

**COLDWATER SPORTFISHERIES  
STRATEGIC VISION DOCUMENT**

Arizona Game and Fish Department  
Statewide Fisheries Program

2019-2029

Arizona Game and Fish Department

2019



Approved [  ] by Chris Cantrell

Aquatic Wildlife Branch Chief

Date:

2/22/19

**Mission:** To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.

**Agency Vision:** To be the national conservation leader supporting the continuation of the North American Model of Wildlife Conservation and Arizona's most trusted, respected and credible source for wildlife conservation products, services and information.

## **AUTHORITY**

The authority under which this Coldwater Sportfisheries Vision has been prepared and the responsibility for the maintenance and management of the state's wildlife resources are vested in the Arizona Game and Fish Commission and Department by Arizona Revised Statute Title 17 in **ARS-17-102, ARS-17-201 and ARS-17-231.**

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## Introduction

Whether you're fishing on the banks of your favorite Mogollon Rim lake, negotiating a cast through a narrow gap in streamside willows, waist deep on a sand bar below Glen Canyon Dam, or watching your bobber along the shore of your local park, trout fishing in Arizona is as diverse and exciting as the state itself.

The path for Arizona's sportfish management and specifically trout management has been long and storied. By the mid-1920s, Arizona's sportsmen had become disgruntled with the form of administration overseeing the management of the state's wildlife resources. They banded together and through their efforts, in 1929, the Legislature created the Arizona Game and Fish Commission to regulate hunting and fishing in the state. This organizational structure remains in place today. The Commission's function has been to act as an advisory, policymaking body for the Arizona Game and Fish Department (Department).

From the turn of the century into the early 1920s, the state acquired Rainbow *Oncorhynchus mykiss*, Cutthroat *Oncorhynchus clarkii*, and Brook Trout *Salvelinus fontinalis* from the United States Bureau of Fisheries. The Rainbow Trout was the first non-native trout to reach Arizona shortly before 1900 when it was planted in Oak Creek. The Cutthroat Trout followed the Rainbow Trout and early introductions were widespread. Similarly, the Brook Trout arrived in 1917, Brown Trout *Salmo trutta* in 1933, Arctic Grayling *Thymallus arcticus* in 1940, and Sockeye *Oncorhynchus nerka* and Coho Salmon *Oncorhynchus kisutch* in the 1950s and 1960s.

Angling for native trout in any state is a unique opportunity, and Arizona is no exception. Arizona's two native trout species, the Apache *Oncorhynchus apache* and Gila Trout *Oncorhynchus gilae*, are currently listed as threatened under the Endangered Species Act (ESA). Being listed as threatened and not endangered under the ESA allows the Department to manage certain populations for angling opportunities via a rule under section 4 (D) of the ESA. This makes it possible for the Department to not only conserve and protect these species, but to also provide anglers an opportunity to fish for trout that are only found in a handful of streams anywhere in the world.

Arizona is a relatively arid state but still has a total of 221 waters that are either managed primarily or secondarily for trout. Those waters make up 36,268 surface acres of lakes and 973 fishable miles of rivers and streams. By 2028, no less than 57 lakes comprising 3,836 surface acres will be managed primarily for trout. Fifty-six other lakes managed primarily for warmwater sportfish will seasonally be able to provide trout fishing opportunities. Wild spawned trout comprise a small percentage of the total trout caught in Arizona. In a few Arizona coldwater streams, natural trout production is dependable and sufficient to meet angling needs, but in most streams, natural production is marginal and insufficient to sustain consistent angler use and harvest. No natural production occurs in Arizona's lakes.

How then does the Department maintain trout fishing in Arizona? Enter the state's hatchery system. Since 1922, the Department has operated 15 fish hatcheries, six of which are still maintained and in operation today. Five of these fish hatcheries are used for coldwater production and play a major role in providing good trout fishing in Arizona. Every year, Department fish hatcheries contribute to the state economy by producing an average of 385,000 pounds of fish and stocking them into 118 locations throughout the state.

The 1930's represented the heyday for hatchery construction, with facilities built at Indian Gardens and Tonto Creek near Payson; Double Springs near Mormon Lake; Pinetop; at Page Springs in the Verde Valley; and the Hunt Bass Hatchery in Phoenix. Little, if any, distinction was given between trout and warmwater fish management practices in these early days. The panacea of stocking fish covered every situation, and the diversity of trout species increased during the era with the addition of Brown Trout.

Throughout the 1930s, the prevailing thought was that small fish, planted in the fall of each year, would provide adequate fishing for anglers during the following year. Over time, however, came the realization that very few of these fish survived through the winter. By the early 1940s, this knowledge led to the decision to plant catchable-size fish in trout streams, and the policy of intensive use trout management commenced. Today most trout harvested in Arizona are stocked as catchables (8 to 12 inches). Still, some stockings of fingerlings occur in a few lakes that have demonstrated conditions that grow small fish to a harvestable size.

Arizona's population growth has caused a continuous decline in the number of acres of lakes and ponds available per capita. This has created more fishing demand for Arizona lakes and ponds. Arizona's population of 6.39 million habitants in 2010 grew to 6.73 million in 2014 with a calculated 1.3% Compound Annual Growth, according to the U.S. Census Bureau. The projected Arizona population in 2050 is estimated to be 9.7 million.

In addition to increased demand, decreasing hatchery spring flows (water supply) have resulted in an annual shortfall of approximately 110,000 pounds of trout. The Department provides fishing opportunities to nearly 400,000 anglers each year. According to the analysis in the 2013 Economic Impact of Fishing in Arizona (Fedler 2014), annual recreational sport fishing produces \$1.47 billion in economic benefits for the state. Among active anglers in 2013, the preference was: 69% fish for trout, 63% fish for bass and 30% fish for catfish.

Opportunity for trout fishing is limited by the natural resources of the state and by uses that may degrade habitat quality. So ultimately, in the face of a decreasing capacity to raise trout and the increasing population and demand in the state, high angler satisfaction can only be achieved by offering as many varied trout fishing opportunities as the state's resources will allow. Trout fisheries can be managed in a variety of ways, depending upon the desired results. In fact, recreational fishing is a multidimensional experience, in which satisfaction depends on a combination of social, aesthetic, and psychological factors. Defining a "satisfying" experience can

be challenging, as anglers define satisfaction on an individual level based on the factors listed above (Quintana 2015).

This vision is based on the assumption that Arizona anglers are varied in the type of trout fishing experience they desire and that by providing a variety of trout fishing opportunities, a high level of satisfaction will be achieved. Some anglers prefer the primitive solitude and challenge of remote streams containing native or wild trout while others prefer the facilities, social interaction, and greater ease of success provided by an intensive-use concept. The vision of the Aquatic Wildlife Branch is to achieve the Department's mission and clearly provide and communicate direction of Arizona's coldwater fish management programs through conservation, habitat protection, and wise use of limited resources.

Ultimately, angler satisfaction with their fishing experiences will determine successful management. Seven themes have been identified that focus objectives to achieve angler satisfaction. Themes and objectives are developed herein. Under each objective, strategic approaches are provided to assess priorities and desired future conditions. The seven themes are:

1. Productivity/Forage/Prey
2. Habitat
3. Species
4. Access
5. Catch/Satisfaction
6. Planning
7. Outreach

As data and information become available, strategies for core areas will be updated.

## **Vision, Core Goals, Objectives, and Strategies for Coldwater Fisheries 2018-2028**

Vision: The Department's Coldwater Sportfisheries Vision is to establish the State of Arizona as one of the most desired coldwater fishing states in the Nation, providing a wide variety of coldwater fishing opportunities.

### **Core goals:**

- 1. Ensure no less than eight of the coldwater fisheries in Arizona are within the Blue Ribbon management approach for at least one species.***
- 2. Ensure no less than 15 of the coldwater fisheries in Arizona are within the Quality management approach.***
- 3. Ensure no less than five of the coldwater fisheries in Arizona are within the Basic Yield management approach.***
- 4. Ensure no less than 100 of the coldwater fisheries in Arizona are within the Intensive Use management approach for at least one species.***
- 5. Ensure no less than 10 of the coldwater fisheries in Arizona are within the featured species approach for at least one species.***
- 6. Ensure no less than 50% of the wild trout coldwater fisheries in Arizona are native trout management focused.***
- 7. Ensure impacts of coldwater fisheries on Threatened and Endangered Species are addressed and offset.***

To achieve the vision, the Department's fisheries managers must be able to manage for and reasonably predict productivity, foodbase, habitat, species composition, access and angling success of those waters with coldwater angling opportunities.

## **Objective 1: Ensure primary productivity and food base production is measured, quantified and analyzed adequately in every fishery.**

Primary productivity is the rate at which energy accumulates and is the foundation of all biologic systems and will ultimately determine what a fishery is capable of producing. It is important to measure and understand the processes that drive primary productivity to improve and protect trout fisheries throughout Arizona.

Each coldwater fishery will be assessed for productivity and trophic structure. Understanding the rate at which energy accumulates and then is lost as organisms in one trophic level are consumed by organisms from the next trophic level is important in managing our fisheries. Food web dynamics can usually sustain no more than six energy transfers before the original primary production is depleted. Understanding the trophic structure in a fishery is extremely important and will determine the species and sizes of fish that will be available to anglers. Some organisms may be invasive, non-native or native to the state and could either short circuit or augment the transfer of energy to the desired species. We must understand primary production and food web dynamic and who they are utilized within a system or can be manipulated to reach the vision and core goals for coldwater fisheries.

### **Strategic Approaches:**

- 1) To ensure managers understand the historic baseline, gather and analyze historical data sets for productivity and food base on coldwater fisheries.
  - a. Water Quality section data
  - b. Datasets from ADEQ/EPA/USGS
  - c. Make analysis available to all fish managers
- 2) Develop water quality ranges and standard methodologies for monitoring applicable chemical and physical parameters that will support primary productivity and sustain it through tertiary consumers.
- 3) Through specific management plans using historic datasets and current objectives, determine parameters and frequency of primary productivity and food base measurements
  - a. Measure parameters used to determine food web dynamics and food base production (i.e. solids, transparency, pH, dissolved oxygen, nitrogen, phosphorus, water temperature, conductivity, invertebrate collections, benthic samples, lake and stream morphology, canopy cover, watershed conditions, uses and size etc...).
- 4) Prioritize coldwater fisheries to be surveyed and on what frequency.
- 5) Partner with other agencies, universities and organizations to gather and analyze data.
  - a. Make analysis available to fish managers
- 6) Explore and implement strategies to increase primary productivity and food base production of a fishery, where appropriate.
  - a. Examples of strategies could include: explore opportunities to augment prey populations with native species of fish and aquatic animals.

- b. Determine which species of Ephemeroptera, Plecoptera, Tricoptera (EPT) are endemic and appropriate to each fishery and pursue ways to culture or transplant individuals to augment forage.

**Objective 2: Assess and enhance fish habitat in lakes and streams to support productive fisheries and healthy aquatic ecosystems.**

Sufficient quantity and quality of habitats are the most important variables for coldwater fisheries. Streams and lakes that maintain sufficient levels of clean, non-contaminated water will be the overarching goal to assure the right amount of quality habitat is present and maintained. Productivity and food base including appropriate insects and other invertebrates require the same types of habitat as fish in which to thrive. The abundance, diversity, and quality of habitats available to both prey and predator species are of primary importance.

Quality instream fish habitat is the result of numerous factors such as: watershed health and condition. Sufficient water and sediment that allows for good riffle/pool ratios; quality streamside riparian habitat that shades the stream channel and provides sufficient inputs to maintain diversity of invertebrate species; and nutrient inputs that are neither too high or too low are all critical in creating and maintaining quality instream habitats.

Quality reservoir fish habitat requires many similar attributes, but also includes factors such as: sufficient vertical structure for larval and young of year protection from predators, vertical structure for ambush predator sites, structures to support periphyton growth for increased invertebrate production, and many others.

**Strategic Approaches:**

- 1) Protect, restore, and/or enhance physical habitat for coldwater fisheries.
  - a. Develop standards and guidelines that describe quality habitat in coldwater streams and lakes.
    - i. Develop a standardized method to assess fish habitat in stream and reservoir systems, including a system to organize assessment data in a standard format.
  - b. Monitor fish habitat in stream and reservoir systems, relative to the standard.
  - c. Increase/restore spawning/juvenile habitat in stream systems, as needed through application of habitat assessment and restoration protocols such as Natural Channel Design as developed by Rosgen (2011), or other approaches.
  - d. Create structural habitat diversity that would be available to adults and juveniles when reservoir water levels or stream flows change.
  - e. Develop and implement stream and reservoir habitat projects and ensure up-to-date guidance documents and equipment to monitor condition are available for maintaining and/or restoring habitat diversity.

- f. Develop and maintain an internal web-based, geo-referenced database for fish habitat data and reservoir assessments, project tracking, and research.
- 2) Work to maintain or restore appropriate hydrologic conditions in stream and reservoir systems to support healthy aquatic ecosystems.
- a. Coordinate and cooperate with water districts, ditch authorities and reservoir controlling authorities to ensure consideration of the needs of fish and aquatic resources within stream and reservoir operations plans.
  - b. Coordinate and cooperate with water districts, ditch authorities and reservoir controlling authorities to adapt stream and reservoir operations plans to address the projected effects of drought.
- 3) Ensure water quality is consistent and considers relationships between fish habitat and reservoir water quality and limnological issues.
- a. Work with partners to monitor water quality to ensure consistency with standards development and review to provide consideration for the habitat needs of fish and aquatic organisms.
  - b. Coordinate with partners to maintain or restore the function of riparian and upland habitats to maintain water quality and run-off volumes reaching streams and reservoirs.

**Objective 3: Actively manage through appropriate means to ensure the desired sizes and species of coldwater fish are present in each fishery.**

The Department has defined six broad strategic management approaches that describe the general types of management and fishing experiences provided in Arizona. Development of these strategic approaches used concepts utilized in prior coldwater plans with adaptations to make them relevant in a changing landscape. Multiple approaches may be used within a fishery for separate species.

The numbers, sizes and species of fish caught by anglers is ultimately the measure of success in fisheries management. Providing for quality fish populations is critical, however managing angler's expectations is far more difficult. Ultimately, we must ensure we have a dialogue with anglers of all types and listen to what they desire in a fishery. To assist in managing expectations, the Department will designate specific targets for all coldwater fisheries per management approach listed below. This will make it clear to anglers what the targets are per approach and will assist in the dialogue.

**Strategic Approaches:**

*Blue Ribbon*- Utilize the natural or augmented productivity of a water to emphasize a highly unique fishery. The focus of these fisheries will be on the experience that may include sizes, quantities or uniqueness of a fishery. One of two special regulations will be utilized; catch and release or a two

fish limit. Both special regulations would apply an artificial fly and lure only method of take and could include a single barbless hook method of take. Catch and release will be the most common regulation; with a two fish limit regulation utilized when harvest may be required to achieve larger size or to maximize forage utilization. Blue Ribbon waters can be maintained through natural reproduction or by stocking, but natural reproduction is preferred. Targets will most commonly be established to define desired population density and growth however, in some cases, catch rates may factor into these targets. Ten (10) waters are proposed for this management approach and are listed in Table 3.

River/Stream Targets:

Blue Ribbon Potential: 5% of adult trout sampled by electrofishing  $\geq$  20 inches

Relative Density:  $>$  500 trout/ stream mile of habitat

or

Angler Catch Rate:  $\geq$  1 fish/hour

Lake Targets:

Trophy Potential: 5% of trout sampled by electrofishing or netting  $\geq$  20 inches

Relative Density: Catch Per Unit Effort: 30 fish/hour of electrofishing  $\geq$  12 inches

or

Angler Catch Rate:  $\geq$  1 fish/hour

*Quality-* Maintain fisheries that may not be able to attain a Blue Ribbon designation, but still represents a quality fishing experience. Quality designated fisheries would utilize the natural productivity of a water to grow larger fish but perhaps cannot sustain numbers of large fish due to habitat or forage limitations. These fisheries may include stocking large fish with the intent to promote growth through special regulations that encourage "catch-and-release" by implementing low daily bag limits, size limits and gear restrictions. Sixteen (16) waters are proposed for this management approach and are listed in Table 4.

River/Stream Targets:

Quality Potential: 25% of trout sampled by electrofishing  $\geq$  12 inches; 5% of trout sampled  $\geq$  18 inches

or

Relative Density:  $>$  300 trout/ stream mile of habitat

Lake Targets:

Catch Per Unit Effort: 20 fish/hour of electrofishing or netting  $\geq$  12 inches

Angler Catch Rate:  $\geq$  1 fish/hour

*Basic Yield-* Utilize the natural or augmented productivity of a water to grow fish without special regulation. Angler demand is met by seasonal stockings of fingerlings or sub-catchables. Basic Yield waters seek to provide angling opportunity yet ensure populations are maintained through time. Objective parameters for Basic Yield waters are intended to establish desired population density and growth rates of stocked fish. Seven (7) waters are currently projected to be managed under this concept into the future. Marginal water quality and quantity combined with predation often limits places where this concept is applied. However, in cases where special regulations are not desirable and some growth is observed by fingerling or sub-catchable sized fish, this concept could be valuable in utilizing the productivity of certain waters to reducing the need for the hatchery system to always produce larger, catchable trout. Seven (7) waters are proposed for this management approach and are listed in Table 5.

Targets:

Size Structure: 50% of trout surveyed  $\geq$  10 inches in length

Catch Per Unit Effort: 10 fish/hour of electrofishing

*Wild and Native Trout-* Provide anglers the opportunity to catch fish that are naturally reproduced in the wild. Wild fisheries are sustained entirely by natural reproduction and are not augmented by stocking hatchery spawned or reared fish. Presently most Arizona Wild Trout designated waters are streams and most are in relatively pristine settings. These fisheries may have difficult access which can limit angler density.

Wild trout waters include populations of trout that are maintained entirely via natural reproduction. Populations may be composed of a single species or include several species. Wild trout waters include Rainbow Trout, Brook Trout, Brown Trout, Cutthroat Trout, Apache and Gila Trout. Since Wild trout populations are entirely supported by natural reproduction, avoiding overfishing, via harvest regulations, is of significant importance. Because access is typically limited, most Wild Trout waters are under the statewide daily bag limit of 6 fish per day while others with better access may require special regulations.

Apache and Gila Trout are native to Arizona, and are listed as threatened under the Endangered Species Act. Extensive efforts to recover both the Apache Trout and the Gila Trout have taken place for over 40 years. The Department desires to ensure the recovery of both species through

established recovery plans. Half (50%) of designated Wild Trout streams will be recovery streams for native trout. Recovery may involve construction of barriers, removal of non-native species, and periods where streams must be closed to fishing. As populations become established, angling opportunities may be presented when appropriate. Under this strategic approach the goal is to recover and ultimately provide fishing opportunities for these native species.

Hatchery Production for Gila Trout has been successful to the point where Gila Trout will be available for stocking in areas that are outside of recovery areas. These stockings have been identified as Conservation Stockings. A Conservation Stocking Plan has been completed and approved by the U. S. Fish and Wildlife Service for Gila Trout in Arizona. These stockings will occur in several areas, including lakes as fish are available to promote opportunity and awareness of the species. There are currently 41 waters proposed for wild and 46 proposed for native management approaches. They are listed in Table 6.

Targets:

Size Structure: Multiple year classes of trout including young of year

Relative Density: > 500 trout/ stream mile of habitat

*Featured Species-* Provide anglers the opportunity to catch species considered to be uncommon or to have unique or unusual qualities. Featured Species are species, subspecies or hybrids that would not otherwise be commonly available to the Arizona angler. Waters managed under this concept may feature Apache Trout, Gila Trout, Arctic Grayling, Brook Trout, Brown Trout, Cutthroat Trout, Tiger Trout, rare species, or fish that demonstrate unusual characteristics worthy of unique status (i.e. albino Rainbow Trout). These fisheries are supported by either natural reproduction or stocking. This concept may be integrated with any other concept. Twenty (20) waters are proposed for this management approach and are listed in Table 7.

Targets:

Size Structure: Multiple year classes

*Intensive Use-* Provide for harvest by stocking catchable fish where the demand for harvest cannot be supported by other management techniques. Angler demand is met by regular stockings of catchable and incentive fish that exhibit minimal growth and are harvested at about the same size as they were when stocked. Management strategies for Intensive Use trout waters are focused on maximizing stocked fish return to the angler and spreading angling opportunity throughout an entire season and among anglers. Objective parameters for Intensive Use trout waters are focused on angler catch rates and stocking rates. These parameters measure how effectively the Department

allocates catchable trout and how those trout return to anglers. There are 108 waters currently proposed to be managed under this approach including Community Fish Program waters (Table 8).

Targets:

Angler Catch Rate: 0.5 fish/angler hour during stocking season

Stocking Rate: Stock 1 fish/angler use day

**Objective 4: Work with land managers, partners and stakeholders to ensure fishing access is safe, usable and appropriate.**

With the ever increasing demand for water and the complexity of Arizona water law, new recreational fishing lakes may never be built in Arizona. Although the addition of new public waters outside of municipalities seems unlikely, sources of stable funding for improving angler and boating access to existing waters is projected to remain consistent. Just as important as providing quality coldwater fishing opportunities is providing safe, consistent and reliable access to those opportunities.

**Strategic Approaches:**

- 1) Ensure each coldwater fishery has adequate facilities to accommodate angler use.
  - a. Work with land management agencies to ensure adequate parking, shoreline access, boat launching and mooring facilities are available to accommodate current and projected use for each coldwater fishery.
  - b. Work with the Department's Development Branch to ensure fishing access facilities are planned for, constructed and maintained adequately to accommodate current and projected use for each coldwater fishery.
  
- 2) Protect Access.
  - a. Work with land management agencies to ensure angler access is protected leading to no significant loss to stream or lake angling access for the period of this vision.
  - b. Work with partner groups, fly-fishing groups and private landowners to ensure no significant loss to stream or lake angling access for the period of this vision.

## **Objective 5: Strive to ensure a satisfaction rate of 80% on all waters.**

Fishing participation in Arizona has been static or declining since the early 1990's. Recent research suggests people have been and are continuing to change the way they look and interact with wildlife. Modernization and urbanization seem to be driving a generational based change in how people view and participate in fishing and hunting. The desire to eat fish has changed to a more mutualistic view involving more catch and release. As societal values move away from a perceived need to hunt and fish, the Department must continue to deploy strategic approaches that embrace changing values but also ensures sound science in managing coldwater fish populations.

Angler satisfaction will be central to these strategic approaches and will be crucial in maintaining the strong fishing heritage in Arizona. Satisfaction may come in many forms, as some anglers will demand high catch rates or trophy opportunities to be satisfied. Others may be satisfied with just a day fishing in the outdoors with family or friends. It will be critical that the Department frequently asks what all types of anglers want from their fisheries as well as asks if they are satisfied or not. If anglers are not satisfied with their fishing experience or opportunity, they may stop fishing. Satisfaction will be the standard that determines success in keeping fishing participation in Arizona as high as it can be. If satisfaction at an individual fishery dips below 80% for more than three years, actions should be implemented to change or improve the fishery.

### **Strategic Approaches:**

- 1) Ensure a standardized question(s) is asked of anglers each time an angler survey is conducted at all coldwater fisheries to measure satisfaction.
- 2) Ensure a statewide angler survey is completed every five years to better understand angler use.

**Objective 6: Make decisions through public, watershed scale, planning efforts about coldwater species composition of all coldwater fisheries.**

The Department currently follows a Watershed-based Fish Management Process. This defined process provides a systematic, data driven way to accommodate socio-political concerns, include public involvement, and facilitate the development of fisheries management plans at various scales. It includes mechanisms to identify critical linkages (e.g., management plans, policies, regulations, databases) that influence criteria for deciding *management emphasis* for a delineated *management unit*, and serves to assist with evaluation of ESA status change proposals, and is useful in supporting fish stocking activities. The Watershed-based Fish Management Process defines existing and desired management emphasis categories and allows for more specific prescriptions under those categories as appropriate. Emphasis designations are derived from analysis and comparison of current and potential angling opportunities as well as native fish conservation opportunities. Recommendations of management emphasis designations are only derived after an analysis of the Department's goal to manage for no net loss to angler opportunity. When reductions to angling opportunities will occur in one management unit due to a management decision, the Watershed-based Fish Management Process requires compensation of lost Angler Use Days (AUDs) in another management unit. Final decision-making authority rests at the Director's level or Commission when deemed appropriate. As with any process, adaptive modifications are periodically implemented to ensure major objectives are being met efficiently and effectively.

Four major objectives: 1) To reduce current and future conflicts between angling opportunity and native fish conservation; 2) To provide an integrated management strategy whereby all fish management activities within the watershed work toward meeting long-term Aquatic Wildlife and other Department goals for the watershed/project area; 3) To proactively manage toward and improve the status of native fish within the watershed/project area, promoting delisting of currently ESA listed species, and preventing the need for future federal listings; and 4) To proactively manage toward coldwater angling opportunity and use within a watershed consistent with the Department's goal of no net loss of angling opportunity and providing the ability to provide future opportunity for angler recruitment.

**Strategic Approaches:**

- 1) Use public processes to determine the use on or demand for a coldwater fishery.
  - a. Commission policies and input
  - b. Environmental checklist process
  - c. Watershed based fisheries management process

- d. Individual lake and stream plans
  - i. Determine if productivity, forage and water stability is appropriate for coldwater sportfish species goals (can it be what we want it to be).
- 2) Ensure anglers are involved in management planning and evaluation to create a sense of ownership among anglers.
  - a. Angler roundtable groups
  - b. Individual angler group communication and presentations
- 3) Ensure impacts to threatened and endangered species are addressed.
  - a. Clearly define impacts
  - b. If impacts to threatened and endangered species are not acceptable, ensure mitigation and or conservation measures are defined and meaningful

**Objective 7: Provide the public with outreach and education materials showcasing the coldwater fishing opportunities of Arizona.**

There are an estimated 360,000 anglers in Arizona. Their participation helps fund fisheries management activities (including conservation of all wildlife and habitats) and outdoor recreation opportunities, and provides economic benefits of approximately 1 billion dollars to state and to local communities. Nearly 70% of anglers in Arizona fish for trout and other coldwater species at some point throughout a given year. Outreach is needed to inform the public about the activities that they support and to educate people about the benefits of the programs in order to build public backing and ensure continued participation.

The use of Arizona's Trout Challenge Program as well as the development of the Fishaz.org website has been very successful in informing, educating and encouraging anglers to learn more about fishing opportunities in the state. It will be critical to continue these efforts and expand on different strategies to keep anglers informed and excited about coldwater fishing opportunities in Arizona.

**Strategic Approaches:**

- 1) Continue and expand Arizona's Trout Challenge Program where appropriate to attract attention and create excitement about Arizona's coldwater opportunities.
- 2) Inform anglers of the most productive angling techniques and methods to increase angler success.

- a. Develop and maintain varied and diverse “how to” videos.
  - b. Conduct fishing clinics around the state.
- 3) Develop innovative ways to provide information on coldwater fisheries through web-based interactive tools that allow anglers to find the latest fishing reports, surveys and management planning.
- a. Post timely information on how fishing license dollars go toward improving coldwater fishing opportunities.
  - b. Maintain active social media efforts to ensure anglers can access the latest information.
- 4) Continue to work with National Trout Organizations to provide consistent and unified messages for trout conservation in Arizona and throughout the Southwest.
- a. Support the Native and Wild Trout Conference.
  - b. Support angling groups with specific fishing clinics.

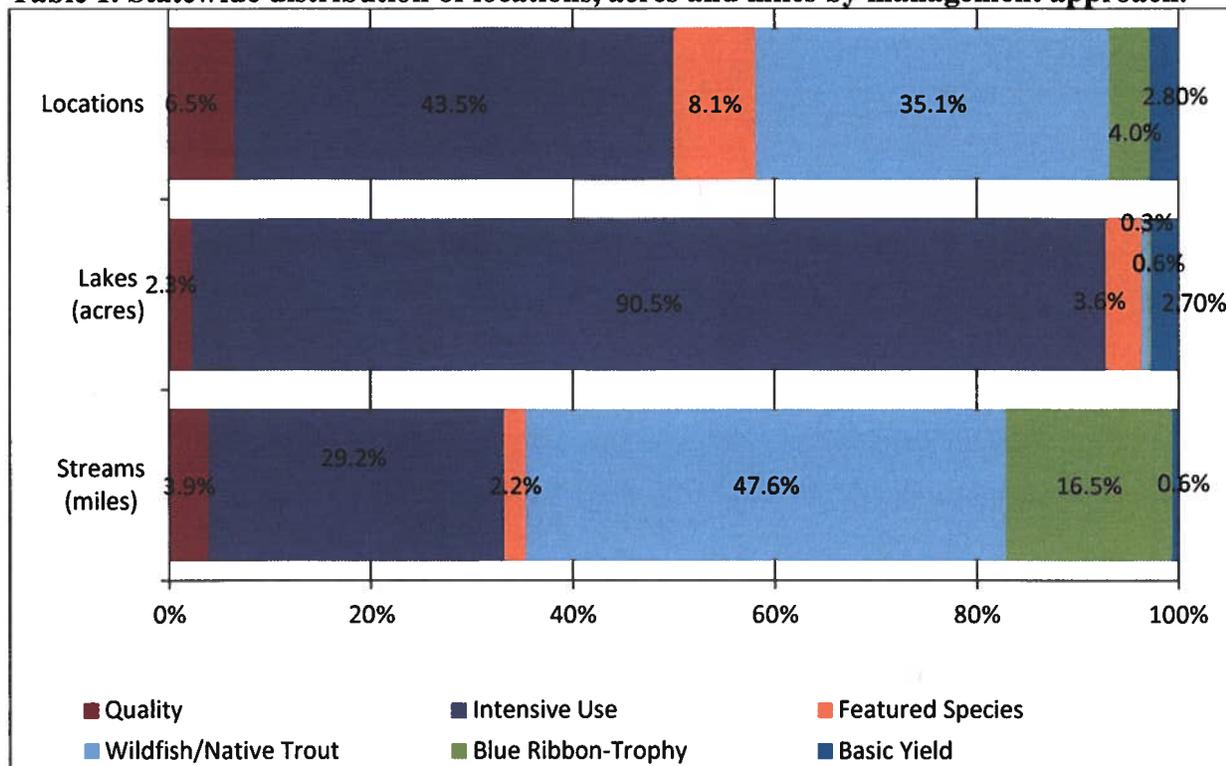
### **Sources Cited**

Fedler, Anthony. 2014. 2013 Economic Impact of Fishing in Arizona. Responsive Management Harrisonburg Virginia.

Quintana, Jessica Leigh. 2015. Understanding Angler Preferences and Participation for Management of Alabama Recreational Fisheries. A thesis submitted to the Graduate Faculty of Auburn University in partial fulfillment of the requirement for the Degree of Master of Science. Auburn, Alabama. August 1, 2015. pp. 1-5.

**Tables.**

**Table 1. Statewide distribution of locations, acres and miles by management approach.**



**Table 2. Coldwater Management Concepts with total miles and acres of opportunity for lakes and streams.**

Management Concept	Locations		Lakes (acres)		Streams (miles)	
Blue Ribbon-Trophy	10	4.0%	141.0	0.3%	163.6	16.5%
Quality	16	6.5%	856.5	2.3%	39.2	3.9%
Basic Yield	7	2.8%	1,000.0	2.7%	6.0	0.6%
Intensive Use	108	43.5%	34,149.7	90.5%	289.9	29.2%
Featured Species	20	8.1%	1,342.5	3.6%	21.3	2.2%
Wild/Native Trout	87	35.1%	235.0	0.6%	473.0	47.6%
<b>Total:</b>	<b>248</b>		<b>37,724.7</b>		<b>993.0</b>	

**Table 3. Proposed Blue Ribbon designated fisheries.**

Stream/Lake	Reach	Size	Species
Becker Lake <sup>1</sup>	Entire lake	85 acres	Rainbow
Black River	Upper reaches	18.5 miles	Brown
Black River-East Fork	Diamond Rock Campground upstream to Three Forks	4.8 miles	Brown
Canyon Creek-lower reach	Below OW Bridge	3.8 miles	Brown
Chevelon Creek-upper creek	Confluence of Willow Springs Creek and Woods Canyon to Chevelon Lake	12.8 miles	Brown
Colorado River-Lees Ferry	Glen Canyon Dam to Paria Riffle	17.8 miles	Rainbow
East Clear Creek	Entire creek	94.4 miles	Rainbow/Brown
JD Dam Reservoir	Entire lake	6 acres	Rainbow/Brown
Little Colorado River	Hwy 261 upstream to River Reservoir	11.5 miles	Rainbow/Brown
River Reservoir (Greer Lakes) <sup>1</sup>	Entire lake	50 acres	Brown

<sup>1</sup>Location is managed under multiple concepts.

**Table 4. Proposed Quality designated fisheries.**

Stream/Lake	Reach	Size	Species
Black River-north fork of east fork <sup>1</sup>	Entire creek	11.1 miles	Brown
Boneyard Creek <sup>1</sup>	Entire creek	6.8 miles	Brown
Carnero Lake <sup>1</sup>	Entire lake	65 acres	Rainbow
Cataract Lake	Entire lake	35 acres	Rainbow/Brown
Chevelon Canyon Lake <sup>1</sup>	Entire lake	200 acres	Rainbow
Chevelon Creek-middle reach	Below Chevelon Dam to Powerlines	4.3 miles	Rainbow/Brown
Coconino Reservoir	Entire lake	5 acres	Rainbow
Crescent Lake	Entire lake	100 acres	Rainbow
Dogtown Reservoir	Entire lake	50 acres	Rainbow/Brown
Elk Tank	Entire lake	2.0 acres	Rainbow
Kinnickinik Lake <sup>1</sup>	Entire lake	126 acres	Brown/Brook
Long Lake-Soldier Complex	Several lakes inter- connected	268 acres	Rainbow
Middle Tank	Entire lake	2 acres	Rainbow
Oak Creek (above Sedona) <sup>1</sup>	Grasshopper Point to Sterling Springs Hatchery	14.5 miles	Brown
Perkins Tank <sup>1</sup>	Entire lake	3.5 acres	Brook/Brown
Silver Creek-upper reach <sup>1</sup>	Seasonal in winter	2.5 miles	Rainbow/Apache

<sup>1</sup>Location is managed under multiple concepts.

**Table 5. Proposed Basic Yield designated fisheries.**

Stream/Lake	Reach	Size	Species
Big Lake	Entire lake	450 acres	Rainbow
Long Lake-Show Low	Entire lake	50 acres	Rainbow
Luna Lake	Entire lake	75 acres	Rainbow
Pratt Lake	Entire lake	5 acres	Rainbow
Sponsellers Tank	Entire tank	70 acres	Rainbow
White Mountain Reservoir	Entire lake	200 acres	Rainbow
Workman Creek	Upper Reach	6.0 miles	Rainbow

**Table 6. Proposed Wild/Native Trout designated fisheries. 247.8 miles are designated for native trout, 235.1 miles and 235 acres are designated to wild trout.**

Stream/Lake	Reach	Size	Species
Ash Creek	Entire creek	9.0 miles	Gila
Barbershop Canyon Creek	Entire creek	15.8 miles	Brown
Bear Creek	Entire creek	3.9 miles	Brown
Bear Wallow Creek	Entire creek	11.2 miles	Apache
Beaver Creek (Black River)	Entire creek	10.4 miles	Brown
Benny Creek	Entire creek	2.0 miles	Brown
Benton Creek	Entire creek	3.0 miles	Apache
Black River, East Fork <sup>1</sup>	Confluence with West Fork Black upstream to Diamond Rock campground	7.8 miles	Brown
Black River-west fork	Middle and Lower reaches	16.5 miles	Apache
Boggy Creek-Centerfire	Entire creek	6.1 miles	Apache
Bonita Creek-East Verde	Entire creek	2.9 miles	Brook
Buckalou Creek	Entire creek	0.7 miles	Gila
Campbell Blue Creek	Entire creek	7.0 miles	Brown
Castle Creek	Entire creek	1.4 miles	Gila
Centerfire Creek	Entire creek	9.2 miles	Apache
Chase Creek-East Verde	Entire creek	2.4 miles	Gila
Chevelon Canyon Lake <sup>1</sup>	Entire lake	200 acres	Brown
Chitty Canyon Creek	Entire creek	5.7 miles	Gila
Coleman Creek, lower reach	Confluence with Campbell Blue upstream to barrier falls	1.4 miles	Brown

**Table 6 continued. Proposed Wild/Native Trout designated fisheries.**

Stream/Lake	Reach	Size	Species
Coleman Creek, upper reach	Barrier falls upstream to headwaters	3.4 miles	Gila
Colter Creek	Entire creek	5.4 miles	Rainbow
Conklin Creek	Entire creek	6.5 miles	Apache
Corduoy Creek	Entire creek	4.0 miles	Apache
Coyote Creek	Entire creek	10.0 miles	Apache
Double Cienega Creek	Entire creek	2.8 miles	Apache
Dude Creek	Entire creek	4.6 miles	Gila
East Verde River	Upper reach	18.5 miles	Rainbow
Ellison Creek	Upper reach	4.1 miles	Rainbow
Fish Creek-Black River	Entire creek	14.2 miles	Apache
Frye Creek	Above reservoir	5.6 miles	Gila
Grant Creek	Entire creek	6.3 miles	Apache
Grant Creek-Blue River, lower reach	Confluence with Blue River upstream to barrier falls	4.4 miles	Rainbow/Brown
Grant Creek-Blue River, upper reach	Barrier falls upstream to headwaters	7.1 miles	Gila
Grapevine Creek	Entire creek	5.2 miles	Gila
Greer Area Lakes (Bunch) <sup>1</sup>	Entire lake	20 acres	wild Browns enter from LCR
Greer Area Lakes (Tunnel) <sup>1</sup>	Entire lake	15 acres	wild Browns enter from LCR
Haigler Creek	Upper reach	3.0 miles	Gila
Hall Creek	Entire Creek	5.5 miles	Rainbow/Brown
Hannagan Creek	Entire Creek	4.2 miles	Apache
Hayground Creek	Entire Creek	12.6 miles	Apache
Home Creek	Entire Creek	6.5 miles	Apache
Horton Creek	Entire creek	2.4 miles	Browns
Houston Creek-Tonto	Entire creek	5.9 miles	Rainbow/Brown
KP Creek, lower reach	Confluence with Blue River upstream to barrier falls	2.9 miles	Rainbow/Brown
KP Creek, upper reach	Barrier falls upstream to headwaters	10.1 miles	Gila
Lanphier Creek	Entire Creek	2.5 miles	Gila
Lee Valley Creek	Entire Creek	1.6 miles	Apache
Little Colo. River-East Fork, lower reach	Confluence with LCR upstream to constructed fish barrier	1.8 miles	Brown

**Table 6 continued. Proposed Wild/Native Trout designated fisheries.**

Stream/Lake	Reach	Size	Species
Little Colo. River-Eash Fork, upper reach	Colter Dam upstream to headwaters	5.5 miles	Apache
Little Colo. River -East Fork, lower reach	Constructed fish barrier upstream to Colter Dam	1.9 miles	Apache
Little Colo. River, (Greer) <sup>1</sup>	River Reservoir upstream to confluence of East and West forks	2.1 miles	Brown
Little Colo. River-South Fork, lower reach	Confluence with LCR upstream to constructed fish barrier	1.0 miles	Brown
Little Colo. River -South Fork, upper reach	Barrier upstream to headwaters	7.2 miles	Apache
Little Colo. River, West Fork, lower reach <sup>1</sup>	Confluence with LCR upstream to constructed fish barrier	2.8 miles	Brown
Little Colo. River, West Fork	Constructed fish barrier upstream to headwaters	7.7 miles	Apache
Marijilda Creek	Entire creek	5.4 miles	Gila
McKittrick Creek	Entire creek	2.0 miles	Gila
Mineral Creek - Concho	Upper reach	3.6 miles	Apache
Monument Creek	Entire creek	1.4 miles	Native
North Canyon Creek (Colorado River)	Entire creek	4.9 miles	Apache
Nutrioso Creek	Upper reach	3.7 miles	Rainbow
Oak Creek-West Fork	Entire creek	11.1 miles	Gila
Paddy Creek - Nutrioso	Entire creek	5.0 miles	Rainbow
Pine Creek	Upper reach	2.6 miles	Rainbow/Brown
Raspberry Creek	Entire creek	4.2 miles	Gila
Reservation Creek – lower reach	Confluence with Black River upstream to reservation boundary	3.5 miles	Brown
Reynolds Creek	Entire Creek	1.5 miles	Rainbow
Rudd Creek - upper	Upper reach	6.1 miles	Apache
Sabino Canyon Creek	Upper reach	6.0 miles	Rainbow
Salome Creek	Upper reach	3.6 miles	Rainbow
Snake Creek - Black River	Entire creek	2.5 miles	Apache
Soldier Creek - Black River	Entire creek	1.4 miles	Apache
Spring Creek-Tonto	Upper reach	7.8 miles	Brown
Stinky Creek	Entire creek	2.4 miles	Apache
Strayhorse Creek	Entire Creek	12.6 miles	Rainbow
Sycamore Creek-Agua Fria	Upper reach	3.0 miles	Rainbow

**Table 6 continued. Proposed Wild/Native Trout designated fisheries.**

Stream/Lake	Reach	Size	Species
Thompson Creek	Entire creek	1.0 miles	Apache
Tonto Creek-Salt	Middle reach	21.4 miles	Brown
Webber Creek	Upper reach	4.6 miles	Rainbow/Brown
West Clear Creek	Upper reach	22.7 miles	Rainbow/Brown
Wet Beaver Creek	Upper reach	7.2 miles	Brown
White Creek	Entire creek	6.7 miles	Brown
Wildcat Creek	Entire creek	4.1 miles	Apache
Willow Springs Creek	Willow Springs Dam to confluence with Woods Canyon Creek	3.4 miles	Brook/Brown
Woods Canyon Creek	From lake to the confluence with Willow Springs Creek	5.8 miles	Brown
Workman Creek	Lower reach	6.0 miles	Rainbow

<sup>1</sup>Location is managed under multiple concepts.

**Table 7. Proposed Featured Species fisheries.**

Stream/Lake	Reach	Size	Species
Ackre Lake	Entire lake	2.0 acres	Apache/Grayling
Bear Canyon <sup>1</sup>	Entire lake	60.0 acres	Tiger
Becker Lake <sup>1</sup>	Entire lake	85.0 acres	Tiger
Big Lake	Entire lake	450	Cutthroat and Brook
Boneyard Creek <sup>1</sup>	Entire creek	6.8 miles	Brook
Carnero Lake <sup>1</sup>	Entire lake	65.0 acres	Tiger
Crescent Lake <sup>1</sup>	Entire lake	100 acres	Brook
Frye Mesa Reservoir	Entire lake	4.0 acres	Gila
Goldwater Lake <sup>1</sup>	Entire lake	22.0 acres	Gila
Hall Creek <sup>1</sup>	Entire Creek	5.5 miles	Cutthroat
Kinnikinick Lake <sup>1</sup>	Entire lake	126 acres	Tiger
Lee Valley Lake	Entire lake	35.0 acres	Apache/Grayling
Luna Lake <sup>1</sup>	Entire lake	75 acres	Cutthroat
Mexican Hay Lake	Entire lake (when it has water)	100 acres	Hatchery Apache
Oak Creek <sup>1</sup>	Above Sedona	14.5 miles	Gila
Perkins Tank <sup>1</sup>	Entire lake	3.5 acres	Grayling
Pratt Lake <sup>1</sup>	Entire lake	5 acres	Brown/Tiger
Willow Springs Creek <sup>1</sup>	Below Willow Springs Lake to confluence with Woods Canyon	3.4 miles	Wild Brook and Brown
Willow Springs Lake <sup>1</sup>	Entire lake	158 acres	Tiger
Woods Canyon Lake <sup>1</sup>	Entire lake	52.0 acres	Tiger

<sup>1</sup>Location is managed under multiple concepts.

**Table 8. List of Intensive Use fisheries**

Stream/Lake	Stream/Lake
Alvord Park*	Little Colo. River, West Fork - confluence with LCR upstream to constructed fish barrier <sup>1</sup>
Apache Lake	Little Colorado River – (Greer) <sup>1</sup>
Ashurst Lake	Long Tom Tank
Bear Canyon Lake <sup>1</sup>	Lynx Lake
Black Canyon Lake	Mansel Carter Oasis Lake*
Black River, East Fork - confluence with West Fork Black upstream to Diamond Rock campground <sup>1</sup>	Marshall Lake
Blue Ridge Reservoir (CC Cragin Reservoir)	McQueen Park*
Bonsall Park*	Mingus Lake
Canyon Creek Upper (above OW Bridge)	Mormon Lake Lodge Tank
Canyon Lake	Morton Lake
Chaparral Park Lake*	Nelson Reservoir
Christopher Creek	Oak Creek (Above Sedona) <sup>1</sup>
City Reservoir	Oak Creek (Below Sedona)
Clear Creek Reservoir	Pacana Park*
Cluff Ranch Ponds	Papago Park Ponds*
Colorado River - Parker Area	Parker Canyon Lake
Colorado River - Topock Area (Davis Dam to I-40)	Pacific Avenue Athletic Complex Pond*
Colorado River - Willow Beach	Patagonia Lake
Copper Sky Park*	Pena Blanca Lake
Cortez Park*	Pioneer Park*
Council Ave Pond – Somerton*	Rainbow Lake
Dankworth Ponds (State Parks)	Red Mountain Lake*
Dave White Regional Park*	Redondo Lake*
Dead Horse Lagoons (State Parks)	Riggs Flat Lake
Desert Breeze Park*	Rio Vista Lake*
Desert West Park*	Riverview Park Lake*
Discovery Park*	Roadrunner Park*
East Verde Riv. - Middle Reach (Pumphouse down to Hwy 87)	Roper Lake
Eldorado Park*	Rose Canyon Lake
Encanto Park*	Russell Tank
Evelyn Hallman Park*	Saguaro Lake
Fain Lake	Sahuarita Lake*
Fool Hollow Lake	Salt River (below Saguaro Lake)
Fortuna Pond (Moser Pond)*	Sante Fe Reservoir
Francis Short Pond	Scott Reservoir
Freestone Park*	Show Low Creek – tailwater
Friendship Park*	Show Low Creek – meadow*
Goldwater Lake*	Show Low Lake
Greenfield Park Pond*	Silver Creek – Upper reach <sup>1</sup>
Green Valley Lakes*	Silverbell Lake*
Greer Area Lakes – Tunnel <sup>1</sup>	Steele Indian School Park Lake*
Greer Area Lakes – River <sup>1</sup>	Surprise Lake*
Greer Area Lakes – Bunch <sup>1</sup>	Tempe Town Lake*
Haigler Creek - Middle Reach	Tonto Creek - Upper Reach (above Hwy 260)
Huffer Tank (Spring)	Verde River (Sycamore Creek to Childs)
Hulsey Lake	Veterans Oasis Park*
Kaibab Lake	Water Ranch Lake*
Kennedy Park Lake*	Watson Lake
Kiwanis Park Lake*	Wet Beaver Creek – Middle Reach (near campground)
Knoll Lake	Willow Springs Lake <sup>1</sup>
Lake Mary (Lower)	Woodland Lake
Lake Mohave	Woods Canyon Lake <sup>1</sup>
Lakeside Park*	Yavapai Lakes*
	Yuma West Wetlands Pond*

\* Community Fishing Program

<sup>1</sup>Location is managed under multiple concepts.