

**Landscape Conservation Forecasting:**  
**Wildfire Risk and Post-fire Runoff Risk Assessments for the Middle Truckee River Watershed**

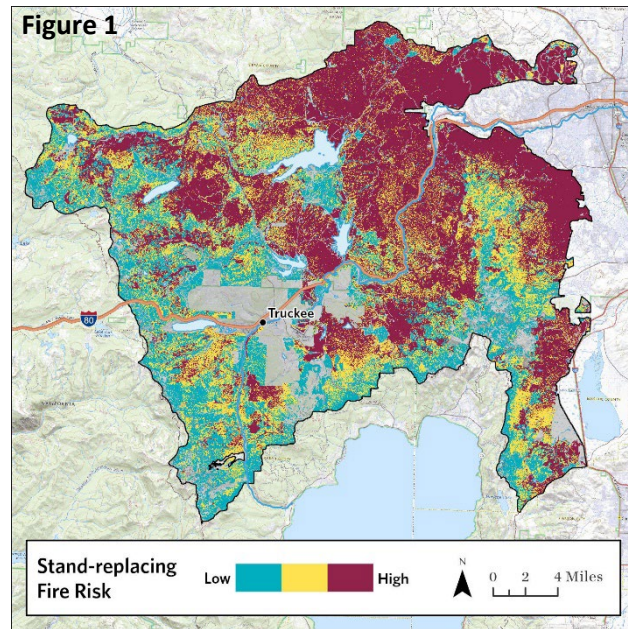
From Summer 2017 – Spring 2019, The Nature Conservancy (TNC) conducted a scientific study of 389,000 acres of the Middle Truckee River Watershed that demonstrated forested areas within the watershed, including those in the wildland urban interface (WUI), are at high risk for stand-replacing fires. The study used Landscape Conservation Forecasting (LCF), a mapping and state-and-transition modeling approach first developed by TNC scientists in Nevada, to assess the risk of uncharacteristically large and intense wildfires and develop strategies for reducing risk. LCF assessed wildfire risks through modeling vegetation succession under different future site condition scenarios. Outputs from LCF were then coupled with hydrologic and sediment transport modeling to analyze post-fire runoff. Various scenarios of climate change and disturbances such as wildfire, floods, and droughts were simulated, followed by an assessment of water resource impacts that would likely result from those disturbances.

LCF uses field-verified high-resolution satellite imagery to create detailed maps of vegetation. Predictive computer models then simulate natural vegetation succession patterns to forecast the future vegetation conditions. Prior to the Middle Truckee River Watershed study, TNC successfully tested and implemented LCF on other projects throughout the western United States for more than a decade. Previous applications of LCF have provided data and decision support to federal and state agencies, including the Bureau of Land Management, Department of Defense, U.S. Forest Service (USFS), and Nevada Department of Wildlife. LCF provides a level of scientific rigor that allows federal land managers to use the outputs for National Environmental Policy Act (NEPA) regulatory decision support. Additionally, LCF is optimized for resource management decisions on large landscapes of hundreds-of-thousands to several million acres. Given the size of the Middle Truckee River Watershed and that the majority of the forested acres are owned and managed by the USFS, LCF was an ideal fit for the watershed risk assessment study.

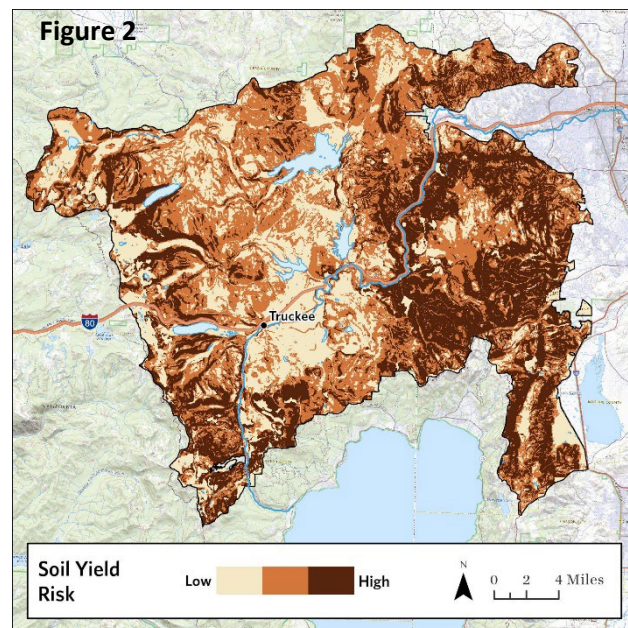
Vegetation map outputs from LCF were used with Precipitation Runoff Modeling System (PRMS) models developed for the Bureau of Reclamation's Truckee Basin Study to quantify changes in snowmelt and runoff. The Water Erosion Prediction Project (WEPP) model was used with the LCF vegetation maps to quantify soil erosion and transport. Combining these modeling processes allowed TNC to predict water quality impacts and changes in flows resulting from burned landscapes, which alter snowpack retention and water release. Coupling LCF outputs with other modeling tools resulted in a rigorous assessment of stand-replacing fire and post-fire runoff risks across the landscape, as well as identification of priority forest treatments areas.

Figure 1 (below) shows the risk of stand-replacing fires, where the unnatural intensity of fires will result in the loss of most or all trees and desirable vegetation. (Areas in red are highest risk.) Stand-replacing fires would:

- Increase risk of flooding and runoff of large amounts of sediment and debris into rivers, streams, and reservoirs. Figure 2 shows areas where sediment runoff would be greatest after a fire.
- Degrade the quality of the source-water for nearly 400,000 people and 7,000 businesses in the Reno-Sparks area that depend on the Truckee River for their drinking water.
- Destroy areas popular for outdoor recreation, which is among the region’s largest economic sectors.
- Directly threaten homes, schools, businesses, and infrastructure.
- Impair air quality and increase respiratory-related health problems.



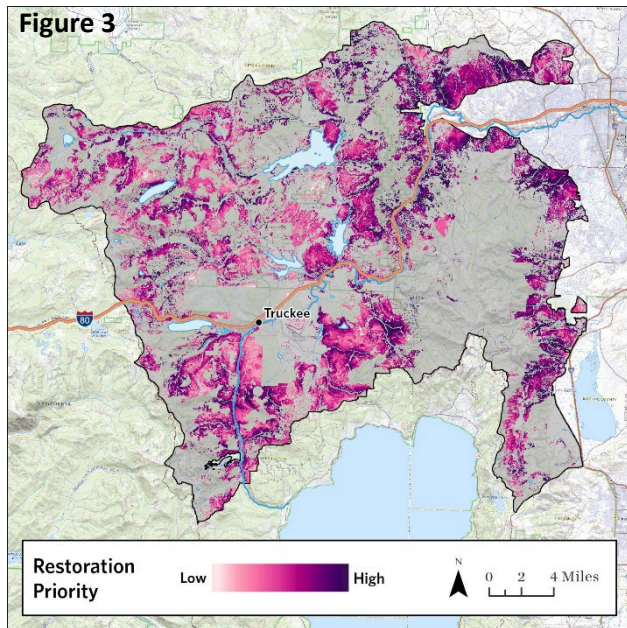
To mitigate wildfire risks, the pace and scale of forest restoration needs to be significantly increased. TNC’s study confirmed that current rates of fuels reduction and prescribed fire treatments, conducted mostly by the US Forest Service with Congressional appropriations, are inadequate to modify fire behavior across this large landscape. Figure 3 (next page), also developed from the TNC study, shows priority areas where investments in forest restoration are most needed to begin bringing the forest and watershed back to health.



The path to increase the pace and scale of these treatments requires overcoming multiple challenges:

- Most of the biomass that needs to be removed from the forest is comprised of small diameter trees, for which there is currently little economic value and no market demand. Thus, forest restoration projects generally aren’t profitable and often result in a net financial loss.
- The scale of restoration planning has been too small to address the size of the problem. Today’s forest fires regularly burn areas of 100,000 acres or more, but planning areas typically cover only a few thousand acres.
- Most of the forested land in the Middle Truckee River Watershed is managed by the USFS, which lacks sufficient budget and staff to increase the pace and scale of restoration on its own, necessitating a coalition of stakeholders to implement forest treatment projects.
- TNC estimated bringing the system back to balance and reducing risks would cost tens of millions of dollars, over several decades.

If we are to reach a pace and scale of restoration treatments that will modify fire behavior and mitigate the risk of unnaturally large wildfires, we must find and implement solutions to these challenges. Lasting



solutions require a multi-pronged approach, with public land managers, conservationists, scientists, leaders of business and industry, and policymakers working together in a coordinated effort. To that end, TNC partnered with the National Forest Foundation, Truckee Meadows Water Authority, USFS Tahoe National Forest (Truckee and Sierraville Ranger Districts), and the Truckee River Watershed Council to establish the Middle Truckee River Watershed Forest Partnership (MTRWFP) to fund and develop the critically needed capacities and collaborative restoration partnerships necessary for success. The MTRWFP represents a significant step forward in restoration of the forests of the Middle Truckee and protection of the Truckee River.

(TNC has a decades-long track record of forest and river restoration in the Truckee River watershed, with more than \$50 million of completed projects since 2000. We are a science-based organization that understands that all large conservation challenges require committed public-private partnerships.)