The Mount Graham Environmental Conflict: Property Rules and the Public Policy Process Under Stress

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ABSTRACT

The absolutist nature of the Endangered Species Act of 1973 encourages uneven enforcement, lengthy litigation and rent seeking in the public policy process. An analysis of the Mt. Graham International Observatory siting conflict reflects all three types of behavior by interested parties.

"The economics discipline is unlikely to have a professional comparative advantage in the near future either in valuing genetic resources or in resolving the controversy about how many and which species to preserve."

Gardner Brown, Jr. (1985, p.516)

Introduction

Later this year, or next year, the 102nd or 103rd Congress will wrestle with the reauthorization of one of the most contentious laws regulating economic activity in this country: the Endangered Species Act of 1973 (ESA). Economic interests have blamed this law for blocking development of the large-scale projects demanded by modern society (e.g. water development) as well as threatening ongoing activities of significant economic importance (e.g. logging of old-growth forests, hydroelectric power generation). Many environmental interests claim the ESA has been underfunded and under-utilized in the federal government's efforts, acting as a proxy for the public, to preserve endangered species and subspecies. The fact that this controversial law comes up for reauthorization during an election year, a prolonged recession, and escalating environmental concerns insures that the national policy debate will be contentious, if not acrimonious.

The facility siting conflict of The University of Arizona's (UA) Mount Graham International Observatory (MGIO) is a unique component of the evolving public policy debate concerning the ESA. Mount Graham is a 10,700-foot "sky-island" in the Coronado National Forest system in southeastern Arizona; so named because it is an isolated massif surrounded by a "sea" of Sonoran and Chihuahuan desert. Ninety miles away in Tucson, arguably the finest collection of astrophysicists in the world conducts a wide range of astronomical research with nearby (e.g. Kitt Peak) and distant (e.g. Chile) instruments[1]. In the late 1970s, UA astronomers and optical scientists developed a new mirror casting technology which represented a significant

[1] The University of Arizona's Departments of Optical Sciences and Astronomy, Steward Observatory, and the Lunar and Planetary Laboratory; the Smithsonian Institution's Whipple Observatory; and the National Optical Astronomy Observatories which manages Kitt Peak.

cost/performance breakthrough in mirror casting (Smithsonian Institution, 1979). Not only did this innovation strategically position the UA as the leading source of telescope mirrors for the future, but this scientific and engineering breakthrough provided the necessary organizational incentive to search for a world-class site for the most powerful telescopes in the world. Mount Graham proved to be the technically and logistically preferred location (Steward Observatory, 1987).

As this search began, the Arizona Game and Fish Department (AGFD) began studying three endemic mammals on Mount Graham for potential listing as endangered species: the Mount Graham red squirrel (MGRS), the white-bellied vole, and the Western pocket gopher. This ongoing program of the AGFD's biologists placed them on a collision course with the vision of many of the astrophysicists at the UA, and their administrators. In addition, the multiple use mandate of the U.S. Forest Service (FS) provided the institutional backdrop for the intense competition over a scarce resource that was to evolve from 1984 to the present day.

Within the context of this specific environmental issue, this paper will (1) briefly review some of the relevant literature associated with endangered species conflicts and facility siting, (2) propose a public policy framework for conceptualizing the conflict, and (3) trace the evolution of Mount Graham controversy within the constructs of the conceptual model. In closing, several "lessons learned" will be explored with direct relevance to the ongoing debate concerning the ESA.

What Does the Literature Tell Us?

Endangered Species

A species is endangered if its continued existence is dependent on some positive level of resource investment or sacrifice (Judge, 1987). The economic literature on endangered species adapts the received theory of natural resource economics to the species extinction/preservation problem. Species extinction caused by human activity is an irreversibility that is fomented by consumptive use of a species or through habitat loss generated by the conversion of land into an alternative use. Because endangered species are an open-access resource and biodiversity is a

public good, the loss of species without policy intervention will be greater than the socially optimal amount (Ciriacy-Wantrup, 1975).

Due to the problems inherent in quantifying non-market costs and benefits, much of the endangered species literature emphasizes qualitative descriptions of value: recreation value, existence value, option value, ecological value, and scientific/information value (e.g. Boyle and Bishop, 1987; Brown and Goldstein, 1984; Samples, Dixon and Gowen, 1986). Yet a critical lack of information on the current economic value of individual species as well as the uncertain nature of future preferences, technology and information undermines the credibility of these analyses. This dilemma is further complicated by our incomplete understanding of the complex and dynamic interdependencies that exist between humans and other organisms in biological systems; it is simply not possible to quantify the marginal costs of species extinction. Nevertheless, the familiar tools of marginal cost and cost-benefit analysis are effective in ranking habitat protection plans, damage mitigation schemes or recovery programs in order to achieve the goal of maintaining biodiversity at the least cost.

Fisher and Krutilla (1974), Bishop (1978) and Miller (1984), acknowledge the problems of valuing development activities which involve irreversibilities that permanently alter the physical environment, such as species extinction. Because we do not know the viewpoint of future generations, it is possible that the optimal allocation in a future period will call for a resource quantity which has been foreclosed upon by an irreversible activity. In cost-benefit studies, uncertainty about the future returns of irreversible activities, together with risk aversion, implies that the present value of such development should be adjusted downward. These issues suggest caution when irreversible environmental degradation is involved.

The absolutist language of the ESA provides a prescribed target of zero loss in domestic endangered species. This uniform directive is an inalienability entitlement which presumably constrains market activity in order to achieve a higher-order social objective (Griffin, 1991). It implies that the marginal cost curve of extinction lies everywhere above the marginal benefit curve. Hence, in theory, the ESA fails to permit any preservation/development tradeoff by placing an

infinite value on all endangered flora and fauna. As a law the ESA avoids the central policy issue raised by Harrington (1981): to what extent should human activities be constrained to reduce the risk of extinction? However, in practice the implementation of the ESA has proven to be less rigid, allowing tradeoffs between human activities and risk to species.

Facility Siting

A complementary issue surrounding the interdependencies between endangered species and modern societies involves facility siting. The recent literature has been critical of the methodologies organizations have used to site their production and processing plants (O'Hare, Bacow and Sanderson, 1983). The "Decide-Announce-Defend" model commonly used by developers is criticized as self-defeating. Opponents of development programs now have a substantial array of tools (e.g. ESA, National Environmental Policy Act (NEPA)) which they can use to stop a proposed project, particularly when proponents of the project have not encouraged and obtained constructive cooperation among the interested parties. With these laws, opponents can use litigation to either stop the project outright or delay it indefinitely while creating significant transaction costs for the developer. In such a confrontational setting, the developer and other proponents of the project often underestimate the commitment and sophistication of the opponents.

The siting literature stresses the importance of a negotiated compromise derived from meaningful public participation by all interested parties (Dritna, 1982; Bean, Fitzgerald and O'Connell, 1991). This participation should begin as early in the process as possible and be characterized by a free flow of information encompassing a broad spectrum of ideas and viewpoints. The returns to a negotiated settlement are usually significant to all parties while on the other hand the results of adversarial litigation frequently spell disaster for at least one of the groups.

Narrow viewpoints of interested parties in the siting process can short circuit a negotiated settlement. For example, the "engineer's fallacy" states that the best technical site, evaluated solely against engineering criteria, should be the socially optimal site for a project. Any interested

individual or group will have their own, unique vision of reality which can be summed up by the statement, "if only people understood the impacts as well as I, they would not oppose us" (O'Hare, Bacow and Sanderson, 1983, p.97). Of course, if this were the case, there would be no siting conflict in the first place.

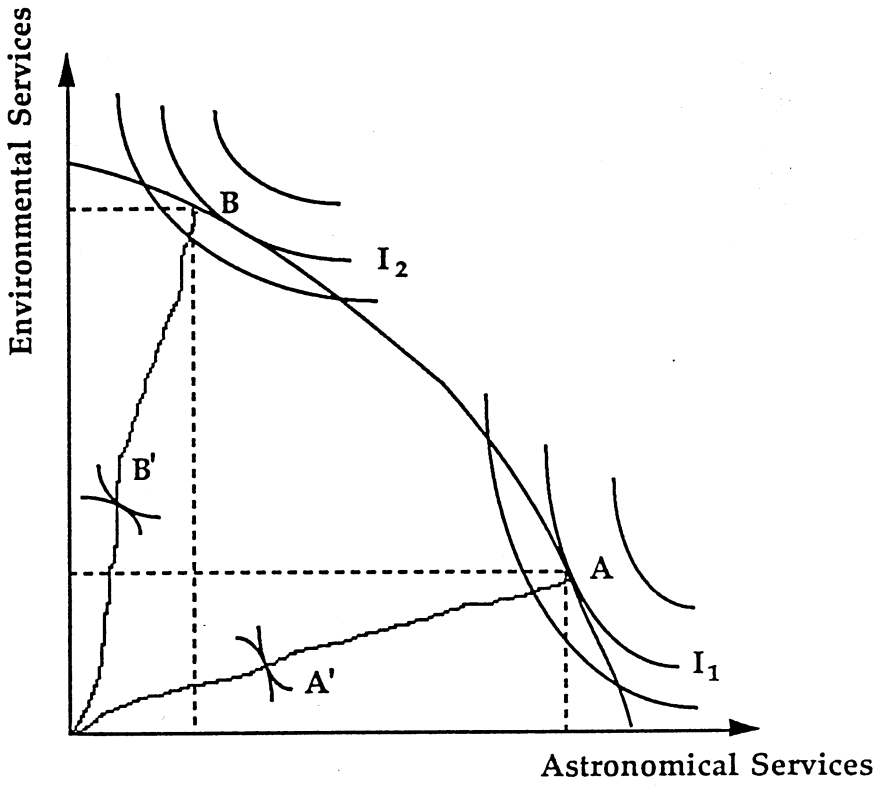
A Conceptual Framework

Contrary to the claims of Gardner Brown, Jr., economists may have an important role to play in the analysis of the evolving interactions between ecosystems and human organizations. The central role of institutional structure in the analysis of the formulation of public policy surely falls within the purview of economic analysis. By its very nature, policy redistributes economic advantage in a society; how and why this advantage is distributed or redistributed is a function of the prevailing institutional structure. This institutional structure defines the incentives that will exist in society: the incidence of costs and benefits, the burden of transaction costs to settle claims, the ability to shift costs on others, and the access to the power that enforces and reallocates property rights. Economic efficiency is itself a byproduct of this institutional structure.

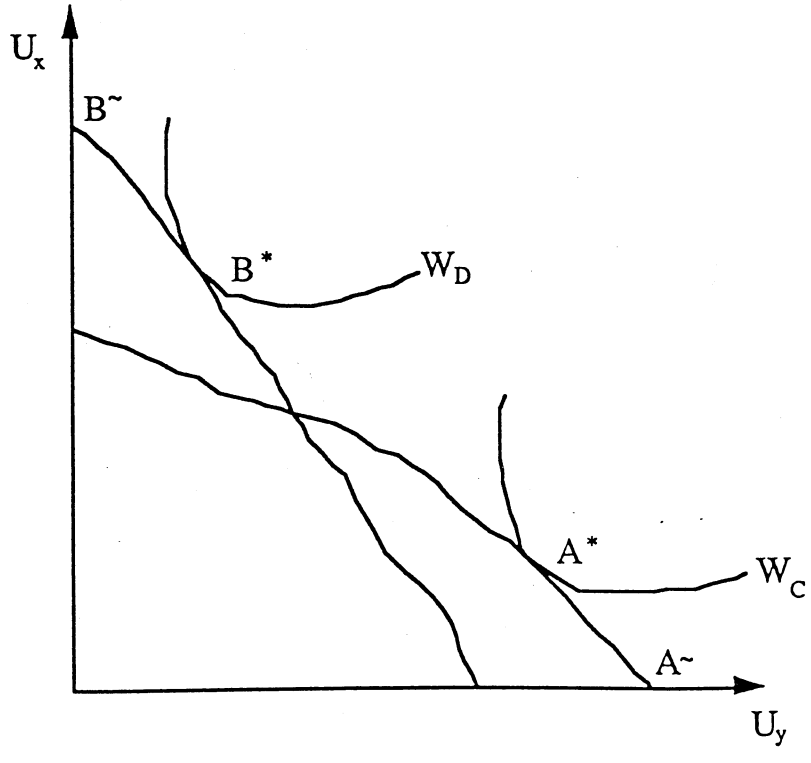
Figure 1 illustrates the foundations of an environmental conflict using a simple social welfare model (Bator; 1957; Bromley, 1989). The production possibilities frontier (Panel A) represents the technically efficient combinations of environmental services and astronomical services that can be produced with a fixed resource endowment (i.e. Mount Graham) and a given institutional arrangement (i.e. FS multiple use mandate). I_1 and I_2 represent different structures of social indifference curves derived from a social utility function which reflect prevailing attitudes towards the bundle of private and public goods available in society. A and B reflect the Pareto-optimal points associated with these two, alternative utility structures. With A, society prefers relatively more astronomical services to environmental services while with allocation B the converse is true. A and B are Pareto-non-comparable outcomes.

Figure 1: A Model of Reallocating Rights on Mount Graham

Panel A: Multiple Use Relationships



Panel B: Alternative Social Welfare " Solutions"



A contract curve for two individuals, one preferring relatively more environmental services to astronomical services (see A' and B') can be constructed for outcomes A and B. These contract curves reflect the various levels of satisfaction for the two individuals at varying combinations of services within the choice set established by the Pareto-optimal bundle. These contract curves can be mapped, $A^{\sim}$ and $B^{\sim}$, into utility space (Panel B). Individual X prefers the social indifference curve associated with I_2 which gives relatively more weight to environmental services. The utility function of individual Y indicates a preference for astronomical services within the given institutional framework and resource base. The public policy process will use a social welfare function to determine the allocation of environmental and astronomical services. Welfare function W_C and the optimal point A* coincide with allocation A in Panel A. In this case, the interests of individual Y count more than the interests of X. W_D would give more weight to the interests of interested party X.

It is generally recognized that W_D reflects the relevant social welfare function revealed through the ESA, where preference is given to environmental services over other types of productive activities. However, those interests which share a vision that is at odds with $B^{\sim}$ and B^* can mobilize to alter the institutional base which influences the shape of the production possibilities frontier(Panel A). These actions can realign the opportunity sets available to individuals X and Y, making one a loser and one a winner in relation to B^*. Or a different structure of social indifference curves can be negotiated through the public policy process thereby modifying the Pareto-optimal allocation of resources. The Mount Graham siting controversy is a case study of just how tenuous B^* is when there is a conflict between existing law and opposing interests.

The Evolution of a Siting Conflict[2]

Approximately 11,000 years ago the climate of the southwestern United States underwent a major transformation as the continental glaciers retreated. Biological communities on Mount

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[2] See Rhodes and Wilson (1991) for a more detailed chronology of these events.

Graham and other sky-islands were isolated from the Mogollon Rim in central Arizona. In 1894 the first specimen of Mount Graham red squirrel (MGRS) was taken from Mount Graham and scientifically classified as a subspecies: (*Tamiasciurus hudsonicus grahamensis*). From the 1880s through the 1960s, natural events and human activities have interacted with the MGRS and its habitat: fire, logging, road and cabin construction, hunting, and the introduction of the Abert squirrel, a non-indigenous competitive species. By 1976 MGRS numbers were so low that the Arizona Game and Fish Department (AGFD) listed the squirrel as a threatened mammal.

But these same sky-islands, given their high, dark, arid and cloudless environments, provide the sites for one of the most significant collections of optical telescopes in the world. Contributing approximately $84 million per year to the local economy, this critical mass of scientific activity induced the development a new mirror technology in the 1970s which allows the cost-effective production of the new generation of optical telescopes. Finding an astrophysical site where this technology could be showcased and used for cosmological research became a priority activity for the UA's Steward Observatory.

By 1980 the UA had put together an international consortium to study Mount Graham as an astrophysical site. In 1982 the Smithsonian Institution requested that the FS consider this sky-island a future astronomical research facility of "major national significance." That same year the AGFD, under a request by the U.S. Fish and Wildlife Service (FWS), began studies to ascertain if the MGRS merited listing as an endangered species. Following FS guidelines, the UA's Steward Observatory submitted a draft plan to the FS in 1984 for an 18 telescope complex on Mount Graham complete with support buildings and a visitors' center.

Environmentalists and other interest groups were not invited to participate in the development of this preliminary proposal. In early 1985 the local FS office recommended full development of the Steward Observatory plan. Even at the earliest stages of this issue it appears that the FS and the UA had consciously, or unconsciously, chosen the Decide-Announce-Defend model for the siting process.

By mid-1985, sportsmen, environmentalists and ecologists had begun to form a loose coalition with the objective of opposing the MGIO. At this same time AGFD forwarded their completed biological study to the FWS, recommending endangered species status for the MGRS. In March of 1986 the FWS published a notice of intent to list the MGRS under the ESA. Recognizing that this listing could threatened the future of the MGIO, the UA administration and Steward Observatory astronomers began a political and public relations effort aimed at preventing the listing of the MGRS. In lieu of the listing, a squirrel conservation plan was offered by these organizations. In addition, the entire Arizona congressional delegation sent a letter to the chief of the FS expressing their concern about the listing and its adverse impact on the proposed MGIO. At the end of the year (1986) a draft Environmental Impact Statement (DEIS) was issued by the FS which recommended five telescopes on seven acres.

The conflict over differences in social welfare functions reached a new, and higher level of intensity in 1987 as the DEIS was deemed inadequate by the Interior Department and the AGFD publicly stated its opposition to the MGIO. In June the MGRS was officially designated an endangered species by the FWS. This listing caused a dramatic shift in the institutional structure and the relative power of the opposing groups. The opposition now had the full legal weight of the ESA as an ally, granting existence rights to the MGRS in the form of an inalienability entitlement which may be contested solely by biological data, excluding all social and economic considerations. Later in the year, the UA countered the DEIS recommendation with a proposal for seven telescopes, stating that the FS's five scope proposal was not economically viable. As each proposal and counterproposal were made, FS and FWS biologists returned to Mount Graham to reorient their biological assessments, further delaying a decision.

After six additional months of study and negotiations, in July of 1988 the FWS released its Biological Opinion which stated that Reasonable and Prudent Alternative 3 would allow three telescopes on 8.6 acres on Emerald Peak (one of Mount Graham's peaks), and eliminate all public access above 10,200 feet. The UA agreed to a one-peak complex of scopes but lobbied hard for seven telescopes on 20-24 acres.

By August of 1988, rumors began to surface that special legislation was being prepared by the Arizona congressional delegation, with the UA's support, to expedite the project review process by avoiding further delays under the ESA and the NEPA. In October a last-minute amendment-- a rider-- was attached to the Arizona-Idaho Conservation Act (AICA), an unrelated and popular bill in the last stage of being approved. The AICA was passed by both legislative bodies (House 312-32 vote; a voice vote in the Senate) and signed by President Reagan on November 18. Title VI of the AICA "deemed satisfied" the NEPA and ESA requirements for three telescopes on Emerald Peak, left open the possibility of four more telescopes in the future, and provided for limited public access above 10,000 feet. The four additional telescopes would have to comply with the NEPA and the ESA and would require their own EIS. The UA was also required to develop and fund a conservation and management plan for the MGRS (projected at $100,000/year for 10 years). In late November the final EIS was issued by the FS supporting the FWS's Reasonable and Prudent Alternative 3.

By March of 1989, various administrative appeals had been filed with the FS challenging the project and the issuance of a special use permit to the UA. Low reported squirrel numbers (99-148) delay this approval process. In the summer the FS denies all pending administrative appeals because they are in direct conflict with the AICA. The Sierra Club Legal Defense Fund (SCLDF) then filed a lawsuit in federal district court to stop the MGIO project, claiming it is in violation of the ESA. The FS and FWS are named as defendants, not the UA. In early September, a federal judge postponed, from September 8 to November 28, the hearing on a restraining order, allowed the UA to intervene in the lawsuit, and approved the initiation of road construction to the site. Winter weather in early November stopped the construction with the road to the telescope sites 98% completed.

In early 1990, reports surfaced that the biological studies used to form FWS's Biological Opinion were flawed. Two FWS biologists stated in depositions that they had been ordered by superiors to provide reports underestimating the habitat impacts of the MGIO project. In March, the U.S. District Judge responsible for the SCLDF lawsuit issued a restraining order for 120 days

claiming that Congress may not have received an accurate biological assessment when they passed the AICA. The Arizona congressional delegation then called for a public hearing on the siting issue while the U.S. Senate announced a General Accounting Office (GAO) investigation of the FWS's biological assessment. In May the 9th U.S. Circuit Court of Appeals lifted the construction ban but the UA voluntarily delayed construction until the congressional hearings were completed. Throughout the summer there were new charges and counter charges by all sides in the siting conflict. But in late August, the U.S. District Court judge denied the SCLDF's request to delay the project construction any further allowing construction of the foundations for two telescopes to begin on Mount Graham. Shortly thereafter, the 9th Circuit Court of Appeals blocked construction (tree cutting). Ten days later, upon an appeal by the UA, the same court reversed itself and allowed construction to proceed until a December hearing. At this hearing, attorneys for the UA claim that cutting of old-growth trees renders all appeals ". . .fundamentally. . .mooted."

The 9th Circuit Court of Appeals again entered the controversy in April, 1991 by blocking construction until the UA could show the court that it had an adequate MGRS monitoring program. In May, the U.S. District Court judge in Tucson rejected claims by the SCLDF that the squirrel monitoring program was flawed and reauthorized the initiation of construction. With the environmental law options effectively closed, the groups in opposition to the MGIO began to mobilize the San Carlos Apache Tribe by claiming that Mount Graham is a sacred mountain protected under the American Indian Religious Freedom Act of 1978. In August, the Apache Survival Coalition, supported by a unanimous vote of the tribal council, filed a lawsuit in U.S. District Court to stop the project. And in February, 1992 the same coalition filed a motion in U.S. District Court asking for a ruling on the constitutionality of Title VI of the AICA. The UA plans to resume construction on Mount Graham as soon as the snow melts in the spring.

Lessons Learned to Date

This siting conflict supports many of the normative suggestions of O'Hare, Bacow and Sanderson. The inclusion of all interested groups in the early stages of project development has a

high probability of producing a negotiated settlement acceptable to all parties. Under this scenario, externalities are internalized and the socially optimal output is achieved by merger and the optimization of a joint utility function (Gifford and Stone, 1975). Diverse organizations such as USX and the Governor's office in Colorado have formal programs to facilitate cooperative facility siting using this methodology. A negotiated settlement in the Mount Graham case could have arguably achieved the same final allocation without the deadweight loss of millions of dollars and thousands of hours in transaction costs. The FS, FWS and the UA appear to have ignored this approach.

Secondly, this case represents an example of the politicization of science where scientific results are altered to suit economic and political agendas. Critics would argue that FS and FWS behavior on this issue strongly suggests that these agencies can be captured by their clientele support groups. The actions and public statements by proponents and opponents of the MGIO provide support for this lesson.

A third lesson is that social welfare functions and a socially optimal allocation of resources as illustrated in Figure 1 are subject to manipulation by special interest groups. When potential returns are larger than the costs, it is rational for the UA to support the modification of property rights on Mount Graham to favor their interests, and for the Sierra Club to defend the status quo (i.e. ESA and NEPA). That the ESA could be superseded by the AICA should come as no surprise; the ESA spreads diffuse benefits over large numbers of people while concentrating the costs on a specific project and its limited number of direct beneficiaries. The AICA does just the opposite by concentrating benefits and diffusing costs--a much more stable outcome.

Finally, what has not been settled is whose interests should count. In an institutional structure where the ESA is the dominant property rule, there is an implicit valuation of biocentric existence rights over development of any kind; endangered species would be given more weight in society's utility function than project development. But with the AICA now the dominant property rule on Mount Graham, the lesson learned is that in natural resource conflicts concerning endangered species, the interests of those with superior economic and political power may

dominate the public policy process. This methodology of Pareto-non-comparable conflict resolution could become the rule rather than the exception in the formulation of public policy.

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