FEMA

Interagency Recovery Coordination

CASE STUDY

Restoring Native Ecosystems to Build Resilience

SANTA CLARA PUEBLO

Learning Objective: Analyze how a tribe used creativity, perseverance, and a long-term mindset to manage and build resilience through a challenging wildfire and flood recovery.

Keywords: Recovery, Wildfire, Flooding, Infrastructure Systems, Natural & Cultural Resources, Resilience, Sustainability, Nature-Based Solutions, Partnerships, Leveraging Financial Resources, Psychological and Emotional Recovery

PART ONE

Background

The Santa Clara Pueblo's Governor reflected on what the community had experienced over the past eight years. The Santa Clara Pueblo, a federally recognized tribe 3,500 strong, had been directly hit by a massive wildfire in August 2011, known as the Las Conchas Fire. Due to the Las Conchas Fire and several other major fires in previous years, 80% of the pueblo's forested areas had been razed. The Las Conchas Fire alone burned 28% of all the land that supports the Pueblo.

The Santa Clara Canyon has been the homeland of the Santa Clara Pueblo Tribe since time immemorial. Today the pueblo encompasses 90 square miles, situated along the Rio Grande in New Mexico. The Santa Clara Creek forms a 32,000-acre watershed that runs west to east down a steep, 26-mile canyon dropping from 11,000 feet to 5,500 feet of elevation. The Santa Clara Creek and Canyon had always been the heart of the life-sustaining ecosystem for its people, and in more recent times had served as a source of public identity and the main economic driver for the Pueblo by providing public fishing, camping, and other recreational opportunities. The Santa Clara Pueblo land has traditionally supported a lifestyle that utilizes resources harmoniously through farming, grazing, hunting, and fishing, with the canyon at the center of the Tribe's ancient history and culture.

The Las Conchas Fire had loosened soil in the canyon and removed stabilizing vegetation along its slopes, creating the perfect conditions for dangerous erosion and flash flooding in the Pueblo's watershed. The Tribe's worst fears became a recurring reality during the 2012, 2013, and 2014 monsoon seasons, when the Santa Clara Creek frequently flooded, creating large-scale debris flows caused by the floods' erosion of the canyon walls. After the 2013 monsoons, roads leading through the canyon lay broken apart and bridges washed away. All four water control structures of the creek's tributaries were breached and critical infrastructure along the river, including a fire station and recreational facilities, were destroyed by the floodwaters. Riparian habitat and 100% of the fish population was eliminated by the debris flow. This was devastating to the Tribe, who view protecting their water source as protecting their way of life, expressed by the emblem "*water is life*".

Figure 1. Before and after photographs of the Santa Clara Canyon. Source: New Mexico PBS.

After facing devastating flash flooding events in both July and September of 2013, Governor Chavarria applied and received the first-ever disaster declarations in the region for which a tribal nation was the direct recipient. The Governor had previously served as Forestry Director, switching into an emergency management role after the Las Conchas Fire at a time when the Tribe did not have an emergency management department. He had led the response efforts during the wildfire and subsequent flooding events and was now equipped to lead the 2013 recovery effort as Governor with the lessons he had learned from the previous two disasters. Restoring the integrity of the Santa Clara Watershed and protecting his community from future harm would be his top priority.

> "This is our home. We have got to protect our home. Each thing [within the reservation] is utilized for specific purposes within our tradition, culture, and religious activities. Each thing has a purpose – from that little pebble, to the ant, to the butterfly, to the trees. Everything is considered a traditional cultural property because it plays a critical role in who we are living off this land and in how we utilize these for a specific purpose each year. We need to restore each of our natural resources for its specific purpose."– Governor Chavarria

The government also faced motivation from local tribal members to restore and protect the Santa Clara Creek and Canyon to continue the cultural traditions practiced within them. This was a sentiment Governor Chavarria shared. Older generations had grown up with ready access to the creek and canyon, an experience now denied to younger generations because of the near-total devastation from the fires and flooding.

Tribal members have expressed concern that the disasters will have a permanent impact on the cultural unity of the tribe, as young tribal members aren't able to fully experience the Tribe's traditions and way of life without access to the creek and canyon. Sacred areas have had to remain closed for nearly a decade due to safety hazards, creating an intergenerational gap in cultural connection. Tribal members expressed a tremendous sense of fear and loss because the Santa Clara Canyon, which has been at the core of the Tribe's identity for generations, is gone. They noted the damage is now a threat to their existence.

Challenges

The Tribe did not have an emergency management department or a recovery structure when the disasters hit, but they did have a team of dedicated staff willing to roll up their sleeves and take on multiple roles to help with the recovery process.

The Tribe placed restoring native ecosystems and long-term sustainability at the forefront of recovery project planning, an approach most federal partners had little experience with as most legislative programs focused funding to immediate reduction of risks to life and property. The Tribe wanted to apply bioengineering principles - the use of living materials (plants, seeds, etc.) to create nature-based solutions - to restore its canyon. However, these techniques had limited applications to reduce the specific hazards in Santa Clara Canyon. The Tribe realized they would need to be persistent and innovative in navigating the authorities and requirements of federal programs.

Figure 2. An example of a bank stabilization technique employed in Santa Clara Pueblo that uses natural materials. Source: Santa Clara Pueblo Forestry.

It was sometimes difficult to meet all FEMA Benefit-Cost Analysis (BCA) requirements for projects supported through the Public Assistance and Hazard Mitigation programs. The intangible ecosystem services that were restored through this approach, cultural importance of the fishing sites, and economic benefits from tourism were negligible in FEMA's BCA calculus, which at the time, only quantified avoided future property damages as benefits. Despite the use of natural materials to save

money, some projects had construction costs that exceeded accepted design-construction cost ratios, and therefore could not be funded with federal grants.

In addition, difficulties finding contractors experienced in the "natural channel function" approach to stream restoration limited progress.

> "Finding subject matter experts with special skills to protect the water source was critical. It was a challenge for people to understand the internal teachings and to get things accomplished in support of those teachings." – Governor Chavarria

Sediment transport and deposition has been the largest physical obstacle in restoring Santa Clara Creek. Since 2011, $26M has been spent on sediment removal from the canyon. In 2015, the first attempt at treating the creek itself was designed, permitted, and eventually abandoned due to the threat of damage to restored structures and habitats from the continuous sediment deposition.

The Tribe would need to remain resilient to restore their way of life. They asked the Creator to guide them and give them the strength and courage they needed to face and overcome these challenges together.

PART TWO

Actions

Santa Clara Pueblo worked with a FEMA Interagency Recovery Coordination team to identify avenues of assistance from across federal departments/agencies, which each have different skillsets and authorities that can support post-disaster recovery efforts. Santa Clara Pueblo Forestry worked with the U.S. Army Corps of Engineers (USACE) to assess impacted watersheds and identify potential opportunities for flood protection projects. The Tribe decided to implement a top-down approach to restoring the watershed, beginning with fuel breaks and replanting vegetation at the highest-elevation point in the watershed and working downward through the canyon. Erosion control and hazardous fuel reduction efforts were implemented to rebuild natural buffer systems. The Tribe obtained funding support from USACE for two low-impact solutions for flood risk reduction - gabion structures (steel wire baskets filled with rock and gravel that stabilize riverbanks) and improved berms (raised riverbanks made of compacted soil). A plan was also developed in coordination with USACE to document and preserve any tribal cultural resources found during debris cleanup and project construction. USACE collaboration continued by integrating the Tribe's innovative strategies to further develop the Corp's Engineering with Nature program and publish the techniques in peer reviewed journals.

Figure 3. A mitigation project installed in the canyon to treat water runoff before it reaches the main stem of the creek improves the resiliency of the watershed while the natural vegetation recovers.

Stream restoration projects applied principles of bioengineering, engineering with nature, and natural channel design, including the use of natural materials and vegetation for construction and the installation of bottomless culverts to provide unobstructed routes for water, sediment, and fish. Bank stabilization and channel reconstruction efforts were essential to restore habitat, control erosion, and connect floodplains. In an effort to restore and strengthen the forested tribal land, local leadership set an annual goal of planting 200,000 locally sourced seedlings.

The Tribe collaborated with more than 10 Non-Governmental Organizations (NGOs) for technical and financial assistance with its watershed restoration efforts. For example, The Nature Conservancy (TNC) coordinated and funded the design of post-fire debris collection fences, which catch landslide material before it would reach infrastructure and threaten resources below. TNC also supported wetland restoration in the Santa Clara Creek headwaters to improve surface and ground water storage through its Rio Grande Water Fund initiative.

The Burned Area Emergency Response (BAER) and Burned Area Rehabilitation (BAR) programs from the U.S. Department of Interior (DOI) were leveraged to mitigate threats to downstream communities in future natural disasters. The BAER program's objectives include alleviating emergency conditions to help stabilize soil; controlling water, sediment, and debris movement; preventing impairment of ecosystems; and mitigating significant downstream threats to health, safety, life, and property.

The recreational resources destroyed by the floodwaters were relocated to an area that is less vulnerable to future flood events and were repurposed as stations for crews assisting with recovery efforts. Though the economic revenue from the cabins was lost for several years, the tribe was able to rebuild their local economy through the opening of hotels, convenience stores, and a casino in a refurbished commercial building. Some tourism activities in the canyon were resumed after funding from the Bureau of Indian Affairs (BIA) was used to replace picnic and camping areas.

Generous grants from the San Manuel Band of Mission Indians in California and the Shakopee Mdewakanton Tribal Nation in Minnesota contributed to the restoration and revitalization of cultural and historic resources damaged during the fires and subsequent flooding. The Tribe used these grants to help meet cost sharing requirements for federal programs; providing leveraging that allowed the Tribe to qualify for 3 – 5 times more funding than they would have been able to on their own, making a strong case for the benefits philanthropy can bring to disaster recovery.

Results

Stream restoration efforts were undertaken throughout the canyon. USACE accomplished new firsts for the agency's work with tribal nations, including developing the first Watershed Management Plan (WMP) with a tribal nation. In total, over 5,300 structures were repaired or installed in 26 tributaries to Santa Clara Creek, which have greatly reduced the risks of erosion throughout the watershed and helped stabilize stream banks in a sustainable, environmentally friendly manner. Water quality has continued to improve, and species that serve as indicators of stream health have returned, including macroinvertebrates, butterflies, and hummingbirds. The stream restoration efforts were so successful that the Santa Clara Pueblo earned the 2018 EPA Outstanding Green Infrastructure/Low-Impact Design Award from the Environmental Protection Agency (EPA) for their innovative approach to watershed-scale recovery. Santa Clara Pueblo plans to eventually reintroduce species such as the Rio Cutthroat Trout, beaver, and river otter as habitat health improves, restoring ancient ecosystems the community has depended on for many, many generations.

Intergovernmental Partners

- Federal Emergency Management Agency
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture
  - Forest Service
  - Natural Resources Conservation Service
- U.S. Department of the Interior
  - Bureau of Indian Affairs
  - Bureau of Reclamation
  - Fish and Wildlife Service
  - National Park Service
  - Geological Survey
- U.S. Environmental Protection Agency
- San Manuel Band of Mission Indians
- Shakopee Mdewakanton Tribal Nation
- State of New Mexico

Reforestation tactics have also been implemented as part of the Tribe's long-term plan to recovery. The Tribe's goal of planting 200,000 seedlings annually was successful, and from 2015 – 2018 this was exceeded. The Tribe has sourced these seeds and plugs from local sources during natural cycles and then propagated them into seedlings at regional greenhouses. The Tribe initially planted species of trees native to the highest elevation areas, moving to willow/shrub planting and herbaceous grass propagation as they entered riparian areas at lower elevations. The Tribe continues to monitor forest health, planting survival rates, and impacts on the watershed to better understand how these treatments can be more effectively managed in the future.

Restoration efforts in the canyon integrated adaptive management principles to build resilience into the recovery process. By implementing a top-down restoration approach, working to stabilize banks and control erosion from higher to lower elevation through the canyon, restored areas can act as a natural buffer in future heavy rain events, mitigating damages that would have occurred farther downstream from debris flows. By combining a collaborative recovery strategy with a "naturalistic approach to watershed restoration and flood mitigation" (Garrett Altmann, Santa Clara Pueblo Forestry Department), the Santa Clara Pueblo is emerging at the forefront of bioengineering, engineering with nature, and nature-based solutions.

Santa Clara Pueblo leadership believes that through collaboration, ecosystem restoration, and integrating traditional ecological knowledge (TEK), the cultural ties to this sacred landscape can be reconnected. Recovery projects have added benefits of recreational opportunities for local residents while concurrently providing resiliency to future disasters.

Santa Clara Pueblo's success directly utilizing Interagency Recovery Coordination and the National Disaster Recovery Framework (NDRF) has been a source of inspiration for other Pueblos in the region. The Tribe's approach to hazard mitigation has also served as an inspiration for surrounding Pueblos, leading to several installing similar debris fences in their own canyon walls. Governor Chavarria has utilized his working relationships with other tribal

leaders to build their trust in the NDRF and his former emergency management director, Paula Gutierrez, has worked with many tribes to improve their emergency management capacity by helping them understand their current capacity among functions that support emergency management. She notes that by taking a team approach, they can leverage the expertise they already have to be successful.

Lessons Learned

- Interagency, non-governmental, and intertribal partnerships were essential for connecting the Santa Clara Pueblo with the resources, funding, and subject matter expertise needed to restore the creek and canyon.
- Strong partnerships established pre-disaster allowed for an improved understanding of recovery needs and greater participation in the recovery process.
- By listening to the community and incorporating traditional ecological knowledge and values into the recovery planning process, the Santa Clara Pueblo was able to achieve sustainable, long-term results that improved the resiliency of the watershed ahead of future disaster events.
- The Santa Clara Pueblo leadership noted that to navigate the complex authorities of many federal disaster programs, it was necessary to both have regular meetings with all federal interagency partners at the table and to work hard to obtain the data those federal agencies needed to document the projects and meet their legislative requirements.

Additional Resources

- After Fire and Floods, Restoring a Sacred New Mexico Canyon and a Way of Life (PBS News Hour)
- A Tribe's Collaborative Journey to Develop Forest Resiliency: A Story Map by Santa Clara Pueblo Forestry
- Santa Clara Pueblo and the Corps of Engineers: A Working Partnership Between Two Nations
- Santa Clara Creek: Headwaters Restoration
- Emergency Management Institute Training Course E0210 Recovery from Disaster: Local Community Roles. Check often for upcoming training offerings.
- FEMA IRC Case Study – Santa Clara Pueblo: A Tribe's Journey to Prepare, Mitigate, and Recover
- Building Community Resilience with Nature-Based Solutions: A Guide for Local Communities.
- Promoting Nature-Based Hazard Mitigation Through FEMA Mitigation Grants.
- Using Engineering with Nature® (EWN®) Principles to Manage Erosion of Watersheds Damaged by Large-scale Wildfires. In Integrated Environmental Assessment and Management (IEAM). DOI: 10.1002/ieam.4453