

# A naturalistic approach to watershed restoration and flood mitigation



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## Background

Santa Clara Pueblo is a federally recognized Native American tribe located on the Rio Grande in Northern New Mexico. Since 1998, three severe wildfires have originated outside tribal boundaries, yet have burned over 80% of Santa Clara forested lands. Compounding these disasters, post-fire flooding devastated the Santa Clara Creek and Canyon, an area historically relied upon for recreation, economic revenue, and spiritual sanctuary.

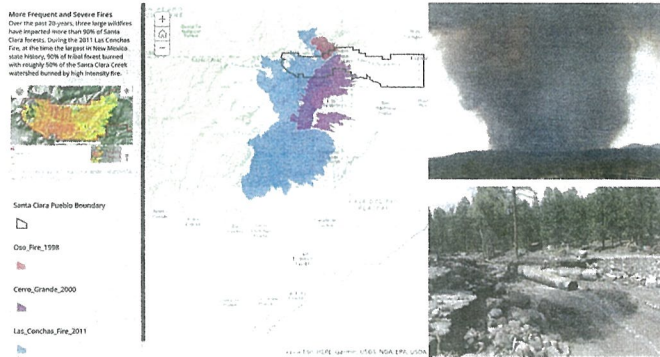


Fig. 1) Three severe wildfires have impacted the Santa Clara Pueblo during the past 25 years. Fire severity, unique geology, and monsoon rains resulted in disastrous flooding and debris flows that inflicted an estimated \$250M in damages.

## Disaster Declarations

The magnitude of these events has resulted in Santa Clara Pueblo receiving five Presidential Disaster Declarations, as both a direct grantee to FEMA and as a sub grantee to the State of New Mexico.



Guided by the National Disaster Recovery Framework (NDRF), Santa Clara Pueblo has embarked on a collaborative recovery strategy that is being made possible through federal and state interagency coordination, inter-tribal support, and collaboration with multiple NGO's. Combining expertise from diverse disciplines has enabled the Santa Clara Pueblo to embark on a landscape-scale recovery.



## Project Area



Fig. 2) Our project area is contained within the Santa Clara Creek Watershed and includes over 32,000 acres, 19-miles of stream, and 5,000 feet of elevation gradient.

## Recovery Strategy

Santa Clara Creek is regarded as a sacred source of life and the Tribe has taken a 'stream-first' approach by prioritizing natural stream function in its flood mitigation and restoration design. This includes emphasizing green infrastructure and bioengineering principles that utilize natural materials while aiming to maximize ecosystem benefits. For example, incorporating woody debris in stream design supports habitat complexity for fish while increasing surface roughness to improve resilience for future flood disturbance.

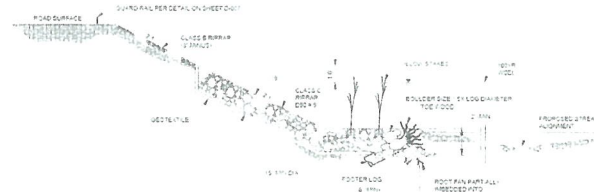


Fig. 3) Bioengineered floodplain and embankment design reinforced with locally sourced logs, root wads, boulders, and willows. Vegetation is integrated with riprap as water table permits.



Fig. 4) Baffles are designed and built to deflect erosive energy and induce meandering. Structures are constructed with on-site rock, log, and/or posts.

## Erosion Control

Erosion control structures are constructed in tributaries to reduce sediment transport, minimize head cutting, and aggrade incised channels. The structures are cost-effective, being built by hand and using on-site materials. Over 5,300 structures have been built in 26 tributaries since 2014.



Fig. 5) Erosion control to minimize sediment transport and facilitate aggradation

## Flood Mitigation

A watershed top-down approach has been implemented to capture sediment before it reaches the main stem of the creek. Now that the system is showing signs of stabilization, design has commenced on the main stem of Santa Clara Creek. Bottomless culverts are being designed to convey 100-year precipitation events, facilitate meandering, floodplain connectivity, and fish passage.

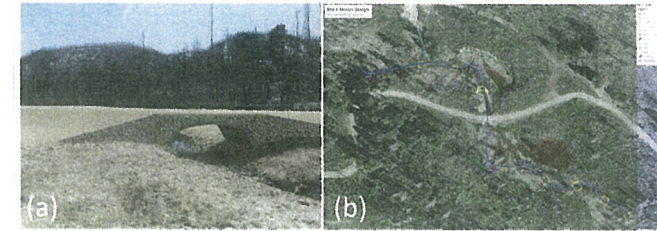


Fig. 6) Bottomless culverts (6a) are supplemented with stream restoration (6b). Natural stream function is promoted with induced meandering, a bankful channel, connected floodplains, vegetation planting, and the use of rock and woody debris to control grade and enhance habitat complexity for reintroduction of endemic trout. Construction will begin in October, 2018.

## A Path to the Future

The goal is to create a more vibrant ecosystem that will increase resiliency to future disturbances while enhancing recreation opportunities and restoring the cultural value of this watershed. By taking a naturalistic approach to watershed restoration and flood mitigation, the Tribe can work to restore this landscape which acts as their spiritual sanctuary, pharmacy, food & clothing store, and biology classroom. As the watershed is restored, this "classroom" will provide the community with the richness and depth needed for their culture to survive.

