Pahranagat roundtail chub
(*Gila robusta jordani*)

5-Year Review:
Summary and Evaluation

Pahranagat roundtail chub

U.S. Fish and Wildlife Service
Southern Nevada Fish and Wildlife Office
Las Vegas, Nevada

October 2022

I. GENERAL INFORMATION

Purpose of 5-Year Reviews

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview

The Pahranagat roundtail chub (*Gila robusta jordani*) is aligned with the roundtail chub complex of the Colorado River drainage (Miller 1946, Minckley 1973, Smith 1978). They are endemic to thermal waters of Pahranagat Valley, Lincoln County, Nevada (Service 1998). Precise historic distribution within these waters is uncertain as the species was not collected prior to the late 1800s, long after aquatic habitats in the area were significantly altered. However, collections made in the late 1940s and present distribution indicates that the species existed in the Pahranagat Creek and outflows from Crystal, Hiko, and Ash Springs. Their native habitat has since been reduced to approximately 2.2 miles (mi.) of natural stream channel (Pahranagat Creek) and 1.6 mi. of cement lined ditch (Pahranagat Ditch), located entirely on private lands within Pahranagat Valley. The chub has not been observed in either Crystal or Hiko Springs since the early 1950s, and suitable lotic habitats at both locations have been reduced or eliminated.

For the purpose of this review, the term Pahranagat Creek will be used to refer to the outflow of Ash Springs, which is mostly downstream of U.S. Route 93. Pahranagat Creek is also commonly referred to as the Pahranagat River, as noted in Figure 1. This habitat also receives water from the outflow of Crystal Springs, which varies seasonally based on irrigation practices. During irrigation season, very little water from Crystal Springs reaches the Pahranagat Creek as it is diverted through a pipeline to irrigate pastures. During the non-irrigation season, almost the entire outflow of Crystal Springs flows through Pahranagat Creek.

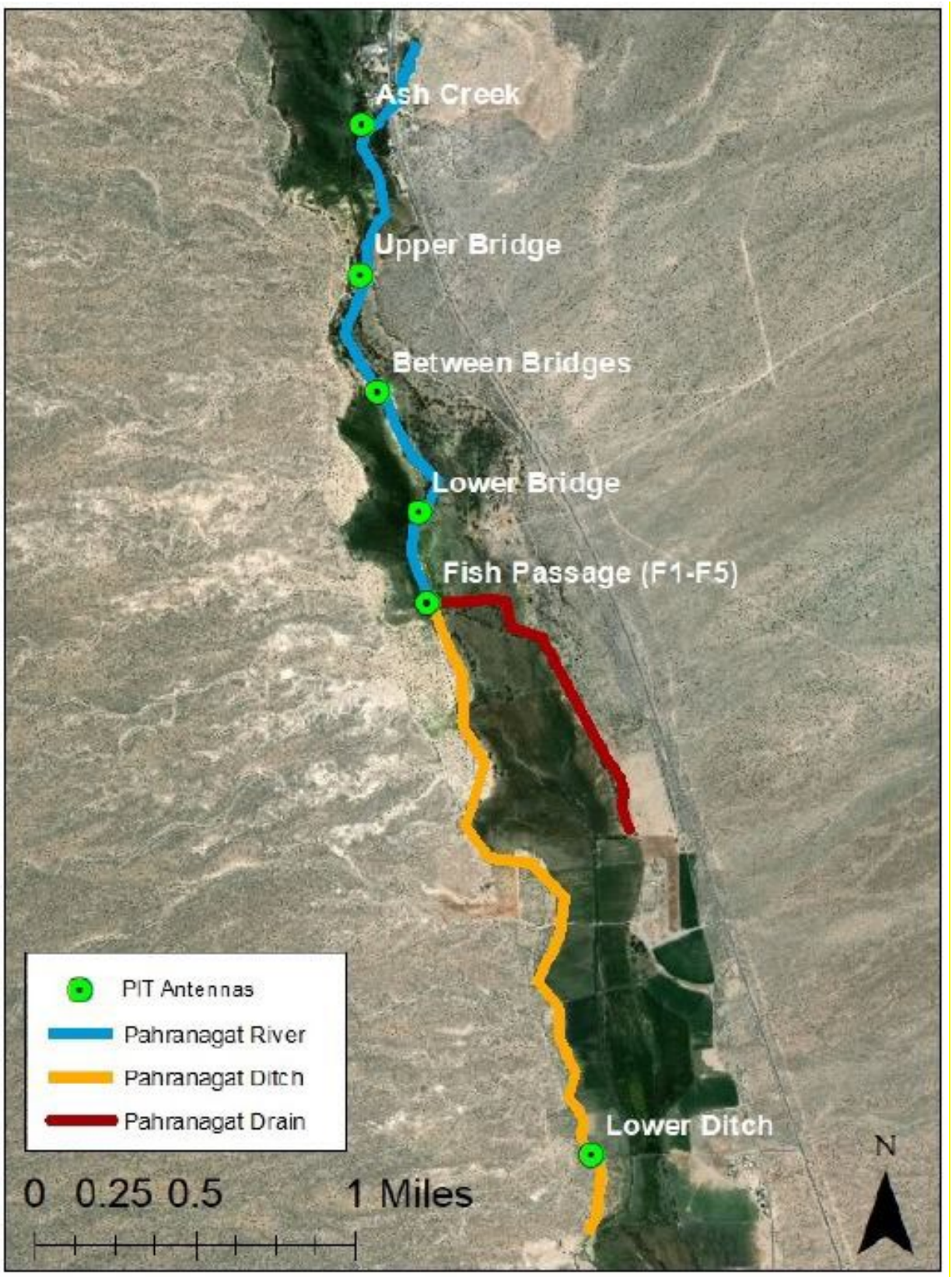

Figure 1. Pahranagat roundtail chub habitat and passive integrated transponder (PIT) tag stations (USGS 2019).

Methodology Used to Complete This Review

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Southern Nevada Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on May 20, 2021 (86 FR 27462). We contacted State agencies, Federal agencies, local agencies, and species experts, to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files. This review contains updated information on the species' biology and an assessment of that information compared to that known at the time of listing. We reviewed threats and found them to be consistent with those described in the recovery plan (Service 1998).

As there has not been a status review of the species, we used information summarized in the Recovery Plan for the Aquatic and Riparian Species of Pahranagat Valley for the basis of our review (Service 1998). After reviewing, the Service has concluded that a moderate amount of new information has become available since listing; however, a majority of this information was captured in the recovery plan. New information includes additional population monitoring, grant specific research, and conservation measures benefitting the species. Additionally, we did not receive any information from the public in response to our Federal Register Notice announcing this 5-year review.

General Information

Lead Field Office: James Harter, Southern Nevada Fish and Wildlife Office

Federal Register (FR) Notice Citation Announcing Initiation of Status Review: 86 FR 27462. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 76 Species in California and Nevada. Published on May 20, 2021.

Listing History

Species: Pahranagat roundtail chub (*Gila robusta jordani*)
Date listed: October 13, 1970
FR citation: 35 FR 16047
Classification: Endangered
Critical habitat: No critical habitat has been designated.

Review History

The Pahranagat roundtail chub was listed as an endangered species by the U.S. Fish and Wildlife Service on October 13, 1970 (35 FR 16047). No status review has been completed since the time of listing.

Species Recovery Priority Number at Start of 5-Year Review

The recovery priority number for Pahranagat roundtail chub is 3, based on a 1-18 ranking system. This number indicates that the taxon faces a high degree of threat but has a high recovery potential.

Recovery Plan

Name of Plan: Recovery Plan for the Aquatic and Riparian Species of Pahranagat Valley.
Date Issued: May 26, 1998

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. The 1996 Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act (61 FR 4722, February 7, 1996) clarifies the interpretation of the phrase "distinct population segment" for the purposes of listing, delisting, and reclassifying species. The Pahranagat roundtail chub (*G. r. jordani*) is not listed as a DPS. There has been no new relevant information regarding the application of the DPS policy to the Pahranagat roundtail chub since listing.

Information on the Species and its Status

Species Biology and Life History

Much of what we know about the life history and habitat requirements of the Pahranagat roundtail chub is from a 3-year (1986-1989) ichthyofauna survey and study conducted by the National Fisheries Research Center, Reno Substation. More recent studies have provided information on movement and survival (U.S. Geological Survey (USGS) 2019).

As previously summarized in the recovery plan (1998), Pahranagat roundtail chub are most similar to roundtail chub of the Colorado River and its larger tributaries, but have more scales in, above, and below the lateral line; are less elongate; and are greenish in color with black blotches (Tanner 1950, La Rivers 1962). Pahranagat roundtail chub are an elongate fish with a narrow caudal peduncle and a deeply incised caudal fin. They obtain a total length of approximately 10 inches. Pahranagat roundtail chub have an omnivorous diet (e.g., insects, crustaceans, plant material, and fish) and forage primarily through drift feeding (Tuttle et al. 1990). Chub have also been observed feeding off the surface of submerged objects, and in one instance, preying directly upon a western mosquitofish.

A recent study by the USGS conducted between 2014 and 2018, provided some additional insight into Pahranagat roundtail chub biology and life history (USGS 2019). Their study used PIT tag technology to track individual chub movements, a total of 64 chub were tagged during the study. This study used stationary antennas at six locations to track when an individual fish passed through a section of stream (Figure 1). Important findings from this study are as follows.

a. Site fidelity – Site fidelity was seen at the individual and population level. A quarter of fish showed site fidelity to a specific station. Likewise, fish captured in the Pahranagat Creek were more likely to be observed at the Between Bridges station while fish captured in the Pahranagat Ditch were more likely to be detected at the Fish Passage station.

b. Effects of season and temperature on movement– Season and temperature influenced movement of Pahranagat roundtail chub and activity levels decreased during the summer when temperatures were warmer. Daylight movement was almost nonexistent during the summer months and chub did not traverse the entire system during these times, which they would often do during other seasons. Activity levels were also greatest in winter and spring based on the number of antenna detections during these time periods.

c. Diel movements – Time of day influenced chub activity level. Antenna encounters showed that chub are most active during nighttime and crepuscular hours. Daytime movements, though less common, were seen most often during winter months. This may be associated with cooler water temperatures and/or spawning activity (Figure 2).

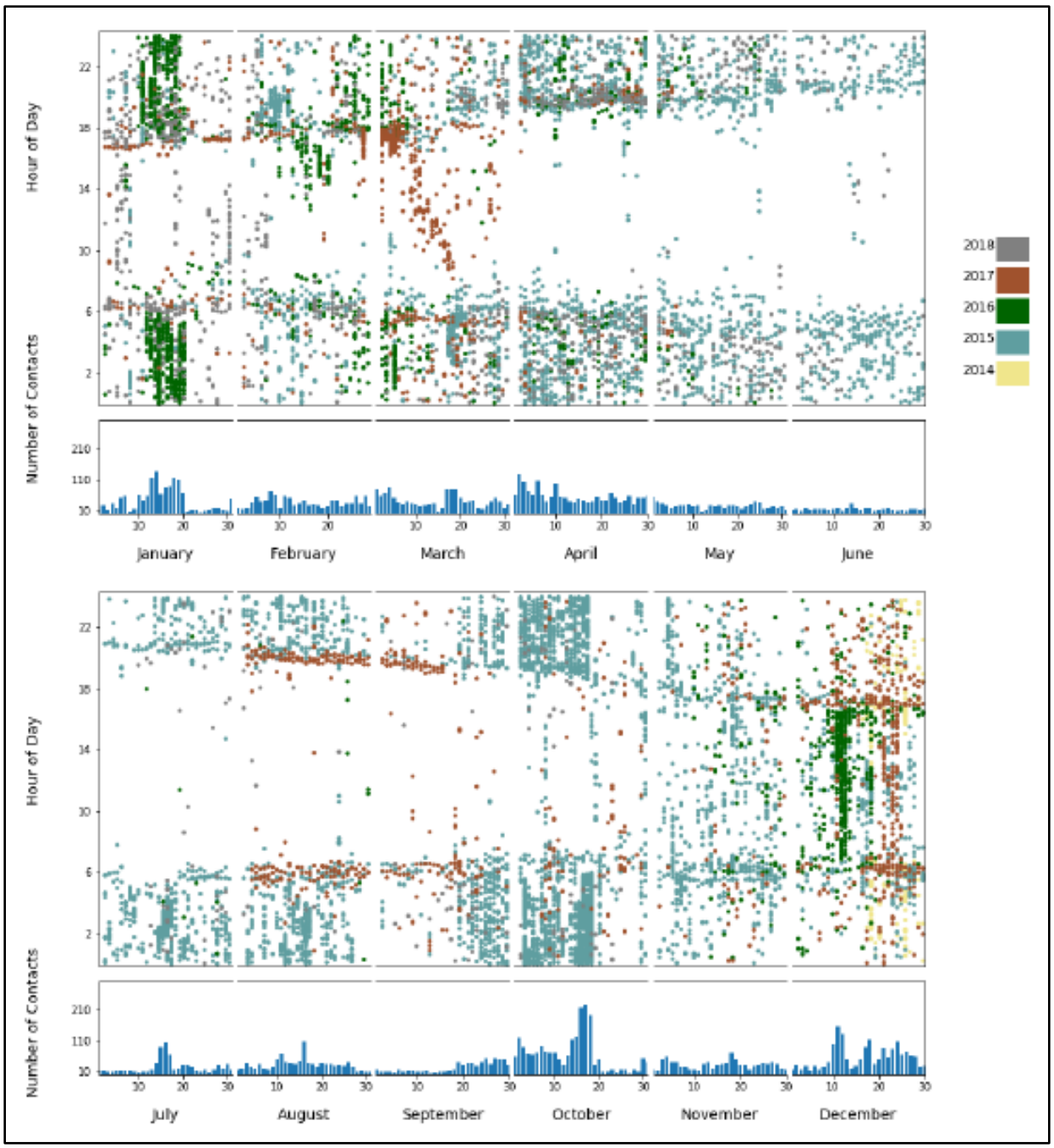

Figure 2. Diel encounters of Pahranagat roundtail chub by season and year, from USGS 2014-2018 (USGS 2019).

d. Longevity – Chub were shown to live at least three years, which can be seen in the post-tagging survival data, given that one chub was observed for a total of 714 days following capture, and that individuals in this study were estimated to be adults at the time of tagging (Figure 3). There was no evidence in this study or previous studies that chub live longer than three years.

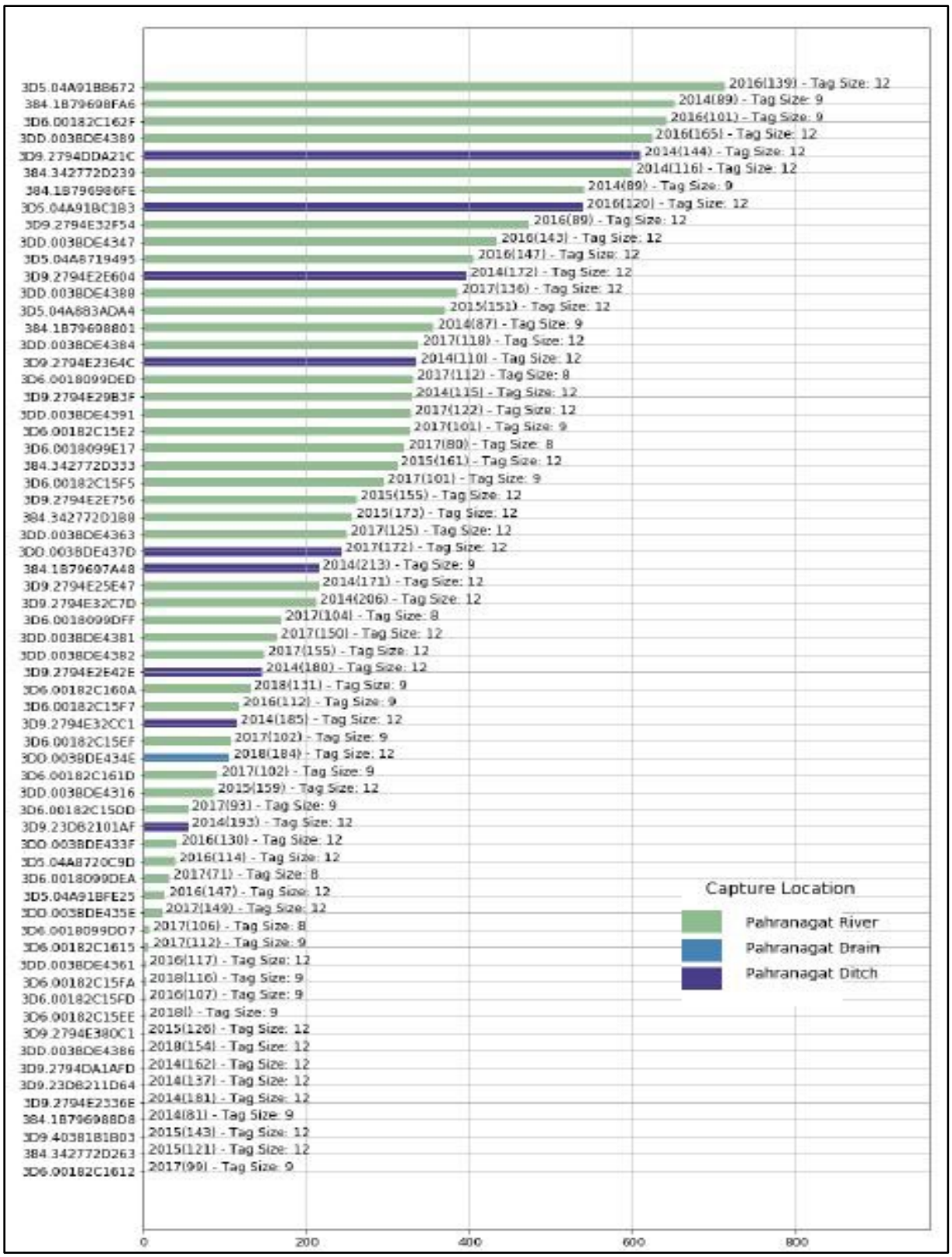

Figure 3. Graph showing number of days detected from the time of tagging to last detection for individual fish color coded for reach, Pahranagat River, Nevada, 2014–18. Each bar is followed by the year tagged, total length of the fish when tagged, and PIT tag size (USGS 2019).

Spatial Distribution

Pahranagat roundtail chub are endemic to thermal waters of Pahranagat Valley, Lincoln County, Nevada (Service 1998). Precise historic distribution within these waters is uncertain as the species was not collected prior to the late 1800s, long after aquatic habitats in the area were significantly altered. However, collections made in the late 1940s and present distribution indicates that the species existed in the Pahranagat Creek and outflows from Crystal, Hiko, and Ash Springs. Their native habitat has since been reduced to approximately 2.2 mi. of natural stream channel and 1.6 mi. of cement lined ditch, located entirely on private lands within Pahranagat Valley (Figure 1). The chub has not been observed in either Crystal or Hiko Springs since the early 1950s, and suitable lotic habitats at both locations have been reduced or eliminated. Given the current conditions of Pahranagat Creek, the Service has increased efforts to establish refuge populations of Pahranagat roundtail chub.

In 1985, the Service established a broodstock at the Southwestern Native Aquatics Research and Recovery Center, formerly the Dexter National Fish Hatchery, in Dexter, New Mexico. This broodstock received juvenile Pahranagat roundtail chub over a multi-year period to capture a representative sample of Pahranagat Creek. This broodstock protects against extinction of the species but also serves to provide individuals for establishment of refuge populations within the boundaries of Pahranagat Valley. To date, efforts to establish refuge populations have focused on Federal and State lands on the Pahranagat National Wildlife Refuge (NWR) and Key Pittman Wildlife Management Area (WMA), respectively. These efforts are as follows:

a. Key Pittman WMA – In 2004, a Pahranagat roundtail chub population was established at an artificial pond habitat on the Key Pittman WMA. This site was functional from 2004 to 2020. Population estimates of this site were often over 500 individuals and reproduction (i.e., presence of larval fish) was documented during site visits. In 2020, the entire population was lost, likely due to low dissolved oxygen during a period when the well pump was not functioning. As of September 2022, the site is still needing repairs (i.e., re-lining pond, removal of vegetation) before re-establishing the population of chub.

b. Pahranagat NWR – Efforts to establish Pahranagat roundtail chub on the Pahranagat NWR have focused on Cottonwood Spring. This site is a natural spring that has been excavated to form a pond-like habitat. In 2011 and 2017, attempts to establish a second chub refugium at Pahranagat NWR failed within a year of establishment, possibly due to unsuitable water quality parameters. A study of water quality conducted in 2014-15 at Cottonwood Spring did not show that water quality conditions were disadvantageous to chub (USGS 2018). However, this study was limited in scope, and focused only on temperature and dissolved oxygen with limited data collection periods. Based on the results of that study, chub were subsequently stocked into Cottonwood Spring in 2017 and monitored over the course of a year to track post-stocking survival. The results of this effort identified a mortality event over a multiple week period during January 2018 (Service 2019). The Service continues to evaluate this habitat for future use as a refuge location.

Abundance

Population surveys have been infrequent, and methods have been inconsistent. Since the early 1980s, snorkel surveys have been used to quantify abundance in Pahranagat Creek. Hardy (1982) estimated that there were only 37 to 45 adults remaining. The National Fisheries Research Center – Reno Field Station conducted seasonal surveys between 1986 and 1989 with adult observations totaling between 129 and 252, depending on year and season (Tuttle et al. 1990). A later survey by this group in 1998, now called the U.S. Geological Survey – Western Field Station, documented 162 chub, while a 2001 survey resulted in an alarmingly low number of 15 adult chub observations (McShane et al. 2004). The Nevada Department of Wildlife (NDOW) conducts snorkel surveys on an annual basis to enumerate chub, these surveys typically result in less than 100 observations of individuals (Figure 4; NDOW 2021).

The ability of snorkel surveys to reliably assess the abundance of the population remains in question. Recent surveys have varied greatly, with some surveys resulting in encounters as low as two individuals. Variability in counts can likely be attributed to the complexity of habitat, turbidity of water, and behavior of chub. The Pahranagat Creek is a complex habitat with an abundance of down woody debris as well as deep undercut banks, which chub may use for cover and to evade surveyors. The turbidity of Pahranagat Creek varies depending on irrigation practices, there are times when visibility during snorkel surveys is less than five feet due to agricultural runoff from fields. Activity level of chub can vary seasonally and daily, making it difficult for snorkelers to encounter individuals.

Changes in Taxonomic Classification or Nomenclature

There have been no changes in the species taxonomic classification or nomenclature since its listing.

Pahranagat roundtail chub are taxonomically aligned with the roundtail chub (*Gila robusta*) complex of the Colorado River drainage (Minckley 1973, Smith 1978). Tanner (1950) originally granted the Pahranagat roundtail chub specific recognition. Later authors, however, recognized its similarity to other roundtail chub and redefined it as a subspecies (La Rivers 1962, Hubbs et al. 1974). More recent studies have suggested that Pahranagat roundtail chub are a hybrid species based on allozyme data and the presence of humpback chub mitochondrial DNA (Dowling and DeMarais 1993, Gerber et al. 2001). The American Fisheries Society recognizes the Pahranagat roundtail chub as a unique species with the common name of White River chub and scientific name of *G. jordani* (Page et al. 2013).

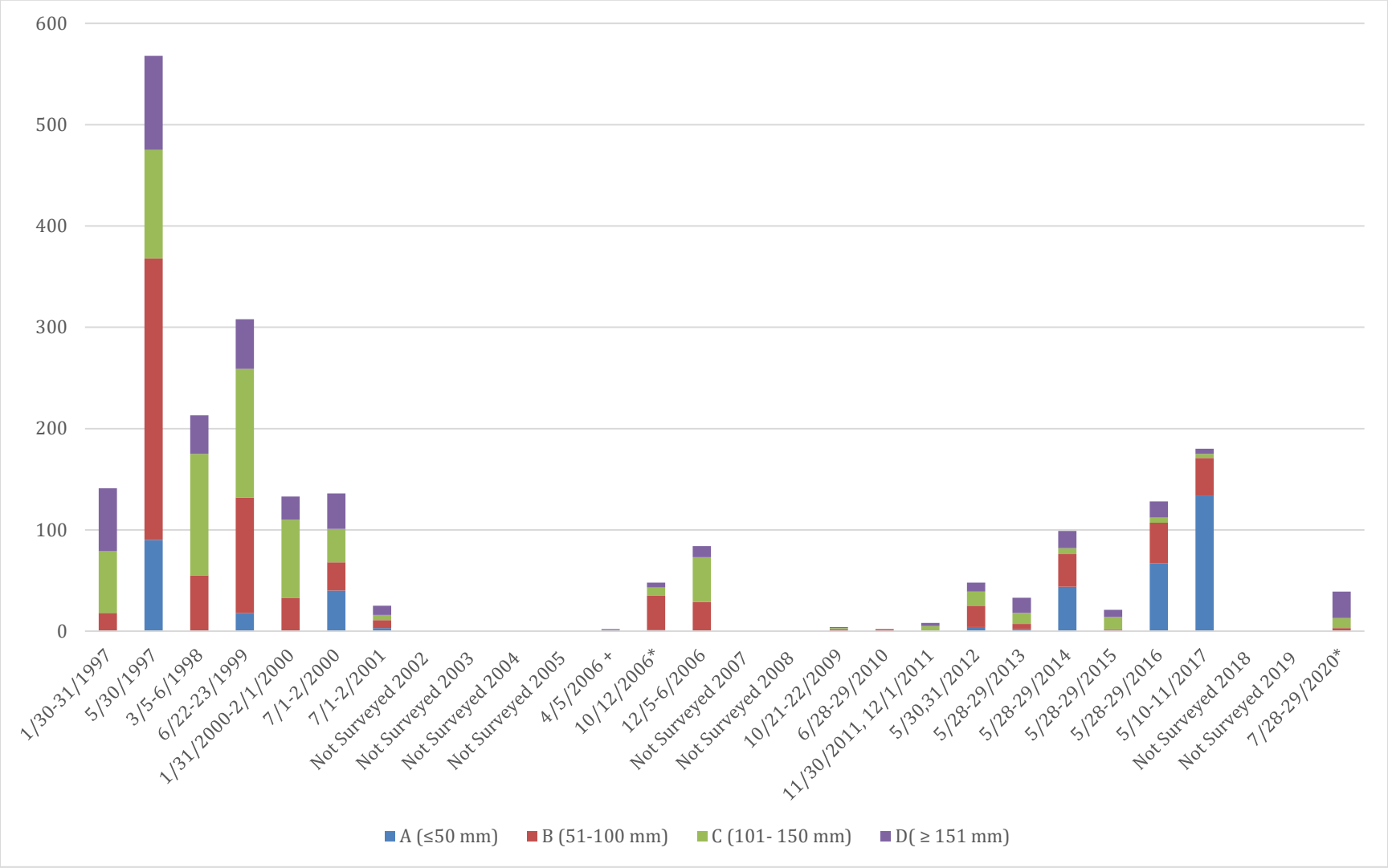

Figure 4. Pahranagat roundtail chub observations by year and size class, NDOW 1997-2020 (NDOW 2021).

Recovery Implementation, Species-specific Research, and Grant-supported Activities

1. National Fish Passage Program

    a. Funded the installation of a small fish ladder between Pahranagat Creek and the Pahranagat Drain. This fish passage structure replaced a corrugated metal culvert that only allowed for downstream movement from Pahranagat Creek to the Pahranagat Drain. A later study by USGS (2019) documented that chub were able to use this structure to move between habitats.

2. Pahranagat Valley Fishes Cooperative Recovery Initiative (CRI; 2013 funded)

    a. Increased monitoring of the population, including, snorkel surveys, larval sampling, and a movement study using PIT tags.

    b. Fencing of riparian habitat – The Service's Partners for Fish and Wildlife Program implemented a fencing project to remove grazing from a portion of Pahranagat Creek. This project also included the installation of a solar well, water tank, and troughs. This action removed grazing and bank trampling from a portion of Pahranagat Creek, allowing for riparian vegetation to recover.

    c. Pahranagat River Habitat inventory (Natural Channel Design 2017). This comprehensive report looked at stream geomorphic features, riparian vegetation, water quality (e.g., temperature), substrate, and fish occurrence data. It also provided recommendations for management options, including, expanding chub habitat into the Pahranagat Ditch and reducing temperature in the Pahranagat River (i.e., Pahranagat Creek). A conceptual design for installing a pipeline to exchange water between Crystal and Ash Springs outflows was provided.

3. Southwestern Native Aquatics Research and Recovery Center (Southwestern ARRC)

    a. Drafted a genetic management plan (draft) for the Pahranagat roundtail chub. This document is important for managing genetics between the wild population, broodstock, and refuge populations.

    b. Provide progeny from broodstock, upon request, to establish and supplement refuge populations of Pahranagat roundtail chub.

4. Partners for Fish and Wildlife funded activities

    a. Installed fish habitat structures in the Pahranagat Ditch and Drain, which are used for fish habitat (e.g., cement fish pools, log veins, lunker structures). Post-construction monitoring of the cement pools in the Pahranagat Ditch have resulted in observations of chub using these habitats.

    b. Implemented fencing project that was funded under the 2013 CRI. Installed cattle troughs and solar fed water tank to provide cattle access to water after exclusion from the Pahranagat Creek.

5. Nevada Department of Wildlife

    a. Assisted with the implementation of recovery actions funded through competitive grants, such as CRI and SNPLMA.

    b. Established and maintained a refugium for the chub at the Key Pittman WMA. Currently, working on habitat renovations before re-introducing chub.

    c. Coordinate the Pahranagat Valley Recovery Implementation Team, which is a multi-stakeholder group that meets bi-annually. The focus of this group is on recovery of Pahranagat Valley fishes. It is also a forum for sharing information between agencies and interested partners.

    d. Conduct population monitoring and nonnative removal efforts.

6. Southern Nevada Public Lands Management Act (SNPLMA; 2022 funded)

    a. A water quality and quantity study of Cottonwood Spring on the Pahranagat National Wildlife Refuge will be conducted in 2022-23.

    b. Modification of Cottonwood Spring and stocking of Pahranagat roundtail chub to establish refugium will occur in 2023-24.

    c. Funding will also be used to develop native and nonnative educational material focused on Pahranagat Valley fishes.

III. FIVE-FACTOR ANALYSIS

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The Recovery Plan for the Aquatic and Riparian Species of Pahranagat Valley noted introductions of nonnative species and habitat alteration as primary threats to the Pahranagat roundtail chub (Service 1998). The introduction of nonnative species and habitat alteration continue to be primary threats.

Habitat alteration or modification

Habitat alteration is one of the greatest threats to Pahranagat roundtail chub. Aquatic habitat in Pahranagat Valley has been extensively modified for agriculture over the past century, if not longer. Modifications include a complex series of ditches and pipelines as well as seasonal changes in water allotments. The result of these modifications is the loss of linear habitat and the potential, functional loss of remaining habitat (i.e., elevated temperature, decreased water depth).

1. Linear loss of habitat

    a. The amount of habitat available for Pahranagat roundtail chub has largely remained consistent since the recovery plan (Service 1998). There remains very little available habitat for Pahranagat roundtail chub due to historical modifications in the Valley, such as the impoundment of Hiko Spring, manipulation (e.g., water diversion) of the outflow of Crystal Springs, and settlement of the lands along the riparian corridor. These events reduced the available habitat for chub from approximately 19 mi. to approximately 2.2 mi. of natural stream channel and 1.6 mi. of cement lined ditch (Service 1998).

2. Limiting factors

    a. Elevated water temperature – It is believed that elevated water temperatures during summer months negatively effects chub in Pahranagat Creek. However, how temperature impacts chub has not been studied. The question of whether temperatures in Pahranagat Creek reach lethal or sublethal conditions for chub remains a concern.

        The initial concern regarding temperature was raised during a biological survey of Pahranagat Creek conducted by Tuttle et al (1990). They discovered that activity level of chub decreased during summer months when temperatures in the Pahranagat Creek rise to above 30°C. A later movement study by the USGS (2019) found similar changes to activity level during summer months. They documented that chub traveled shorter distances and restricted the time of day that they traveled. Daytime movement during summer months was essentially nonexistent.

        The concern of elevated water temperatures may also be relevant to the status of the Pahranagat speckled dace (*Rhinichthys spp.*). Between 1998 and 2008, the Pahranagat speckled dace went from being the most abundant fish in Pahranagat Creek to extirpated. This is potentially due to: 1) the disconnecting of upstream habitat to Pahranagat Creek (i.e., diverting of Crystal Springs outflow); and/or 2) Pahranagat Creek water temperatures exceeding the maximum thermal temperature of speckled dace.

    b. Changes to stream depth, width, and substrate – A geomorphic study by Natural Channel Design (2017) collected a series of data at numerous cross sections of Pahranagat Creek, which were compared to data collected by Stein and Hobbs (2000). Their results found that the stream on average has become wider, shallower, and with an increase in fine sediment.

    c. Changes to flow – The amount of water allotted to irrigation has remained unchanged since the Lakes Decree (State of Nevada 1927). Additionally, the amount of water that is discharged from Crystal and Ash Springs has remained constant. Irrigation systems in Pahranagat Valley have become more efficient for irrigators resulting in changes to the amount of water entering the Pahranagat

Creek. Specifically, earthen and cement ditches have been replaced by pipelines for flood irrigating fields. These allow for better irrigation practices but also potentially reduces the amount of cool water returning to the upper portions of the Pahranagat Creek from Crystal Springs during irrigation season (March 15th through September 30th).

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial, recreational, or scientific purposes does not appear to be a threat at this time. No such use of Pahranagat roundtail chub has occurred since the species was listed nor is it likely to become an issue in the foreseeable future.

Factor C: Disease or Predation

No new information concerning disease has since been published and disease is not considered a significant threat at this time.

Predation

Interactions between nonnative species and Pahranagat roundtail chub have not been studied in depth. However, there is potential for predation by nonnative fish species on Pahranagat roundtail chub. The most likely mechanism for this would be predation occurring from overlap between nonnative fish and early life stages (i.e., egg, larval fish) of Pahranagat roundtail chub. Previous work in Nevada by Scoppettone (1993) found that shortfin molly (*Poecilia mexicana*) were effective larval predators in laboratory settings. Convict cichlid (*Amatitlania nigrofasciata*) have also been documented on spawning areas, which may be associated with egg predation.

Factor D: Inadequacy of Existing Regulatory Mechanisms

National Environmental Policy Act (NEPA)

NEPA (42 U.S.C. 4371 *et seq*.) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of a project with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Clean Water Act

Under section 404, the U.S. Army Corps of Engineers (ACOE) regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters, headwaters, and adjacent wetlands (33 U.S.C. 1344). In general, the term "wetland" refers to areas meeting the ACOE criteria of hydric soils, hydrology (either sufficient annual flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in

wetlands). Any action with the potential to impact waters of the United States must be reviewed under the Clean Water Act, NEPA, and the Act. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts. The ACOE interprets "the waters of the United States" expansively to include not only traditional navigable waters and wetlands, but also other defined waters that are adjacent or hydrologically connected to traditional navigable waters. However, on April 21, 2020, the U.S. Environmental Protection Agency and the Department of the Army published the Navigable Waters Protection Rule in the Federal Register (85 FR 22250) that finalized a revised definition of "waters of the United States" under the Clean Water Act. The overall effect of the new rule on loss of isolated wetlands is not known at this time.

Endangered Species Act (Act)

The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

Section 9 prohibits the taking of any federally listed endangered or threatened species. Section 3(18) defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct". Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns that include, but are not limited to, breeding, feeding, or sheltering. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that result from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section 10(a)(1)(B). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan that details measures to minimize and mitigate the project's adverse impacts to listed species.

Nevada State Protection

The State of Nevada classifies the Pahranagat roundtail chub as a protected species and an endangered species under Nevada Administrative Code §§ 503.065. State regulations providing protection for Pahranagat roundtail chub are described below.

Under Nevada Administrative Code §§ 503.050, 503.065, 503.067, 503.075, 503.080, 503.090, 503.103, and 503.104 (Nevada Revised Statutes §§ 501.105, 501.110, 501.181, and 503.650), a species may be designated as protected, threatened, endangered, or sensitive. The State statutes and regulations aimed at protecting wildlife and plant species, respectively, are administered by the NDOW and the Nevada Division of Forestry, under the Department of Conservation and Natural Resources. Capturing, removing, or destroying animals and plants on the State's fully protected list is prohibited for wildlife under Nevada Administrative Code §§ 503.093 and 503.094 (Nevada Revised Statues §§ 501.105 and 501.181) and for plants under Nevada Administrative Code §§ 527.250 to 527.460 (Nevada Revised Statutes §§ 527.050 and 527.300), unless a special permit has been obtained from the NDOW or Nevada Division of Forestry.

Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence

Introduction of nonnative aquatic species

Within Pahranagat Creek, nonnative aquatic species are diverse and widespread. The common carp was introduced to the Valley more than a century ago. Later, during the mid-1960s, a suite of aquarium fish was introduced, which included the convict cichlid, shortfin molly, and sailfin molly (*P. latipinna*). An aquarium plant (red ludwigia [*Ludwigia repens*]) and a snail (red-rimmed melania [*Melanoides tuberculate*]) were also introduced.

The NDOW has documented and/or removed a few isolated nonnative fish species, including, an unknown individual in the family Osphronemidae (possible gourami species), an unknown cichlid (possible blue tilapia [*Oreochromis aureus*]), an unknown cyprinid (possible barb species), and green sunfish (*Lepomis cyanellus*). These fish species did not become established in the Pahranagat Creek.

Nonnative fish species can impact the Pahranagat roundtail chub through competition and predation. A summary of aquatic nonnative species occurrences is provided below:

1. Fishes – Shortfin molly (established), swordfin molly (established), western mosquitofish (*Gambusia affinis*; established), common carp (*Cyprinus carpio*; established), green sunfish (not established), unknown cyprinid – possible blue tilapia (not established, removed), unknown Ospheronemidae – possible gourami (not established, removed), unknown cyprinid – possible barb (not established, removed);

2. Aquatic vegetation – Red ludwigia (established); and

3. Invertebrates – Red rimmed melania (established), red swamp crayfish (*Procambarus clarkia*; established).

IV. CONCLUSIONS

After reviewing the best available scientific information, we conclude that Pahranagat roundtail chub remains an endangered species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species remains an accurate reflection of the species current status.

V. RECOMMENDATIONS FOR FUTURE ACTIONS

Over the next 5 years, the Service recommends the following:

- Establish and maintain secondary populations of Pahranagat roundtail chub. These efforts should focus on repairing or creating habitat on Federal and State lands (i.e., Key Pittman Wildlife Management Area, Pahranagat National Wildlife Refuge).
- Establish local watershed group that focuses on finding win-win situations between water users and management agencies. The water and environmental issues in Pahranagat Valley are complex and providing a forum to exchange ideas and to create better decision-making processes is needed.
- Look into feasibility of exchanging water from Ash Spring and Crystal Springs during the summer months to lower stream temperature.
- Look into feasibility of retiring water rights or changing the point of diversion to areas to increase flow in Pahranagat Creek.
- Implement a rear and release program to increase and/or subsidize the population in Pahranagat Creek. This could also be used to maximize gene diversity in refuge populations.
- Evaluate existing population survey protocols and redesign to make more effective at tracking abundance.

VI. APPROVAL

Lead Field Supervisor, Fish and Wildlife Service

Approve GLEN KNOWLES Digitally signed by GLEN KNOWLES Date: 2022.10.28 12:33:25 -07'00' Date _____

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