


# Intel Corporation

# Restore Water Goal

## 2020 Annual Report

Prepared for Intel Corporation

April 2021

LimnoTech
Water Environment | Scientists Engineers

BONNEVILLE ENVIRONMENTAL FOUNDATION

LimnoTech
Water Environment | Scientists Engineers

501 Avis Drive
Ann Arbor, MI 48108
734.332.1200
www.limno.com

# Restore Water Goal: 2020 Annual Report

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# Introduction

Water is an essential element of the semiconductor manufacturing process. Intel has focused on sustainable water management for more than two decades and has taken action both within and outside its operations to manage water responsibly. Intel's multifaceted water strategy has three main objectives:

- **Conserve** the amount of water used in their operations;
- **Collaborate** on water initiatives with their local communities; and
- **Create** technology solutions to help others reinvent the way they use and conserve water.

Intel's ongoing water management practices enable Intel to treat and return approximately 80% of the water the company uses globally to local communities and watersheds. Additionally, through investments in water conservation and partnerships with local municipalities, Intel has saved about 37 billion gallons of water over the last ten years. As part of its global water strategy, in 2017 Intel announced their commitment to restore 100% of their global freshwater consumption[1]. In September 2020, Intel increased its ambition by committing to achieve **net positive water use by 2030,** by conserving 60 billion gallons of water onsite, returning water through water management practices and restoring more than 100% of their global freshwater use by funding local water restoration projects.

This report provides a summary of Intel's 2020 progress toward its goal to achieve net positive water use by restoring more than 100% of their global freshwater consumption. It describes Intel's water restoration activities during 2020, including a description of all projects funded by Intel (i.e., initiated projects) as well as the volume of water restored during 2020 (for completed projects), as a result of Intel's project support. For those initiated projects that are funded but not yet completed, the report includes projections of volumetric restore benefits (hereafter referred to as restore benefits) that are expected once the projects are completed.

# Intel's Restore Commitment

To achieve its ambitious 2030 goal, Intel is engaging local community groups, nonprofits, and conservation organizations to fund projects that benefit the watersheds where Intel operates. These projects aim to address local water issues and support the well-being of communities and the environment.

## Project Selection Process

Intel considers a range of project types and evaluates them based on a set of criteria, including:

- Credible partner with proven project development record and capacity
- Located in source watershed, tied to water supply, or connected to the local community
- Feasible project timeline that includes project initiation and completion in the relative near-term

[1] Consumption is defined as the portion of water use (withdrawals) that is not directly returned to the municipality for reuse or source recharge, primarily lost to evaporation.

- Potential for long-term or permanent benefit[2] (i.e., able to deliver water benefit for multiple years)

Other criteria used to assess the overall value of projects include:

- Potential to catalyze and/or scale up water solutions
- Community and employee engagement
- Ability to leverage additional funding through matching grants or other sources
- Favorable project cost vs. benefit ratio

## Benefit Quantification Approach

Intel's water restoration commitment is based on restoring a cumulative annual volume of water to the environment that exceeds the volume of freshwater consumed in operations. The anticipated restore benefits are assessed for each project based on an estimated volume of water that is *saved, protected, treated, or returned* to the environment through funding and project implementation. Benefits are calculated and based on a comparison between a pre-project condition and the expected improved condition once the project is completed. Upon completion of each project, the restore benefit is quantified based on project results reported by implementing partners.

Restore water benefits are based on peer-reviewed quantification methodologies (Rozza et al., 2013) previously developed by LimnoTech in collaboration with The Nature Conservancy (TNC) (LimnoTech, 2017), and more recently documented by the World Resources Institute (WRI) (Reig et al., 2019). The type of restore water benefit calculated and the quantification methodology applied varies by project type and depends on the project objectives, the activities implemented, and the information and data available to support the calculation. It is recognized that the estimated benefits have some uncertainty. To reduce this uncertainty, scientifically defensible methodologies and conservative assumptions are employed in the quantification process, in combination with available data and project information.

Consistent with the established quantification methodologies, restore water benefits are counted in the year the project is completed or partially completed if actual benefits are achieved during the year, and in each subsequent year, provided that the project is maintained and continues to function as intended. Ongoing project performance verification is provided to Intel annually by the implementing partner.

In situations where there are multiple project funders and Intel funds cover less than 100% of the project cost, the restore water benefit is adjusted to reflect the Intel-funded portion of the total project cost (i.e., cost share). For projects where investments were made before Intel's involvement (e.g., land acquisition), the total project cost is estimated based only on investments that pertain specifically to creating measurable water benefits achieved as a result of Intel's financial support of the project.

## Summary of All Projects

As of December 31, 2020, Intel has provided grants to implementing partners to support 32 collaborative community projects located in seven U.S. states, as well as India and Costa Rica. Implementing partners to

[2] During 2020, several projects were funded by Intel that provided restore benefits during 2020 only. These projects were selected because of critical need in locations such as the Colorado River and Rio Grande, due to high temperatures and prolonged drought. These projects are included in this report and are noted as providing benefit during 2020 only.

date include American Forests, Arizona Land and Water Trust, Audubon, Calapooia Watershed Council, CLEAN International, Clean Water Institute, Colorado River Indian Tribes, Colorado Water Trust, Deschutes River Conservancy, Friends of the Tualatin National Wildlife Refuge, Fundecor, Greenbelt Land Trust, McKenzie Watershed Council, National Forest Foundation, The Nature Conservancy, TreeFolks, Trout Unlimited, and Watershed Management Group.

Altogether, these projects are estimated to restore approximately 1.8 billion gallons of water each year, once complete. Table 1 summarizes the projects by location and presents the 2020 restore benefit in million gallons per year (MGY) for 24 projects that achieved benefits during calendar year 2020. Estimated restore benefits are presented for 8 projects funded (i.e., initiated) that are not yet achieving restore benefits.

**Table 1. All 32 Intel-Funded Projects through December 31, 2020**

| Project location | Restore Benefit Achieved in 2020 (MGY) | Estimated Restore Benefit Upon Project Completion (MGY) | Total number of projects in 2020 |
|---|---|---|---|
| Arizona, Utah, Colorado (benefitting Arizona) | 622 | 120 | 15 |
| California | 36 | 145 | 3 |
| New Mexico | 142 | 0 | 3 |
| Oregon | 473 | 109 | 7 |
| Texas | 0 | 1 | 1 |
| India | 35 | 67 | 2 |
| Costa Rica | 0 | 46 | 1 |
| **Total (MGY)** | **1,308** | **488** | **32** |

# Summary of 2020 Restoration

Projects that achieved restore benefits during 2020 are shown in Table 2. Together, these projects are estimated to have restored over 1,300 million gallons during 2020.

**Table 2. 24 Projects That Restored Water During 2020**

| Project Location | Project Name | Implementing Partner | Project Activity | Restore Benefit Achieved in 2020 (MGY) |
|---|---|---|---|---|
| Arizona | Barley Conversion | The Nature Conservancy | Crop conversion | 32.0 |
| Arizona | Long Valley Meadow Restoration | National Forest Foundation | Wet meadow restoration | 20.0 |
| Arizona | West Clear Creek Pipeline | The Nature Conservancy | Irrigation efficiency improvement | 26.1 |
| Arizona | Lower San Pedro Agriculture | Arizona Land and Water Trust | Crop conversion | 21.3 |
| Arizona | Lower Salt River Restoration | National Forest Foundation | Invasive species removal | 89.3 |
| Arizona | Verde Valley Irrigation Conversion | The Nature Conservancy | Drip irrigation | 14.4 |
| Arizona | Groundwater Recharge in the Tucson Basin | Watershed Management Group | Infiltration structures | 19.6 |
| Arizona | Eureka Ditch Piping | The Nature Conservancy | Piping/system modernization | 65.6 |
| Arizona | Colorado River Indian Tribes Drought Contingency | Audubon Arizona | Water rights leasing | 26.3 |
| Utah | Mountain Island Ranch Agriculture | Trout Unlimited - Utah | Crop conversion and fallowing | 124.0 |
| Utah | Price and Colorado River Winter Flow Restoration | Trout Unlimited - Utah | Conversion of consumptive use water right for 3 months of instream winter benefits | 40.0 |
| Utah | Price River Flow Restoration (2020 Only) | Trout Unlimited - Utah | Conversion of a 1-month consumptive use water right for 1 month of instream flow | 70 |
| Colorado | 15-Mile Reach (2020 Only) | Colorado Water Trust | Instream leasing (1-year) | 73.0 |

| Project Location | Project Name | Implementing Partner | Project Activity | Restore Benefit Achieved in 2020 (MGY) |
|---|---|---|---|---|
| Colorado | Rio Grande Projects for Water Resource Benefit | Trout Unlimited | Winter flow release | 116.1 |
| New Mexico | | National Forest Foundation | Floodplain reconnection | |
| New Mexico | Middle Rio Grande 2020 lease (2020 Only) | Audubon New Mexico | Instream leasing (1-year) | 26.0 |
| California | Bird Returns Wetland Habitat Creation | The Nature Conservancy | Wetland habitat creation | 18.1 |
| California | Expanded Dynamic Conservation Water | The Nature Conservancy | Wetland habitat creation | 18.1 |
| Oregon | Middle Deschutes Instream Flow Restoration | Deschutes River Conservancy | Water leasing and instream protection | 113.0 |
| Oregon | Bowers Rock State Park Side Channel Restoration | Calapooia Watershed Council | Flow enhancement to side channel | 101.0 |
| Oregon | Horseshoe Lake Oxbow Restoration | Greenbelt Land Trust | Oxbow restoration | 41.0 |
| Oregon | Lower South Fork McKenzie River Floodplain Enhancement | McKenzie Watershed Council | Floodplain restoration | 198.7 |
| Oregon | Deer Creek Floodplain Restoration | McKenzie Watershed Council | Floodplain restoration | 18.8 |
| India | Nanjapura Lake Restoration | CLEAN International | Lake desilting | 35.2 |
| | | | ***TOTAL 2020 RESTORE BENEFIT =*** | **1,308** |

## Project-Specific Results

The locations of projects achieving 2020 restore benefits are shown in Figure 1, and project-specific details are described in the remainder of this section.

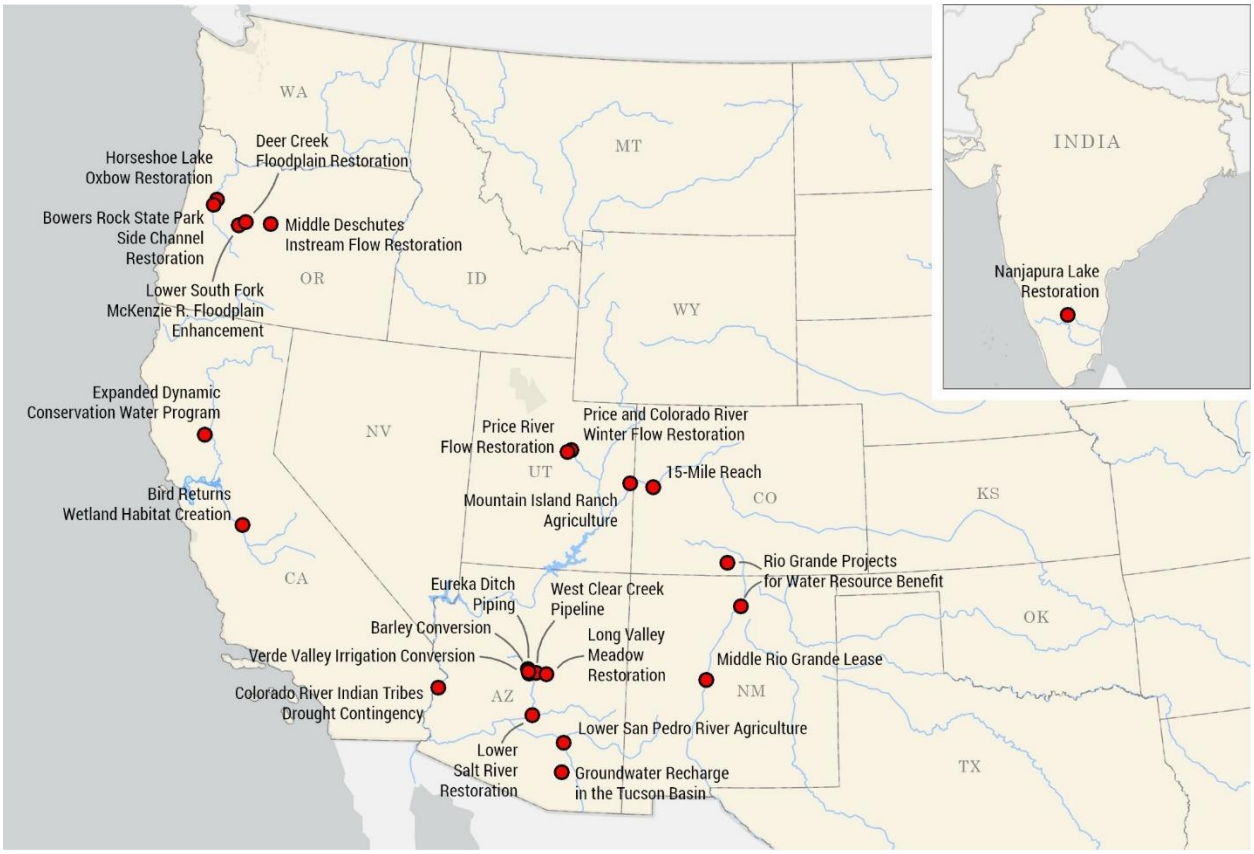



**Figure 1. Locations of Projects with 2020 Restore Benefits**

## Barley Conversion

**Location:** Camp Verde, Arizona

**Implementing partner**: The Nature Conservancy (TNC)

**2020 restore benefit:** 32.0 million gallons

**Project Timeline**:

Project initiation: 2017

Year of initial restore benefit: 2018

Anticipated benefit end date: 2027

**Barley is harvested before the critical low flow summer period**

(Photo credit: LimnoTech)

The Verde River is an important surface water source for the metropolitan Phoenix area and is a lifeline for wildlife in the American Southwest, including migratory birds, nesting bald eagles, rare species of reptiles and amphibians, and many species of native fish. The Verde River is one of only two places in Arizona with an active breeding population of river otter. Like many western rivers, streamflow is low or nonexistent in some reaches during the hot summer months when water availability is low and peak irrigation needs occur throughout the valley. Resulting low river flows impact ecosystem health and impede river-based recreation.

TNC led this collaborative project with local partners, including Friends of the Verde River and Sinagua Malt. These organizations recognize that agriculture is an important part of the economic and cultural identity of the area, and they understand that there are innovative opportunities to reduce irrigation water use and support local economic development through crop switching.

**Crop conversion contributes to increased stream flows in the Verde River**

(Photo credit: TNC)

The objective of this crop switching project was to reduce the volume of water used for irrigation during the critical summer months, leaving more water in the river. Project funds were used to incentivize farmers to replace existing high-water consumption crops with barley which has a lower consumptive water use. Funds were also used to invest in a local malt house (Sinagua Malt) to reduce transaction costs involved in malting barley. The malted barley is sold to craft breweries around the state and to smaller markets for candy and bakery products. In concert with many other water stewardship projects planned and underway in the Verde River, this project plays an important part in developing new pathways to support economic development alongside improved water stewardship. The restore benefit is calculated as the reduction in consumptive water use. The project was initiated in 2017, and barley has been planted each season as a result of Intel's grant. In 2020, 45 acres of barley planting occurred as a result of Intel funding.

## Long Valley Meadow Restoration

**Location**: Verde River Watershed, Arizona

**Implementing partner**: National Forest Foundation (NFF)

**2020 restore benefit**: 20.0 million gallons

**Project Timeline**:

Project initiation: 2017

Year of initial restore benefit: 2018

Anticipated benefit end date: 2027+

(This project provides a long-term benefit)

**Volunteers working in an eroded section of Long Valley meadow**

(Photo credit: NFF)

Long Valley Meadow is a high elevation meadow located at the headwaters of the Verde River watershed in the Coconino National Forest. This meadow filters water that drains into the C.C. Cragin Reservoir, part of a system of reservoirs owned and operated by the Salt River Project (SRP). The SRP system delivers water to more than four million residents and businesses located in the greater Phoenix metropolitan area.

Long Valley Meadow has been degraded as the result of historical grazing. The loss of vegetation and soil compaction have increased surface runoff, which has carved deep gullies with actively eroding banks. These impacts have lowered the water table and limited the meadow's ability to store precipitation, attenuate peak floods, and support summer baseflow during dry periods.

**Long Valley after restoration (2019)**

(Photo credit: Spencer Plumb, NFF, 2019)

The objective of this meadow restoration project was to reduce erosion and increase infiltration and shallow groundwater storage by reconnecting an incised stream channel to the meadow floodplain. A total of 42 acres of wetlands were restored using the plug and pond technique on 1,500 linear feet of stream channel. This technique diverts water out of the incised channels and onto the meadow, restoring the floodplain connection and allowing surface water to infiltrate into the groundwater. By reconnecting the channel to the meadow, the soil storage capacity increases, keeping the soil wet for a longer duration in the spring and summer. Acting like a sponge, the restored meadow increases available water to support native habitat, birds, wildlife, and recreation. Additionally, the restoration increases native vegetative cover by limiting encroachment of pine trees into the meadow that occurs as a result of meadow drying. The project supports rare meadow habitat that is important for elk and mule deer that rely on meadows like Long Valley as a source of food in the summer. The tall meadow grasses also provide cover for newborn elk and deer.

The restore benefit is calculated as the increase in annual groundwater storage as a result of the restoration.

## West Clear Creek Pipeline

**Location**: West Clear Creek, Arizona

**Implementing partner**: The Nature Conservancy (TNC)

**2020 restore benefit:** 26.1 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2019

Anticipated benefit end date: 2028+

(This project provides a long-term benefit)

**West Clear Creek ditch**

(Photo Credit: Intel, 2018)

West Clear Creek originates in a high mountain wilderness area and provides rare cold-water habitat on route to the Verde River. The lower reaches of the creek provide some of the most intact and valuable fish and wildlife habitat in the region, but irrigation diversions that dewater the lower 3-4 miles of the creek significantly curtail aquatic ecosystem function. This project is part of a larger, comprehensive TNC program that implemented a range of activities to reduce withdrawals from West Clear Creek. Together with local irrigators, TNC has upgraded irrigation infrastructure, converted from flood irrigation to drip irrigation, piped leaky sections of irrigation canals, established new head gates with improved control, and implemented high-tech soil moisture monitoring. The project provides a low-maintenance, durable solution to minimize consumptive water loss in the watershed. Project funding supported the replacement of 1,600 feet of porous gravel irrigation canal with a high-density polyethylene pipe to eliminate transmission losses and reduce the volume of water diverted from West Clear Creek at its uppermost point of diversion.

This project helps achieve both region and local water sustainability and conservation goals. The Salt and Verde Rivers supply critical water for the Phoenix Metro area and are also some of the most important rivers for native fish in the desert southwest. This project benefits these fish populations. Additionally, implementation of this project has attracted additional investment from downstream partners as well as encouraged other ditch companies and landowners to step forward to improve and modernize irrigation operations.

The project was initiated in 2018 and completed in 2019 with 1,600 feet of irrigation canal replaced with a pipeline. The restore benefit is calculated as the reduced withdrawal from West Clear Creek for irrigation due to the elimination of transmission losses.

## Lower San Pedro River Agriculture

**Location**: Lower San Pedro River, Arizona

**Implementing partner**: Arizona Land and Water Trust (ALWT)

**2020 restore benefit:** 21.3 million gallons

**Project Timeline**:

Project initiation: 2017

Year of initial restore benefit: 2019

Anticipated benefit end date: 2028+

(This project provides a long-term benefit)

**The middle and south agricultural fields (top, with south plot shown on the bottom) were previously flood irrigated to grow cotton and wheat. They have been converted to drought-tolerant native grasses that will not require sustained irrigation.**

(Photo credit: Kerry Dinsmore (top), ALWT (bottom))

The San Pedro River flows through the Sonoran Desert in Arizona for 140 miles until it reaches its confluence with the Gila River, a tributary to the Colorado River. As the last major free flowing river in the southwestern U.S., the San Pedro River provides essential stopover habitat for millions of migratory birds and other wildlife. The health of this critical ecosystem is adversely impacted by extremely low flows and intermittent dry sections of the river due primarily to ground water depletion, localized pumping, and irrigation diversion.

The objective of this project is to help sustain dry season flows, critical riparian habitat, and a healthy water table in the Lower San Pedro River by reducing the volume of irrigation water withdrawn from the aquifer. Intel supported conversion of 63 acres of agricultural fields adjacent to the Lower San Pedro River. The fields were converted to drought-tolerant native grasses that will not require sustained irrigation over the long-term. The agricultural fields were historically leased for growing cotton and wheat, two water-intensive crops that were flood irrigated from two wells located near the river.

This project directly reinforces related efforts to protect and enhance the function of the San Pedro River ecosystem and serves as an important demonstration of how innovative water conservation agreements can help sustain landscapes while protecting and restoring critical riparian habitats. Additionally, the Lower San Pedro River corridor is a highly significant stretch of the Pinal County Birding Trail, which showcases the area's best sites to find birds and other wildlife. Intel's investment in this site, to restore former wheat fields to native, perennial pasture, has enabled a diversity of pollinators and wildlife at a publicly accessible site that will serve birders and benefit local residents and businesses.

The restore benefit is calculated as the reduced consumption from the conversion from cotton and wheat to native grass, based on metered volumes pumped. As the result of record heat and little rain, increased irrigation was required in 2020 to support the young grasses, resulting in a slightly lower restore benefit in 2020 than expected.

## Lower Salt River Restoration

**Location**: Salt River Basin, Tonto National Forest, Arizona

**Implementing partner**: National Forest Foundation (NFF)

**2020 restore benefit:** 89.3 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Invasive species**

(Photo Credit: NFF, 2018)

Tonto National Forest, located north of Phoenix, is one of the most-visited National Forests in the U.S. with approximately 5.8 million visitors annually. In 2012, invasive and noxious weed infestations covered an estimated 514,361 acres of the forest. Most of these infestations (490,450 acres) have spread beyond the U.S. Forest Service's (USFS) capability to eradicate them. These invasions threaten native plant species by direct competition, limiting natural regeneration and reducing overall biodiversity and habitat for wildlife.

This project replaced dense stands of invasive *Arundo* (20 acres) and tamarisk (20 acres) with native species. Additionally, 30 acres burned by the Cactus Fire were replanted with native upland species. In total, 70 acres of riparian habitat were restored along a section of the Salt River frequently used for swimming, floating, hiking and bird watching.


**Intel Volunteer Tree Planting Event**

(Photo Credit: Intel. 2018)

The project was initiated in October 2018. 40 acres were cleared and replanted, and 30 burned acres were replanted by December 2019. In February 2020, the project implementation was completed after some areas were treated again to eliminate invasive species.

In addition to providing financial support for this project, Intel hosted a volunteer event in 2018, with 134 Intel employees, family and friends, who, collectively planted 1,200 trees. An additional volunteer day with Intel and community volunteers was held in December 2019. This project also catalyzed a larger effort to restore the Lower Salt River, with three other companies supporting the work.

The restore benefit is calculated as the reduced evapotranspiration from replacing invasive species with native species and the reduced runoff from revegetating the area burned.

## Verde Valley Irrigation Conversion

**Location**: Verde River Watershed, Arizona

**Implementing partner**: The Nature Conservancy (TNC)

**2020 restore benefit:** 14.4 million gallons

**Project Timeline**:

Project initiation: 2019

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029

**Drip irrigation has been implemented to improve irrigation efficiency**

(Photo credit: LimnoTech)

The Verde River supports a diverse population of rare native desert fish, including the Round Tail Chub, Colorado River Pikeminnow and Razorback Sucker. The Verde River also provides irrigation and drinking water supply for farms and cities in the region, including downstream water supply for the Phoenix metropolitan area. The streamside forest habitat supports many bird species that are dependent on water in the river for its health and sustainability, including two threatened bird species, the Southwestern Willow Flycatcher, and the Yellow-billed Cuckoo.

The project area is located near Clarkdale, Arizona, on one of the first large ditches in the Verde Valley. The primary objective of this project is to leave more water in the Verde River by converting farmland from flood irrigation to drip irrigation, benefiting fish as well as the streamside forest and wildlife. The project also aims to build on other activities in this watershed focused on increasing stream flow in these waterbodies. Another project objective is to demonstrate the viability of drip irrigation for other farms in the Verde Valley.

The restore benefit is calculated as the reduced consumption of irrigation water as a result of converting 30 acres from flood irrigation to drip irrigation. In 2020, irrigation consumption of water was reduced by 14.4 MG.

## Groundwater Recharge in the Tucson Basin

**Location**: Santa Cruz Watershed, Arizona

**Implementing partner**: Watershed Management Group (WMG)

**2020 restore benefit:** 19.6 million gallons

**Project Timeline**:

Project initiation: 2019

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Ponded water accumulating in a wash as a result of this project, prior to infiltrating**

(Photo credit: Mark Reid, 2019)

Tucson, Arizona has a hot desert climate, receiving roughly 12 inches of precipitation per year. As a result, groundwater is an important source of water in the region. Streamflows in Tucson-area creeks and rivers have been severely depleted by groundwater pumping, erosion, and decades of poor water management and drought. This has impacted riparian vegetation, groundwater reserves for Tucson, and natural springs. Tucson's efforts to trap and store increased groundwater are linked to Arizona's ability to reduce Central Arizona Project (CAP) water deliveries to Arizona without compromising economic development in Phoenix and Tucson.

The objective of this project is to increase groundwater infiltration and facilitate groundwater recharge to increase groundwater levels and improve streamflow. Working with landowners and volunteers, a variety of stone structures were placed in degraded arroyos (steep-sided gullies formed by fast-flowing water) to reduce erosion, capture, and slow runoff and facilitate increased infiltration to groundwater. Multiple structures were placed at each location, depending on the restoration needs of each site. Structures included media luna, which manage sheet flow and prevent erosion; one-rock dams, which stabilize the bed of the channel and gradually raise the bed level over time; and Zuni bowls, which prevent erosion and facilitate water retention and storage. These structures are strategically placed to address channel erosion, restore floodplain habitat, capture runoff, slow the flow of water and increase infiltration to groundwater.

The restore benefit is calculated as the increased groundwater recharge as a result of this project. The project was completed in 2020 with increased infiltration across 10 acres and a 2020 restore benefit of 19.6 MG of water.

## Eureka Ditch Piping

**Location**: Verde River Watershed, Arizona

**Implementing partner**: The Nature Conservancy (TNC)

**2020 restore benefit:** 65.6 million gallons

**Project Timeline**:

Project initiation: 2019

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Verde River**

(Photo credit: TNC, 2019)

Established in 1895, the Eureka Ditch is the newest of the four major ditches in the Camp Verde area that draw water from the Verde River. Settlers began construction on the ditch in 1895 to service six farms located on the former Fort Verde Military Reservation. Today the ditch system provides water to over 200 individual property owners, including areas of the Pecan Lane Rural Historic Landscape along Montezuma Castle Highway.

The eight-mile-long earthen irrigation ditch withdraws up to 15 cfs from the Verde River and serves 375 acres in the Verde Valley. From the point of diversion located at the north end of the ditch to the end of the ditch, project partners have measured over 12% per-mile losses of water through ditch seepage and evaporation, although the loss rate varies over the length of the ditch due to variations in substrate and vegetation. The objectives of this project are to enhance river flows and improve water conveyance efficiency to benefit fish and wildlife habitat.

This is being accomplished by installing a pipeline in an approximately 0.5-mile section of Eureka Ditch that experiences high transmission losses. Habitat and recreation benefits will accrue as this project (and others in the area) increases instream flows on the mainstem Verde River during critical periods of the year. Since the ditch piping project will require less maintenance and produce more reliable and efficient water delivery to irrigators, the project also plays an important role in building resilience for local farms and supporting food security.

TNC collaborated with farmers and water users to more efficiently convey water to farms and reduce the amount of water diverted from the Verde River. As a result of this project, diversions from the Verde River are reduced, enhancing flows to an 8-mile section of the Verde River that includes a section that suffers from low flow. Additionally, the Salt and Verde Rivers are critical water supplies for the Phoenix Metro area and are also some of the most critical rivers for native fish in the desert southwest. This project is expected to benefit these fish populations. Furthermore, implementation of this project has catalyzed more water benefits by attracting additional investment from downstream partners and has encouraged other ditch companies and landowners to improve their operations.

The restore benefit is calculated as the reduced volume withdrawn from the Verde River. The project was initiated in 2020, and by July, 1,382 feet of pipeline had been installed, with a 2020 restore benefit of 65.6 MG of water.

## Colorado River Indian Tribes Drought Contingency Project

**Location**: Colorado River Watershed, Arizona

**Implementing partner**: Audubon Arizona

**2020 restore benefit:** 26.3 million gallons

**Project Timeline**:

Project initiation: 2020

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029

With the Colorado River experiencing long-term drought conditions, reservoir levels in Lake Mead have reached unprecedentedly low levels in recent years. In response, representatives of the Department of the Interior, Bureau of Reclamation, all seven Colorado River Basin states, and Mexico agreed to a Drought Contingency Plan (DCP). The plan is designed to reduce risks from ongoing drought by promoting conservation, reducing demand, and stabilizing water levels in Lake Mead and Lake Powell through projects that achieve system conservation.

The Colorado River Indian Tribes (CRIT) have lands that stretch along 56 miles of the lower Colorado, with the majority of their reservation located in Arizona. The CRIT have nearly 720,000 acre-feet of water rights which by law are to be used on the reservation. Due to stipulations in the DCP, CRIT was allowed to lease water for "system conservation" benefit for this project only in 2020-2022, making the CRIT an important partner in the DCP process and shoring up declining lake levels in Lake Mead. The CRIT pledged to forgo irrigation water deliveries and fallow approximately 10,000 acres of farmland, leaving 150,000 acre-feet (48,878 million gallons) in Lake Mead. The creation of Native reservations sets aside not only the land, but also the water needed to irrigate, so these water rights are among the most senior in the lower Colorado River. As a result, they have priority over other rights and are more reliable.

The objective of this project is to lease water rights from CRIT to use to increase the volume of water in Lake Mead in order to reduce the likelihood that shortage declarations are triggered, which would curtail water deliveries to cities, businesses and farms, of which the greatest potential near-term impacts would be felt in Arizona.

The project was initiated in 2020 and is supported by Intel and other funders. Intel's investment supported the leasing of 26.3 million gallons of water, increasing the volume of water in Lake Mead and reducing the likelihood that shortage declarations are triggered. The restore benefit is calculated as the reduced withdrawal volume, with an estimated 2020 restore benefit of 26.3 MG of water.

## Mountain Island Ranch Agriculture

**Location:** Main Stem of Colorado River near Thompson, Utah

**Implementing partner**: Trout Unlimited (TU) - Utah

**2020 restore benefit:** 124.0 million gallons

**Project Timeline**:

Project initiation: 2017

Year of initial restore benefit: 2019

Anticipated benefit end date: 2028+

(This project provides a long-term benefit)

**Colorado River near Mountain Island Ranch**

(Photo credit: Intel, 2019)

Mountain Island Ranch holds grazing leases that support an organic cattle operation on roughly 100,000 acres of Bureau of Land Management land in Utah. The ranch is an environmental oasis in the midst of an arid landscape and is home to one of Utah's four known Bald Eagle nesting sites, a heron rookery, and sensitive riparian areas that support endangered and threatened fish species. The owners of this multi-generational working ranch are committed to using resources responsibly and preserving and enhancing critical wildlife habitat.

Historically, water was diverted from the Colorado River to irrigate alfalfa and support other agricultural operations. Alfalfa is a relatively water intensive crop, and ranch owners recognized that crops with lower water demand could replace alfalfa as a food supply for cattle. Project funding supported fallowing of 39 acres and conversion of 506 acres of alfalfa to low water use pasture grasses and wetland grasses with lower water irrigation requirements. This fallowing and crop conversion reduces the volume of water diverted from the Colorado River while sustaining ranch operations and restoring wildlife habitat. Water conserved through these activities remains in the Colorado River as "system water" that helps shore up main stem Colorado River and Lake Powell water levels. This supports broad efforts across the Colorado River watershed to conserve water and help ensure that water supplies across the upper basin are adequate to meet delivery obligations downstream to Lake Mead, Arizona, and other lower basin states. From a Colorado Basin perspective, the project showcases solutions that support local ranching needs while freeing up water to help mitigate drought and support economic and community benefits for the more than 40 million people that rely on Colorado River water.

The restore benefit is calculated as the reduced consumption volume. The 2020 restore benefit is slightly lower than 2019 due to sorghum planting and irrigation on a portion of the site to improve the soil.

## Price and Colorado River Winter Flow Restoration

**Location**: Colorado River Basin, Utah

**Implementing partner**: Trout Unlimited (TU) - Utah

**2020 restore benefit:** 40 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029

**Scofield Dam**

(Photo credit: J. Nielson, TU, 2019)

The Price River flows downstream to the Green River in Utah before joining with the Colorado River. An impoundment on a Price River tributary, Lower Fish Creek, creates Scofield Reservoir. Downstream of Scofield Reservoir, Lower Fish Creek is a Blue Ribbon Fishery. Due to drought and limited water releases from reservoirs in winter, a portion of the river has experienced chronic low flows and suboptimal winter habitat conditions for fish. The closing of the nearby Carbon Power Plant in 2015 provided an opportunity to re-water the creek downstream of the Scofield Dam outlet and generate water benefits for the Price River and Colorado River system.

**Lower Fish Creek**

(Photo credit: J. Nielson, TU, 2019)

Since 1956, the coal-fired Carbon Power Plant exercised its water right for evaporative cooling, consuming the volume of water withdrawn. Following the closure of the power plant in 2015, certain water rights reverted back to ownership by the Carbon Canal Company. A portion of the Carbon Canal Company's water right became available in 2018 to benefit depleted river flows in three winter months. If this water right were not protected and designated to support river flows, it is likely that irrigators would seek to sell, transfer, use, or store the water, making it unavailable in winter months for instream flow and Colorado River system water benefits.

This project enables TU to lease the winter water right from the Carbon Canal Company for a 10-year period and assures that up to 3.5 cubic feet per second (cfs) will be released from Scofield Reservoir between December and February to enhance depleted instream flows downstream of the dam. This water right was processed through the Utah State Engineers Office and will provide ten years of instream winter flow benefit downstream of Scofield Reservoir. The increased volume released benefits Lower Fish Creek and Price River and increases flows in the Green River and Colorado River because there is little potential for users to divert this water in winter.

The restore benefit is calculated as the increased volume of water in creeks downstream of Scofield Reservoir to the Green River and ultimately to the Colorado River between December and February. The 2020 restore benefit is 40 MG of water.

## Price River Flow Restoration (2020 only)

**Location**: Colorado River Basin, Utah

**Implementing partner**: Trout Unlimited (TU) - Utah

**2020 restore benefit:** 70.0 million gallons

**Project Timeline**:

Project initiation: 2020

Year of initial restore benefit: 2020

Anticipated benefit end date: 2020

**Price River**

(Photo credit: Intel, 2019)

This project built on the 10-year winter water lease described in the above Price and Colorado River Winter Flow Restoration Project summary by extending the duration of the leasing period in 2020. TU leased the water right from the Carbon Canal Company and assured that 3.5 cubic feet of water per second (cfs) was released from Scofield Reservoir in October 2020 to enhance depleted instream flows downstream of the dam. This water right was approved through the Utah State Engineers Office and provided an additional 31 days of instream flow benefit downstream of Scofield Reservoir (October 1-31, 2020). The full volume of released water benefitted Lower Fish Creek and the Price River down to the City of Price (roughly 25 miles downstream of the dam). A portion of the released water also increased flows down to the confluence with the Green River and further downstream to the Colorado River.

The restore benefit is calculated as the increased streamflow volume in Lower Fish Creek and the Price River, downstream of Scofield Reservoir to the City of Price. The one-time restore benefit in 2020 is 70.0 MG of water.

## 15-Mile Reach (2020 Only)

**Location**: Colorado River, Colorado

**Implementing partner**: Colorado Water Trust (CWT)

**2020 restore benefit:** 73.0 million gallons

**Project Timeline**:

Project initiation: 2020

Year of initial restore benefit: 2020

Anticipated benefit end date: 2020

**15-Mile Reach**

(Photo credit: Colorado Water Trust, 2020)

The Upper Colorado River supports native endangered fish species such as the humpback chub and Colorado pikeminnow, which is the largest minnow in North America. During early spring and again in late summer through early fall, flows within the "15-Mile Reach" section of the Colorado River between Palisade and Grand Junction often fall so low they cannot support these species.

Although there is water available in upstream reservoirs that could be used to increase flows during critical periods, much of this water cannot be released to provide instream benefit without ensuring that it is used for a designated beneficial use. To fulfill this requirement, CWT, Grand Valley Water Users Association and Orchard Mesa Irrigation District entered into an innovative agreement to allow CWT to lease upstream water decreed for power generation and deliver it to the Grand Valley Power Plant (providing the necessary beneficial use) during times when the 15-Mile Reach is in need of additional flow for fish habitat that supports passage, rearing, and spawning. This provided an opportunity to lease and draw water from an upstream reservoir and deliver it downstream to benefit the river when flows are low.

One key, reliable source of the water for this project is from the Colorado River District with water released from Ruedi Reservoir. The increased flow to the 15-Mile Reach of the Colorado River complements water dedicated to the river by the U.S. Fish and Wildlife Service's Recovery Program and Historic Users Pool, a group of western Colorado water users that release water from Green Mountain Reservoir. Additionally, the dedicated water from this project remained instream for the entire 15-Mile Reach to support fish and wildlife.

The leased flows also benefit flows upstream on the Frying Pan and Roaring Fork Rivers. As a further benefit, any hydropower generated by the project creates carbon-free energy and additional revenue that can support rehabilitation of the Grand Valley Power Plant.

The restore benefit is calculated as the increased streamflow volume released in September 2020 as a result of the leasing agreement, with a one-time restore benefit of 73.0 MG of water.

## Rio Grande Projects for Water Resource Benefit

**Location**: Rio Grande Watershed in Colorado and New Mexico

**Implementing partner**: Trout Unlimited (TU) and National Forest Foundation (NFF)

**2020 restore benefit**: 116.1 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2018

Anticipated benefit end date: 2027

**Conejos River downstream of Platoro Dam (fall 2019). Winter releases enhance flows in this reach of the Conejos.**

(Photo credit: K. Terry, TU, 2019)

The Upper Rio Grande River extends from its headwaters in southern Colorado to Cochiti Lake in New Mexico. Its tributaries support farming, ranching, rural communities, recreation, and a renowned trout fishery. However, during winter, water retained in headwater reservoirs contributes to acute low flows and ecological impacts in downstream reaches that do not meet minimum flow requirements for fish and wildlife. Over the past few years, TU's Colorado Water Program, together with other stakeholders, has pioneered a voluntary program to increase winter flow releases from reservoirs to maximize rearing and spawning benefits for fish.

By creating new partnerships and approaches that build collaboration and trust among ranchers, water districts, agencies and non-governmental organizations, the Program has reconfigured the timing of water delivery to maximize social and environmental benefits. By providing incentives to water rights holders and paying fees that allow water to be stored and delivered at different times of year, TU and partners have been able to release water at critical, low flow periods to achieve significant instream winter flow benefits for the Upper Rio Grande, while also meeting existing water delivery obligations under the Rio Grande Compact.

In addition, stream channel degradation, loss of wetlands, and floodplain disconnection in Rio Grande tributary streams have contributed to adverse ecological impacts in the basin. In the Valle Vidal Unit of Carson National Forest, past grazing, mining, and logging activities have degraded Comanche Creek, downcutting the channel and disconnecting the creek from its historic floodplain. These impacts have also reduced the groundwater table and wetland water storage and caused drying of the surrounding wetlands.

The objectives of this project are to enhance flow in Rio Grande tributaries during critical winter low-flow periods, and to raise groundwater levels in the Comanche Creek watershed to reconnect the stream to the historic floodplain and wetlands, restore hydrologic function, and provide recreation and wildlife benefits.

Two activities funded by Intel are benefitting the water resources of the Rio Grande and tributaries in New Mexico:

- TU partners with a variety of stakeholders to facilitate and incentivize water releases from reservoirs during critical winter low-flow periods. Flow releases enhance flows in up to five upper Rio Grande tributaries in any given year, including the Conejos River, Beaver Creek, South Fork Rio Grande, North Clear Creek, and the Alamosa River. Flow releases also benefit the Upper Rio Grande in Colorado and northern New Mexico over a long-term period. This work is accomplished by managing the growing partnership, structuring agreements with agencies and water districts, and paying storage fees, incentives, and management costs required to store and release water at critical times of the year to maximize downstream benefits.


**Comanche Creek after restoration**

(Photo Credit: T. Mitchell, TU, 2019)

- TU and NFF completed instream and floodplain restoration activities to reconnect Comanche Creek to 52.4 acres of historic floodplain. This benefits Comanche Creek by enhancing water supply for wetlands, replenishing the depleted water table, and improving late season water availability to benefit fish, wildlife, and recreation in the Upper Rio Grande basin. Intel funding of the Comanche Creek floodplain reconnection project also leverages a 3:1 match from Pittman-Robertson funds to support complementary wildlife conservation activities in the area.

The restore benefit is calculated as the sum of the increased winter flow volume in the Rio Grande tributaries (99 MG)[3] and the increased storage volume within restored floodplain and wetland habitat along Comanche Creek (17.1 MG). Without the project, water is retained in Colorado reservoirs with minimal winter flow released and dewatered river conditions, and Comanche Creek remains disconnected from its floodplain with a depleted water table.

The project was initiated in 2018. 2020 was the third year of winter flow release and the second full year of wetland restoration.

[3] From January 1 – February 20, 2020, 303.77 AF (99 MG) was released from Continental Reservoir, an off-channel reservoir on North Clear Creek.

## Middle Rio Grande 2020 Lease (2020 Only)

**Location**: Middle Rio Grande, New Mexico

**Implementing partner**: Audubon, New Mexico

**2020 restore benefit:** 26.0 million gallons

**Project Timeline**:

Project initiation: 2020

Year of initial restore benefit: 2020

Anticipated benefit end date: 2020

**Lower Peralta Drain #2 Outfall location**

(Photo credit: Quantina Martine, Audubon Southwest, 2020)

The Rio Grande is an important migratory, wintering and nesting corridor supporting over 200,000 waterfowl, 18,000 Sandhill Cranes and tens of thousands of other water birds and shorebirds (Audubon, 2019). It is also highly regulated and serves as an important supply for irrigation and drinking water.

The Isleta Reach of the Middle Rio Grande extends between the southern boundary of the Isleta Pueblo and the San Acacia Diversion Dam. Agriculture is the predominant land use and primary consumptive use in this area and irrigation withdrawals contribute to persistent low flows and intermittent drying in this reach, especially in times of severe drought, and very little water is available to support wetlands and wildlife. Work to restore flow to the river and improve critical riparian habitat is a focus for groups in this region, and water leasing offers a solution that continues to generate increased river and wetland benefits.

In 2016, Audubon New Mexico initiated the first Rio Grande flow restoration project, delivering San Juan Chama water to the Isleta Reach, setting the stage for future work to enhance environmental flows and habitat in the Middle Rio Grande. This 1-year project funded by Intel, builds on past success to restore flows to the Isleta reach of the Middle Rio Grande during 2020 when the Rio Grande Basin experienced high temperatures and prolonged drought.

The objective of this project is to restore flows to a de-watered reach of the Rio Grande to improve wetland habitat for key species of concern, including the yellow billed cuckoo, the southwest willow flycatcher and the Rio Grande silvery minnow. This project also demonstrates how flexible water management agreements between municipal and environmental interests can be used to meet multiple objectives.

This project leases water from New Mexico municipalities which possess water rights from the San Juan Chama (Colorado River origin) Project that are in excess of the current municipal demand. The leased water was released through the Chama River in northern New Mexico and delivered it to key wetland areas in the Isleta Reach of the Rio Grande that lack adequate water supply to support riparian and environmental function. Audubon, the Middle Rio Grande Water Conservancy District (District) and the U.S. Bureau of Reclamation collaborated and used the District's infrastructure to deliver the leased water.

The project was focused on ensuring that leased water was put to maximum ecologic benefit and coordinated with federal water leases for endangered species. This included ensuring that: 1) river flows in the Isleta Reach were prioritized for water delivery to locations of rich bird usage and nesting, and 2) water was delivered to the key project reach through the month of July, a critical period for nesting songbird fledgling success. During the months of May and June federally leased water was delivered to the Isleta Reach. It was determined that the best use of this project's leased water was to deliver water to locations in the northern section of the Isleta Reach for the month of July. It is estimated that this water helped keep 35 river miles flowing or wetted during the July 2020 period. Comprehensive bird surveys at three locations monitored during the July water release identified a total of 75 species within the project area.

The restore benefit is calculated as the volume leased through water rights transactions, with a one-time restore benefit of 26.0 MG of water in 2020. Instead of being assigned for consumptive municipal or industrial purposes and withdrawn from the river, water rights are repurposed and delivered to support river, wetland, and wildlife needs.

## Bird Returns Wetland Habitat Creation

**Location**: Central Valley, California

**Implementing partner**: The Nature Conservancy (TNC)

**2020 restore benefit**: 18.1 million gallons

**Project Timeline**:

Project initiation: 2017

Year of initial restore benefit: 2017

Anticipated benefit end date: 2026

**Dunlin flock over flooded fields**

(Photo credit: Drew Kelly, TNC, 2014)

**Sandhill cranes rest and feed in a flooded field**

(Photo credit: Drew Kelly, TNC, 2014)

The expansive wetlands of the Central Valley once provided critical habitat for migratory birds traveling the Pacific Flyway that extends from Alaska to South America. While California still supports some of the world's largest concentrations of wintering waterfowl and shorebirds, more than 90 percent of California's wetlands have been drained for development and agricultural production, and bird populations are in significant decline. Water tables are also falling due to loss of critical recharge areas and pumping that exceeds renewable supply.

The primary objective of TNC's Bird Returns Wetland Habitat Creation project is to create temporary wetland habitat on agricultural lands through "dynamic conservation" projects that achieve multiple social and environmental benefits. Farmers receive income to pump water from surface water in the late spring and early fall and apply it to fields before and after the growing season. The water is applied precisely at the times and locations needed for migratory birds based on real-time bird sighting data and extensive monitoring of past project results. In this way, the project leverages citizen science and precision conservation to provide critical habitat. In addition, water applied to up to 30% of the fields associated with this project in the Sacramento Valley infiltrates and returns to groundwater.

While this program has been underway since 2014, Intel committed to supporting this work for ten years, beginning in 2017, which supports continued innovations and adaptations to TNC's "dynamic conservation" programs to maximize social and environmental benefits.

The restore benefit is calculated as the volume of water provided annually to the fields that creates habitat and recharges depleted aquifers. In 2020, 18.1 MG of water was applied to the fields, creating 137.5 acres of wetland.

## Expanded Dynamic Conservation Water Program

**Location**: Central Valley, California

**Implementing partner**: The Nature Conservancy (TNC)

**2020 restore benefit**: 18.1 million gallons

**Project Timeline**:

Project initiation: 2019

Year of initial restore benefit: 2019

Anticipated benefit end date: 2028

**Birds camouflaged in flooded, post-harvest rice field**

(Photo credit: Intel, 2019)

As mentioned above, more than 90 percent of California's wetlands have been drained for development and agricultural production. Wetlands in the Central Valley region historically provided critical habitat for migratory birds on the Pacific Flyway. To restore some of this wetland habitat, TNC is implementing dynamic conservation projects, such as Bird Returns Wetland Habitat Creation (described above), to create pop-up wetlands and short-term habitat benefits when and where migratory shorebirds need it most. In addition, the Sustainable Groundwater Management Act (SGMA), passed in 2014, is already changing how California's water and land assets are managed. As such, on-farm ground-water recharge projects are expected to increase, providing an opportunity to create co-benefits for migratory birds and groundwater with the strategic deployment of funding, projects, and programs.

This project pilots wildlife-friendly groundwater recharge on Central Valley farm fields in Colusa County, an important area for migrating birds, and demonstrates how collaboration with groundwater managers can incorporate this and similar projects into local and regional Groundwater Sustainability Plans. This project helps ensure a reliable supply of water to supply migratory bird habitat while helping communities (and Northern California) meet their sustainable groundwater targets.

TNC scaled up its dynamic conservation work by providing incentives for farmers to apply water to agricultural fields before and after the growing season to facilitate groundwater recharge and provide migratory bird habitat at critical times of the year. TNC monitors groundwater recharge and migratory bird activity on the project parcels. TNC anticipates developing and testing new approaches and modifying the locations, deployment strategies, and other aspects of the work to maximize benefits.

The restore benefit is calculated as the volume of water provided annually to the fields that creates habitat and recharges depleted aquifers. Other important benefits include support for migratory bird populations and farmer income, with farmers receiving incentives for flooding their fallow fields. By funding this program for 10 years, Intel is supporting continued innovations and adaptations to TNC's "dynamic conservation" programs to maximize social and environmental benefits. This project was initiated in 2019. The total benefit for this project and the Bird Returns Wetland Habitat Restoration is split evenly between the two projects. In 2020, 18.1 MG of water was applied to the fields, creating 137.5 acres of wetland.

## Middle Deschutes Instream Flow Restoration

**Location**: Deschutes River watershed, Oregon

**Implementing partner**: Deschutes River Conservancy (DRC)

**2020 restore benefit:** 113.0 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2019

Anticipated benefit end date: 2028

**Deschutes River at Tumalo confluence**

(Photo Credit: Deschutes River Conservancy)

The Deschutes River offers miles of camping, floating, hiking, and fishing in Central Oregon. Historically, the Middle Deschutes River flowed at approximately 1,200 cubic feet per second (cfs). However, since the late 1800s/early 1900s, the Middle Deschutes has been heavily impacted by water withdrawals, including some of the state's largest irrigation diversions. As a result of these diversions, summer flows in this section of the river have been severely depleted, causing higher stream temperatures, inadequate habitat to support healthy native trout populations, and a decline in overall river health. From 1960-1990, the Middle Deschutes below Bend had an average May-September flow of 52 cfs (data accessed for DEBO station at: https://www.usbr.gov/pn/hydromet/arcread.html).

Water rights in most western states, including Oregon, follow the prior appropriation doctrine which gives a water right to whomever first puts the water to a beneficial use. The date of the water right is referred to as the priority date. Older, more senior water rights have priority over more recent, or junior, water rights. In 1999, the DRC created the country's first large-scale water leasing program, working collaboratively with irrigation districts and farmers to voluntarily leave their water instream for an agreed-upon period, in return for an annual payment. This program leases water rights from water rights holders and protects the water to create and sustain instream habitat and water quality benefits. By working through the State of Oregon, this program assures that water is protected instream during critical low flow periods of the year to benefit portions of the river that suffer from chronic low flow. Leasing this water through the State of Oregon ensures that the water restored to the river qualifies as a "designated beneficial use" and ensures that water rights are not subject to loss or forfeiture. These efforts have been successful in helping increase flows during the dry summer season. The Middle Deschutes River's flow now regularly exceeds 125 cfs during the summer months, expanding and improving habitat for native fish and wildlife.

Intel's funding supports the DRC's annual program for 10 years to lease water rights from landowners to restore and protect instream flow through the Oregon Water Resources Department's (OWRD) instream leasing program. Each year, funding supports continued lease payments to irrigators, enrollment and protection of water rights for instream benefits, and administration and monitoring of the instream leasing program. The restore benefit is calculated as the reduced withdrawal, which is equal to the volume leased and protected within the Deschutes River each year, beginning in 2019 and continuing through 2028. The actual volume of restored streamflow each year is measured by DRC and OWRD using monitoring and lease verification. In 2020, DRC confirmed that Intel funding supported leasing of 113 MG of water to restore streamflow in the Middle Deschutes River.

## Bowers Rock State Park Side Channel Restoration

**Location**: Willamette River Basin, Oregon

**Implementing partner**: Calapooia Watershed Council

**2020 restore benefit:** 101 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Bowers Rock**

(Photo credit: River Design Group, 2021)

Side channels that meander through the Willamette River floodplain are critical to ecological health and provide diverse flow, temperature, and habitat benefits for several species of concern. Restoration of flow to these off-channel habitats is identified in state, federal, and local salmon recovery plans as a priority action to support winter rearing for endangered species of fish, to attenuate floods, and to support groundwater systems that can provide temperature benefits for fish and wildlife. Over the past century, nearly half of these valuable floodplain channels on the Willamette River main stem have been eliminated to improve main channel navigation.

The objective of this project is to restore natural river flow to a side channel complex within the 568-acre Bowers Rock State Park. The area includes several former side channels and floodplain wetlands that have been cut off from Willamette River flows by past gravel mining operations and levees. Specifically, this project restored flows to the Coon Creek side channel off the Willamette River, as well as an historic gravel pit that, prior to this project, was ponded and supported primarily non-native fish species.

A connector channel through the floodplain was excavated to reconnect the perennial portion of Coon Creek and the remnant gravel pit to the main stem of the Willamette River and reestablish flow and connectivity to several other disconnected channels (RDG, 2018).

As a result of these activities, typical high winter flows from the Willamette are anticipated to annually connect and flow through the approximately 1.4-mile-long complex for roughly 81 additional days per year at six inches depth or greater, providing over-wintering habitat for juvenile salmon (RDG, 2018). Improved flow and hydrologic function through this system now provide a diversity of off-channel habitats for fish and wildlife, and access to the restored, remnant gravel pit, facilitates fish passage and provides overwinter rearing benefits to fish.

In addition to hydrologic reconnection, the project also involved habitat improvements in the pond (the remnant gravel pit) and revegetation of portions of the floodplain forest, providing significant benefits to wildlife.

The restore benefit is calculated as the average minimum necessary increased streamflow now available to support fish passage into the restored to the side channel and pond. The 2020 restore benefit is 101 MG of water.

## Horseshoe Lake Oxbow Restoration

**Location**: Willamette River Basin, Oregon

**Implementing partner**: Greenbelt Land Trust

**2020 restore benefit:** 41.0 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Horseshoe Lake**

(Photo credit: Greenbelt Land Trust, 2020)

Horseshoe Lake is a historic oxbow located on the east bank of the Willamette River. It is located on a floodplain that supports wetlands, prairie, and riparian forests that are permanently protected through conservation easements and managed by Greenbelt Land Trust[4]. Due to a perched culvert that blocks river flow from accessing the site, the oxbow is disconnected from the nearby Willamette River except during peak flow periods. The objective of this project is to restore flow between the Willamette River and the oxbow to provide habitat for endangered salmonids during the critical winter rearing period. Additional benefits of this project include habitat for other fish and wildlife species, flood attenuation, and restored floodplain function. The site is part of a larger matrix of priority restoration sites and is linked to several restoration initiatives funded by state and federal agencies.

This project replaced a perched culvert with a low water crossing to allow flow exchange and fish passage to the oxbow during lower river flows. As a result of this project, the volume of water in the oxbow and the frequency of inundation increased. Riparian restoration and tree planting (44 acres) were also completed to create a contiguous floodplain forest of more than 400 acres.

The restore benefit is calculated as the increased inundation volume restored to the oxbow by reconnecting the oxbow to the Willamette River. The 2020 restore benefit is 41.0 MG of water.

**Reestablishing the oxbow connection to the Willamette River (before and after)**

(Photo Credit: Greenbelt Land Trust, 2019)

[4] http://greenbeltlandtrust.org/conserving-land/horseshoe-lake/

## Lower South Fork McKenzie River Floodplain Enhancement

**Location**: Willamette River Basin, Oregon

**Implementing partner**: McKenzie Watershed Council (MWC)

**2020 restore benefit:** 198.7 million gallons

**Project Timeline**:

Project initiation: 2018

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Project area following project completion**

(Photo credit: MWC, 2019)

Historically, the South Fork McKenzie River (South Fork) provided habitat for Spring Chinook Salmon, Bulltrout, Pacific Lamprey, Western Pond Turtle, and other native species. The river has been significantly altered by logging, the construction of Cougar Dam, and straightening and channelization of the lower river with levees and riprap. Additionally, the floodplain and side channel have been dewatered and disconnected from the South Fork by the addition of fill materials that raised the floodplain elevation.

The project is a multi-phased effort designed to restore the physical, chemical, and biological processes that maintain a healthy, diverse, and resilient ecosystem within the lower portion of South Fork downstream of Cougar Dam. The objective of this project is to reconnect and restore flow to the floodplain at base river flows to provide critical habitat as well as improved water quality and hydrologic function to benefit a myriad of species. This project included the removal of levee, riprap, and fill material, aggradation of incised channels, rehabilitation of the historical channel network using relic channels where they exist, addition of roughly 800 pieces of large woody material, and riparian planting and noxious weed treatment. This project also included redistribution of sediment, reconnection of the floodplain to the main stem, and a dramatic increase to the quantity and quality of available spawning and rearing habitat for endangered salmon and other species. Spawning surveys conducted soon after project completion showed a dramatic increase in the number of fish residing in the project area, including Chinook salmon redds.

The restore benefit is calculated as the increased volume of water inundating the floodplain as a result of this project. The 2020 restore benefit is 198.7 MG of water.

## Deer Creek Floodplain Restoration

**Location**: Willamette River Basin, Oregon

**Implementing partner**: McKenzie Watershed Council

**2020 restore benefit:** 18.8 million gallons

**Project Timeline**:

Project initiation: 2020

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Deer Creek**

(Photo credit: McKenzie Watershed Council)

Deer Creek is an 8.2-mile long tributary of the McKenzie River, within the larger Willamette River Basin. Deer Creek enters the McKenzie River roughly 15 miles upstream of the Lower South Fork McKenzie River Floodplain Enhancement Project.

Historically, Deer Creek was an anastomosing (braided) system with abundant gravels, complex pools and multiple channels providing high quality habitat for spring Chinook salmon, bull trout, rainbow trout, cutthroat trout, Harlequin duck, beaver and other native species. The creek was altered by historical logging and stream clean-out of wood, the placement of powerlines through the middle of the valley, a significant flood in 1964 that scoured the valley, and subsequent channel straightening and channelization with levees and berms to protect surrounding roads and powerlines.

As a result of these changes, stream velocity increased significantly, flushing gravels, sediment, large wood and other organic material from the creek, reducing habitat for native fishes and increasing stream downcutting.

The objective of this project is to restore the physical, chemical and biological processes that maintain a healthy, diverse and resilient ecosystem within Deer Creek. The project, which was completed in 2020, restored 28 acres of floodplain over 0.8 miles of Deer Creek by removing floodplain berms, filling incised channels with over 16,000 cubic yards of floodplain sediment and placement of over 700 pieces of large wood to restore braided channel networks across the valley bottom.

The restore benefit is calculated as the increased volume of water inundating the valley bottom as a result of this project, with a 2020 restore benefit of 18.8 MG of water. A broad range of habitat, water quality and water availability benefits are also realized by this work.

## Nanjapura Lake Restoration

**Location**: Ponnaiyar Watershed, Bengaluru, India

**Implementing partner**: CLEAN International

**2020 restore benefit:** 35.2 million gallons

**Project Timeline**:

Project initiation: 2020

Year of initial restore benefit: 2020

Anticipated benefit end date: 2029+

(This project provides a long-term benefit)

**Nanjapura Lake after dredging (bottom)**

(Photo credit: Say Trees)

India has the second largest population in the world and is facing water scarcity across the country. Currently, over 100 million people are affected by groundwater shortages in 21 Indian cities including Bengaluru.

Bengaluru, the capital of the State of Karnataka, was once known as the "city of lakes" because of the region's rich green environment and famous lakes. The lakes were used to harvest rainwater and serve as a source of water for agriculture. These lakes have begun to disappear due to rapid economic and demographic growth and urbanization. Over the last few decades, dozens of lakes in the city have vanished and many of the lakes in Bengaluru are full of sediment or completely dried up. In addition, groundwater levels have dropped significantly in Bengaluru. Restoration of Nanjapura Lake, located in south Bengaluru, is helping capture monsoon and other rains and promote groundwater recharge.

The objective of this project is to increase the capacity of the lake and improve the region's water table and biodiversity. This was achieved by desilting 16 acres of Nanjapura Lake. The sediment dredged from the lake was used to build a walking path around the lake and any additional sediment was taken to nearby government land for disposal. Trees have been planted along the walking path and near the lake.

The restore benefit is calculated as increased volume captured by desilting and increasing the capacity of Nanjapura Lake. The 2020 restore benefit is 35.2 MG of water.

# Funded Projects Not Yet Achieving Restore Benefits

In addition to the projects described in the previous section, Intel has funded eight projects that are in various stages of implementation, but not restoring water as of December 31, 2020. Restore benefits will be reported when these projects are fully completed, and benefits are being achieved. Table 3 summarizes these projects and the estimated future restore benefits.

**Table 3. Estimated Future Benefits of Projects Funded by Intel**

| Project Location | Project Name | Implementing Partner | Project Activity | Estimated Restore Benefit Upon Project Completion (MGY) |
|---|---|---|---|---|
| Arizona | Lower Salt River Invasive Species Removal | National Forest Foundation | Invasive species removal | 79 |
| Arizona | Wallow Fire Reforestation | National Forest Foundation | Reforestation | 41.4 |
| California | King Fire Reforestation | American Forests | Reforestation | 145.0 |
| Oregon | Wapato Lake Restoration and Management | Clean Water Institute | Infrastructure replacement for water level management | 89.0 |
| Oregon | Chicken Creek Restoration | Friends of the Tualatin National Wildlife Refuge | Tree planting and floodplain/side channel/wetland restoration | 20.0 |
| Texas | Travis County floodplain reforestation | TreeFolks | Reforestation | 0.6 |
| India | Dyavasandra Lake Restoration | CLEAN International | Lake desilting | 67.0 |
| Costa Rica | Agua Tica Forest Protection | Fundecor | Forest protection | 45.9 |
| | | | ***Total Estimated Restore Benefit (MGY) =*** | **488** |

## Project-Specific Results

The locations of eight funded projects not yet achieving restore benefits as of December 31, 2020, are shown in Figure 2, and project-specific details are described in the remainder of this section.

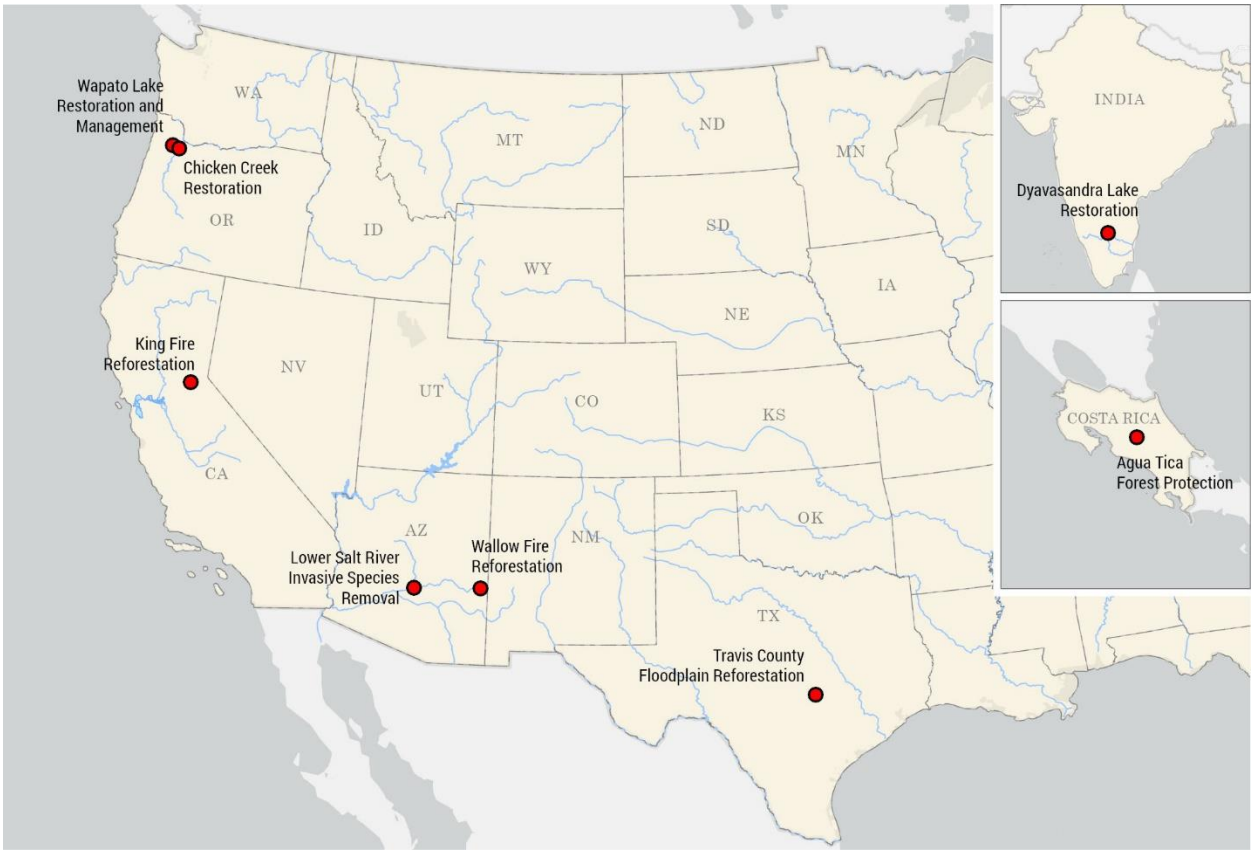



**Figure 2. Locations of Funded Projects not Achieving Restore Benefits in 2020**

## Lower Salt River Invasive Species Removal

**Location**: Salt River Watershed, Arizona
**Implementing partner**: National Forest Foundation (NFF)
**Estimated restore benefit upon completion:** 79.0 million gallons per year
**Project Status:** Initiated in 2020; Expected completion in 2022

As mentioned in the Lower Salt River Restoration project summary above, Tonto National Forest, located north of Phoenix, one of the most-visited National Forests in the U.S., is experiencing significant infestation of invasive and noxious weed species. In 2012, infestations were estimated to cover 514,361 acres of the forest. Most of these infestations (490,450 acres) have spread beyond the U.S. Forest Service's capability to eradicate. These invasions threaten native plant species by direct competition and limiting natural regeneration, reducing overall biodiversity and habitat for wildlife.

This project will remove invasive, non-native vegetation from a 70-acre area, which includes 20 acres of dense *Arundo* located in the riparian zone. *Arundo* is a non-native large grass that grows in dense stands up to 10 meters in height and thrives in riparian areas where the water table is at or near the soil surface. The *Arundo* will undergo removal and a series of three treatments to ensure it does not reestablish. In concert with these treatments, the entire project area will be treated to remove invasive species, including tamarisk, and will be replanted with native species that include willow, cottonwood, paloverde, and mesquite. These species are necessary to support ecological function at the site and create a vegetative community that can outcompete *Arundo* and prevent reestablishment. Reestablished native vegetation at the site will reduce evapotranspiration and provide critical habitat for birds, amphibians, and wildlife in vital desert riparian corridors.

In total, 70 acres of riparian habitat will be restored along a section of the Salt River that is frequently used for swimming, floating, hiking and bird watching. The figure below shows the Salt River and another project area that is in the process of being cleared. In the photo (below, right), the river is less than 10 meters past the crew members but is not visible due to the dense *Arundo* stands.

**Salt River (left) and Arundo Removal from a Nearby Riparian Location (right).**

(Photo Credit: NFF, 2019)

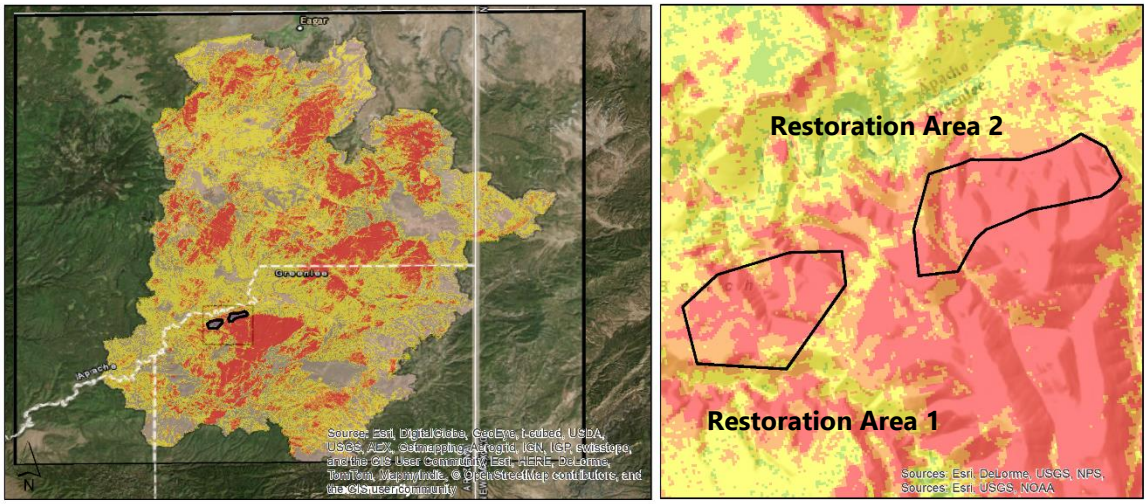
The estimated restore benefit is calculated as the reduced evapotranspiration volume due to replacement of *Arundo* with native vegetation.

## Wallow Fire Reforestation

**Location**: Salt River Watershed, Arizona
**Implementing partner**: National Forest Foundation (NFF)
**Estimated restore benefit upon completion:** 41.4 million gallons per year
**Project Status:** Initiated in 2019; Expected completion in 2021

Forests in the southwestern U.S. have evolved in response to low and mixed severity fires that typically burned 250 acres or less. However, the severity and extent of fires has increased due to fire suppression, prolonged drought, and outbreaks of introduced and endemic pests and diseases. In 2011, the Wallow Fire burned 217,740 acres in Apache, Greenlee, and Graham Counties in Arizona and Catron County in New Mexico. An estimated 31% of the total area burned at either a high or moderate severity (Youberg, 2015).

NFF is working to restore forest cover within the burned area of the Apache-Sitgreaves National Forest by replanting native pine, fir, and spruce trees. The objective of this work is to restore an ecologically appropriate and fire-adapted forest that provides broad habitat and hydrologic benefits in the headwater forest locations.




**Two restoration areas within the Wallow Fire area targeted for replanting. These areas burned at primarily moderate (orange) or high (red) intensity**

(Fire intensity map: Youberg, 2015)

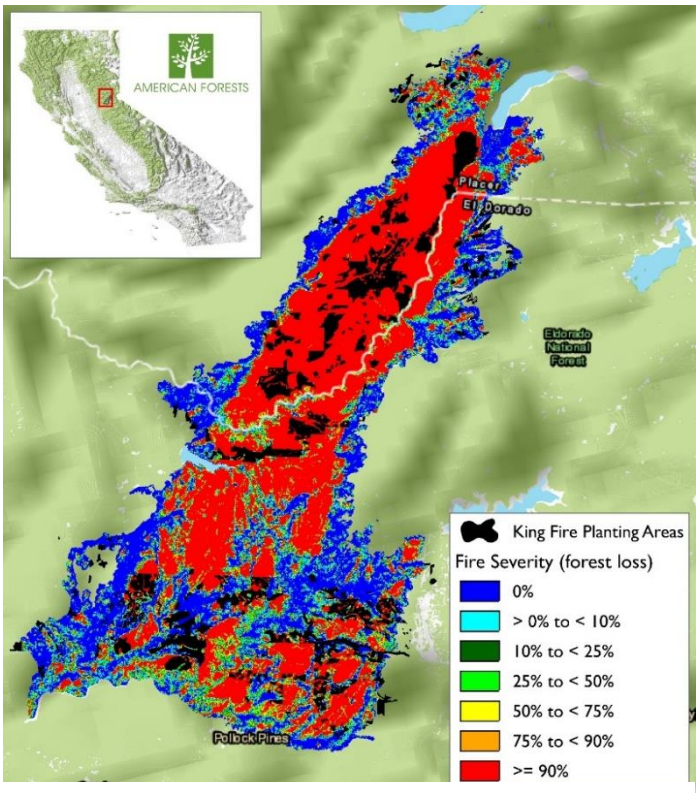
A total of 682 acres will be reforested to restore a key headwater area of the forest burned by the Wallow Fire. The planting prescription is 100 trees per acre planted in randomly sized clumps that mimic natural seeding patterns and reduce future wildfire risk.

The estimated restore benefit is calculated as the reduced runoff volume as a result of restoring forest cover on the burned site.

## King Fire Reforestation

**Location**: American River Watershed, California
**Implementing partner**: American Forests
**Estimated restore benefit upon completion:** 145.0 million gallons per year
**Project status:** Initiated in 2019; Expected completion in 2022

In fall 2014, the King Fire scorched over 97,000 acres in El Dorado and Placer Counties in California within a month, including 30,000 acres within the El Dorado National Forest. Almost half of the area burned at a high severity, killing 90% of the plants and trees. A significant portion of the burned area is located within the American River watershed, which supplies water to Sacramento County as well as other water agencies and irrigation districts.




**King Fire Location, Extent and Severity**

(Map credit: American Forests)

In 2016-2017, American Forests conducted the first large scale reforestation effort in partnership with the USFS. This work restored a mix of forest conditions that mimic natural and post-fire regeneration forest conditions to improve resilience to fire, pests and other stressors.

This project expands on the earlier effort by replanting 1,000 acres in the Middle and North Forks of the American River in Eldorado National Forest. Sites will be prepared to reduce fuel loads, and planted with a mixture of Sierra white fir, California incense-cedar, sugar cone pine, ponderosa pine, Douglas fir and giant redwood seedlings that will be planted primarily in clusters to mimic natural seeding patterns and reduce future wildfire risk. The improved vegetative cover will reduce runoff and help restore the natural hydrology.

The estimated restore benefit is calculated as reduced runoff volume as a result of restoring forest on 1,000 acres of the burned site.

## Wapato Lake Restoration and Management

**Location**: Tualatin River Basin, Oregon
**Implementing partner**: Clean Water Institute
**Estimated restore benefit upon completion:** 89.0 million gallons per year
**Project Status:** Initiated in 2018; Completed in 2020 (expected restore benefit in 2021)

Wapato Lake is a historic lake and wetland area that has been actively managed for decades using levees and pumps to drain winter runoff from the site so it can be used for farming. The lake bed area, designated as the Wapato Lake National Wildlife Refuge, is managed by the U.S. Fish and Wildlife Service (USFWS). Water level management in Wapato Lake benefits wildlife by providing aquatic and wetland habitat.

The USFWS management plan for the Wapato Lake area requires major pumping from the lake to be completed by May 1 of each year to prevent adverse downstream impacts on the Tualatin River, including nuisance and toxic algal growth, high stream temperatures, and low dissolved oxygen. However, aging infrastructure such as unreliable and failing pump and pipe systems currently impedes the timely pumping of excess water. Failure to evacuate excess water early in the year directly contributes to human health and water quality risks for the Tualatin River basin because the quality of retained, shallow water declines in the warm spring and summer months. By replacing Wapato Lake piping and pumping infrastructure, pumping can be properly timed to minimize adverse impacts to downstream water quality, as well as to precisely manage water levels in Wapato Lake to benefit wetland habitat for migratory bird populations.

This project supported the infrastructure improvements to ensure that Wapato Lake water levels can be reliably managed and will facilitate controlled water releases prior to May 1 to avoid water quality impairment downstream. The estimated restore benefit is calculated as the average annual volume of water pumped in March and April each year, to improve the flow regime and prevent downstream water quality impacts. Without the project, Wapato Lake could not be reliably managed for water quality benefits and for maximized wetland wildlife habitat.

## Chicken Creek Restoration

**Location**: Tualatin River Basin, Oregon
**Implementing partner**: Friends of the Tualatin National Wildlife Refuge
**Estimated restore benefit upon completion:** 20.0 million gallons per year
**Project Status:** Initiated in 2020; Expected completion in 2021

Chicken Creek traverses the Tualatin River National Wildlife Refuge Complex (TRNWRC) on the Refuge's Atfalat'i Unit, prior to draining into the Tualatin River. Over 100 years ago, Chicken Creek was straightened into an agricultural ditch, allowing farmers to manage the land for crops and dairy cows, and reducing the length of the formerly meandering creek from 2.5 to 0.5 miles. This change impacted fish and wildlife habitat by impeding passage, altering hydrology, and eliminating habitat. Additionally, the higher flow velocity in the straightened channel has caused significant channel erosion, disconnecting the creek from its floodplain and depositing eroded sediment into the Tualatin River.

The Tualatin River NWR was established in 1992. Since then, water control structures and water delivery canals have been used to manage hydrologic function at the site. Currently, the water control structures are a barrier to aquatic organisms accessing habitat upstream of NWR, and Chicken Creek remains in an altered, eroded channel which limits rearing opportunities for native species such as cutthroat trout and western brook lamprey.

The objective of this project is to increase floodplain inundation within NWR to provide stormwater and habitat benefits during the wetter winter months in the near term. This will set the stage for beaver to colonize the site and create habitat conditions that will support biodiversity, improve water quality and promote water storage across an active floodplain. This project involves excavation of a new channel to restore meanders to Chicken Creek, the addition of large woody debris to the creek channel, removal of water control infrastructure and planting wetland and riparian vegetation for beaver. Additionally, the site is expected to provide habitat for Winter Steelhead and Pacific Lamprey, as well as other species in the Tualatin River that will have access to Chicken Creek after removal of a water control structure. The estimated restore benefit is calculated as the increased volume of water inundating the floodplain as a result of this project.

**Restoring the historic meandering flow of Chicken Creek, TRNWRC (left) and placement of woody debris in restored Chicken Creek, TRNWRC (right).**

(Photo credit: B. Anderson, Friends of the Tualatin River National Wildlife Refuge Complex, 2020)

## Travis County Floodplain Reforestation

**Location**: Colorado River Basin, Texas
**Implementing partner**: TreeFolks
**Estimated restore benefit upon completion:** 0.6 million gallons per year
**Project Status:** Initiated in 2020; Expected completion in 2021

Healthy riparian forests can improve water quality by filtering pollutants, shading streams and stabilizing streambanks. They also provide wildlife habitat and other benefits such as carbon sequestration. However, many of the historically forested riparian buffers in Travis County, Texas have been degraded due to pasture and grazing. These areas are often barren or overgrown with invasive species.

The Travis County Floodplain Reforestation Program was initiated in 2019 and is a collaborative effort between TreeFolks, the City of Austin's Watershed Protection Department, Travis County and City Forest Credits. This project provides free reforestation services, including free trees, planting services and consultations to landowner applicants. These applicants can choose to participate in the Carbon+ Credit pilot whereby carbon credits are sold to the City to help meet their 2020 carbon neutral goal. Proceeds from the sale of the carbon credits will be exclusively used by TreeFolks for program administration and future tree planting in Central Texas. For properties participating in the Carbon+ Credits program, there is a 25-year easement protecting the trees from cutting or removal.

The objective of this project is to restore healthy forest buffers in eastern Travis County floodplains, by replanting large, contiguous sites within or very near the 100-year floodplain, reducing water runnoff. Deforested areas with little-to-no canopy cover are targeted for planting. The average floodplain width that will be planted, averages 50 meters or more, but varies by site. Several additional objectives include: promoting stewardship through volunteer involvement; providing education through workshops for participants focused on land stewardship, reforestation, and carbon sequestration to aid in creating a network of landowners preserving floodplains; improving water quality through riparian planting; and improving air quality through tree planting.

The estimated restore benefit is calculated as reduced runoff volume as a result of replanting 16 acres of degraded riparian buffers with trees.

## Dyavasandra Lake Restoration

**Location**: Ponnaiyar Watershed, Bengaluru India
**Implementing partner**: CLEAN International
**Estimated restore benefit upon completion:** 67.0 million gallons per year
**Project Status:** Initiated in 2020; Expected completion in 2021

Bengaluru, the capital of the State of Karnataka, was once known as the "City of Lakes" because of the region's rich green environment and famous lakes. The lakes were used to harvest rainwater and serve as a source of water for agriculture. These lakes have begun to disappear due to rapid economic and demographic growth and urbanization. Over the last few decades, dozens of lakes in the city have vanished and many of the lakes in Bengaluru are full of sediment. In addition, groundwater levels have dropped significantly in Bengaluru.

CLEAN International and their local implementation partner, SayTrees, are working to address water scarcity through restoration of lakes, such as Dyavasandra Lake, throughout the city. Lake rejuvenation will increase the ability to capture monsoon and other rains and promote groundwater recharge.

The objective of this project was to increase the storage capacity of Dyavasandra Lake, recharge groundwater and improve the region's biodiversity. This will be achieved by desilting 14 acres of Dyavasandra Lake which is currently overgrown and predominantly filled with silt and vegetation. This project will also involve strengthening of the main embankment and planting of 1,500 trees around the lake. These activities will help alleviate morphological stressors that include blocked inlets and altered lake boundaries. Recovered sediment will be used to build a walking path around the lake and will be shared with local farmers.

The estimated restore benefit is calculated as increased volume captured as a result of the increased storage capacity.

**Current Condition of Dyavasandra Lake**

(Photo credit: SayTrees, Sept. 2020)

## Agua Tica Forest Protection

**Location**: San Jose, Costa Rica
**Implementing partner**: Fundecor
**Estimated restore benefit upon completion:** 45.9 million gallons per year
**Project Status:** Initiated in 2020; Expected completion in late 2021/early 2022

There are rising pressures on water resources near San Jose, Costa Rica due to high population growth, poor urban planning, and changing land uses. To protect water resources in the Grande and Virilla River subwatersheds, Fundecor has led the development of Agua Tica, the first public-private water fund established in Costa Rica. A technical program has been established to promote water replenishment in a groundwater recharge area, by protecting forest from conversion to grassland, agriculture and residential development. Although land use conversion is forbidden in Costa Rica, it still occurs.

**Photos of potential project site to be protected.**

(Photo credit: Manuel Guerrero, FUNDECOR, October 2020)

This project supports Fundecor efforts to establish agreements between Fundecor and landowners to protect approximately 370 acres of forest from degradation for a 10-year period, avoiding increased runoff by preserving forest and preventing conversion. This portion of the forest will be secured and monitored to ensure it remains protected.

The estimated restore benefit is calculated as avoided runoff volume as a result of protecting existing forest from conversion to a more degraded condition.

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