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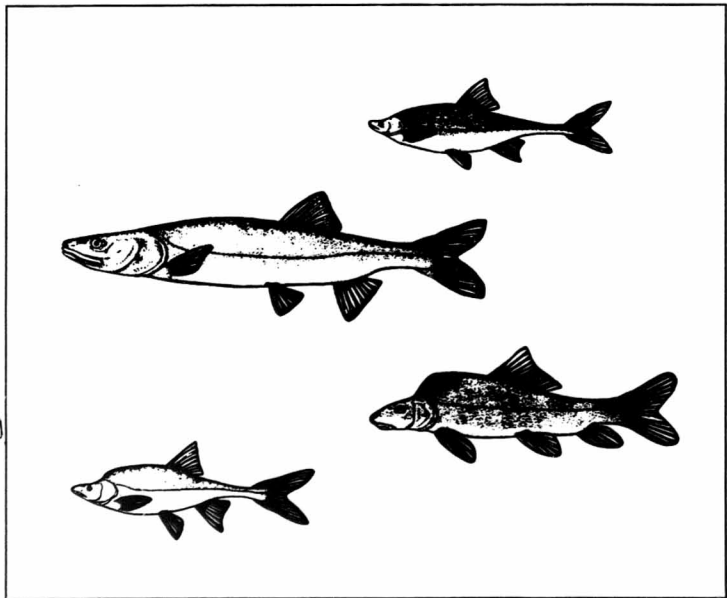
COMPLETED

OVERVIEW OF THE PROPOSED CRITICAL HABITAT FOR THE COLORADO RIVER ENDANGERED FISHES

DRAFT

ITEM # 0631

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Department of the Interior
 U.S. Fish and Wildlife Service
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OVERVIEW OF THE PROPOSED
 CRITICAL HABITAT DESIGNATION
 FOR THE FOUR COLORADO RIVER
 ENDANGERED FISHES

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TABLE OF CONTENTS

LIST OF TABLES iv

LIST OF FIGURES v

PREFACE 1

PART I - General Overview 1

 INTRODUCTION 1

 PROPOSED CRITICAL HABITAT DESIGNATION 2

 Razorback Sucker 6

 Colorado Squawfish 8

 Humpback Chub 9

 Bonytail 10

PART II- Biological Overview 12

 BACKGROUND 12

 HABITATS AND STATUS OF ENDANGERED FISHES 13

 General 13

 Razorback Sucker 13

 Colorado Squawfish 15

 Humpback Chub 15

 Bonytail 16

 DETERMINATION OF CRITICAL HABITAT 17

 General 17

 Water 17

 Physical Habitat 17

 Biological Environment 17

PART III - Economic Overview 19

 ECONOMIC SETTING 19

 Economic Output 19

 Employment 20

 Historical Development of the Basin 20

 MODELING OVERVIEW 20

 THE MODELING APPROACH 21

 Without Fish and With Fish Scenarios 21

 Aggregation of Producing Sectors 22

 Flow Activities 23

 Nonflow Related Activities 26

 The Division Between Listing and Critical Habitat 27

 DIRECT ECONOMIC IMPACTS 28

 STATE- AND REGIONAL-LEVEL ECONOMIC IMPACTS 30

 Output 30

 Earnings Impacts 32

 Regional Government Revenue Impacts 32

 State- and Regional-Level Employment Impacts 35

 Present Value and Annualized Incremental Impacts 35

 A COMPUTABLE GENERAL EQUILIBRIUM (CGE) FRAMEWORK 37

 Scenario A1 and B1 — Construction-Related Impacts 37

 Scenarios A2 and B2 — Recreation-Related Impacts 38

 Present Value and Annualized Incremental Impacts 40

CONCLUSION 41

PART IV - Relationship of Critical Habitat to other Provisions
of the Endangered Species Act 42

 INTRODUCTION 42

 RECOVERY PLANNING 42

 SECTION 7 CONSULTATION 43

 Basis for Section 7 Analysis 46

 Examples of Proposed Actions 47

 Results of Formal Consultation 47

 Reasonable and Prudent Alternatives 49

 EXPECTED IMPACTS OF DESIGNATION 50

PART V - Exclusion Process Overview 52

 EXCLUSION PROCESS 52

 BENEFITS AND COSTS OF DESIGNATION 53

 CONSERVATION AND EXTINCTION AS FACTORS IN DESIGNATING
 CRITICAL HABITAT 54

PART VI - Public Comments 56

 BACKGROUND 56

 CONTENT ANALYSIS 56

 SUMMARY OF PUBLIC COMMENTS RECEIVED TO DATE 57

 CONTINUED PUBLIC INVOLVEMENT 59

 APPENDIX - COMMENTS RECEIVED 60

 Administrative 60

 Biological 62

 Economic 64

LIST OF TABLES

Table	Page
1. Constituent elements for razorback sucker	3
2. Constituent elements by proposed critical habitat reach for Colorado squawfish, humpback chub, and bonytail	4
3. Critical habitat for four endangered Colorado River fishes	5
4. Ownership of shoreline (in miles) for proposed critical habitat for the endangered Colorado River fishes	5
5. Industrial Sectors used in Economic Analysis	23
6. Activity and Percentage of Costs Attributable to Critical Habitat in the Upper Basin with Recovery in the Year 2003.	27
7. The Percentage of Costs Attributable to Critical Habitat in the Lower Basin if Substantial Recovery Has Occurred by 2003.	28
8. Direct Economic Impacts	29
9. Present Value (3%) of Incremental Output Impacts for Proposed Critical Habitat Designation for 20 Economic Sectors by State and for the Colorado River Basin	31
10. Present Value (3%) of Incremental Earnings Impacts for Proposed Critical Habitat Designation for 20 Economic Sectors by State and for the Colorado River Basin	33
11. Present Value (3%) of Incremental Indirect Business and Personal Taxes Impacts for Proposed Critical Habitat Designation for 20 Economic Sectors by State and for the Colorado River Basin	34
12. State Employment - Incremental Impacts Over Time of Critical Habitat Designation	35
13. State- and Regional-Level Present Value and Annualized Incremental Critical Habitat Impacts	36
14. Colorado River Basin: National Efficiency Results (CGE)	39
15. Colorado River Basin — National Economic Impacts: Levels and Differences	40
16. National Efficiency (CGE): Present and Annualized Values	41
17. National Efficiency (CGE): Present and Annualized Values	41
18. Possible outcomes of a Section 7 Consultation	48
19. Examples of possible reasonable and prudent alternatives	49
20. Sources of comments received	58
21. Position of commentors and type of response to the proposed critical habitat designation	59

LIST OF FIGURES

Figure	Page
1. Critical habitat proposed for the razorback sucker, Colorado squawfish, humpback chub, and bonytail	2
2. Example Hydrograph used in the Economic Analysis.	25
3. Major steps in a Section 7 evaluation	44
4. Origin of comments received on the proposed designation of critical habitat	57

PREFACE

This document presents an overview of the process, procedures and determinations associated with the proposed critical habitat designation for the razorback sucker, Colorado squawfish, humpback chub, and bonytail (also known as bonytail chub). These species are listed as endangered under the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Part I is an overview of the proposed critical habitat designation for the Colorado River endangered fishes. Part II is a summary of the biological information used in determining areas for proposed designation and the description of each area proposed on January 29, 1993 (58 FR 6578). Part III is a summary of the economic and other impacts of the proposed critical habitat designation. Part IV discusses the Section 7 consultation requirements of the Act and available conservation measures. Part V discusses the Exclusion Process and the economic and biological factors which are considered during exclusion considerations. Part VI is an analysis and summary of public comments received on the proposed rule. The information contained herein provides additional information about the proposed critical habitat designation prior to the development of a final rule.

The Fish and Wildlife Service (Service) welcomes public comment on this document and all aspects of the critical habitat designation for the four endangered Colorado river fishes. Additionally, information and comments are welcome on the overall exclusion process, recommendations on economic criteria for use in the exclusion determination, any other benefits associated with exclusion, benefits of including proposed areas as critical habitat, and information on which areas, if excluded, would result in the extinction of any of the four endangered fishes.

PART I - General Overview

INTRODUCTION

On January 29, 1993 (58 FR 6578), the Service proposed to designate critical habitat for the four Colorado River endangered fishes: the razorback sucker (*Xyrauchen texanus*), the Colorado squawfish (*Ptychocheilus lucius*), the humpback chub (*Gila cypha*), and the bonytail (*Gila elegans*).

There is considerable overlap in critical habitat proposed for the four species, and the proposed designation of 2,094 miles for all four species includes portions of Colorado, Utah, New Mexico, Arizona, Nevada, and California (Figure 1). The Service proposed 1,824 miles of critical habitat for the razorback sucker (52 percent of its historical range); 1,148 miles for the Colorado squawfish (29 percent of its historical range); 379 miles for the humpback chub (28 percent of its historical range); and 344 miles for the bonytail (15 percent of its historical range).

PROPOSED CRITICAL HABITAT DESIGNATION

The critical habitat areas proposed are those that the Service believes are required for the survival and recovery of each species. Figure 1 displays the total extent of proposed critical habitat for all four species combined (i.e., this area includes the overlap of proposed critical habitat that is common among the four species).

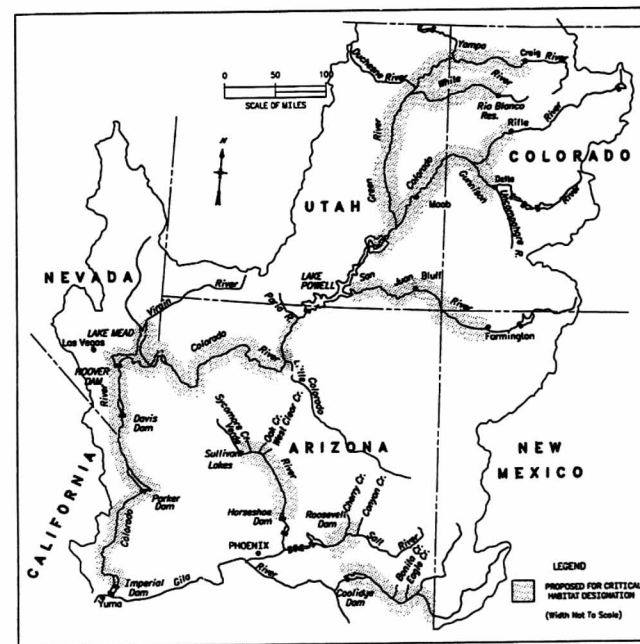


Figure 1. Critical habitat proposed for the razorback sucker, Colorado squawfish, humpback chub, and bonytail.

Critical habitat was proposed for each of the four species by evaluating river segments, or reaches. A detailed discussion of the biological basis for selection of each river reach proposed for critical habitat was included in the Biological Support Document. This discussion also indicated the attributes of the constituent elements that need to be enhanced. Tables 1 and 2 provide a summary of the applicable constituent elements for each river reach being proposed for critical habitat. This information was condensed from the Critical Habitat section of the Biological Support Document. A discussion of proposed critical habitat is presented by river reach in the Biological Support Document.

Table 1. Constituent elements for razorback sucker by proposed critical habitat reach.

RIVER REACH ¹	CONSTITUENT ELEMENTS ²			OTHER CRITERIA ³	
	WATER	PHYSICAL HABITAT	BIOLOGICAL ENVIRONMENT	ADDITIONAL SELECTION CRITERIA	RECOVERY TEAM
RZ1	W1,W2	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ2	W1?, W2	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ3	W1	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ4	W1,W2	P1,P2,P3,P4	B1	A2,A3,A5	Y
RZ5	W1?	P1?,P2,P3,P4	B1	A2,A3,A4,A5	Y
RZ6	W1,W2?	P1,P2,P3,P4	B1,B2?,B3?	A2,A3,A4,A5	Y
RZ7	W1	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ8	W1	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ9	W1?,W2?	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ10	W1?,W2	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ11	W1,W2	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ12	W1,W2	P1,P2,P3,P4	B1	A1,A2,A3,A4,A5	Y
RZ13	W1,W2?	P1,P2,P3,P4	B1	A2,A3,A4,A5	Y
RZ14	W1,W2	P1,P2,P3,P4	B1	A2,A3,A4,A5	Y
RZ15	W1,W2?	P1,P2,P3,P4	B1	A2,A3,A4,A5	Y

1 - A description of each "River Reach" code is given in this section.

2 - The presence of a criterion code under the appropriate column in the table indicates that criterion is met within that reach. The use of a question mark (?) behind a criterion code indicates insufficient data to determine with certainty if the criterion is met within that reach.

Water: W1=Quality; W2=Quantity
Physical Habitat: P1=Spawning Habitat; P2=Nursery Habitat; P3=Feeding Areas; P4=Movement Corridors
Biological Environment: B1=Food Supply; B2=Predation; B3=Competition
Additional Selection Criteria: A1=Known or suspected spawning population; A2=Area with juvenile razorback sucker or nursery habitat; A3=Presently or historically occupied; A4=Important for maintaining range-wide distribution; A5=Special management or protection required
Other criteria: Y=Recovery Team suggestion for razorback sucker

Table 2. Constituent elements by proposed critical habitat reach for Colorado squawfish, humpback chub, and bonytail.

RIVER REACH ¹	CONSTITUENT ELEMENTS ²			OTHER CRITERIA
	WATER	PHYSICAL HABITAT	BIOLOGICAL ENVIRONMENT	RECOVERY PLAN
CSF1	W1,W2	P1,P2,P3,P4	B1	Y
CSF2	W1?	P1,P2,P3,P4	B1	Y
CSF3	W1,W2	P1,P2,P3,P4	B1	Y
CSF4	W1,W2?	P1,P2,P3,P4	B1	Y
CSF5 ³	W1	P1,P2,P3,P4	B1	N ⁴
CFS5 ⁵	W1	P1,P2,P3,P4	B1	Y
CFS6	W1?,W2?	P1,P2,P3,P4	B1	Y
HBC1	W1,W2	P1,P2,P3,P4	B1	Y
HBC2	W1,W2?	P1,P2,P3,P4	B1	Y
HBC3	W1,W2?	P1,P2,P3,P4	B1	Y
HBC4	W1,W2	P1,P2,P3,P4	B1	Y
HBC5	W1,W2?	P1,P2,P3,P4	B1	Y
HBC6	W1,W2	P1,P2,P3,P4	B1,B2,B3	Y
HBC7	W1?,W2?	P2,P3,P4	B1,B2?	Y
BT1	W1,W2	P1?,P2?,P3?,P4?	B1	Y
BT2	W1,W2?	P1?,P2?,P3?,P4?	B1	Y
BT3	W1,W2?	P1?,P2?,P3?,P4?	B1	Y
BT4	W1,W2?	P1?,P2?,P3?,P4?	B1	Y
BT5	W1,W2?	P1?,P2?,P3?,P4?	B1	Y
BT6	W1,W2	P1,P2,P3,P4	B1	Y

1 - Description of the area for each "River Reach" code is at the beginning of the legal descriptions starting on page 13.

2 - The presence of a criterion code under the appropriate column in the table indicates that criterion is met within that reach. The use of a question mark (?) behind a criterion code indicates insufficient data to determine with certainty if the criterion is met within that reach.

Water: W1=Quality; W2=Quantity
Physical Habitat: P1=Spawning Habitat; P2=Nursery Habitat; P3=Feeding Areas; P4=Movement Corridors
Biological Environment: B1=Food Supply; B2=Predation; B3=Competition
Other criteria: Y=Identified as important area in Recovery Plan (other three fish)

3 - The portion of CSF5 from Rifle, Colorado to Price-Stubb Dam

4 - The Colorado River from Rifle, CO to Price-Stubb Dam, Palisade, CO was not included as a recovery reach within the Colorado Squawfish Recovery Plan

5 - The portion of CSF5 from Price-Stubb Dam to the Dirty Devil Arm of Lake Powell

Critical habitat for each species is summarized by State in Table 3 and by shoreline ownership in Table 4. The 100-year floodplain delineates the lateral boundary of the proposed critical habitat for the razorback sucker and Colorado squawfish. This boundary encompasses the productive areas adjacent to the rivers that provide essential food resources for various life stages of the fish, and it includes the mouths of smaller tributaries and other habitats that provide essential fish habitat when seasonally inundated.

Table 3. Critical habitat for four endangered Colorado River fishes (in river miles¹).

STATE	RAZORBACK SUCKER	COLORADO SQUAWFISH	HUMPBACK CHUB	BONYTAIL	STATE TOTALS ²
COLORADO	217	362	59	59	362
UTAH	688	726	139	139	728
NEW MEXICO	39	60	---	---	60
ARIZONA	617	---	181	---	617
AZ/NEVADA	130	---	---	82	130
AZ/CALIFORNIA	133	---	---	64	197
BASIN TOTAL	1,824	1,148	379	344	2,094

- 1 - The river distances shown in this table were compiled using total shoreline miles (assuming 1 mile of river centerline has 2 miles of shoreline) for each proposed critical habitat reach. Because of rounding differences, numbers in this table may not exactly match those proposed for each species. There is considerable overlap of proposed critical habitat reaches between species; thus, total miles of critical habitat for all four Colorado River endangered fishes proposed to be designated cannot be obtained from this table.
- 2 - State totals do not equal the cumulative totals of the four species due to extensive overlap between species.

Table 4. Ownership of shoreline (in miles) for proposed critical habitat for the endangered Colorado River fishes¹.

OWNERSHIP ²	RAZORBACK SUCKER	COLORADO SQUAWFISH	HUMPBACK CHUB	BONYTAIL
NPS	1215	559	338	426
BLM	713	695	126	83
USFS	286	---	---	---
USFWS	99	22	---	25
TRIBAL	620	280	276	86
STATE LANDS	43	49	<1	25
PRIVATE	673	691	17	37
TOTAL	3,649	2,296	758	682

- 1 - The river distances shown in this table were compiled using total shoreline miles (assuming 1 mile of river centerline has 2 miles of shoreline) for each proposed critical habitat reach. Because of rounding differences, numbers in this table may not exactly match those proposed for each species. There is considerable overlap of proposed critical habitat reaches between species; thus, total miles of critical habitat for all four Colorado River endangered fishes proposed to be designated cannot be obtained from this table.
- 2 - NPS--National Park Service; BLM--Bureau of Land Management; USFS--U.S. Forest Service; USFWS--U.S. Fish and Wildlife Service.

Razorback Sucker--The Service is proposing 15 reaches of the Colorado River system as critical habitat for the razorback sucker (Table 1). These reaches total 1,824 miles as measured along the center line of each reach (Table 3). This represents approximately 52 percent of the historical habitat for this species. In the Upper Basin, critical habitat is being proposed in the Green, Yampa, Duchesne, Colorado, White, Gunnison, and San Juan rivers. Portions of the Colorado, Gila, Salt, and Verde rivers are being proposed in the Lower Basin. These reaches flow through a variety of landownerships, both public, tribal, and private. The approximate number of proposed shoreline miles of critical habitat by landownership for the razorback sucker is presented in Table 4.

Critical habitat areas proposed for the razorback sucker in each State are as follows:

RZ1: Colorado, Moffat County. The Yampa River and its 100-year floodplain from the mouth of Cross Mountain Canyon in T.6N., R.98W., section 23 (6th Principal Meridian) to the confluence with the Green River in T.7N., R.103W., section 28 (6th Principal Meridian).

RZ2: Utah, Uintah County, and Colorado, Moffat County. The Green River and its 100-year floodplain from the confluence with the Yampa River in T.7N., R.103W., section 28 (6th Principal Meridian) to Sand Wash at river mile 96 in T.11S., R.18E., section 20 (6th Principal Meridian).

RZ3: Utah, Uintah, Carbon, Grand, Emery, Wayne, and San Juan Counties. The Green River and its 100-year floodplain from Sand Wash at river mile 96 at T.11S., R.18E., section 20 (6th Principal Meridian) to the confluence with the Colorado River in T.30S., R.19E., section 7 (6th Principal Meridian).

RZ4: Utah, Uintah County. The White River and its 100-year floodplain from the boundary of the Uintah and Ouray Indian Reservation at river mile 18 in T.9S., R.22E., section 21 (Salt Lake Meridian) to the confluence with the Green River in T.9S., R.20E., section 4 (Salt Lake Meridian).

RZ5: Utah, Uintah County. The Duchesne River and its 100-year floodplain from river mile 2.5 in T.4S., R.3E., section 30 (Salt Lake Meridian) to the confluence with the Green River in T.5S., R.3E., section 5 (Uintah Meridian).

RZ6: Colorado, Delta and Mesa Counties. The Gunnison River and its 100-year floodplain from the confluence with the Uncompahgre River in T.15S., R.96W., section 11 (6th Principal Meridian) to Redlands Diversion Dam in T.1S., R.1W., section 27 (Ute Meridian).

RZ7: Colorado, Mesa and Garfield Counties. The Colorado River and its 100-year floodplain from Colorado River Bridge at exit 90 north off Interstate 70 (river mile 238) in T.6S., R.93W., section 16 (6th Principal Meridian) to Westwater Canyon (river mile 125) in T.20S., R.25E., section 12 (Salt Lake Meridian) including the Gunnison River and its 100-year

floodplain from the Redlands Diversion Dam in T.1S., R.1W., section 27 (Ute Meridian) to the confluence with the Colorado River in T.1S., R.1W., section 22 (Ute Meridian).

RZ8: Utah, Grand, San Juan, Wayne, and Garfield Counties. The Colorado River and its 100-year floodplain from Westwater Canyon (river mile 125) in T.20S., R.25E., section 12 (Salt Lake Meridian) to full pool elevation, upstream of North Wash and including the Dirty Devil arm of Lake Powell in T.33S., R.14E., section 29 (Salt Lake Meridian).

RZ9: New Mexico, San Juan County, and Utah, San Juan County. The San Juan River and its 100-year floodplain from the Hogback Diversion in T. 29N. R.16W., section 9 (New Mexico Meridian) to the full pool elevation at the mouth of Neskahai Canyon on the San Juan arm of Lake Powell in T.41S., R.11E., section 26 (Salt Lake Meridian).

RZ10: Arizona, Coconino and Mohave Counties, and Nevada, Clark County. The Colorado River and its 100-year floodplain from the confluence with the Paria River in T.40N., R.7E., section 24 (Gila and Salt River Meridian) to Hoover Dam in T.30N., R.23W., section 3 (Gila and Salt River Meridian) including Lake Mead to the full pool elevation.

RZ11: Arizona, Mohave County, and Nevada, Clark County. The Colorado River and its 100-year floodplain from Hoover Dam in T.30N., R.23W., section 1 (Gila and Salt River Meridian) to Davis Dam in T.21N., R.21W., section 18 (Gila and Salt River Meridian) including Lake Mohave to the full pool elevation.

RZ12: Arizona, La Paz and Yuma Counties, and California, San Bernardino, Riverside, and Imperial Counties. The Colorado River and its 100-year floodplain from Parker Dam in T.11N., R.18W., section 16 (Gila and Salt River Meridian) to Imperial Dam in T.6S., R.22W., section 25 (Gila and Salt River Meridian) including Imperial Reservoir to the full pool elevation or 100-year floodplain, whichever is greater.

RZ13: Arizona, Graham, Greenlee, Gila, and Pinal Counties. The Gila River and its 100-year floodplain from the Arizona-New Mexico border in T.8S., R.32E., section 34 (Gila and Salt River Meridian) to Coolidge Dam in T.3S., R.18E., section 17 (Gila and Salt River Meridian), including San Carlos Reservoir to the full pool elevation, Bonita Creek and its 100-year floodplain from the infiltration gallery in T.6S., R.28E., section 5 (Gila and Salt River Meridian) to the confluence with the Gila River in T.6S., R.28E., section 21 (Gila and Salt River Meridian) and Eagle Creek and its 100-year floodplain from the Phelps-Dodge Pumping Plant in T.4S., R.28E., section 26 (Gila and Salt River Meridian) to the confluence with the Gila River in T.5S., R.29E., section 31 (Gila and Salt River Meridian).

RZ14: Arizona, Gila County. The Salt River and its 100-year floodplain from the old U.S. Highway 60/State Route 77 bridge (unsurveyed) to Roosevelt Diversion Dam in T.3N., R.14E., section 4 (Gila and Salt River Meridian) including Cherry Creek and its 100-year floodplain from the Cherry Creek road crossing in T.4N., R.15E., section 3 (Gila and Salt River Meridian) to the confluence with the Salt River in T.4N., R.15E., section 23 (Gila and

Salt River Meridian) and Canyon Creek and its 100-year floodplain from the Indian Route 1 crossing (about 1 mile upstream of the confluence of Canyon Creek and the Salt River; an unsurveyed area) to the confluence with the Salt River in T.5N., R.16E., section 21 (Gila and Salt River Meridian).

RZ15: Arizona, Yavapai County. The Verde River and its 100-year floodplain from the base of the dam forming Sullivan Lake in T.17N., R.2E., section 15 (Gila and Salt River Meridian) to Horseshoe Dam in T.7N., R.6E., section 2 (Gila and Salt River Meridian), including Horseshoe Lake to the full pool elevation, Sycamore Creek and its 100-year floodplain from the boundary with the Sycamore Canyon Wilderness Area in T.17N., R.3E., section 8 (Gila and Salt River Meridian) to the confluence with the Verde River in T.17N., R.3E., section 7 (Gila and Salt River Meridian), Oak Creek and its floodplain from Page Springs State Fish Hatchery in T.16N., R.4E., section 23 (Gila and Salt River Meridian) to the confluence with the Verde River in T.15N., R.4E., section 20 (Gila and Salt River Meridian) and West Clear Creek and its 100-year floodplain from the boundary of the West Clear Creek Wilderness Area in T.13N., R.6E., section 15 (Gila and Salt River Meridian) to the confluence with the Verde River in T.13N., R.6E., section 21 (Gila and Salt River Meridian).

Colorado Squawfish--The Service is proposing six reaches (Table 2) of the Colorado River System as critical habitat for the Colorado squawfish. These reaches total 1,148 miles as measured along the center line of each reach (Table 3). This represents about 29 percent of the historical habitat of this species. Critical habitat is being proposed in the Colorado, Green, Yampa, White, and San Juan rivers in the Upper Basin. There is no critical habitat proposed for this species in the Lower Basin. The approximate number of proposed shoreline miles of critical habitat by landownership for the Colorado squawfish is presented in Table 4.

Critical habitat areas proposed for Colorado squawfish in each State are as follows:

CSF1: Colorado, Moffat County. The Yampa River and its 100-year floodplain from the State Highway 394 bridge (river mile 137.7) in T.6N., R.91W., section 1 (6th Principal Meridian) to the confluence with the Green River in T.7N., R.103W., section 28 (6th Principal Meridian).

CSF2: Utah, Uintah, Carbon, Grand, Emery, Wayne, and San Juan Counties, and Colorado, Moffat County. The Green River and its 100-year floodplain from the confluence with the Yampa River in T.7N., R.103W., section 28 (6th Principal Meridian) to the confluence with the Colorado River in T.30S., R.19E., section 7 (Salt Lake Meridian).

CSF3: Colorado, Rio Blanco County, and Utah, Uintah County. The White River and its 100-year floodplain from Rio Blanco Lake Dam (river mile 150) in T.1N., R.96W., section 6 (6th Principal Meridian) to the confluence with the Green River in T.9S., R.20E., section 4 (Salt Lake Meridian).

CSF4: Colorado, Delta and Mesa Counties. The Gunnison River and its 100-year floodplain from the confluence with the Uncompahgre River in T.15S., R.96W., section 11 (6th Principal Meridian) to the confluence with the Colorado River in T.1S., R.1W., section 22 (Ute Meridian).

CSF5: Colorado, Mesa and Garfield Counties; and Utah, Grand, San Juan, Wayne, and Garfield Counties. The Colorado River and its 100-year floodplain from the Colorado River Bridge at exit 90 north off Interstate 70 (river mile 238) in T.6S., R.93W., section 16 (6th Principal Meridian) to North Wash including the Dirty Devil arm of Lake Powell up to the full pool elevation in T.33S., R.14E., section 29 (Salt Lake Meridian).

CSF6: New Mexico, San Juan County, and Utah, San Juan County. The San Juan River and its 100-year floodplain from the State Route 371 Bridge in T.29N., R.13W., section 17 (New Mexico Meridian) to Neskahai Canyon in the San Juan arm of Lake Powell in T.41S., R.11E., section 26 (Salt Lake Meridian) up to the full pool elevation.

Humpback Chub--The Service is proposing seven reaches of the Colorado River system as critical habitat for the humpback chub (Table 2). These reaches total 379 miles as measured along the center line of each reach (Table 3). This represents approximately 28 percent of the historical habitat of the species. Critical habitat for the humpback chub is being proposed in the Colorado, Green, and Yampa rivers in the Upper Basin, and the Colorado and Little Colorado Rivers in the Lower Basin. The approximate number of proposed shoreline miles of critical habitat by landownership for the humpback chub is presented in Table 4.

Critical habitat areas proposed for humpback chub in each State are as follows:

HBC1: Colorado, Moffat County. The Yampa River from the boundary of Dinosaur National Monument in T.6N., R.99W., section 27 (6th Principal Meridian) to the confluence with the Green River in T.7N., R.103W., section 28 (6th Principal Meridian).

HBC2: Utah, Uintah County, and Colorado, Moffat County. The Green River from the confluence with the Yampa River in T.7N., R.103W., section 28 (6th Principal Meridian) to the southern boundary of Dinosaur National Monument in T.6N., R.24E., section 30 (Salt Lake Meridian).

HBC3: Utah, Uintah and Grand Counties. The Green River (Desolation and Gray Canyons) from Sumner's Amphitheater (river mile 85) in T.12S., R.18E., section 5 (Salt Lake Meridian) to Swasey's Rapid (river mile 12) in T.20S., R.16E., section 3 (Salt Lake Meridian).

HBC4: Utah, Grand County, and Colorado, Mesa County. The Colorado River from Black Rocks (river mile 137) in T.10S., R.104W., section 25 (6th Principal Meridian) to Fish Ford (river mile 106) in T.21S., R.24E., section 35 (Salt Lake Meridian).

HBC5: Utah, Garfield and San Juan Counties. The Colorado River from Brown Betty Rapid River (mile 212.5) in T.30S., R.18E., section 34 (Salt Lake Meridian) to Imperial Canyon (river mile 200) in T.31S., R.17E., section 28 (Salt Lake Meridian).

HBC6: Arizona, Coconino County. The Little Colorado River from river mile 8 in T.32N., R.6E., section 12 (Salt and Gila River Meridian) to the confluence with the Colorado River in T.32N., R.5E., section 1 (Salt and Gila River Meridian).

HBC7: Arizona, Coconino County. The Colorado River from Nautiloid Canyon (river mile 34) in T.36N., R.5E., section 35 (Salt and Gila River Meridian) to Granite Park (river mile 208) in T.30N., R.10W., section 25 (Salt and Gila River Meridian).

Bonytail--The Service is proposing six reaches of the Colorado River system as critical habitat for the bonytail (Table 2). These reaches total 344 miles as measured along the center line of each reach (Table 3). This represents approximately 15 percent of the historical habitat of the species. Critical habitat for the bonytail is being proposed in the Colorado, Green, and Yampa rivers in the Upper Basin, and the Colorado River in the Lower Basin. The approximate number of proposed shoreline miles of critical habitat by landownership for the bonytail is presented in Table 4.

Critical habitat areas proposed for bonytail in each State are as follows:

BT1: Colorado, Moffat County. The Yampa River from the boundary of Dinosaur National Monument in T.6N., R.99W., section 27 (6th Principal Meridian) to the confluence with the Green River in T.7N., R.103W., section 28 (6th Principal Meridian).

BT2: Utah, Uintah County, and Colorado, Moffat County. The Green River from the confluence with the Yampa River in T.7N., R.103W., section 28 (6th Principal Meridian) to the boundary of Dinosaur National Monument in T.6N., R.24E. section 30 (Salt Lake Meridian).

BT3: Utah, Uintah and Grand Counties. The Green River (Desolation and Gray Canyons) from Sumner's Amphitheater (river mile 85) in T.12S., R.18E., section 5 (Salt Lake Meridian) to Swasey's Rapid (river mile 12) in T.20S., R.16E., section 3 (Salt Lake Meridian).

BT4: Utah, Grand County, and Colorado, Mesa County. The Colorado River from Black Rocks (river mile 137) in T.10S., R.104W., section 25 (6th Principal Meridian) to Fish Ford (river mile 106) in T.21S., R.24E., section 35 (Salt Lake Meridian).

BT5: Utah, Garfield and San Juan Counties. The Colorado River from Brown Betty Rapid (river mile 212.5) in T.30S., R.18E., section 34 (Salt Lake Meridian) to Imperial Canyon (river mile 200) in T.31S., R.17E., section 28 (Salt Lake Meridian).

BT6: Arizona, Mohave County; Nevada, Clark County; and California, San Bernardino County. The Colorado River from Hoover Dam in T.30N., R.23W., section 3 (Gila and Salt River Meridian) to Parker Dam in T.11N., R.18W., section 16 (Gila and Salt River Meridian) including Lakes Mohave and Havasu up to their full pool elevations.

PART II- Biological Overview

This biological overview provides a brief summary of the life histories and habitat requirements for each species. It provides a synopsis of the Service's Biological Support Document and readers may wish to refer to that document for detailed information on the biological aspects of the critical habitat designation.

BACKGROUND

The four endangered fishes are endemic to the Colorado River Basin (Basin), which consists of portions of seven Western States. The Basin drains approximately 242,000 sq. miles within the United States and has been politically divided into an Upper and Lower Basin. The Upper Basin consists of portions of the States of Colorado, New Mexico, Utah, and Wyoming. The Lower Basin consists of portions of the States of Arizona, California, and Nevada. An additional 2,000 sq. miles of the Basin lies within Mexico.

Historically, the native fish fauna of the mainstream Colorado River was dominated by minnows (cyprinids) and suckers (catostomids; Minckley et al. 1986). However, four of these, the razorback sucker, Colorado squawfish, humpback chub, and bonytail, are now listed as endangered species under the Endangered Species Act of 1973. These fishes are threatened with extinction due to the combined effects of habitat loss (including regulation of natural flow and changes to temperature and sediment regimes); proliferation of introduced fishes; and other man-induced disturbances (Miller 1961; Minckley 1973; USFWS 1987; Carlson and Muth 1989).

Colorado squawfish populations survive only in the Upper Basin, where their numbers are relatively high only in the Green River basin of Utah and Colorado when compared with other rivers in the Basin (Tyus 1991). Razorback sucker and bonytail populations throughout the Basin consist predominately of old adult fish, and they persist only because of the longevity inherent in these species (USFWS 1990a; Minckley et al. 1991). Humpback chub populations in the Little Colorado River, Black Rocks, and Westwater in the Colorado River appear relatively stable in number of fish, but declines have been apparent in other locations (USFWS 1990b).

Conservation of these four species will require the identification and management of water resources and habitat areas that are considered important to any fish species, such as spawning areas and nursery grounds. However, because the four endangered fishes are present in such low numbers, basic life history and habitat use information has been difficult to obtain. Some areas used by Colorado squawfish and razorback sucker for spawning have been located by radiotracking, tagging, and collection of eggs or larvae (Tyus and Karp 1990; Tyus 1990). Spawning information is less available in other places where these species are more rare. Actions that have resulted in a lack of reproduction and/or recruitment have been hypothesized as factors in their endangerment (USFWS 1990a, 1990b, 1991). In this case, not only would a lack of successful recruitment lead to small numbers of fish, but over time,

remnant stocks may lose genetic diversity. Ultimately, extinction could result because the loss of genetic diversity may make populations more susceptible to environmental change.

The historical ranges of the four endangered species have been fragmented by construction of dams and water diversions throughout the Basin (Carlson and Muth 1989). The Service believes that it is important to the survival and recovery of these species to reestablish populations in several geographically distinct areas within their former range. Providing geographically distinct areas that contain varying thermal, chemical, geological, and physical parameters will encourage maintenance of the current genetic pool. These parameters influence important life history characteristics such as time of spawning, recruitment, growth, mortality rates, and longevity.

HABITATS AND STATUS OF ENDANGERED FISHES

General--The four endangered Colorado River fishes evolved in the Colorado River and were adapted to the natural environment that existed prior to the beginning of large-scale water development. Thus, they were adapted to a system of fluctuating seasonal and annual flows influenced by wet, average, and dry climatic periods. Recent population declines and disappearances of endemic fish species in much of their former range have been associated with relatively rapid and widespread anthropogenic changes. These changes have altered the physical and biological characteristics of many mainstream rivers in the Basin and occurred so rapidly that the fishes have not had time to adapt to them (Carlson and Muth 1989). Dams and diversions have fragmented former fish habitat by restricting fish movement. As a result, genetic interchange (emigration and immigration of individuals) between some fish populations is no longer possible. Large floods were once normal in the Basin and provided food and nutrient exchange between river channels and shallow-water floodplain habitats. These floods are now controlled by numerous dams. As a result of these dams, major changes also have occurred in water quality, quantity, temperature, sediment and nutrient transport, and other characteristics of the aquatic environment (Carlson and Muth 1989). The altered habitats that have resulted are now more suitable for introduced, nonnative fishes, some of which have flourished (Minckley et al. 1982; Tyus et al. 1982; Carlson and Muth 1989). These changes have greatly altered the river environment and no unaltered habitat remains in the Basin for the four Colorado River endangered fish species.

Razorback Sucker--This species was abundant and widely distributed in mainstream rivers of the Colorado River (Jordan and Evermann 1896; Minckley 1973). A relatively large stock of razorback suckers remain in Lake Mohave (Minckley et al. 1991). However, the formerly large Lower Basin populations have been virtually extirpated from all natural riverine environments, and recruitment is virtually nonexistent in the remnant stocks (Minckley et al. 1991). In the Upper Basin, the fish persists in the lower Yampa and Green rivers, mainstream Colorado River, and lower San Juan River (Tyus et al. 1982; Minckley et al. 1991; Platania et al. 1991), but there is little indication of recruitment in these remnant stocks. The largest extant riverine population occurs in the upper Green River Basin, but it consists

of only about 1,000 fish (Lanigan and Tyus 1989). Recent information suggests that this population may have declined further. In the absence of conservation efforts, it is presumed that wild populations will be lost as old fish die and are not replaced.

Reproduction and habitat use of razorback suckers has been studied in lower basin reservoirs, especially in Lake Mohave. Fish reproduction has been visually observed in reservoir shorelines for many years. The fish spawn over mixed substrates that range from silt to cobble, and at water temperatures ranging from 50 to 70°F (reviewed by Minckley et al. 1991).

Habitat use and spawning behavior of adult razorback suckers in riverine habitats have been studied by radiotelemetry in the Green River Basin (Tyus and Karp 1990) and in the upper Colorado River (Osmundson and Kaeding 1989). The fish in the Green River Basin spawned in the spring with rising water levels and increasing temperatures. The fish moved into flooded areas in early spring, and they made spawning migrations to specific locations as they became reproductively active. Spawning occurred over rocky runs and gravel bars.

In nonreproductive periods, adult razorback suckers occupy a variety of habitat types. These include impounded and riverine areas and habitats represented by: eddies, backwaters, gravel pits, flooded bottoms and the flooded mouths of tributary streams, slow runs, sandy riffles, and others (reviewed by Minckley et al. 1991). Summer habitat use included deeper eddies, backwaters, holes, and midchannel sandbars (Osmundson and Kaeding 1989; Tyus and Karp 1990; Minckley et al. 1991).

Habitats used by young razorback suckers have not been fully evaluated because of the low number of young fish present in the river system. However, most studies indicate that the larvae prefer shallow, littoral zones for a few weeks after hatching, then they disperse to deeper water areas (reviewed by Minckley et al. 1991). Laboratory studies indicated that, in a riverine environment, the larvae enter stream drift and are transported downstream (Paulin et al. 1989).

During winter, adult razorback suckers utilize main channel habitats that are similar to those used during other times of the year, including eddies, slow runs, riffles, and slackwaters (Osmundson and Kaeding 1989; Valdez and Masslich 1989; Tyus and Karp 1990).

Although habitat use of razorback suckers has been studied for years, the habitat preferences and factors limiting their abundance in native riverine habitats are not well known because of the scarcity of extant populations (Minckley 1983; Lanigan and Tyus 1989) and the absence of younger life history stages (Minckley et al. 1991). However, based on available data, Tyus and Karp (1989) and Osmundson and Kaeding (1989) considered interactions with nonnative fishes, impacts to low winter flows, high spring flows, seasonal changes in river temperatures, and inundated shorelines and bottomlands as factors that potentially limit the survival, successful reproduction, and recruitment of this species.

Colorado Squawfish--This species is the only living representative of the genus *Ptychocheilus* in the Basin, where it is endemic. Its origins there predate recorded history, but by the mid-Pliocene epoch (about 6 million years ago) fossils indicate that early *Ptychocheilus* had riverine adaptations that were similar to modern forms. Native populations of the Colorado squawfish are restricted to the Upper basin in Wyoming, Colorado, Utah, and New Mexico. Colorado squawfish populations have been extirpated from the Lower Basin.

During winter, adult Colorado squawfish use backwaters, runs, pools, and eddies, but are most common in shallow, ice-covered shoreline areas (Osmundson and Kaeding 1989; Wick and Hawkins 1989). In spring and early summer, adult squawfish utilized shorelines and lowlands inundated during typical spring flooding. This natural lowland inundation is viewed as important for their general health and reproductive conditioning (Osmundson and Kaeding 1989; Tyus 1990). Use of these habitats mitigate some of the effects of winter stress and aid in providing energy reserves required for migration and spawning. Migration is an important component in the reproductive cycle of Colorado squawfish. Tyus (1990) hypothesized that migration cues, such as high spring flows, increasing river temperatures, and possible chemical inputs from flooded lands and springs, are important to successful reproduction.

Colorado squawfish spawning has been documented in canyons in the Yampa and Green Rivers. This reproduction is associated with declining flows in June, July, or August, and average water temperatures ranging from 72 to 77°F depending on annual hydrology. After spawning, adult Colorado squawfish utilize a variety of riverine habitats, including eddies, backwaters, shorelines, and others (Tyus 1990). River mile 130 on the Colorado River, near the Colorado-Utah state line, also has been identified as a spawning site and radio tagged adults have moved to a specific 0.1 mile area in four different years (Osmundson and Kaeding 1989; USFWS unpublished data 1992-1993). In the mainstream Colorado River, McAda and Kaeding (1991) determined that spawning occurs at many locales. They also suggested that Colorado squawfish spawning may have been adversely impacted by construction of mainstream dams and a 48 percent reduction in peak discharge. On the San Juan River a spawning reach has been identified between river mile 133.4 and 129.8, near the confluence of the Mancos River (Ryden and Pfeifer 1993).

In the Green River Basin, larval Colorado squawfish emerge from spawning substrates and enter the stream drift as young fry (Haynes et al. 1989). The larval fish are actively or passively transported downstream for about 6 days, traveling an average distance of 100 miles to reach nursery areas (Tyus and Haines 1991). These areas are nutrient rich habitats that consist of ephemeral alongshore embayments that develop as spring flows decline. These nursery habitats are associated with lower gradient reaches.

Humpback Chub--Humpback chub remains in archaeological sites have been dated to about 4000 B.C., but the fish was not described as a species until recent times (Miller 1946). This disparity has been attributed to its restricted distribution in remote, white water canyons (USFWS 1990b). The abundance and distribution of the species until recently was not well

known. The largest populations of humpback chub occur in the Little Colorado and Colorado rivers in the Grand Canyon, and in the Black Rocks/Westwater Canyon area of the Colorado River. Other populations have been reported in Debeque and Cataract canyons of the Colorado River, Desolation and Gray canyons of the Green River, and Yampa and Whirlpool canyons in Dinosaur National Monument (USFWS 1990b).

Populations of humpback chub are found in river canyons, where they utilize a variety of habitats, including pools, riffles, and eddies. Most of the existing information on habitat preferences has been obtained from adult fish in the Little Colorado River, the Grand Canyon, and the Black Rocks of the Colorado River (Holden and Stalnaker 1975; Kaeding and Zimmerman 1983; Kaeding et al. 1990). In these locations, the fish are found associated with boulder-strewn canyons, travertine dams, pools, and eddies. Some habitat-use data are also available from the Yampa River Canyon where the fish occupy similar habitats, but also use rocky runs, riffles, rapids, and shoreline eddies (Karp and Tyus 1990). This diversity in habitat use suggests that the adult fish is adapted to a variety of habitats, and studies of tagged fish indicated that they move between habitats, presumably in response to seasonal habitat changes and life history needs (Kaeding and Zimmerman 1983; Karp and Tyus 1990). Reduced spring peak flows, availability of shoreline eddy and deep canyon habitats, and competition and predation by nonnative fishes were reported as potential limiting factors for humpback chub in the Yampa River (Tyus and Karp 1989). The impact of hybridization with other species is currently being evaluated.

Humpback chub in reproductive condition are usually captured in May, June, and July, depending on location. Little is known about their specific spawning requirements, other than the fish spawn soon after the highest spring flows when water temperatures approach 68°F (Karp and Tyus 1990; USFWS 1990b). The importance of spring flows and proper temperatures for humpback chub is stressed by Kaeding and Zimmerman (1983), who implicated flow reductions and low water temperatures in the Grand Canyon as factors curtailing successful spawning of the fish and increasing its competition with other species.

Bonytail--The bonytail is the rarest native fish in the Basin. Formerly reported as widespread and abundant in mainstream rivers (Jordan and Evermann 1896), its populations have been greatly reduced. The fish is presently represented in the wild by a low number of old adult fish (i.e., ages of 40 years or more) in Lake Mohave and perhaps other Lower Basin reservoirs (USFWS 1990a). The fish were once common in Lake Mohave vicinity where Wagner (1955) observed the fish in eddy habitats. A few individuals were reported in other locations, but concentrations of the fish have not been recently reported (Kaeding et al. 1986).

The bonytail is adapted to mainstream rivers, where it has been observed in pools and eddies (Minckley 1973; Vanicek 1967). In reservoirs, the fish occupies a variety of habitat types (Minckley 1973). Spawning requirements have never been documented in a river, but Vanicek and Kramer (1969) reported that spawning occurred in June and July at water temperatures of about 64°F. Although habitats that are required for conservation of the

bonytail are not well known, the limited data suggests that in addition to the rivers themselves, flooded, ponded, or even inundated riverine habitats may be suitable for adults, especially in the absence of competing nonnative fishes (USFWS 1990a).

DETERMINATION OF CRITICAL HABITAT

General--Detailed area descriptions and the biological basis for constituent elements of critical habitat were presented in the Biological Support Document. In determining areas for designation as critical habitat for a species, the Service considers those physical and biological features (i.e., constituent elements) that are essential for its conservation. In addition, areas containing these elements may require special management considerations or protection. As stated at 50 CFR 424.12, such physical and biological features include but are not limited to, the following items:

- (1) Space for individual and population growth, and for normal behavior;
- (2) Food, water, air, light, minerals, or other nutritional or physiological requirements;
- (3) Cover or shelter;
- (4) Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and generally;
- (5) Habitats that are protected from disturbance or are representative of the historical geographical and ecological distributions of a species.

In considering the biological basis for proposing critical habitat, the Service focused on the primary physical and biological elements that were essential to the conservation of each species.

The primary constituent elements determined necessary to the survival and recovery of the four Colorado River endangered fishes include:

Water--A quantity of water of sufficient quality (i.e., temperature, dissolved oxygen, contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species.

Physical Habitat--Areas of the Colorado River system that are inhabited or potentially habitable for use in spawning, nursery, feeding and rearing, or corridors between these areas. In addition to river channels, these areas also include bottomlands, side channels, secondary channels, oxbows, backwaters, and other areas in the 100-year floodplain, which when inundated provide spawning, nursery, feeding and rearing habitats, or access to these habitats.

Biological Environment--Food supply, predation, and competition are important elements of the biological environment and were considered components of this constituent

element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation, although considered a normal component of this environment, may be out of balance due to introduced fish species in some areas. This may also be true of competition, particularly from nonnative fish species.

These primary constituent elements interact to provide the conditions needed to meet the life history requirements of these four endangered fishes. The presence of or potential for suitable conditions resulting from the interaction of the constituent elements was a prime consideration in selection of proposed critical habitat for the fishes.

Only those areas in the 100-year floodplain that contain the constituent elements are considered part of critical habitat. Although critical habitat may only be seasonally occupied by the fish, such habitat remains important for their conservation.

The biologically based determination of proposed critical habitat areas consisted of an inventory and evaluation of areas needed for the survival and recovery of the four species. The constituent elements and selection criteria were then applied throughout the historical range of the razorback sucker. For the Colorado squawfish, humpback chub and bonytail, the biological determination was based on the primary constituent elements, recovery plans for these species, past Service findings, and other published and non-published sources. For the razorback sucker, the biological determination was based on the primary constituent elements, five additional selection criteria determined by the Service, past Service findings, and other published and non-published sources. A recovery plan for the razorback sucker is in preparation, but it has not been finalized. The additional selection criteria used included: 1) Areas with known or suspected wild spawning populations although recruitment may be limiting or nonexistent; 2) Areas where juvenile razorback suckers have been collected or which seem to provide suitable nursery habitat (backwaters, flooded bottomlands, or coves); 3) Areas currently occupied or that were historically occupied that are considered necessary for recovery and that have the potential for establishment of razorback sucker; 4) Areas and water required to maintain rangewide fish distribution, and diversity under a variety of physical, chemical, and biological conditions; 5) Areas that need special management or protection to insure razorback sucker survival and recovery.

References Cited

A complete list of all references cited herein is available upon request from the U.S. Fish and Wildlife Service, Salt Lake City, Utah (address located at beginning of document).

PART III - Economic Overview

INTRODUCTION

Section 4 (b)(2) of the Act directs the Secretary of the Interior (Secretary) to consider economic and other relevant impacts in determining whether to exclude proposed areas from the final designation of critical habitat. The Service, as delegated by the Secretary, may exclude areas from critical habitat designation when the costs or impacts of designation outweigh the benefits, provided that exclusion will not result in extinction of a species. An Economic Analysis was conducted on the costs of the proposed critical habitat designation.

The study region for the Economic Analysis encompasses Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming. Economic input-output (I-O) models were constructed for each State and for the seven-State region. A computable general equilibrium (CGE) model also was developed for the seven-State region. The models are aggregated to 20 representative sectors in the economy. The time frame chosen for the study, 1989 through 2020, reflects the time period projected for the recovery of the endangered fishes.

Linkages between the biological requirements for recovering the endangered fishes and the economic activities in the region were assessed and these formed the basis for the economic analysis. The biological requirements include adjustments made in the operations of Federal reservoirs in the Basin and/or mitigation of nonflow-related activities along the river 100-year floodplain. The effects of recovery efforts on future water depletions in the basin were also taken into consideration. The impacts of these possible changes on current and prospective economic activities were then estimated for each State, the region and the national economy.

ECONOMIC SETTING

Economic Output

Economic output measures the values of all goods and services produced and/or consumed in a regional economy. The region consisting of seven States, generates approximately \$1.3 trillion in economic output annually. This output is dominated by the combined manufacturing and the finance, insurance, and real estate sectors, which produce 18.4 percent and 14.9 percent of total output, respectively. The petroleum and gas production sector generates 2.4 percent of the total output, while the recreation services sector produces 7.7 percent of the total output. The electric power production sector comprises about 1.5 percent of the total output. The combined agricultural sectors are responsible for 3.0 percent of the total output, of which the livestock feed sector produces 0.33 percent of total regional output and the other crops sector produces 0.95 percent of the output.

Employment

Approximately 3.5 million people are employed in the Basin economy. The largest single employment sector is the public sector (includes all levels of government), which accounts for 16.9 percent of total employment. The combined manufacturing sector is only slightly behind the public sector, with 15.4 percent of total employment within the Colorado River Basin States. The recreation services sector is also a very significant part of total employment at 10.5 percent. The electric power production sector is around 0.5 percent of the total employment. Combined agricultural employment is approximately 4.3 percent of total employment (the livestock feed sector is 0.19 percent of employment, and the other crops sector is approximately 0.17 percent of employment). The petroleum and gas production sector accounts for about 0.2 percent of total employment.

Historical Development of the Basin

The rapid urbanization of the Basin has had a significant effect on the endangered fishes. This is reflected in the fraction of the population living in urban areas in 1990 as compared with this fraction in 1950. With the exception of California, this fraction was in the 50-65 percent range in 1950 and is now in the 65-90 percent range. The major consequence has been a significant increase in the use of water and electric power.

MODELING OVERVIEW

Two types of economic effects are of interest when considering the economic impacts of critical habitat designations: regional economic impacts and national economic efficiency impacts. Regional economic impacts refer to the impact of the proposed critical habitat designations on specific geographic regions, such as States or other sub-regions of the country. Frequently, regional economic impacts effect a transfer of resources from one region to another. For example, if one State in the Basin increases its consumptive use of Colorado River water, another State may have to forego some of its use of Colorado River water. Thus, a positive regional impact to one State can be a negative impact to another, and vice versa.

Regional economic impacts in this study were analyzed using input-output models which organize the basic accounting relationships that describe the production sector of the economy. The input-output method starts with the assumption that all sectors of the economy are tied together by virtue of economic relations called linkages, and the production of a good or service can be described by a recipe whose ingredients are the outputs of the other sectors of the economy. The primary inputs are labor, capital, and other raw resources. Through its multiplier analysis, the input-output model is capable of generating estimates of the changes in output for sectors, changes in employment, and changes in income due to species listing and proposed critical habitat designation. The models report the total impacts that result from the interactions among the sectors of the economy.

The computable general equilibrium model (CGE) analyzes resource reallocations (e.g., changes in river flows as represented by increased or decreased hydroelectric generation) in a manner such that the net effects, not just the total effects, are calculated. Given this capability, the CGE is able to estimate net national efficiency impacts at the national level.

National economic efficiency effects refer to the overall net effects on the national economy after the effects of interregional transfers have been accounted for. The goal of a national efficiency analysis is to determine whether a proposed action would have an overall positive or negative impact on the national economy. National economic efficiency impacts were analyzed in this study using a CGE model. The model captures the economic interactions of consumers, the production sectors, and the government sectors.

THE MODELING APPROACH

A set of input-output (I-O) models was developed as part of a staged investigation, where each was stage developed to address a particular issue. During the initial stage, a separate I-O model was developed for each of the States in the affected region: Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. These models focused on the impacts that are generated by species listing and proposed critical habitat designation within each individual State.

In most cases, impacts in a given State generated impacts in neighboring States. Thus, it was necessary to investigate potential by offsetting impacts. As a result, a second model was constructed which investigated the impacts of the entire region (all seven States included). The first two model stages provide estimates of the State and regional-level economic impacts.

The third stage involved the development of a CGE model for the economies of the seven-State area and the rest of the U.S. This model provides a comprehensive aggregate assessment of the national economic efficiency impacts.

Without Fish and With Fish Scenarios

Without Fish Scenario

The without fish economic scenario analyzed in this study consists of projections, over the study period, of the level of economic activities that would be observed if no action were taken to recover the endangered fishes. The study period of analysis chosen to reflect the recovery projections for the endangered fishes was 1989 through 2020. Economic activity under the without fish scenario was estimated using Impact Analysis for Planning (IMPLAN) 1982 data sets updated and projected through the year 2020 using data from the Bureau of Economic Analysis of the U.S. Department of Commerce. These economic projections formed the without fish scenario for determining the impacts due to proposed critical habitat.

With Fish Scenario

The with fish scenario was constructed by analyzing potential changes in economic activity that may occur due to listing and proposed critical habitat designations and/or other protection and recovery efforts for endangered fishes. These potential changes were projected for specified intervals over the entire study period.

Aggregation of Producing Sectors

The IMPLAN input-output data base that serves as a foundation for both the input-output models and the CGE model is composed of 528 producing sectors. For the analyses, this number was reduced by aggregating like sectors. Several considerations affected the level of sectoral aggregation.

The type of analysis is one factor in the determination of the appropriate level of aggregation and the manner in which the aggregation is performed. In general, it is desirable to aggregate those sectors that are not of direct interest to this study. This results in a level of detail that can be managed. Conversely, those sectors that are of interest to the task at hand must be kept separate. Thus, the aggregation scheme adopted for this analysis retains several agriculture sectors, the recreation sector, the electric power sector, and some key mining sectors.

For each stage of the input-output modeling process, 20 economic sectors, aggregated from the original 528, were modeled using the IMPLAN data sets (Table 5).

This aggregation permits investigation of changes in the economic activity of the sectors in the study due to designation of critical habitat. For the CGE model, sectors 19 and 20 in Table 5 were combined into a single sector. Estimating the economic impacts of the proposed critical habitat designations for endangered fishes poses formidable challenges because many impacts will result, not from current activities but, from future activities set in motion by Section 7 Consultations.

Table 5. Industrial Sectors used in Economic Analysis

Sector	Industry
1	Livestock
2	Other Crops
3	Livestock Feed
4	Other Agriculture
5	Non-petroleum Mining
6	Petroleum and Natural Gas Mining
7	Construction
8	Combined Manufacturing
9	Food Products
10	Wood Products
11	Petroleum and Coal Products
12	Transportation, Communication, and Utilities
13	Recreational Services
14	Electric Power
15	Wholesale and Retail Trade
16	Finance, Insurance, and Real Estate
17	Household and Business Services
18	Local Amusements
19	Health, Education, and Social Services
20	Government Industries

Flow Activities

A critical element of the analysis was the determination of the current hydrologic conditions in the Basin. This effort was undertaken by the Service and the Bureau of Reclamation. The current conditions were determined by examining a historical set of flows for the years 1967 through 1985 at 10 United States Geological Survey (USGS) gaging stations. Next, flows for recovery of the fishes were projected as well as depletions for future activities with and without endangered fishes. These projections took into account both listing and proposed critical habitat designations. An illustration of the hydrograph for one gaging station (Colorado River at Cisco, Utah) is shown in Figure 2. The details of this analysis are available in Chapter II-6 of Volume II of the Economic Analysis.

The hydrologic analysis formed the basis for the without fish and the with fish scenarios. There are four hydrologic scenarios and these can be discussed in the context of Figure 2:

1. Current depletions without any actions taken on behalf of the endangered fishes (the dotted line in row 1 of the figure);
2. Current depletions but with actions taken on behalf of the endangered fishes (the dashed line in row 1 of the figure);
3. Future depletions to be allowed without considerations of the requirements of the endangered fishes (dotted line in row 2 of the figure);
4. Future depletions taking into account the requirements of the endangered fishes (dashed line in row 2 of the figure).

The solid lines represent Service identified flow levels believed necessary for recovery of the endangered fishes after being modified to be compatible with outputs of the Colorado River System Simulation model. A critical element of the economic analysis involved determining the economic impacts in the study region due to changes in the river flows as required for recovery of the endangered fishes. This involved assessing the impacts of revised operating plans of the dam system on recreation, hydroelectric generation, agriculture, municipal, and industrial water uses.

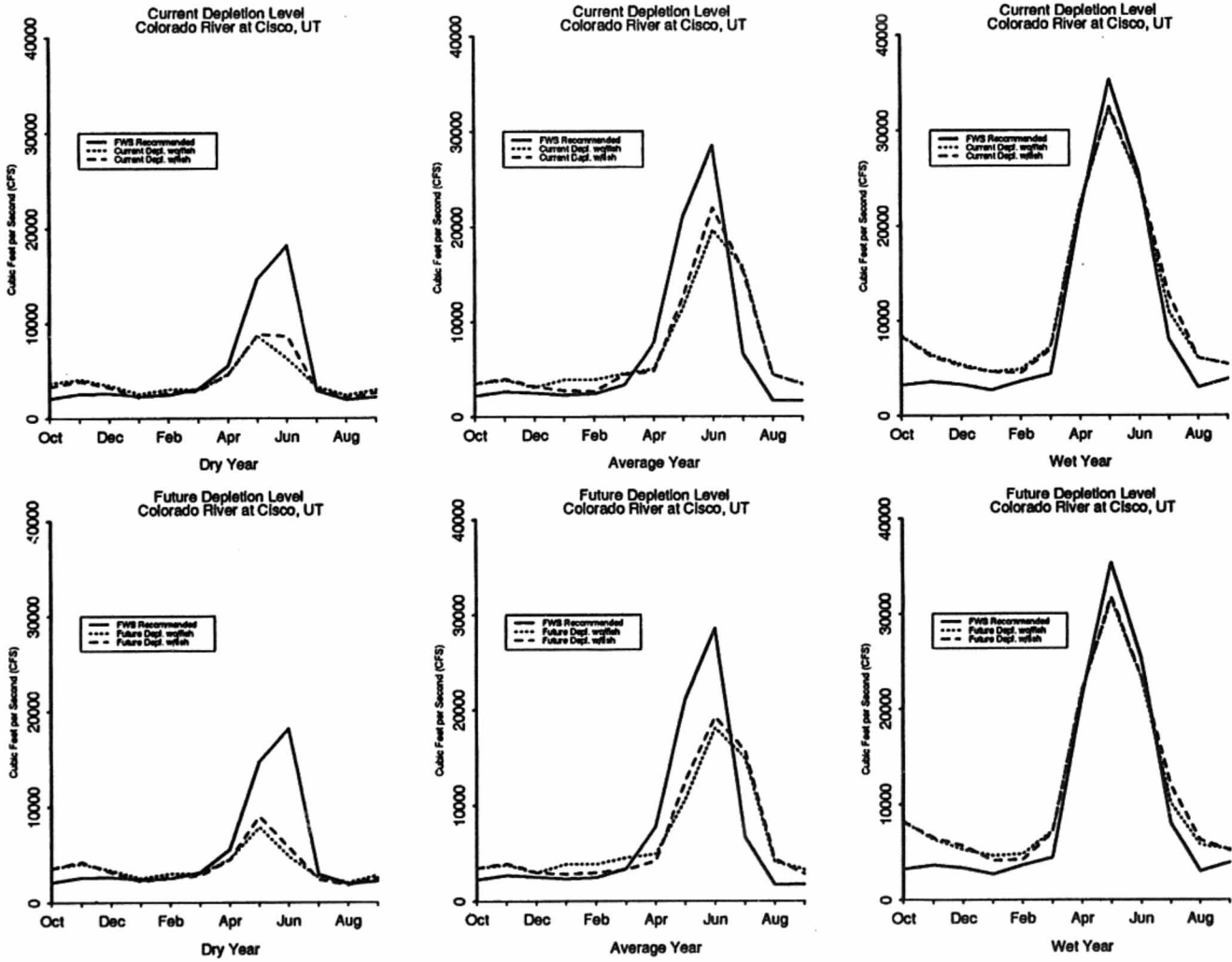
Hydroelectric Impacts

Hydroelectric modeling required a cooperative effort among the Service, the Bureau of Reclamation, the Western Area Power Authority (Western), and Stone and Webster Consultants, Inc. Utilizing the hydrographs and taking into consideration the alternative depletion frameworks, the Bureau of Reclamation modeled the potential effects of flow requirements for the endangered fishes on monthly hydroelectric generating capacity in the Upper Basin. Western used the data generated by the models to estimate the changes in the amount of marketable power. Finally, Stone and Webster Consultants, Inc. input the data into a model framework that yields the net effects of the change in the power system.

Recreation Impacts

A recreation survey was developed that also relied upon the hydrographs. Outdoor planners in the seven States and a variety of Federal agencies were asked to assess the impacts of potentially modified operating plans on recreational activities. Three versions of the survey were generated to meet the needs of different recreation units along the rivers. These were: (a) units outside critical habitat areas but impacted by flow changes; (b) units including critical habitat areas that may be impacted by flow changes; and, (c) units including critical habitat areas that may not be impacted by flow changes.

Figure 2. Example Hydrograph used in the Economic Analysis.



Agricultural Impacts

To assess whether current and future planned agricultural depletions could be met with existing water resources in the relevant scenario, existing State agricultural data and the biological flow recommendations were determined. In cases where adequate flows could not be achieved, the purchase of Upper Basin agricultural water rights was assumed.

Municipal and Industrial Impacts

The flow recommendations may, in isolated cases, affect future municipal water acquisitions. However, it was assumed that municipalities would, in fact, acquire the needed water through the acquisition of agricultural water rights. Thus, the impacts appear as foregone agricultural production.

Nonflow Related Activities

Nonflow activity related changes from the without fish scenario are those that stem from activities generated by oil and gas operations, mining operations (sand and gravel), construction (recreation and/or private dwellings), and the stocking of nonnative fishes. These are activities that might well impinge upon the recovery of the endangered fishes.

Oil, Gas, and Other Drilling Activities

Significant amounts of oil and gas have been developed in the Colorado River Basin. Little, however, is known regarding the effects of proposed critical habitat designation on this production. The impacts to society of the additional cost of production resulting from listing or critical habitat designation would be measured by a permanent loss of production. A marginal production facility that is closed due to increased monitoring costs represents a loss of production in the short term. Thus, the critical determination for well-related impacts resulting from contaminants is what percentage of producing wells will be capped and what percentage of the actual production will truly be lost to society. For purposes of this report, given the lack of available information, oil and gas impacts were assumed to be zero in the seven-State region.

Nonnative Fish Stocking and Fish Program

A questionnaire was designed to determine the effects of critical habitat designation on the stocking and fishing programs in the seven-States area. Nonflow effects on these programs were determined through the use of personal interviews with State game and fish personnel.¹

¹ There was a section of the survey that focused upon flow effects of the stocking program and these results were incorporated into the recreation analysis.

Other Impacts

Other activities potentially impacted include sand and gravel operations, the construction industry, and public recreation facilities. No data were available for the effects on sand and gravel operations and the construction industry. The impacts of public recreation facilities were documented through the recreation survey (B.2).

The Division Between Listing and Critical Habitat

The Act requires that only the incremental impacts of proposed critical habitat designation be quantified. To meet this requirement, a method had to be devised for determining the percentage of an impact that was due to listing and the percentage that was due to designation of critical habitat. This method is discussed in detail in Chapter II-14 of Volume II of the Economic Analysis. By applying the percentage for the proposed critical habitat designation to the direct impacts, the incremental impacts of critical habitat designation were determined.

Tables 6 and 7 present the percentage of impacts attributable to listing and critical habitat for the Upper and Lower Basins if recovery were to occur by the year 2003. To derive the direct economic impacts due to the listing of the endangered fishes, the residual percentages were applied to the sectors where direct economic impacts were expected to occur.

Year	Flows and Flow Timing	Nonnative Fish	Contaminants	Floodplain	Passage	Recreation
1989	10	4	2	4	4	4
1995	10	19	4	26	4	14
2000	10	34	5	50	4	22
2005	10	38	5	56	4	24
2010	10	38	5	56	4	24
2015	10	38	5	56	4	24
2020	10	38	5	56	4	24

Year	Flows and Flow Timing	Nonnative Fish	Contaminants	Floodplain	Passage	Recreation
1989	3	3	3	4	3	3
1995	8	7	7	25	11	7
2000	14	11	11	50	20	11
2005	15	13	13	56	23	13
2010	15	13	13	56	23	13
2015	15	13	13	56	23	13
2020	15	13	13	56	23	13

DIRECT ECONOMIC IMPACTS

The direct economic impacts due to listing and critical habitat designation occur over several economic sectors and are unique to particular stretches of the rivers. A complete description of these impacts is detailed in Chapters II-9 and II-10 of Volume II of the Economic Analysis. The direct economic impacts were found to stem from both flow alterations and nonflow activity changes.

Table 8 presents the direct economic impacts for each State over the time for proposed critical habitat designation. For Arizona, Colorado, New Mexico, Nevada, Utah and Wyoming, the impacts are predominantly negative. For California, the impacts are all positive. For the Colorado River Basin as a whole, the overall impacts are positive. For the livestock feed, recreation and electric power sectors, the impacts are negative. The other crops, non-petroleum mining, oil and gas production, construction, and combined manufacturing the impacts are positive. The net effects of these offsetting direct impacts is that the total direct impacts for the Colorado River Basin are positive.

Sector	1995	2000	Year 2005	2010	2015	2020
Arizona						
Recreation	0.000	-0.028	-0.065	-0.098	-0.130	-0.162
Electric Power	-0.104	-0.011	0.095	0.056	-0.130	-0.061
TOTAL DIRECT IMPACTS	-0.104	-0.039	0.030	-0.042	-0.260	-0.223
California						
Other Crops	0.524	1.906	4.370	5.812	8.379	10.924
Livestock Feed	0.100	0.361	0.826	1.099	1.584	2.065
TOTAL DIRECT IMPACTS	0.624	2.267	5.196	6.911	9.963	12.989
Colorado						
Livestock Feed	-0.230	-0.459	-0.812	-0.857	-1.034	-1.321
Other Crops	-0.063	-0.126	-0.173	-0.221	-0.272	-0.320
Recreation	-0.229	-0.458	-0.458	-0.458	-0.458	-0.458
Electric Power	-0.198	-0.359	-0.819	-0.419	-0.758	-0.066
Non-petroleum Mining	0.131	0.198	0.311	0.138	0.161	0.141
Oil and Gas Mining	0.250	0.025	0.069	0.149	1.655	0.096
Construction	0.635	0.635	0.635	0.635	0.635	0.635
Combined Mfg.	0.635	0.635	0.635	0.635	0.635	0.635
TOTAL DIRECT IMPACTS	0.931	0.091	-0.612	-0.398	0.564	-0.658
Nevada						
Recreation	0.000	-0.028	-0.065	-0.098	-0.130	-0.163
TOTAL DIRECT IMPACTS	0.000	-0.028	-0.065	-0.098	-0.130	-0.163
New Mexico						
Livestock Feed	-0.115	-0.401	-1.118	-1.655	-2.558	-3.396
Electric Power	-0.021	-0.044	-0.046	-0.045	-0.044	-0.049
TOTAL DIRECT IMPACTS	-0.136	-0.445	-1.164	-1.700	-2.602	-3.445
Utah						
Livestock Feed	0.000	-0.019	-0.042	-0.084	-0.088	-0.092
Recreation	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Electric Power	-0.021	-0.014	-0.031	-0.057	-0.093	-0.118
Non-petroleum Mining	0.093	0.136	0.140	0.125	0.126	0.136
TOTAL DIRECT IMPACTS	-0.217	-0.186	-0.222	-0.305	-0.344	-0.363
Wyoming						
Livestock Feed	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036
Recreation	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011
Non-petroleum Mining	0.000	0.000	0.005	0.001	0.010	0.008
TOTAL DIRECT IMPACTS	-0.047	-0.047	-0.042	-0.046	-0.037	-0.039

Table 8. Direct Economic Impacts (1982\$ Millions) (Critical Habitat Only)						
Sector	Year					
	1995	2000	2005	2010	2015	2020
Colorado River Basin						
Livestock Feed	-0.318	-0.777	-1.542	-1.871	-2.535	-3.317
Other Crops	0.551	1.558	3.724	5.041	7.440	9.887
Recreation	-0.143	-0.372	-0.409	-0.435	-0.461	-0.487
Electric Power	-0.388	-0.412	-0.859	-0.490	-1.015	-0.046
Non-petroleum Mining	0.236	0.339	0.478	0.369	0.594	0.390
Oil and Gas Mining	0.158	0.115	0.364	0.263	0.847	0.176
Construction	0.623	0.635	0.667	0.667	0.667	0.667
Combined Manufacturing	0.623	0.635	0.667	0.667	0.667	0.667
TOTAL DIRECT IMPACTS	1.342	1.721	3.090	4.211	6.204	7.937

The procedures for determining the incremental impacts due to the proposed critical habitat designation were as follows. The adjusted direct economic impacts (due to listing only) were input into the model stages. The models were run. The data yielded direct and indirect economic impacts due to listing only. These results were then netted from the total (listing plus proposed critical habitat) regional direct and indirect impacts, and the net national impacts. This process yielded the incremental impacts associated with the proposed critical habitat designation.

STATE- AND REGIONAL-LEVEL ECONOMIC IMPACTS

The results are organized by the major aggregate measures developed for the models used in the analysis in this report: output, earnings, government revenues, and employment.

Output

Table 9 presents the State- and regional-level output impacts by State as well as for the entire Basin. The data reported in the table are the discounted present values of the stream of incremental output impacts associated with the proposed critical habitat designation.²

Table 9 illustrates the first conclusion that can be drawn. For the Colorado River Basin as a whole, the overall impacts are clearly positive. The stream of impacts over the study period (discounted at 3 percent to yield a present value) yields a positive impact of \$167.20 million for the Basin.

²The worth of a future stream of impacts expressed in terms of today's value.

Table 9. Present Value (3%) of Incremental Output Impacts for Proposed Critical Habitat Designation for 20 Economic Sectors by State and for the Colorado River Basin (\$1982 millions)³

	Arizona	California	Colorado	Nevada	New Mexico	Utah	Wyoming	Colorado River Basin ⁴
Livestock	-0.027	1.8	-1.542	-0.005	-1.863	-1.216	-0.042	-0.916
Other Crops	-0.009	147.0	-6.931	-0.002	-0.126	-0.053	-0.003	128.232
Livestock Feed	-0.004	28.1	-27.267	-0.001	-39.557	-30.437	-1.139	-52.273
Misc. Agriculture	-0.004	13.2	-0.460	-0.006	-0.497	-0.199	-0.014	9.333
Non-Petroleum Mines	-0.031	0.3	8.528	-0.002	-0.375	5.937	0.081	16.363
Petroleum and Gas Production	-0.000	3.8	6.711	-0.010	-3.416	-1.348	-0.075	12.649
New Construction	-0.103	3.8	32.283	-0.150	-1.085	-0.821	-0.032	34.152
Combined Manufacturing	-0.050	7.8	35.035	-0.041	-1.214	-3.305	-0.068	41.611
Food Products	-0.085	0.6	-1.340	-0.014	-0.137	-0.986	-0.005	-1.391
Wood Products	-0.030	3.0	0.436	-0.038	-0.089	-0.310	-0.001	2.83
Petroleum & Coal Products	-0.037	13.2	-2.209	-0.010	-2.497	-3.783	-0.120	0.85
Trans., Comm. & Utilities	-0.174	6.2	-1.510	-0.283	-1.383	-1.833	-0.062	1.216
Recreation Services	-2.317	3.20	-20.012	-2.409	-0.332	-16.279	-0.401	-16.787
Electric Power Production	-1.397	2.0	-21.074	-0.152	-2.595	-2.301	-0.024	-25.159
Wholesale/Retail Trade	-0.001	1.4	.730	-0.018	-0.296	-0.270	-0.010	1.74
Finance, Insurance & Real Estate	-0.122	19.7	-2.905	-0.273	-3.236	-4.303	-0.069	7.907
Household & Business Services	-0.129	6.3	2.234	-0.266	-1.206	-1.598	-0.009	6.274
Local Amusements	-0.008	0.6	-0.102	-0.018	-0.019	-0.096	-0.000	0.164
Health, Education and Social Serv.	-0.007	0.2	-0.021	-0.006	-0.053	-0.019	-0.002	0.101
Government Industries	-0.020	0.6	-0.068	-0.040	-0.126	-0.168	-0.004	0.306
TOTAL	-4.556	262.60	1.012	-3.74	-60.10	-63.389	-2.00	167.20

³The results are from individual State-level I-O models and a Colorado Basin I-O model. The time period of analysis for the 20 economic sectors is 1995 to 2020.

⁴Totals for the State models do not and should not equal the value for the Colorado River Basin model.

The remaining entries in Table 9 demonstrate the second basic conclusion. The impacts of the proposed critical habitat designation are not distributed evenly over the individual States in the Basin. In fact, the total impacts range from a positive \$262.60 million (California) to a negative \$63.39 million (Utah).

Finally, the entries inside the table illustrate the third conclusion. The impacts of the proposed critical habitat designation are not distributed evenly over the economic sectors that make up the State and the Basin economy. For example, the impacts in the other crops sector range from a positive \$147 million in California to a negative \$6.93 million in Colorado. The overall impact for the Basin for the other crops sector is \$128.23 million. Livestock feed has impacts that range from a positive impact of \$28.10 million in California to a negative \$39.56 million in New Mexico. And the overall Basin impact for this sector is a negative \$52.27 million.

Similarly, in the recreation services sector the total impacts range from a positive \$3.20 million in California to a negative \$20.01 million in Colorado. The overall impacts across the Basin are a negative \$16.79 million in the recreation services sector. Finally, the electric power production sector impacts are a positive \$2.0 million in California and a negative \$21.07 million in Colorado.

Earnings Impacts

Table 10 presents the earnings impacts organized in the same way as those in Table 9. The conclusions expressed for output hold also for the earnings impacts. In Colorado and California the positive impacts outweigh the negative impacts; therefore for California the earnings impacts are a positive \$44.10 million and for Colorado a positive \$14.77 million. In the remaining States, the impacts are predominately negative. The net earnings impacts for the Basin are a positive \$49.70 million. Incremental earnings impacts in the other crops sector range from a positive \$23.00 million in California to a negative \$0.54 million in Colorado.

Regional Government Revenue Impacts

Table 11 reports the incremental impacts of the proposed critical habitat designation on government revenues from personal income taxes and indirect business taxes. California's revenues have a positive total impact of \$18.10 million. The impact for Utah is a negative \$9.601 million. The Basin impact is a positive \$16.16 million.

Table 10. Present Value (3%) of Incremental Earnings Impacts for Proposed Critical Habitat Designation for 20 Economic Sectors by State and for the Colorado River Basin (\$1982 Millions)⁵

	Arizona	California	Colorado	Nevada	New Mexico	Utah	Wyoming	Colorado River Basin ⁶
Livestock	-0.003	0.1	-0.093	0.0	-0.113	-0.256	-0.003	-0.056
Other Crops	-0.002	23.0	-0.537	0.0	-0.014	-0.020	0.00	19.042
Livestock Feed	-0.000	0.9	-0.919	0.0	-1.333	-1.927	-0.038	-1.761
Misc. Agriculture	-0.002	4.5	-0.184	-0.005	-0.180	-0.116	-0.005	3.213
Non-Petroleum Mines	-0.021	0.1	3.008	-0.001	-0.137	9.595	0.024	5.910
Petroleum and Gas Production	-0.000	0.3	0.473	-0.001	-0.241	-0.182	-0.005	0.891
New Construction	-0.040	1.3	10.231	-0.063	-0.337	-0.535	-0.009	11.292
Combined Manufacturing	-0.021	2.6	11.159	-0.012	-0.303	-1.506	-0.012	13.494
Food Products	-0.021	0.1	-0.172	-0.003	-0.022	-0.973	-0.001	-0.193
Wood Products	-0.011	0.8	0.136	-0.047	-0.025	-0.248	0.0	0.804
Petroleum & Coal Products	-0.002	0.5	-0.086	-0.001	-0.092	-0.642	-0.004	0.034
Trans., Comm. & Utilities	-0.072	2.1	-0.460	-0.262	-0.324	-0.984	-0.013	0.376
Recreation Services	-0.867	0.9	-5.717	-0.800	-0.100	-23.834	-0.117	-4.823
Electric Power Production	-0.223	0.3	-2.770	-0.051	-0.343	-1.655	-0.003	-3.275
Wholesale/Retail Trade	-0.001	0.6	0.337	-0.010	-0.137	-0.191	-0.004	0.796
Finance, Insurance & Real Estate	-0.019	2.8	-0.407	-0.062	-0.417	-0.794	-0.008	1.108
Household & Business Services	-0.060	2.5	0.879	-0.244	-0.522	-1.159	-0.003	2.470
Local Amusements	-0.003	0.2	-0.033	-0.007	-0.006	-0.162	0.0	0.049
Health, Education and Social Serv.	-0.003	0.1	-0.010	-0.002	-0.025	-0.016	-0.001	-0.049
Government Industries	-0.019	0.6	-0.062	-0.039	-0.119	-0.182	-0.004	0.284
TOTAL	-1.39	44.1	14.77	-1.61	-4.79	-25.79	-0.21	49.70

⁵The results are from individual State-level I-O models and a Colorado Basin I-O model. The time period of analysis for the 20 economic sectors is 1995 to 2020.

⁶Totals for the State models do not and should not equal the value for the Colorado River Basin model. See Chapter II-12 for a discussion.

Table 11. Present Value (3%) of Incremental Indirect Business and Personal Taxes Impacts for Proposed Critical Habitat Designation for 20 Economic Sectors by State and for the Colorado River Basin (1982\$ Millions)⁷

	Arizona	California	Colorado	Nevada	New Mexico	Utah	Wyoming	Colorado River Basin ⁸
Indirect Business Taxes	-0.226	7.1	-0.973	-0.237	-2.821	-3.154	-0.207	3.743
Personal Income Taxes	-0.348	11.0	3.693	-0.403	-1.197	-6.447	-0.052	12.421
Total Tax Impacts	-0.574	18.1	2.72	-0.640	-4.018	-9.601	-0.259	16.164

⁷The results are from individual State-level I-O models and a Colorado Basin I-O model. The time period of analysis for the 20 economic sectors is 1995 to 2020.

⁸Totals for the State models do not and should not equal the value for the Colorado River Basin model.

State- and Regional-Level Employment Impacts

Table 12 presents State- and regional-level incremental impacts on employment over the period of the study. The values in the table represent the deviation in employment, measured as jobs, between the without fish and with fish scenarios. As discussed above, employment impacts are both positive and negative both across States and over time. For New Mexico, the employment impact is approximately 2 jobs foregone in 1995 and this figure rises to 126 jobs foregone by the year 2020. On the other hand, for California there is a gain of approximately 21 jobs in 1995 and this positive impact increases to a projected 1,232 jobs by 2020. For the Basin as a whole the employment impacts are positive through the study period. In 1995 the projected gain is approximately 29 jobs. By 2020 the gains in employment are projected to be approximately 878 jobs.

	1995	2000	2005	2010	2015	2020
Arizona	-0.91	-2.065	-3.69	-6.90	-12.97	-19.65
California	21.20	28.060	274.00	504.41	828.15	1231.78
Colorado	11.32	9.240	-2.17	-14.76	-30.83	-47.95
Nevada	0.00	-1.067	-3.68	-7.62	-12.90	-19.49
New Mexico	-1.78	-7.840	-23.94	-47.36	-82.62	-126.34
Utah	-22.27	-42.390	-60.09	-72.56	-84.60	-95.58
Wyoming	0.00	-0.770	-1.50	-2.27	-2.91	-3.55
Colorado River Basin	28.88	84.700	204.21	364.21	586.82	877.69

Present Value and Annualized Incremental Impacts

Table 13 presents three ways of representing the impacts associated with the designation of critical habitat for the aggregate measures of economic activity. The values presented in Table 13 were previously presented in Tables 9, 10, and 11 and are included here for comparison purposes. In addition, Table 13 reports the annualized values and the present value of the impacts as a percent of the present value using the without fish scenario projections.⁹ This provides a relative comparison of the size of the incremental critical habitat impacts between the without fish and with fish scenarios.

An examination of the percentage deviations reported in Table 13 illustrates that incremental critical habitat impacts represent a small deviation from the level of economic activity projected in the without fish scenario. For example, for the Basin as a whole, the deviation in total output is 0.0006 percent (6 ten thousandths of a percent).

⁹The annualized value transforms a fluctuating impact stream into a leveled equivalent present value.

	Output	Earnings	Indirect Business Taxes	Personal Income Taxes
Arizona				
Present Value	-4.56000	-1.3900	-0.2260	-0.3480
% Deviation from Without Fish Scenario	-0.00020	-0.0002	-0.0002	-0.0002
Annualized Values	-0.22800	-0.0700	-0.0110	-0.0170
California				
Present Value	262.60000	44.1000	7.1000	11.0000
% Deviation from Without Fish Scenario	.00013	0.0006	0.0008	0.0006
Annualized Values	13.13000	2.2050	0.3550	0.5500
Colorado				
Present Value	1.01600	14.7700	-0.9730	3.6900
% Deviation from Without Fish Scenario	0.00300	0.0022	-0.0010	0.0022
Annualized Values	0.05100	0.7390	-0.0490	0.1850
Nevada				
Present Value	-3.74000	-1.6100	-0.2400	-0.4000
% Deviation from Without Fish Scenario	-0.00050	-0.0005	-0.0005	-0.0005
Annualized Values	-0.18700	-0.0800	-0.0120	-0.0200
New Mexico				
Present Value	-60.10000	-4.7900	-2.8200	-1.2000
% Deviation from Without Fish Scenario	-0.00770	-0.0021	-0.0052	-0.0021
Annualized Values	-3.00500	-0.2390	-0.1410	-0.0600
Utah				
Present Value	-63.39000	-25.7900	-3.1500	-6.4500
% Deviation from Without Fish Scenario	-0.00640	-0.0042	-0.0063	-0.0042
Annualized Values	-3.16900	-1.2900	-0.1580	-0.3220
Wyoming				
Present Value	-2.00000	-0.2100	-0.0870	-0.0520
% Deviation from Without Fish Scenario	-0.00040	-0.0003	-0.0003	-0.0003
Annualized Values	-0.10000	-0.0100	-0.0040	-0.0030
Colorado River Basin				
Present Value	167.20000	49.7000	3.7400	12.4200
% Deviation from Without Fish Scenario	0.00060	0.0005	0.0003	0.0005
Annualized Values	8.36000	2.4800	0.1800	0.6200

A COMPUTABLE GENERAL EQUILIBRIUM (CGE) FRAMEWORK

The economic consequences of the proposed critical habitat designation can be evaluated from the perspective of national efficiency impacts in such a manner that the above assumptions are violated to a minimum degree. A CGE analysis captures the interactions across the various sectors that make up the economy and takes explicit account of the exchanges between the region and the remainder of the economy.¹⁰ In what follows, four alternative scenarios are analyzed. These scenarios represent bounds on the results where it is either assumed there is or is not excess construction capacity and whether or not substitute recreation sites exist outside the region.

Scenario A1 and B1 — Construction-Related Impacts

The distinction between region-level impacts and national efficiency effects is due to the fact that some region-level impacts are canceled out at the national level through transfers of resources from other parts of the economy. The extent to which the impacts are pure transfers depends on the extent to which capacity remains unused in the relevant economic sectors elsewhere in the economy. The thermal generation capacity expansion, projected to be required to offset losses in hydroelectric generation, involves the construction sector and the combined manufacturing (capital equipment) sector. These are sectors which are sensitive to the overall state of the economy. During economic slowdown periods there is typically considerable excess capacity in these sectors and the expansion within the Colorado River Basin will draw these idle resources from the national economy. In this case, the net national direct impacts in these sectors will be the same as the regional impacts. This constitutes Scenario A1 in the following discussion. Alternatively, if the economy is near or at full employment, the expansion in thermal capacity will simply shift already employed resources from elsewhere in the economy and the net national impacts will be zero. This is the case depicted in Scenario B1 below.

Table 14 reports the impacts associated with the proposed critical habitat designation in terms of percentage deviation from the without fish scenario. Under Scenario A1 there is an expansion in the national economy and this expansion is reported in Table 14 relative to the level of economic activity in the Colorado River Basin region. Thus, the expansion represents 0.0009 percent of the gross regional product of the Colorado River Basin. This gross regional product expansion would be added to the output of the national economy. Similarly, there are expansions in employment (0.0015 percent), earnings (0.0018 percent), and government revenues (0.0007 percent). Under Scenario B1, there are contractions in the national economy and these are also reported relative to the level of activity in the Colorado River Basin regional economy. The contraction represents -0.0008 percent of the product of

¹⁰ A presentation of consumer surplus and producer measures can be found in Volume II of the Economic Analysis, Chapter II-15.

the regional economy and this product would be withdrawn from the national economy. There are similar contractions in employment, earnings, and government revenues.

Table 15 reports the results of national efficiency in terms of the levels of activity in the without fish data set. Thus, under Scenario A1, there would be a \$4.40 million dollar expansion in the national economy projected on the basis of the 1982 levels of economic activity. Similarly, there would be an increase in employment of 230 jobs and increases in earnings and government revenues. Under Scenario B1, there would be a contraction in the national economy of -\$3.90 million. There would be a corresponding reduction in employment of 150 jobs.

Table 14 reports the impacts associated with the proposed critical habitat designation in terms of percentage deviation from the without fish scenario. Under Scenario A2 there is an expansion in the national economy and this expansion is reported in Table 14 relative to the level of economic activity in the Colorado River Basin region. Thus, the expansion represents 0.0011 percent of the real gross regional product of the Colorado River Basin. This real gross regional product expansion would be added to the output of the national economy. Similarly, there are expansions in employment (0.0015 percent), earnings (0.0018 percent), and government revenues (0.0009 percent). Under Scenario B2, the impacts in the national economy are reported relative to the level of activity in the Colorado River Basin regional economy. Effectively 0.0 percent of the real gross regional product would be withdrawn from the national economy. There are expansions in employment (0.0003 percent) and earnings (0.0001 percent).

Scenarios A2 and B2 — Recreation-Related Impacts

Two additional scenarios are added for the assessment of the impacts associated with the present proposed critical habitat designation. These examine the extent of excess capacity in the recreational services sector. Scenario A2 follows from Scenario A1 and is based on the conjecture that there is sufficient excess capacity in the recreation sector in the national economy that the negative impacts in the regional economy are fully offset. Thus, there would be no negative impact in the recreation sector. Scenario B2 follows from B1 and is based on the conjecture that there is no excess capacity at the national level in the recreation sector. Thus, the negative regional impact also would be felt by the national economy.

The increase in the aggregate output would be \$5.38 million for Scenario A2, earnings are projected to grow by \$5.2 million, employment is projected to increase by 230 jobs, and government revenues to grow by \$2.06 million (see Table 15). These are, of course, national economic impacts. For Scenario B2, these impacts would result in an increase in output of \$0.09 million, an increase in employment of 50 jobs, an increase in earnings of \$0.30 million, and an increase in government revenues of \$0.01 million. As before, Scenarios A2 and B2 provide a set of bounds on the national economic effects associated with the proposed critical habitat designation.

**Table 14. Colorado River Basin: National Efficiency Results (CGE)
(Critical Habitat Only)**

(Percentage Deviation from Without Fish Scenario)

Variable	Scenario A1 vs Without Fish	Scenario A2 vs Without Fish	Scenario B1 vs Without Fish	Scenario B2 vs Without Fish
Real Gross Regional Product	0.0009%	0.0011%	-0.0008%	0.0000%
Employment	0.0015%	0.0015%	-0.0010%	0.0003%
Earnings	0.0018%	0.0018%	-0.0002%	0.0001%
Gov't Revenue	0.0007%	0.0009%	-0.0016%	0.0000%

Notes:

Scenario A1: There exists sufficient underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) that all additions to thermal electric capacity are a net positive addition to the level of national economic activity. The recreation resources within the Basin are unique and the loss of these recreation opportunities cannot be replaced within the U.S. economy.

Scenario B1: There is no underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) and all additions to thermal electric capacity within the Basin are constructed with resources that must be displaced from elsewhere in the national economy. Thus, there is no net positive economic impact from the expenditure on thermal expansion. The recreation resources within the Basin are unique and the loss of these recreation opportunities cannot be replaced within the U.S. economy.

Scenario A2: There exists sufficient underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) that all additions to thermal electric capacity are a net positive addition to the level of national economic activity. This is the same assumption that was made in A1. However, in this scenario, the recreation resources within the Basin are not unique. In particular, it is assumed that foregone recreation opportunities in the Basin can be completely offset through opportunities elsewhere in the U.S. economy. Thus, there are no negative impacts in the recreation sector.

Scenario B2: There is no underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) and all additions to thermal electric capacity within the Basin are constructed with resources that must be displaced from elsewhere in the national economy. Thus, there is no net positive impact from this expenditure on thermal expansion. However, in this scenario, the recreation resources within the Basin are not unique. In particular, it is assumed that foregone recreation opportunities in the Basin can be completely offset through opportunities elsewhere in the U.S. economy. Thus, there are no negative impacts in the recreation sector.

**Table 15. Colorado River Basin — National Economic Impacts: Levels and Differences
(\$1982 in Millions) (Employment in Jobs)**

Variable	Without Fish	With Fish Scenario A1	With Fish Scenario B1	Without Fish vs Scenario A1 With Fish	Without Fish vs Scenario B1 With Fish
Real Gross Regional Product	484213.30	484217.70	484209.40	4.40	-3.90
Employment	15029220.00	15029450.00	15029070.00	230.00	-150.00
Earnings	288907.20	288912.30	288905.50	5.10	-1.70
Gov't Revenue	166249.60	166250.86	166246.90	1.26	-2.70

Variable	Without Fish	With Fish Scenario A2	With Fish Scenario B2	Without Fish vs Scenario A2 With Fish	Without Fish vs Scenario B2 With Fish
Real Gross Regional Product	484213.30	484218.66	484213.39	5.38	0.09
Employment	15029220.00	1529450.00	15029270.00	230.00	50.00
Earnings	288907.20	288912.40	288907.50	5.20	0.30
Gov't Revenue	166249.60	166251.05	166249.61	2.06	0.01

Present Value and Annualized Incremental Impacts

If it is assumed that the adjustments to the national economy represented by Scenarios A1 and B1 results are permanent, then the present value and annualized values can be estimated. Table 16 presents these results. For output, the discounted present value (3 percent) would range from \$75.46 million for Scenario A1 to -\$66.89 million for Scenario B1. In comparison, the traditional approach would provide a value of \$52.69 million, which falls within the range as projected by the CGE model. This is also the case for the annualized values.

Table 17 reports the results for Scenarios A2 and B2. Under Scenario A2, the present value of the output increase is projected to be \$94.30 million. Earnings are projected to increase by \$92.90 million and government revenue by \$36.11 million. Alternatively, for Scenario B2 the growth in output, earnings, and government revenues is projected to be \$15.78 million, \$7.01 million, and \$11.39 million, respectively. The range of the annualized values for output is from \$4.72 million (Scenario A2) to \$0.79 million (Scenario B2). If the direct impacts to the recreation sector within the Colorado River Basin region are offset by substitution to other recreational activities outside the region, then the upper bound scenario of national economic impacts for the with fish scenario still would be positive.

Table 16. National Efficiency (CGE): Present and Annualized Values

		Annualized Value (1982 \$ millions)				Present Value (1982 \$ millions)			
		0%	3%	5%	10%	0	0.03	0.05	0.1
Scenario A1	Real Gross Regional Product	4.045	3.77	3.59	3.15	125.40	75.46	55.98	29.85
	Earnings	4.69	4.37	4.16	3.65	145.35	87.47	64.88	34.60
	Gov't Rev.	1.10	1.03	0.98	0.86	34.20	20.58	15.27	8.14
Scenario B1	Real Gross Regional Product	-3.59	-3.34	-3.18	-2.79	-111.15	-66.89	-49.61	-26.46
	Earnings	-0.64	-0.60	-0.57	-0.50	-19.95	-12.01	-8.910	-4.75
	Gov't Rev.	-2.48	-2.32	-2.20	-1.93	-76.95	-46.31	-34.35	-18.32

Table 17. National Efficiency (CGE): Present and Annualized Values

		Annualized Value (1982 \$ millions)				Present Value (1982 \$ millions)			
		0%	3%	5%	10%	0	0.03	0.05	0.1
Scenario A2	Real Gross Regional Product	5.12	4.72	4.45	3.89	158.71	94.30	69.52	36.74
	Earnings	5.04	4.64	4.38	3.84	156.35	92.90	68.48	36.19
	Gov't Rev.	1.96	1.81	1.70	1.49	60.77	36.11	26.62	14.07
Scenario B2	Real Gross Regional Product	0.86	0.79	0.74	0.65	26.55	15.78	11.63	6.15
	Earnings	0.38	0.35	0.33	0.29	11.8	7.01	5.12	2.73
	Gov't Rev.	0.62	0.57	0.54	0.47	19.18	11.39	8.40	4.44

CONCLUSION

The regional impacts depicted in Table 13 provide three conclusions. First, for the Colorado River Basin as a whole, regional economic impacts are clearly positive. Second, the State-level impacts are not distributed evenly over the individual States in the Basin. Finally, the percent deviation from the without fish scenario is small.

The national efficiency output impacts reported in Tables 16 and 17 range from -\$3.34 million (Scenario B1) to \$4.72 million (Scenario A2). Based upon the characteristics of the Basin and the nature of the regional economies, the annualized value of \$3.77 million reported for Scenario A1 is the most plausible.

PART IV - Relationship of Critical Habitat to other Provisions of the Endangered Species Act

INTRODUCTION

The purpose of the Endangered Species Act (Act), as stated in Section 2(b), is to provide a means to conserve the ecosystems upon which endangered and threatened species depend and to provide a program for the conservation of listed species. Section 2(c)(1) of the Act states that "... all Federal departments and agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." Conservation requirements of species listed as endangered or threatened under the Act include recovery actions, requirements for Federal protection, and prohibitions against certain practices.

The Act mandates the conservation of listed species through different mechanisms, such as: Section 6 (Federal grants to States); land acquisition; research; Section 7 (requiring Federal agencies to further the purposes of the Act by carrying out conservation programs and insuring that Federal actions will not likely jeopardize the continued existence of the listed species or result in the destruction or adverse modification of critical habitat); Section 9 (prohibition of taking of listed species); and Section 10 (permits for scientific purposes or to enhance propagation and survival of listed species and habitat conservation planning on non-Federal lands).

Critical habitat designation is primarily intended to identify the habitat needed for survival and recovery. Such designation is not intended to be a management or conservation plan. Designation of critical habitat does not offer specific direction for managing habitat. That type of direction, as well as any change in management priorities, will come through the administration of other facets of the Act (e.g., Section 7, Section 10 permit process, and recovery planning) and through development of management plans for specific species or areas. The designation of critical habitat in an area can result in additional protection for that area through administration of Section 7 of the Act. The objective of this part is to delineate the relationship between the designation of critical habitat and other provisions of the Act so that impacts of critical habitat can be more easily evaluated.

RECOVERY PLANNING

Recovery plans developed under Section 4(f) of the Act guide much of the Act's activities and promote a species' conservation and eventual delisting. Recovery plans address the steps needed to recover a species throughout its range and provide a mechanism for implementation. Recovery plans provide guidance, which usually includes population goals and may include identification of areas in need of protection or special management. Recovery plans can include management recommendations for areas proposed or designated

as critical habitat. Recovery plans for the Colorado River endangered fishes may be modified to include specific recommendations for managing critical habitat.

Critical habitat designation should be compatible with recovery efforts. Recommendations or management prescriptions in recovery plans should be directed to critical habitat. Recovery plans exist for the Colorado squawfish, humpback chub, and bonytail. The Colorado River Fishes Recovery Team and Service staff will be preparing a recovery plan for the razorback sucker. In developing a recovery plan, the relationships between critical habitat and other current planning efforts are evaluated. A recovery plan is not a regulatory document. The plan may identify recommendations for implementing actions and managing designated critical habitat on Federal lands, as well as considerations for management of critical habitat on other landownership.

Consistent with Section 7(a)(1) of the Act, Federal agencies should consider incorporating recommendations and goals provided within recovery plans for these species into land and water management plans. Biologically sound plans offer opportunities for resolving conflicts between development interests and endangered species conservation, and provide a basis for present and future management decisions. Valid and acceptable management prescriptions contained in land and water development plans can help guide the Service and other agencies in managing critical habitat for the Colorado River endangered fish, and other listed and non-listed species.

SECTION 7 CONSULTATION

Section 7(a)(2) of the Act applies to only Federal agencies and requires them to insure that activities they authorize, fund, or carry out are not likely to destroy or adversely modify critical habitat. This Federal responsibility accompanies, and is in addition to, the requirement in Section 7(a)(2) of the Act that Federal agencies insure that their actions are not likely to jeopardize the continued existence of any listed species. Jeopardy is defined at 50 CFR 402.02 as any action that would be expected to appreciably reduce the likelihood of survival and recovery of a species in the wild by reducing its numbers, reproduction, or distribution. Destruction or adverse modification of critical habitat is defined at 50 CFR 402.02 as a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. The regulations also state that such alterations include, but are not limited to alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical. The requirement to consider potential adverse modification of critical habitat is necessary and in addition to the review necessary to evaluate the likelihood of jeopardy in a Section 7 consultation. Figure 3 shows the major steps in a Section 7 evaluation.

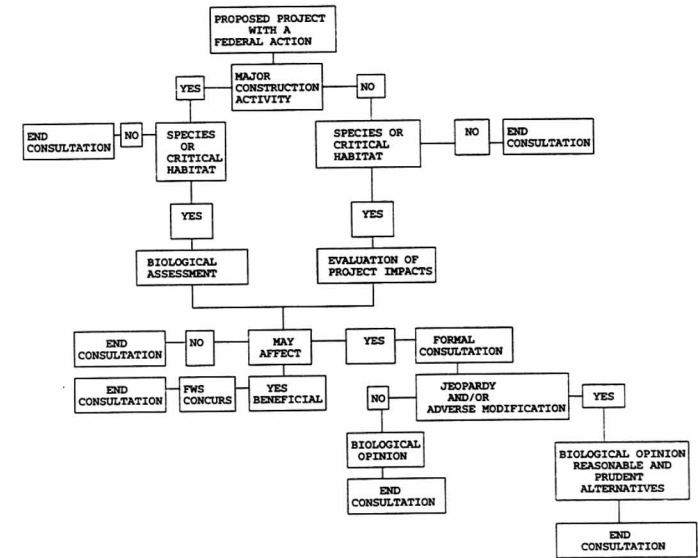


Figure 3. Major steps in a Section 7 evaluation.

As required by 50 CFR 402.14, a Federal agency must consult with the Service if their action may affect either a listed species or its critical habitat. Federal action agencies are responsible for determining whether or not to consult with the Service. The Service will review agencies' determinations on a case-by-case basis and may or may not concur with the agencies' determination of "no effect" or "may affect" for critical habitat, as appropriate.

Survival and recovery, as mentioned in the definitions of adverse modification and jeopardy, are conceptually related. The survival of a species may be viewed, in part, as a progression between extinction and recovery of the species. The closer a species is to recovery, the greater the certainty of its continued survival. Thus, terms "survival" and "recovery" differ by the degree of confidence about the ability of a species to persist in nature over a given time period.

The purpose of critical habitat is to contribute to a species' conservation, which leads to recovery and delisting. Section 7(a)(2) prohibitions against the destruction or adverse modification of critical habitat apply to actions that would impair survival and recovery of a listed species. As a result of the link between critical habitat and recovery, these prohibitions should protect the value of critical habitat until recovery.

In Section 7 consultations involving critical habitat, the Service considers the effects of proposed actions on the primary constituent elements and the value of that particular area to the species. Section 7 consultation is initiated by a Federal agency when its actions may affect critical habitat by impacting any of the primary constituent elements or by reducing the potential of critical habitat to develop these elements. The consultation also would take into consideration Federal actions outside of critical habitat that also may impact a critical habitat reach (e.g., water management, water quality, water depletions, and nonnative fish stocking or introductions). Though an action may not adversely modify critical habitat, it still may affect one or more of the Colorado River endangered fish and, therefore, be subject to consultation under Section 7 of the Act to determine the likelihood of jeopardy to the species.

Prior to finalizing the critical habitat designation, Federal agencies are required to confer on any of their discretionary actions which are likely to result in the adverse modification or destruction of the proposed critical habitat. The conference is designed to identify and resolve potential conflicts. Conferences are different than formal consultations in that they involve informal discussions and the Service makes advisory recommendations on ways to minimize or avoid adverse effects. Agencies are not precluded from making irreversible and irretrievable commitments of resources while critical habitat is merely proposed; they are, however, precluded by Section 7(d) from making such commitments after a final designation of critical habitat is effective.

A number of Federal entities fund, authorize, or carry out actions that may affect areas the Service is designating as critical habitat. Among these are the Bureau of Land Management, Western Area Power Administration, Fish and Wildlife Service, Forest Service, Army, Air Force, National Guard, Environmental Protection Agency, Bureau of Mines, Corps of

Engineers, Bureau of Reclamation, Federal Energy Regulatory Commission, Housing and Urban Development, National Park Service, Bureau of Indian Affairs, Federal Emergency Management Agency, and Federal Highway Administration.

Basis for Section 7 Analysis

Designation of critical habitat focuses on the primary constituent elements within the defined areas and the contribution of these elements to the species' recovery, based on consideration of the species' biological needs and factors that contribute to survival and recovery. The evaluation of actions that may affect critical habitat for the Colorado River endangered fish should consider the effects of the action on any of the factors that were the basis for determining the habitat to be critical. These include the primary constituent elements of water, physical habitat, and biological environment as well as the contribution of the reach and the local sites to recovery. The desired outcome of Section 7 should be to avoid actions that further reduce the ability of the habitat to support Colorado River endangered fish (e.g., the type of activities that led to listing, such as depletions, predation, competition, fragmentation, and habitat degradation).

For wide-ranging species such as the Colorado River endangered fishes, where multiple critical habitat reaches are designated, each reach has a local role and a rangewide role in contributing to the conservation of the species. The loss of a single piece of habitat may not jeopardize the continued existence of the species, but it may reduce the ability of critical habitat to contribute to recovery. In some cases, the loss of a site containing a primary constituent element could result in local population instability. This could have a detrimental effect on the reach or that portion of the reach where the loss occurred. This could preclude recovery or reduce the likelihood of survival of the species. Each critical habitat reach is dependent upon conditions in adjacent reaches, whether or not those reaches were designated critical habitat. Consideration must therefore be given to Federal actions that would take place both within and outside of a critical habitat reach. Degradation of a critical habitat reach, regardless of the source of that degradation, may impact the survival and recovery of the species.

The level of disturbance a particular critical habitat reach could withstand and still fulfill its intended purpose is variable for each species and each area of the Basin. Any proposed activity will need to be reviewed in the context of affected species, habitat condition, and project location. Because of the habitat overlap among these species, it may be difficult to completely separate out the effects on any one species.

The designation of unoccupied habitat to provide for the conservation (recovery) of a listed species adds another dimension to the analysis. Because listed species are not present in unoccupied critical habitat, it is not possible to reach a "jeopardy" finding for actions affecting that habitat. However, it may be possible to conclude "destruction or adverse modification" for a species if unoccupied critical habitat is affected and its value for

conservation of the species is diminished. Thus, a distinction between occupied and unoccupied critical habitat may be necessary when a biological opinion is prepared.

Examples of Proposed Actions

For any final regulation that designates critical habitat, Section 4(b)(8) of the Act requires a brief description and evaluation of those activities (public or private) that may adversely modify such habitat or may be affected by such designation. Destruction or adverse modification of critical habitat is defined as a direct or indirect alteration that appreciably diminishes the value of critical habitat for both survival and recovery of a listed species. Some activities may disturb or remove the primary constituent elements within designated critical habitat for the Colorado River endangered fishes. These activities may include, among others, actions that would reduce the volume and timing of water, destroy or block off spawning and nursery habitat, prevent recruitment, adversely impact food sources, contaminate the river, or increase predation and competition with nonnative fishes. In contrast, other activities may have no effect on the critical habitat's primary constituent elements. Activities such as recreation (boating, hiking, hunting, etc.), some types of farming, and properly managed ranching may not adversely modify critical habitat.

Areas designated as critical habitat for the Colorado River endangered fishes support a number of existing and proposed commercial and noncommercial activities. Some of the commercial and governmental activities that may affect critical habitat include construction and operation of hydroelectric facilities, irrigation, flood control, bank stabilization, oil and gas drilling, mining, grazing, stocking or introduction of nonnative fish, municipal water supplies, and resort facilities. Commercial activities not likely to destroy or adversely modify critical habitat include nonconsumptive activities such as river float trips, guided sport fishing, and excursion boat tours. Noncommercial activities are largely associated with private recreation and are not considered likely to adversely affect critical habitat. Such activities include boating, fishing, and various activities associated with nature appreciation. However, it must be emphasized that Section 7 of the Act only applies to Federal actions (projects, permits, loans etc.) and that each Federal action must be evaluated on a case-by-case basis.

Results of Formal Consultation

There are four possible results from a formal Section 7 consultation (Table 18). When the proposed action neither jeopardizes the continued existence of a species nor destroys or adversely modifies its critical habitat (Table 18, Case 1), there are no economic impacts attributable to critical habitat. A Biological Opinion finding of not likely to jeopardize but likely to adversely modify critical habitat (Table 18, Case 2) is a situation where the action agency or project sponsor will likely incur additional costs to avoid adverse modification of critical habitat and/or to minimize "take" of listed species. Where a proposed action jeopardizes the species but does not destroy or adversely modify critical habitat (Table 18, Case 3), there are no additional costs from critical habitat. When both jeopardy and adverse modification occur (Table 18, Case 4), the designation of critical habitat may cause additional

economic costs if actions needed to avoid adverse modification exceed those required to avoid jeopardy. This table is intended to represent a basic framework for estimation of the economic effects of critical habitat designation.

Table 18. Possible outcomes of a Section 7 Consultation.

CASE	LISTED SPECIES WITHOUT CRITICAL HABITAT	LISTED SPECIES WITH CRITICAL HABITAT	IMPACTS CREATED BY DESIGNATING CRITICAL HABITAT
1	NON-JEOPARDY	NON-JEOPARDY NO ADVERSE MOD.	NO
2	NON-JEOPARDY	NON-JEOPARDY ADVERSE MOD.	YES
3	JEOPARDY	JEOPARDY NO ADVERSE MOD.	NO
4	JEOPARDY	JEOPARDY ADVERSE MOD.	PROBABLY ¹

¹ In some cases, actions to avoid Jeopardy or implementation of the Reasonable and Prudent Alternative will be sufficient to avoid adverse modification.

Costs incurred by a Federal agency as a result of avoiding actions that would jeopardize the species, plus costs associated with implementing other requirements of the Act (Sections 9 and 10), can occur in the absence of critical habitat. These costs are considered "listing impacts" because the species is listed and occur regardless of whether critical habitat is designated. In addition, if a proposed action was limited or prohibited by another statute or regulation, any increase in economic costs would not be attributable to either listing or critical habitat designation. The purpose of the economic analysis on the designation of critical habitat for the Colorado River endangered fish is to determine the incremental economic costs and benefits resulting from the designation and the requirement to avoid destruction or adverse modification.

In cases where destruction or adverse modification is indicated (with or without the likelihood of jeopardy), a portion of the economic impacts that result may already have been addressed by incidental take (Section 9) of the Biological Opinion. An incidental take statement is provided in a Biological Opinion if the Service anticipates incidental loss of individuals of the species or habitat losses that constitute "taking" from the Federal action. The incidental take statement outlines the number of individuals and/or amount of habitat the Service anticipates will be lost due to the Federal action. The Service then identifies reasonable and prudent

measures necessary to minimize such take and sets forth terms and conditions that must be complied with by the Federal agency and or applicant to implement the reasonable and prudent measures. In some cases, the requirements of incidental take (Terms and Conditions) may be similar to any Reasonable and Prudent Alternatives developed under an adverse modification or jeopardy finding.

Reasonable and Prudent Alternatives

If the Service concludes in a biological opinion that an action would likely result in the destruction or adverse modification of critical habitat, the Service is required to provide reasonable and prudent alternatives, if any, to the proposed action in its biological opinion. By definition, reasonable and prudent alternatives allow the intended purpose of the proposed action to go forward while avoiding the conditions that would adversely modify critical habitat. To increase the potential for identifying such alternatives, the Service recommends that the agencies initiate discussions early in the planning process before plans have advanced to the point where alternatives may not be as feasible. If discussions are initiated early, more opportunities to reduce impacts may be available. If an adverse modification was anticipated, examples of possible reasonable and prudent alternatives provided in a biological opinion include those noted in Table 19.

Table 19. Examples of possible reasonable and prudent alternatives.

EXAMPLE ALTERNATIVES
Relocate the proposed activity to another location within or outside of critical habitat to avoid destruction or adverse modification of habitat
Modify the project (physically/operationally) to avoid adverse modification of critical habitat
Provide offsetting measures to either Colorado river endangered fish or the critical habitat area by actions such as: <ul style="list-style-type: none"> A. acquiring water or securing water rights for Colorado River endangered fish from other sources to offset a proposed depletion B. implementing water conservation measures so that no net loss of water occurs C. enhance constituent element areas so that a net benefit to Colorado River endangered fish occurs, i.e. acquiring bottomlands, removal or large-scale reductions of non-native fishes within a critical habitat reach D. undertaking other recovery actions identified in recovery plans, Recovery Implementation Programs, or other approved management plans or activities

Some reasonable and prudent alternatives may only require minor modifications to construction and/or operational plans. As an example, a proposed boat ramp may need to be relocated a short distance to avoid impacting a spawning or nursery area. Projects resulting in more significant impacts may require major changes to the original proposal. A large irrigation diversion project, as an example, may be likely to affect most of the constituent elements of a critical habitat reach and also impact adjacent and downstream reaches. The Service may recommend reduction in the scope of the project, seasonal timing constraints on depletions and operation, and reservoir releases to provide required instream flows.

Some activities could be considered a benefit to Colorado River endangered fish habitat, such as the Colorado River and San Juan River Recovery Implementation Programs and, therefore, would not be expected to destroy or adversely modify critical habitat. Examples of activities that could benefit critical habitat in some cases include protective measures such as instream flow protection, development of backwater or cove habitat which benefits native species, or eradication of nonnative fishes. However, these activities should be evaluated on a case-by-case basis.

Federal actions related to fisheries management in general, require close evaluation by the Service. The introduction or stocking of nonnative fishes may require evaluation under Section 7 for both the jeopardy and adverse modification standards and the Section 9 "takings". While the significance of predation on eggs, larvae, and juvenile endangered fish species by nonnative fish has not been quantified throughout the Basin, this impact has been documented for several species of endangered fishes in the Basin and is considered a key factor. Nonnative fishes may have other effects on individual fish and critical habitat through competition, changes in habitat, and incidental mortality.

Endangered fish research and management activities are more likely to affect individual fish or improve the quality and usefulness of habitat for the endangered fishes. These types of activities are addressed through the Section 10 permit process, which includes a Section 7 evaluation to determine the effects of the action.

Areas inside and outside of critical habitat are still subject to Section 7 consultation on the jeopardy standard and to Section 9 "take" prohibitions for their effects on Colorado River endangered fish. The Service anticipates that the importance of areas outside of critical habitat reaches to the conservation of the Colorado River endangered fish will be addressed through Section 7, Section 9, Section 10 permit process, the recovery planning process, and other appropriate State and Federal laws.

EXPECTED IMPACTS OF DESIGNATION

The Service anticipates that the factors described in this document and the Biological Support Document will be used as a basis for determining the effects of various activities on critical habitat. The Service also will use Recovery Action Plans developed within the Recovery

Implementation Programs of the Upper Basin and the San Juan River Basin, and the recovery plans for the razorback sucker (when developed), Colorado squawfish, humpback chub, and bonytail during consultation to evaluate actions within a critical habitat reach. The Service also will use new information as it becomes available.

Federal actions proposed in critical habitat reaches may or may not adversely modify critical habitat, depending on the current condition of the area and the degree of impact anticipated from implementation of the project. The potential level of allowable impacts or habitat reduction in critical habitat reaches will be determined on a case-by-case basis during Section 7 consultation.

The areas proposed as critical habitat may be affected by the results of the exclusion process. The exclusion process is discussed in detail in the following section.

PART V - Exclusion Process Overview

EXCLUSION PROCESS

This Part outlines the methods and procedures that will guide the U.S. Fish and Wildlife Service (Service) in determining whether or not to exclude an area (or areas) from designation as critical habitat for any or all of the four Colorado River endangered fishes. Section 3(5)(A) of the Endangered Species Act of 1973 (Act), as amended, defines critical habitat as:

- (i) the specific areas within the geographic area occupied by the species...on which are found those physical and biological features (I) essential to the conservation of the species, and (II) that may require special management considerations or protection.

Section 3 further states that in most cases critical habitat will not encompass the entire range of the species. Section 4 (b)(2) of the Act directs the Secretary of the Interior (Secretary) to consider economic and other relevant impacts in determining whether to exclude proposed areas from the final designation of critical habitat. The Service, as delegated by the Secretary, may exclude areas from critical habitat designation when the costs or impacts of designation outweigh the benefits to the species, provided that exclusion will not result in its extinction. The determination on whether to exclude a reach or portion of a reach considers (1) the benefits of including that reach; (2) the costs of designating that reach as critical habitat; and (3) the effects of excluding that reach or the cumulative effect of excluding more than one reach on the probability of species extinction. If the exclusion of a reach or portion of a reach could result in the eventual extinction of a species, the exclusion is prohibited under the Act.

Exclusion of an area as critical habitat would only eliminate the protection provided under the adverse modification provision of Section 7 for critical habitat; it would not remove the need to comply with other requirements of the Act for that area, such as the jeopardy provision of Section 7 consultation (for Federal actions) and Section 9 (take). The Section 7 consultation requirements will apply in full to Federal actions regardless of whether or not critical habitat is designated for a particular area.

To carry out the process used to evaluate critical habitat areas to determine whether the benefits of inclusion outweigh the benefits of their exclusion as critical habitat requires several sequential steps, as described below:

Step 1 Identify areas that meet the definition of critical habitat in Section 3(5) of the Act and that are essential to the conservation of the species. This was accomplished and the areas needed for conservation were published January 29, 1993, in the proposed rule to designate critical habitat (58 FR 6578).

Justification for these areas were presented in the Biological Support Document, which was made available to the public on September 15, 1993.

Step 2

Conduct an economic analysis to determine the anticipated economic consequences of designating areas as critical habitat. The draft economic analysis has been completed and made available to the public for comment at the same time this overview document was made available.

Step 3

Develop economic criteria and thresholds to help identify areas which would be significantly affected by the critical habitat designation. These criteria are currently being developed by the economists and the Service, and public comments are solicited on what these thresholds might be.

Step 4

In addition to the Biological Support Document, compile the biological information that needs to be considered to determine whether excluding an area would result in extinction. Downlisting and delisting criteria and other information contained in published recovery plans will of primary consideration. This information will be provided to the Regional Director, Region 6 of the Service prior to the exclusion process. Service biologists determine whether exclusion of an area may result in the extinction of a species.

Step 5

Regional Directors of Regions 1, 2, and 6 (Service Regions involved in Colorado River Basin issues and management) conduct exclusion process. The exclusion process will require that the directors of the three Service regions affected by the designation convene to evaluate which areas (if any) should be excluded due to economic or other relevant impacts. Prior to that time economic thresholds (Step 3) will be developed to provide a method by which the severity of economic impacts can be assessed. Those areas which exhibit economic impacts above the thresholds will then be examined to determine if the biological threshold of extinction would be exceeded (Step 4) if the specific area in question is dropped from consideration as critical habitat. Those areas which exceed the economic threshold but not the biological threshold may be dropped from the designation of critical habitat. The Act prohibits removing those areas which would result in extinction of the species regardless of impact.

BENEFITS AND COSTS OF DESIGNATION

A public sector analysis examines the allocation of scarce resources with concern for two basic objectives: (1) economic efficiency, and (2) distribution or equity. The efficiency criterion asks whether designating areas as critical habitat produces net benefits greater than costs. The equity criterion looks at the resulting distribution of gains and losses. The primary mandate of the Service under the Act is to protect threatened and endangered species

for all citizens, both now and in the future. This mandate mostly falls under the national economic efficiency concern, where policy adjustments seek economic efficiency gains for society by preserving endangered species.

The Service does not have a mandated requirement to conduct a strict efficiency-based benefit-cost analysis when carrying out its resource protection activities. This is particularly true for species listing activities under the Act where economic considerations are explicitly prohibited. During critical habitat designation, however, consideration of benefits and costs can occur when "economic and other relevant impacts" are specifically included as part of the process of final determination.

The economic analysis only addressed market related benefits and costs. No attempt was made to estimate non-market values associated with the preservation of the endangered fishes. However, the Service recognizes that the benefits of preservation are positive. The extant literature addressing the value of wildlife resources demonstrates that for consumptive and non-consumptive uses of wildlife species. These values are unambiguously positive. The legislative history of the Act indicates that Congress believed that the "worth" or value of a species is incalculable and invaluable. Arguably, the Colorado River Basin represents one of the most unique collections of flora and fauna in North America.

Economic data which will be considered during the exclusion process include impacts to: river basin by State, each State as a whole, the region, and the Nation. For these areas, impacts to each of the sectors of the economy will be examined. Direct and indirect impacts on employment, wages, and State and Federal revenues from business and personal income taxes will also be factored into the exclusion process.

CONSERVATION AND EXTINCTION AS FACTORS IN DESIGNATING CRITICAL HABITAT

The Act defines "conservation" to include the use of all means necessary to bring about the recovery of an endangered or threatened species. Because critical habitat consists of areas that contain elements that are essential to the conservation of a listed species, critical habitat identifies areas that should be considered in the conservation effort and provides additional protection to those areas through Section 7 consultation. Critical habitat is designated to contribute to a species' conservation, however not all areas proposed as critical habitat may be necessary to prevent extinction. Consequently, some areas or portions of areas may be excluded due to economic considerations, provided that such exclusions would not result in the extinction of the species.

Species conservation is related to a number of factors, such as the number of individuals, the amount of habitat, the condition of the species and its habitat, the species' reproductive biology, and the genetic composition of the remaining populations. Many of these factors

cannot be determined in a short period of time, especially for wide-ranging or long-lived species.

In its designation of critical habitat for the Colorado River fishes, the Service has attempted to conserve habitat for recovery of each species, identifying reaches that contain habitat features needed for spawning, rearing, feeding, and migration. Throughout its previous efforts (e.g., Section 7 consultation, research), the Service has also identified biologically important areas that still contain these endangered fishes. Additionally, important reaches have been identified in recovery plans for the Colorado squawfish, humpback chub, and bonytail. The Recovery Implementation Programs in the Upper Colorado River and San Juan River basins have also identified reaches essential for the survival and recovery of these species. Although all areas proposed are important to conservation, those areas currently supporting the largest remaining populations may be key to the long-term survival of these species. Additionally, the physical and ecological relationships between these areas is an important consideration.

Extinction of these endemic fishes would most likely occur as a result of the presence and continued introductions of nonnative fishes, significant changes in the hydrologic cycle, increased fragmentation and channelization of their habitat, and decreased water quality. Although a single action could result in extinction, the cumulative reduction in suitable habitat resulting from many actions could also lead to species' extinction. Because these species are long-lived, the specific effects of some impacts are difficult to establish. Therefore, the exclusion analysis focuses not only on specific reaches but also their relationship to other reaches to evaluate whether or not extinction would be probable if a reach were excluded. Such factors as (1) current population status, (2) habitat quality (e.g., presence of spawning sites, nursery areas, and condition of the habitat), (3) geographical distribution of the populations, (4) genetic variability within the population, and (5) the relationship between critical habitat units will be considered.

Determination of river reaches required to prevent extinction (insure survival) of these fishes will rely upon available biological information and approved recovery plans. Information relating to the species biological and ecological needs such as habitat, reproduction, rearing, and genetics will be used in determining whether an area is needed to prevent extinction of the species. Where enough information is available, the recovery plans present downlisting and delisting criteria. The downlisting criteria generally equate to the survival level; the delisting criteria to the recovery level. Because no recovery plan has been prepared for the razorback sucker, reaches required for their survival (downlisting) and recovery (delisting) change as a recovery plan is developed by the Service and the Colorado River Fishes Recovery Team.

Not all river reaches that may contain suitable habitat for the fishes are included in the proposed critical habitat designation. These areas may play a future role in the conservation of these species, and some may need to be considered for designation as critical habitat in the future.

PART VI - Public Comments

BACKGROUND

The Service proposed the designation of critical habitat for four endangered Colorado River fishes on January 29, 1993 (58 FR 6578). The public comment period was initially scheduled from January 29 to March 30, 1993. On March 5, 1993, the comment period was extended to April 15, 1993 (58 FR 12573) and public hearing and scoping meetings were scheduled as follows:

March 29, 1993, 5-8 p.m., Sturges Center for the Fine Arts, 780 North E. Street, San Bernardino, California;

March 30, 1993, 5-8 p.m., YWCA Leadership Development Center, 9440 North 25th Avenue, Phoenix, Arizona; and

March 31, 1993, 5-8 p.m., Sheraton Denver West Hotel and Conference Center, 360 Union Boulevard, Denver, Colorado.

In addition to the *Federal Register* notice (58 FR 12573), notices were published in State and local newspapers to formally announce the hearings.

Registration cards were provided at each hearing to facilitate receiving testimonial from interested parties. Attendees were asked to record on the card if they would like to receive additional information on the designation as it became available. The Service used this information to develop a mailing list for the critical habitat designation. All parties that gave written or oral comments were placed on this list. The public hearings included a 20-minute Service presentation on the critical habitat designation. Prior to receiving testimonial, attendees were informed that written comments were encouraged.

CONTENT ANALYSIS

The Service summarized the written responses and testimonial received during the public hearings. All letters received were reviewed and a list of all issues developed. The list was separated into four categories based on the nature of the comment: Administrative, Biologic, Economic, or Sociologic (Appendix). Each comment was assigned to one of these categories and then to an issue within that category (Appendix). In addition to issues contained in a letter, the origin of the letter, position on the critical habitat designation, and type of letter (agency, form letter, private, etc.) was recorded.

Letters containing economic information or raising economic issues were photocopied and forwarded to the economists working on the proposed designation. A mailing list was established for individuals, agencies, companies, etc. who provided comments. Those who

sent in comments but provided no address could not be placed on the mailing list. If the comment was written on behalf of an organization, the name of the organization was included in the mailing list. Individuals who phoned the Salt Lake City Office requesting additional information on the proposed designation were also placed on the mailing list.

The summary that follows includes the number of respondents that raised each issue. However, the intent of the public hearing and comment process is not to determine how many people raised any given issue, but to encapsulate the range and nature of comments from the public on the proposed critical habitat designation. Therefore, substantive comments made by one individual received equal consideration as the same comment made by many individuals.

SUMMARY OF PUBLIC COMMENTS RECEIVED TO DATE

To date, 686 public responses were received on the proposed designation of critical habitat. Of these 79.1 percent came from Arizona, and 67.6 percent came from the Safford, Arizona area, which includes the towns of Safford, Pima, Thatcher, and Fort Thomas. The origin of public comments is provided in Figure 4 and Table 20.

Each letter was rated according to its position, i.e., either for or against the critical habitat designation. Letters which did not state a position on the proposed critical habitat designation were coded depending on the overall tone of the letter. Sixty-one percent of all the comments were form letters, most of which (97 percent) expressed opposition to the designation of critical habitat (Table 21).

Most Administrative Comments were: the need for more than 60 days to review the economic analysis and biological support document; the difficulty of commenting on the proposed rule without economic analysis and biological support documents; and that the Service needs to prepare an EIS (Environmental Impact Statement) and comply with NEPA guidelines.

Of the 458 commentors that suggested areas be removed from the designation, 81 percent were form letters. Although recommending specific areas to be dropped, most of these letters provided little biological support for their position. The other biological issues raised were related primarily to razorback suckers in the Gila River Basin. These comments include: the razorback sucker was not native to the area; razorback suckers are found in the area only because of stocking; and the designation will not benefit the species.

The proposed rule did not contain information from a completed economic analysis, and most commentors did not raise specific economic issues, but most expressed concerns on what the potential economic impacts might be. The main comment included in the Social section was that the designation would effect the quality of human life and livelihood.

Figure 4. Origin of comments received on the proposed designation of critical habitat.

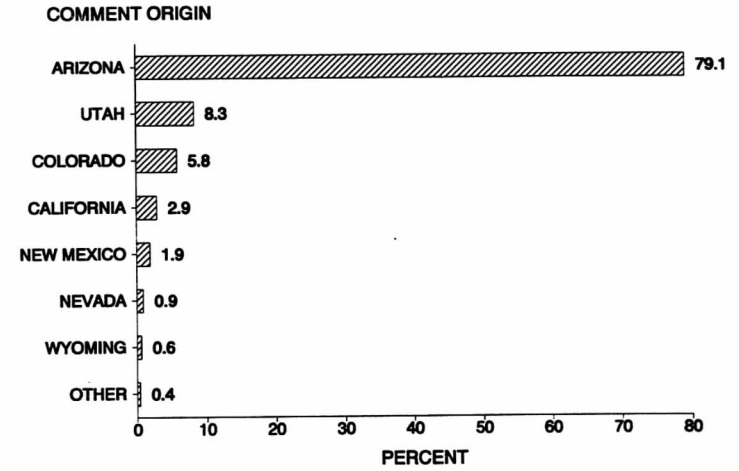


Table 20. Sources of comments received.

COMMENTOR TYPE	NUMBER
Federal Agency	7
State Government Agency	10
Local Government Agency	13
Tribal Government or Representative	6
Other Agency ¹	78
Agency Form Letter ¹	29
General Public	111
General Public Form Letter	388
Public Hearing Testimonial	44
TOTAL	686

¹ - This includes letters from businesses, irrigation districts, water districts, and other publicly owned or operated entities.

Table 21. Position of commentors and type of response to the proposed critical habitat designation .

COMMENTOR	SUPPORT	OPPOSE	NEUTRAL	NEUTRAL NEGATIVE ²	NEUTRAL POSITIVE ²
Federal Government Agency	3	2	1	1	0
State Government Agency	0	1	3	4	2
Local Government Agency	0	2	4	7	0
Tribal Government or Representative	0	3	0	3	0
Other Agency ¹	4	14	18	37	5
Agency Form Letter ¹	1	21	5	2	0
General Public	9	90	3	7	2
General Public Form Letter	1	382	0	5	0
Public Hearing Testimonial	6	12	12	13	1
TOTAL	24	527	46	79	10

1 - This includes letters from businesses, irrigation districts, water districts, and other publicly owned or operated entities.

2 - No specific position was stated. Classification was determined by the overall tone of the letter.

CONTINUED PUBLIC INVOLVEMENT

On September 15, 1993, the Service published notice (58 FR 4835) that the public comment period for the proposed critical habitat designation had been reopened, and that it would remain open until further notice. The Service continues to invite public comment on all aspects of the critical habitat designation for the four endangered Colorado River fishes. Additionally, information and comments are welcome on the overall exclusion process, recommendations on economic criteria for use in the exclusion determination, any other benefits associated with exclusion, benefits of including proposed areas as critical habitat, and information on which areas, if excluded, would result in the extinction of any of the four endangered fishes. The Service also requests additional information concerning possible impacts on oil and gas exploration and drilling, sand and gravel mining, and for any other activity that was not fully addressed in the economic analysis.

Requests for information and comments concerning the designation of critical habitat should be addressed to Field Supervisor, U.S. Fish and Wildlife Service, 2060 Administration Building, 1745 West 1700 South, Salt Lake City, Utah 84104-5110.

APPENDIX - COMMENTS RECEIVED

Administrative

NUMBER COMMENT

- 86 Critical habitat should not have been published without first completing the biological and economical analysis; difficult to comment until biological support document and economic analysis are made public. Proposed Rule should be withdrawn until these are completed.
- 74 Service should prepare an Environmental Impact Statement and comply with NEPA (National Environmental Policy Act). Magnitude of designation will have significant impact on human environment.
- 63 Comment Period for review of Biological Support Document and Economic Analysis should be of sufficient length to allow adequate review; 60 days proposed by Service is inadequate time for review; need 120 days or more for adequate review. Public hearings should be held in more locations. Locations should be close to impacted areas.
- 44 How will critical habitat affect existing water laws, compacts, treaties, etc.
- 23 Critical Habitat designation will result in a "takings" of water rights and private property.
- 21 How will critical habitat fit with existing Recovery Implementation Programs? The Recovery Implementation Programs should be involved in critical habitat designation.
- 16 Designation includes so much area that it will not be manageable.
- 15 Service should publish a revised proposed rule to allow for additional public comment before making a final decision; Service should prepare a draft final rule and make that available to public before finalizing designation.
- 14 Critical habitat designation will increase administration/implementation costs of doing Section 7 consultation.
- 14 Service did not seek adequate consultation with affected groups; did not seek economic information from affected groups.

NUMBER COMMENT

- 13 Public should be part of decision process; Workgroup should be established to designate critical habitat and involve affected groups.
- 12 Impacts of "listing" should be included in economic analysis.
- 10 Critical habitat should not be designated until a recovery plan is completed for the razorback sucker.
- 9 Critical habitat should only have been designated for razorback sucker and not for all four species at the same time.
- 8 Designating critical habitat on Tribal lands violates the Federal government's trust responsibility.
- 7 Critical habitat designation is not "prudent and/or determinable."
- 5 The Service must comply with the Endangered Species Act regardless of the court order, and do an economic analysis prior to finalizing the critical habitat designation.
- 4 Private property should not be included in designation.
- 3 Tribal lands are Sovereign and therefore should not be designated.
- 2 The Service should allow for public comment on the balancing/exclusion process.
- 1 Allowing for comment period after biological support document/economic analysis are available, does not allow for meaningful public comment on the rule.
- 1 There are no economic impacts from listing - all costs should be attributed to critical habitat.
- 1 Delay in designating critical habitat has harmed endangered species.

Biological

NUMBER COMMENT

- 458 Recommended specific areas for exclusion.
- 183 The species is found in the area only because of stocking (reintroduction) programs. Stocking programs may not have been successful.
- 118 There is no historic information that the fish species were ever found in the area proposed for designation. The species is not native to the area. Fish (razorback suckers) were not native to the area but were introduced here.
- 99 Designation would not benefit the species.
- 65 Nonnative fish species have adversely affected the species. This effect is more important to the survival of these species than changes to physical habitat. The presence of non-native fish species in an area precludes the designation as critical habitat.
- 53 Area proposed for designation is too large.
- 25 Commentor provided additional biological information to oppose the designation. Additional research data provided or cited.
- 23 The Service needs more time/biological data to determine critical habitat.
- 21 Justify the rationale for the selected areas in the determination.
- 21 Flood plain areas should not be included because the river is too regulated to allow floods, agricultural and municipal development has occurred, on area not used by species. Inclusion of floodplain is not biologically supportable.
- 19 Commentor indicates that additional areas should be included in the designation. Additions may be to proposed reaches or to rivers currently not included in designation.
- 15 No non-degraded suitable habitat is available in the area proposed for designation. Degradation may include seasonal drying of the river or portions thereof, changes to temperature and silt/sediment load, changes to the historic hydrograph and construction of dams and reservoirs.

NUMBER COMMENT

- 9 Flow requirements for fish have inadequate biological base.
- 4 Commentor provided additional biological information to support the designation. Additional research data provided or cited.
- 4 The four fish species do not have enough in common biologically (habitat use, life history, etc.) to be included in this single designation. It will be too difficult to manage all four fish together.
- 4 Management of these areas should be the responsibility of the land owning agency, tribe or individual owner. Other laws provide for the management of wildlife and fish.
- 4 Question regarding the designation of reservoirs as critical habitat and questions regarding full pool elevation.
- 4 Designation will benefit ecosystem; return river to more natural state.
- 3 Species should be allowed to go extinct since they cannot adapt.
- 3 Justify why some areas were not included in the determination.
- 2 Selection of boundaries appears related to landmarks rather than strictly biological.
- 2 Service doesn't address role of fish eradication program on listed fish.
- 2 Designation will aid in the recovery of the species.
- 1 Recovery Implementation program is not a substitute for designation of critical habitat.
- 1 The additional selection criteria for razorback sucker are too broad.
- 1 The designation of critical habitat will improve water quality.

Economic

NUMBER COMMENT

- 173 Designation of critical habitat will cause impacts to commodity crop production (corn, grain, cotton, etc.), livestock production (include pasture, hay, alfalfa, etc.).
- 134 There will be impacts to municipal water supply, future growth existing land and water uses and loss of local planning control, etc.
- 85 Recreation/Economic impacts; sportfish, rafting, hiking, etc.
- 33 Hydropower impacts; loss of peaking power, higher rates, contract obligations, reduced power flexibility.
- 23 Impacts to coal, production, exploration, transportation, etc.
- 19 Critical habitat will cause economic and job loss; specific town or county mentioned.
- 12 Impacts to oil and gas exports, production, exploration, pipelines, etc.
- 11 Impacts to Tribal economies; water use rights; growth stops/reduction; land use restriction.
- 5 Critical habitat will cause economic loss, jobs; general no specific location or area of concern.
- 4 The economic benefits of listing/critical habitat designation must be addressed.
- 3 Indian tribes need to be considered as separate government units for the economic analysis.
- 1 Because critical habitat area being proposed is too large; economic impacts too great.

Social

<u>NUMBER</u>	<u>COMMENT</u>
202	Designation would adversely affect quality of life in communities adjacent to the critical habitat. Loss of water rights, elimination of floodplain developments, prevention of new flood control projects and similar issues may result in destruction of communities.
57	Humans are the real endangered species. Fish should not be considered more important than people. No benefit to people from these species.
19	Need balance between economic/environmental needs.
16	Designation would adversely affect historic use of resources and lands.
4	Decisions regarding issues that affect the quality and way of life in a community should be made locally and for the benefit of the local community.
2	Designation would have effects on use of these rivers and reservoirs for recreation.