Cover Photo: The middle fork of the Gila River in New Mexico's Gila National Forest. Photo: Michael Melford/National Geographic Creative. Source: Audubon

The Gila River

The AWSA, Gila Trout, and Instream Flows

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Abstract:

The New Mexico Central Arizona Project (NMCAP) was created in 2014 to oversee the operations and maintenance of potential diversion projects along the Gila River and San Francisco tributary. The proposed diversion projects must aid the future supply of water to four counties in southern New Mexico: Luna, Catron, Hidalgo, and Grant County. This paper will focus on the impact of three project proposals, asserted by NM CAP, which would divert approximately 7,000 acre feet, annually, along the two rivers.

The Gila River is one of the last wild river systems in the southwest, which is currently being impacted by climate change. The Gila is also home to several endangered species that would be affected by the diversons. The issues outlined in this paper will explore the need to complete pending environmental surveys required by the National Environmental Policy Act (NEPA). As of summer 2018, only the Public Scoping Report has been completed, a first step in NEPA process, and the federal Department of Interior must approve proposed projects by 2019.

This report will conclude with the complications of managing a common pool resource while bringing awareness to institutional arrangements that contribute to complications of damn diversions along the Gila River.

"The Gila River is a vital source of water for multiple groups in New Mexico and Arizona including farmers, industries, and local communities including the Gila River Indian Community. It supplies water to Catron, Grant, Hidalgo and Luna Counties, in New Mexico, for varied purposes including agriculture which accounts for 86% of water consumption in the state, commercial use, industry, mining and power extraction."
(Pascolini-Campbell, 2015 495)

Arizona Water Settlement Act (AWSA)

The Arizona Water Settlement Act (AWSA) was passed in 2004 during the last Bush administration. This settlement was the first attempt aimed at resolving a water rights priority call with the Gila River Indian Community and Apaches near San Carlos Reservoir. Since the headwaters of the Gila River originate in New Mexico, the state was given a 14,000 acre-feet availability agreement by the federal government.

The state was also granted sixty-six million dollars of non-reimbursable funds to be made available to develop any water projects that meet a water demand in Grant, Catron, Luna, and Hidalgo Counties. These funds are now worth approximately one $128 million dollars. These proposed projects must outline a need to impact the security of future water planning, ecosystem services, and forest restoration projects. Water planning projects could include anything from dams and diversions, restoration projects to municipal water projects.

The AWSA later ratified the Consumption and Forbearance Agreement (CUFA) , signed by Gila River users downstream in Arizona and New Mexico. The Colorado River Basin Project Act of 1968, as amended by the AWSA, requires that the Central Arizona Project (CAP) water be delivered to some downstream users in Arizona in exchange for consumptive use in New Mexico (BOR, 2018). AWSA contains specific requirements for the Secretary of the Interior, regarding any proposed construction, operation, and maintenance of a NM Unit on the Gila River in New Mexico.

Project Authorizations

The New Mexico Interstate Stream Commission must approve any contract between the Secretary of Interior and New Mexico water users, or any expenditure of the non-reimbursable federal funds allocated to the State of New Mexico. The Secretary of the Interior can contract up to 14,000 acre-feet of water, annually, over any consecutive 10-year period for consumptive use of water from the Gila River in exchange for delivery of CAP water to downstream users in Arizona (AWSA, 2004). The structures will be

designed to allow a minimum of 150 cfs to bypass before diverting any flow and will be designed to divert no more than 350 cfs at any given moment, per the CUFA (2014, Engineering Report, ISC). This consumptive use is over and above consumptive uses provided by Article IV of the Decree of the Supreme Court of the United States in *Arizona v. California*, 376 US 340 (1964) *(NM CAP EIS website).*

The Colorado River Basin Project Act of 1968 and the Arizona Water Settlements Act of 2004, Public Law 108-451 (AWSA), authorize the New Mexico Unit of CAP to deliver Arizona's allocation of Colorado River water to central and southern Arizona. The Secretary of the Interior is also authorized to contract with water users in New Mexico for water from the Gila River, its tributaries including the San Francisco River in New Mexico, and underground sources (AWSA, 2004).

Who's Who of the AWSA?

Joint Lead Agencies ISC and BOR

Federal - Department of Interior Bureau of Reclamation (BOR)

Federal decisions regarding implementation of the proposed action are the responsibility of the Secretary of the Interior, Ryan Zinke. Zinke was appointed under the Trump Administration, an administration that has proven to be directly opposed to the conservation and preservation of life-sustaining natural resources of common land, water, and air. The Trump administration is clearly into sustained domestic, non-renewable energy development and has little or no ethical dilemma with (or interest in) the drying out of an ancient life sustaining stream channel and watershed.

State - New Mexico Interstate Stream Commission (NM ISC)

The New Mexico Interstate Stream Commission must approve any contract between the Secretary of Interior and New Mexico water users, or any expenditure of the non-reimbursable federal funds allocated to the State of New Mexico. They are also members of the NM CAP Entity.

Public-Private - New Mexico Unit of the Central Arizona Project Entity (NM CAP)

NM CAP is considered a quasi-governmental entity of municipalities (NOT Silver City), irrigation ditch associations, and Soil and Water Conservation Districts. As the proponent of the AWSA-enacted project proposals, they officially approved their proposed action on July 6, 2018. Comprehensive project details can be found on the NM CAP website, as a link to their summary engineering report (2018), conducted by Stantec.

Staff: Executive Director: Anthony Gutierrez (575) 313-5242

Representatives: Interstate Stream Commission, Upper Gila Irrigation Association, Gila Hot Springs Irrigation Association, Gila Farm Irrigation Association, Fort West Irrigation Association, Grant SWCD, San Francisco SWCD, Hidalgo SWCD, Village of Santa Clara, City of Lordsburg, City of Deming, Luna County, Hidalgo County, Grant County, Catron County.

Cooperating Agencies - USFS, USFW, US Army Corps of Engineers, USGS, BLM, Others

NEPA Contractor (Scoping/EIS) - EMPSi

"EMPSi is a leader in environmental planning and compliance, natural and cultural resources consulting, public engagement, GIS support and integration, and project management. We leverage these skills for successful outcomes on some of the most complex and controversial projects in the US."

The Consumptive Use and Forbearance Agreement (CUFA) 2005

The Consumptive Use and Forbearance Agreement (CUFA), details the conditions that must be met for New Mexico to be able to divert water from the Gila River and its tributaries, including the San Francisco River in New Mexico, and underground water sources.

REQUIREMENTS (NON-COMPREHENSIVE LIST OFFERED ON BOR WEBSITE)

1. Before New Mexico can divert any water, there must be satisfaction of the water quality injunction of the Globe Equity court for delivery of water of good quality to the San Carlos Apache Tribe.
2. New Mexico must provide notice to the forbearing parties two (2) years before diversions begin.
3. The exchange is one for one: for every acre-foot of water used in New Mexico, the Gila River Indian Community and the San Carlos Irrigation & Drainage District receive one acre-foot of Central Arizona Project water (to be divided 55% to the Community and 45% to the District).
4. The Entity must have credits already purchased in the New Mexico Water Bank equal to the amount of water it intends to divert in one year. The maximum amount of credits New Mexico can accumulate in the Water Bank is 70,000 acre-feet.
5. There are minimum monthly flows that must be bypassed (for the benefit of downstream users in Arizona) before any diversion can occur in New Mexico.
6. No water shall be diverted in New Mexico in any calendar year until San Carlos Reservoir has at least 30,000 acre-feet of storage. (This storage limit amount can be re-evaluated periodically).
7. New Mexico can never divert more than 350 cubic feet per second (cfs) out of the Gila or the San Francisco. (2018, BOR)

NM CAP Proposed Projects:

The diversion project area includes lands around portions of the Gila River and its tributaries in four counties in southwestern New Mexico: Catron, Grant, Luna and Hidalgo. Although the where infrastructure are proposed are the Upper Gila, the Virden Valley, and San Francisco River. These projects are the Cliff-Gila Component, Virden Component, and the San Francisco Component. Total budget proposal for these three components is just over fifty million dollars, with the majority of funds earmarked for the

project in the Upper Gila/Cliff area.

Here are the descriptions of the three diversion projects proposed by CAP, (taken from the Gila Conservation Coalition website):

Cliff/Gila Valley

- Large concrete diversion dam in the vicinity of Upper Gila diversion site to serve existing Upper Gila, Fort West, and Gila Farm ditches and new ditches.
- Ditches will be enlarged; capacities will be doubled. Conveyance changes include connecting the Fort West Ditch to diversion dam and connecting the Gila Farms Ditch to the Fort West Ditch; reconstructing or reinitiating use of several additional ditches in the lower part of the Cliff/Gila Valley, Riverside, and Bill Evans reaches of the Gila River; reconstructing lateral ditches to deliver water from several existing and reconstructed ditches to potential new AWSA irrigation sites; increasing capacity of Upper Gila Ditch and Fort West Ditch to 50 cfs; line approximately ⅓ of the ditch length.
- Storage ponds in Cliff/Gila Valley totaling 3, 735 acre - feet (5 lined ponds in the floodplain plus 2 unlined ponds in Winn Canyon); pumps to fill the Winn ponds; 3 large conventional wells for recovery of leakage from Winn Canyon ponds.
- Groundwater pumping – (7) 500 gpm production wells for direct groundwater pumping into ditches.

Virden

- Storage ponds totaling 551 acre-feet with pumps to move water back to ditches.
- Conveyance - Ditch “improvements” (lining?) and “gauges” (metering?).

San Francisco

- Large concrete diversion dam at existing Spurgeon diversion site above Hwy 180 Bridge.
- Conveyance - 48” pipe across Pueblo Creek plus enlarging rest of ditch down to Weedy Canyon; reconstruct west -side Pleasanton Ditch.
- Storage - Weedy Canyon Reservoir capacity 1,874 acre-feet, including large pump station to fill reservoir from ditch.

AWSA funds v. NM CAP Spending

NM CAP has spent nearly seventeen million in federal and state funding, more than eleven million in federal subsidies. NM CAP will have access to a total of ninety million in federal money which the group plans to receive in full. The joint lead agencies have spent six million in outstanding contracts, about one-point seven million in ISC's operating budget. The state plans to spend another sixteen million on the project for the Fiscal Year 2018, new budget approved by the legislative approved which has expanded for FY 2019. Currently, NM CAP has been granted $700,000 while ISC has been given $315,000 for the continuation of projects, not to mention that BOR has already spent near fifteen million through September (Paskus 2018).

In 2014, in a prepared report for the Interstate Stream Commission, it was stated that total estimated project costs adjusted to 2024 dollars will be equal to five hundred fifty-six million dollars, assuming a 27% increase in inflation over the next ten years. The original amount of federal funding provided by the AWSA started at sixty-six million, but was later doubled to one-hundred and twenty-eight million to serve the need of the larger projects proposed by NM CAP.

During the 2017 legislative session Senator Howie Morales, democrat from Silver City, proposed a senate bill (SB340) which sought to oversee ISC funding by creating a process in which approvals must go through a legislative budget process. The bill did not come to fruition since many state officials believed that the bill would kill the projects entirely. This included folks like NM CAP attorney Pete Domenici Jr. and NM CAP Chair Shannon Darr. Although NM CAP responds to ISC, many have noted that the process seems to be driven by CAP rather than the state agency (Paskus 2017).

National Environmental Policy Act (NEPA) Requirements:

NEPA was signed into law in the 1970's during the Carter Administration. NEPA requires a comprehensive environmental impact assessment to be done for any kind of natural resource development on public lands. This is crucial for water planning projects

since permitting should not begin until the final assessments have been made. The impact of future facilities must be surveyed thoroughly and there should be a plan to mitigate damage done to existing ecosystems, this may include risk to endangered species

Bureau of Reclamation (BOR) and the NMISC are the joint lead agencies have been preparing the EIS for AWSA related projects. So far only the Public Scoping report has been completed to reach NEPA benchmarks which was conducted as of summer 2018. The deadline for the DOI to make a final decision based on NEPA is until the end of 2019, which may be extended no farther than 2030. This is concerning since the process has begun so late in the process. Below are some public comments from the Public Scoping Report:

> " Commenters question if CUFA minimum requirements and stipulations would be met before diverting water, considering climate change, droughts, reduced snowpack, lower flows, etc., to justify the proposed project."
>
> "Funding allocated to the proposed project will be depleted to support engineering design, technical studies, consulting services, NEPA evaluation, and potential litigation and will not allow for construction, maintenance, or operation."

Management of the Threatened Gila Trout

Dangers to the Gila Trout

There are numerous dangers to the Gila trout. One danger comes from the ash flows and debris slides that follow high-temperature wildfires. Extreme sedimentation also occurs post-fire, when fire destroys soil-anchoring vegetation and trees. Gila trout thrive with a river system free of significant sedimentation. Increasing droughts are another concern for the Gila trout where low or no flow conditions cause their habitats to disappear. Rising stream temperatures are also an issue for the Gila trout. Some of this rise in stream temperatures is due to the destruction of riparian vegetation. This destruction happens due to a number of factors including: increased droughts and no or low flow

conditions causing die off; destruction by wildfire; and unmanaged grazing along riversides. Another danger for the Gila trout is hybridization with non-native trout species and/or predation by the non-native species. Yet another danger to the Gila trout is the loss of connectivity of stream habitats. Man-made diversions of rivers such as the Gila River can cause a loss of connectivity of the native Gila trout's stream habitats. Anything that affects the health of the watershed affects the health of the ecosystem. In the next sections, we will explore the some important events in the conservation efforts for the Gila trout, examine some of the management techniques used on behalf of the preservation of the Gila trout and the cross-scale linkages involved over the years.

Highlights of Past Conservation Struggles

While conservation efforts began earlier, the main acts affecting the Gila trout were the ESPA of 1966 and the ESA under which in 1973 the trout were listed as endangered (71 Federal Register 40657; Brookshire et al., 2012; 16 U.S.C. 1531-1544). Then, in 1979, the first Gila Trout Recovery Plan was completed (USFWS 1979; 71 Federal Register 40657). It's four main ideas are laid out in Figure 1. The recovery plan was revised multiple times over the years (USFWS 1984; 71 Federal Register 40657; USFWS 1993). By 2003, the Gila Trout Recovery Plan was revised for the last time. Figure 2 outlines the criteria for downlisting a species from endangered to threatened. This is the plan that is still in effect, guiding our treatment of the Gila trout today (USDA 2017). The agencies listed in Figure 2 continue to work together for the benefit of the Gila trout. Then, in 2004, Congress passed the AWSA which has been discussed in detail.

After some struggles to maintain populations over the years, finally, in 2006, the Gila trout populations were felt to be secure enough that the Gila trout was downlisted from endangered to threatened. In the years leading up to 2006, there was an increase in the total population of wild Gila trout. In 1992, there were less than 10,000 wild Gila trout over the age of 1, and by 2001, there were estimated to be approximately 37,000 Gila trout in the wild (71 Federal Register 40657). Hatcheries were also producing well. The NMDGF began to allow recreational fishing of the Gila trout overstock (NMDGF).

Figure 3 shows good angling locations for those interested in the rare Gila trout (USFWS). Allowing for fishing of this rare trout opened up a new funding source for conservation efforts.

In 2012, the Whitewater-Baldy Wildfire burned almost 300,000 acres and the next year the Silver Fire destroyed over 135,000 acres. Eight out of 17 populations of Gila trout along 47 miles (76 km) of their habitat were destroyed (NMDGF 2017). This timeline is not exhaustive but provides the highlights of the struggle. Efforts since this point lead us into the current management strategies and conservation efforts surrounding the Gila trout.

Current Conservation Efforts

The two main documents that govern the efforts for the Gila trout are the 2003 Gila Trout Recovery Plan, still in effect today, and the ESA. Based on these documents, current efforts at the governance of this threatened species are much the same as in previous years. Authorities are continuing to use nonnative salmonid removal through electrofishing or chemically treating the water. Barrier construction continues in various locations. Figure 4 shows a fish barrier on Willow Creek to protect the native Gila trout from invading nonnative species. Habitat restoration efforts continue through efforts of many state and federal agencies as well as TNC. Additionally, the ISC under CUFA has instituted minimum flow requirements of 150 cfs. Hatchery production is continuing at Mora National Fish Hatchery, and efforts are beginning to use the Glenwood State Fish Hatchery for production of Gila trout as well (NMDGF 2017).

In times of wildfires and other risks, Gila trout continue to be evacuated and translocated, and eventually returned to affected streams once those streams have recovered. Figure 5 shows the West Fork Gila River drainage at Whiskey Creek where one such rescue and evacuation of Gila trout occurred following the 2012 Whitewater-Baldy Fire. Efforts also continue to establish populations in new streams. For example, in 2017, a new population of Gila trout was established in Mineral Creek from thousands of fish raised at

Mora National Fish Hatchery. Other conservation efforts include developing opportunities to fish the Gila trout, raising public awareness and interest in the rare trout, as well as ongoing public education efforts. Monitoring of population data is also being undertaken.

Current efforts for the Gila trout also include a partnership between TNC and GNF to 'Restore Fire's Natural Role' to the area, which in turn preserves the safety of the ecosystem and the Gila trout's habitat. They have also been working with the BLM on parts of this venture. They have hired fire ecologists who oversee forest restoration including prescribed burns and tree thinning to reduce the risk of wildfire by reducing the fuel load (Miller). TNC has several other efforts underway including the 165,000-acre Headwater Ranch for which several groups coordinate including TNC, USDA, USFS, local ranchers, and a large local corporation for the purpose of improving watershed and stream conditions. TNC and NMDGF are working jointly on the 160-acre Gila Iron Bridge Conservation Area along the Gila River, purchased jointly under the authority of NLPA.

One of the largest projects TNC has is the Gila Riparian Preserve which is adjacent to a wilderness area. The project area includes both the preserve which runs along 8 river miles and includes over 12,000 acres, as well as over 250,000 acres managed by TNC, local landowners, federal and state agencies, and local organizations (cross-scale linkages at work again). Their long-term vision is to "let the river rediscover its natural flood plain", allowing fertile and favorable soil conditions to allow cottonwoods and willows to grow easily to provide a habitat for rare, threatened, and endangered species. The Gila trout will be included as a beneficiary of these efforts (Cooper 2010).

The BOR is also working on projects including the Upper Gila Riparian Restoration Project which focuses on river borderland restoration including increasing native plant inventory and removing invasive species, which improves in-stream habitat for the Gila Trout.

Instream Flows – Keeping the Gila Wet and Wild

An instream flow is water flowing in the stream channel. Instream flows equate to keeping the Gila wet and wild (undammed). Currently, New Mexico is the only state in the west without a legal pathway for protecting instream flows (Berrens et al. 2000). The subject of instream flows has often been controversial due to potential conflicts over this scarce resource with diversionary users like agricultural users and municipalities. However, instream flows are valuable for "recreational activities, enhancing water quality, and protecting biodiversity and riparian areas" (Crawford et al. 1993). Supporting a wet and wild Gila River promotes economic interests by increasing water related recreational activities including angling. Instream flows also benefit those coming to the river for its scenic beauty. They also benefit the local/regional ecology and the environment (Berrens et al. 2000).

AWSA Effects: the Gila trout and Instream Flows

At the current time, the EIS is being prepared. Public scoping has been completed and the public issued many concerns. It is beyond the scope of this document to explore them all, but the main issues are outlined in Figure 6. Without the benefit of the EIS, there are still things we can definitively state. We do know that a "river with predominantly unmodified flows can sustain its ecosystem better than rivers whose flow patterns that have been altered by diversions and dams" (Ogelsby 2012; Pastel & Richter 2003). Diversion would disturb the river's ecosystem. Further, the USFWS has asserted, "Should water be diverted from the Gila or San Francisco rivers, flows would be diminished and direct or indirect losses or degradation of habitat for aquatic and riparian species would result" (USFWS; 77 Federal Register 10810).

We can say, definitively, that degradation of the Gila River and its ecosystem would result from the proposed projects. The degradation of the ecosystem would cause detriment to the Gila trout. Further, the project area is home to more than 45 species of concern, as well as 25 federally and state listed threatened and endangered species

including the southwestern willow flycatcher (Oglesby 2012; NMDGF). The riparian habitats that house these endangered and threatened species as well as species of concern would be severely degraded with the removal of additional water from the Gila River and the proposed projects.

The largest budget project being proposed for diversions is in the Cliff-Gila Valley area. Diversion in this area would certainly affect the habitats that TNC and the NMDGF are working hard to restore and maintain on Gila Iron Bridge Conservation Area. Additionally, a diversion in this area would seriously undermine the efforts of TNC together with the OSE and local Cliff-Gila Valley irrigators working to improve management practices to restore the river to a more natural cycle by "eliminating periods of no flow in portions of the channel" (Cooper 2010; Miller). Apparently, instream flow conditions of "no flow" have been an issue along this portion of the Gila.

Climate Change: Current and Projected Conditions

"Climate models suggest that there may be no snowpack at all in New Mexico south of Santa Fe by the end of this century." (Gutzler, 2007)

The Gila watershed exists in an arid (less than 10 in/year of precipitation) and semi-arid (less than 20 in/year of precipitation) climate. The strategic management of water resources in this environment is critical and must be done with great care. Gila flows are dependent on the weather and evolving climate in the region. "The Gila River, is characterized by two peaks in streamflow: one in the winter–spring (December–May), and summer (August–September). The region is influenced both by Pacific SST variability as well as the North American Monsoon," (Pascolini-Campbell, 2015 494).

Instream flows are affected by the precipitation received from storm fronts generated in larger weather events in the greater region including seasonal hurricanes, summer monsoons and the El Nino and La Nina cycles. As the global climate continues with a warming trend, the arid and semi-arid regions are heavily impacted with further

intensified volatile drought conditions. Under these conditions the severity of climate driven drought, fires and floods will increase.

The headwaters of the Gila River are located on the western slopes of the continental divide in Sierra County and are fed by annual snowpack runoff. The size and location of the snowpack is affected by seasonal temperatures. Sierra Blanca is a primary example of a major range in southern New Mexico that has been experiencing trends of snowpack lines receding and reduction of overall snowpack, due to warming trends. Since the 1930s temperatures in the January to April time period have risen more than 2°F, with most of the increase occurring after the 1970s, (Gutzler, 2013, 9). See Figure 8.

As the region becomes drier, the threat more catastrophic wildfires becomes greater. The vegetation throughout the ecosystem will continue to wither and die, leaving a buildup of fuels. Extended drought conditions provided plenty of fuel for the high-impact, 2013 Whitewater-Baldy Fire, to burn at the intensity and magnitude that it did. The fire destroyed 300,000 acres of forest and endangered the wildlife, causing extreme actions to be taken to ensure their safety. Large fires destroy crucial forest canopy that protect the current snowpack, causing snowpack to melt sooner. Earlier than normal snow melts have a negative effect on the wildlife, because species such as the trout rely on the snowpack melt to signal spawning.

Fire destabilizes the landscape and introduces ash and debris into the water channels during post-fire flooding events, causing changes in stream chemistry and turbidity. The loss of a large area of tree canopy, ground cover and soil hardening post-fire, increase impacts of post-fire flooding. The tree canopy leaves and branches also decrease the rate at which precipitation reaches the ground. Monsoon rains in New Mexico occur in rapid burst with torrential rains falling in a short period of time. If underbrush and grasses that normally hold soil and rocks in place during heavy rains are no longer present (post fire) and the soil has been dried out and compacted it does not absorb rain, so it shoots over the surface tearing the surface soils with it downstream. This process is very destructive to overall watershed health and definitely impacts instream species like the Gila Trout.

The Gila river was pelted with heavy rains in 2013 for 13 days, post- Whitewater Baldy burn, causing the river to run above 1,000 cfs, with periodic jumps up to 10,000 cfs and peaking at 30,000 cfs. These high flow rates ripped up large cottonwood trees, other vegetation, moved boulder, debris and large amounts of sediment, (Paskus, 2016). "All of New Mexico's major snow-fed rivers (including the Pecos, Canadian, Gila, and San Juan Rivers) will experience similar climatic effects, leading to predictions of lower flows.Will we have the foresight to plan for shortages of water during severe droughts and lower river flows in the years to come?" (Gutzler, 2007)

Discussion- Conclusion:

NM CAP will continue to push for their AWSA stipulated water diversion entitlements, but there are many years where flow is below 150 CFS, so the concern that CUFA required minimum flows will not be met under the new paradigm of a dammed river is valid. Figure 7 shows many years where flow is below 150 cfs without any of the proposed diversions to the river and the proposed removal of additional water. Meeting minimum flow requirements, in perpetuity, laid out in the CUFA should be a primary concern of all stakeholders and administrators (including NM CAP). New Mexico could spend upwards of $500M of taxpayer money building and maintaining a river diversion that will cost more than it benefits the region, according to the federal government's own analysis. Our newly elected Democratic NM State Governor, Michelle Lujan Grisham, is opposed to these AWSA diversion projects. The Governor appoints the Interstate Stream Commissioner, so this whole dynamic will probably shift very soon in favor of instream flows. The project will very likely miss the NEPA/EIS deadlines set for end of 2019.

If more water is taken out of the Gila River, as proposed, there will be a direct effect on ecosystems and the threatened and endangered species that depend on the instream flows of this common resource. NM must consider the complexity and costs that have been associated with managing the controversial, Silvery Minnow (considering the threatened Gila Trout). New Mexico also does not need another stressful Rio Grande Compact

situation where we struggle as a state to meet minimum flow requirements, to satisfy interstate compacts. Our recommendations are below. Here is former Interstate Stream Commission, Norm Gaume, former Interstate Stream Commission director and chief critic of the diversion project:

> Gaume pointed out that whether or not New Mexico builds the diversion, it will still have the right to exchange 14,000 acre feet annually. "The water right never goes away," he said. "But it's not a very good water right; lots of years there's no water at all. And nobody has come to grips with that." (Paskus, 2018)

Recommendations:

1. Prioritize meeting minimum CUFA instream flow requirements in perpetuity~ (150 -350 cfs baseflows) (for legal reasons and to benefit the many lifeforms that rely on this source of flowing water for survival).
2. Include threatened and endangered species management (i.e. Gila Trout) in future development plans/economic models (consider the complexity of Silvery Minnow management in the Rio Grande). Could be done through a payment for ecosystem services model.
3. Maintain transparency of all proposed project budgets to the public.
4. Meet NEPA requirements and deadlines. Communicate environmental concerns to the public.
5. Consider how any diversions to the Gila or tributaries will impact the whole ecosystem and all water users dependent on its sustained flows. The Gila River is a common pool resource that is scarce and highly valued by all regional water users.
6. Consider collaborative forest and watershed restoration strategies as systems approach to sustained regional water supply solutions (i.e. TNC and Rio Grande Water Fund 'forest to faucet' solutions)

Acronyms, Abbreviations, and Glossary of Terms

AGFD - Arizona Game and Fish Department

AWSA - Arizona Water Settlements Act

BLM - Bureau of Land Management

BOR - Bureau of Reclamation

CUFA - Consumptive Use Forbearance Agreement

DOI - Department of Interior

EIS - Environmental Impact Statement

ESA - Endangered Species Act

ESPA - Endangered Species Preservation Act

GNF - Gila National Forest

Hybridize - Two species mix or crossbreed to form another mixed species that is not pure

ISC - Interstate Stream Commission

Morphotype - An informal group of taxa with similar or identical morphology

NEPA - National Environmental Policy Act

NLPA - National Lands Protection Act

NMDGF - New Mexico Department of Game and Fish

Nonnative salmonid - Trout not native to New Mexico (e.g. Rainbow or brown trout)

OSE - New Mexico Office of the State Engineer

TNC - The Nature Conservancy

Salmonid - Trout

UNM - University of New Mexico

USDA - United States Department of Agriculture

USFWS - United States Fish and Wildlife Service

USFS - US Forest Service

Appendix

Figure 1: 1979 Gila Trout Recovery Plan:

- Perpetuate and replicate each surviving population as a distinct genetic entity.
- Select streams suitable for reestablishment of Gila trout.
- Chemically treat streams to remove nonnative salmonids.
- Translocate Gila trout from donor streams to renovated streams (71 Federal Register 40657).

Figure 2: 2003 Gila Trout Recovery Plan revised criteria for down listing a species.

The main changes for down listing to be appropriate are:

- The four known nonhybridized indigenous Gila trout lineages are both protected and replicated in the wild in a minimum of 52 miles (85 km) of streams.
- Each of the known nonhybridized lineages is replicated in a stream that is geographically separate from its remnant population in order that no natural or human-caused incident or event may eliminate a lineage.
- Emergency Evacuation Procedures Plan is developed and implemented in order to address wildfire impacts and discovery of the invasion salmonids of nonnative origins in streams in which the Gila trout are established (USFWS 2003). Plan completed in 2004 along with a broodstock management plan (USFWS 2004).
- Formation of the Gila Trout Recovery Team consisting of various federal and state agencies of different states along with a university (cross-scale linkages at work): NMDGF, USFS, USFWS, UNM, AGFD. One of their goals is "stream restoration" which involves:
    - Removing nonnative species from stream reaches.
    - Constructing barriers to prevent nonnatives from returning.
    - Returning the Gila trout to the restored stream (USFWS 2003).

Figure 3: Gila Trout Angling Streams

Photo Credit: NMDGF

Figure 4: Willow Creek Fish Barrier Photo Credit: USFWS

Figure 5: West Fork Gila River Drainage at Whiskey Creek - Rescue and evacuation of Gila Trout after 2012 Whitewater-Baldy Fire Photo Credit: USFWS

Figure 6: NEPA Public Scoping

Public Scoping elicited these main concerns:

- Proposed storage ponds and reservoirs could increase nonnative species that would directly compete with or harm native species.
- Proposed projects appear to threaten the 150 cfs minimum flow requirement.
- Diversions and extractions of an additional 14,000 AF per year will dewater the river, and extending periods of dewatering during ecologically critical times, causing damage to the river ecosystem, harming wildlife, limiting recreation, and potentially impacting certain irrigators (NEPA 2017, Gila Conservation Coalition 2017).
- Lessened water availability in the Gila River will negatively affect the natural hydrology of the river, which is a very delicate balance (NEPA 2017).

Figure 7: USGS Flow Annual Average Discharge for the Gila River 2000-2018

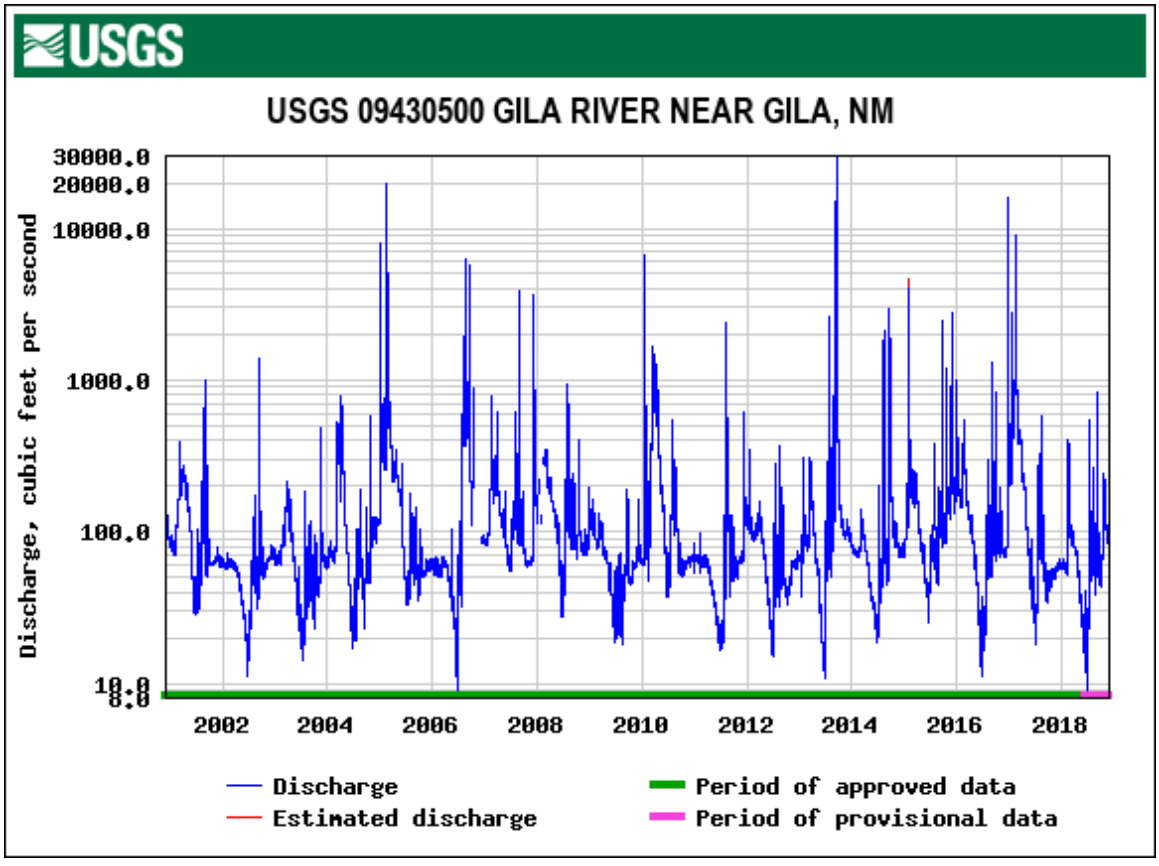

Figure 8: NM Temperature (JAN-APRIL trends) 1931-2012

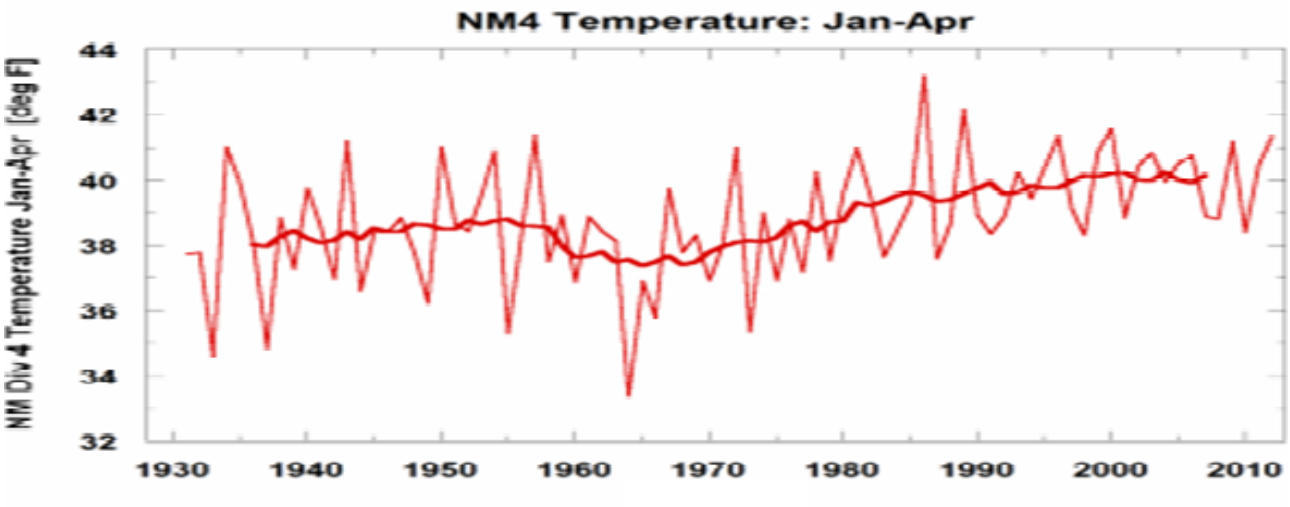

Figure xx. Time series of seasonal temperature (top) and precipitation (bottom) for New Mexico Climate Division 4, which includes the headwaters of the Gila River. Temperature averaged over 4 months (Jan-Apr) from 1931-2012. Thin red line shows annual data; thick red line shows an 11-year running average through the annual data. (Gutzler, 2013)

Figure 9: NM Projected Temperatures (Gutzler, 2011)

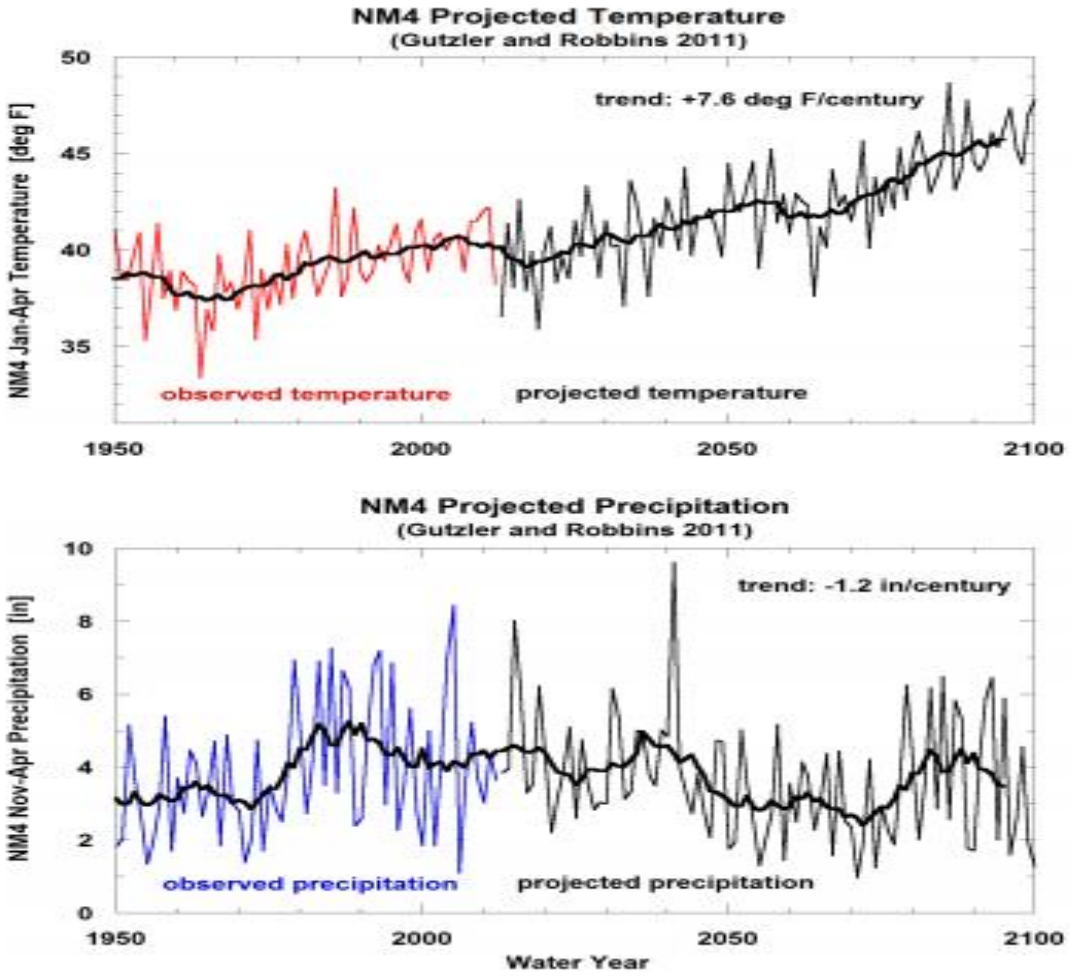

Figure 9 (above)

Projections of 21st Century temperature (top) and precipitation (bottom) in New Mexico Climate Division 4, generated by Gutzler and Robbins (2011). The initial segments of each time series, from 1951-2012, are observed data as shown in Figure 6. Projected monthly temperature and precipitation are derived by reproducing interannual variability from 20th Century observations in the 21st Century, then adding the linear trend for the 21st Century derived from the average of an ensemble of global climate models forced by the A1B radiative forcing scenario. Thick black lines in each panel indicate 11-year running averages. (Guztler, 2013)

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