THE UNIVERSITY OF MAINE

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UMaine's Emergence as a Leader in Tackling Sustainability Challenges

John Peckenham and David Hart
plus 100's of Colleagues
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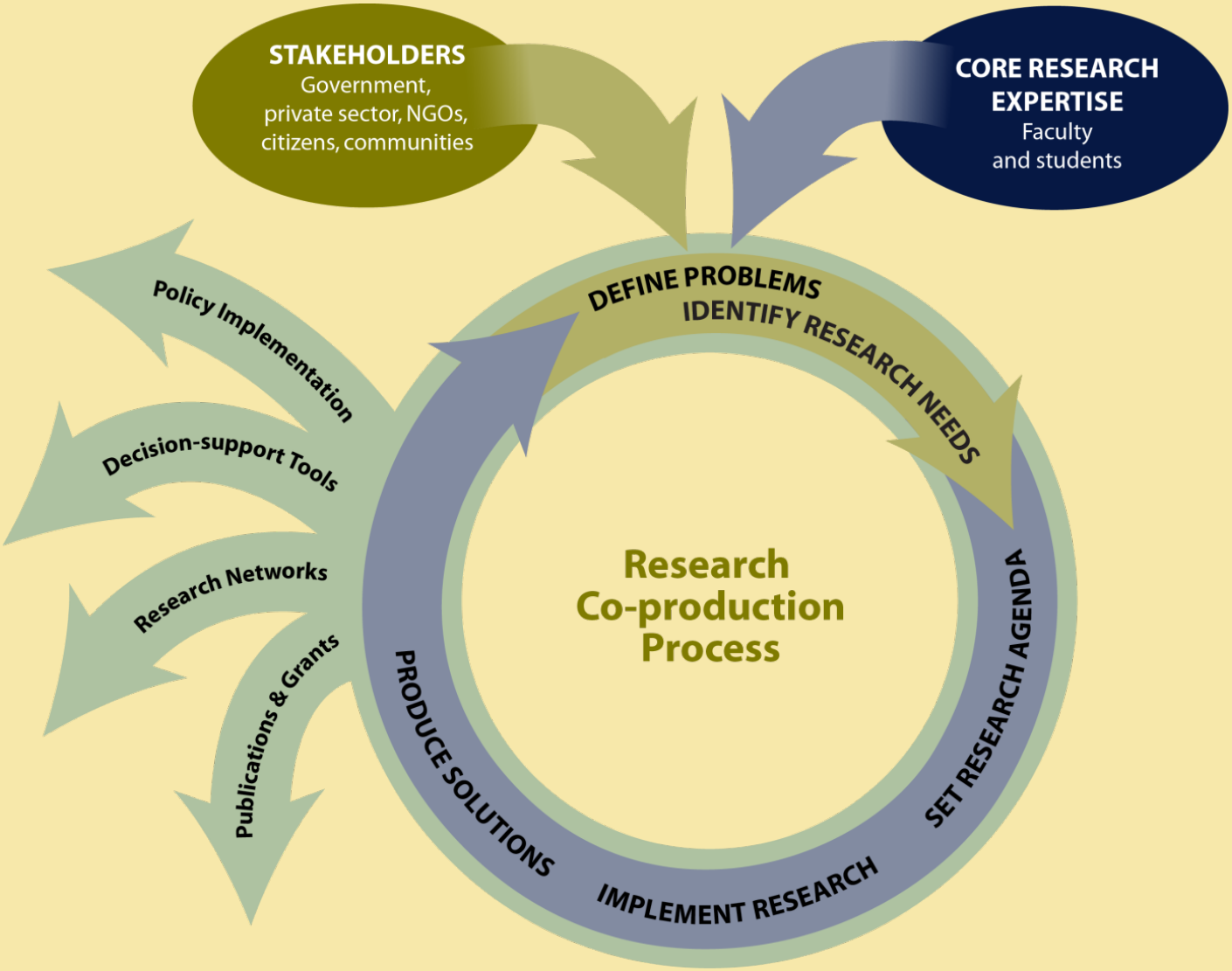
How can universities help solve sustainability problems?

- People need help solving problems
- Researchers want their work to be relevant
- Human dimensions are important
- Solutions come from broad collaboration

Sustainability integrates diverse goals, values, and processes.

Research is embedded in a shared, iterative process of problem identification and problem solving.



Bringing together diverse expertise.

- Anthropology
- Biology and Ecology
- Civil and Environmental Engineering
- Climate Change Institute
- Communication and Journalism
- Cooperative Extension
- Earth and Climate Sciences
- Economics
- Education
- Forest Resources
- Margaret Chase Smith Policy Center
- Marine Sciences
- Muskie School of Public Service (USM)
- Native American Studies
- New Media
- Psychology
- Sea Grant
- Spatial Information Science and Engineering
- School of Law
- Wabanaki Center
- Wildlife Ecology

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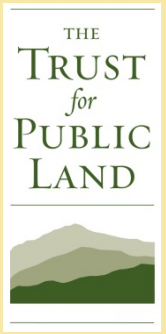
A small sub-set of our partners.

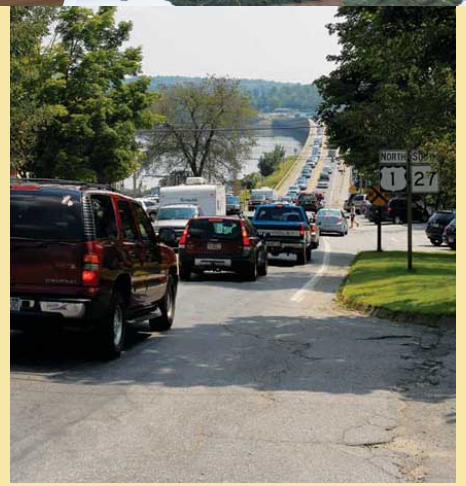
US Army Corps of Engineers®

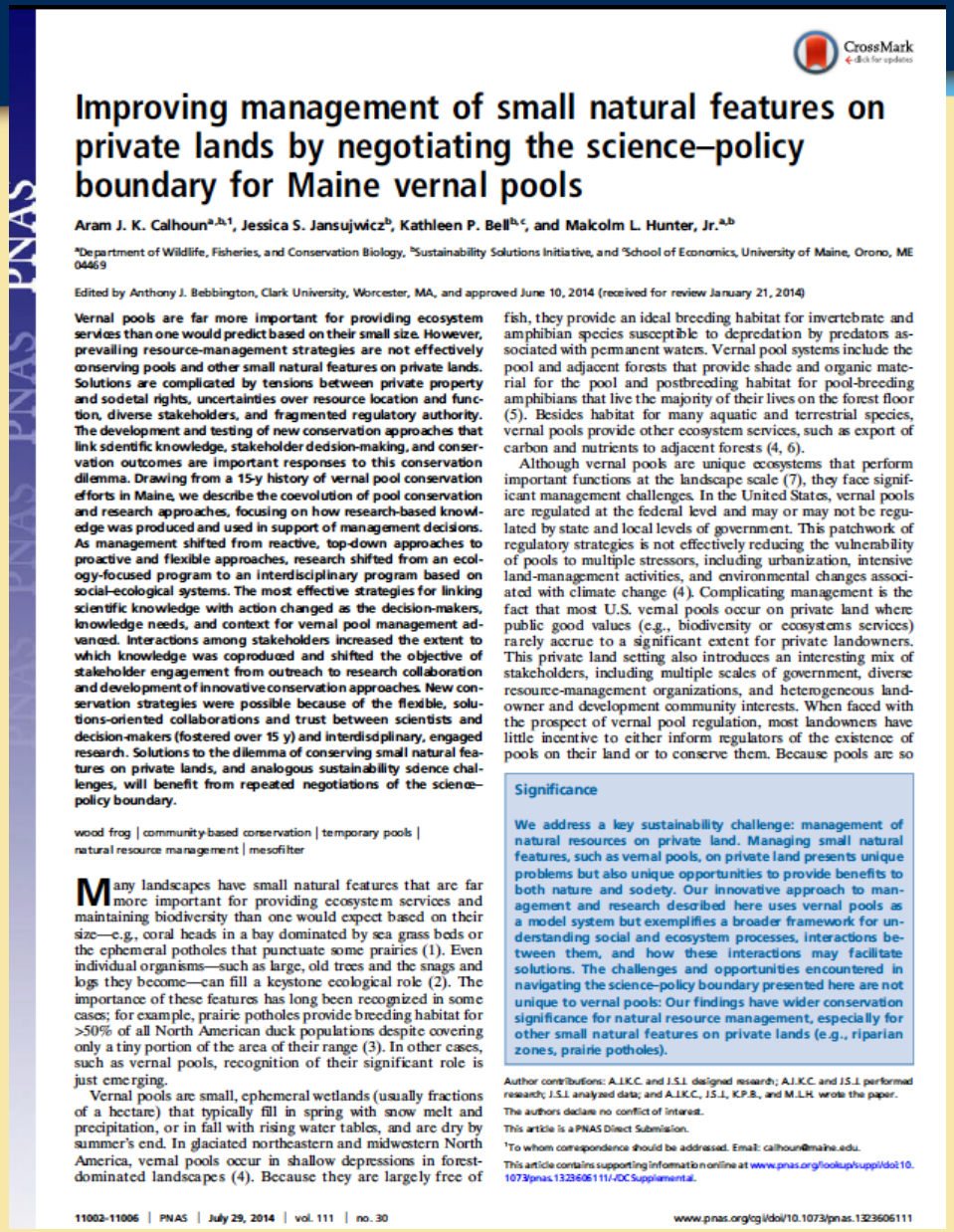


Penobscot Indian Nation

Houlton Band of Maliseet Indians

A portfolio of projects and partnerships.





Improving management of small natural features on private lands by negotiating the science–policy boundary for Maine vernal pools

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Vernal pools are far more important for providing ecosystem services than one would predict based on their small size. However, prevailing resource-management strategies are not effectively conserving pools and other small natural features on private lands. Solutions are complicated by tensions between private property and sodetal rights, uncertainties over resource location and function, diverse stakeholders, and fragmented regulatory authority. The development and testing of new conservation approaches that link scientific knowledge, stakeholder decision-making, and conservation outcomes are important responses to this conservation dilemma. Drawing from a 15-y history of vernal pool conservation efforts in Maine, we describe the coevolution of pool conservation and research approaches, focusing on how research-based knowledge was produced and used in support of management decisions. As management shifted from reactive, top-down approaches to proactive and flexible approaches, research shifted from an ecology-focused program to an interdisciplinary program based on social-ecological systems. The most effective strategies for linking scientific knowledge with action changed as the decision-makers, knowledge needs, and context for vernal pool management advanced. Interactions among stakeholders increased the extent to which knowledge was coproduced and shifted the objective of stakeholder engagement from outreach to research collaboration and development of innovative conservation approaches. New conservation strategies were possible because of the flexible, solutions-oriented collaborations and trust between scientists and decision-makers (fostered over 15 y) and interdisciplinary, engaged research. Solutions to the dilemma of conserving small natural features on private lands, and analogous sustainability science challenges, will benefit from repeated negotiations of the science–policy boundary.

wood frog | community-based conservation | temporary pools | natural resource management | mesofilter

Many landscapes have small natural features that are far more important for providing ecosystem services and maintaining biodiversity than one would expect based on their size—e.g., coral heads in a bay dominated by sea grass beds or the ephemeral potholes that punctuate some prairies (1). Even individual organisms—such as large, old trees and the snags and logs they become—can fill a keystone ecological role (2). The importance of these features has long been recognized in some cases; for example, prairie potholes provide breeding habitat for >50% of all North American duck populations despite covering only a tiny portion of the area of their range (3). In other cases, such as vernal pools, recognition of their significant role is just emerging.

Vernal pools are small, ephemeral wetlands (usually fractions of a hectare) that typically fill in spring with snow melt and precipitation, or in fall with rising water tables, and are dry by summer's end. In glaciated northeastern and midwestern North America, vernal pools occur in shallow depressions in forest-dominated landscapes (4). Because they are largely free of fish, they provide an ideal breeding habitat for invertebrate and amphibian species susceptible to depredation by predators associated with permanent waters. Vernal pool systems include the pool and adjacent forests that provide shade and organic material for the pool and postbreeding habitat for pool-breeding amphibians that live the majority of their lives on the forest floor (5). Besides habitat for many aquatic and terrestrial species, vernal pools provide other ecosystem services, such as export of carbon and nutrients to adjacent forests (4, 6).

Although vernal pools are unique ecosystems that perform important functions at the landscape scale (7), they face significant management challenges. In the United States, vernal pools are regulated at the federal level and may or may not be regulated by state and local levels of government. This patchwork of regulatory strategies is not effectively reducing the vulnerability of pools to multiple stressors, including urbanization, intensive land-management activities, and environmental changes associated with climate change (4). Complicating management is the fact that most U.S. vernal pools occur on private land where public good values (e.g., biodiversity or ecosystems services) rarely accrue to a significant extent for private landowners. This private land setting also introduces an interesting mix of stakeholders, including multiple scales of government, diverse resource-management organizations, and heterogeneous landowner and development community interests. When faced with the prospect of vernal pool regulation, most landowners have little incentive to either inform regulators of the existence of pools on their land or to conserve them. Because pools are so

Significance

We address a key sustainability challenge: management of natural resources on private land. Managing small natural features, such as vernal pools, on private land presents unique problems but also unique opportunities to provide benefits to both nature and sodety. Our innovative approach to management and research described here uses vernal pools as a model system but exemplifies a broader framework for understanding social and ecosystem processes, interactions between them, and how these interactions may facilitate solutions. The challenges and opportunities encountered in navigating the science–policy boundary presented here are not unique to vernal pools: Our findings have wider conservation significance for natural resource management, especially for other small natural features on private lands (e.g., riparian zones, prairie potholes).

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Blend Disciplines-
Ecology, Hydrology, & Planning

Integrate to Produce-
Conservation on Private Lands

Management Tools

Legislation

Corps of Engineer Regulations

Local Development Control

Leverage Funding-
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Foundations

Dramatic growth of UMaine's sustainability research capacity.

- Publishing > 250 research papers
- Receiving > $100 million in external grants
- Active participation by >100 faculty from > 25 academic disciplines
- 17 institutions of higher education
- >12 postdoctoral researchers
- >70 graduate students
- >300 undergraduates
- >400 stakeholder organizations representing business and industry, government, and NGOs

Dramatic growth of UMaine's sustainability research capacity.

- Launched via a $20M NSF EPSCoR grant, 2009
- Expanded across New England via the creation of the New England Sustainability Consortium (NEST)
  - Safe Beaches and Shellfish Project, begun in 2013 and supported by $6M NSF EPSCoR grant in partnership with New Hampshire
  - The Future of Dams Project, begun in 2015 and supported by $6M NSF EPSCoR grant in partnership with New Hampshire and Rhode Island