



CASE STUDY:

Using the Hazard Mitigation Grant Program to Address Post-Wildfire Flooding in Chelan County, Washington

Project Title: Antoine Creek Culvert Replacement Project

Project Leads: Chelan County Flood Control Zone District and Chelan County Department of Public Works

Background

The area

The Antoine Creek basin is situated in the northeastern corner of Chelan County in Central Washington. Stretching 3.25 miles along Antoine Creek Road, the Antoine Creek Canyon continues north into Okanogan County. The canyon is characterized by a diverse landscape of shrub-steppe habitat interspersed with forested sections nestled between steep canyon walls. A floodplain at the basin's lower end reveals the remnants of agricultural activity where orchards were cultivated, while the upper portion features alfalfa and hay fields. After the Chelan Complex Fire, approximately 30 properties (including 16 homes) along Antoine Creek Road were at risk of post-fire flooding.

The Chelan Complex Fire

In August of 2015, an early morning thunderstorm in the lower Lake Chelan area caused lightning strikes igniting wildfires on Chelan Butte, First Creek, Cagle Gulch, and Antoine Creek—known collectively as the Chelan Complex Fire. The fire burned over 90,000 acres of land, forcing the evacuation of over 1,000 residences and ultimately destroying over 50 structures.



Flooding along Antoine Creek Road before culvert replacement. Photo Credit: Chelan County Public Works

Wildfire Effects

The burn severity within the Antoine Creek basin was high enough that discharge and velocity of surface water flows significantly increased in the following years. During subsequent spring runoff events, three culverts along Antoine Creek Road could not adequately convey the increased quantity of sediment-laden runoff, ultimately causing flooding.

The resulting flooding severely disrupted residents' access to their homes and properties as well as damaged the county's right-of-way, requiring deployment of significant public resources to mitigate the impacts. Under these new surface flow conditions, a substantial runoff event could ultimately render Antoine Creek Road impassable, resulting in cascading impacts such as forcing residents to navigate detours spanning several hundred miles to access services and restricting emergency vehicle access.

Prior to the Chelan Complex Fire there were no floods or damages of record at the affected sites. The fire fundamentally altered ground conditions, generating extremely rapid runoff that overwhelmed culverts previously capable of handling rapid snowmelt or intense rainfalls. Under pre-fire conditions, vegetation would naturally slow runoff and promote ground infiltration, minimizing the amount of water reaching the creek. In the current high burn severity landscape condition, land adjacent to the creek is nearly impervious, dramatically altering the area's hydrological dynamics.

CASE STUDY: Using the Hazard Mitigation Grant Program to Address Post-Wildfire Flooding in Chelan County (continued)

Recovery Efforts

In 2020, the Chelan County Flood Control Zone District secured \$240,000 from the FEMA Hazard Mitigation Grant Program to upsize three culverts intersecting Antoine Creek to address future post-fire flooding risks in the area. In the years leading up to the grant application, two damaging events occurred, underscoring the urgent need for infrastructure improvements as a proactive solution to a recurring post-fire problem.

In 2021, construction was completed to replace the existing culverts. The project involved:

- Replacing two 24-inch diameter and one 36-inch diameter corrugated metal pipe culverts.
- Installing three new culverts, each 3-feet tall and 8-feet wide, with variable lengths.

Hydrological capacity has significantly improved:

- Post-fire, Antoine Creek's estimated capacity was 100 cubic feet per second (CFS). The original 24-in and 36-in culverts only conveyed 30 CFS and 70 CFS, respectively.
- New, upsized culverts can pass 270 CFS. This additional capacity is designed to manage anticipated post-fire debris flows.
- Since the culverts were upsized, no further flooding events occurred.



Culvert 3 before replacement. Photo Credit: Chelan County Public Works



Culvert 3 before replacement. Photo Credit: Chelan County Public Works

Lessons Learned

Federal recovery assistance programs operate within a complex regulatory framework, which can extend implementation timelines. In this case, flooding from the 2015 Chelan Complex Fire began in 2016. While FEMA launched the grant application process in 2018, funds were not awarded until 2020—pushing construction to the summer of 2021 and the close of the project to 2023.¹

Different funding sources assist at different points of the recovery timeline. While federal funding is often helpful for longer term recovery, other immediate needs will most likely have to be covered by sources with faster timelines. It is vital to work closely with recovery funding sources and identify the process and timelines for each respective source. Understanding the nuances of grant funding systems helps in developing a recovery strategy for mitigating impacts to residents.

Federal assistance program timelines may conflict with immediate community needs and expectations.

Communication is critical during prolonged recovery and can bridge gaps between administrative processes and community needs. Chelan County Public Works worked closely with the homeowners impacted by flooding throughout the project. Regular updates and transparency helped to manage community expectations with the project timeline.

Work with partners and stakeholders to develop a communications approach early in recovery. Establishing a plan to provide regular, detailed updates on project status with residents can minimize frustrations and provide opportunities for feedback and information sharing.

¹ Construction timelines were also impacted by delays related to the COVID 19 pandemic.

