

## Edgework and Boundary Crossings: Assessing Foundations for Public Ecology in the Appalachian Region

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### ABSTRACT

Public ecology is one name for an interdisciplinary, multisectoral approach to the study and management of complex socio-ecological systems. Emerging around the world under a variety of names such as civic environmentalism, community-based natural resource management, collaborative ecosystem management, and cultural conservation, public ecology traverses institutionalized boundaries, framing expert-driven environmental research and decision-making. We describe “edgework” as a metadiscursive practice in the peer-reviewed literature that marks pathways emerging across five sets of “boundaries.” Edgework and boundary crossings operate pragmatically to affect the epistemological and ontological shifts required for new multisectoral research communities engaging complex, multicausal, interdisciplinary objects of sustainability. The status of these shifts in relation to three objects of sustainability—water, forests, and carbon-based energy production—bears significantly on our study of foundations for public ecology in the Appalachian region.

### INTRODUCTION

The past twenty years have witnessed the remarkable growth, worldwide, of interdisciplinary, multisectoral partnerships for the study and management of environmental resources. Such partnerships blur disciplinary boundaries as they build teams of experts with the diverse specializations needed to understand multicausal, complex,

socioecological processes. Such partnerships blur entrenched boundaries between sectors (community, civil society, government, industry, and academia) when local knowledge of ordinary citizens makes valuable contributions to understanding and managing watersheds, forests, and other environmental resources. Finally, such partnerships blur *conceptual* boundaries that categorize objects of environmental stewardship according to whether their values are economic, social, or ecological.

The variety of names for these hybrid partnerships, approaches, and reconceptualized objects of environmental stewardship map emerging pathways across multiple boundaries: “civic environmentalism” (Agyeman and Angus 2003), “grassroots ecosystem management” (Weber 2000), “citizen science” (Puckett et al. 2012), “civic science” (Craynon et al. 2012), “collaborative adaptive management” (Hull 2008), “cultural conservation” (Howell 2002, Hufford 1994), “corporate social responsibility” (Hilson 2012), “social ecological systems” (Brondizio et al. 2009), “collaborative ecosystem governance” (Karkkainen 2003), and “adaptive ecosystem management” (Norton 2005) to name just a few. Such terms are linked by a common objective: the integration of social, economic, and ecological values in the research and management of environmental resources. This integration is a complex undertaking that entails learning to communicate across boundaries within and between academic disciplines and social sectors, and revising the

processes linking knowledge making with the formation and application of public policy. Drawing on the insights of colleagues working across schools at Virginia Tech over the past decade, we are calling this complex undertaking “public ecology” (Craynon et al. 2012; Robertson and Hull 2003b; Luke 2005).

### PUBLIC ECOLOGY

Public ecology names an interdisciplinary, multi-sectoral approach to the study and management of complex adaptive socio-ecological systems. John Craynon et al. (2012) locate public ecology at the “nexus of science, engineering, public policy and interest, citizen views and values, market forces and environmental protection statutes and regulations.” The authors further define public ecology as “an open and participatory discourse... intended to ensure ecological systems continue to function as societies operate within and derive benefits from them.”

This approach requires an alternative epistemological and ontological framework for a shared public process of knowledge making and for researching and managing objects of environmental stewardship. As Robertson and Hull (2003b) summarize it, public ecology:

- entails public dialogue and collaboration across disciplinary, institutional, professional, and cultural boundaries;
- integrates local knowledge with professional expertise in studying, monitoring, and designing for environmental health;
- measures environmental resources in terms of ecological and social as well as economic values;
- addresses the interdependencies of local human ecosystems with larger regional and global systems.

A growing number of theoretical and case studies suggest that a public ecology approach could be used to resolve thorny environmental issues, including conflicts over the production of energy from coal. As Craynon, Sarver, and Robertson ask in the title of their recently published article, “Can a Public Ecology Approach Help to

Resolve the Mountaintop Mining Controversy?” (Craynon et al. 2012). The history of struggle between labor and industry (Corbin 1989; Eller 1982; Fisher 1993) and within and between coalfield communities and industry over environmental and health impacts of coal extraction has left a legacy of distrust that could seriously impede a public ecology approach (Craynon et al. 2012). At the same time, the social history of the region points to an abundance of the kind of social and political capacity (Couto 1999; Fisher and Smith 2012) foundational to the kinds of multisectoral partnerships envisioned for public ecology (Figure 1).

Our broad research questions are: What are the foundations for public ecology in the Appalachian Region? Where in the region are multidisciplinary, multisectoral approaches used to build knowledge about forests, water, and energy production in relation to complex socio-ecological systems? How are people working across sectors to sustain the region’s historic ecological, social, and economic values to meet the needs of the present generation without compromising the ability of future generations to meet their needs?

To place our study in a global context, we are presently surveying the literature on interdisciplinary, multisectoral approaches to the research and management of complex socio-ecological systems around the world. We are specifically

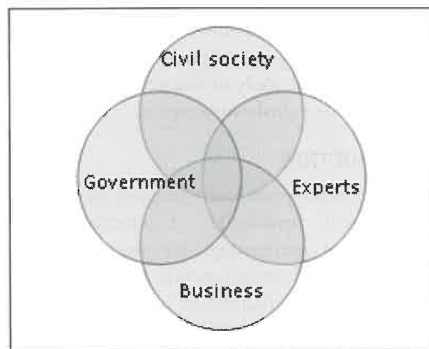


Figure 1. Multisectoral partnerships for sustainability

reviewing interdisciplinary, multisectoral efforts organized around the collaborative study and management of three “objects, water, forests, and energy production. Our broad questions are: Around the world, what are innovative models for public ecological practices in industrial development and planning that could be effective in the energy sector? How have these efforts been evaluated in peer reviewed studies? What are the shared attributes and best practices? What foundations for public ecology are being laid in the Appalachian region? We are limiting our review to peer-reviewed articles that describe and evaluate interdisciplinary, multisectoral approaches to three objects of sustainability: water, forests, and carbon-based energy production (coal mining).

In this paper we characterize two of the broader issues facing public ecologists: (1) the formation of collaborative multisectoral research communities; and (2) the constitution of an object of environmental research and stewardship, that is, a shared object of sustainability. Both of these issues require a good deal of attention to emerging ways of communicating across boundaries to shape a new, public, environmental discourse.

### EDGEWORK AND BOUNDARY CROSSINGS

Considerable attention is given across the literature to innovative discourse practices and their effectiveness in communicating across boundaries (see Agrawal 2005, Hajer 2005, Hufford 1994, Huttunen 2009, Rodela 2013, Scott 1988). The public ecology literature is itself a site of numerous linguistic operations that identify and traverse disciplinary and sectoral boundaries. Introduced by Katherine Young in her study of the phenomenology of narrative communication (1987) and drawing on the work of Husserl, Schutz, James, Luckman and Goffman, “edgework” is our term for metadiscourse that reflexively shapes conversations across boundaries to reframe both the research community and its object of sustainability. This reframing is displayed in terms such as “integrated assessment” (German 2008), “collaborative management,” “community-based participatory research,” “community-based natural resource management,” “multi-level

collaboration,” “civic science,” and “environmental citizenship.” In what follows, we identify edgework that integrates what the boundaries divide in emerging forms of public ecology around the world and in the Appalachian region.

The public ecology literature is especially attentive to boundaries that impede public communication, social learning, and democratic decision-making. While boundary maintenance, (called “boundary work” in the history of disciplines, see Klein 1996) is crucial to the design and conduct of scientific research, the object of environmental stewardship cannot be adequately known and managed without open lines of communication that reveal the multiplicity of ways in which environments provide for human communities. In the public ecological literature we see at least five sets of boundaries that are repeatedly framed and traversed:

- boundaries maintained between research and policy phases of environmental management;
- boundaries dividing social, ecological, and economic functions of environmental resources;
- boundaries preserved among academic disciplines and professions;
- boundaries distinguishing the public sector from government, industry, and the academy; and
- spatio-temporal boundaries defining local, regional, and global ecological scales.

We will focus here on the edgework indicated by the proliferation of hybrid terms, and the epistemological and ontological implications for emerging multisectoral research communities and the complex socio-ecological systems that form their objects of sustainability.

### EPISTEMOLOGICAL AND ONTOLOGICAL IMPLICATIONS

#### Between Research and Public Policy: The Research Community

In the literature on public ecology one often finds the use of qualifiers for terms such as “science,” “assessment,” “management,” “ecology,” and

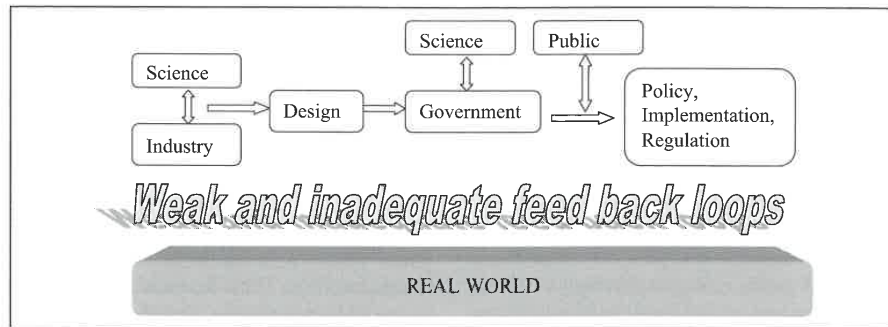


Figure 2. Serial model, separating scientific research phase from public engagement phase

“development.” Drawing attention to what we have taken for granted about such terms, the qualifiers are meta-discursive, prompting reflection on our own assumptions and awareness of multiple points of view. Hence, the term “science,” long an unmarked category, is now qualified by a contrast between, for example, “conventional” and “post-normal” science, or “traditional” and “civic” science. This distinction marks an ontological shift in the role for science and scientists in public life; and in the models for producing and circulating the knowledge that supports democratic deliberation and policy setting. Moving science from a “traditional” or “conventional” position outside of society to a “postnormal” or “civic” position within, this ontological shift alters relationships and identities throughout the system.

These insights are gradually changing official frameworks and processes for environmental decision-making, from what environmental philosopher Bryan Norton calls a “serial” process to a process characterized by feedback loops linking phases of research, policy making, and management (Norton 2005). The serial process prescribed by the U.S. EPA positioned science as an input from outside the system, yielding data and a model to be turned over to managers responsible for applying the science (Figure 2).

The environmental assessment process is initiated after the science and technological design have informed a “proposed action.” This externalized location for the science and the linear, unidirectional flow of information through the

regulatory channels expresses the ideology that science cannot be objective if the scientist engages policy questions. (For critiques of this position see Harding 1992; Hess 2007; Robertson and Hull 2003b; and Innocenti and Albrito). Yet, because the serial process does not accommodate feedback when the models fail to predict real world scenarios, the serial process itself is increasingly seen as an impediment to good science. (Examples of studies that focus on overcoming the problems faced by managers attempting to use “model-based tools” generated through the serial process include Biggs et al. 2010 and Borowsky and Hare 2007.)

Alternative models for multi-directional research and management processes express the growing recognition of academic researchers as citizens with specialized skill sets who can design and conduct research leading to information that supports democratic decision-making (Boyte 2009; Fischer 2000). Publicly engaged collaborative research models such as action research (Barton et al. 2009) and learning action networks (Craynon et al. 2012) are characterized by feedback loops that make the research, evaluation, and management phases of shared inquiry and action iterative, multidirectional, and ongoing (Figure 3).

Removing the boundary between science and society opens channels of communication that contribute to a collective knowledge making process that can never be seen as complete or finalized (Norton 2005; Rittel and Webber 1973). Civic scientists are specialized citizens who participate

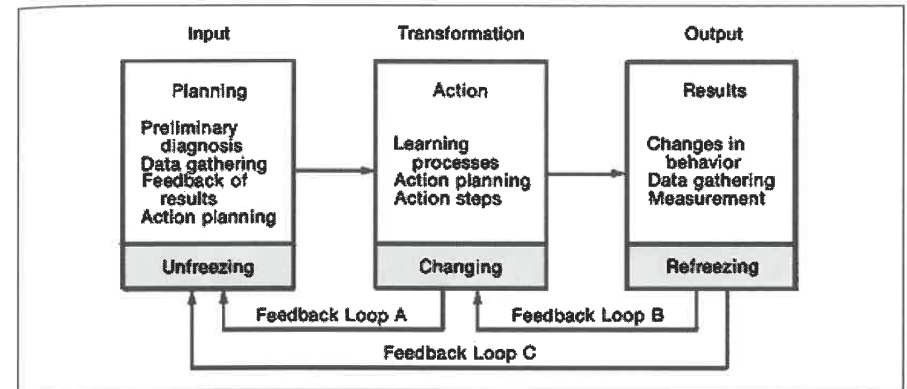


Figure 3. Systems model of action research, showing feedback loops integrating research and management (action) phases Source: Wikipedia Commons [http://en.wikipedia.org/wiki/File:Systems\\_Model\\_of\\_Action-Research\\_Process.jpg](http://en.wikipedia.org/wiki/File:Systems_Model_of_Action-Research_Process.jpg) downloaded 01/20/2013

in knowledge communities foundational to public ecology (Fischer 2000). Edgework helps to track emerging kinds of public space in which scientists and citizens constitute a world in common for which they co-exist and to which they contribute from different perspectives.

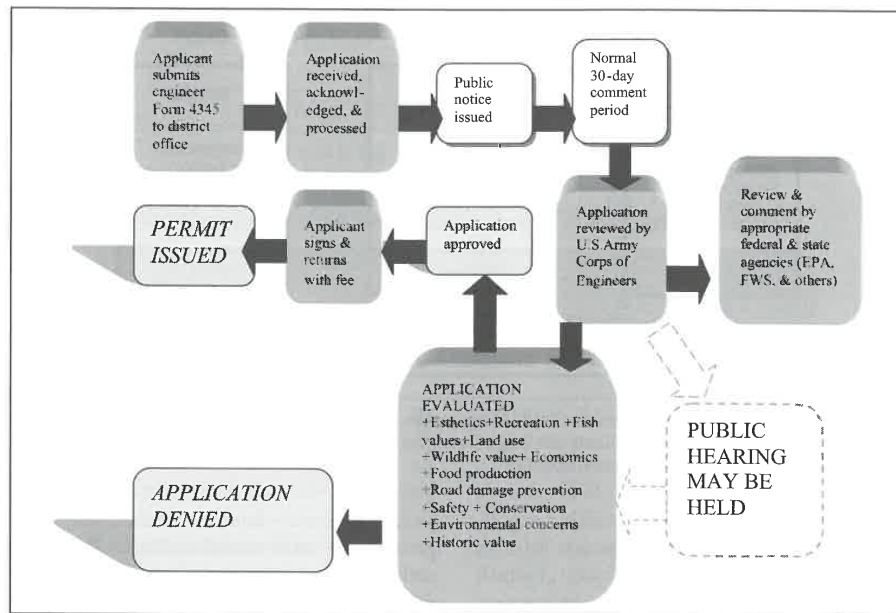
In the Appalachian region, the serial model is still used for the permitting of valley fills necessitated by mountaintop removal. The flow chart in Figure 4 depicts the model presently used for environmental research and decision-making when the object of sustainability is the production of carbon-based energy through mountaintop removal mining (Figure 4). In this model, the science has already been completed and applied to the design of technologies for mining and reclamation before the public decision-making process begins. The assumption that the science has been completed, embodied in the form of data, models, and existing technologies, contributes to a “one size fits all” approach to permitting.

The space entitled “Application Evaluated” provides for feedback on the real world impacts of this design through regulatory review and optional “hearings.” In practice, hearings are not spaces for public dialogue; rather they comprise one-way communication events in which government employees record citizen comments for review by decision-makers. By sequestering

public input away from the research and design process, the serial model makes it difficult to address impacts on “esthetics, recreation, fish values, land use, wildlife value, economics, food production, road damage prevention, safety, conservation, environmental concerns and historic value.”

Federal policy instruments such as the Executive Order on Environmental Justice (E.O. 12898) are changing the relationship between scientists and the public, and between research and management, particularly as these bear on the sustainability of water and forests. There have been a number of community-based participatory research projects led by scientists in the Appalachian region with both federal and corporate funding, including citizen monitoring of forest and stream health, community-based biomonitoring of water and of body burden pollution, as well as numerous academic-community partnerships (Wills et al. 1997; Emmett et al. 2009; Haynes et al. 2011; Puckett et al. 2012; Hendryx et al. 2012; Cook and Taylor 2001). And a recent memorandum issued by the US EPA advises mining regulators to incorporate more public input and to be attentive to environmental justice issues in the course of mine permitting (USEPA 2011). Our study will look closely at peer-reviewed scientific articles describing and evaluating these and other





**Figure 4.** Flow chart depicting U.S. Army Corps of Engineers review process for Section 404 dredge-and-fill permits issued for mountaintop mining and valley fill projects. Based on graphic downloaded on 02-01-2013 <http://water.usgs.gov/nwsum/WSP2425/legislation.html>

emerging forms of interdisciplinary, multisectoral planning for sustainability related to forests, water, and energy production.

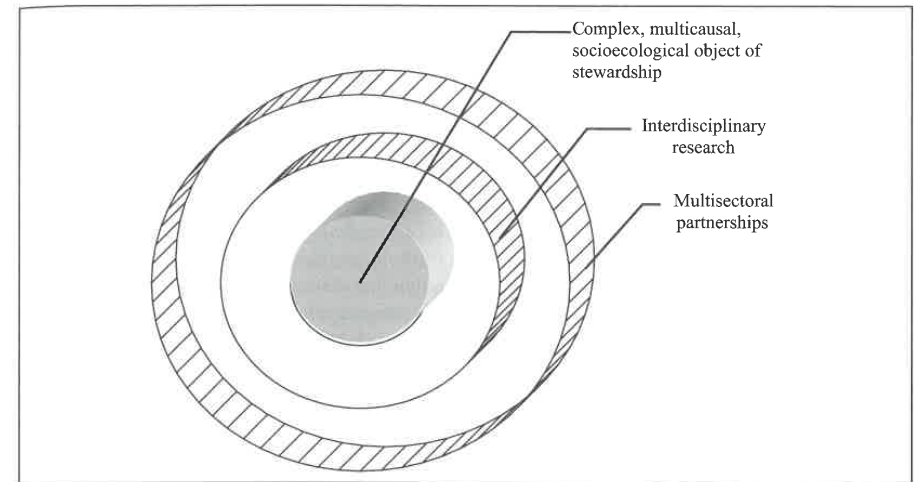
#### Between Social, Ecological, and Economic Functions at Local, Regional, and Global Scales: The Object of Sustainability

A number of environmental philosophers cite the need for what Robertson and Hull (2003b) describe as “a vision of nature and human society that encourages people to create healthy human ecosystems and sustainable communities at local, regional, and global scales.” Arriving at such a vision entails the historically unprecedented project of building a culture of sustainability across disciplinary, sectoral, and scalar boundaries.

Bringing multiple perspectives into dialogue, ongoing conversations between scientists and the public have illuminated the extent to which categories that compartmentalize nature, society, and economy into separate spheres for research and

management impede planning for sustainability. Integrating these spheres transforms the object of environmental protection from an inventory of static “resources” into a complex multifunctional system. Comprising social as well as ecological and economic values, this system is situated at a public nexus of interdisciplinary and multisectoral perspectives (Figure 5).

Terms for such systems, emerging in the public ecology literature, signal innovative experiments underway for managing water, forests, and energy production within interdisciplinary, multisectoral frameworks that integrate social, ecological, and economic values. Among many terms embodying the integration of these three “pillars of sustainability” we find “socio-ecological systems” (Brondizio et al. 2009), “industrial ecology (Hoffman 2003),” “community forestry” (Baker and Kusel 2003; Gibson et al. 2000), “corporate social responsibility” (Hilson 2012, Hutchins et al. 2007, Jenkins and Yakovleva



**Figure 5.** Sectors, disciplines, and the object of stewardship

2006), “corporate partnerships for sustainability” (Juniper and Moore 2002), “cultural conservation” (Hufford 1994, Howell 2002), “traditional ecological knowledge” (Huntington 2000), “mixed mesophytic community forest and watershed” (Hufford et al. 2008), and “commons” (Reid and Taylor 2010; Boyer 2007; Hufford 2002).

“The land community” was Aldo Leopold’s term for what he arrived at as the object of adaptive management at the local level (Leopold 1948). Integrating economy, ecology, and society, Leopold’s term complicates the opposition often drawn between economy and ecology. Norton argues that Leopold’s vision not only transcended the polarization of ecological and economic values, it challenged positivist approaches restricting the assessment of risk to physical and economic impacts. Establishing standards for the physical survival of individual persons, species, and artifacts, such approaches fail to recognize negative impacts on cultural institutions that produce and reproduce a land ethic: a set of ideas and practices established over generations that enable communities to meet their needs in the present without compromising the needs of future generations to meet their needs (Norton, 2005: 72–73; King 1998).

Aldo Leopold’s notion of the land community guided by a land ethic highlights the importance of ongoing collective cultural processes for sustainability over multiple generations. Terms like “landcare” (Kimmel et al. 2011; Kimmel et al. 2012), “commons” (Hufford 2002; Nonini 2007; Reid and Taylor 2012) and “common pool resource systems” (Armitage 2005; McKean 2000) capture the institutional arrangements subtending communities of land and people. While such arrangements may seem amorphous when viewed from academic, industrial, and government sectors, they have functioned over many generations to articulate and transmit land ethics governing the production and reproduction of communities of land and people (Reid and Taylor 2010). Such arrangements are strongest at the local level. (Efforts to integrate social and cultural into design professions and resource management have produced terms like “soft systems” (Checkland 2000), “intangible cultural resources” (King 2008), and “traditional cultural properties” (King 2003).)

Recognition that local knowledge and culture have a foundational role to play in sustainability at regional and global scales underpins growing interest in locally-centered models like

community-based natural resource management (CBNRM) and grassroots ecosystem management (GREM) (Weber, 2000), as well as place-based approaches and the study and application of traditional ecological knowledge (TEK) (see Agrawal 1999; Armitage 2005; Huntington 2000; See also Taylor 2009). Such terms appear in connection with innovative efforts around the world to engage land communities in the collaborative study and integration of traditional management practices with scientific knowledge for long-term sustainability across scales. Implications explored in the literature include the possibility of developing international markets for global services provided by land communities such as the preservation of biodiversity and carbon sequestration (Jenkins et al. 2004).

In the U.S., a growing number of studies focus on the sustainability of local commons and common pool resource systems and related implications for public policy. The Executive Order on Environmental Justice (E.O. 12898) directs all federal agencies to consider the needs of communities for continued access to fish, game, and non-timber forest products when making decisions that could affect that access (US EPA 2004; US EPA 2011). Since then a number of studies of nontimber forest products have sought to clarify the implications of this policy outside of Native American contexts, including "forest practitioners" in the Appalachian region, whose harvesting is not only economically productive, but socially, culturally, and ecologically reproductive (Fortmann 1990; Goodman 2002; Jones et al. 2002; Chamberlain 1998). Nontimber forest products are yet another example of edgework—employing the marked category to reveal what is hidden by the unmarked term, and ultimately diversifying constituencies whose knowledge can contribute to sustainability.

One of the most challenging questions raised in the literature is that of how to promote communication across sectors and disciplines. The public ecology literature identifies and evaluates a number of theories and strategies for promoting communication as a means of reaching common ground among stakeholders, including

social learning (Cundill and Rodela 2012; Rodela 2013; Schusler 2003; Ison et al. 2007; Craynon et al. 2012), participatory reason (Reid and Taylor, 2010), and storylines (Hendriks 2005). A question we have is whether the full complement of disciplines with relevant expertise have been engaged. Given the importance of cultural processes to the sustainability of land communities, efforts made to understand such processes could fruitfully engage the skills of ethnographers and public humanists. Such studies presently inform the integration of TEK with managerial ecology, relying on ethnomethodologists for translation. But in communities like those in the Appalachian region, where citizens and scientists share a common language, it is not translation that is needed so much as appreciation for the social, economic, and ecological functions embedded in land communities. Prompting reflection on local forms of management for multiple values, collaborative ethnographies can contribute to learning that integrates scientific and community perspectives into public culture for sustainability.

## CONCLUSION

As an approach to sustainable development, public ecology is in its infancy. The simultaneous emergence, worldwide, of cognate approaches to sustainability signals that public ecology is part of an important epistemological and ontological shift that is underway, rewriting the interrelations of research and management, science and public policy, and the social, ecological, and economic values ascribed to environmental resources. Salient aspects of this shift are marked in the hybrid terms appearing over the past two decades in peer-reviewed environmental studies literature. These terms are metadiscursive and pragmatic, both naming and constituting new alliances across disciplines and sectors. Linking values systems operating at local, regional, and global scales, these terms also constitute new, public objects of sustainability. In effect, these are metadiscursive operations that illuminate emerging trailheads to public ecology, some of which appear in the Appalachian region. Awaiting discovery, through our systematic review of the

peer-reviewed literature, are the theoretical and practical routes to best practices for public ecology, in the Appalachian region and around the world.

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