DRAFT 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 proposing critical habitat for the spikedace and loach minnow. The Service is proposing approximately 1,325 km (822 mi) of critical habitat for the spikedace and approximately 1,443 km (894 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 detail in the proposed rule.

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 will be 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, and regional 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 by expenditures by management agencies are the main potential regional impacts in the case of the spikedace and loach minnow.

Benefits of Critical Habitat Designation: Designating critical habitat may result in economic benefits provided directly by the species and indirectly by their habitat, biodiversity, ecosystem

and passive use (existence) values. Quantitative or monetary values for such benefits are not now possible due to data limitations.

III. CRITICAL HABITAT

The Service is proposing approximately 1,325 km (822 mi) of critical habitat for the spikedace and approximately 1,443 km (894 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 proposed 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. Effects attributable to critical habitat designation can occur only where an action adversely modifies critical habitat but does not jeopardize the species. The Service believes that 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.

V. EFFECTS ON ACTIVITIES OF FEDERAL AGENCIES

The U.S. Forest Service, U.S. Bureau of Land Management, and the National Park Service manage areas of proposed 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.

VI. CRITICAL HABITAT ON NON-FEDERAL LAND

Some of the area proposed 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 proposed 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 by 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.

The designation does have an informational role for non-Federal land owners by identifying areas that are important for recovery of the threatened species. That information may be useful for managers and owners of those lands who may choose to take protective actions on their own. However, lacking a Federal nexus, any economic impacts created by those management decisions are not attributable to critical habitat designation under the Act.

VII. THE EXCLUSION PROCESS

This section summarizes the procedure that we will follow in determining whether or not to exclude an area (or areas) from designation as critical habitat. We will use information provided by State agencies, public hearings and written comments on the proposed habitat in making the final designation of critical habitat.

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VIII. PREVIOUSLY IDENTIFIED ECONOMIC EFFECTS

In 1992, Karl Souder and Associates, Inc. of Santa Fe, New Mexico, provided an economic analysis of the economic impacts of designating critical habitat for the spikedace and loach minnow under contract No. 20181-2-0427. The Souder reports identified the eight activities, shown in Table 7, where there was a possibility of economic effects attributable to critical habitat designation. The activities included agriculture, grazing, timber, fuelwood, recreation, roads, water supply, and private development. Most of the identified activities occur on lands managed by the Forest Service, Bureau of Land Management, National Park Service or the State of Arizona. In current dollars, Souder identified an annual economic effect of slightly over $834,000. However, the proposed areas as critical habitat identified by Souder have been updated and expanded with current information. Therefore, the list of activities and the amount of activity may well have changed also. The Fish and Wildlife Service will contact the Federal and State agencies with land management responsibility where critical habitat has been designated to obtain the most recent information available pertaining to the economic effects of changing management on the areas identified as critical habitat.

Public Comments Solicited

It is the intent of this economic analysis to accurately estimate the economic effects of critical habitat designation for the spikedace and loach minnow. The best available data will be used during the exclusion process to determine if exclusions are warranted before final critical habitat designation. Specifically, the Service is seeking economic information on:

(1) Land use practices and current or planned activities in the subject areas and their possible impacts on proposed critical habitat;

(2) Any foreseeable economic or other impacts resulting from the proposed designation of critical habitat, in particular, any impacts on small entities or families;

(3) Economic and other values associated with designating critical habitat for the spikedace and loach minnow, such as derived from non-consumptive uses (e.g. hiking, camping, birding, enhanced watershed protection, increased soil retention, existence values and reductions in administrative costs.

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

I. INTRODUCTION

The Fish and Wildlife Service (Service), is proposing to designate critical habitat pursuant to the Endangered Species Act of 1973 (Act), for the spikedace (Meda fulgida) and the loach minnow (Tiaroga [= Rhinichthys] cobitis). This proposal 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 February 17, 2000. The chronology of the listings and previous critical habitat designations for the spikedace and loach minnow, and ensuing Court decisions is discussed in the proposed rule.

The Service is proposing approximately 1,325 km (822 mi) of critical habitat for the spikedace and approximately 1,443 km (894 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 proposed areas of critical habitat. Section IV describes critical habitat consultation requirements under the Act. Section V presents a discussion of the possible effects of critical habitat designation on Federal agencies and identifies information we need to obtain in order to complete the analysis. Section VI gives a summary of the exclusion process that will precede the final rule.

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. Efficiency effects are used primarily to determine whether an action is economically sound: whether benefits exceed costs. 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 modifying 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). Economic efficiency analysis seeks to maximize national income from a given resource base. Gains and losses in recreation values, increased costs imposed on management agencies or development projects, loss of earnings by displaced labor or capital assets, and changes in revenue from user fees are typical 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 labor s earnings before critical habitat designation and earnings in its 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. They are usually estimated using IMPLAN or a similar input-output model.

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, 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 the preserved recreation and the regional jobs and household income it produces 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

Designating critical habitat may result in economic benefits in terms of preserving or enhancing nonrecreational economic values provided directly by the species and indirectly by its habitat. Categories of potential benefits for the spikedace 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. Quantitative or monetary values for these kinds of benefits of designating critical habitat cannot be provided at this time, due to the limitations of available data and benefit valuation techniques.

B. Baseline for Analysis

Prior to their listing as threatened, the spikedace and loach minnow had some protection under the Federal Clean Water Act, and the National Environmental Policy 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 those other statutes and to listing of the two fish as threatened. Actions taken for those other purposes establish the baseline for this analysis. It is the marginal increase in species protection provided by designation of critical habitat and the marginal change in economic costs, regional impacts, and benefits that the designation produces that are the subject of this analysis.

C. Economic Profile of the Affected Areas

Five counties in the State of Arizona may be affected by the designation of critical habitat in areas that are currently not occupied by either species. They include Graham, Greenlee, Apache, Yavapai, and Pinal counties. In total, approximately 281.2 river miles are being designated as critical for the loach minnow and 262.7 river miles for the spikedace (Table 1). The percent of total miles of rivers in Arizona affected by critical habitat designation is approximately 11 percent for both the loach minnow and spikedace. All of the areas being proposed as critical habitat in New Mexico are currently occupied by one or both species; therefore, no additional economic effects are expected from designation of critical habitat, above and beyond those already occurring due to the listing of these species.

Arizona

In Arizona, the economies of the eight affected counties are primarily rural agricultural areas with between 12 percent (Greenlee County) and 81 percent (Apache County) of the county land base in agriculture enterprises (Table 2, U.S. Bureau of the Census, USA Counties 1996). The most populated county (Pima County) had over 752 thousand residents in 1995, but still had 59 percent of its lands in farm businesses. The services and government sectors were the predominant employers with Pima County having nearly 182,000 residents employed in those sectors in 1994 (Table 3, 1994 National IMPLAN Database and 1994 County Business Patterns).

Without exception, all counties had approximately 90 percent of their employment in establishments with fewer than 20 employees (Table 4, 1994 County Business Patterns). The recreation industry was dominated by establishments with fewer than 20 employees with the lowest percent reported being 85 percent in Yavapai County. Overall, the seven counties had diversified economies with substantial contributions to total output and employment coming from many sectors.

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

Table 1. River Miles of Critical Habitat

Summary	Spikedace	Loach Minnow
River Miles Occupied by loach minnow & spikedace	541.0	619.3
River Miles Not Currently Occupied by loach minnow &spikedace	262.7	281.2
Total River Miles Designated	803.7	882.6
Total River Miles in Arizona	2,590	2,590
Unoccupied River Miles as a Percent of Total River Miles Designated	32%	32%
Unoccupied River Miles as a Percent of Total River Miles in Arizona	10%	11%

Table 2. Selected Statistics on Affected Counties in Arizona

	Cochise	Pima	Yavapai	Gila	Apache	Graham	Greenlee	Pinal	Greenlee
Population in 1995 (thou.)	110.1	752.4	134.6	46.0	67.8	29.6	9.2	131.2	
Per Capita Income	14,509	17,271	15,733	14,271	9,769	11,276	15,304	13,534	
Number of Farms - 1992	831	448	463	143	332	317	107	611	
Percent of Land in Farms	48	59	41	38	81	62	12	55	
Unemployment Rate - 1994	9.8	4.5	5.8	8.3	16.4	9.7	8.9	5.9	

Source: U.S. Bureau of the Census, USA Counties 1996 CD-ROM

Table 3. Output and Employment, 1994

	Arizona Cochise	Pima	Yavapai	Gila	Apache	Graham	Greenlee	Pinal
Industry Output (Millions of Dollars)								
Cattle	35.6	27.6	26.5	11.3	21.6	17.4	4.0	518.1
Agriculture, except Cattle	104.5	124.5	53.4	7.1	76.2	60.0	7.3	145.6
Mining	15.5	742.1	28.4	202.5	2.4	1.2	488.8	788.3
Construction	177.6	2,308.5	487.0	128.3	63.0	32.6	41.8	215.9
Manufacturing	188.7	3,974.0	330.4	1,527.2	72.7	26.3	1.9	1,771.1
Transportation, Utilities, etc.	271.7	1,943.2	213.2	78.5	210.4	25.8	9.6	140.9
Trade	355.2	3,593.1	520.4	168.9	149.9	75.5	18.1	318.1
Finance, etc.	298.7	4,430.0	670.0	140.0	202.2	53.9	14.9	348.5
Services	456.6	5,603.1	666.9	174.1	256.3	69.3	10.4	385.8
Government	595.3	2,327.3	246.9	94.7	228.9	96.7	16.7	355.4
Total:	2,497.4	25,074.6	3,242.4	2,532.0	1,282.2	459.7	613.3	4,985.2
Employment								
Cattle	743	700	373	235	257	160	85	1,822
Recreation	119	1,566	206	164	24	176	0	394
Agriculture, except Cattle	1,064	3,152	698	114	825	562	147	1,705
Mining	81	3,256	304	1,001	20	9	2,252	3,684
Construction	2,597	29,151	6,698	1,588	871	504	449	2,515
Manufacturing	1,204	27,521	3,255	1,843	470	222	20	4,299
Transportation, Utilities, etc.	1,500	13,571	1,509	600	1,013	186	56	878
Trade	8,893	82,192	13,505	4,294	3,565	2,069	459	8,360
Finance, etc.	1,456	22,305	3,643	642	819	194	32	1,634
Services	9,124	114,980	15,472	4,106	6,495	1,857	328	8,422
Government	18,012	67,686	8,181	3,275	7,380	3,203	673	13,684
Total:	45,107	370,809	54,351	18,092	21,841	9,228	4,570	47,673

Cattle consists of IMPLAN categories for Ranch Fed Cattle, Range Fed Cattle, Cattle Feedlots, and Sheep, Lambs and Goats.
Recreation employment taken from 1994 County Business Pattern data. Output data at this level is not available.
Recreation includes SIC codes 5941 Sporting Goods Stores, 7030 Camps and Recreational Vehicle Parks, and 7999 Recreational Services, not elsewhere classified.
Source: Minnesota IMPLAN Group, 1994 National IMPLAN Database and 1994 County Business Patterns.

Table 4. Small Entities in Affected Counties

	Arizona							
	Cochise	Pima	Yavapai	Gila	Apache	Graham	Greenlee	Pinal
All Industries								
Total Establishments	1,985	16,843	3,711	997	436	427	102	1,791
Fewer than 20 Employees	1,780	14,524	3,420	911	377	386	95	1,587
Percent	89.7%	86.2%	92.2%	91.4%	86.5%	90.4%	93.1%	88.6%

Recreation includes SIC codes 5941 Sporting Goods Stores, 7030 Camps and Recreational Vehicle Parks, and 7999 Recreational Services, not elsewhere classified.
Source: 1994 County Business Patterns.

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 proposed rule.

The proposed rule identifies an array of activities that may affect spikedace or loach minnow and their critical habitats. They include land management plans; land acquisition and disposal by Federal agencies; 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.

Spikedace

The following areas are proposed as critical habitat for spikedace. The proposed designation includes portions of 26 streams; however, individual streams are not isolated, but are connected with others to form 7 areas or "complexes." The complexes include those which presently support populations of spikedace as well as some presently unoccupied by spikedace but which are considered essential for reestablishing populations of spikedace to achieve recovery. Distances and conversions are approximate.

1. Verde River complex, Yavapai County, Arizona. The Verde River is presently occupied by spikedace. Its tributary streams are believed to be presently unoccupied by spikedace. The Verde complex is unusual in the relatively stable thermal and hydrologic regime

found in the upper river and in Fossil Creek, and spikedace in the Verde River are genetically and morphologically distinct from all other spikedace populations.

a. Verde River. One-hundred fifty-one kilometers (94 miles) of river extending from the confluence with Fossil Creek upstream to Sullivan Dam, but excluding lands belonging to the Yavapai-Prescott Indian Community. 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 becomes larger due to the input of Fossil Creek and changes character to an extent which may not provide substantial suitable habitat for spikedace.

b. Fossil Creek. Seven kilometers (5 miles) 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 habitat at present, except sufficient discharge. Relicensing of the Childs/Irving Hydropower project will provide enhanced flows into lower Fossil Creek, although the amount of that flow restoration is still under negotiation.

c. West Clear Creek. Eleven kilometers (7 miles) 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 spikedace and contains suitable, although degraded, habitat. Gradient and channel morphology change above Black Mountain Canyon make the upstream area not suitable for spikedace.

d. Beaver/Wet Beaver Creek. Thirty-two kilometers (21 miles) 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 contain suitable, although degraded, habitat. Above Casner Canyon gradient and channel morphology changes make the stream unsuitable for spikedace.

e. Oak Creek. Fifty-five kilometers (34 miles) 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 historic range of spikedace and contains suitable, although degraded, habitat. Above the unnamed tributary the creek becomes unsuitable due to urban and suburban development and to increasing gradient and substrate size.

f. Granite Creek. Two and a half kilometers (1.4 miles) of creek extending from the confluence with the Verde River upstream to a spring. As a perennial tributary of the upper Verde River, Granite Creek is considered important expansion area for spikedace recovery.

2. Black River complex, Apache and Greenlee counties, Arizona. The Salt River subbasin is a significant portion of spikedace historic 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. Recovery planning for spikedace envisions reestablishing populations in the subbasin and the following are thought to be the most suitable areas outside of Tribal lands.

a. East Fork Black River. Seven kilometers (5 miles) of river extending from the confluence with the West Fork Black River upstream to the confluence with Boneyard Creek. The East and West Forks Black River contain suitable habitat and the continuing presence of loach minnow in the East Fork is evidence that it may support reestablishment of spikedace, which were historically sympatric with loach minnow in most streams in the Gila River basin.

b. West Fork Black River. Ten and a half kilometers (6 miles) 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 spikedace.

3. Tonto Creek complex, Gila County, Arizona. Tonto Creek was historically occupied by spikedace and loach minnow. 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 Forest Service lands make this one of the most promising areas for reestablishment of spikedace in the Salt River subbasin.

a. Tonto Creek. Forty-five 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 Creenback Creek, and gradient and substrate changes above Houston Creek, make the stream unsuitable for spikedace.

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

c. Rye Creek. One and a half kilometers (1.3 mile) 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 spikedace reestablishment.

4. Middle Gila/Lower San Pedro/Aravaipa Creek complex, Pinal and Graham counties, Arizona. This complex is occupied by spikedace with population status ranging from rare to common. Aravaipa Creek supports one of the best, and most protected, spikedace populations and enhancement of downstream habitats in the San Pedro and Gila Rivers would contribute substantially to recovery of this species.

a. Gila River. Sixty-one kilometers (39 miles) of river extending from Ashurst-Hayden Dam upstream to the confluence with the San Pedro River. A small population of spikedace presently 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 spikedace.

b. San Pedro River. Twenty-one kilometers (13 miles) of river extending from the confluence with the Gila River upstream to the confluence with Aravaipa Creek. This area is presently occupied by spikedace. Existing flow in the river comes primarily from surface and subsurface contributions from Aravaipa Creek.

c. Aravaipa Creek. Forty-five kilometers (28 miles) 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 spikedace. Stowe Gulch is the upstream limit of sufficient perennial flow for spikedace.

5. Middle-Upper San Pedro River complex, Cochise, Graham, and Pima counties, Arizona. None of the habitat in this complex is presently occupied by spikedace. However, the San Pedro River is the type locality of spikedace and this complex contains important restoration area.

a. San Pedro River. Seventy kilometers (46 miles) 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 has increasing surface flow due to restoration activities, primarily groundwater pumping reductions.

b. Redfield Canyon. Twenty one kilometers (14) miles of creek extending from the confluence with the San Pedro River upstream to the confluence with Sycamore Canyon. Above Sycamore Canyon perennial water becomes too scarce and the habitat becomes unsuitable.

c. Hot Springs Canyon. Eighteen kilometers (12 miles) of creek extending from the confluence with the San Pedro River upstream to the confluence with Bass Canyon. Hot Springs Canyon is presently unoccupied but contains suitable habitat for restoration of spikedace.

d. Bass Canyon. Five kilometers (3 miles) 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. Fifty-eight kilometers (37 miles) of river extending from the confluence with the Babocomari River upstream to the US/Mexico border. Although presently unoccupied, this area is identified in Bureau of Land Management and Fish and Wildlife Service planning documents as high potential restoration area for spikedace.

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

complex. This complex has the largest area of habitat suitable for spikedace restoration and management in the Gila Box, Bonita Creek, and the Blue River are highly compatible with recovery goals, giving restoration of spikedace in this complex a high likelihood of success.

a. Gila River. Thirty-seven kilometers (23) miles 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 presently support spikedace, but is considered to have a high potential for restoration of the species. Both above and below the Gila Box, the Gila River is highly modified by agriculture, diversions, and urban development.

b. Bonita Creek. Twenty one kilometers (12 miles) of creek extending from the confluence with the Gila River upstream to the confluence with Martinez Wash. Bonita Creek has no spikedace at present, but has suitable habitat. Bonita Creek above Martinez Wash lies on the San Carlos Apache Reservation and no information is available on species or habitat.

c. Eagle Creek. Seventy three kilometers (46 miles) 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. Eagle Creek supports a small population of spikedace. Below the diversion dam the creek is dry large portions of the time. Because the creek repeatedly flows from private or Forest Service land into the San Carlos Reservation and back, it is difficult to separate out the milage on tribal lands versus lands of other ownership. Therefore, the above milage is approximate and contains excluded Tribal lands.

d. San Francisco River. One hundred seventy-seven kilometers (113 miles) 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 recovery habitat for restoration of the species.

e. Blue River. Seventy-nine kilometers (51 miles) of river extending from the confluence with the San Francisco River upstream to the confluence of Campbell and Dry Blue Creeks. The Blue River is not presently occupied by spikedace, but planning is underway between several State and Federal agencies for restoration of native fishes in the Blue River.

f. Campbell Blue Creek. Thirteen kilometers (8 miles) of creek extending from the confluence of Dry 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.

g. Little Blue Creek. Five kilometers (3 miles) of creek extending from the confluence with the Blue River upstream to the mouth of a box canyon. Little Blue Creek is not presently occupied by spikedace, but contains suitable habitat and is considered important restoration area for the species.

7. Upper Gila River complex, Grant and Catron Counties, New Mexico. This complex is occupied by spikedace and represents the largest remaining population. It is considered to represent the "core" of what remains of the species. Because of the remoteness of the three Forks, they have a relatively low degree of habitat threats.

a. Gila River. One hundred sixty one kilometers (102 miles) 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. Below Moore Canyon, the river is substantially altered by agriculture, diversion, and urban development, thus making it unsuitable for spikedace.

b. East Fork Gila River. Forty three kilometers (26 miles) 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. Eleven kilometers (8 miles) of river extending from the confluence with the West Fork Gila River upstream to the confluence with Big Bear Canyon.

d. West Fork Gila River. Twelve and a half kilometers (8 miles) 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, but the river becomes unsuitable for spikedace above EE Canyon due to gradient and channel morphology.

Loach Minnow

The following areas are proposed as critical habitat for loach minnow. The proposed designation includes portions of 26 streams; however, individual streams are not isolated, but are connected with others to form 7 areas or "complexes." The complexes include those which presently support populations of loach minnow as well as some presently unoccupied by loach minnow but which are considered essential for reestablishing populations of loach minnow to achieve recovery. There is substantial overlap with the proposed critical habitat for spikedace; 7 complexes and 26 streams are included in the proposed designation for both species. Distances and conversions are approximate.

1. Verde River complex, Yavapai County, Arizona. Historically known from the Verde River and some of its tributaries, the loach minnow is believed to be extirpated in this complex. The Verde complex is unusual in the relatively stable thermal and hydrologic regime found in the upper river and in Fossil Creek. 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. One-hundred sixty five kilometers (106 miles) of river extending from the confluence with Fossil Creek upstream to Sullivan Dam, but excluding lands belonging

to the Yavapai-Prescott Indian Community. 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 becomes larger due to the input of Fossil Creek and changes character to an extent to which it may not provide substantial suitable habitat for loach minnow.

b. Fossil Creek. Seven kilometers (5 miles) 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 loach minnow habitat at present, except sufficient discharge. Relicensing of the Childs/Irving Hydropower project will provide enhanced flows into lower Fossil Creek, although the amount of that flow restoration is still under negotiation.

c. West Clear Creek. Eleven kilometers (7 miles) 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 contains suitable, although degraded, habitat for loach minnow. Gradient and channel morphology changes above Black Mountain Canyon make the upstream area unsuitable for loach minnow.

d. Beaver/Wet Beaver Creek. Thirty-two kilometers (21 miles) 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 contain suitable, although degraded, habitat. Above Casner Canyon gradient and channel morphology changes make the stream unsuitable for loach minnow.

e. Oak Creek. Fifty-five kilometers (34 miles) 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 contains suitable, although degraded, habitat, for loach minnow. Above the unnamed tributary the creek becomes unsuitable due to urban and suburban development and to increasing gradient and substrate size.

f. Granite Creek. Two and a half kilometers (1.4 miles) of creek extending from the confluence with the Verde River upstream to a spring. Below the spring, which supplied much of the base flow of Granite Creek, there is suitable habitat for loach minnow.

2. Black River complex, Apache and Greenlee counties, Arizona. The Salt River subbasin is a significant portion of loach minnow historic 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. Seven kilometers (5 miles) of river extending from the confluence with the West Fork Black River upstream to the confluence with Boneyard Creek.

This area is occupied by loach minnow, although the downstream end of the population is not well known. This population was only discovered in 1996.

b. North Fork of the East Fork Black River. Fifteen kilometers (11 miles) of river extending from the confluence of the East Fork Black River and Boneyard Creek upstream to the confluence with an unnamed tributary. This area is occupied by loach minnow, although the upstream end of the population is not well known. Above the unnamed tributary, the river character makes it unsuitable for loach minnow.

c. Boneyard Creek. Two and a half kilometers (1.4 miles) 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, their presence there is likely based on the pattern of occupation of lower portions of small tributaries in other parts loach minnow range.

d. Coyote Creek. Three kilometers (2 miles) 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. Ten and a half kilometers (6 miles) 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. As part of the complex, it is considered important in conservation of the Black River remnant of the Salt River subbasin portion of the historic range of loach minnow.

3. Tonto Creek complex, Gila County, Arizona. Tonto Creek was historically occupied by spikedace and loach minnow. 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 Forest Service lands make this one of the most promising areas for reestablishment of loach minnow in the Salt River subbasin.

a. Tonto Creek. Seventy one kilometers (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. Fourteen kilometers (8 mi) of creek extending from the confluence with Tonto Creek upstream to Lime Springs.

c. Rye Creek. One and a third kilometers (1.3 mile) 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 loach minnow reestablishment.

4. Middle Gila/Lower San Pedro/Aravaipa Creek complex, Pinal and Graham counties, Arizona. This complex presently has loach minnow only in Aravaipa Creek and its tributaries. Aravaipa Creek supports one of the best, and most protected, loach minnow populations and enhancement of downstream habitats and expansion of the Aravaipa Creek population into the San Pedro and Gila Rivers would contribute substantially to recovery of this species. Expansion of this population is important to recovery of the species.

a. Gila River. Sixty-one kilometers (39 miles) of river extending from Ashurst-Hayden Dam upstream to the confluence with the San Pedro River. 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 is becomes marginally suitable for loach minnow.

b. San Pedro River. Twenty-one kilometers (13 miles) of river extending from the confluence with the Gila River upstream to the confluence with Aravaipa Creek. This is 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. Forty-five kilometers (28 miles) 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 loach minnow. Stowe Gulch is the upstream limit of sufficient perennial flow for loach minnow.

d. Turkey Creek. Five kilometers (3 miles) 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 tributary Oak Grove Canyon.

e. Deer Creek. Four kilometers (3 miles) 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. No nearby topographical features exist for easy on-the-ground identification.

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

a. San Pedro River. Seventy one kilometers (46 miles) 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 has increasing surface flow due to restoration activities, primarily groundwater pumping reductions.

b. Redfield Canyon. Twenty one kilometers (14) miles of creek extending from the confluence with the San Pedro River upstream to the confluence with Sycamore Canyon. Above Sycamore Canyon perennial water becomes too scarce and the habitat becomes unsuitable.

c. Hot Springs Canyon. Eighteen kilometers (12 miles) of creek extending from the confluence with the San Pedro River upstream to the confluence with Bass Canyon. Hot Springs contains suitable habitat for restoration of loach minnow.

d. Bass Canyon. Five kilometers (3 miles) 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. Fifty-eight kilometers (37 miles) of river extending from the confluence with the Babocomari River upstream to the US/Mexico border. Although presently unoccupied, this area is identified in Bureau of Land Management and Fish and Wildlife Service planning documents as high potential restoration area for loach minnow.

6. Gila Box /San Francisco River complex, Graham and Greenlee counties, Arizona and Catron County, New Mexico. 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 presently 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 in the Gila Box, Bonita Creek, and the Blue River are highly compatible with recovery goals, giving restoration of loach minnow in this complex a high likelihood of success.

a. Gila River. Thirty-seven kilometers (23) miles 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 considered to have a high potential for restoration of the loach minnow and populations are located shortly upstream in both Eagle Creek and the San Francisco River. Both above and below the Gila Box, the Gila River is highly modified by agriculture, diversions, and urban development.

b. Bonita Creek. Thirty five kilometers (23 miles) of creek extending from the confluence with the Gila River upstream to the confluence with Martinez Wash. Suitable habitat for loach minnow exists in Bonita Creek. Bonita Creek above Martinez Wash lies on the San Carlos Apache Reservation and no information is available on species or habitat.

c. Eagle Creek. Sixty-six kilometers (41 miles) 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. Below the diversion dam the creek is dry large portions of the time. Because the creek repeatedly flows from private or Forest Service land into the San Carlos Reservation and back, it is difficult to separate out the milage on tribal lands versus lands of other ownership. Therefore, the above milage is approximate and contains excluded Tribal lands.

d. San Francisco River. Two hundred six kilometers (126 miles) 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 substantially throughout the length of the river, from common to rare.

e. Tularosa River. Twenty-nine kilometers (19 miles) 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. Five and a half kilometers (4 miles) 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. One and a half kilometers (1 mile) 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 it unsuitable for loach minnow.

h. Blue River. Seventy-nine kilometers (51 miles) of river extending from the confluence with the San Francisco River upstream to the confluence of Campbell and Dry Blue creeks. Planning is underway between several State and Federal agencies to do significant restoration of native fishes in the Blue River.

i. Campbell Blue Creek. Thirteen kilometers (8 miles) of creek extending from the confluence of Dry 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 loach minnow.

j. Dry Blue Creek. Four kilometers (3 miles) of creek extending from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek.

k. Pace Creek. One and a half kilometers (.8 miles) of creek extending from the confluence with Dry Blue Creek upstream to a barrier falls.

l. Frieborn Creek. One and a half kilometers (1.1 mile) of creek extending from the confluence with Dry Blue Creek upstream to an unnamed tributary.

m. Little Blue Creek. Five kilometers (3 miles) of creek extending from the confluence with the Blue River upstream to the mouth of a box canyon. Little Blue Creek is not presently occupied by loach minnow, but contains suitable habitat and is considered important restoration area for the species.

7. Upper Gila River complex, Grant and Catron Counties, New Mexico. This complex is occupied by loach minnow throughout. It is considered to represent the "core" of what remains of the species. Because of the remoteness of the three Forks, they have a relatively low degree of habitat threats.

a. Gila River. One hundred sixty one kilometers (102 miles) 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. Below Moore Canyon, the river is substantially altered by agriculture, diversion, and urban development, thus making it unsuitable for loach minnow.

b. East Fork Gila River. Forty kilometers (26 miles) 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. Eighteen kilometers (12 miles) 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. Twelve kilometers (8 miles) 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 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 Service reviews the agency's proposed action and determines 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: 1) jeopardizes the continued existence of the listed species, 2) destroys or adversely modifies any designated critical habitat or 3) does not harm the species or its 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 against livestock and recreational use; 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 in unoccupied areas 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 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.

The similarity of the jeopardy and adverse modification standards is true for actions that affect spikedace and loach minnow. The Service does not anticipate that when the designation of critical habitat is final, it will need to impose additional restrictions in occupied habitat relative to critical habitat that were not previously in place due to the listing of the species. 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 areas currently unoccupied as critical habitat will simply require Federal agencies to consult with the Service on any action that is likely to result in destruction or adverse modification of unoccupied critical habitat.

Although each section 7 consultation must be decided on its merits, based on Service experience, activities that result in adverse modication of critical habitat occupied by either the spikedace or the loach minnow are expected always to result in a jeopardy decision, through the application of the jeopardy standard. 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 spikedace or loach minnow but which have the necessary habitat characteristics to serve as areas required for recovery of the two species.

Table 5 lists the areas of proposed critical habitat that are currently occupied by one or both of the two fish. Table 6 lists those areas that are not currently occupied by either spikedace 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 6 which result in adverse modification but not jeopardy decisions that are the focus of this study.

As shown in the tables, land ownership within the proposed critical habitat is mixed. There are large blocks of Federal land managed by the U.S. Forest Service, U.S. Bureau of Land Management, and the National Park Service. 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 proposed rule.

Table 5. Stream distances in kilometers (miles) occupied by either Loach Minnow (*Tiaroga cobitis*) or Spikedace (*Meda fulgida*) by county and ownership.

	Private	State	Federal	Other Gov.	Total
Apache Co., AZ	0	0	31.5 (19.6)	0	31.5 (19.6)
Cochise Co., AZ	0	0	0	0	0
Gila Co., AZ	0	0	0	0	0
Graham Co., AZ	7.7 (4.8)	0	7.0 (4.4)	0	14.7 (9.2)
Greenlee Co., AZ	60.5 (37.6)	2.8 (1.7)	148.8 (92.5)	0	212.0 (131.8)
Pima Co., AZ	0	0	0	0	0
Pinal Co., AZ	78.4 (48.7)	7.3 (4.5)	33.8 (21.0)	0	119.5 (74.2)
Yavapai Co., AZ	69.8 (43.4)	3.3 (2.0)	96.3 (59.8)	0	169.4 (105.2)
AZ Total	**216.3 (134.5)**	**13.4 (8.2)**	**317.4 (197.3)**	**0**	**547.1 (340.0)**
Catron Co., NM	73.9(46.2)	0	159.7(99.8)	0	233.6(146)
Grant Co., NM	50.2(31.4)	2.0(1.3)	108.6(67.9)	0	160.8(100.5)
Hidalgo Co., NM	12.7(7.9)	0	9.0(5.6)	0	21.7(13.6)
NM Total	**136.8(85.5)**	**2.0(1.3)**	**277.3(173.3)**	**0**	**416.1(260.1)**
TOTAL	**353.1(220.7)**	**15.4(9.5)**	**594.7(371.7)**	**0**	**963.2(601.4)**

Table 6. 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	0.3(.2)	2.8(1.8)	7.2(4.5)	0	10.3(6.4)
Cochise Co., AZ	66.0(41.3)	7.5(4.7)	61.3(38.3)	0	134.8(84.3)
Gila Co., AZ	10.1(6.3)	0	77.0(48.1)	0	87.1(54.4)
Graham Co., AZ	13.9(8.7)	10.6(6.6)	37.6(23.5)	0	62.1(38.8)
Greenlee Co., AZ	1.8(1.1)	0	18.2(11.4)	0	20.0(12.5)
Pima Co., AZ	20.5(12.8)	3.1(1.9)	0	0	23.6(14.8)
Pinal Co., AZ	4.4(2.8)				4.4(2.8)
Yavapai Co., AZ	60.3(37.7)	0.5(.3)	44.5(27.8)	2.3(1.4)	107.6(67.3)
AZ Total	**177.3(110.8)**	**24.5(15.3)**	**245.8(153.6)**	**2.3(1.4)**	**449.9(281.2)**

V. EFFECTS ON ACTIVITIES OF FEDERAL AGENCIES

As noted above, the U.S. Forest Service, U.S. Bureau of Land Management, and the National Park Service manage areas of proposed 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.

VI. CRITICAL HABITAT ON NON-FEDERAL LAND

Some of the area designated as critical habitat for the spikedace and loach minnow is on State owned, municipal and private land. The specific areas and their legal descriptions are shown above. The designation of critical 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 proposed 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.

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.

VII. THE EXCLUSION PROCESS

This section summarizes the procedure that will be used in determining whether or not to exclude an area (or areas) proposed as critical habitat for the spikedace and loach minnow from the final designation.

Section 4 of the Act directs the Secretary to consider economic and other relevant impacts in the designation of critical habitat. Section 4(b)(2) states:

> The Secretary shall designate critical habitat, and make revisions thereto, under subsection (a)(3) on the basis of the best scientific data available and after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data

available, that the failure to designate such area as critical habitat will result in the extinction of the species concerned.

The authority to make determinations under section 4(b)(2) of the Act has been delegated to the Director of the Fish and Wildlife Service to implement the provisions of the Act. Exclusion of an area as critical habitat would only eliminate the protection provided under section 7 (adverse modification) for critical habitat; it would not alleviate the need to comply with other requirements of the Act in that area, such as section 7 (jeopardy) consultation and section 9 (take). These requirements will apply in full regardless of whether or not critical habitat is designated for a particular area.

The implementation of section 4(b)(2) requires three determinations: (1) the benefits of including an area as critical habitat, (2) the costs of including an area, and (3) the cumulative effects of exclusions on the probability of species extinction. That includes determining the benefits and costs of retaining or excluding areas or portions of areas proposed as critical habitat, weighing those effects, and concluding if exclusion of an area or areas will lead to the extinction of the species. If the exclusion of an area or areas from critical habitat would lead to eventual species extinction, then the exclusion would be prohibited under the Act.

At the conclusion of the comment period the Service will review the areas proposed as critical habitat in light of the assessment of the benefits and costs associated with the designated areas. The Service will take into consideration information provided by Federal and State agencies, obtained at public hearings and in written comments on the critical habitat proposal before making a final critical habitat designation.

VIII. PREVIOUSLY IDENTIFIED ECONOMIC EFFECTS

In 1992, Karl Souder and Associates, Inc. of Santa Fe, New Mexico provided an economic analysis of the economic impacts of designating critical habitat for the spikedace and loach minnow under contract No. 20181-2-0427. The Souder reports identified the eight activities, shown in Table 7, where there was a possibility of economic effects attributable to critical habitat designation. The activities included agriculture, grazing, timber, fuelwood, recreation, roads, water supply, and private development. Most of the identified activities occur on lands managed by the Forest Service, Bureau of Land Management, National Park Service or the State of Arizona. In current dollars, Souder identified an annual economic effect of slightly over $834,000. However, the proposed areas as critical habitat identified by Souder have been updated and expanded with current information. Therefore, the list of activities and the amount of activity may well have changed also. The Fish and Wildlife Service will contact the Federal and State agencies with land management responsibility where critical habitat has been designated to obtain the most recent information available pertaining to the economic effects of changing management on the areas identified as critical habitat.

Public Comments Solicited

It is the intent of this economic analysis to accurately estimate the economic effects of critical habitat designation for the spikedace and loach minnow. The best available data will be used during the exclusion process to determine if exclusions are warranted before final critical habitat designation. Specifically, the Service is seeking economic information on:

(1) Land use practices and current or planned activities in the subject areas and their possible impacts on proposed critical habitat;

(2) Any foreseeable economic or other impacts resulting from the proposed designation of critical habitat, in particular, any impacts on small entities or families;

(3) Economic and other values associated with designating critical habitat for the spikedace and loach minnow, such as derived from non-consumptive uses (e.g. hiking, camping, birding, enhanced watershed protection, increased soil retention, existence values and reductions in administrative costs.

In the interim, the Service will be seeking to update county level information for the State of Arizona in order to have the best available information to make the required determination of the impact of critical habitat designation on small businesses and entities.

Table 7. Estimated maximum Economic Effects in 1992 (current dollars)

	Agriculture	Grazing	Timber	Fuelwood	Recreation	Water Roads	Private Supply	Development	Total
Arizona:									
Aravaipa Creek		0			0	0			
Lower San Francisco R.		$84,700				0			$84,700
Blue River		$157,300		$1,936	0	0			$159,236
Campbell Hill Creek		?	$472,948			0			$472,948
Dry Blue Creek		?	$117,486			0			$117,486
Total		$242,000	$590,434	$1,936					$834,370

Note: A zero indicated to expected economic effect and a blank indicates that no information was provided.

Source: Analysis of the Economic Impacts of Designating Critical Habitat for Tiaroga cobitis (Loach Minnow) Table 3 by Karl Souder and Associates, Inc. Santa Fe, New Mexico August 12, 1992 Contract No. 20181-2-0427.