Facebook

Volumetric Water Benefits: 2020 Report

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August 6, 2021

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Water Environment | Scientists Engineers

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Introduction

Facebook takes a comprehensive approach to water stewardship involving efficient operations, reuse, and water restoration. Since 2012, Facebook has tracked and reported water usage effectiveness at its data centers, which are among the most water-efficient in the world.

Facebook has set a goal of being Water Positive by 2030. To achieve this goal, Facebook will restore more water than we consume, starting with high water stressed regions, as well as funding non-volumetric water projects that have a catalytic impact in the watersheds where we operate. In 2017 and 2018, respectively, Facebook piloted two water restoration projects in the Upper and Middle Rio Grande watershed, and has since funded additional, longer-term projects providing volumetric water benefits in the source watersheds of four data centers with high to extremely high water risk. Through the end of 2020, Facebook funded ten additional projects that are in various stages of completion. Six of these projects generated volumetric benefits totaling 2,250,266 cubic meters (m3) in 2020. Project locations are shown in Figure 1.

Figure 1. Project Locations

Quantification Methodology

Volumetric water benefits (VWBs) are the volume of water resulting from water stewardship activities, relative to a unit of time, that modify the hydrology in a beneficial way and/or help reduce shared water challenges, improve water stewardship outcomes, and meet the targets of Sustainable Development Goal 6 (Reig et al., 2019). Volumetric water benefits of water restoration projects are quantified following Reig et al. (2019) and the specific method applied depends on the project objectives, activities implemented, and the information available for calculating benefits. It is recognized that the estimated benefits have some uncertainty, as they are based on best available data and information using models and estimation techniques. To reduce this uncertainty, scientifically-defensible methodologies and conservative assumptions are employed in the quantification process.

Volumetric water benefits of completed projects are first counted in the year the project begins achieving volumetric water benefits, and in each subsequent year, for up to ten years maximum, provided the project is maintained and confirmed to function as intended. If a project has multiple funders, the volumetric water benefit is adjusted to reflect Facebook's financial contribution compared to the total project cost to report the percent of the total volumetric water benefit that can be attributed to Facebook.

Overview of Benefits of Completed Project

As of December 31, 2020, eight Facebook-supported water restoration projects were completed. Six of these projects generated volumetric water benefits in 2020 and two are projected to first generate volumetric water benefits in 2021 (Table 1). The projects are located in areas degraded by past activities that have altered the hydrology and ecosystems. The completed projects restore water-related ecosystems (SDG 6.6) including floodplains, riparian areas, wetlands, and waterways by implementing activities that help restore the hydrology. One reuse project improves water management in the local community (SDG 6.B). In addition to volumetric water benefits, these projects contribute to improvements in water quality, summer baseflows, and aquatic habitat.

Table 1. Completed Projects with Current or Future Volumetric Water Benefits

Project	Location	Data Center	Implementing Partners	Project Activity	VWB Indicator	2020 VWB m3/yr	Anticipated 2021 VWB m3/yr	Project Completion	Year of initial VWB claim	Anticipated Benefit Duration End Date
Comanche Creek Restoration	New Mexico	Los Lunas	Trout Unlimited and National Forest Foundation	Floodplain Reconnection	Increased storage	30,000	30,000	2018	2019	2028
Cedro Creek Restoration	New Mexico	Los Lunas	The Nature Conservancy; Rocky Mountain Youth Corps; Stream Dynamics	In-channel structures to facilitate recharge	Increased infiltration	74,000	74,000	2019	2020	2029
La Jara Wetland Restoration	New Mexico	Los Lunas	The Nature Conservancy, Amigos Bravos, Watershed Artisans	Wetland restoration	Increased storage	11,400	11,400	2019	2020	2029
Ingram Meadow Restoration	Oregon	Prineville	National Forest Foundation; U.S. Forest Service; Middle Deschutes Watershed Council; Rocky Mountain Elk Foundation	Wetland restoration	Increased storage	5,800	5,800	2019	2020	2029
Middle Rio Grande Flow Restoration	New Mexico	Los Lunas	Audubon New Mexico	Water rights leasing	Reduced withdrawal	555,066	308,000	2020	2020	2027[1]

[1] The volumetric water benefit of the longer-term (8-year) commitment to lease 308,000 m3/yr will end in 2027. 2020 is the end date for the shorter-term leases.

Project	Location	Data Center	Implementing Partners	Project Activity	VWB Indicator	2020 VWB m3/yr	Anticipated 2021 VWB m3/yr	Project Completion	Year of initial VWB claim	Anticipated Benefit Duration End Date
Provo River Flow Restoration	Utah	Eagle Mountain	Central Utah Water Conservancy District	10-year water rights lease	Reduced withdrawal	1,574,000	1,574,000	2020	2020	2029
California Wildfire Reforestation	California	Santa Clara	Arbor Day Foundation, American Forest Foundation	Reforestation	Reduced runoff	--	141,045	2020	2021	2027
Eagle Mountain Wastewater Reuse	Utah	Eagle Mountain	Eagle Mountain City	Wastewater reuse	Reduced withdrawal	--	37,800[2]	2020	2021	2030
2020 Volumetric Water Benefit						**2,250,266**		-	-	-
Anticipated 2021 Volumetric Water Benefit from Completed Projects							**2,182,045**			

[2] The full volumetric water benefit is anticipated to equal 136,000 m3/yr when this project is fully built out. The project will be phased in from 2021-2024; the 2021 estimated volumetric water benefit will be updated in the 2021 report to reflect the actual volume reused.

2020 Quantification Results

The cost-share adjusted 2020 volumetric water benefit for Facebook is 2,250,266 m3/yr, based on completion of six projects that are achieving volumetric water benefits in 2020. These projects are described below.

Comanche Creek Restoration

Comanche Creek is a high elevation tributary to the Rio Costilla and Upper Rio Grande located in Carson National Forest upstream of the Los Lunas data center (Figure 2).

- **Challenge**: Wetland loss, floodplain disconnection and lowered groundwater table
- **Outcome**: Restored 24 acres of off-channel floodplain wetland habitat
- **Volumetric Water Benefit:** 30,000 m3/yr increased storage
- **SDG Goal**: 6.6

Figure 2. Project Location: Comanche Creek Restoration

Past logging, road building, mining, and heavy grazing activities have caused stream channel incision, wetland loss, and floodplain disconnection within the Comanche Creek watershed. As a result, the groundwater table has dropped, and wet meadow vegetation has converted to dryland and shrub vegetation. A combination of instream and bank restoration activities were identified and carried out by Trout Unlimited and the National Forest Foundation to address channel incision, reconnect Comanche Creek to its floodplain, and recharge floodplain wetlands. As a result of this project, 24 acres of off-channel floodplain wetlands were restored, and positive results have been observed indicating the water table has increased as a result of this project (Figure 3).

Figure 3. Project area before restoration (left) and after restoration (middle (2018) and right (2019)). Photo credits: Craig Sponholtz, Watershed Artisans, Inc. (left and middle photos). T. Mitchell, Trout Unlimited, 2019 (right photo)

Cedro Creek Restoration

Cedro Creek is located within the Cibola National Forest upstream of the Los Lunas data center (Figure 4), in an area that has been severely impacted by improper road and trail alignment, historic logging and grazing, and wildfire suppression.

- **Challenge**: Channel erosion causing drying riparian zone
- **Outcome**: Reconnected floodplain, increased baseflow duration, reduced erosion and increased riparian vegetation
- **Volumetric Water Benefit:** 74,000 m3/yr increased infiltration
- **SDG Goal**: 6.6

Figure 4. Project Location: Cedro Creek Restoration

Cedro Creek and its tributaries have become highly eroded and incised (Figure 5). Channelization has increased runoff volume and velocity and has reduced infiltration and storage. Zuni bowls, rock rundowns, one-rock dams, and diversion dams were implemented at approximately 70 degraded locations to increase soil moisture along the stream corridor and decrease wildfire risk in the Cedro Creek headwaters. As a result of this project, streambank erosion and down-cutting were addressed, increasing infiltration, reducing sediment loading, and improving water quality. Native woody plants, grasses and forbs benefit from increased soil moisture and improve biodiversity. Additionally, increased infiltration is expected to increase the baseflow duration in Cedro Creek.

Figure 5. Bank erosion (left) and structure installation (right). Photo credit: Rocky Mountain Youth Corps/Stream Dynamics, 2019

La Jara Wetland Restoration

La Jara wetland is located within the Carson National Forest (Figure 6) and is degraded due to historic and current land management activities including livestock grazing, forestry and fire suppression, road drainage, and recent, prolonged drought cycles.

- **Challenge**: Channelization and headcuts causing loss of hydrologic function
- **Outcome**: Restored 12.7 acres of off-channel wetland habitat, reduced erosion, increased floodplain connectivity and groundwater storage
- **Volumetric Water Benefit:** 11,400 m3/yr increased storage
- **SDG Goal**: 6.6

Figure 6. Project Location: La Jara Wetland Restoration

High priority erosion areas were identified for headcut repair along the Rio Fernando de Taos and three tributary valleys. This project restored 12.7 acres of off-channel wetland habitat by stabilizing eroding headcuts with rock rundowns, controlling channel grade with one rock dams, and increasing floodplain connectivity with sheet flow spreaders (Figure 7). This project increases groundwater storage, supports increased summer baseflow in Rio Fernando de Taos, and improves water quality.

Figure 7. Lower project area restoration structures (3 visible in photo on the left). Photo on the right shows headcut repair and erosion control. Photo credit: Rachel Conn, Amigos Bravos, 2019

Ingram Meadow Restoration

Ingram Meadow is located within Ochoco National Forest, Oregon (Figure 8), in the same watershed as the Prineville data center. Past grazing, removal of riparian hardwood vegetation, and timber harvest have resulted in a downcut channel that drains the wet meadow and has lowered the water table for most of the year. Although the stream channel supported perennial water, the meadow no longer functioned as a "sponge," holding groundwater throughout the year. Instead, the meadow dried out, and areas with important fen habitat were at risk of being drained and lost.

- **Challenge**: Incised channel draining a wet meadow and lowering the water table
- **Outcome**: Restored 15 acres of wet meadow, increasing late summer water availability
- **Volumetric Water Benefit:** 5,800 m3/yr increased storage
- **SDG Goal**: 6.6

Figure 8. Project Location: Ingram Meadow Restoration

This project repaired a degraded, incised channel to halt headcutting using plug and pond techniques (Figure 9). Significant amounts of large wood, rock, and soil were placed in the channel to prevent upstream headcutting and increase groundwater storage. The refilling of the water table supports increased summer water availability. Additionally, this project improves water quality, reduces sediment loading, and provides improved wet meadow habitat.

Figure 9. Ingram Meadow Restoration Site (Photo credit: USFS, 2018)

Middle Rio Grande Flow Restoration

Flow depletion in the Middle Rio Grande is a chronic issue with important cultural, water quality, and wildlife implications. The river corridor provides crucial habitat for migratory, wintering, and nesting birds. Isleta Reach is a 42-mile portion of the Middle Rio Grande downstream of Albuquerque (Figure 10). Irrigation withdrawals contribute to persistent low flows and intermittent drying, depriving cottonwoods, wetlands, birds, fish, and other wildlife of water that is needed to survive.

Figure 10. Project location: Middle Rio Grande Flow Restoration

- **Challenge**: Chronic flow depletion impacting aquatic and riparian habitat
- **Outcome**: Restored flows in a dewatered reach, improving fish and wildlife habitat
- **Volumetric Water Benefit :** 555,066 m3/yr reduced withdrawal
- **SDG Goal**: 6.6

Endangered species like the Rio Grande Silvery Minnow and Southwestern Willow Flycatcher remain imperiled in this area, and work to restore flow to the river and improve critical riparian habitat is a focus for many groups across the region. In 2020, this project leased a total of 450 acre-feet of water (555,066 m3) from the City of Bernalillo which was delivered to key wetland and channel areas in the Isleta Reach of the Rio Grande that lack adequate water supply to support riparian, in-channel, and environmental function. The total volume is the sum of three separate leases, one of which will continue to deliver 250 acre-feet of water to these key wetland and channel areas through the end of 2027. This 8-year flow restoration project is the first long-term commitment to lease water for environmental flows in the Rio Grande. To maximize the duration of flows to the Isleta Reach, the water was comingled with volumes acquired through other leases. Together the leases helped keep 35 river miles flowing or wetted in 2020. This was crucial to sustain wetland vegetation and fish and wildlife habitat during normally dry periods; a total of 75 bird species were identified at three monitored locations in the project area in July 2020.

Provo River Flow Restoration

For over one hundred years, lower Provo River flows have been diverted out of the river at Olmstead Diversion Dam for hydropower generation (Figure 11). As a result, in-river flows were reduced for an approximately 5-mile stretch of the river, with very significant low flow impacts occurring in the most downstream 1.2-mile portion. During periods of high irrigation demand, river flows have dropped below 5 cfs, resulting in warmer water and reduced oxygen levels, which can be fatal to wild brown and rainbow trout populations in this popular fishery.

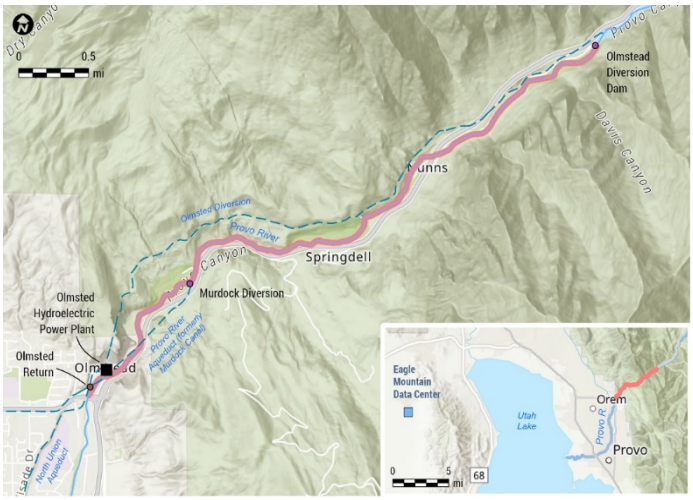

Figure 11. Project location: Provo River Flow Restoration

- **Challenge**: Seasonal flow depletion impacting aquatic habitat and recreation
- **Outcome**: Restored flows in a dewatered reach, improving fisheries and catalyzing increased investment and restored flows.
- **Volumetric Water Benefit :** 1,574,000 m3/yr reduced withdrawal
- **SDG Goal**: 6.6

Facebook was the initial funder of this collaborative project to increase flows in the lower Provo River, paying Central Utah Water Conservancy District for foregone revenue to ensure 7.15 cfs remains in the river during the hottest months of the year for a 10-year period. Figure 12 shows the project reach before and after this project was implemented. This project has received widespread support from NGOs, as well as federal and state agencies, and has piqued interest of others. The initial investment from Facebook has since been leveraged to raise significant additional funds that ensure 20 cfs remains in the river from April 15 to October 15 each year through 2029. These flows will be measured and dedicated to support instream flow in the project reach.

Figure 12. Provo River before and after flow restoration
Photo Credit: Trout Unlimited

Future Quantification Results for Completed Projects

Two projects supported by Facebook have been completed and are expected to generate volumetric water benefits beginning in 2021. Together with six projects that have continuing volumetric water benefits, these projects are expected to achieve 2,182,045 m3/yr volumetric water benefit in 2021, but this volume will be confirmed before it is reported. Information on these projects is provided below.

California Wildfire Reforestation

In 2018, over 1.8 million acres of California forestland were burned by wildfires. To restore these areas, Arbor Day Foundation and American Forest Foundation are planting two million trees on 8,000 acres, focusing on large swaths of private lands, which are often omitted from governmental revitalization efforts.

In 2020, Facebook supported the planting of 70,000 trees on 280 acres, within the larger project area. Species planted included Ponderosa Pine, Douglas fir, Sugar pine and Incense cedar. This restoration of vegetative cover on burned lands will reduce runoff and erosion and will also restore habitat.

- **Challenge**: Fire impacts and altered hydrology
- **Outcome**: Reforested 380 acres of forest to restore hydrologic function
- **Volumetric Water Benefit:** 141,045 m3/yr reduced runoff
- **SDG Goal**: 6.6

Eagle Mountain Wastewater Reuse, Utah

The City of Eagle Mountain is at risk of future water scarcity because of its location in a hydrologically closed watershed, limited precipitation, and increasing water demand due to rapid population growth. This project involves construction of infrastructure to treat and reuse wastewater effluent from Facebook's data center to irrigate a city park using drip irrigation. The treated water will reduce withdrawal from a freshwater supply currently used for irrigation. This project was completed in 2020 and reuse is expected to be initiated in 2021, with monitoring and maintenance handled by the City following completion.

- **Challenge**: Local water availability
- **Outcome**: Increased supply reliability
- **Volumetric Water Benefit:** 136,000 m3/yr reduced withdrawal at full buildout
- **SDG Goal**: 6.B

Overview of Benefits of Funded Projects Not Yet Complete

As of December 31, 2020, Facebook funded two projects that are not yet complete (Table 3), which are expected to have future volumetric water benefits. The first project addresses local water availability challenges related to increased water demand in the region. The estimated volumetric water benefit for this project is based on currently available information and will be revisited and after project completion. One community project, Harvey Jones Bioswale is included for which volumetric water benefits have not yet been evaluated. Volumetric benefits will be evaluated when project design details are available. Brief project descriptions follow the table below.

Table 3. Funded Projects Not Yet Complete

Project	Location	Data Center	Implementing Partners	Project Activity	VWB Indicator	Estimated Future VWB (m3/yr)	Implementation Timeline
Prineville Aquifer Storage and Recharge	Oregon	Prineville	City of Prineville; Apple	Aquifer recharge	Increased recharge	TBD	2018-2020
Harvey Jones Bioswale	New Mexico	Los Lunas	The Nature Conservancy and Southern Sandoval County Arroyo Flood Control Authority	Bioswale construction	Increased recharge	TBD	TBD[3]

[3] Project planning, design and groundwork are delayed due to COVID.

Prineville Aquifer Storage and Recharge, Oregon

- **Challenge**: Local water availability
- **Outcome**: Increased supply reliability
- **Volumetric Water Benefit:** TBD m3/yr increased recharge
- **SDG Goal**: 6.B

The City of Prineville has experienced growing water demand from its customers, including multiple data centers. There are concerns about meeting peak day demands, which can vary from 1 to 4 million gallons per day (MGD) and the long-term resiliency of the city's water supply. This project creates an Aquifer Storage and Recovery (ASR) System that takes advantage of underground storage in geologic formations and will allow the City to meet growing peak day demands. Groundwater is extracted from wells located near the Crooked River during the winter when streamflows are higher and demand is lower. It is conveyed uphill to the ASR, where the aquifer is recharged with injection wells and stored for use during summer periods of greater demand. This project is expected to begin delivering volumetric benefits in 2021, with monitoring and maintenance handled by the City following completion.

Harvey Jones Bioswale Demonstration Project, New Mexico

- **Challenge**: Flooding and degraded water quality
- **Outcome**: Reduced peak runoff and improved water quality
- **Volumetric Water Benefit:** TBD m3/yr increased recharge
- **SDG Goal**: 6.6

The Nature Conservancy and the Southern Sandoval County Arroyo Flood Control Authority are partnering to develop a bioswale in Rio Rancho, New Mexico, upstream of the Los Lunas data center. This green stormwater treatment feature will capture and infiltrate stormwater runoff from the Montoya watershed, filtering sediments, toxics, and nutrients from the stormwater before slowly releasing it to the Rio Grande. The slow release of stormwater will also support fish and wildlife habitat through creation of wetland habitat.

References

Reig, P., Larson, W., Vionnet, S. and JB Bayart. 2019. Volumetric Water Benefit Accounting (VWBA): A Method For Implementing and Valuing Water Stewardship Activities. URL: https://wriorg.s3.amazonaws.com/s3fs-public/volumetric-water-benefit-accounting.pdf