



# Repairing and Restoring Natural Ecosystems Impact Statement

## Investigators

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## SUMMARY

Globally accelerating rates of ecosystem degradation and habitat loss pose significant challenges for ecosystem managers and affect the range of natural goods and services to humans. Human-induced disturbances to ecosystems include resource exploitation, altered wildfire activity, grazing and agriculture, invasive species, soil erosion and the effects of climate change. Ecosystem restoration provides a means to repair the damage caused by humans and our work is having impacts across multiple continents.

## SITUATION

Climate change threatens to cause significant changes to natural ecosystems and habitats by altering the conditions under which plants and animals have to survive. Changes in climate are, however, taking place alongside growing human impacts on the natural environment. For example, increasing wildfire activity threatens to fundamentally change the character of multiple ecosystems from rare sagebrush-steppe habitats in the western United States to carbon-storing peatlands in northern Europe. Agricultural land-use in sensitive landscapes, such as those found associated with volcanically-derived soils in Iceland can be rapidly degraded by processes like over-grazing by livestock. Natural resource exploitation can often result in substantial environmental impact. Mineral extraction in many parts of Ohio has led to issues with soil contamination and poor soil health. This can require costly remediation and reclamation but many historic efforts to restore natural ecosystem in such settings have met with limited success.

## RESPONSE

School of Environment and Natural Resources scientists develop methods to restore degraded ecosystems and train the next generation of restoration professionals. We research and teach across multiple systems:

**Wildfire Protection:** Projects in the sagebrush steppe, temperate peatlands and tropical grasslands are investigating factors controlling the prevalence and impacts of wildfires

- **Soil Resilience:** working with Soil Conservation Service of Iceland, we are studying the dynamics of soil development to evaluate the effectiveness of land protection and vegetation enhancement.



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- **Degraded Landscapes:** in Ohio we are researching methods to reclaim areas used for disposal of contaminated waste rock from coal separation plants, and to restore former strip-mines. On campus we are informing restoration of the iconic Mirror Lake.

Our restoration curriculum is aligned to the Society for Ecological Restoration's certification requirements, including a range of courses that offer opportunities to learn restoration skills and put them into practice.

### IMPACT

Our work is being adopted into practice and policy through diverse outreach activities. Data from our work in sagebrush steppe habitats is used by managers to develop effective, economic methods for post-fire revegetation efforts. This work has also been developed into a "state and transition" model, providing managers with a conceptual map of how disturbance affects ecosystems so they can choose appropriate management strategies. In the U.K our research has been cited in Parliamentary debates and is helping agencies and regional governments plan regulations for managed burning. Studies in Iceland have established that soil resilience is greatly enhanced by land protection, vegetation enhancement and forest cover development. Farmers and landowners are voluntarily participating in group projects to protect land and improve management, taking ownership of positive outcomes and providing leadership to activate others in the process. In Ohio we have assessed how varying soil cover depths applied over acid-toxic mine waste affect vegetation establishment, runoff, and water quality. Resulting reductions in the amount of soil used can mitigate offsite soil-collection impacts reducing by half the area disturbed for soil borrowing and reducing operator costs. Our Ecosystem Restoration specialization has developed into a large undergraduate specialization. As part of this program students have developed restoration plans for external stakeholders, informing practice on the ground.

### Contact Information

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