Table 1. Major water storage reservoirs, Gunnison Basin.

Reservoir	Total storage capacity (acre-feet)
Blue Mesa Reservoir	940,700
Morrow Point Reservoir	117,190
Taylor Park Reservoir	106,700
Ridgway Reservoir	94,176
Crystal Reservoir	25,240
Paonia Reservoir	20,950 (15,977 present capacity)
Crawford Reservoir	14,395
Silver Jack Reservoir	13,520
Gould Reservoir	9,000
Overland Reservoir	5,828
Fruitgrowers Reservoir	4,540 (3,576 present capacity)

Annual evaporation depletions at the Aspinall Unit averaged 8,100 acre-feet in the 2001-2005 period and 8,700 af in the 1975-1995 period. Depletions from water sales from the Aspinall Unit are less than 1,000 af annually.

2.0 DESCRIPTION OF PROPOSED ACTION

2.1 Aspinall Unit Operations

This section describes the process that Reclamation will use to implement the proposed modification of Aspinall Unit operations while maintaining other authorized purposes and assuring safe operations. The modification of the operations of the Aspinall Unit portion of the proposed action will be implemented by Reclamation following signature of a Record of Decision prepared under the National Environmental Policy Act.

RiverWare was the simulation software selected by Reclamation for use in the development of a hydrology model to be used to evaluate and compare alternatives. The Gunnison River model simulates historic hydrology from 1975 to 2005. This period of record was selected as the most complete historical dataset at the time that model analysis began. The initial conditions of the Gunnison River model were selected to be the state of the Aspinall Unit and Gunnison River system at the start of January of 1975. The Gunnison River model runs for the 31 year period between 1975 and 2005. The model runs a single trace of 31 years during this time period. The model separates annual reservoir operations into 3 time periods: January-March, April-July, and August-December. Basic daily input data to the model are: historic Blue Mesa inflows, both actual and unregulated; historic side inflows to Morrow Point and Crystal; Gunnison Tunnel diversions; and various downstream gains computed from actual gage data. Other data provided as input to the model include forecasted inflow and Gunnison Tunnel demands for each forecast period.

The model will not be used for actual operations. Operations of the Aspinall Unit will be based upon forecasted inflow volume to Blue Mesa Reservoir as well as other factors such as storage levels, physical capabilities of the facilities, and flood control to determine the magnitude, duration, and timing of releases. The spring inflow is highly

variable and dependent on the previous winter's snowpack. For example, between 1975 and 2005 the April-July Blue Mesa inflow ranged between 166,700 af in 1977 and 1,434,000 af in 1984. Because of this, the operating plan will vary from year to year based on the forecasted inflow to Blue Mesa Reservoir.

In terms of downstream endangered fish, the new operation plan has four basic goals:

- Attempting to meet spring peak targets as outlined in the Flow Recommendations;
- Attempting to meet minimum duration targets for half bankfull discharge and bankfull discharges pursuant to the Flow Recommendations;
- Attempting to meet targets for base flows as outlined in the Flow Recommendations; and
- Attempting to meet fish ladder, fish screen, and migration flows at and below the Redlands Water and Power Diversion Dam (Redlands Diversion).

2.1.1 Flow Recommendations

Flow Recommendations (McAda 2003) can be found at
http://www.usbr.gov/uc/wcao/rm/aspeis/pdfs/GunnCoFlowRec.pdf

Flow Recommendations for the Gunnison and mainstem Colorado rivers were published by the Recovery Program (McAda 2003) and recommend flows designed to create and maintain habitat conditions that the four endangered fish species require for all aspects of their life history. Flow Recommendations were developed during conditions including the existence and operation of the Aspinall Unit. In general, the recommendations concentrate on a more natural hydrograph with high spring peak flows and moderate base flows; the flow recommendations vary from year to year based on snowpack and forecasted spring runoff. The flow "targets" in the recommendations are measured at the U.S.G.S. gaging station at Whitewater on the Lower Gunnison River. In addition, recommendations for the Colorado River are targeted at the U.S.G.S. Colorado-Utah stateline gaging station. Flow Recommendations are summarized in Attachment 2.

While habitat needs of the endangered fish vary between species, spring peak flows benefit all the species by accomplishing several physical goals in addition to providing cues for migration and spawning:

- Maintain complex in-channel habitats
- Provide access to floodplains
- Minimize vegetation encroachment, channel narrowing, and vertical accretion, thus protecting side-channel habitats
- Form low-velocity habitats for staging, feeding, and resting during runoff
- Inundate and maintain connections to floodplains and off-channel habitat to provide warmer water food-rich conditions for larval and adult fish
- Provide clean spawning substrates and adequate interstitial spaces for periphyton and aquatic invertebrates

Overall, the priority in the Flow Recommendations is peak flows in the spring. Also included are relatively high base flows in wet years and relatively lower base flows in drier years. Flow Recommendation targets are based on meeting half bankfull and bankfull discharges to reach or exceed thresholds for sediment movement with higher instantaneous peaks in some years.

Pitlick et al. (1999) summarized the importance of spring flows in moving sediment:

> The single most important thing that can be done to maintain habitats used by the endangered fishes is to assure that the sediment supplied to the critical reaches continues to be carried downstream. Sediment that is not carried through will accumulate preferentially in low velocity areas, resulting in further channel simplification and narrowing.

Pitlick et al. (1999) also provided specific flow targets based on Gunnison River field studies:

> Flows equal to or greater than one-half the bankfull discharge are needed to mobilize gravel and cobble particles on a widespread basis and to prevent fine sediment from accumulating in the bed…Flows greater than one-half the bankfull discharge thus provide several important geomorphic functions, assuming they occur with sufficient regularity. Flows equal to bankfull discharge are also important because they fully mobilize the bed and thereby maintain the existing bankfull hydraulic geometry.

As discussed in Section 3.2, the median value for half bankfull flows is 8,070 cfs and the half bankfull flow range is 4,660 to 12,700 cfs as determined from 54 different cross sections along the Gunnison River in critical habitat. The median value for bankfull flows is 14,350 cfs with a range of 7,352 to 28,000 cfs. Corresponding median values for the Colorado River at the Colorado-Utah stateline are 18,500 cfs and 35,000 cfs.

Fish and Wildlife Service (2004) referred to several studies in the Upper Colorado Basin that indicated a relationship of strong year classes of pikeminnow with hydrologic conditions that included a spring and summer of moderately high flows following a year of exceptionally high flows.

Bottomland or floodplain habitats provide important habitat to several life stages of endangered fish. Irving and Burdick (1995) studied bottomlands on the Gunnison River. In 1993, 48 bottomland sites were identified on the Gunnison River with a total potential area of 3,227 acres. Of this total, approximately 828 acres were inundated at spring flows (of approximately 14,000 cfs) and 161 acres at lower fall flows (approximately 2,400 cfs). Limited inundation of floodplains began around 5,000 - 6,000 cfs; however, significant acreage inundation did not occur until flows reached 10,000-15,000 cfs. Bottomlands included terraces, depressions, gravel pits, oxbows, side channels, and canyon mouths.

The majority of the floodplain habitat within critical habitat in the Gunnison River is located between Delta and the confluence with Roubideau Creek-- Johnson Boys' slough, Escalante State Wildlife Area (SWA), Confluence Park, Morgan, and Fedler (Valdez and Nelson 2006). The greatest potential for flooded habitat occurs at the Escalante SWA (RM 50-52) where the greatest relative gain in flooded habitat occurs as flows increase to 10,000 cfs. McAda and Fenton (1998) evaluated available habitat in Escalante SWA in relation to flow and determined that little relative gain occurs between 981 and 5,560 cfs, but substantial increases occur between 5,560 and 13,300 cfs and diminish again at higher levels. The Johnson Boy's slough (RM 52-54) is another important site. Further downstream, the river enters a valley in the Whitewater area where railroad construction and other developments have restrained the river in the main channel since the late 19th century. A few sites are located close to the Colorado River confluence-for example the Craig site that has been acquired and improved by the Recovery Program. Water begins to enter the Craig site as flows reach 4,500 to 5,000 cfs.

Among Gunnison River floodplain habitats, the Recovery Program prioritized the Johnson Boy's slough and Escalante SWA as #2 and #8 among 26 potential sites in the entire Upper Colorado River basin (Valdez and Nelson 2006). Prioritizations were based on location, size, connectivity and land ownership. In the Colorado River below the Gunnison River confluence, nineteen sites were identified. Of these, Walter Walker SWA was ranked #1 in the entire Upper Colorado River basin, and the Panorama site was ranked #6 overall.

To incorporate natural variation in the river system, flow recommendations were developed for six hydrological categories based on April-July runoff volumes. An indication of the variability of water availability in the Gunnison River is the range of April-July runoff volume at Whitewater – 281,000 af in 1977 and 3,147,000 af in 1984. The six hydrological categories are:

- Wet years: April-July runoff volume has been equaled or exceeded 10% of the time during the study period.
- Moderately wet years: April-July runoff volume has been equaled or exceeded 10-30% of the time during the study period.
- Average wet years: April-July runoff volume has been equaled or exceeded 30-50% of the time during the study period.
- Average dry years: April-July runoff volume has been equaled or exceeded 50-70% of the time during the study period.
- Moderately dry years: April-July runoff volume has been equaled or exceeded 70-90% of the time during the study period.
- Dry years: April-July runoff volume has been equaled or exceeded 90% of the time during the study period.

Water inflow to Blue Mesa Reservoir for the six categories was estimated by McAda (2003) based on 1937-1997 data:

- Wet years: inflow of 1,123,000 af or greater

- Moderately wet years: inflow between 871,000 af and 1,123,000 af
- Average wet years: inflow between 709,000 af and 871,000 af
- Average dry years: inflow between 561,000 af and 709,000 af
- Moderately dry years: inflow between 381,000 af and 561,000 af
- Dry years: inflow less than 381,000 af

The Flow Recommendations adopted Pitlick's analysis that to maintain habitat conditions in the Gunnison and Colorado rivers, half bankfull and bankfull flows should occur with a long-term average duration equal to what occurred during 1978-1997 and that to improve habitat, the threshold flows should occur with a long-term average equal to what occurred during 1993-1997. "Pitlick et al.'s (1999) recommendation to maintain habitat conditions would mean that over the long term flows should exceed 8,070 cfs for an average of 20 days per year and flows should exceed 14,350 cfs for an average of 4 days per year. Their recommendation to improve habitat conditions requires that, over the long term, flows should exceed 8,070 cfs for an average of 32 days per year and flows should exceed 14,350 cfs for an average of 7 days per year" (McAda, 2003). While target durations are based on geomorphology studies, durations of higher flows are also important for maintaining use of floodplain and backwater habitats.

Table 2 presents one of the possible scenarios by which flow recommendations for the Gunnison River could be derived from Pitlick's work (McAda 2003).

Table 2. Peak flow recommendations for the Gunnison River-number of days per years the flows should exceed half bankfull and bankfull.

Hydrologic Category	Expected Occurrence	Flow Target and Duration		Instantaneous Peak Flows cfs
		Days/Year Greater or equal To 8,070 cfs*	Days/Year Greater or equal to 14,350 cfs*	
Wet	10%	60-100	15-25	15-23,000
Moderately Wet	20%	40-60	10-20	14,350-16,000
Average Wet	20%	20-25	2-3	=/> 14,350
Average Dry	20%	10-15	0-0	=/> 8,070
Moderately Dry	20%	0-10	0-0	=/> 2,600
Dry	10%	0-0	0-0	~ 900-4,000
Long Term Weighted Average		20-maintenance 32-improvement	4-maintenance 7-improvement	

*Lower value in each range is for maintenance, higher value in each range is for improvement

Peak flows in the Gunnison River are recommended to occur between May 15 and June 15 and should be managed, to the extent possible, by matching peak flows in the North Fork of the Gunnison with peak releases from the Aspinall Unit.

Peak flow recommendations were developed in a similar manner for the Colorado River measured at the Colorado-Utah stateline (see Attachment 2 and McAda 2003).

A minimum base flow for the Gunnison River (as measured at Whitewater gage) of at least 1,050 cfs is recommended in all but moderately dry and dry years in order to protect quiet water habitats for the fish and provide migration flows below the Redlands Fish Ladder. Included would be flows of 100 cfs to operate the fish ladder. It has been recommended that the ladder be operated from April 1 through September 15 (Burdick 2001). During dry and moderately dry years, flow recommendations provide for flows decreasing below 1,050 cfs after the Colorado pikeminnow migration period. During wetter periods, base flow recommendations are higher.

The Flow Recommendations recognize uncertainties (Section 6.7) in understanding the biology of the fishes and the response of the fish and their habitat to flow changes. For that reason, the recommendations call for using adaptive management to respond to new knowledge and using monitoring to evaluate the physical response of the habitat and biological response of the fish to the flow regimes.

In summary, the Flow Recommendations call for peak flows to periodically prepare cobble and gravel spawning areas, to connect backwaters, and to maintain channel diversity; and sufficient flows to cue and allow migration. Base flows that promote growth and survival of young fish during summer, autumn, and winter are also provided.

2.2.2 Planned Operations

The plan modifies operations where Reclamation has discretion to do so. There are elements of existing operations that are non-discretionary and are not changed. These non-discretionary operations are based on legal authorities, existing water rights, structural limitations, structural safety consideration, flood control rules, and existing water service contracts. Attachment 3 contains more information on discretionary and non-discretionary operations.

Pursuant to the proposed operating regime, Reclamation will attempt to meet the desired spring peak, minimum duration, and base flow targets at Whitewater and below the Redlands Diversion.

The new operation plan makes releases that attempt to meet a spring peak target at the Whitewater gage at the time the North Fork of Gunnison River is near its peak (generally May 15 to May 31). Peak targets at Whitewater are based on the May 1 or May 15 “April through July forecast” of Blue Mesa unregulated inflow. The forecast is provided by the National Weather Service through the Colorado Basin River Forecast Center starting in January and is updated twice per month until the end of July.

Attachments 8 and 9 and Section 6.0 of this report summarize modeled results of the proposed action.

Operations are described on a seasonal basis:

- **January-March:**

Water would be released based upon the most recent April-July inflow forecast and downstream water demands with the goal of achieving a March 31st Blue Mesa Reservoir content target (determined from the January, February, and March 1st forecasted April-July Blue Mesa inflow) and with a goal of higher releases during January for power purposes. The March 31st target is intended to optimize Aspinall Unit operations for storage, flood control, and hydropower production.

The proposed action sets a minimum downstream release for instream flow, generally 300 cfs, but can be higher based on the previous year's operations that consider factors such as the fall brown trout spawn or downstream senior water rights. Maximum releases are limited to the 2,150 cfs Crystal powerplant capacity in most years. Generally the above release patterns would meet downstream base flow needs for endangered fish; if not, releases will be adjusted accordingly. Crystal releases will reregulate peaking releases from Morrow Point throughout the year to produce stable downstream flows.

- **April-July :**

Reclamation will not bypass the powerplant at Crystal Dam from April 1 through May 10, thus making more water available for a spring peak and/or duration flows (however, in order to reduce flooding risk, Reclamation may bypass the powerplant during this time period if Blue Mesa's forecasted inflow indicates that the Year Type is in a "Wet" category). This has the effect of holding water for 40 days that may have been bypassed unnecessarily if the runoff was over-forecasted that year. In addition to making water available for peak releases it also may improve the chance of filling Blue Mesa, with a slight risk of increasing flood frequency at Delta.

Peak releases will generally be made after May 10th and before June 1st in an attempt to match the peak from the North Fork in order to maximize the potential of meeting the desired peak at Whitewater. However, this timeframe could be altered to May 1-June 15 if appropriate for endangered species and other resource concerns. Crystal releases, and releases from Morrow Point and Blue Mesa as needed, would begin to be ramped up approximately 5 days prior to the predicted North Fork peak. Releases may be reduced in an attempt to reduce flooding if the Gunnison River at Delta approaches 14,000 cfs.

The magnitude of the desired peak at Whitewater is determined based on the "Year Type" category, as defined in the Flow Recommendations, in conjunction with the most recent forecast information as shown in Figure 1 and Table 3. Releases will be made from the Aspinall Unit using the necessary combination of available powerplants, bypasses and spillways, while attempting to reach the spring peak target. Reclamation's ability to meet a desired peak is limited by the physical constraints/availability of the Aspinall Unit outlet features in some years. For example, Blue Mesa water elevation may not be high enough to use its spillway.

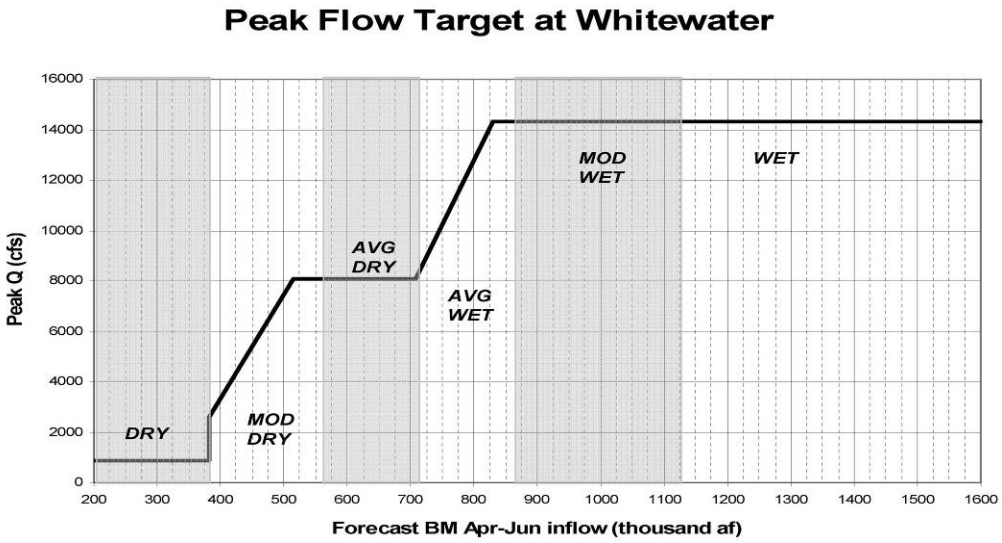

Figure 1. Determination of peak flow target

Table 3. Spring peak and duration targets for range of forecasted inflow.

Blue Mesa Forecasted Inflow	Peak Target @Whitewater	Duration of Half Bank (8,070 cfs)	Duration of Bankfull (14,350 cfs)
Acre-feet	cfs	Days	Days
< 381,000	900	0	0
381,000 to 516,000	2,600 to 8,070	0	0
516,001 to 709,000	8,070	10	0
709,001 to 831,000	8,070 to 14,350	20	2
831,001 to 1,123,000	14,350	40	10
> 1,123,001	14,350	60	15

After a peak flow release is made, high releases may continue in an attempt to maintain flows at half bankfull or bankfull levels. Releases for duration of higher flows in conjunction with the desired peak at Whitewater will be made if it is possible to reach 90 percent of the desired peak. The length of duration of flows is dependent on the "Year Type" category in the Flow Recommendations (see Tables 2 and 3). Minimum duration is targeted and may be exceeded at times.

- **August-December:**

Releases will be set utilizing the most recent forecast of August through December inflow and downstream senior water demands, with the goal of having Blue Mesa Reservoir at or below an elevation of 7,490 feet (580,000 af of live storage) by December 31st to minimize upstream icing. The minimum release criteria of 300 cfs for

downstream resources will still apply, in addition to existing downstream senior water right demands (meaning that Blue Mesa will not store that portion of water needed to satisfy downstream senior water rights).

- **Ramping**

Ramping guidelines for release changes under the proposed action are as follows:

-Daily ramping rates on the ascending limb will be the maximum of 500 cfs or 25% of flow in Black Canyon on the previous day. Ramping can be accomplished with more than one change per day.
-Daily ramping rates guidelines for the descending limb will be the maximum of 400 cfs or 15% of flow in the Black Canyon on the previous day. Ramping can be accomplished with more than one change per day.
-Ramping up will begin 5 days prior to the estimated peak flow date on the North Fork Gunnison River.

- **Base flows**

Base flows are provided under the proposed action and can vary under different hydrologic conditions. Additional releases to maintain minimum base flows at Whitewater will be set each year based on discussions with the Service. In most years, a base flow of 1,050 cfs will be maintained at the Whitewater gage; however, this target will be reduced in dry or moderately dry years.

Table 4 summarizes base flow targets as outlined in the Flow Recommendations. As footnoted, additional releases will be made to provide 100 cfs to the Redlands Fish Ladder as needed in April through September and 40 cfs for the Redlands Fish Screen from March through November, using storage water if necessary. Base flows would normally provide adequate migration flows downstream from the Redlands Diversion.

Table 4. Base flow targets (cfs) at Whitewater Gage under the proposed action.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1050	1050	1050	1050	1050	1500	1500	1500	1050	1050	1050	1050
Mod Wet	1050	1050	1050	1050	1050	1500	1500	1500	1050	1050	1050	1050
Avg Wet	1050	1050	1050	1050	1050	1500	1500	1050	1050	1050	1050	1050
Avg Dry	1050	1050	1050	1050	1050	1500	1500	1050	1050	1050	1050	1050
Mod Dry*	750	750	750/790	750/890	750/890	1050	1050	1050	750/890	750/790	750	750
Dry*	750	750	750/790	750/890	750/890	1050	1050	750/890	750/890	750/790	750/790	750

* During March through November in Moderately Dry and Dry type years, additional releases will be made as necessary to provide flows, above the 750 cfs anticipated to be diverted by the Redlands Water and Power Company, for the fish ladder and fish screen as shown.

- **General**

Attachment 11 summarizes many of the general guidelines for operations that will continue under the proposed action.

2.2 Adaptive Management

Adaptive management is a systematic approach for improving resource management by learning from management outcomes. Adaptive management promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become understood. Essentially, the long-term responses of endangered fish to new operations and other Recovery Program actions are uncertain and future monitoring will be needed to make adjustments in implementing operations and the overall Recovery Program.

Uncertainties of endangered fish response to management actions exist throughout the Recovery Program and adaptive management principles are integral to addressing them. The Recovery Program acts both as a scientific clearing house on the technical side of adaptive management and as a vehicle for agencies (such as the state of Colorado, Western Area Power Administration, Reclamation, the Service, and others) to identify and coordinate research and monitoring in the presence of other stakeholders.

There are uncertainties related to the response of endangered fish populations and critical habitat to the flow modifications proposed under the preferred alternative for Aspinall Unit reoperation. For that reason, the Flow Recommendations Report (McAda 2003) suggested using adaptive management principles, including monitoring responses of fish and their habitat to the new flow regime, to address uncertainties.

Uncertainties identified in the Flow Recommendations Report by McAda (2003) include:

- Determination of the amount and location of floodplain habitat necessary for recovery of species.
- Determination of relationship of reproductive success of pikeminnow and humpback chub to increased spring flows. Effect of new flow regime on non-native fishes that adversely affect native fish.
- Determination of the frequency (recurrence interval) and duration (number of days) that flows need to exceed half bankfull and bankfull discharge to maintain habitats required by the endangered fishes.
- Determination of response of primary and secondary production in the rivers to new flow regime.
- Consideration of the trade-off between high spring flows and base flows needed during the mid-to late summer.

Other uncertainties include whether elevated selenium concentrations and other water quality elements affect the recovery of the endangered fish in the Gunnison and other basin rivers. As discussed in Section 3.4.3 of this PBA, the effect of selenium levels on

fish recovery in the Gunnison and Colorado rivers is not clear. Long-term trends in selenium concentrations have not been determined. Clarifying these effects is a necessary first step in addressing these uncertainties.

Reclamation and the Service will work together and with the Recovery Program to develop study plans to evaluate endangered fish populations and their habitat and their response to the new flow regime. This coordination will occur within one year of the finalization of the biological opinion and Record of Decision on the reoperation. Reclamation and the Service will also work through the Recovery Program to implement the study plans**.** This would include (1) identifying appropriate monitoring and research to evaluate effects of Aspinall reoperation and (2) including these activities in the Recovery Program's RIPRAP as necessary to identify the potential for modifying or refining flows from the Aspinall Unit. These plans may include research-driven requests for flows to answer questions identified in the study plan.

New information developed by the Recovery Program from these activities will be presented to Reclamation to determine operational flexibility available to address the new information. It is expected that any refinements in operation of the Aspinall Unit would be within the scope of the current proposed action and that implementation of refinements would occur with appropriate Section 7 consultation as necessary.

2.3 Extreme Conditions, Maintenance, and Emergencies

Flow recommendations address dry years by basing peak flow and duration targets on annual inflow conditions. Also in severe drought years such as 1977 and 2002 no special peak releases are targeted for endangered fish. Dry year peaks are only 900 cfs. Severe droughts, with anticipated shortages to Aspinall Unit water uses, will be responded to through shortage sharing. Operational changes could include temporary modifications to normal operations of the reservoir and potential short-term modifications in the target flows in the proposed operation. In periods of extreme, multi-year droughts, releases from the Aspinall Unit may have to be reduced to match the inflow to the reservoir during part of the year.

The proposed action would include certain specific drought rules:

- In Wet, Moderately Wet, and Average Wet years following a Dry year in which the previous December 31 Blue Mesa content was less than 522,300 af and if March 31 content is less than 400,000 af, half bankfull targets are reduced to the next lower category.
- During Dry and Moderately Dry years, if Blue Mesa content drops below 600,000 af, Whitewater base flow target is reduced from 1,050 cfs to 900 cfs until Blue Mesa content exceeds 600,000 af.
- If a Moderately Dry year follows a Dry or Moderately Dry year, decrease peak target to 5,000 cfs if Blue Mesa content is less than 400,000 af on March 31 or April 30.

Operations at the Aspinall Unit may be modified due to special maintenance or replacement needs which may limit outlet capacities or require special downstream flows for repairs and inspections. Special flows may also be needed at some time in the future for repairs or replacement of the Gunnison Tunnel Diversion Dam, located a short distance downstream from Crystal Dam.

Emergencies are not predictable but may be associated with dam safety, personal safety of individuals or groups associated with recreation or other activities on the river, power system conditions, or releases of oil, hazardous substances, pollutants, or contaminants. Emergencies associated with dam safety could include unforeseen high or low releases or operations to protect dam structures. Emergencies with the safety of individuals may be associated with river rescue or recovery operations. Power emergencies could include insufficient short-term generation capacity, transmission maintenance, and other factors. Emergency operations are typically of short durations as a result of emergencies occurring at the dam or within the transmission network. In the case of emergencies, Reclamation will immediately address the problem and then comply with 50 CFR Section 402.05 emergency procedures.

2.4 Coordination of Operations

Reclamation will continue to conduct Aspinall Unit operations meetings 3 times per year. The purpose of operation meetings-- held in January, April, and August-- is to share information between Reclamation and Aspinall stakeholders regarding issues in the Gunnison Basin related to the operation of the Aspinall Unit. The meetings are used to coordinate activities among agencies, water users, and other interested parties concerning the Gunnison River. Reclamation considers the information exchange at these meetings in preparing operation plans for the Unit. The projected operation of the Aspinall Unit is used by Reclamation in the development of the overall 24-month Study, a comprehensive planning model for the operation of Reclamation projects in the Upper and Lower Colorado River Basins, and includes operating plans for Glen Canyon, Flaming Gorge, and Navajo Units, as well as the Aspinall Unit. Operation of the Aspinall Unit considers projected hydrologic factors, authorized unit purposes, existing water rights, target elevations for reservoirs, implementing the preferred alternative for endangered fish, and other factors.

Reclamation will communicate with appropriate agencies and organizations prior to scheduled operation meetings or as needed to gather information useful in developing proposed operation plans to be presented at operation meetings.

2.5 Other Elements of the Action

The proposed action includes the continuation of the operation of other Reclamation Projects in the Gunnison Basin as listed in Section 1.3. Operation of these projects would continue by water districts or associations under contract with Reclamation.

In addition, private, local, and state water projects and uses in the Gunnison Basin would continue. As with the Aspinall Unit, construction and past operations of facilities for these water uses is part of the environmental baseline and non-discretionary.

It is estimated that depletions from the Gunnison River above the Whitewater gage averaged 428,348 af over the 1975-2005 period (Reclamation 2008). Approximately 95% of these depletions result from irrigation and 5% from domestic and industrial water use and reservoir evaporation.

In this assessment, new depletions of 3,500 af, primarily in the North Fork Basin, are also addressed along with full development of the Dallas Creek Project (17,200 af) and use of 30,800 af of subordination water in the Upper Gunnison Basin. The new depletions of 3,500 af are not specifically identified but will most likely be related to residential development in the basin. Additional information on other water uses is found in Section 3.3.

In total, depletions under the proposed action would range in the 450,000-500,000 af. Table 5 summarizes the depletions under the proposed action.

Table 5. Estimated average annual depletions in the environmental baseline.

Project	Estimated average annual depletion (af)
Aspinall Unit	10,000
Uncompahgre Project	155,000
Dallas Creek Project	17,200
Paonia Project	10,000
Smith Fork Project	6,000
Bostwick Park Project	4,000
Fruitgrowers Project	4,100
Other water uses	210,000-260,000
Dolores Project	99,200*
Upper Gunnison Subordination	30,800 (maximum rather than average depletion)
Total for Gunnison Basin (excludes Redlands)	450-500,000 af

*The original Dolores Project ESA consultation addressed a 131,000 af depletion. Updated information indicates actual depletions are approximately 99,200 af. For ESA purposes, return flows to the San Juan Basin were considered depletions.

2.6 Conservation Measures

In addition to re-operating the Aspinall Unit, Reclamation will continue to support the Recovery Program and will continue to support efforts to improve water quality in the Gunnison River and downstream.

Public Law 106-392 authorizes the Bureau of Reclamation to provide up to $6 million per year (adjusted for inflation) of CRSP power revenues to partially meet the base funding needs of the Recovery Program and the San Juan River Recovery Program. Additional funding is provided by the participating States and the Service. Base funding provides for operation and maintenance of capital projects, implementation of recovery actions other than capital projects, monitoring and research to evaluate the need for or effectiveness of recovery actions, and program management to carry out the Programs. Reclamation will continue to support these activities as authorized by P.L. 106-392 as amended as well as subsequent legislation.

Adaptive management (Section 2.2) is considered a conservation measure and will allow flexibility in operations to respond to new information on the species.

A Selenium Management Program will also be developed that addresses potential selenium impacts on endangered fish species in the Gunnison and Colorado rivers (see Section 3.4.3 for potential effects). The Selenium Management Program will incorporate and continue ongoing selenium reduction efforts in the Uncompahgre Valley and other areas of the Gunnison Basin and will add several new elements to ensure the future effectiveness of the program. The overall long-term goal of the program is to assist in species recovery per the Recovery Goals. Elements of the Selenium Management Program include:

- Accelerated implementation of salinity/selenium control projects for irrigated agriculture
- Reduction of other non-point source selenium loading
- Technology development
- Water quality monitoring
- Monitoring of endangered fish populations
- Coordination with lower Gunnison River Basin watershed management plan
- Regulatory support
- Public information and education
- Adaptive management
- Institutional support

A final Selenium Management Program, including timeframes and goals, will be developed within 18 months of issuance of the programmatic biological opinion. This timeframe allows monitoring data and other information collected in the first year to be used to refine the plan. During this period, ongoing projects that reduce selenium will continue.

Reclamation's vision for the program involves a cooperative effort with the substantial involvement of stakeholders. Reclamation will request annual Federal funding subject to appropriations (in addition to existing Salinity Control Program funding under the Colorado River Basin Salinity Control Project [CRBSCP] Act). Keys to success are the support and participation of basin water users for selenium reduction measures and

improved management of water and land resources. With limited Federal budgets, local support and participation are critical elements to achieving success.

The development of the Selenium Management Program will focus on the lower Gunnison River and will pay particular attention to the Uncompahgre Valley. The Selenium Management Program will involve the established Selenium Task Force participants, federal agencies, water users, and state, county, and local government agencies. Because the Program will involve many interests and parties, formal documentation and funding mechanisms will be developed over the 18 month period following issuance of the programmatic biological opinion by the Service. Implementation will begin immediately with completion of the programmatic biological opinion, and implementation of all aspects of the Selenium Management Program not already underway will begin within 5 years of issuance of the opinion for the Gunnison River Basin in accordance with a Long Range Plan to be prepared.

The Selenium Management Program Long Range Plan will include identification of specific cost effective selenium reduction measures, high priority implementation locations, implementation schedule, benchmarks, responsible entities, monitoring needs, and coordination with ongoing Recovery Program activities. The Selenium Management Program will define funding and other resources needed for implementation, including commitments by Reclamation, the State of Colorado, water users, local governments and other parties. The Long Range Plan will be formatted similar to the Recovery Program's Recovery Action Plan and will be updated annually. Progress in implementing the Long Range Plan will serve as the benchmark for evaluating progress in implementing the Selenium Management Program.

Implementation of a Selenium Management Program in the Lower Gunnison River basin will be based on the best available information that focuses actions toward the recovery of razorback sucker and Colorado pikeminnow. Initially, this means that efforts will be made to reduce selenium loading in a timeframe complimentary to Recovery Goal timelines for razorback sucker and Colorado pikeminnow.

The ultimate objective of this Program is to meet the Recovery Goals for razorback sucker and Colorado pikeminnow (2002; currently being updated by the FWS); thus, additional selenium reduction efforts may continue and expand per the Program timelines. Once self-sustaining, recovered populations per the Recovery Goals have been attained, further selenium reduction efforts could be discontinued as long as new agreements are developed to maintain the selenium remediation measures that had contributed to the recovery of the subject species.

The Selenium Management Program will include the elements described below:

A. Accelerated Implementation of Salinity/Selenium Control Projects for Irrigated Agriculture: The salinity/selenium control projects implemented to date are described in Section 3.4.3. Future implementation is described below.

It is anticipated that the majority of reductions in selenium loading will be accomplished via the CRBSCP, NRCS Environmental Quality Incentives Program (EQIP) and grant-funded Task Force activities. Continuing implementation of CRBSCP projects is dependent on a competitive selection process. Uncompahgre Project proposals in the area of most concern are expected to remain cost competitive; however, more costly projects may require supplemental funding.

In the past, supplemental funding for Uncompahgre Project irrigation system improvement proposals was provided by the National Irrigation Water Quality Program (NIWQP), Congressional "write-ins" for selenium control, and EPA Section 319 funding. As shown in Table 5 in Section 3.4.3, supplemental funding provided about $1 for every $2 from the CRBSCP for initial irrigation system improvements (Phases 1-4). Although this amount of supplemental funding has traditionally been required to make Uncompahgre Project lateral piping projects more competitive under CRBSCP, the Program's current competitive cost range is increasing and recent Uncompahgre Project proposals have been found to be cost effective absent supplemental funding.

In the future, supplemental funding to augment CRBSCP funding for the more costly canal lining and pipe replacement of large laterals will be provided by Reclamation, subject to appropriations, and may be further complimented by state funds and various grant funding opportunities. Reclamation will seek supplemental funding (subject to appropriation) to assist in implementing all facets of the Selenium Management Program. Portions of this funding will be used to implement agriculture-related projects as well as the other activities as described in items B through J below.

Three phases of salinity/selenium control projects have been implemented or are underway in the Uncompahgre Valley. The recently funded Phase 4 includes an additional 11.4 miles of lateral lining in high priority selenium reduction areas, bringing the total length of laterals completed or under contract to 51 miles. This phase is presently scheduled to be completed by 2012. Approximately $2.8 million will be available for implementation of Phase 4, $2 million from the Salinity Control Program and $800,000 from the Environmental Protection Agency's (EPA) 319 grant program. Phase 4 is expected to reduce salinity loading by 3,650 tons/years and selenium loading by 70 to 360 pounds/year.

It is anticipated that the development of the Selenium Management Program will include advanced planning to outline future CRBSCP proposals involving larger scale lateral piping and possibly canal lining projects in the Uncompahgre Valley that should provide more rapid selenium loading reductions to the lower Gunnison River. With approximately $2 million/year (in current dollars) for lateral piping, Uncompahgre Project managers estimate that they could install approximately 10 miles of laterals each year on the east side of the Uncompahgre Valley. This commitment, subject to appropriations, exceeds current average construction rate of 5 miles/year. With more dependable funding, equipment could be purchased and a crew could be working year around on installation of pipe. Given sufficient resources, it is estimated that all remaining laterals and small canals in the planned East Side (of Uncompahgre Valley)

Laterals Project could be piped in approximately 15 years or by 2024 if the biological opinion is completed in 2009. This additional 151 miles of pipeline will reduce salt loading by approximately 50,000 tons/year and selenium loading by 1,000 to 5,000 pounds/year at a total cost of $35 to $40 million (in current dollars). Canal lining in the highest selenium loading sub-basins will also be investigated in the development of the Selenium Management Program. Lining a major delivery canal such as the Selig Canal through the Loutzenhizer Arroyo drainage could be expected to reduce salinity loading by an additional 400 to 500 tons/mile/year and associated selenium loading by an additional 10 to 50 pounds/mile/year.

Other Lower Gunnison basin salinity/selenium projects, outside the Uncompahgre Project service area will be incorporated into the Selenium Management Program if determined to be viable and necessary.

In addition to increasing water delivery system efficiency by piping laterals and lining of canals, future salinity/selenium control measures will focus on a) increasing near-farm water delivery system efficiency by installing pipelines, b) increasing on-farm irrigation efficiency by installing high efficiency systems such as sprinkler and drip systems and c) encouraging other more efficient irrigation practices and measures to reduce deep percolation of water that results in reductions of selenium loading to the lower Gunnison River. This component will be accomplished via the NRCS EQIP and the recently created Basin States Salinity Control Program.

Reclamation will work with water providers, conservation districts and NRCS to promote on-farm salinity control projects to reduce seepage losses and deep percolation from irrigation practices in areas with known high selenium loading rates. To the extent possible, Reclamation will work with NRCS to prioritize the funding of EQIP projects in high selenium loading areas of the basin. Such targeted efforts have been documented to result in more cost effective non-point source control proposals by controlling ‘two contaminates for the price of one’. Utilizing this approach may further improve Lower Gunnison projects cost effectiveness under the CRBSCP.

Reclamation will support funding from any source that might accelerate selenium control efforts, consistent with applicable federal, state and local laws.

B. Reduction of Non-Point Source Selenium Loading from Developing Areas: To accelerate efforts to reduce selenium loading from urbanizing areas, Federal and State agencies and basin water users will enhance their level of participation in the Task Force. Reclamation and others will provide additional technical, financial, and administrative assistance so that the Task Force can achieve the following:

- identify and encourage implementation of Best Management Practices to minimize selenium loading to the lower Gunnison River associated with urban and suburban development activities;
- discourage the construction of unlined ponds and/or water features in pervious selenium rich soils;

- work with local governments, responsible for land use planning, to minimize new selenium loading by avoiding housing and industrial developments which utilize leach fields or outdoor irrigation in areas with high selenium loading potential, such as previously unirrigated lands;
- support local government requirements to convert irrigation delivery systems from open channel to piped systems in urbanizing areas;
- support local government implementation of development codes which encourage native landscaping, limit irrigated landscape areas, and/or require efficient landscape irrigation systems on selenium rich lands;
- increase educational programs for better understanding of selenium issues and acceptance of appropriate solutions; and
- support general water conservation programs for all outdoor water uses (lawns, golf courses, septic systems, etc.), including public education efforts to promote more efficient water use and minimization of deep percolation.

C. Technology Development: Reclamation will utilize its Science and Technology Program, to the extent possible, to explore new technologies for reducing selenium loading and/or remediating drainage water with elevated selenium concentrations. The technologies to be reviewed for feasibility include development of approved flocculating agents that can potentially be extremely cost effective and can be implemented quickly to reduce seepage and selenium loading, bioreactors, and other technologies to cost effectively treat selenium-rich waters.

D. Water Quality Monitoring: Federal, state and local entities will partner to monitor selenium concentrations in the lower Gunnison River and its tributaries in order to better understand selenium loading mechanisms, quantify selenium loading reductions and establish selenium loading trends over time.

Although, selenium concentrations in the lower Gunnison Basin have been monitored for years, current water quality monitoring for selenium on a regular basis is occurring only at two stations: Uncompahgre River at Delta (Colorado Department of Public Health and Environment, quarterly sampling) and Gunnison River near Grand Junction (USGS and Colorado Department of Public Health and Environment). Water quality monitoring for selenium has previously occurred at Gunnison River at Delta, Gunnison River below the Gunnison Tunnel, Uncompahgre River at Colona, and North Fork of the Gunnison River near Somerset.

The Colorado River Water Conservation District is working on a proposal to expand selenium and flow monitoring by installing real-time specific conductance monitors and gage stations to help define relationships between selenium and total dissolved solids. Proposed monitoring includes samples for major ions and dissolved selenium, as well as flow. The sites under discussion include:

- Gunnison River below Gunnison Tunnel (above selenium loading areas)
- North Fork of the Gunnison River at its mouth
- Gunnison River at Delta

- Uncompahgre River at Colona (above selenium loading areas)
- Uncompahgre River at Delta

Depending on the level of monitoring, cost estimates, exclusive of initial gage installation costs, range from $40,500-$118,000/year.

The Colorado River Water Conservation District is developing cost sharing arrangements. The resulting final monitoring program will be included in the Selenium Management Program.

E. Monitoring of Endangered Fish Populations: The Recovery Program experimentally stocked razorback sucker in the lower Gunnison River (i.e., downstream of Delta) during the mid-1990's and initiated an integrated stocking plan in 2003. Operation of the fish ladder at the Redlands Diversion Dam on the lower Gunnison River began in 1996 and restored access to 50 miles of critical habitat for the endangered fishes. The Recovery Program periodically conducts fish surveys in the lower Gunnison River. Over the past several years, those surveys have included sampling to determine if razorback sucker and Colorado pikeminnow are reproducing in the lower Gunnison River. Larvae of both species have been found, and survival of razorback sucker larvae through the first year is evidenced by collections of juveniles (it is uncertain whether these juveniles were stocked as larvae or produced from reproduction by stocked adults). The Recovery Program monitors the Colorado pikeminnow population in the Upper Colorado River Subbasin to develop population estimates for the purpose of tracking progress toward achieving the Subbasin demographic Recovery Goal criteria. This monitoring includes the Gunnison River downstream of the Redlands Diversion Dam and incorporates fish using the fish ladder.

The Recovery Program is developing a basin-wide razorback sucker monitoring program that will include monitoring of all life stages. Design of the monitoring program is expected to be completed in fiscal year 2009. Implementation will begin in 2010. It will include multi-life stage monitoring on the lower Gunnison River. Eventually, population estimates will be developed for razorback sucker that will include fish in the lower Gunnison River.

Results of future fish surveys, ongoing population estimates for Colorado pikeminnow, and the future monitoring program for the razorback sucker will provide the basis for determining the status of Colorado pikeminnow and razorback sucker in the lower Gunnison River. This information will be used to measure the success of recovery efforts and perhaps the effects of the Selenium Management Program and will be incorporated into the adaptive-management process to determine factors limiting recovery of Colorado pikeminnow and razorback sucker

F. Coordination with Lower Gunnison River Basin Watershed Management Plan: The Selenium Task Force is developing a Watershed Management Plan (WMP) for the lower Gunnison River Basin. The WMP will focus on remediation of selenium with the goal of meeting the 4.6 parts per billion (ppb) water quality standard. Any organization

addressing remediation planning within the watershed may utilize the WMP for planning purposes. The objective of the WMP, once adopted, is to guide, direct, and prioritize 319 Grants from EPA to specific projects within the watershed. The WMP will identify causes and sources of water quality impairment, estimate load reductions, and describe nonpoint source management measures, identify technical and financial assistance needed to carry out the WMP, provide an implementation schedule, define an education and outreach program, develop milestones for determining progress, set criteria to measure selenium load reductions, and develop a monitoring program to determine effectiveness of implementation efforts.

The Task Force will complete the watershed management plan by September 1, 2010. WMP development is supported by 319 Grant funds ($32,479) and local matching funds ($23,020). Development of the WMP will guide and direct future 319 Grants to high priority selenium reduction areas in the Gunnison Basin and provide a source of funding for a number of activities in the Selenium Management Program.

G. Regulatory Support: Reclamation will consider selenium loading as a factor in its NEPA/ESA review of any proposed new irrigated lands associated with Reclamation projects in the basin. The Bureau of Land Management will be encouraged to fully consider possible ramifications of any land transfers or exchanges on selenium loading and implement restrictions where any increases are possible.

H. Public Information and Education: Reclamation will provide staff support for implementation of a public information and education element as part of the Selenium Management Program.

I. Adaptive Management: An adaptive-management component will be described in the final Selenium Management Program. It will include annual review of progress and reporting to the Service, annual updating of the Long Range Plan, a periodic review of the effectiveness of ongoing selenium reduction measures, water quality monitoring data, and status of endangered fish, followed by adjustments in the Selenium Management Program as needed. To ensure transparency, the process will be formalized in terms of timing of reviews, procedures, and development of reports for publication that include recommendations for modification of the Selenium Management Program as needed.

J. Institutional Support: Development and implementation of the Selenium Management Program and its associated Long Range Plan is a significant responsibility. There will be a need for oversight of the implementation of the Selenium Management Program and the Long Range Plan, annual update of the Long Range Plan, coordination of activities, reporting of progress on Selenium Management Program implementation, and coordination of the adaptive management process. It is recommended that the Task Force assume a significant share of responsibilities, with substantial institutional and financial assistance from Reclamation, Colorado River Water Conservation District, State of Colorado, the Service, and other parties involved in the Task Force.

Reclamation will have primary responsibility for development of the Selenium Management Program and the Long Range Plan. Coordinating implementation of the Selenium Management Program and Long Range Plan is recommended to be the responsibility of the Task Force. The Task Force would have ongoing responsibilities for tracking implementation of the Long Range Plan, agreements and attainment of funding. The Task Force – and its staff – would not be responsible for implementation of the Selenium Management Program, but would have responsibilities for oversight, monitoring, and reporting. In addition, the Task Force would be responsible for facilitating modifications to the Selenium Management Program and the Long Range Plan, based on recommendations developed through an adaptive management process.

Reclamation will be responsible for implementation of the piping of laterals, subject to appropriations. Reclamation will also be responsible for implementation of more costly canal lining and pipe replacement of large laterals should the Selenium Management Program determine these methods effective. Reclamation will implement effective selenium reduction subject to appropriations and supplemental funding provided by state and grant programs.

2.7 Authority

The PBA is prepared in accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531et seq.).

The following paragraphs describe the Department of the Interior's basis and authority for implementing the new operations at the Aspinall Unit. The authority to implement the operations is found in Section 1 of CRSPA. This section states:

> In order to initiate the comprehensive development of the water resources of the Upper Colorado River Basin, for the purposes, among others, of regulating the flow of the Colorado River, storing water for beneficial consumptive use, making it possible for states of the Upper Basin to utilize, consistently with the provisions of the Colorado River Compact, the apportionments made to and among them in the Colorado River Compact and the Upper Colorado River Basin Compact, respectively, providing for the reclamation of arid and semi-arid land, for the control of floods, and for the generation of hydroelectric power, as an incident of the foregoing purposes, the Secretary of the Interior is hereby authorized (1) to construct, operate, and maintain the following initial units of the Colorado River storage project, consisting of dams, reservoirs, powerplants, transmission facilities and appurtenant works…

The Colorado River Compact of 1922 established an Upper Basin and a Lower Basin within the Colorado River system and apportioned the exclusive beneficial consumptive use of Colorado River water in perpetuity to the Upper and Lower Basins. The Upper Colorado River Basin Compact of 1948 apportioned the Upper Basin's share of the Colorado River system among the states of Colorado, Utah, Arizona,

Wyoming, and New Mexico. CRSPA was enacted in 1956 to facilitate the development of the water and power resources of the Upper Basin consistent with the Compacts.

The Recovery Program (Section 2.8) was developed to facilitate the continued development of states' Compact apportionments in light of ESA concerns. The goal of the Recovery Program, therefore, is to conserve the Gunnison and Colorado rivers populations of endangered fish species consistent with the recovery goals of the species published by the Service, while proceeding with the continued operation and development of water resources of the Colorado River Basin. All Recovery Program participants, agreeing that recovery to the point of de-listing will both facilitate and insure the continued development of water resources, have agreed with the principles and goals of the Recovery Program through their participation in and support of program activities. In addition to its recovery objectives, the Recovery Program includes an agreement on principles for conducting ESA Section 7 consultations, wherein program actions and sufficient progress toward recovery constitute a Reasonable and Prudent Alternative for existing and future water resource management and development activities that are likely to jeopardize the continued existence of endangered fish species or cause the destruction of or adverse modification of critical habitat of those species.

The Flow Recommendations for the Gunnison River, in concert with other program actions, are intended to avoid jeopardy and assist in recovery. By implementing actions that assist in meeting the Flow Recommendations, Reclamation is taking the steps necessary to avoid jeopardizing the continued existence of the endangered fish from the operation of the Aspinall Unit and to voluntarily and cooperatively take steps to facilitate recovery of the fish, which, in turn, will support the continued and further utilization of the Federal facilities to aid in the development of the states' Compact apportionments. Thus, consistent with the authorized purposes of CRSPA, implementation of the proposed action supports the States in the utilization of their Compact apportionment while assisting in the recovery of endangered species. Moreover, that specific authorized purposes of the Aspinall Unit may not be fully maximized for limited durations in certain year types does not invalidate the actions of the Secretary, as long as the overall purposes of CRSPA are met and we expect in this instance, these purposes will be met.

This action is limited to the proposition that both avoiding jeopardy and making progress toward recovery of listed fish facilitate the ability of the Upper Basin states to continue utilizing and further developing their Colorado River apportionments. In these particular and unique circumstances, therefore, we conclude the implementation of an operations regime that is consistent with the proposed alternative is deemed to be within the authorization contained in Section 1 of CRSPA.

2.8 Upper Colorado River Endangered Fish Recovery Program

The Recovery Program involves federal, state, and private organizations and agencies in Colorado, Utah, and Wyoming with a common goal of recovering endangered fish and

providing for present and future water uses in the Upper Colorado River Basin. The program involves several elements:

- Improving river habitat-protecting and improving floodplains, constructing fish passages, installing fish screens in canals
- Conducting research-studying the fish and their habitat, monitoring
- Providing adequate streamflows-manage releases from upstream reservoirs, improve efficiency of existing uses, modify timing and magnitude of releases from major reservoirs
- Managing non-native fish species-stocking agreements, control escapement from reservoirs, remove selected species from critical habitat
- Stocking-establish hatcheries and growout ponds, establish refugia ponds, reestablish populations

In cooperation with the Recovery Program, Reclamation has operated the Aspinall Unit to provide research flows in the lower Gunnison River. Research and monitoring studies have been completed on the Gunnison River, including biological investigations, river morphology studies, and water temperature studies. Monitoring of endangered fish populations and reproduction and recruitment are continuing. Habitat studies continue through U.S. Geological Survey sediment movement studies. A fish ladder has been constructed around the Redlands Diversion and a fish screen installed in the Redlands Canal. Water has been supplied to operate the fish ladder and screen. Backwater improvements and protection and floodplain conservation easements have been made near Delta and Whitewater and are monitored; and Colorado pikeminnow and razorback suckers have been stocked in the Gunnison and this stocking will continue.

In addition studies have been completed on the Colorado River in Colorado and Utah and on its major tributaries, and backwater improvement/ protection and fish passages and fish screening have been completed. Research, stocking and monitoring programs continue.

In order to define and clarify processes of the Recovery Program, a Section 7 Agreement and a Recovery Implementation Program Recovery Action Plan (RIPRAP) were developed (Fish and Wildlife Service 1993) and updated annually. The Agreement established a framework for conducting Section 7 consultations on depletion impacts related to new projects and impacts associated with existing projects in the Upper Basin. Activities and accomplishments under the Recovery Program are intended to provide the reasonable and prudent alternatives which avoid the likelihood of jeopardy to the continued existence of the endangered fish resulting from depletion impacts of new projects and all existing or past impacts related to historic projects with the exception of the discharge by historic projects of pollutants such as trace elements, heavy metals, and pesticides.

Procedures outlined in the Section 7 Agreement are used to determine if sufficient progress is being accomplished in the recovery of endangered fishes to enable the Recovery Program to serve as a reasonable and prudent alternative to avoid the likelihood

of jeopardizing and/or adversely modifying critical habitat. The RIPRAP presents specific recovery actions such as providing instream flows, constructing and operating fish passages and fish screens, controlling non-native fishes, and propagating and stocking endangered fish. The Gunnison River portion of the Recovery Plan includes 63 individual actions, 78% of which are completed or ongoing. One remaining high priority action is to operate the Aspinall Unit to improve conditions for downstream endangered fish.

2.9 ESA Consultation History

Consultation on the operation of initial units of the Colorado River Storage Project was deferred in the 1980's pending completion of hydrologic, biological, and other studies. Construction of the units occurred prior to passage of the ESA. At the present time, consultations have been completed on the operations of Flaming Gorge Dam and Reservoir and Navajo Dam and Reservoir and operations of these features have been modified to improve habitat conditions of the endangered fish.

There are several ESA consultations related to the present Aspinall Unit consultation and the Gunnison Basin:

> Dallas Creek Project Biological Opinion--"The most serious problem posed by the Dallas Creek Project and related water developments is the loss of water from the Gunnison River and the Colorado River. We know of only one alternative which would allow the proposed project to be constructed and operated without jeopardizing the Colorado squawfish and the humpback chub. That alternative is the release of water from the Dallas Creek Project or from other projects that regulate flows in the Gunnison River and the Colorado River in order to replace the depletions caused by the Dallas Creek Project. This released water could provide for essential life stages of the endangered fishes. The Curecanti (Aspinall Unit) Project may be the best source of water for such releases….The Dallas Creek Project would deplete 17,200 acre-feet of water in an average year. To compensate for this loss of water from the river system, it may be necessary that an equal volume be released to the Gunnison River from one or more projects…However, our studies may reveal that flow releases totaling less than 17,200 acre-feet annually are adequate for the fishes to survive in the areas and in the numbers that we believe necessary for recovery" (Fish and Wildlife Service 1979).
>
> Dolores Biological Opinion--"…only one alternative which would allow the proposed project to be constructed and operated without jeopardizing the Colorado squawfish, humpback chub, and the bonytail chub. That alternative is the release of water from the Dolores Project, or from other projects that regulate flows in the Colorado River, to replace the depletions caused by the Dolores Project. …..The Dolores Project would deplete 131,000 acre-feet of water in an average year. To compensate for

> this loss of water from the river system, it may be necessary that an equal volume be released to the Colorado River from one or more projects. This alternative would prevent the Dolores Project itself from jeopardizing the existence of the fishes of concern…We are intensively studying the endangered Colorado River fishes, but at present we cannot recommend specific flows that should be released. However, our studies may reveal that flow releases totaling less than 131,000 acre-feet annually are adequate for the fishes to survive in the areas and in the numbers that we believe necessary for recovery" (Fish and Wildlife Service 1980).

The original depletion estimate for the Dolores Project, 131,000 af, included downstream releases for the trout fishery. This release is at least 31,097 af and was incorrectly considered a depletion. Thus the present estimated depletion for the Dolores Project is no more than 99,200 af above Lake Powell.

Since the Dallas Creek and Dolores Projects' opinions were written, the Upper Colorado River Recovery Program has been established. Reclamation has also had informal conversations with the Service on how to address the above opinions. The goal of Reclamation and the Service during these discussions was to arrive at a proposed alternative that offsets the impacts of Dallas/Dolores depletions and satisfies the biological opinions on those projects. At the present time the full depletions from the Dallas Creek Project have not been realized; full depletions for Dolores are occurring but, as indicated above, the original depletion estimate was higher (approximately 30,000 af) than what is actually occurring under full depletion.

Upper Gunnison Subordination Agreement—The Fish and Wildlife concurred with a "no effect" determination for impacts to the downstream endangered fish based on two conditions: "1) The 60,000 acre-foot depletion will be consulted on during the upcoming Aspinall Unit consultation; and 2) During the interim, all actions that deplete water out of the 60,000 acre-foot block will be considered new projects and consulted on as we have done in the past." (Fish and Wildlife Service 1999)

Minor water sales—Sixty nine ESA consultations totaling less than 1,000 af of minor water sales have been made from the Aspinall Unit and have received biological opinions, citing the Recovery Program as the reasonable and prudent alternative to avoid jeopardy to the endangered fish due to the depletions. These sales are primarily for augmentation water.

Redlands Canal Fish Screen Biological Opinion—In this opinion (Fish and Wildlife Service 2004), the following conservation measures were included. The opinion identified the Recovery Program as the reasonable and prudent alternative.

> "Reclamation will to the extent allowable under State and Federal law, attempt to release from the Aspinall Unit sufficient water to maintain a

> minimum flow of 300 cubic feet per second (cfs) during the months of July August, September, and October in the Gunnison River from the Redlands Diversion to the confluence of the Gunnison River with the Colorado River. Said flows include water necessary to maintain fish access to critical habitat in the Gunnison River below Redlands Diversion for authorized fish and wildlife purposes (providing suitable endangered fish habitat). During periods of drought when the 300 cfs below Redlands cannot be met, Reclamation will work with the Service and water users to attempt to maintain flows lower than 300 cfs below Redlands for endangered fish. The operation will remain in place until the Aspinall Operations Environmental Impact Statement is complete and Reclamation has issued a Record of Decision on Aspinall Operations to address endangered fish flows in the Gunnison and Colorado Rivers. Operations developed through the environmental impact statement and Endangered Species Act Section 7 consultation process will address long term flow requirements below the Redlands Diversion.

15-Mile Reach Programmatic Biological Opinion (Fish and Wildlife Service 1999b)—This biological opinion addressed the continuation of Reclamation operations and depletions in the Upper Colorado River Basin above the confluence with the Gunnison River; Reclamation's portion of 120,000 af/year of new depletions in the same area; and recovery actions in the Colorado River.

Paonia Project Biological Opinion (Fish and Wildlife Service 2002b)—This opinion, related to a temporary water service contract using temporary capacity in the sediment pool of Paonia Reservoir, calls for a portion of the water in the surplus capacity to be released during the spring spill period of the reservoir.

The Service has consulted on approximately 330 water projects/uses in the Gunnison Basin upstream from the Redlands Diversion. These projects included 11,918 af of new depletions and 171,148 af of existing depletions.

3.0 ENVIRONMENTAL BASELINE

3.1 Baseline

For purposes of this PBA, an environmental baseline was developed which includes the past and present impacts of all Federal, State, and private actions and other human activities in the action area; the anticipated impacts of all proposed projects in the action area that have already undergone formal Section 7 consultation under the ESA; and the impact of State or private actions contemporaneous with the consultation process. This baseline is a "snapshot" of species' health at a specified point in time. Under this baseline, the decision to construct the Aspinall Unit for Congressionally authorized purposes and the decisions to build and operate other basin water projects are past federal, state, or private actions, and by definition, they are part of the baseline.