

Policy Transformations
In the US Forestry Sector, 1970-2000

by
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Introduction

Between 1970 and 1999, two similar scenarios occurred in the management of national forests in the United States. Each time, action began when a local problem of ecosystem imbalance induced litigation that led to a court halting Forest Service timber harvesting. After the first stoppage, Congress passed the National Forest Management Act, but the Forest Service continued high levels of wood fiber production. The impact of these cuts on an endangered species led to the second halt. In the second scenario, the President intervened and assisted the Forest Service to create the Northwest Forest Plan. Harvests have not returned to the previous high levels. This paper addresses two questions. Why did the second scenario differ from the first? Will the different result improve negative feedback as the United States manages its forests?

In the first case, no significant change occurred because the dominant elites in the forestry sector were able to continue to use the internally contradictory idea of “sustained yield,” with the emphasis on “yield,” not on “sustained.” High production of timber inevitably raises questions about sustaining that yield and about the condition of the forest in general. If the yield of one resource is driven too high, the yields of other uses fall and the future yield of the dominant resource is also threatened. The 1897

Organic Act of the Forest Service, the Sustained Yield Forest Management Act of 1944, and the 1960 Multiple Use and Sustained Yield Act all provide the contradiction. The National Forest Management Act, by not removing the contradiction between dominant and subordinate ideas, provided room for continued timber harvest at high rates.

In the presence of such a contradiction, powerful elites must continue to provide lip service to the subordinate idea. While the harvest continued, many interests outside of the forestry sector developed ideas that emphasized the idea of “sustain,” which became “ecological sustainability.” A successful challenge to the Forest Service’s “yield” policy occurred under the Endangered Species Act, allowing the formerly suppressed idea to rise to the top and displace the previously dominant idea. “Sustained” became a concept independent of the idea of yield. A national polarization resulted with outright opposition between commodity interests and environmentalists. Both desired completely to dominate policy.

In the midst of the political conflict, a Committee of Scientists provided a reinterpretation of the provisions of the NFMA and the other environmental legislation. The committee proposed that complementarities exist among the interests of all groups, particularly when forest condition is seriously degraded. They proposed redefining the planning units at regional and local levels in ecosystem terms. Their proposal also emphasized communication among parties, which would change the Forest Service from an arbiter among competing interests to a facilitator of local collaborative efforts. Whether these changes create a system of continued conflict or the realization of complementarities in forest management remains undetermined.

If the changes create a realization of complementarities, they may also improve the resilience of the linked social and ecological system by improving feedback from ecosystem condition to the human cultural system. Different configurations of ideas create different conditions for the treatment of information about ecosystem condition. When a constraining contradiction such as the idea of sustained yield dominates, then information that would reveal the contradiction and upset policy tends to be denied. Concepts that minimize the contradiction are supported; these concepts place barriers in the processing of objective information. In the case of forest management, the timber-dominated paradigm of sustained yield limits information to data on timber types, volume, age structure, and so forth.

When contradictory conceptions are in conflict, and are not necessarily related as in the case of sustained yield, then the parties each promote the data that support their ideas. The parties which triumph will, after their victory, have an easier time of suppressing the contradictory data and ideas, because there is no necessarily relationship to their own ideas. During the time of contest among the ideas, new data will be developed; once the contest is settled, problems may arise, because the adherents of the dominant ideas will support only data collection favorable to that approach.

If the Committee of Scientists' emphasis on complementarities is accepted, then useful monitoring should increase as a consequence of a new configuration of ideas about forests. If the contending parties agree that ecosystem condition matters for all

interests, then the result of accurate feedback is mutually beneficial. This paper tells the story of these shifts in the structure of political conflict in the United States.

The Contradiction of Sustained Yield

That “sustained yield” is an internally contradictory concept is basic to this paper. To explain the point, Figure 1 shows a usual depiction of the idea of sustained yield. The vertical axis is the annual consumption of a renewable resource such as timber or fish. The horizontal axis is the stock of the resource. In the case of timber, often the horizontal axis is the rotation age of trees of a particular species. Since older trees are larger, higher ages also mean higher biomass. The yield graph expresses annual growth as a function of the stock of the resource. If consumption occurs on the yield line, then stock neither increases nor decreases. If consumption is above the yield line, then the stock decreases. If consumption is below the yield line, then the stock increases.

The highest point on the yield line is usually described as “maximum sustained yield.” The contradiction can be described by comparing three utility functions. Let c_t represent consumption of the resource in year t , let s_t represent the stock in year t . Three alternative ways to understand society’s valuation of the annual consumption and the stock are as follows:

	Utility Expression	Short Title	Example
(1)	$u(c_t)$	“Commodity Viewpoint”	Timber plantation
(2)	$u(c_t, s_t)$	“Balanced Viewpoint”	Menominee Tribe
(3)	$u(s_t)$	“Preservation Viewpoint”	Wilderness reserve

The first expression says society values only consumption; this is the commodity viewpoint. The last expression says society values only the stock. This might be called the preservation viewpoint. The middle expression says society values both annual consumption and the stock of the resource. Valuing the stock in this situation is a shorthand way of stating that society receives non-commodity values from the standing forest biomass—such as aesthetic value, preservation of biodiversity, or ecosystem services (Heal 1998, 14-20). If people in general understand the term “sustained yield” in the sense of (2) but a profession such as forestry uses it in the sense of (1), then the same term is being used to describe two different ideas, and it is internally contradictory.

The peril of using “sustained yield” in the sense of (1)—with “yield” dominating “sustained”—is that the political process may lead to an inversion of terms to the expression in the sense of (3), with “sustain” dominating. The Menominee Tribe, which has actually managed its forest using sustained yield in the sense of (2), runs a far

smaller risk of having polarization between (1) and (3) occur. For a description of the Menominee approach, see Pecore (1992) and Huff and Pecore (1995).¹

Federal legislation in the United States which established the Forest Service in 1897, and the subsequent acts in 1944 and 1960 used the term “sustained yield” in the sense of (2); but the Forest Service interpreted it in the sense of (1) after 1950. With the National Forest Management Act of 1976, Congress attempted to define the idea in the sense of (2); but the Forest Service was able to continue to use the idea in the sense of (1) into the 1990s. In the 1990s, application of the Endangered Species Act seemed to imply that the proper idea was (3), the preservation of old growth in order to preserve species such as the spotted owl. A fight ensued between the advocates of $u(c_t)$ and the advocates of $u(s_t)$. The Committee of Scientists proposed that management of the national forests should follow the middle idea.

Cultural Change

Figure 1 is an economist’s depiction of three ideas which have been in contention in the forestry sector of the United States throughout the twentieth century. The picture is extremely simplified, typical of the type of analysis that labels economics the “dismal science.” To add to this criticism, economists often use a diagram such as Figure 1 to illustrate alternative “steady states;” society, through an unexplained process, selects one of the three alternatives, based upon society’s preferences as

¹The Menominee Tribe, whose forest management was among the first in the United States to be certified under Forest Stewardship Council criteria, has been criticized by commodity-oriented observers for using long rotation ages, and by preservation-oriented observers for not leaving old enough trees.

illustrated by one of three utility functions.² How is the utility function selected? How might it change over time?

This case study provides an opportunity to study such change because two plays of the same type of opening event in similar scenarios in the management of national forests in the United States led to different results. Using a metaphor of a stage play, the act begins with a stage, lit by dominant ideas. The actors interact during the particular act, limited by the props on stage and the lighting provided. During the act, they can change props and affect the lighting, as well as state their lines. At the end of the act they have provided a show as well as rearranged the props and the lighting for the subsequent act. Of particular interest is the set of ideas that are lit at start of each act, and the supply of alternative lights stored just off stage. This approach, conceptually separating the stage from the actors but allowing the actors to rearrange the stage, draws upon the “realist social theory” explained by Margaret Archer in two recent books (Archer 1995, 1996).

The US Forestry Sector, 1950-1970

The situation that led up to the decade of the 1970s is a prelude to the main two acts. The idea of “sustained yield” of “multiple uses” of the forest operated as a

²Most economists, in analyzing Figure 1, would include the impact of discounting utility into the future and would seek the optimum using control theory. The optimum point for $u(c_v)$ would move to the left, as would the point for $u(c_v, s_v)$. For an explanation of the analysis for $u(c_v)$, see Bowes and Krutilla (1989,). For an explanation of $u(c_v, s_v)$, see Heal (1998, 46-56). In Figure 1, I have chosen to use the green golden rule point for the dynamic solution to the maximization problem for $u(c_v, s_v)$. The green golden rule applies when the far future receives some weight in the social welfare function; see Chichilnisky (1997) and Heal (1998). Colin Clark (1990, 4-10) pointed out, using a model based on $u(c_v)$, that a high enough interest rate would justify harvesting a slowly reproducing resource—such as whales—to extinction even under private ownership. This result is not possible when the evaluation of the optimum is governed by $u(c_v, s_v)$, an approach Clark does not consider.

constraining contradiction during the 1950s, 60s, and 70s. The main organizations in the forestry sector all agreed with the dominant interpretation of the idea of sustained yield, as defined in the Sustained Yield Forest Management Act of 1944, and the 1960 Multiple Use and Sustained Yield Act. The contradictions between a commodity orientation and intrinsic valuation of the forest is clear in two key texts from the Multiple Use Sustained Yield Act of 1960:

Sustained yield means the “achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land” (16 U.S.C. § 531(b))

4(a) “Multiple Use means the management of all the various renewable surface resources of the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.” (16 U.S.C. §)

In spite of the balanced view in the above language, the dominant interpretation became the production of timber for the expanding American economy, with its emphasis on expanding homeownership among all who could afford homes (Hirt 1994). Given the contradiction, the adherents of the post World War II dominant interpretation had to keep the related subordinate idea under control. If they failed to do this, then the subordinate idea, preservation of the productivity of the land, would

threaten change. In the 1940s, Aldo Leopold had advocated preserving the integrity of ecosystems. In his view, a forest is a system of interrelated parts, and excessive utilization of one part would threaten the whole.

Containing the idea of ecosystems required an alternative forest definition. In the Forest Service and in forestry schools, the alternative defined any forest is a collection of stands.. The primary decision in forest management is selection of the schedule of harvests among the stands. Cross-stand events are excluded. With the exact location of the stands unknown, impacts on other forest uses--streams, views, wildlife--cannot be identified. This conception of the forest as a collection of stands means that any collection of stands can be a forest. For instance, the widely used textbook by Davis and Johnson identifies a forest with a management unit and defines a management unit as follows:

Management Unit. A geographically contiguous parcel of land containing one or more stand types and usually defined by watershed, ownership, or administrative boundaries for purposes of locating and implementing prescriptions. A management unit is usually larger than a stand and typically contains many stand types and individual stands. (Davis and Johnson 1987, 29)

This is from a revised textbook originally published in 1954. All of part 4 of the book defines a forest as a collection of stands (Davis and Johnson 1987, 475-715). Although watershed is mentioned as one way to define a management unit, neither it nor any other ecological concept is *necessary*; administrative boundaries can suffice. The light available for illuminating forests was limited to this concept of forests, which successfully subordinates ecological ideas.

On the structural side, the props for the stage, there was a contradiction as well. As mills were built for the liquidation of old growth, mill capacity usually exceeded the long-term prospect for harvest of timber from the national forests. The investment in capital, labor skills, and other components of the private economies next to forests were not configured with long-term sustainability. Rather, the local economies were oriented to the use of mature timber. The Forest Service became enamored of the idea of “intensive forestry,” the idea that with intensive management and manipulation of the forest, high cuts consistent with the actual cuts could be sustained. National political and economic leaders demanded increases in the cut, which the assumptions of intensive management could justify (Hirt 1994).

At the national level, the following configuration of agents (an “iron triangle”) created lack of change in the cultural system and social structure (Wilkinson 1992, 169-171). Timber companies received wood fiber. Politicians at both the national and local level were satisfied. At the national level, they provided a steady flow of timber for home construction. At the local level, the sale of timber provided “in lieu of” tax payments to county governments. Forestry schools modeled forests as producers of timber, and the graduates of the schools staffed the Forest Service. Trained to supervise timber harvest and timber management, foresters were happy to provide the materials and financial flows desired by timber companies and national politicians. The USFS prospered, due to political support and a flow of budgets for support of timber harvest. But increases in cut intensified the contradiction between maximizing $u(c_i)$ and

maximizing $u(c_t, s_t)$. The ecosystems of the forests were moving far out of resilient regimes.

Containment Strategy Tested: The 1970s

The apparently stable cultural and social system in the forestry sector received a jolt from the federal courts and from Congress in the early 1970s. Outside of the forestry sector, substantial change occurred with the passage of the National Environmental Protection Act, the Endangered Species Act, and other environmental acts such as the Clean Air and Clean Water Acts.

In West Virginia, on the Monongahela Forest, high timber harvests had caused impacts on other forest uses. The Isaac Walton League sued. The courts interpreted the 1897 Organic Act to prohibit the cutting of trees not biologically mature and not individually marked. Although the decision did not prohibit clearcutting, its restrictions effectively would have stopped clearcutting if applied nationwide.

In another part of the country, visual concerns on the face of the Bitterroot Mountains, plus additional concerns about wildlife and water by local hunters and local farmers led to the establishment of a committee of professors from the University of Montana. Chaired by the dean of the forestry school, the resulting "Bolle Report" concluded that "multiple use management does not exist as the governing principle on the Bitterroot National Forest" (Bolle et al., 1970) and defined "timber mining" as harvest above the levels justified by economic analysis of regeneration costs. Senator Metcalf from Montana used the Bolle Report to initiate legislative action; that action became mandatory when timber harvest was halted by the Monogahela decision.

The 1976 passage of the National Forest Management Act repealed the language in the Organic Act which had halted timber harvest. The new law restated the constraining contradiction between timber harvest and ecosystem sustainability. In addition to referring to the 1960 Multiple Use and Sustained Yield Act for definitions, the NFMA provided statements such as the following:

“The Forest Service . . . has both a responsibility and an opportunity to be a leader in assuring that the Nation maintains a natural resource conservation posture that will meet the requirements of our people in perpetuity” (16 U.S.C. § 1600(6))

“It is the policy of the Congress that all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans.” ((4)(d)(1))

Various statements in section 6 of the Act, on planning, repeat similar ambiguities.

Ostensibly, the National Forest Management Act required a change in the operation of the Forest Service. Multiple uses of the forest were to be considered in a system of planning that would involve the public in determining the priorities of the planning process. The new National Environmental Protection Act, with its requirements that public hearings be held on impact statements would seem also to require a change in policy. But no change in policy occurred, because NFMA and NEPA left considerable discretion to the Forest Service. As long as proper procedures were followed, the contradictions in the law could justify continued high harvest.

New planning regulations were to be written with advice from a Committee of Scientists. The committee appointed for this purpose was drawn from existing schools

of forestry. Ideas prevalent in schools of forestry at the time were not suitable for the change in direction that at least some of the senators wanted. Planning was an exercise in rational deduction from a set of premises, best done by planners. A number of tools existed to ensure that the idea of “sustained” could be contained. Foremost among these tools was the linear programming model, FORPLAN, which exactly embodied the definition of a forest as a sum of stands, location not identified. Utilization of the FORPLAN model, with its inability to keep track of stand locations, meant that non-timber concerns would be hard to handle in the fundamental database for forest planning. President Reagan’s appointed officials increased Allowable Sale Quantities above those recommended by forestry staff on forests using FORPLAN.

In addition, Forest Service discretion under both NFMA and the National Environmental Policy Act lead to many sidebars on public participation. The alternatives to be presented to the public were determined by the agency, which provided ways to contain both the idea that timber supply would be unsustainable and that other uses of the land be considered. For instance, in the Pacific Northwest, all alternatives presented to the public embodied “minimum management requirements” that were not subject to debate. Ostensibly, these requirements would meet the needs of non-timber species. In fact, they allowed continued high timber harvest.

Despite isolated examples of resistance within the forestry sector, policy continued to emphasize high timber harvests. Harvests from the national forests were six billion board feet in 1960 and rose to twelve billion board feet in 1970. Harvests fell

somewhat in the early 1980s, and rose above twelve billion in the late 1980s (Committee of Scientists 1999, 7).

Meanwhile, the ecosystems were continuing to degrade as a consequence of the massive harvests, road networks, and policies of the Forest Service under the continuing dominance of the timber-oriented ideas. The stage was set for a loud, clear ecosystem signal to be sent to the social system. How could that happen? Local signals through the court system had been ruled out by the discretion granted agencies in the planning system under NMFA and NEPA. Signals through the legislative or executive branches were not possible because of the iron triangle configuration of members of Congress, leaders of the USFS, and the timber industry.

The Endangered Species Act

The 1991-1993 District Court enforcement of the Endangered Species Act represents the start of a transformation of the fundamental contradiction. From 1976 to the early 1990s, the Forest Service and the Republican administrations had been able to contain the idea of “sustain” as a modifier of the idea of “yield.” But developments outside of the forestry sector, as well as the consequences of proposed continued harvest of timber in the Pacific Northwest created a crisis that could not be contained. Extinction of a species is an ecosystem signal that cannot be explained away with complicated rationalizations. The NFMA allowed the Forest Service to ignore local ecosystem signals. The ESA provided a potential “national” ecosystem signal.

The forest plans of Region 6 of the Forest Service were “dead on arrival,” for failure to comply with protection of the spotted owl. Just as with the start of the first act of this drama, the courts stepped in and brought Northwest timber harvest to a full stop. Judge Dwyer ruled that the forest plans paid inadequate attention to the habitat of the spotted owl. His data base was scientific, drawn in great part from the work of the research branch of the Forest Service.

Repeated attempts by the Forest Service to comply with Judge Dwyer’s requirements failed. After taking office in 1993, President Clinton organized a Forest Summit in order to get the harvest moratorium lifted. The resulting Northwest Forest Plan implemented ideas of ecosystem management which were very new to the forestry sector. An attempt was made to reach a solution that combined a lower level of commodity harvest as well as some stock preservation. Advocates of either extreme position were not pleased. Deeper issues of ecosystem structure and function are added to issues of species viability in the scientific understanding that underpins the Northwest Forest Plan. (Tuchmann, et al. 1996)

In terms of utility functions, the Northwest Forest Plan proposed to evaluate policy both in terms of commodity production and changes to the forest. Timber growing stock as a measure of s_t is replaced with ecosystem health (Tuchman 1996, 76-77). The cut under the adopted policy of the Northwest Forest Plan no longer is the driver of management; it is the consequence of seeking other goals. The proof of this assertion is that more timber comes from lands being treated for ecosystem reasons than from lands reserved only for timber harvest under the Northwest Forest Plan.

Restoration of ecosystem integrity now runs the show, and the court approved of the new plan, validated by science.

Why, after twenty years of successful resistance to a change in the dominant scientific theory of forest management, did change occur? Part of the answer is that the national strength of the Endangered Species Act could not be nullified, even though Congressional action delayed it by two years (Tuchman 1996, 22). Substantial public support existed for enforcement of the act. This is only part of the answer, however, because the Northwest Forest Plan was temporarily modified by the salvage rider in 1995. For one year, the rider allowed harvest of old growth without enforcement of the constraints of the Northwest Forest Plan (Tuchman 1996, 107). Due to lack of public support, the advocates of timber harvest, however, were not able to perpetuate the salvage rider. The President removed one side of the triangle by appointing successively two individuals as Chief of the Forest Service who were not from the dominant timber paradigm.

Polarization Emerges

With the application of the ESA, the protection offered by the MUSY concept simply disappeared. Total polarization developed at the national level. The procedural republic (Kemmis 1990) encourages a fight between those who want pristine nature and those who want plantation forestry. In a majority-rule system such as the United States, those who can prevail can take over all policy. This encourages those on the extremes, those who favor $u(c_i)$ and $u(s_i)$.

This polarization results from the dynamics of the tactics used to keep the idea of timber production dominant over the related subordinate idea of protection of the land and production of other commodities. Having been subordinate for so long, the idea of sustainability, present in the law, finds adherents who want to repeat the strategy used by the timber interests: place preservation firmly on top, with complete subordination for the idea of timber yield.

The temptation exists for the idea of preservation to dominate; but the law still contains a statement represented by $u(c_v, s_i)$. If support for the stock involves improving ecosystem integrity, then a necessary connection remains. In this case, ecosystem management of a forest does require timber harvest--but not an even flow or a sustained timber harvest. Vegetation treatments are driven by the goals of ecosystem management (which include other uses and preservation of future options). Consequently, those desiring high timber harvests, once out of control, are in a position of competing with other uses.

Politically, no middle position appears feasible in the debate, even if middle positions exist logically. Polarization tends to obscure any complementarity or potential for compromise. Roger Sedjo (1996) portrayed the choices as between custodial or commodity management of the forests, leaving out an option that combined the two. This polarization remains, as shown by examination of the web sites of the Sierra Club (2000) and the American Forest and Paper Products Association (2000b).

The nature of the distortions in each position changed. Whereas when they were connected, the desire was to emphasize elements of consistency and to suppress

inconvenient ideas and data; when the ideas are in competition, the desire is to emphasize elements of difference, of truth on one side and falsity on the other. As a result of competition, both sides begin to improve their analysis. This is a positive feedback loop, making the competition even stronger as each side resists elimination. This is good for the receipt of signals, until one side dominates.

At the beginning of this second act, actors on the stage picked up the light called the “Endangered Species Act,” pointed it at the data on the spotted owl, and convinced another actor, a federal judge, to tell the Forest Service to cease harvest. Previous agents had put the ESA light on stage, and Judge Dwyer grabbed it. The result was that major interests lined up on either side of the stage, polarized over whether or not the ESA should be enforced.

As the change occurred in the Pacific Northwest, the defenders of timber interests were able to deploy some containment strategies. Witness the fate of the idea of protecting “forest health.” Among ecologists, ecosystem health has a strong following; many scientists regard it as a useful way to think about ecosystem integrity. But in the political sphere, the idea of protecting forest health can also mean: cut the dead trees. If trees will die from disease, then cut them to prevent disease. The salvage rider is a good example of this rhetoric. When timber interests emphasize forest health and fire dangers, leaders of environmental organizations hear an excuse for timber harvest.

The Committee of Scientists Recognizes Complementarities

While the salvage rider was a hot issue, the Seventh American Forest Congress convened in February, 1996. The Congress provided “Vision Elements” and “Principles” that contained very strong support for sustainability. One can argue that the previously subordinate idea had by the mid-1990s risen to the top in the cultural system of the forestry sector (Langbein 1996). To adherents of the old idea of timber yield, this was a rapid and revolutionary event, which complemented the shock administered by Judge Dwyer in the Pacific Northwest. The American Forest and Paper Association came to recognize the profound nature of the shift (Wallinger, 1995).

The existence of a contradictory policy presented the possibility of completely reversing the hierarchy of ideas within the policy. Proponents of ecosystem approaches to management used the NFMA’s authorization to consult scientists to appoint a second Committee of Scientists. While the charge to the committee was neutrally stated, the changes in public values regarding forest management, as represented by the results of the Seventh Forest Congress, opened the door for the new committee to provide a reinterpretation of the provisions of the NFMA and the other environmental legislation as applied to forest planning.

With national polarization at a high level, which side would the new Committee of Scientists select? The committee took a new track, by proposing to unify ecological, social and economic sustainability. The committee pointed to fundamental complementarities, asserting that protection and promotion of ecosystem integrity is needed for all of the multiple uses of the forest. The Committee connected the idea of

ecological sustainability to another idea, prevalent in American politics: the idea of local control.

To some observers, complementarity is not an empirical truth: they see the choice as either using the forest for man's purposes or excluding commodity use altogether. This can be illustrated with the figure used to compare different sustainability goals, as in Figure 2. In that figure, a point below the annual yield curve, a low level of ecosystem integrity such as A might be used as an analogy to the current situation, where there are limited harvests because of difficulties when full timber yield occurs.

From a point like A, three directions are possible. One is to harvest the current increment of fiber, by moving to a point like H. Another is to leave the forest alone, and allow all of the increment to add to the timber stock, ultimately moving toward a point like E. A third possibility is to increase both the stock and the level of timber harvest, moving to a point somewhere in the area marked G. The Committee of Scientists emphasized the importance of the possibility of a move to a point like G. A study by the Society of American foresters reached a similar conclusion (Floyd 1999).

The graph, however, does not capture adequately the latest ideas about ecological systems. These ideas emphasize the complexities of ecosystems, which are dynamic, hard to predict, and relatively poorly understood when management aims at achieving a balance of uses. Such ecosystems need to be considered at multiple scales both in space and in time. For instance, after a century of controlling fires, many western forests in the United States have a high risk of catastrophic crown fires which

would reduce the growing stock to zero, and completely reset forest conditions. Such fires are a disaster for both those who wish to save timber volumes and those who wish to hold the forest in a condition suitable to particular species that are in danger of extinction. Figure 2 is too deterministic to capture this aspect of ecosystems.

But the public discussion of forest policy is perhaps too simplistic to capture such complexities in forest ecosystem management. Rather, simple alternatives such as those in Figure 2 capture the nature of the public discussion. The committee addressed this potential simplicity by emphasizing desired future conditions as a focus of planning that would assist in helping the public and the Forest Service reach consensus about desired management activities. Desired future condition could represent a point like A, or one like E, or any point in between. If the public values the condition of the forest as well as the flow of commodities from the forest, then a planning process that places attention on both is likely to succeed.

The Committee also proposed that a successful planning effort would produce “stewardship capacity” among the participants in the planning process. Stewardship capacity is the existence of both the willingness and the ability to care for the condition of forests. The ability to care for forests results both from knowledge and from the maintenance of needed capital, such as harvesting equipment. The willingness results both from the desires of those involved and from the existence of social networks that promote the trust needed for public cooperative action.

Forest Certification

With governmental processes apparently deadlocked, the development of two different certification efforts illustrates an alternative response that can be compared to the proposal of the Committee of Scientists. Both of the certification processes recognize the existence of complementarities in the values provided by forested lands. They differ in emphasis, however. The principles proposed by the Forest Stewardship Council (2000) lean toward the quality of the stock—or the integrity of the ecosystems—while the principles of the American Forest and Paper Association (2000a) tend to emphasize commodity production. Both, however, could be broadly construed to be statements of the form $u(c_t, s_t)$ —both include attention to commodities and to the quality of the stock. Either could be aimed at results in the circle labeled “G” in Figure 2.

An emphasis on monitoring is another similarity between the certification processes and the proposal of the Committee of Scientists. Certification involves third parties that audit or evaluate the management results of forest owners. The Forest Stewardship Council emphasized third-party audits from the start. The American Forest and Paper Association had self-monitoring in their initial certification process; but by the fourth year of its operation they had started to include optional audits by third parties.

The Committee of Scientists proposed scientific review panels at each level of planning within the Forest Service system. Planning involves a tension between the interests and values of people living near forests, and the interests and desires of the

nation, which owns national forests and grasslands. How is this tension to be addressed? One solution is to have local people dominate in the formation of plans, but have the national interest represented by external review of those plans. External review also addresses the distrust generated by the Forest Service in its devotion to timber production.

The ultimate outcome for forest management on the national forests and grasslands is unknown as the twenty-first century opens. The iron triangle which supported the $u(c_i)$ interpretation of the laws has weakened considerably, but could be re-established, depending on electoral outcomes. On the other hand, other electoral outcomes could support environmental concerns allied with the idea of supporting the $u(s_i)$ interpretation. A third possibility is that collaborative efforts as envisioned by the Committee of Scientists, which are consistent with forest certification, could dominate.

The fate of monitoring plans depends upon which of these views wins. In the fight between two positions, neither side is really interested in the facts of forest behavior. Data about the forest is evidence to be used in the battle of position. In the collaborative and certification positions, how the forest responds to treatments matters for everyone. Uncertainty about forest ecosystem processes is not caught up in a debate about who is right or wrong; rather, uncertainty obscures the choice of policy which will benefit everyone.

Reference List

American Forest and Paper Association. 2000a. "SFI Program." Web page, [accessed 6 March 2000]. Available at <http://www.afandpa.org/forestry/forestry.html>.

- American Forest and Paper Association. 2000b. "Welcome to AF&PA's "Washington Watch"." Web page, [accessed 6 March 2000]. Available at <http://www.afandpa.org/legislation/legislation.html>.
- Archer, Margaret S. 1996. *Culture and Agency: The Place of Culture in Social Theory*. Cambridge: Cambridge University Press.
- . 1995. *Realist Social Theory: The Morphogenetic Approach*. Cambridge: Cambridge University Press.
- Behan, Richard W. 1990. Multiresource Forest Management: A Paradigmatic Challenge to Professional Forestry. *Journal of Forestry* 88, no. 4: 12-18.
- Bolle, Arnold W., Richard W. Behan, Gordon Browder, W. Leslie Pengelly, Thomas Bayne, Robert Wambach, and Richard W. Shannon. 1970. "Report on the Bitterroot National Forest." U. S. Government Printing Office, Washington, D.C., Senate document 91-115.
- Bowes, Michael D, and John V. Krutilla. 1989. *Multiple-Use Management: The Economics of Public Forestlands*. Washington, D.C.: Resources for the Future.
- Carey, Henry. 1999. The Guiding Star of Ecological and Rural Sustainability. *Journal of Forestry* 97, no. 5: 42-43.
- Chichilnisky, Graciela. 1997. What is Sustainable Development? *Land Economics* 73, no. 4: 467-91.
- Clark, Colin W. 1990. *Mathematical Bioeconomics: The Optimal Management of Renewable Resources*. Second ed. New York: John Wiley & Sons.
- Committee of Scientists. 1999. *Sustaining the People's Lands: Recommendations for Stewardship of the National Forests and Grasslands into the Next Century*, United States Forest Service, Washington, DC.
Online at <http://www.fs.fed.us/news/science>.
- Cooper, Arthur W. 1999. The *Second* Committee of Scientists: Moving Forward While Looking Backward. *Journal of Forestry* 97, no. 5: 24-25.
- Davis, Lawrence S., and K. Norman Johnson. 1987. *Forest Management, Third Edition*. New York: McGraw Hill.
- Floyd, Donald W., Editor. 1999. *Forest of Discord: Options for Governing Our National Forests and Federal Public Lands*. Bethesda, MD: Society of American Foresters.

- Forest Stewardship Council. 2000. "About Forest Product Certification." Web page, [accessed 6 March 2000]. Available at <http://www.fscus.org/aboutcert/about.html>.
- Geisinger, Jim. 1999. Nonscience from the Committee of Scientists. *Journal of Forestry* 97, no. 5: 24-25.
- Heal, Geoffrey. 1998. *Valuing the Future: Economic Theory and Sustainability*. New York: Columbia University Press.
- Hirt, Paul W. 1994. *A Conspiracy of Optimism: Management of the National Forests since World War II*. Lincoln, NB: University of Nebraska Press.
- Huff, Paula Rogers and Pecore, Marshall. 1995. "Case Study: Menominee Tribal Enterprises." Web page. Available at <http://www.menominee.com/sdi/articles/csstdy.htm>.
- Kemmis, Daniel. 1990. *Community and the Politics of Place*. Norman: University of Oklahoma Press.
- Langbein, William D. 1996. *Final Report, Seventh American Forest Congress*, Office of the Seventh American Forest Congress, New Haven, 205 Prospect St, New Haven, CT 06511.
- Leopold, Aldo. (25th Printing, 1988). *A Sand County Almanac, With Essays on Conservation from Round River*. New York: Ballantine Books.
- Pecore, Marshall. 1992. Menominee Sustained Yield Management: A Successful Land Ethic in Practice. *Journal of Forestry* 90, no. 7: 12-16.
- Sedjo, Roger A. 1996. Toward an Operational Approach to Public Forest Management. *Journal of Forestry* 94, no. 8: 24-27.
- Sierra Club. 2000. "Stop Logging Our National Forests!" Web page, [accessed 6 March 2000]. Available at <http://www.sierraclub.org/forests/>.
- Tuchmann, E. Thomas, Kent P. Connaughton, Lisa E. Freedman, and Clarence B. Moriwaki. 1966. *The Northwest Forest Plan: A Report to President and Congress*. Washington: U. S. Department of Agriculture, Office of Forestry and Economic Assistance.
- Wallinger, Scott. 1995. A Commitment to the Future: AF&PA's Sustainable Forestry Initiative. *Journal of Forestry* 93, no. 1: 16-19.
- Wilkinson, Charles F. 1992. *Crossing The Next Meridian: Land, Water, and the Future of the West*. Wash., D.C.: Island Press.

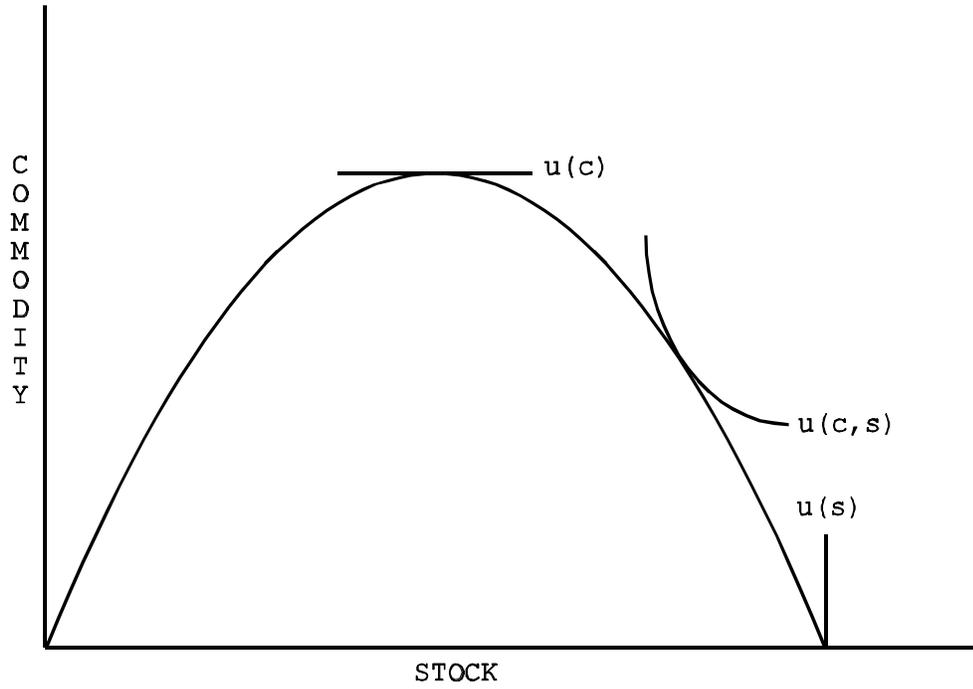


Figure 1. Three optima: commodity, commodity and stock, and stock as valued goals

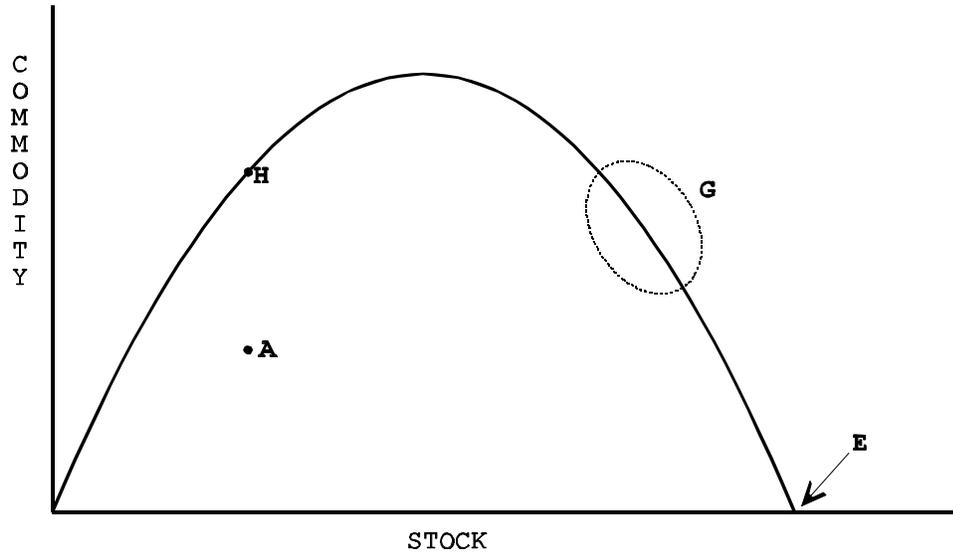


Figure 2. Different targets from point A