

# 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 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 over-grazing by livestock**. Natural resource exploitation can also generate substantial environmental impact. Mineral extraction in many parts of Ohio has led to 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.



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### RESPONSE

The School of Environment and Natural Resources (SENR) develops methods to restore ecosystems and tackles issues including:

- **Managing disturbance:** projects in forest, sagebrush, peatland, grassland and rock-face ecosystems are investigating how human disturbances affect ecosystem stability. Particular attention continues to be given to managing prescribed and wild fires
- **Soil resilience:** working with Soil Conservation Service of Iceland, we are studying the dynamics of soil development to evaluate land protection and vegetation enhancement.
- **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.
- **Campus sustainability:** learning projects are informing restoration of water courses and sustainable landscape design

Our restoration curriculum, aligned to the Society for Ecological Restoration's certification, is delivering new basic, advanced skills-based courses to produce the next generation of restoration leaders.



### IMPACT

Our work has regional, national and international impact. 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. **We catalogued extant, degraded and destroyed peatlands across Ohio and completed the first major inventory of their ecology.** In the sagebrush steppe of the northwestern United States, we responded to another damaging fire year by tracking unique long-term monitoring plots. **This data yielded vital information to inform managers** about how repeated wildfires and species invasions are altering the ecosystem. In Bolivia we have provided conservation managers with information on how livestock grazing and wildfire alters the abundance of threatened bird species. 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. Our Ecosystem Restoration specialization continues to grow. As part of this program students have developed restoration plans for external and internal stakeholders, informing practice on the ground.

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