Apache Trout (*Oncorhynchus apache*) Cooperative Management Plan

Electrofishing for Apache Trout on the South Fork Little Colorado River. Credit: D. Dauwalter.

May, 2021

Cooperating Agencies:

Arizona Game and Fish Department

White Mountain Apache Tribe

U.S. Fish and Wildlife Service

U.S. Forest Service

Trout Unlimited

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1. Introduction, Purpose, and Goals

The Apache Trout *Oncorhynchus apache* is native to the Salt and Little Colorado river basins above 1,800 m elevation in the White Mountains in east-central Arizona. Currently the species is comprised of 37 naturally-reproducing relict, replicated, and hybridized populations, and other unoccupied streams have been identified for establishment of future populations (Figure 1)(Dauwalter et al. 2021). Apache Trout streams that have been the focus of recovery occur on lands owned and managed primarily by the Fort Apache Indian Reservation (FAIR) and Apache-Sitgreaves National Forests (ASNFs).

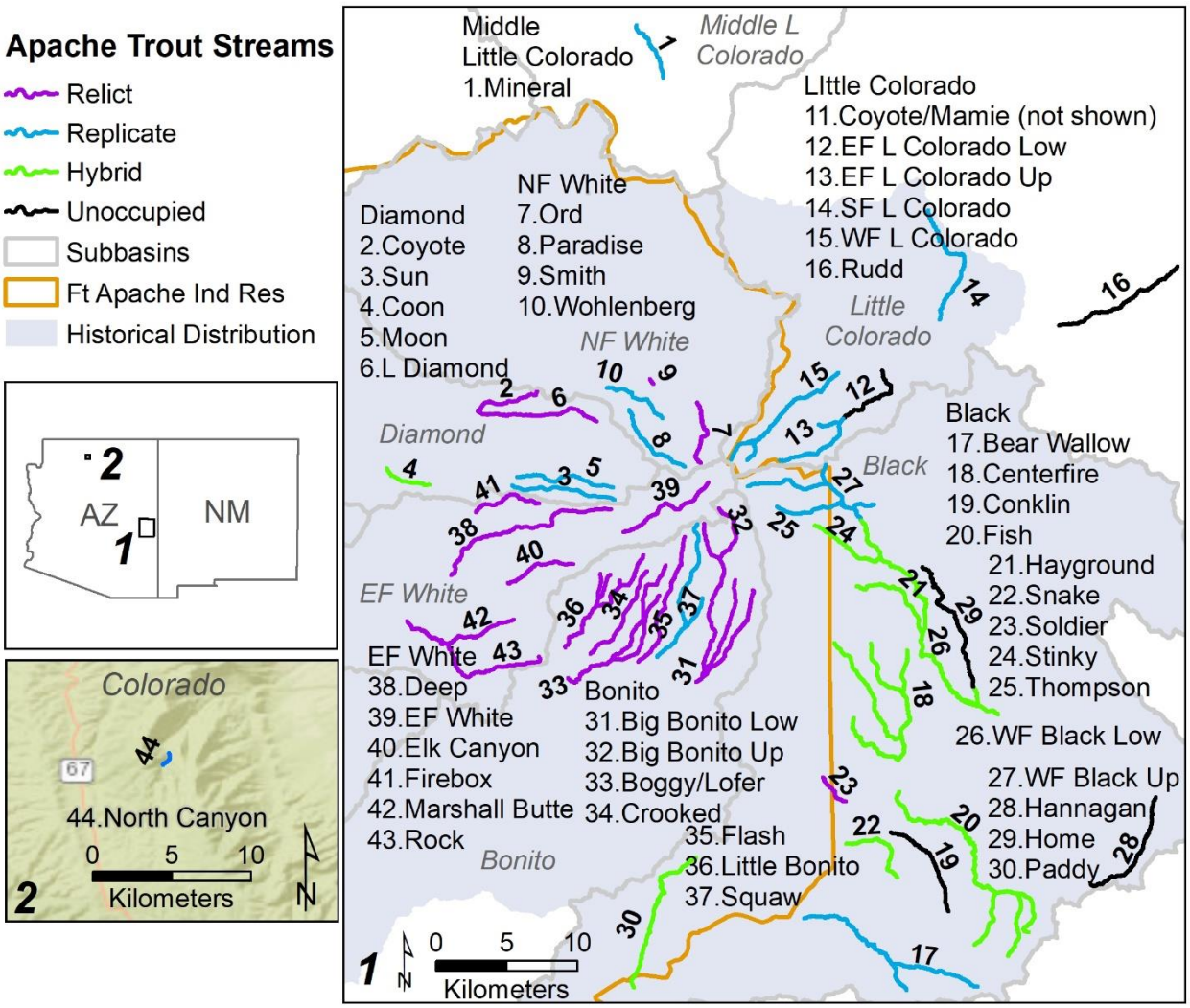

Figure 1. Relict, replicate, and hybrid Apache Trout populations and unoccupied recovery streams in east-central Arizona. Generalized historical distribution denoted in grey, and subbasins outlined in black with grey label.

The Apache Trout is listed as threatened on the Federal List of Endangered and Threatened Wildlife under the Endangered Species Act of 1973, as amended (ESA; 16 USC 1531 *et seq.*). The species was first listed as endangered in 1967 (March 11, 1967, 32 FR 4001) and was downlisted to threatened in 1975 (July 16, 1975, 40 FR 29863) after successful culturing in captivity and new knowledge of existing

populations. The downlisting included a 4(d) rule under ESA that allows Arizona Game and Fish Department to manage the species as a sportfish and establish sportfishing opportunities. There is no critical habitat designation for the Apache Trout because its listing and reclassification occurred before the 1978 and 1982 amendments to the ESA that provide for critical habitat designation. The first recovery plan for the species was developed in 1979, and a revised plan was developed in 1983 (USFWS 1983). A second revision was completed in 2009 (2009 Plan; USFWS 2009).

This Cooperative Management Plan (CMP) has been developed and entered into by Arizona Game and Fish Department (the Department), White Mountain Apache Tribe (WMAT), U.S. Fish and Wildlife Service (Service), U.S. Forest Service (USFS), and Trout Unlimited to manage and protect Apache Trout populations and habitat for the long-term conservation of the species. These entities will hereafter be referred to as "Cooperators" within this CMP. Other entities may choose, with agreement of the Cooperators, to participate in implementation of the CMP in the future.

Purpose

The Cooperators consider the Apache Trout to be a conservation-reliant species, which is defined as a species requiring some level of management to remain viable as a species even when recovery goals for self-sustaining populations are met (Scott et al. 2005). The purposes of this CMP, then, are to: 1) outline the management actions and step-down activities needed to achieve recovery and provide for long-term management if and when the Apache Trout is removed from the Federal List of Endangered and Threatened Wildlife due to recovery (these actions and activities are based in part on those in the 2009 Plan, and 2) identify the roles and responsibilities of the Cooperators in the implementation of these management actions and activities. As such, the CMP provides the opportunity to fulfill the joint missions of Cooperators to conserve and recover Apache Trout, or if delisted to maintain a recovered status, while providing sportfishing opportunities and allowing for multiple use of areas occupied by Apache Trout or that are important to their continued viability.

The Cooperators recognize that collaboration and partnering is important in accomplishing priority actions to achieve long-term conservation of Apache Trout habitats and populations. The Cooperators propose, per this CMP, to work together to implement actions and promote conservation of the Apache Trout in the most efficient means possible. All Cooperators recognize that they each have specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of wildlife and the management, development, and allocation of water resources, and nothing in the CMP is intended to abrogate any of the parties' respective individual responsibilities. The CMP has no termination date, and Cooperator participation is a voluntary commitment.

Goals

The goals of this CMP are:

Goal 1: Ensure the long-term persistence of the Apache Trout, such that naturally viable populations become established or are maintained to reach recovery and delisting and to maintain a recovered (delisted) status

Goal 2: Restore and maintain quality instream habitats to ensure spawning, rearing, and adult habitat are in sufficient abundance to allow for viable populations of Apache Trout (sufficient abundance, consistent recruitment), as well as other native non-game species with which they were historically associated

Goal 3: For land under the control of the Cooperators, ensure that land management is compatible with functioning watershed conditions that support high-functioning riparian areas, instream habitats, and native fish assemblages

Goal 4: Provide and enhance sportfishing opportunities for Apache Trout

2. 2009 Recovery Plan Criteria and Objectives

Since development of the original and revised recovery plans, Cooperators have partnered to implement the conservation strategy in those plans to achieve recovery. The 2009 Plan identifies its primary objective as: "establish and/or maintain 30 self-sustaining discrete populations of pure Apache Trout within its historical range." The 2009 Plan states the Apache Trout should be considered for removal from the Federal List of Endangered and Threatened Wildlife (delisting) when the following recovery criteria are met (USFWS 2009):

1) **Habitat sufficient to provide for all life functions at all life stages of 30 self-sustaining discrete populations of pure Apache Trout has been established and protected through plans and agreements with responsible land and resource management entities. These plans will address and serve to remedy current and future threats to Apache Trout habitat.**

2) **Thirty discrete populations of pure Apache Trout have been established and determined to be self-sustaining. A population will be considered self-sustaining by the presence of multiple age classes and evidence of periodic natural reproduction. A population will be considered established when it is capable of persisting under the range of variation in habitat conditions that occur in the restoration stream (Propst and Stefferud 1997).**

3) **Appropriate angling regulations are in place to protect Apache Trout populations while complying with Federal, State, and Tribal regulatory processes.**

4) **Agreements with USFWS, AZGFD, and WMAT to monitor, prevent, and control disease and/or causative agents, parasites, and pathogens that may threaten Apache Trout.**

3. Cooperator Roles and Responsibilities

Each Cooperator has a vested interest and obligation in the recovery and long-term viability of the Apache Trout; therefore, each Cooperator has various roles and responsibilities in Apache Trout

conservation. To ensure that recovery populations are viable, and to mitigate for potential future risks, the Cooperators propose to implement the actions and step-down activities proposed in section "5. Cooperative Management Actions" and implement the emergency contingency plan listed in section "7. Emergency Contingency Plan" as needed to address potential threats from introduction of non-native species, wildfire, or other (unforeseen) threats. All Cooperators will meet annually to discuss accomplishments and plan future actions and activities. Conservation actions and activities will be shared by the Cooperators as follows:

Arizona Game and Fish Department

The Department will:

- Designate a principal contact to coordinate with Cooperators regarding planning, resource allocation, and project activities related to Apache Trout.
- Attend and participate in annual and other Cooperator meetings.
- Implement Apache Trout management activities on the national forests and state lands in coordination with the appropriate Cooperators.
- Work with Cooperators in overall development of proposed management activities that will contribute to the attainment of the goals listed in section "1. Introduction, Purpose, and Goals" above.
- Act as lead Cooperator, when appropriate, or provide assistance to the lead Cooperator in complying with regulatory and procedural requirements set forth in the National Environmental Policy Act (including public involvement), the Endangered Species Act (e.g., compliance with Section 7 consultation), Clean Water Act, the National Historic Preservation Act, and other applicable federal and state regulations.
- Provide leadership, expertise, and personnel during the planning of proposed activities, including selection of project sites, technical design, and project engineering.
- Provide resources (e.g., personnel, equipment, materials) to lead or assist in the implementation of proposed activities, including project construction and maintenance (fish barriers and habitat restoration), piscicide applications, mechanical non-native fish removal, and stocking.
- Provide resources to lead or assist in the monitoring, reporting, and public outreach associated with proposed activities.
- Work with Cooperators and others to pursue grants and cooperative funding opportunities and seek appropriate funds through normal agency budgeting.
- Implement Apache Trout management, including sportfishing regulations, to enhance and promote sportfishing opportunities, garner public support, and conserve populations.
- Provide facility space (refugia ponds) and staff support for emergency fish rescues due to stochastic events such as wildfire.
- Manage non-native sportfish stocking consistent with long-term conservation objectives for Apache Trout populations (e.g., the Department currently only stocks triploid Rainbow Trout).
- Manage Apache trout recovery populations as identified in the Department's Little Colorado River and Salt River watershed management plans.

White Mountain Apache Tribe

The WMAT will:

- Designate a principal contact to coordinate planning, resource allocation, and project activities with Cooperators.
- Attend and participate in annual and other Cooperator meetings.
- Implement Apache Trout management activities on the Fort Apache Indian Reservation.
- Work with the Service and Cooperators in overall development of proposed management activities that will contribute to the attainment of the goals listed in section "1. Introduction, Purpose, and Goals" above.
- Act as lead organization, when appropriate, or provide assistance to the lead organization in complying with any regulatory and procedural requirements set forth by the Tribal Council or other applicable regulations.
- Provide leadership, expertise, and personnel during planning of proposed activities, including the selection of project sites, technical design, and project engineering.
- Provide personnel to assist in implementation of proposed activities including project construction and maintenance (fish barriers and habitat restoration), non-native fish removal, and stocking.
- Provide personnel to assist in monitoring, reporting, and public outreach associated with proposed activities.
- Work with Cooperators to pursue grants and cooperative funding opportunities and seek appropriated funds through the normal agency budgeting process.
- Provide facility space and staff support for emergency fish rescues due to stochastic events such as wildfire.
- Maintain Apache Trout broodstock.
- Implement Apache Trout management, including sportfishing regulations, to enhance and promote sportfishing opportunities, garner public support, and conserve populations.
- Hire a seasonal crew, annually, to implement Apache Trout conservation activities.
- Manage non-native sportfish stocking consistent with long-term conservation objectives for Apache Trout populations.

U.S. Fish and Wildlife Service

The Service will:

- Designate a principal contact to coordinate planning, resource allocation, and project activities with Cooperators.
- Attend and participate in annual and other Cooperator meetings.
- Implement Apache Trout management activities on the national forests, state lands, and Fort Apache Indian Reservation in coordination with the appropriate Cooperators.

- Work with Cooperators and other partners in development of proposed management activities that will contribute to the attainment of the goals listed in the section "1. Introduction, Purpose, and Goals".
- Designate principal contacts with Cooperators and others to assist with coordination of field activities, share information about hatchery production and distribution, and share information on progress toward recovery of Apache Trout while listed under the ESA.
- Act as lead organization, when appropriate, or provide assistance to the lead organization in complying with regulatory and procedural requirements set forth in the National Environmental Policy Act, 42 U.S.C § 4321 *et seq.* (including public involvement), the ESA (Section 7 consultation), Clean Water Act, 33 U.S.C. § 1251 *et seq*., the National Historical Preservation Act, 54 U.S.C. § 300101 *et seq.*, and other applicable federal laws.
- Provide leadership, expertise, and personnel during planning of proposed activities, including the selection of project sites, technical design, and project engineering.
- Provide personnel to assist in implementation of proposed activities including project construction and maintenance (fish barriers and habitat restoration), piscicide applications, mechanical non-native fish removal, and stocking.
- Provide personnel to assist in monitoring, reporting, and public outreach associated with proposed activities.
- Work with Cooperators and others to pursue grants and cooperative funding opportunities and seek appropriated funds through the normal agency budgeting process.
- Provide facility space and staff support for emergency fish rescues due to stochastic events such as wildfire.
- Maintain Apache Trout broodstock.
- Provide technical assistance to tribes, as requested, regarding the management of sportfish and conservation populations.
- Hire a seasonal crew, annually, to implement Apache Trout conservation activities.
- Work with Cooperators to manage non-native sportfish stocking consistent with long-term conservation objectives for Apache Trout populations.

Apache-Sitgreaves National Forests

The Southwestern Region of the Forest Service and Apache-Sitgreaves National Forests will:

- Designate a principal contact to coordinate planning, resource allocation, and project activities with Cooperators.
- Attend and participate in annual and other Cooperator meetings.
- Implement Apache Trout management activities on the national forest lands in coordination with the appropriate Cooperators.
- Work with Cooperators in overall development of proposed management activities that will contribute to the attainment of the goals listed in section "1. Introduction, Purpose, and Goals".
- Act as the lead agency, when appropriate, or provide assistance to the lead agency in complying with regulatory and procedural requirements set forth in the National Environmental Policy Act

(including public involvement), the ESA (Section 7 consultation), Clean Water Act, the National Historical Preservation Act, and other applicable federal laws.
- Provide leadership, expertise, and personnel during planning of proposed activities, including the selection of project sites, technical design, and project engineering.
- Provide personnel to assist in implementation of proposed activities including project construction and maintenance (fish barriers and habitat restoration), piscicide treatments, mechanical non-native fish removals, and stocking.
- Provide personnel to assist in monitoring, reporting, and public outreach associated with proposed activities.
- Work with Cooperators to pursue grants and cooperative funding opportunities and seek appropriated funds through the normal agency budgeting process.
- Manage Apache Trout habitat on forest service lands for sufficiency based on land management plans (ASNFs 2015) and other Forest Service guidance documents.

Trout Unlimited

Trout Unlimited National and the Arizona Council of Trout Unlimited and its affiliate chapters will:

- Designate a principal contact to coordinate planning, resource allocation, and project activities with Cooperators.
- Attend and participate in annual and other Cooperator meetings.
- Work with Cooperators in overall development of proposed management activities that will contribute to the attainment of the goals listed in section "1. Introduction, Purpose, and Goals" above.
- Provide assistance to the lead organization in complying with any regulatory and procedural requirements.
- Work with Cooperators and other interested organizations to identify and make known anticipated resources (personnel, equipment, monetary) available for programs, funding, data, and volunteer needs to facilitate use in proposed activities.
- Contribute operation, maintenance, and restoration resources as agreed to in site-specific project plans and agreements.
- Work with Cooperators and others to pursue grants and other fundraising opportunities.

4. Cooperator Authorities

The Arizona Game and Fish Department enters into this voluntary CMP through its authority for the State of Arizona to manage and conserve native fish (and other legally defined "wildlife"), including Apache Trout, which is currently listed as a 1A in the Arizona State Wildlife Action Plan (AZGFD 2012). Title 17-102 of the Arizona Revised Statutes designates the Arizona Game and Fish Commission as the authority for Wildlife in the State of Arizona, and Title 17-231 B.7. authorizes the Arizona Game and Fish Commission, working through its Administrative Agency, the Arizona Game and Fish Department, to enter into agreements with other entities to further the purposes of its mission, which includes

providing sport fishing opportunity to the public and conservation of native fishes. Management and conservation authority (e.g., rulemaking to establish seasons, amounts, manner, fees, and penalties for taking "wildlife") is provided to the Arizona Game and Fish Commission and the Department in Arizona Statutes, with additional authorities and responsibilities relative to threatened and endangered species also mentioned.

The White Mountain Apache Tribe enters voluntarily into this CMP through its authority to manage fish and wildlife through White Mountain Apache Game and Fish Code set by the Tribal Council and its administration agency the Game and Fish Department; Game and Fish Code Section 2.1 establishes the Tribe's general powers and duties to manage fish and wildlife. The White Mountain Apache Tribe regulates recreational take of fish on the Fort Apache Indian Reservation through Section 3.1 and 5.1, as well as Section 3.5 for collecting or holding wildlife, for conducting field trials, or for any other recreational, educational or scientific purpose and Chapter 5 for possession and taking of wildlife.

Apache-Sitgreaves National Forests enter into this voluntary CMP by the authority provided through the Federal Land Policy and Management Act of 1976, as amended, 43 U.S.C. § 1701 *et seq.*, National Forest Management Act of 1976, the ESA, and the National Environmental Policy Act of 1969, as amended, 16 U.S.C. 1600 *et seq*.

The Service enters voluntarily into this CMP by the authority provided by the ESA, the Fish and Wildlife Coordination Act, 16 USC 661 *et seq.*, and the Fish and Wildlife Act of 1956, 16 USC 742f. *et seq*. Under these authorities, the Service may enter into agreements, receive and distribute funds, carry out conservation programs, and provide assistance in order to protect, recover, and increase the supply of wildlife and wildlife resources.

Trout Unlimited enters into this voluntary CMP as a national organization representing over 300,000 members and supporters with a mission to conserve, protect, and restore North America's coldwater fisheries and their watersheds. The Arizona Council of Trout Unlimited provides a link between national Trout Unlimited and chapters within the State of Arizona (Gila Trout, Grand Canyon, Zane Grey, and Old Pueblo chapters). Trout Unlimited has no authority to implement local, state, or national laws.

5. Cooperative Management Actions

Since the Apache Trout was listed under the ESA in 1967, and during implementation of the 1979 Recovery Plan (USFWS 1979) and 1983 and 2009 revisions (USFWS 1983; USFWS 2009), there have been various management actions and conservation measures implemented to address many of the threats to the Apache Trout that led to the species' decline. These threats included watershed alterations from forestry, livestock grazing, reservoir construction, agriculture, road construction, and mining practices that led to subsequent deterioration of Apache Trout habitat. This deterioration of habitat included loss of riparian vegetation, reduced streambank stability, and increased erosion and subsequent sediment loads (USFWS 1983). This, in turn, has decreased the quality of spawning and rearing habitat, altered stream flows and temperatures, and altered stream productivity and food supply. More than a century

of stocking non-native trouts, such as Brook Trout *Salvelinus fontinalis*, Brown Trout *Salmo trutta*, Rainbow Trout *O. mykiss*, and Cutthroat Trout *O. clarkii*, has led to competition, predation, and hybridization negatively impacting Apache Trout (Carmichael et al. 1993).

The proposed actions and step-down activities, in part based on the 2009 Plan (USFWS 2009) for recovery of Apache Trout and long-term persistence if and when delisting occurs, are listed below under Actions 1 and 2. The actions are intended to provide broad guidance necessary for the Apache Trout to remain viable as a species. A Species Status Assessment for the Apache Trout, as well as updates during annual meetings, can be used to identify the current (and future) condition of each Apache Trout population, habitat, or watershed. The prioritization and planning of management activities is likely to not only depend on current and future conditions but also on availability of resources and other factors and, therefore, should be conducted on an annual basis among Cooperators (e.g., annual meeting). For example, a Species Status Assessment for the Apache Trout may reveal several streams that require meadow restoration to achieve habitat sufficient to support Apache Trout as evidenced by stream temperatures and habitat quality; however, which meadows are prioritized first for restoration, and the planning to carry out the activity, should be done at semi-annual or annual work meetings attended by Cooperators. Detailed information and metrics on watershed condition class, road density, potential natural vegetation type, and other planning documents (e.g., Land Management Plan Objectives for Riparian Areas; ASNFs 2015) may help to inform these prioritization and planning processes for specific activities. The proposed actions and step-down activities are:

Action 1: Assess, protect, enhance, and maintain habitats sufficient for recovery and long-term conservation of Apache Trout populations that are self-sustaining and genetically pure within the species' historical range

1.1. Complete any required regulatory compliance for fish stocking and stream improvements

Prepare documentation for compliance with National Environmental Policy Act (NEPA), Clean Water Act, ESA section 7 consultations, or other statutes, policies, and procedures for all management activities.

Activities needed:

- Comply with applicable regulations for all management actions.

1.2. Maintain, improve, establish, or re-establish fish barriers if natural barriers are absent

Barriers are often needed to protect Apache Trout populations by preventing invasion by non-native trout from downstream (Avenetti et al. 2006). Routine barrier monitoring and maintenance is needed to protect populations. Consideration should be given to barrier designs that can be modified or retrofitted to provide for passage during staged non-native removals (e.g., staged piscicide treatments) with additional barriers downstream where appropriate. Consider habitat length, number of tributaries, physical habitat quality and quantity, and thermal suitability when siting barriers to facilitate areas of refuge and recolonization potential and, therefore, high levels of population persistence when stochastic disturbances such as floods and wildfires occur (e.g., meeting common persistence criteria, create metapopulations)(Fausch et al. 2006).

Activities needed:

- Maintain existing barrier effectiveness.
    - Monitor conservation barriers for effectiveness after rainfall events that result in streamflows that compromise barrier integrity (e.g., flows that exceed barrier design standards) or on an as needed basis. Monitoring may include visual inspection of barriers to assess structural integrity, marking fish below the barrier to assess passage through attempted recapture above the barrier, or sampling above the barriers to assess whether undesirable species are present when they are not known to occur there (Avenetti et al. 2006; Dauwalter et al. 2017).
    - Remove threats to structural integrity (e.g., log jams).
    - Improve barrier integrity when structural integrity is in question or it is determined to be ineffective per design standards.
    - Assess barriers with questionable effectiveness.
- Establish new or re-establish barriers to isolate Apache Trout populations from undesirable species downstream.
    - Repair or re-establish non-functional barriers on streams where barriers have been deemed ineffective but needed (Table 1).
    - Create new barriers where they are deemed necessary to protect Apache Trout populations, expand populations, or create larger metapopulations.
- Remove or retrofit barriers to provide passage where appropriate to facilitate metapopulation dynamics where non-native trout have been removed.
    - Remove or retrofit barriers for passage in metapopulations once downstream barriers have been constructed and non-native threats removed.

1.3. Remove or minimize undesirable fishes using piscicides, electrofishing, or other feasible means in invaded Apache Trout populations

Rainbow Trout and Cutthroat Trout can hybridize with Apache Trout. Brown Trout and Brook Trout can negatively impact Apache Trout through competition and predation. Non-native trout can effectively be removed using piscicides (Clancey et al. 2019). Mechanical removal of non-native trout is possible but can take substantial effort and may not be 100% effective (Thompson and Rahel 1996).

Activities needed:

- If possible, remove non-native trout, or other undesirable aquatic species, using piscicides (after barriers are established or repaired if needed).
- Suppress populations using mechanical removal or other feasible means when complete removal via piscicides is not possible due to authority, presence of relict populations, or other factors.

1.4. Stock streams with genetically pure Apache Trout

Unoccupied or renovated streams should be stocked with genetically pure Apache Trout using fish or eggs from populations, if available and practical (e.g., biological, logistical, political reasons), in the

following priority order: 1) a relict population; 2) a replicated population; 3) a hatchery stock. It is recommended that donor streams contain more than 500 individuals as to not deplete the source population. Supplemental stockings should use fish from the original donor populations if possible.

Activities needed:

- Stock unoccupied or renovated streams.
- Augment small (<500 individuals) or recently founded populations through supplemental stocking, as needed and as source stocks are available, to minimize effects of inbreeding and maintain genetic diversity.

1.5. Salvage and provide refuges for Apache Trout populations that are affected by wildfire, drought, barrier failures, disease, or other threats

Wildfire, drought, non-native trout invasions (e.g., barrier failure), and disease can threaten the viability and genetic integrity of Apache Trout populations (Dunham et al. 2002; Rieman et al. 2003). If threatened, Apache Trout should be salvaged and moved to other streams or hatcheries with suitable isolation facilities until they can be repatriated into the wild.

Activities needed:

- Implement 7. Emergency Contingency Plan.

1.6. Maintain, restore, or enhance habitat for Apache Trout populations as warranted

Apache Trout require coldwater streams with physical habitats suitable to meeting all life history requirements and maintaining viable populations. Inappropriate land management can result in poor watershed conditions that lead to altered hydrology and increased sediment yield from watersheds, compacted floodplains, altered riparian vegetation, reduced streambank stability, and simplified and poor-quality habitat. Proper forest and roads management, livestock and other animal use, as well as habitat restoration and connectivity, can help maintain high-quality Apache Trout habitat and viable populations and facilitate adaptation to future climates (Williams et al. 2015).

Activities needed:

- Restore, maintain, and enhance watershed condition class by removing or mitigating degrading factors to facilitate functional riparian and instream habitats sufficient to support Apache Trout.
    - Minimize grazing impacts, including impacts from unplanned uses, to improve and protect watershed, riparian, and aquatic habitat conditions so that they are functional.
    - Coordinate and conduct vegetation and fire management to facilitate watershed, riparian, and aquatic habitat conditions that are functional.
    - Manage road and trail construction, maintenance, and decommissioning, and related sediments, to facilitate watershed, riparian, and aquatic habitat conditions that are functional.
- Restore, maintain, and enhance instream and riparian habitat that is sufficient to support Apache Trout.

- Decommission, relocate, or improve roads or trails that contribute sediments, damage riparian vegetation, erode streambanks, cause gullies, or compact floodplain soils.
- Minimize grazing impacts, including from unplanned uses, to riparian and aquatic habitat conditions.
- Remove unintentional fish passage barriers to improve stream connectivity.

1.7. Monitor Apache Trout populations and habitats

Monitoring is the repeated evaluation of something periodically over time and can help to assess long-term trends. Population monitoring data can convey the likelihood of population persistence, abundance, distribution, and recruitment and detect invasion by non-native aquatic species. Too, population and habitat monitoring can elucidate long-term conditions and trends (Dauwalter et al. 2010; Roper et al. 2019), both of which can inform and trigger adaptive management and restoration (Roni 2005). Due to the small endemic range of the Apache Trout and the inherently small size of some individual populations, it is important to monitor population status long-term even after recovery is achieved and after an ESA post-delisting monitoring plan is completed and implemented for the mandated five-year period.

Activities needed:

- Monitor each Apache Trout population at least every 8 years, and ideally every 5 years, per the Apache Trout Monitoring Plan (Dauwalter et al. 2017). The plan emphasizes estimating stream-wide abundance of adult Apache Trout (≥130-mm TL), distribution within a stream, and distribution of reproduction within a stream.
- Monitor habitat within Apache Trout streams concurrently with population monitoring (at least every 8 years; ideally every 5 years). Habitat monitoring encompasses monitoring residual pool depths.
- Monitor stream temperature, as needed, using year-round thermograph deployments, as suggested in the Apache Trout Monitoring Plan and other guidance documents (Dunham et al. 2005).
- Monitor Apache Trout populations for genetic purity every other population monitoring cycle, unless other information suggests hybrids may be present (e.g., visual appearance), in which case genetic monitoring (for hybridization) should be conducted immediately.
- Complete fish health surveys, as needed, such as when fish are collected for transfer into another waterbody or hatchery.

Action 2. Implement laws and regulations to protect Apache Trout populations and habitat while complying with Federal, State, and Tribal regulatory processes

2.1. Develop, implement, enforce, and evaluate regulations as necessary to maintain self-sustaining Apache Trout populations

Fishing regulations can help to protect Apache Trout populations. Such regulations include: fishing closures, closed or restricted seasons, harvest limits, length limits, and restricting gear types. Establishment of recreational fisheries for sensitive species can benefit conservation (e.g., funding,

awareness, appreciation) as long as post-release mortality is low or fisheries are developed on non-conservation populations (e.g., reservoirs) (Cooke et al. 2016).

Activities needed:

- The Department and WMAT will continue to implement fishing regulations to protect Apache Trout populations while also providing angling opportunities to the public where possible.

2.2. Use regulatory mechanisms, laws, and policies for long-term protection of Apache Trout

Mechanisms, laws, and policies that are inefficient or inadequately enforced, including State or Tribal regulations, NEPA, Clean Water Act, ESA section 7 consultations, etc., will be brought to the attention of the appropriate management authorities.

Activities needed:

- Take corrective action if any populations are adversely impacted due to insufficient or inadequately enforced laws or policies.

Table 1. Streams associated with Apache Trout recovery, status of populations, and barrier status as of the signature date on this plan. Classifications include: Relict (original population), Replicate (naturally occurring population founded by individuals from another stream), Hybrid (Apache Trout predominate but suspected/known hybridization), Unoccupied (stream is candidate for replicate population).

Subbasin	Stream (Agency)	Classification	Barrier (Only, or Upper)	Barrier (Lower)
Black	Bear Wallow (ASNF)	Replicate (Soldier)	Non-Functional	Functional
	Hannagan (ASNF)	Unoccupied	None	
	Snake (ASNF)	Hybrid	None	
	Soldier (ASNF/FAIR)	Relict	Functional	
	WF Black (Upper; ASNF/FAIR)	Replicate (EF White)	Functional	Non-Functional
	Thompson (Upper; FAIR)	Replicate (Firebox)	Functional	
	WF Black (Lower; ASNF)	Hybrid	Functional	
	Stinky (ASNF)	Hybrid	Non-Functional	
	Hayground (ASNF)	Hybrid	Non-Functional	
	Home	Unoccupied	Non-Functional	Functional
	Fish (ASNF)	Hybrid	None	
	Conklin (ASNF)	Unoccupied	Functional	
	Centerfire (ASNF)	Hybrid	Non-Functional	
	Paddy (FAIR)	Hybrid	None	
Bonito	Big Bonito - Upper (FAIR)	Relict	Functional	
	Big Bonito - Lower (FAIR)[c]	Relict	Non-Functional	
	Boggy/Lofer (FAIR)	Relict	Functional	
	Crooked (FAIR)	Relict	Functional	Functional
	Flash (FAIR)	Relict	Non-Functional	
	Little Bonito (FAIR)	Relict	Functional	Non-Functional
	Squaw (FAIR)	Replicate (Flash)	Functional-suspected	
Diamond	Coon (FAIR)	Hybrid	None	
	Coyote (FAIR)	Relict	Functional - Suspected	
	Little Diamond (FAIR)	Relict[a]	Functional - Suspected	
	Moon (FAIR)	Replicate[a] (Mixed)	None (Christmas Tree Lk)	
	Sun (FAIR)	Replicate[a] (Mixed)	None (Christmas Tree Lk)	
E Fk White	Deep (FAIR)	Relict	Functional	
	E Fk White (FAIR)	Relict	Functional	
	Elk Canyon (FAIR)	Relict	Functional	
	Firebox (FAIR)	Relict	None	
	Marshall Butte (FAIR)	Relict	Functional	
	Rock (FAIR)	Relict[a]	Functional - Suspected	
L Colorado	Coyote/Mamie (ASNF)	Unoccupied	Functional	
	E Fk Little Colo. (Lower; ASNF)	Unoccupied	Non-Functional	Non-Functional
	E Fk Little Colo. (Upper; ASNF)	Replicate (Soldier)	Functional	
	S Fk Little Colo. (ASNF)	Replicate (Big Bonito)	Functional - Suspected	Functional
	W Fk Little Colo. (ASNF)	Replicate (EFWR)	Functional - Suspected	Functional – Susp.
	Rudd (ASNF)	Unoccupied	Functional	
Mineral	Mineral (ASNF)	Replicate (Ord)	Functional	
N Fk White	Ord (FAIR)	Relict	Functional	
	Paradise (FAIR)	Replicate (Deep)	Functional	
	Smith (FAIR)	Relict	Functional - Suspected	Functional – Susp.
	Wohlenberg (FAIR)	Replicate (Coyote)	Functional	
Colorado	North Canyon (KNF)[b]	Replicate (Ord)	Functional	

[a]Evidence of past hybridization but has been shown to be genetically pure during recent testing. [b]Refuge population located outside of historical range on Kaibab National Forest. [c]Includes Hurricane and Hughey creeks.

6. Coordination, Monitoring, and Reporting

The Cooperators will meet no less than annually to provide updates and coordinate future work, staffing, budgets and other topics as needed to plan and implement Apache Trout conservation activities. Cooperators will provide reports of Apache Trout activities to other Cooperators prior to meetings. Cooperators will also provide a status review and activity summary every 5-years.

7. Emergency Contingency Plan

Certain threats to Apache Trout trigger the need to temporarily secure a population or populations in the event the population's persistence is under threat. Therefore, an emergency contingency plan for evacuations and related efforts is needed, especially for relict populations that potentially represent unique genetic lineages and adaptations (USFWS 2015).

Problem identification: The Cooperators will track threats that reveal themselves during the monitoring described in this CMP or through other monitoring and reporting systems (e.g., fire reporting systems, streamflow gages, site visits). Examples of such threats are:

- Barrier failure.
- Invasion of Apache Trout habitat by non-native, hybridizing salmonids such as Rainbow Trout or Cutthroat Trout (although the Department currently stocks only triploid Rainbow Trout).
- Invasion of Apache Trout habitat by non-native, non-hybridizing species such as Brook Trout and Brown Trout.
- Detection of hybrid individuals during monitoring or incidental sampling.
- Very few individuals are estimated to remain in a [relict] population during monitoring.
- Occurrence of wildfire in the watershed of Apache Trout habitat with potential for ash flows or debris flows.
- Power outages at hatchery facilities.
- Significant mortality due to disease, parasites, or pathogens.
- Other factors that present risk to Apache Trout populations.

Communication: All Cooperators will be informed if a threat is deemed immediate, and initial contacts will be made by the person(s) discovering the threat. This includes Arizona Game and Fish Department Pinetop office in Pinetop, Arizona; Game and Fish Department Headquarters office in Phoenix; Service - Arizona Fish and Wildlife Conservation Office (AZFWCO) in Whiteriver or Flagstaff; Service – Arizona Ecological Services Office (AESO) in Phoenix; and White Mountain Apache Tribe office in Whiteriver (See Appendix A. Key Contacts). A lead Cooperator agency and contact will be established and will coordinate and communicate support needs and response planning with the Cooperators.

Actions: The Cooperators will coordinate to provide staff and resources to 1) remove the threat to Apache Trout, or 2) transfer Apache Trout to a holding location, remove the threat, return Apache Trout to the original habitat, and monitor for continuing problems.

Handling of Apache Trout will be minimized to reduce stress. If temperature and dissolved oxygen conditions permit, fish will be held in portable live cars in shaded locations in the stream. If buckets are used to hold and transport fish they should be outfitted with portable aerators or oxygenators.

Transportation may be via personnel with backpacks, pack animals, truck, or helicopter outfitted with aeration equipment. Hauling water will be treated with therapeutic agents to minimize stress and have the following properties (USFWS 2015) or as recommended by fish health experts:

- Temperature: slightly lower than host water (determined by thermometer).
- Dissolved Oxygen: saturated, >6.0 mg/l (determined by D.O. meter).
- NaCl: 0.5%.
- Polyaqua (Stresscoat): 0.26 mg/l.
- MS-222: 6 ppm. (this is less than 1/2 of the minimum concentration recommended for sedation [15 – 50 ppm], so long holding times are permissible)

Extended threats to factors such as population structure or genetic integrity, or barrier failure may require extended holding, whereas threats to habitat may require temporary holding. Potential locations for holding refuge fish are:

- Alchesay-Williams Creek National Fish Hatchery, Whiteriver, Arizona (AZFWCO).
- Pinetop Ponds, Arizona Game and Fish Department Pinetop Regional Office, Pinetop.
- Arizona Game and Fish Department hatchery facilities as available.
- Other streams.

Upon arrival at a hatchery facility, fish will be placed into quarantine and sampled for fish health. Fish health sampling will exclude lethal methods unless approved by the appropriate authority.

Final disposition of rescued fish will be made on a case-by-case basis based on type of threat, threat duration, relict status, availability of holding facilities, captive propagation needs, and availability of recipient streams.

Diseases, causative agents, parasites, and pathogens: During any transfer of dead or live fish, hatchery operations and other quality control and assurance safeguards (e.g., Hazard Analysis Critical Control Point plans, etc.) should be implemented to prohibit the spread of diseases, parasites, pathogens, or other causative agents. Monitor populations for bacterial pathogens (e.g., *R. salmoninarum*), viral pathogens (e.g., IHNV), and parasites (e.g., *M. cerebralis*) through wild fish health surveys using standard protocols (Heil 2009). Fish health surveys should be done on an as needed basis, such as during population monitoring or when fish are collected for transfer into another waterbody or hatchery.

Mortalities: Apache Trout mortalities incurred during evacuation and rescue (or other management actions such as translocations) will be enumerated, measured for total length, age and growth structures collected, and preserved in 10% formalin for later examination and inclusion into a fish collection to be determined by Cooperators.

Reporting: An interagency report providing details on the number, size, and fate of fish collected will be provided to all agencies. The report will contain as appropriate: the type and extent of threat to the Apache Trout population; condition of barrier; source of threat, species identification, distribution, abundance of non-natives; location of non-natives relative to barrier; access (trail location, road); extent of stream intermittency; estimate of mortality in numbers; persons assisting with field collection and transport. Key correspondence and communication chains should also be reported.

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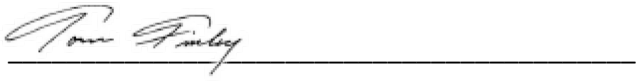
9. Signature Pages

This Cooperative Management Plan shall become effective when signed by the designated representatives of the Cooperator Agencies hereto and shall remain in force until terminated by mutual agreement. Any involved Cooperator may withdraw from this plan on 30 days written notice to the other signatories. Amendments to this CMP may be proposed by any involved Cooperator and shall become effective upon written approval by all Cooperators.

Arizona Game and Fish Department

Apache Trout Cooperative Management Plan

IN WITNESS WHEREOF, each Cooperator has caused this Cooperative Management Plan to be executed by an authorized official on the date and year set forth by their signature



9/1/21

Director

Date

Arizona Game and Fish Department

White Mountain Apache Tribe

Apache Trout Cooperative Management Plan

IN WITNESS WHEREOF, each Cooperator has caused this Cooperative Management Plan to be executed by an authorized official on the date and year set forth by their signature

12/14/2021

Director

Date

White Mountain Apache Tribe Game and Fish Department

IN WITNESS WHEREOF, each Cooperator has caused this Cooperative Management Plan to be executed by an authorized official on the date and year set forth by their signature

Forest Supervisor

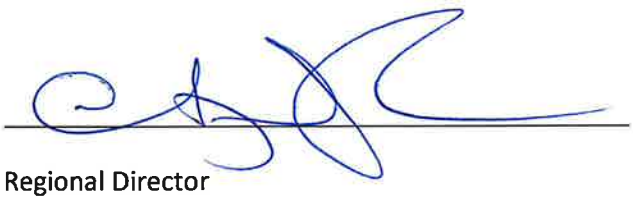
Date

Apache-Sitgreaves National Forests

U.S. Fish and Wildlife Service

Apache Trout Cooperative Management Plan

IN WITNESS WHEREOF, each Cooperator has caused this Cooperative Management Plan to be executed by an authorized official on the date and year set forth by their signature



Regional Director

8/19/21

Date

U.S. Fish and Wildlife Service

Trout Unlimited

Apache Trout Cooperative Management Plan

IN WITNESS WHEREOF, each Cooperator has caused this agreement to be executed by an authorized official on the date and year set forth by their signature

August 26, 2021

Steve Reiter, Council Chair
Arizona Council of Trout Unlimited, Inc.

Date

May 27, 2021

Robert Masonis, Vice President for Western Conservation
Trout Unlimited

Date

Appendix A. Key Contacts

Appendix A. Key contacts for emergency contingency planning for Apache Trout. Names are current as of the signature date of this plan. Refer to position titles for the life of the Apache Trout Cooperative Management Plan.

Name	Position, Agency	Address	Phone
TBD (Planning)	Statewide Native Aquatics Program Manager, Aquatics Branch, AZGFD	5000 W. Carefree Hwy. Phoenix, AZ 85086	
Julie Carter (Planning)	Aquatic Wildlife Branch Chief, Aquatics Branch, AZGFD	5000 W. Carefree Hwy. Phoenix, AZ 85086	O: 623-236-7576 C: 480-254-4567
Zach Beard (Planning, Field)	Native Trout and Chub Coordinator, Aquatics Branch, AZGFD	5000 W. Carefree Hwy. Phoenix, AZ 85086	O: 623-236-7653 C: 414-534-4747
Ryan Follmuth (Planning, Field)	Aquatic Wildlife Program Manager, Region 1 (Pinetop), AZGFD	2878 E. White Mtn Blvd. Pinetop, AZ 85935	O: 928-532-3692
Kaleb Smith (Field)	Streams Biologist, Region 1 (Pinetop), AZGFD	2878 E. White Mtn Blvd. Pinetop, AZ 85935	O: 928-532-3684
Stephanie Coleman (Planning)	Forest Aquatics Program Manager, Apache-Sitgreaves National Forests	Supervisor's Office Apache-Sitgreaves NFs 30 South Chiricahua Drive Springerville, AZ 85938	O: 928-333-6307 C: 575-202-0996
Jerry Ward (Field)	Fisheries Biologist, Apache-Sitgreaves National Forests	Supervisor's Office Apache-Sitgreaves NFs P. O. Box 640 Springerville, AZ 85938	O: 928-333-6313
Tim Gatewood (Planning, Field)	Fisheries Biologist, White Mountain Apache Tribe	White Mountain Apache Tribe, PO Box 220, Whiteriver, AZ 85941	O: 928-369-5087
Zac Jackson (Planning, Field)	Project Coordinator, AZFWCO, USFWS	USFWS-AZFWCO P.O. Box 39 Pinetop, AZ 85935	O: 928-338-4288
Jess Newton (Planning)	Project Leader, AZFWCO, USFWS	USFWS-AZFWCO 2500 S Pine Knoll Dr Flagstaff, AZ 86001	O: 928-556-2140 C: 928-556-2140
Jeff Humphrey (Planning)	Field Supervisor, AESO, USFWS	9828 N. 31st Ave, #C3 Phoenix, AZ 85051	O: 602-242-0212
Rosalinda Gonzalez (Planning, Field)	Geographic Species Lead, AESO, USFWS	9828 N. 31st Ave, #C3 Phoenix, AZ 85051	O: 602-889-5952