

**ECONOMIC ANALYSIS**  
**of**  
**CRITICAL HABITAT DESIGNATION**  
**for the**  
**SPIKEDACE AND LOACH MINNOW**

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## EXECUTIVE SUMMARY

### I. INTRODUCTION

The U.S. Fish and Wildlife Service (Service) is designating critical habitat for the spikedace and loach minnow. The Secretary may exclude an area from critical habitat if it is determined that the economic or other benefits of exclusion outweigh the benefits of designating the area as critical habitat, unless such exclusion would result in extinction of the species. This economic analysis was used in making that determination by examining how the designation may affect Federal lands, and any non-Federal activity with some Federal involvement. Activities on private or state-owned lands that do not involve Federal permits, funding or other Federal actions are not restricted by the designation of critical habitat.

Economic effects caused by the listing of the spikedace and loach minnow as threatened are the baseline upon which critical habitat is imposed. The analysis examines the incremental economic and conservation effects of the critical habitat addition. Economic effects are measured as changes in national income, regional and local jobs, and household income.

### II. ESTABLISHING A FRAMEWORK OF ANALYSIS AND A BASELINE

The economic analysis uses a "with" critical habitat versus a "without" critical habitat framework and seeks to measure the net change in the various categories of benefits and costs when the critical habitat designation is imposed on the existing baseline.

National economic (efficiency) costs represent changes in national income. Losses of timber and grazing revenues and changes in agency operating costs are the main potential economic costs in the case of the spikedace and loach minnow.

Regional economic (distributional) impacts represent transfers between people, groups, or geographic regions, with no net effect on the national total. Changes in employment and household income resulting from changes in use of critical habitat areas and expenditures by management agencies are the main potential regional impacts in the case of the spikedace and loach minnow.

Benefits of Critical Habitat Designation: In addition to eco-tourism and recreational benefits, designating critical habitat may result in other kinds of economic benefits provided directly by the species and indirectly by their habitat. They include biodiversity, ecosystem and passive use (existence) values.

### **III. CRITICAL HABITAT**

The Service is designating approximately 1,302 km (807 mi) of critical habitat for the spikedace and approximately 1,448 km (898 mi) for the loach minnow in portions of the Gila, San Francisco, Blue, Black, Verde, San Pedro rivers and some tributaries in Apache, Cochise, Gila, Graham, Greenlee, Pima, Pinal, and Yavapai counties, Arizona, and Catron, Grant, and Hidalgo counties, New Mexico. The specific areas are identified in more detail below and in the rule.

### **IV. SECTION 7 CONSULTATION**

Critical habitat plays more than an informational role only through Section 7 consultations in which the Service reviews proposed Federal actions. In cases where species are listed without critical habitat, we determine only whether the proposed action is likely to jeopardize the continued existence of the species. In cases where critical habitat has been designated, the Service also determines whether the proposed action is likely to destroy or adversely modify critical habitat. The incremental restrictions and economic effects that result from the additional requirement to avoid adverse modification are the subject of this analysis. The Service believes that generally actions in all designated areas occupied by either spikedace or loach minnows in which there is a finding of adverse modification of critical habitat will also result in a jeopardy decision. The Service does not anticipate that the designation of critical habitat will require additional restrictions in occupied habitat that were not previously in place due to the listing of the species. In most cases, effects attributable to critical habitat designation can occur only where a proposed action adversely modifies critical habitat but does not jeopardize the species. Designation of areas currently unoccupied as critical habitat will now require Federal agencies to consult with the Service on any proposed action that is likely to adversely affect unoccupied critical habitat. Possible impacts of critical habitat designation on unoccupied areas are the focus of this report.

### **V. ECONOMIC PROFILE OF THE AFFECTED COUNTIES**

This section provides a summary of the kinds of economic activities that occur in the Arizona and New Mexico counties with unoccupied critical habitat. It also includes data on income, unemployment rates, and selected demographic characteristics. The affected counties are primarily agricultural. Some have significant minority populations and per capita incomes that are below both state and national averages.

### **VI. EFFECTS ON ACTIVITIES WITH A FEDERAL NEXUS**

The U.S. Forest Service and the U.S. Bureau of Land Management manage areas designated as critical habitat for the spikedace and loach minnow. Section 7 consultations with these agencies must now consider whether their activities result in adverse modification of critical habitat as well as jeopardy. Other Federal agencies that may be involved through actions they fund, authorize or carry out include the Natural Resources Conservation Service, Army Corps of Engineers, Bureau of Reclamation, Environmental Protection Agency, Federal Emergency Management Agency, and the U.S. Fish and Wildlife Service.

In comments on the proposal, the Forest Service said that all but 6% of unoccupied critical habitat on National Forests was already protected for other purposes and that adding critical habitat for the two fish would have only a small economic impact. The Bureau of Land Management (BLM) comments said there may be a significant adverse impact on the town of Safford which currently uses Bonita Creek, an unoccupied designated area, as its principle source of potable water. Two other relatively small areas of unoccupied BLM land may require modification of grazing and recreation activities, but what the changes would be was unknown, pending consultation with the Service. The Army Corps of Engineers said they had 25 applications for road maintenance and other projects requiring Section 404 permits on the river segments designated as critical habitat. They could not provide any detail about the projects and whether they affect occupied or unoccupied habitat, given the time constraints on this rule-making. The other Federal agencies had no comments on the proposal.

## **VII. NON-FEDERAL LAND**

Some of the area designated as critical habitat for the spikedace and loach minnow is on state and private land. The specific areas and their legal descriptions are included in the rule. The designation of critical habitat has no direct effect on non-Federal actions on state or privately owned land even if such land is within the mapped boundary of designated critical habitat. Critical habitat has possible effects on activities of non-Federal landowners only if the activity involves Federal funding, a Federal permit, or other Federal action. If such a Federal nexus exists, we will work with the landowner and the appropriate Federal agency during Section 7 consultation to develop a project that can be completed without jeopardizing the species or destroying or adversely modifying critical habitat.

## ECONOMIC ANALYSIS OF DESIGNATING CRITICAL HABITAT FOR THE SPIKEDACE AND LOACH MINNOW

### I. INTRODUCTION

The Fish and Wildlife Service (Service), is designating critical habitat pursuant to the Endangered Species Act of 1973 (Act), for the spikedace (Meda fulgida) and the loach minnow (Tiaroga = (Rhinichthys) cobitis). This rule is made in response to a court order, Southwest Center for Biological Diversity v. Clark, CIV 98-0769 M/JHG, directing the Service to complete designation of critical habitat for the spikedace and loach minnow by April 21, 2000. On October 6, 1999, the court amended the September 20, 1999 order to require us to make a critical habitat determination rather than requiring actual designation. On December 22, 1999, the court extended the deadline to complete our determination until April 21, 2000. We published our proposed rule to designate critical habitat in the Federal Register on December 10, 1999. The chronology of the listings and previous critical habitat designations for the spikedace and loach minnow, and ensuing Court decisions are discussed in the rule.

The Service is proposing approximately 1,302 km (807 mi) of critical habitat for the spikedace and approximately 1,448 km (898 mi) for the loach minnow in portions of the Gila, San Francisco, Blue, Black, Verde, San Pedro rivers and some tributaries in Apache, Cochise, Gila, Graham, Greenlee, Pima, Pinal, and Yavapai counties, Arizona, and Catron, Grant, and Hidalgo counties, New Mexico. The specific areas are identified in more detail below.

The Act stipulates that the listing of species should not consider economic consequences, but when critical habitat is designated Section 4(b)(2) of the Act directs the Secretary of the Interior (Secretary) to evaluate economic and other impacts that result from its designation. An area may be excluded from critical habitat if the Secretary determines that the economic or other benefits of exclusion outweigh the benefits of designating the area as critical habitat, unless such exclusion would result in extinction of the species.

This economic analysis was designed to provide information to assist in making that determination. It was conducted by examining how designation of critical habitat for the spikedace and loach minnow is expected to affect the use of Federal lands, and any non-Federal activity with some Federal involvement. Activities on private or state-owned lands that do not involve Federal permits, funding or other Federal actions are not restricted by the designation of critical habitat, although the "take" provisions of Sections 9 and 10 of the Act still apply.

The economic analysis distinguishes between effects caused by the listing of the two fish as threatened and those caused by the proposed designation of critical habitat. Furthermore, if an

action would otherwise have been limited or prohibited by another Federal or state statute or regulation, such as the Clean Water Act, those economic effects would not be attributable to either listing or critical habitat designation under the Endangered Species Act. In essence, the economic effects of proposed actions subject to some restriction without this rulemaking are not attributed to this rulemaking.

The remainder of this report is organized as follows. Section II establishes a framework and baseline for the analysis. Section III provides a brief description of the areas of critical habitat. Section IV describes critical habitat consultation requirements under the Act. Section V provides an economic profile of the affected counties. Section VI presents a discussion of the possible effects of critical habitat designation on Federal agencies. Section VII describes the effect of critical habitat designation on non-Federal land.

## **II. ESTABLISHING A FRAMEWORK OF ANALYSIS AND A BASELINE**

Economic effects of critical habitat designation are the costs or benefits to society of precluding or limiting specific land and water uses in areas designated as critical habitat. In this report, economic effects are categorized as either efficiency or distributional. Economic efficiency effects are those consequences of critical habitat designation that cause changes in national income. Economic distribution effects pertain to regional changes that may have offsetting effects elsewhere in the economy. Efficiency consequences in this report are referred to as economic costs, or simply costs, and distributional consequences are referred to as economic impacts. Distributional effects are used to evaluate regional and local economic impacts. Both are also used to fulfill environmental justice and regulatory burden requirements (Executive Orders 12898 and 12866).

This economic analysis examines the costs and benefits of precluding or limiting specific land uses within areas designated as critical habitat. It is cast in a "with" critical habitat versus a "without" critical habitat framework and seeks to measure the net change in the various categories of benefits and costs when the critical habitat designation is imposed on the existing baseline.

### **National and Regional Effects:**

The economic effects of critical habitat designation consist of those affecting national income and those economic and social impacts that are important on a local or regional level.

National economic (efficiency) costs represent changes in national income (the total value of goods and services). They are measured as changes in consumer surplus and producer surplus (economic rent). Gains and losses in recreation values, changes in costs of management agencies or development projects, changes in earnings of displaced labor or capital assets, and changes in revenue from user fees are possible national economic costs of critical habitat designation. The economic cost of designating critical habitat includes any additional costs that

are imposed, regardless of whether they are incurred by a Federal agency, a state agency or the private sector so long as they stem from a Section 7 consultation.

Costs are measured in terms of opportunity cost, defined as what society gives up by using scarce economic resources to protect or enhance critical habitat. For additional labor or other resources used to protect or enhance habitat, market prices are used to measure opportunity cost, the resources' value in their next best alternative use. For labor or other resources displaced by critical habitat, opportunity cost is measured as the difference in their earnings before critical habitat designation and earnings in their next best use when the current use is precluded.

Regional economic (distributional) impacts represent transfers between people, groups, or geographic regions, with no net effect on the national total. Distributional impacts relate to equity and fairness considerations and deal primarily with how income and wealth are divided among regions and groups. Changes in employment, household income and local or state tax revenues are frequently used to portray regional effects.

## **II. A A Net-Cost With and With-out Approach**

Designation of critical habitat may result in both economic gains and losses. Careful application of a with and without analytical framework will help to distinguish between the two. For example with critical habitat, eco-tourism and recreation such as fishing may be preserved that otherwise would have been lost because of a development project or continued habitat loss. The national income value of those activities and the regional jobs and household income they produce are gains, or benefits, of designation. Without critical habitat, an area may have been used for other commercial or recreational purposes, ORV use for example, but critical habitat designation may limit those uses. The values and jobs associated with that now precluded use become a loss due to critical habitat designation. It is the net effect of these changes in both the national and regional accounts that is important. Describing what probably would happen to an area of critical habitat in the with and without scenarios, both currently and in the future, is an important part of the analysis. The availability of data limits quantification of the net effects in many instances.

### **Benefits of Critical Habitat Designation**

In addition to recreation and eco-tourism benefits, designating critical habitat may result in other kinds of economic benefits provided directly by the species and indirectly by its habitat. Categories of these kinds of potential benefits for the spinedace and loach minnow include biodiversity, ecosystem and passive use (existence) values. These benefits may result because society, species, and ecosystems are spared adverse and irreversible effects of habitat loss and species extinction.

## **II. B Baseline for Analysis**

Prior to their listing as threatened, the spikedace and loach minnow had some protection under the Federal Clean Water Act. The Endangered Species Act added additional protection in its listing provisions. The economic effects of critical habitat designation, as well as the conservation benefits that designation provides for the species, are incremental to other statutes and to listing of the two fish as threatened. Actions taken for those purposes establish the baseline for this analysis. It is the increase in species protection provided by designation of critical habitat and the change in economic costs, regional impacts, and benefits that the designation produces compared to that baseline that are the subject of this analysis.

### **III. CRITICAL HABITAT FOR THE SPIKEDACE AND LOACH MINNOW**

The spikedace is a small, slim fish less than 80 millimeters (3 inches) long. It is characterized by very silvery sides and spines in the dorsal and pelvic fin. This species is found in moderate to large perennial streams, where it inhabits shallow riffles with sand, gravel, and rubble substrates and moderate to swift currents as well as swift pools over sand or gravel substrates. Specific habitat for this species consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at downstream riffle edges. The spikedace was once common throughout much of the Gila River basin. At present, the species is common only in Aravaipa Creek and some parts of the upper Gila River in New Mexico.

The loach minnow is a small, slender, elongated fish less than 80 millimeters (3 inches) long. It is olivaceous in color with an oblique terminal mouth and eyes markedly upward-directed). This species is found in small to large perennial streams, using shallow, turbulent riffles with primarily cobble substrate and swift currents. The loach minnow was once locally common throughout much of the Gila River basin. Because of habitat destruction and competition and predation by nonnative aquatic species, its range and abundance have been severely reduced. The present range is only 15-20% of this historic range and the status of the species within occupied areas ranges from common to very rare. At present, the species is common only in Aravaipa Creek, the Blue River, and limited portions of the San Francisco, upper Gila, and Tularosa Rivers in New Mexico.

The loach minnow and spikedace share much of the same habitat. Recurrent flooding and a natural hydrograph are very important in maintaining that habitat for both species and also help them maintain a competitive edge over invading non-native aquatic species. A detailed discussion of the fish and their habitat requirements is included in the rule.

The rule identifies an array of activities that may affect spikedace or loach minnow and their critical habitats. They include land management plans; road and bridge construction, maintenance, and repair; water diversion and development; reservoir construction; off-road vehicle uses; livestock grazing and management; prescribed burning; powerline construction and repair; game fish stocking; timber harvest; flood repair and control; groundwater development;

channelization; municipal or industrial water withdrawal, and canal and other water transport facilities construction and operation.

Unless otherwise indicated, the following areas are designated as critical habitat for both spikedace and loach minnow (see the Regulation Promulgation section of the rule for exact descriptions of boundaries). The designation includes portions of 24 and 36 streams for spikedace and loach minnow, respectively; however, individual streams are not isolated, but are connected with others to form areas or “complexes.” The complexes include those that currently support populations of the fishes, as well as some currently unoccupied by the species, but which are considered essential for reestablishing populations to achieve recovery. The distances and conversions below are approximate; more precise estimates are provided in the Regulation Promulgation section of the rule.

1. Verde River complex, Yavapai County, Arizona. The Verde River complex is currently occupied by spikedace. Its tributary streams are believed to be currently unoccupied by either species. The Verde River complex is unusual in that a relatively stable thermal and hydrologic regime is found in the upper river and in Fossil Creek. Also, spikedace in the Verde River are genetically (Tibbets 1993) and morphologically (Anderson and Hendrickson 1994) distinct from all other spikedace populations. The continuing presence of spikedace and the existence of suitable habitat create a high potential for restoration of loach minnow to the Verde system.

a. Verde River—171 km (106 mi) of river extending from the confluence with Fossil Creek upstream to Sullivan Dam, but excluding lands belonging to the Yavapai Apache Tribe. Sullivan Dam is at the upstream limit of perennial flow in the mainstem Verde River. Perennial flow results from a series of river-channel springs and from Granite Creek. Below Fossil Creek, the Verde River has a larger flow and was thought at the time of the proposal to offer little suitable habitat for spikedace or loach minnow. However, this is historical range for both species and comments from the U.S. Forest Service (USFS) indicate this stretch of the river may offer substantial value for spikedace and loach minnow recovery. We will seek further information regarding the role of this portion of the Verde River for the species and may consider its designation in future potential revisions of the critical habitat.

b. Fossil Creek—8 km (5 mi) of creek extending from the confluence with the Verde River upstream to the confluence with an unnamed tributary. The lower portion of Fossil Creek contains all elements of spikedace and loach minnow habitat at present, except sufficient discharge. Discharge is currently diverted for hydropower generation at the Childs/Irving Hydropower site. However, operators of the Childs/Irving Hydropower project have agreed to provide enhanced flows into lower Fossil Creek, although the amount of that flow restoration is still under negotiation.

- c. West Clear Creek—12 km (7 mi) of creek extending from the confluence with the Verde River upstream to the confluence with Black Mountain Canyon. The lower portion of West Clear Creek was historically known to support the spikedace and contains suitable, although degraded, habitat for the fishes. Gradient and channel morphology changes above Black Mountain Canyon make the upstream area unsuitable for either species.
- d. Beaver/Wet Beaver Creek—33 km (21 mi) of creek extending from the confluence with the Verde River upstream to the confluence with Casner Canyon. Beaver Creek, and its upstream extension in Wet Beaver Creek, historically supported spikedace and loach minnow and contains suitable, although degraded, habitat. Above Casner Canyon, gradient and channel morphology changes make the stream unsuitable for either species.
- e. Oak Creek—54 km (34 mi) of creek extending from the confluence with the Verde River upstream to the confluence with an unnamed tributary (near the Yavapai/Coconino County boundary). The lower portion of Oak Creek is part of the historical range of the two species and contains suitable, although degraded, habitat. Above the unnamed tributary, the creek becomes unsuitable for either species due to urban and suburban development and to increasing gradient and substrate size.
- f. Granite Creek—2.3 km (1.4 mi) of creek extending from the confluence with the Verde River upstream to a spring. Below the spring, which supplies much of the base flow of Granite Creek, there is suitable habitat for loach minnow. As a perennial tributary of the upper Verde River, Granite Creek is considered an important expansion area for spikedace recovery.

2. Black River complex, Apache and Greenlee counties, Arizona. In response to comments received on the suitability of this complex, we have not designated any areas within the complex as critical habitat for spikedace. The basis for this deletion from the proposed rule is biological, given that spikedace are not known to historically occupy areas at this elevation. However, the data on maximum elevation for spikedace are not definitive and if information becomes available that differs from that currently available, the Black River complex may be reevaluated for spikedace critical habitat designation. The Salt River subbasin is a significant portion of spikedace historical range and has no existing population of spikedace. Large areas of the subbasin are unsuitable, either because of topography or because of reservoirs, stream channel alteration by humans, or overwhelming nonnative species populations.

The Salt River subbasin is a significant portion of loach minnow historical range, but loach minnow have been extirpated from all but a small portion in the Black and White rivers. As the only remaining population of loach minnow on public lands in the Salt River basin, the Black River complex is considered vital to survival and recovery of the species.

- a. East Fork Black River– Loach minnow only: 8 km (5 mi) of river extending from the confluence with the West Fork Black River upstream to the confluence with Deer Creek. This area is occupied by loach minnow, although the downstream extent of the population is not well known. This population was only discovered in 1996.
- b. North Fork of the East Fork Black River– Loach minnow only: 18 km (11 mi) of river extending from the confluence with Deer Creek upstream to the confluence with an unnamed tributary. This area is occupied by loach minnow, although the upstream portion of the population is not well known. Above the unnamed tributary, the river character makes it unsuitable for loach minnow.
- c. Boneyard Creek– Loach minnow only: 2.3 km (1.4 mi) of creek extending from the confluence with the East Fork Black River upstream to the confluence with an unnamed tributary. Although no loach minnow have been found in Boneyard Creek, they are probably present based on the pattern of occupation of lower portions of small tributaries in other parts of the loach minnow range.
- d. Coyote Creek– Loach minnow only: 3 km (2 mi) of creek extending from the confluence with the East Fork Black River upstream to the confluence with an unnamed tributary. Loach minnow are thought to use the lower portion of this creek as part of the population in the East Fork Black River.
- e. West Fork Black River– Loach minnow only: 10 km (6 mi) of river extending from the confluence with the East Fork Black River upstream to the confluence with Hay Creek. Above Hay Creek, the gradient and channel morphology are unsuitable for loach minnow. The West Fork Black River is not known to be occupied by loach minnow at present. However, it is considered important for conservation of the Black River remnant of the Salt River subbasin population.

3. Tonto Creek complex, Gila County, Arizona. Spikedace are known to have occupied Tonto Creek, and loach minnow are presumed to have done so although no records exist. Suitable habitat still exists, although degradation has occurred due to watershed uses, water diversion, agriculture, roads, and nonnative species introduction. The presence of substantial areas of USFS lands make this one of the most promising areas for reestablishment of spikedace and loach minnow in the Salt River subbasin.

a. Tonto Creek–

Spikedace: 47 km (29 mi) of creek extending from the confluence with Greenback Creek upstream to the confluence with Houston Creek. The influence of Roosevelt Lake below Greenback Creek, and gradient and substrate changes above Houston Creek, make the stream unsuitable for spikedace.

Loach minnow: 70 km (44 mi) of creek extending from the confluence with Greenback Creek upstream to the confluence with Haigler Creek. The influence of Roosevelt Lake above Greenback Creek and changes in channel morphology above Haigler Creek make those portions of the stream unsuitable for loach minnow.

b. Greenback Creek—14 km (8 mi) of creek extending from the confluence with Tonto Creek upstream to Lime Springs.

c. Rye Creek—2.1 km (1.3 mi) of creek extending from the confluence with Tonto Creek upstream to the confluence with Brady Canyon. This area of Rye Creek still supports a native fish community indicating high potential for spokedace and loach minnow reestablishment.

4. Middle Gila/Lower San Pedro/Aravaipa Creek complex, Pinal and Graham counties, Arizona. This complex is occupied by spokedace with its population status ranging from rare to common. Aravaipa Creek supports some of the best and most protected spokedace and loach minnow populations due to special use designations on Bureau of Land Management (BLM) land and to substantial ownership by The Nature Conservancy as well as planned construction of fish barriers to prevent invasion of nonnative fish species. Enhancement of downstream habitats in the San Pedro and Gila rivers would contribute substantially to recovery of these species.

a. Gila River—63 km (39 mi) of river extending from Ashurst-Hayden Dam upstream to the confluence with the San Pedro River. A small population of spokedace currently occupies this area. At Ashurst-Hayden Dam, all water is diverted into a canal. Above the confluence with the San Pedro River, flow in the Gila River is highly regulated by San Carlos Dam and becomes marginally suitable for either species. Below the confluence, the input of the San Pedro provides a sufficiently unregulated hydrograph which is a primary constituent element of loach minnow and spokedace critical habitat.

b. San Pedro River—21 km (13 mi) of river extending from the confluence with the Gila River upstream to the confluence with Aravaipa Creek. This area is currently occupied by spokedace. It provides an important connection between the existing population of loach minnow in Aravaipa Creek and the recovery habitat in the Gila River. Existing flow in the river comes primarily from surface and subsurface contributions from Aravaipa Creek.

c. Aravaipa Creek—45 km (28 mi) of creek extending from the confluence with the San Pedro River upstream to the confluence with Stowe Gulch. Aravaipa Creek supports a substantial population of spokedace and loach minnow. Stowe Gulch is the upstream limit of sufficient perennial flow for either species.

d. Turkey Creek—Loach minnow only: 4 km (3 mi) of creek extending from the confluence with Aravaipa Creek upstream to the confluence with Oak Grove Canyon.

This creek is occupied by loach minnow. A substantial portion of the flow in Turkey Creek comes from the Oak Grove Canyon tributary.

e. Deer Creek–Loach minnow only: 4 km (3 mi) of creek extending from the confluence with Aravaipa Creek upstream to the boundary of the Aravaipa Wilderness. This stream is occupied by loach minnow. Suitable habitat extends to the Wilderness boundary.

5. Middle-Upper San Pedro River complex, Cochise, Graham, and Pima counties, Arizona. None of the habitat in this complex is currently occupied by spinedace or loach minnow. However, the San Pedro River is the type locality of spinedace, and this complex contains important restoration areas.

a. San Pedro River–74 km (46 mi) of river extending from the confluence with Alder Wash (near Redfield) upstream to the confluence with Ash Creek (near the Narrows). This middle portion of the river is expected to have increasing surface flow due to restoration activities, including riparian and channel restoration, watershed improvements, and groundwater pumping reductions.

b. Redfield Canyon–22 km (14 mi) of creek extending from the confluence with the San Pedro River upstream to the confluence with Sycamore Canyon. Above Sycamore Canyon, permanent water becomes too scarce, and the habitat becomes unsuitable.

c. Hot Springs Canyon–19 km (12 mi) of creek extending from the confluence with the San Pedro River upstream to the confluence with Bass Canyon. Hot Springs Canyon is currently unoccupied but contains suitable habitat for restoration of spinedace and loach minnow.

d. Bass Canyon–5 km (3 mi) of creek extending from the confluence with Hot Springs Canyon upstream to the confluence with Pine Canyon. Bass Canyon is an extension of the Hot Springs Canyon habitat.

e. San Pedro River–60 km (37 mi) of river extending from the confluence with the Babocomari River upstream to the U.S./Mexico border. Although currently unoccupied, this area is identified in BLM (1993) planning documents as a restoration area for spinedace and loach minnow.

6. Gila Box/San Francisco River complex, Graham and Greenlee counties, Arizona and Catron County, New Mexico. The only spinedace population remaining in the complex is in Eagle Creek. Substantial restoration potential for spinedace exists in the remainder of the complex. This complex has the largest area of habitat suitable for spinedace restoration.

Most of this complex is occupied by loach minnow, although the status varies substantially from one portion to another. Only Bonita Creek, Little Blue Creek, and the Gila

River are currently unoccupied. The Blue River system and adjacent portions of the San Francisco River is the longest stretch of occupied loach minnow habitat unbroken by large areas of unsuitable habitat. Management of Federal lands and resources in the Gila Box, Bonita Creek, and the Blue River are highly compatible with recovery goals, giving restoration of spikedace and loach minnow in this complex a high likelihood of success.

a. Gila River—36 km (23 mi) of river extending from the Brown Canal diversion, at the head of the Safford Valley, upstream to the confluence with Owl Canyon, at the upper end of the Gila Box. The Gila Box is not known to currently support spikedace, but is considered to have a high potential for restoration of both species. Both above and below the Gila Box, the Gila River is highly modified by agriculture, diversions, and urban development.

b. Bonita Creek—24 km (15 mi) of creek extending from the confluence with the Gila River upstream to the confluence with Martinez Wash. Bonita Creek has suitable habitat for spikedace and loach minnow. Bonita Creek above Martinez Wash lies on the San Carlos Apache Reservation, which is excluded from this designation.

c. Eagle Creek—73 km (45 mi) of creek extending from the Phelps-Dodge Diversion Dam upstream to the confluence of Dry Prong and East Eagle creeks, but excluding lands of the San Carlos Apache Reservation. Because the creek repeatedly flows from private or USFS lands into the San Carlos Apache Reservation and back, it is difficult to separately calculate stream mileages on tribal lands. Therefore, the above mileage covers the entire stream segment and is not corrected for tribal exclusions. Eagle Creek supports a small population of spikedace. Below the Phelps-Dodge Diversion Dam the creek is often dry; however comments received on the proposed rule suggest the stretch of Eagle Creek below the dam may offer sufficient connective value and habitat value to justify its inclusion in critical habitat. This area may be considered for critical habitat in future revisions of this designation.

d. San Francisco River—

Spikedace: 182 km (113 mi) of river extending from the confluence with the Gila River upstream to the confluence with the Tularosa River. Habitat above the Tularosa River does not appear suitable for spikedace. The San Francisco River was historically occupied by spikedace and is important habitat for restoration of the species.

Loach minnow: 203 km (126 mi) of river extending from the confluence with the Gila River upstream to the mouth of The Box, a canyon above the town of Reserve. Loach minnow in the San Francisco River vary from common to rare throughout the length of the river.

e. Tularosa River–Loach minnow only: 30 km (19 mi) of river extending from the confluence with the San Francisco River upstream to the town of Cruzville. Above Cruzville, the habitat becomes unsuitable.

f. Negrito Creek–Loach minnow only: 7 km (4 mi) of creek extending from the confluence with the San Francisco River upstream to the confluence with Cerco Canyon. Above this area, gradient and channel morphology make the creek unsuitable for loach minnow.

g. Whitewater Creek–Loach minnow only: 2 km (1 mi) of creek extending from the confluence with the San Francisco River upstream to the confluence with Little Whitewater Creek. Upstream gradient and channel changes make the portion above Little Whitewater Creek unsuitable for loach minnow.

h. Blue River–82 km (51 mi) of river extending from the confluence with the San Francisco River upstream to the confluence of Campbell Blue and Dry Blue creeks. The Blue River is not currently occupied by spikedace, but planning among several State and Federal agencies for restoration of native fishes in the Blue River is under way.

i. Campbell Blue Creek–13 km (8 mi) of creek extending from the confluence of Dry Blue and Campbell Blue creeks upstream to the confluence with Coleman Canyon. Above Coleman Canyon, the creek changes and becomes steeper and rockier, making it unsuitable for spikedace or loach minnow.

j. Dry Blue Creek–Loach minnow only: 5 km (3 mi) of creek extending from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek.

k. Pace Creek–Loach minnow only: 1.2 km (0.8 mi) of creek extending from the confluence with Dry Blue Creek upstream to a barrier falls.

l. Frieborn Creek–Loach minnow only: 1.8 km ( 1.1 mi) of creek extending from the confluence with Dry Blue Creek upstream to an unnamed tributary.

m. Little Blue Creek–5 km (3 mi) of creek extending from the confluence with the Blue River upstream to the mouth of a box canyon. Little Blue Creek is not currently occupied by spikedace or loach minnow, but contains suitable habitat and is considered an important restoration area for both species.

7. Upper Gila River complex, Grant, Catron, and Hidalgo counties, New Mexico. This complex is occupied throughout by loach minnow and contains the largest remaining population of spikedace. It is considered to represent the "core" of what remains of the species. Because of the remoteness of the area, there is a relatively low degree of habitat threats.

- a. Gila River—164 km (102 mi) of river extending from the confluence with Moore Canyon (near the Arizona/New Mexico border) upstream to the confluence of the East and West Forks. Spikedace and loach minnow are known to occupy the river into the Duncan-Virden Valley (Rinne 1999b).
- b. East Fork Gila River—42 km (26 mi) of river extending from the confluence with the West Fork Gila River upstream to the confluence of Beaver and Taylor creeks.
- c. Middle Fork Gila River—
  - Spikedace: 12 km (8 mi) of river extending from the confluence with the West Fork Gila River upstream to the confluence with Big Bear Canyon.
  - Loach minnow: 19 km (12 mi) of river extending from the confluence with the West Fork Gila River upstream to the confluence with Brothers West Canyon
- d. West Fork Gila River—12 km (8 mi) of river extending from the confluence with the East Fork Gila River upstream to the confluence with EE Canyon. This lower portion of the West Fork is occupied by spikedace and loach minnow, but the river becomes unsuitable above EE Canyon due to gradient and channel morphology.

#### **IV. CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT**

Section 7(a)(2) of the Act requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of critical habitat. In a Section 7 consultation the action agency and the Service review the agency's proposed action to determine whether that action may adversely affect the species or its critical habitat. During consultation, the Service prepares a biological opinion in which it is determined whether the proposed action is likely to : 1) jeopardize the continued existence of the listed species, or 2) destroy or adversely modify any designated critical habitat. If the action is found to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat, the Service is required to provide, to the extent possible, reasonable and prudent alternatives to the proposed action. By definition, reasonable and prudent alternatives are technologically and financially feasible, and allow the proposed action to go forward while removing the conditions that jeopardize the species or destroy or adversely modify its critical habitat.

For the spikedace and loach minnow such alternatives may include adjustment in timing of projects to avoid sensitive periods for the species or their habitats; replanting of riparian vegetation; minimization of work and vehicle use in the wetted channel; restriction of riparian and upland vegetation clearing; fencing to control livestock access and use of alternative

livestock management techniques; monitoring of riparian vegetation, channel morphology, and fish populations; sign installation; protection of buffer zones; avoidance of pollution; cooperative planning efforts; minimization of ground disturbance in the floodplain; use of alternative materials sources; storage and staging outside the floodplain; use of block nets to exclude fish from the work site; use of sediment barriers; removal of fish from the project area; access restrictions; and use of best management practices.

In cases where species are listed without critical habitat, in Section 7 consultations the Service determines only whether the proposed action is likely to jeopardize the continued existence of the species. In cases where critical habitat has been designated the Service also determines whether the proposed action is likely to destroy or adversely modify its critical habitat. The additional requirement for Federal agencies to avoid destruction and adverse modification of critical habitat may result in incremental restrictions on agency actions beyond those required to avoid jeopardy or for other statutory or regulatory purposes.

Such incremental restrictions arising from Section 7 consultations are the only way that designating critical habitat produces an economic impact attributable to the Act. The incremental costs and benefits resulting from the additional requirement to avoid adverse modification are the subject of this analysis. Determination of whether an action will result in jeopardy and/or adverse modification is dependent upon a number of factors, such as the type of project, its size, location, and duration.

“Jeopardize the continued existence” (of a species) is defined as an appreciable reduction in the likelihood of survival and recovery of a listed species. “Destruction or adverse modification” (of critical habitat) is defined as a direct or indirect alteration that appreciably diminishes the value of critical habitat for the survival and recovery of the listed species for which critical habitat has been designated. Thus, the definitions of “jeopardy” to the species and “adverse modification” of critical habitat are very similar (50 CFR Sec. 402.02).

Common to both definitions is an appreciable detrimental effect on both survival and recovery of a listed species. Thus, for most species, actions in occupied habitat that are likely to destroy or adversely modify critical habitat are nearly always found likely to jeopardize the species concerned, and in most cases the existence of a critical habitat designation in occupied habitat does not materially affect the outcome of a consultation. In fact, biological opinions that conclude that a Federal agency action in occupied habitat is likely to adversely modify critical habitat but not to jeopardize the species for which it is designated are extremely rare historically and none have been issued in recent years by the Service. Thus, designation of critical habitat on areas occupied by either or both of the fish will result in no incremental economic costs or impacts beyond those created by listing. This economic analysis will address only potential costs or impacts created by adverse modification decisions on areas not currently occupied by either spinedace or loach minnow but which have the necessary habitat characteristics to serve as areas required for recovery of the two species.

The similarity of the jeopardy and adverse modification standards is true for actions that affect spinedace and loach minnow. Federal agencies currently consult with the Service to ensure their actions do not jeopardize the continued existence of the species in occupied areas. Designation of critical habitat may require re-opening of those consultations to consider adverse modification. The Service does not anticipate that the designation of critical habitat will require additional restrictions in occupied habitat that were not previously in place due to the listing of the species. Designation of areas currently unoccupied as critical habitat will now require Federal agencies to consult with the Service on any action that is likely to adversely affect any unoccupied critical habitat.

Critical habitat may assist in focusing conservation activities on non-Federal land with no Federal nexus by identifying areas that contain essential habitat features. This alerts the public and land management agencies to the importance of an area in the conservation of that species. Critical habitat also identifies areas that may require additional species management or protection.

Table 1 lists the areas of critical habitat that are currently occupied by one or both of the two fish. Table 2 lists those areas that are not currently occupied by either spinedace or loach minnow but which can contribute towards their recovery. It is the economic effects of Section 7 consultations on the unoccupied areas in Table 2 which result in adverse modification but not jeopardy decisions that are the focus of this report.

**Table 1.** Stream distances in kilometers (miles) occupied by either Loach Minnow (*Tiaroga cobitis*) or Spikedace (*Meda fulgida*) by county and ownership.

	Private State		FederalOther Gov.	Total	
Apache Co., AZ	0	0	11.3 (7.0)	0	11.3 (7.0)
Cochise Co., AZ	0	0	0	0	0
Gila Co., AZ	0	0	0	0	0
Graham Co., AZ	10.3 (6.4)	0	4.7 (2.9)	26.1 (16.2)	41.1 (25.5)
Greenlee Co., AZ	45.0 (27.9)	2.6 (1.6)	109.5 (67.9)	0	157.1 (97.4)
Pima Co., AZ	0	0	0	0	0
Pinal Co., AZ	58.5 (36.3)	6.8 (4.2)	48.2 (29.9)	1.0 (0.6)	114.5 (71.0)
Yavapai Co., AZ	56.5 (35.0)	5.8 (3.6)	52.2 (32.4)	1.6 (1.0)*	116.1 (72)
<b>AZ Total</b>	<b>170.0 (105.4)</b>	<b>15.7 (9.7)</b>	<b>225.7 (140.0)</b>	<b>28.7 (17.8)</b>	<b>440.1 (272.9)</b>
Catron Co., NM	79.0 (49.0)	5.3 (3.3)	145.23 (90.0)	0.8(0.5)	230.3 (142.8)
Grant Co., NM	53.2 (33.0)	2.1 (1.3)	72.9 (45.2)	0	128.2 (79.5)
Hidalgo Co., NM	10.6 (6.6)	0	7.3 (4.5)	0	17.9 (11.1)
<b>NM Total</b>	<b>142.8 (88.6)</b>	<b>7.4 (4.6)</b>	<b>225.4 (139.7)</b>	<b>0.8 (0.5)</b>	<b>376.4 (233.4)</b>
<b>TOTAL</b>	<b>312.8 (194.0)</b>	<b>23.1 (14.3)</b>	<b>451.1 (279.7)</b>	<b>29.5 (18.3)</b>	<b>816.5 (506.3)</b>

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\* This area is included in the total critical habitat mileages, but is excluded by description.

**Table 2.** Stream distances in kilometers (miles) unoccupied but recoverable by either Loach Minnow (*Tiaroga cobitis*) or Spikedace (*Meda fulgida*) by county and ownership.

	Private State	Federal	Other Gov.	Total	
Apache Co., AZ	3.4(2.1)	0	24.1(15.0)	0	27.6(17.1)
Cochise Co., AZ	17.3(10.7)	5.6(3.5)	61.2(38.0)	0	84.1(52.2)
Gila Co., AZ	12.0(7.5)	0	81.6(50.6)	0	93.6(58.1)
Graham Co., AZ	21.1(13.1)	13.9(8.6)	50.1(31.1)	5.5(3.4)	90.6(56.2)
Greenlee Co., AZ	30.6(19.0)	3.9(2.4)	18.9(11.7)	0	53.4(33.1)
Pima Co., AZ	70.6(43.8)	3.2(2.0)	0	0	73.9(45.8)
Pinal Co., AZ	0	0	0	0	0
Yavapai Co., AZ	55.3(34.3)	7.1(4.4)	95.2(59.0)	0	157.6(97.7)
<b>AZ Total</b>	<b>210.3(130.5)</b>	<b>33.7(20.9)</b>	<b>331.1(205.4)</b>	<b>5.5(3.4)</b>	<b>580.8(360.2)</b>
Catron Co., NM	0	0	0	0	0
Grant Co., NM	4.0(2.5)	0	47.9(29.7)	0	51.9(32.2)
Hidalgo Co., NM	0	0	0	0	0
<b>NM Total</b>	<b>4.0(2.5)</b>	<b>0</b>	<b>47.9(29.7)</b>	<b>0</b>	<b>51.9(32.2)</b>
<b>TOTAL</b>	<b>214.3(133.0)</b>	<b>33.7(20.9)</b>	<b>379.0(235.1)</b>	<b>5.5(3.4)</b>	<b>632.7(392.4)</b>

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\* Yavapai and Gila Counties share a border at Fossil Creek. The mileage is included in Gila County and not here.

As shown in the tables, land ownership within the critical habitat is mixed. There are large blocks of Federal land managed by the U.S. Forest Service, and the U.S. Bureau of Land Management. There is also non-Federal land belonging to the States of Arizona and New Mexico as well as private and municipal owners. A detailed listing of land ownership is included in the rule.

Table 3 shows total occupied and unoccupied river miles designated for the two fish.

**Table 3. River Miles of Critical Habitat**

	<u>Spikedace</u>	<u>Loach Minnow</u>	<u>Both</u>
River Miles Occupied by loach minnow and spikeace	289	381	506
River Miles Not Currently Occupied by loach minnow and spikedace	537	526	392
Total River Miles Designated	826	898	898
Occupied River Miles as a Percent of Total River Miles Designated	35%	42%	56%
Unoccupied River Miles as a Percent of Total River Miles Designated	65%	58%	44%

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## **V. Economic Profile of the Affected Areas**

### **New Mexico**

#### **Grant County Economic Profile**

In New Mexico, the economy of the only county affected (Grant County) is primarily rural. The population of Grant County was just over 31,000 in 1977 and has grown by 13 percent since 1990. During this period of growth, the percent of the population living below the poverty level ( 1993 data, the most recent available) was 22 percent. Many of the county residents are of Hispanic origin ( 51 percent of the county residents). Of the total business establishments in the County, 94 percent employed fewer than 20 employees.

Descriptions of the 10 year trends for each county are shown below. They were taken from the Regional Economic Information System developed by the Bureau of Economic Analysis and posted on their web site at [http://govinfo.library.orst.edu/cgi-bin/bfact?8\\_05-017.nmc](http://govinfo.library.orst.edu/cgi-bin/bfact?8_05-017.nmc).

Grant County - 1987-97

## PER CAPITA PERSONAL INCOME

In 1997, Grant County had a per capita personal income (PCPI) of \$16,713. This ranked 15th in the State, and was 87 percent of the State average, \$19,298, and 66 percent of the national average, \$25,288. In 1987, the PCPI of Grant was \$10,955 and ranked 14th in the State. The average annual growth rate of PCPI over the past 10 years was 4.3 percent. The average annual growth rate for the State was 4.6 percent and for the nation was 4.7 percent.

## EARNINGS BY INDUSTRY

Earnings of persons employed in Grant increased from \$197,147,000 in 1987 to \$339,462,000 in 1997, an average annual growth rate of 5.6 percent. The largest industries in 1997 were mining, 28.4 percent of earnings; state and local government, 21.5 percent; and services, 12.4 percent. In 1987, the largest industries were mining, 28.5 percent of earnings; state and local government, 19.4 percent; and retail trade, 11.4 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was retail trade (9.3 percent of earnings in 1997) which increased at an average annual rate of 3.4 percent; the fastest was services, which increased at an average annual rate of 6.7 percent.

## Arizona

Eight counties in the State of Arizona are affected by the designation of unoccupied habitat as critical habitat for either the spikedace or loach minnow. They are Apache, Cochise, Gila, Graham, Greenlee, Pima, Pinal, and Yavapai counties. In total, approximately 633 river miles are being designated as critical habitat for the loach minnow and spikedace. However, because some of the river miles are occupied by at least one of the fish, the net unoccupied habitat being designated is approximately 360 miles. The percent of unoccupied river miles in Arizona affected by critical habitat designation is approximately 58 percent for both the loach minnow and spikedace. A high percentage of public access to rivers and streams exists in Arizona.

## Arizona - County Economic Profile

In Arizona, the economies of the eight affected counties are a mix of rural agricultural areas and counties in metropolitan areas (Pima and Pinal Counties). The agricultural counties vary with between 32 percent (Cochise County) and 50 percent (Pima County) of the county land base in agriculture enterprises (Table 4, Census of Agriculture, 1997). The most populated county (Pima County) had over 780 thousand residents in 1997, but still had 50 percent of its lands in farm businesses. The population growth in the 1990's for each of the eight counties was substantial, ranging from 12 to 34 percent (Table 4). During this period of rapid growth, the percent of the population living below the poverty level (1993 data, the most recent available) ranged from 12 percent (Greenlee County) to 40 percent (Apache County). Many of the counties have significant numbers of Hispanic residents (between a fourth and a third of the population, <http://www.census.gov/statab/USA98>) and Apache County has 77 percent of its population identified as American Indian.

A summary of each counties industrial base and employment sectors is given in Table 5. Descriptions of the 10 year trends for each county is shown below and was taken from the Regional Economic Information System developed by the Bureau of Economic Analysis and posted on their web site at [http://govinfo.library,orst.edu/cgi-bin/bfact?8\\_05-001.azc=073458](http://govinfo.library,orst.edu/cgi-bin/bfact?8_05-001.azc=073458).

### **Apache County , Arizona - 1987-97**

#### **PER CAPITA PERSONAL INCOME**

In 1997, Apache County had a per capita personal income (PCPI) of \$11,044. This ranked 15th in the State, and was 50 percent of the State average, \$21,998, and 44 percent of the national average, \$25,288. In 1987, the PCPI of Apache County was \$6,874 and ranked 15th in the State. The average annual growth rate of PCPI over the past 10 years was 4.9 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

#### **EARNINGS BY INDUSTRY**

Earnings of persons employed in Apache County increased from \$332,920,000 in 1987 to \$510,193,000 in 1997, an average annual growth rate of 4.4 percent. The largest industries in 1997 were services, 36.0 percent of earnings; state and local government, 21.1 percent; and federal civilian government, 16.1 percent. In 1987, the largest industries were state and local government, 23.1 percent of earnings; services, 20.0 percent; and federal civilian government, 16.0 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was transportation and public utilities (8.7 percent of earnings in 1997), which increased at an average annual rate of 3.0 percent; the fastest was services, which increased at an average annual rate of 10.7 percent.

### **Cochise County, Arizona - 1987-97**

#### **PER CAPITA PERSONAL INCOME**

In 1997, Cochise County had a per capita personal income (PCPI) of \$16,532. This ranked 9th in the State, and was 75 percent of the State average, \$21,998, and 65 percent of the national average, \$25,288. In 1987, the PCPI of Cochise County was \$10,919 and ranked 8th in the State. The average annual growth rate of PCPI over the past 10 years was 4.2 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

#### **EARNINGS BY INDUSTRY**

Earnings of persons employed in Cochise County increased from \$704,900,000 in 1987 to \$1,094,354,000 in 1997, an average annual growth rate of 4.5 percent. The largest industries in 1997 were services, 21.7 percent of earnings; military, 17.8 percent; and federal civilian government, 16.1 percent. In 1987, the largest industries were federal civilian government, 21.8 percent of earnings; military, 20.9 percent; and services, 12.9 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was federal civilian government, which increased at an average annual rate of 1.4 percent; the fastest was services which increased at an average annual rate of 10.1 percent.

## **Gila County, Arizona - 1987-97**

### **PER CAPITA PERSONAL INCOME**

In 1997, Gila County had a per capita personal income (PCPI) of \$16,569. This ranked 8th in the State, and was 75 percent of the State average, \$21,998, and 66 percent of the national average, \$25,288. In 1987, the PCPI of Gila County was \$10,644 and ranked 9th in the State. The average annual growth rate of PCPI over the past 10 years was 4.5 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

### **EARNINGS BY INDUSTRY**

Earnings of persons employed in Gila County increased from \$241,133,000 in 1987 to \$429,831,000 in 1997, an average annual growth rate of 6.0 percent. The largest industries in 1997 were services, 25.0 percent of earnings; durable goods manufacturing; and state and local government, 15.1 percent. In 1987, the largest industries were mining, 18.7 percent of earnings; durable goods manufacturing, 17.3 percent; and state and local government, 16.5 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was state and local government, which increased at an average annual rate of 5.0 percent; the fastest was services which increased at an average annual rate of 11.8 percent.

## **Graham County, Arizona - 1987-97**

### **PER CAPITA PERSONAL INCOME**

In 1997, Graham County had a per capita personal income (PCPI) of \$12,835. This ranked 13th in the State, and was 58 percent of the State average, \$21,998, and 51 percent of the national average, \$25,288. In 1987, the PCPI of Graham County was \$8,161 and ranked 14th in the State. The average annual growth rate of PCPI over the past 10 years was 4.6 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

### **EARNINGS BY INDUSTRY**

Earnings of persons employed in Graham County increased from \$110,033,000 in 1987 to \$204,119,000 in 1997, an average annual growth rate of 6.4 percent. The largest industries in 1997 were state and local government, 34.5 percent of earnings; services, 20.5 percent; and retail trade, 15.6 percent. In 1987, the largest industries were state and local government, 36.6 percent of earnings; retail trade, 15.2 percent; and services, 15.1 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was construction (5.3 percent of earnings in 1997), which increased at an average annual rate of 5.1 percent; the fastest was services, which increased at an average annual rate of 9.7 percent.

## **Greenlee County, Arizona - 1987-97**

### **PER CAPITA PERSONAL INCOME**

In 1997, Greenlee County had a per capita personal income (PCPI) of \$19,119. This ranked 5th in the State, and was 87 percent of the State average, \$21,998, and 76 percent of the national average, \$25,288. In 1987, the PCPI of Greenlee County was \$10,067 and ranked 12th in the State. The average annual growth rate of PCPI over the past 10 years was 6.6 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

#### **EARNINGS BY INDUSTRY**

Earnings of persons employed in Greenlee County increased from \$81,345,000 in 1987 to \$196,234,000 in 1997, an average annual growth rate of 9.2 percent. The largest industries in 1997 were mining; construction; and state and local government, 7.3 percent. In 1987, the largest industries were mining, 69.5 percent of earnings; state and local government, 12.0 percent; and construction, 3.7 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was state and local government, which increased at an average annual rate of 3.9 percent; the fastest was construction.

#### **Pima County, Arizona - 1987-97**

Pima County is part of the Tucson Metropolitan Area. Its 1997 population of 778,860 ranked 2nd in the State.

#### **PER CAPITA PERSONAL INCOME**

In 1997, Pima County had a per capita personal income (PCPI) of \$21,068. This ranked 2nd in the State, and was 96 percent of the State average, \$21,998, and 83 percent of the national average, \$25,288. In 1987, the PCPI of Pima County was \$13,806 and ranked 2nd in the State. The average annual growth rate of PCPI over the past 10 years was 4.3 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

#### **EARNINGS BY INDUSTRY**

Earnings of persons employed in Pima County increased from \$5,760,233,000 in 1987 to \$10,181,367,000 in 1997, an average annual growth rate of 5.9 percent. The largest industries in 1997 were services, 31.6 percent of earnings; state and local government, 15.3 percent; and retail trade, 11.1 percent. In 1987, the largest industries were services, 25.4 percent of earnings; state and local government, 15.6 percent; and durable goods manufacturing, 14.1 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was construction (6.6 percent of earnings in 1997), which increased at an average annual rate of 2.6 percent; the fastest was services, which increased at an average annual rate of 8.2 percent.

#### **Pinal County, Arizona - 1987-97**

Pinal County is part of the Phoenix-Mesa Metropolitan Area. Its 1997 population of 142,932 ranked 4th in the State.

#### PER CAPITA PERSONAL INCOME

In 1997, Pinal County had a per capita personal income (PCPI) of \$15,372. This PCPI ranked 11th in the State, and was 70 percent of the State average, \$21,998, and 61 percent of the national average, \$25,288. In 1987, the PCPI of Pinal County was \$10,472 and ranked 11th in the State. The average annual growth rate of PCPI over the past 10 years was 3.9 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

#### EARNINGS BY INDUSTRY

Earnings of persons employed in Pinal increased from \$794,655,000 in 1987 to \$1,429,174,000 in 1997, an average annual growth rate of 6.0 percent. The largest industries in 1997 were state and local government, 22.5 percent of earnings; mining, 18.9 percent; and services, 18.6 percent. In 1987, the largest industries were state and local government, 22.3 percent of earnings; farm, 16.0 percent; and mining, 13.8 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was farm (7.0 percent of earnings in 1997), which decreased at an average annual rate of 2.3 percent; the fastest was services which increased at an average annual rate of 13.4 percent.

#### **Yavapai County, Arizona - 1987-97**

#### PER CAPITA PERSONAL INCOME

In 1997, Yavapai County had a per capita personal income (PCPI) of \$19,362. This ranked 3rd in the State, and was 88 percent of the State average, \$21,998, and 77 percent of the national average, \$25,288. In 1987, the PCPI of Yavapai County was \$13,177 and ranked 3rd in the State. The average annual growth rate of PCPI over the past 10 years was 3.9 percent. The average annual growth rate for the State was 4.2 percent and for the nation was 4.7 percent.

#### EARNINGS BY INDUSTRY

Earnings of persons employed in Yavapai increased from \$551,952,000 in 1987 to \$1,311,085,000 in 1997, an average annual growth rate of 9.0 percent. The largest industries in 1997 were services, 29.2 percent of earnings; retail trade, 14.8 percent; and state and local government, 13.1 percent. In 1987, the largest industries were services, 23.4 percent of earnings; retail trade, 15.4 percent; and state and local government, 14.9 percent. Of the industries that accounted for at least 5 percent of earnings in 1997, the slowest growing from 1987 to 1997 was durable goods manufacturing (6.5 percent of earnings in 1997), which increased at an average annual rate of 6.5 percent; the fastest was finance, insurance, and real estate (6.1 percent of earnings in 1997), which increased at an average annual rate of 12.7 percent.

**Table 4. Selected Statistics on Affected Counties in Arizona**

	Apache	Cochise	Gila	Graham	Greenlee	Pima	Pinal	Yavapai
Population in 1997(thou.)	69.5	112.2	48.4	31.1	9.4	780.1	143.3	144.3
Percent Pop. Growth from 1990-1997	12%	15%	20%	17%	17%	17%	23%	34%
Per Capita Income	11,044	16,532	16,569	12,835	19,119	21,068	15,372	19,362
Percent Below Poverty (1993)	40%	21%	21%	26%	12%	19%	25%	15%
Number of Farms - 1997	288	824	148	281	99	419	541	453
Percent of Land in Farms	NA	32%	NA	42%	2%	50%	38%	15%
Farms with Grazing Permits	132	233	78	83	42	91	63	144
Source of Permits:								
Forest Service	40	72	62	39	20	23	18	57
Taylor Grazing	27	87	18	40	19	38	28	64
Unemployment Rate - 1996	19%	9%	8%	10%	7%	3%	5%	4%

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Sources: 1997 Census of Agriculture- County Data, <http://www.census.gov/statab/USA98>, and [http://govinfo.library.orst.edu/cgi-bin/reis-list?9\\_30-001.asc=073458](http://govinfo.library.orst.edu/cgi-bin/reis-list?9_30-001.asc=073458).

**Table 5. Total Personal Income, Earnings and Employment by Industry in Arizona, 1997**

	Apache	Cochise	Gila	Graham	Greenlee	Pima	Pinal	Yavapai
<b>Industry Earnings (Millions of Dollars)</b>								
Farm	7.8	31.8	3.6	6.4	5.7	25.5	100.4	11.6
Ag. Services	.6	N/A	1.4	3.0	0.2	67.7	20.2	N/A
Mining	N/A	1.3	N/A	0.2	N/A	121.8	270.4	N/A
Construction	17.2	53.4	N/A	10.8	N/A	675.6	69.6	152.9
Manufacturing	9.5	33.2	86.4	5.8	0.1	1,332.8	112.6	118.2
Transportation, Utilities, etc.	44.2	64.1	21.4	9.6	4.2	537.2	41.0	53.9
Wholesale and Retail Trade	37.7	120.4	62.4	36.5	7.4	1,483.2	162.7	236.9
Finance, etc.	N/A	N/A	13.7	4.0	0.4	563.4	29.9	79.6
Services	183.7	237.8	107.4	41.8	3.8	3,218.0	265.7	383.1
Government	191.3	519.7	82.1	85.9	16.7	2,156.3	356.6	222.6
Totals:	510.2	1,094.4	429.8	204.1	196.2	10,181.4	1,429.2	1,311.1
<b>Employment (Full and Part-time Employees)</b>								
Farm	340	1,333	202	502	168	945	2,295	630
Ag. Services	198	N/A	177	275	48	4,922	1,147	N/A
Mining	N/A	65	N/A	N/A	N/A	2,698	5,336	N/A
Construction	860	2,369	N/A	447	N/A	24,835	2,403	6,051
Manufacturing	382	1,567	1,868	244	11	30,696	3,187	4,124
Transportation, Utilities, etc.	1,194	1,859	704	329	116	16,174	1,179	1,979
Wholesale and Retail Trade	2,814	9,326	4,455	2,410	493	83,134	9,442	15,596
Finance, etc.	N/A	N/A	1,123	346	43	25,977	1,829	5,097
Services	7,553	11,453	5,621	2,457	439	140,267	13,118	20,704
Government	5,8422	16,130	3,140	3,049	656	71,963	13,461	7,947
Totals:	20,246	47,008	10,077	10,065	5,323	401,611	53,397	64,161
Source: <a href="http://govinfo.library.orst.edu/cgi-bin/reis-list?9_25-001.azc=073458">http://govinfo.library.orst.edu/cgi-bin/reis-list?9_25-001.azc=073458</a> and 104816.								

**Table 6. Small Entities in Affected Counties in Arizona - 1996**

	Arizona							
	Apache	Cochise	Gila	Graham	Greenlee	Pima	Pinal	Yavapai
<b>All Industries</b>								
Total Establishments	447	2,095	1,068	483	109	17,658	1,928	4,264
Fewer than 20								
Employees	386	1,884	968	433	100	15,229	1,703	3,920
Percent of total	86.4%	89.9%	90.6%	89.6%	91.7%	86.2%	88.3%	91.9%

Source: <http://fisher.lib.virginia.edu/cgi-local/cbpbin/go.cgi>

Without exception, all counties in Arizona had over 86 percent of their employment in establishments with fewer than 20 employees (Table 6, 1996 County Business Patterns).

## **VI. EFFECTS ON ACTIVITIES WITH A FEDERAL NEXUS**

### **FEDERAL LANDS**

As noted above, the U.S. Forest Service, and the U.S. Bureau of Land Management manage areas of critical habitat for the spikedace and loach minnow. Section 7 consultations with these agencies must now consider whether their activities result in adverse modification of critical habitat as well as jeopardy. Other Federal agencies that may be involved through actions they fund, authorize or carry out include the Natural Resources Conservation Service, Army Corps of Engineers, Bureau of Reclamation, Environmental Protection Agency, and the Federal Emergency Management Agency.

### **U.S. Forest Service**

Unoccupied critical habitat for either spikedace or loach minnow occurs in Tonto, Coconino, and Apache-Sitgreaves National Forests. In responding to the critical habitat proposal, the Forest Service Southwestern Regional Office addressed, among other things, the potential economic impacts. That part of their response is shown below.

- 4) Foreseeable economic or other impacts resulting from the proposed designation of critical habitat.

Where spikedace and loach minnow already occupy the habitat, we do not expect that designation of critical habitat will result in any additional adjustments in land use activities above and beyond our current management direction for the species. Where there is no occupancy of habitat, designation of critical habitat may place additional unforeseen impacts on ongoing or planned activities. It is difficult to qualify, let alone quantify the economic impacts of such alteration in activities. About 75% of the proposed critical habitat reaches are within Forest Service System lands. Approximately 30% of these

proposed critical habitat areas are unoccupied. We estimate that there are over 200 grazing allotments within the unoccupied critical habitat areas. Many of these areas are already implementing modified actions and mitigation measures in order to minimize impacts on other listed species or their critical habitat. Approximately 80% of the unoccupied proposed critical habitat overlaps with other species designations (primarily razorback sucker and southwestern willow flycatcher). Therefore less than 6% of the newly proposed critical habitat on National Forest Service System lands would be expected to result in any noticeable changes in management above and beyond our current direction. Overall economic costs may be low to moderate within these limited areas.<sup>1</sup>

To summarize the Forest Service response, because of management actions already taken for other purposes, the impact of critical habitat for spikedace and loach minnow, although as yet unquantified, is expected to be small.

### **U.S. Bureau of Land Management**

Two areas of unoccupied critical habitat for the spikedace and loach minnow occur on land managed by the Bureau of Land Management (BLM).

(1) Bonita Creek and the adjoining approximately 40 km (26 miles) of the Gila/San Francisco river segment in Graham and Greenlee counties. BLM expects grazing and recreation in those areas may be affected by critical habitat designation but is unable to quantify those impacts pending additional consultation with the Service. The City of Safford, with water rights from the state, draws water from Bonita Creek and provides water to some 22,000 people in the town and surrounding area. The city holds four rights-of-way through the area which enables them to maintain the water system. The area has a large minority population, with a very low per capita income. Immediate action is required in case of flood damage to its water supply in order to minimize the cost of repair. The cost of a temporary, alternative water supply is prohibitive. In their comments on the proposal, BLM noted the potential for significant costs and time delays the city may be faced with when repairing flood damage to the system if such actions would be subject to Section 7 consultation.<sup>2</sup>

(2) Approximately 45 km.(27 miles) of the San Pedro river near Sierra Vista, Arizona. BLM has already designated this stretch of river as a special management area to enhance fish and wildlife habitat and ecological values. There is no grazing. The area is used for sport fishing and nature tours. No effects of critical habitat designation are expected.<sup>3</sup>

### **NON-Federal Land**

Some of the unoccupied areas designated as critical habitat for the spikedace and loach minnow are on state owned, municipal, and private land. The designation of critical

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<sup>1</sup>Letter from Forest Service Southwestern Regional Office to U.S. Fish and Wildlife Service, Phoenix, Arizona. February 10, 2000.

<sup>2</sup>Letter from Bureau of Land Management to U.S. Fish and Wildlife Service, Phoenix, Arizona. January 14, 2000.

<sup>3</sup>Personal communication. Mark Fredlake, Bureau of Land Management. March 8, 2000.

habitat has no direct effect on non-Federal actions taken on state, municipal, or privately owned land even if such land is within the mapped boundary of critical habitat. Critical habitat has possible effects on activities of non-Federal landowners only if the activity involves Federal funding, a Federal permit, or other Federal action. In such cases, designation of critical habitat will require that Section 7 consultation address possible adverse modification as well as jeopardy.

A number of comments expressed concern about the possible effects of this designation on development or other activities on privately owned land. Without specific information about such situations, it is difficult even to speculate about impacts, if any. If the site involves critical habitat already occupied by either spinedace or loach minnow, it is already subject to jeopardy consultation and the take provisions of the Act. If the site is on currently unoccupied habitat and there is involvement of a Federal agency, we will work with the landowner and the appropriate Federal agency during Section 7 consultation to develop a project that can be completed without jeopardizing the species or adversely modifying its critical habitat.

Some activities on private lands are known to have a federal nexus. The following discussion considers effects on those activities.

### **U.S. Army Corps of Engineers**

The Corps is currently processing, or has on file, 25 applications for Section 404 permits under the Clean Water Act for projects such as road crossing maintenance in the areas designated as critical habitat for spinedace and loach minnow.<sup>4</sup> Information about the nature of the proposed projects and whether they involved occupied or unoccupied habitat was not available within the time constraint for this rule.

### **Other Potential Impacts**

The Arizona Department of Game and Fish provided the following comments pertaining to the potential economic impacts to the State stocking programs in a letter dated February 14, 2000.

This proposal will affect the Department's ability to implement our programs, including the stocking of sportfish and operation of aquaculture facilities adjacent to or within the watersheds proposed for designated critical habitat. Restrictions on our stocking and operation of aquaculture facilities could result in significant impacts to the Department's mission.

Annually, expenditures by anglers in Arizona exceed \$300 million and contribute almost \$600 million into the state's economy (Maharaj and Athey 1996). The Department is concerned that the proposed critical habitat designations may significantly impact several important sportfisheries, which could result in significant impacts to both statewide and rural economies. Our primary concern is that designation of critical habitat may severely restrict or modify our sportfish stocking and management programs without identifiable conservation benefits to the species. The proposed critical habitats of concern include the East and West forks of the Black River; Haigler Creek; West Clear Creek; Wet

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<sup>4</sup>Personal Communication. Cindy Lester. Army Corps of Engineers. Phoenix, Arizona. March 16, 2000.

Beaver Creek; Oak Creek and the middle Verde River (Clarkdale to Camp Verde). Angler use, economic value (based on Maharaj and Athey 1996; USFWS 1998), and proposed critical habitat modifications for each of these streams are summarized below:

East Fork, West Fork, and Big Lake: We are concerned that designation of the East and West forks (including North Fork of the East Fork) could jeopardize sportfish management of these areas, including Big Lake (draining into the East Fork). These three waters have been managed for trout (several species) since the 1930s, and over 29 million trout have been stocked to date. The streams are considered occupied habitat for the loach minnow and consequently the management focus converted to Apache trout in 1997. Based on creel surveys, over 60,000 angler days are spent on these three waters resulting in a direct expenditure of \$4.2 million and a total economic benefit of \$7.5 million. Actual angler use is likely higher as Big Lake angler use information was based on data collected in 1986. The Department is concerned about potential impacts to our fish stocking program that could result from designating these areas as critical habitat.

Haigler and Tonto Creeks. Haigler and Tonto Creeks are stocked with rainbow trout immediately upstream of the upper limits of critical habitat proposed for loach minnow. Based on a 1995 angler questionnaire, Haigler and Tonto creeks support 27,000 and 50,700 angler days, respectively. Based on this information, the two creeks provide \$5.4 million in direct expenditures and a total of \$9.8 million to the economy. Tonto Creek is not occupied habitat for either species. The Department is concerned about the proposed upstream critical habitat boundary for the loach minnow.

West Clear and Wet Beaver Creeks: Wet Beaver and West Clear creeks are managed as trout fisheries and several species of trout have been stocked into the creeks since 1933. Stockings of rainbow trout have occurred since the 1930s and continue today. The stream supports from 1,000 and 1,500 angler days per year with a total economic value of \$204,000 (\$105,000 in direct expenditures). These creeks are not occupied habitat for either species.

Oak Creek: Oak Creek is managed as a trout fishery; over 6 million trout have been stocked into the creek since 1933. The creek supports approximately 80,000 angler days each year with a total economic value of \$10.08 million (\$5.6 million in direct expenditures). Oak Creek is not occupied habitat for either species.

Middle Verde River: In 1989, the Department initiated a winter rainbow trout fishery in the middle Verde River from the Peck's Lake diversion at Clarkdale downstream to Camp Verde. This fishery supports 1,600 angler days each year with a total economic value of \$217,000 (\$112,000 in direct expenditures).

Designation of Granite Creek as critical habitat for spinedace and loach minnow may impact the Department's ability to provide fishing opportunities in Watson and Willow lakes, which could adversely impact the economic of the community in and around Prescott.

In total, the Arizona Game and Fish Department is managing over 220,000 angler days worth approximately \$27.8 million annually in economic benefits in areas designated as critical habitat for either the spinedace or loach minnow. This program is in the Section 7 consultation process and an outcome that would call for a reduction or elimination of the stocking program would have the potential for a high economic loss to the affected county economies. However, since trout is the species stocked by the Department and trout are not known to conflict with the recovery of either the spinedace or loach minnow, the Service does not expect any change in this annual benefit to the Arizona economy.

## **Appendix I. Economic Issues Identified in Public Comments**

Issue 3: Economic Analysis. There were numerous comments that addressed economic issues.

Issue 3a: Will critical habitat designation result in more consultations than would have occurred without the critical habitat designation?

Our Response: We expect that the designation of critical habitat will result in more consultations, especially for activities which may affect unoccupied habitat. If these consultations result in any increased costs to the applicant, these costs will be attributable to critical habitat designation. However, consultations are only required of Federal agencies and those projects with a Federal nexus.

Issue 3b: Are private lands affected by critical habitat designation if there is no Federal nexus?

Our Response: Under Section 7 of the Endangered Species Act, private lands are not impacted by the designation of critical habitat unless there is a Federal nexus.

Issue 3c: If permit requirements from a Federal agency change, is that a critical habitat impact?

Our Response: There are many reasons why a permit requirement may change. Each Federal agency has enabling legislation that determines its mission and, consequently, what activities can occur on the land it manages. As more information becomes available about the environment, public activities on Federal land may require changes to permit requirements. These may be due to the Federal agency's own legislation. In those cases, we have attributed any impact to the legislation requiring the change and not the Endangered Species Act. If permit requirements change on unoccupied habitat as a result of a consultation with us, then the impact would be attributable to critical habitat designation.

Issue 3d: Critical habitat designation will drive away current and future businesses.

Our Response: There is a common misconception that critical habitat designation will reduce business activity. Without a Federal nexus, there is no direct impact of critical habitat designation on private activities or businesses. In addition, restrictions resulting from the listing of the species are not attributable to critical habitat designation. In areas currently occupied by the species, little or no economic impact is expected to result from critical habitat designation. In unoccupied areas, some economic impacts may result. Our economic analysis considers those anticipated impacts, including effects on businesses. However, we believe that the benefits of designating critical habitat outweigh the benefits of excluding areas from designation.

Issue 3e: Impacts on land uses next to the river were not evaluated in the economic analysis.

Our Response: At the time of releasing the draft economic analysis of critical habitat designation, very little information was available to us on land uses next to the rivers. Subsequently, some Federal and State agencies have provided us with their management

activities and expected changes relative to critical habitat. This new information is reflected in the final economic analysis.

Issue 3f: The draft economic analysis only addresses 5 of the streams when the proposal includes many more streams.

Our Response: The table with the analysis of 5 streams comes from study of the previous critical habitat designation. It was included in the draft economic analysis to illustrate the kinds of economic impacts for which we were seeking additional information. All streams in the final designation have been evaluated in the final economic analysis.

Issue 3g: The Service must prepare an economic analysis that considers the total effect of listing and critical habitat.

Our Response: Congress has stated that the listing of a species be based solely on biological considerations. As a result, an economic analysis of the listing of a species is not undertaken as part of the listing process. The current rule being considered is the designation of critical habitat and thus only economic and other relevant impacts of specifying any particular area as critical habitat are considered. A recent court decision on designation of critical habitat for the southwestern willow flycatcher (Empidonax extimus trailli) New Mexico Cattle Growers et al. v. USFWS et al. CIV 98-0275 LH/DJs - ACE (D. Ariz. 1999) (on appeal) affirmed our approach of considering only the economic and other relevant impacts of critical habitat designation above and beyond those associated with listing the species.

Issue 3h: The Regulatory Flexibility Act and the Small Business Regulatory Enforcement Fairness Act analyses were inadequate.

Our Response: There were substantial data gaps that precluded a full analysis of the impact on small entities. A more complete analysis is in the administrative record for this designation, and is available for public review (see ADDRESSES).

Issue 3i: There needs to be a takings implication assessment completed.

Our Response: A taking implications assessment is in the administrative record for this designation, and is available for public review (see ADDRESSES).

Issue 3j: The economic analysis lacks dollar amounts for the impact on Agriculture, Recreation, Roads, Water Supply, and Private Development on page 26.

Our Response: The table on page 26 of the draft economic analysis was reproduced from an earlier study and the blank entries were in the original document. We provide a more complete accounting of the impacts in the final economic analysis.

Issue 3k: No economic analysis was done for the State of New Mexico.

Our Response: The revised economic analysis includes information about Grant county, the only county in the State of New Mexico that contains critical habitat unoccupied by either the spikedace or the loach minnow.

Issue 3l: An incorrect baseline was used for the economic analysis.

Our Response: The baseline we used considered the Federal actions expected to occur in the absence of critical habitat. Thus, all Section 7 consultations with Federal agencies and other restrictions resulting from the listing of the species are not attributable to critical habitat designation. The only economic impacts attributable to critical habitat designation would be those resulting from Federal activities in designated critical habitat and only those activities likely to destroy or adversely modify critical habitat.

Issue 3m: The use of IMPLAN is not appropriate below the State level.

Our Response: IMPLAN was not used in the draft economic analysis. However, the data sets that come with IMPLAN describe the economic activity at the county level, which provide a useful summary of the industries in the affected counties.