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# Chatfield Reservoir–Plum Creek



from **Engineering With Nature: An Atlas, Volume 2.**

by US Army Engineer Research and Development Center



## Denver, Colorado, United States

**Developing a unique vegetation monitoring and reporting program.** Living with nature is fundamental to Denver's culture. So when reallocated water storage space in Chatfield Reservoir freed 3.6 meters of elevation for municipal use, protecting sustainability of the ecosystem was key. One of two primary tributaries feeding into Chatfield Reservoir, Plum Creek represents a critical source of water for Denver. However, rapid urban development and increased stormwater runoff from impervious surfaces had disrupted the creek's sediment dynamic and caused severe streambed degradation. The water table dropped, drying out the adjacent floodplain and wetlands habitat within Chatfield State Park. The lost wetland eliminated existing habitat for the federally endangered Preble's meadow jumping mouse (*Zapus hudsonius preblei*), starved the mature riparian cottonwood forest and wetlands of water, and allowed invasive species to dominate the ecosystem. From 2017 to 2019, the U.S. Army Corps of Engineers, in cooperation with several state and local partners, installed naturalized riffles to raise the streambed's elevation and water table; and they planted 50,500 shrubs, 1,800 trees, 18,000 willow stakes, and 2,200

meters of willow logs. The restoration aimed to sustainably balance human development needs with natural systems, and was critical for supplying additional water to the people of Denver.

Article cover: Plum Creek floodplain restoration area (flowing from top to bottom), 2017. (Image from Google Earth)

## Producing Efficiencies

The team removed and repurposed trees lost from degradation and dewatering effects; and the use of naturalized, void-filled riffle structures reduced the conditioning period that traditional solutions require. The conditioning period brings an increased risk of failure, so to further reduce this risk, the team developed a high-resolution, spatially referenced monitoring and adaptive management program to rapidly communicate restoration status during the conditioning phase. Data from restoration monitoring crews upload immediately to a master database. Access to near real-time monitoring data facilitates adaptive decision-making to improve restoration efficiency.



The same view as seen on the article cover but prior to restoration, 2017.

(Image from Google Earth)

## Using Natural Processes

Void-filled riffle structures customized and installed at the project site now divert portions of high flows to dissipate energy and provide surface water



to the floodplain. The project team used many of the removed trees to construct beaver-dam analogues to encourage local beavers to take up residence. Others they strategically anchored or used to armor the stream bank and outside bends, providing habitat for the Preble's meadow jumping mouse and for fish and other aquatic organisms. Restoring the streambed elevation on Plum Creek was a catalyst to reviving ecosystem processes, active beaver ecology, and a functional stream fishery.



Incised Plum Creek and dewatered “dead” floodplain prior to restoration.  
(Photo by Chatfield Reallocation Mitigation Company [CRMC])



Repurposed tree anchored for habitat.  
(Photo by Clayton Ridenour, USACE)

## Broadening Benefits

In addition to revitalizing habitat for many native species, the project is providing additional water for Colorado by using environmentally responsible methods. Restoring the Plum Creek floodplain not only reduces flood height and power but also naturalizes sediment dynamics to improve the quality of water delivered to Chatfield Reservoir. Further, Chatfield State Park experienced record visitor use in 2019 despite ongoing construction for the restoration. Momentum from the successful restoration at Plum Creek has served as a case study for water conservation programs in the developing communities upstream.



Integrated recreation trail through Plum Creek restoration area. The Park experienced 28% higher visitor use in 2020 than in 2019.

(Photo by CRMC)





Floodplain wetlands and side channels respond quickly to restored water table at Plum Creek. Restored braided and meandering side channels promote ecosystem resilience.

(Photo by CRMC)

## Promoting Collaboration

The diverse team organized itself into a project coordination team and a technical advisory committee. Thirty members worked on each team, representing stakeholders and interest groups. The Chatfield Reservoir Mitigation Company managed implementation of the project and maintained critical communication with the two teams and the general public through regular meetings, interactive web media, and outreach with the community. Nurturing effective communication among all the partners and stakeholders allowed the collective focus to stay on maximizing the benefits of restoring Plum Creek.



Monitoring and data collection during conditioning at Plum Creek.

(Photo by CRMC)



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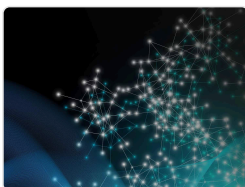
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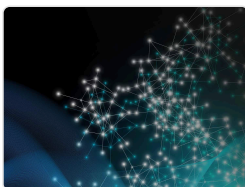
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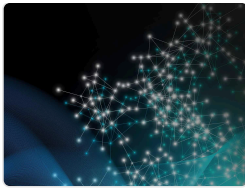
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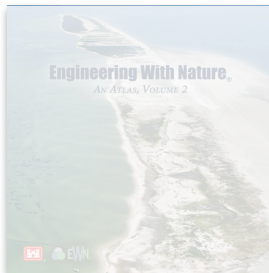
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