

Our Animas

WATERSHED + COMMUNITY = RESILIENCE

A publication of the Animas River Community Forum

—2019 Edition—





Photo: Alex Ratcliff. Cover photo: Jonathan Harvey

Our Animas

ANIMAS RIVER COMMUNITY FORUM (ARCF)

Out of Deep Concern ... Answering the Call to Action

The Animas River Community Forum (ARCF) is a group of citizens, businesses, government agencies and nonprofits that came together in response to the Gold King Mine release in summer of 2015. Our purpose is to: promote communication, coordination and collaborative action; foster public confidence; support resiliency in our communities; enhance planning, and improved public safety and health for the future.

OUR ANIMAS

Our Animas was created by an ARCF committee that shared a common vision of creating an educational document that would address community concerns, use locally collected data, promote the understanding of river health, and share actions that community members can take to support river resiliency. We intend to update this document every other year. We encourage you to provide comment on the document on our website at animasrivercommunity.org.

The following nine questions guide Our Animas: (following this is the 9 questions)

The following nine questions guide *Our Animas*:

- #1 Is my water safe to drink? **p. 5**
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- #8 Can the river sustain impacts? **p. 29**
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For each question, we present widely recognized indicators that reflect current local data to tell the story of the river. Dive in and take a look!

ACKNOWLEDGMENTS

Multiple organizations and individuals generously contributed their time, resources and expertise to develop this first edition of *Our Animas*.

Contributing authors include:

- Ann Oliver** Animas Watershed Partnership
- Barb Horn** Colorado Parks and Wildlife – River Watch Program
- Brian Devine** San Juan Basin Public Health
- Chara Ragland** Querencia Environmental
- Leslie Jakoby and Gerome Bernard** La Plata County
- Marcel Gaztambide** San Juan Citizens Alliance
- Scott Roberts** Mountain Studies Institute
- Shannon Manfredi** Coordinator, Animas River Community Forum

Editors:

Scott Roberts, Ann Oliver, and Shannon Manfredi

Graphic Design:

Sarah Douglas gaiacreative

Reviewed and approved by members of the Animas River Community Forum

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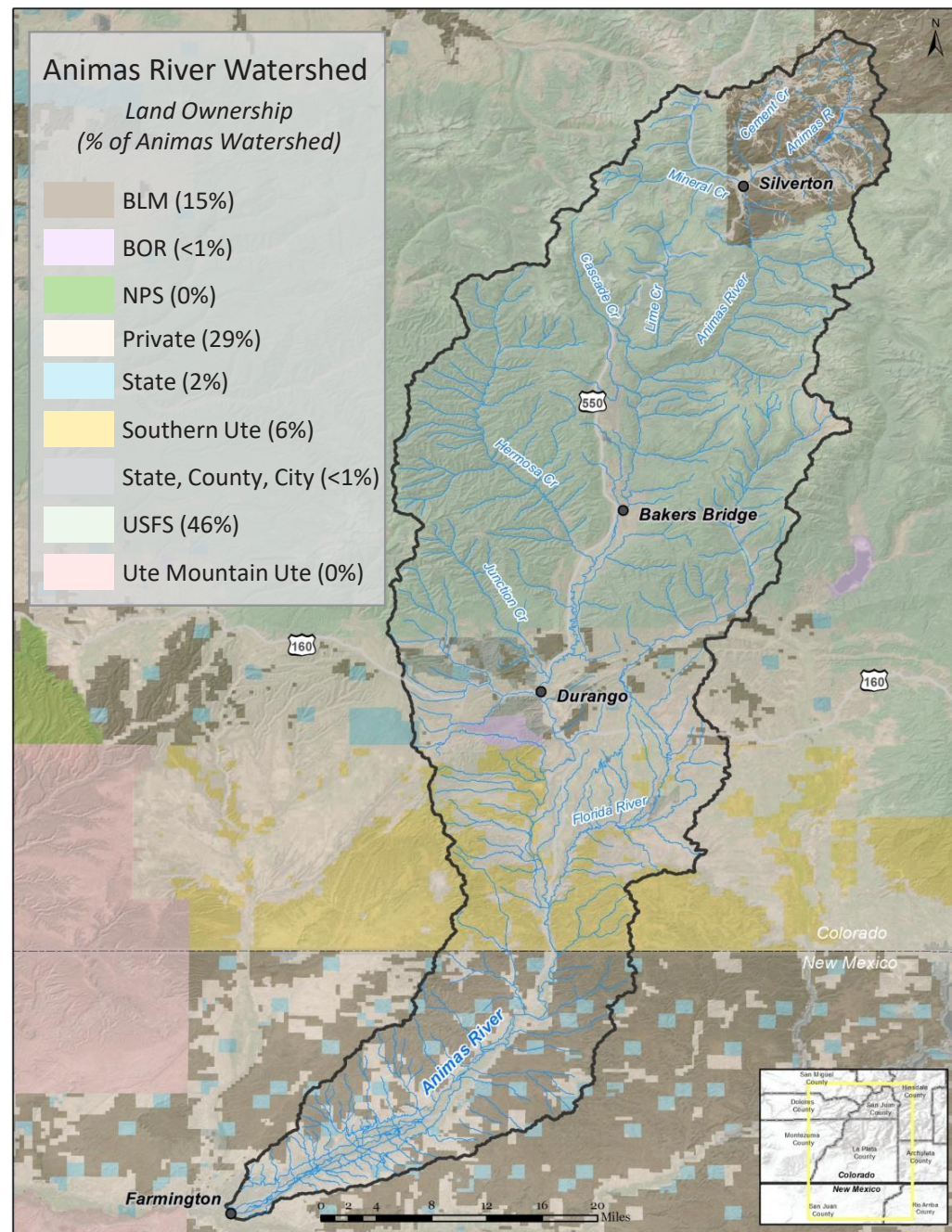


Figure 1. The watershed of the Animas River

Did you know?

A watershed is a geographic area in which all of the water that falls from the sky and runs over land or through the ground drains into the same primary water body, often a river such as the Animas. A watershed comprises many “mini” systems that interact with each other. Many small tributaries flow into the mainstem and form the river system, in this case the Animas River system (see Figure 1).

Water that soaks into the ground from snow or rain makes the groundwater system. Lakes, wetlands and the forest are all natural micro systems in the watershed. In contrast, agriculture lands and urban and developed areas are lands that have been managed or manipulated, and are referred to as “unnatural systems” within the land and water in a watershed.

1 Is My Water Safe to Drink?

HOW “SAFE” IS DEFINED

If you live in the Animas watershed, your drinking water may come from surface water such as a lake or a river (including the Animas River). Others receive their drinking water from groundwater via a well. Your drinking water may be delivered to you through pipes by a public water system, or it may arrive at your faucet directly from your own private well.

If your water comes from a public water system, the U.S. Environmental Protection Agency (EPA) requires that the provider tests and treats the water. The EPA sets Primary Drinking Water Standards based on risks to human health from drinking the water over long periods of time, and on the ability of water providers to treat water using current technology. Public water systems must deliver water to you that meets these standards. To meet this requirement, public water systems may need to treat the water to remove certain pollutants.

The EPA also sets Secondary Drinking Water Standards as voluntary guidelines for public water systems in managing the aesthetic quality of the water they provide. Aesthetic quality includes taste, color and odor, as well as corroded and stained plumbing. One example is manganese, which can cause black to brown coloring, black staining and a bitter metallic taste when it exceeds the secondary drinking water standard.

If your water comes from your private well, it is not required to meet any of these standards. However, these standards are still recommended and provide good guidance for evaluating your water quality and safety in a private drinking water system.

To determine how safe your water is, first answer the question: Is my water from a public or a private system? If you receive a water bill, you are most likely on a public water system. Most homeowner associations that provide water service are public water systems. Typically, if you are not on a public system, you are connected to a private well.

Public water systems are required to test the quality of the water they deliver and to share the results with their customers. Contact the number on your water bill to request your water provider’s most recent sampling results or the annual Consumer Confidence Report that summarizes their testing over the past year.

Private well owners are responsible for ensuring that their own water quality is safe. The only way to ensure that your well water is safe is to arrange for testing with a certified laboratory. Contact San Juan Basin Public Health (CO) at 970-335-2030 and San Juan County Public Health (NM) at 505-327-4461 for more information.

WHAT THE DATA TELL US

Surface water for use as domestic water supply

Colorado and New Mexico set water quality criteria to protect surface water for the use as a domestic water supply. The Colorado reach of the Animas River from Bakers Bridge to the Southern Ute Indian Tribe is considered impaired for use as a domestic water supply due to high levels of dissolved manganese that exceed secondary drinking water regulations. As described in the above section, exceedances of secondary drinking water standards do not pose a threat to human health but indicate aesthetic concerns.

Public water systems

The Animas River watershed includes 47 public water systems in Colorado and 8 in New Mexico. If a public water system cannot deliver water that meets the Primary Drinking Water Standards, the EPA mandates that the water provider notify the public. In 2017, none of the public water systems in the Colorado portion of the Animas River watershed had testing results that required public notice to their customers; however, two of the public water systems in New Mexico did. Contact your water provider to obtain their annual testing results.

Do you know where your drinking water comes from?

- Silverton** – Bear and Boulder creeks
- Animas River Valley** – primarily from groundwater wells
- Durango** – primarily from the Florida River supplemented by Animas River water in the summer
- Aztec** – Animas River
- Farmington** – Animas River

Private wells

In 2016 and 2017, water from over 125 private wells in the Animas watershed in Colorado and New Mexico were sampled by San Juan Basin Public Health, Colorado Department of Public Health and Environment, and New Mexico Bureau of Geology and Mineral Resources.

In the Colorado portion of the Animas Valley:

- About 25% of wells tested showed bacteria present. Bacteria in well water can be naturally occurring or related to septic systems, fertilizer, or livestock.
- About 5% of wells tested showed unsafe levels of lead or arsenic. These metals can be naturally occurring or can be introduced from other sources.

In the New Mexico portion of the Animas Valley:

- Concentrations of metals associated with the Gold King Mine release, including iron, aluminum, manganese, lead, copper, arsenic, zinc, cadmium, and mercury, were below maximum contaminant levels as defined by the EPA National Primary Drinking Water Regulations.
- At several wells, iron and manganese were found at levels that did not pose a risk to human health, but did exceed EPA secondary maximum contaminant levels, which are non-enforceable guidelines regarding cosmetic or aesthetic conditions.

There was no geographic pattern as to where contamination occurred. You should not make any assumptions about your water based on your neighbor's water or on your water's taste, color, or odor. The only way to be certain about your well's drinking water quality is to have it tested on a regular basis.

FURTHER RESOURCES

- Colorado Department of Public Health & Environment, 2017 Annual Compliance Report (see Appendix A for list of violations that require public notice): <https://www.colorado.gov/pacific/cdphe/drinking-water-consumer-information>
- Envirofacts Safe Drinking Water Information System: <https://www3.epa.gov/enviro/facts/sdwis/search.html>
- Environmental Protection Agency—National Primary Drinking Water Regulations: www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations
- New Mexico Bureau of Geology and Mineral Resources (2017). Hydrogeology and Geochemistry of the Animas River Alluvial Aquifer after the Gold King Mine Spill: <https://geoinfo.nmt.edu/publications/openfile/details.cfm?Volume=592>
- San Juan Basin Public Health—Water Quality: <http://sjbpublichealth.org/waterquality/>

Actions you can take

Know where your water comes from (river, lake or groundwater) and who supplies it to you (public or private system).

Public water system customers should:

- Obtain and read the annual Consumer Confidence Report to know the quality of your drinking water.
- Contact your public water supplier if your water has an unusual color, smell or taste.

Private well users should:

- Arrange for your well to be tested. San Juan Basin Public Health recommends first-time sampling for arsenic, fluoride, hardness, iron, lead, manganese, nitrate/nitrite, pH, total dissolved solids and coliform bacteria.
- Install a filtration and treatment system on your well. Filtration and treatment systems can vary widely and should be selected specifically to treat any contamination found in your well test. There is no “one-size-fits-all” water filter. Some pollutant levels can fluctuate rapidly, so even wells that are tested and shown to be safe should have a basic water treatment system.
- Test your water annually for bacteria, nitrate and nitrite.

2 Is My Water Safe to Play In?

HOW “SAFE” IS DEFINED

Locals and visitors alike treasure recreation in the Animas River, whether it is boating, swimming, fishing, wading, or simply sitting and splashing. At least two types of pollutants can affect how safe it is to play in the Animas River: metals and bacteria (*E. coli*).

Metals

The EPA has established “recreational screening levels” for the Animas River that represent unsafe levels of metals in water and sediment for skin contact, as well as accidentally swallowing water or sediment. The screening levels incorporate assumptions about how often people recreate and how much exposure to water they have each time they recreate. These assumptions are deliberately set to err on the side of safety.

E. coli

E. coli is a type of bacteria that lives in the guts of animals and humans. If *E. coli* is in the river, it means that animals have reached the water. Colorado and New Mexico use the concentration of *E. coli* bacteria in rivers and lakes as an indicator of the risk of getting sick from swallowing that water, either on purpose or by accident. Both states consider a river or lake to be safe for recreation if the concentration of *E. coli* is lower than the standard that they set.

WHAT THE DATA TELL US

Metals

From 2015 to 2018, Colorado Department of Public Health & Environment, Mountain Studies Institute, San Juan Basin Public Health, and San Juan County, Colorado collected hundreds of water and sediment samples along the Animas River and compared the results against the recreational screening levels. All samples were far below the screening levels—they showed no unsafe levels of metals to recreationalists.

E. coli

In Colorado, all streams in the Animas watershed met the state's *E. coli* standard. However, the entire reach of the Animas River in New Mexico is considered impaired for recreational use due to high levels of *E. coli* (Figure 2).

Recent sampling by the Animas Watershed Partnership and the San Juan Watershed Group have demonstrated elevated levels of *E. coli* in the Florida River and the presence of human and ruminant-sourced *Bacteroides* in the New Mexico reach of the Animas River.

Photo: Jonathan Harvey



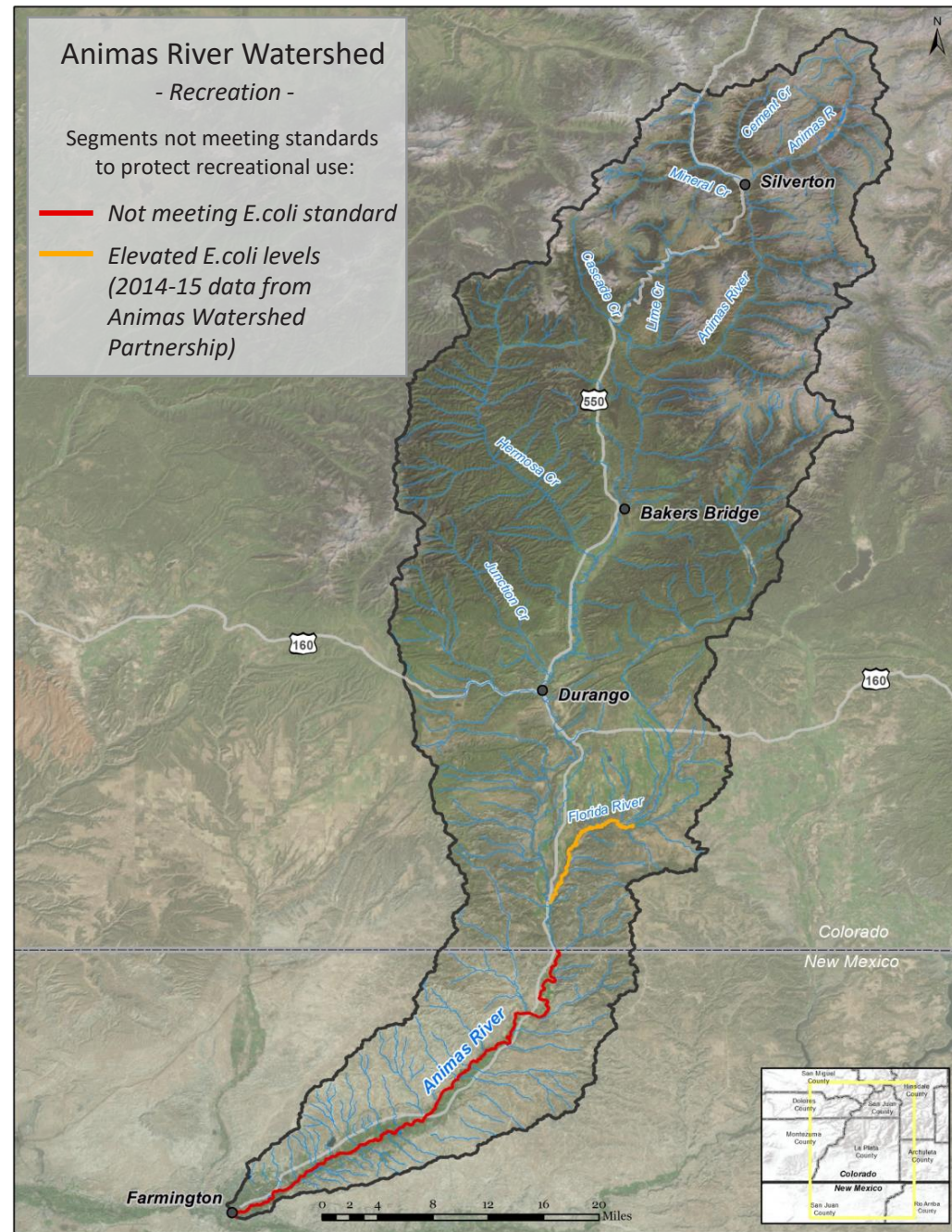


Figure 2. E. coli levels in the Animas River and its tributaries

3 Is Food Produced with My Water Safe to Eat?

HOW "SAFE" IS DEFINED FOR CROPS AND LIVESTOCK

Colorado and New Mexico consider water to be safe for livestock to drink and for irrigating crops if it meets standards for levels of specific pollutants, including certain metals, nitrate/nitrite (forms of nitrogen), and three different radionuclides (radioactive materials).

HOW "SAFE" IS DEFINED FOR FISH CONSUMPTION

Fish is another food that many people enjoy from the waters in our watershed. Fish caught in polluted waters sometimes can be risky to eat, because some pollutants may "bioaccumulate," or build up to higher concentrations in the fishes' bodies.

To protect people from these health risks, Colorado and New Mexico have identified standards for pollutants that have the potential to harm the health of people who eat fish caught in rivers and lakes. These standards address certain metals (including mercury) and organic compounds (such as PCBs and DDT). The standards set by the states are based on studies of the likely health impacts if a person consumes 17.5 grams of fish per day (equivalent to about one-sixth of a drained can of tuna).

Fish ingestion

The only water body in the Animas River watershed that is known to support fish but that does not meet the fish ingestion standards is Farmington Lake in New Mexico where fish tissue samples were found to have high levels of mercury and PCBs. In the neighboring Pine River watershed, Vallecito reservoir does not meet Colorado fish ingestion standards due to elevated levels of mercury in fish tissue.

Actions you can take

- Protect personal safety:**
 - Wash all garden and farm produce with treated water
 - Limit consumption of fish from Farmington Lake and Vallecito reservoir. See guidelines for consumption of types of fish: <https://www.colorado.gov/pacific/cdphe/wq-fish-consumption-statewide-guidelines>
- Protect the river:**
 - Dispose of household chemicals at periodic county collection events
 - Minimize use of pesticides, and be sure to apply them as directed
 - Support renewable energy and reduce emissions (fossil fuels are one source of mercury pollution)

WHAT THE DATA TELL US

Irrigation and livestock

Colorado and New Mexico have identified all stream segments and lakes in the Animas River watershed used for irrigation of crops and for watering of livestock as meeting the standards set to protect those uses.

FURTHER RESOURCES

- Colorado Fish Consumption Advisories: <https://www.colorado.gov/pacific/cdphe/wq-fish-consumption-statewide-guidelines>
- New Mexico Fish Consumption Advisories: <https://www.env.nm.gov/swqb/advisories/>

Actions you can take

Protect personal safety:

- Do not drink river water
- Wash your hands after playing in the river and before eating
- Wash your body after a day of playing in the river

Protect the river:

- Maintain your septic system as recommended

- Manage livestock away from streams
 - Maintain or restore riverside vegetation to filter runoff
 - Pick up and dispose of your pet's waste
- Further resources

FURTHER RESOURCES

- Animas Watershed Partnership: <http://animaswatershedpartnership.org>
- San Juan Basin Public Health: <http://sjbpublichealth.org/waterquality>
- San Juan Watershed Group: <https://sanjuanswcd.com/watershed>

4 Is the River Safe for Fish and Wildlife?

HOW “SAFE” IS DEFINED

Safe means that all wildlife that live in or use the Animas River and its tributaries are not harmed when using the water. Most birds and mammals drink river water. Some wildlife, like macroinvertebrates, fish, beaver, otter and American dipper, also depend upon the river and wetland environments for their homes and food.

Animals and plants that live all or part of their life in streams and lakes are the most sensitive to water quality and therefore require the most restrictive or “safe” criteria of all the uses protected by water quality standards. To protect the animals and plants in streams and lakes, Colorado and New Mexico identify safe levels of physical habitat conditions, such as dissolved oxygen, temperature and sedimentation, as well as a wide range of pollutants including metals and organic chemicals.

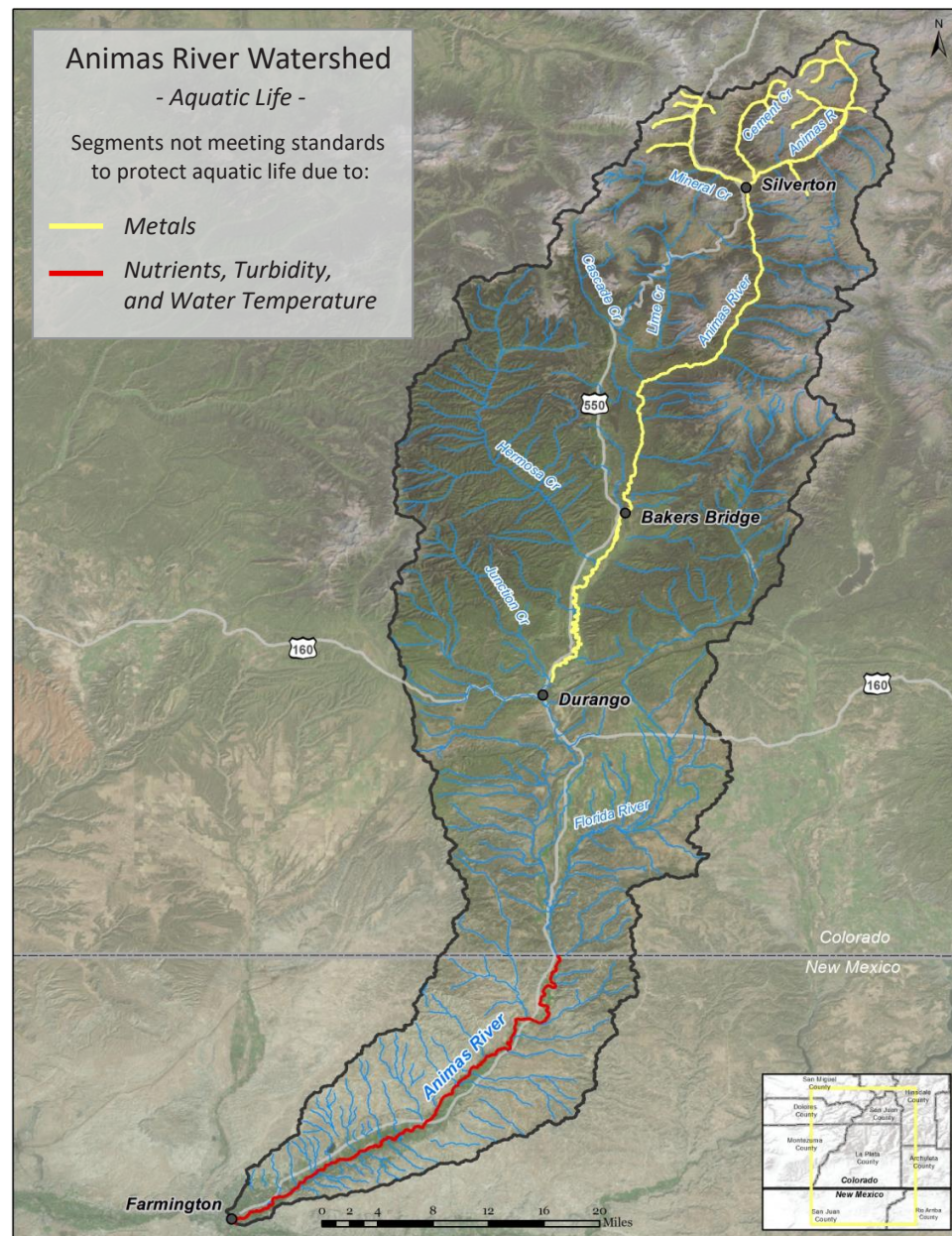
To assess the safety of the Animas River for wildlife, we present monitoring results related to:

- a) Habitat conditions & water quality
- b) Benthic macroinvertebrates
- c) Fish
- d) American dipper

Figure 3. Aquatic life standards in the Animas River and tributaries. Note: segment is either identified as impaired, or goals have been set to address impairment through the establishment of a total maximum daily load (CDPHE Reg. 34; NM Surface Water Quality Bureau).

WHAT THE DATA TELL US: HABITAT CONDITIONS

The states of Colorado and New Mexico provide an assessment of whether water bodies can support aquatic life based on observed habitat conditions (temperature, dissolved oxygen) and measured levels of contaminants (excessive metals or nutrients). Based on the 2018 assessment used in developing this publication,



Colorado considers most water bodies in the Animas watershed to be capable of supporting aquatic life.

However, several segments of the Animas River (and its tributaries) upstream of Junction Creek have levels of metals that are high enough to cause concern for aquatic life (see Figure 3). The high levels of metals observed in these segments are likely the result of the natural geology and of the legacy of mining in the Silverton area. The state of New Mexico considers the entire New Mexico reach of the Animas River to not meet safe criteria for aquatic life because of excessive nutrient levels (nitrogen and phosphorus), turbidity and elevated water temperatures. The sources of this contamination include surrounding land uses and the natural geology of the lower watershed.

During the summer of 2018, the 416 Fire burned 54,000 acres primarily in the Hermosa Creek drainage north of Durango, CO. Ash and sediment delivered from the burn area during storm events resulted in degraded water quality and reports of fish kills in Hermosa Creek and the Animas River. Continued monitoring will examine the extent and duration of impacts from the 416 Fire to Animas River habitat condition and aquatic life.

WHAT THE DATA TELL US: BENTHIC MACROINVERTEBRATES

In addition to habitat conditions and levels of pollutants, the state of Colorado uses observations of benthic macroinvertebrate (BMI) communities as indicators of the health of a stream for aquatic life. BMIs are organisms that live on the river bottom—in the rocks, sand and sediment—and are big enough to see with the naked eye. As such, contaminants that settle in or on the river bottom will affect the health and condition of the macroinvertebrate community as well as of the fish, birds and other species that depend upon these organisms for food.

BMI communities make great indicators of water quality and stream health because:

- they are key to the aquatic and riverside food chain;
- they are diverse, with a wide range of habitat requirements, food sources, life spans and tolerances to pollution; and
- they are intimately tied to their habitat and are exposed to possible contaminants in sediment and in the water column.

Colorado uses a bioassessment tool called the Multi-Metric Index (MMI) to quantify the extent to which biological communities may have been altered by environmental stressors such as habitat conditions or water quality contaminants. MMI scores are evaluated in comparison to MMI scores from known undisturbed sites and disturbed sites in Colorado. The state sets MMI thresholds that can be used to evaluate whether a water body is in attainment or impairment of designated aquatic life use. Based on MMI scores that suggest a stressed benthic community, the state of Colorado considers the reach of the Animas River from Bakers Bridge to the Southern Ute Indian Tribe to be provisionally impaired. Recent surveys by Mountain Studies Institute from 2014-2018 indicate that according to MMI scores, the benthic community was in attainment at several locations: Animas River at Baker's Bridge; Animas River at James Ranch; Animas River at the confluence with Lightner Creek; and Animas River at Purple Cliffs below Durango. However, Mountain Studies Institute reported MMI scores that indicate impairment of the Animas River benthic community at the confluence with Elk Creek in the Animas River canyon and at 32nd street in Durango.

HOW ARE THE FISH DOING?

Fish require river ecosystems for their existence. Fish communities use the variety of underwater habitats that a river creates and maintains. Fish are good indicators of the overall river condition because they depend on these habitats to complete every stage of their life cycle, from egg to spawning adult, and because they depend on aquatic plant life, macroinvertebrates and/or smaller fish for their food.

Biologists assess the health of a population of fish by measuring the number of fish in each age class. As with humans, a healthy fish population needs young, adult and old fish. A population with many old fish and few young or adult fish may not be able to grow or even maintain its size or genetic diversity.

Biologists assess the health of fish habitat by the community of fish species it can support. The total number of individuals and the total number of species indicate a food web that provides for all species. Changes in factors including flow, water quality, sedimentation and macroinvertebrate production affect these indicators. The availability of habitat features



Photo this page: Joe Lewandowski - Colorado Parks and Wildlife

such as pools, riffles and cover are key to maintaining healthy populations and communities of fish.

Fish communities change upstream to downstream because of changes in elevation, temperature, flow, water quality, precipitation, climate, geology and other factors that create their habitat. The Animas River begins at high elevation in small, cold headwater streams. Flow increases downstream as the river drops to lower, warmer elevations, draining more area. Like many rivers in Colorado, cold water species such as trout dominate the Animas River in the higher elevations. Downstream of Durango, a transition occurs where trout diminish and warm water fish begin to appear and then dominate, due to warmer water temperatures.

Native, introduced, stocked, and invasive fish species all exist in the Animas River. Native fish evolved in the Animas River and other tributaries of the San Juan River. The native cold water fish in the Animas is the Colorado River cutthroat trout. Native warm water fish include mottled sculpin, speckled dace, roundtail chub, bluehead sucker and flannel mouth sucker. The Animas River has some of the few remaining Colorado River cutthroat trout populations – in Hermosa Creek, the Bear Creek tributary to Mineral Creek, the Bear Creek tributary to the Animas, and Grasshopper Creek.

Introduced species are those that people have placed into the river. Some species were introduced long ago and persist without additional stocking. This is true for Animas River brook and brown trout populations. Colorado Parks and Wildlife, the Southern Ute Tribe, and the New Mexico Department of Game and Fish

routinely stock rainbow trout of different sizes into reaches of the Animas River in order to maintain and enhance fishing opportunities in the watershed.

Invasive fish are non-natives that get into the river but are undesirable because they tend to out-compete native or desired fish for habitat and food. Many, such as green sunfish and carp, end up in the river when people dump bait or unwanted pets into a river.

WHAT THE DATA TELL US: FISH

Segment 1: Animas River Headwaters (Figure 4)

Historically, the headwaters of the Animas River had Colorado River cutthroat trout in streams not influenced by the highly mineralized caldera geology. Many streams located in the caldera are naturally devoid of fish due to low pH (acid) and high metal concentrations. In other streams, steep gradients limit fish habitat. Anecdotal evidence suggests that historic mining activities contributed to loss of the small and isolated native fishery communities in these headwaters.

Brook and rainbow trout were introduced initially to provide food. Colorado Parks and Wildlife ceased stocking rainbow trout in this segment in the mid 1990s. A healthy population of brook trout exists in the Animas River upstream of Cement Creek (with some rainbow and cutthroat trout individuals as well). The length frequency distribution data for the Animas River at Howardsville show a range of fish sizes/ages, from young of year to older, egg-laying adults.

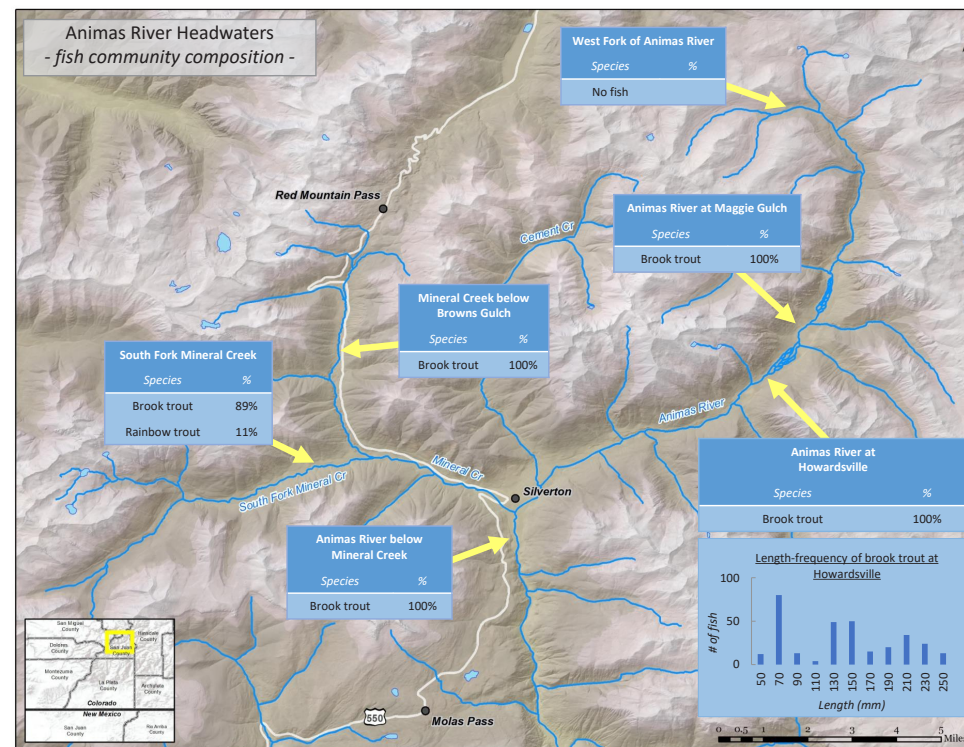


Figure 4. Fish presence/absence sampling data in Segment 1: Animas River headwaters (Colorado Parks and Wildlife, 2016)

Segment 2: Animas River Canyon (Figure 5)

The Animas Canyon is difficult to access, so there are few sampling stations in this segment. In many healthy rivers, the fishery increases in individuals and species as sampling moves downstream. This is not the case for this segment of the Animas River. The fishery here supports very few individuals, primarily brook trout, although brown trout and rainbow trout have been collected. Low numbers of individuals and species, as well as a community comprising solely adult fish, indicate an unhealthy environment for fish in most of the Canyon. Cutthroat and rainbow trout are the most sensitive to the elevated metals present in this reach, then brown and brook trout.

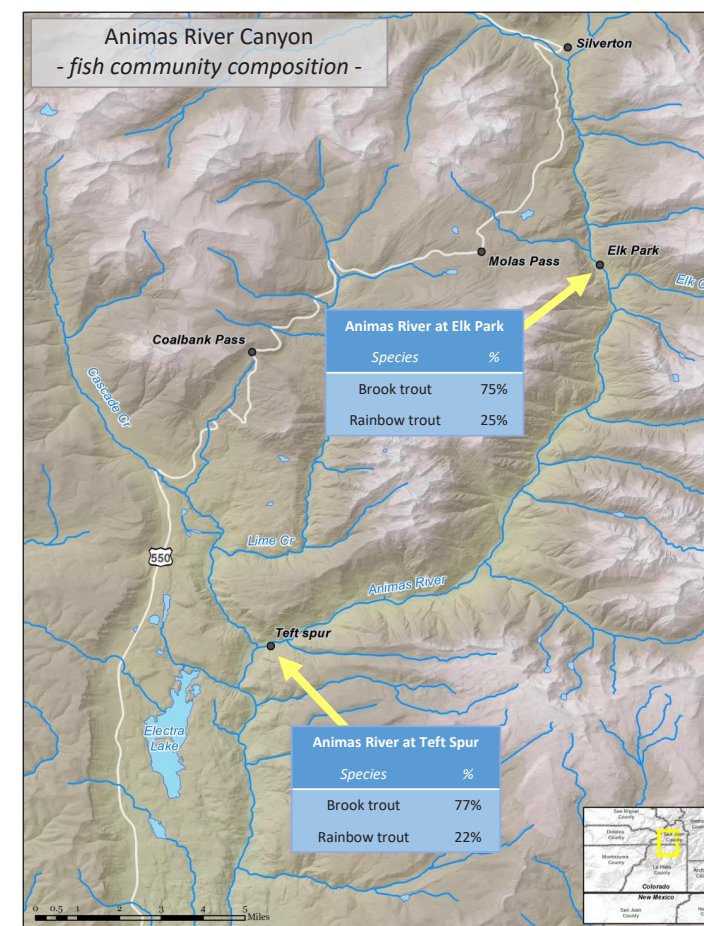


Figure 5. Fish presence/absence sampling data in Segment 2: Animas River Canyon (Colorado Parks and Wildlife, 2016)

Segment 3: Animas River Valley and Durango (Figure 6)

Through this segment the Animas transitions from a steep canyon to a flat valley, then again increases its gradient and gradually shifts from a cold to a warm water fishery. The number of species increases downstream. Sampling data show a mix of native, introduced and invasive fish, both cold and warm water species.

South of Highway 160 the Animas River supports a Colorado Parks and Wildlife-designated Gold Medal Trout fishery. To qualify as a Gold Medal water, a river must support a minimum of 12 "quality trout" of 14 inches or larger per acre.

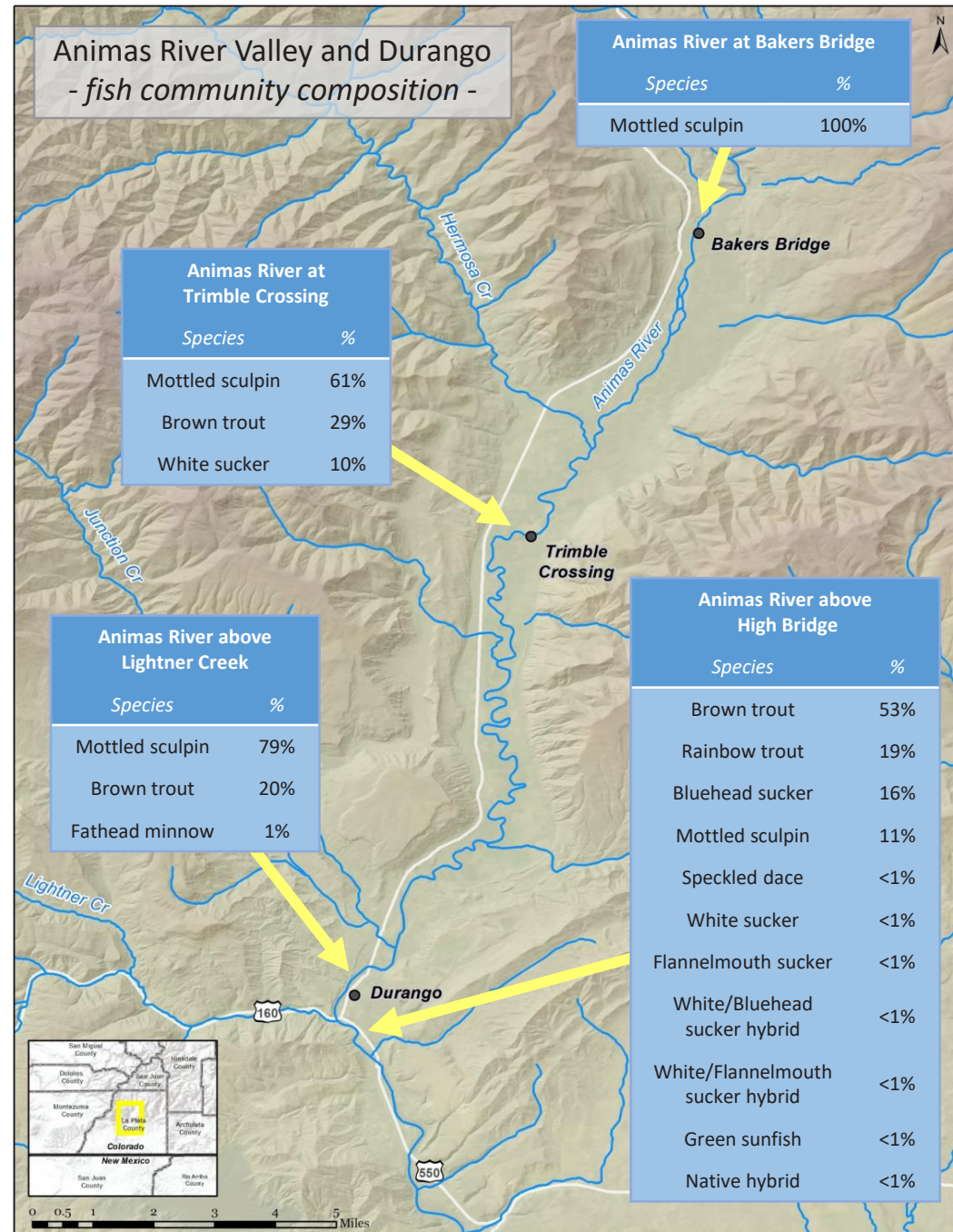


Figure 6. Fish presence/absence sampling data in Segment 3: Animas River Valley (Colorado Parks and Wildlife, 2016)

Segment 4: Animas River Southern Ute Tribal Waters (Figure 7)

As the Animas transitions from a cold to a warm water system, the numbers of trout decline, and warm water fish increase. Populations of mottled sculpin, speckled dace, and white, bluehead, and flannel mouth suckers increase downstream. Some invasive green sunfish and fathead minnows also occur. Downstream, water

withdrawals and diversions remove water from the river, and can degrade habitat for some types of fish by reducing flows and increasing water temperature. However, mottled sculpin and speckled dace appear to be adapted to these conditions.

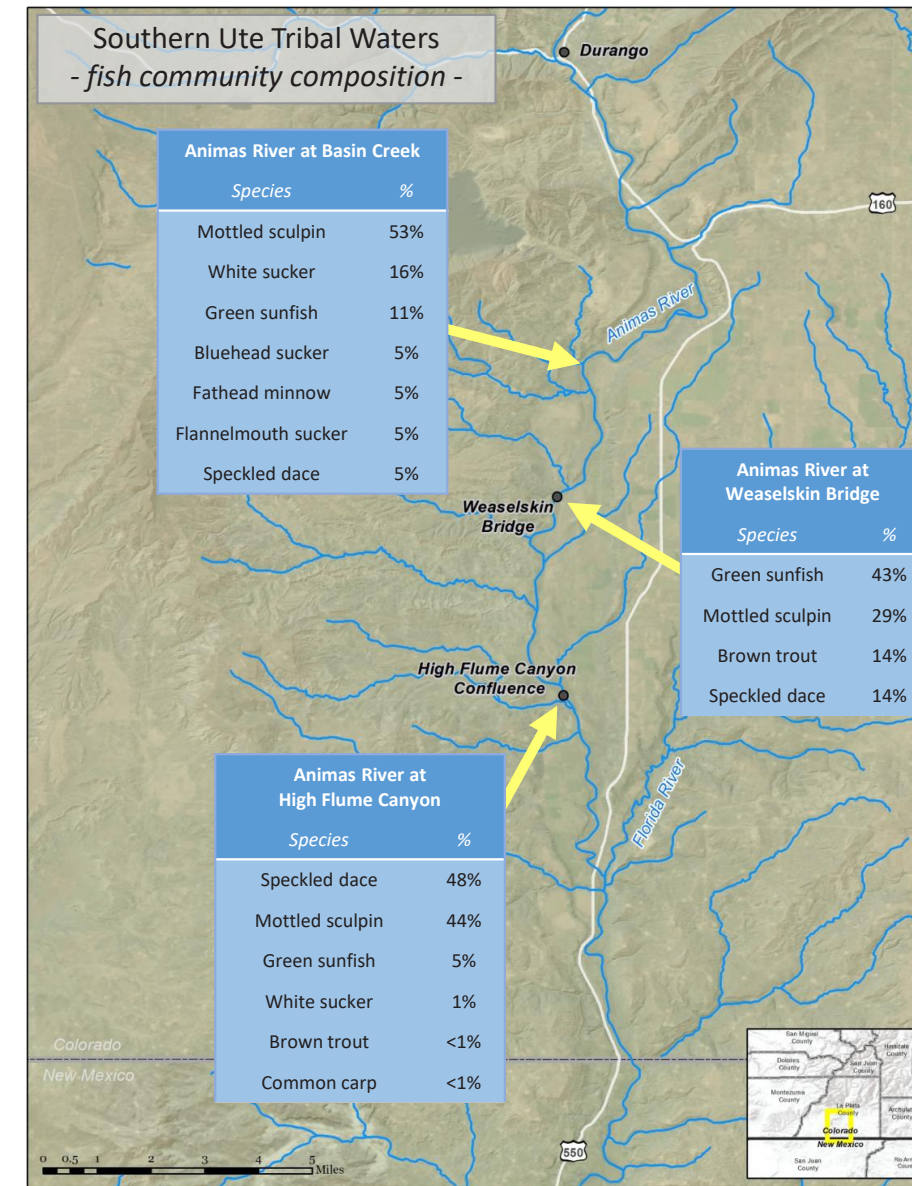


Figure 7. Fish presence/absence sampling data in Segment 4: Animas River Southern Ute Tribal Waters (Colorado Parks and Wildlife, 2016)

Segment 5: Animas River in New Mexico

The New Mexico reach of the Animas River is dominated by bluehead sucker, flannelmouth sucker, and speckled dace. Two federally listed endangered fish that are native only to the Colorado River basin,

Colorado pikeminnow and Razorback sucker, have been released in the Animas River near the confluence with the San Juan River by the U.S. Fish and Wildlife Service to establish self-sustaining populations.



American dipper. Photos this page: Robert Winslow

WHAT THE DATA TELL US: BIRDS AND WILDLIFE THAT DEPEND ON THE RIVER

Most birds and wildlife species use the river not just for drinking water, but also for the food and habitat it provides along the river corridor.

Many birds prefer to nest in dense thickets near the river or its tributaries. At least 210 bird species use the Animas watershed on either a year-round, seasonal or migratory basis. Many of these species use wetland or riparian habitat at some time during their lives. Annual bird surveys indicate a substantial decline in the number of birds observed since 1966.

Some wildlife, such as the beaver, otter and American dipper, spend a large part of their lives in a river's waters, not just on its banks. American dippers are amazing birds, because although they are songbirds, their behavior is more like a duck, as they dive underwater, float down small rapids and sing a lovely and bubbling song.

Dippers spend their lives along river corridors and are commonly seen in the Animas River in Durango during the winter and spring. Dippers do not migrate south the way most other songbirds do. Instead, they migrate uphill, moving from Durango to spend summer months living in higher mountain streams.

Dippers forage for invertebrates and small fish by walking, swimming and diving in the water; therefore they have a higher risk of accumulating toxins from river sediments than other bird species. For this reason, American dippers are great indicators of a healthy mountain water system.

Dippers prefer to build their nests close to moving water, usually on a rock cliff or under a bridge. In 2016, a group of bird watchers with the American Dipper Project began monitoring dipper nests on the Animas River and its tributaries. Their surveys in 2016 and 2017 revealed that the bird's populations are healthy on the Animas River in Durango and on tributary streams, but are non-existent or impaired upstream from town.

Actions you can take

- Maintain or restore native riverside vegetation to filter runoff and avoid erosion
- Join the American Dipper Project and other citizen science efforts.
- Don't flush any pet fish species down the toilet or release them into area rivers, lakes, ponds or ditches. Also, don't release your pet frogs, toads or turtles outside.
- Bury your bait: do not dump it in any river, pond or lake.

5 How is the Overall Function of the Animas River System?

HOW YOU TELL IF THE RIVER IS "HEALTHY"

If the Animas River went to the doctor for a check-up, what would the Doc measure to gauge how healthy the system is and how well it can recover from injury? Indicators that the doctor might measure include the pattern of flows in the river, channel stability and the ability of water to escape the banks when flows are high, the diversity and quantity of aquatic life the system supports, and how diverse and intact the riparian zone (the area along the riverbanks) is. Just as with human weight, blood pressure and temperature, each of these indicators tells part of the story of overall river health and resilience.

WHAT THE DATA TELL US

Flows

The pattern of high and low flows in a river is called the flow regime. Similar to the blood flow in a person, the flow regime of a river determines the condition and function of that river. High flows move rocks and sediments around to form and clean the variety of habitats for fish and bugs.

Flood flows carry and deposit sediment and nutrients on the floodplain, preparing the way for riparian plants to lay down seed. Low flows sustain riparian and aquatic life through the heat of summer and the cold of winter.

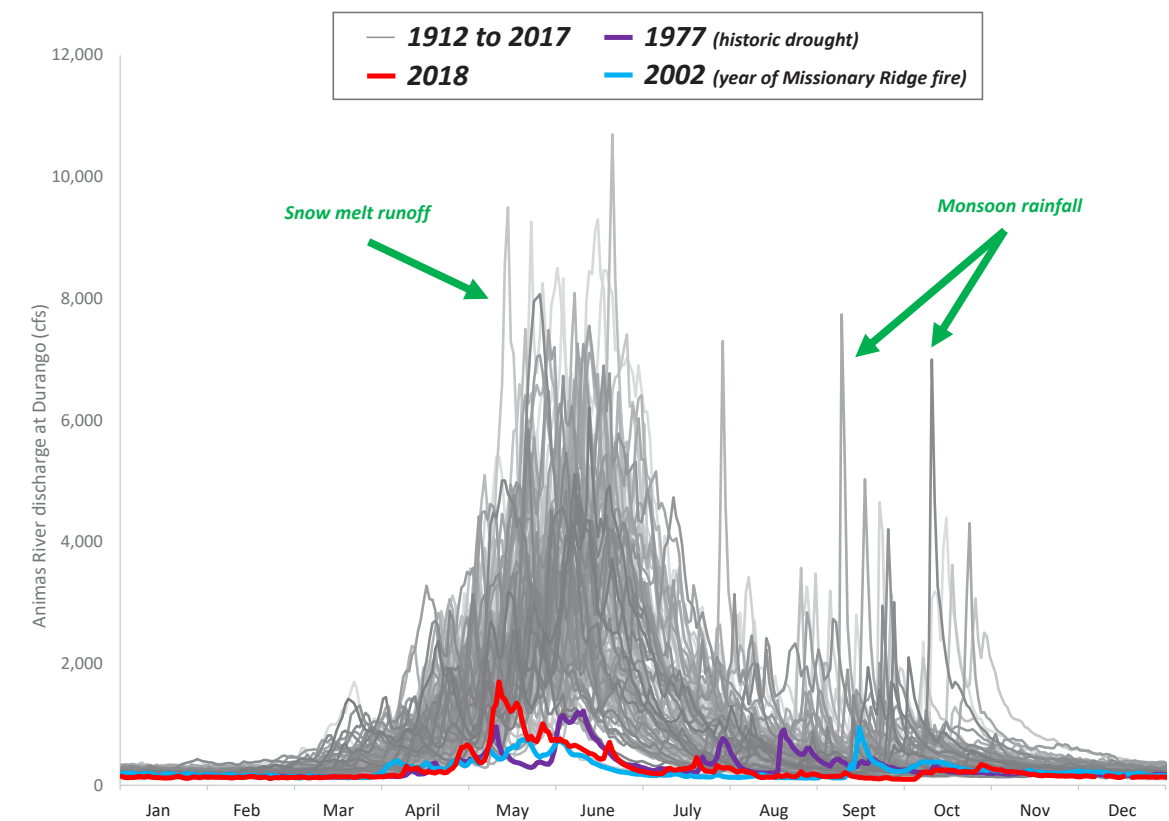


Figure 8. Flow in the Animas River at Durango from 1912 to 2018 (United States Geological Survey data)



Photos: Mountain Studies Institute

Photo: Ryan Cox

Around the world, dams built to store water have significantly changed the flow regime on many rivers. But the Animas River is not dammed, and the overall pattern of seasonal flow regime has changed little. However, the actual timing of when the river increases and decreases throughout the year is highly variable from year to year, as shown in Figure 8.

Typically, the highest flows of the year on the Animas occur in the spring driven by melting snow, and the lowest flows of the year occur between November and February. While high flows driven by snowmelt have typically occurred in May and June, flow data from recent years demonstrate that peak snowmelt is occurring earlier in the year and is shorter in duration and magnitude. Monsoon-season storms and late-season tropical storms can also cause high flows on the Animas River and lead to flooding.

Channel, banks and riverside vegetation

The channel, banks and riparian vegetation vary from point to point along a river's edge and contribute to the overall health and function of the river system. The Animas River has natural areas of constriction, such as the narrow canyon found at Baker's Bridge, as well as natural flat openings where flooding occurs. Rivers need both of these to maintain equilibrium in flows, especially during extreme events.

Together, the narrow channels and wide banks of the Animas river system allow it to cycle nutrients, assimilate pollutants, transport energy and deliver nutrients from upland, which provides a food source for aquatic organisms. Flooding recharges the groundwater, which is the primary flow of the river in the wintertime. Maintaining the natural channel and undeveloped space along the river's edge allows the river to perform these and other healthy river functions.

In the Animas River Watershed, there are stretches of the river where the channel, banks, and riparian vegetation are very healthy and there are stretches where these components are significantly degraded. Human development near the river's edge, aging irrigation infrastructure, and other human activities have altered the natural function of the river and contributed to the degradation of aquatic habitat and water quality.

Fortunately, watershed groups like the Animas Watershed Partnership and the San Juan Watershed Group are working hard to repair and improve these natural functions. Projects to restore healthy riparian vegetation, streambanks, wetlands, and floodplains have been completed across the watershed and projects to improve agricultural best management practices and irrigation infrastructure are currently underway.

Whenever you walk, drive or float along a section of the Animas River, study the channel, banks and bottom. Ask yourself the following questions to help you judge the health of the Animas River:

- Can the river water escape the banks at higher flows to deposit sediment and nutrients on the floodplain?
- Are there a variety of different habitats for fish and bugs within the channel (deep pools, shallow riffles, overhanging banks, logs, etc.)?

- Are the gravels and cobbles on the river bottom clean enough to provide spaces for bugs and baby fish, or are they clogged with silt?
- Is there a dense overstory and understory of trees, shrubs and plants with roots to hold the riverbanks and provide cover for wildlife?
- Are the plants that you see mostly native to the valley, or are they non-native and invasive?



Flooded banks of the Animas River when the flow reached 8,500 cubic feet per second in late May 2005

Did you know that the largest flood recorded on the Animas River occurred on October 5, 1911 as a result of a tropical storm?



Photo:Hank Blum

7 What is Impacting the Natural System?

Natural events and human activities impact the Animas River system. Impacts can have positive, neutral or negative effects on a system. Impacts to a river system can come in physical, biological or chemical forms.

- Physical impacts include drought, wildfire, floods, sedimentation, erosion, rip rap, dams, diversions and dredging.
- Biological impacts can include bacterial pollution, algal blooms, invasive plants and animals, shifts in species composition, loss of native plant or animal populations, and revegetation.
- Chemical impacts include changes in the pH and/or the amount of chemicals such as metals, nutrients, salts, medicines, pesticides and solvents in the river.

As discussed in question 4, segments of the Animas River and certain tributaries within the watershed are recognized as being impacted by elevated metals, E. coli bacteria, turbidity, excessive nutrients, eutrophication, and warm water temperatures. Many of these impacts are from “nonpoint” sources of pollution that people can manage in order to maintain a healthy, resilient Animas River system. Whereas “point” sources of pollution (i.e., pipes that discharge to the river) require permits and are regulated, “nonpoint” sources of pollution are not regulated and so depend on the voluntary action to address pollution reaching the river.

Runoff from agriculture, forestry and residential areas outside the cities is not regulated by a permit

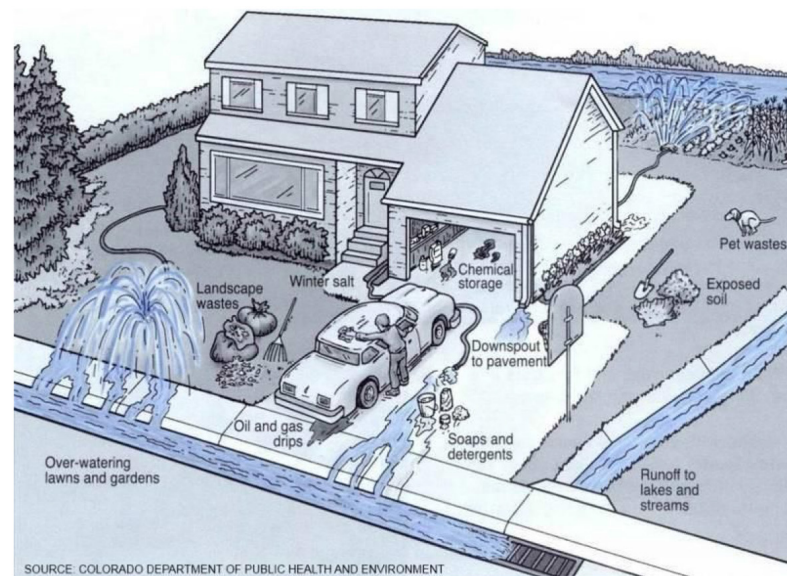


Figure 12. What you do at home matters to the river

system. In these areas, keeping soil and pollutants from entering waterways depends on communities implementing best available knowledge and techniques (“Best Management Practices”).

Communities along the Animas River depend on the river’s ability to absorb and mitigate our wastewater

Eutrophication occurs when excessive nutrients in a waterbody cause the overgrowth of algae that can deplete the oxygen supply in the water, killing aquatic life.

What human and/or natural influences on the Animas River have you observed?

How do you think they affect the river’s ability to be resilient?

and runoff as climate change continues to alter the amount of snow and rain falling on Southwest Colorado, the Animas River may not be able to absorb and process pollutants as well as it has in the past.

The graphic on the next page shows some common connections between what happens on the land and how that can influence our rivers and streams.

FURTHER RESOURCES

Urban and Residential Best Management Practices:

- Animas Valley: https://www.colorado.gov/pacific/sites/default/files/atoms/files/ADWA_SWPP_Outreach_Flyer_2017.03.21.pdf
- Florida River Valley: <http://www.durangogov.org/DocumentCenter/View/1077>
- City of Durango: <http://www.durangogov.org/stormwater>
- City of Aztec: <http://www.aztecnm.gov/waterplant.html>
- City of Farmington: <http://www.fmtn.org/306/Stormwater-Management>
- Colorado Roadway Best Management Practices: <https://www.codot.gov/programs/environmental/water-quality/stormwater-programs/stormwater-programs.html>

Agricultural Best Management Practices:

- NRCS Conservation Planning—Colorado: <https://www.nrcs.usda.gov/wps/portal/nrcs/main/co/technical/cp>
- NRCS Conservation Planning—New Mexico: <https://www.nrcs.usda.gov/wps/portal/nrcs/main/nm/technical/cp>

Actions you can take

- Learn about and implement the Best Land Management Practices wherever you can (see links below under “Further resources”). Encourage others to do the same!
- Maintain your septic system as recommended to avoid bacterial pollution
- Manage your livestock away from streams
- Dispose of household chemicals and motor oil properly
- Wash your car at the carwash to minimize runoff into streams
- Minimize the amount of fertilizer applied to your lawn
- Follow instructions very carefully if you need to apply pesticides
- Use water conservation practices
- Dispose of all medicines at local collection points – never flush medicine down the toilet or sink

Recreation Best Management Practices:

- Leave No Trace Principles: <https://int.org/learn/seven-principles-overview>

Disposal of Drugs and Hazardous Products:

- Disposal of Hazardous Products in Durango, Colorado: <http://www.durangogov.org/index.aspx?NID=373>
- Disposal of Hazardous Products in Farmington, New Mexico: <https://farmingtonnm.org/events/household-hazardous-waste-collection/>
- Disposal of Prescription Drugs in Colorado: <https://www.colorado.gov/pacific/cdphe/colorado-medication-take-back-program>
- Disposal of Prescription Drugs in New Mexico: <https://nmhealth.org/news/information/2017/10/?view=637>

Water Conservation:

- Colorado Waterwise: <http://coloradowaterwise.org/>
- New Mexico Water Use and Conservation: <http://www.ose.state.nm.us/WUC>

Animas River

WATER QUALITY IMPACTS

1 RESIDENTIAL

Homes and lawns



- Chemical runoff: fertilizers, herbicides, insecticides, household products, de-icers.
- Pet waste runoff.
- Vegetation removed from stream banks.
- Floodplain wetlands drained or filled to create dry building sites.
- Riverbanks stabilized with rock or concrete to protect homes from channel movement.

Septic Systems



- Human wastes, medicines and cleaning agents leaking into groundwater and/or surface water from malfunctioning septic systems.

Waste Water Discharge



- Permitted discharge of nutrients and bacteria, temperature.
- Discharge of unregulated pollutants, such as medicines.

2 AGRICULTURE

Cultivated Fields



- Soil erosion and runoff.
- Chemical runoff: pesticides, herbicides, insecticides.
- Vegetation removed from stream banks.
- Wetlands drained and/or filled.

Livestock Pastures



- Soil erosion and runoff.
- Manure runoff.
- Streamside vegetation may be suppressed or lost due to heavy livestock browsing.
- Chemical runoff: pesticides, herbicides, insecticides.

Irrigation Diversions



- Annual disturbance of channel bottom and/or banks.

What is impacting the natural system?

This infographic was created to illustrate the key activities and their potential effects and influences on the river system.

Key impacts on our Animas River water:

- Sedimentation of channel bottom
- Loss of channel stability due to channel widening
- Decreased flow to support fish and bugs
- Shallower, warmer river
- Changes in plants, bugs, fish, birds and other wildlife
- Increase in pollutants such as sediment, nutrients, metals, bacteria and medicines
- Channel-bed down-cutting
- Altered flow regime
- Increase in stream temperature and algae growth
- Decrease in clarity and dissolved oxygen

3 INDUSTRY

Oil and gas well pads, roads and pipelines.



- Chemical runoff: herbicides, oil, fracking chemicals, produced water.
- Riverbanks stabilized with rock for protection from channel migration.

4 RECREATION

Parks, Sport Fields and Golf Courses



- Chemical runoff: fertilizers, herbicides, insecticides, household products.
- Pet waste runoff.
- Impervious parking lots and roads cause excessive runoff.
- Vegetation removed from stream banks.
- Floodplain wetlands drained or filled.
- Riverbanks stabilized with rock for protection from channel migration.

Poorly planned and "rogue" trails



- Erosion and soil runoff to streams.

Illegal camping



- Human waste, trash and/or soil runoff into surface water.

5 CONSTRUCTION & URBAN AREAS

Buildings and Roadways



- Soil erosion and runoff to streams and rivers.
- Increase in impervious surface: pavement and roofs do not absorb runoff.
- Vegetation removed from stream banks.
- Floodplain wetlands drained or filled.
- Impervious parking lots, roads, and roofs cause runoff of contaminants.
- Riverbanks stabilized with rock for protection from channel movement.

Culverts and Bridges



- Sediment deposition in the channel.



Photo: Joe Lewandowski - Colorado Parks and Wildlife

8 Can the River Sustain Impacts?

In question 7, we examined what is impacting the river system. Now, we want to examine how the river responds to those impacts. The river's ability to sustain negative impacts is often described as resiliency, or assimilative capacity: the ability of the system to absorb impacts and still retain its basic function.

Resilient river systems can withstand or bounce back from significant disturbance. Resiliency depends upon both the condition of the river before the impact and on the magnitude, frequency and duration of the exposure to that impact. Plants, animals, people and the river have different exposure thresholds or limits before harm occurs from a given impact, such as elevated zinc in river water. If the exposure to the impact is greater than the system's ability to absorb it, then harm will occur.

Some natural "disasters," such as fire and flood, are important triggering events for some species to flourish. For example, cottonwood trees depend on high, overbank flows (i.e., floods) to deposit sand and gravel where their seeds can establish and survive. The changing climate in the Southwest is altering the frequency, duration,

amount and timing of rain and snow. These changes influence the risk of fires and floods, leading to longer-term, as yet unknown, changes in the river system.

People often hope to maintain resiliency in the face of various, necessary impacts, such as discharge of wastewater effluent into the river. Maintaining resiliency while continuing these impacts depends on finding ways to minimize the risk that the impacts pose to the river system.

EXPOSURE

Exposure to an impact is the combination of three determinants: magnitude, frequency and duration of the impact. Magnitude refers to the size or extent of something, such as the level of zinc. Frequency refers to the rate at which something occurs or is repeated, such as daily, weekly, or monthly. Duration refers to the amount of time that something occurs, such as how long a storm event lasts (Figure 13).

ACUTE VERSUS CHRONIC EXPOSURE

Any of the three determinants of exposure can produce an "acute" exposure or a "chronic" exposure. Usually, acute exposure is high magnitude, happens once and is short. Acute exposure results in loss of the organism or severe damage to the system.

Examples of acute exposure in the Animas River system include:

- In June 1978, Lake Emma collapsed into the mine workings below, out the mouth of the Sunnyside Mine, and eventually reached the Animas River, killing fish as far downstream as Farmington, New Mexico.
- Following the Missionary Ridge fire in 2002, and again after the 416 fire in 2018, storms washed ash and sediment into rivers, killing fish and impacting water quality in the reaches immediately downstream of the burned areas.

In both examples, the fish populations were resilient, quickly repopulating the impacted reaches.

In contrast, chronic exposure is low magnitude, happens frequently and is longer in duration. Chronic exposure causes long-term stresses and changes.

Examples of chronic exposure in the Animas River include:

- Decades of legacy mining sites releasing metals into the Animas River and slowly changing or eliminating fish or macroinvertebrate life downstream.
- Persistent drought conditions occurring almost every year for over a decade that can slowly lower soil and groundwater levels, and impacting vegetation, wildlife, people, and the ability of the river to dilute and absorb pollutants.

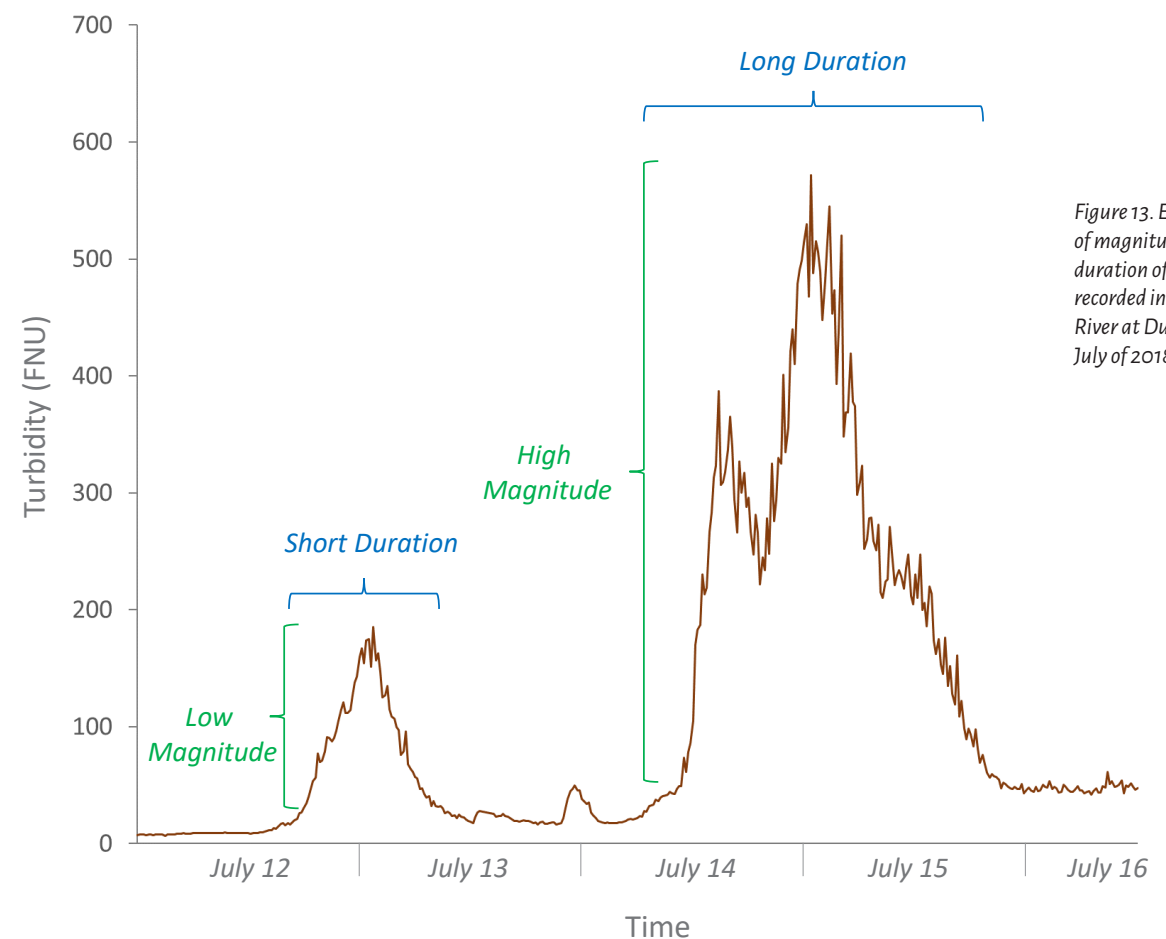


Figure 13. Example of magnitude and duration of turbidity recorded in the Animas River at Durango in July of 2018.



Photo (left): Joe Lewandowski - Colorado Parks and Wildlife | (right): Jeremy May - Mountain Studies Institute

Ways You Can Learn More

As you have seen, assessing the safety and resiliency of the Animas River is valuable. Collecting the data needed for these assessments is a big job. Many local, state and national organizations, both governmental and non-governmental, help collect this data.

Engage, volunteer, and donate to Community groups!

- Animas River Community Forum, www.animasrivercommunity.org
- Animas River Stakeholders Group, www.animasriverstakeholdersgroup.org
- Animas Watershed Partnership, www.animaswatershedpartnership.org
- Bonita Peak Mining District Community Advisory Group, www.bonitapeakcag.org
- San Juan Clean Water Coalition, www.sanjuancleanwater.org
- San Juan Watershed Group, www.sanjuanswcd.com/watershed
- Trout Unlimited 5 Rivers Chapter, www.fiveriverstu.org

Other entities conducting monitoring, research, or management in the Animas River watershed:

- Bureau of Land Management, <https://www.blm.gov/office/tres-rios-field-office>
- City of Durango, <http://durangogov.org/utilities>
- Colorado Department of Public Health and the Environment, <https://www.colorado.gov/cdphe>
- Colorado Department of Reclamation, Mining, and Safety, <https://mining.state.co.us/Pages/Home.aspx>
- Colorado Division of Water Resources, <https://www.dwr.state.co.us/SurfaceWater/default.aspx>
- Colorado Parks and Wildlife, <https://cpw.state.co.us>



Photo: Reddit

- Fort Lewis College, <https://www.fortlewis.edu>
- New Mexico Environment Department, <https://www.env.nm.gov/river-water-safety>
- Mountain Studies Institute, www.mountainstudies.org
- San Juan Basin Public Health, www.sjbpublichealth.org
- Southern Ute Indian Tribe, <https://www.southernute-nsn.gov/justice-and-regulatory/epd/water-quality>
- U.S. Bureau of Reclamation, <https://www.usbr.gov>
- U.S. EPA Bonita Peak Mining District Super Fund Site, <https://cumulis.epa.gov/supercpad/cursites/csinfo.cfm?id=0802497>
- U.S. Geological Survey, <https://co.water.usgs.gov/infodata/Animas/index.html>
- U.S. Forest Service, San Juan National Forest, <https://www.fs.fed.us>

RISK

An impact to a river system carries risk. Risk is the chance that the impact may cause harm to the system. Some impacts, like drought and wildfire, combine to increase risk to the river. Also, multiple impacts happening simultaneously can increase the risk to the system's resiliency.

While risk is difficult to eliminate, people who depend on and value the river often seek ways to minimize the risk that the river will lose its ability to absorb impacts.

Examples of such "risk management" strategies include best management practices in forestry and agriculture, improving technologies for wastewater management or irrigation, water quality standards and regulations, discharge permits, water conservation tools and behaviors, and grant funding to support and incentivize implementation of best management practices. Managing risk helps to maintain the river system's resiliency.

FURTHER RESOURCES

- Hannah Grover, "Mine waste has fouled the Animas River several times over the years," Farmington Daily Times, August 12, 2015: <https://www.daily-times.com/story/san-juan-county/2015/08/12/mine-waste-has-fouled-animas-river-several-times/73044374/>
- San Juan National Forest, Missionary Ridge Burned Area Timber Salvage Project Final Environmental Impact Statement, July 2003.

ACTIONS YOU CAN TAKE

The Animas River system has sustained natural and human induced impacts throughout its long history. From wildfire and severe drought to historic mine waste and human development, the Animas has seen large fluctuations in its overall health and resiliency.

The good news is that rivers, like the Animas, have a remarkable ability to rebound from negative impacts and there are steps that we can take, as a watershed community, to help the river recover and maintain a healthy system into the future.



Lake Emma after it collapsed and drained into mine structures below the surface

9 What is my Impact on the River and What Can I Do?

If you live in or visit the Animas watershed, you will have some level of impact on the river system. Each person in the Animas watershed can take actions, large and small, to minimize the risk of our cumulative impacts on our river.

THINGS I CAN DO DAILY:	I WANT...		
	SAFE DRINKING WATER	A SAFE RIVER TO PLAY IN	SAFE RIVER WATER FOR FOOD & FISH CONSUMPTION
Conserve water			
Follow Leave No Trace recreation principles			
Pick up pet poop and put it in the trash			
Dispose of my household chemicals & motor oil properly			
Minimize my use of pesticides			
Never flush my medicines down the toilet or sink; instead, deposit at local collection sites			
Bury my fishing bait; do not dump it in rivers, ponds or lakes			
Minimize my application of fertilizer to my lawn			
Wash my car at a carwash to minimize runoff into streams			
Control non-native trees and weeds on my land			
Keep my pet shop fish, frogs and turtles in captivity; they can become invasive and spread disease to natives			
Test my well routinely, and follow up			
Maintain and restore riverside vegetation to shade the channel, stabilize banks and filter runoff			
Maintain my septic system			
Manage my livestock away from stream and banks			
Learn and apply best management practices on my land			
Help prevent the spread of zebra mussels			
Avoid building close to the river, to save money and worry as the river continues to move			
Help monitor river health and wildlife. (e.g., American Dipper Project, CO River Watch)			
Read annual Consumer Confidence Reports from my water supplier			
Read fish consumption guidance from San Juan Basin Public Health Department			

THINGS I CAN DO DAILY:	I WANT...			
	A SAFE RIVER FOR FISH & WILDLIFE	A RESILIENT RIVER	A RIVER FOR GREAT QUALITY OF LIFE!	FIND OUT MORE IN QUESTION(S):
Conserve water				1, 2, 3, 4, 5, 9
Follow Leave No Trace recreation principles				2, 5, 9
Pick up pet poop and put it in the trash				2, 4, 5, 9
Dispose of my household chemicals & motor oil properly				1, 2, 3, 4, 5, 9
Minimize my use of pesticides				1, 2, 3, 4, 5, 9
Never flush my medicines down the toilet or sink; instead, deposit at local collection sites				1, 2, 3, 4, 5, 9
Bury my fishing bait; do not dump it in rivers, ponds or lakes				4, 5, 9
Minimize my application of fertilizer to my lawn				4, 5, 9
Wash my car at a carwash to minimize runoff into streams				1, 2, 3, 4, 5, 9
Control non-native trees and weeds on my land				5
Keep my pet shop fish, frogs and turtles in captivity; they can become invasive and spread disease to natives				4, 5, 9
Test my well routinely, and follow up				1
Maintain and restore riverside vegetation to shade the channel, stabilize banks and filter runoff				4, 5, 9
Maintain my septic system				2, 3, 4, 5, 9
Manage my livestock away from stream and banks				2, 3, 4, 5, 9
Learn and apply best management practices on my land				1, 2, 3, 4, 5, 9
Help prevent the spread of zebra mussels				5, 9
Avoid building close to the river, to save money and worry as the river continues to move				5, 9
Help monitor river health and wildlife. (e.g., American Dipper Project, CO River Watch)				1, 2, 3, 4, 5, 9
Read annual Consumer Confidence Reports from my water supplier				1
Read fish consumption guidance from San Juan Basin Public Health Department				2

Can you find at least one new action that you're able to take today?

How many ways can you identify that you impact the Animas River?

Are these negative, neutral or positive impacts?



Harris Family Fund

Hermosa Company Ditch



SGC



SAN JUAN BASIN
public health

