FUTURE OF DAMS PROJECT OUTCOMES 100320

Hydropower is a major source of renewable energy in New England, where more than 50 dams are scheduled for relicensing in the next decade, requiring communities to make critical decisions about aging infrastructure. Mill dams no longer provide energy but are iconic of New England's industrial history and continue to provide recreational, water supply, and aesthetic benefits for communities. Concerns about fish passage, safety issues, water quality, and other issues place constraints on decisions to remove, relicense, or retrofit dams. Decisions about the future of dams must be made thoughtfully, integrating environmental, social, and economic tradeoffs among ecosystem services such as energy production, migratory fish populations, water quality for safe drinking water, recreational activities, and cultural uses.

The Future of Dams was a five-year project led by the University of New Hampshire with partners at the universities of Maine and Rhode Island, Keene State College, and the Rhode Island School of Design. Scientists, engineers, economists, and artists collaborated with stakeholders such as property and dam owners, municipal officials, non-governmental organizations and community members to co-produce innovative, interdisciplinary research that helps society make evidence-based decisions about dam management.

Intellectual merit: We developed new approaches for using science in decision-making and made our decision-support tools publicly available. These innovative approaches will be useful to scientists, engineers, government agencies, stakeholders, and community members facing the multi-faceted problems of aging dam infrastructure that has significant ecological impacts.

We produced regional and watershed-scale decision-support tools to help stakeholders make better, cost-effective decisions. Using a vast dataset including metrics on dam utilities, freshwater flow, and fish migration, we created a series of specific, realistic future scenarios that align with a broad diversity of stakeholder preferences, from ecological restoration by dam removal to mixed approaches that emphasize a balance between restoration, renewable energy production, water storage, property values, and river recreation. Our integrated modeling framework is a powerful method to help stakeholders understand water-energy-fish interactions and related economic and social impacts under alternative dam decision scenarios. We developed a web application for our participatory multi-criteria decision-support tool for small-to-medium scale hydropower dams to elicit stakeholder preferences for 12 decision criteria and five decision alternatives.

We created the online New England Dams Database, with over 80 attributes, and a digital and printable Dam Atlas of Southeast New England to advance regional knowledge by providing quantitative rankings and visual tools that decision makers and the public can use to understand, describe, and manage site-specific and regional scale social, physical and ecological attributes of dams. We developed and are commercializing close-range remote sensing methods to evaluate ecosystem changes associated with dam removal using small unmanned aerial systems which can provide a high-resolution landscape perspective of how streams change over time.

We have produced 33 peer-reviewed journal publications to date, including 11 multi-state collaborative efforts; six more are in review and 18 manuscripts are in development. We produced three technical reports, three conference proceedings, one book, and one book chapter.

New awards totaling $54,402,893 will advance knowledge gained in this project.

Broader impact: We developed a science-based role-play negotiation simulation and a teaching packet which is an off-the-shelf tool for use in workshop and educational settings. The negotiation simulation is designed to teach stakeholders along cognitive, relational and normative dimensions of learning through role-playing, in which participants experience dam decisions from another stakeholder's perspective, engage in an interest-based negotiation, and work together to develop consensus-based solutions. We developed new ways to engage communities in decisions about the future of aging dam infrastructure using visualizations to describe the alternatives and an interactive physical site model, materials that describe the trade-offs, and a decision matrix. We developed partnership commitments and processes that supported decolonizing research commitments with indigenous communities.

We cultivated critical social capital among a diverse research team, advanced fields of study across a broad disciplinary spectrum, and produced new talent of highly skilled early career researchers with the orientation, experience, and passion to address some of the world's greatest challenges. We supported and mentored 24 early-career faculty and technical staff, two post-doctoral associates, 59 graduate students, and 32 undergraduates.