Tonto Creek
Fisheries Management Plan
2020-2030

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Approved [X] by Chris Cantrell D. Andrew Clark acting for Date: 10/1/2020

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Location

Tonto Creek is a tributary to the Salt River (confluence at Roosevelt Lake) and is located roughly 30 kilometers (18.5 miles) northeast of Payson in Gila County, Arizona. This section, or management unit of the creek flows approximately 13.5 kilometers (8 miles) within the Tonto National Forest.

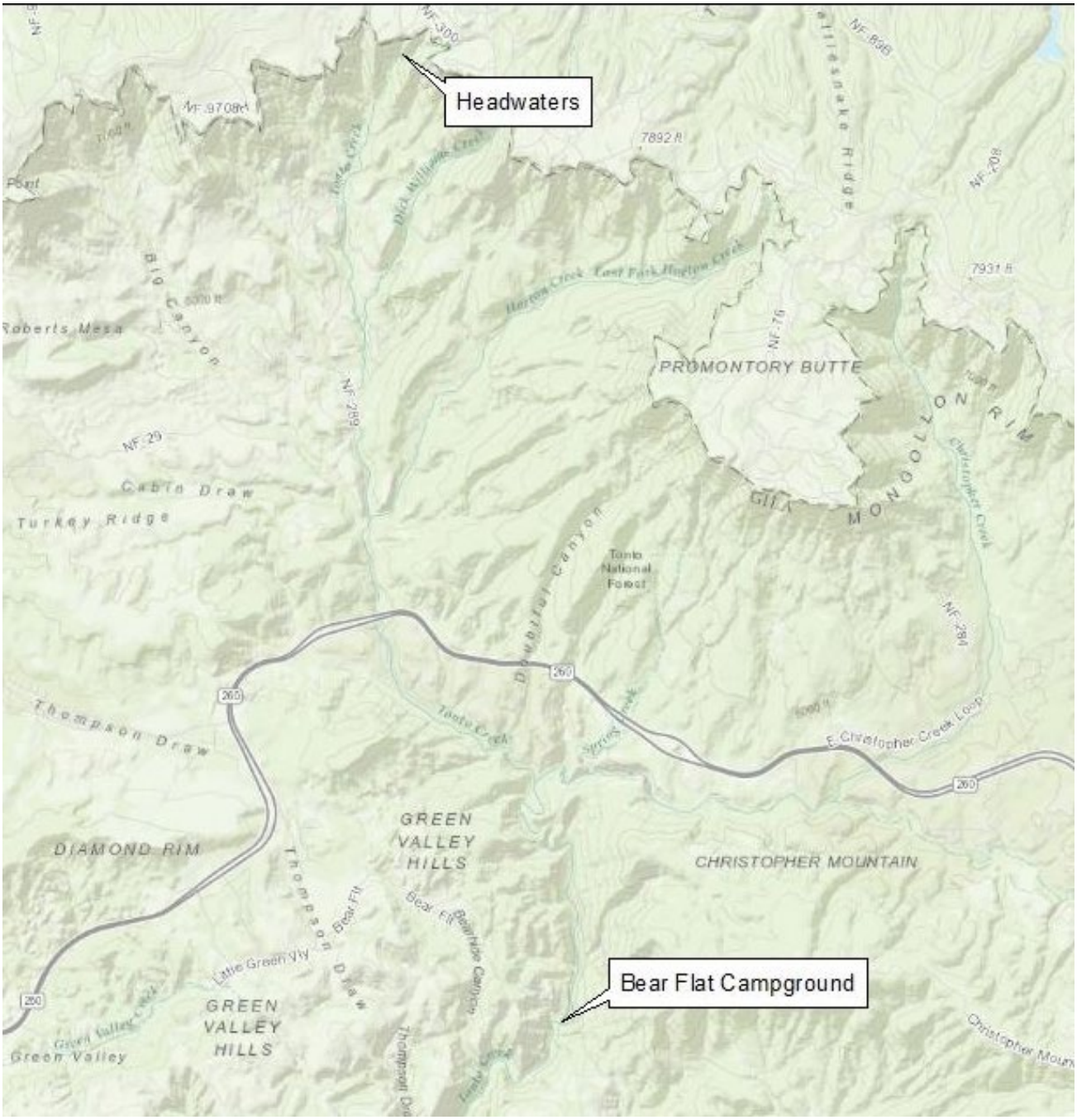

Figure 1. Location Map for Tonto Creek –Headwaters to Bear Flat Campground**.**

Management Prescription

The Arizona Game and Fish Department has developed approaches for coldwater species management in Arizona under a Coldwater Strategic Vision Document (AGFD 2019). The primary management emphasis for Tonto Creek is a coldwater sport fishery broken up into two management approaches. Above the Highway 260 Bridge, Tonto Creek's primary management will follow an Intensive Use approach to be supported by frequent stockings of Rainbow Trout *Oncorhynchus mykiss*. Below the Highway 260 Bridge, primary management will follow the Featured Species approach for wild Brown Trout *Salmo trutta* based on the lack of access and a naturally reproducing trout population that provides a unique angling opportunity.

Management objectives and adaptive management strategies have been set under the Intensive Use and Featured Species approaches. Monitoring activities, including community-wide or species-specific fish surveys and angler creel surveys will be used to determine if management objectives are being met. Guidelines to meet objectives are listed in Table 1 below:

Objective 1: Maintain the Rainbow Trout population to meet or exceed Intensive Use standards.

Objective 2: Maintain a wild reproducing population of Brown Trout downstream of the Highway 260 Bridge.

Objective 3: Maintain angler satisfaction at 80%.

Table 1. Tonto Creek objectives and adaptive management strategies:

Parameters	Objective Guideline	Trigger point to address unmet Objectives	Strategies if Objectives are not met
Objective 1: Maintain the Rainbow Trout population to meet or exceed Intensive Use standards.			
Angler Catch Rates	No less than 0.5 fish per hour	Angler catch rates drop below 0.5 fish per hour for two consecutive creel surveys	• Stocking • Regulation changes • Outreach/education
Objective 2: Maintain a wild reproducing population of Brown Trout downstream of the Highway 260 Bridge.			
Size Structure	Multiple year classes of trout including young of year	Missing age classes, especially young fish, for three consecutive sampling events	• Habitat improvement • Stocking • Regulation changes
Relative Density	Greater than 500 trout per stream mile of habitat	Three consecutive sampling events of low relative density	• Prey base stocking • Regulation changes • Habitat improvement
Objective 3: Maintain angler satisfaction at 80%.			
Angler Satisfaction	Angler satisfaction in creel surveys >80%	Angler satisfaction drops below 80% for two consecutive creel surveys	• Stock at least 9" average Rainbow Trout • Increase number of stockings • Adjust stocking locations • Outreach/education

Background

The Tonto Creek watershed lies immediately below the Mogollon Rim. The stocked reach is located in the headwaters of Tonto Creek in Gila County and is roughly 7 miles long. The stocked area begins just upstream of the confluence with Dick Williams Creek and ends at the Bear Flat Campground, downstream of the Highway 260 bridge crossing. It is approximately 16 miles east of Payson and is totally within the boundaries of the Tonto National Forest, although there are portions of stream with private cabins and in-holdings. The area ranges from 6,400 feet to 5,350 feet elevation and the stream gradient averages 93 feet/mile until the confluence with Gunn Creek, where it averages only 23 feet/mile.

Tonto Creek is managed by the Tonto National Forest (Forest), Arizona Game and Fish Department (Department) and other partners for recreation, including camping, picnicking, hiking, bird watching, fishing, hunting, and water activities. The area includes picnic units and vault toilets within the Horton Day Use Area and the Upper Tonto Creek Campgrounds.

Tonto Creek Hatchery operates under a special use permit from the U.S. Forest Service and has been in operation since 1937. The hatchery was renovated in 1993 to modernize operations. The

hatchery produces and stocks approximately 140,000 catchable-sized Rainbow Trout each year, along with a smaller number of Brook Trout *Salvelinus fontinalis*. In 1990, the Dude Fire encircled the hatchery but burned only one building down. The watershed has stabilized and continues to recover from the fire. With few exceptions, trout stocked into Tonto Creek come from the Tonto Creek Hatchery. Tonto Creek received an estimated 56,152 angler use days mainly within areas routinely stocked with Rainbow Trout (Fisheries Branch 2015).

The Department intends for this management plan to become a living document that is used to guide future Tonto Creek planning processes and decisions related to management of the Tonto Creek fishery. It is critical the Department work closely with its federal and non-federal partners as well as local businesses, anglers and stakeholders to manage this fishery. This document will be amended with new science and information as it becomes available.

Productivity/Water Quality

Water temperatures are a primary driver for the well-being and health of native and non-native fish communities in Tonto Creek. The temperature, pH, and conductivity has been documented at each site during a fish sampling survey for yearly comparison. In the most recent fish survey conducted in August 2019, water temperature, pH, and conductivity was recorded averaging 17.8°C, 8.3, and 243 µS, respectively (Table 2). These changes in temperature are directly correlated to time of year and annual precipitation. Warm water temperatures negatively impact Rainbow Trout and Brown Trout survival the most, but still affect the remaining native and non-native species within the stream. Ideal water temperatures for trout is 72°F or less.

The Department needs in-depth documentation of the water quality parameters that exist within the Tonto Creek watershed. The data that exists does not fully analyze the system and cannot predict environmental changes that may be occurring. Further analysis of sediment transport, temperature, dissolved oxygen, conductivity, pH, and environmental contamination is needed for evaluation.

Forage/Prey

The current native fish population within Tonto Creek consists of Speckled Dace *Rhinichthys osculus*, Longfin Dace *Agosia chrysogaster*, and Desert Sucker *Catostomus clarki*. Their overall populations are limited according to surveys conducted within Tonto Creek from 2011-2015. In the three years surveyed, only three Longfin Dace, five Speckled Dace, and 13 Desert Sucker were sampled between the headwaters and Bear Flat Campground. In the most recent 2019 survey, only three Desert Suckers were sampled and no Longfin Dace or Speckled Dace were captured. These species are considered the primary prey base for larger Brown Trout due to the piscivorous nature of the species. Crayfish and other invertebrates are also a forage base for Brown Trout. Invertebrates such as midges, mayflies, stoneflies, and caddisflies are present but have not been quantified for relative abundance. Stocked Rainbow Trout, wild Rainbow Trout, and juvenile Brown Trout utilize these macro-invertebrates as their primary prey base. Water quantity and quality are the driving factor in invertebrate productivity, and the presence of a high quality invertebrate population results positively in a fishery. An intensive invertebrate study for most waters along the Mogollon Rim would be helpful to identify limiting factors within the streams.

Habitat

Over the last 20-30 years, there have been several large wildfires that have burned along the Mogollon Rim. These fires have caused extreme damage to the Tonto Creek watershed. The damage has resulted in high slope reaches being scoured to bedrock, while cobble material is aggraded in lower slope reaches. The stream has lacked adequate hiding cover and extensive pool habitat throughout much of the area covered in this plan. Additionally, the stream lacked sufficient woody vegetation to shade the stream causing increases in water temperature.

The Department desired to increase the length of time that stocked trout remain in the stream between stockings and distribute angler use more evenly. To that end, a restoration project was implemented by the Department in conjunction with Natural Channel Design in 2010. In total, 140 structure elements were constructed to improve instream habitat and morphology at a total cost of $250,750 (Department's Mogollon Streams Habitat Restoration Plan). Numerous willow plantings were also done to stabilize stream banks, improve stream shading and improve overall riparian condition. The project improved trout habitat and trout holding capacity in a 6.5 kilometer (4 mile) section of Tonto Creek. Further evaluation of the effectiveness of the 2010 project will be analyzed to confirm success of the structures. No additional habitat restoration is planned within Tonto Creek at this time.

Species

Tonto Creek provides a good opportunity for an Intensive Use Rainbow Trout fishery along the Mogollon Rim. It also provides anglers the opportunity to catch wild Rainbow Trout and Brown Trout downstream of the Horton Creek confluence. Downstream of the Highway 260 Bridge, angler pressure is reduced and quantities of wild trout increase.

Rainbow Trout:

The objectives for Rainbow Trout are include in Table 1. The Region VI Aquatic Wildlife Program coordinates with the Tonto Creek Hatchery to ensure stockings of catchable-size trout. The number of stocked catchable-sized Rainbow Trout stocked annually is 12,900 fish between the months of April and October. Rainbow Trout are also naturally reproductive downstream of the Highway 260 bridge to below Bear Flat Campground, where summer water temperatures can become lethal to trout. Rainbow Trout are currently managed under general statewide daily bag limits and no special regulations are being proposed at this time. The Department will maintain a stocked Rainbow Trout fishery within Tonto Creek that does not adversely affect the native aquatic community downstream.

Brown Trout:

The objectives for Brown Trout are included in Table 1 as well. These fish are naturally reproductive within Tonto Creek, as well as within the tributary of Horton Creek. Fish within Tonto Creek are impeded to upstream movement by a natural barrier located roughly 100 meters upstream of the Horton Creek confluence. From that point, Brown Trout occupy the creek downstream to at least the Hells Gate area, where water temperatures can become lethal. Brown

Trout are currently managed under general statewide daily bag limits and no special regulations are being proposed at this time.

Non-Native Warm Water Species:

Green Sunfish *Lepomis cyanellus* are the only warm water, non-native species in Tonto Creek above Hells Gate. Green Sunfish are naturally reproducing but are not desired within the creek. Monitoring of the fishery is planned bi-annually within the creek. Green Sunfish encountered during survey efforts will be removed from the system.

Native Fish Species:

Desert Sucker, Longfin Dace, and Speckled Dace currently occupy Tonto Creek mostly below the 260 Bridge. Roundtail chub *Gila robusta* were historically documented within this section of creek but currently only occur downstream of Bear Flat, where water temperatures begin to warm. Warmer water temperatures exclude non-native trout persistence and native species increase in abundance. Native species conservation will be in partnership with the U. S. Fish and Wildlife Service and other partners and stakeholders. Actions regarding these species will be consistent in the fulfillment of Department commitments to recovery, conservation plans and programs consistent with the Department's best management practices.

Invasive Species:

All crayfish are considered invasive species within the state of Arizona; however, only two species of crayfish (Rusty and Red claw Crayfish) qualify under the Director's Order 1. Arizona Revised Statutes 17.255(b) states: *Any species introduced into this state by the department, by other governmental entities or by any person pursuant to this title.* Per the statute, other crayfish species introduced by the Department cannot qualify under the Director's Order 1, such as the Northern Crayfish *Orconectes virilis* and Red Swamp Crayfish *Procambarus clarkii*. Currently, the Northern Crayfish is the only species of crayfish within Tonto Creek. It was introduced by the Department and the Park Service in the 1940s. These crayfish are not desirable within the creek and are to be removed whenever sampled. The Department will work with partners to maintain and enhance Aquatic Invasive Species education and better inform the recreating, angling, and boating public to ensure awareness and compliance.

<u>Monitoring</u>

Monitoring within this section of river is completed by the Department's Regional Aquatic Wildlife Program bi-annually to track long-term trends over time which is the key to effectively managing a waterbody. Standardized electrofishing surveys of the fish population has been the primary method of sampling. These surveys usually occur in July, prior to monsoon rains, and provide valuable information on relative abundance, population structure, and condition of the entire fish community in Tonto Creek.

From the most recent fish survey done in 2019, a total of 81 Brown Trout were collected, including 1 young-of-year (YOY). Brown Trout were only collected in the lower three reaches (Table 1).

Brown Trout ranged from 106 – 429 millimeters in total length (4 to 17 inches), with an average length of 215 millimeters (8.5 inches) and an average weight of 112.5 grams (4 ounces). The largest Brown Trout collected measured 429 millimeters (17 inches) in total length and weighed 821 grams (1.81 pounds). Mean relative weight was 91 (SD 8.0) and catch per unit effort for Brown Trout was 56.1 fish/hour. Age-1+ Brown Trout density estimates an averaged 435/hectare or approximately 366/mile, and biomass estimates averaged 45 kilograms/hectare (Table 3).

Several Rainbow Trout were collected in Reach 5 that fit the criteria to be a wild trout, but no determination was made in the field. Stocked trout were collected throughout all of the reaches.

Access

Access to the Intensive Use section of Tonto Creek is relatively easy. Forest Service road 289 is paved and parallels the creek until you reach the boundary of the Tonto Creek Hatchery. This section of creek is easily accessed by foot via trails that come right off the road. The five most fished areas along Tonto Creek are all located ¾-1 kilometers (.46-.62 miles) upstream of the Horton Creek confluence (Figure 2, Beard 2016)). There is also vehicular access to Bear Flat Campground on the Forest Service road 405. The section of creek between the Highway 260 Bridge and Bear Flat is the most difficult area to access. It requires extensive hiking from the road to get to this section of the creek. There is also two sections of private property (Kohl's Ranch and Bear Flat Subdivision) that limits public access. Downstream of Bear Flat, the only access is via hiking as this section of creek enters the Hells Gate Wilderness. The stream through this section is rugged and remote until the stream exits the wilderness just upstream of Gisela in an area known as "The Box".

Catch

A large research study by the Department was started in 2014 and completed in 2016 looking at the fate of stocked trout in several streams across the Mogollon Rim and White Mountain areas. Proportional angling success was used to try and take into account the amount of trout stocked long with angler catch rates. Proportional angling success (PAS) is the proportion of anglers with catch rates greater than or equal to a target catch rate value (Bailey 2007). PAS is a useful tool for fisheries managers to measure angler success because it has greater statistical power and is less biased than mean angler catch per unit effort (Bailey 2007). Creel data collected in 2016 suggests that PAS was approximately 42.9% at 0.5 fish per hour, and that approximately 57.5 percent of fish stocked returned to creel (Beard 2019). This is an increase from 2014 when stocking rates were decreased and PAS was only approximately 29.4% at .5 fish per hour (Table 4).

One of the biggest factors contributing to whether an angler caught a fish was the number of days since the last fish stocking in relation to the day the angler was fishing. An angler fishing the day after a stocking was significantly more likely to catch a fish than that of someone who fished the week after a stocking (Beard 2019).

Beard et al. (2019) found that 82.1 percent of anglers surveyed said they would harvest trout, with bait fisherman more likely to harvest trout versus an angler using a fly or lure.

Data from the Fate of Stocked Trout study determined angler catch rates prior to stocking reductions were at 0.81 fish/hour (Beard, 2019). After the stocking reduction, angler catch rates fell to 0.31 fish/hour (Beard, 2019). Catch rates within this section of creek are desired to be ≥ 0.5 Rainbow Trout per hour during the months of stocking. This means that to maintain catch rates within the objectives, Tonto Creek should be stocked at the current requested stocking rate of 12,900 trout. It should be noted that size of trout stocked was not taken into account when analyzing angler catch rates. Increases in the average size of trout stocked into Tonto Creek may reduce the number of trout needed to maintain the target catch rate.

Satisfaction

Beard et al. (2019) asked standard questions regarding an angler's satisfaction with the fishery with an overall goal rating of good-excellent for the fishery. In 2016, 60% of anglers rated their satisfaction level as good/excellent, while 21% rated their satisfaction level as poor. This is an improvement from the 2014 creel ratings at the beginning of the study. Of anglers surveyed in 2014, 53.2% of anglers rated their satisfaction level as good/excellent, while 24.5% of anglers rated their satisfaction level as poor.

According to the Department's statewide objectives, an overall satisfaction rating of 80% is desired for all waters under fish management. Angler expectations of the Intensive Use fishery on Tonto Creek include elevated catch rates, healthy trout and the ability to harvest a daily bag limit. Anglers on Tonto Creek specified catching fish, and the location close to home as the two biggest reasons for fishing Tonto Creek (Beard 2019).

The number of days fished post stocking was found to be one of the biggest influencers on whether or not anglers catch fish (Beard 2019). A strong negative relationship was found between the likelihood of catching a trout and the number of days after a stocking had occurred. More frequent stockings with fewer fish have been experimented with as well as placing those stockings within 3 days of high angler use times. Results suggest an increase in the likelihood of an angler catching a fish and therefore boosting angler satisfaction (Beard 2019).

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Tables and Figures

Table 2. Water temperature (°C), pH, and conductivity (µS) measurements taken during fish sampling at Tonto Creek August 21, 2019.

Location	Temperature (°C)	pH	Conductivity (µS/cm)
TC1	14.1	8.0	128
TC2	16.1	8.5	160
TC3	15.2	8.63	240
TC4	20.4	7.79	330
TC5	23.0	8.39	360

Table 3. Wild Brown Trout collections, sample area, length, and densities by reach in Tonto Creek: August 21, 2019.

Reach	SATR	Area (m^2)	Length (m)	(SATR/KM)	SATR/Ha
TC3	50	867.8	195	256	576
TC4	14	557.2	103	136	251
TC5	17	690.8	114	289	478
Total	81	2115.8	412		
			Average	**227**	**435**

Table 4. The number of Rainbow Trout stocked, estimated total angling effort, estimated Rainbow Trout catch (total stocker catch) and harvest (total stocker harvest), return to creel (%) of stocked trout, and proportional angling success (%) in Tonto Creek from 2014 to 2016. (Beard, 2019)

Tonto Creek	Total RBT Stocked	Total Angler Effort (hrs.)	Total Stocker Catch	Total Stocker Harvest	Return to Creel (%)	Proportional Angling Success (%)
2014	10,185	8,810 (1,337)	5,731 (1,913)	2,041 (845)	20.0 (3.8, 36.3)	29.4
2015	11,394	7,633 (1,052)	4,081 (1,057)	3,206 (926)	28.1 (12.2, 44.1)	43.2
2016	11,746	8,866 (1,584)	12,299 (3,166)	6,754 (2,237)	57.5 (19.8, 96.7)	42.9

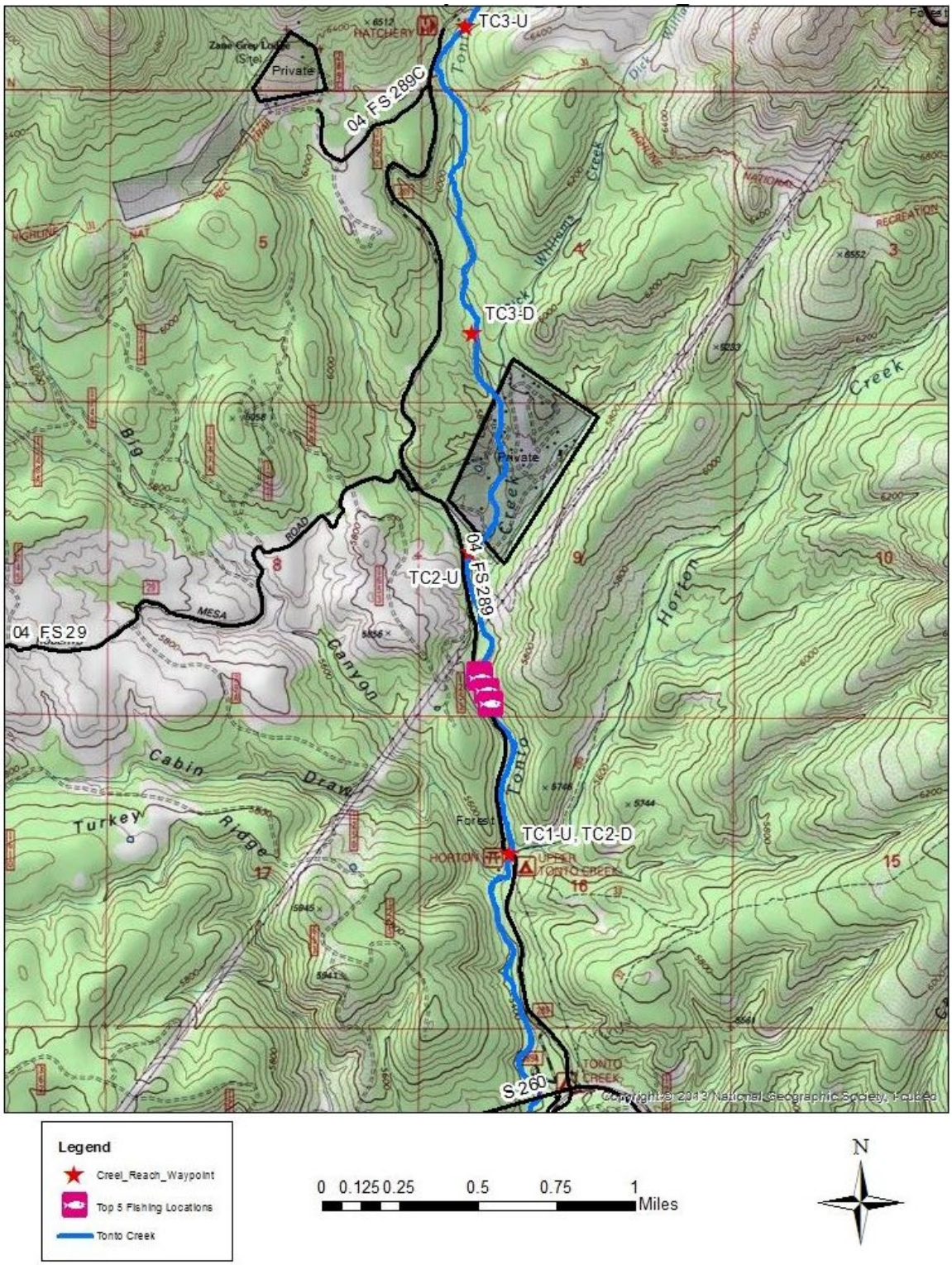

Figure 2. Location map for the five most fished areas along Tonto Creek according to the recent 2015 AGFD creel study. Pink fish indicate the areas of high use, all of which occur within one km of the Horton Creek confluence.

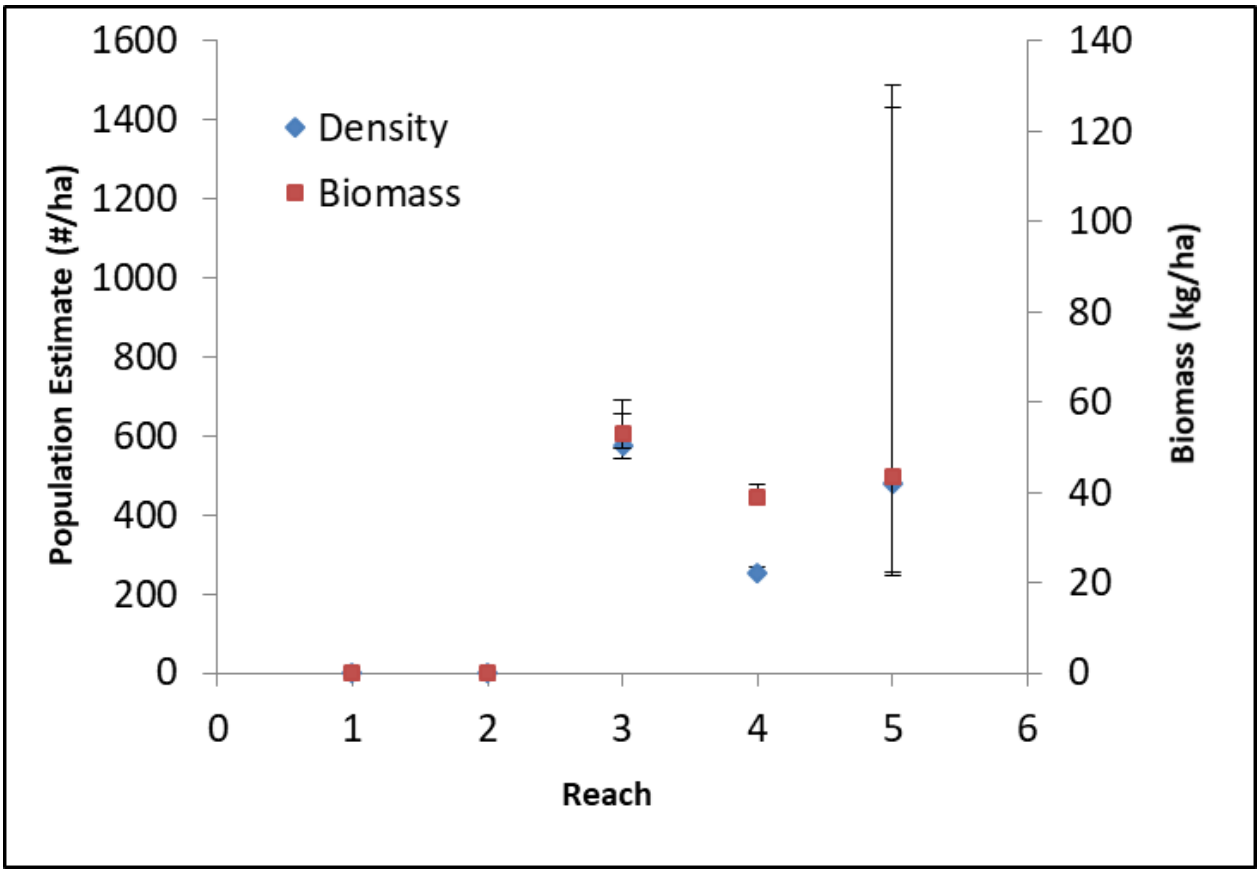

Figure 3. Age-1+ Brown Trout population estimates at the lower three reaches sampled on Tonto Creek August 21, 2019 (95% confidence intervals included with lower confidence interval set equal to catch).