Background:
Lands that have been ravaged by fire experience a reduction in ecosystem services, destruction of soil quality, and increase in erosion that contributes to impaired water quality. Quantifying the benefits of the reclamation of fire ravaged land and the reduction of the potential severity of future fires with the use of biosolids is a high priority for areas damaged by fires. Research has shown that an effective solution is to encourage the restoration of ecosystems. However, because of the loss of essential plant nutrients and organic matter, areas that have been impacted by wildfire can be difficult to regenerate and may experience a loss of ecosystem resilience. In addition, if revegetation of fire impacted landscapes is not conducted effectively, areas can feel the double impact of flooding and erosion which will cause long term degradation of the plant community and negatively impact water quality.

The primary factors limiting the re-establishment of vegetation on fire impacted landscapes and which lead to erosion and water quality degradation are poorly structured soils, reduced water holding capacity, and low soil nutrient concentrations. However, research has shown that the land application of biosolids can increase soil organic matter, improve soil water holding capacity, and support microbial diversity and activity which can promote the regeneration of ecosystems including reduced erosion and improved water quality.

In addition, the use of biosolids on fire impacted lands can be a cost-effective biosolids management solution for communities prone to severe fires. Land application of biosolids in these areas can have multiple benefits for municipalities including, the restoration of ecological services, improved water quality, the establishment of vegetation which can serve as a fire break to reduce the severity of future fires and another beneficial use of biosolids.

Objective:
The overarching objective of the research is to evaluate the ability of biosolids to restore and enhance the ecological services provided by fire impacted landscapes. The ecological services serving as the primary focus include: 1) water quality protection, 2) future wildfire risk reduction, 3) terrestrial carbon sequestration, 4) erosion control, and 5) vegetative biodiversity.

This research project will analyze whether the use of biosolids will enhance the restoration of ecosystems on fire impacted lands. The project will also see if the application of biosolids reduces the risk and severity of future wildfires. The team has preliminarily selected one location, and is seeking another, in California with a controlled burn site and a naturally burned site that will both receive biosolids as an amendment. There will be control site at each location which will not receive any amendment.

This research will also revisit the Buffalo Creek fire site in Colorado that received biosolids soil amendments in the 1990’s, in order to evaluate its long term soil and habitat health.
**Expected Tasks:**

- Utilize a suite of biosolids products including Exceptional Quality cake and/or soil blends, biosolids compost, and Class B cake and apply them to environmentally compromised ecosystems following high temperature fire.
- Monitor and quantify any improvements to soil health and water quality, through analytical evaluation of organic carbon, nutrients, metals, organics, and other constituents. Measurements would be taken in soil and water before and after application at designated intervals. Data will also be obtained for constituent concentrations in biosolids prior to application.
- Monitor and quantify constituent levels in impacted water and gauge changes over time.
- Control plots will also be established to provide sound methodology and provide the do nothing alternative for comparative purposes.
- Monitor and quantify the impacts of biosolids on vegetative growth, health, and biomass production on fire-ravaged land following biosolids application.
- Utilize a range of application rates to determine the most effective use of biosolids to yield the highest environmental benefit.

**Research Team Qualifications**

The Principal Investigator is Greg Kester, Director of Renewable Resource Programs for the California Association of Sanitation Agencies (CASA). Mr. Kester is a civil and environmental engineer with years of wastewater and biosolids experience and expertise. He served on the National Academies of Science committee which evaluated the federal biosolids regulations and program, producing a report in 2002. He has studied trace organics in biosolids, risk assessment, developed treatment standards, and worked on the reclamation of fire-ravaged land for many years.

**Co-PIs:**
Dr. Kate Scow, UC Davis  
Dr. Mike McFarland, Utah State  
Robert B. Brobst, P.E., USEPA Region 8/Colorado State University

**Collaborators:**
Dr. Sally Brown, University of Washington; Dr. Vijay Chaganti, UC Riverside; Dr. Samantha Ying, UC Riverside; Dr. Tom Young, UC Davis; Dr. David Crohn, UC Riverside; Tal Robinson, California Central Valley Regional Water Quality Control Board

**Project Partners and Funding:**

WE&RF would like to raise $200,000 to support this project. We are searching for interested partners who would be willing to contribute to the research in order to join the Project Steering Committee (PSC). PSC members will help refine the scope of the research, refine the request for proposals, and provide comments on interim and final research projects.