ATTACHMENT 9

BIOLOGICAL OPINION

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UTAH 84119

June 14, 2010

In Reply Refer To

FWS/R6
ES/UT
07-F-0246
07-FA-0163

Memorandum

To: Field Manager, Price Field Office, Bureau of Land Management, Price, Utah

From: Utah Field Supervisor, Ecological Services, U.S. Fish and Wildlife Service, West Valley City, Utah

Subject: Conclusion of Section 7 Consultation for the West Tavaputs Plateau Natural Gas Full Field Development Plan proposed by Bill Barrett Corporation

In accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.), and the Interagency Cooperation Regulations (50 CFR 402), this transmits the Fish and Wildlife Service's (Service) final biological opinion for impacts to federally listed endangered species and designated critical habitat for Bill Barrett Corporation's (BBC) Proposed West Tavaputs Plateau Natural Gas Full Field Development Plan. Reference is made to your letter dated June 2, 2010 requesting initiation of consultation for the subject project.

Although not included in this biological opinion, we bring your attention to our March 5, 2010 decision that the greater sage-grouse warrants protection under the Endangered Species Act, (50 FR 17) and thus it is a candidate species. With this recent decision, it is imperative that federal land management agencies design projects to reduce impacts on sage-grouse populations. Various studies have shown that oil and gas development can negatively impact sage-grouse populations and their habitat. Lek persistence is positively influenced by the proportion of sagebrush habitat within 6.4 km (4 miles) of the lek (Walker et al. 2007), and can thus be impacted by activities that remove or degrade this habitat type. Sage-grouse also avoid suitable wintering habitats if these areas are developed for energy production (Doherty et al. 2008). For these reasons, we recommend no new surface disturbance associated with this EIS be allowed within greater sage grouse brooding and wintering habitats. If development in these habitats is allowed to proceed, we recommend the following conservation measures be implemented:

1. Topography and the latest muffling technology should be used to ensure noise levels do not exceed 45dB within 5 km (3.1 miles) of a lek;

2. No surface disturbing activities should occur within identified crucial wintering habitat between December 1 and March 15 (Figure 3.10-2 within EIS);
3. No permanent structures or facilities should be developed within identified crucial wintering habitat; and
4. Well density should not exceed 1 well pad per square mile within sage grouse brooding habitat

Based on the information provided in the EIS/BA, we concur that the proposed project may affect, but is not likely to adversely affect, the Uinta Basin hookless cactus (*Sclerocactus wetlandicus*), southwestern willow flycatcher (*Empidonx trailii extimus*), and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*). Our concurrence is based, in part, on the applicant committed environmental protection measures designed to avoid or minimize negative effects in the project area during project related activities: see Tables 2.2-6 and 2.6-8 within the EIS.

Based on the information presented in the environmental impact statement (EIS) (#UT-070-05-055)/biological assessment (BA), and other information that BLM provided through personal communications, meetings, and site visits, we concur that the proposed action, the Agency Preferred Alternative, may adversely affect the endangered Colorado pikeminnow *(Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*) and critical habitat and the threatened Mexican spotted owl (*Strix occidentalis lucida*) and critical habitat.

Consultation History

This section summarizes significant steps in the consultation process:

Colorado River Fish Recovery Program

- On January 21-22, 1988, the Secretary of the Department of the Interior; the Governors of Wyoming, Colorado, and Utah; and the Administrator of the Western Area Power Administration were cosigners of a Cooperative Agreement to implement the "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" (Recovery Program; Service 1987). The Recovery Program has been extended until September 30, 2013. An objective of the Recovery Program is to recover the listed species while providing for new water development in the Upper Colorado River Basin.

  In order to further define and clarify processes outlined in sections 4.1.5, 4.1.6, and 5.3.4 of the Recovery Program, a section 7 Agreement (Agreement) and a Recovery Implementation Program Recovery Action Plan (RIPRAP) was developed. The Agreement establishes a framework for conducting all future section 7 consultations on depletion impacts related to new projects and all impacts associated with historic (defined as being initiated prior to January 1988) projects in the Upper Basin. Procedures outlined in the Agreement are used to determine if sufficient progress is being accomplished in the recovery of the endangered fishes to enable the Recovery Program to serve as a

reasonable and prudent alternative to avoid jeopardy. The RIPRAP was finalized on October 15, 1993, and has been reviewed and updated annually.

In accordance with the 1993 Agreement, we assess the impacts of projects that require section 7 consultation and determine if progress toward recovery has been sufficient for the Recovery Program to serve as the reasonable and prudent alternative. As long as the Recovery Program achieves sufficient progress, biological opinions are written to identify activities and accomplishments of the Recovery Program that support it being used as the reasonable and prudent alternative. If sufficient progress in the recovery of the endangered fishes is not achieved by the Recovery Program, additional actions from the RIPRAP are identified for the project proponent to implement in order to avoid jeopardy to the endangered fishes. For historic projects, the Recovery Program serves as the reasonable and prudent alternative as long as recovery actions are completed according to the schedule identified in the RIPRAP. For new projects, the Recovery Program and/or addition actions identified from the RIPRAP serve as the reasonable and prudent alternative so long as they are completed prior to the project being implemented.

After many years of successful implementation of the Recovery Program and Agreement, Federal action agencies anticipate recovery activities that must be included in their project planning to avoid jeopardy to listed species. Thus, our reasonable and prudent alternative is essentially part of the proposed action. The Recovery Program now serves as a conservation measure within the proposed action and in many cases minimizes adverse effects to listed species or critical habitat. The following excerpts summarize portions of the Recovery Program that address depletion impacts, section 7 consultation, and project proponent responsibilities:

"All future section 7 consultations completed after approval and implementation of this program (establishment of the Implementation Committee, provision of congressional funding, and initiation of the elements) will result in a one-time contribution to be paid to the Service by water project proponents in the amount of $10.00 per acre-foot based on the average annual depletion of the project . . . This figure will be adjusted annually for inflation [the current figure is $18.99 per acre-foot] . . . Concurrently with the completion of the Federal action which initiated the consultation, e.g., . . . issuance of a 404 permit, 10 percent of the total contribution will be provided. The balance . . . will be . . . due at the time the construction commences . . . ."

It is important to note that these provisions of the Recovery Program were based on appropriate legal protection of the instream flow needs of the endangered Colorado River fishes. The Recovery Program further states:

". . . it is necessary to protect and manage sufficient habitat to support self-sustaining populations of these species. One way to accomplish this is to provide long term protection of the habitat by acquiring or appropriating water rights to ensure instream flows. Since this program sets in place a mechanism and a commitment to assure that the instream flows are protected under State law, <u>the</u>

[U.S. Fish and Wildlife] Service (Service) will consider these elements under section 7 consultation as offsetting project depletion impacts."

On July 8, 1997, we issued an intra-Service biological opinion determining that the depletion fee for average annual depletions of 100 acre-feet or less are no longer required because the Recovery Program has made sufficient progress to be the reasonable and prudent alternative to avoid the likelihood of jeopardy to the endangered fishes and to avoid destruction or adverse modification of their critical habitat by these small depletions. The intra-Service biological opinion has been reinitated several times since 1997 to account for additional water depletions. The most recent update occurred on June 4, 2010 and increased the cap for small water depletions to 12,000 af. This increase will allow us to continue to exempt small depletions of 100 af or less.

Proposed Action

- July 26, 2006; we met with the Price BLM and other cooperating agencies to discuss data needs, analysis, and avoidance measures for Mexican spotted owl within the West Tavaputs project area. .
- August 23, 2006; we met with the Price BLM and other cooperating agencies for two days to discuss the West Tavaputs Plateau Full Field Development and develop alternatives.
- January 26, 2007; we met with Buys and Associates and the Price BLM to discuss the background and scope of the West Tavaputs Plateau Full Field Development project.
- May 9, 2007; our office provided comments on the preliminary draft EIS to the Price BLM.
- June 20, 2007; we met with the Price BLM and other cooperating agencies via conference call to discuss the preliminary draft EIS.
- January 29; 2008, our office received a draft EIS for review along with a request for comments from the Price BLM.
- March 25, 2008; we met with the Price BLM via conference call to discuss issues with the draft EIS.
- April 24, 2008; we met with the Price BLM to visit and review the proposed project area.
- May 1, 2008; our office provided comments on the draft EIS for the above referenced project to the Price BLM.
- November 5, 2008; our office met via conference call with the Price BLM and other cooperating agencies to discuss the preliminary final EIS and the relevant changes that had been made to the document since the draft form was last reviewed.
- November 7, 2008; our fisheries office in Vernal, Utah received a copy of the preliminary final EIS with a request to provide comments. The copy was eventually delivered to our office on November 13, 2008.
- November 21, 2008; our office provided comments on the preliminary final EIS to the Price BLM.
- December 1, 2008; our office received a letter from the Price BLM requesting formal consultation for the West Tavaputs Plateau Full Field Development Project.

- January 12, 2009; our office received an email from the Price BLM clarifying the amount of water depletion that would be consulted on, the sources for the water depletion, and survey protocol to be used for Mexican spotted owl surveys.
- January 13, 2009; our office received an email from the Price BLM clarifying the amount of water depletion for dust suppression for the life of the project.
- January 14, 2009; we met with Buys and Associates to briefly discuss additional mitigation measures for Mexican spotted owl should any be found during surveys in the project area. A subsequent email was sent to the BLM on January 16, 2008, by Buys and Associates explaining the additional mitigation.
- February 25, 2009; we provided a draft biological opinion to the Price BLM.
- April 27, 2009; we received a letter from the Price BLM requesting suspension of formal consultation.
- April 28, 2010; we received a revised preliminary final EIS for review and comment from the Price BLM.
- On May 12, 2010, we provided comments to the Price BLM and their preliminary final EIS.

Additional correspondence, email transmissions, telephone conversation records, and conference calls that occurred between July 26, 2006, and April 28, 2010, are documented in the administrative record for this consultation.

Biological Opinion

Table of Contents

1. Description of Proposed Action 8
   1.1 Description of Action Area 9
   1.2 Applicant Committed Conservation Measures 9
      1.2.1 Upper Colorado River Endangered Fish: Colorado pikeminnow, razorback sucker, bonytail and humpback chub 9
      1.2.2 Mexican Spotted Owl 11
      1.2.3 Uinta Basin Hookless Cactus 12
2. Status of the Species / Critical Habitat 13
   2.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub 13
      2.1.1 Colorado Pikeminnow 13
      2.1.2 Razorback Sucker 17
      2.1.3 Humpback Chub 21
      2.1.4 Bonytail 26
   2.2 Mexican Spotted Owl 28
      2.2.1 Species / Critical Habitat Description 28
      2.2.2 Life history and Population dynamics 29
      2.2.3 Status and Distribution 30
3. Environmental Baseline 31
   3.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub 32
      3.1.1 Colorado Pikeminnow 32
      3.1.2 Razorback Sucker 35
      3.1.3 Humpback Chub 38
      3.1.4 Bonytail 41
   3.2 Mexican Spotted Owl 42
      3.2.1 Status of the Species within the Action Area 42
      3.2.2 Factors Affecting Species Environment within the Action Area 43
4. Effects of the Action 44
   4.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub 44
      4.1.1 Species Response to the Proposed Action 46
   4.2 Mexican Spotted Owl 47
      4.2.1 Factors to be Considered 47
5. Cumulative Effects 48
   5.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub 48
   5.2 Mexican Spotted Owl 49
6. Conclusion 49
7. Incidental Take Statement 50
Amount or Extent of Take Anticipated 51
Effect of the Take 51
Reasonable and prudent measures 51
Terms and Conditions 52
Monitoring 53

8. Reinitiation – Closing Statement 54
9. Literature Cited 55

1. DESCRIPTION OF PROPOSED ACTION

Under the Agency Preferred Alternative (Proposed Action), BBC will to drill up to 807 new natural gas wells from 488 well pads. Additionally, BBC will construct approximately 164 miles of new access roads, 189 miles of pipeline, three 5-acre equipment storage locations, 3 compressor stations, 3 water management facilities, and 3 salt water disposal wells. The life of the project is estimated to be approximately 34 years. BBC plans to drill the 807 proposed wells over a 9 year development period. Total disturbance associated with project activities, including road, pipeline, and well pad construction, is estimated to be 3,339 acres (2.4% of the project area).

Under the Agency Preferred Alternative, BBC and other operators will be limited to approximately 540 acres of new surface disturbance annually. In addition, total unreclaimed surface disturbance within the project area (i.e., surface disturbance from any project-related feature such as well pads, access roads, pipeline ROWs, compressor stations, pump stations, etc.) at any given time will be limited to approximately 2,310 acres (1.7% of the project area). To accommodate surface disturbance thresholds, all operators, including BBC, will be required to initiate interim reclamation measures as soon after development as practicable. Acreages of disturbance will be removed from the unreclaimed surface disturbance totals upon meeting successful interim reclamation standards. Assuming successful interim reclamation, the maximum long-term disturbance (i.e., after all construction, drilling, completion, and interim reclamation activities have been completed) will be approximately 1,678 acres.

The proposed project plans to use water from several sources, all of which are hydrologically connected to the Upper Colorado River System. The water depletion during the construction phase will average of 216.4 acre feet per year over these first 9 years, with the peak development year using approximately 289.78 acre feet. Due to peak use exceeding average annual use by more than 10%, depletion fees for this project are based on peak annual use.

The Price Field Office in coordination with the UDWR has developed a Wildlife Mitigation Plan, which outlines proposed mitigation for natural gas full field development in the West Tavaputs Plateau (WTP) Project Area. The agencies' mitigation plan, which is a modified version of BBC's Wildlife Mitigation Plan, emphasizes the importance of offsetting, to the extent reasonable, the effects of the full field development in its entirety. The agencies' plan gives priority to compensating for potential effects to greater sage-grouse, deer, raptors, and elk.

The Agency Wildlife Mitigation Plan requires mitigation at a 4:1 replacement ratio based on total potential long-term surface disturbance. This ratio generally serves as the limitation on the extent to which operators would be required to mitigate.

The Agency Wildlife Mitigation Plan also establishes an oversight committee to be led by the BLM, in coordination with UDWR, and other agencies. The West Tavaputs Plateau Mitigation Oversight Committee (WTPMOC) will evaluate the implementation and effectiveness of mitigation measures, provide direction on effective means of mitigating planned development activities, and develop adaptive strategies and projects to mitigate beyond the initial 30 percent commitment. The WTPMOC will complete evaluations and make recommendations to the

authorized officer on on-going and planned mitigation activities on an annual basis, in advance of considerations for winter activities, and prepare a report on its findings.

1.1 Description of Action Area

The action area of the Project includes the WTP Project area and the Green River from Nine Mile Creek downstream to Lake Powell. The stretch of the Green River from Nine Mile Creek to Lake Powell is considered the action area because changes in the quantity of water alter habitat conditions downstream. Water depletions in the Green River Basin reduce habitat quantity and quality. This Project will constitute a water depletion in the Green River Basin by using water for natural gas development.

The WTP Project Area is located within Duchesne and Carbon Counties, Utah. The project area is bounded on the west by Sheep Canyon, on the north by Nine Mile Canyon, and on the east by the Green River. The southern boundary is a straight line reflecting the anticline in the sub-surface that limits the southern extent of the natural gas resources targeted by the project. The total project area is 137,930 acres in size. It is estimated that there are approximately 458 acres of existing soil disturbance associated with oil and gas development within the project area. In addition to oil and gas development, land uses within the project area include grazing, hunting, hiking, off-highway vehicle use, camping and cultural/heritage tourism.

1.2 Applicant Committed Conservation Measures

Conservation measures are actions that the action agency and applicant agree to implement to minimize effects of the proposed action and to further the recovery of the species under review. We commend the BLM and BBC in their proactive application of applicant committed conservation measures. The following sections list the applicable conservation measures for the federally listed fish and plant species:

1.2.1 Upper Colorado River Endangered Fish: Colorado pikeminnow, razorback sucker, bonytail and humpback chub

The applicant committed conservation measures designed to minimize or avoid impacts to water resources will also minimize impacts to the endangered fish and their designated critical habitat, and include:

- Pipelines within the channel crossings or in mapped flood hazard areas will be constructed such that the pipeline is buried at least 3 feet below the channel bottom and in conformance with hydrological design practices.
- The operators will be required to fund an annual water quality monitoring program as outlined in the EIS. If samples and monitoring detect or determine any degradation of water quality as a result of the WTP project, the BLM will reevaluate the effectiveness of the BMPs and mitigation measures discussed in Tables 2.6-7 and 2.6-8 of the EIS
- No excess material (e.g., soil, overburden, etc.) will be stored within 100-year floodplains; all excess material would be relocated to appropriate locations outside of 100-year floodplains but within the WTP Project Area.

- For wells within 100-year floodplains, springs, or riparian areas, closed-loop drilling system will be utilized.
- Centralized production facilities will be located at an optimal location away from 100-year floodplains.
- As feasible, crossings of intermittent or perennial streams to access well pads will be avoided. Where stream crossings are necessary, engineered culverts, low water crossings, or a bridge would be constructed as appropriate; the type and location of crossing structures will be determined by the surface management agency as part of the APD process.
- For wells within 100-year floodplains, springs, or riparian areas, impervious well pads will be constructed using plastic, bentonite, etc.
- For wells within 100-year floodplains, springs, or riparian areas, an impervious containment structure or a permanent high berm (approximately 18 - 24 inches in height) will be constructed around all well pads and storage tanks located within 100-year floodplains. Within 100-year floodplains, springs, or riparian areas, remote monitoring of well locations will be used to closely observe the status of each well.
- To the maximum extent possible, construction will be avoided in riparian zones. In riparian areas where road and pipeline crossings are necessary, an erosion, revegetation, and reclamation plan will be required.
- Within 100-year floodplains, springs, or riparian areas, major spill kits will be available on each location during drilling.
- A reclamation plan will be developed and implemented for all impacted riparian areas.
- Regular inspections of well locations, topsoil stockpiles, cut- and fill-slopes, roads, and pipeline corridors will be conducted by a third-party monitor for signs of erosion and runoff problems. Problem locations will be stabilized and seeded as appropriate to prevent additional erosion and potential impacts to receiving waters.

In addition, the applicant has agreed to have the Upper Colorado River Recovery Program (Recovery Program) serve as a conservation measure within the proposed action. The following paragraphs further clarify the Recovery Program's role.

In determining if sufficient progress has been achieved under the Recovery Program, we consider--a) actions which result in a measurable population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction; b) status of fish populations; c) adequacy of flows; and, d) magnitude of the Project impact. In addition, we consider support activities (funding, research, information, and education, etc.) of the Recovery Program if they help achieve a measurable population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction. We evaluate progress separately for the Colorado River and Green River Subbasins; however, it gives due consideration to progress throughout the Upper Basin in evaluating progress toward recovery.

Depletion impacts can be offset by--a) the water Project proponent's one-time contribution to the Recovery Program in the amount of $18.99 per acre-foot of the Project's average annual depletion; b) appropriate legal protection of instream flows pursuant to State law; and, c)

accomplishment of activities necessary to recover the endangered fishes as specified under the RIPRAP. We believe it is essential that protection of instream flows proceed expeditiously, before significant additional water depletions occur. As the project's peak annual new depletion of 289.78 acre-feet is below the current sufficient progress threshold of 4,500 acre-feet, Recovery Program activities will serve as the conservation measures to minimize adverse affects to the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail and destruction or adverse modification of critical habitat caused by the project's new depletion.

With respect to (a) above (i.e., depletion charge), the applicant will make a one-time payment which has been calculated by multiplying the Project's peak annual depletion (289.78 acre-feet) by the depletion charge in effect at the time payment is made. For Fiscal Year 2010 (October 1, 2009, to September 30, 2010), the depletion charge is $18.99 per acre-foot for the average annual depletion which equals a total payment of **$5,502** for this Project. A minimum of 10% of the total payment will be provided to the Service's designated agent, the National Fish and Wildlife Foundation (Foundation), at the time of issuance of the Federal approvals from the BLM, with the rest to be paid when construction commences. Fifty percent of the funds will be used for acquisition of water rights to meet the instream flow needs of the endangered fishes (unless otherwise recommended by the Implementation Committee); the balance will be used to support other recovery activities for the Colorado River endangered fishes. All payments should be made to the National Fish and Wildlife Foundation.

National Fish and Wildlife Foundation
1133 15th Street, NW
Suite 1100
Washington, DC 20005

Each payment is to be accompanied by a cover letter that identifies the Project and biological opinion that requires the payment, the amount of payment enclosed, check number, and any special conditions identified in the biological opinion relative to disbursement or use of the funds (there are none in this instance). A copy of the cover letter and of the check is to be sent directly to the Service field office that issued the biological opinion. The cover letter shall identify the name and address of the payor, the name and address of the Federal Agency responsible for authorizing the Project, and the address of the Service office issuing the biological opinion. This information will be used by the Foundation to notify the payor, the lead Federal Agency, and the Service that payment has been received. The Foundation is to send notices of receipt to these entities within 5 working days of its receipt of payment.

1.2.2 Mexican Spotted Owl

The applicant committed conservation measures designed to reduce direct and indirect impacts to the Mexican spotted owl would include, but not be limited to, the following:

- Where feasible, well pads and facilities will be located away from steep-walled canyons.
- On Federal lands, all noise-producing production facilities (e.g., compressor engines, pump jacks, water pumping units, etc.) within potential Mexican spotted owl habitats and within 0.5 miles of potential Mexican spotted owl habitat will be tested to determine noise levels of the equipment. If noise from production equipment within potential

Mexican spotted owl habitat exceeds 45 dBA, the operators will be required to use reasonable measures (e.g., hospital-grade mufflers, housing of equipment, and/or other measures determined to be reasonable by the BLM and operator) to reduce noise levels of that particular facility to 45 dBA or lower. Furthermore, if its determined that production equipment located more than 0.5 miles from potential Mexican spotted owl habitat generates exceedances of 45 dBA within the 0.5-mile buffer of potential Mexican spotted owl habitat, that particular facility will be modified so that it does not exceed 45 dBA within 0.5 miles of potential Mexican spotted owl habitat. If future modeling or ground-truthing of existing modeling determines that an area currently mapped as potential Mexican spotted owl habitat actually does not support the constituent elements needed for potential Mexican spotted owl habitat, the operators will not be obligated to comply with this mitigation measure.

- Where feasible, well pads and facilities will be located in a manner that conceals development that occurs within mixed-conifer vegetation.
- The operators will fund ground-truthing exercises to categorize modeled Mexican spotted owl habitats into "good," "fair," or "poor" Mexican spotted owl habitat (see Section 3.10.2.1). The ground-truthing exercises will help refine where actual Mexican spotted owl surveys are needed as well as where additional noise mitigation/abatement is needed as previously discussed. Field surveys for Mexican spotted owls will be conducted according to Service protocol in all "fair" and "good" Mexican spotted owl habitats and within 0.5 miles of those habitats.
- Road access and fencing will be minimized to reduce or prevent habitat fragmentation and disturbance, and to reduce above-ground obstacles to birds in flight.
- Down-shield security lighting will be used for on-ground facilities and equipment to keep light within the boundaries of the affected location.
- White (preferable) or red strobe lights will be used at night at airstrips.
- Lighting at all facilities will be downshielded/directed to areas of human activity as much as possible to ensure human safety. Lighting at compressor stations would be kept to the minimum safely permissible level.
- Total dissolved solids levels in water management facilities and reserve pits will be regularly monitored to minimize the risk of salt toxicity.
- A noise monitoring study would be initiated if field surveys detect Mexican spotted owls in the WTP Project Area.

1.2.3 Uinta Basin Hookless Cactus

- Measures to protect the Uinta Basin hookless cactus include adherence to the Service and BLM jointly developed conservation measures included in the July 30, 2007 BLM memo to the Service requesting re-initiation of section 7 consultation. The most important of these measures includes the requirement to avoid surface disturbance within 300 feet (previously 100 feet) of known plants, which would eliminate direct impacts on the species.

For a detailed description of the proposed project and all applicant committed conservation measures, refer to the Final Environmental Impact Statement UT-070-05-055, and the administrative record for this project.

2. STATUS OF THE SPECIES / CRITICAL HABITAT

The purpose of this section is to summarize the best available information regarding the current range wide status of threatened and endangered species. Additional information regarding these species are contained in the administrative record for this consultation and from the sources of information cited for each species.

2.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub

2.1.1 Colorado Pikeminnow

2.1.1.1 Species / critical habitat description

The Colorado pikeminnow is the largest cyprinid fish (minnow family) native to North America and evolved as the main predator in the Colorado River system. It is an elongated pike-like fish that during predevelopment times may have grown as large as 6 feet in length and weighed nearly 100 pounds (Behnke and Benson 1983). Today, Colorado pikeminnow rarely exceed 3 feet in length or weigh more than 18 pounds; such fish are estimated to be 45-55 years old (Osmundson *et al.* 1997). The mouth of this species is large and nearly horizontal with long slender pharyngeal teeth (located in the throat), adapted for grasping and holding prey. The diet of Colorado pikeminnow longer than 3 or 4 inches consists almost entirely of other fishes (Vanicek and Kramer 1969). Males become sexually mature earlier and at a smaller size than do females, though all are mature by about age 7 and 500 mm (20 inches) in length (Vanicek and Kramer 1969; Seethaler 1978; Hamman 1981). Adults are strongly countershaded with a dark, olive back, and a white belly. Young are silvery and usually have a dark, wedge-shaped spot at the base of the caudal fin.

Colorado pikeminnow (=squawfish) was first listed on March 11, 1967 (32 FR 4001). It is currently designated as endangered throughout its range, except in the Salt and Verde River drainages in Arizona.

We designated six reaches of the Colorado River System as critical habitat for the Colorado pikeminnow on March 21, 1994 (59 FR 13374). These reaches total 1,848 km (1,148 mi) as measured along the center line of each reach. Designated critical habitat makes up about 29% of the species' original range and occurs exclusively in the Upper Colorado River Basin. Critical habitat is designated in portions of the Colorado, Green, Yampa, White, and San Juan Rivers in the Upper Basin.

We have identified water, physical habitat, and the biological environment as the primary constituent elements of critical habitat (59 FR 13374). Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment.

2.1.1.2 Life history and population dynamics

Colorado pikeminnow are long-distance migrators; adults move hundreds of miles to and from spawning areas, and require long sections of river with unimpeded passage. Adults require pools, deep runs, and eddy habitats maintained by high spring flows. These high spring flows maintain channel and habitat diversity, flush sediments from spawning areas, rejuvenate food production, form gravel and cobble deposits used for spawning, and rejuvenate backwater nursery habitats. Spawning occurs after spring runoff at water temperatures typically between 18 and 23 ºC. Spawning has occurred as early as June 15th in some years and as late as August 15th. After hatching and emerging from spawning substrate, larvae drift downstream to nursery backwaters that are restructured by high spring flows and maintained by relatively stable base flows. Flow recommendations have been developed that specifically consider flow-habitat relationships in habitats occupied by Colorado pikeminnow in the upper basin, and were designed to enhance habitat complexity and to restore and maintain ecological processes. The following is a description of observed habitat uses in the Upper Colorado River Basin.

Colorado pikeminnow live in warm-water reaches of the Colorado River mainstem and larger tributaries, and require uninterrupted stream passage for spawning migrations and dispersal of young. The species is adapted to a hydrologic cycle characterized by large spring peaks of snow-melt runoff and low, relatively stable base flows. High spring flows create and maintain in-channel habitats, and reconnect floodplain and riverine habitats, a phenomenon described as the spring flood-pulse (Junk *et al.* 1989; Johnson *et al.* 1995). Throughout most of the year, juvenile, subadult, and adult Colorado pikeminnow use relatively deep, low-velocity eddies, pools, and runs that occur in near-shore areas of main river channels (Tyus and McAda 1984; Valdez and Masslich 1989; Tyus 1990, 1991; Osmundson *et al.* 1995). In spring, however, Colorado pikeminnow adults use floodplain habitats, flooded tributary mouths, flooded side canyons, and eddies that are available only during high flows (Tyus 1990, 1991; Osmundson *et al.* 1995). Such environments may be particularly beneficial for Colorado pikeminnow because other riverine fishes gather in floodplain habitats to exploit food and temperature resources, and may serve as prey. Such low-velocity environments also may serve as resting areas for Colorado pikeminnow. River reaches of high habitat complexity appear to be preferred.

Because of their mobility and environmental tolerances, adult Colorado pikeminnow are more widely distributed than other life stages. Distribution patterns of adults are stable during most of the year (Tyus 1990, 1991; Irving and Modde 2000), but distribution of adults changes in late spring and early summer, when most mature fish migrate to spawning areas (Tyus and McAda 1984; Tyus 1985, 1990, 1991; Irving and Modde 2000). High spring flows provide an important cue to prepare adults for migration and also ensure that conditions at spawning areas are suitable for reproduction once adults arrive. Specifically, bankfull or much larger floods mobilize coarse sediment to build or reshape cobble bars, and they create side channels that Colorado pikeminnow sometimes use for spawning (Harvey *et al.* 1993).

Colorado pikeminnow spawning sites in the Green River subbasin have been well documented. The two principal locations are in Yampa Canyon on the lower Yampa River and in Gray Canyon on the lower Green River (Tyus 1990, 1991). These reaches are 42 and 72 km long, respectively, but most spawning is believed to occur at one or two short segments within each of the two reaches. Another spawning area may occur in Desolation Canyon on the lower Green

River (Irving and Modde 2000), but the location and importance of this area has not been verified. Although direct observation of Colorado pikeminnow spawning was not possible because of high turbidity, radiotelemetry indicated spawning occurred over cobble-bottomed riffles (Tyus 1990). High spring flows and subsequent post-peak summer flows are important for construction and maintenance of spawning substrates (Harvey *et al.* 1993). In contrast with the Green River subbasin, where known spawning sites are in canyon-bound reaches, currently suspected spawning sites in the upper Colorado River subbasin are at six locations in meandering, alluvial reaches (McAda 2000).

After hatching and emerging from the spawning substrate, Colorado pikeminnow larvae drift downstream to backwaters in sandy, alluvial regions, where they remain through most of their first year of life (Holden 1977; Tyus and Haines 1991; Muth and Snyder 1995). Backwaters and the physical factors that create them are vital to successful recruitment of early life stages of Colorado pikeminnow, and age-0 Colorado pikeminnow in backwaters have received much research attention (e.g., Tyus and Karp 1989; Haines and Tyus 1990; Tyus 1991; Tyus and Haines 1991; Bestgen *et al.* 1997). It is important to note that these backwaters are formed after cessation of spring runoff within the active channel and are not floodplain features. Colorado pikeminnow larvae occupy these in-channel backwaters soon after hatching. They tend to occur in backwaters that are large, warm, deep (average, about 0.3 m in the Green River), and turbid (Tyus and Haines 1991). Research studies (Day *et al.* 1999a, 1999b; Trammell and Chart 1999) have confirmed these preferences and suggested that a particular type of backwater is preferred by Colorado pikeminnow larvae and juveniles. Such backwaters are created when a secondary channel is cut off at the upper end, but remains connected to the river at the downstream end. These chute channels are deep and may persist even when discharge levels change dramatically. An optimal river-reach environment for growth and survival of early life stages of Colorado pikeminnow have warm, relatively stable backwaters, warm river channels, and abundant food (Muth *et al.* 2000).

2.1.1.3 Status and distribution

Based on early fish collection records, archaeological finds, and other observations, Colorado pikeminnow were once found throughout warm water reaches of the entire Colorado River Basin down to the Gulf of California, and including reaches of the upper Colorado River and its major tributaries, the Green River and its major tributaries, and the Gila River system in Arizona (Seethaler 1978). Colorado pikeminnow apparently were never found in colder, headwater areas. The species was abundant in suitable habitat throughout the entire Colorado River Basin prior to the 1850s (Seethaler 1978). By the 1970s they were extirpated from the entire lower basin (downstream of Glen Canyon Dam) and portions of the upper basin as a result of major alterations to the riverine environment. Having lost some 75 to 80 percent of its former range due to habitat loss, the Colorado pikeminnow was federally listed as an endangered species in 1967 (Miller 1961; Moyle 1976; Tyus 1991; Osmundson and Burnham 1998). Full protection under the Act of 1973 occurred on January 4, 1974.

Colorado pikeminnow are presently restricted to the Upper Colorado River Basin and inhabit warm water reaches of the Colorado, Green, and San Juan Rivers and associated tributaries. The Colorado pikeminnow recovery goals (Service 2002a) identify occupied habitat of wild Colorado pikeminnow as follows: the Green River from Lodore Canyon to the confluence of the Colorado

River; the Yampa River downstream of Craig, Colorado; the Little Snake River from its confluence with the Yampa River upstream into Wyoming; the White River downstream of Taylor Draw Dam; the lower 89 miles of the Price River; the lower Duchesne River; the upper Colorado River from Palisade, Colorado, to Lake Powell; the lower 34 miles of the Gunnison River; the lower mile of the Dolores River; and 150 miles of the San Juan River downstream from Shiprock, New Mexico, to Lake Powell.

Recovery goals for the Colorado pikeminnow (Service 2002a) were approved on August 1, 2002. According to these recovery goals, downlisting can be considered if, over a 5-year period:

- a genetically and demographically viable, self-sustaining population is maintained in the Green River subbasin such that (a) the trends in separate adult (age 7+; > 450 mm total length) point estimates for the middle Green River and the lower Green River do not decline significantly, and (b) mean estimated recruitment of age-6 (400–449 mm total length) naturally produced fish equals or exceeds mean annual adult mortality for the Green River subbasin, and (c) each population point estimate for the Green River subbasin exceeds 2,600 adults (2,600 is the estimated minimum viable population needed to ensure long-term genetic and demographic viability); and

- a self-sustaining population of at least 700 adults (number based on inferences about carrying capacity) is maintained in the upper Colorado River subbasin such that (a) the trend in adult point estimates does not decline significantly, and (b) mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality; and

- a target number of 1,000 age-5+ fish (> 300 mm total length; number based on estimated survival of stocked fish and inferences about carrying capacity) is established through augmentation and/or natural reproduction in the San Juan River subbasin; and

- certain site-specific management tasks to minimize or remove threats have been identified, developed, and implemented.

Delisting can be considered if, over a 7-year period beyond downlisting:

- a genetically and demographically viable, self-sustaining population is maintained in the Green River subbasin such that (a) the trends in separate adult point estimates for the middle Green River and the lower Green River do not decline significantly, and (b) mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality for the Green River subbasin, and (c) each population point estimate for the Green River subbasin exceeds 2,600 adults; and

- either the upper Colorado River subbasin self-sustaining population exceeds 1,000 adults or the upper Colorado River subbasin self-sustaining population exceeds

700 adults and San Juan River subbasin population is self-sustaining and exceeds 800 adults (numbers based on inferences about carrying capacity) such that for each population (a) the trend in adult point estimates does not decline significantly, and (b) mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality; and

- certain site-specific management tasks to minimize or remove threats have been finalized and implemented, and necessary levels of protection are attained.

2.1.2 Razorback Sucker

2.1.2.1 Species / critical habitat description

Like all suckers (family Catostomidae, meaning "down mouth"), razorback sucker have ventral mouths with thick lips covered with papillae and no scales on its head. In general, suckers are bottom browsers, sucking up or scraping off small invertebrates, algae, and organic matter with their fleshy, protrusible lips (Moyle 1976). Razorback suckers are the only sucker with an abrupt sharp-edged dorsal keel behind its head. The keel becomes more massive with age. The head and keel are dark, the back is olive-colored, the sides are brownish or reddish, and the abdomen is yellowish white (Sublette *et al.* 1990). Adults often exceed 3 kg (6 pounds) in weight and 600 mm (2 feet) in length. Like Colorado pikeminnow, razorback suckers are long-lived, living 40-plus years.

Razorback sucker was first listed on October 23, 1991 (56 FR 54957). It is currently designated as endangered throughout the entire range.

We designated 15 reaches of the Colorado River system as critical habitat for the razorback sucker. These reaches total 2,776 km (1,724 mi) as measured along the center line of the river within the subject reaches. Designated critical habitat makes up about 49% of the species' original range and occurs in both the Upper and Lower Colorado River Basins (Service 1994). In the Upper Basin, critical habitat is designated for portions of the Green, Yampa, Duchesne, Colorado, White, Gunnison, and San Juan Rivers. Portions of the Colorado, Gila, Salt, and Verde Rivers are designated in the Lower Basin. Critical habitat was designated for razorback sucker on March 21, 1994 (59 FR 13374). The primary constituent elements are the same as those described for Colorado pikeminnow.

2.1.2.2 Life history and population dynamics

McAda and Wydoski (1980) and Tyus (1987) reported springtime aggregations of razorback suckers in off-channel habitats and tributaries; such aggregations are believed to be associated with reproductive activities. Tyus and Karp (1990) and Osmundson and Kaeding (1991) reported off-channel habitats to be much warmer than the mainstem river and that razorback suckers presumably moved to these areas for feeding, resting, sexual maturation, spawning, and other activities associated with their reproductive cycle. Prior to construction of large mainstem dams and the suppression of spring peak flows, low velocity, off-channel habitats (seasonally flooded bottomlands and shorelines) were commonly available throughout the Upper Basin (Tyus and Karp 1989; Osmundson and Kaeding 1991). Dams changed riverine ecosystems into

lakes by impounding water, which eliminated these off-channel habitats in reservoirs. Reduction in spring peak flows eliminates or reduces the frequency of inundation of off-channel habitats. The absence of these seasonally flooded riverine habitats is believed to be a limiting factor in the successful recruitment of razorback suckers in their native environment (Tyus and Karp 1989; Osmundson and Kaeding 1991). Wydoski and Wick (1998) identified starvation of larval razorback suckers due to low zooplankton densities in the main channel and loss of floodplain habitats which provide adequate zooplankton densities for larval food as one of the most important factors limiting recruitment.

Razorbacks can spawn as early as age 3 or 4, when they are 14 or more inches long. Depending on water temperature, spawning can take place as early as November or as late as June. In the upper Colorado River basin, razorbacks typically spawn between mid-April and mid-June. These fish reportedly migrate long distances to spawn, congregating in large numbers in spawning areas. While razorback suckers have never been directly observed spawning in turbid riverine environments within the Upper Basin, captures of ripe specimens (in spawning condition), both males and females, have been recorded (Valdez *et al.* 1982; McAda and Wydoski 1980; Tyus 1987; Osmundson and Kaeding 1989; Tyus and Karp 1989; Tyus and Karp 1990; Osmundson and Kaeding 1991; Platania 1990) in the Yampa, Green, Colorado, and San Juan Rivers. Sexually mature razorback suckers are generally collected on the ascending limb of the hydrograph from mid-April through June and are associated with coarse gravel substrates (depending on the specific location).

Outside of the spawning season, adult razorback suckers occupy a variety of shoreline and main channel habitats including slow runs, shallow to deep pools, backwaters, eddies, and other relatively slow velocity areas associated with sand substrates (Tyus 1987; Tyus and Karp 1989; Osmundson and Kaeding 1989; Valdez and Masslich 1989; Osmundson and Kaeding 1991; Tyus and Karp 1990).

Habitat requirements of young and juvenile razorback suckers in the wild are not well known, particularly in native riverine environments. Prior to 1991, the last confirmed documentation of a razorback sucker juvenile in the Upper Basin was a capture in the Colorado River near Moab, Utah (Taba *et al.* 1965). In 1991, two early juvenile (36.6 and 39.3 mm total length) razorback suckers were collected in the lower Green River near Hell Roaring Canyon (Gutermuth *et al.* 1994). Juvenile razorback suckers have been collected in recent years from Old Charley Wash, a wetland adjacent to the Green River (Modde 1996). Between 1992 and 1995 larval razorback suckers were collected in the middle and lower Green River and within the Colorado River inflow to Lake Powell (Muth 1995). In 2002, eight larval razorback suckers were collected in the Gunnison River (Osmundson 2002). No young razorback suckers have been collected in recent times in the Colorado River.

The razorback sucker is adapted to the widely fluctuating physical environment of the historical Colorado River. Adults can live 44-50 years and, once reaching maturity between two and seven years of age (Minckley 1983), apparently produce viable gametes even when quite old. Survival adaptations included the ability to spawn in a variety of habitats and flows regimes, and over a long season. In the event of several consecutive years with little or no recruitment (due to either too much or too little water), the demographics of the population as a whole might shift, but

future reproduction would not be compromised. Average fecundity recorded in studies ranged from 100,800 to 46,740 eggs per female (Bestgen 1990). With varying age of maturity and the fecundity of the species, historically it would have been possible to quickly repopulate after a catastrophic loss of adults.

2.1.2.3 Status and distribution

On March 14, 1989, we were petitioned to conduct a status review of the razorback sucker. Subsequently, the razorback sucker was designated as endangered under a final rule published on October 23, 1991 (56 FR 54957). The final rule stated "Little evidence of natural recruitment has been found in the past 30 years, and numbers of adult fish captured in the last 10 years demonstrate a downward trend relative to historic abundance. Significant changes have occurred in razorback sucker habitat through diversion and depletion of water, introduction of nonnative fishes, and construction and operation of dams" (56 FR 54957). Recruitment of razorback suckers to the population continues to be a problem.

Historically, razorback suckers were found in the mainstem Colorado River and major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and in Mexico (Ellis 1914; Minckley 1983). Bestgen (1990) reported that this species was once so numerous that it was commonly used as food by early settlers and, further, that commercially marketable quantities were caught in Arizona as recently as 1949. In the Upper Basin, razorback suckers were reported in the Green River to be very abundant near Green River, Utah, in the late 1800s (Jordan 1891). An account in Osmundson and Kaeding (1989) reported that residents living along the Colorado River near Clifton, Colorado, observed several thousand razorback suckers during spring runoff in the 1930s and early 1940s. In the San Juan River drainage, Platania and Young (1989) relayed historical accounts of razorback suckers ascending the Animas River to Durango, Colorado, around the turn of the century.

Currently, the largest concentration of razorback sucker remaining in the Colorado River Basin is in Lake Mohave on the border of Arizona and California. Estimates of the wild stock in Lake Mohave have fallen precipitously in recent years from 60,000 as late as 1991, to 25,000 in 1993 (Marsh 1993, Holden 1994), to about 9,000 in 2000 (Service 2002b). Until recently, efforts to introduce young razorback sucker into Lake Mohave have failed because of predation by non-native species (Minckley *et al.* 1991, Clarkson *et al.* 1993, Burke 1994). While limited numbers of razorback suckers persist in other locations in the Lower Colorado River, they are considered rare or incidental and may be continuing to decline.

In Utah, the razorback sucker currently occupies parts of the Green River Subbasin (Green River, Yampa River, White River, and Duchesne River), the Upper Colorado River Subbasin (Upper Colorado River), and the San Juan River Subbasin (San Juan River) (Service 2002b; 54 FR 54967; 54 FR 13374).

In the Upper Colorado River Basin, above Glen Canyon Dam, razorback suckers are found in limited numbers in both lentic (lake-like) and riverine environments. The largest populations of razorback suckers in the upper basin are found in the upper Green and lower Yampa Rivers (Tyus 1987). In the Colorado River, most razorback suckers occur in the Grand Valley area near Grand Junction, Colorado; however, they are increasingly rare. Osmundson and Kaeding (1991)

reported that the number of razorback sucker captures in the Grand Junction area has declined dramatically since 1974. Between 1984 and 1990, intensive collecting effort captured only 12 individuals in the Grand Valley (Osmundson and Kaeding 1991). The wild population of razorback sucker is considered extirpated from the Gunnison River (Burdick and Bonar 1997).

Razorback suckers are in imminent danger of extirpation in the wild. As Bestgen (1990) pointed out:

> "Reasons for decline of most native fishes in the Colorado River Basin have been attributed to habitat loss due to construction of mainstream dams and subsequent interruption or alteration of natural flow and physio-chemical regimes, inundation of river reaches by reservoirs, channelization, water quality degradation, introduction of nonnative fish species and resulting competitive interactions or predation, and other man-induced disturbances (Miller 1961, Joseph *et al.* 1977, Behnke and Benson 1983, Carlson and Muth 1989, Tyus and Karp 1989). These factors are almost certainly not mutually exclusive; therefore it is often difficult to determine exact cause and effect relationships."

The virtual absence of any recruitment suggests a combination of biological, physical, and/or chemical factors that may be affecting the survival and recruitment of early life stages of razorback suckers. Within the Upper Basin, recovery efforts endorsed by the Recovery Program include the capture and removal of razorback suckers from all known locations for genetic analyses and development of discrete brood stocks. These measures have been undertaken to develop refugia populations of the razorback sucker from the same genetic parentage as their wild counterparts such that, if these fish are genetically unique by subbasin or individual population, then separate stocks will be available for future augmentation. Such augmentation may be a necessary step to prevent the extinction of razorback suckers in the Upper Basin.

Recovery goals for the razorback sucker (Service 2002b) were approved on August 1, 2002. According to these recovery goals, downlisting can be considered if, over a 5-year period:

- genetically and demographically viable, self-sustaining populations are maintained in the Green River subbasin and either in the upper Colorado River subbasin or the San Juan River subbasin such that (a) the trend in adult (age 4+; > 400 mm total length) point estimates for each of the two populations does not decline significantly, and (b) mean estimated recruitment of age-3 (300–399 mm total length) naturally produced fish equals or exceeds mean annual adult mortality for each of the two populations, and (c) each point estimate for each of the two populations exceeds 5,800 adults (5,800 is the estimated minimum viable population needed to ensure long-term genetic and demographic viability); and

- a genetic refuge is maintained in Lake Mohave of the lower basin recovery unit; and

- two genetically and demographically viable, self-sustaining populations are maintained in the lower basin recovery unit (e.g., mainstem and/or tributaries)

such that (a) the trend in adult point estimates for each population does not decline significantly, and (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each population, and (c) each point estimate for each population exceeds 5,800 adults; and

- certain site-specific management tasks to minimize or remove threats have been identified, developed, and implemented.

Delisting can be considered if, over a 3-year period beyond downlisting:

- genetically and demographically viable, self-sustaining populations are maintained in the Green River subbasin and either in the upper Colorado River subbasin or the San Juan River subbasin such that (a) the trend in adult point estimates for each of the two populations does not decline significantly, and (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each of the two populations, and (c) each point estimate for each of the two populations exceeds 5,800 adults; and

- a genetic refuge is maintained in Lake Mohave; and

- two genetically and demographically viable, self-sustaining populations are maintained in the lower basin recovery unit such that (a) the trend in adult point estimates for each population does not decline significantly, and (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each population, and (c) each point estimate for each population exceeds 5,800 adults; and

- certain site-specific management tasks to minimize or remove threats have been finalized and implemented, and necessary levels of protection are attained.

2.1.3 Humpback Chub

2.1.3.1 Species / critical habitat description

The humpback chub is a medium-sized freshwater fish (less than 500 mm) of the minnow family. The adults have a pronounced dorsal hump, a narrow flattened head, a fleshy snout with an inferior-subterminal mouth, and small eyes. It has silvery sides with a brown or olive colored back.

The humpback chub is endemic to the Colorado River Basin and is part of a native fish fauna traced to the Miocene epoch in fossil records (Miller 1946; Minckley *et al.* 1986). Humpback chub remains have been dated to about 4000 B.C., but the fish was not described as a species until the 1940s (Miller 1946), presumably because of its restricted distribution in remote white

water canyons (Service 1990). Because of this, its original distribution is not known. The humpback chub was listed as endangered on March 11, 1967.

Until the 1950s, the humpback chub was known only from Grand Canyon. During surveys in the 1950s and 1960s humpback chub were found in the upper Green River including specimens from Echo Park, Island Park, and Swallow Canyon (Smith 1960; Vanicek *et al.* 1970). Individuals were also reported from the lower Yampa River (Holden and Stalnaker 1975), the White River in Utah (Sigler and Miller 1963), Desolation Canyon of the Green River (Holden and Stalnaker 1970) and the Colorado River near Moab (Sigler and Miller 1963).

Critical habitat was designated for humpback chub on March 21, 1994 (59 FR 13374). Designated critical habitat makes up about 28% of the species' original range and occurs in both the Upper and Lower Colorado River Basins. Although humpback chub life history and habitat use differs greatly from the other endangered Colorado River fish, we determined that the primary constituent elements (water, physical habitat, and biological environment) of their critical habitat were the same.

Critical habitat for humpback chub in the Green River system include the Yampa River within Dinosaur National Monument, Green River from its confluence with the Yampa River downstream to the southern boundary of Dinosaur National Monument, and the Green River within Desolation and Gray Canyons.

2.1.3.2 Life history and Population dynamics

Unlike Colorado pikeminnow and razorback sucker, which are known to make extended migrations of up to several hundred miles to spawning areas, humpback chubs do not appear to make extensive migrations (Karp and Tyus 1990). Generally, humpback chub show fidelity for canyon reaches and move very little (Miller *et al.* 1982; Archer *et al.* 1985; Burdick and Kaeding 1985; Kaeding *et al.* 1990). Humpback chubs in Black Rocks (Valdez and Clemmer 1982), Westwater Canyon (Chart and Lentsch 1999a), and Desolation and Gray Canyons (Chart and Lentsch 1999b) do not migrate to spawn and movements of adult humpback chub in Black Rocks on the Colorado River were essentially restricted to a 1-mile reach. These results were based on the recapture of Carlin-tagged fish and radiotelemetry studies conducted from 1979 to 1981 (Valdez *et al.* 1982) and 1983 to 1985 (Archer *et al.* 1985; Service 1986; Kaeding *et al.* 1990).

In the Green River and upper Colorado River, humpback chubs spawned in spring and summer as flows declined shortly after the spring peak (Valdez and Clemmer 1982; Valdez *et al.* 1982; Kaeding and Zimmerman 1983; Tyus and Karp 1989; Karp and Tyus 1990; Chart and Lentsch 1999a, 1999b). Similar spawning periods were reported from Grand Canyon (Kaeding and Zimmerman 1983; Valdez and Ryel 1995, 1997). Although humpback chub are believed to broadcast eggs over mid-channel cobble and gravel bars, spawning in the wild has not been observed for this species. Gorman and Stone (1999) reported that ripe male humpback chubs in the Little Colorado River aggregated in areas of complex habitat structure (i.e., matrix of large boulders and travertine masses combined with chutes, runs, and eddies, 0.5–2.0 m deep) and were associated with deposits of clean gravel.

Chart and Lentsch (1999b) estimated hatching dates for young *Gila spp.* collected from Desolation and Gray Canyons between 1992 and 1995. They determined that hatching occurred on the descending limb of the hydrograph as early as June 9,1992, at a flow of 139 m^3/s and as late as July 1, 1995, at a flow of 731 m^3/s. Instantaneous daily river temperatures on hatching dates over all years ranged from 20 to 22 ºC.

Newly hatched larvae average 6.3–7.5 mm total length (Holden 1973; Suttkus and Clemmer 1977; Minckley 1973; Snyder 1981; Hamman 1982; Behnke and Benson 1983; Muth 1990), and 1-month-old fish are approximately 20 mm long (Hamman 1982). Unlike Colorado pikeminnow and razorback sucker, no evidence exists of long-distance larval drift (Miller and Hubert 1990; Robinson *et al.* 1998). Upon emergence from spawning gravels, humpback chub larvae remain in the vicinity of bottom surfaces (Marsh 1985) near spawning areas (Chart and Lentsch 1999a).

Backwaters, eddies, and runs have been reported as common capture locations for young-of-year humpback chub (Valdez and Clemmer 1982). These data indicate that in Black Rocks and Westwater Canyon, young utilize shallow areas. Habitat suitability index curves developed by Valdez *et al.* (1990) indicate young-of-year prefer average depths of 2.1 feet with a maximum of 5.1 feet. Average velocities were reported at 0.2 feet per second.

Valdez *et al.* (1982), Wick *et al.* (1979), and Wick *et al.* (1981) found adult humpback chub in Black Rocks and Westwater Canyons in water averaging 50 feet in depth with a maximum depth of 92 feet. In these localities, humpback chub were associated with large boulders and steep cliffs.

2.1.3.3 Status and distribution

Historic abundance of the humpback chub are unknown and historic distribution is surmised from various reports and collections that indicate the species presently occupies about 68% of its historic habitat and is restricted to about 756 km of river. The species exists primarily in relatively inaccessible canyons of the Colorado River Basin and was rare in early collections (Tyus 1998). Common use of the name "bonytail" for all six Colorado River species or subspecies of the genus *Gila* confounded an accurate early assessment of distribution and abundance (Holden and Stalnaker 1975; Valdez and Clemmer 1982; Minckley 1996). Of three closely related and sympatric *Gila* species, the roundtail chub (*G. robusta*) and bonytail (*G. elegans*) were described in 1853 by Baird and Girard (Girard 1856), but the humpback chub was the last big-river fish species to be described from the Colorado River Basin in 1946 (Miller 1946). Also, extensive human alterations throughout the basin prior to faunal surveys may have depleted or eliminated the species from some river reaches before its occurrence was documented.

It is surmised that the humpback chub speciated from a *Gila robusta*-like form in canyons of northern Arizona (i.e., Grand Canyon) about 3–5 million years ago (Miller 1946; Minckley *et al.* 1986) during the mid-Pliocene and early Pleistocene epochs. Earliest evidence of the species are skeletal remains from 4,000-year old flood deposits in Stanton's Cave in Grand Canyon (Miller 1955), from a 750–1,100-year old archeological site in Catclaw Cave near present-day Hoover Dam (Miller 1955), and from 1,000-year old archeological sites in Dinosaur National Monument, Colorado (Tyus 1998).

Earliest collections of humpback chub are anecdotal and related to early explorations of the Colorado River Basin that pre-date the species description in 1946. In 1911, Elsworth and Emory Kolb reported a large aggregation of *"bony tail"* in the lower Little Colorado River in Grand Canyon; photographs show that the fish were humpback chub. A specimen in the fish collection at Grand Canyon National Park, caught in 1932 by angler N.N. Dodge at Bright Angel Creek, was examined in fall 1942 and used as the holotype for the species description (Miller 1946), along with a second specimen of unknown origin. In the 1940's, five specimens of humpback chub were collected from the Grand Canyon region along with 16 specimens of *Gila elegans* and six *G. robusta* (Miller 1944). In 1950, juvenile humpback chub were reported from Spencer Creek in lower Grand Canyon (Kubly 1990), but icthyofaunal surveys in 1958–1959 (McDonald and Dotson 1960) failed to find humpback chub immediately upstream in the gentle meandering reaches of Glen Canyon.

Following completion of Glen Canyon Dam in 1963, humpback chub were consistently reported by Arizona Game and Fish Department creel surveys from Lee Ferry during 1963–1968. However, Stone and Rathbun (1968) failed to find humpback chub in seven tributaries sampled between Lee Ferry and Lake Mead in 1968, excluding the Little Colorado River. Humpback chub were captured in July 1967 and August 1970 (Holden and Stalnaker 1975), all within *"...a few hundred meters downstream of Glen Canyon Dam"* (personal communication, P. Holden, Bio/West, Inc.). Humpback chub have not been captured in this reach since the dam began releasing cold hypolimnetic waters in about 1970. Humpback chub have consistently been reported in the Little Colorado River and Colorado River in Grand Canyon since 1967 as a result of better sampling gear and a better understanding of the life history of the species (Holden and Stalnaker 1975; Kaeding and Zimmerman 1983; Valdez and Ryel 1995; Douglas and Marsh 1996).

Five specimens were reported from Lake Powell in the late 1960's (Holden and Stalnaker 1970) following completion of Glen Canyon Dam in 1963 and impoundment of the upper Colorado River through Glen, Narrow, and Cataract canyons. Reproducing populations of humpback chub were first reported from Black Rocks, Colorado in 1977, and from Westwater and Cataract canyons, Utah, in 1979 (Valdez *et al.* 1982; Valdez and Clemmer 1982).

Humpback chub were first reported in the Upper Colorado River Basin in the 1940's from Castle Park, Yampa River, Colorado, in June and July 1948 (Tyus 1998). Pre-impoundment surveys of Flaming Gorge Dam on the Green River in 1958–1959 (Bosley 1960; Gaufin *et al.* 1960; McDonald and Dotson 1960) treated all *Gila* as *"bonytail"*, which were common downstream of Green River, Wyoming. Humpback chub were reported from Hideout Canyon in the upper Green River (Smith 1960), although a checklist of fish killed by a massive rotenone operation from Hideout Canyon to Brown's Park in September 1962 stated that *"...no humpback chub were collected..."* (Binns 1967). Post-impoundment investigations (Vanicek *et al.* 1970) reported three humpback chub from the Green River downstream of Flaming Gorge Dam; one each from Echo Park, Island Park, and Swallow Canyon. Specimens were collected in Desolation Canyon on the Green River in 1967 (Holden and Stalnaker 1970), in Yampa Canyon in 1969 (Holden and Stalnaker 1975), in Cross Mountain Canyon of the Yampa River in the 1970's, and an individual specimen was reported from the White River in Utah in the 1950's

(Sigler and Miller 1963). Seven suspected humpback chub were captured in the Little Snake River, a tributary of the Yampa River in 1988 (Wick *et al.* 1991). Surveys downstream of Flaming Gorge Dam, including Lodore Canyon, have not yielded humpback chub in that region of the Green River, despite warmer dam releases (Holden and Crist 1981; Bestgen and Crist 2000).

Six humpback chub populations are currently identified: (1) Black Rocks, Colorado; (2) Westwater Canyon, Utah; (3) Little Colorado River and Colorado Rivers in Grand Canyon, Arizona; (4) Yampa Canyon, Colorado; (5) Desolation/Gray Canyons, Utah; and (6) Cataract Canyon, Utah (Service 2002c). Each population consists of a discrete group of fish, geographically separated from the other populations, but with some exchange of individuals. River length occupied by each population varies from 3.7 km in Black Rocks to 73.6 km in Yampa Canyon. Each population consists of a discrete group of fish, geographically separated from the other populations, but with some exchange of individuals.

Recovery goals for the humpback chub (Service 2002c) were approved on August 1, 2002. According to these recovery goals, downlisting can be considered if, over a 5-year period:

- the trend in adult (age 4+; > 200 mm total length) point estimates for each of the six extant populations does not decline significantly; and

- mean estimated recruitment of age-3 (150–199 mm total length) naturally produced fish equals or exceeds mean annual adult mortality for each of the six extant populations; and

- two genetically and demographically viable, self-sustaining core populations are maintained, such that each point estimate for each core population exceeds 2,100 adults (2,100 is the estimated minimum viable population needed to ensure long-term genetic and demographic viability); and

- certain site-specific management tasks to minimize or remove threats have been identified, developed, and implemented.

Delisting can be considered if, over a 3-year period beyond downlisting:

- the trend in adult point estimates for each of the six extant populations does not decline significantly; and

- mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each of the six extant populations; and

- three genetically and demographically viable, self-sustaining core populations are maintained, such that each point estimate for each core population exceeds 2,100 adults; and

- certain site-specific management tasks to minimize or remove threats have been finalized and implemented, and necessary levels of protection are attained.

2.1.4 Bonytail

2.1.4.1 Species / critical habitat description

Bonytail are medium-sized (less than 600 mm) fish in the minnow family. Adult bonytail are gray or olive colored on the back with silvery sides and a white belly. The adult bonytail has an elongated body with a long, thin caudal peduncle. The head is small and compressed compared to the rest of the body. The mouth is slightly overhung by the snout and there is a smooth low hump behind the head that is not as pronounced as the hump on a humpback chub.

The Bonytail chub was first listed on April 23, 1980 (45 FR 27710). It is currently designated as endangered throughout its entire range.

A total of 499 km (312 miles) of river have been designated as critical habitat for the bonytail in the Colorado River Basin, representing about 14% of the species' historic range (59 FR 13374). River reaches that have been designated as critical habitat in the Green River extend from the confluence with the Yampa River downstream to the boundary of Dinosaur National Monument and Desolation and Gray Canyons. In addition, critical habitat has been designated in the Yampa River from the upstream boundary of Dinosaur National Monument to its confluence with the Green River.

We identified water, physical habitat, and the biological environment as the primary constituent elements of bonytail critical habitat (59 FR 13374). Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment. Recent information collected by the Recovery Program suggests that floodplain habitats may be more important to the survival and recovery of the bonytail than we originally thought.

2.1.4.2 Life history and Population dynamics

The bonytail are considered a species that is adapted to mainstem rivers, where it has been observed in pools and eddies (Vanicek 1967; Minckley 1973). Spawning of bonytail has never been observed in a river, but ripe fish were collected in Dinosaur National Monument during late June and early July suggesting that spawning occurred at water temperatures of about 18 C(Vanicek and Kramer 1969). Similar to other closely related *Gila spp.*, bonytail probably spawn in rivers in spring over rocky substrates; spawning has been observed in reservoirs over rocky shoals and shorelines. It has been recently hypothesized that flooded bottomlands may provide important bonytail nursery habitat. Of five specimens captured most recently in the

upper basin, four were captured in deep, swift, rocky canyons (Yampa Canyon, Black Rocks, Cataract Canyon, and Coal Creek Rapid), but the fifth was taken in Lake Powell. Since 1974, all bonytails captured in the lower basin have been caught in reservoirs.

2.1.4.3 Status and distribution

The bonytail is endemic to the Colorado River Basin and was historically common to abundant in warm-water reaches of larger rivers of the basin from Mexico to Wyoming. The species experienced a dramatic, but poorly documented, decline starting in about 1950, following construction of several mainstem dams, introduction of nonnative fishes, poor land-use practices, and degraded water quality (Service 2002d).

Currently, no self-sustaining populations of bonytail are known to exist in the wild, and very few individuals have been caught anywhere within the basin. An unknown, but small number of wild adults exist in Lake Mohave on the mainstem Colorado River. Since 1977, only 11 wild adults have been reported from the upper basin.

Bonytail are so rare that it is not currently possible to conduct population estimates. The current stocking plan (Nesler et al. 2003) calls for bonytail to be stocked in the middle Green, lower Yampa and Colorado Rivers. The middle Green River and the Yampa River in Dinosaur National Monument have been identified as the highest priority for stocking. The only known bonytail that presently occur in the Yampa River are the individuals recently reintroduced at Echo Park, near the confluence with the Green River.

Recovery goals for the bonytail (Service 2002d) were approved on August 1, 2002. According to these recovery goals, downlisting can be considered if, over a 5-year period:

- genetically and demographically viable, self-sustaining populations are maintained in the Green River subbasin and upper Colorado River subbasin such that (a) the trend in adult (age 4+; > 250 mm total length) point estimates for each of the two populations does not decline significantly, and (b) mean estimated recruitment of age-3 (150–249 mm total length) naturally produced fish equals or exceeds mean annual adult mortality for each of the two populations, and (c) each point estimate for each of the two populations exceeds 4,400 adults (4,400 is the estimated minimum viable population needed to ensure long-term genetic and demographic viability); and

- a genetic refuge is maintained in a suitable location (e.g., Lake Mohave, Lake Havasu) in the lower basin recovery unit; and

- two genetically and demographically viable, self-sustaining populations are maintained in the lower basin recovery unit (e.g., mainstem and/or tributaries) such that (a) the trend in adult point estimates for each population does not decline significantly, and (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each

population, and (c) each point estimate for each population exceeds 4,400 adults; and

- certain site-specific management tasks to minimize or remove threats have been identified, developed, and implemented.

Delisting can be considered if, over a 3-year period beyond downlisting:

- genetically and demographically viable, self-sustaining populations are maintained in the Green River subbasin and upper Colorado River subbasin such that (a) the trend in adult point estimates for each of the two populations does not decline significantly, and (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each of the two populations, and (c) each point estimate for each of the two populations exceeds 4,400 adults; and

- a genetic refuge is maintained in the lower basin recovery unit; and

- two genetically and demographically viable, self-sustaining populations are maintained in the lower basin recovery unit such that (a) the trend in adult point estimates for each population does not decline significantly, and (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each population, and (c) each point estimate for each population exceeds 4,400 adults; and

- certain site-specific management tasks to minimize or remove threats have been finalized and implemented, and necessary levels of protection are attained.

2.2 Mexican Spotted Owl

2.2.1 Species / Critical Habitat Description

The Mexican spotted owl (*Strix occidentalis lucida*) is one of three subspecies of spotted owl recognized by the American Ornithologists' Union (AOU 1957:285). The other two subspecies are the northern (*S. o. caurina*) and the California spotted owl (*S. o. occidentalis*). The Mexican subspecies is geographically isolated from both the California and northern subspecies.

The spotted owl is mottled in appearance with irregular white and brown spots on its abdomen, back and head. Several thin white bands mark an otherwise brown tail. The spots of the Mexican spotted owl are larger and more numerous than in the other two subspecies, giving it a lighter appearance. *Strix occidentalis* translates as "owl of the west"; *lucida* means "light" or "bright." Unlike most owls, spotted owls have dark eyes.

Adult male and female spotted owls have similar plumage. However, the sexes can be identified by voice and size differentiation. Juveniles, subadults, and adults can be distinguished by plumage characteristics (Forsman 1981; Moen *et al.* 1991). Juvenile spotted owls (hatchling to approximately five months) have a downy appearance. Subadults (5 to 26 months) have pointed rectrices with white tips (Forsman 1981, Moen *et al.* 1991). Rectrices of adult (>27 months) feathers have rounded, mottled tips.

Although the spotted owl is often referred to as a medium-sized owl, it ranks among the largest owls in North America. Of the 19 species of owls that occur in North America, only 4 are larger than the spotted owl (Johnsgard 1988). As a species, the spotted owl averages 41-48 cm (16-19 inches) long (Earhart and Johnson 1970), 107-114 cm (42-45 inches) across the spread wings (Walker 1974), and weighs 547-647 grams (19.5-23 ounces). These measures are expressed as ranges because, similar to other owl species, spotted owls exhibit reversed sexual dimorphism (i.e., females are larger than males).

2.2.2 Life history and Population dynamics

Spotted owls have one of the lowest clutch sizes among North American owls (Johnsgard 1988); females lay one to three eggs, two being the most common. Mexican spotted owls breed sporadically and do not nest every year (Ganey 1988). In good years, most of the population will nest, whereas in other years only a small proportion of pairs will nest successfully (Fletcher and Hollis 1994).

Courtship begins in March and eggs are laid in late March or, more typically, early April. Incubation begins shortly after the first egg is laid, and is performed entirely by the female. Female spotted owls generally incubate for approximately 30 days. During incubation, the female leaves the nest only to defecate, regurgitate pellets, or receive prey delivered by the male, who does most or all of the foraging. The eggs usually hatch in early May (Ganey 1988). Females brood their young almost constantly, leaving their nests for only brief periods during the night. Nestling owls fledge from four to five weeks after hatching, from early to mid-June in most cases (Ganey 1988). Owlets often leave the nest before they can fly, simply jumping from the nest onto surrounding tree branches or the ground. Three weeks after leaving the nest owlets can hold and tear up prey on their own, and by late July most have become proficient at pouncing on crawling insects (Forsman *et al.* 1984). The young depend on their parents for food during the summer and will eventually disperse out of the natal area in the fall. Reproductive output varies both spatially and temporally, but may be higher than the California and the Northern spotted owl (Verner *et al.* 1992, Thomas *et al.* 1993).

Forsman *et al.* (1976) described spotted owls as "perch and pounce" predators. They typically locate prey from an elevated perch by sight or sound, then pounce on the prey and capture it with their talons. Spotted owls have also been observed capturing flying prey such as birds and insects (Verner *et al.* 1992). Specific prey groups include: woodrats, mice, voles, rabbits, gophers, bats, birds, reptiles, and arthropods. Spotted owls dwelling in canyons of the Colorado Plateau take more woodrats and fewer birds than do spotted owls from other areas.

Mortality factors include predation, starvation, and accidents. Little is known about how disease and parasites contribute to mortality of spotted owls. Avian predators include great horned owls,

northern goshawks, red-tailed hawks, and golden eagles. The extent of predation is unknown; however both juveniles and adults are preyed upon (Willey 1993). Starvation may result from low abundance or availability of prey. Most instances of starvation occurred from late fall through winter when prey resources were reduced in abundance and availability (Willey 1993, Block and Ganey, unpub. data). Starvation may also predispose individuals to increased predation. Little data is available on frequency of accidents, and subsequent mortality. Instances of spotted owls being hit by cars have been documented. Owls may also collide with power lines or other obstacles (Service 1995).

Based on limited study information, annual survival rates of adult Mexican spotted owls is 0.8-0.9 and juvenile survival is 0.06-0.29 (Service 1995). Survival estimates may be biased low, but conclude higher survival of adults than juveniles. Available data is either insufficient or has not been analyzed to estimate population trends.

2.2.3 Status and Distribution

The Mexican spotted owl (*Strix occidentalis lucida*) was listed as a threatened species on March 16, 1993 (58 FR 14248). The primary threats to the species were cited as even-aged timber harvest and catastrophic wildfire, although grazing, recreation, and other land uses were also mentioned as possible factors influencing the Mexican spotted owl population. We appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the Recovery Plan for the Mexican Spotted Owl (Recovery Plan) in 1995 (Service 1995).

On August 31, 2004, we designated approximately 8.6 million acres of critical habitat for the Mexican spotted owl in Arizona, Colorado, New Mexico, and Utah, on Federal lands (69 FR 53181). Some of the primary constituent elements for the Mexican spotted owl include: (1) cooler and often more humid conditions than the surrounding area, (2) clumps or stringers of trees and/or canyon walls with crevices, ledges or caves, (3) high percent of ground litter and woody debris, and (4) riparian or woody vegetation. The primary constituent elements related to forest structure include (1) a range of tree species, (2) a shade canopy created by the tree branches covering 40 percent or more of the ground, and (3) large dead trees with a trunk diameter of at least 12 inches (69 FR 53181-5398).

Vegetation communities and structural attributes used by the owl vary across the range of the subspecies, but consist primarily of mixed conifer forests or canyons. Mixed-conifer, pine-oak communities and canyon habitat appear to be the most frequently used communities throughout most portions of the subspecies' range (Skaggs and Raitt 1988; Ganey and Balda 1989, 1994; Gutierrez and Rinkevich 1991; Service 1995). In Utah, owls utilize canyon habitats (Willey 1998).

Primary constituent elements related to critical habitat in Utah (canyon habitat) include one or more of the following: (1) presence of water (often providing cooler temperatures and higher humidity than the surrounding areas); (2) clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; (3) canyon walls containing crevices, ledges, or caves; and (4) high percent of ground litter and woody debris. The primary constituent elements provide a qualitative description of those physical and biological features necessary to ensure the conservation of the owl in Utah (69 FR 53181).

Although the Mexican spotted owl's entire range covers a broad area of the southwestern United States and Mexico, the Mexican spotted owl does not occur uniformly throughout its range. Instead, it occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Surveys have revealed that the species has an affinity for older uneven-aged forests but also is known to inhabit a physically diverse landscape in the southwestern United States and Mexico. Owls can be found in forested mountains and canyons from southern Utah and Colorado to the mountains of Arizona, New Mexico, western Texas, and into the mountains of northern and central Mexico.

Steep-walled rocky canyonlands provide typical owl habitat within the Utah portion of the Colorado Plateau Recovery Unit. Canyon habitat is used by owls for nesting, roosting, and foraging and includes landscapes dominated by vertical walled rocky cliffs within complex watersheds, including many tributary side canyons. Rock walls must include caves, ledges, and fracture zones that provide protection for nesting and roosting sites. Breeding sites are located below canyon rims; however, it is known that owls use areas outside of canyons (i.e., rims and mesa tops). Owls nest and roost primarily on cliff faces using protected caves and ledges, and forage in canyon bottoms, on cliff faces and benches, and along canyon rims and adjacent lands. Although it is difficult to rely upon vegetation alone to identify canyon habitat, these areas frequently contain small clumps or stringers of mixed-conifer, ponderosa pine, pine-oak, pinyon-juniper, and/or riparian vegetation (69 FR 53181). Little is known about patterns of habitat use by foraging owls. In Utah, owls have been documented using canyon bottoms and adjacent rims (Willey 1998).

Colorado Plateau canyon habitats in Utah are naturally discontinuous and may explain the patchy locations of owls in the region. A study conducted in Zion National Park found owls nesting and roosting in humid, narrow canyons with dense understories (Rinkevich 1991). These canyons provide large cliffs with escape cover to avoid predation, shaded roost sites to avoid high summer temperatures, patches of forest vegetation, and availability of suitable prey.

Historic population size estimates and range of the Mexican spotted owl are unknown; however present population size and distribution are thought to be similar (Service 1995). Ninety-one percent of known owls in 1990-1993 occurred on U.S. Forest Service lands, primarily in Arizona and New Mexico. It is unknown why there are fewer owls in Utah and Colorado, but that may be a function of habitat type. Total range wide population estimates are 1,176 to 2,352 owls (69 FR 53181). Seamans *et al.* 1999 reported 10 percent or greater population declines and low survival rates in central Arizona and west-central New Mexico. The decline in New Mexico appears to be continuing, whereas the decline in Arizona appeared to have stabilized. Wide population fluctuations may be common for Mexican spotted owls (Gutierrez *et al.* 2003).

3. ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed State or Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process.

The action area is defined at 50 CFR 402 to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action". The action area also depends on the species being discussed. For the purposes of this consultation, we define the action area to include the Green River from Nine Mile Creek downstream to Lake Powell for the four Colorado River endangered fish and their designated critical habitat. For Mexican spotted-owl, the action area is defined as areas containing suitable Mexican spotted owl habitat within the project area. Federal lands administered by other agencies and State, Tribal, and private lands that adjoin BLM-administered land are also considered part of the action area.

3.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub

3.1.1 Colorado Pikeminnow

3.1.1.1 Status of Species and Critical Habitat in the Action Area

Preliminary population estimates for the Green River Subbasin population ranged from approximately 6,000 to 8,000 adults (Nesler 2000; Service 2002a). These numbers provided a general indication of the total wild adult population size at the time Recovery Goals were developed, however, it was also recognized that the accuracy of the estimates varied among populations. Monitoring of Colorado pikeminnow populations is ongoing and sampling protocols and the reliability of the population estimates are being assessed by the Service and cooperating entities.

For the period 1986–1997, the catch of adult Colorado pikeminnow per hour of electrofishing in the Green River steadily increased (McAda *et al.* 1997). Catch rates from the 1986–1988 period to the 1996–1997 period increased by three-fold from about 0.8 fish/hour to about 2.5 fish/hour. Relative condition of adult Colorado pikeminnow in the Green River declined between these two time periods, suggesting that the population was at or near carrying capacity under existing conditions.

Currently, two primary reaches of Colorado pikeminnow nursery habitat are present in the Green River system. The action area contains one of these reaches mostly by Desolation and Gray Canyons (Tyus and Haines 1991; Day *et al.* 1999b). These backwaters are especially important during the Colorado pikeminnow's critical first year of life. The stretch of river occurring from near Green River, Utah, downstream to the Colorado River confluence also provides nursery habitat (Tyus and Haines 1991; McAda *et al.* 1994a, 1994b, 1997).

3.1.1.2 Factors Affecting Species Environment within the Action Area

The primary threats to Colorado pikeminnow are stream flow regulation and habitat modification from mainstem dams; competition with and predation by nonnative fishes; and pesticides and pollutants (Service 2002a). The existing habitat, altered by these threats, has been modified to the extent that it impairs essential behavior patterns, such as breeding, feeding, and sheltering. These impairments are described in further detail below.

Stream flow regulation includes mainstem dams that cause the following adverse effects to Colorado pikeminnow and its habitat:

- block migration corridors,
- changes in flow patterns, reduced peak flows and increased base flows,
- release cold water, making temperature regimes less than optimal,
- change river habitat into lake habitat, and
- retain sediment that is important for forming and maintaining backwater habitats.

Cold water releases from dams eliminate suitable habitat for native fishes, including Colorado pikeminnow, from river reaches downstream for approximately 50 miles. In addition to main stem dams, many dams and water diversion structures occur in and upstream from critical habitat that reduce flows and alter flow patterns, which adversely affect critical habitat. Diversion structures in critical habitat divert fish into canals and pipes where fish are permanently lost to the river system. It is unknown how many endangered fish are lost in irrigation systems, but in some years, in some river reaches, the majority of river flow is diverted into unscreened canals. High spring flows maintain habitat diversity, flush sediments from spawning habitat, increase invertebrate food production, form gravel and cobble deposits important for spawning, and maintain backwater nursery habitats (McAda 2000, Muth *et al.* 2000).

Predation and competition from nonnative fishes have been clearly implicated in the population reductions or elimination of native fishes in the Colorado River Basin (Dill 1944; Joseph *et al.* 1977; Behnke 1980; Meffe 1985; Osmundson and Kaeding 1989; Propst and Bestgen 1991). Data collected by Osmundson and Kaeding (1991) indicated that during low water years nonnative minnows capable of preying on or competing with larval endangered fishes greatly increased in numbers.

More than 50 nonnative fish species were intentionally introduced in the Colorado River Basin prior to 1980 for sportfishing, forage fish, biological control and ornamental purposes (Minckley 1982; Tyus *et al.* 1982; Carlson and Muth 1989). Nonnative fishes compete with native fishes in several ways. The capacity of a particular area to support aquatic life is limited by physical habitat conditions. Increasing the number of species in an area usually results in a smaller population of most species. The size of each species population is controlled by the ability of each life stage to compete for space and food resources and to avoid predation. Some life stages of nonnative fishes appear to have a greater ability to compete for space and food and to avoid predation in the existing altered habitat than do some life stages of native fishes. Tyus and Saunders (1996) cite numerous examples of both indirect and direct evidence of predation on razorback sucker eggs and larvae by nonnative species. One can assume that predation on Colorado pikeminnow eggs and larvae would be similar due to the similarity of habitat use by these two species.

Threats from pesticides and pollutants include accidental spills of petroleum products and hazardous materials; discharge of pollutants from uranium mill tailings; and high selenium concentration in the water and food chain (Service 2002a). Accidental spills of hazardous material into critical habitat can cause immediate mortality when lethal toxicity levels are exceeded. Pollutants from uranium mill tailings cause high levels of ammonia that exceed water

quality standards. High selenium levels may adversely affect reproduction and recruitment (Hamilton and Wiedmeyer 1990; Stephens *et al.* 1992; Hamilton and Waddell 1994; Hamilton *et al.* 1996; Stephens and Waddell 1998; Osmundson *et al.* 2000).

Management actions identified in the recovery goals for Colorado pikeminnow (Service 2002a) to minimize or remove threats to the species included:

- provide and legally protect habitat (including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations;
- provide passage over barriers within occupied habitat to allow adequate movement and, potentially, range expansion;
- investigate options for providing appropriate water temperatures in the Gunnison River;
- minimize entrainment of subadults and adults in diversion canals;
- ensure adequate protection from overutilization;
- ensure adequate protection from diseases and parasites;
- regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries;
- control problematic nonnative fishes as needed;
- minimize the risk of hazardous-materials spills in critical habitat;
- remediate water-quality problems; and
- provide for the long-term management and protection of populations and their habitats beyond delisting (i.e., conservation plans).

Programs were established to recover the endangered Colorado River fish in the Green and Colorado River sub-basins (the Upper Colorado River Endangered Fish Recovery Program; established in 1988) and in the San Juan River sub-basin (the San Juan River Recovery Implementation Program; established in 1995), while allowing for continued water development under state and federal water law. Program sponsors include federal and state agencies, water users, and environmental groups. These programs are designed to offset impacts to the endangered fish stemming from historic and future water depletions. To date, recovery efforts have focused on:

- Providing instream flows through the development of flow recommendations for important reaches of occupied habitat; flows are then provided through the re-operation of mainstem reservoirs or through lease and purchase of water rights.
- Controlling non-native fish populations, primarily via mechanical removal.
- Restoring habitats through the construction of fish passage structures at instream barriers and installing screens at the head of irrigation canals to reduce entrainment of native fishes.
- Developing genetically viable refuge populations in hatcheries and then using hatchery reared stocks to augment wild populations where necessary.
- Working with cooperating state agencies to minimize the conflicts between native fish recovery and sportfish management.

- Monitoring populations in the wild to determine the effectiveness of the aforementioned recovery actions.
- Sharing information about the endangered fish and the recovery efforts through an information and education program.

Within the action area, critical habitat for Colorado pikeminnow is located along the Green River and its 100-year floodplain. As was discussed above, all primary constituent elements of critical habitat (water, physical habitat, and biological environment) are affected by various activities on the Green River and could be further influenced through implementation of the proposed action. Water quantity and quality is affected by flow regulation and land management practices (water depletion), which result in increased concentrations of contaminants (most notably selenium). Physical habitat (spring adult staging areas (floodplain), spawning and nursery habitats) are affected through flow regulation, land management practices (diking), and encroachment of nonnative vegetation (primarily tamarisk). The biological environment is altered primarily due to the introduction of numerous species of nonnative fish disrupting the natural balance of competition and predation. All constituent elements of designated Colorado pikeminnow critical habitat along the Green River will be considered in our analysis of the effects of the proposed action.

3.1.2 Razorback Sucker

3.1.2.1 Status of Species and Critical Habitat in the Action Area

In Utah, razorback sucker currently occupy parts of the Green River Subbasin (Green River, Yampa River, White River, and Duchesne River), the Upper Colorado River Subbasin (Upper Colorado River), and the San Juan River Subbasin (San Juan River) (Service 2002b; 54 FR 54967; 54 FR 13374). The Green River Subbasin is the only population that is likely to be affected by the proposed action. Therefore, further discussions regarding this species will be limited to this population.

The largest concentration of razorback suckers in the Upper Colorado River Basin exists in low-gradient flat-water reaches of the middle Green River between and including the lower few miles of the Duchesne River and the Yampa River (Tyus 1987; Tyus and Karp 1990; Muth 1995; Modde and Wick 1997; Muth *et al.* 2000). This area includes the greatest expanse of floodplain habitat in the Upper Colorado River Basin, between Pariette Draw at river mile (RM) 238 and the Escalante Ranch at RM 310 (Irving and Burdick 1995). Within the White River, razorback suckers are found in low numbers from the confluence with the Green River upstream to Taylor Draw Dam (Service 2002b).

Known spawning sites are located in the lower Yampa River and in the Green River near Escalante Ranch between river km 492 and 501 (distance upstream from Colorado River confluence), but other, less-used sites are probable (Tyus and Karp 1990; Modde and Wick 1997; Modde and Irving 1998).

The middle Green River population consisted of about 1,000 adults in the 1980s (Lanigan and Tyus 1989; Modde et al. 1996) with a relatively constant length frequency distribution (most frequent modes were in the 505–515 mm total length interval) and an estimated annual survival

rate of 71 percent. In the late 1990s, the population of wild razorback sucker in the middle Green River was estimated to be about 100 (Bestgen et al. 2002).

The Green River from the confluence with the Yampa River to Sand Wash has the largest existing riverine population of razorback sucker (Lanigan and Tyus 1989; Modde *et al.* 1996). Razorback suckers are permanent residents of the Green River below its confluence with the Yampa River and are reliant on in-channel habitat for spawning and flooded off-channel habitats for several aspects of their life history. In turn, these habitats are created and maintained by the natural hydrology and sediment transport provided by the Yampa River.

Spawning migrations (one-way movements of 30.4–106.0 km) include movements between the Ouray and Jensen areas of the Green River and between the Jensen area and the lower Yampa River (Tyus and Karp 1990). Initial movement of adult razorback suckers to spawning sites was influenced primarily by increases in river discharge and secondarily by increases in water temperature (Tyus and Karp 1990; Modde and Wick 1997; Modde and Irving 1998). Flow and temperature cues may serve to effectively congregate razorback suckers at spawning sites, thus increasing reproductive efficiency and success. Reduction in spring peak flows may hinder the ability of razorback suckers to form spawning aggregations, because spawning cues are reduced (Modde and Irving 1998).

Spawning areas include the mouth of the Yampa River(McAda and Wydoski 1980); Island and Echo parks of the Green River in Dinosaur National Monument, including the lower mile of the Yampa River; the Jensen area of the Green River from Ashley Creek (RM 299) to Split Mountain Canyon (RM 319); and the Ouray area of the Green River, including the lower few miles of the Duchesne River (McAda and Wydoski 1980; Tyus 1987).

Substantial numbers of razorback sucker adults occur in flooded off-channel habitats in the vicinity of mid-channel spawning bars shortly before or after spawning. Tyus (1987) located concentrations of ripe fish associated with warm floodplain habitats and in shallow eddies near the mouths of tributary streams. Radio-telemetry and capture-recapture data compiled by Modde and Wick (1997) and Modde and Irving (1998) demonstrated that most razorback sucker adults in the middle Green River moved into flooded environments (e.g., floodplain habitats and tributary mouths) soon after spawning. Tyus and Karp (1990, 1991) and Modde and Wick (1997) suggested that use of warmer, more productive flooded habitats by adult razorback suckers during the breeding season is related to temperature preferences (23–25°C; Bulkley and Pimental 1983) and abundance of appropriate foods (Jonez and Sumner 1954; Vanicek 1967; Marsh 1987; Mabey and Shiozawa 1993; Wolz and Shiozawa 1995; Modde 1997; Wydoski and Wick 1998). Reduced spring flooding caused by lower regulated river discharges, channelization, and levee construction has restricted access to floodplain habitats used by adult razorback suckers for temperature conditioning, feeding, and resting (Tyus and Karp 1990; Modde 1997; Modde and Wick 1997; Wydoski and Wick 1998). The fact that these fish actively seek out this habitat suggests that the conditioning it provides them is important to their continued successful reproduction.

Razorback sucker larvae were collected each year in the Green River during 1992–1996. Over 99 percent (N = 1,735) of the larvae caught in the middle Green River during spring and early

summer were from reaches including, and downstream of, the presumed spawning area near the Escalante Ranch (Muth *et al.* 1998). Based on the few larvae ($N = 6$) recorded from collections in the Echo Park reach in 1993, 1994, and 1996, reproduction by razorback suckers at the lower Yampa River spawning site appeared minimal, but sampling efforts in the two reaches immediately downstream of that site were comparatively low (Muth *et al.* 1998). Mean catch per unit effort (CPUE) was highly variable among years and river reaches but it is unclear whether this was a true measure of population abundance or was biased by differences in sampling efficiency (Muth *et al.* 1998). Numbers of razorback sucker larvae captured per year ranged from 20 in 1992 to 1,217 in 1994 for the middle Green River and from 5 in 1995 to 222 in 1996 for the lower Green River.

Historically, floodplain habitats inundated and connected to the main channel by over-bank flooding during spring-runoff discharges would have been available as nursery areas for young razorback suckers in the Green River. Tyus and Karp (1990) associated low recruitment with reductions in floodplain inundation since 1962 (closure of Flaming Gorge Dam), and Modde *et al.* (1996) associated years of high spring discharge and floodplain inundation in the middle Green River (1983, 1984, and 1986) with subsequent suspected recruitment of young adult razorback suckers. These floodplain habitats are essential for the survival and recruitment of larval fish. Relatively high zooplankton densities in these warm, productive habitats are necessary to provide adequate zooplankton densities for larval food. Loss or degradation of these productive floodplain habitats probably represents one of the most important factors limiting recruitment in this species (Wydoski and Wick 1998). The importance of these habitats is further underscored by the relationship between larval growth and mortality due to non-native predators (Bestgen *et al.* 1997). Predation by adult red shiners on larvae of native catostomids in flooded and backwater habitats of the Yampa, Green, or Colorado Rivers was documented by Ruppert *et al.*(1993) and Muth and Wick (1997).

3.1.2.2 Factors Affecting Species Environment within the Action Area

The primary threats to razorback sucker are stream flow regulation and habitat modification; competition with and predation by nonnative fishes; and pesticides and pollutants (Service 2002b). A marked decline in populations of razorback suckers can be attributed to construction of dams and reservoirs, introduction of nonnative fishes, and removal of large quantities of water from the Colorado River system. Dams on the mainstem Colorado River and its major tributaries have segmented the river system, blocked migration routes, and changed river habitat into lake habitat. Dams also have drastically altered flows, temperatures, and channel geomorphology. Major changes in species composition have occurred due to the introduction of numerous nonnative fishes, many of which have thrived due to human-induced changes to the natural riverine system. These nonnative fishes prey upon and compete with razorback suckers. Existing habitat altered by these threats has been modified to the extent that it impairs essential behavior patterns such as breeding, feeding, and sheltering. Threats to razorback sucker in relation to flow regulation and habitat modification, predation by nonnative fishes, and pesticides and pollutants are essentially the same threats identified for Colorado pikeminnow

Management actions identified in the recovery goals for razorback sucker (Service 2002b) to minimize or remove threats to the species included:

- provide and legally protect habitat (including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations;
- provide passage over barriers within occupied habitat to allow unimpeded movement and, potentially, range expansion;
- investigate options for providing appropriate water temperatures in the Gunnison River;
- minimize entrainment of subadults and adults in diversion/out-take structures;
- ensure adequate protection from overutilization;
- ensure adequate protection from diseases and parasites;
- regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries;
- control problematic nonnative fishes as needed;
- minimize the risk of hazardous-materials spills in critical habitat;
- remediate water-quality problems; and
- minimize the threat of hybridization with white sucker.

Programs were established to recover the endangered Colorado River fish in the Green and Colorado River sub-basins (the Upper Colorado River Endangered Fish Recovery Program; established in 1988) and in the San Juan River sub-basin (the San Juan River Recovery Implementation Program; established in 1995), while allowing for continued water development under state and federal water law. These programs were described in detail in section 3.1.1.2 under Factors Affecting the Species Environment within the Action Area for the Colorado pikeminnow.

Within the action area, critical habitat for razorback sucker is located along the Green River and its 100-year floodplain. As was discussed above, all primary constituent elements (water, physical habitat, and biological environment) have been affected throughout designated critical habitat on the Green River. Habitat could be further affected through implementation of the proposed action. To date, water quantity and quality are affected by flow regulation and land management practices (irrigated agriculture), which has resulted in increased concentrations of contaminants (most notably selenium). Physical habitat (spring adult staging areas (floodplain), spawning and nursery habitats) is affected through flow regulation, land management practices (diking), and encroachment of nonnative vegetation (primarily tamarisk). The biological environment is altered primarily due to the introduction of numerous species of nonnative fish disrupting the natural balance of competition and predation. All constituent elements of designated razorback sucker critical habitat along the Green River will be considered in our analysis of the effects of the proposed action.

3.1.3 Humpback Chub

3.1.3.1 Status of Species and Critical Habitat in the Action Area

Six self-sustaining populations of humpback chub are known to exist, three of which are in Utah (Service 2002c):

- Westwater Canyon, Colorado River, Utah – estimated population 2,900-6,500
- Desolation/Gray Canyons, Green River, Utah -- estimated population 1,500
- Cataract Canyon, Colorado River, Utah – estimated population 500

Desolation/Gray Canyon is the only population that has the potential to be affected by the proposed action.

Each population consists of a discrete group of fish, geographically separated from the other populations, but with some exchange of individuals. Monitoring humpback chub populations is ongoing and sampling protocols and reliability of population estimates are being assessed by the Service and cooperating entities. The Utah Division of Wildlife Resources has monitored the fish community in Desolation and Gray Canyons since 1989 and has consistently reported captures of age-0, juvenile, and adult *Gila,* including humpback chub, indicating a reproducing population (Chart and Lentsch 1999b).

Humpback chubs in the Yampa and Green Rivers spawn during spring and early summer months (May-July) following peak flows at water temperatures of about 20°C (Tyus and Karp 1990, 1991). Humpback chubs occupy and spawn in and near shoreline eddy habitats and that spring peak flows were important for reproductive success because availability of these habitats is greatest during spring runoff (Tyus and Karp 1989).

High spring flows that simulate the magnitude and timing of the natural hydrograph provide a number of benefits to humpback chubs in the Yampa and Green Rivers. Bankfull and overbank flows provide allochthonous energy input to the system in the form of terrestrial organic matter and insects that are utilized as food. High spring flows clean spawning substrates of fine sediments and provides physical cues for spawning. High flows also form large recirculating eddies used by adult fish. High spring flows (50 percent exceedance or greater) have been implicated in limiting the abundance and reproduction of some nonnative fish species under certain conditions (Chart and Lentsch 1999a, 1999b) and have been correlated with increased recruitment of humpback chubs (Chart and Lentsch 1999b).

3.1.3.2 Factors Affecting Species Environment within the Action Area

Within the footprint of the project area, there is no designated critical habitat. However, water depletion from the Upper Colorado River Basin may affect critical habitat for the four federally endangered Colorado River fish species throughout the basin.

The primary threats to humpback chub are stream flow regulation and habitat modification; competition with and predation by nonnative fishes; parasitism; hybridization with other native *Gila* species; and pesticides and pollutants (Service 2002c). Although historic data are limited, the apparent range-wide decline in humpback chubs is likely due to a combination of these threats that have modified existing habitat to the extent that it impairs essential behavior patterns, such as breeding, feeding, and sheltering. The threats to humpback chub in relation to flow regulation and habitat modification, predation by nonnative fishes, and pesticides and pollutants are essentially the same threats identified for Colorado pikeminnow.

Hybridization with roundtail chub (*Gila robusta*) and bonytail, where they occur with humpback chub, is recognized as a threat to humpback chub. A larger proportion of roundtail chub have been found in Black Rocks and Westwater Canyon during low flow years (Kaeding *et al.* 1990; Chart and Lentsch 2000), which increase the chances for hybridization.

Management actions identified in the recovery goals for humpback chub (Service 2002c) to minimize or remove threats to the species included:

- provide and legally protect habitat (including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations;
- investigate the role of the mainstem Colorado River in maintaining the Grand Canyon population;
- investigate the anticipated effects of and options for providing warmer water temperatures in the mainstem Colorado River through Grand Canyon;
- ensure adequate protection from overutilization;
- ensure adequate protection from diseases and parasites;
- regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries;
- control problematic nonnative fishes as needed;
- minimize the risk of increased hybridization among *Gila* spp.; and
- minimize the risk of hazardous-materials spills in critical habitat.

Programs were established to recover the endangered Colorado River fish in the Green and Colorado River sub-basins (the Upper Colorado River Endangered Fish Recovery Program; established in 1988) and in the San Juan River sub-basin (the San Juan River Recovery Implementation Program; established in 1995), while allowing for continued water development under state and federal water law. These programs were described in detail in section 3.1.1.2 under Factors Affecting the Species Environment within the Action Area for the Colorado pikeminnow.

Water depletion associated with the propose action may impact designated critical habitat. We have identified water, physical habitat, and the biological environment as the primary constituent elements of humpback chub critical habitat (59 FR 13374). Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment. Recent information collected by the Recovery Program suggests that floodplain habitats may be more important to the survival and recovery of the humpback chub than we originally thought.

3.1.4 Bonytail

3.1.4.1 Status of Species and Critical Habitat in the Action Area

Bonytail were once widespread in the large rivers of the Colorado River Basin (Cope and Yarrow 1875; Kirsch 1889; Jordan 1891; Gilbert and Scofield 1898; Chamberlain 1904). The species experienced a dramatic, but poorly documented, decline starting in about 1950, following construction of mainstem dams, introduction of nonnative fishes, rotenone poisoning, cold-water releases from Flaming Gorge Dam, poor land-use practices, and degraded water quality (Miller 1961; Service 2002d).

Surveys from 1964 to 1966 found large numbers of bonytail in the Green River in Dinosaur National Monument downstream of the Yampa River confluence (Vanicek and Kramer 1969). Surveys from 1967 to 1973 found far fewer bonytail (Holden and Stalnaker 1975). Bonytails were generally found in pools and eddies in the absence of, although occasionally adjacent to, strong current and at varying depths generally over silt and silt-boulder substrates (Vanicek 1967). Few bonytail were captured after this period, and the last recorded capture in the Green River was in 1985 (Service 2002d). Following this evident decline, large numbers of bonytail were stocked in the Green River Basin between 1998 and 2009. To date, stocked bonytail do not appear to be surviving as well as razorback sucker. In 2009, biologists working on the Green River in the Uintah Basin, Utah, captured in excess of 40 bonytail stocked more than a year earlier (Upper Colorado River Endangered Fish Recovery Program & San Juan River Basin Recovery Implementation Program. 2010).

3.1.4.2 Factors Affecting Species Environment within the Action Area

Within the footprint of the project area, there is no designated critical habitat. However, water depletion from the Upper Colorado River Basin may affect critical habitat for the four federally endangered Colorado River fish species throughout the basin.

The primary threats to bonytail are stream flow regulation and habitat modification; competition with and predation by nonnative fishes; hybridization with other native *Gila* species; and pesticides and pollutants (Service 2002d). The existing habitat, altered by these threats, has been modified to the extent that it impairs essential behavior patterns, such as breeding, feeding, and sheltering. The threats to bonytail in relation to flow regulation and habitat modification, predation by nonnative fishes, and pesticides and pollutants are essentially the same threats identified for Colorado pikeminnow.

Management actions identified in the recovery goals for bonytail (Service 2002d) to minimize or remove threats to the species included:

- provide and legally protect habitat (including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations;
- provide passage over barriers within occupied habitat to allow unimpeded movement and, potentially, range expansion;

- investigate options for providing appropriate water temperatures in the Gunnison River;
- minimize entrainment of subadults and adults at diversion/out-take structures;
- investigate habitat requirements for all life stages and provide those habitats;
- ensure adequate protection from overutilization;
- ensure adequate protection from diseases and parasites;
- regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries;
- control problematic nonnative fishes as needed;
- minimize the risk of increased hybridization among *Gila* spp.;
- minimize the risk of hazardous-materials spills in critical habitat; and
- remediate water-quality problems.

Programs were established to recover the endangered Colorado River fish in the Green and Colorado River sub-basins (the Upper Colorado River Endangered Fish Recovery Program; established in 1988) and in the San Juan River sub-basin (the San Juan River Recovery Implementation Program; established in 1995), while allowing for continued water development under state and federal water law. These programs were described in detail in section 3.1.1.2 under Factors Affecting the Species Environment within the Action Area for the Colorado pikeminnow.

Water depletion associated with the propose action may impact designated critical habitat. We have identified water, physical habitat, and the biological environment as the primary constituent elements of bonytail critical habitat (59 FR 13374). Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment. Recent information collected by the Recovery Program suggests that floodplain habitats may be more important to the survival and recovery of the bonytail than we originally thought.

3.2 Mexican Spotted Owl

3.2.1 Status of the Species within the Action Area

The Mexican spotted owl occurs in the eastern and southern thirds of Utah, including Carbon and Emery counties (UDWR 2003). The Mexican Spotted Owl Recovery Plan was finalized in 1995. Six Recovery Units in the United States were identified based on similarities, or obvious dividing lines, between the following: physiographic provinces, biotic regimes, perceived threats to habitat or individual birds, administrative boundaries, and owl distribution. Suitable habitat and designated critical habitat on public lands managed by the BLM in Utah are within the Colorado Plateau Recovery Unit (Service 1995). Five critical habitat units are delineated in Utah:

Unit CP–11. Located in Iron, Washington, and Kane Counties in southwest Utah, approximately 22 mi (35 km) northeast of St. George. Approximately half of the unit is on BLM owned lands; Zion National Park is the other land owner.

Unit CP–12. Located in the vicinity of the Kaiparowits Plateau and the Cockscomb, in Kane and Garfield Counties. This unit is primarily on the Grand Staircase-Escalante National Monument, which is owned and managed by the BLM. The other land owner is the Forest Service (Dixie National Forest).

Unit CP–13. Located in Wayne, Garfield, Kane, and San Juan Counties, Utah. It is primarily in the Waterpocket Fold landform extending to Lake Powell. The primary land owner in this Unit is the National Park Service (Capitol Reef National Park and Glen Canyon National Recreation Area). The BLM owns and manages lands within this unit primarily on the Grand Staircase-Escalante National Monument and along the eastern edge of the Unit. The Forest Service (Fishlake National Forest) also owns land, but to a much lesser extent.

Unit CP–14. Located in Wayne, Garfield, San Juan, and Grand Counties, Utah. It includes the Dark Canyon Primitive and Wilderness areas of the BLM and FS, respectively. This Unit has lands owned and managed by the National Park Service (Canyonlands National Park and Glen Canyon National Recreation Area), the BLM, and the Forest Service (Manti La-Sal National Forest).

Unit CP–15. Located approximately 30 mi (48 km) east of Price, in Carbon and Emery Counties. Situated in the West Tavaputs Plateau, it is located largely along the Desolation Canyon area of the Green River. The BLM is the primary owner and manager of land within this unit.

It is important to note that critical habitat is not the only suitable or occupied habitat available for owls. Critical habitat is only a regulatory delineation of habitat meeting primary constituent elements, and was defined based largely on known localities of nest sites (Protected Activity Centers; PACs) at the time of designation. There is substantial suitable habitat that occurs outside of the designated critical habitat boundaries and these should be assessed using the models and field evaluations as previously described.

Designated critical habitat and suitable habitat occur within the Price BLM Field Office. Approximately, 186,361 acres of designated critical habitat in Unit CP-15 exists within the Price planning area. In addition, there are 3 designated and 1 potential PACs in the planning area. A portion of one of these PACs (Flat Canyon) could fall within the WTPA once designated. However, no development is proposed for that area and no oil or gas leases predating the designation of wilderness study area exist for that location.

3.2.2 Factors Affecting Species Environment within the Action Area

Threats to this species and its habitat include recreation, grazing, oil and gas exploration and development, and road improvement and development within canyons; loss, fragmentation, or modification of habitat from catastrophic fire and timber harvest within upland forests potentially

used for foraging, dispersal, and wintering; and increased predation associated with habitat fragmentation (Service 1995).

4. EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

To estimate the surface disturbance within the WTPA, the assumptions on page 2-12 of the EIS were used here, namely

- Surface disturbance for a well pad: 2.85 acres;
- Surface disturbance for a pump station: 0.5 acres
- Surface disturbance for an equipment storage area: 5 acres
- Surface disturbance for a compressor station: 5 acres
- Surface disturbance for a water management facility: 5 acres
- Surface disturbance for temporary worker housing locations: 10 acres

Based on these assumptions, the reasonably foreseeable development (807 wells) under the Agency Preferred Alternative would be approximately 3,339 acres of disturbance. The total new disturbance would make up approximately 2.4% of the entire project area.

4.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub

Total water depletion associated with this project is approximately 1,877 acre-feet, with an average of 216.4 acre-feet per year during the first 9 years of the construction phase and a peak depletion of 289.78 acre-feet.

Water depletions from the Upper Colorado River Drainage System, along with a number of other factors, have resulted in such drastic reductions in the populations of the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker that we have listed these species as endangered and have implemented programs to prevent them from becoming extinct. Water, physical habitat, and the biological environment are the primary constituent elements of critical habitat. This includes a quantity of water of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species. Water depletions reduce the ability of the river to create and maintain the primary constituent elements that define critical habitats. Food supply, predation, and competition are important elements of the biological environment. Food supply is a function of nutrient supply and productivity, which could be limited by reduction of high spring flows brought about by water depletions. Predation and competition from nonnative fish species have been identified as

factors in the decline of the endangered fishes. Water depletions contribute to alterations in flow regimes that favor nonnative fishes.

Only if no practical alternative exists, would BBC drill gas wells within 100-year floodplains of streams that drain to the Green River. If drilling outside of these sensitive areas is not deemed technically or economically feasible, well pads and associated structures could be located in riparian or floodplains that drain to the Green River thereby increasing the potential for a release or spill that would impact surface waters. The highest risk for contamination is from leaks/spills at the drilling rigs, oil and gas wellheads, pit breaches, and pipeline ruptures or leaks at sites in floodplains that are tributary to the Green River. Although drilling would not occur during flooding, unexpected events could cause releases of brine or other substances that could flow into the river channel.

Accidental spills of hydrocarbon products would have the potential to affect ground water and surface waters if spills occurred when washes were flowing in the Project Area. Accumulations of contaminants in floodplain areas of the Green River could result in lethal and/or sublethal impacts to endangered fish. While applicant-committed measures may reduce the chance for spills or leaks of contaminants, accidental releases can and do still occur. According to the National Response Center, there have been at least 146 spills and releases within Carbon, Duchesne, and Uintah Counties from January 1990 through January 2009 due to oil and gas development and related activities affecting water, land and air.

Spill incidences reviewed in Utah include corrosion and leakage of surface and buried pipelines, broken well rods, valve and gasket failures, wellhead pressure buildups, shutoff alarm malfunctions, leakage of trace systems, loss of formation water to the surface during drilling, and vehicular related traffic accidents. Releases have included crude oil, natural gas, hydrochloric acid, condensate, salt water, ethylene glycol, and produced water in various quantities.

Releases of harmful agents into floodplain habitats could result in significant adverse impacts to the endangered fish and their designated critical habitat. One of the constituent elements of the designated critical habitat for the four Colorado River fish is contaminant-free water. Any release of contaminants into the floodplain would result in degradation of critical habitat and could result in take of individual fish, including downstream impacts to larvae and juveniles.

The Green River is a large river with high dilution factors. However, contaminants are likely to accumulate in backwater/depressional areas that have reduced dilution and less flushing capacity (Woodward *et al.* 1985). Colorado pikeminnow and razorback sucker use these sites downstream, which provide cover and a food source, for overwinter survival and rearing areas. The proposed action includes applicant committed measures to minimize and reduce the potential for contaminants to be released into the natural systems. However, oil and gas related accidents can be severe and have serious consequences to fish and wildlife resources.

Although most incidents are relatively small in size, large scale spills do occur. If large-scale breaks occur in sensitive resource areas, the results can be catastrophic to fish and wildlife resources. The effects of smaller leaks that may cause chronic, sub-lethal effects to fish populations may be more prevalent. While the oil and gas industry has a wide variety of

methods available to detect substantial leaks or integrity breeches, the technology for detection of small "pinhole" leaks is not as advanced. This creates a significant problem in that the current available methodology may allow small leaks to go undetected for extended periods of time often evading detection until they are manifested on the surface sediments or water.

4.1.1 Species Response to the Proposed Action

Sublethal exposure of fish to contaminants can result in altered behavior and impede necessary life functions such as growth, habitat selection, competition, predator avoidance, feeding, and reproduction (Laurence 1972; Little *et al.* 1985; Brown *et al.* 1987; Lemly and Smith 1987; Little *et al.* 1993). Changes in heart and respiratory rates; gill hyperplasia; enlarged liver; reduced growth; fin erosion; impaired endocrine system; a variety of biochemical, blood, and cellular changes; and behavioral responses may also result. Behavioral and physiological changes generally occur at lower toxicant concentrations than that which cause mortality (Little and Finger 1990). Early life stages of fish are generally more sensitive to environmental contaminants than juveniles or adults (Mayer and Ellersieck 1986).

Disruption of behavioral functions can result in population declines or changes in year-class strength if enough individuals are affected (Little *et al.* 1993). Links between behavioral alterations and population level effects in the natural environment have been limited to documentation of avoidance responses. More research is needed to determine population-level responses to the effects of environmental contaminants on aquatic communities.

Fish may avoid or be attracted to certain contaminants and this response varies widely with species, habitat conditions, and chemical constituents. While avoidance may provide short-term protection by minimizing exposure, the fish are displaced from preferred habitats into less desirable or already occupied areas (Atchison *et al.* 1987). Free-ranging fish have been documented to avoid oil-contaminated water and gas-supersaturate water (Gray 1990).

Contaminant studies associated with oil and gas drilling activities have been conducted in the San Juan River to assess potential impacts to endangered fish species. Concentrations of hydrocarbons in sediments, surface water, and pore water were low; however compounds which have been found to be toxic to aquatic organisms and to have the potential for photoactivation were present. Aquatic organisms exposed to certain hydrocarbons (flouranthene, anthracene, pyrene, and chrysene) and simultaneously or subsequently exposed to sunlight or other sources of ultraviolet radiation exhibit much greater adverse effects, including deterioration of body tissues, than organisms exposed to hydrocarbons alone. In the presence of ultraviolet light, all the hydrocarbons, except chrysene, were acutely toxic to the fish in the 4 to 15 µg/l. Historical studies of hydrocarbon toxicity did not involve UV light. Increased hydrocarbon toxicity associated with photo-activation elevates concerns regarding environmental hazards of oil and gas developments (Wilson et al. 1995; Midwest Science Center 1995, unpub. rep.).

The severity of the impacts from larger spills would be dependent on the time of year, the river flows, presence of endangered fish, and the volume of the contaminant plume. Immediate effects of small leaks to fish populations would be difficult to ascertain but would likely become evident in future reproductive or growth issues.

4.2 Mexican Spotted Owl

4.2.1 Factors to be Considered

Proposed project activities can directly affect the Mexican spotted owl through auditory or visual disturbance. This disturbance can disrupt activities such as breeding, feeding, and roosting. The response of wildlife to noise disturbance is complex, being neither uniform nor consistent. Delaney *et al.* (1997) reviewed literature on the response of owls and other birds to noise and concluded the following: (1) raptors are more susceptible to disturbance-caused nest abandonment early in the nesting season; (2) birds generally flush in response to disturbance when distances to the source are less than approximately 200 feet and when sound levels are in excess of 95 dBA; and (3) the tendency to flush from a nest declines with experience or habituation to the noise, although the startle response cannot be completely eliminated by habituation.

Owls have more sensitive hearing than other birds (Bowles 1995). If noise arouses an animal, it has the potential to affect its metabolic rate by making it more active. Increased activity can, in turn, deplete energy reserves (Bowles 1995). Noisy human activity can cause raptors to expand their home ranges, but often birds return to normal use patterns when the humans are not present (Bowles 1995). Such expansions in home ranges could affect the fitness of the birds, and thus their ability to successfully reproduce and raise young. Species that are sensitive to the presence of people may be displaced permanently (Hammitt and Cole 1987; Gutzwiller 1995; Knight and Cole 1995). If animals are displaced from areas that are essential for reproduction and survival, then that population will decline. Likewise, if animals are disturbed while performing behaviors such as foraging or breeding, that population will also likely decline (Knight and Cole 1995).

The proposed action will likely impact any Mexican spotted owl in the vicinity of project related activities through visual or auditory disturbance or displacement from vehicles, heavy equipment, and humans, affecting foraging, roosting, and/or reproductive behavior. The Mexican spotted owl breeding season is from early-March when courtship begins through the end of August when owlets fledge. Birds may respond to disturbance caused by construction activities during the breeding season by abandoning their nests or young or by altering their behavior such that they are less attentive to the young. This increases the risk of young being preyed upon by disrupting feeding patterns; or by exposing young to adverse environmental stress (Knight and Cole 1995). There is also evidence that disturbance can result in lost foraging time that, in turn, may cause some raptors to leave an area or to not breed at all (Knight and Cole 1995). While applicant committed conservation measures to reduce noise on federal lands may lessen these impacts, approximately 11% of suitable Mexican spotted owl habitat within the project area occurs on private and state lands. According to the EIS, these lands would not have the same level of noise mitigation requirements and could become unsuitable for Mexican spotted owl use due to noise disturbance.

Project related activities will remove vegetation and disturb soil conditions which may remove key habitat components for nesting, foraging, roosting, or cover. Habitat alteration may also increase interspecies competition for resources. While little research has been completed in Utah, we can assume that effects will be similar to those in other states where studies have been conducted. Ganey *et al.* (1997) studied habitat use of sympatric Mexican spotted and great

horned owls in Arizona. Their study indicated activities that create large openings or reduce canopy cover below 40% favor great horned owls. Ganey *et al.* also suggested that creating open stands in habitat adjacent to Mexican spotted owl roosting and nesting areas may increase predation on Mexican spotted owl due to an increase in use of these areas by great horned owls.

Habitat alteration may also affect prey base and prey availability. Prey species may be temporarily displaced or crushed from project related vehicles and heavy equipment. This may result in changes in food or prey quality and quantity or foraging habitats in the localized vicinity of the project. Juvenile owls would be more susceptible however; adult and juvenile owls in Arizona have both been found dead of apparent starvation (Ganey and Block, unpublished data).

5. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Declines in the abundance or range of many special status species have been attributed to various human activities on federal, state, and private lands, such as human population expansion and associated infrastructure development; construction and operation of dams along major waterways; water retention, diversion, or dewatering of springs, wetlands, or streams; recreation, including off-road vehicle activity; expansion of agricultural or grazing activities, including alteration or clearing of native habitats for domestic animals or crops; and introductions of non-native plant, wildlife, or fish or other aquatic species, which can alter native habitats or out-compete or prey upon native species. Many of these activities are expected to continue on state and private lands within the range of the various federally protected wildlife, fish, and plant species, and could contribute to cumulative effects to the species within the action area of the WTPA. Species with small population sizes, endemic locations, or slow reproductive rates, or species that primarily occur on non-federal lands where landholders may not participate in recovery efforts, would generally be highly susceptible to cumulative effects.

5.1 Colorado Pikeminnow, Razorback Sucker, Bonytail, and Humpback Chub

Reasonably foreseeable future activities that may affect river-related resources in the area include oil and gas exploration and development, fire management, irrigation, urban development, recreational activities, Central Utah Project, Colorado River Salinity Control Project, and activities associated with the Upper Colorado River Endangered Fish Recovery Program. Implementation of all or any of these projects has affected and continues to affect the environment including but not limited to water quality, water rights, socioeconomic and wildlife resources.

Cumulative effects to this species would include the following types of impacts:

- Changes in land use patterns that would further fragment, modify, or destroy potential spawning sites or designated critical habitat;

- Shoreline recreational activities and encroachment of human development that would remove upland or riparian/wetland vegetation and potentially degrade water quality;
- Competition with, and predation by, exotic fish species introduced by anglers or other sources.

5.2 Mexican Spotted Owl

Mexican spotted owls occur throughout the action area, generally as year-around residents (Ganey and Block 2005). In these areas, Mexican spotted owl locations are surrounded by a checkerboard pattern of land ownership including Federal, State, and private landowners. Mexican spotted owls are susceptible to activities on State and private lands. Many of these activities, such as livestock grazing, oil and gas exploration and development, human population expansion and associated infrastructure (increased trails and roads) development, research, and recreation activities (including OHV use and any activities that increase human presence), are expected to continue on State and private lands within the Mexican spotted owl's range. Contributing as cumulative effects to the proposed action, these activities will continue to affect Mexican spotted owls' productivity with disturbances to breeding, nesting, and foraging behaviors and further fragmenting habitat of prey populations.

6. CONCLUSION

After reviewing the current status of the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the Project, as described herein, is not likely to jeopardize the continued existence of endangered fish and the proposed project is not likely to destroy or adversely modify designated critical habitat. We base our conclusions on the following:

1. No surface disturbance (i.e. drilling and pumping activities) will occur in designated critical habitat.
2. Pumping activities will not occur within the Green River.
3. An increase in sediment loading in the Green River as a result of the project would be approximately 0.011 percent
4. Applicant committed conservation measures will reduce impacts to the Colorado River fish.

We recognize that who depletes and the amount of water they deplete may vary from year to year. Consequently, water users assume the risk that the future development of senior water rights, including Tribal water rights, may result in shortages of water to junior users. Nothing in this biological opinion precludes any new depletion that results from the exercise of senior water rights within the action area.

After reviewing the current status of the Mexican spotted owl and its critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Mexican spotted owl or adversely modify or destroy critical habitat. We base our conclusion on the following:

1. Only one Mexican spotted owl was heard over multiple years of calling surveys within the Project Area. Therefore, nesting was not confirmed in the Project Area.
2. The closest known breeding pair of Mexican spotted owls is located approximately 2.85 miles southwest from the Proposed Area boundary.
3. Direct impacts to critical habitat are minimal. According to the 1997 and 2000 habitat models for Mexican spotted owl (Spotskey and Willey), the amount of suitable habitat located within designated critical habitat that will be altered by the project is approximately 0.2% and 0.3% respectively of the total suitable habitat available. This amount of alteration will not appreciably diminish the value of critical habitat for the species in the project area.
4. Applicant committed conservation measures will reduce impacts to the Mexican spotted owl if they are located in the project area.

7. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR § 17.3). Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the BLM so that they become binding conditions of any grant or permit issued to BBC for the exemption in section 7(o)(2) to apply. The BLM has a continuing duty to regulate the activity covered by this incidental take statement. If the BLM (1) fails to assume and implement the terms and conditions or (2) fails to require BBC to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, either BLM or BBC must report the progress of the action and its impact on the species to us as specified in the incidental take statement. [50 CFR § 402.14(i)(3)]

We have developed the following incidental take statement based on the premise that the applicant committed conservation measures will be implemented.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

We have developed the following incidental take statement based on the premise that the reasonable and prudent alternative and the applicant committed conservation measures will be implemented.

We anticipate that all age classes of Colorado pikeminnow, humpback chub, razorback sucker, and bonytail could be taken from within the Upper Colorado River Basin as result of this proposed action. Incidental take is expected to be in the form of harm (death or injury) due to accidental contamination from leaks/spills during project related activities of project area streams and washes that are tributaries to the Green River.

We anticipate a combined total of 10 Colorado pikeminnow, humpback chub, bonytail, or razorback sucker could be lethally taken as a result of habitat lost through contamination of backwater areas located within 0.5 river miles downstream of the confluence of project area washes and the Green River. Incidental take of actual species numbers may be difficult to detect because finding a dead or impaired specimen is unlikely.

Based on the above information, we authorize a total combined lethal take of 10 larval fish for Colorado pikeminnow, humpback chub, bonytail, and razorback sucker; take of habitat not to exceed 0.5 river miles from the confluence of project area washes and the Green River; and all take in the form of harm that would occur from the removal of 216.4 acre feet of water per year during the first 9 years with a peak depletion of 289.78 acre feet.

We anticipate that one breeding pair of Mexican spotted owls and two juveniles could be taken as result of this proposed action. The incidental take is expected to be in the form of harm and harassment through increased noise associated with construction activities, including human activity, vehicular traffic, and the use of heavy equipment; through the direct loss of potential foraging and roosting habitat; and through an increase in interspecies competition. Take is authorized for one breeding pair of Mexican spotted owl and two juveniles in the form of harm and harassment.

EFFECT OF THE TAKE

In the accompanying biological opinion, we determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Colorado pikeminnow, razorback sucker, humpback chub, bonytail, and Mexican spotted owl:

1. Conduct all proposed actions in a manner that will minimize all impacts to listed endangered fish species and their designated critical habitat
2. Conduct all proposed actions in a manner that will minimize all impacts to the Mexican spotted owl and its designated critical habitat.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, BLM and BBC must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions are assumed to include all previously listed applicant-committed environmental protection measures, but in some cases include more restrictive or more detailed measures. Conservation measures include implementing the Recovery Program (and relevant RIPRAP measures).

For Reasonable and Prudent Measure #1:

1. To ensure proper tracking of water depletions from the Upper Colorado River System, BBC will notify the BLM and/or our office as to what water resources will be used for the project as they are designated, and the amounts that will be withdrawn from each one.

2. Coordinate with our office regarding design and placement of any structures that may need to be placed in washes or 100-year floodplains of tributaries to the Green River.

3. Production facilities (e.g., well pads, tanks, pipelines, roads, etc.,) will be located outside of the channel of Nine-Mile Creek. During on-sites, production facility locations will be determined to minimize potential impacts to the environment.

4. As appropriate (i.e., if water is pumped directly Nine-Mile Creek or perennial drainages), the following measures will be applied to reduce or eliminate direct impacts to habitat for the Colorado River fish species.
    a. Where directed by the appropriate surface management agency (SMA), the operator will construct erosion control devices (e.g., riprap, bales, and heavy vegetation) at culvert outlets. All construction activities will be performed to retain natural water flows.
    b. Closed-loop drilling (see Appendix A) will be used for any wells within the 100-year floodplain for Nine-Mile Creek.

5. Appropriate erosion control and revegetation measures will be employed. In areas with unstable soils where seeding alone may not adequately control erosion, grading will be used to minimize slopes and water bars will be installed on disturbed slopes. Erosion control efforts will be monitored by the operator and necessary modifications will be made to control erosion.

For Reasonable and Prudent Measure #2:

1. As discussed via email between the BLM and our office, Mexican spotted owl surveys will be conducted according to protocol and will take place in all "fair" and "good" habitats **and** within a 0.5 mile buffer of those habitats.

2. If during Mexican spotted owl surveys a Mexican spotted owl sighting/auditory response is documented, the BLM will require a **1/2 mile** no surface occupancy around the location until further surveys confirm whether or not a protected activity center (PAC) is needed. If during Mexican spotted owl surveys a breeding pair or nest is documented, the BLM would require a temporary **1-mile** no surface occupancy around the location until a PAC is established.

MONITORING

In order to be exempt from the prohibitions of section 9 of the Act, the BLM must comply with all Recovery Program activities and the monitoring proposed below.

The implementing regulations for incidental take require that Federal agencies must report the progress of the action and its impact on the species (50 CFR 402.14(i)). To meet this mandate, the BLM will monitor and report the progress of their action as follows:

1. The BLM is required to submit to our office an annual report of water depletions associated with oil and gas development, including the following information:
    - Project name and/or applicant name
    - Permit number and/or special use authorization
    - General location and legal description
    - Depletion amount in acre-feet
    - Timing of depletion
    - Identify if new or historic depletion[1]
    - Sub-total water depletion (acre-feet) for each applicant
    - Total depletion for the entire year in acre-feet
    - Total number of APDs approved
    - Total number of wells spudded

Reports shall be due to our office on a yearly basis by October 31. The address for the Utah Fish and Wildlife Service Field Office is:

2369 West Orton Circle, Suite 50
West Valley City, Utah 84119

[1] It is important to include information on whether each depletion is new or historic (occurring prior to January 1988), because we addresses new and historic depletions differently under the new section 7 agreement of March 11, 1993. Historic depletions, regardless of size, do not pay a depletion fee.

8. REINITIATION – CLOSING STATEMENT

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation in the formulation of this biological opinion and your interest in conserving endangered species. If further assistance is needed or you have any questions, please contact Drew Crane, at (801) 975-3330 ex 124.

bcc: Project file
Reading file

Crane/cmh:6/14/2010
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