

COMMON PROPERTY, REGULATORY PROPERTY, AND ENVIRONMENTAL PROTECTION: COMPARING COMMON POOL RESOURCES TO TRADABLE ENVIRONMENTAL ALLOWANCES.

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Introduction

The days are long gone in which environmentalists have believed that there is a "nature" or "natural world" out there, separable from human activity. Our newspapers are full of stories of the overhunting, overfishing, overgrazing, and polluting activities affecting even the most remote areas of the globe.

Because no corner of the world's environment is untouched by human activity, environmental protection must be seen in large measure as a matter of human social organization. But what social organization is possible for dealing with environmental resources? The pessimistic views of Garrett Hardin, and his successor William Ophuls, have been well-known for decades: on Hardin's analysis, as elaborated by Ophuls, environmental resources are the locus of the "tragedy of the commons," a multiple-person Prisoners' Dilemma (PD) (Hardin, 1968; Ophuls, 1977; Ullman-Margalit, 1977). Here it is in the interest of each resource user, taken individually, to exploit the resource a outrance, while doing nothing to conserve—with the result that otherwise renewable resources instead become wasting assets. On their view, environmental degradation—overfishing, deforestation, overgrazing, pollution, whatever—is only a bleak set of repetitions of the "tragedy," and only two solutions are possible to stave off the tragic decimation: individual property on the one hand, which internalizes the externalities of common

pool exploitation, or "Leviathan" on the other, the governmental directives that force individuals to perform in ways that promote the common good.(Hardin, 1968; Ophuls, 1977)

The great service of Elinor Ostrom and her colleagues, of course, has been to contest this bleak view, and to offer a powerful set of counterexamples of conservationist social institutions. Ostrom and her colleagues have pointed out that the problem Hardin called "the commons" was rather a problem of "open access," whereas a "common property resource" (CPR) may suffer no such decimation. Indeed, Hardin's dominating example of the medieval common fields was not tragic at all, but was rather part of a sustainable agricultural practice that lasted centuries, if not millennia (Ostrom, 1990; Cox, 1985; Dahlman, 1980; Rieser 1999; H. Smith, 2000).

CPRs have by this time been the subject of a growing and rather affectionate literature, including descriptions and analyses of community-based resource management practices all over the world—Turkish fisheries, Japanese and Swiss grazing communities, ancient and modern Spanish irrigation areas, communal forestry in India and Indonesia, medieval English "fen people," northern Canadian hunting and fishing clans, Maine lobstermen.(Berkes, 1995; Bosselman, 1996; Ostrom, 1990)

Obviously, there is a great deal to be said simply for setting the record straight about what the commons really mean and have meant over time. But there are larger lessons implicit or explicit in the CPR literature as well, and they are lessons of a somewhat more political nature. First is the lesson that voluntary social action is possible, and in particular is possible as a means to solve resource-related problems. That is to say, contrary to some of the more pessimistic presentations of the dismal science, human beings are not always individual maximizers, getting themselves stuck in the endless repetition of n-person PDs; instead, quite ordinary people have

the psychological, social and moral wherewithal to arrive at cooperative arrangements on matters of common interest. The second lesson is that bigger is not always better. More particularly, the CPR literature offers numerous examples in which larger governmental forays into resource management are distinctly inferior to community-based solutions; and indeed, governmental intervention may badly damage perfectly workable community systems. In short, the CPR literature argues strongly that smaller, community-based resource management offers models for efficient and sustainable resource use.

Given the surge of interest in CPRs, it is curious that CPR structures do not appear more frequently in legal proposals for the improvement of environmental regulation. This is not because legal scholars are unaware of CPRs. Although CPR scholars for the most part appear to be completely untouched by legal scholarship, the reverse is not true; legal scholars regularly cite major CPR studies in a number of contexts, from intellectual property (Merges, 1996) to the burgeoning literature on informal norms (Ellickson, 1991). But aside from a handful of scholars (Bosselman, 1996; Rieser, 1997; Rose, 2000), few in the legal academy have paid much attention to CPRs as potential engines to drive improved environmental regulation.

Instead, the poster children of proposed environmental improvement are tradeable environmental allowances (TEAs). TEA regimes have already been established, to great applause, for the regulation of sulphur dioxide in the United States; they have been used to manage fisheries in Australia, New Zealand and elsewhere; and they are very likely to become a central element of international regimes to control greenhouse gases (Rieser, 1997; Stavins, 1998). Their attractiveness lies in their property-like characteristics: as with conventional property, it is thought that if resource users are confronted with the need to purchase TEAs, they

will husband resources carefully and will consider conservation or innovation to take the place of resource use. (Ackerman & Stewart, 1988; Kriz, 1998, Tipton 1995) While TEAs do not entirely vindicate the Hardin/Ophuls view that the choice for governing structures lies either with private property or with Leviathan, TEAs do have a Hardin/Ophuls ring about them. TEAs in effect combine Leviathan with private property; they are state-created private rights, tradeable in a market along with other commodities.

Despite their differences, however, TEA and CPR regimes share a basic underlying structure. Neither takes a "hands off" approach to environmental protection. Quite the contrary, both types of regime contemplate some use or consumption of renewable resources, whether those resources are wildlife, fish, grasses, trees, the air mantle, aquifers, surface water stocks, or whole ecosystems. But while both regimes contemplate consumption, in both the critical issue is to limit that consumption to a some "fringe" amounts that are compatible with the renewal of the underlying core of the resource stocks.

Beyond those basics, however, CPRs and TEAs diverge dramatically. For example, in TEA regimes, as modern legislative programs, there may be an explicit discussion of the appropriate setting for the overall permissible "fringe" usage of the resource in question, that is, the total allowable take or total allowable catch of the resource (Ackerman & Stewart, 1988). In CPR regimes, on the other hand, explicit discussions of this sort are less likely to occur, and the total take is more likely to emerge from traditional practice (Seabright, 1993). Even more noticeable are the very different ways in which individual entitlements are allocated and enforced. TEA regimes split up the allowable totals into individual allowances, and permit the trade of those allowances among total strangers, leaving enforcement largely to governmental

bodies. In CPR regimes, on the other hand, individual entitlements depend on longstanding residence, reputation, and adherence to community norms—norms that are often very elaborate, and that are enforced by the community members themselves.

I will return shortly to both these subjects, that is, the question of setting the total take on the one hand, and the structures of entitlements on the other hand. I will do so because both subjects have some bearing on the series of comparisons to which I now turn. In these comparisons, I look to various dimensions of environmental issues, and I ask how CPRs and TEAs respectively fare.

CPRs and TEAs as Management Devices under Varying Conditions.

1. Resource Size.

One important dimension of any environmental issue is simply the size of the resource in question. Environmental resources are generally too large for individual ownership. In fact, that is what creates environmental problems: individual resource uses have spillover or common pool effects on other persons and resources. The environmental resources of air, surface water, groundwater, and wildlife lie adjacent to individual landholdings. But the landowner who burns trash affects the neighbors' air; similarly, the landowner who removes trees on his own land may diminish nesting bird populations and contribute to an insect explosion throughout the vicinity. And similarly again, the landowner who spills toxins on the ground may pollute an aquifer or stream that carries the deadly materials miles into the distance. In all these instances, individual uses of individual property spill out into a larger environmental arena. Global environmental issues of course carry over much larger spaces; the most everyday form of combustion anywhere

in the world—a motor scooter, a backyard barbecue-- may contribute to greenhouse gases that raise global temperatures, lift the levels of the oceans, and contribute to melting tundra. (Weiner, 1999)

Indeed, the sheer size of many environmental problems may be one reason why CPRs have been relatively little noticed as social management regimes for environmental resources. The study of CPRs takes place in a growing context of "new institutional economics," a study of non-governmental social problem-solving of all sorts. A growing consensus suggests that human beings can indeed overcome PD problems (including the n-person form of the "tragedy of the commons"); that is one of the chief lessons of CPR scholarship. But certain group factors are very helpful—especially relatively small numbers, kinship or other intense relationships such as religion, and/or interactions on wide numbers of fronts. Such factors lend themselves to the formations of mutual trust and the emergence of shared behavioral norms; trust and norms in turn allow people to overcome commons problems, of which environmental problems are of course a species.(Ellickson, 1991; Ullman-Margolit, 1977)

But if environmental problems have large and even global dimensions, then CPRs would appear to be beside the point; the range of CRP social interactions is simply too small to contain the larger environmental damage, and indeed may exacerbate that damage. Nineteenth-century whalers, for example, navigated the globe but often came from the same towns, in which they enjoyed thick familial and associative relationships; perhaps not surprisingly, at sea they generated group customary practices that assisted in the cooperative capture of these large and dangerous animals. But no overarching social norms ever developed among groups of whalers to regulate the total catch of the various types of whales, with the well-known result that a number

of the most valuable species were decimated. (Ellickson, 1991)

Resource size, then, seems to favor TEAs, with their formal structures and reliance on governmental enforcement rather than social norms. Indeed, TEAs operate best at larger scales for another important reason as well. One of the positive features of TEAs is precisely that they can be traded, so that the allowances tend to flow to those who value them most. But trading works best in large, thick markets. That is why TEAs are feasible for the far-ranging gases like sulfur dioxide, where many market participants can participate in trades, but TEA regimes are less easily established for more localized pollutants. (Schmalensee et al, 1998)

This is not to say, however, that CPR regimes are irrelevant to environmental problems, even global ones. Some seemingly global environmental issues are in large part an additive sum of intensely local ones. "Biodiversity loss," for example, is in some measure an umbrella term for a whole series of local losses, from golden-cheeked warblers in Austin, Texas, to radiated tortoises and lemurs in Madagascar (Webster, 1997). In the United States, the most serious loss of species is in isolated Hawaii, and indeed this pattern is typical; it is precisely the isolated areas that are most likely to have unique plants and animals that have come under siege (Dobson 1997). Moreover, global problems may have at least some localized solutions; greenhouse gases, for example, may be sequestered in local forests. Insofar as environmental problems can be subdivided into more local ones, then, CPR regimes may still be players in the environmental game.

2. Resource complexity.

It is a truism in environmentalism that everything is connected to everything else. Pull one thread, it is often said, and the entire skein unravels. If true, this interconnectedness would

create problems for either TEA or CPR regimes, since both contemplate some use of resources; to be environmentally friendly, the contemplated "fringe" use must be constricted to some level that is compatible with renewability of the resources used. Thus the complexity and interactiveness of environmental resources brings us back to an subject mentioned earlier: what is the appropriate level of use, the total "take," of any given environmental resource?

The fishing industry may have been the first to attempt to answer this question in a disciplined way (Scheiber & Carr, 1997) Toward the end of the nineteenth century, fishing industry experts hit upon the concept of "maximum sustainable yield," an amount that related fishing effort to its effect on the underlying stock; on this view, an appropriate limit on total fishing effort could maintain a consistent maximum catch level. Similar ideas soon pervaded forestry practices, as reflected in the US Forest Service mantra of MUSY (maximum use, sustainable yield). By the 1950s, the great resource economist Scott Gordon refined the model, observing that the appropriate economic goal should not be to maximize the yield but rather the "rents," the difference between revenues and the costs of extraction. Gordon's work suggested instead the goal of "maximum economic yield" (MEY), a total take level that has become the new conventional wisdom in resource economists (Gordon, 1954; Townsend & Wilson, 1987).

But more recent scholarship has cast doubt even on the MEY goal in the environmental context. Once again, fishing gives an example: although human catch levels clearly influence fish populations, many other things do as well: weather patterns, shifts in water temperature and currents, alterations in food sources and predators, and so on. All these fluctuating factors undermine not only the idea of some ideal climax state of any given resource, but also the idea of a smoothly curved relationship between human activity (fishing, pollution) and resource stock

levels (bountiful fish, clean air). The new "nonequilibrium" thinking suggests that complex and interrelated resources fluctuate in much spikier patterns, and that the best management method may be what is called "adaptive management"—basically, intense use followed by rapid shifts away from the resource at early signs of trouble, allowing the resource to recover (Tarlock, 1994) (Townsend & Wilson, 1987).

Now, returning to TEAs and CPRs, I begin with TEAs: the rhetoric of total take in TEA regimes often sounds rather close to the traditional resource economists' models. In analyzing "optimal pollution," for example, the goal is often said to be to equate prevention costs and environmental damage at the margin, as illustrated by curves on the conventional charts (e.g. Shavell & Kaplow --). In fact, however, current TEA regimes have set totals in a manner that departs from economic models, and instead have generally taken historic practice as the benchmark: they generally roll back previous use levels by some agreed-upon percentage (Heinzerling, 1995; Stavins, 1998; Tipton, 1994).

It is hardly surprising that rollback should be the method of setting totals, given the intense political pressures surrounding the introduction of any new environmental regulatory regime—particularly a regime in which users will have to pay for something they previously used "for free" (Libecap, 1989). Rollback is an easy concept to grasp, and it seems to distribute costs with some rough justice. Moreover, rollback can be quite effective to cut down use; for example, the U.S. acid rain control legislation, which instituted TEAs in sulfur dioxide, cut total sulfur dioxide production by quite substantial amounts (Schmalensee et al, 1998). All the same, rollback can hardly be called adaptive management. While rollback amounts can be rolled back further in the future, political inertia creates "stickiness" for rapid adaptation once rollback levels

are set.

Moreover, aside from the methods of setting totals, another factor also impedes rapid adaption in TEA regimes, bringing us again to a second subject mentioned earlier: the methods of allocating individual entitlements. If TEAs are to bring the usual advantages of property rights—encouraging care and investment by right-holders—then individual allotments must be relatively secure, so that the holders of these rights can rely on them and plan accordingly. Moreover, if TEAs are to bring the standard benefits of trading and marketability—allowing the entitlements flow to those who most value them—these allowances must be relatively simple, so that can be more or less fungible, and so that future holders know what they have. Thus if regulators hedge TEAs with qualifications and conditions, they will undermine both their security and their marketability. (Rose, 2000)

This pattern creates something of a dilemma for the flexibility of TEA regimes. In Australia, for example, fishery managers realized that too many TEAs had been allocated for the health of the fishery; but they faced "takings" claims if they tried to cut back on the existing entitlements. Noticing this pattern, and noticing the reluctance that buy-back programs elicit among politicians, some proponents of TEAs have proposed that the TEA be set at a given percentage of the resource rather than at some fixed amount. But they have further noted the problem: that a percentage-based right is more labile, and hence offers less security and marketability to the holders (Tipton, 1994).

These are not insuperable problems for TEA regimes, and some ingenuity can no doubt help to create a practical balance between flexibility and security, as is the case with other property regimes—even landed property, which is relatively secure but still subject to eminent

domain and regulation. But the problems do suggest that TEA regimes may be insufficiently responsive where environmental resources are most densely interactive, complex, and fluctuating.

Indeed, related problems may derive from the necessarily relatively simple rights structures of TEAs. Because TEAs are designed to be traded, their rights structures are necessarily fairly simple; otherwise they could not be easily marketed. In the air pollution area, TEAs focus on a single pollutant, like sulfur dioxide in the existing regulations for acid rain precursors, or perhaps carbon dioxide for future regulation of greenhouse gases. In fisheries too, TEAs are also defined in some measure of weight in particular species, e.g. each TEA corresponds to some number of pounds of quahogs or surf clams. But these relatively simple measures can lead to problems when applied to complex and interactive resources. For example, in fishing, the gross weight of the landed catch may correspond only very inexactly with species conservation. Holders of fishing TEAs know that the larger-size fish are more profitable than the small ones, and "highgrading" fishermen may actually catch far more fish than their allowances suggest, throwing out the small specimens and keeping the large fish. Even more serious in a complex ecosystem, TEAs in a target species may make fishermen careful about that species, but they may kill with abandon other species, the so-called "bycatch." (Tipton, 1994; Rieser, 1997; Rose, 2000)

These problems of highgrading and bycatch have been noticed in the literature on fishing TEAs, and even strong TEA proponents have suggested that supplemental command-and-control regulation to control these problems (Wilens ----). As I have noted elsewhere, these problems are examples of a phenomenon that might be classed as "too much property": creating property

rights in one resource may create an imbalance, drawing care and attention to the propertized resources, but crowding out non-propertized resources. (Rose, 1998) Imbalances of this sort are apt to be most serious where resources interact in complex ways. Unless hedged with other regulations or supplementary property regimes, property rights in a single segment of this web could undermine the larger ecosystem. But of course regulatory hedges complexify the TEA property rights, making them less secure for the holders and less tradeable to others.

What about CPRs? Interestingly enough, although traditional CPRs are far less organized around rational planning, and far more driven by tradition and norms, some CPR regimes may have certain advantages with respect to complex resources. The new, dynamic understanding of environmental resources suggests that intensive use and prompt switching are appropriate adaptive management techniques for complex resource bases (Townsend & Wilson, 1987) . Certain traditional resource practices follow this pattern-- hunting, fishing, planting and gathering in "pulse" patterns, and moving from resource to resource over the course of time (Berkes, 1987; McEvoy, 1986). This pulse pattern sometimes follows no set of conscious calculations about the whole stock; indeed, a common traditional belief in hunting and fishing communities is that human activity does not affect the stocks of wild animals. Rather, it shows disrespect to the fish or animals to suggest that they are ruled by human action; instead, the resource stocks are thought to be controlled by the animals themselves, or by God (Berkes, 1987; Brightman, 1987; Carrier, 1987)

Such beliefs run quite contrary to modern resource management techniques; e.g. they may impede counting fish or other wildlife for conservation purposes, since counting is "disrespectful." In that sense these beliefs could be counterproductive in some circumstances,

and could lead to the complete decimation of particular resources. My own view is that this is most likely to happen when traditional practices are confronted with sudden shifts in commercial demand from outsiders, and I will return to that subject. But because CPR regimes often rest on diversified resource bases, whose parts are exploited with relatively low technology methods in "pulse" patterns, CPR practices do often correspond in a rough way to adaptive management, perhaps particularly in groups that subsist by hunting, fishing, and gathering communities. (McEvoy, 1986)

More settled CPR regimes, e.g. grazing or irrigation regimes, are undoubtedly more consciously attuned to the human impact on underlying resources, perhaps because water levels and agricultural resources are more visible than wildlife stocks. But here too traditional practices may respond adaptively to overall resource levels. For example, Swiss grazing villages limit the right of any individual to "common" of more sheep than the individual can feed over the winter; this is a rule that would appear to vary approximately to the levels of forage vegetation. (Ostrom, 1990)

These adjustments are possible for CPRs because the individual entitlements in CPR regimes are often defined in an adjustable way--unlike the more fixed TEA entitlements. There is a tradeoff here, as there is in TEAs, but it is made in the opposite direction: CPR practices often show considerable flexibility and responsiveness to dynamic natural change, but at the cost of the security and tradeability than promotes investment and innovation.

3. Extraction vs. pollution.

Environmental problems may be grossly divided into two classes: the pollution or

"putting-in" issues on the one hand, and the "taking-out" or extractive issues, like fishing or hunting or even farming. Curiously enough, in a very rough way, this distinction maps onto TEA and CPR regimes. While there currently some extractive TEAs in the form of individual fishing quotas, the best-known TEAs are about pollution-- that is, the sulfur dioxide TEAs in the U.S. Acid Rain program (Stavins, 1998). Proposed new applications of TEAs also tend to focus on pollution control as well, particularly the effort to cut back on global greenhouse gas emissions. By contrast, CPRs are generally organized around "taking out" or extractive issues--fishing, hunting, irrigation, agriculture, grazing, and the like.

What are the reasons for this pattern? Any answer is necessarily speculative, but there are some possible reasons for this rough division of labor, some of them harking back to subjects already touched upon above.

(1) First is the factor of regime size: Pollution problems are typically externalized onto outsiders. While CPR practices undoubtedly control the ill-effects of pollution within the community, a CPR community is unlikely to have much motivation or ability to contain pollution that only affects outsiders, except insofar as they are required to do so by interactions with "downstream" CPRs. TEAs, on the other hand, are typically organized by larger governmental bodies, and they are aimed precisely at controlling external effects of the use of environmental resources (Esty, 1996). Thus where pollution is likely to flow far from its source, TEA regimes would seem to be more practicable than CPRs.

(2) A second factor is monitoring. Both CPR regimes and TEAs depend on monitoring; indeed, every property-based regime must have the ability to ascertain whether rights-holders stay within their allotments, or the entire regime will unravel. But in general, extractive

activities are much easier to monitor than are polluting ones: harvested logs can be observed, the fish or hunting catch can be seen, and even overuse of grazing fields is noticeable, while pollution may be entirely invisible. While some extractive activities may be undertaken surreptitiously (e.g. cheating in taking water from irrigation ditches), CPR regimes structure rights so that community members can monitor and control one another with respect to this type of overreaching (Ostrom, 1990; Smith, 2000).

The difficulties of monitoring extractive activities, however, pale by comparison to the problems of monitoring introduction of pollutants into the air or water or groundwater. Not only does the receiving medium disperse the polluting elements, but insofar as pollutants are invisible and intangible, even polluters themselves may not know what they are doing. Insofar as CPR communities are relatively small and scientifically unsophisticated, they may lack the technical ability to monitor many forms of pollution. Monitoring pollutants is a critical and extremely difficult issue for TEA regimes as well, but larger governments enjoy economies of scale with respect to scientific research (Esty, 1996). Indeed, TEAs have only become feasible as governments have acquired the technical skills to monitor and model pollutants, e.g. with remote sensing satellites or with sophisticated chemical tags (Rose, 1998, Schmalensee et al, 1998).

(3) A third factor may relate the different feedback effects of "putting in" and "taking out" activities, a point that relates to the new dynamic model of the environment discussed earlier. Extraction of certain resources—e.g. fruits or shellfish—may have deleterious effects that ripple in unexpected feedback loops throughout an entire ecosystem, but here the practical "adaptive management" of CPR regimes may be advantageous; such adaptive regimes can respond to particular resource shortages by moving on to others, before the ill-effects cause resource crashes

with all the attendant disruptions to the larger ecosystem.

Like extractions, pollutants too have ripple effects throughout an ecosystem. By the same token, removals of pollutants consequently also have ripple effects. But here the ripple effects--i.e. from pollution removal-- are generally considered an unalloyed good. For this reason, the simple and single-element focus of TEAs is generally unproblematic with respect to pollution control; removal of, say, SO₂ may have synergistic effects that are not taken into account by TEA holders, but those effects are all desirable ones. Moreover, although CPR regims may have complex and flexible responses, these flexible responses give no particular advantage with respect to pollution removal, since any such removals, no matter how simple and single-resource focused, are likely to represent an advance over a more polluted condition.

For these various reasons, one might expect CPRs to be most effective with the management of environmental issues revolving around "taking out" or resource extraction, while TEAs are probably at their most effective with "putting in" or pollution problems. No doubt there are exceptions, but there are also some reasons why we might be more likely to find TEA regimes associated with pollution control, and CPR regimes associated with issues of resource extraction.

4. Commerce in resources.

In Western legal regimes, commercially available property tends to be divided into a finite and relatively limited number of categories. Thus in Continental countries, property rights must be among the "numerus clausus," a defined and closed set of cognizable types property rights; somewhat similarly, Anglo-American property regimes also provide a number of off-the-rack forms of property, and they sharply discourage others. Recent scholarship suggests that

this pattern stems from the fact that a property right—as distinguished from a contractual right—is traded commercially from one person to the next, and then on to the next and the next. Because property is traded to strangers, property rights need to be relatively simple, so that strangers will know what they are getting. (By contrast, contracts can create far more complex forms of rights and duties, because these obligations generally affect only the immediate parties, who know the "deal.") Thus for the sake of trades that may take place over many years among complete strangers, Western property rights pare back the forms to a limited number of relatively simple forms. (Rose, 1999; Merrill & Smith, 2000).

TEAs, because they are tradeable, are subject to the same pressures for simplification. Simplification in TEAs is well-known to cause imperfections; for example, because of prevailing west-to-east wind patterns, sulfur dioxide TEAs are more damaging if traded and exercised in the Midwest than they would be if exercised on the Atlantic coast (Revesz, 1996; Stavins 1998). But if TEAs were hedged with qualifications as to location, they could split into numerous different markets, creating the usual problems of thin markets (holdouts, strategic bargaining etc.), and also creating problems for monitoring ("did Factory X purchase enough of the right kind of rights for its location?").

In an imperfect but relatively simple form, however, TEAs can be effective devices for dealing with commerce and for incorporating strangers into that commerce. Strangers and innovators can purchase and sell TEAs, and officials can monitor and police their use, no matter who they are. If demand rises and a given environmental resource becomes scarce, the market-based TEA regime responds automatically, by a rise in prices. In turn, a price rise may encourage innovation in substitutes, for example in more effective and cheaper pollution control

devices. In this way, TEAs can protect environmental resources from changes in commercial demand. Again, TEAs illustrate the tradeoff between different desirable factors: they can accommodate demand shifts, and they encourage innovation as well as passage of rights to those who most value them; but the cost of these good things is that TEAs may be only inexactly adjusted to natural environmental conditions.

CPRs, though sometimes highly adaptive to natural change, are much less adaptive to commercial practice, and in some ways they may leave environmental resources much more vulnerable to commercial pressure from outsiders. Commerce opens up the uses of resources to vastly larger numbers of people, but unfortunately, CPRs sometimes seem ill-equipped to deal with this phenomenon. A particularly sad example of environmental decimation is now occurring in Madagascar, where endangered radiated tortoises are being hunted out by local gatherers. These animals were once hunted only for occasional feastday meals, but they are now the object of an illegal but seemingly insatiable trade to collectors throughout the world. Local peoples have responded to this leap in commercial demand by hunting as many tortoises as they can today, shrugging off tomorrow's almost certain dearth (Webster, 1997). Because of the suddenness and unexpectedness of this demand--perhaps reminiscent of the European demand for beaver several centuries ago in Northern Canada--local peoples seem to have had insufficient time to develop norms or customs that might withstand this onslaught, or that might contain their own contribution to it (Brightman, 1987).

Having said all this, there are certain ways in which CPR customary practices sometimes do contain the onslaughts of commerce, precisely because of the impediments that CPR norms raise to commerce. Whereas TEAs are driven towards relatively simple forms, like most

Western property entitlements, CPR entitlements seem to be driven toward complexity. Rights structures may be fabulously complicated; Papuan fishermen, for example, own overlapping rights to fish in certain places as well as other rights to fish with certain equipment (Carrier, 1987); pre-contact Maori families owned overlapping rights in objects as small as individual bushes (some had fowling rights, others berrying rights) (Banner, 1999); and in medieval Europe, villagers owned scattered strips in the fields (Dahlman, 1980; Smith, 2000). Long residence, kinship, extended practice, and the respect of one's fellows are necessary for the full enjoyment of many of these entitlements, and even where an occasional outsider enters, e.g. by buying land, he or she is subject to a seasoning process (e.g., Acheson, — ; Acheson, 1987)

In short, quite the opposite of TEA regimes, in CPR practice, outsiders find it difficult to enter, and insiders cannot easily sell out. What this means, however, is that the members of the CPR community are stuck with one another, due to the very complexity of entitlement structures. And being stuck with one another, they are more likely to interact on multiple fronts, and those dense interactions make them more likely to generate the normative structures that help to moderate their own uses of resources (Ullman-Margolit, 1977; Rose, 2000). In that sense, the complexity of CPR entitlement structures is part of a social pattern that may protect environmental resources from both insider and outsider depredations. Insofar as complex entitlement baffle and thwart outsiders, they may also discourage outsiders from getting their hands on common resources; hence the very anti-commercial character of CPR entitlements may protect these resources from commercial shifts.

Historical examples suggest, however, that while CPR practices may impede outside access to the resources most central to the CPR community, these same practices are very weak

at containing unexpected waves of commercial demand for resources not previously considered important or scarce to the community members. The terrible overhunting of Madagascar tortoises is one example, the decimation of sandalwood in early post-contact Hawaii is another, the historic overtrapping of beaver in the Canadian North is perhaps a third. In all these cases, outside commercial demand devastated environmental resources that were nominally in control of CPR community; indeed, CPR community members were recruited to participate in the decimation. Perhaps because CPR regimes are governed by norms that emerge over time, these regimes have proved unable to adapt rapidly enough to save some resources from sudden spurts in human demand.

All this suggests that as between TEAs and CPRs, TEAs are vastly better prepared to cope with shifts in human demand on natural resources. Notice the contrast to resource scarcity coming from natural shifts; there, as was discussed earlier, CPR practices may be preferable, and show more of the characteristics of adaptive management. But with respect to commerce, matters are different. TEAs are creatures of a thoroughly commercial understanding of property and contract, and for all its reductionist faults and oversimplifications, this is an understanding that is centrally aimed at accommodating, monitoring, and controlling relationships among strangers. All this suggests that if CPR structures are to be deployed to manage environmental resources that have become commercially valuable in the modern world—e.g. wildlife in reserve areas—CPRs communities may need assistance (or restraints) from the state, in order to shield them from direct contact with that commercial demand.

5. Adding it all up.

Putting together all these factors, one is struck by the degree to which TEAs and CPRs are mirror images, having the opposite strengths and weaknesses. In a chart form, and discounting for the extremes of "ideal type" presentation, their respective situational advantages might be laid out as follows:

<u>TEA characteristic/advantage</u>	<u>TEA characteristic/advantage</u>	<u>CPR characteristic/advantage</u>
<u>scale</u>	large	small
<u>resource complexity practices encouraged</u>	simple, single-focus security of investment, innovation	complex, interactive adaptation, longterm stability, risk sharing
<u>social structure</u>	loose, stranger relations	close-knit
<u>adaption to shifts in human demand</u>	adaptive	unadaptive
<u>adaption to shifts in natural environment</u>	unadaptive	adaptive
<u>resource problem type</u>	pollution (putting in)	extraction (taking out)
<u>relation to commerce</u>	accommodates commerce	vulnerable to commerce

Thus while TEAs have been the flagship for modern property rights schemes in environmental resources, there is also something to be said for CPRs as property-based environmental management regimes. Indeed, one can say the most good things about them precisely at the points where TEAs tend to be least effective as environmental protectors.

Among institutional economists, perhaps this is not news; CPRs have acquired something of a cheering section among those who study them. I think there is some reason to be cautious about joining this cheering section unqualifiedly, however. It might be well to keep in mind that American legal institutions in the past, for the most part, were implacably hostile to "customary law," the efforts to claim a legal place for customary practice. There were some notable

exceptions—the acceptance of newly-formed customary norms in certain new industries, as among gold miners and whalers. But unlike British courts, American courts refused to accept the claim that long-standing practice, without more, could create legal rights that would govern communities (Rose, 1994) .

The reasons given were instructive: American courts thought that customary rights were feudal remnants, smacking of the hierarchy of manorial life, at once sclerotic and anti-democratic. They thought that communities should be governed not by the accidents of hoary custom, but rather according to the open constitutional practices of a democratic republic, in which legislation was openly discussed, determined, and changed by elective representatives (Rose, 1994).

An unjaundiced view of modern CPR regimes should give rise to some of the same concerns that track through the very inhospitable nineteenth century American jurisprudence of "customary law." Take, for example, James Acheson's attractive, picturesque, and much-cited portrait of the lobster fishermen of Maine's Monhegan Island. The islanders are effectively a CPR community, controlling depredation of nearby lobstering grounds by following customary norms; they allocate fishing rights among themselves and use informal punishment to defend the "perimeter" of their fishing grounds from outsiders (Acheson, ----; Acheson, 1987) In a somewhat flintier light, however, these same lobster fishermen appear to be much less attractive: they look xenophobic, hierarchical, thuggish, and thoroughly misogynist. Feminist writers on international human rights echo such concerns in discussing demands for the devolution of governing authority onto fundamentalist religious communities (Okin, —; Shahar ---): these communities too seem xenophobic, hierarchical, thuggish and thoroughly misogynist. This is

not to say that CPRs should all be viewed with suspicion. But some of them should, on democratic grounds, however environmentally friendly they may be.

Perhaps the strongest case for the recognition and promotion of CPR regimes is actually a feature of international human rights: recognition of CPR practices can help to protect traditional communities who would otherwise be deprived of their longstanding homes and livelihoods altogether, in large part through the operation of conventional European-model property regimes, in which traditional CPRs are simply invisible as property (Rose 1998). As Lee Breckenridge has pointed out, there are a number of areas in which conservationist concerns overlap with such human rights concerns, and it is in those areas that the recognition of CPRs are likely to be most attractive (Breckenridge, 1992).

Even aside from that, as this paper and others have pointed out, there is an environmentalist case to be made for learning from traditional CPRs. But that case may be strengthened by attempting to devise modern CPR regimes in which participation is more egalitarian and democratic. Hanoch Dagan and Michael Heller argue that we have models of such "liberal property" regimes in cooperatives, condominiums, and even corporations (Dagan & Heller, 2000). It may be that the future of CPRs, with their many environmental strengths, indeed lies in this more liberal direction.

SOURCES CITED

James M. Acheson, *The Lobster Gangs of Maine* —.

James M. Acheson, *The Lobster Fiefs Revisited: Economic and Ecological Effects of Territoriality in the Maine Lobster Industry*, in Bonnie J. McCay and James M. Acheson, *The Question of the Commons: The Culture and Ecology of Communal Resources* (1987).

Bruce A. Ackerman and Richard B. Stewart, *Reforming Environmental Law: The Democratic*

Case for Market Incentives, 13 Colum. J. Env't'l L. 171, 184 (1988).

Stuart Banner, Two Properties, One Land, in 24 L. & Soc. Inquiry 807 (1999).

Fikret Berkes, Common-Property Resource Management and Cree Indian Fisheries in Subarctic Canada, in Bonnie J. McCay and James M. Acheson, *The Question of the Commons: The Culture and Ecology of Communal Resources* 66-91 (1990).

-----, Indigenous Knowledge and Resource Management Systems: a Native Canadian Case Study from James Bay, in *Property Rights in a Social and Ecological Context: Case Studies and Design Application* 99 (1995).

Fred P. Bosselman, Limitations Inherent in the Title to Wetlands at Common Law, 15 Stan. Env't'l L. J. 247 (1996)

Lee Breckenridge, Protection of Biological and Cultural Diversity: Emerging Recognition of Local Community Rights in Ecosystems Under International Environmental Law, 59 Tenn. L. Rev. 735 (1992);

Robert A. Brightman, Conservation and Resource Depletion: The Case of the Boreal Forest Algonquians, in Bonnie J. McCay and James M. Acheson, *The Question of the Commons: The Culture and Ecology of Communal Resources* 121 (1990).

James G. Carrier, Marine Tenure and Conservation in Papua New Guinea, in Bonnie J. McCay and James M. Acheson, *The Question of the Commons: The Culture and Ecology of Communal Resources* 142-67 (1990).

Susan Jane Buck Cox, No Tragedy of the Commons, 7 Env't'l Ethics 49 (1985);

Hanoch Dagan & Michael Heller, *The Liberal Commons* (manuscript, 2000)

Carl J. Dahlman, *The Open Field System and Beyond: A Property Rights Analysis of an Economic Institution* (1980)

A. P. Dobson, Geographic Distribution of Endangered Species in the United States, 275 Science 650 (1997)

Robert C. Ellickson, *Order Without Law: How Neighbors Settle Disputes* (1991)

Daniel C. Esty, Revitalizing Environmental Federalism, 95 Mich. L. Rev., No. 3, 570-653 (1996)

H. Scott Gordon, The Economic Theory of a Common-Property Resource: The Fishery, 62 J. Pol. Econ. 124, 128 (1954)

Garrett Hardin, The Tragedy of the Commons, 162 Science 1243 (1968).

Lisa Heinzerling, Selling Pollution, Forcing Democracy, 14 Stan. Envtl L. J. 300 (1995)

Gary D. Libecap, Contracting for Property Rights (1989)

Kaplow & Shavell, GET CITE

Margaret Kriz, After Argentina, in Nat. Journal, Dec. 5, 1998, at 2848,

Arthur F. McEvoy, The Fisherman's Problem (1986)

Robert P. Merges, Contracting Into Liability Rules: Intellectual Property Rights and Collective Rights Organizations, 84 Cal. L. Rev. 1293 (1996).

Thomas W. Merrill & Henry E. Smith, The Numerus Clausus Principle and the Property/Contract Interface, manuscript (2000)

Susan Muller Okin, Justice and the Family ----

William Ophuls, Ecology and the Politics of Scarcity (1977).

Elinor Ostrom, Governing the Commons 23 (1990)

Richard L. Revesz, Federalism and Interstate Environmental Externalities, 144 U. Penn. L. Rev. 2341-2416 (1996)

Alison Rieser, Property Rights and Ecosystem Management in U.S. Fisheries: Contracting for the Commons? 24 Ecol. L. Q. 813, 824-29 (1997)

Alison Rieser, Prescriptions for the Commons: Environmental Scholarship and the Fishing Quotas Debate, 23 Harv. Envt'l L. Rev. 393 (1999)

Carol M. Rose, Property and Persuasion (1994)

---- The Several Futures of Property: Of Cyberspace and Folk Tales, Emission Trades and Ecosystems, 83 Minn. L. Rev. 129 (1998).

----What Government Can Do for Property (and Vice Versa), in N. Mercuro & W. J. Samuels, The Fundamental Interrelationships Between Government and Property, 209-222 (1999)

---- Expanding the Choices for the Global Commons: Comparing Newfangled Tradable Emission Allowance Schemes to Oldfashioned Common Property Regimes, 10 Duke Envt'l L. & Pol. Rev. 101 (2000)

Harry N. Scheiber & Chris Carr, The Limited Entry Concept and the Pre-history of the ITQ Movement in Fisheries Management, in G. Palsson & G. Petursdottir, *Social Implications of Quota Systems in Fisheries* (1997)

Richard Schmalensee, Pasul L. Joskow, A. Denny Ellerman, Juan Pablo Montero, & Elizabeth M. Bailey, An Interim Evaluation of Sulfur Dioxide Emissions Trading, 12 *J. Econ. Perspectives*, No. 3, 58-68 (1998)

Paul Seabright, Managing Local Commons: Theoretical Issues in Incentive Design, 7 *J. Econ. Perspectives*, no. 4, at 113 (1993).

Ayelet Shahar, ----

Henry E. Smith, Semicommon Property Rights and Scattering in the Open Fields, 29 *J. Legal Stud.* 131 (2000).

Robert N. Stavins, What Can We Learn from the Grand Policy Experiment? Lessons from SO₂ Allowance Trading, 12 *J. Econ. Perspectives*, No. 3, 69-88 (1998)

A. Dan Tarlock, The Nonequilibrium Paradigm in Ecology and the Partial Unraveling of Environmental Law, 27 *Loyola L.A. L. Rev.* 1121 (1994)

Thomas H. Tietenberg, *Emissions Trading: An Exercise in Reforming Pollution Policy*. Washington: Resources for the Future, 1985.

Carrie A. Tipton, Note, Protecting Tomorrow's Harvest: Developing a National System of Individual Transferable Quotas to Conserve Ocean Resources, 14 *Va. Env't'l L. J.* 381 (1995).

Ralph Townsend and James A. Wilson, An Economic View of the Tragedy of the Commons, in Bonnie J. McCay and James M. Acheson, *The Question of the Commons: The Culture and Ecology of Communal Resources* 311 (1987).

E. Ullmann-Margalit, *The Emergence of Norms* (1977).

Donovan Webster, The Animal Smugglers: The LOOTING and SMUGGLING and FENCING and HOARDING of IMPOSSIBLY PRECIOUS, FEATHERED and SCALY WILD THINGS *The New York Times*, Feb. 16, 1997 (Sunday Magazine).

Joanathan Baert Wiener, Global Environmental Regulation: Instrument Choice in Legal Context, 108 *Yale L. J.* 677 (1999)

Wilens ---- *Env't'l L. Q.*