REVOLUTIONIZING RESTORATION

SEEDS — Seeding Evaluation and Experimental Design Strategies for Transformational Outcomes in the Great Basin

THE PROBLEM

Non-native annual grasses, wildfire, and climate change have contributed to substantial and widespread vegetation change in the Great Basin [1] (Fig. 1), making postfire rehabilitation and restoration critical management priorities. Tens of millions of dollars are spent annually by state and federal agencies (e.g., Bureau of Land Management's Emergency Stabilization and Rehabilitation Program [ESR] and Forest Service's Burned Area Emergency Response Program [BAER]) to facilitate postfire recovery [2]. These postfire rehabilitation efforts have provided site stabilization but often fail to recover key plant community components necessary to meet biodiversity, pollinator, and wildlife needs [3], partly because only a small subset of potential treatments are used [4].

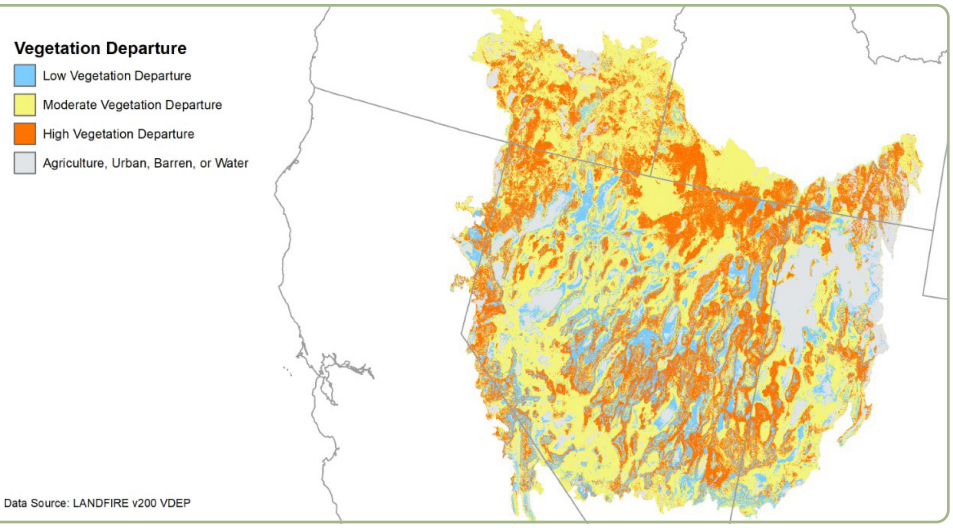
THE OPPORTUNITY

Hundreds of post-fire rehabilitation and restoration treatments are applied across the western US each year. Every fire and post-fire seeding project offers an opportunity to test and compare novel and innovative treatments. **This can be accomplished by creating "leave" areas within each burn perimeter where experimental treatments would be tested by an independently funded research team working with land managers.** By pairing land management treatments and scientific experimentation, we can rapidly advance restoration practice by finding novel seeding treatments that work[5] (Figs. 2 and 3). This project aligns directly with sections 40803 (Wildfire Risk Reduction) and 40804 (Ecosystem Restoration) of the Bipartisan Infrastructure Law, [6] section 50221 (Public Lands Conservation and Resilience) of the Inflation Reduction Act[7] and agency plans for implementation of the BIL and IRA investments on focal landscapes,[8,9] where:

- A national revegetation effort will be established and implemented following the National Seed Strategy for Rehabilitation and Restoration guidance [10].
- Projects utilizing revegetation with native plants and pollinator-friendly wildflowers are prioritized.
- Ecosystem restoration work focused on setting focal landscapes on a path toward natural recovery and climate resilience.

Figure 1.

The LANDFIRE Vegetation Departure spatial layer depicts the difference between a pre-European colonization reference condition and current conditions.[4] Vegetation departure is an indicator of ecosystem degradation, which is a product of land use, nonnative grass dominance, increased fire frequency, and climate changes in the Great Basin.



THE SOLUTION

A **self-contained, independently funded team of researchers and managers using a co-produced master study design** is the framework for Seeding Evaluation and Experimental Design Strategies (SEEDS) that will:

- **Coordinate and leverage new and existing resources** with local agency field offices without encumbering local ESR or BAER funding, staff time, or priorities.
- **Design, implement, and monitor innovative experiments** that evaluate and compare seeding practices alongside regular ESR and BAER treatments.
- **Evaluate novel seeding practices**, such as varied seed mix compositions, seed sources, seeding rates and timing, site preparation techniques, and post-seeding management to expand the restoration tool kit and broaden knowledge on achieving restoration goals (Figs. 2 and 3).
- **Holistically monitor and analyze treatment effects** and outcomes within relevant environmental contexts, from soil to climate, to determine which treatments impact ecosystem function most (Fig 4).
- **Rapidly adapt future experiments and treatments** based on early findings, leading to true adaptive management practices that can be implemented across the landscape (Fig. 4).

Figure 2.

More experimental replication across the landscape will increase restoration knowledge and project success, especially for conservation goals that have been less studied historically.

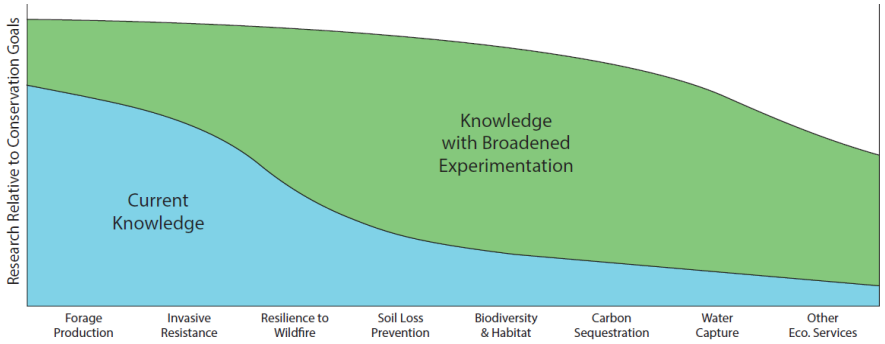
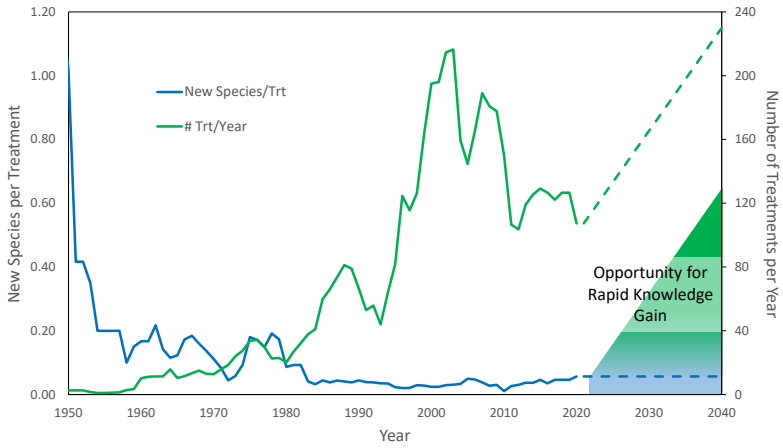


Figure 3.

Adding experimental post-fire treatments will generate learning opportunities. For example, the rate of new species in seeding treatments has remained flat since the mid-1980s.[11] Given the large number of post-fire seeding treatments implemented each year, increasing the experimental use of new species, even minimally, will produce rapid knowledge gains. Data represent 5-year moving averages.



THE FUTURE

Implementation of this experimental restoration framework can move management options toward strategic treatments that increase project success, reduce the need for repeated treatments, and reduce costs.

We will restore functional and resilient Great Basin ecosystems through, 1) experiments using local management and researcher knowledge, 2) monitoring a suite of integrated ecosystem processes, 3) determining successful restoration outcomes, and 4) increasing the effectiveness of adaptive management by incorporating experimental findings into future treatments.

Restoration that addresses ecosystem processes will lead to diverse and resilient wildlife and plant communities and support diverse socioeconomic groups.

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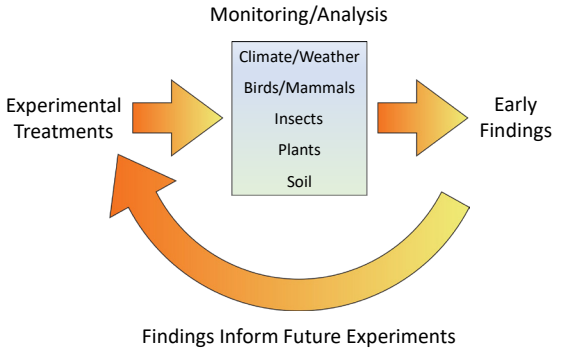
Figure 4.

Following the installation of experiments, treatment responses from soil to climate will be monitored and analyzed. Early findings will be considered when proposing new treatments on the next recently burned site.



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[6] H.R.3684–117th Congress (2021-2022): Infrastructure Investments and Jobs Act. (2021, January 3).

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[9] U.S. Department of Interior, BLM. 2022. Infrastructure Investment and Jobs Act - Wildfire Risk Five-Year Monitoring, Maintenance, and Treatment Plan.

[10] Plant Conservation Alliance [PCA]. 2015. National seed strategy for rehabilitation and restoration 2015-2020. Washington, DC: U.S. DOI BLM. 52 p.

[11] Pilliod, et al. 2019. USGS Land Treatment Digital Library data release: A centralized archive for land treatment tabular and spatial data (ver. 3.0, November 2020): U.S. Geological Survey data release.