

Collaborative Watershed Governance in Lake Tahoe: An Institutional Analysis

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Abstract: This paper examines the emergence of collaborative watershed management in Lake Tahoe by focusing on how institutions managing coordination and conflict changed. It begins by describing the evolution of watershed governance and examines the extent to which the institutional arrangement demonstrates the eight design principles proposed by Elinor Ostrom for successful common pool resource (CPR) management. The paper then develops the concept of a complex environmental commons (CEC) to differentiate the situation of Lake Tahoe from the simpler CPR dilemmas frequently discussed in the CPR literature. We then propose five additional principles that contribute to collaborative management of a CEC.

Keywords: Collaboration, common pool resources, environmental policy, institutional analysis, policy process, and watershed management

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Introduction

Lake Tahoe straddles the California/Nevada border with approximately two-thirds of the watershed area located in California and one-third in Nevada. The lake is renowned for its crystalline blue waters and clarity and is matched only by Russia's Lake Baikal and Oregon's Crater and Waldo Lakes.¹ The extraordinary clarity is due to historically low amounts of fine sediment and, until recently, little atmospheric nitrogen deposition. Sedimentation and nutrients from a variety of sources has increased algae growth. Under natural conditions the lake receives only a small amount of nutrients due to natural filtering mechanisms such as wetlands and vegetation, slowing sediment transport and absorbing nutrients. Left undisturbed, algal growth would occur so slowly that the changes would be imperceptible over a lifetime. However, steep slopes and erodible soils make the watershed extremely sensitive to human disturbance. A number of factors have contributed to increased sedimentation and nutrient loadings including artificially high lake levels; erosion from land development activities; stormwater runoff; wetland loss; atmospheric deposition of nutrients; and historic logging activities. Nutrient loading has increased phytoplankton productivity leading to decreasing water clarity. When consistent measurements were first taken in 1968, transparency was measured at around 100 feet. It is currently around 70 feet.

The Tahoe watershed comprises 506 square miles, of which the Lake's surface covers thirty-eight percent. The lake itself is twenty-two miles long and twelve miles wide, making it the largest alpine lake in North America. The bottom plunges to a depth of 1,636 feet and is the third deepest in the United States.² With mountain slopes often greater than twenty percent, development has been limited to the relatively flat area along the shoreline.³

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[Insert Figure 1 here]

Controlling the decline in lake clarity has been a priority for basin policy for the past four decades. Most of the history of watershed management has been ridden with conflict over the competing goals of economic development and preservation of water quality.⁴⁻⁶ At the center of the conflict was the Tahoe Regional Planning Agency (TRPA), a bi-state regional agency created in 1969 pursuant to an interstate compact to protect environmental quality in the Tahoe basin. However, the creation of a single agency responsible for both development and environmental quality was problematic and throughout the 1970's this administrative solution had only limited success. The continuing decrease in water quality triggered the development of a new *Regional Plan* in 1987 better suited to address water quality issues. However, the potential for more stringent land use and environmental regulations became the focal point for intense conflict and litigation among competing basin interests. During the mid-1980s, the conflict was so intense that the policy environment was described as a “war zone” by local residents.⁷

The decade that followed the *Regional Plan*'s approval witnessed a dramatic shift in behavior among basin actors. Many of the same agencies and nongovernmental organizations at odds over the very existence of the TRPA and its policies have since begun to work cooperatively to solve basin problems. Various forms of cooperation developed around the issue of maintaining water quality. A key indicator of the degree of cooperation was the creation of the Tahoe Transportation and Water Quality Coalition. This unlikely partnership consisted initially of a local environmental group, casino and ski industry interests, and a local private property rights group—the same organizations that represented opposing ideological positions a decade earlier. The local press immediately dubbed it the “unholy alliance”.⁸ By 1997, the unique level of

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collaboration gained national attention when basin actors organized the Presidential Summit, attracting public attention as well as federal financial resources. As one participant recalled, “with the presidential summit, we had everyone's attention at once.”⁷

This paper examines the causes of this dramatic shift in behavior among the network of policy actors in the Tahoe Basin. We begin by analyzing how well the current institutional arrangements conforms to the eight design principles Ostrom (1990) proposed for successful management of common-pool resources (CPRs). We then use the case to identify additional factors important for understanding the evolution of cooperative governance arrangements in policy environments that involve what we term “complex environmental commons.”

Our analysis is based on data from a number of sources. Field interviews were conducted with 41 individuals representing 27 organizations active in Lake Tahoe watershed governance. The individuals and organizations were identified using snowball-sampling technique. A semi-structured interview questionnaire was used. Vignettes from interviews are used to highlight important points throughout the document. Other data analyzed included documents and archival records about the organizations, programs, and collaborative efforts. Examining different data sources allowed triangulation to be used to improve the validity of the study's findings⁹. A draft case study was also sent to principle informants for factual verification. A full description of the case and methodology can be found in Imperial and Kauneckis (2003) and Kauneckis, Koziol, and Imperial (2000).

The Institutional Analysis and Development Framework

The level of cooperation among basin policy actors is itself remarkable; however, it is more so given the level of conflict surrounding the creation of the TRPA and subsequent development of basin policies. This section uses elements of the Institutional Analysis and Development (IAD) framework developed by Elinor Ostrom (1999, 1990) and her colleagues^{10, 11} to analyze the institutional arrangements governing the Lake Tahoe watershed. The IAD framework has proven to be a useful framework for examining the structure and performance of a variety institutional arrangements managing common-pool resources (CPRs), defined as those situations where consumption is rivalrous, but exclusion is difficult and not technically or economically feasible.

Institutions are essentially the rules that define the types of strategic interaction possible by different types of policy actors. They are defined as the “enduring regularities of human action in situations structured by rules, norms, and shared strategies, as well as by the physical world ... constituted and reconstituted by human interaction in frequently occurring or repetitive situations”¹². Rules are prescriptions that forbid, permit, or require some action or sanction if not followed. They include both enforcement and monitoring components and can be formal (e.g., laws, policies, regulations, etc.) or informal (e.g., social norms).¹²

Institutions promote positive outcomes by helping actors resolve social dilemmas, or situations produced when individually rational actions aggregate to produce socially undesirable outcomes. Institutional analysis examines the design of rules to address the problems that individuals face and how the configuration of rules influences the ability to solve collective problems. In the context of watershed management, institutional analysis examines the characteristics of a watershed, who makes decisions, how decisions are made, the rules used to

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allocate and distribute resources, rules governing the behavior of the various actors, and sources of monitoring and enforcement.¹³

Managing Complex Environmental Commons

Lake Tahoe represents a particular form of common pool resource that differs in significant ways from those frequently investigated in the literature. We term these “complex environmental commons.” Complex environmental commons are defined by three principle characteristics. First, there is a complex organizational network responsible for rule-making. Second, there is a high level of diversity of perceptions of the value and appropriate use of the resource being managed. Third, there are multiple, interrelated resources requiring intervention in order to address the problems facing a principle resource of interest. Each of these characteristics is discussed in detail below.

In a complex environmental commons (CEC), the organizations that design the rules governing resource use are not necessarily composed of the individuals who directly use the resource (termed “appropriators” in the IAD framework). CPR theory typically focuses on the incentives and rules created by appropriators themselves in managing locally governed commons.^{14, 15} In the case of a CEC, however, rules are created and designed by formal political organizations (e.g., Congress, state legislatures, and county and town councils), courts, regulatory agencies, and civil society actors, rather than local resource users. This additional level of complexity compounds the number and types of policy dilemmas that actors face in overcoming the basic CPR problem.

Watersheds, for example, are typically governed by multiple organizations with different jurisdictions responsible for making the decisions that influence the distribution, allocation, and use of a resource.¹⁶ Whether a public agency or a civil society group, any single rule-making

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organization represents, at best, only a subset of basin interests. Consequently, in the aggregate the governance arrangement will be comprised of many overlapping rules generated by different organizations that, in many cases, represent competing policy interests. The organizations responsible for designing institutions will be located at different levels of government (i.e., local, regional, state, or federal) and include nongovernmental organizations operating at various scales (i.e., local, state, national or international). The governance of a CEC requires the development of a broad set of rules that coordinates the actions of multiple organizations with different jurisdictions, responsibilities, missions, and policy goals. Accordingly, the establishment of effective rules to manage a CEC requires long periods of negotiation with high coordination costs. For example, in the Lake Tahoe watershed there are forty-six different organizations involved in a variety of implementation and regulatory functions (see Table 3).

The second characteristic of a complex environmental commons (CEC) relates to aspects of the resource itself. Because environmental resources provide diverse types of goods and services, they are often valued differently by various policy actors. In situations where the fundamental dilemma is to design rules to manage the sustainable use of a single resource (e.g., fishery, forest, ground water, etc.), the rule structure is typically directed at finding the correct harvesting or consumption level that maintains the resource at a sustainable level. For a simple CPR, rules are designed with a shared understanding of the use and underlying resource value. However, when other uses and values of the resource come into play, then policy actors must negotiate over different goals. For example, managing a commercial fishery for sustainable harvest is a different policy dilemma than attempting to manage simultaneously for fishery production, biological diversity, and the social welfare of coastal communities¹⁷. The greater the diversity of values and uses that can be assigned to a resource, the more difficult it is to design suitable governance institutions. It is easier to reach a shared understanding of the problem and

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craft solutions among competing groups when there is a common understanding of the characteristics of the good in question, a characteristic often lacking in CEC's.

The final characteristic of a CEC is that it includes multiple, interrelated resources that span different environmental media. For example, simple CPR such as a local fishery may focus on managing fish populations by regulating such things as the size of catch, harvesting seasons, and the type of gear. However, managing a watershed involves decisions about land use, forestry, wetlands, development, hydrological systems, and even atmospheric deposition. There are multiple environmental media and natural resources involved, each of which has its own common-pool characteristics. A rule structure designed to manage only one resource, may serve to exacerbate the problems caused from a second. For example, installing sewers to prevent groundwater contamination from onsite sewage disposal systems can result in increased development that destroys habitat.¹⁸ The rule structure necessary for managing a CEC requires institutional arrangements that are complex enough to deal with multiple media but flexible enough to adapt to changing information.

Management approaches that attempt to simultaneously address problems spanning multiple environmental media such as watershed, ecosystem, or regional environmental management, are implicitly invoking the management of a CEC. While much can be learned from the existing CPR literature, there are additional factors that are important when trying to develop institutional arrangements designed to govern a CEC.

The next section examines the history of watershed management in the Tahoe basin. It outlines the evolution of the governance arrangements for the management of the CEC of the Lake Tahoe basin. We then examine how well the current institutional arrangement satisfies the eight core design principles proposed by Ostrom (1990) for successful CPR management. The final

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section identifies additional factors significant for developing successful institutional arrangements for managing a CEC.¹

From Conflict to Cooperation: A Short History of Lake Tahoe Policy

The earliest effort to manage the Lake Tahoe watershed occurred in response to the explosive development in the 1950's. The construction of a large subdivision destroyed a significant portion of the largest wetland on the lake, which led to the creation of the area's first environmental organization, the Lake Tahoe Area Council (LTAC). This community group began by representing a wide variety of basin interests. In order to resolve increasingly contentious development disputes, the LTAC established planning commissions in a number of local jurisdictions, contained within an umbrella organization, the Tahoe Regional Planning Commission (TRPC). In 1964, the TRPC funded the creation of the *Lake Tahoe 1980 Regional Plan*. Intended to provide a basin-wide development plan, it projected a population of 313,000 residents by 1980, proposed a four-lane highway circling the lake, and a bridge over Emerald Bay (now an International Natural Heritage Site). While there was no discussion of implementing the plan, this view of the future strengthened membership in a local environmental group, the League to Save Lake Tahoe.^{6, 19}

At about the same time, the LTAC funded a study on basin water quality that identified the lack of sewage treatments facilities and erosion as the primary contributors to declining water quality. It recommended prohibiting septic tanks and exporting all sewage from the basin. An accidental discharge of two million gallons of untreated sewage into the lake during Labor Day weekend in 1961 provided the focusing event that spurred action. The President's Water Quality Advisory Board and the governors of California and Nevada held public meetings that focused attention on the problem of sewage treatment. Construction of the facilities necessary to export

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sewage from the basin began soon after and by 1978 all sewage was exported outside the watershed.⁶

Unfortunately there were unintended consequences from addressing only the sewage issue. Steep slopes and alpine soils had prevented the widespread use of septic systems and effectively constrained development in the basin. With that constraint removed, there were virtually no development restrictions. Addressing the water quality problem as a technical issue only exacerbated the underlying problem of rampant development and uncontrolled land use and during the 1960s, almost 20,000 new housing and hotel units were approved.²⁰ In response, the Lake Tahoe Joint Study Committee (LTJSC) was created in 1965 by the California and Nevada state legislatures to develop recommendations for a bi-state agency to control basin development. The new agency would have the ability to formulate a region-wide development plan, coordinate local government planning, and ultimately would be responsible for regulating basin land use. The LTJSC's 1967 report recommended creating a regional planning agency headed by a governing board consisting of one presidential appointee, one governor's representative for California and Nevada, 3 members-at-large from each state, and representatives from each of the six local governments. Decisions would be made using simple majority voting.²¹

In 1969, Congress approved an interstate compact creating the Tahoe Regional Planning Agency (TRPA). However, the TRPA's final design differed significantly from the original proposal. Rather than a mix of government representatives, local officials dominated the Governing Board and its Advisory Planning Commission (APC). Rejecting a development permit required a "double-majority", or a majority vote of each state's representatives. Projects would also be automatically approved if not acted upon within 60-days. While the original proposal recommended that the agency would have the authority to levy property taxes if necessary, the final formulation funded the TRPA with a limited annual budget of \$150,000, provided solely by

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local governments. Additionally, the TRPA's original proposal for the *Regional Plan* was based on a land use capacity classification system that focused on controlling the amount of impervious surface to reduce development and runoff. Examples of impervious surface include roads, buildings, driveways, and even wooden decks. Concerns over the plan's limits on development led the TRPA's Governing Board to adopt a less stringent plan and land use ordinance that permitted significantly more growth. Rather than limiting private development it called for the public acquisition of 34,000 acres of environmentally sensitive land on private parcels.^{6, 22}

Environmental interests were disappointed by the TRPA's performance. Some areas were exempt from the new land use requirements. The TRPA also approved 99 percent of all projects during its first 15 months, including a number a large developments such as a new casino and shopping mall. Given its voting rules and local government's dominance of the Governing Board, projects were rarely rejected. As a result, the State of California viewed the agency as too friendly towards development and threatened to discontinue its funding. California strengthened funding for the California Tahoe Regional Planning Agency (CTRPA), created as an interim agency during the Interstate Compact's negotiation. The CTRPA drafted a more restrictive land use plan to regulate development on parcels greater than an acre on California's side of the basin. It also filed a lawsuit against the TRPA for approving a Casino on the California side.¹⁹ However, private landowners and many local officials viewed these restrictions as being too stringent. Some felt the regulations represented an unconstitutional taking of property. Placer, El Dorado and Douglas Counties withheld funds and challenged the TRPA's constitutional authority. While California argued for more stringent regulations, Nevada favored additional development. By 1975, California and Nevada passed separate state legislation to amend the Compact. At one point, California cut the TRPA's funding in response to the Nevada legislature's rejection of its proposed

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amendments. Support for the TRPA waned and some California legislators proposed federal management for the entire basin by the U.S. Park Service.

The next five years involved considerable conflict and negotiation over a revised Interstate Compact. An amended Compact was eventually agreed to in 1980.¹⁹ The 1980 Compact included several significant changes. The TRPA adopted a system of nine environmental threshold carrying capacities (ETCCs), which served as performance measures for scenic, recreational, water quality, air quality, noise, wildlife, soil conservation, fisheries, and vegetation. Previously exempt activities were now subject to the TRPA's regulatory authority. The revised Compact also modified the membership of the Governing Board and the Advisory Planning Commission (APC). The Governing Board was expanded to 15 members with the ratio of state to local officials changed from 3:2 to 4:3. The APC added four non-local members, expanding its membership to 19 members and now included both professional planning and natural resource management staff as well as lay members representing the public. Voting rules were also changed. Approval of a permit now required a vote of five members from the state where it is located, and nine overall members. The no-action period resulting in automatic permit approval increased from 60 to 180 days [Table 1].

[Insert Table 1 here]

The TRPA was also required to develop a new *Regional Plan* and ordinances to achieve the ETCCs. Not surprisingly, the potential of increased regulatory authority set the stage for the most conflict-ridden period in basin policy making.⁷ New organizations were created to protect competing basin interests. The Tahoe-Sierra Preservation Council was formed in 1981 to represent the rights of private property owners and the organization filed numerous lawsuits

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challenging the TRPA's regulations. The Gaming Alliance was formed in 1980 in response to the TRPA's reorganization to represent the interests of the casino industry. The League to Save Lake Tahoe was strengthened as the principle environmental group. Public agencies as well became affiliated with specific policy perspectives. California state agencies tended to favor greater restrictions, while those of Nevada typically supported development^{4, 19} [Table 2]. Even individual citizens became involved, with property rights advocates and development interests pitted against those favoring tighter regulatory controls. Reportedly, during this period the level of conflict was so high that having a bumper sticker favoring environmental protection invited vandalism and confrontation.⁷

[Insert Table 2 here]

The TRPA's first attempt at approving a revised *Regional Plan* in 1983 met with tremendous resistance and lawsuits from both environmental and development interests. A federal court injunction was issued in 1984 preventing the TRPA from implementing the plan or approving any development projects. The League to Save Lake Tahoe and the California Attorney General sued the agency for not providing adequate protection. A federal district court judge issued an injunction preventing the agency from approving the revised plan since it failed to adequately protect lake quality. The Tahoe-Sierra Preservation Council also filed suit on behalf of 700 landowners arguing that the moratorium resulted in an unconstitutional taking. The State of Nevada introduced an unsuccessful bill in the state legislature to end its participation in the Compact.

A change in the Executive Director of the TRPA resulted in instituting a dispute resolution process known as the consensus-building workshop (CBW). This represented the beginning of the

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end of the political stalemate. The objective of the CBW was to bring together major stakeholders to negotiate key issues at the heart of the *Regional Plan*. While the CBW was initially met with skepticism, the product of the consensus building process was a series of compromise solutions that form the foundation of the 1987 *Regional Plan*. These include an individual parcel evaluation system (IPES) that ranks all residential lots in terms of their suitability for development and a transferable development rights (TDR) program. Development of single and multiple-family houses was permitted, but limited to 350 per year for six years, with a basin-wide prohibition on all new subdivisions of land. New restrictions were also put in place on all commercial development.

During the last decade, many of the same governmental and nongovernmental organizations in opposition during the 1970s and 1980s have begun to work in cooperation to address basin problems. While strong ideological differences remain, a mutual understanding was achieved that cooperation could be pursued in some areas. As one organization active in litigation reported, “we don't want to go back to the days of conflict. From our point of view it is better to accept some things than go back to fighting . . . there is more to be gained from cooperation . . .” One sign of the transformation of the policy environment was the creation in 1989 of The Tahoe Transportation and Water Quality Coalition, a loose alliance of interest groups that traditionally had been fierce opponents.

A second indicator of the new level of cooperation, it that many of the key policy actors now work together to jointly lobby for additional federal support for basin projects through the Lake Tahoe Joint Federal Legislation Agenda. The increased spirit of collaboration led to the Lake Tahoe Presidential Forum in 1997 – a series of events and community workshops attended by President Clinton and Vice President Gore and other high ranking federal and state officials that focused national attention on Lake Tahoe²³. During the Presidential Forum, basin actors also

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unveiled a new Environmental Improvement Program (EIP). The EIP coordinates restoration efforts designed to achieve the ETCCs. It identifies over 700 projects and programs estimated to cost almost \$1.5 billion (in 2000 dollars) spanning a 20-year period from 1997 – 2016.²⁴ Even a casual review of the proposed activities reveals that most are inherently collaborative and involve a wide range of basin actors [Table 3]. As one agency director observed, “there are few projects that can be done by just one agency.”

[Insert Table 3 About Here]

An Institutional Analysis of the Lake Tahoe Basin

The Institutional Analysis and Development (IAD) framework has been applied to a wide variety of resource management problems. It remains one of the major theoretical approaches to environmental and natural resource policy dilemmas²⁶. The application of the framework to the Lake Tahoe watershed follows in that tradition, in addition to attempting to expand on the basic framework. The following sections describe and apply Ostrom’s eight design principles to the Lake Tahoe watershed [Table 4].

[Insert Table 4 About Here]

Boundary Rules

Ostrom (1990) argues that two types of boundaries are important for successful management of CPRs; those defining the boundaries of the resource and those that define the group of resource users. Watershed management research has likewise concluded that the physical boundaries and size of the watershed have a strong influence on program development

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and implementation.²⁷⁻²⁹ In terms of a resource boundary, the Lake Tahoe watershed exhibits exceptional characteristics. The entire watershed sits nestled within a visually distinct basin defined by mountain peaks. This boundary makes the management area of a 'watershed' salient for most basin residents and political actors. The watershed is a visible entity rather than merely an abstract concept. This visible watershed boundary has facilitated formulating basin-wide policy by providing a clear rationale for working together to solve common problems.

Boundary rules that define resource users are more difficult to pinpoint in the Tahoe case due to the comprehensive nature of the rules regulating impacts on water quality, land use, soil, natural vegetation, riparian areas, natural water bodies, as well as man-made impervious surfaces. All commercial, residential, and public property owners are resource users in some fashion since every type of surface area is regulated in terms of run-off and effects on sedimentation and nutrient loading. Another set of users includes those who benefit from the water quality. These include seasonal visitors enjoying any combination of natural and man-made attractions, business owners who cater to visitors, and landowners whose property value is contingent on good water quality. Accordingly, a wide range of policy actors simultaneously benefit from maintaining water quality or potentially contribute to its decline.

Appropriation and Provision Rules

One of the recurrent empirical observations is that CPRs tend to be successfully managed when appropriation and provision rules are locally determined and fit local conditions.^{15, 25} Appropriation rules are the institutional arrangements that manage the use of a resource, whereas provision rules are those that specify the inputs necessary for maintaining the stock of a resource. The homogeneity of rules that emerge from centralized decision-making is typically unable to account for the diverse conditions of local commons. In Lake Tahoe, there has been a gradual

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decentralization of decision-making over the past two decades. While initial efforts envisioned the TRPA as a centralized planning agency, there has been increased devolution of rule-making authority to other organizations and lower level management units during the last decade. Consequently, the TRPA has increasingly taken on the role a coordinating agency, rather than being the sole decision-making authority.

Two principle components of basin policy facilitated the devolution of decision making to local actors. The first is the integration of TRPA rules into local government planning and decision making by devolving authority to review many land use activities for consistency with TRPA policies to local governments. Initially, the TRPA acted as the planning office for the entire basin. However, there has been increased devolution and coordination of planning efforts between the TRPA and local planning offices. The TRPA now has a Permit Integration Program that uses over thirty Memorandums of Understanding (MOUs) with local governments, public utilities districts, and other agencies. Some local governments have been delegated the authority to review and approve development projects, mostly single-family residential homes. Local governments also have the right to be more restrictive than the TRPA if they so choose. Audits are carried out quarterly to insure activities are consistent with the TRPA's regulations. The City of South Lake Tahoe has gone so far as to informally adopt the TRPA's codes and ordinances as a local zoning guidelines to streamline their permit process.⁷

The second aspect permitting greater local decision-making has been the use of flexible policy instruments such as transferable development rights (TDRs). In order to build a residential unit in the Tahoe basin, TRPA's regulations require obtaining a development allocation, a development right, and an appropriate coverage, all of which can be transferred among parcels. Local governments are allocated a specific number of development allocations and decide how to distribute these among single and multi-family dwellings. Every residential parcel has also been

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assigned a development right that can be transferred within each of the watershed's nine hydrological areas. Each area has been assigned a maximum amount of impermeable area in order to reduce surface area runoff. To increase development an owner must have an appropriate amount of impermeable surface coverage allocated to that parcel. Landowners wishing to acquire more coverage can either provide mitigation funds or transfer impermeable coverage from another parcel. The amount of coverage that can be transferred varies and the rules are more stringent for commercial and tourist accommodations. Transferable coverage rights can also be purchased; however, the price has so far been prohibitive for most development. The advantage of the TDR system over more traditional zoning and land use restrictions is that it allows flexibility on the part of individual land owners and development interests, and helps reach the overall goal of limiting the total amount of impervious surface in the basin while allowing individual property owners to make the final resource allocation decision.

Collective Choice Arrangements

Ostrom's (1990) third design principle argues that individuals affected by operational rules need to be able to participate in modifying institutional rules. This includes mechanisms for direct participation in decision-making or for aggregating the preferences of individual policy actors. There are multiple collective choice arrangements involved in the governance of Lake Tahoe. These can be understood as two types, those within an organization and those that occur across different organizations. Preference aggregation mechanisms exist within rule-making organizations such as the TRPA, the United States Forest Service (USFS), and local governments. The mechanisms within each organization vary. Government organizations have formal mechanisms such as elections and political appointments as well as various forums for public input and review of agency policies. Nongovernmental (or civic) organizations aggregate the

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preferences of individual members through the generation of policy positions, internal elections, member meetings, and the selection of representatives.

The second type of collective choice arrangement is the mechanism that allows for joint decisions among different organizations. Since watershed policy affects all actors within the watershed boundaries, collective choice arrangements need to be interorganizational and allow decision-making at the network level. Rather than there being a single centralized preference aggregation mechanism, such as TRPA public meetings, it is more important that there are mechanisms in place to reach decisions within the interorganizational network active in Tahoe policy-making. This means that there are collective choice arrangements for each unit of government, public agency and civil society group, as well as arrangements that bring organizations together to solve shared problems. In the Tahoe basin, there are three principle mechanisms where preferences are aggregated to determine basin-wide policy: formal forums; formal ad hoc working groups organized around specific issues; and, informal interorganizational networks.

While the TRPA as a single organization has goals and interests of its own, it was initially intended to represent the interests of all the major stakeholders in the basin. Accordingly, it still provides a central forum for bringing together the diverse interests active in the basin. The TRPA's Governing Board includes representative from California for the three local governments bordering the lake, two governor's appointees, one from the state Senate and a second representative of the state Assembly Speaker. Nevada is has representatives for the three adjacent counties, a representative of the Director of the Dept. of Conservation and Natural Resources, one governor's appointee, an at-large member and the Nevada Secretary of State. Additionally, there is a non-voting US presidential appointee. Thus, the various forms of formal government organizations maintain critical decision-making power. Subsequently, changes to the Governing

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Board's composition and decision rules have had dramatic effects on the substance of the TRPA's policies because it changed the relative influence of different constituency groups [see Table 1].

A more important aspect of collective choice has been the creation of various ad hoc forums that have allowed increased of a broad array of organizations beyond those of formal government. One example is the CBW. The CBW was created in the mid-1980s as a means to reach agreement on the *1987 Regional Plan*. The success of the CBW led to similar efforts where the TRPA acted as the lead agency or key participant in formal working groups. Over thirty-four workgroups have been organized around various policy issues involving the TRPA. As a result, the agency has slowly evolved from a central planning department to a coordinating agency for basin policy. The creation of various workgroups is important because it creates a common forum for organizations active in basin policy to identify common interests and find ways to work together.

These working groups also provided a mechanism to develop interpersonal networks among the representatives of various organizations active in watershed policy. Informal networks have created a third type of collective choice arrangement. While discussions of collective choice arrangements typically focus on formal decision-making bodies, informal networks also provide an important mechanism for reaching agreement on policy issues and finding room for cooperation on common goals before they enter into the formal policy-making processes. The creation of the Tahoe Transportation and Water Quality Coalition occurred due to the informal interactions of the various individuals active in the CBW. While the CBW brought groups with disparate interest together, it was the informal network that developed apart from the formal meetings that permitted future cooperation. While the individual organizations disagree on many of the core policy issues, collectively they found some common interests where they could work together towards specific goals.

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Monitoring Rules

Research has demonstrated that effective monitoring is a critical component of successful management of CPRs.^{10, 15, 25} Effective monitoring involves actively auditing CPR conditions and appropriator behavior and ensuring that monitors are accountable. In Lake Tahoe, multiple monitoring institutions exist. One type of monitoring involves identifying the sources of water quality degradation. The Tahoe Research Group (TRG), consisting of scientists at University of California at Davis, The Desert Research Institute (DRI) and the University of Nevada, coordinate an intensive resource monitoring program. As a result, there is a tremendous amount of scientific information used to formulate basin policy.

Another important type of monitoring is the Environmental Threshold Carrying Capacities (ETCC's). These serve as performance measures for the TRPA's policies. The agency is required to complete a threshold evaluation every 5 years that measures progress towards achieving the ETCCs and to then recommend changes in policies and programs when necessary. The preparation of the threshold report gathers tremendous amounts of data and provides an opportunity for all basin actors to collectively review progress towards the TRPA's policies on a periodic basis. The monitoring results also provide an important motivator for collective action. For example, the disappointing findings of the 1991 and 1996 threshold reviews created an important incentive for basin actors to cooperate toward the development of the EIP.³⁰

There are a variety of other monitoring mechanisms as well. When the TRPA began devolving authority to local governments and other organizations using MOUs it incorporated an auditing procedure to monitor compliance with its policies. As a result, local officials are now actively involved in enforcing TRPA's rules. This is significant since historically local governments were reluctant to take on these activities since having authority vested in the TRPA

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allowed deflecting criticism for local land use decisions by blaming it on the TRPA's heavy-handedness.

Graduated Sanctions

Another design principle proposed by Ostrom (1990) is the use of graduated sanctions when appropriators violate rules. Monitoring is meaningless without sanctions applied to prevent unauthorized resource use. The initial design of the TRPA and regulatory framework underpinning basin management has meant that there is a long-standing structure of fines and penalties against violators of land use restrictions. There are varying levels of fines and other sanctions that increase with the severity of the offense. The size of the fine varies according to the type of violation, the number of violations by the same individual, the willfulness of the act, the egregiousness of the offense, and whether the violation is merely procedural and the activity could have been permitted. While the system of graduated sanction allows for discretion and matching the fine to the specific circumstance, it has also generated complaints about the arbitrariness of different sized fines for similar violations.

Actual sanctioning authority is distributed among the various federal, state and local agencies, in addition to the TRPA. The agency also seeks assistance from the California's Lahontan Regional Water Quality Control Board since it is mandated broader enforcement authority and the authority to impose fines administratively, whereas the TRPA can only impose fines using the judicial system.⁷

Conflict Resolution Mechanisms

Ostrom's (1990) sixth design principle is that long-enduring CPR institutions provide access to low cost local arenas to resolve conflicts among appropriators. During the early 1980's

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litigation was frequently used as a dominant means of conflict resolution. However, it eventually became clear that the costs of litigation were high and that none of the parties to the litigation were able to reach a satisfactory solution through the courts alone. As a result, the negotiations surrounding the revised *Regional Plan* tried a new technique, the CBW. Since the CBW was successful in reaching compromise agreements on many contentious issues, numerous interorganizational workgroups have since been used to address problems, negotiate policy, and craft compromise solutions to basin policies. As a result, affected interest groups, agencies, and citizens now have an increased opportunity to get involved in discussions about basin policy.

As important as these conflict resolution mechanisms have been, there is also recognition by basin actors that it is possible to remain opposed on some issues while cooperating on others. In spite of a reduction in overt conflict, the different policy coalitions have not stopped pursuing their core policy goals or set aside issues of critical importance for the sake of cooperation. Thus, while they may coordinate efforts on some shared problems where there is common agreement, they continue to pursue separate agendas when there is less agreement.

The Right to Organize

Ostrom (1990) also argues that in successful CPRs, individuals retain the right to organize around collective interests and craft new institutional arrangements to address shared resource management problems. Furthermore, it is important that external government authorities do not challenge the rights of appropriators to devise their own institutions. In Lake Tahoe, the organization of basin interests into new organizations whose legitimacy was recognized by other policy actors marked an important turning point in the development of basin policy. Initially, the organization of interests into groups representing private property owners (The Tahoe-Sierra Preservation Council), the casino industry (The Gaming Alliance), environmental (The League to

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Save Lake Tahoe), and business (Chambers of Commerce) exacerbated the conflict surrounding basin politics as each group tried to directly influence TRPA decisions and sought litigation when they could not. However, over the long term the formation of established interest groups has ensured that the preferences of the individuals and organizations affected by the TRPA's decisions are represented in the policy process.

Nestedness of Institutional Rules

For CPRs that are part of larger systems, Ostrom (1990) argues that it is important to organize appropriation, provision, monitoring, enforcement, and conflict resolution around multiple layers of nested enterprises. Local institutional rules in Lake Tahoe are recognized and nested within broader governance structures and are not deemed unconstitutional or regarded as illegitimate by outside policy actors. Because the Lake provides benefits of national significance, spans state boundaries, and contains a variety of county and local governments, nestedness is a critical feature of the institutional arrangements governing Lake Tahoe's watershed. This institutional arrangement is embedded within a larger set of federal and state environmental regulations. The 1980 Compact between the federal government and the states of California and Nevada also specifies a set of rules that guide all state, regional, and local decisions in the basin. This creates a complex set of relationships between TRPA's policies and those developed by federal, state, and local authorities.

An example of the nested nature of the various institutional rules is the *Water Quality Management Plan for the Lake Tahoe Region* developed pursuant to Section 208 of the Clean Water Act. Many of the provisions contained in the basin's Section 208 Plan are also contained in the TRPA's *Regional Plan*. While most Section 208 plans are no longer in effect, Tahoe's plan is an integral part of the basin's regulatory framework as it applies to the California portion of the

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watershed. The TRPA has also been designated by EPA as the Areawide Waste Treatment Planning Agency for the Lake Tahoe Basin pursuant to Section 208. Thus, any changes to the *Regional Plan* require changes to the Section 208 plan. Consequently, as a high level TRPA official noted, “if 208 is history... we would lose our basic structure...we would have to change the *Regional Plan*.” Another TRPA staff noted “the 208 Plan is the gorilla in the closet.” If the *Regional Plan* were ever abolished, many of its key requirements would still be in effect pursuant to the Section 208 plan.

Designing Governance Arrangements for Complex Environmental Commons

Ostrom's (1990) core principles provide an important framework for understanding the successful management of common-pool resources (CPRs). However, our analysis suggests that additional factors are important in order to explain the emergence of cooperation in a complex environmental commons (CEC) such as Lake Tahoe. The following section identifies the design principles that contributed to the shift from a period of conflict to one marked by the development of new cooperative institutional arrangements that improved the governance of the complex environmental commons of Lake Tahoe [Table 5].

[Insert Table 5 About Here]

Establishing Trust Across Organizations

Our first additional factor is the development of networks of trust across organizations. Trust is essential to cooperation because it lowers the transaction costs associated with negotiating and implementing rules. This principle is consistent with the diverse body of research documenting the importance of trust in facilitating a wide range of cooperation and collective

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action.³¹⁻³⁵ Watershed research has likewise reached similar conclusions about the importance of trust in successful programs.^{27, 36-39}

By definition, a CEC has nested institutional arrangements that produce a complicated series of multiple, overlapping network interactions. In order to develop and maintain mutually agreed upon rules in a CEC, network relationships must produce the trust necessary for competing basin interests to develop new institutional arrangements around shared policy objectives. As network members develop these relationships, they also learn about each other's policy preferences, which further reduces the transaction costs associated with bargaining and negotiation. As a result, participation in a network involved in one issue area can serve to facilitate trust and cooperation in subsequent interactions addressing other issues.

In the early stages of basin policy, there was intense competition between agencies for control over rule making and jurisdiction over resources, competition over access to decision-makers in both states and influence over federal agencies, and lawsuits by both private landowners and environmental groups. Policy coalitions formed according to support or opposition to the TRPA's policies. One by product of this period of interaction was that it allowed the representatives of many of the basin's competing interests to develop personal relationships and trust that did not previously exist. As one interest group leader recalled: "after several years of working together, we started building up some level of trust amongst the executive directors of various groups." Now, the directors of various federal agencies and the TRPA reportedly have regular monthly lunch meetings. These meetings are important because they provide the opportunity to share their beliefs off-the-record and get to know each other on a personal rather than merely a professional level.

Trust among network actors also increased as a result of the increased professionalism and organizational capacity of local governments. Much of the early reluctance of the TRPA to

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delegate authority to local governments was due to their limited capacity. Until the mid-1980's, few local governments even had planning staff. With greater local capacity, came the TRPA's increased willingness to devolve authority to local officials. Today, local governments have professional planners who share similar professional and educational backgrounds as their TRPA counterparts. The increased professionalism of local planning helped facilitate the development of trust across organizations since as one local government official noted, "planners tend to think alike."

The development of interpersonal and interorganizational networks also created an environment that fosters a broad range of collaborative activities in the watershed.^{7, 16} The institutional arrangements have also evolved and become more complex over time. As a result, the network of organizations with responsibility for implementing basin policy has expanded, as have the interactions between organizations. This ensures that there are the types of repeated interactions necessary to develop and maintain trust.^{29, 31, 32}

Developing a Shared Definition of the Problem

One of the factors distinguishing a CEC from a simple CPR is that it contains interrelated resource management problems that span different environmental media. Consequently, there are competing views about how a watershed should be managed.^{16, 38} Thus, a prerequisite for designing successful institutions for a CEC is that the members of the multiple, overlapping networks develop a shared definition of the underlying problem.

The ability of policy entrepreneurs to frame problems in ways that present solutions that are acceptable to most actors is dependent on a fundamental agreement that a problem exists in the first place, and that there is some shared understanding of its general causes. Problem definitions change over time as some problems are reduced or eliminated and new understandings of old

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problems emerge as a result of scientific research, changes in local conditions, and shifts in perceived interests. In Lake Tahoe, early efforts centered on a shared problem definition that attributed water quality problems to improper sewage treatment. Competing interests found a win-win solution by installing sewage systems and exporting sewage from the basin.

Environmental interests were satisfied because water pollution was removed from the basin and casino and development interests were satisfied because it allowed development activity.

Unfortunately, development activity ended up increasing faster than anticipated because the policy opened up new land for development. As a result, the effort failed to halt declining lake clarity.

By the late 1970s and early 1980s, environmental interests and regulatory agencies began to attribute water quality problems to nonpoint source (NPS) pollution and the alteration of wetland habitat due to development. Under this view, any new development was perceived as bad for environmental quality. Casinos and development interests, and private property right advocates neither shared the definition of the underlying problem nor its severity. The lack of a shared problem definition drove the conflicts surrounding the *1987 Regional Plan*.

However, by the late 1980s the tourist industry began noticing a decline in visitors. Casinos were experiencing increased competition from the relaxation in gambling laws across the county and a series of surveys discovered that few tourists were repeat visitors and many complained about the limited infrastructure. The most significant disadvantages were a poor mass transit system, traffic, a lack of appropriate signage to communicate tourist information, few dedicated pedestrian areas, and no core commercial area.⁷ A local newspaper editorial at the time commented on the state of the infrastructure and wrote, "...if you don't like gambling you can drive and look at the ghetto in the mountains."² A series of studies in the early 1990's found disturbing trends.⁴⁰ One study reported that, "Despite certain competitive advantages...economic performance substantially trails that of other western US mountain resorts. Critical destination

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business is stagnate. Peak period utilization patterns remain a problem.”⁴¹ Business leaders faced the challenge of finding ways to improve the infrastructure within the strict regulatory structure of TRPA management. Furthermore, it became clear that the lake was their only comparative advantage in an increasingly competitive market and the local economy was intimately tied to maintaining lake clarity.

By the mid-1990s, the problem of declining lake clarity had been redefined again, in part due to the disappointing results of the threshold evaluations in 1991 and 1996. Business and casino interests by now recognized that they had a vested interest in halting declining lake clarity. Environmental interests and agency officials had begun to recognize that declining lake clarity could not be stopped through tighter regulation of new development. There was growing recognition among all interest groups that non-regulatory approaches would be needed to correct poor decisions made decades earlier. Moreover, all basin interests accepted the need to revitalize the local economy and improve the region’s infrastructure. While there was never a shared vision of what the future of Lake Tahoe should be in the next decade, the competing interests had reached agreement on what they did not want to happen. As a local business leader stated, “I think there is a common vision of what we don't want and that becomes a very powerful motivator of what we do.” This became a strong motivator to pursue other avenues of collective action in an attempt to halt declining lake clarity. This increased the incentive to cooperate and use collaborative strategies for improving watershed governance.⁷

Establishing Mutual Interests

The policy emphasis in the basin has shifted over time from a focus on regulation and development restrictions toward mitigation and environmentally beneficial redevelopment. This change marks an important turning point in basin cooperation. The initial design of the TRPA as a

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centralized regulatory agency created a strategic setting where most issues produced a clear set of winners and losers. If local governments and development interests controlled the TRPA, then environmental groups saw agency policy as a clear loss. When, however, the agency was strengthened following the *1987 Regional Plan*, development interests saw their interests threatened and environmental groups were perceived as winning. As long as the policy issues were defined as being pro- or anti-development, it exacerbated conflict because policy choices were framed as zero sum games.

Once the emphasis for addressing declining lake clarity changed from regulating new development to improving water quality and habitat through non-regulatory strategies such as installing BMPs, re-development, and habitat restoration, the strategic setting policy actors faced changed since it opened the door to a wide range of policy solutions that were of a win-win or at least a win-no lose nature (i.e., positive sum games). This allowed new cooperative strategies to emerge among the key policy actors because solutions were available that permitted compromise and mutual gain. It was no longer a question of win-lose but a mix of incremental gains and losses to both sides. There was mutual understanding that cooperation could be pursued in some areas, while disagreement remained on others. As one interest group leader noted, “on some issues we agree and on others we sue.” Notable examples of these positive sum games include coordinated lobbying efforts, the Presidential Summit, the development and implementation of the EIP, and the efforts of the Tahoe Transportation and Water Quality Coalition. There are numerous examples of where positive sum games led to the emergence of institutional arrangements that improved the governance of this CEC.

The ability to recognize mutual interests occurred due to a number of reasons. First, a shared definition of the problem emerged where all competing interests recognized the need for new policy solutions. It was clear that regulatory strategies alone would be unable to halt

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declining lake clarity. This opened the door to other mutually beneficial collaborative projects that packaged redevelopment with environmental improvements. Much of this occurred due to the movement away from the purely regulatory mission of the TRPA.

A second factor was policy-oriented learning stimulated by two disappointing threshold reviews, over ten years of implementation experience, and research suggesting that additional action was needed to address declining lake clarity. Over time it became clear to the TRPA, other regulatory agencies, environmental, and other interest groups that regulation of new development, no matter how draconian the requirements, would be unable to halt and reverse declining lake clarity. This led to the search for new non-regulatory approaches.

A third factor was establishing a common goals that brought mutual benefits to diverse basin actors fostered additional forms of cooperation. For example the goal of obtaining federal funding for basin projects allowed disparate interest groups to work together to advance a set of collective interests. As a result, basin interests have been remarkably successful in leveraging their respective policy networks to lobby the federal government. For example, in 1994, the Water Quality and Transportation Coalition concentrated on getting additional federal support for transportation and other projects by creating the Lake Tahoe Joint Federal Legislation Agenda. Prior to this, each organization had its own lobbying agenda, which given the diversity and contentiousness of basin issues, typically competed for congressional and state legislative attention. Through the Joint Federal Legislation Agenda, organizations coordinated their lobbying efforts by focusing on common issues and communicating a shared set of priorities to lawmakers.

Establishing a Balance of Power

Another factor that explains the shift from conflict to cooperation was establishing a balance of power among policy actors. During much of the TRPA's history there have been

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dramatic shifts in the ability of the respective interests to dominate TRPA policy. Conflicts were understood as zero-sum game interactions and each party generally pursued its best alternative to negotiated agreement. Environmental interests and property rights groups generally relied on litigation and lobbied the California state legislature to advance their agendas. Business and casino interests used their political influence to lobby TRPA's governing board and the Nevada state legislature.

However, by the late 1980s it was clear that a balance of power had emerged. By blocking the 1984 *Regional Plan*, environmental interests through the League to Save Lake Tahoe and the California Attorney General had effectively exercised their veto power. However, it came at a high cost in terms of extended legal battles and failed to force more stringent regulations. Furthermore, the moratorium on development in the late 1980's not only halted development, but also stopped environmentally friendly re-development and environmental mitigation projects. Litigation was able to stop some policies, but was unable to force the TRPA to adopt the development restrictions they desired. Conversely, development interests, casinos, and local governments exercised their influence through the TRPA's Governing Board, but were unable to move forward with development with the court-ordered moratorium in place. Landowners had also litigated against the agency, but faced a very long wait for court decisions while being prevented from many investment and land use decisions.

By the decade's end a political stalemate had emerged where all basin policy actors were able to effectively veto the actions of the others. As one interest group director observed: "If you have this process where everyone can veto, what it becomes is an understanding that in order to get 'A' you have to give up 'B'. As a whole we are going to get consensus because everybody needs something, everybody wants something and everybody is afraid of something."⁸ A balance of power was established that compelled competing interest groups to seek negotiated solutions.

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This is consistent with negotiation research which finds that a balance of power often contributes to successful negotiation when each party has sufficient power or influence or can exercise some sanction over others.^{42, 43}

Accordingly, it became clear to the competing interest groups in Lake Tahoe that they would be unable to achieve the desirable results by utilizing unilateral strategies that seek to maximize their own policy goals at the expense of others. Cooperation was not achieved through the realization that cooperative solutions were inherently better. Rather other strategies were perceived to be too costly or simply ineffective. The establishment of effective veto power by each of the policy actors meant that all parties could prevent action, but none was able to force others to pursue its desired course of action. This made cooperative solutions more appealing. Over time, the competing interests became dissatisfied with costs of pursuing legal challenges, the transaction costs associated with conflict, and opportunity costs resulting from the impasse. Moreover, as participants discovered new ways to work together on common interests, the calculus changed in ways that encouraged cooperation and collective action rather than other conflict-oriented strategies.

Increasing Policy Instrument Diversity

Using a wide variety of policy instruments to address shared problems creates additional opportunities for cooperation among the network of organizations involved in basin governance. First, different organizations tend to utilize or prefer different policy instruments. Enlarging the range of instruments used broadens the network of organizations involved and increases the potential opportunities for organizations to work together to advance common interests. Second, diversifying the use of policy instruments can increase the likelihood that competing interests will find some course of action that creates a positive sum game. Accordingly, while basin actors may

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be unable to reach agreement on a regulatory policy, there may be a wide range of nonregulatory policy instruments that can be agreed upon. Broadening the range of policy instruments expands the range of policy choices, which in turn increases the likelihood that basin actors will develop new institutional arrangements that improve the governance of a CEC.

In Lake Tahoe, shifting from regulatory to nonregulatory policy instruments increased cooperation in various ways. Examples include the increased emphasis on the private sector to address basin problems through activities such as the re-development of aging infrastructure, the use of grants and other incentives to encourage ecological restoration and mitigation, and the use of various policy instruments to encourage land owners to install best management practices (BMPs). Re-development expanded the private sector's role in basin rehabilitation efforts. A change in the TRPA's directors shifted the agency's emphasis from "regulation is the answer" towards the "project is the fix."⁷ One example, the Park Avenue Redevelopment Project, focuses on redeveloping aging lodging facilities and small, scattered motels. It includes a gondola to pick up skiers in a central entertainment plaza and transport them to ski runs at both sides of the Heavenly Ski Resort. It also includes scenic improvements and a number of wetlands and stream restoration projects. Another creative example of a public-private partnership is the Coordinated Transit System (CTS). It involves local governments, state, federal and business organizations and focuses on improving the coordination among the existing public (roads, parking and busses) and private (casino shuttles) transportation systems in the basin.

The increased emphasis on using grants and other incentives to encourage ecological restoration and environmental mitigation also increased cooperation between governmental and nongovernmental organizations. Between 1984 and 1989, \$9.6 million in federal funds were spent on restoration efforts with an additional \$24 million in matching funds coming from local governments.⁴⁴ The USFS has long administered an Erosion Control Grants Program providing

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financial assistance to local governments for water quality improvements. The California Tahoe Conservancy (CTC) also has an active ecological restoration program that provides technical assistance to public agencies and private landowners for wetland and ecological restoration work. The CTC provides funds to federal, state, and local agencies to conduct restoration and water quality improvement projects and has funded more than 375 projects in the basin.^{44, 45} The Conservancy and the City of South Lake Tahoe recently completed part of the re-development of the tourist infrastructure to include a stream restoration and wetland project.

The TRPA also established a Best Management Practices (BMP) Retrofit Program that uses policy instruments such as education, technical assistance, and low interest loans to private land owners to encourage older, pre-existing residential units to install BMPs for re-vegetation, paving driveways to prevent sediment runoff, installing drip line filtration and stabilizing slopes.⁴⁶ The program operates in close cooperation with a number of agencies such as the Natural Resources Conservation Service (NRCS).

Summary and Conclusions

This paper presents an analysis of a single case of cooperation in governing a complex environmental commons (CEC) through the theoretical lens of the IAD framework. More specifically, we used a case of collaborative policy making in the Lake Tahoe watershed to test the eight design principles proposed by Ostrom's (1990). Our analysis suggests that the design principles help explain, in part, the shift from a period of policy conflict during the 1970s and 1980s to one marked increasingly by cooperation that produced new institutional arrangements that enhanced basin governance over the last decade. However, our analysis of Lake Tahoe produces additional design principles that also help explain the emergence of cooperation that

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facilitated the development of new institutional arrangements that improved the governance of this CEC.

The first principle highlights the fact that cooperation is costly without a basic level of trust among policy actors. Without trust, it is difficult to monitor the actions of other policy actors with whom a governmental agency or interest groups are interacting. Accordingly, it is important for practitioners to create forums that encourage routine interactions among divergent policy interests. This provides important opportunities for members of competing belief systems to develop relationships of trust, and explore opportunities for collective action.

Developing institutional arrangements that enhance the governance of a CEC is also more likely when there is a shared understanding of the problems requiring collective action. In some cases, this requires the input of scientific information and analysis. In others, it requires reframing basin problems in ways that motivate joint action. In either case, a shared understanding of the problems reduces the transaction costs associated with developing new institutional arrangements for a CEC.

Institutional arrangements governing a CEC are also more likely to emerge when solutions to basin problems result in policy choices that are viewed as positive sum games. When policy choices are framed in terms of zero sum games, conflict is more likely to result because there will be clear winners and losers. Accordingly, it is important for practitioners to highlight common interests across diverse groups when seeking cooperative solutions.

We also propose that institutional arrangements for governing a CEC are more likely to emerge when a balance of power exists among competing network members. The balance of power makes it less likely that any organization or set of interests will pursue its best alternative to negotiated agreement in order to achieve its policy goals at the expense of other legitimate interests. In Lake Tahoe, the balance of power emerged after the competing interests realized that

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unilateral strategies such as litigation imposed high costs and were unsuccessful in advancing their objectives. It also resulted when a shared understanding of problems emerged and policy choices were increasingly framed in terms of positive sum games.

Our final design principle proposes that cooperation and the development of new institutional arrangements are more likely when a wide range of policy instruments are used to manage a CEC. Flexibility in the use of policy instruments to reach common goals increases the opportunities for cooperation by expanding the number of organizations involved in basin governance. For example, in Lake Tahoe heavy reliance on regulatory policy instruments during the 1970s and 1980s gave a prominent role to a narrow set of regulatory agencies, primarily the TRPA, state water quality agencies, and local governments. However, the expansion of policy instruments over the last decade through efforts such as the environmental improvement program (EIP) has drastically expanded the role of other governmental and nongovernmental organizations [Table 3].

Our objective in proposing these design principles for CECs is to advance the understanding of these complicated policy dilemmas. In recent years, research has expanded our understanding of successful CPR management.⁴⁷ However, natural resource and environmental practitioners are increasingly asked to manage CECs such as ecosystems and watersheds, and to manage habitats for multiple species and interrelated resource management problems. These CECs introduce additional challenges for the development of effective institutional arrangements. Accordingly, while much of the theoretical work on successful CPR management provides useful insights, this paper helps advance our understanding of the management of CECs by proposing design principles that can be empirically tested and reformulated in other settings.

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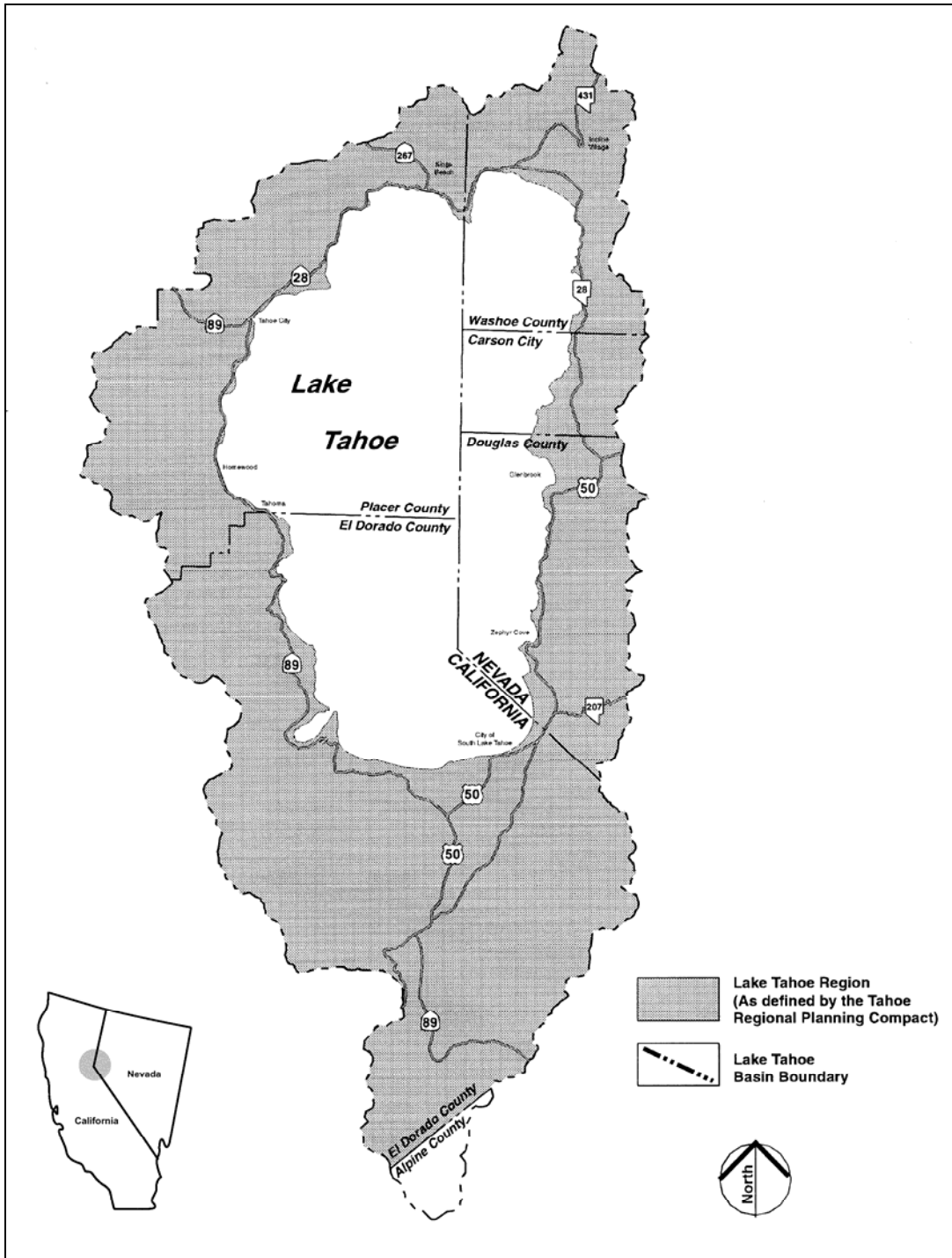
Notes

¹ There have been numerous works that identify the factors leading to successful CPR management. In Agrawal's (2000) recent review he identifies 36 different factors that lead to successful CPR management. Our attempt is not to merely add to this growing list, but rather to differentiate two fundamental types of environmental commons; local simple-use CPRs, and a more complex type of commons involving multiple public and private organizations, which we term complex environmental commons (CECs).

² Editorial reported second hand by TRPA Planning staff.

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Figure 1: The Lake Tahoe Watershed, California and Nevada



Source: Tahoe Regional Planning Agency (TRPA), *Regional Plan for the Lake Tahoe Basin: Goals and Policies* (Zephyr Cove, NV: TRPA, April 1999).

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Table 1: Evolution of Key Rules Governing the Tahoe Regional Planning Agency

	1969 Original Compact	1980 Compact Amendments	1987 <i>Regional Plan</i> Amendments	Present Focus
Governing Board	<ul style="list-style-type: none"> ▪ 3:2 local majority ▪ 10 members 	<ul style="list-style-type: none"> ▪ 4:3 state majority ▪ 15 members 	<ul style="list-style-type: none"> ▪ No change 	<ul style="list-style-type: none"> ▪ No change
APC	<ul style="list-style-type: none"> ▪ Primarily local planners 	<ul style="list-style-type: none"> ▪ n/a 	<ul style="list-style-type: none"> ▪ No change 	<ul style="list-style-type: none"> ▪ No change
TRPA staff	<ul style="list-style-type: none"> ▪ 5 	<ul style="list-style-type: none"> ▪ n/a 	<ul style="list-style-type: none"> ▪ n/a 	<ul style="list-style-type: none"> ▪ 50-60
Gov. Board Voting	<ul style="list-style-type: none"> ▪ Dual majority for project denial 	<ul style="list-style-type: none"> ▪ Dual majority for project approval 	<ul style="list-style-type: none"> ▪ No change 	<ul style="list-style-type: none"> ▪ No change
Permit Review	<ul style="list-style-type: none"> ▪ 60-day deemed approval 	<ul style="list-style-type: none"> ▪ 180-day de facto denial 	<ul style="list-style-type: none"> ▪ No change 	<ul style="list-style-type: none"> ▪ No change
Authority over public works	<ul style="list-style-type: none"> ▪ None 	<ul style="list-style-type: none"> ▪ Full 	<ul style="list-style-type: none"> ▪ No change 	<ul style="list-style-type: none"> ▪ No change
Casinos	<ul style="list-style-type: none"> ▪ Grandfathered any approved prior to by Feb. '68 or any which could be constructed on land zoned for casinos 	<ul style="list-style-type: none"> ▪ Prohibited all new casinos in the Lake Tahoe Basin 	<ul style="list-style-type: none"> ▪ No change 	<ul style="list-style-type: none"> ▪ No change
Other	<ul style="list-style-type: none"> ▪ California continued to fund CTRPA which had control over public works projects 	<ul style="list-style-type: none"> ▪ Required thresholds (ETCC) established 	<ul style="list-style-type: none"> ▪ IPES ▪ TDRs ▪ Coverage Transfers ▪ <i>Regional Plan</i> and ordinances 	<ul style="list-style-type: none"> ▪ Focus on stream-lining (MOUs) ▪ EIP ▪ Ban on 2-stroke outboard motors

Source: Kauneckis, Koziol and Imperial (2000)

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Table 2: Description of the Main Actors in Lake Tahoe’s Governance System

Organizations	Brief Description
Tahoe Regional Planning Agency (TRPA)	Created in 1969 pursuant to a federal-state compact. It is bi-state regional planning and regulatory agency with a staff of over 50 people. It maintains environmental standards, issues permits, has enforcement powers, and is charged with attaining state and federal water and air quality standards. It is directed by a 15 member governing board of various federal, state, and local officials and a 19 member Advisory Planning Commission (APC) comprised of highly educated professionals.
United States Department of Agriculture (USDA) Forest Service (USFS) Lake Tahoe Basin Management Unit (LTBMU)	It manages 77 percent of the land in the watershed. Unlike many USFS plans that emphasize resource extraction, the LTBMU plan emphasizes water quality protection. It spends \$500,000 per year to correct erosion problems. It is also involved in the acquisition of ecologically sensitive private parcels through the Santini-Burton Act (P.L. 96-586), which has provided \$100 million for land acquisition.
State Water Quality Agencies	The California State Water Resources Control Board (SWRCB), Lahontan Regional Water Quality Control Board (LRWQCB)/Nevada Department of Environmental Protection (NDEP). They implement state water quality laws and the CWA. The LRWQCB has been more involved than the NDEP in the and still implements the watershed’s Section 208 plan pursuant to the CWA.
California Tahoe Conservancy (CTC)	Independent state agency created in 1984. A board of state and local officials makes decisions. To date, the CTC funded more than \$175 million on land acquisition and restoration projects. Acquired more than 5,450 undeveloped and environmentally sensitive private parcels covering more than 6,000 acres.
Local Governments	There are six local governments: Placer County (CA); Douglas County (CA); City of South Lake Tahoe (CA); Washoe County (NV); El Dorado County (NV); and, Carson City (NV).
The Gaming Alliance	Formed in the early 1980 in response to the TRPA’s re-organization, it represents the gaming industry’s interests and was instrumental in helping form the Tahoe Transportation and Water Quality Coalition.
The League to Save Lake Tahoe	It was created in 1957 and is the oldest environmental organization dedicated to protecting Lake Tahoe. It serves as a “watchdog” and scrutinizes every project brought before TRPA.
Tahoe-Sierra Preservation Council	It was formed in 1981 to represent the rights of private property owners and has filed numerous lawsuits against TRPA.
Tahoe Transportation and Water Quality Coalition	It was established in 1989 and is a coalition of basin actors including The League to Save Lake Tahoe, Tahoe Gaming Alliance, The Tahoe-Sierra Preservation Council, and other NGOs focused on finding creative solutions to transportation and water quality problems. It also prepares the Lake Tahoe Joint Federal Legislation Agenda.
Tahoe Research Group (TRG)	It coordinates the Lake Tahoe Interagency Monitoring Program (LTIMP), established in 1979 to collect and analyze water and air quality data.

Source: Imperial and Kauneckis (2003, 1014).

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Table 3: Selected Organizations and their Areas of EIP Involvement

Participant	Area of Participation				
	Improvement	Programs	Studies	Regulation	Financing
Regional Agencies					
Tahoe Regional Planning Agency	X	X	X	X	X
Tahoe Transportation District	X	X			X
South Shore Trans. Mgt. Assoc.	X	X			X
Truckee North Tahoe Transportation Management Association	X	X			X
Federal Agencies					
Environmental Protection Agency	X	X	X	X	X
U.S. Forest Service	X	X	X	X	X
Soil conservation Service		X	X		
Army Corps of Engineers	X	X		X	X
U.S. Postal Service	X	X	X		X
Bureau of Reclamation	X				X
U.S. Geological Survey		X	X		
Federal Highways Administration	X	X			X
Federal Transit Administration	X	X			X
State Agencies					
CA Department of Transportation	X	X	X		X
CA State Water Quality Control Board		X	X	X	X
CA Air Resources Board		X	X	X	X
California State Lands	X	X	X	X	X
California State Parks	X	X			X
California Tahoe Conservancy	X		X		X
Nevada Dept. of Transportation	X	X	X		X
Nevada Division of State Parks	X	X			X
NV Division of Env'tl. Protection		X	X	X	X
Nevada Division of State Lands	X	X	X	X	X
Local Governments					
City of South Lake Tahoe (and Redevelopment agency)	X	X	X	X	X
Douglas County	X	X	X	X	X
Carlson County	X	X	X	X	X
El Dorado County	X	X	X	X	X
Placer County (and Redevelopment agency)	X	X	X	X	X
Washoe County	X	X	X	X	X
Washoe Tribe	X				X
Douglas County Sewer Improvement District	X				X
Incline Village Improvement District	X				X
North Tahoe Public Utility District	X				X
South Tahoe Public Utility District	X				X
Tahoe City Public Utility District	X				X
Nevada Tahoe Conservation District	X	X			
Tahoe Resource Conservation District	X	X			

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Table 3: Selected Organizations and their EIP Involvement (Cont.)

Participant	Area of Participation				Financing
	Improvement	Programs	Studies	Regulation	
Private Entities					
Heavenly Ski Resort	X				X
Homeowner Associations	X				X
Residential Property Owners	X				X
Commercial Property Owners	X				X
North Lake Tahoe Resort Association	X				X
Academic Institutions					
University of California – Davis			X		X
University of Nevada – Reno			X		X
Desert Research Institute			X		X

Source: Imperial and Kauneckis (2003, 1036-1037).

Table 4: Design Principles Illustrated by Long-Enduring CPR Institutions

Clearly Defined Boundaries	Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must boundaries of the CPR itself.
Congruence Between Appropriation and Provision Rules and Local Conditions	Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.
Collective-Choice Arrangements	Most individuals affected by the operational rules can participate in modifying the operational rules.
Monitoring	Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.
Graduated Sanctions	Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.
Conflict-Resolution Mechanisms	Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
Minimal Recognition of Rights to Organize	The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
Nested Enterprises	Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Source: Ostrom (1990, 90).

Table 5: Design Principles for Complex Environmental Commons

Establishing Trust Across Organizations	Cooperation and the development of new institutional arrangements for managing complex environmental commons is more likely when relationships of trust can be established among individuals in interorganizational networks.
Developing a Shared Definition of the Problem	Institutional arrangements for managing complex environmental commons are more likely to emerge when competing interests develop a shared definition of the underlying problems.
Defining Mutual Interests	When policy actors view policy choices in terms of positive sum games, cooperation is more likely to result in the development of new institutional arrangements for managing complex environmental commons. Conversely, cooperation is less likely to occur when policy choices are viewed as zero sum games.
Establishing a Balance of Power	Institutional arrangements for managing complex environmental commons are more likely to emerge when there is a balance of power among competing interests.
Increasing Policy Instrument Diversity	Cooperation and the development of new institutional arrangements is more likely when a wide range of policy instruments are used to manage complex environmental commons.

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