MANAGING COMPETING DEMANDS ON A SCARCE NATURAL RESOURCE: NON-MARKET ALLOCATION OF WATER IN THE COLUMBIA RIVER BASIN

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INTRODUCTION

The democratic choice between government agencies directing actions and individuals taking actions based on property rights is an old one. Over time, most societies have in fact moved in both directions along the spectrum between individual actions and collective agencies. Although dramatic jumps between organizational solutions in response to real or perceived crises have occurred, change is often restricted to one end or region of the spectrum of organizational choice.[1] Over the past 20 years, governmental (i.e., non-market) institutions in the Pacific Northwest have attempted to allocate scarce water resources by policy, with very limited opportunities for economic exchange. Existing property rights in water are vested almost entirely in various government agencies, although Indian tribes, irrigation districts, and utilities also have either direct rights or rights by assignment, license or contract. Conflicts among these non-market institutions have resulted in many attempts at coordination and planning.

The thesis of this paper is that our focus on coordination and planning has led to repeated failures to allocate water resources in the Columbia River Basin to their highest-valued uses, although there are limited examples of agencies beginning to rely on contractual understandings and trade-offs. These new understandings and the example of withdrawal rights exercized by irrigation districts can be expanded in the direction of market-based mechanisms. I will not discuss the putative benefits of markets in water rights generally, which have been amply and ably demonstrated by others.[2] It is easy to argue against establishing real property rights, contractual understandings, and opportunities for exchange, on the grounds that water resources are "too complex" and

too endowed with public good attributes. In the case at hand, however, some non-market institutions are in fact moving toward market-like mechanisms, which implies that even water resources can be managed by property rights. I attempt to bolster the argument for moving toward water rights by discussing the nature of non-market failures and successes. Understanding the faults and benefits in the current system is the first step toward improving the use of this scarce resource.

Currently several state and federal agencies manage water resources in the Columbia River Basin, which covers most of Washington, Idaho, and Oregon, as well as parts of Montana, Wyoming, Nevada, Utah, and the Canadian province of British Columbia. The Bonneville Power Administration (BPA), a federal power marketing agency in the Department of Energy, is responsible for selling and transmitting the power output of several federal hydroelectric facilities throughout the region, operated by the Army Corps of Engineers and the Bureau of Reclamation. In addition to power generation, the Corps and Bureau have operational responsibilities in the areas of flood control, navigation, and recreation, as defined by the "project purposes" listed in the legislation associated with each dam. State and federal fish and wildlife agencies are responsible for managing fish and wildlife resources and commercial and sport fish harvest, both nationally and internationally in some cases. Indian tribes have legal rights to fish and irrigate, and they also build fish hatcheries, conduct research, and manage their own fish harvests. Non-federal utilities, both public and private, own and operate dams in the Columbia River Basin under license from the Federal Energy Regulatory Commission. Federal and state land management agencies oversee certain

environmental resources. The Northwest Power Planning Council, an interstate compact agency, is charged with resolving conflicts between power and fish interests in the Basin. Finally, private and public activities such as commercial navigation, irrigation, recreation, and domestic and industrial water supply have interests and/or rights to the water resources that must be managed along with the demands from the power and fish interests.

Subsequent sections of this paper review the general bases for non-market failure, describe some examples of non-market failure in the current case, review the previous institutional solutions to the problem of allocating scarce water resources, describe some moves toward contractual solutions by non-market institutions that rely more on economic incentives and guidelines, and suggest how these moves in the "right" direction can and should be expanded.

HOW CAN NON-MARKET INSTITUTIONS FAIL IN THE ALLOCATION OF SCARCE RESOURCES?

All mechanisms established to allocate scarce resources can "fail", whether market-based or governmental. Markets are generally recognized to fail when externalities are not taken into account in individual decision-making, when economic activities are subject to increasing returns and decreasing marginal costs, and where information is imperfect and barriers to entry exist. However, non-market institutions offer no guarantees of their ability to overcome these same complications. Indeed, government agencies often erect barriers to entry and exit, and generally have less clearly

defined incentives to seek out and use new information than do non-governmental decision-makers, both for-profit and not-for-profit.[3]

Misallocation of resources. The non-market separation of costs from prices, of decisions from their impacts, and of decision-making from accountability can lead to the misallocation of resources, excessive costs, and inefficiencies, because there may be no reliable feedback mechanisms to allow performance of the non-market institutions to be measured. Failure of non-market supply can also occur when there are inadequate incentives to minimize cost on the part of suppliers, who will then be encouraged to be wasteful. This has an obvious analogy in imperfectly competitive markets.

Lack of accountability. Bureaucracies can establish internal standards for performance unrelated to public goals: maximizing budgets or staff, minimising innovation, controlling information, maximizing perceived receptivity to public input, and/or maximizing administrative flexibility. Unfortunately, it is difficult to gather evidence of the extent of this problem and its impact on real allocative efficiencies.

Externalities. Individuals often take actions with unintended side-effects, which can be either beneficial or harmful. Likewise, government agencies may create "side effects that are not realized by the agency responsible for creating them, and hence do not affect the agency's calculations or behavior."[4] Rising demand for non-market goods/services may lead to greater supply, but with the cost of that supply not reflected in the price paid for these services. If no means exist to pass the higher cost along to those who are using the services (i.e., charge them a higher price), then non-market allocation will fail, because price will be divorced from cost. However, if the supply

increases anyway and others are required to bear the cost, then an externality has been created without compensation.

Inequities. Distributional inequities may arise based on relative access to political power and privilege. The market analogy is distributional inequities based on income or wealth. Access to non-market decision-makers however depends on organizational ability, which means that concentrated interests will tend to benefit at the expense of diffuse and dispersed interests, and that interests perceived to be politically popular will be advanced without being required to demonstrate benefits and costs.

Persistent excess demand or supply. Non-market demand may exceed non-market supply at current prices: either equilibration is prohibited (the bounds of legally permitted activity do not include the core of the market), or the legally allowed equilibration mechanisms are so costly that all available consumer and producer surplus would be erased in the attempt to achieve an equilibrium. Persistent disequilibrium can occur because

> [t]he mechanism by which nonmarket demand and supply are brought into balance is weak and unreliable. It is essentially a political process characterized by lags, bottlenecks, coalitions, logrolling, and the other fuzzy attributes of political behavior. Consequently, imbalances between nonmarket demand and nonmarket supply may persist for long periods of time. Disequilibrium may be more typical of the relation between them than equilibrium.[5]

Appeals to the legislative or judicial branches for resolution of disputes. Court actions and changes in federal legislation are further evidence of non-market failure, because decisions or adjustments are discontinuous, "jerky", incomplete, and are made by individuals on grounds other than personal interest and defined rights.

One significant cause of these forms of non-market failure is the explicit avoidance of economic criteria or incentives that can guide actual decision-making. Previous institutional arrangements for allocating water in the Northwest have relied almost exclusively on non-economic criteria. The next section illustrates how two forms of non-market failure have occurred as a result: externalities and persistent disequilibrium. Recent events indicate that there is a substantial risk that these two particular problems will continue unless some change of course is made.

NON-MARKET FAILURE IN ALLOCATING COLUMBIA BASIN WATER

Externalities. In the case of trade-offs among competing uses of Columbia River Basin water resources, non-market institutions run the standard risks of imposing externalities on other entities. The most prominent examples of this are the many public decisions since the 1930s to use water resources in the Columbia River and to allow fish harvests, among other things, that harm anadromous fish populations. Every consumptive and in-stream use of the river, with the exception perhaps of Indian fishing and irrigation rights, stems from decisions made directly or regulated by federal and state agencies. This includes power production, irrigation withdrawals, fish harvest, domestic and industrial water supply, recreation, navigation, and logging. An analysis of all the externalities created by government action is well beyond the scope of this paper. However, a recent example provides evidence of how one agency responds to the charge that it is imposing economic externalities on others.

Aside from environmental impacts generally, the potential for externalities on the Columbia is substantial because of the proximity of federal and non-federal hydroelectric facilities, especially in central Washington, where the operation of two large federal dams (Grand Coulee and Chief Joseph) affects five downstream non-federal dams. Water releases upstream can exceed the hydraulic capacity of downstream turbines, causing water to be "spilled" around the turbines instead of stored for later production of electrical power. Spilled water is a loss of "fuel" for the operation of these hydroelectric facilities. The Northwest Power Act (1980) provided for compensation for externalities created by BPA when fulfilling its obligation to protect fish and wildlife.[6] Previous statutes did not require BPA to compensate for externalities.

In 1987 the first claims requesting compensation were filed against BPA, by three Public Utility Districts (PUDs), non-profit electric utilities, in eastern Washington. The PUDs argued that they had experienced excessive flows at their projects due to upstream water releases at federal dams, and were thus forced to spill water, losing potential hydropower generation. While negotiating separate settlements with the three utilities, BPA began a "policy development process" because it anticipated future claims resulting from water releases. In the 1988 notice announcing this process, BPA distinguished between water releases and "mandated physical changes or operational restrictions", with the possibility that they would only compensate for the latter form of externality.[7]

By the time the policy was complete in mid-1989, the three PUDs' claims had been settled, for amounts ranging from 63% to 83% of the original claims. However, the final policy itself strictly limited BPA's liability under any future claims, by placing most

potential actions outside the statutory definition of "measures" imposed on non-federal entities and thus subject to compensation. First, BPA stated that it would only compensate for externalities caused by actions taken to carry out the Fish and Wildlife Program prepared by the Northwest Power Planning Council, and not by any other action taken by BPA or any other federal agency in response to a request from BPA. Second, only losses due to actions taken by others in response to "an order issued by a Federal agency by force of regulation or law" would be compensated. Specifically, "[w]ater releases from upstream projects will not qualify for compensation unless the claimant is required by an order to store or release water under authority of law."[8]

BPA funds scientific research, hatchery operation, and bypass facilities, and cooperates in water releases at various times of the year to help fish migration. The activities funded by BPA affect the three PUDs by increasing the rates that BPA charges for power purchased by the utilities, which unlike upstream water releases does not directly affect the operation of the utilities' dams.[9] The water releases result from the Council's Fish and Wildlife Program, which appoints Fish Passage Managers to direct the actual releases each year. As the only actions taken by federal agencies under the control of the Council's Program that could have a major impact on these utilities' hydroelectric operations would be water releases, the second policy restriction effectively eliminates almost all of BPA's liability for externalities imposed on non-federal utilities by the upstream release of water. With these two restrictions, BPA recognized that externalities would be created by its actions, but simultaneously rejected a responsibility to compensate for those externalities by interpreting the relevant statute narrowly. The

utilities in turn brought suit in the Ninth Circuit Court of Appeals against BPA, arguing that the policy eliminates any chance that they would collect compensation for the costs imposed by the water releases, in which they must participate or face flooding at their dams. BPA did not argue that it did not create externalities, but merely that the federal agency had no statutory obligation to internalize these impacts.[10]

Persistent Disequilibrium. Persistent excess demand or supply can also accompany non-market decision-making, and lead to judicial, legislative or administrative action in an atmosphere of perceived crisis or near-crisis. In the late 1970s, petitions were filed under the Endangered Species Act (ESA) on behalf of several runs of anadromous fish in the Columbia River Basin. The combination of these actions, retail rate disparities across utilities, and an apparently impending power shortage led to the passage of federal legislation creating a new interstate compact agency (the Power Planning Council) charged with developing a program to protect the fish, and requiring federal wholesale power rates to increase to pay for this protection. In 1990, despite a decade of effort to protect fish and wildlife and a cost of about $1 billion in programs and lost revenues, new ESA petitions were filed, in some cases by entities (Indian tribes) that, at least nominally, had a substantial role in the formulation of the fish protection program. As we will see, part of the current problem stems from the fact that the control of fish harvests is not part of the power system's current efforts to rebuild fish populations. The commercial fisheries in fact create a "derived demand" for water as a function of their demand for fish to harvest. Given the concentrated nature of this particular economic interest, the fact that the demand is derived, and the difficulty of

enforcing harvest limits, the political system has not been able to control harvest as part of an overall effort to reallocate water resources.

The excess demand for water resources that led to a near-crisis in the late 1970s has persisted, despite federal and state efforts to shift water and financial resources to the fish, and the courts or a new agency may be called on to make difficult judgements over scarce resources. This persistent excess demand is a sign that non-market institutions have failed to effectively allocate water resources in the Basin toward their most highly valued uses. Excess demand for water has not been satisfied, despite an increase in the price of power that internalizes costs previously imposed on fish, and despite the dedication of substantial blocks of water to fish migration. The next two sections explain how and why non-market institutions have failed to "plan and coordinate" actions in the past in ways that would solve these allocation problems.

PLANNING AND COORDINATION (1): THE PACIFIC NORTHWEST RIVER BASIN COMMISSION

Since at least the mid-1940s there has been a recognition that the large number of federal, state, and local agencies with control over water might come into conflict. This section reviews the history of the first federal institution designed to substitute for markets in the use of scarce water in the Columbia River Basin: the Pacific Northwest River Basin Commission (1967-1981). The explicit mission of this institution was to coordinate the activities of the agencies involved with the water resources of the Columbia River Basin. Congress recognized that water resources were subject to competing demands, all regulated, and that coordination of regulatory actions appeared

necessary. We have here (and in the next section) examples of the "government of governments", where independently authorized agency activities might run into one another and create conflicts.

The spark for many debates on competing uses of the water resources in the Columbia River Basin has been the status of fish. Since the early part of this century, fish runs have been declining for several reasons: over-harvesting; the construction and operation of dams; changes in water quality; changes in habitat due to mining, grazing, road building, other construction, and logging; irrigation withdrawals; and changes in water flows due to recreational and navigational demands. Cooperative efforts of several state and federal agencies to promote anadromous fish runs date from the 1930s; in the late 1940s the Columbia River Fishery Development Program was started to preserve, protect, and enhance the anadromous fish runs. Most of the funds in this program went to the construction and operation of hatcheries providing fish passage on tributaries and the screening of irrigation diversions.[11] In the case of the dams, these previously externalized costs are being internalized.[12]

However, by the mid-1960s it was recognized that water resources generally required greater attention. The Water Resources Planning Act (1965) authorized River Basin Commissions (RBCs) throughout the country. Each Commission was intended to "serve as the principal agency for the coordination of Federal, State, interstate, local and nongovernmental plans for the development of water and related land resources in its area, river basin, or group of river basins."[13] Each Commission was composed of a Chair, not an employee of any federal agency, a member from each federal agency

"determined by the President to have a substantial interest in the work to be undertaken by the commission", a member from each state with territory inside the relevant basin, a member from each affected interstate agency created by Congressionally-authorized interstate compacts, and a member from any affected international commissions. The activities of the Commissions were supposed to be governed by consensus, and the duties included "such activities … and [preparing] such studies and investigations as are necessary and desirable" in carrying out the policies of the enabling legislation. More specifically, the Commissions were to write "comprehensive, coordinated, joint plan[s] … for water and related land resources development" in the river basins, and to submit to the federal Water Resources Council (WRC) recommendations for implementing the plans. The WRC in turn would consider the regional plans in its recommendations to the President regarding federal legislation. Nowhere in this statute was there a *requirement* that any agency or individual act in accordance with the plans developed by the Commissions, although there was the threat that the Commissions' plans would end up in federal legislation affecting projects supported by federal tax revenues.[14]

One of the first accomplishments of the RBC was to compile a multi-volume study of the projected demands on water resources in Columbia River Basin.[15] The study projected "needs" over 50 years (1970-2020) in many areas, including hydropower, fish and wildlife, recreation, and navigation. The RBC projected that minimum flows and augmentation of flows could be accomplished to "enhance environmental values" at the same time that hydroelectric generating capacity would increase ten-fold, navigation traffic would quadruple, water consumption by municipalities and industrial users would

almost triple, irrigated acreage and the associated withdrawals would almost double, and the water surface area devoted to recreation would more than quadruple.[16] None of these projections has been realized, and yet serious environmental questions have reappeared.[17]

There was little recognition of the conflicts inherent in the magnitudes of the various projected "needs". The Commission noted that additional hydropower capacity might lead to problems for navigation, fish and wildlife, and recreation.[18] Some of this lack of attention appears to have been driven by peculiar economic and environmental perspectives: "[t]he economic efficiency objective [of the study] includes the identification of needs and methods of meeting needs in the least costly manner in terms of the constraints imposed by the national economic projections. … The environmental quality objective is the maintenance or improvement of the quality of the region's environment for man."[19] On the other hand, "[s]ingle-purpose solutions were compared within each time frame for potential conflicts, and adjustments were made or alternatives proposed when conflicts could not be resolved."[20] The natures of the resolution of these conflicts and the corresponding adjustments are not known.

Although the Northwest RBC had been created in 1968 to coordinate the activities of several agencies with potentially conflicting responsibilities, it took until late 1979 for the Commission to begin analyzing trade-offs among power, irrigation, and fish.[21] In December of that year the Commission adopted a Comprehensive, Coordinated Joint Plan.[22] This led to a Regional Tradeoff Analyses Program "directed toward achieving regional agreement on important water management items such as:

additional storage; water conservation; drought contingency measures; and allocation of water among such competing uses as hydroelectric energy production, instream flows for fish, diversions for irrigation, etc."[23] However, no action was ever taken on this Regional Program, because of the withdrawal of funds for the RBC and the creation of the Power Planning Council in 1981.

By that time, questions had begun to arise regarding the ability of the Water Resources Council and the River Basin Commissions to actually affect the operation of federal and state agencies responsible for making decisions regarding water resources. In 1981, the Congressional Research Service (CRS) prepared a report on proposals for reform of the WRC and amendments to the Water Resources Planning Act, which had authorized the formation of the WRC and the RBCs.[24] The CRS report summarized several studies from the late 1970s that basically questioned the ability of the WRC to make a difference. For example, a 1975 assessment offered a variant of the "regulatory capture" theory of administrative agencies: the agencies that were supposed to *be* coordinated in fact may have *controlled* the coordination: "[i]t was found that major Federal agencies often controlled the direction of plans because they had the personnel and funds to promote their cause. Furthermore, it was noted that the problem of coordinating the [Water Resource] Council's plans with those of other agencies had not been satisfactorily resolved."[25] Two years later, the General Accounting Office found "limited progress in achieving their (i.e., the WRC and the RBCs) objectives and [in] carrying out the responsibilities of the Act."[26] Finally, in January 1977 several outgoing members of the WRC, their alternates, and other observers wrote a report noting that

§ 3 of the Water Resources Planning Act restrained the ability of the WRC to alter "existing laws, rights, or the duties of Federal officials authorized to develop or regulate water and land resources." Furthermore, there was "no clear understanding as to the Council's responsibilities. … [M]ember agencies are reluctant to expose their programs to possible criticism and loss of prerogative and control resulting from Council decisions. … Internally, a large department may have conflicting missions necessitating in-house resolution before a departmental position can be presented at the Council." Finally, the Council members argued that assignment of agency staff to work on WRC or RBC activities was subordinate to the agencies' own missions.[27] The CRS concluded that "[w]hile there are provisions for coordination and policy assessment in [the Water Resources Planning Act], there is little authority to do the job and limited appropriations have imposed further constraints."[28]

Two problems surface in these reports. First, the WRC and the regional RBCs had little legal authority to order changes in the activities of the federal and state agencies that they were authorized to "coordinate". As noted above, the RBCs formulated plans that were passed along to the federal WRC, which then could make recommendations to the President for changes in federal legislation. The 1965 Act had created a network of coordination and planning, but offered no teeth for any actual changes in the activities of government agencies. As if this were not enough of a limitation, the efforts of the WRC and the regional RBCs were apparently co-opted by the very agencies that they were supposed to coordinate. Although this may have been the result of insufficient funding, which required the regional Commissions to rely on the

state and federal agencies for staff, expertise, and information, the result is a familiar one to students of economic regulation. Although the fortunes of the theory of "regulatory capture" have waxed and waned over the years, the principle is simple and has a theoretical basis in the ideas of informational assymetry: regulated entities, usually electric or gas utilities, railroads, or telecommunications companies, are able to assemble an array of human resources exceeding those available to regulatory agencies, and are at an advantage in their possession of the information necessary for the regulators to perform their functions. Regulators may not even know which questions to ask, let alone whether they are receiving accurate and complete responses.[29] It is a short step from the theory of capture of regulatory agencies by utilities to the possibility or even probability that government coordinating agencies will be effectively captured by those agencies that they are attempting to coordinate, especially if the coordinating agencies have little authority to order changes in practices.

Not surprisingly, the CRS report concluded that bureaucratic controls needed to be tightened before the purposes of the 1965 Act would be accomplished: "The need for tighter coordination between water quality and water quantity planning and management has long been expounded by water authorities. … The great array of affected Federal agencies and programs must be considered, but little improvement in the current situation can be expected unless some authoritative institutional structure for promoting cooperation, coordination, and control among the various actors emerges."[30] This conclusion basically sidestepped the issue of choosing between market and non-market mechanisms to govern or decide among the competing uses of water resources, noting

merely that "[t]here is a great variability in the extent and nature of prioritization processes used by the Federal water resources agencies. Except for the Corps of Engineers, most internal rankings have been on the basis of individual project merits or purposes rather than on the basis of river basin or regional considerations."[31] In the final analysis, instead of reforming the regional RBCs and the Water Resources Council, in 1980 Congress created a new coordinating agency for the Northwest, discussed in the next section, and President Reagan effectively abolished the RBCs by removing their funding.[32]

PLANNING AND COORDINATION (2): THE NORTHWEST POWER PLANNING COUNCIL

Although the River Basin Commission had been planning the multiple uses of the Columbia since the late 1960s, by the late 1970s a two-edged sword was poised over the Northwest: petitions seeking status under the Endangered Species Act (ESA) had been filed with the National Marine Fisheries Service on behalf of certain anadromous fish, and the region was facing what appeared to be an imminent shortage of electrical power, as strong economic growth in the 1970s ran into an ill-fated program of simultaneously constructing several large nuclear power plants on a cost-plus basis. The court battles associated with the ESA petitions, growing retail rate disparity between consumer-owned and investor-owned utilities, and the threat of brown-outs led to new federal legislation: the Pacific Northwest Electric Power Planning and Conservation Act (1980). The statute created a new interstate compact agency, the Northwest Power Planning Council,

which was given the mandate of preparing a Fish and Wildlife Program to protect the environment.[33] The Council described itself as a

> planning, policy-making and reviewing body. It develops and monitors implementation of … [the] fish and wildlife program, which is implemented by the Bonneville Power Administration, the Corps of Engineers, the Bureau of Reclamation, and the Federal Energy Regulatory Commission and its licensees. … [T]hese federal operating and regulating agencies are directed by Congress to exercise their responsibilities, in a manner consistent with the purposes of the Act and other applicable laws, to provide equitable treatment for fish and wildlife.[34]

The Council was required by statute to prepare a Fish and Wildlife Program based on information received from state and federal fish and wildlife agencies and Indian tribes, although information was also received from other quarters. According to Hemmingway, one of the Council's founding members, the compact agency

> was not able to fashion the fish and wildlife program out of new cloth of its own choosing. The Council's role was one of mediation, consultation, and judgment among the interests of the competing parties. … [T]he Council's fish and wildlife role falls somewhere between the legislative and the judicial. The procedural and substantive rights of the fish and wildlife interests, power interests, and the extent of the Council's discretion, remain murky.[35]

The importance of this legislation raising the implicit "rights" of fish and wildlife has been emphasized by several observers since 1980. For example, Blakley points out that prior to 1980, there were no implicit or explicit water rights accorded to fish:

> Anadromous fish need water … but they have no water rights. To have a right to water, anadromous fish would have to derive that right from another lawful user or show a vested, prior right. The use of water by fish is not specified as an authorized purpose of hydropower dams. Fish, therefore, can derive no rights from the dams or an action that gives water rights to a dam project. Furthermore, the water managers and agencies maintain that fish have no vested water rights nor any other claim on the flow.[36]

Blakley believes that the legislation creating the Council in fact gave the fish a property right in the water for the first time. Whether this in fact occurred and whether it helped the fish are questions posed here.

Although the River Basin Commission had nominal authority over all competing uses of the water resources in the basin, the Power Council was given a mandate over only two of those demands: fish and power. "The Council … may not address activities such as irrigation, logging, or other practices that also have degraded fish habitat."[37] This restriction has meant a greater focus on the trade-offs between power and fish and some greater strides toward protecting the environment, but also has meant that externalities, both pecuniary and non-pecuniary, created by other water uses in the Basin that previously affected both fish and power now are borne entirely by the power users. The benefit was action where little or none had occurred before, but the cost was the imposition of externalities on only one set of users of the resource.

The legislation creating the Power Council solved some of the problems associated with previous efforts at "inter-agency coordination". First, the Council was given authority to hire its own staff, to be paid for by a tax on federal wholesale power rates in the region. This gave the Council some independence from the agencies it was required to "coordinate" and reduced the risk of "agency capture" that plagued the RBCs.[38] Second, the language governing the Council's relationship with other agencies was much more explicit and determinative than was the case with the River Basin Commissions. Instead of the indirect route of basin plans leading up through the Water Resources Council to federal legislation, all relevant federal agencies in the Northwest

were now required to take into account the Council's Fish and Wildlife Program "at each relevant stage of decision-making processes to the fullest extent practicable."[39] The Fish and Wildlife Program became a real constraint on new hydropower development in the region, and led in its first decade to the expenditure of about a billion dollars (through FY 1991) by electric consumers on fish and wildlife.[40] By 1987, the Council had developed several ways to exercise its "rights" on behalf of the anadromous fish. Implicit water rights were created and granted to state agencies and Indian tribes, and BPA had included in its regular budgeting process some tens of millions of dollars annually on facilities and research on behalf of fish and wildlife. However, the Program had to operate inside the existing framework of water rights, because the Council had no authority to appropriate water or affect existing rights to water.[41]

The following assessment of the Council's activities on behalf of fish finds both beneficial and detrimental results. Although most of the Council's activities have concentrated on planning and the coordination of other agencies' activities, there have been some moves in the direction of establishing and trading real water rights for anadromous fish in the Basin. It remains to be seen whether these newly created and assigned property rights will be exercised by those given responsibility for doing so in a manner that will actually benefit the fish on whose behalf the rights were created and assigned.

One area of potential failure involves the fact that a substantial portion of the Council's Program involved "coordination" among existing federal and state agencies and Indian tribes, just as the RBCs were charged with "coordinating" the actions of other

federal agencies. This tendency to supplement existing bureaucracy with a new layer is a traditional response to non-market failure, but itself is likely to repeat the problem.[42] For example, the Council addressed the "competing uses" of water resources by requiring that "federal project operators and regulators shall work with the fish and wildlife agencies and tribes to develop mutually satisfactory arrangements for implementing the consultation and coordination requirements ... of the Northwest Power Act. They shall submit proposed consultation and coordination processes to the Council."[43] The efficacy of this requirement is doubtful given the long history of ineffective coordination under the RBC in the 1960s and 1970s. In any case, there is no clear connection between a requirement to coordinate and the improved use of these resources: "coordination" cannot be measured and performance rewarded or penalized.

A second problem is that the statute that created the Council required existing negative externalities not to be internalized by their creators but instead to be shifted from one water use to another. Thus, logging, recreation, and navigation can continue to use the resources without paying for the related effects on other users, while the operation of the river for power production has been reduced by *all* uses.[44] On the other hand, positive externalities have been created by the power users, who fund all Council-mandated research for fish disease, hatcheries, and habitat, but who share those benefits with the commercial fisheries in the Basin and in the Pacific Ocean, including foreign fisheries. These externalities are not the fault of the Council itself or its Program, but of the legislation that created the agency, which required power users to pay for the research and habitat improvements but did not simultaneously limit the

ability of the fisheries industry or other water users to benefit from those expenditures or to require that commercial fishing licenses or recreation permits be similarly taxed in support of the fish. However, to the extent that these externalities were created and are allowed to persist, they are evidence of non-market failure.

Third, the Council has approved and encouraged the reallocation of water resources with at best minimal attention to the benefits and costs of the specific changes. The enabling statute directed that the Fish and Wildlife Program should also assure "an adequate, efficient, economical, and reliable power supply" and that the Council, when choosing between two means of achieving a biological objective, should choose the alternative with the minimum economic cost, as long as both means were equally effective.[45] In practice, these guidelines are difficult to implement. For example, the Council has established priorities for the use of the hydropower system without any obvious systematic examination of the impacts of this particular ranking.[46] Also, the Council set a 90% survival goal for fish passage assisted by the spill of water, without considering the costs and benefits of this particular level.[47] In fact, five years after requiring changes in river operation on behalf of the fish, the Council limited its responsibility to *"consider[ing]* developing a performance standard for juvenile fish passage facilities during the next five years."[48] In other words, actions were required for several years that would have economic impacts on all users of the water resources, without having established criteria to judge the success or failure of these required actions.[49]

Fourth, the Council's mandate to exercise its implicit property rights on behalf of fish was severely limited in scope, mostly obvious in the area of harvest management.[50] Fish populations are of course a function of spawning, survival prior to migration, passage downstream of juveniles, survival in the ocean, harvest, and passage back upstream of mature adults, but the Council's control of fish harvest was in fact non-existent: "the [fish and wildlife] program calls on harvest managers to regulate catch … to support … production and passage efforts."[51] The Council expects only to "consult" and "monitor", neither of which bears any direct relationship to fish survival.[52] Although many federal agencies were required to follow the Council's Program, in no case was there any requirement that those agencies that regulate fish *harvests* abide by the Council's Program to protect fish. Entry restrictions on commercial fisheries are difficult to enforce at best. The Council's limited mandate means that their exercise of property rights on behalf of anadromous fish may simply lead to larger fish harvests at the expense of naturally spawning populations, which is not obviously the intent of the legislation.

A final major point is that the Council has concentrated on hatchery fish at the expense of naturally spawning fish populations. In this regard, the Council has again simply followed the legislation, which required that the Fish and Wildlife Program use and rely on recommendations from state agencies, who have wanted to spend money on hatcheries operated by the agencies themselves. These actions were taken in spite of the knowledge that hatcheries cause problems for the fish, because of the spread of disease, the deterioration of genetic diversity, and the overharvesting of naturally spawning runs

that are caught along with the hatchery fish because harvesting methods are non-selective.[53] The emphasis on the construction of hatcheries follows a pattern established in developing countries, where attempts to foster economic development initially concentrated on capital investments, ignoring the fact that the capital assets must be effectively managed after their construction.[54] In this case, the Council may in fact have exercised its property rights on behalf of some fish to the detriment of some other fish: an emphasis on hatcheries led to increased harvests, which included species with limited or declining populations, as well as "crowding out" of naturally-spawning populations by hatchery populations, and these led in turn to the new ESA petitions. The new petitions under the Endangered Species Act support this conclusion because they allege continuing damage to naturally spawning runs.

On the other side of this ledger lies some movement in the direction of creating and assigning property rights. First and foremost, the Council assigned the right to certain flows of water to anadromous fish: the Water Budget is a "block of water set aside for fish and relased during the spring runs [April 15 to June 15] to create an artificial freshet that speeds juvenile fish to the ocean." The Water Budget is measured in millions of acre-feet that can be managed during the two-month period, "to implement any flow schedule that provides maximum juvenile salmon survival, within the limits of firm non-power requirements, physical conditions, and flows required for firm [electric power] loads."[55] The Budget is implemented by Fish Passage Managers, appointed by state and federal fish and wildlife agencies and the region's Indian tribes.[56] The Water Budget acts as an implicit contract in many ways: the Fish Passage Managers have

responsibilities to notify the operators of the hydroelectric dams for the exact operation (release) of the Water Budget All participants have reporting responsibilities and there are dispute resolution procedures.[57]

There are several problems with this particular solution, however. First, management of the Water Budget by the Fish Passage Center may be the weakest aspect of this arrangement. Instead of assigning responsibility to individuals or agencies in a manner that promotes accountability and performance, the Water Budget provides no connection between the actions taken by officials at the Center on behalf of fish passage and the continuing role of the Center in managing that passage: there is no accountability. This points to a second irony of the existing situation: for a resource with multiple common-property characteristics, we often rely on federal or state institutions to allocate the resource among competing uses and to collect the costs from some or all of the users. However, in this case we have a resource for which a particular property right has been established, assigned, and exercised, *but* we have failed to take the next logical step and assign that right to an institution that has a clear incentive to husband the resource by careful use of the associated property right. If a property right can be defined, assigned, and exercised, then the resource has taken on some more "private" aspects, and there is less apparent need for relying on agencies whose survival and health is independent of their actions regarding the resource. Second, in addition to the lack of incentives to make best use of the flows in the Water Budget, the guarantee of a specific amount of water notwithstanding overall hydraulic conditions expands the problems associated with "first priority" water rights from their riparian base to fish.

That is, during shortages a particular use is accorded higher priority than other uses, without some mechanism to make social and economic trade-offs among the competing uses. If economic mechanisms for allocating the resource were available, we would expect to find some users giving up (selling or leasing) rights to higher-valued uses during periods of relatively low water availability. However, as with many aspects of state water law, the Water Budget preserves priorities that may make little economic (or social) sense under changed conditions. Again, non-market mechanisms have established a "solution" that is inflexible and unable to adapt to changed circumstances.

A second area of potential improvement is that by 1987 Council had decided to *consider* studying the feasibility of using "uncontracted water stored in existing reservoirs" to improve water flows for fish throughout the Basin. The Council directed the Bureau of Reclamation to use storage constructed for irrigation use but not yet contracted for on a long-term basis to improve flows in the Umatilla River.[58] The Council also moved in the direction of addressing all competing uses in the Yakima River Basin of eastern Washington, calling on non-power users to become more efficient in the use of water.[59] These changes fall into the "better late than never" category, although consideration of a study is a far cry from actual institutional changes.

Finally, the Council has adopted a program called "Protected Areas", which restricts hydropower development along several thousand miles of streams in the Basin. Because this provides a direct signal that the Council will oppose proposals for new hydroelectric licenses in Protected Areas, this may allow developers to concentrate their efforts on streams that are not critical for fish survival. However, because of the

Council's statutory mandate, these streams are protected only from power operations, not from *other* encroachments on the river and on the environment for fish. This is another example of all externalities shifted to only one use of the resource instead of being borne by other uses. In addition, there are likely both Type I" and Type IP kinds of errors in the process of selecting streams for designation as "protected". That is, without an economic ranking of the value of the region's streams for all potential uses, both "false positives" and "false negatives" are highly likely: streams with little environmental value will be protected from hydropower development, and streams with great environmental value will be open to development. This result is *more* likely given that the Council has no ability to control non-power uses of these stream reaches.[60]

CONTRACTUAL APPROACHES TO MANAGING COMMON RESOURCES

While the Council put together its Fish and Wildlife Program, including the Water Budget, several entities representing competing uses of the water resources entered into contractual understandings designed to avoid litigation and resolve some of the competition for scarce water. (This section also briefly describes another, similar example from the early 1960s.) First, the Spill Agreements are multilateral contracts, signed in the spring of 1989 by federal and state agencies and Indian tribes, according to which water will be spilled at certain dams in the Columbia River Basin to help the migration of anadromous fish. Second, BPA signed a Fish and Wildlife Agreement with the members of the Columbia Basin Fish and Wildlife Authority, an umbrella organization of state agencies and Indian tribes, which commits the federal agency to

negotiate guidelines for the release of water from storage newly available in Canadian reservoirs pursuant to an agreement between BPA and British Columbia Hydro. The Spill Agreement and the Fish and Wildlife Agreement demonstrate that non-market entities can move in the direction of more-or-less market-oriented devices to settle disputes over scarce common-property resources, and that after decades of coordination and planning these agencies are discovering that contractual understandings offer at least the promise of resolving these disputes.

In 1989, BPA and the Department of the Interior (governing the Bureau of Reclamation) signed two Fish Spill Memoranda of Agreement with several Indian tribes and state and federal fish and wildlife agencies. These Spill Agreements represented "final and complete settlements] of any claims regarding any obligation of the United States of America to provide spill as mitigation for mortality to anadromous fish attributable to turbine passage at all Federal Columbia River Hydroelectric Projects." However, given that fish mortality might be reduced by measures other than the spill of water at dams, the Agreements did not limit the ability of the signatories to seek relief through mechanisms other than spill. In return for agreeing to spill specified amounts of water at certain places and times, BPA received protection from legal challenges (judicial or administrative) to the spill itself and to certain transmission policies, transmission construction projects, and power and transmission contracts.

Importantly, instead of guaranteeing a certain block of water measured in millions of acre-feet, as with the Water Budget, the Spill Agreements provided for a *proportional* right to whatever flows were available at each of four hydroelectric dams on the

Columbia and Snake Rivers. For example, between April 15 and May 31, 70 percent of the water available at Lower Monumental Dam would be spilled to assist fish migration. This sharing arrangement is an application of a principle used to manage unpredictable water resources for power production. The Water Budget on the other hand gave a first priority to certain water flows between hydroelectric facilities in support of fish passage, notwithstanding hydraulic conditions. Complicated formulae in the Spill Agreements govern the actual timing and amounts of water that are made available by BPA, the Corps of Engineers, and the Bureau of Reclamation. Water can be "banked" for later use, within limits, depending on the specific annual requirements for fish passage as determined by the fish agencies and tribes. Spill cannot be requested during peak-load hours, when the water is also needed to generate electricity, and there are maximum and minimum levels of spill. Perhaps most interesting, requests for spill must be "prescheduled", which is a term normally applied to the notification by a purchaser of bulk power 24 hours before the actual delivery of electrical power is to be made. This indicates that non-power uses of the water resources are beginning to be more formally integrated into daily operational decisions on the system, and are taking on responsibilities similar to those of the power system.

Equally important, the Agreement establishes a mechanism to monitor passage of juvenile fish at four sites. This may provide evidence of the efficacy of the agreed-upon flows in assisting in the migration of fish, and stands in sharp contrast to the Council's 1987 Fish and Wildlife Program, which merely indicated that the Council would *consider* developing a performance standard for the efficacy of fish passage faculties. The Spill

Agreements set out an efficiency standard expressed as "daily bypass", a measure of the percentage of fish diverted from the dam's turbines and carried past the dam by some alternative route. However, although the parties agreed on the mechanism, spill, to achieve greater passage of fish around the dams, they could not agree on the exact percentage of fish bypass to be used as a target or goal, and the impacts of these understandings are yet to be seen.

Separately, BPA was negotiating an agreement the Non-Treaty Storage Agreement with British Columbia Hydro, to allow the use of additional space in reservoirs behind three existing dams in Canada managed by the provincial utility, by storing water for release on a deliberate schedule to produce electricity downstream on both sides of the U.S.-Canada border. Despite assurances that fish migration would be helped by this international power agreement, many U.S. fish agencies and Indian tribes were concerned about the storage of water in the spring when run-offs are highest, for probable release in the late summer and fall when the demand for power is higher in California. BPA feared a suit under the National Environmental Protection Act that could threaten the agreement with B.C. Hydro, on the grounds that BPA's Environmental Assessment was inadequate. As a result, BPA agreed in an associated NTSA Fish and Wildlife Agreement to negotiate "operational guidelines" with the members of the Columbia Basin Fish and Wildlife Authority, a coalition of fish agencies and tribes, that would determine how the additional Canadian storage would be used. These guidelines have not yet been established, but there is concern among the non-federal utilities who operate projects on the Columbia that the guidelines will create

externalities similar to those that BPA has already refused to compensate (described above). BPA also agreed to try to rent water from the Idaho Water Bank to increase flows in the Snake River during the Water Budget, and agreed to fund a pilot project for this purpose. This latter action is a clear move in the direction of market-based mechanisms for the use of scarce water to assist fish migration, because the power users will be purchasing or renting water that belongs to the Bureau.[61]

A final example of the contractual approach comes from the power system. In the early 1960s, BPA, the Corps of Engineers, and 13 utilities in the region signed a 40-year "Agreement for Coordination of Operations among Power Systems of the Pacific Northwest" (the Coordination Agreement). For almost three decades these utilities and federal agencies have managed the hydroelectric resources of the Columbia River to "optimize" the production of firm energy, given both varying water conditions and non-power constraints on the ability to operate the system. The Coordination Agreement is another example of a contractual understanding among private and public parties that differs significantly from the "coordination and planning" approach embodied in the River Basin Commission and the Power Planning Council. Although there are definitely limitations of this approach to the management of scarce and unpredictable resources (no two years since 1964 have been exactly alike in terms of snowpack, rainfall, and the resulting pattern of water run-off in the Basin, and opportunistic behavior occasionally abounds), the parties to the Coordination Agreement have generally been able to agree on how to run the resources dedicated to coordinated operation. However, the operation of these resources is determined by the interests of the signatories to the

Agreement, and not by the decisions of a body charged with coordination and planning but without any of its own property rights at stake.

The Spill and NTSA Agreements illustrate that non-market entities can rely on market-like devices to resolve disputes and the establish rights and obligations for reasonably long periods of time, even in an area as contentious as water resources. The Agreements define certain amounts of water at specified times and places, subject to contingencies in some cases, and define the use of the water in the competition between fish migration and power production. The parties agreed on notice provisions, performance standards, and dispute resolution techniques. Although there is considerable skepticism about the extent to which these Agreements, as well as the Water Budget, will actually work, help the fish, and help avoid disputes, the contractual approach holds out more promise than do additional "coordination" and "planning".

CONSTRAINTS ON EXPANDING THE USE OF CONTRACTUAL MECHANISMS

Although the theoretical ideal of property rights may be relatively straightforward, and although some entities are apparently moving toward contractual mechanisms based on (implicit) water rights, there are significant obstacles to the expansion of rights in water resources, especially in the face of existing institutions. Some property rights may already be defined in ways that thwart exchange, and the attempt to bring about the reforms that will encourage exchange runs into conflicts with another form of property rights, those associated with the federal and state agencies charged with mediating conflicts among competing uses, or who perceive rights to control water use.

Bureaucratic adhesion to existing institutional arrangements can act as an effective property right, not over the scarce resource, but over the social and political devices used to allocate that scarce resource. It is thus necessary to devise reforms that take into account these "bureaucratic property rights", or to expect that crisis will be the only source of real change (not to say reform).

Aside from bureaucratic inertia, those individuals who benefit from the existing distribution of rights, however poorly defined, may be another hurdle for reform.[62] Existing state laws generally encumber any attempt to improve efficiency in the use of water, or to introduce market-like mechanisms to determine the optimal distribution of the available water among competing uses. State laws often do not establish charges for the use of water, and often allocate water during shortages based on the principle of seniority (prior appropriation, also known as "first in time, first in right"), by appeals to public virtue, by recognizing riparian rights (those on the banks of the rivers have the rights), or simply by requiring equal reductions from a base amount. Both appropriate and riparian rights vary depending on definitions of "beneficial use". These mechanisms may save on social transaction costs, but with unknown impacts on allocative efficiency. Existing state regulations may have been socially appropriate and even economically efficient at a time when society's total demand for water was less than the available supply, even assuming a price of zero. However, excess demand at the implicit price of zero has been a fact of life for some time in many areas, and the institutions established to allocate on non-economic grounds have been slow to change.[63]

We must recognize that water is an input into many different productive processes: fish, hydropower, agriculture, navigation, and water supply, among others. Each use has an interest in different amounts of water at different times and places under different conditions. Although some agencies are moving in the direction of contractually defined rights and obligations, a comprehensive solution to the current situation will first depend on defining property rights for *all* uses, both consumptive and ill-stream. As a first step, existing uses of the water should be temporarily frozen and inventoried, to establish the status quo as a "fair" allocation.[64] The "status quo equity rule" says that the simplest means to determine equity is to freeze existing allocations where they are, instead of attempting to determine the "superfair" allocation, which requires that each person in the allocation strongly prefers her assigned bundle of goods or services to everyone else's, or the "superequal" allocation, in which no individual prefers her most-preferred bundle of goods to her actually attained bundle. As Brown, et al., point out, superequality is simply impractical, because it requires the examination of all possible bundles of goods for all individuals, which would be practically infinite: "[i]mplementing such a scheme is implausible."[65] Once the inventory is complete, the next step is a deliberate move toward promoting the exchange of rights based on long-term voluntary agreements; this may require a *temporary* interstate compact agency, established solely to create the markets in which rights may be exchanged.

INSTITUTIONAL REFORM

The major defects of the River Basin Commissions were that they had no teeth, no staff, and no funding, and they were captured by the agencies they were intended to coordinate; they also had no responsibility or accountability, and could only plan but not act. Many but not all of these problems continued with the Power Planning Council. An effective interstate compact agency would have to have a very limited mandate: to establish the market in which property rights could be traded, and then to disappear via a sunset provision. Accountability could be established by strict timelines and deadlines: e.g., an inventory to be completed within 12 months and potential conflicts to be resolved with 36 months by independent arbitration *(not* by the agency) once the inventory was complete. The agency's remaining time would be spent establishing the rules under which trades would take place, based on freely negotiated contracts. Water rights should be assigned for a reasonably long period of time, or even in perpetuity. New contracts among parties with rights would be the only means by which additional uses or expansions of existing uses would occur. There would be *no* role for the agency in allocating those rights already established by law or vested interest or court order.[66]

This shift away from allocation by government agency toward allocation by voluntary agreement is necessary to accomplish existing environmental goals. There is a definite need to find a better mechanism to assign property rights to fish, especially in light of new petitions under the Endangered Species Act: government agencies, whose existence and budgets do not depend on careful husbanding of property rights, may not be the best stewards of environmental assets with common properties. It is almost an

oxymoron that we should create a federal agency to manage an asset that can be defined to have the characteristics of private property. If the asset can be defined and assigned, then other institutional mechanisms, perhaps not-for-profit, can be established that have a greater and clearer incentive to perform.[67] If anadromous fish require greater protection than they have received in the past, then we should recognize that the traditional institutional solution has not worked. Instead, entities with an incentive to act as "agents" on behalf of the fish should be located or created, and the "rights" of the fish to water resources should be assigned to these entities. (This conclusion holds for all other water rights as well.) Preferably, such entities would not be governmental in nature, with the associated lack of incentives, performance indicators, and feedback mechanisms, although there is also no need for such entities to be for-profit. Indian tribes and environmental groups with experience managing natural resources may be better "agents" for fish than existing or new government bureaucracies.

Butcher, et al, recommend a role for "congressional committee action and executive oversight" to integrate federal and state water law. Without doubt, the Northwest needs some mechanism to deal with the conflicts over state and federal jurisdiction. However, the "legislative/executive" approach has been tried and should be rejected: coordination and planning solutions have repeatedly failed.[68] Agencies designed solely to coordinate should be abolished or reformed. State agencies that manage natural resources should be required to conduct their business "as if" they were independent of tax revenues, or turn over their activities to other entities operating on a contractual basis. Performance measures, incentives, and penalties can be devised to

substitute for coordination and planning, which have no measureable content. Auction mechanisms may offer some promise of selecting even state entities to receive funding to manage environmental assets.[69] Non-profit entities should also be encouraged to bid to carry out public policy goals regarding the use of scarce natural resources in place of state and federal agencies.[70]

CONCLUSIONS

Several conclusions can be drawn from this review of non-market allocation of water resources in the Columbia River Basin. First, government agencies can both create and shift externalities, and are thus prone to some of the same sources of "failure" that undermine allocations by market mechanisms. Second, coordination and planning are not obviously solutions to the problems associated with a multiplicity of actors and fuzzy responsibilities. Third, over tune even government agencies have discovered the benefits of shifting toward a contractual basis for defining long-term relationships between economic and environmental variables, and for allocating resources that have substantial common property characteristics.

These lessons can be applied in the further pursuit of economic decision-making that benefits the environment. Water use can gradually but deliberately move toward a larger system of trading rights and systematic exchanges, analogous to the spread of the electric power system, which began as islands of individual companies that slowly interconnected as economics, engineering, and law grew more sophisticated. The

problem in power was defining property rights in keeping with technological advances. Those rights basically evolved slowly behind changes in engineering and economics.[71]

In the case at hand, dramatic changes in the law and practice of water use in the Columbia River Basin have occurred over the past fifty years, but these changes have mainly been limited to rearranging governmental institutions. As Hemmingway has noted,

> [i]t is a curious phenomenon of government that when it seeks to streamline a process encumbered in red tape or political stalemate, it often creates new procedures or a new bureaucracy without eliminating any of the old ones. The Northwest Power Act is a prime example.[72]

The Council's Fish and Wildlife Program raises important questions about the efficacy and efficiency of giving property rights in a common resource to a government agency, because it is not clear what incentives the agency has to make best use of those rights. As we have seen, the Council has exercised its "property rights" on behalf of the fish by requiring increased water flows at certain times and locations as well as hatcheries, research, and by-pass facilities, and yet the environmental crisis (perceived or real) that led to the creation of the Council has reappeared in renewed petitions under the Endangered Species Act.

Non-market solutions have been unable to avoid a repeat of the situation that led to federal legislation and a new bureaucracy in 1980. Coordination and planning cannot resolve competing demands on this scarce resource. Unless we decide deliberately to shift toward long-term contracts based on property rights, we run the serious risk that the errors and omissions of the last two decades will be perpetuated, increasing uncertainty and the risk of political and economic paralysis in the region. Based on their track

record, coordinating agencies are ill-equipped to make the difficult and complex decisions regarding this scarce resource. Recent events suggest that property rights can be defined and assigned, even by government agencies, and the record of non-market successes and failures should encourage more movement toward market-based solutions.

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NOTES

1. For a good review of several examples of change in the face of crisis, see Higgs (1987). For an historical perspective on changes in the European commons that emphasizes the confluence of political and economic factors, see Field (1989).

2. See Anderson (1983a,b), Frederick (1986a,b), and Wahl (1989).

3. The following has been stimulated by Wolf (1988) and Telser (1987).

4. Wolf (1988), 77. See also Stavins and Jaffe (1990) for more recent evidence of government-created externalities in the use of natural resources.

5. Wolf (1988), 61-2.

6. Specifically, the statute states that "[t]he Administrator [of BPA] and other Federal agencies responsible for managing, operating, or regulating Federal or non-Federal hydroelectric facilities located on the Columbia River or its tributaries shall ... exercise such responsibilities, taking into account at each relevant stage of decisionmaking processes to the fullest extent practicable, the [fish and wildlife] program adopted by the [Northwest Power Planning] Council under this subsection. If, and to the extent that, such other Federal agencies as a result of such consideration impose upon any non-Federal electric power project measures to protect, mitigate, and enhance fish and wildlife which are not attributable to the development and operation of such project, then the resulting monetary costs and power losses (if any) shall be borne by the Administrator in accordance with this subsection." Pacific Northwest Electric Power Planning and Conservation Act, P.L. 96-501, 1980, § 4(h)(11)(A)(ii).

7. See BPA, "Notice of Proposed Policy and Procedures to Compensate Costs and Power Losses at Non-Federal Hydroelectric Power Projects and Request for Comments", May 17,1988.

8. BPA, "Final Policy for Compensating Non-Federal Hydroelectric Projects for Monetary Costs and Power Losses Caused by Federal Agency Actions to Implement Columbia River Basin Fish and Wildlife Program Measures", June 14,1989.

9. These utilities almost undoubtedly do respond to the economic incentives posed by those rates. See Peters and Seiden (1987).

10. Case No. 89-70381; the case is under advisement after oral argument. In its Final Policy, BPA also decided to require claimants to disclose "(a]ny actions that the claimant took or could have taken to mitigate or reduce the impact created by the Federal agency imposition;" and "[a]ny generation capability the claimant may have had but did not use to realize benefit from the Federal agency imposition." An expansion of these particular externalities is threatened by BPA's agreement with the Columbia Basin Fish and Wildlife Authority over operation of the Non-Treaty Storage Agreement with British Columbia Hydro, which could reduce power production at the same non-federal hydroelectric facilities on the Columbia. This is discussed further below.

11. Pacific Northwest River Basin Commission (1972), Appendix XVI, June, p. 144.

12. Recent estimates indicate that current levels of internalized costs may be nearly "socially optimal". See Olsen et al. (1990).

13. P.L. 89-80, § 201(b)(l); printed in Pelz (1972), vol. III, 1828-1839.

14. For a review of previous attempts to coordinate government actions and a listing of the agencies involved, see "Review of Power Planning in the Pacific Northwest, Calendar Year 1981", Power Planning Committee, Columbia River Water Management Group, 1983.

15. Pacific Northwest River Basin Commission (1972).

16. *Ibid.*, Appendix XVI: "Comprehensive Framework Plans", June, Table 40,135.

17. For current water uses in the region, see U.S. Geological Survey (1990).

18. Pacific Northwest River Basin Commission (1972), Vol. 1, 355.

19. *Ibid.*, Appendix I: "History of Study", December 1971, 6.

20. *Ibid.*, Appendix XVI: "Comprehensive Framework Plans", June 1972,137.

21. *Ibid.*, 21.

22. "Water - Today and Tomorrow, Pacific Northwest Regional Program for Water and Related Land Resources". See "Review of Power Planning in the Pacific Northwest, Calendar Year 1979" Power Planning Committee, Columbia River Water Management Group, July 1980, p. 10.

23. *Ibid.*, 12.

24. Viessman (1981).

25. *Ibid.*, 3: summary of The Water Resources Planning Act: An Assessment", Report of the Subcommittee on Energy Research and Water Resources of the Committee on Interior and Insular Affairs, U.S.G.P.O., 1975.

26. *Ibid.*, 6: summary of "Improvements Needed by the Water Resources Council and River Basin Commissions to Achieve the Objectives of the Water Resources Planning Act of 1965", General Accounting Office, CED-78-1, 1977.

27. *Ibid.*, 7-8.

28. *Ibid.*, 9. See also 56: § 102(b) of the Act contains a mandate to assess coordinating machinery though it does not define coordination or give WRC the authority to coordinate in a forceful manner.

29. The theory of informational assymetry and the potential biases of cost-based rate-making have led to new regulatory proposals based on price caps, which may avoid or correct some of these problems.

30. Viessman (1981), 57, footnote deleted.

31. *Ibid.*, 58.

32. Executive Order 12319, September 1981.

33. The Council is also responsible for preparing a long-range power plan, to guide the actions of the Bonneville Power Administration in meeting the demand for electricity.

34. Northwest Power Planning Council (1987), 22.

35. Hemmingway (1983), 675.

36. Blakley (1988/89), 325.

37. Northwest Power Planning Council (1987), 27.

38. The first Fish and Wildlife Program, in 1982, temporarily stumbled on this problem: the agencies that were supposed to implement the Program could not agree on priorities and so many actions were delayed. In subsequent Programs the Council began to set out priorities. *Ibid.*, 161.

39. See Hemmingway (1983), 692. On the subject of the Council's authority versus that of the Bonneville Power Administration, see Hemmingway (1983), 684ff.

40. BPA, documentation for "1990 Programs in Perspective"; see also Northwest Power Planning Council (1987), 26, for an earlier, much lower estimate.

41. Northwest Power Planning Council (1987), 28.

42. Hemmingway (1983), 689.

43. Northwest Power Planning Council (1987), 151.

44. According to the Council, the Water Budget has reduced the firm energy capability of the Columbia hydroelectric system by about 300 aMW, which is expected to cost the power users between $40 million and $130 million per year, depending on the expected growth in electrical demand. As of late 1989, no studies had been done of the losses of hydroelectric capability due other non-power uses: flood control operations, irrigation withdrawals, navigation, municipal and industrial water use, and recreation. Northwest Power Planning Council, Response to Comments on the Council's Water Budget Impact on Firm Energy Letter dated May 17,1989, September 28,1989.

45. P.L. 96-501 (1980), §§ 4(h)(5) and 4(h)(6)(C).

46. Northwest Power Planning Council (1987), 57.

47. Northwest Power Planning Council (1987), 63.

48. Northwest Power Planning Council (1987), 70, italics added.

49. A similar failure occurred at the second powerhouse at Bonneville Dam, which has only been allowed to operate on a limited basis since it was built because the fish protection devices have a very low success rate. Northwest Power Planning Council (1987), 71.

50. In 1980, Congress also passed the Salmon and Steelhead Conservation and Enhancement Act, to encourage stability of Indian treaty and non-treaty fishing through the purchase of vessels, gear, and licenses, coordinated research enhancement, management of salmon and steelhead resources and habitat, and the improvement of recreational fishing.

51. Northwest Power Planning Council (1987), 24.

52. *Ibid.*, 176.

53. *Ibid.*, 99,103,105, describing the "supplementation* of naturally spawning stocks with hatchery stocks.

54. Datta-Chaudhuri (1990), 38.

55. Northwest Power Planning Council (1987), 54.

56. *Ibid.*, 53-4.

57. *Ibid.*, 58-59. See also Butcher, et al. (1986), 42.

58. *Ibid.*, 95.

59. *Ibid.*, 109.

60. *Ibid.*, 143.

61. This follows also the direction adopted by the Department of the Interior in late 1988, for voluntary water transactions. See Wahl (1989), 297-99.

62. The following relies on Butcher, et al. (1986), 25.

63. See also Frederick (1986a).

64. See Brown et al. (1989), especially 19-23.

65. *Ibid.*, 22.

66. It is important not to regulate heavily the subsequent trades in water rights. According to Vaux, a survey of water trades in California in the mid-1070s found two characteristics of such trades: clear title resided with seller, and trades were not subject to review and approval by State Water Resources Control Board. Vaux, in Frederick (1986b), 95.

67. On a similar note, the Council has required other federal agencies to submit regular budgets and work plans, but has only just begun to bear a responsibility to demonstrate that its own actions and deliberations on behalf of the fish have in fact improved the situation. Northwest Power Planning Council (1987), 182.

68. On this score, Senator Hatfield (R.-Oregon) has introduced legislation that would in fact create yet another federal agency to "coordinate" water resources.

69. For example, the Washington State Energy Office recently submitted a demand-side management bid in response to a request by Puget Sound Power and Light for proposals to supply energy resources.

70. Northwest Power Planning Council (1987), 62.

71. In 1900 the idea of defining the long-term right to receive 350 mW per hour at 500,000 volts for a given number of hours at a given point of delivery coupled with the obligation to return the energy at a later time unless restrictions were placed on the return would have been inconceivable. Hughes (1983), especially Ch. XII.

72. Hemmingway (1983), 689.