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East Verde River Headwaters Watershed Restoration Action Plan

Payson Ranger District, Tonto National Forest
Gila County, Arizona

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Arizona Trail Association

Arizona Wild

Friends of the Tonto National Forest

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Salt River Project

Trout Unlimited

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What is the Watershed Condition Framework and Why a Watershed Restoration Action Plan?

The restoration of watershed and forest health is a core management objective of the national forests and grasslands managed by the Forest Service, an agency of the U.S. Department of Agriculture (USDA). To achieve this goal, the Forest Service is directed to restore degraded watersheds by strategically focusing investments on watershed improvement projects and conservation practices at the landscape and watershed scales. The Watershed Condition Framework (WCF) is a comprehensive approach for classifying watershed condition, proactively implementing integrated restoration in priority watersheds on national forests and grasslands and tracking and monitoring outcome-based program accomplishments for performance accountability (USDA, USFS, Watershed Condition Framework 2011).

The scope of the WCF is broad and it encompasses multiple resource areas. The Forest Service Watershed Program, as defined by OMB and the Forest Service Strategic Plan, encompasses all Forest Service activities that contribute to improved watershed condition (OMB 2006, USDA Forest Service 2004b), including soil and water improvements, vegetation management, reforestation, range management, wildlife and fisheries improvements, road decommissioning, and other activities. Watershed restoration refers to activities that improve the conditions of watersheds, restore degraded habitats, and provide long-term protection to soils and aquatic and riparian resources.

The WCF consists of a process involving six steps (Figure 1).

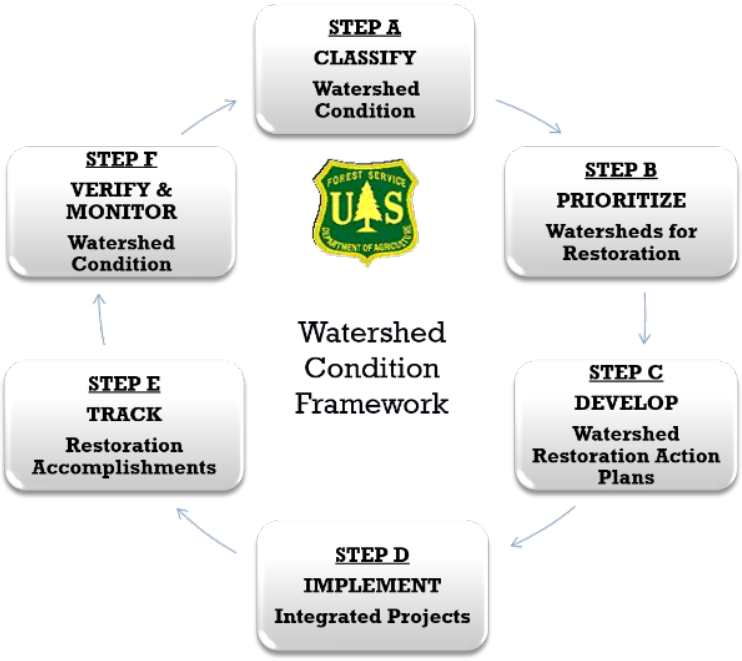


Figure 1: Watershed Condition Framework Process

Step A, watershed condition classification, is based on 12 core indicators that are rated good (1), fair (2), or poor (3) based on nationally established attributes that can be adjusted to fit local conditions.[1] The 12

[1] The WCF only assesses watershed condition on National Forest System lands – lands owned and managed by other entities within the watershed are not part of the assessment, but through partnerships may be part of a Watershed Restoration Action Plan where appropriate.

core indicators are: water quality, water quantity, aquatic habitat, aquatic biota, riparian vegetation, roads and trails, soils, fire regime, forest cover, rangeland vegetation, terrestrial invasive species, and forest health. The Tonto National Forest completed an initial assessment of its 181 sub-watersheds (6th code hydrologic unit code) watersheds in 2011. Step B is the determination of priority watersheds where restoration and enhancement work will occur. National direction limits each national forest or grassland to no more than five priority watersheds. In 2021 the Tonto National Forest has three priority watersheds: Camp Creek on the Cave Creek District, Green Valley Creek on the Payson District, and this priority watershed — East Verde Headwaters on the Payson District. The Green Valley Creek Watershed Restoration Action Plan (WRAP) was signed in April 2021 and the Camp Creek WRAP will be completed in Fiscal Year 2022.

WRAPs describe the existing condition of the priority watershed and identify specific essential projects designed to improve, or in some cases maintain, the overall condition of the watershed. It can be helpful to think of the WRAP like a treatment plan for an ailing patient – the WRAP provides health history and pre-existing conditions (e.g., highly erosive soils, overgrazing, proliferation of roads or user-created routes): examines the current ailments (e.g., head cuts, erosion, water quality impairment); prescribes treatments to put the patient on the path to recovery (e.g., road decommissioning, stream restoration, fencing of sensitive areas); and a then provides a plan for monitoring the prescribed treatments to determine their effectiveness (e.g., monitoring dissolved oxygen in streams, riparian area extent and composition). A WRAP does not address all that ails a watershed because it is designed to be completed in five to six years and because there are some watershed condition impairments that would be economically impossible to remedy. The watershed condition assessment according to the twelve indicators is conducted by Forest Service specialists, however, the development, implementation, improvement, and monitoring of watershed condition is an effort that succeeds only with the participation of the Tonto National Forest's many federal, state, local, and non-profit partners.

East Verde Headwaters Summary

Watershed Name and Hydrologic Unit Code (HUC) [2]: East Verde River Headwaters.
HUC #150602030202

General Location: Northern portion of the Tonto National Forest in Gila County. Northern portion of the Payson Ranger District. See Figure 2.

Total Watershed Area/National Forest System Area Within the Watershed:: 18,809 acres and 97%

Watershed Characterization: The East Verde River Headwaters (EV Headwaters) Watershed is in the transitional zone that runs northwest-by-southeast between the Colorado Plateau and Basin & Range physiographic provinces in central Arizona. The watershed is bound from the north by the Mogollon Rim, an escarpment along the southwestern edge of the Colorado Plateau. It is bound on the west by the ridge west of North Sycamore Creek and neighbored on the east by the ridge east of Dry Dude Creek. It is bound on the southwest by Little Diamond Rim and the southeast by Brody Hills.

Primary land use activities in the watershed include recreation, Off Highway Vehicle (OHV) use, wildlife habitat, fuelwood harvesting, and grazing. There are two developed day use areas within the watershed, Second Crossing and Third Crossing, and many areas for dispersed camping. Roughly nine miles of the Highline Trail cut across the top of the watershed. About half of this milage is also designated as part of the of the Arizona Trail. The watershed contains several private communities and properties: Washington Park, Whispering Pines, Verde Glen, and the Shadow Rim Ranch Girl Scout Camp.

Endangered, threatened, proposed or candidate species and select species critical habitats within in the EV Headwaters Watershed include narrow-headed garter snakes (*Thamnophis rufipunctatus*), Chiricahua leopard frogs (*Lithobates chiricahuensis*), Mexican spotted owls (*Strix occidentalis lucida*), and Gila trout (*Oncorhynchus gilae*). The East Verde River flows into a designated Wild and Scenic portion of the Verde River, which is a major source of surface water for the Phoenix metro area as well as a host to other different endangered and threatened species. Dude Creek, a tributary to the East Verde, falls completely within the watershed and is eligible for Wild and Scenic River designation per the Tonto NF Revised Forest Plan.

Primary concerns in the watershed include water quality, in-stream and riparian habitat, and stream channel form and function. Uncharacteristically severe wildfires in the watershed in the past have caused significant damage to channel form and function in Dude Creek and Chase Creek, which in turn has caused increased sedimentation and flooding downstream. Road density and condition also contribute sediment to streams and degrade water quality. In-stream habitat and riparian improvements along the East Verde River will support native fish populations and the effort to improve sport fishing along the river. The current watershed condition class for the EV Headwaters is Class 2 (Functioning at Risk) and the target condition class is Class 1 (Functioning Properly). The watershed is Functioning at Risk because 8 of the 12 watershed condition indicators have attributes that are ranked as poor or fair. The key watershed conditions that are within EV Headwaters Watershed within Forest Service jurisdictional control and can be affected by changes in management are shown on Table 1.

[2] East Verde Headwaters is a 12-digit HUC, which is technically designated by the USGS as a *subwatershed.* To use nomenclature like other WRAPs within the USFS and the language most commonly used by the public and partners, this document will refer to the area as a watershed not a subwatershed.

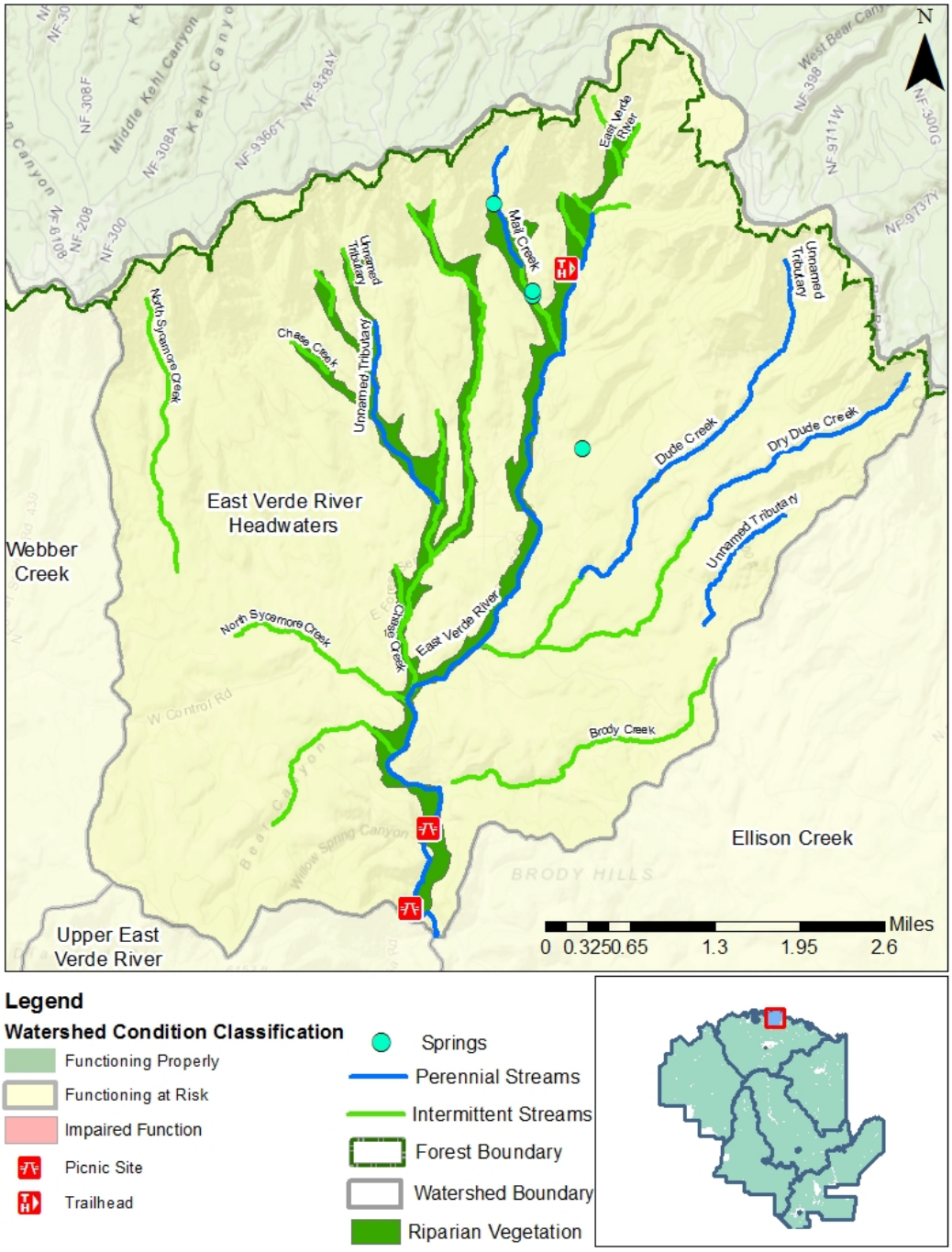


Figure 2: Overview of East Verde River Headwaters Watershed

Table 1: Summary of key watershed conditions ranked as fair or poor in the East Verde River Headwaters Watershed within Forest Service jurisdictional control and can be affected by changes in management

Attribute	Rating and Brief Reason(s) for Rating (Indicator Number)
Water Quality (1)	
Other Water Quality Problems	Rating *Fair* – Mail Creek and East Verde River are listed as "Supporting some Uses" in the Arizona Department of Environmental Quality 2020 draft assessment.
Aquatic Habitat (3)	
Habitat Fragmentation	Rating *Fair* - Between 25% and 95% aquatic habitats are connected. Mail Creek has a perched culvert, other streams such as Dude Creek and Dry Dude Creek are disconnected from the East Verde River, however, this disconnect benefits native species.
Large Woody Debris	Rating *Fair* – Large wood as an ecosystem component is present but is recruited into the system at less than natural rates.
Channel Shape & Function	Rating *Fair* – Post fire widening, channel incision, and flooding on Dude Creek and Chase Creek.
Aquatic Biota (4)	
Native Species	Rating *Fair* – Native species (Gila trout) are present on a limited number of perennial streams in the watershed and are largely self-sustaining.
Exotic and/or Invasive Species[3]	Rating *Fair* – Crayfish are present in all streams in the watershed.
Riparian / Wetland Vegetation (5)	
Vegetation Condition	Rating *Fair* – Watershed disturbance has impaired the condition of riparian vegetation, between 25-80% of riparian vegetation shows moderate to high geomorphic, hydrologic, and biologic integrity compared to relative natural potential.
Roads & Trails (6)	
Open Road Density	Rating *Poor* – With 82.1 miles of roads and trails currently within the watershed, the current road density is 2.9 miles per square mile.
Road Maintenance	Rating *Poor* – Best Management Practices for the maintenance of design drainage features and overall annual maintenance of Class 2 roads occurs on less than 50% of the roads in the watershed.
Proximity to Water	Rating *Poor* – There are 26.2 miles of road or trail within 300 feet of perennial or intermittent streams.
Soils (7)	
Soil Productivity	Rating *Fair* – Roughly 10-15% of the watershed's soil productivity is impaired from stressors such as uncharacteristically severe wildfire and lack of fire, cattle, and/or invasive species.
Soil Erosion	Rating *Fair* – Soil conditions show some departure from expected erosion rates which effect the ecosystem and hydrologic integrity of the watershed.

[3] Note that Rainbow trout, which are neither considered exotic or invasive species in the state of Arizona, are considered a non-native sportfish and are present in multiple streams throughout the watershed. The presence of these fish does not contribute to this score.

Attribute	Rating and Brief Reason(s) for Rating (Indicator Number)
Terrestrial Invasive Species (11)	
Extent & Rate of Spread	Rating *Fair* – The naturalization of invasive species that are present throughout the watershed has been facilitated by uncharacteristically severe wildfire events in the last few decades, as well as legacy historic grazing management practices.

There are no watershed conditions beyond Forest Service control to affect that will prevent the Forest Service from improving watershed condition on the EV Headwaters Watershed. Water quantity (Flow Characteristics) is, however, ranked as fair because of flow augmentation in the East Verde River from CC Cragin dam by the Salt River Project; multiple springs within the watershed that support domestic and livestock consumptive use; and eighty-seven wells held by private entities for use on their properties. While this flow augmentation changes the natural flow regime by increasing baseflows, it likely provides more benefit than harm to the East Verde River system by providing additional habitat for aquatic biota during low flow times of the year (summer and fall).

Detailed Watershed Characteristics

Climate

Climate statistics are available from a weather station in Payson, Arizona, located about ten miles south of the EVHW watershed.[4]

- Average annual maximum temperature: 72.5° F
- Average annual minimum temperature: 39.2° F
- Average annual total precipitation: 21.16 inches
- Average annual total snowfall: 24.1 inches
- Highest average monthly precipitation: 3.06 inches (August)
- Highest average monthly snowfall: 6.1 inches (January)
- Lowest average monthly precipitation: 0.36 inches (June)

Geology/Geomorphology

The upper portion of the watershed consists of Permian sedimentary rocks, primarily limestone from the Kaibab and Toroweap Formations, with underlying Coconino Sandstone. Below this layer, Permian to Pennsylvanian Sedimentary Rocks are found, consisting of interbedded sandstone, shale, and limestone. The largest portion of the watershed consists of Mississippian, Devonian, and Cambrian sedimentary rocks, with sandstone, shale, limestone, and dolostone. A small area of Early Protozoic Granitic Rocks is found near the mouth (bottom) of the watershed, consisting of a wide variety of granitic rocks: granite, granodiorite, tonalite, quartz diorite, diorite, and gabbro.

Geophysical and Geomorphic Setting

The EV Headwaters Watershed is in the transitional zone between the Colorado Plateau and Basin & Range physiographic provinces. The East Verde River is the primary drainage in the watershed, and it flows from the top of the watershed at southern end of the Colorado Plateau to the south roughly following East Verde River Road and Houston Mesa Road, exiting the EV Headwaters Watershed near Second Crossing Campground. Elevation ranges from approximately 7800’ at the highest point on the

[4] https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az6323 Payson, Arizona (026323) Period of Record: 11/06/1940 – 06/09/2016

Mogollon Rim to 5000’ at valley bottom.

Soils

There are 17 Terrestrial Ecosystem Unit Inventory (TEUI) units within the watershed, below are descriptions for the larger units in the watershed.

The Ponderosa Pine and Mixed Conifer areas of this watershed are primarily composed of Udic Haplustalfs soils (Pink, Figure 3), which are characterized as fine loamy, mixed mesic deep gravelly to cobbly loam. Soil erosion hazard within this soil type ranges from slight to severe. The transition point between the lower valley of the watershed and the rim consists mostly of Udic Ustochrepts (Magenta, Figure 3) with loamy skeletal, mixed mesic gravelly loams with condition rating of unsuitable and severe erosion hazard.

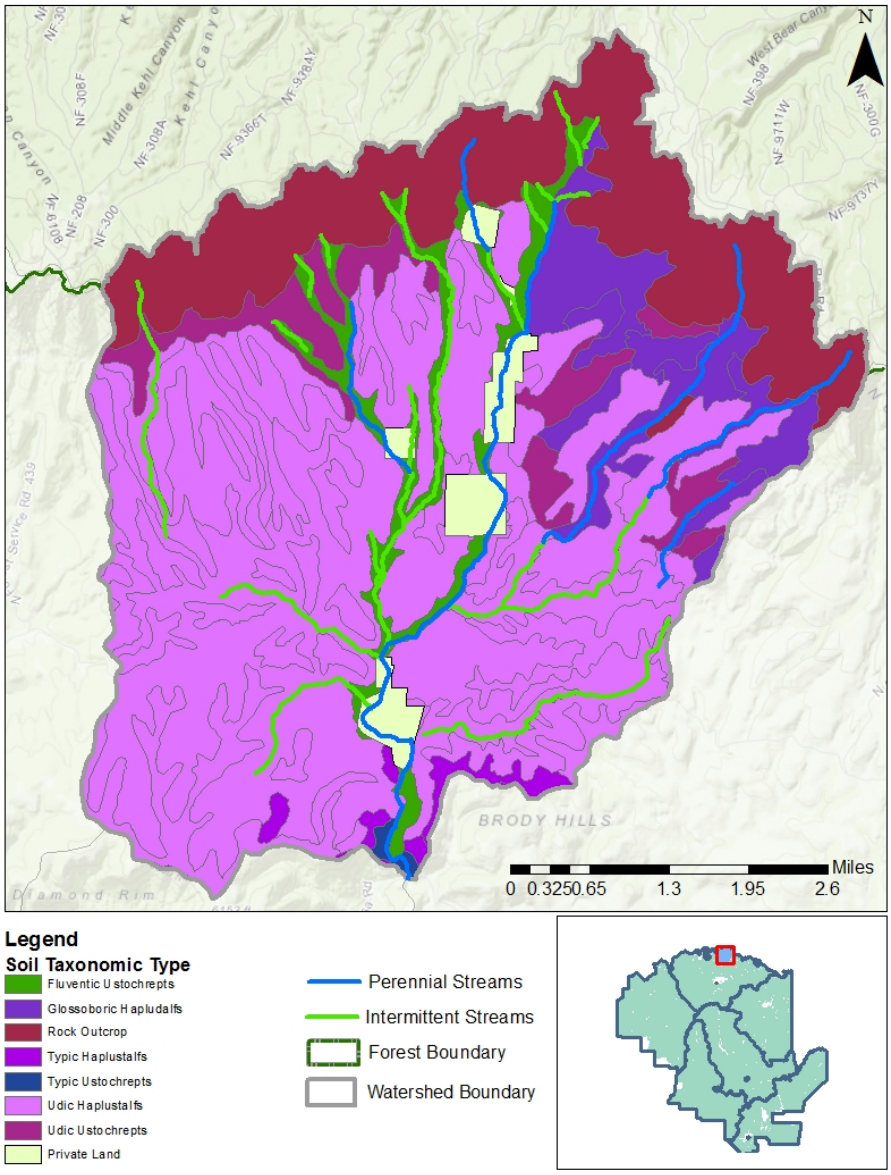
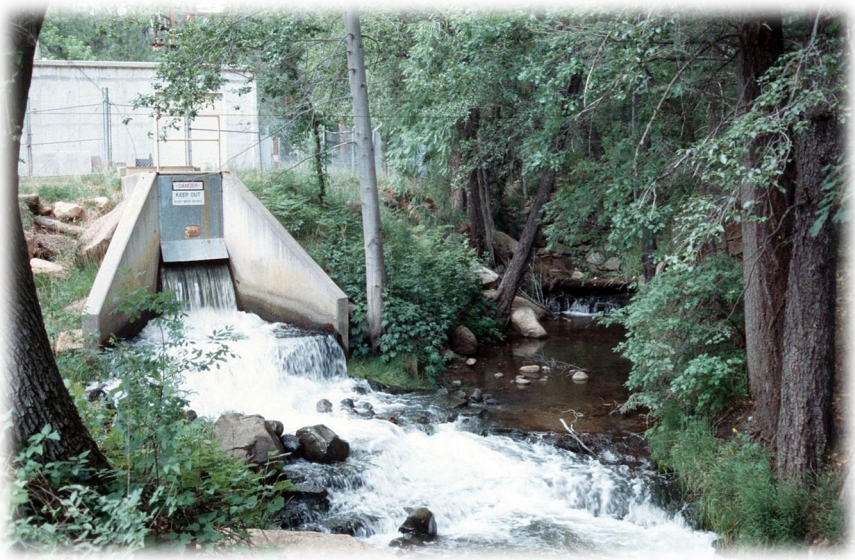


Figure 2: Soil Types

Found mostly along the southeastern portion of the watershed, Glossoboric Haplustalfs (Purple, Figure 3) with fine, mixed mesic deep gravelly to cobbly loam soils are rated with a slight erosion hazard in some areas and severe erosion hazard in others. Typic Udorthents (Blue, Figure 3) with sandy-skeletal mixed frigid and mesic gravelly sandy loams are dominant in the northeastern portion and have a severe soil erosion hazard. Riparian areas, or Fluventic Ustochrepts (Green, Figure 3), are unrated for erosion.

Hydrology

The EV Headwaters Watershed is located within the East Verde River 5th level watershed. The East Verde River is a major tributary to the Verde River, one of the largest rivers in the state, and a significant contributor to the water supply for the Phoenix metro area.



Control structure where water from C.C. Cragin Dam enters East Verde River

Since September 1965 a trans-basin diversion from the C.C. Cragin Reservoir on East Clear Creek has contributed as much as 18,000 acre-feet (1969) and as little as 4 acre-feet (1992) of water per year to the East Verde River near the mouth of Mail Creek. In 2019 this trans-basin diversion also began supplying the Town of Payson water via a pipeline that runs through the watershed. In the past decade, the median of flows contributed to the East Verde River from C.C. Cragin Reservoir have been 4,800 acre-feet per year. The number of months with imports, median, and maximum cubic feet per second (cfs) varies from year to year (Table 2 – summarized from USGS gage #09507580 East Verde River Diversion from East Clear Creek, Near Pine, AZ). Generally, the largest augmentation occurs in the summertime when low flows would have naturally occurred, and overall, the additional water has greatly increased the natural flow of the river (Carson 1986). To our knowledge, the long-term impacts of this augmentation have not been studied, however, a 1966 report by Hjalmarson and Davidson, indicate that the channel has "very small storage capacity along the entire length of the river, and there is usually sufficient water available to satisfy the demands of vegetation regardless of the amount of streamflow" (Hjalmarson and Davidson 1966) and Carson (1986) found that that the increased flow is confined to the already saturated low flow channel and losses of the added water due to seepage and evapotranspiration were minor. Both would indicate that the riparian area is not enhanced by the increased flows per se but could be impacted if those flows contribute to downcutting or channel instability. Finally, the entire length of the East Verde River, from headwaters to its confluence with the Verde River is protected by an instream flow water right (33-90310) with a priority date of November 26, 1985 for 2,889.6 acre-feet at the point where the river crosses the Highway 87 bridge (downstream from this watershed) and for 2,894.3 acre-feet at the USGS Gauge near Childs (near where the East Verde River meets the Verde River.) The instream flow right does not include any augmented flows from C.C. Cragin.

Table 2: Summary of flow statistics for 1966-2020 on the East Verde River Diversion from East Clear Creek, Near Pine, AZ gauge

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Mean cfs	3.7	4	4.3	7	11	14	13	13	12	11	8.3	5.6
Maximum cfs	25.5	30.9	29.8	32.5	33.2	32.2	30.3	30	30.1	28.6	28.2	23
% of yrs. with 0 cfs	70%	70%	72%	49%	19%	14%	19%	19%	23%	16%	32%	51%

Unamed tributary to Chase Creek – Site of Gila Trout reintroduction

Including the East Verde River, the watershed contains 16.4 miles of perennial streams and 22.3 miles of intermittent streams. Drainages run in a generally north-south direction, draining down from the Colorado Plateau. Perennial and intermittent reaches are found primarily in the upper northeastern half of the watershed in the steeper slopes coming down from the Mogollon Rim. Streams with perennial reaches in the watershed include East Verde River, Mail Creek, Chase Creek, Dude Creek, Dry Dude Creek, two unnamed tributaries to Chase Creek, and an unnamed tributary to Dry Dude Creek. Aside from the East Verde River, the southwestern half of the watershed consists of nearly all ephemeral reaches. Prominent springs exhibiting perennial or intermittent characteristics include Pieper Hatchery, Washington, Mail, and Heron Springs.

Upland & Riparian Vegetation

Vegetation is classified following the Ecological Response Units (ERU) framework[5]. Upland ERUs include Ponderosa Pine – Evergreen Oak, Mixed Conifer – Frequent Fire, Pinyon Juniper Woodland, and Pinyon Juniper Shrub. Riparian ERUs include Ponderosa Pine/Willow and Herbaceous wetland. Table 3 identifies the acreage and proportion of ERUs located within the projected watershed and Figure 4 displays the location of the ERUs within the watershed.

[5] Ecological response units are mapped ecosystem types based off biophysical themes that represent the range of conditions (e.g., dominant species, vegetation associations, soils, landscape features) that prevail under nature disturbance regimes.

Table 3. Ecological Response Units (ERU) located within the East Verde River Headwaters Watershed

ERU	Acres	Percentage of Watershed
Ponderosa Pine – Evergreen Oak	11,819	64.6%
Mixed Conifer – Frequent Fire	5,005	27.3%
Riparian (Ponderosa Pine/Willow and Herbaceous Wetland)	1,186	6.5%
PJ Woodland	243	1.3%
PJ Evergreen Shrub	51	0.3%

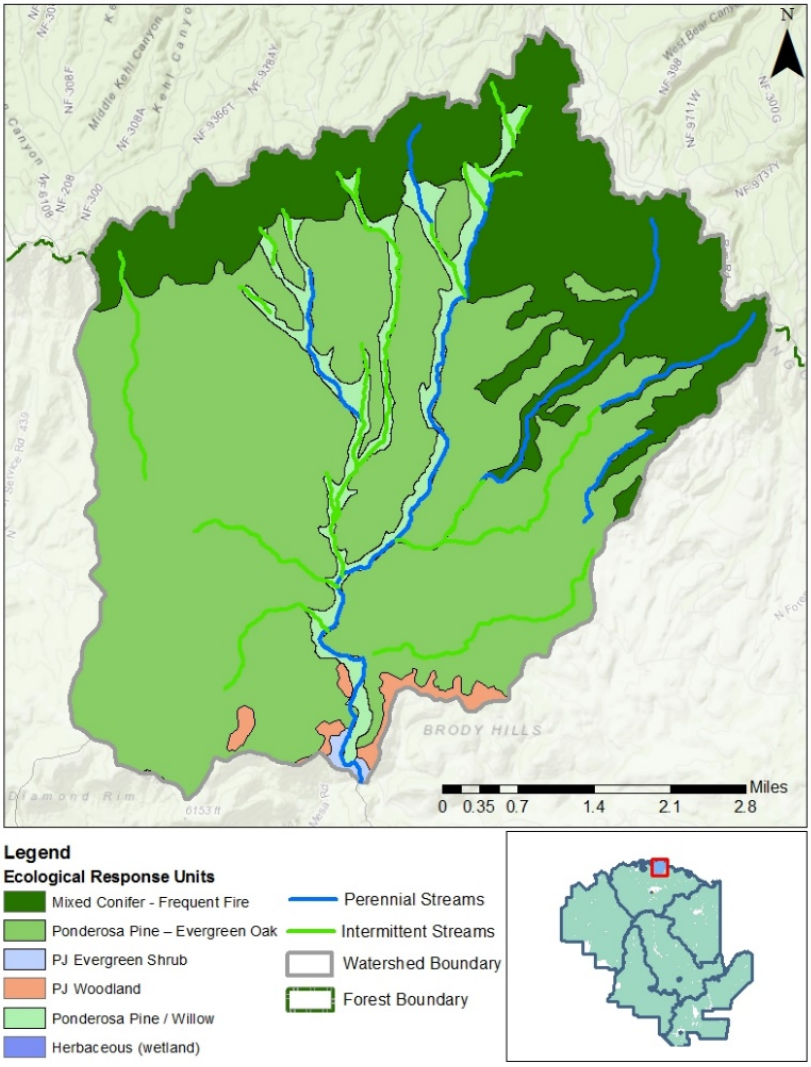


Figure 4: Ecological Response Units

Upland ERUs

Ponderosa Pine-Evergreen Oak

The ponderosa pine-evergreen oak ecological response unit occurs in the mild climate gradients of central and southern Arizona and in southern New Mexico, particularly below the Mogollon Rim, where warm summer seasons and bimodal (winter-summer) precipitation regimes are characteristic. This type occurs at elevations ranging from 5,500-7,200 feet, on sites slightly cooler-moister than the Madrean pinyon-oak ecological response unit, and with a much greater plurality of ponderosa pine. This system is dominated by ponderosa pine (*Pinus ponderosa var. scopulorum*) and can be distinguished from the ponderosa pine forest ecological response unit by well-represented evergreen oaks (for example, Emory oak, (*Quercus emoryi*), Arizona white oak (*Quercus arizonica*), alligator juniper (*Juniperus deppeana*), and pinyon pine (for example, *Pinus edulis*). In some areas, ponderosa pine-evergreen oak communities can alternatively be dominated or co-dominated by Apache pine (*Pinus englemannii*) and Chihuahuan pine (*Pinus leiophylla*), both site potential indicators. In terms of disturbance, the ponderosa pine-evergreen oak averages greater fire severity than the ponderosa pine forests above the Mogollon Rim, and greater patchiness with less horizontal uniformity and more even-aged conditions. Understory shrubs include manzanita (*Arctostaphylos spp*.), turbinella oak (*Quercus turbinella*), skunkbush sumac (*Rhus trilobata*), and mountain mahogany (*Cercocarpus montanus*).

Mixed Conifer-Frequent Fire

In the southwestern United States, mixed conifer forests may be found at elevations between 6,000 and 10,000 feet, situated between ponderosa pine, pine-oak, or pinyon-juniper woodlands below and spruce-fir forests above. Typically, these types were dominated by ponderosa pine *(Pinus ponderosa var. scopulorum*) in an open forest structure with less than 30 percent tree cover and had occasional occurrence of aspen (*Populus tremuloides*), Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), and Southwestern white pine (*Pinus strobiformis*). This forest vegetation community typically occurs with an understory of grasses, forbs, and shrubs. The frequent fires that typify this ecological response unit are primarily low severity and are generally not limited by lack of fuel connectivity or high fuel moistures.

Pinyon-Juniper Woodland

Pinyon-juniper woodland is found mostly on lower slopes and in upland rolling hills at approximately 4,500 to 7,500 feet in elevation. Pinyon-juniper woodland characteristically has a moderate to dense tree canopy and a sparse understory of perennial grasses, annual and perennial forbs, and shrubs. Fire is infrequent and variable due to differences in ground cover, though some sites can carry surface fire. Typical species for pinyon-juniper woodland include two-needle pinyon (*Pinus edulis*), single leaf pinyon (*Pinus monophylla var. fallax*), Utah juniper (*Juniperus osteosperma*), oneseed juniper (*Juniperus monosperma*), and alligator juniper (*Juniperus deppeana*).

Pinyon-Juniper Evergreen Shrub

Pinyon-juniper evergreen shrub generally occurs at elevations of 2,400 to 7,800 feet. This ecological response unit is generally found on lower slopes bordering chaparral at the lower elevations and montane forests at higher elevations. Pinyon may be absent in some areas; however, juniper is always present. Oaks (Arizona white oak, grey oak, Emory oak) become more common among mild climate zones in central Arizona. The understory is dominated by low to moderate density shrubs, with herbaceous plants in the interspaces. This ecological response unit is found on well-drained soils, frequently with coarse-textured or gravelly (stony) soil characteristics**.** Dominant tree and shrub species include two needle pinyon (*Pinus edulis*), single leaf pinyon (*Pinus monophylla var. fallax*), Utah juniper

(*Juniperus osteosperma*), oneseed juniper (*J. monosperma*), alligator juniper (*J. deppeana*), Manzanita spp. (*Arctostaphylos spp.*), mountain mahogany (*Cercocarpus montanus*), Antelope bushes (*Purshia spp.*), silktassles (*Garrya spp*.), Stansbury cliffrose (*Purshia stansburiana*), turbinella oak (*Quercus turbinella*), and sumacs (*Rhus spp*.).

East Verde River at Washington Park

Riparian ERUs

Ponderosa Pine/Willow and Herbaceous Wetlands

There are 1,186 acres of riparian systems in the watershed. The most common is ponderosa Pine/Willow, which is typically found at elevations ranging from 4,500 to 9,700 feet and is typified by an overstory of ponderosa pine with an understory of shrub-form willow species. As a result of the pine overstory, this map unit is particularly hard to distinguish from pine-oak systems of similar physiognomy, and therefore is believed to be underrepresented in current mapping. Common riparian tree species include Arizona alder (*Alnus oblongifolia*), sycamore (*Plantanus wrighti*), cottonwood (Populus fremontii, P. angustifolia) box elder (*Acer negundo*), ash (*Fraxinus velutina*), big tooth maple (*Acer grandidentatum*), willows (Salix spp.), walnut (Juglands major), and mulberry (*Prunus spp*.). Understory species may include willows, brackenfern (*Pteridium aquilinum*), scarlet sumac (*Rhus glabra*), Virginia creeper (*Pathenocissus quinquefolia*), canyon grape (*Vitus arizonica*), sedges (*Carex spp.*), and rushes (*Juncus spp*.). Species composition and abundance is highly depended on flood regime and site potential. There are 1,149 acres of Ponderosa Pine/Willow located along the East Verde River, Chase Creek, and several unnamed tributaries. The second largest riparian ERU area (31 acres) is along Dude Creek and is contains species such as Boxelder, Maple, Alder, Walnut. Finally, 6 acres along Dry Dude Creek are classified as herbaceous wetland ERU.

Threatened, Endangered, and Sensitive Wildlife and Plants

The watershed supports a variety of game and nongame species. It falls within Game Management Unit 22. Big game in the area include elk, black bear, whitetail deer, mountain lion, javelina, and turkey. Game birds and small game found in the project area include Gambel's quail, mourning dove, white-winged dove, cottontail rabbits, black tailed jackrabbits and Abert's and grey squirrel, as well as coyote and bobcat. Non-game species include a large variety of birds, mammals, reptiles, and amphibians. Northern goshawks and peregrine falcons are also known to inhabit the area. Sensitive fish species found in the East Verde River, but outside of this watershed include desert sucker, Sonora sucker, Roundtail chub. Sensitive plant species within this watershed include blumers dock (*Rumex orthoneurus*) and broadleaf lupine (*Lupinus latifolius subsp. Leucanthus*).

Endangered, threatened, proposed or candidate species and their critical habitat found within in the EV Headwaters Watershed include Narrow-headed garter snakes and their proposed critical habitat,

Chiricahua leopard frogs and their critical habitat, Mexican spotted owls and their critical habitat, and Gila trout.

Chiricahua leopard frog

Chiricahua leopard frog (*Lithobates chiricahuensis*) **-** The watershed falls in the Upper Verde Management Area (UVMA) in Recovery Unit 5 outlined in the Chiricahua leopard frog (CLF) Recovery Plan. Suitable habitat types within the watershed include stock tanks, springs, and streams. In addition to habitat, there is at least one known population of Chiricahua leopard frogs within the watershed.

Narrow-headed garter snake (*Thamnophis rufipunctatus*) **-** Critical habitat for the Northern Mexican garter snake and the Narrow-headed garter snake was proposed along the entire length of the East Verde River, including 1,160 acres in the EV Headwaters watershed in 2013. In April 2020, the U.S. Fish and Wildlife Service (USFWS) published a revised proposed critical habitat rule for the Northern Mexican garter snake and Narrow-headed garter snake. In their revised proposed rule, they recommended a significant reduction in acreage compared to the original proposed critical habitat rule published in 2013. This revised rule removed the proposed critical habitat reaches of the East Verde River within the watershed for both snakes.

Mexican spotted owl

Mexican spotted owl (*Strix occidentalis*) **–** There are 10,352 acres of designated critical habitat in the watershed. The watershed falls within the Mexican spotted owl Upper Gila Mountain Recovery Unit. There are two Protected Activity Centers (PACs) completely within the water shed, Shadow Rim and East Chase Creek, and one PAC, East Bray Creek, falls partially within the watershed. Outside of designated critical habitat and PACs, there is Forested and Riparian Recovery Habitat across the watershed, including ponderosa pine-Gambel oak, mixed conifer, and riparian forest communities that may be used by owls for various life history needs.

Gila trout (*Oncorhynchus gilae*) **–** Recovery populations currently are managed in Dude Creek and Chase Creek. Dude Creek was stocked with Gila trout from 2015-2017 with fish from multiple lineages and reproduction has been documented over time. While there are no plans for future stockings currently, population and genetic monitoring is ongoing. Additionally, the Arizona Game and Fish Department has approved opening Dude Creek to catch-and-release angling beginning in May 2021. Chase creek was stocked with Gila trout from the Iron Creek lineage in 2017 and 2018 with reproduction observed in following years. Additional stocking planned when fish from the Iron Creek lineage become

available. In the fall of 2019, the Arizona Game and Fish Department began stocking the East Verde River with Gila trout for recreation put-and-take fishing in lieu of the rainbow trout stocked historically. Recreational fishing of Gila trout is authorized by a special rule in section 4(d) of the Endangered Species Act (16 USC 1531 et seq.; ESA) and as outlined under the down-listing rule for the species (USFWS 2006). These fish are considered surplus to the needs for recovery and are generally expected to be harvested in the same season as stocked. A creel and movement study are currently being conducted by the AGFD Sportfish Research program to evaluate stocking of Gila trout in the East Verde River.

Blumer's dock (*Rumex orthoneurus*) – Blumer's dock is a species of conservation concern. A conservation assessment and plan were developed in 1993. Due to the rarity and threats to the species, plants were transplanted along several drainages below the Mogollon rim. The populations have been declining at the East Verde River and Washington Park area. Only one induvial was located during surveys along the East Verde River below Washington Park in June of 2020 (Personal Communication, R. Madera). Past surveys have documented a steady decline of individuals at Dude Creek – likely the result of significant flooding and scouring following the Dude Fire in 1990 (Gobar 1991). It's unclear if the populations are still extant along Dude Creek.

Blumer's dock

Boadleaf Lupine (*Lupinus latifolius subsp. leucanthus*) – broadleaf lupine is a species of conservation concern. Plants occur along streams and moist soil of stream beds (lower elevations), in oak-cottonwood, mixed shrub, pine-oak and mixed conifer forests. Only one population has been documented in the watershed near the Washington Park area.

Range Management

Historically, there were two allotments within the watershed, Cross V and Payson, containing six pastures which cover a little more than 97% of the watershed. From 1968 to 2001, the Payson and Cross V allotments were paired together as one grazing unit and authorized 177 to 207 adult cattle yearlong (CYL).

In 2018, the Cross V and Payson allotments, as well as three other historic allotments, underwent a rangeland analysis as part of the Diamond Rim Range Environmental Assessment. Since the Diamond Rim Range Environmental Assessment, all five historic allotments have been merged into one larger allotment: the Diamond Rim Grazing Allotment (DRGA). When the DGRA Decision Notice was signed in February of 2018, permitted numbers became 619 CYL and 40 yearlings through September 30th, operated with rotation between the pastures. Below is a synthesis of conditions and rangeland management activities occurring within the DRGA within this watershed.

Table 4: Current and Historic Range Management Within the Watershed

Current Allotment Name	Historic Allotment Name	Permitted Numbers	Season of Use	Acres	% of Watershed
Diamond Rim	Cross V	619 CYL, 40 yearlings 1/1-9/30	Variable	9,292	51%
	Payson			8,451	46%
	Percent of watershed grazed				97%

Pasture movements within a season are dictated by utilization levels, growing conditions, and the need to provide planned rest and to vary the season and intensity of pasture use to eliminate the development of use patterns. Grazing intensity is managed to allow for the physiological needs of plants. Anticipated days within each pasture manage intensity and frequency of defoliation. Distribution of grazing impacts are assessed on an ongoing basis to determine where specific improvements may be useful, based on the need to adaptively manage the development of infrastructure to achieve the desired result.

The eastern half of this watershed and consists of the East Verde, Dry Dude, Brody, and Beaver Valley pastures. All the above pastures are authorized for grazing yearlong but used typically in the summer (May through September). The western half of this watershed consists of two pastures which are the Girl Scout and Hell's Half Acre pastures. The Girl Scout pasture is also used in the summer months while the Hell's Half Acre pasture is utilized in the winter (October through April).

The East Verde and Girl Scout pastures comprise roughly 89% of the grazed area within the EVHW watershed. Both pastures are considered upper elevation areas. They are dominated by Weeping Lovegrass and are more suited to spring/summer grazing because this species is more palatable and nutritious during the active growing season. These pastures were rested in 2019 and 2020 with scheduled grazing in 2021.

Timber

There have been multiple thinning and prescribed burning (Rx) projects within this watershed dating back to 2008. From 2008 to 2019, a total of 15,883 acres were treated through fourteen different prescribed burns and fourteen different thinning projects. The thinning projects throughout the eleven years account for 4,561 acres. The remaining 11,322 acres are claimed through Rx burns, of which 1,901 acres were accounted for via wildfire management of the 2009 Rim fire.

Fire History and Fire Regime

There is significant variability between the fire regimes of the ERUs within this watershed, but about 92% of the watershed is mapped as Ponderosa Pine – Evergreen Oak (PPE) or Mixed Conifer with Frequent Fire (MCD), both of which are frequent fire systems that typically burned about every 10-12 years, averaging about 2,700 acres annually within the EVHW watershed (See Figure 4 for ERUs).

There have been six wildfires which have burned portions of the EV Headwaters Watershed since 1970. These fires burned a total of about 60% of the watershed, not including the multiple prescribed fires and mechanical treatments described in the previous section.

The Dude fire of 1990 was the largest fire which impacted this watershed burning a total of 24,174 acres, 3,653 acres which was within the watershed (Figure 5). The smallest fire which impacted the EV Headwaters Watershed was the Water Wheel fire of 2009, with a total of 773 acres where 195 acres were within the watershed. The 2,500-acre Rim fire also burned in 2009 where 1,901 acres were within the watershed boundary. In 2002 and 2006, the Packrat and February fire, respectively, burned a cumulative of 7,247 acres with a total of 3,103 acres within the ECRW watershed. The most recent fire, the 2017 Highline fire, burned a total of 4,724 acres, 308 acres of which were within the watershed boundary.

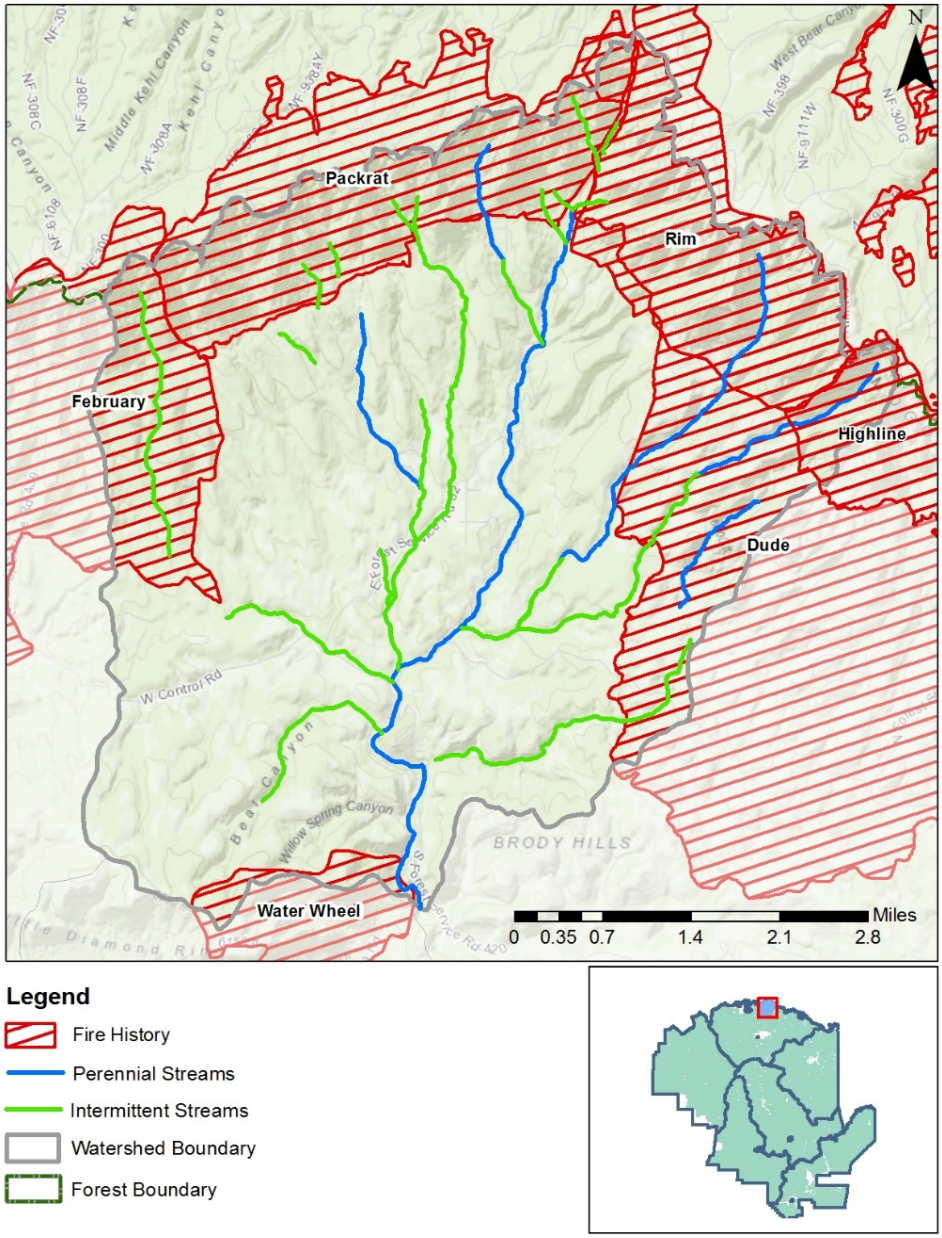


Figure 5: Fire History

Heritage

The EV Headwaters Watershed falls within the Diamond Rim Grazing allotment complex, on which there are over 700 known archaeological sites, and a high probability of many more undocumented prehistoric and historic sites. These sites represent occupation by Hohokam, Salado, Central Arizona Tradition (Northern Salado), and Western Apache, as well as several historic sites reflecting use and occupation by Anglo ranchers, stockmen, miners and prospectors, the Civilian Conservation Corps, and the Forest Service. The density of prehistoric sites within the surveyed areas has ranged from moderate to high, however, much of the area has not been surveyed.

Trailhead at Washington Park

Recreation

There are two developed day use areas located in the EV Headwaters watershed, Second Crossing and Third Crossing, which are also popular day use areas with river access for fishing and swimming. Dispersed camping, limited to areas 200 feet from a stream, can be found south of Verde Glen and in the areas around Dude Creek. These areas also see significant OHV use.

The watershed includes nine miles of the Highline Trail. From the western boundary of the watershed to Washington Park the Highline Trail is also the Arizona Trail, which is classified as a National Scenic Trail (NST). At Washington Park the Arizona Trails turns north and takes hikers up to the Mogollon rim. There is approximately seven miles of the Arizona Trail within the watershed. Other recreation in the watershed includes hunting, fishing, dispersed camping, mountain biking, and shooting of firearms.

IRAs, ROS, and Wilderness

There are no inventoried roadless areas, congressionally designated wilderness areas, or acres recommended for wilderness designation within the watershed.

There are 4 Recreation Opportunity Spectrum classes found within the watershed:
Semi-Primitive Motorized (SPM) – 6,359 acres
Roaded Natural (RN) – 3,575 acres
Semi-Primitive Non-motorized (SPNM) – 4,687 acres
Rural (R) – 3,683 acres

Climate Change Vulnerability

Based on the Climate Change Vulnerability Assessment (CCVA) ratings for upland ecosystems (USDA Forest Service 2016, Triepke et al. 2019), the East Verde Headwaters Watershed has an overall vulnerability rating of high, based on a four-tier system of low, moderate, high, and very high. The CCVA rating is based on location, projected climate departure, and departure from the historic climate envelope for each ERU in the watershed. Even though riparian ERUs were not specifically analyzed

within the CCVA, one can infer the vulnerability of those systems based on the watershed scale results. (Figure 6)

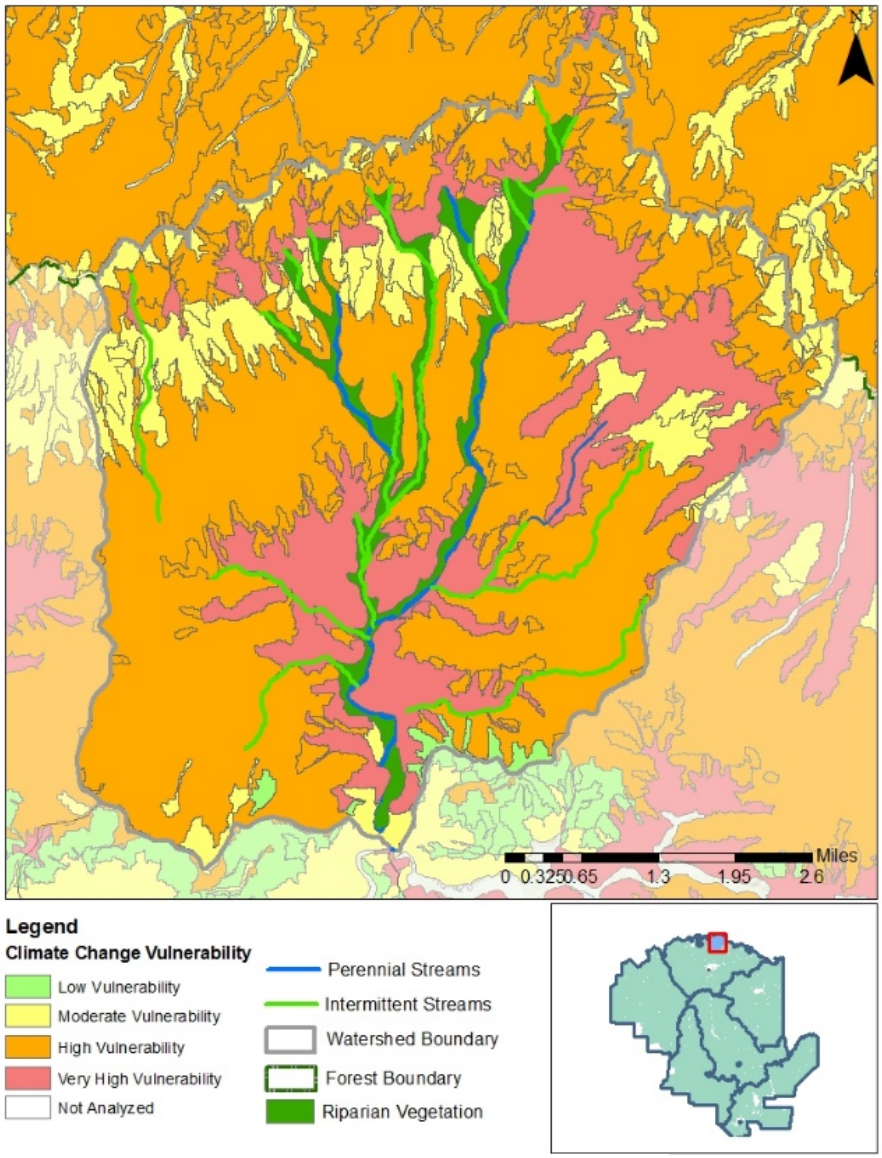


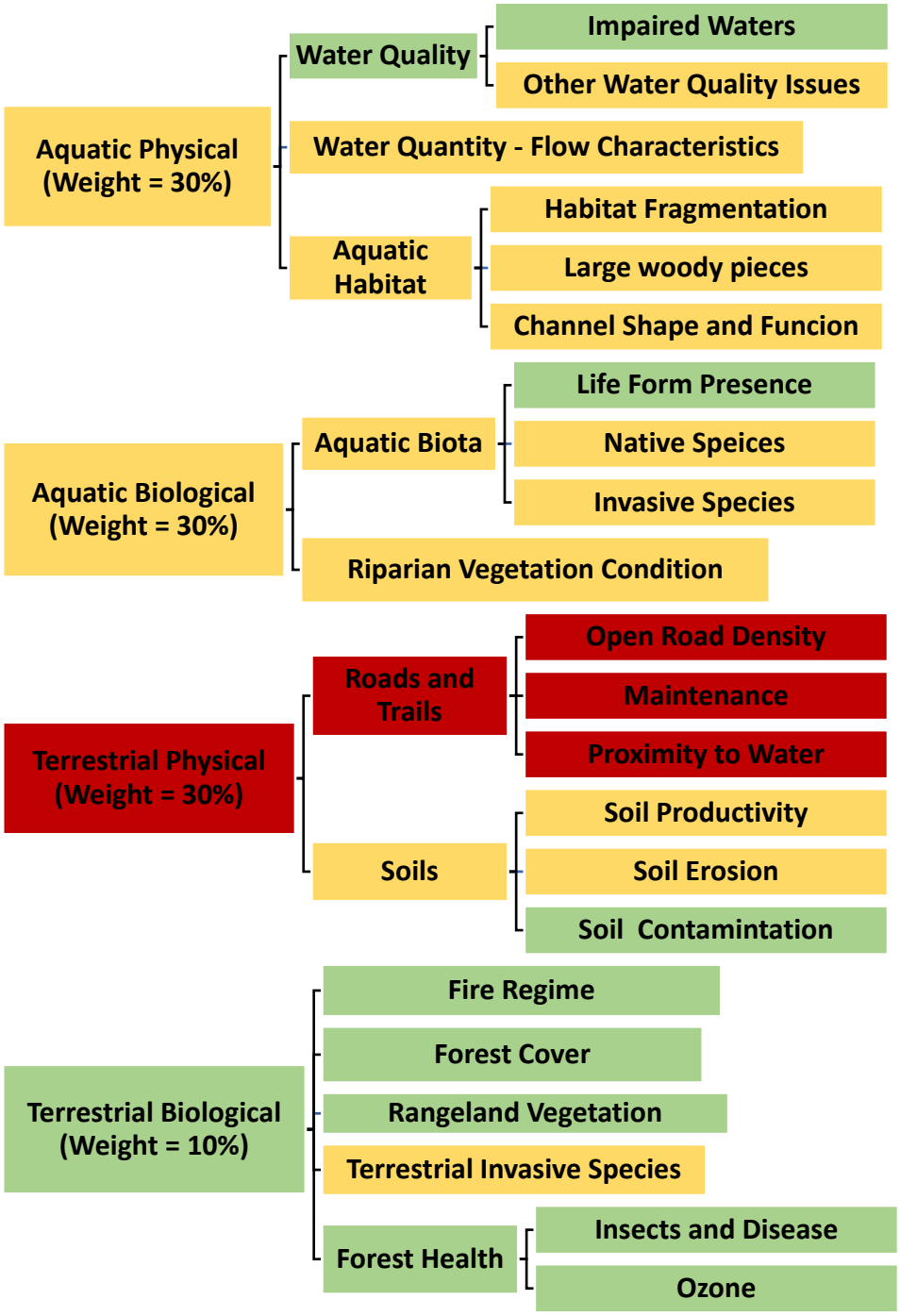
Figure 6: Climate Change Vulnerability Assessment

Watershed Conditions

Figure 7 displays all 12 indicators and their attributes, color coded by their current condition score. Detail on how each score was determined is included in this section. The indicator and category scores are the simple average of all attributes. The overall watershed condition class is weighted as follows: aquatic physical, aquatic biological and terrestrial physical scores make up 30% each and terrestrial

biological constitutes the remaining 10% of the score. The current condition class of the watershed is Class 2 – Functioning at Risk based on a weighted score of 1.9.[6]

Figure 7: Summary of current condition for all watershed attributes
green = good, yellow = fair, and red = poor



[6] Breaks for attribute averages and overall condition class are as follows: 1.0-1.6 is good or class 1, 1.7 to 2.2 is fair or class 2 and 2.3 to 3.0 is poor or class 3.

Water Quality

Mail Creek and East Verde River were most recently assessed in 2020 by the Arizona Department of Environmental Quality and were both determined to be category 2, supporting some uses. Designated uses for East Verde in the watershed are aquatic and wildlife, fish consumption, full body contact (recreation), drinking water supply, and agricultural use. The 2020 report is not yet available, however, in 2016, the last time a report was issued, biocriteria was the parameter with an exceedance on this portion of the East Verde. Mail Creek designated uses include aquatic and wildlife, fish consumption, and full body contact (recreation). In 2016, Mail Creek was listed as a category 3, inconclusive, stream for dissolved oxygen exceedances. Because there are no streams in the watershed on the 303(d) list, impaired waters is ranked as good, however, due to Mail Creek and East Verde River being listed as category 2 in the 2020 assessment other water quality concerns is ranked as fair.

Water Quantity

There are no diversions from streams or dams within this watershed. The East Verde River, however, has a higher than normal baseflow due to the water that is wheeled through the river from the CC Cragin Reservoir on the Coconino NF. There are also multiple springs within the watershed that support domestic and livestock consumptive use and therefore decrease natural baseflow in streams. Finally, the watershed contains eighty-seven wells held by private entities for use on their properties. Only one well is owned and operated by the Tonto National Forest. Because of the altered baseflows, both increase from CC Cragin water and decrease from spring and groundwater use, water quantity is rated as fair.

Aquatic Habitat

Suitable habitat for native aquatic species diminished over time due to historic fire events and other stressors (e.g., recreation pressure, non-native invasive species, and grazing by wild ungulates). A head cut has developed at the headwaters of Dude Creek and is slowly growing, allowing for more sediment to deposit into the system and altering the habitat conditions for native fish found within the creek. Near the beginning of the perennial portion of Mail Creek there is a perched culvert that interrupts connectivity. On the East Verde River generally, there is a dearth of suitable holding/hiding habitat for aquatic species to reproduce, however, improvements over the last decade at Second and Third Stream Crossings on the river have improved conditions in those areas and the system is recovering there. Finally, the lack of near-bank vegetation cover caused by recreation use on the East Verde has also increased stream bank erosion and the amount of sediment entering the stream. Based on this assessment Aquatic habitat overall is rated as fair.

Aquatic Biota

Chiricahua leopard frogs and Gila trout, species listed as threatened under the U.S. Endangered Species Act, are known to occur in the East Verde River Watershed. Recovery actions for both species are on-going in this area and include removal of nonnative species, habitat assessments and restoration, releases to augment existing sites, and potential introductions into new sites.

From 2015-2017, in partnership with Arizona Game and Fish, US Fish and Wildlife Service, and Trout Unlimited, Dude Creek was stocked with native Gila trout (*Oncorhynchus gilae*). In 2017-2018 Gila trout were introduced in Chase Creek and an unnamed tributary to Chase Creek with the same partners as well as the Girl Scouts of America. Gila trout within these streams are classified as recovery populations. The East Verde River has a more complex mix of native and non-native aquatic species and the reach within this watershed, until its confluence with Ellison Creek, has recreational fishing for Gila trout and Rainbow Trout (*Oncorhynchus mykiss*).

Gila trout restocking with partners

Chiricahua leopard frogs were first released to the watershed in 2010 when tadpoles and metamorphosed frogs were introduced to Pieper Hatchery Spring. Since the initial release, Pieper Hatchery Spring has remained a stable productive site and often a source site of egg masses for head starting at the Phoenix Zoo or wild to wild egg mass translocation. In 2020, AGFD identified a second site, Dude Creek, as a suitable introduction site for the Chiricahua leopard frog. That same year, 22 metamorphosed frogs were released into the creek with 2021 survey results showing persistence. Based on elements of the system that are recovering but not recovered as well as ongoing issues with invasive aquatic species aquatic biota are ranked as fair overall.

Riparian Vegetation

Riparian condition was assessed for key reaches of the East Verde River and Dude Creek within the East Verde River Headwaters watershed in August 2019. The site potential for both East Verde River and Dude Creek are mix broadleaf riparian ecosystems characterized by a mix of deciduous riparian species (mapped as the Ponderosa Pine/Willow riparian ERU). Riparian condition was rated fair for the East Verde River. Many areas along the reach had eroding banks, bare ground, and compacted soils largely from recreational use and grazing. There was an overall low abundance of stream bank stabilizing riparian species, with only scattered occurrences of red willow (*Salix bonplondiana*) and patches of panicled bulrush (*Scirpus microcarpus*). Riparian condition was rated fair for Dude Creek. Downcutting, and large amounts of bedrock and boulders were present throughout the reach. Riparian tree species were present but not in great abundance and herbaceous riparian species were sparse to absent. Impaired conditions appear largely influenced from past fires. No recreation or grazing impacts were observed. Finally, selected spring habitats have also been recently improved within the EV Headwaters watershed, Pieper and Flowing Springs. These projects were developed to restore the vegetation within and around the springs as well as the flow regime. Based on recent field assessment and previous restoration activities at springs and at Second and Third Crossing (see description in Aquatic Habitat), between 25%-80% of the riparian areas within the watershed are properly functioning and riparian vegetation is rated as fair.

Roads and Trails

Within the EV Headwaters Watershed there are 70.1 miles of road and 11.2 miles of trail making the current road/trail density 2.9 miles per square mile. Of these road and trail miles, 8 miles of road and 2 miles of trail are within 300 feet of perennial streams and 14 miles of road and 2.2 miles of trails are within 300 feet of intermittent streams. Overall, 37% of road miles are proximate to streams. Finally, less than 50% of the roads and trails within the watersheds have documented best management practices to protect water quality. Each of these indicators are ranked as poor making the overall ranking for roads and trails attribute poor.

Soils[7]

Soil quality assessment and monitoring (soil condition) assess the ability of the soil to hold and release water (hydrologic function), the ability of the soil to resist erosion and degradation (soil stability), and the ability of the soil to accept, hold and release nutrients (nutrient cycling). Based on this assessment soils are rated as satisfactory (good), impaired (fair), or unsatisfactory (poor). A soil condition assessment was completed with 2007 data as a part of the Diamond Rim Grazing Allotment EA. Separate datasets are not available to distinguish soil erosion and soil productivity attributes, therefore, the overall soil condition information is used for both attributes. Most of the watershed, about 85% or 15,314 acres, consists of satisfactory soil conditions. Soils along riparian areas are subject to natural erosion, and 6% (1,172 acres) of these soils are considered impaired. Impaired soils are also found in the northeast portion of the watershed due to soil conditions post-fire (7%, 1,620 acres) Finally, <1% of the soils in the southern portion of the watershed are rated as unsatisfactory. Overall soil condition and productivity were rated as fair because >40% of soils in the watershed have been assessed as impaired or unsatisfactory. (Figure 8)

[7] Thresholds for soil erosion and soil productivity attributes are - 0-5% = Good, 5-25% = Fair, and > 25 = Poor for the sum of Unsatisfactory and Impaired soils in the watershed.

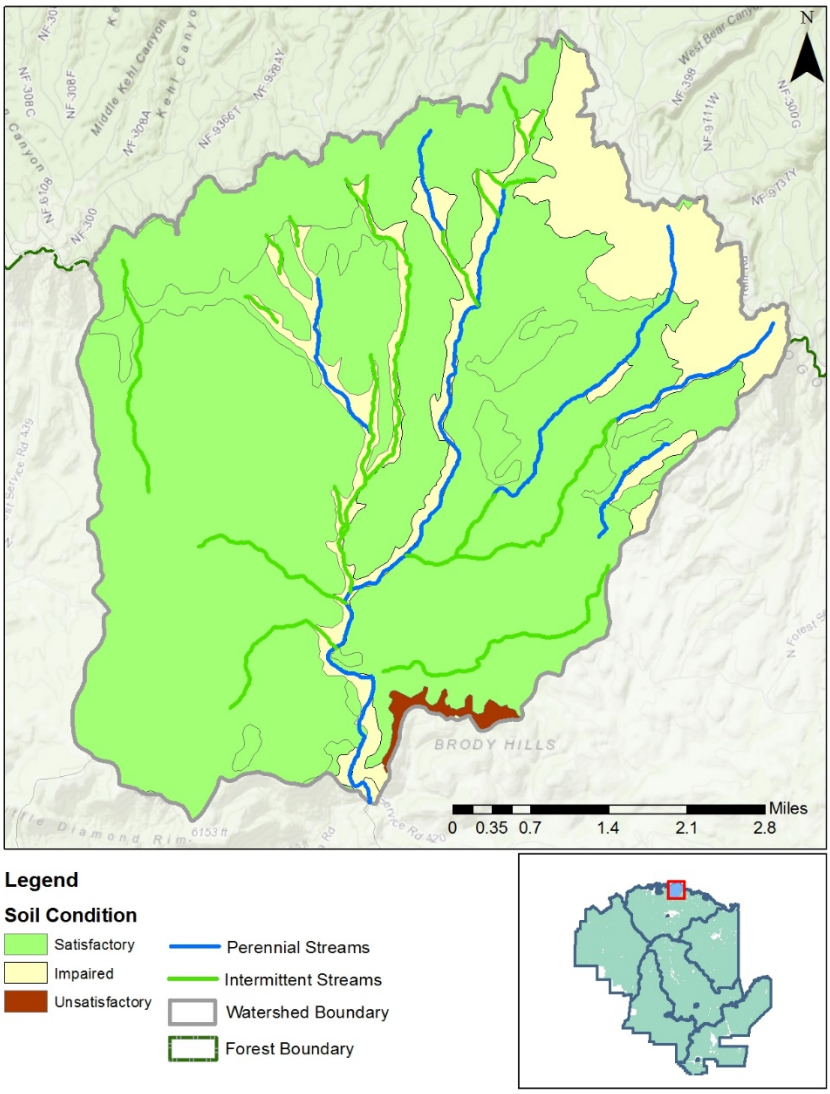


Figure 8: Soil Condition

Fire Regime & Vegetation

The Fire Hazard Index (FHI) is an index that incorporates modeled fire behavior with soil characteristics to produce a spatial layer that identifies where potential fire effects would be expected to be beneficial or adverse. On a scale of 0 – 9, with 0 being no effect and 9 being the highest level of adverse effects, Figure 9 shows the modeled results for the East Verde Headwaters HUC. This includes, but not limited to, the potential for first order fire effects such as the consumption of organic matter in the surface layers, decreased ground cover, or chemical and structural changes produced by heat. It also includes,

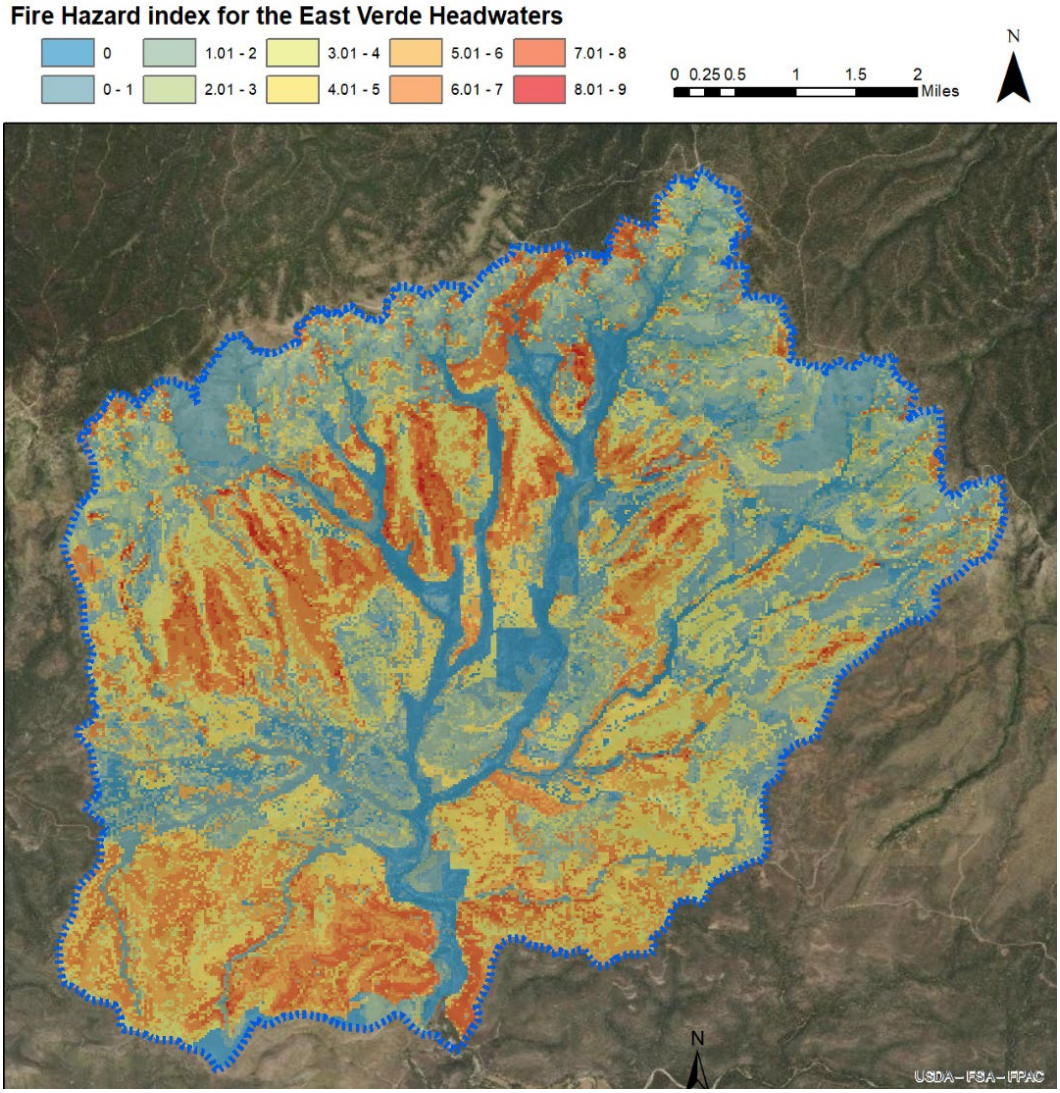


Figure 9: Fire Hazard Index

but is not limited to, the potential for second order fire effects, such as debris flows, post-fire mortality, or increased erosion.

About 10% of the watershed is in a condition with little concern for adverse fire effects, with another 19% being rated at a low concern for adverse fire effects. About 45% of the watershed is at a moderate risk, mostly in areas with low to moderate slope and erosion potential, sufficient shrub fuels to carry fire, but not heavy surface fuel loading. Those areas in lighter red and dark orange include about 20% of the watershed which is at high risk. In those areas, the combination of potential Soil Burn Severity and erosion could produce long-term damage to soils, including loss of topsoil. The area in the darkest red

(about 5% of the watershed) is rated as being at very high risk for potential adverse fire effects. In these areas, soil burn severity would likely be high on soils that are highly erodible and on steep slopes. Overall, about 75% of the East Verde Watershed is at low to moderate risk of adverse fire effects and therefore fire regime is rated as good.

Forest Cover and Forest Health

The EV Headwaters Watershed is rated as good for forest health. Over the past 4 years, the level of tree defoliation and mortality identified during aerial detection surveys (ADS) within the watershed was relatively low. In 2017, tree mortality due to bark beetles was limited to two individual ponderosa pine trees. Although 2018 witnessed a marked increase in tree defoliation and mortality across the forest due to drought, relatively little mortality was observed within the EV Headwaters Watershed. Mortality due to bark beetles was mainly limited to 10 occurrences less than ¼ acre in size scattered throughout the watershed. Only one larger area approximately 4 acres in size was observed. This area of "moderate" ponderosa pine mortality (11-29% of host tree affected) was observed east of the community of Whispering Pines and was attributed to bark beetles. In 2019 and 2020, no tree mortality or defoliation was observed during ADS flights. Endemic population levels of bark beetles may result in pockets of ponderosa and pinyon pine mortality. However, during favorable environmental conditions, bark beetle populations can build up rapidly and result in landscape-level tree mortality. While endemic levels of tree mortality are beneficial to wildlife by creating snags, tree mortality at the landscape-level may result in loss of forest cover, decreased wildlife habitat, and increased dead and down fuel loading.

Rangeland Vegetation

The current rangeland condition is generally stable with an overall upward trend overall and is therefore rated as good. Key areas, which are representative of the of rangeland location, use, or grazing value allow specialists to make management decisions to meet desired conditions for the allotments. The Girl Scout pasture hasn't been used for several years allowing for regrowth of rangeland vegetation without stressors other than wildlife which can be found in the watershed or pasture area.

Terrestrial Invasive Species

Invasive species which have been identified within this watershed include Bull thistle (*Cirsium vulgare*), Nodding plumeless thistle (*Carduss nutans*), Himalayan blackberry (*Rubus armeniacus)*, Weeping lovegrass (*Eragrostis curvula*), and Common mullein (*Verbascum thapsus*). Weeping lovegrass accounts for most of the invasive species area within this watershed at about 3,600 acres. Due to the stressor and land disturbance from the Dude Fire in 1990, Weeping lovegrass has established itself in the north-western pocket of the watershed making it nearly impossible to eradicate. Common mullein, even though it is an invasive species, is one of low concern as it is mostly naturalized throughout the forest and doesn't displace native plants for extended periods of time. Overall terrestrial invasive species is ranked as fair.

Restoration Goals and Objectives

The overall goal of this Watershed Restoration Action Plan is to improve the existing watershed condition from Functioning at Risk with a rating of 1.9 to Functioning with a rating of 1.5 within a 6-year timeframe through the implementation of the proposed projects. The order projects are implemented is dynamic and not necessarily tied to a given Fiscal Year.

Objectives

Table 5 provides a summary of essential projects and Table 6 shows objectives for project implementation within six years to move the watershed to a functioning condition. While most of the projects within this WRAP are designed to improve one or multiple indicators, some projects also work to maintain indicators in good condition. These objectives align with the Forest Service FY2015-2020 Strategic Objectives 1-A (Foster resilient, adaptive ecosystems to mitigate climate change, all essential projects (EP)); 1-B (Mitigate wildfire risk, EP 1); and 2-D (Provide abundant clean water, all EPs). All essential projects within the WRAP also algin with the following overall goals for watersheds within the 1985 Forest Plan: meeting minimum air and water quality standards, emphasizing improvement of soil productivity, air and water quality, enhancing riparian ecosystems and inventorying and interpreting soil, air, and water resources. It is also keeping with the management direction for the Management Area 4-F (Payson Ranger District General Management Area), which states: "Manage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, livestock forage production, and dispersed recreation. Watersheds will be managed to improve them to a satisfactory or better condition. Improve and manage the included riparian areas (as defined by FSM 2526) to benefit riparian dependent resources." Finally, this WRAP also supports desired conditions within the Draft Revised Tonto National Forest Plan relating to watershed and riparian conditions including WAT-DC 01, 02, 03 (specifically addressing properly functioning watersheds), 04, 07, and 09.

Table 5: Summary of Essential Projects

Essential Project #	Name	Time frame	Est. Cost	NEPA Complete?	Partners Identified?
1	Route Decomissioning	FY22-FY26	$17,000	N	N
2	Road BMPs	FY24-FY27	TBD	N	N
3	Highline Trail Improvements	FY22-FY25	$200,000	Y	Y
4	Restoration of Dispersed Camping Areas	FY23-FY25	TBD	N	N
5	Keger Timber Sale	FY24-FY25	$784,000	Y	N
6	Bear Canyon Prescribed Fire	FY25	$225,000	Y	N
7	East Verde Stream Habitat Restoration	Completed in FY21	$51,000	Y	Y
8	Dude Creek Stream Habitat Restoration	FY22-FY23	$29,500	N	Y
9	Chase Creek Stream Habitat Restoration	FY23-FY26	$75,000	N	Y
10	Wildlife Water Catchment Restoration	FY22-FY23	TBD	Y	Y
11	Dude Fire Revegetation	FY22-FY26	$825,000	N (part of Rim Country EIS)	Y
12	Noxious Weed Removal	FY22-FY27	$1,000	Y	Y

Table 6: Restoration Objectives for the East Verde River Headwaters Watershed

***Indicator*/Attributes**	**Current Score**	**Score After Implementation of Essential Projects**	**Essential Project #**
Water Quality (1)			
Impaired Waters (303d listed)	Good	Good	NA
Water Quality Problems (other)	Fair	Good	1, 2, 3, 4, 7, 8, 9, 11
Water Quantity (2)			
Flow Characteristics	Fair	Fair	NA
Aquatic Habitat (3)			
Habitat Fragmentation	Fair	Good	1, 7, 8, 9
Large Woody Debris	Fair	Good	7, 8, 9
Channel Shape and Function	Fair	Good	1, 2, 3, 4, 7, 8, 9
Aquatic Biota (4)			
Life Form Presence	Good	Good	7, 8, 9
Native Species	Fair	Good	7, 8, 9
Exotic and /or Invasive Species	Fair	Fair	NA
Riparian Vegetation (5)			
Vegetation Condition	Fair	Fair	7, 8, 9
Roads & Trails (6)			
Open Road Density	Poor	Fair	1, 3
Road/Trail Maintenance	Poor	Good	2, 3
Proximity to Water	Poor	Fair	1, 3
Soils (7)			
Soil Productivity	Fair	Good	4, 5, 6, 11
Soil Erosion	Fair	Good	4, 5, 6, 7, 8, 9, 11
Soil Contamination	Good	Good	NA

*Indicator/*Attributes	Current Score	Score After Implementation of Essential Projects	Essential Project #
Fire Regime (8)			
Fire Condition Class	Good	Good	5, 6, 10
Forest Cover (9)			
Loss of Forest Cover	Good	Good	5, 6, 10
Rangeland Vegetation (10)			
Range Vegetation Condition	Good	Good	12
Terrestrial Invasive Species (11)			
Extent & Rate of Speed	Fair	Fair	12
Forest Health (12)			
Insects & Disease	Good	Good	5, 6, 11
Ozone	Good	Good	NA

Alignment with State or local Goals

There are no Total Maximum Daily Load (TMDL) reports within this watershed. The East Verde River and Mail Creek have been assessed in the Arizona Department of Environmental Quality's 2020 draft report, but neither has a TMDL set.

Opportunities for Engagement and Partner Involvement

There are several partners that have expressed interest in assisting the Tonto NF with restoration in the East Verde Headwaters Watershed. These partners include, but are not limited to: Trout Unlimited, Arizona Game and Fish, Arizona Trail Association, Arizona Wild, Arizona Department of Forestry and Fire Management, Salt River Project, Friends of the Tonto and Northern Arizona Forest Fund. Continued photopoint monitoring at 16 designated sites within the watershed along the East Verde River, Dude Creek, and Dry Dude Creek will be completed in partnership with the Friends of the Tonto.

Anticipated Outcomes

Completion of the WRAP will result in accomplishments in the following categories:

- Watershed class improved (WTRSH-CLS-IMP-NUM)
- Miles of road decommissioned (RD-DECOM-SYS)
- Acres of soil and water improved (S&W-RSRC-IMP)
- Miles of stream habitat restored/enhanced (HBT-ENH-STRM)
- Timber volume sold (TMBR-VOL-SOLD)
- Acres of timberland treated (TIMBER-SALES-TRT-AC)

Socioeconomic Considerations

The Payson Ranger District, like all districts on the Tonto NF, has a high ecosystem services exposure for surface water supply because all watersheds on the district and forest supply surface water for Maricopa County. Even though the East Verde Headwaters Watershed is not designated as a municipal watershed it is a headwater watershed for the East Verde River and eventually the Verde River which in turn ultimately contributes to the water supply for Maricopa County. In terms of employment opportunities generated by this WRAP, within Gila County, these projects will employ contractors for some of the work. Other employment opportunities may occur using stewardship, service, or timber sale contracts. The sale of livestock from Forest Service allotments provides benefits to the permittee, his or her employees, and those businesses that supply materials to local ranching operations. Some seasonal employment is possible to build and maintain range developments and install erosion control measures. Finally, youth conservation crews from Gila County were used in 2020 to complete initial wet-dry mapping on Dude Creek as well as other streams within the Payson district. As funding allows, we will annually employ these crews to assist in monitoring in this and other watersheds on the Payson District.

Essential Projects

Essential Project #1 –Route Decommissioning

Project description: To reduce sediment delivery to streams within the EV Headwaters Watershed, work includes, but is not limited to, decreasing road density and proximity to water ratios by decommissioning approximately 16.5 miles of road, as identified in the 2021 Travel Management Record of Decision.

Decommissioning of roads per Forest Service Manual 7734.1 includes applying various treatments, including one or more of the following:

- reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation
- blocking the entrance to a road or installing water bars
- removing culverts, reestablishing drainages, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed
- completely eliminating the roadbed by restoring natural contours and slopes

Field coordination throughout the NEPA process will determine actual treatment and final impacted mileage for each segment of road. See Figure 10 and Table 7.

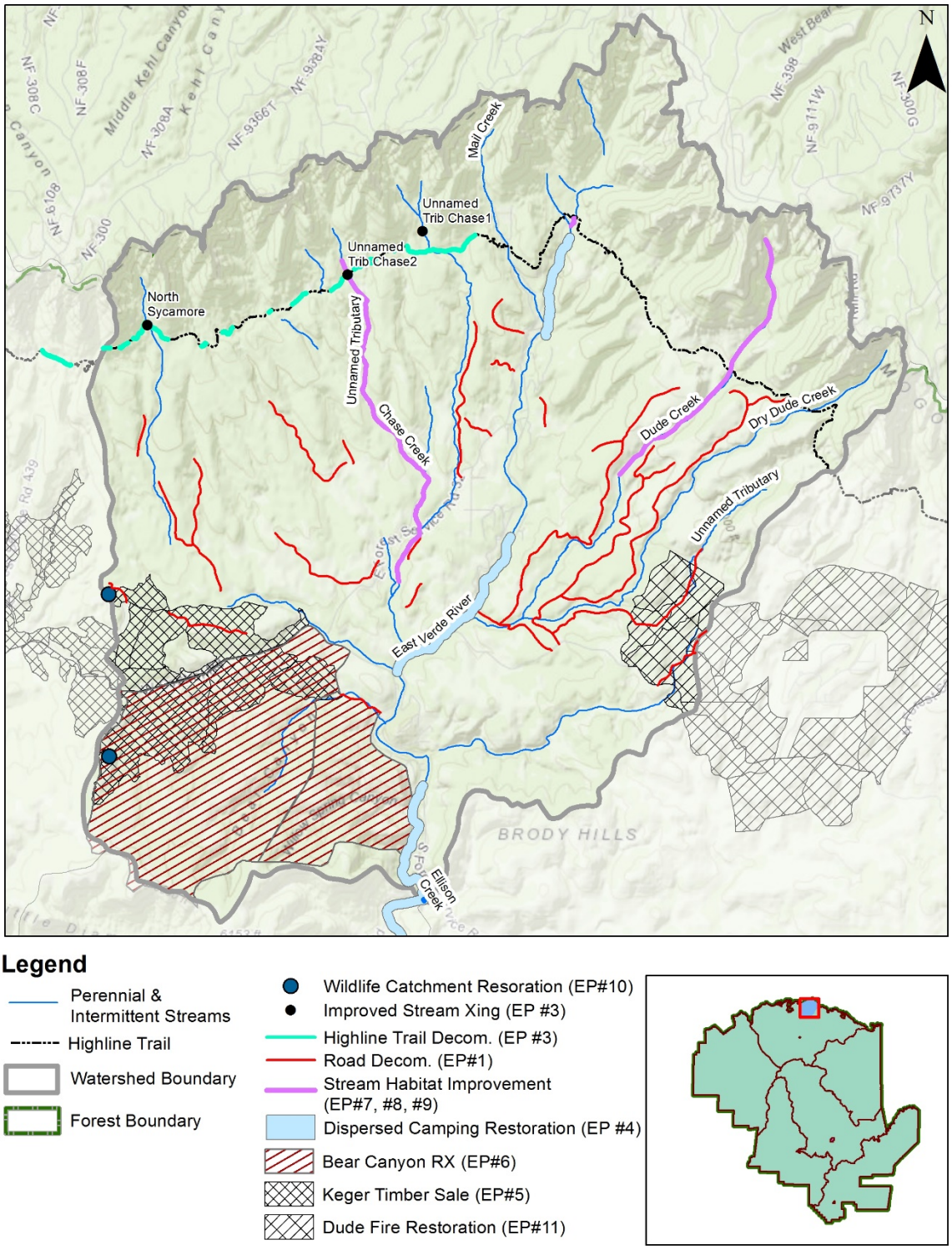


Figure 10: Overview of Essential Projects

Table 7: Routes to Decommission

FS Road Number	Total Miles to Decommission	Decommissioned Miles w/in 300 Ft of Streams
195	0.177	0
1175	0.68	0
1179	0.71	0
1181	1.10	0.49
1182	0.45	0
1184	1.00	0
1189	1.18	0.12
1191	0.86	0.21
1192	0.25	0
1193	0.38	0.12
1199	0.23	0
1206	1.31	1.00
1564	0.37	0.37
1568	2.68	0.90
1569	0.23	0.23
1573	0.25	0.25
1574	0.26	0
1575	0.23	0
1576	0.45	0
1637	0.72	0.46
1638	0.37	0.01
3042	0.35	0
3733	0.24	0
3735	0.32	0.18
3736	0.20	0
1191a	1.38	0.03
1203A	0.23	00.12
Unauthorized Route	0.37	0

NEPA: Routes identified in Travel Management on the Tonto National Forest Final Supplemental Environmental Impact Statement. Decommissioning actions on individual routes will be analyzed through a CE under 36 CFR 220.6(e)(20)
Function Lead: Engineering/Watershed
Timeline: FY22-FY25
Partners: None identified
Estimated Cost: ~$1,000/mile of road @ 17miles = $17,000

Essential Project #2 – Road BMP Implementation
Project description: To improve road maintenance indicator, open roads within the watershed will be reviewed for existing best management practices to protect water quality and new BMPs will be implemented as needed. This work began in the watershed in FY20 with the replacement of existing, non-functional culverts on Forest Service Road 32, which is near the Washington Park Trailhead and next to the East Verde River. Other road BMPs that may be implemented include new surfacing treatments, enhanced stream crossings, and soil cover on cut banks, fill slopes and drainage areas from roads.
NEPA: TBD
Functional Lead: Engineering/Watershed
Timeline: FY24-FY27
Partners: None identified
Estimated Cost: TBD

Essential Project #3 – Highline Trail Improvements
Project description: The Highline Trail spans nine miles across the top of the watershed and crosses seven perennial or intermittent streams, the East Verde River, Dude Creek, Dry Dude Creek, Mail Creek, East Sycamore Creeks and two unnamed tributaries to Chase Creek. The western portion of the Highline in the watershed is also the Arizona Trail. This project will reroute 2.89 miles of trail onto more sustainable grade, decommission 1.98 miles of trail, improve and maintain all existing trail miles, and improve crossings at East Sycamore and the two unnamed tributaries to Chase Creek. East Sycamore and the easternmost tributary to Chase Creek will be improved with bank stabilization where the trail crosses the stream and the westernmost tributary to Chase Creek will be improved with a trail bridge.
NEPA: Highline Trail CE
Function Leads: Recreation/Watershed
Timeline: FY22-FY25
Partners: Arizona Trail Association, Arizona Wild, National Forest Foundation, Friends of the Tonto
Estimated Cost: $200,000

Essential Project #4 – Restoration of Dispersed Camping Areas
Project description: In FY18 the Payson Ranger District established camping restrictions along a 200-foot buffer of many of the areas adjacent to streams in the EV Headwaters Watershed. These areas have been delineated with snake fence; however, no additional restoration has occurred. This essential project will restore native vegetation to these denuded areas using a combination of seeding and erosion control structures such as one rock structures and Zuni bowls. Additional areas within 200-feet of the stream that remained open to dispersed camping will also be evaluated and may be closed, fenced, and restored if it is determined that resource damage is occurring. Over time, it is expected that bank stability and vegetative cover will increase because of the restrictions and restoration activities, which would increase potential hiding and overwintering habitat features for aquatic species as well as decrease erosion into the stream.
NEPA: TBD
Function Lead: Recreation
Partners: None identified
Timeline: FY23-FY25

Essential Project #5 – Keger Timber Sale
Project description: Approximately 930 acres of the Keger timber sale is within this watershed and covers about 930 acres. This project will be a task order on the 4 Forest Restoration Initiative (4FRI) phase 2 RFP contract. The task order will be issued in 2024 under the authority of the Rim Country EIS. The objectives of the Rim Country EIS are to improve and sustain watershed health, improve wildlife habitat, conserve biodiversity, protect old forest, reduce the risk of uncharacteristic wildland fire, and to restore forest health, structure, and function so that forests are more resilient to disturbance and climate change. Treatment will consist of uneven-aged management (single tree or group selection) and weed/release of the understory.
NEPA: Rim Country Environmental Impact Statement
Function Lead: Timber Management
Timeline: FY24 - FY26
Partners: None identified
Estimated Cost: $748,400

Essential Project #6 – Bear Canyon Prescribed Fire
Project description: Plan and implement prescribed fire to better the overall health of wildlife habitat, reduce the risk of uncharacteristic wildland fire, restore forest health and structure so that the watershed is healthier and more resistant to climate change. A total of 2,246 acres of the planned 2,271 acres will be treated within the watershed.
NEPA: Verde WUI EA
Function Lead: Fire Management
Timeline: FY25
Partners: None identified
Estimated Cost: $225,000

Essential Project #7 – East Verde Stream Habitat Improvement
Project description: In partnership with Arizona Game and Fish (AZG&F) and Trout Unlimited, the Tonto National Forest conducted restoration work focused on four reaches of the East Verde River: Washington Park, 2nd Crossing, 3rd Crossing, and Flowing Springs. Projects sought to create holding/hiding habitat and introducing heterogeneity to the East Verde system to benefit the sport fishery. Work was also done to realign and restructure the stream channel in areas previously impacted by low water crossings to both reduce the width to depth ratio of the stream and allow for better sediment transfer through the system. Within reaches heavily impacted by recreation pressure, riparian trees and grasses were reintroduced to improve streambank stability, reduce erosion and associated sediment input, and provide cover and shade to help maintain lower water temperatures. Other erosion treatments were added to reduce major contributors of sediment near recreation sites.
NEPA: East Verde River Aquatic Restoration Project
Function Lead: Wildlife
Timeline: Completed in FY21
Partners: Arizona Game and Fish, Trout Unlimited
Estimated Cost: $51,000

Essential Project #8 – Dude Creek Habitat Enhancement and Headcut Remediation
Project description: Dude Creek is an important Gila trout (*Oncorhynchus gilae)* conservation stream. The creek has year-round surface water, but post-fire flooding has incised the stream over several years in turn having negative impacts to habitat quality throughout the stream. A headcut has developed on Dude Creek, endangering the upper reach of the steam which is less incised and still retains relatively good habitat quality. The purpose of this project is to arrest the advancing headcut that threatens good condition habitat and restore geomorphic function to this reach of channel. Additionally, concepts are provided to enhance habitat for Gila trout in an incised reach downstream of the headcut.
The project site is not directly accessible via forest system roads, thus most work will need to be performed by hand crews, potentially with support of a small, rubber-tracked excavator. Construction practices focus on the use of locally harvested materials of size appropriate for hand crews. The proposed work will include grade control features and induced meanders. The grade control features will consist of K-Dam structures, anchored log jams, and one rock dam.
NEPA: Categorical exclusion under CE 32.2(19)). The project will also likely need consultation with U.S. Fish and Wildlife Service on possible effects to Gila trout, Mexican spotted owl, and Chiricahua leopard frog.
Function Lead: Wildlife
Timeline: FY22 – FY23
Partners: Arizona Game and Fish, Trout Unlimited
Estimated Cost: $29,500

Essential Project #9 – Chase Creek Habitat Restoration Project
Project description: Chase Creek, a Gila Trout recovery stream, has recently been affected by a large-scale flood event. Portions of the channel have scoured and reduced the amount of pool habitat available for adult Gila Trout. Since then, the watershed has stabilized to the point where habitat restoration activities will be beneficial to Gila Trout. Funding will likely be available in the Department's FY22 budget cycle for an assessment of the watershed and a subsequent design of habitat restoration practices. Implementation could likely occur in the next three to five years. Chase Creek is currently the only self-sustaining replicate population of the Iron Creek lineage of GilaTrout.
NEPA: Categorical exclusion under CE 32.2(19)). The project will also likely need consultation with U.S. Fish and Wildlife Service on possible effects to Gila trout, Mexican spotted owl, and Chiricahua leopard frog.
Function Lead: AZGFD Region VI Aquatics Program, Wildlife
Timeline: FY23 – FY26
Partners: AZGFD, Trout Unlimited, Tonto NF
Estimated Cost: $75,000

Essential Project #10 – Wildlife Water Catchment Restoration Project
Project description: The Arizona Game and Fish Department (AGFD) in conjunction with the Forest Service is planning to replace two existing wildlife catchments in the watershed that have surpassed do not hold enough storage capacity to provide year-round water for wildlife needs. The catchments consist of approximately 1,000 gallon underground concrete water storage vault with an attached concrete in ground - walk in wildlife drinker. The water storage and drinker are fed by a large concrete collection apron connected to the vault at ground level. Each catchment arrangement lies with a

livestock exclosure fence approximately 150-foot by 150-foot (0.5 acre). Ongoing repairs have been made over the years to keep the catchments functional. These repairs have included cleaning out built-up sediment and patching cracked concrete on the aprons. In recent years the AGFD has worked to completely replace the outdated 1950s catchments with a modern system that allows for more water storage and less maintenance.
NEPA: CE – Completed 2020
Functional Lead: Wildlife
Timeline: FY22-FY23
Partners: Arizona Game and Fish
Estimated Cost: TBD

Essential Project #11 – Dude Fire Revegetation
Approximately 970 acres of the Dude Fire Restoration Project is located within this watershed. This project will include mastication of brush, juniper, and evergreen oaks, prescribed broadcast burning, and strategic planting of ponderosa pine. Service contracts will be awarded between 2022 - 2025 under the authority of the Rim Country EIS. The objectives of the Rim Country EIS are to improve and sustain watershed health, improve wildlife habitat, conserve biodiversity, reduce the risk of uncharacteristic wildland fire, and to restore forest health, structure, and function so that forests are more resilient to disturbance and climate change. Treatment will primarily focus on weed/release treatments around ponderosa pine that were planted in the 1990s after the Dude Fire or ponderosa pine that regenerated naturally.
NEPA: Rim Country EIS
Functional Lead: Silviculture
Timeline: FY22- FY26
Partners: Arizona Department of Forestry and Fire Management, Salt River Project
Estimated Cost: $825,000

Essential Project #12 – Noxious Weeds Removal
There are observed accounts of newly established nodding, musk, and bull thistles throughout the area. It is important to remove and monitor these species while they are in small quantities in order to mitigate any rapid spread of them throughout the watershed and other nearby watersheds. Project work will be organized by Friends of the Tonto and their volunteers, and will occur in the Spring/ Summer portions of the WRAP lifetime.
NEPA: Tonto National Forest, Noxious weeds programmatic EA
Functional Lead: Invasive Species
Timeline: FY22-FY27
Partners: Friends of the Tonto
Estimated Cost: $1,000

Monitoring

Monitoring is an essential process, pre- and post-implementation, to understand the health of the resource as well as the effectiveness of essential projects in improving site conditions. The following monitoring activities will help inform management of the EV Headwaters watershed during and beyond

the life of this WRAP. Monitoring cooperating partners may include: Friends of the Tonto, Arizona Department of Environmental Quality, Arizona Game and Fish Department, and Trout Unlimited.

Range condition monitoring and adaptive management: Under the Diamond Rim Grazing Allotment EA, range condition monitoring will be conducted using, but not limited to, pace transects, pace quadrat frequency, dry weight rank, ground cover, Parker 3-step and repeat photography. Monitoring occurs at established permanent monitoring points.

Riparian vegetation monitoring: Riparian vegetation monitoring consists of 3 established photo points on the East Verde River, 12 photo points on Dude Creek, and 3 points on Dry Dude Creek that are maintained by Friends of the Tonto. These photopoints allow managers to qualitatively monitor riparian areas overtime to see how the system is responding to management objectives. Some photo points date back to 1992 with the most recent photos from 2020. If future locations or areas become of interest, specifically in and around project areas where photo points are not already established, new ones will be created.

Rare plant monitoring: There are two rare species identified within the watershed. Monitoring these species is crucial to ensure their longevity and their responses to management actions. In partnership with Friends of the Tonto, monitoring of the bloomer's dock and the broadleaf lupine will occur at known and potential site locations throughout the watershed.

Hydrology/Geomorphology monitoring: Three monumented cross-sections have been established on the two tributaries to Chase Creek and East Sycamore Creek to monitor change in channel morphology over time. In 2020 wet-dry mapping was conducted for Dude Creek and in 2021 mapping was completed for Mail Creek and Dude Creek. Wet dry mapping will be completed on Dude Creek, Mail Creek, the two unnamed tributaries to Chase Creek, and Dry Dude Creek annually as part of the monitoring during and beyond the life of this WRAP.

Water Source Inventory Monitoring: There are four springs within this watershed. Monitoring these water sources is crucial for management decisions in relation to recreation, wildlife, range, and more. In partnership with Friends of the Tonto, yearly site visits to the springs will occur where water quality, flow, riparian vegetation, developed features will be recorded.

Water quality monitoring: The Tonto watershed program will continue water quality monitoring sites established by ADEQ at Mail Creek Upstream for Washington Park and East Verde River Below Washington Park. An additional site will be established on Dude Creek downstream of the restoration area. At a minimum, water quality parameters that will be monitored include dissolved oxygen, temperature, pH, and electrical conductivity.

Aquatic species monitoring: The Arizona Game and Fish Department conducts annual surveys of Gila trout in both Chase Creek and Dude Creek. Surveys may include visual counts, electroshocking, redd counts, and opportunistic habitat assessments. Periodically the department may provide population estimates based on these efforts. In the East Verde River, there is ongoing research project to evaluate angler satisfaction and the fate of rainbow and Gila trout stocked as part of the put-and-take sport fishery. Initial results should be forthcoming in -2022. The Tonto National Forest and Ranid Frogs Project of the AGFD routinely monitor occupied Chiricahua leopard frog sites. Monitoring includes protocol visual encounter surveys pre-monsoon and post monsoon. Monitoring also focuses on identifying and removing threats and habitat assessments. Tonto National Forest also plays an active role in completing

annual Arizona toad surveys; data from these surveys will feed an occupancy model in development by the AGFD's Amphibians and Reptiles Program.

Action Plan Date: 11/05/2021
Reviewing Official and Title: Neil Bosworth, Forest Supervisor, Tonto National Forest
Signature:

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This Watershed Restoration Action Plan is a programmatic document in which the Forest Service describes existing resource conditions and identifies possible management actions that could be taken to move the Agency towards a desired future condition. If the Forest Service determines that it wants to move forward with any of these possible actions, the proposed actions will be subject to National Environmental Policy Act requirements at the time the projects are proposed. NEPA may already be completed on some of these actions.

References

Carson, R. 1986. Streamflow augmentation effects on the flow characteristics of the East Verde River, AZ. U.S. Bureau of Reclamation, Lower Colorado River Region. 38pp.

Hjalmarson, H.W., and E.S. Davidson, 1966. Anticipated changes in the flow regimen caused by the addition of water to the East Verde River, Arizona. Arizona State Land Department Water Resources Report Number 28, prepared by The Geological Survey, US Department of Interior, Phoenix, AZ.

U.S. Fish and Wildlife Service. 2006. Reclassification of the Gila Trout (Oncorhynchus gilae) From Endangered to Threatened; Special Rule for Gila Trout in New Mexico and Arizona; Final Rule. Federal Register 71: 40657-40674. https://www.govinfo.gov/content/pkg/FR-2006-07-18/pdf/06-6215.pdf#page=1