Forest Policy and Economics 35 (2013) 50–56

Contents lists available at ScienceDirect

Forest Policy and Economics

journal homepage: www.elsevier.com/locate/forpol

Institutional environments and arrangements for managing complex aquatic ecosystems in forested landscapes☆,☆☆

Claire A. Montgomery *

Department of Forest Resources, Engineering, and Management, Oregon State University, Corvallis, OR 97331, United States

ARTICLE INFO

Article history:
Received 6 April 2012
Received in revised form 30 September 2012
Accepted 3 October 2012
Available online 12 July 2013

Keywords:
Forest economics
Institutional economics
Watershed management policy
Forested watersheds
Complex ecosystems

ABSTRACT

The forested watersheds of the Pacific Northwest are complex aquatic ecosystems. They are adapted to disturbance cycles that occur at multiple temporal and spatial scales. They are embedded in a complex institutional system involving multiple governance structures spanning multiple ownership types. The salmon populations that inhabit the streams, rivers, and estuaries are diffuse and provide heterogeneous values to a heterogeneous user population. Management of these watersheds has been controlled by "top down" hierarchical land management agencies with policy dictated at the federal level, but there appears to be a transition to a more collaborative multi-level, polycentric approach based on local watershed councils. In this paper, the relevance of an emerging sub-discipline of economics, known as the New Institutional Economics, is explored as a vehicle for understanding how institutional governance structures relate to characteristics of the resource and the resource user community and guiding future watershed management policy. The recently established Watershed Councils in the state of Oregon, U.S., are explored as an example of how institutional arrangements for resource management may evolve over time. While some studies evaluate the effectiveness of this decentralized approach based on participants' opinions about process, the question of effectiveness with regards to ecosystem health remains to be addressed. This is a topic for future research.

1. Introduction

Forests are complex ecosystems in which cycles of conservation and renewal are triggered by disturbances that occur at many scales in time and space. Spatial scales can range from individual components of organisms to entire biomes. Temporal scales can range from seconds to millennia. An ecosystem successional cycle might involve an exploitation phase that is characterized by pioneer species that populate recently disturbed sites and organize resources (e.g. biomass and energy) into increasingly complex structures with more numerous niches inhabited by increasing numbers of species. As time passes, the phase shifts to conservation in which the system stabilizes and resources slowly become more tightly bound and less accessible for use. Diversity may decline. The biota may reach a successional climax. A new phase of release is triggered by disturbance—fire, storm, disease—that releases nutrients and other resources from their bound state and makes them available to be reorganized during a phase of renewal. And the cycle begins again. The larger landscape consists of a shifting pattern or mosaic of smaller systems, each at a different stage in the disturbance/recovery cycle so that, at any point in time, some portion of the landscape will be highly impacted by disturbance. Indeed, the larger system may exhibit less variation than the smaller units that comprise it because the proportion of area that is in any condition at any point in time may be relatively stable.

In this paper, I highlight three of the many issues to be resolved in the quest to maintain healthy ecosystems where people are present: the trade-off between global and local stability in ecosystems in which disturbance plays an important restorative role; multiple and overlapping spatial and temporal scales at which complex ecosystems and human institutions function; uncertainty and information costs.

1.1. Disturbance

People prefer stability and it can be argued that one legitimate role of government is to reduce uncertainty, limit fluctuations, and maintain a stable economy. However, this effort to bring order to chaos, protect resources, and ensure a predictable supply of ecosystem services by regulating ecosystems to dampen disturbance cycles can lead to ecological crisis because, in disturbance-adapted ecological systems, there is a trade-off between local stability and global stability (Holling, 1995). When the disturbance regime is interrupted, ecosystems may become less resilient and more vulnerable to collapse when disturbance does occur.

☆ This research was conducted while the author was under contract to the USDA Forest Service Pacific Research Station as a senior economist. The author is a professor in the College of Forestry, Oregon State University, Corvallis, Oregon 97331 and can be reached by phone: 541-737-5533, by fax: 541-737-4316, and by email: claire.montgomery@oregonstate.edu. The opinions expressed in this paper are those of the author and do not necessarily reflect the positions of the USDA Forest Service or Oregon State University.

☆☆ This article belongs to the Special Issue: *New Frontiers of Forest Economics*.

* Corresponding author. Tel.: +1 541 737 5533; fax: +1 541 737 4316.
E-mail address: claire.montgomery@oregonstate.edu.

1389-9341/$ – see front matter
http://dx.doi.org/10.1016/j.forpol.2013.06.008

The stream systems of the Oregon Coast Range are one example of a disturbance-adapted ecological system in which the disturbance regime has been seriously disrupted (Reeves et al., 1995). Those aquatic systems are periodically subjected to large-scale catastrophic wildfires that occur every 200–400 years. Immediately following a fire, aquatic habitat is seriously degraded in the burned watersheds, but they then enter a recovery phase that might last for centuries. During that time, the suitability of the habitat for anadromous fish slowly improves as landslides, triggered by the fire and subsequent storm events, introduce large wood and sediment into the streams and this material moves throughout the system. This forms the basis for complex high-quality freshwater salmon habitat with gravel beds for spawning and pools that provide places to hide from prey for multiple salmonid species. After a period of stability, the habitat slowly degrades as wood decays and sediment is eventually transported to river deltas. The system is then ripe for renewal by another catastrophic fire.

This fire regime has been disrupted by a century of aggressive wildfire suppression, and it is unlikely that its reintroduction will ever be considered socially acceptable (Reeves and Duncan, 2009). At the same time, regulatory practices have developed in the U.S. and Oregon, particularly since the 1960s, that attempt to dilute the impact of human-caused disturbance by spreading it evenly across the landscape so that salmon habitat is moderately degraded everywhere and little high quality habitat exists anywhere (Reeves et al., 2002). These practices include maximum stream temperature and sediment load thresholds for every stream segment, and maximum clearcut size and minimum stream buffer standards on timber harvest activities (Blinn and Kilgore, 2001). Degradation of freshwater habitat that results from forest practices, including the exclusion of wildfire and regulation of forest practices, has contributed to the listing of several evolutionarily significant units of Pacific salmon and distinct population segments of steelhead in the Pacific Northwest as endangered under the Endangered Species Act (NOAA, 2011).

1.2. Multiple spatial and temporal scales

The aquatic ecosystems of the Oregon Coast Range comprise multiple headwaters where streams originate (typically relatively high-elevation forested land that is managed by public agency), the higher order streams and rivers that the headwaters feed (typically moving through gentler terrain of private forest and agricultural land), and, finally, estuaries that serve as ports and centers of economic activity in coastal cities where they interface with the Pacific Ocean. Healthy salmonid populations require high quality habitat in each of these spatial components, but resource use along the route from headwaters to the open ocean is governed by an array of entities. These entities range from federal land management agencies (e.g. the U.S. Forest Service) that manage publicly-owned forest land to private landowners whose resource use is regulated by a dizzying array of regulatory agencies with different, and sometimes conflicting, objectives.

Ecosystem processes function at multiple temporal scales as well. Salmon life cycles vary from 2-to-8 years. There are annual cycles of weather and harvest. There are cyclical weather patterns of 15-to-25 years that impact salmonid populations through their effect on ocean currents and nutrients. And there are the long-term disturbance cycles that may last centuries.

Economic systems are also complex. They function at multiple institutional scales: individuals; households or families; firms; communities; and state, regional, national and international levels, at which institutional arrangements are defined and economic activity is regulated. The temporal scale at which economic interactions occur ranges from momentary price fluctuations to multi-decadal recessionary/expansionary cycles to millennial evolution in the economic and political institutions upon which they depend.

1.3. Information and uncertainty

Economists have traditionally applied methods that have roots in neo-classical economics to water resource issues. Social cost-benefit analysis (CBA), in particular, provides a useful framework for thinking systematically about management alternatives because it requires defining management objectives, modeling causal relationships between actions and outcomes, and explicitly considering trade-offs. CBA takes efficiency as a standard for evaluating alternatives; a policy for which the net present value of the benefits exceeds the net present value of the costs is an improvement over the status quo.

However, CBA shares a major limitation with neo-classical economics in general; it neglects information costs. CBA synthesizes an enormous amount of information; the cost of obtaining and processing that information and of allowing for contingencies when knowledge is incomplete can swamp any potential policy benefits that might be indicated. In decision environments involving complex ecosystems such as forested watersheds, one must know how the actions people take in the forest will affect the development of forest vegetation; how changes in vegetation will affect the ability of the forest to provide the full array of ecosystem services that people value; how unpredictable events might impact the ability of the forest to provide services under different alternatives; how people value these services relative to one another; and how that valuation might change under alternative management trajectories, particularly if they involve non-marginal changes.

For over a century, the dominant approach in the U.S. to addressing the challenges of managing large disturbance-adapted ecosystems was one of centralized planning and standardized regulation administered by large bureaucracies—a “top down” approach (Kenney, 1999). The Progressive Conservation movement of the 20th century, of which Theodore Roosevelt was a driving force, promoted large federal resource management agencies for forests and rangeland, such as the USDA Forest Service and the USDI Bureau of the Interior, as well as regional-scale watershed management projects, such as the Bonneville Power Administration in the Pacific Northwest and the Tennessee Valley Administration in the Midwest. Likewise, legislation to protect environmental quality via broad-scale regulation administered by federal agencies was enacted in the 1960s and 1970s (e.g. the Clean Water Act of 1972, the Clean Air Act of 1970, the Endangered Species Act of 1973, and the National Environmental Protection Act of 1969). Central planning became a paradigm for federal forest management. Tools, such as the linear programming model FORPLAN, were used in the hope of systematically, consistently, and cost-effectively processing massive amounts of information about complex forested landscapes to meet the mandate of the Multiple-Use Sustained-Yield Act of 1960 to manage “all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people.” However, just as the costs of central planning overwhelmed the economies of the Soviet Union, the costs of National Forest planning in the U.S. meant that it has “largely been a failure” (Sedjo, 2004).

The challenge for economists is to identify institutional arrangements that handle information costs efficiently. The undertaking is particularly challenging because ecosystems do not align to property, jurisdictional, or political boundaries. In this paper, I explore the potential for recent developments in economics—particularly the new institutional economics (Williamson, 2000)—to inform policy for managing large-scale, complex, dynamical systems in which periodic stochastic disturbances play a critical restorative role. As Kijazi and Kant (2012) observe, the neo-classical approach to optimal forest management neglects the evolutionary nature of the institutions within which individuals interact—with one another and with nature. While, at any point in time, optimal management may appear to be quite simple, the dynamic and multi-layered nature of both eco- and human systems may involve switching strategies as institutional arrangements evolve over time.

In fact, we may be at such a switching point in the U.S. The last few decades have seen the emergence of voluntary, community-based, participatory approaches to resource management that might be characterized as "bottom-up." As of yet, there is little evidence that these local governance structures will be more successful at maintaining healthy ecosystems because impacts are difficult to measure and they occur over long spans of time. Nonetheless, the approach has enthusiastic advocates who see effective watershed management as only one of many potential benefits of local cooperative arrangements; others include enhancing social capital in communities by bringing people together and building trust.

I begin with a description of new institutional economics (NIE), its development over time, and its current extension into environmental economics. That is followed by a description of Oregon's current experiment with new institutional arrangements for managing the forested watersheds in the state. This experiment may present an opportunity to observe a major adjustment of governance structures for watershed management and to evaluate the new multi-level structure for its effectiveness relative to the hierarchical approach of the past century. I conclude with a brief discussion of what I think the NIE framework can help us understand about cost-effective management of forested watersheds, what may be beyond its scope, and possible avenues for carrying this work forward.

2. New Institutional Economics

New Institutional Economics represents an attempt to consider the implications of imperfect information and complex decision environments on the development of economic systems. According to Ronald Coase (1998), the term New Institutional Economics was first coined by Oscar Williamson in 1979 to distinguish it from the existing subdiscipline of institutional economics. What distinguishes the "new" most clearly from the "old" is that NIE builds upon accepted theory underlying neoclassical economics—specifically, that competition for scarce resources drives relative price changes—and extends that theory from the study of individual choice to the analysis of institutional arrangements and governance, whereas the "old" institutional economics is atheoretical (Coase even calls it "anti-theoretical") and largely descriptive (Coase, 1984). In the perfectly competitive general equilibrium model that provides the baseline in mainstream microeconomics, instrumentally rational individuals come together in markets and, acting independently and in their own self-interest, engage in exchange—the outcome of which is efficient, meaning that scarce resources are allocated to their highest valued uses so that they generate the highest possible aggregate value to society. The efficient outcome depends on an array of conditions: that individuals do indeed weigh costs against benefits in making utility-improving choices; that there are many individuals on either side of exchange; that sellers supply homogeneous goods and services; and that individuals have perfect information relevant to the choices they make. In this world, transactions are costless and instantaneous. Market failures (deviations from efficiency) arise when a subset of these conditions is violated.

While NIE accepts the idea that competition arises from scarcity and that individuals are self-serving, it challenges at least two key conditions for efficiency. First, because individuals do not have perfect information and it is costly to obtain information, transactions are not costless. Second, even with perfect information, we lack the mental capacity to process it all, particularly in complex environments characterized by fundamental uncertainty, so that our ability to act rationally is bounded and it is impossible to design a contract that accounts for every eventuality (Paavola and Adger, 2005; Williamson, 2000). Therefore, in addition to the cost of obtaining information, every transaction involves contracting costs—negotiating, preparation, ex post monitoring and enforcement. Hence, the set of basic questions that economics addresses about production and consumption must be expanded to include questions about the acquisition and management of information.

Mainstream economics recognizes that individuals have only incomplete information, but it underestimates the importance of that limitation. In contrast, NIE places incomplete information at the center of the analysis of why institutions exist and why they are organized as they are. In this context, an institution is a set of "working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions" (Ostrom, 1990).

Williamson (2000) proposed four levels of analysis within NIE along a temporal scale: the institutional environment as defined by informal rules; the institutional environment as defined by formal rules; governance structures; and the allocation of resources and price determination.

At the longest temporal scale of *centuries to millennia*, the institutional environment is defined by informal rules—social norms, ideologies, and traditions—that evolve slowly out of an accumulation of interactions between individuals. To the extent that people adhere to these norms, their behavior is relatively predictable; e.g. the statement that "Henry is a good sort and can be trusted" means something. For example, there are legal commitments embodied in a marriage contract, but there is also an array of expectations that arise from the social context (including religion, tradition, and social norms) that are not stated explicitly. These rules are generally taken as given by economists, if we acknowledge them at all. Human economic behavior as it is embedded in an institutional environment defined by informal rules is the subject of the emerging discipline of economic sociology.

Resource allocation and price determination that occur at the other temporal extreme, where change is *continuous* and occurs within existing institutional environments and governance structures, is the subject of the neoclassical economics that most people understand as economics.

NIE concerns itself with two levels that lie between these two extremes. The formal rules that further define the institutional environment result from purposeful collective choice that occurs over at a temporal scale of *decades to centuries*; these rules dictate property rights (defined by law) and processes for decision-making and enforcement (encoded in constitutions). Property rights systems fall along a continuum between the extremes of open access (no assignment or enforcement of ownership) and private property (assignment of rights of use to individuals). A range of collective ownership, such as common property or state ownership, falls between. Early property rights economists argued that, once property rights are assigned, government can disappear except to arbitrate property rights disputes (Williamson, 2000). Most economists now understand that the success of an economy is tightly linked to the nature of the institutions that govern it (Bromley, 1992). NIE, at this level, seeks to understand how institutions develop, to analyze their determinants, and to inform policy about the effectiveness of different institutional structures in various settings.

Governance structures are defined within the context of an institutional environment and adapt to new circumstances relatively quickly—on an order of *years to decades*. Economic interactions or transactions are organized within governance structures (e.g., firms, bureaucracies, non-profit organizations, long-run contracts, and households). Private governance structures range from individual market exchange to hierarchical corporations; intermediate structures include various forms of contracting that involve long-term or exclusive agreements.

It is said that NIE was born when Ronald Coase asked why firms exist (Coase, 1937) and suggested that the primary reason is to reduce transaction costs. This triggered a quest to understand how transactions that differ in their attributes are aligned with governance structures that manage them most efficiently. Transactions differ in several ways. Asset specificity (the degree to which investment in physical or human capital loses value if it is transferred to another use) creates incentives for both parties to act opportunistically to capture rent after investments are made. They will likely try to hide information and to negotiate contracts to protect their investments. Uncertainty and complexity increase transaction costs because they make it impossible to account for every contingency in an enforceable contract; hence, discretion must be allowed for the parties to adapt to unforeseen events. Incomplete contracts and the potential for opportunistic behavior necessitate a vehicle for conflict resolution, the cost of which can be reduced by investment in trusting relationships. Klein and Shelanski (1996) surveyed empirical studies of private governance structure and organization of the firm and found evidence that "[t]he probability of observing a more integrated governance structure depends positively on the amount or value of the relationship-specific assets involved and, for significant levels of asset specificity, on the degree of uncertainty about the future of the relationship, on the complexity of the transaction, and on the frequency of the trade."

The study of governance structure and transaction costs has subsequently expanded its scope beyond the firm. For example, the household serves as a building block for the theory of consumer choice in neoclassical economics much in the same way that the firm serves as a building block for production theory. Pollak (1985) used the transaction cost approach to look inside the household and explain the allocation of resources, the division of labor, and the household governance structures within which these choices are made: e.g. patriarchal extended families versus nuclear families, family versus hired farm labor; and sharecropping.

We can also attempt to explain the existence and organization of public bureaucracy. Economists have, in the past, offered two widely disparate views of bureaucracy. In public choice economics, the government and its agencies are represented as "the benevolent dictator" who knows all and makes welfare-maximizing allocational decisions on behalf of society. When markets fail, government is the solution. This view supports the top-down rational planning approach to forest planning employed by the U.S. Forest Service. In contrast, property rights advocates see bureaucracy as grossly inefficient and potentially corrupt; they argue for complete assignment of property rights and privatization of state-owned resources. NIE rejects both of these simplistic views of bureaucracy just as it rejects the black box version of the firm (Williamson, 1999). Bureaucracy, like the firm, comprises a range of governance structures ordered along a continuum between autonomy and cooperation and defined by the degree of reliance on privatization, regulation, or public agency. Once it is acknowledged that firms operate as hierarchical organizations within which an individual or a group of individuals exercises supreme authority, many of the insights obtained through analysis of the firm can be applied to bureaucracies as well.

It is here that NIE turns from positive to normative science—analyzing policy for governance structure, both public and private, for different kinds of transactions. For example, Picciotto (1995) applied the framework of NIE to provide guidance for implementing projects in developing countries, particularly in cases where public, private, and volunteer sectors overlap and success depends on cooperative management of common pool resources, alignment of incentives with the common good, and credible recourse for resolving conflict. Johnson and Libecap (1994) applied it to explain the evolution of the Federal Civil Service in the U.S. as a governance structure in which career bureaucrats are protected from manipulation by politically appointed leadership that serves at the discretion of the president. They claim that the Civil Service, despite its flaws, "may in fact be relatively efficient." Richards et al. (2007) and Auer et al. (2011) apply NIE to develop guidelines for the U.S. Forest Service to outsource U.S. National Environmental Protection Act reporting tasks—a bureaucratic analog to the "make or buy" decision underlying the organizational structure of the firm.

3. Environmental institutionalism

Recently, NIE has entered the complicated realm of environmental and resource policy, primarily as a framework for considering management of open access or common property resources (Libecap, 2005; Ostrom, 2008). These are resources that are rival in consumption (use by one party makes them unavailable to others), but have poorly defined and/or poorly enforced property rights, so that incentives to manage for future use are missing. They are prone to depletion. Libecap notes that attempts to prevent depletion can fail because, in some cases, transaction costs of constraining use exceed any benefits expected to result. In such cases, it may well be efficient to allow the overuse to persist.

Some types of resources tend to involve high transaction costs. For example, if a resource is diffuse, it will be difficult to define and monitor property boundaries. If a resource is mobile, monitoring will involve tracking across the landscape. If a resource is poorly understood, the impact of current use on future availability may be unknown, especially if the link between use and impact are geographically disparate. In such cases, rules for resource use must account for a range of contingencies; these rules are likely to be complex, complicated to negotiate, and difficult to enforce.

Likewise, attributes of users will influence transaction costs. For example, if users are numerous, they may not know each other and individuals may not feel accountable to the community. If the user community is heterogeneous, individuals are likely to hold disparate values thereby increasing the likelihood that misunderstanding and prejudice will lead to conflict. Lack of social capital in the user community leads to lack of trust that will also increase conflict and reduce the sense of accountability of individuals to community.

The optimal institutional arrangement for managing common pool resources depends, therefore, on the characteristics of the resource and the users. Kant (2000) and Kant and Berry (2001) emphasize two attributes of users (heterogeneity and resource dependence) and formulate a "transaction" function to help identify optimal property rights systems. They argue that open access might work well when heterogeneity is low and resource dependence is high while private property may work well when heterogeneity is high and resource dependence is low. State ownership may be the most efficient arrangement and provide the highest net value to society where transaction costs, taken together, make other types of collective action impractical (Ostrom, 2008). Hybrid arrangements that combine state and private governance structures also exist. Land use zoning and forest practice rules are examples of arrangements in which ownership is private but use is heavily regulated. The Tree Farm Licenses in the provincial forests of Canada are an example of an arrangement with public ownership and private use by contract (Zhang and Pearse, 1996).

Change in institutional arrangements and governance structure is costly because it requires negotiation; it often involves reassignment of property rights and, hence, is accompanied by conflict. Therefore, the efficiency of a particular outcome depends on a legacy of past decisions (it is path-dependent) and the status quo may be the most efficient outcome once the cost of change is considered. Nonetheless, private property arrangements appear to be gradually emerging as workable solutions in situations where, in the past, they were inefficient (Libecap, 2005). There are several reasons for this. Increasing scientific knowledge about ecosystems reduces uncertainty about resource use impacts. Advances in computing and information science, combined with new technologies for detection and monitoring, reduce enforcement costs. Increasing scarcity and population growth lead to increased resource values relative to transaction costs. Private property systems have the advantage of being self-enforcing because they are incentive-based. Where private incentives align with social values, efficient resource management may involve relatively low monitoring and enforcement costs.

4. Forested watersheds of the Oregon Coast Range

The factors that lead to high transaction costs all exist in the case of the forested watersheds of Oregon. The salmon populations they support are diffuse and mobile; the impact of resource use is poorly understood, in part because actions and outcomes can be far apart in time and space. For example, changes in salmon runs (salmon returning from the ocean to spawn) at one location can be due to changes in stream temperatures, blockages, gravel beds, woody debris, or fishing pressure in the headwaters; blockages, fishing, or pollution in the larger river system or in estuaries; or fluctuations in temperatures and currents, parasites, and harvest levels in the open ocean. If fry mortality increases in streams, the effect on salmon runs will not be observed for years. This complexity has made it impossible to determine the effectiveness of freshwater salmon habitat restoration in watersheds in Oregon and Washington in recent years because fluctuations in ocean conditions have occurred at the same time (Preusch, 2010).

The people who use these watersheds and the benefits they obtain are many and diverse. There may be direct use of water for drinking and irrigation; reservoirs may be managed for flood control; and there may be recreational use for boating and fishing. The salmon that inhabit the forested watersheds provide an array of values to diverse and geographically separate populations of users: the commercial ocean and freshwater recreational fishery provide employment in coastal and forest communities; salmon are valued by indigenous populations as a symbol of their heritage; and they are valued by city dwellers as a symbol of wildness.

The system of property rights varies along the gradient from headwaters to ocean. Salmon spawn in headwaters that are often on federal forest land; they feed and grow in streams and rivers that run through private forest and agricultural land; they adjust to saltwater during their time in estuaries in urban ports; and, before they return to spawn, they spend years in open-access ocean fisheries in international waters.

Legacy plays a large role in the pattern of land ownership comprising forested watersheds. Property rights were established haphazardly under homesteading rules and land swaps under a mandate of privatization. What remains in federal ownership is largely an artifact—the land nobody wanted. For example, the land deal with the railroads and subsequent O&C Act of 1937 (www.oandccounties.com) resulted in a mile-square checkerboard of federal and private land. The water itself is allocated through a complex system of property rights established piecemeal over time, largely by precedent, as the western U.S. was settled.

Top-down regulation by federal agencies under the National Environmental Protection Act, the Clean Water Act, the Endangered Species Act, and the National Forest Management Act has led to rigidly-imposed, uniform standards that sometimes conflict with one another. Local groups feel disenfranchised and powerless. Agencies feel hamstrung and unable to manage the resource which has been entrusted to them.

5. The Oregon experiment

A movement towards more localized, collaborative, and flexible governance structures for managing watersheds appears to be emerging throughout the western states of the U.S., largely in reaction to what is increasingly recognized as a dysfunctional hierarchical institutional environment (Kenney, 1999). The state of Oregon has been particularly proactive in exploring and supporting an alternative institutional arrangement that brings together multiple levels of governance. The Oregon plan promotes “watershed councils” in which landowners, government agencies, business interests, Native American tribal groups, and nongovernmental organizations cooperate to develop and implement plans and projects locally. There are currently 90 watershed councils authorized in the state (http://www.oregon.gov/OWEB/).

The watershed council arrangement in Oregon is a multi-level governance structure. It was originally motivated by the listing of several salmonid species populations as endangered under federal law. The region was torn by conflict over forest use in the early 1990s, when federal agencies responded to litigation under the Endangered Species Act regarding habitat for the endangered northern spotted owl by reducing federal timber harvest by over 80%. Employment impacts were sudden and dramatic, particularly in small rural communities. When faced with the possibility of another round of economic disruption, Oregon state officials acted proactively to develop an alternative that would involve the people who rely on forested watersheds for employment while meeting standards set by the U.S. Fish and Wildlife Service.

The Oregon Plan for Salmon and Watersheds (www.oregon-plan.org) was the result. Local watershed councils can receive start-up funding if they demonstrate that diverse interests are represented in their membership and there is a local government sponsor (Butler, 2003; Habron, 2003; Lurie and Hibbard, 2008). Grant funding is available for projects that further the objectives of the state plan with respect to salmon and water quality but they must receive matching funds from the communities. Hence, at least four levels of governance are involved: the federal level, the state level, the local county or city level, and the level of voluntary cooperation of individuals. The function of the councils is, first, to develop plans for watershed management that make use of local knowledge and are responsive to local interests while meeting state and federal standards and, then, to design and seek funding for projects that will move the plans forward.

This is an experiment. As Ostrom (2008) notes, that is as it should be. After examining hundreds of cases involving different property arrangements for common pool resources, she found that no single system is clearly superior to the others. She states, “Instead of presuming that one can design an optimal system in advance and then make it work, we must … adopt a multi-level, experimental approach…” Likewise, Paavola (2007) argues that “there is a need to be able to deal with traditional national policies based on the enforcement power of the state in conjunction with solutions based on voluntary cooperation.” That appears to be what the Oregon plan is intended to do.

One potential benefit of such an approach is that flexibility is built into the process, enabling management to adjust to changing circumstances and new knowledge. The plans are based on local knowledge of local conditions, but are required to meet national watershed health and endangered species policy objectives. Enforcement costs may be reduced because members are more likely to adhere to plans that they feel they own. Negotiation costs may be reduced due to the community's investment in social capital—building trust and creating networks. Such investment in social capital may increase community resilience to shocks arising from natural disturbances, policy changes, and economic fluctuations.

But are these benefits real or are they wishful thinking? These collaborative efforts seem to be overwhelmingly motivated by a desire to find a cost-effective institutional solution to a complex problem. In some cases, it is to avoid a costly bureaucratic intervention; in others, it is to protect private property rights from appropriation by federal regulation, such as the Endangered Species Act; in still others, it is the promise of state funds that subsidize activities that may be mandated by law anyway and that stimulate community economies (Habron, 2003; Hibbard and Lurie, 2006; Rosenberg and Margerum, 2008).

The watershed councils are not without critics. Local landowners express concern that the community groups may infringe on their perceived right to do what they want on their property (Rickenbach and Reed, 2002). They don't feel that they should be held accountable to the community at large. Others see the councils as just one more government bureaucracy to deal with. Environmentalists have been reluctant to participate at all. Environmental organizations represent the interests of large segments of the population who likely do not reside in the rural areas affected by environmental policy. Most have their headquarters in cities. They have become adept at working within the regulatory environment using litigation to achieve outcomes consistent with the goals of their constituencies. They fear, perhaps rightly, that local watershed councils may be short-sighted and narrow in scope—that broader longer-term ecosystem health objectives may be compromised in the name of rural economic vitality. Hibbard and Madsen (2003) cite a letter written to the Sierra Club board of directors by the retired chairperson of the Sierra Club in 1996: “Industry thinks its odds are better in these forums. It is ready to train its experts in mastering this process. It believes it can dominate them over time and relieve itself of tough national rules.”

Some participants question whether the watershed councils really do reduce bureaucracy and transaction costs (Habron, 2003). Most of the groups operate by consensus. And many participants express frustration and amazement at how long it can take to make even the simplest decisions. As a result, some groups are evolving in such a way that a small committed group, sometimes on payroll, undertakes the bulk of the council's activities with meetings becoming forums for disseminating information.

How, in fact, are the watershed councils doing with respect to ecosystem health? Factors that appear to lead to successful self-organization to manage common-pool resources in general (Ostrom, 1999) include attributes of the resource itself (such as its status or potential ability to recover, the ease with which its condition can be monitored, and its spatial extent) and attributes of the users (shared values, dependence on the resource for livelihood or life style enhancement, trust, and administrative experience). Some studies have been specific to the Oregon watershed council experiment and some examine collaborative watershed groups more broadly, evaluating their success and the attributes that support it (e.g., Chaffin et al., 2012; Hardy and Koontz, 2009; Hibbard and Lurie, 2006; Lurie and Hibbard, 2008; McKinney and Field, 2008; Rickenbach and Reed, 2002; Rosenberg and Margerum, 2008). But these studies all define success in terms of process rather than outcome for the resource. They ask if participants feel heard, how conflict is handled, whether the group has been able to agree on objectives and acquire grants, and whether participants are generally happy with how things are going.

In my view, these evaluative efforts miss the point. They do not ask whether the collaborative bottom-up approach is more effective than the top-down regulatory approach at protecting key watershed values. That is, are salmon populations less endangered in the long run and are ecosystems more resilient and less vulnerable to catastrophic disturbance? That is not surprising given the fundamental problem of missing information. It will be interesting to see whether this experimental institutional arrangement survives long enough to make a difference and whether that difference leads to improved ecosystem health.

The watershed councils' approach may have a real advantage over bureaucratic regulation that arises from their heterogeneity. The National Forests of the western U.S. have suffered in the past from rigidly imposed policies applied across the board—policies that, while well-intentioned, were misinformed and simply wrong. For example, a century of aggressive forest fire suppression has left forests burdened with fuels and vulnerable to catastrophic stand-destroying fire that is costly, if not impossible, to contain. If the watershed councils are allowed to take different approaches in different places, some may fail, but the overall outcome may be a more robust landscape less vulnerable to disturbance and change.

6. Concluding remarks

The coastal watersheds of Oregon are complex ecosystems in which large-scale disturbance plays an important role in the cycle of conservation and renewal over a large spatial extent. They are institutionally complex as well because they span multiple ownerships of different types and are managed under overlapping jurisdictions by agencies at every level of government. They provide multiple benefits to a variety of resource users who hold different values—values that can lead to conflict between user groups. They are characterized by enormous uncertainty about the connection between resource use activities and the condition of the resource. Hence, it is nearly impossible to hold resource users accountable for impacts of their actions on the resource at risk, salmon.

New Institutional Economics is an evolving discipline that might provide insights into the development of policy for managing these ecosystems over the long run. The fundamental basis for cost-benefit analysis still holds—weighing costs and benefits to identify potential efficiency gains. However, explicit consideration of information costs substantially increases the relevance of CBA for managing people in large, complex, dynamical forested watersheds.

The problem of watershed health has historically been addressed in a top-down fashion within hierarchical bureaucratic agencies that operate under a rational planning paradigm. Typically, regulation is used as the main vehicle for controlling resource use activities. This may be the best we can do because transactions that are complex, difficult to understand, and involve long time spans with uncertain outcomes are arguably managed most cost-effectively in a hierarchical governance setting. Standards can be enforced by regulation across ownerships and across lower-level jurisdictional boundaries at the spatial scale at which ecosystems function. Nonetheless, while the application of “one-size-fits-all” uniform regulatory standards across the landscape may reduce monitoring and enforcement costs, the outcome can be disastrous if those standards prove to be wrong. Furthermore, by dampening the disturbance cycles to which ecosystems are adapted, the regulatory approach puts ecosystems at risk of collapse when disturbance does occur.

Technological change appears to be reducing transaction costs associated with diffuse and mobile resources—particularly costs of monitoring resource conditions, enforcing resource use restrictions, and disseminating new knowledge to users. This trend increases the feasibility of experimentation with alternative governance structures that may allow more variability across the landscape and over time. Some will surely fail, but their diversity and, perhaps, their very lack of stability, may lead to greater resilience of aquatic ecosystems over larger spatial and longer temporal scales than under the bureaucratic system.

The Oregon Plan for Salmon and Watersheds is just such an experiment. It isn't top-down; nor is it bottom-up. It applies uniform objectives for the resource at the federal level (the Endangered Species Act), but relies on local collaborative arrangements for planning and implementation. Because the Plan was established recently, in 1997, it is too early to judge its effectiveness. To date, evaluative efforts have focused on whether participants in watershed councils like how the councils are working for their communities, but from a policy perspective, the important questions are whether these governance structures are effective in achieving social resource management objectives (e.g. recovering salmon populations) and whether they are efficient in doing so. These questions, to my knowledge, have yet to be answered.

There are some important and challenging issues that are beyond the reach of the NIE framework. Missing information is the central focus of NIE. While missing information is an important and vexing aspect of the problem of managing for healthy forested watersheds, uncertainty due to missing information is not the same as uncertainty arising from unpredictable natural disturbance events. One can at least hope to obtain missing information by investing in research, thereby reducing one type of uncertainty. But dampening disturbance cycles to increase predictability in the short run may do more harm than good in the long run.

Governance structures that allow rules for resource use to vary across time and space may allow for adaptation to disturbance when it occurs. But a system that allows for flexibility and adaptation may also be perceived as arbitrary and unfair by resource users when compared to uniform rules and standards. Flexibility also presents opportunities for manipulative behavior by relatively powerful local stakeholders (e.g. extractive industry). This is the concern that environmental groups have expressed about Oregon's watershed councils (Hibbard and Madsen, 2003).

Nonetheless, the variability in resource rules that arise from a localized collaborative approach to resource management may also be the most promising way to manage for periodic disturbance. The tradeoff between local and global stability of ecosystems may exist for economic and institutional systems as well (Rosser, 1999). Understanding complex economic systems may be just as important as understanding complex ecological systems for improving watershed health. In particular, understanding how institutional arrangements evolve to accommodate new knowledge, new technology, and changing values may help people become more accepting of an experimental and adaptive approach to institutional design for resource management.

Acknowledgements

This research was made possible by financial support from the U.S. Forest Service's Pacific Northwest Research Station. The views described here are those of the authors alone and do not represent those of the U.S. Forest Service.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.forpol.2013.06.008.

References

Auer, M., Richards, K., Seesholtz, D., Fischer, B., Freitag, C., Grice, J., 2011. The U.S. Forest Service and its responsibilities under the National Environmental Policy Act: a work design problem. Public Organization Review 11, 135–153.

Blinn, C.R., Kilgore, M.A., 2001. Riparian management practices: a summary of state guidelines. Journal of Forestry 99 (8), 11–17.

Bromley, D.W. (Ed.), 1992. Making the Commons Work: Theory, Practice, and Policy. Institute for Contemporary Studies Press, San Francisco, CA.

Butler, W.H., 2003. Planning for Water: Statewide Approaches to Watershed Planning and Management. (M.S. thesis) Virginia Polytechnic Institute, Blacksburg, VA.

Chaffin, B.C., Mahler, R.L., Wulfhorst, J.D., Shafii, B., 2012. Collaborative watershed groups in three Pacific Northwest states: a regional evaluation of group metrics and perceived success. Journal of the American Water Resources Association 48 (1), 113–122.

Coase, R.H., 1937. The nature of the firm. Economica 4 (16), 386–405.

Coase, R.H., 1984. The new institutional economics. Journal of Institutional and Theoretical Economics 140, 229–231.

Coase, R., 1998. The new institutional economics. American Economic Review 88 (2), 72–74.

Habron, G., 2003. Role of adaptive management for watershed councils. Environmental Management 31 (1), 29–41.

Hardy, S.D., Koontz, T.M., 2009. Rules for collaboration: institutional analysis of group membership and levels of action in watershed partnerships. The Policy Studies Journal 37 (3), 393–414.

Hibbard, M., Lurie, S., 2006. Some community socio-economic benefits of watershed councils: a case study from Oregon. Journal of Environmental Planning and Management 49 (6), 891–908.

Hibbard, M., Madsen, J., 2003. Environmental resistance to place-based collaboration in the U.S. West. Society and Natural Resources 16 (8), 703–718.

Holling, C.S., 1995. What barriers? What bridges? Ch. 1 In: Gunderson, L.H., Holling, C.S., Light, S.S. (Eds.), Barriers and Bridges to the Renewal of Ecosystems and Institutions. Columbia University Press, New York.

Johnson, R.N., Libecap, G.D., 1994. The problem of bureaucracy. In: Johnson, R.N., Libecap, G.D. (Eds.), The Federal Civil Service System and the Problem of Bureaucracy. NBER.

Kant, S., 2000. A dynamic approach to forest regimes in developing economies. Ecological Economics 32, 287–300.

Kant, S., Berry, R.A., 2001. A theoretical model of optimal forest regimes in developing economies. Journal of Institutional and Theoretical Economics 157 (2), 331–355.

Kenney, D.S., 1999. Historical and sociopolitical context of the western watersheds movement. Journal of the American Water Resources Association 35 (3), 493–503.

Kijazi, M.G., Kant, S., 2012. Complexity theory and forest resource economics. In: Kant, S. (Ed.), Post-Faustmann Forest Resource Economics. Springer, Netherlands.

Klein, P.G., Shelanski, H.A., 1996. Transaction cost economics in practice: applications and evidence. Journal of Market-Focused Management 1, 281–300.

Libecap, G.D., 2005. State regulation of open-access, common-pool resources. In: Menard, C., Shirley, M.M. (Eds.), Handbook of New Institutional Economics. Springer, Netherlands.

Lurie, S., Hibbard, M., 2008. Community-based natural resource management: ideals and realities for Oregon watershed councils. Society and Natural Resources 21 (5), 430–440.

McKinney, M., Field, P., 2008. Evaluating community-based collaboration on federal lands and resources. Society and Natural Resources 21 (5), 419–429.

NOAA [National Oceanic, Atmospheric Administration], 2011. ESA Salmon Listings. Accessed August 11, 2011 http://www.nwr.noaa.gov/ESA-Salmon-Listings.

Ostrom, E., 1990. Governing the Commons: the Evolution of Institutions for Collective Action. Cambridge University Press, Cambridge.

Ostrom, E., 1999. Self-governance and forest resources. Occasional Paper No. 20.Center for International Forestry Research, Jakarta, Indonesia.

Ostrom, E., 2008. Institutions and the environment. Economic Affairs 28 (3), 24–31.

Paavola, J., 2007. Institutions and environmental governance: a reconceptualization. Ecological Economics 63, 93–103.

Paavola, J., Adger, W.N., 2005. Institutional ecological economics. Ecological Economics 53, 353–368.

Picciotto, R., 1995. Putting institutional economics to work: from participation to governance. World Bank Discussion Papers, 304. The World Bank, Washington DC.

Pollak, R.A., 1985. A transaction cost approach to families and households. Journal of Economic Literature 23 (2), 581–608.

Preusch, M., 2010. Columbia River salmon runs plentiful now, but don't count on the trend continuing. The Oregonian. (www.oregonlive.com/environment/index.ssf/2010/02/).

Reeves, G.H., Duncan, S.L., 2009. Ecological history vs. social expectations: managing aquatic ecosystems. Ecology and Society 14 (2), 8 ([online] www.ecologyandsociety.org/vol14/iss2/art8/).

Reeves, G.H., Benda, L.E., Burnett, K.M., Bisson, P.A., Sedell, J.R., 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17, 334–349.

Reeves, G.H., Burnett, K.M., Gregory, S.V., 2002. Fish and aquatic ecosystems of the Oregon Coast Range. In: Hobbs, S.D., Hayes, J.P., Johnson, R.L., Reeves, G.H., Spies, T.A., Tappeiner, J.C., Wells, G.E. (Eds.), Forest and Stream Management in the Oregon Coast Range. Oregon State University Press, Corvallis, OR.

Richards, K., Seesholtz, D., Grice, J., Auer, M., Barbour, J., Fischer, B., Freitag, C., McCardle, G., 2007. Internal organization and external contracting for the NEPA process: lessons from New Institutional Economics and strategic organizational design. A White Paper Prepared for the USDA Forest Service.

Rickenbach, M.G., Reed, A.S., 2002. Cross-boundary cooperation in a watershed context: the sentiments of private forest landowners. Environmental Management 30 (4), 584–594.

Rosenberg, S., Margerum, R.D., 2008. Landowner motivations for watershed restoration: lessons from five watersheds. Journal of Environmental Planning and Management 51 (4), 477–496.

Rosser Jr., J.B., 1999. On the complexities of complex economic dynamics. Journal of Economics Perspectives 13 (4), 169–192.

Sedjo, R.A., 2004. Streamlining forest service planning. Ch. 13 In: Morgenstern, R.D., Portney, P.R. (Eds.), New Approaches on Energy and the Environment. Resources for the Future, Washington DC.

Williamson, O.E., 1999. Public and private bureaucracies: a transaction cost economics perspective. The Journal of Law, Economics, and Organization 15 (1), 306–342.

Williamson, O.E., 2000. The new institutional economics: taking stock, looking ahead. Journal of Economic Literature 38, 595–613.

Zhang, D., Pearse, P.H., 1996. Differences in silvicultural investment under various types of forest tenure in British Columbia. Forest Science 42 (4), 442–449.