

United States Department of the Interior

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In Reply Refer To:
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October 14, 2010

Memorandum

To: Field Supervisor, Utah Ecological Services Office, Fish and Wildlife Service,
West Valley City, Utah

From: Field Supervisor

Subject: Final Biological Opinion on the Virgin River Gorge (Gorge) Rotenone Treatment between
the Stateline Fish Barrier in Washington County, Utah, and the Virgin River Gorge Fish
Barrier, Mohave County, Arizona

Thank you for your request for intra-Service formal consultation with the Arizona Ecological Services Office (AESO) of the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was dated October 7, 2010, and received by us on October 8, 2010. At issue are impacts that may result from the proposed rotenone treatment of the Virgin River between the Stateline Fish Barrier in Washington County, Utah, and the Virgin River Gorge Fish Barrier in Mohave County, Arizona. The proposed action may affect the endangered Virgin River Virgin River chub (*Gila seminuda*) and woundfin (*Plagopterus argentissimus*) and designated critical habitat for these two species. In your request for consultation, you also requested our concurrence on findings of may affect, not likely to adversely affect for the California condor (*Gymnogyps californianus*) and southwestern willow flycatcher (*Empidonax traillii extimus*). We concur with your findings and include our rationale in Appendix A.

This biological opinion (BO) is based on information provided in the draft environmental assessment prepared for National Environmental Policy Act (NEPA) compliance (also acting as the biological assessment) (USFWS 2010), telephone conversations, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, the effects of rotenone on aquatic fauna, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

Planning for the proposed renovation to remove non-native fish species from the target reach of the Virgin River began in 2009. Cooperating agencies include Arizona Game and Fish Department (AGFD), Bureau of Land Management (BLM), Utah Division of Wildlife Resources (UDWR), the Virgin River Fishes Recovery Team (Recovery Team), the Virgin River Resource Management and Recovery Program (Program), and our FWS offices. The success shown by the Program and UDWR of removing non-native fish, particularly red shiner (*Cyprinella lutrensis*), from the river in Utah allowed for planning to expand the program downstream. Since the Stateline Fish Barrier is not a fully effective barrier to upstream movement of fishes during high streamflows, elimination of red shiner from the reach between the barriers is needed to protect the upstream reaches from re-invasion. This is the essential next step in the process of restoring the Virgin River for native fish. Your office, the Utah Ecological Services Office (UESO), is the lead office for the Environmental Assessment (EA) for NEPA and has requested intra-Service section 7 consultation with the AESO. Funding for the proposed action is through the Program, and a Preventing Extinction Grant obtained by AESO which allows AGFD to participate in the salvage and treatment. The following is a list of important milestones in the planning process for this project.

- Initial planning conference call on December 7, 2009, with subsequent calls through October 7, 2010, to discuss issues and coordinate between agencies.
- October 8, 2010: Formal consultation initiated.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action as described in the draft EA is for one or more rotenone treatments to remove non-native fish species over the next 10-year period in 17 miles of the Virgin River between the Stateline Fish Barrier in Utah and the Virgin River Gorge Barrier in Arizona. Approximately 2.25 miles are in Utah, and 14.75 miles are in Arizona. The proposed action envisions an initial rotenone treatment in the fall of 2010, with subsequent review of the results and development of a management plan to address removal options for non-native species in the treatment reach over a 10-year period. This BO focuses on the potential effects of rotenone treatments in the Gorge over the 10-year period covered by the EA, with the understanding that any future rotenone treatments beyond the initial treatment would be first evaluated under the context of the management program before a decision is made to proceed with a treatment. The project area is on lands managed by the BLM and is in the Beaver Dam Mountains and Piute Wilderness areas. Access to the river will be made using existing roads, the Cedar Pockets Campground, and from lands under special use permit to the Arizona Department of Transportation (ADOT) along Interstate 15. A complete description of the proposed action is found in the draft EA (USFWS 2010) and the October 7, 2010, request for formal consultation.

A detailed treatment plan that includes various options that provide operational flexibility was developed by UDWR and reviewed by AGFD for the pre-treatment species monitoring, mapping and documentation of the treatment site, fish salvage operations (which include fish capture techniques, short and long-term holding and disease treatments, and release back into the river into the treatment reach or above the reach into Utah), the application of rotenone, detoxification of rotenone at the Virgin River Gorge Barrier, and post-treatment monitoring to assess success of the project. In addition, a pesticide use plan was developed and then approved by BLM for the application of the rotenone. This plan is described in detail in the draft EA and related documents with modifications as noted below and is incorporated here by reference. The proposed schedule for the rotenone treatment of the proposed action is:

- Pre-treatment fish surveys and habitat assessments between the two fish barriers on July 12-16, August 16-20, September 13-17, and October 18-20, 2010.
- Salvage of native fish species from the treatment reach prior to the treatment. Based on the results of the pre-treatment surveys, an estimate of the native fish populations in the treatment reach will be made. That estimate will be used to determine if effective salvage (a goal of at least 80 percent removal of native fish) can be accomplished with the available time, work effort, and holding/transport facilities available. If this level of salvage is not practicable, the treatment will not occur.
- Treatment on October 18-22, with November 15-19 as an alternate and/or retreatment period. Owing to issues with completion of the EA, the proposed treatment period is now scheduled between November 22 and December 31, 2010 based on the suitability of flows in the river.

Because there is inherent uncertainty in the number of Virgin River chub and woundfin that would be present in the treatment area during any future treatments that may be determined necessary in the 10-year period covered in the EA, we are unable to address incidental take for any future treatments beyond the one scheduled for November or December, 2010, except to extend the period in which a treatment could be completed to May, 2011 to allow for uncertainties of weather and streamflow that can affect the ability to perform the treatment. We are able to do this based on the survey data available that indicates the number of Virgin River chub and woundfin in the treatment area is unlikely to increase over the winter months, and the treatment period would not encompass the entire spawning period for these species. This BO will address the effects of future treatment actions as envisioned in the draft EA, but will require amendment to the baseline and incidental take statement for any future treatment actions.

An important component of the proposed action is the pre-treatment monitoring of the native fish (Virgin River chub, woundfin, Virgin spinedace, speckled dace, desert sucker, and flannelmouth sucker) populations in the treatment reach, the salvage of native fish prior to the treatment, and their repatriation to the Virgin River in Utah after the treatment. For each rotenone treatment pre-treatment monitoring will be accomplished by personnel from AGFD, UDWR and the FWS under section 10(a)(1)(A) permits issued to those offices and scientific research permits from AGFD issued to the AESO and the FWS' Arizona Fish and Wildlife Conservation Office. This monitoring is necessary to assess the amount of salvage needed to preserve the native fish population. For this treatment, native fish will be salvaged from the river prior to the proposed treatment dates using seines and, where appropriate, hoop nets (baited or unbaited as determined to be most effective) and transported to a central location for processing and short-term holding.

All cyprinids (Virgin River chubs, speckled dace, and woundfin) will be treated for Asian tapeworm in accordance with fish health requirements under a permit from the state of Utah prior to their transport to Utah for release into the Virgin River upstream of the treatment area. Native suckers are not required to have tapeworm treatments, and will be transported to Utah as soon as practicable after capture. After the treatment is completed, a small flushing flow (approximately 200 cubic feet per second) will be released from Quail Creek Reservoir in Utah to encourage the redistribution of salvaged fish back into the treatment reach. Winter precipitation and spring runoff streamflows are anticipated to move fish downstream into the treatment reach to restore the populations. Monitoring over the next year will document the return of the native species and if necessary, native fish will be moved from Utah down to the reach to ensure that the native fish community is restored as quickly as possible within the treatment reach.

Activities involved with the physical salvage (fish collection, transport, holding, and relocation) of native fish from the river will be covered largely through the section 10(a)(1)(A) permits held by the agencies participating in the activity. The intent of the salvage operations is to remove Virgin River chub and woundfin from the treatment reach and then safely return them to the river. This type of activity is “direct take” through handling, with the intent that all fish will be unharmed at the end of the action and is covered by section 10(a)(1)(A) permits held by the participating agencies. The inadvertent death of any Virgin River chub or woundfin during the salvage, holding, or repatriation is not the intent of those actions, but is incidental to them, so that take will be covered under the incidental take statement included in this BO. Mortalities of Virgin River chub and woundfin due to rotenone poisoning during the treatment will also be covered by the incidental take statement in this BO.

STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

Virgin River chub

The Virgin River chub was proposed for listing as endangered, with critical habitat, on August 23, 1978 (43 FR 37668). On September 30, 1980, the proposal was withdrawn because the 1978 amendments to the Act required that all proposals pending for more than two years be withdrawn (45 FR 64853). The Virgin River chub was re-proposed as endangered, with critical habitat, on June 24, 1986 (51 FR 22949). On August 24, 1989, the Virgin River chub was listed as endangered (54 FR 35305) throughout its entire range (50 CFR 17.11) but critical habitat was not designated at that time. When the Virgin River chub was listed it was considered a subspecies of roundtail chub (*Gila robusta*) and its taxonomic classification was *Gila robusta seminuda*. DeMarais et al. (1992) asserted that full species status was warranted for the Virgin River chub and reclassified it as *Gila seminuda*. On July 24, 1995, a proposed rule was published in the Federal Register (60 FR 37866) proposing a change in rank from subspecies to species as the Virgin River chub, and proposing a change in the status of the Virgin River population of Virgin River chub from a subspecies to a vertebrate population segment. The latter action was necessary because DeMarais’ work concluded that the Muddy (=Moapa) River Virgin River chub was the same species as the Virgin River chub in the Virgin River, and only the Virgin River population was included for listing in the final rule. That proposed rule has not been finalized.

Critical habitat was designated on January 26, 2000 (65 FR 4140) and includes 87.5 miles of the Virgin River and its associated 100-year flood plain, extending from the confluence of La Verkin

Creek, Utah, to Halfway Wash, Nevada. The physical and biological features (PBFs) of critical habitat determined necessary for the survival and recovery of the Virgin River chub are water, physical habitat, and biological environment (see details below).

The Virgin River chub is most often associated with deep runs or pool habitats of slow to moderate velocities with large boulders or instream cover, such as root snags. Adults and juveniles are often associated together within these habitats; however, the larger adults are collected most often in the deeper pool habitats within the river. Hardy et al. (1989) determined that Virgin River chubs were most often collected in depths ranging from 0.6 feet to 3.0 feet in velocities ranging from 0.0 to 2.5 cubic feet/sec and associated with sand substrates with boulders or instream cover. Schumann (1978) and Deacon et al. (1987) found that the final adult thermal preference was approximately 75 °F. The Virgin River chub is omnivorous, showing considerable dietary shifts with age. Young fish feed almost entirely on macro-invertebrates while adults feed almost exclusively on algae and debris. Spawning is known to occur in the spring, and ripe females have been reported during the months of April, May, and June (Hickman 1987). Hickman (1987) also noted that good spawning years coincided with good spawning years for woundfin. It is likely that Virgin River chub live for many years, perhaps for decades, but they mature rapidly and probably spawn in their second or third year of life (Williams and Deacon 1998).

The historical range of the listed population of Virgin River chub encompassed the Virgin River in Arizona, Nevada, and Utah. The species remains extant throughout its historical range although in reduced numbers.

Woundfin

The woundfin was listed as endangered on October 13, 1970 (35 FR 16047). Subsequent to listing, critical habitat was originally proposed on November 2, 1977 (42 FR 57329). The proposal was withdrawn because the 1978 amendments to the Act required that all proposals pending for more than two years be withdrawn (45 FR 64853). Critical habitat was proposed, finalized, and designated concurrently with that for Virgin River chub. Designated critical habitat and the physical and biological factors (PBFs) of critical habitat are slightly different from those for the Virgin River chub (see details below). A Woundfin Recovery Plan was developed and approved in July 1979 and later revised and updated in March 1984. In 1995, this plan was superseded by the Virgin River Fishes Recovery Plan, which included both the woundfin and the Virgin River chub (USFWS 1995).

Adult woundfin are often collected from runs and quiet waters adjacent to riffles. Larvae are found in backwaters or slowly moving water along the stream margin, and often are associated with dense growths of filamentous algae. Juveniles use habitats that are slower and deeper than those characteristic of adults. Woundfin greater than 1.6 inches total length are collected most frequently at depths between 0.48 and 1.4 feet, in current velocities ranging from 0.78 to 1.6 feet per second, over sand and sand-gravel substrate (Hardy et al. 1989). There is some indication that when water clarity is high, adult woundfin move into deeper water. The critical thermal maximum temperature for woundfin in the Virgin River is about 102⁰ F (with acclimation at 77⁰ F) with mean preferred temperatures of about 52 to 75⁰ F, depending on the overall stream temperature (Deacon et al. 1987). Woundfin feed on a variety of items, including filamentous algae, detrital material, seeds, and aquatic insects; displaying a seasonal shift in food selectivity. Dietary overlap with introduced red shiners is greatest when food is most abundant. During

periods of lower food abundance, woundfin and red shiners may experience greater competition for food, leading to a more pronounced partitioning of the food niche. Spawning has been documented from April to August (Hickman 1987, Hardy et al. 1989).

The historical range of the woundfin included rivers in Arizona, Nevada, and Utah, extending from near the junction of the Salt and Verde Rivers at Tempe, Arizona, to the mouth of the Gila River at Yuma, Arizona, and the Colorado River from Yuma, Arizona upstream to the Virgin River in Nevada, Arizona, and Utah, and into La Verkin Creek in Utah. Woundfin are extirpated from much of their former range, and are now confined primarily to the mainstem Virgin River from Pah Tempe Springs in Utah to Lake Mead in Nevada.

Physical and Biological Features of Critical Habitat

The PBFs of critical habitat determined necessary for the survival and recovery of the Virgin River chub and woundfin are water, physical habitat, and biological environment. The desired conditions for each of these elements are further discussed below:

Water:

A sufficient quantity and quality of water (i.e., temperature, dissolved oxygen, contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrological regime that is identified for the particular life stage for each species. This includes the following:

- 1 Water quality characterized by naturally seasonally variable temperature, turbidity and conductivity;
- 2 Hydrologic regime characterized by the duration, magnitude, and frequency of flow events capable of forming and maintaining channel and instream habitat necessary for particular life stages at certain times of the year; and
- 3 Flood events inundating the floodplain necessary to provide the organic matter that provides or supports the nutrient and food sources of the listed fishes.

Physical habitat:

Areas of the Virgin River that are inhabited or potentially habitable by a particular life stage for each species, for use in spawning, nursing, feeding, and rearing, or corridors between such areas.

For woundfin these habitats include the following:

- 1 River channels, side channels, secondary channels, backwaters, and springs, and other areas which provide access to these habitats;
- 2 Areas inhabited by adult and juvenile woundfin include runs and pools adjacent to riffles that have sand and sand/gravel substrates;
- 3 Areas inhabited by juvenile woundfin are generally deeper and slower. When turbidity is low, adults also tend to occupy deeper and slower habitats; and

- 4 Areas inhabited by woundfin larvae include shoreline margins and backwater habitats associated with growths of filamentous algae.

For Virgin River chub these habitats include the following:

- 1 River channels, side channels, secondary channels, backwaters, and springs, and other areas which provide access to these habitats; and
- 2 Areas with slow to moderate velocities, within deep runs or pools, with predominantly sand substrates, particularly habitats which contain boulders or other instream cover.

Biological environment:

Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage. Predation and competition, although considered normal components of this environment, are out of balance due to non-native fish species in many areas. For both species, a properly functioning biological environment contains:

- 1 Seasonally flooded areas that contribute to the biological productivity of the river system by producing allochthonous (humus, silt, organic detritus, colloidal matter, and plants and animals produced outside the river and brought into the river) organic matter which provides and supports much of the food base of the listed fishes; and
- 2 Few or no predatory or competitive non-native species in occupied Virgin River fishes' habitats or potential reintroduction sites.

The entire critical habitat reach is considered essential for the conservation of the Virgin River chub and woundfin. At the time of designation of critical habitat in 2000, all PBFs were identified as not being at optimum levels for Virgin River chub and woundfin, with different portions of the reach more or less suitable for water and physical habitat. Under the biological environment section, it was stated that predation and competition were out of balance in the critical habitat due to the presence of non-native fish species. Red shiner was named as being a significant reason why critical habitat was not able to meet the conservation needs at the time of designation, with additional management identified as required to address this issue. Since the designation in 2000, red shiner have been eliminated in the Utah sections of the critical habitat upstream of the Stateline Fish Barrier, which has enabled that reach of critical habitat to meet conservation needs under biological environment, although portions of the reach may not fully meet physical or water requirements at all times.

Threats and Current Status

Virgin River chub

The abundance and distribution of Virgin River chub have declined significantly due to impacts from water diversions and the introduction of non-native species, particularly red shiner and large predaceous non-native species such as catfish and bass species. Virgin River chub remain extant in the Virgin River in Arizona, particularly in the lower Gorge and the river upstream of Littlefield. The section of Virgin River most negatively impacted by the invasion of red shiner is from Lake Mead in Nevada upstream to the Washington Fields Diversion in Utah. Prior to invasion by red shiner, the fish population in this reach was composed almost exclusively of native fish. For example, at one of the standard Recovery Team monitoring sites within this reach, Atkinville Wash in Utah, fish composition in September 1984, just prior to discovery of the first red shiner, was wouundfin (57%), desert sucker (27%), speckled dace (10%), Virgin River chub (4%), and flannelmouth sucker (2%). Since 1999, Virgin River chub have been nearly absent from samples taken at this and other sample sites between the Gorge and the Washington Fields Diversion. In 1988, attempts to chemically eradicate red shiner from the reach of the river between the Gorge and the Washington Fields Diversion began with the treatment of the reach between the Washington Fields and Johnson diversions. Successive treatments have focused on treating additional reaches in each year. Prior to all treatments, an extensive salvage operation is conducted, with native fish moved to habitat above the Washington Fields Diversion.

As a result of the treatments, the red shiner has been eliminated from the Atkinville Wash and Twin Bridges sites down to the Stateline Fish Barrier has been eliminated. However, the numbers of Virgin River chub are also low due to the previous overwhelming numbers of red shiner previous to salvage efforts, inadvertent mortality during treatment, and fish kills resulting from flood events with poor water quality. Above the Washington Fields Diversion, populations of Virgin River chub have not been impacted by red shiner (red shiner were noted in 2002 within the reach, but not since) and the fish community is composed primarily of native fish (Fridell and Morvilius 2005). Virgin River chub populations in this reach declined in 2002 and 2003 due to low flow, low turbidity, and high water temperatures. Populations rebounded dramatically in 2005 due to higher flow levels and lower water temperatures. A return to persistent long-term drought conditions in 2006 and 2007 lowered all native fish populations, including Virgin River chub, back to critical levels. Lethal dissolved oxygen levels were noted throughout most of the upper portion of critical habitat for Virgin River chub (above Washington Fields Diversion) during two back-to-back flood events in late July and early August 2007. Close to 90% of the remaining native fish population, including Virgin River chub, was lost from La Verkin Creek to Washington Fields Diversion. Sampling from within this reach by UDWR in autumn 2007 and spring 2008 indicates that the populations of native fish within this reach were extremely low. Recently, Virgin River chub and other native species have been reintroduced from upstream and off channel areas, as well as hatcheries in the hopes of reestablishing a larger, more stable native fish population in this reach. Full pass sampling results from April 5-8, 2010 in the Pah Tempe Springs to Washington Fields Diversion documented 880 Virgin River chub; 731 adults and 149 young-of-the year (YOY) in the reach. Surveys below Washington Fields Diversions in 2009 have documented low numbers of Virgin River chub present down to the Stateline Fish Barrier (Fridell 2009).

The preservation of Virgin River chub in the lower Gorge and in the Littlefield reach in Arizona is very important to ensure the species' survival into the future in the event of another loss of Virgin River chub in Utah. Preservation of the chub population in this reach is also important in the event of a situation where Virgin River chubs currently held at Dexter National Fish

Hatchery and Technology Center (DNFH&TC) were lost or, due to disease or invasive species concerns, were barred from stocking in the Virgin River in the future. The 2010 documentation of Largemouth Bass Virus at DNFH&TC is an example of a situation where stocking actions can be affected in this way. Due to increasing concerns about the spread of quagga mussels in the Colorado River drainage including the Virgin River, after this salvage event, DNFH&TC will not transfer any additional Virgin River fish to that facility to avoid the risk of contamination.

In Arizona, Virgin River chub are found through the Gorge and downstream to Nevada, although most are found in areas upstream of the Arizona-Nevada boundary. Non-native fish species including red shiner, largemouth bass, and channel catfish are present and have effects on Virgin River chub through predation and competition. Streamflows through the Gorge vary seasonally, while the flows from springs in the lower Gorge and at Littlefield maintain a higher baseflow in the river at least to the first significant water diversion at Mesquite. Below the Mesquite Diversion, there are other diversions and return flows which affect the amount of water present to support Virgin River chub and non-native fish populations are very high.

Woundfin

Woundfin abundance has declined significantly due to the introduction of red shiner. Woundfin has virtually been eliminated wherever red shiner became established (Arizona and Nevada, and in previously in Utah up to Washington Fields Diversion). Prior to 2007, the only viable populations of woundfin were found above the Washington Fields Diversion (Fridell and Morvilius 2005). In 2005, woundfin and Virgin River chub were the most common species in this reach. However, the 2007 flood events discussed for Virgin River chub functionally extirpated woundfin from this portion of the river. Nearly 10,000 woundfin from DNFH&TC were stocked back into this area in autumn 2007 and spring 2008. The spring 2010 surveys documented 270 woundfin; 110 adults and 117 YOY in the surveyed reach (Fridell 2010a). Woundfin are also found below Washington Fields Diversion to the Stateline Fish Barrier (Fridell 2009). Very few woundfin are found in the reach of the Virgin River in Arizona and Nevada. Repatriations from DNFH&TC into Arizona or Nevada were not made after 2007 and any woundfin in the river now are likely to be those moving downstream from Utah.

Previous Consultations

The Virgin River chub and woundfin are found in three states: Arizona, Nevada, and Utah. Consultations on effects to these species are completed by three FWS Ecological Services Field Offices based on the location of the proposed action. In Utah, consultations address water-resource issues and implementation of recovery actions under the Program. In Arizona and Nevada, land-management, flood-control, and recovery actions sponsored by the Recovery Team are generally the topics for consultation. A list of recent (post-2000) formal consultations addressing these species in the action area is found in Appendix B.

ENVIRONMENTAL BASELINE [in the action area]

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Description of the Action Area

The action area for the proposed action is the reach of the Virgin River including the 100-year floodplain from the Stateline Fish Barrier (located just above the Arizona-Utah line) to the Interstate 15 Bridge crossing of the Virgin River at Littlefield. The action area was determined by the area of Virgin River chub and woundfin habitat that would be temporarily affected by the application of rotenone and the potassium permanganate used to detoxify the rotenone. The portion of the action area below the Virgin River Gorge Barrier is included due to minor changes in water quality that may occur due to the application of chemicals within the treatment reach; and that this area would be affected if rotenone were not fully detoxified at the Virgin River Gorge Barrier. In 1988, a rotenone treatment in Utah above the Stateline Fish Barrier was not properly detoxified and a partial fish kill was observed in the Virgin River in Arizona and Nevada. Subsequent rotenone treatments in Utah underwent significantly more detailed planning and careful execution and all were completed safely with no rotenone moving beyond the treatment reach. Effects to Virgin River chub below the Virgin River Gorge Barrier are not anticipated; however, we are including this reach within the action area to provide a complete evaluation of potential risks.

The action area is comprised of BLM-administered lands with some private lands below the Gorge toward Littlefield. The Gorge is a long canyon carved out by the Virgin River. The climate is typical of the Mojave Desert, with hot summers and cool winters characterized by low precipitation and humidity. Average rainfall is approximately 7 inches per year, the majority of which occurs in late summer and during winter months. Similar to other desert rivers, the Virgin River is characterized by large flow fluctuations (0 to 20,000 cubic feet per second) and high salinity, temperature, and turbidity. Streamflows are generally highest during the winter precipitation period and spring months, particularly during spring runoff. Summertime and fall base streamflows are typically much lower, although large, short-lived flood events may occur following intense summer thunderstorms. The flow regime of the Virgin River and its tributaries have been modified by developments and diversions designed to capture and deliver water for municipal and agricultural use. Another issue specific to the Virgin River Gorge is the role that the geology plays on the hydrologic system. The bedrock exposed to the river in the gorge consists of massive limestone units which contain well developed karst systems. Water from the river is lost to underground flow systems. Large-volume springs discharge water back to the river at the mouth of the gorge. It is not uncommon for the river to be completely dry in the gorge during the summer as a result of the water lost to the groundwater flow system. Within the Gorge, the Virgin River experiences periods of extremely low flow and at times may be intermittent during summer months (May – September). This is not likely due to the flow diversions, as historical data indicate that the Virgin River within the Gorge was historically intermittent (Addley and Hardy 1998).

In general, the Virgin River is a low-gradient (0.3%) river with a wide channel and a sandy substrate. However, the gradient is steeper (0.55%) within the Gorge and the habitat more varied (Addley and Hardy 1998). According to aquatic habitat mapping done by Addley and Hardy (1998), habitat from the Stateline barrier down to the Cedar Pockets Campground is dominated by shallow runs. From the Cedar Pockets Campground down, habitat is more complex, with a mix of runs, riffles, and pools. Below the Virgin River Gorge Barrier, a series of groundwater springs in the lower Gorge and the reach above Littlefield enhance the baseflow and provide more permanent water for native fish until the diversions begin at Mesquite.

A. Status of the species and critical habitat within the action area

The primary sampling in the treatment reach has been the biannual sampling at the Recovery Team's Cedar Pockets site located near the Cedar Pockets Campground (approximately five miles upstream of the lower end of the treatment area). This site has been sampled since 1992 and the data are presented in Table 1. The data from the Cedar Pockets Site shows that until recent years (2007), fish distribution at the site was composed primarily of red shiner, with relatively few native species. The lower number of red shiner in recent years is likely the result of the upstream treatments that removed red shiner from significant portions of the Virgin River in Utah so there is a reduced drift of red shiner into the Gorge from the upstream areas. With the decline in red shiner there was a slight increase in the number of Virgin River chub. However, the data show that in general there are relatively few native species at the Cedar Pockets site.

Table 1 Number of each species at the Cedar Pockets site from 1992 – 2007

Date	Desert sucker	Flannelmouth sucker	Speckled dace	Virgin River chub	Woundfin	Red shiner
April 1992	1	3	0	2	0	1688
September 1992	1	0	0	1	0	742
July 1993	0	154	0	4	0	134
September 1993	10	10	0	0	7	414
May 1994	4	4	0	1	11	201
September 1994	0	1	0	0	0	4142
April 1995	1	4	0	0	0	192
October 1995	2	2	0	0	0	594
April 1996	0	1	0	1	2	283
October 1996	0	44	0	0	0	722
June 1997	80	127	0	16	0	119
June 1998	3	132	0	1	0	86
September 1998	0	22	0	1	0	117
April 1999	0	0	0	0	0	15
October 1999	28	85	0	2	0	382
April 2000	3	5	0	1	0	74
October 2000	6	57	0	1	0	786
April 2001	6	5	2	0	2	188
October 2001	0	4	1	2	0	6360
May 2002	0	1878	0	0	0	596
September 2002	0	50	0	0	0	6
April 2003	4	11	1	2	0	6
September 2003	0	2	1	3	0	29
July 2005	4	39	3	6	0	1
October 2005	5	12	3	5	1	864

May 2006	2	5	1	3	0	51
October 2006	1	15	5	3	0	370
April 2007	2	1	9	0	0	2
October 2007	1	13	0	15	0	3
May 2008	3	34	1	13	0	2

In 2007 and 2008, UDWR and AZGFD surveyed the Virgin River within the upper portion of the Gorge (from the Stateline Fish Barrier down to the Virgin River Gorge Barrier). Table 2 shows the total number of each species from 21 comparable sites in each year, separated out by age class. These data cannot be directly compared to the Cedar Pockets data due to differences in sample methodology. The data show that the number of native fish present was lower in 2008 than in 2007. However, the more intensive sampling indicated that young-of-the-year (YOY) Virgin River chub compose a large percentage of the total fish population. In 2008, YOY Virgin River chub were the most abundant species at the 21 sites sampled in the upper Gorge. It is unclear if the YOY are the result of spawning within the Gorge or if they drift into the reach from upstream areas. Further, sampling has not been done in the fall to determine how the fish population changes. As can be seen in the Cedar Pockets data, fish population numbers are generally lower in the fall and it is thought that the YOY fish likely experience high mortality during the summer months due to low streamflows and resultant high water temperatures. The adults present persist within suitable microhabitats (i.e., deep pools with spring inflows) during periods of low flow and high temperature (Addley and Hardy 1998). Surveys for Virgin River chub in deep pools using only seines are not effective in determining the number of Virgin River chub in the pool, since seines cannot go deep enough to capture all fish present.

Table 2 Fish species captured in the Virgin River Gorge during 2007 and 2008

Species	2007		2008	
	YOY	Age 1+	YOY	Age 1+
Desert sucker	248	0	7	0
Flannemouth sucker	675	9	18	2
Speckled dace	3	1	2	0
Virgin River chub	406	0	188	3
Virgin spinedace	1	0	0	0
Woundfin	4	0	0	0
Black bullhead	5	7	0	0
Largemouth bass	1	0	0	0
Mosquitofish	1	0	0	0
Red shiner	563	25	2	0
Unidentified	0	0	0	29
TOTAL	1907	42	217	34

Source: Chris Cantrell, AGFD

Surveys on July 12-13, 2010 documented 188 Virgin River chub in the Utah portion of the treatment reach with most fish taken in the uppermost reach nearest the Stateline Barrier. All survey work was accomplished using seines, which are less able to capture Virgin River chub that are in deep pools, and very clear water conditions allowed some fish to escape capture. No YOY Virgin River chub were captured; however the size distribution (150 mm to 250 mm with peak numbers at 190 mm) indicates all captures were of fish at least one year old. Virgin River chub comprised 31 percent of the total catch. No seining was done in the Arizona section; approximately 1,500 native fish (Virgin River chub and suckers) were observed (Schijf 2010a).

Surveys on August 16-18, 2010 seined the almost the entire treatment reach and captured 165 Virgin River chub (Schijf 2010b). The Virgin River chub were distributed through the reach, with most captured in the upper half of the treatment reach. Increased streamflow and turbidity affected fish use of the habitat, with more use of riffles and runs, but this also made it harder to assess the number of fish in pool habitats, and moved some fish further downstream. Use of pools by native fish did remain high. Three YOY Virgin River chub were collected in August, with the overall age distribution the same as in July.

Surveys in July documented 17 woundfin, two of which were YOY fish in the Utah sections of the treatment reach (Lien and Schijf 2010). These fish likely came from upstream sources, as the number of red shiner in the treatment reach is quite high and woundfin recruitment is low to non-existent in the presence of red shiners. The August surveys found eight woundfin distributed throughout the treatment reach, with four adults and four YOY (Schijf 2010b).

Additional pre-treatment surveys were accomplished during September 13-17, 2010. The survey captured 110 Virgin River chub and three woundfin (Fridell 2010b). Flows were low and water temperatures high; the latter may have contributed to mortality of some native fish since the previous survey effort. These three sets of data are critical to understand the potential numbers of Virgin River chub and woundfin (plus other native species) that will be subject to salvage operations prior to the treatment. It must also be understood that the numbers derived from these efforts may not represent the total number of native fish present; seining is not the most efficient way to survey for fish in deep pools, so the number of fish present may be underestimated. However, we can use these figures to create an estimate of the Virgin River chub and woundfin populations in the treatment reach. Assuming that the survey efforts only captured 50 percent of the Virgin River chub and woundfin present (due to un-surveyed reaches and missing fish in deep pools), then we estimate a population of 400 Virgin River chub and 50 woundfin in the treatment reach. Additional information on the numbers of Virgin River chub in pools will be obtained during additional surveys scheduled for October 18-20, 2010, and if that information results in a significant change in estimated population size, that new information will be used to assess the potential for incidental take and for the effectiveness of salvage operations needed to proceed with a treatment.

The Virgin River from the site of the Virgin River Gorge Barrier downstream about 22.25 miles (river mile 87.5 to 65.25) is the core area for all native fish in the lower Virgin River. This is as shown in the multi-year data sets from the Recovery Team surveys at Beaver Dam Wash initiated in 1976 and the BioWest dataset initiated in 1996, covering the area from Beaver Dam Wash downstream to Riverside, Nevada (Holden and Abate 1999, Golden and Holden 2004, Albrecht et al. 2007, Albrecht and Kegerries 2009, Rogers et al. 2009, Albrecht 2010). Table 3 contains the data from the BioWest spring and fall surveys at Beaver Dam Wash and Table 4 contains the data from the lower Gorge, at which surveys were initiated in 2009 (Table 4). These surveys show that native fish are generally lacking in the Virgin River below river mile 65.25, which is approximately 22 miles below the Virgin River Gorge Barrier. As with other surveys, these surveys used seines; there are deep pools within the survey reaches where Virgin River chub are not accessible, so populations of Virgin River chub may be significantly higher. No woundfin were found in the reach below the barrier.

Table 3 Number of each species at the Beaver Dam Wash site from 2000-2010 (spring survey data presented first, fall survey data presented second for each year)

Date	Desert sucker	Flannelmouth sucker	Speckled dace	Virgin River chub	Woundfin
2000	138	165	26	2	0
2000	791	341	373	24	0
2001	368	218	43	15	0
2001	47	91	419	14	0
2002	563	2,011	1,124	358	0
2002	40	405	241	18	0
2003	305	504	3169	21	0
2003	170	132	466	49	0
2004	728	185	3204	98	18
2004	137	90	662	95	0
2005	297	123	319	172	6
2005	45	11	250	47	3
2006	60	61	183	147	0
2006	163	49	179	41	0
2007	164	5,612	2,549	16	0
2007	38	104	164	442	0
2008	421	1,000	268	155	0
2008	350	427	923	155	0
2009	254	170	129	130	0
2009	43	29	35	48	0
2010	27	10	22	13	0

Table 4 Number of each species from the lower Gorge and mouth of Gorge sites

Date	Desert sucker	Flannelmouth sucker	Speckled dace	Virgin River chub	Woundfin
2009 spring	202	356	407	308	0
2009 fall	34	64	9	226	0
2010 spring	5	36	3	51	0

As discussed under the rangewide status, the PBFs for water and physical habitat are currently being met in portions of the action area; however, the presence of red shiner and other non-native species is compromising the conservation value of the action area.

B. Factors affecting species' environment and critical habitat within the action area

The current status of the Virgin River chub and woundfin and their habitats in the action area is a result of changes to the natural hydrograph from water development and use upstream and the spread of non-native fish species throughout the Virgin River Basin. The action area has itself been impacted by the construction of Interstate 15; however, the free flow of water through the river channel is not impeded by the highway. The importance of the Gorge as historical habitat for both species is uncertain. Likely the Gorge acted as a connecting reach between the upstream and downstream habitat areas, with perennial pools providing seasonal habitats during dry periods. Those features are currently maintained in the Gorge.

Most of the action area is controlled by the BLM, with some private lands below the Gorge and a right of way granted for Interstate 15 through the Gorge. Actions that could affect the Virgin River chub and woundfin are significantly limited to those actions proposed under Land Management Plans prepared by BLM. The Arizona Strip District Land Management Plan underwent section 7 consultation in 2007. BLM is not proposing activities within the action area that would have significant adverse effects to the listed species or their critical habitat.

Implementation of the proposed action is part of the ongoing efforts to recover the Virgin River chub and woundfin by the Program and the Recovery Team. Renovation of the river reach between the fish barriers will provide additional non-native free habitat for Virgin River chub and woundfin and protect occupied habitats upstream from reinvasion by non-native red shiner and other species. This project provides the platform for future recovery actions in Arizona and Nevada that are part of the post-treatment planning and monitoring.

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.

Virgin River chub

Direct effects

The pre-treatment monitoring provides an estimate of the number of Virgin River chub in the treatment reach. The current estimate, based on incomplete surveys and individuals not captured from deep pools, is approximately 400 Virgin River chub. Assuming an 80 percent salvage level, approximately 320 individuals would be salvaged, leaving 80 individuals in the river during the treatment.

Once the rotenone treatment is initiated, any Virgin River chub remaining in the treatment area would be killed, and attempts to rescue them from the river once exposed to rotenone have not proved successful during past treatments in Utah, as they are sensitive to rotenone and post-exposure mortality is virtually 100 percent even if they are removed alive from the water.

The intent of the pre-treatment salvage effort is to remove as many Virgin River chub as possible from the treatment reach to minimize mortality related to the application of rotenone to the river. The capture, handling, and transport of fish by experienced personnel using the protocols in place for the pre-treatment salvage is generally safe, and mortality is rare. The handling of Virgin River chub is covered under the appropriate section 10(a)(1)(A) permits, which provide take coverage for routine survey and handling efforts. The more intense salvage efforts required here may put additional stress on captured fish as this project was not envisioned in approved permits for some participants. As this salvage operation would not occur without the proposed rotenone treatment, we believe it is appropriate to consider any adverse effects to Virgin River chub that occur because of the salvage operation to be effects of the action.

Virgin River chubs will be captured according to the protocols in the treatment plan, held for up to 72 hours in hatchery trucks for treatment for Asian tapeworm, then transported to Utah and released into the river at several locations below the Johnson Diversion. All captured Virgin River chub will be carefully monitored for health and optimum survival and maintained in water with proper water quality and dissolved oxygen parameters. Capture and handling does result in stress to individual fish; this stress can be ameliorated by safe holding conditions and appropriate care. Under these controlled conditions, the level of handling-related mortality is likely to be very low.

Virgin River chub moved upstream to Utah will compete with existing Virgin River chub for food and space in those habitats. The relocated Virgin River chub will concentrate additional fish to pools that may already have high fish densities, may increase susceptibility to disease, increase both intra- and inter-specific competition, and increase predation. For example, Addley and Hardy (1998) observed adult Virgin River chub exhibiting predatory behavior towards YOY fish in pools with high density. Based on recent survey data, there are not many Virgin River chub in the areas of the Virgin River proposed for release of the salvaged Virgin River chub. This is likely the result of slow recovery of those populations since 2007. Further, assuming approximately 400 are present in the river and, under the salvage protocol, a salvage of 80 percent is desired, approximately 320 fish would be placed into several miles of river. This amount is not likely to overwhelm the available habitats.

Virgin River chub in the Gorge below the treatment reach will be exposed to minor changes in water quality resulting from the mixing of the rotenone and chemical neutralizer. The treatment plan protocol for the detoxification stations at the Virgin River Gorge Barrier is based on protocols used successfully in the Virgin River in Utah and has several safeguards as described in the plan. Live cages will be in place to monitor the detoxification success and adjustments to permanganate releases will be made in response. The inflows from the springs in the lower Gorge will also provide an additional dilution effect to the detoxified streamflow as it moves into that area. Minor water quality changes may cause fish to move to other habitats, or concentrate in the spring inflows within the lower Gorge, but are not expected to result in mortality below the treatment reach.

Woundfin

Direct effects

The direct effects to woundfin will be the same as described for Virgin River chub except it is unlikely there are any woundfin below the Virgin River Gorge Barrier that could be affected if rotenone is not sufficiently detoxified. The low number of woundfin within the treatment area and the fact that these fish are not likely to be successfully recruiting here in the presence of red shiner, reduces the significance of any losses due to the treatment or the salvage and transport operations. All woundfin salvaged will be transported and released upstream into occupied habitats in Utah under the same protocols as Virgin River chub. We expect fewer than 10 woundfin to be in the treatment area prior to salvage operations. Mortality due to the treatment would be reduced through the salvage operations, with potentially eight woundfin salvaged and two remaining in the river under our current estimate.

Indirect Effects: Effects to Critical Habitat

The physical environment of critical habitat will not be affected by the proposed action. The temporary effects to water are anticipated, but post-treatment flows will remove detoxified rotenone from the treatment reach and significant effects to water quality are not expected. There will, however, be indirect effects to Virgin River chub and woundfin related to the biological environment through the loss of a portion of the invertebrate forage base due to the rotenone treatment.

Concentrations of rotenone used to eliminate fish can temporarily reduce populations of some species of aquatic invertebrates, causing changes in macroinvertebrate community composition. Certain species of aquatic invertebrates are more sensitive to rotenone than others, and some take longer to recover than others (Engstrom-Heg et al. 1978). Most of the sensitive species are in the insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). Also, a high mortality of Chironomides (insect order Diptera) was observed during rotenone treatments on the San Rafael restoration project (Jim Rorabaugh, FWS, pers. comm. 2009). The ability of aquatic invertebrates to survive a rotenone treatment depends on life history, oxygen requirements and habitat. In most cases, reduction of aquatic invertebrates was temporary with the majority of taxa recovering within 1-2 years (Binns 1967, Trumbo et al. 2000, UDWR 2002). Engstrom-Heg et al. (1978) reported long-term impacts of rotenone are mitigated because those insects that were most sensitive to rotenone also tended to have the highest rate of recolonization. Short life cycles (Anderson and Wallace 1984), good dispersal ability (Williams and Hynes 1976) and generally high reproductive potential (Anderson and Wallace 1984) give aquatic invertebrates the capability for rapid recovery from disturbance (Jacobi and Deegan 1977, Boulton et al. 1992, Matthaei et al. 1996).

Both Virgin River chub and woundfin use aquatic invertebrates for food. The National Aquatic Monitoring Center studied invertebrates in the Virgin River in 2001, 2002, 2004, and 2005 (Vinson 2003, Vinson and Dinger 2006). In 2002 and 2003, 17 locations were sampled from Beaver Dam Wash upstream to LaVerkin Creek. Sampling included a location near the Cedar Pockets Campground and one in the lower end of the Gorge. The results showed that the highest genera richness was within the Gorge and above the Washington Fields Diversion. Between the Washington Fields Diversion and the Webb Hill barrier, invertebrate genera richness was up to 60 percent less than above the Washington Fields Diversion. This is likely due to the repeated rotenone treatments below the Washington Fields Diversion, as well as effects from water diversions, reduced water quality from urban runoff, and habitat modification (Vinson 2003).

In 2004 and 2005, nine sites were sampled before and after two rotenone treatments (conducted in 2004 and 2005). This was done in order to study the effects of rotenone on invertebrate assemblages. Two sample sites were above the Washington Fields Diversion (control), with seven sites downstream (treatment). This included the same sites at Cedar Pockets Campground and in the lower Gorge (Vinson and Dinger 2006). Results of the study showed that invertebrate assemblages in treated reaches did not change significantly following treatment. It was hypothesized that this was due to 1) repeated treatments in this reach that, prior to the study, had already eliminated species that are both rare and sensitive to rotenone; and 2) large flood events in 2004 and 2005 that may have impacted invertebrate assemblages in upstream (control) reaches and helped improve colonization of downstream (treated) reaches (Vinson and Dinger 2006).

Application of rotenone to the treatment reach would eliminate some or all of the aquatic invertebrate populations present. Past rotenone treatments upstream have resulted in changes to the invertebrate fauna that are not reflected in the treatment reach, which has not been subject to rotenone since the 1988 event, when a rotenone treatment in Utah allowed the passage of active rotenone down into Arizona due to a failure of the detoxification process. Recovery of the invertebrate fauna has generally occurred post-treatment (Vinson and Dinger 2006, Vinson et al. 2010). Recolonization of the common species from upstream is likely to be rapid. Since the treatment is proposed for late fall, and it will take several months for fish to move into the reach from upstream, the demand for food resources over the winter and early spring will be reduced. Recolonization by aquatic invertebrates is likely to be rapid, since upstream populations of the common species are available, and streamflows are constant through the Gorge during the winter and early spring. The recovery of the invertebrate population will occur in sequence with expansion of the fish population in the Gorge. The effects to the forage base component of the biological environment due to the proposed action will be temporary. The conservation value of the critical habitat in the treatment reach will be significantly improved with the elimination of non-native fish from the reach.

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.

The action area is within BLM-administered land and is entirely within the Virgin River Corridor ACEC. In addition, much of the action area is within the Beaver Dam Mountains and Piute Wilderness areas. As a result, non-Federal activities within the action area are mostly limited to use and maintenance of Interstate 15 (which often also has a Federal nexus and would be subject to NEPA).

We are not aware of any large, new, private activities on the private lands below the Gorge downstream to Littlefield that would result in significant changes to the Virgin River. Surface water rights are fully allocated; however, additional groundwater development that may affect springs in the lower Gorge or near Littlefield remains a concern for baseflow in the river. There is continuing growth in the region, and the effects of developing water supplies for that growth will need to be identified in the future.

CONCLUSION

After reviewing the current status of the Virgin River chub and woundfin, the environmental baseline for the action area, the effects of the proposed renovation of the Virgin River between the Stateline Fish Barrier and the Virgin River Gorge Fish Barrier, and the cumulative effects, it is the FWS's biological opinion that the renovation of the Virgin River to remove non-native species, as proposed, is not likely to jeopardize the continued existence of the Virgin River chub or woundfin, nor is it likely to destroy or adversely modify the critical habitat.

We present this conclusion for the following reasons:

- The proposed action involves only a portion of the occupied habitat for the Virgin River chub and woundfin, with the populations upstream and downstream of the treatment reach not expected to be affected.
- The proposed action would temporarily remove the existing populations of these species in the action area; however efforts to reduce mortality of Virgin River chub and woundfin are provided in the proposed action through the salvage program and the populations are expected to recover over time through salvaged fish moving or being moved into the reach from Utah.
- The proposed action will benefit these two species by providing additional habitat that can be managed to be free of non-native fish species that are the significant cause of decline for both species.
- Effects to the PBFs of critical habitat are either transitory (effects to water quality and invertebrate forage base) or positive (removal of non-native fish species), which provides an improvement to the conservation value of the critical habitat.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations 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 to attempt to engage in any such conduct. “Harm” is further defined (50 CFR 17.3) 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. “Harass” is defined (50 CFR 17.3) 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. “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 UESO so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The UESO has a continuing duty to regulate the activity covered by this incidental take statement. If the UESO (1) fails to assume and implement the terms and conditions or (2) fails to require the Recovery Program 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, the UESO or Recovery Program must report the progress of the action and its impact on the species to the AESO as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Despite the provisions for the safe capture, transport, holding, and release of Virgin River chub and woundfin from the treatment reach, there is always a risk of mortality when handling fish in these situations. The proposed action includes provisions for safe handling of salvaged fish; however, conditions cannot always be controlled to eliminate the risk of mortality. Further, it is unlikely that all Virgin River chub or woundfin would be removed by the salvage operation, and any individuals remaining in the river would die due to the effects of rotenone.

The AESO does not anticipate a worst case scenario, where all Virgin River chub and woundfin in the river at the time salvage operations are initiated would be incidentally taken as a result of the proposed action. The intense salvage effort will likely remove at least 80 percent of Virgin River chub and woundfin from the treatment reach prior to the treatment, and we would not expect more than 10 percent of the salvaged fish to be lost. Based on our population estimates of 400 Virgin River chub and 10 woundfin in the treatment reach, we then estimate 320 Virgin River chubs and eight woundfin would be salvaged. Of those, if there was a 10 percent loss, 288 Virgin River chubs and one woundfin would not be lost to the proposed action. The amount of incidental take associated with the proposed action is 112 Virgin River chub and three woundfin. This take is in the form of mortality due to exposure to rotenone and handling stress. The remaining Virgin River chub and woundfin would be subject to non-lethal harassment due to handling stress prior to their release back into the river. Virgin River chub located downstream of the treatment reach may experience minor harassment due to changes in water quality, but these are not significant enough to rise to the level of take.

The proposed action contains measures to minimize the amount of incidental take. The extended (two week) salvage effort provides sufficient time to find, capture, and remove most Virgin River chub and woundfin from the project area and safely relocate them into the river in Utah.

EFFECT OF THE TAKE

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat for the reasons stated in the Conclusions section.

REASONABLE AND PRUDENT MEASURES and TERMS AND CONDITIONS

Reasonable and prudent measures and terms and conditions should minimize the effects of take, and provide monitoring and reporting requirements [50 CFR 402.14(i)(3)]. All handling of Virgin River chub and woundfin would be by experienced personnel holding section 10(a)(1)(A) permits for scientific research. This level of experience and the provisions to move and monitor fish included in the proposed action should be sufficient to reduce the amount of incidental take resulting from salvage, treatment, and transport of Virgin River chub and woundfin under the proposed action. We include only a reporting requirement on the results of the salvage operation, activities related to handling and transport, monitoring of the status of fish while held for Asian tapeworm treatment, and visual estimates of the number of dead Virgin River chub and

woundfin found in the river post-treatment as the reasonable and prudent measure relating to reporting of the amount of take.

Virgin River chub and woundfin

The following reasonable and prudent measure is necessary and appropriate to minimize take:

1. The UESO, or an entity of its choosing, shall document the amount of incidental take occurring for the two fish species through monitoring to be conducted before, during, and after the treatment.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the following term and condition, which implements the reasonable and prudent measure described above and outlines required reporting/monitoring requirements, must be implemented. This term and condition is non-discretionary.

Virgin River chub and woundfin

The following term and condition implements reasonable and prudent measure #1:

- 1.1 The UESO shall submit, or cause to be submitted to the AESO a report of all monitoring for Virgin River chub and woundfin conducted as part of the implementation of this proposed action. The report is due within 90-days of the completion of the rotenone treatment and return of all surviving fish to the river. The report will contain a listing of all species found, the numbers of such species and their disposition and the number of dead Virgin River chub or woundfin documented and whether the death was related to rotenone poisoning or handling stress.

Review requirement: The reasonable and prudent measure, with its implementing term and condition, is designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measure provided. UESO must immediately provide an explanation of the causes of the taking and review with the AESO the need for possible modification of the reasonable and prudent measure.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species, staff must initially notify FWS's Law Enforcement Office, 2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, (telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph, if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The recovery of the Virgin River chub and woundfin in the Virgin River has made significant progress in Utah under the Program's implementation of recovery actions including rotenone treatments. The Virgin River Fishes Recovery Plan is somewhat outdated, and does not provide the type of operational guidance on the continuation of recovery efforts in Arizona and Nevada that can set the stage for actions in the Gorge and below. Construction of the Halfway Wash Fish Barrier at the lower end of the critical habitat reach is anticipated within the next two years, and this barrier will preclude movement of non-native fish up from Lake Mead into the Virgin River. The developing section 10(a)(1)(B) Habitat Conservation Plan for the Virgin River in Nevada will provide opportunities to implement recovery actions for the Virgin River chub and woundfin in the lower river. The Lower Virgin River Recovery Implementation Team initiated a planning effort to identify recovery needs, opportunities, and solutions for the river in Arizona and Nevada; however, implementation of the plan has been slow. The extension of barrier construction and rotenone treatment recovery actions into Arizona from Utah covered in this BO reinforces a need to revise the Arizona-Nevada plan to include more specific protocols for future treatments and other coordinated activities with the Program in Utah. We recommend that all parties involved in this proposed action commit to work together over the next year to develop the plan for Arizona and Nevada. We would be happy to facilitate that work.

The Virgin River chub populations in the Virgin River express a degree of genetic difference between those in the headwater areas in Utah and those in the downstream areas of Arizona and Nevada. The relationship of the Gorge populations to the up-and down-stream populations is uncertain. We suggest that any Virgin River chub mortalities due to the proposed action be saved for future use in a genetic evaluation. This information will be helpful in determining future management of the species within the river.

REINITIATION NOTICE

This concludes formal consultation on the action(s) 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.

The AESO appreciates the efforts of all partners to contribute to the implementation of this important recovery project. Implementation of this project will benefit the Virgin River chub and woundfin through protecting upstream habitats from reinvasion by non-native fish species and provide additional habitat for recruitment by these species. For further information, please contact Lesley Fitzpatrick at (602) 242-0210 (x236) or me at (x244). Please refer to consultation number 22410-2010-F-0567, in future correspondence concerning this project.

/s/Jean Calhoun for

Steven L. Spangle

cc (email):

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(Attn: Marty Tuegel) (ARD-ES)

Steve Meismer, Virgin River Resource Management and Recovery Program, St. George, UT

Larry Voyles, Director, Arizona Game and Fish Department, Phoenix, AZ

(Attn: Eric Gardner, Nongame Branch Chief)

W: Lesley Fitzpatrick\Virgin River\10-0567 final BO.docx:cgg

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Appendix A

Concurrences with Not Likely to Adversely Affect

California condor

During sampling, salvage, and treatment any California condors present in the immediate vicinity of ground crews could be disturbed and displaced temporarily into adjacent habitat. These impacts would be both temporary and negligible. As described in the EA, the toxicity of rotenone to birds is extremely low. Furthermore, the consumption of fish killed by rotenone would not be toxic to California condors. Unlike other toxins that commonly impact California condors (e.g., lead); rotenone has not been shown to bioaccumulate. As a result, California condors would not be significantly affected by rotenone application and the overall impacts would be limited to temporary disturbance by ground crews. These effects are insignificant.

Southwestern willow flycatcher

The Project would occur outside the breeding and nesting season for southwestern willow flycatcher and there would be no impacts on breeding success. Any individual adults still present in the immediate vicinity of ground crews could be disturbed and displaced temporarily into adjacent habitat. These impacts would be both temporary and negligible. Furthermore, the rotenone applied to the river would not affect birds as described in the EA. As the project does not involve impacts to vegetation, there would be no direct impacts to Designated Critical Habitat for this species.

Following treatment, there would be a temporary decrease in food availability for insectivorous birds. However, it is unknown what proportion of the southwestern willow flycatcher's diet is composed of aquatic insects. It is likely that in the absence of aquatic insects, southwestern willow flycatcher would continue to feed on terrestrial insects. Furthermore, it is likely that aquatic invertebrates would reestablish in the treated reach prior to the onset of the nesting season. As a result, the indirect effects would be negligible and temporary. Overall, effects are discountable.

Appendix B

Formal Consultations for the Virgin River Chub and Woundfin in the Action Area 2000-2008

Arizona

Title	Agency	Date	Finding
Arizona Strip Resource Management Plan	BLM	11/07/07	Not likely to jeopardize Not likely to destroy or adversely modify
Beaver Dam Wash Bridge over Highway 91	FHA	12/21/06	Not likely to jeopardize No effect to critical habitat
Reinitiation of Tilapia Removal Program on Virgin River, Clark County, Nevada	FWS	03/09/05	Not likely to jeopardize Not likely to destroy or adversely modify
Approval of State of Arizona Revisions to Water Quality Standards for Surface Water	EPA	06/21/04	Not likely to jeopardize Not likely to destroy or adversely modify
Tilapia Removal Program on Virgin River, Clark County, Nevada	FWS	10/04/02	Not likely to jeopardize Not likely to destroy or adversely modify
Construction of Virgin River Gorge Fish Barrier	BLM	9/18/08	Not likely to jeopardize Not likely to destroy or adversely modify

Nevada

Title	Agency	Date	Finding
Short-Term Flood Control Actions, City of Mesquite	COE	04/06/05	Not likely to jeopardize Not likely to destroy or adversely modify
Post-Flood Actions and 2005 Runoff Season Flood Control Measures	COE	04/21/05	Not likely to jeopardize Not likely to destroy or adversely modify
New State Route 170 Bridge	FHA	12/20/05	Not likely to jeopardize Not likely to destroy or adversely modify
Replacement of Mesquite Bridge	FHA	07/15/08	Not likely to jeopardize Not likely to destroy or adversely modify