DISSERTATION

HOW STAKEHOLDER ROLES, POWER, AND NEGOTIATION IMPACT NATURAL RESOURCE POLICY: A POLITICAL ECONOMY VIEW

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY LYNNE CAUGHLAN ENTITILED HOW STAKEHOLDER ROLES, POWER, AND NEGOTIATION IMPACT NATURAL RESOURCE POLICY: A POLITICAL ECONOMY VIEWBE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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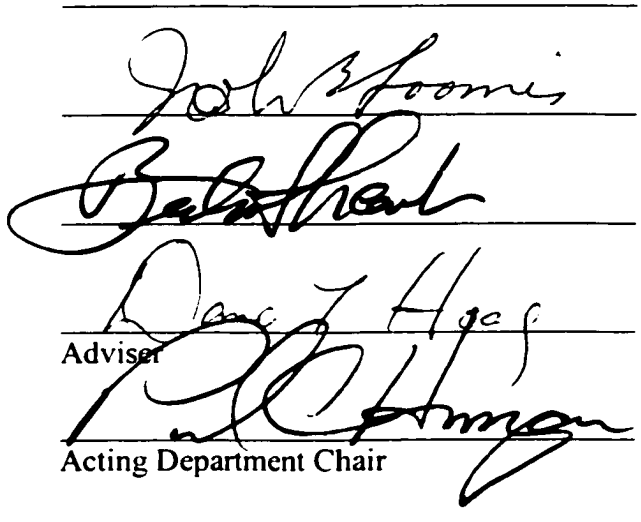

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ABSTRACT OF DISSERTATION

HOW STAKEHOLDER ROLES, POWER, AND NEGOTIATION IMPACT NATURAL RESOURCE POLICY: A POLITICAL ECONOMY VIEW

Natural resource management decisions are complicated by multiple property rights, management objectives, and stakeholders with varying degrees of influence over the decision making process. In order to make efficient decisions, managers must incorporate the opinions and values of the involved stakeholders as well as understand the complex institutional constraints and opportunities that influence the decision-making process. Often this type of information is not understood until after a decision has been made, which can result in wasted time and effort.

The purpose of my dissertation was to show how institutional frameworks and stakeholder involvement influence the various phases of the resource management decision-making process in a public choice framework. The intent was to assist decision makers and stakeholders by developing a methodology for formally incorporating stakeholders' objectives and influence into the resource management planning process and to predict the potential success of rent-seeking activity based on stakeholder preferences and level of influence. Concepts from decision analysis, institutional analysis, and public choice economics were used in designing this interdisciplinary framework. The framework was then applied to an actual case study concerning elk and bison management on the National Elk Refuge and Grand Teton National Park near

Jackson, Wyoming. The framework allowed for the prediction of the level of support and conflict for all relevant policy decisions, and the identification of each stakeholder's level of support or opposition for each management decision.

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Chapter 1: Introduction

Ecosystems encompass complicated and intertwined physical and biological systems. Managing an ecosystem requires integrating the complexities of the physical and biological systems with the rules and constraints of the underlying economic and political systems. Managing within this *political ecosystem* framework requires the development and implementation of resource management policies that rely on collaboration between natural resource managers, government officials at all levels, and the public. Involved federal, state, local, private and public stakeholder groups have diverse values and preferences about the use and management of public resources. Underlying institutional factors will give certain stakeholders a greater level of influence over the policy outcome. How a stakeholder uses their influence can greatly effect the time, effort and costs of the decision making process. The overall result of an individual stakeholder or stakeholder group's influence on a negotiation will depend both on their relative power and their level of conviction for a particular outcome.

In order to make efficient decisions, managers must incorporate the opinions and values of the involved stakeholders as well as understand the complex institutional constraints and opportunities that influence the decision-making process. Many tools have been developed to facilitate group negotiation and decision-making. Decision analysis models are commonly used to prioritize the goals and objectives of stakeholders' preferences for resource planning by formally structuring conflicts and assisting decision makers in developing a compromised solution (Forman 1999). Because each stakeholder has the ability to exert a certain level of power and influence over the process, the use of decision analysis is not enough to fully depict

most situations. Institutional models such as the Legal Institutional Analysis Model (LIAM) describe the organizational rules of behavior and the institutional boundaries constraining the management decision (Lamb et al 1999). While some stakeholders will not be able to effectively influence the outcome under the existing institutional constraints, they engage in rent seeking behavior by spending additional time and money to exert political pressure to change the political rules (Becker 1983). Public Choice models describe how stakeholders will rent seek within the given institutional constraints. Knowing stakeholders' preferences for management outcomes, what the institutional system looks like, and the opportunities for rent seeking, allows for a more complete understanding of what influences the management decision, how the decision is made, and what the potential outcomes will be.

1.1 Objectives

My purpose is to show how institutional frameworks and stakeholder involvement influence the various phases of the resource management decision-making process in a public choice framework. The intent is to assist decision makers and stakeholders by developing a methodology for formally incorporating stakeholders' objectives and influence into the resource management planning process and to predict the potential success of rent-seeking activity based on stakeholder preferences and level of influence. This can be accomplished by applying the following objectives in an empirical setting:

Objective 1: Develop a public choice economic framework to evaluate group decision making in a resource setting.

Objective 2: Establish a framework to determine stakeholders' level of influence in a collaborative decision outcome.

Objective 3: Determine a method to measure stakeholders' preferences for management objectives.

Objective 4: Combine stakeholders' level of influence and management preferences to evaluate the likely decision outcome under existing institutional constraints and rent seeking behavior.

This work presents an addition to public choice theory by integrating decision techniques from at least three areas. Concepts from decision analysis, institutional analysis, and public choice are used to develop an inter-disciplinary framework for examining the natural resource decision-making process. This framework will be tested on one important controversial land management planning process.

1.2 Case Study

The U.S. Fish and Wildlife Service (FWS) and National Park Service (NPS) have initiated the planning process for a Jackson Bison and Elk Management Plan and Environmental Impact Statement (JBEMP/EIS) to manage the southern segment of the Greater Yellowstone Area elk and bison populations. The Jackson bison and elk herds summer on Grand Teton National Park (GRTE) and the Bridger/Teton National Forest (BTNF). The majority of these animals winter on the National Elk Refuge (NER) in Jackson, Wyoming attracted by the feed lines administered by the U.S. Fish and Wildlife Service (FWS/NPS 2000). The study area for the JBEMP/EIS includes the overall range of the Jackson bison and elk herds, which has been defined by the Wyoming Game and Fish Department (WGFD) to contain approximately 1.5 million acres (Figure 1).

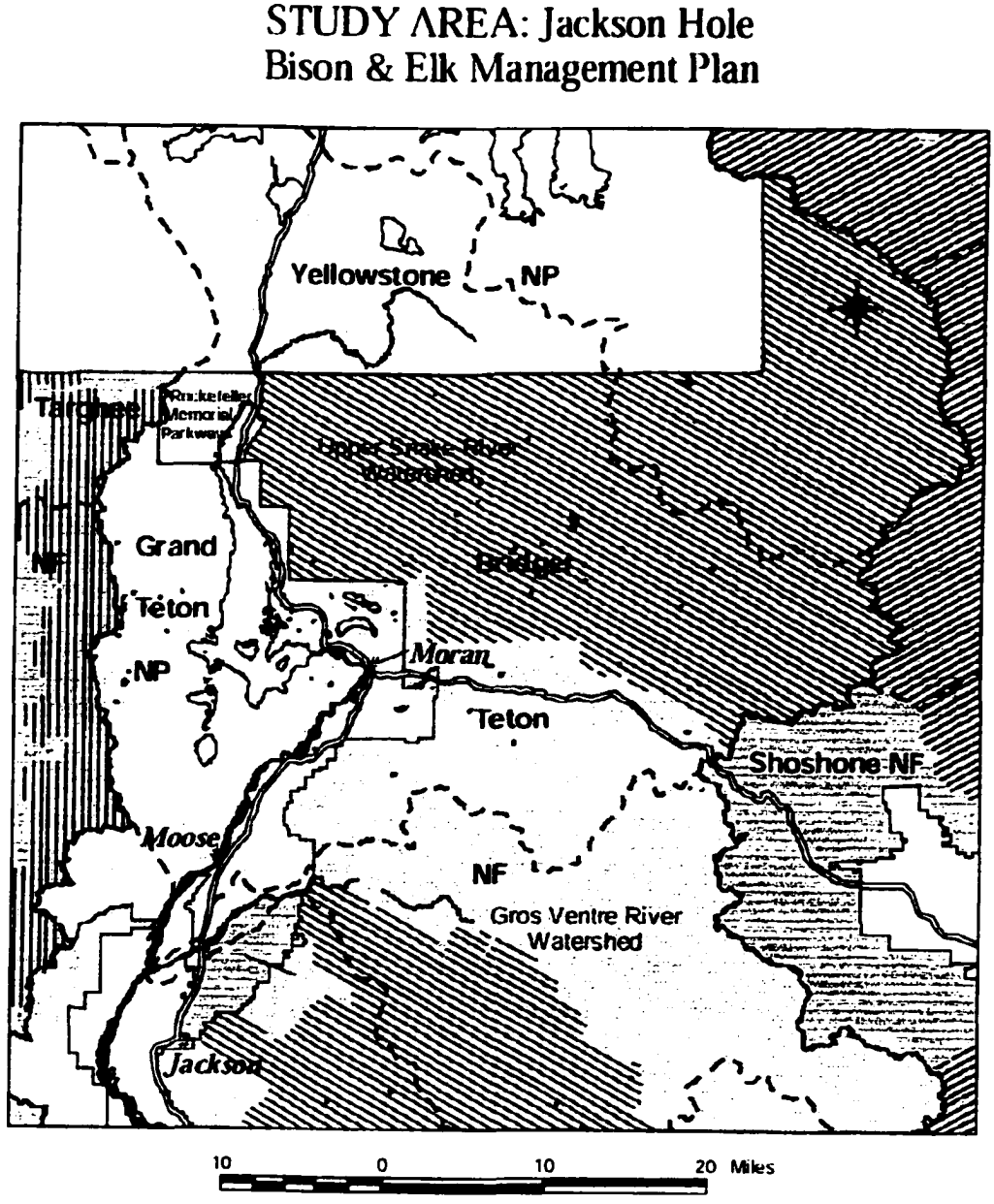


Figure 1. Map of Southern Greater Yellowstone Area. Source: U.S. Institute 2000.

The Jackson elk herd is the largest in the United States, with an average size of 15,000 to 19,000 animals. It is the most intensively managed population in North America with over 3,000 animals removed annually through hunting (FWS/NPS 2000). Elk hunts or reduction programs

are administered on the NER, GRTE, BTNF by the WGFD as a cooperator with the respective managing agencies.

The brucellosis disease, prevalent in the Jackson bison and elk, may pose potential threats to livestock and may have undesirable effects on wildlife populations (FWS/NPS 2000). Evidence indicates that brucellosis is at high levels in the Jackson bison and elk herds due to the characteristics of winter feed ground practices (US Institute 2000). Winter-feeding of Jackson elk population takes place on the NER and three state feed grounds operated by the WGFD along the Gros Ventre valley. In the past ten years, the winter population of elk on the NER has fluctuated from a high of 10,700 in 1997 to a low of 7,300 in 1999 (FWS/NPS 2000). Elk and bison concentrated on winter feed lines are vulnerable to infection should a brucellosis caused abortion occur to a nearby elk or bison (FWS/NPS 2000). The WGFD supports the use of vaccine to reduce the spread of brucellosis. The FWS will not concentrate the elk for vaccination purposes until the effectiveness of the vaccine has been scientifically proven.

Included in the JBEMP/EIS will be disease management strategies for brucellosis including the issue of vaccination and its effectiveness for the Jackson elk and bison herds. Programs of the NER related to the JBEMP/EIS include winter feeding, elk hunting and experimental irrigation. Related programs of GRTE include elk reduction, predator management, and prescribed burning. Programs of the BTNF related to the JBEMP/EIS include elk and bison hunting, winter feeding of the elk by WGFD, and prescribed burning for improving winter elk habitat. The JBEMP/EIS will examine the effects and impacts of all of these programs to develop a range of appropriate alternatives for managing the bison and elk (FWS/NPS 2000). The final EIS is scheduled for completion by March 2003.

1.3 Scope of Work

To address the stated objectives, this research is divided into the following segments. Chapter 2 provides a review of the decision analysis, LIAM, and the public choice literature related to natural resource decision-making. Based on the reviews of the literature, a methodology for formally incorporating stakeholders' objectives and influence into the resource management planning process is developed in Chapter Three. Results from testing the model are presented in Chapter Four. A discussion of the results and suggestions for future research conclude this study in Chapter Five.

Chapter 2: Literature Review

2.1 Decision Analysis

Decision-making is a process of choosing among alternative courses of action in order to attain goals and objectives (Forman 1998). Decision analysis has been described as a set of steps crucial for understanding any decision (McDaniels, 1999). These steps include: "clearly specifying the decision to be made; structuring the relevant objectives and how they are measured; clarifying potential alternatives; analyzing the consequences of alternatives in terms of basic objectives; clarifying preferences regarding trade-offs among objectives; and evaluating the alternatives" (Keeney 1980; McDaniels, 1999). The field of decision analysis offers several techniques to aid in the decision process. These techniques differ based on the number of decision-makers involved, the degree of mathematical sophistication, quality of measurement needed and computational difficulty for the type of problem being assessed (Anselin et al. 1989).

According to Forman (1998), the most frequent decision method used today is *BOGSAT* (a **B**unch of **O**ld **G**uys/Gals **S**itting **A**round **T**alking). Peterson et al. (1994) observed this process with a group of decision-makers attempting to develop an inventory and monitoring program for Olympic National Park. Using the BOGSAT technique, several objectives were overlooked and not given appropriate weight with respect to their importance on the overall decision. The BOGSAT technique should therefore not be the exclusive decision-making process (Page et al. 1999).

Methods that move beyond the BOGSAT approach typically employ either single or multiple attribute decision programs depending on the complexity of the decision. Up until the early 1970's, single attribute decision-making models such as linear programming were the only commonly existing programs. When decision issues become more complex and involve large numbers of objectives, the use of a single attribute decision models is no longer appropriate (Wheeler and Russell 1977).

The first computer-based multi-objective decision program model was developed by Hotelling and Fisher in the early 1970's (Nijamp 1990; Page 1997). Since then, several multi-criteria decision-making (MCDM) models have been developed including Goal Programming, Multi-Attribute Utility Theory (MAUT), PROMOTHEE, the Analytic Hierarchy Process (AHP), and Conjoint Analysis (Goicoechea et al. 1982; Page 1997). MCDM methods can be categorized as value-oriented or goal-oriented based on the type of information needed from the decision maker. Value-oriented methods such as the AHP and MAUT require the decision maker to state preferences between criteria or alternatives. Goal-oriented methods such as goal programming require the decision maker to explicitly state levels of criteria that are required or desired (Davey & Olson, 1998). Published reviews describe the applications of MCMD techniques for natural resource management (Romero and Rehman 1987) and fisheries management (Mardle and Pascoe 1999).

2.1.1 Stakeholder Involvement in Natural Resource Management

MCDM models are valuable tools for identifying, understanding, structuring and solving decision problems involving many stakeholders (Malczewski et al. 1997). The use of a MCDM model aids the group decision-making process by allowing participants to gain an understanding of the pros and cons of decision alternatives from various perspectives (Mc Daniels 1999).

MCDM models have been used for several types of natural resource management issues involving many stakeholders. Uses of MCDM models include structuring stakeholder preferences for wilderness preservation (McDaniels 1999), national forest management (Kangas 1993, Shields et al. 1999, Martin et al. 2000), fisheries management (Hilborn and Walters 1977), and water resources planning (Goicoechea et al. 1992; Hamalainen et al. 1999; Flug et al. 2000).

Goicoechea et al. (1992) evaluated the relative utility and effectiveness of four MCDM models for water resources planning when multiple stakeholders are involved. The MCDM models tested were: MATS-PC a system based on multi-attribute value theory; Expert Choice, a user friendly model based on the AHP (Saaty, 1980); the ARIADNE method, which makes use of a hierarchy of attributes to obtain the dominance structure of alternative plans; and ELECTRE method that has been extensively used to perform structured modeling and ranking of alternative systems (Goicoechea et al., 1992). Results showed that the choice of model did not affect the ranking of alternative plans significantly. Expert Choice was the most preferred model due to ease of use and understandability while ARIADNE fostered the largest degree of agreement (Goicoechea et al., 1992).

The AHP has become one of the most commonly used models for natural resource decision-making (Forman 1999). It has been used for ecological evaluation analysis (Anselin et al. 1989), prioritizing fire research needs (Schmoldt and Peterson 1996), land resource allocation (Malczewski et al. 1997), and prioritizing National Park monitoring activities (Peterson et al. 1994). The AHP has also been used to assess the level of influence different stakeholder groups have on the outcome. Rapoport and Golan (1985) used the AHP to assess the perceived political power of the parties represented in the Israeli Knesset. Malczewski et al. (1997) used the Expert Choice software (AHP method) to incorporate the conflicting preferences of different interest

groups to structure the problem of land resource allocation in the Cape Region of Mexico. Because the stakeholders had different abilities to influence the outcome, a pairwise comparison matrix was constructed to contrast the relative importance of interest group sectors. The importance of the socio-economic activities with respect to each interest group was determined through a separate pairwise comparison matrix. This was multiplied by the adjusted strength of the interest groups to obtain the contribution of each activity to the overall goal (Malczewski et al. 1997). According to Forman (1998), any complex situation that requires structuring, measurement, and/or synthesis is a good candidate for AHP. However, AHP is rarely used in isolation. Rather, it is used along with, or in support of other methodologies (Forman 1998).

2.2 The Legal Institutional Analysis Model

Decision-making activities for federal land management take place within established boundaries provided by statute, legal precedent and tradition (Lamb 1980). Institutional analysis provides an assessment of these boundaries by studying the legal, political, and administrative processes through which public policy decisions are made (Ingram 1984). Interest in how institutions affect the decision-making process continues to increase as institutions become larger, more autonomous and more influential in political decision-making (March and Olsen 1984; Lamb et al. 1999).

The LIAM is a computerized model that examines the political aspects of a natural resource conflict (Lamb 1987). Developed by Lamb and his colleagues (1993), the LIAM is based on the findings of a long tradition of research in bureaucratic decision-making processes (Lamb et al.1998). The model enables the various stakeholders involved to understand the nature of the issue at hand as well as evaluate the roles, needs, and power of organizations involved in a natural resource conflict (Lamb et al. 1999; Cady and Soden 2001).

The LIAM has been used to analyze several types of natural resource conflicts. Lamb et al. (1999) used LIAM to help citizens make recommendations to the Wyoming Game and Fish Department about how to best conduct the public participation process for developing a state grizzly bear management plan. Lamb et al. (1998) used the LIAM to assess the obstacles and opportunities for reaching a satisfactory conclusion in restoring salmon runs to the Klamath River. Lybecker (1996) showed how the LIAM results differ across political systems by using the model to assess the different institutions involved in the decision-making process for the Lake Chapala water system in Mexico. Cady and Soden (2001) tested the applicability of the LIAM for bi-national water policy disputes between the United States and Mexico.

The LIAM has guided numerous workshops for hydroelectric power licensing negotiations (Wilds 1990; Lamb et al. 1998; Taylor and Lamb 1989). These workshops have been beneficial to the negotiation process by: bringing parties together to share information in a neutral setting; promoting an atmosphere of trust and cooperative problem solving; allowing participants to clarify the roles and perspectives of all stakeholders as well as discover potential allies; and showing each parties likely negotiation strategies and their willingness to negotiate (Lamb et al.1999; Lamb et al.1998).

The LIAM uses a questionnaire to measure respondent knowledge about an organization's (stakeholder's) likely role and sources of power in the natural resource conflict (Taylor 1993; Wilds 1990). The model relies on the theory that organizations consistently employ behavioral roles in bargaining situations (Lamb et al. 1998). Organizational behavior is expected to occur in two distinct dimensions, which are the result of organizational preferences for the outcome and the way in which the outcome is generated (Wilds 1990). A stakeholder's preference for the actual outcome is linked to its traditional values or goals (Wilds 1988). In this

regard, the LIAM will categorize a stakeholder as either an advocate or a guardian. An advocate will press for change in the status quo natural resource management approach. A guardian tends to protect the status quo by relying on traditional decision processes.

The other role dimension measured by the LIAM looks at a stakeholder's preferred type of process for resolving the conflict. Procedural preference is related to the resources a stakeholder has available to influence the outcome (Wilds 1990). The LIAM categorizes this preference as a broker or an arbitrator. A broker prefers a negotiated solution through tradeoffs and bargaining. An arbitrator prefers a neutral body to solve the conflict in an objective court-like manner (Lamb et al. 1993).

According to Lamb et al. (1998), the way a role is played is based on the power of the stakeholder and its stake in the outcome. Organizational power is determined by the resources, expertise, and outside support that a stakeholder has as well as the degree to which it is willing to use these elements of power to force an outcome that is favorable to its own position (Wilds 1988). The LIAM measures three different sources of agency power: resource, information, support (Wilds 1990). Resource power focuses on the available personnel, funding, experience, and legal authorities of an agency (Lamb et al. 1998). Information power indicates the type, volume, and influence of information that an organization produces or has access to (Cady and Soden 2001). Support power focuses on the organization's constituency in terms of size, cohesiveness, interest, and reputation of groups of supporters (Lamb et al. 1998).

The policy outcome will depend on how skillfully stakeholders can use their role and relative power to influence the bargaining process (Lamb 1980). Understanding the strengths and needs of involved stakeholders allows managers to gain a better understanding of the likely negotiation strategies and serve as the first step in an actual negotiation (Lamb et al. 1998).

2.3 Public Choice Theory

Public choice is the application of economic theory to the study of politics. (Mueller 1981). Public choice theory contends that the political bargaining arena consists of rational and self-interested participants who invest in activities that will maximize their utility (Stigler 1971). Politicians and bureaucrats will supply political favors and favorable policies to the demanders (stakeholder groups) in exchange for votes, contributions to political campaigns, and job privileges (Gardner 1997). Because the allocation of scarce resources necessarily excludes or limits some types of resource use, stakeholders have an incentive to compete for a larger share of the allocation through the political process.

According to Becker (1983), political equilibrium exists when all groups maximize their incomes by spending their optimal amount on political pressure, given the productivity of their expenditures, and the behavior of other groups. For public land management, "it is important to recognize that the demanders of favors cannot purchase commodities (services) directly, as they would in an economic market" (Gardner 1997 p.14). The government has discretion in making the allocation, and competing stakeholders can rent seek to influence the allocation.

Rent seeking is the activity of influencing the political process to obtain favorable results or avoid unfavorable ones. Rent seeking occurs because political interference with markets creates differentially beneficial positions for some stakeholders who can gain greater access by influencing the outcome (Buchanan et al. 1980). Economic rent is that part of the payment to an owner of resources over and above that which those resources could command in any alternative use, it is the receipt in excess of opportunity cost (Buchanan et al. 1980). For users of public land resources, " rent may be calculated as the use value of the product (service) minus the costs (including fees paid to the government) of obtaining this use value" (Gardner, 1997 p.15).

Because most of the prices (fees) for using public land resources are far below market value, high economic rents increase the incentives for stakeholder groups to compete for a larger share by influencing the decision making process.

Stakeholder groups can influence the decision making process by means of lobbying, media campaigns, public hearings, and litigation (Becker 1983; Rhodes and Wilson 1995; Boyce 1998). The concept of "concentrated benefits and diffused costs" is helpful in explaining why some stakeholders will engage in rent seeking activities while others will not. Gardner (1997) explains this concept as the most powerful public choice principle (Gardner,1997 p.15) :

> *Political decisions can be more effectively manipulated to redistribute wealth in behalf of an interest group if the beneficiaries are relatively small in number and individually have a large stake in the outcome. Free riding can be more effectively controlled with a small number of beneficiaries, so generating resources to influence the political decision is less costly. On the other hand, those who lose from the redistribution must be numerous and individually have a small stake. For example, subsidized federal grazing fees have an important impact on the wealth of a relatively few permittees, while their costs are spread over many millions of taxpayers who allow their wealth to be confiscated as long as the individual costs of blocking redistributive policies are greater than the amount of wealth taken.*

The concept of "rational ignorance" gives another reason why the concentrated interests of a small stakeholder group can dominate the interest of a larger stakeholder group. Stakeholders are assumed to weigh the benefits and costs of becoming informed about a particular issue (Gardner 1997). If the expected costs of becoming informed exceed the expected benefits, stakeholders will choose to remain ignorant and not actively participate in the decision making process.

Rent seeking has important welfare implications because the transactions costs associated with individual or group efforts to maximize their own utility can generate social waste rather than social surplus (Buchanan et al. 1980). Resources that could otherwise be devoted to value producing activities are used in competitive effort that determines nothing other than the

distributive results (Buchanan et al. 1980). Transaction costs can include the cost of information gathering, establishing a bargaining position, public hearings, negotiation, compromise, and litigation (Griffin 1991; Rhodes and Wilson 1995). The amount and distribution of rent seeking activity and resulting transaction costs will depend on the initial entitlement, the disparity of influence levels between stakeholders, the degree of competition (Gardner 1997), and whether a property or liability rule is held by one party or another (Griffin 1991).

Wasteful rent seeking activities will always be part of political allocations unless the differential advantages granted to some stakeholders as a result of the allocation are eliminated. According to Buchanan et al. (1980 p. 11):

> *This principle in turn suggests that all persons in the community must be allowed equal access to the scarcity values created by governmental intervention in the market economy. For example, if government decides to restrict the production or sale of a commodity, thereby creating the opportunity for economic rents, each person in the community must be granted an equal share in the prospective rents. If this sharing is announced in advance and becomes generally known, it will not be rational for anyone to invest resources in trying to secure differential advantages. Only if the equal-sharing rule could somehow be permanently implemented in each and all possible scarcity value distributions could we predict the total absence of rent seeking, even at the most basic level.*

The rent seeking literature was initially developed to describe the level of resource wasting activities of individuals seeking transfers of wealth through the sponsorship of the state (Tullock 1967; Krueger 1974; and Possner 1975). Rent seeking models that included lobbying and its influence on government regulations evolved from research on trade and regulation policies (Chen et al. 1998). These models address how various interest groups compete for political allocations and whether the allocations are efficient (Peltzman 1976; Stigler 1971) Becker (1983) modeled how government regulations results from interest groups purchasing political favors by increasing campaign contributions. According to Becker (1983), political

equilibrium depends on the efficiency of each group in producing pressure, the effect of additional pressure on their influence, the number of persons in different groups, and the deadweight costs of taxes and subsidies. An increase in deadweight costs discourages pressure by subsidized groups and encourages pressure by taxpayers (Becker 1983).

2.3.1 Rent Seeking in Resource Management Decisions

Rent seeking models have been developed to explain allocations of environmental and natural resource policies. Chen (1998) and Damania (1999) have shown how rent seeking and lobbying activities influence federal environmental policy instruments. Boyce (1998) investigated the ways in which the government can affect the rent seeking behavior of competing user groups in natural resource quota allocations by setting the ground rules for competition. This framework was concerned with various institutional frameworks and their effect upon the level of rent-seeking waste. The final allocation was dependent on the initial allocation and the change in allocation resulting from political competition (Boyce 1998).

Rhodes and Wilson (1995) demonstrated how rent seeking activities affected the environmental conflict surrounding the Mount Graham International Observatory project. A traditional welfare model (Bromley 1989; Griffin 1991) was used to illustrate the public policy process involving choices and conflicts between alternative property rights. Rhodes and Wilson (1995) concluded that a negotiated solution without changes in the property rights could have achieved the same final allocation without the deadweight loss to society of at least $10 million and five years of forgone astrophysical research.

Chapter 3: Methodology

3.1 Road Map

Natural resource management (NRM) decisions are complicated by multiple property rights, multiple management objectives, and multiple stakeholders with varying degrees of influence over the decision making process. My purpose is to show how institutional frameworks and stakeholder involvement influence the various stages of a NRM decision making process. Knowing stakeholders' preferences for management outcomes, what the institutional system looks like, and how stakeholders are likely to react to the different management options **before** the decision is made can assist and improve the decision makers' understanding of the decision process and lead to a collaborative decision that includes the preferences of all stakeholders. This significantly increases the overall efficiency of the natural resource decision-making process and reduces the risk of having the process sent into litigation.

The flowchart in Figure 2 illustrates the five stages of a NRM decision making process. The conceptual framework section develops a theoretical public choice model for the five stages. Following the conceptual framework, the public choice model is constructed mathematically. This model is then applied to the JBEMP/EIS case study.

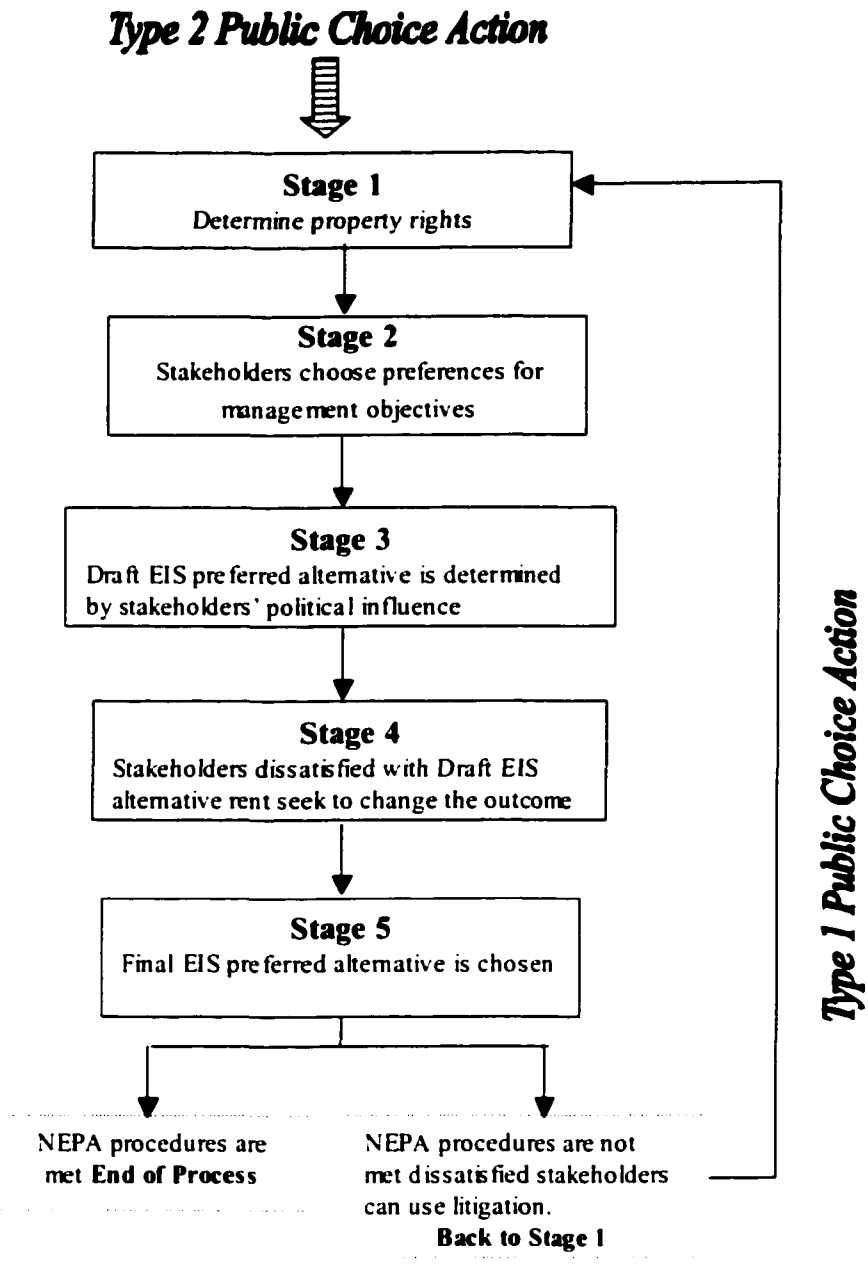


Figure 2. Stages of the Decision Making Process for Natural Resource Management

3.2 Conceptual Framework

Stage 1: Determining Property Rights

Building on a traditional welfare model (Bator 1957; Bromley 1989; Griffin 1991), Rhodes and Wilson (1995) illustrated the difficulties surrounding the NRM planning process when there are conflicts between alternative property rights. Following Rhodes and Wilson (1995), the production possibilities frontier (PPF), PPF* in Figure 3 represents the technically efficient combinations of two types of land use services that can be produced using available resources in the absence of transaction costs. The PPF has two management objectives with many alternative combinations of each objective possible along the curve. Two management objective proxies, Land Use Management Practice 1 and Practice 2, represent the multiple objectives associated with each resource management objective. The assumption of diminishing marginal returns creates a bowed PPF because each alternative offers some of each land use management practice objective.

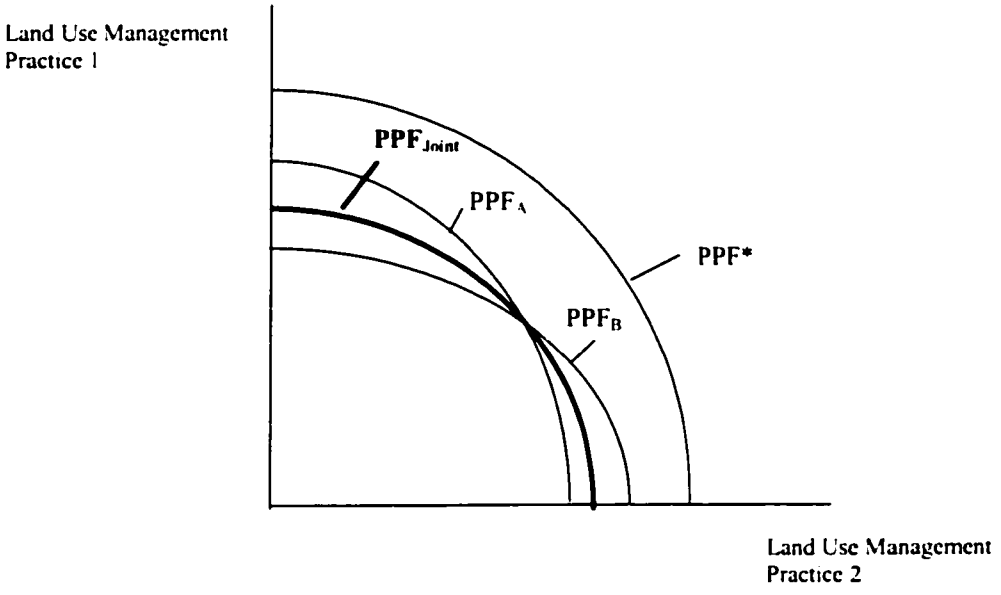


Figure 3. Property Rights in a Natural Resource Management Planning Process

Transaction costs use resources that that could otherwise be applied to management practices to obtain objectives. Transaction costs can include the cost of information gathering, establishing a bargaining position, public hearings, negotiation, compromise, imperfect information, and litigation (Griffin 1991; Rhodes and Wilson 1995). Property rights A and B produce different frontiers due to differing levels and types of transaction costs associated with each property right. Imperfect information and decisions create inefficiencies for each agency (Rhodes and Wilson 1995). Transactions costs associated with the different property rights will shift the PPF inwards to PPF_A for the property right of Agency A and PPF_B for property right of Agency B.

For a NRM planning process, property rights are held by the controlling land management agencies. If more than one agency is involved, the way in which the prevailing property right is chosen can be a complex process. For the purposes of my paper, choosing which agency is awarded the property right and control over the planning process will be generalized into two different types of public choice actions: Type 1) there can be a fight between agencies and involved stakeholder groups for control of the process; or Type 2) there can be an interagency agreement and cooperative effort between the involved agencies. A Type 1 public choice action examines what happens when there is a fight to determine which agency's PPF will be used to make the decision. An example of a fight for property rights is the current litigation between the FWS and the WGFD over the use of the brucellosis vaccination for the elk on the NER. In Figure 3, this is represented as a choice between PPF_A and PPF_B. A battle for property rights can happen during Stage One of the planning process or at the end of Stage Five if legal mandates such as NEPA are not properly followed during the planning process giving unsatisfied stakeholders means to litigation.

Rhodes and Wilson (1995) focused on the welfare implications of a Type 1 public choice action when there is a battle for property rights. If Agency A has full rights, choices along Agency B's PPF exterior to Agency A's PPF are no longer attainable and the opposite is true when Agency B holds the property rights. As the agencies continue to compete over who has control, the transactions costs and deadweight loss to society associated with a change in property rights will continue to increase shifting the final decision PPF farther inwards (Griffin 1991; Rhodes and Wilson 1995). Therefore, from a social standpoint it would be beneficial for the agencies to negotiate instead of trying to change the institutional property rights. Because Rhodes and Wilson (1995) explained the case where there is a fight for property rights, my dissertation will focus on what happens during the Type 2 public choice action when an interagency agreement is formed in Stage One of the NRM planning process.

For a Type 2 public choice action, the NRM production possibilities frontier is assumed to be a combination of the production possibilities allowed by the involved agencies, represented by PPF_{Joint} in Figure 3. An example of an interagency NRM effort would be the NPS, USFS, and FWS working together to protect the habitat of an endangered species. While a Type 1 public choice action examines what happens when there is a fight to determine the controlling PPF represented as change in PPF curves, a Type 2 public choice action focuses on the available choices for stakeholders to negotiate represented as a movement along and within the boundaries of the agreed upon PPF (PPF_{Joint} in Figure 3). This dissertation is focused on a Type 2 public choice action.

Stage 2: Stakeholder Preferences

The mandates, environmental regulations, and current budget allocations of the NRM agencies will restrict and establish the boundary and location of the PPF_{Joint} curve to the level of

resources available. The PPF_{Joint} has two management objectives, O_1 and O_2, with many alternative ($k_1 \ldots k_n$) combinations of each objective. Stakeholders that do not have property rights will not have leverage in determining the actual placement of the PPF_{Joint} curve. After the PPF_{Joint} curve boundaries have been legally established, it is assumed that the stakeholder groups involved in the public participation process can influence the position of the decision outcome along the PPF_{Joint} curve. The Council for Environmental Quality requires agencies to make diligent efforts to involve the public in preparing and implementing their NEPA procedures. Because of the high level of controversy surrounding most NRM planning processes, public involvement plays a crucial role in the development of a successful plan. Therefore, it is assumed that it is in the best interest of a NRM planning team to work with all stakeholder groups --within the boundaries of the negotiated PPF_{Joint} established by the NRM agency or planning team mandates -- in the development of the management plan.

All of the different federal, state, local, private and public stakeholder groups involved in the NRM planning process have diverse values and preferences about the management objectives and proposed alternatives. Along and within the boundary of the PPF_{Joint} curve, stakeholders can select their preferred management alternative (Figure 4). Amounts of land use services exterior the PPF_{Joint} boundary are not achievable without social reform and will not be considered.

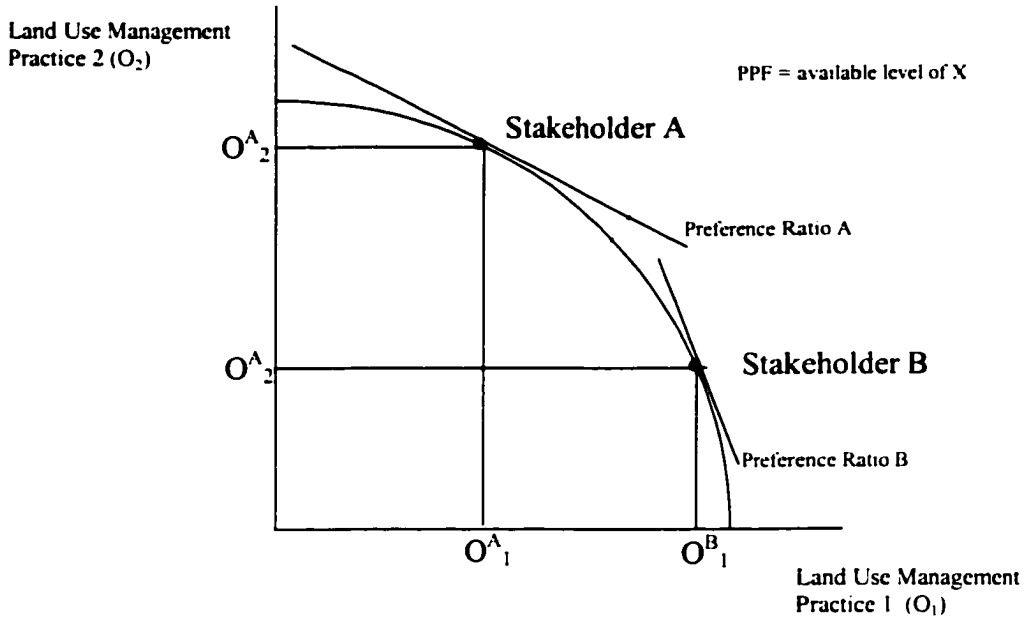


Figure 4. Stakeholder Preferences along on the PPF_{Joint} curve.

In Figure 4, for the available resource level, X, various quantities of the two types of land use management practices (O_1, O_2) can be conducted. Land use practice$_1$ and land use practice$_2$ are management objective proxies that will be used to represent the multiple objectives associated with each land use management practice. Assuming diminishing marginal returns, as more X is used in one type of land use practice less is available to be used for the other type of land use practice, this bows the shape of the PPF outwards. The amount of utility a Stakeholder$_i$ receives at their preferred management alternative can be measured by:

$U_i = \lambda_{i1} O_1 + \lambda_{i2} O_2$

Where
U_i = measure of utility for Stakeholder$_i$
λ_{ij} = the weight placed by Stakeholder$_i$ on objective j.
$X = O_1 + O_2$

By solving for O_2, the tradeoff in preference between O_1 and O_2 for Stakeholder$_i$ can be determined.

$$O_2 = \frac{U_i}{\lambda_{i2}} - \frac{\lambda_{i1}}{\lambda_{i2}} O_1$$

where $\frac{\lambda_{i1}}{\lambda_{i2}}$ = preference ratio for Stakeholder$_i$

$\frac{U_i}{\lambda_{i2}}$ = O_2 intercept for Stakeholder$_i$

It is assumed that stakeholders will exhibit two stages of rent seeking behavior during the decision making process. The first stage is an initial low-cost rent seeking used during the first stages of the decision making process. During this initial stage, stakeholder comments are recorded from attendance at pubic meetings and letters, requiring minimal time and effort on behalf of each involved stakeholder. At this point, stakeholder involvement can only influence the position of the decision outcome along the PPF_{Joint} curve. The second more intensive stage of rent seeking behavior occurs after the draft EIS preferred management alternative is chosen. The transactions costs associated with this more intensive rent seeking can be large enough to cause an inward shift of the PPF_{Joint} curve.

Stage 3: Draft EIS Preferred Alternative is Determined

Public choice theory differs from traditional economic models where a neutral government maximizes for the social welfare of society. Instead, public choice models provide a more realistic understanding of how public land management decisions are made by including the political influence and rent seeking behavior of stakeholder groups (Boyce 1998; Chen 1998). It is assumed that the underlying institutional factors determine the 'political influence' weight a stakeholder has for influencing the policy outcome (Boyce 1998). The NRM planning team is assumed to select policies that will maximize its own objectives (mandates, budget

constraints, and agency missions) and the objectives of other stakeholders (within the PPF_{Joint} boundaries).

Once management preferences and the political influence weights of all stakeholders are known, the NRM team must use some sort of decision weighting rule to select the Draft EIS preferred alternative. It will be assumed that the NRM team will select the draft EIS preferred alternative based on the 'average' of the summed politically influenced weighted preferences of all stakeholders (Figure 5). According to Buchanan et al. (1980), if all stakeholders are granted an equal share of the economic rents, it will not be rational for stakeholders to invest resources in rent seeking behavior. By taking the average of stakeholders' management preferences without the political influence weights, an equal influence average outcome can be determined. The equal sharing principle is not achievable in reality because of the requirement that it be announced in advance and become generally known (Buchanan et al. 1980). However, it is used as a reference point in this paper to show how political influence alters the outcome. The difference between the politically influenced weighted outcome (the draft EIS preferred alternative) and the equally weighted outcome is equivalent to a movement along the PPF_{Joint} curve (Figure 5).

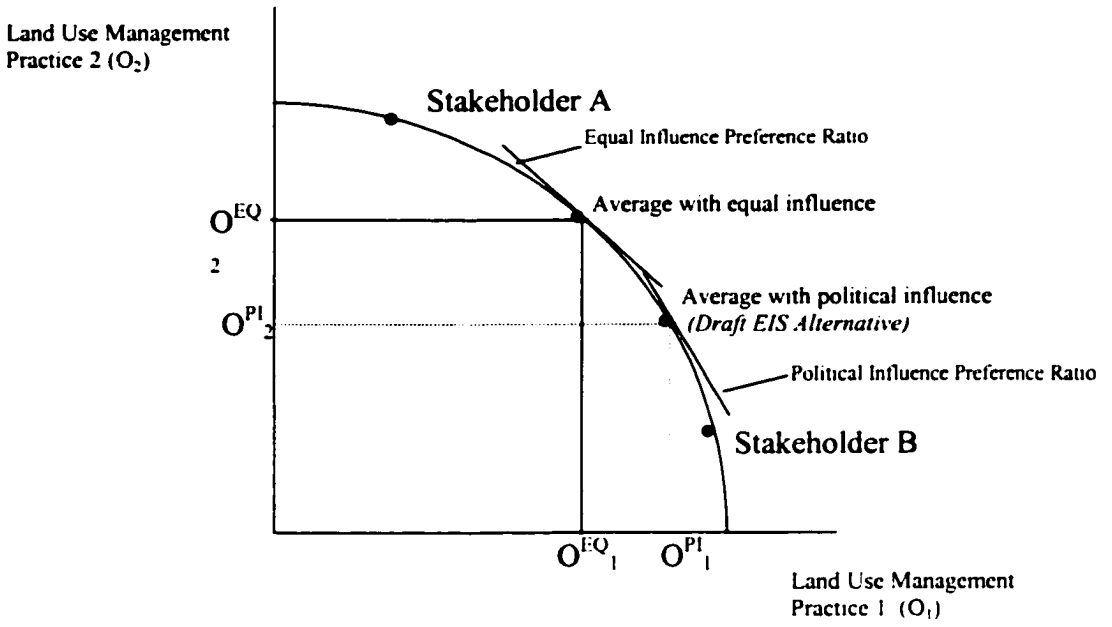


Figure 5. Outcomes along the PPF_{Joint} curve.

Stakeholder participation in the public scoping meetings and public comment period will help select the preferred management alternative for the draft EIS. The minimal time and effort associated with this initial low-cost form of rent-seeking do not create transactions costs large enough to shift the PPF_{Joint} inwards. The draft EIS will be represented by the politically influenced weighted sum of the utility functions of all stakeholders including the planning team agencies (Figure 5).

Stage 4: Rent Seeking

Political influence is not held at a fixed level by the political process; it can be expanded by expenditures of time and money to exert political pressure (Becker 1983). After the draft EIS preferred management alternative is chosen, if the outcome is not close to the preferences of a given stakeholder, that stakeholder can increase its rent seeking activities to try to force a more favorable outcome. How much rent seeking actually happens depends the degree of importance of each issue to a stakeholder, how different the draft alternative is to their preferred alternative,

what abilities they have to influence the outcome, and the level of rent seeking by other stakeholder groups.

How a stakeholder uses its influence can greatly effect the time, effort, and costs of the decision making process (Chen et al. 1998). When rent-seeking activities are considered, financial and personnel resources of the planning team are spent on unproductive activities (fighting litigation) leaving fewer resources available for providing management services (Rhodes and Wilson 1995; Chen et al. 1998). The transactions costs associated with rent seeking are reflected by an inward shift of the PPF_{Joint} (Figure 6). The degree of rent seeking will determine the level of transaction costs and how far the PPF_{Joint} shifts inwards. Transactions costs are a real and unavoidable aspect of any economic system (Griffin 1991). Even without rent seeking activities, information generation will occur pushing the PPF_{Joint} inward (e.g. Curve B Figure 6). Highly disputed outcomes will lead to more resources being spent on the decision process and less on actually providing management services (Curve C Figure 6).

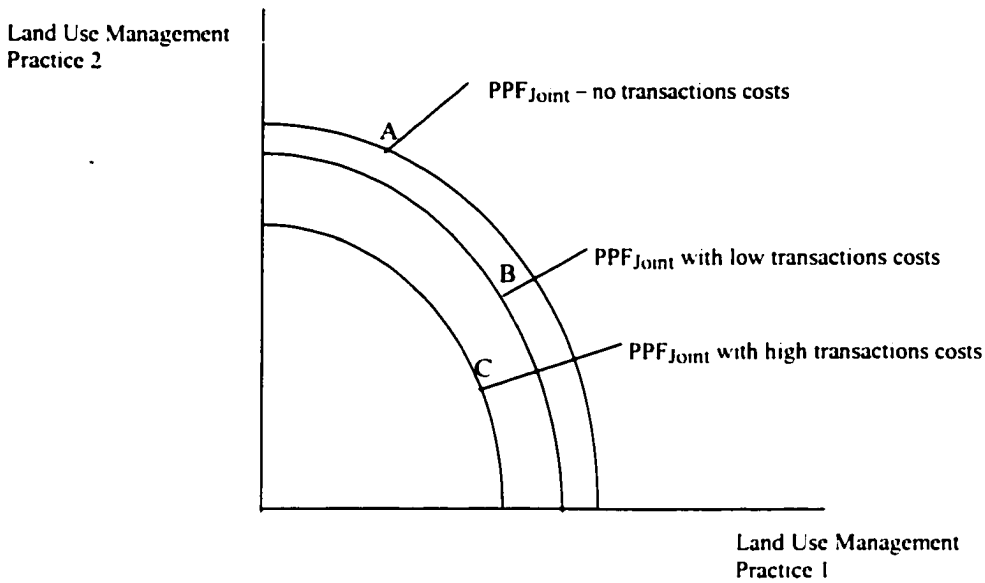


Figure 6. Rent seeking shifts of the PPF_{Joint} curve

Stage 5: Final EIS Preferred Alternative

The final EIS preferred alternative will be chosen based on the draft EIS alternative and the rent seeking activities of all stakeholder groups within the boundaries of the EIS planning team PPF_{Joint}. However, this decision might not be the final outcome. Stakeholders not satisfied with the NRM planning team's final alternative may renew efforts to expand their opportunity set by continuing to rent seek to modify the existing institutional constraints. This could result in having the property rights changed to a different agency and sending the decision making process back to Stage One (Type 1 public choice action). The transactions costs and deadweight loss to society associated with a change in property rights would be dramatically higher than the transactions costs without a change in property rights shifting the final decision PPF even farther inwards (Griffin 1991; Rhodes and Wilson 1995). Therefore, it would be beneficial for all stakeholders to negotiate along the PPF_{Joint} curve boundaries (Type 2 public choice action) instead of trying to change the institutional property rights. In the case of the Mount Graham International Observatory, a negotiated solution without changes in the property rights could have achieved the same final allocation without the deadweight loss to society of at least $10 million and five years of foregone astrophysical research (Rhodes and Wilson 1995).

The inclusion of interested stakeholders in the early stages of the decision making process generates a higher probability of producing an acceptable, negotiated settlement (Rhodes and Wilson 1995). A NRM planning team should be well aware of the importance of public cooperation and take the initial steps towards a negotiated settlement by including the public early on as part of the pre-scoping process and planning for public involvement throughout the NRM planning process.

3.3 Constructing the Model

The land management decision has a set of management alternatives, (k = 1,2....K), with the set of measurable objectives (j = 1,2,...J). Let i represent the stakeholders involved in the decision making process (i = 1,2,....,n). To incorporate stakeholders' values into the decision process, each stakeholder must specify their own distinguishable preferences for the management outcome. Each stakeholder evaluates the same management issues in accordance with their own preference for outcome. Let λ_j equal the weights or priorities $\lambda = (\lambda_{11}, \ldots \lambda_{ij})$, for stakeholder$_i$ for each management objective, j.

The most common forms of utility functions are the additive, multilinear, and multiplicative. Selection of the proper utility function is based upon the degree of conformance of individual or group preferences to standard independence conditions (Shields et al. 1999). For simplicity, I will use an additive utility function.

A stakeholder$_i$'s utility function can be represented as

$$U_{ik} = \sum_{j=1}^{J} \lambda_{ij} x_{kj} \qquad (1)$$

Where: U_{ik} = Stakeholder$_i$'s utility from alternative k.
λ_{ij} = the weight placed by Stakeholder$_i$ on objective j.
x_{kj} = the objective level of x for alternative k given objective j.

Equal Weighting

The first of the two weighted outcomes to be examined is equal weights. If all stakeholders had equal influence over the decision outcome, the preferred alternative, K_{eq}, would be the average of the summed individual utilities. This decision outcome is the average across all individuals.

$$K_{eq} = \frac{\sum_{i=1}^{n} U_{ik}}{n} \qquad (2)$$

Political Influence Weighting

The second type of outcome to be considered is a political influence weighted outcome. Institutional factors determine the roles and levels of power a stakeholder has for influencing the policy outcome decision. This level of influence will depend on who holds the property rights. Let μ_i denote the "political influence weight" of stakeholder$_i$ as described by Van Winden (1999). Following Lamb et al.(1993), the political influence weight for a stakeholder$_i$ can be defined as:

$$\mu_i = f(\alpha_i, \text{Role Type}_i, \text{Power}_i) \qquad (3)$$

Where

α_i = relative importance weight
μ_i = measure of each stakeholder's relative importance on final decision
Role Type$_i$ = a function of the LIAM role attributes = g (Advocate Role, Guardian Role, Arbitrator Role, Broker Role)
Power$_i$ = a function of the LIAM power attributes = h (Resource Power, Information Power, Support Power)

The politically influenced weighted utility function for an individual stakeholder can be defined as:

$$V_{ik} = \mu_i * U_{ik} \qquad (4)$$

Where $\sum_{i=1}^{n} \mu_i = 1.0$

The NRM planning team is assumed to set policies to maximize its own objectives (mandates, budget constraints, and agency missions) and the objectives of the public within the NRM PPF boundary (Van Winden 1999; Chen 1998). This will be represented by the politically

influenced weighted sum of the utility functions of all stakeholders including the planning team agencies. The draft EIS preferred alternative, K_{PI}, is the average of the summed individual politically influenced weighted utility functions.

$$V_{PI} = \sum_{i=1}^{n} V_{ik} \Rightarrow K_{PI} \qquad (5)$$

If μ_i is identical for all stakeholders, then the political influence of all stakeholders is equal $K_{PI} = K_{eq}$ in an efficient political economy, K_{PI} is found by maximizing V by choosing K.

It will be assumed that K_{PI} = the draft EIS preferred alternative.

Rent Seeking

Political influence is not a fixed level by the political process, it can be expanded by expenditures of time and money to exert political pressure (Becker 1983). Assuming that the decision will stay on the boundaries of the NRM PPF, once K_{PI} is known, each stakeholder will choose their level of rent seeking based on:

1) the distance between what they prefer (e.g. stakeholder A in Figure 5) and the draft EIS alternative allocation (e.g. K_{PI}, average with political influence in Figure 5). This is the ***policy cost*** of not getting everything they wanted.

2) the importance (magnitude of preference) of policy issues. This is the ***policy benefit*** of getting their preferred allocation

3) the level of rent seeking of other stakeholder groups.

If the expected costs of contesting the draft EIS alternative exceed the expected benefits, stakeholders will choose to not actively participate in the decision making process.

Let

K^*_i = preferred alternative for stakeholder $_i$

b_{ij} = policy benefits stakeholder $_i$ receives from management objective j

$d_{K^{\bullet}i,PI}$ = the utility distance along the PPF curve (policy cost) between the allocation level of the Draft EIS policy allocation and stakeholder $_i$'s preferred policy allocation.

Where $d_{K^{\bullet}i,PI} = V_{K^{\bullet}i} - V_{PI}$

The amount of political pressure (rent seeking) from stakeholder group$_i$ will be a function of

$$p_{ij} = f(b_{ij}, d_{K^{\bullet}i,PI}, \sum_{l \neq i}^{L} d_{K^{\bullet}l,PI}) \qquad (6)$$

Where $\sum_{l \neq i}^{L} d_{K^{\bullet}l,PI}$ = pressure or rent seeking from other stakeholder groups. If the expected benefits, b_{ij}, are greater than the expected costs, $d_{K^{\bullet}i,PI} + \sum_{l \neq i}^{L} d_{K^{\bullet}l,PI}$, stakeholder$_i$ will engage in rent seeking activities.

In order to have an affect on the outcome, stakeholders must engage in legitimate and legal (within the PPF_{Joint} boundaries) rent seeking activities. In response to stakeholder political pressure, the EIS planning team will choose to stay with the preferred alternative, modify the draft preferred alternative to respond to stakeholder comments, or select a different alternative as the final EIS preferred alternative.

The final EIS preferred alternative, K*, will be a function of the draft preferred alternative and the amount of rent seeking by all stakeholder groups.

$$K^* = f(K_{PI}, \sum_{i=1}^{n} p_{ij}) \qquad (7)$$

3.4 Case Study

The Jackson bison and elk migration corridor includes land managed by the USFWS, NPS, USFS, as well as small areas of private and state owned lands. Current environmental laws

and regulations as well as each land management agency's mandated mission, creates differing degrees of property rights (production possibilities) over the management of the Jackson herds. While the NPS is required to manage more for the "natural regulation" preservation of resources, the multiple-use mandate of the USFS requires a more "managed" use that includes several types of resource uses and user groups. For example, recreational elk hunting is permitted on the BTNF while only a restricted number of reduction hunting permits for population control purposes are issued for the GRTE and NER. Bison hunting is currently prohibited on the NER and GRTE due to the 1998 court order prohibiting federal agencies from destroying any bison for population control purposes until NEPA compliance is complete. During this time, however, the WGFD is allowed to conduct limited recreational bison hunts on USFS lands (NPS 2000).

For the Jackson Bison and Elk Management planning process, it will be assumed that the property rights are held by the land management agencies involved in the JBEMP/EIS process (Figure 7). The FWS and NPS are the joint lead agencies in the planning and compliance process. Given the anticipated level of involvement by agency, the JBEMP/EIS PPF is conceptualized as a combination of the production possibilities that are allowed by the GRTE and NER and to a lesser extent, the BTNF and WGFD (Figure 7). The mandates, environmental regulations, and current budget allocations of GRTE, NER, BTNF, and WGFD will restrict the boundary and location of the JBEMP/EIS PPF curve (to the dashed lines area). The agencies' PPFs are not known with certainty or achievable in reality. Under a Type 1 public choice action, an analysis of the JBEMP/EIS would focus on determining which agency PPF curve would be chosen for control over the decision. My analysis will focus on a Type 2 public choice action where it is assumed that there is some sort of agreement, such as NEPA, that defines the ground rules between planning team agencies mandates and missions. The actual placement of the

JBEMP/EIS planning team PPF curve is a combination of all planning team agencies PPFs (JBEMP/EIS Team PPF in Figure 7).

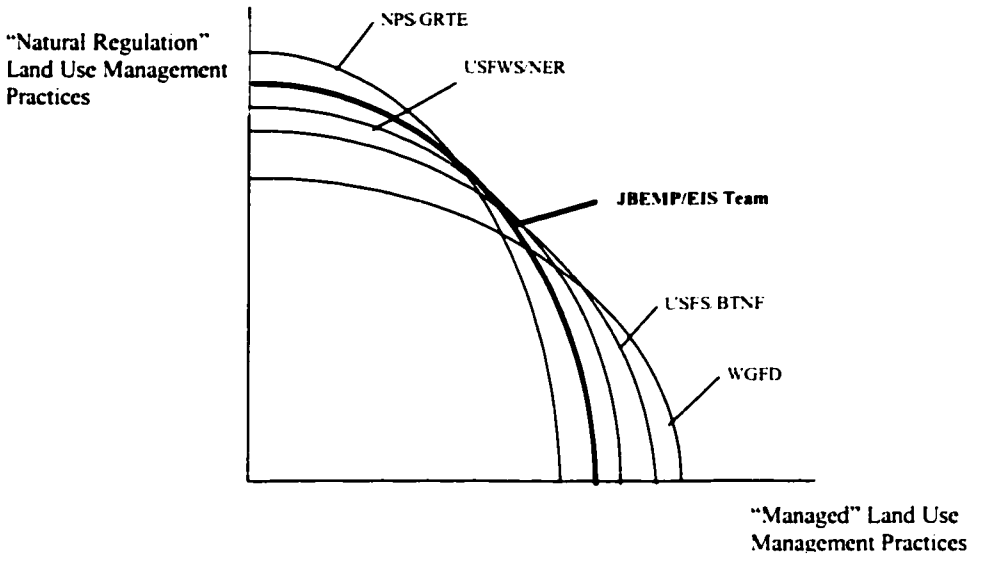


Figure 7. Bison and Elk Management PPF by Agency

The PPF has two management objectives, O_1 and O_2, with many alternative (k_1....k_n) combinations of each objective (Figure 8). Two management objective proxies, Natural Regulation and Managed, will represent the multiple objectives associated with each land use management practice. Assuming diminishing marginal returns, as more X is used to produce one type of land use practice less is available to produce the other type of land use practice, this arcs the shape of the PPF outwards (Figure 8).

$X = f(O_1, O_2)$

O_1 = objective proxy for Managed Land Use Practices = *h* (active disease management practices, winter feeding, and hunting)

O_2 = objective proxy for Natural Regulation Land Use Practices = *g* (management practices that encourage dispersal, no feeding, and no hunting)

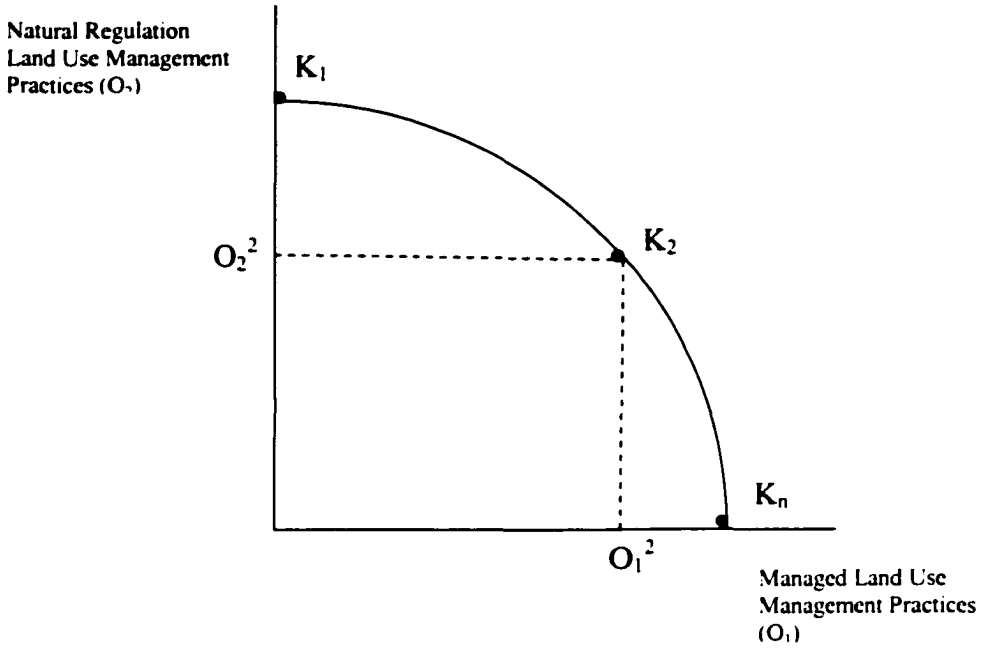


Figure 8. Management Objectives on the PPF

Stakeholders not included on the planning team will not have leverage in determining the actual placement of the JBEMP/EIS PPF curve. After the JBEMP/EIS PPF curve boundaries have been established, it is assumed that the stakeholder groups involved in the public participation process can influence the position of the decision outcome along the JBEMP/EIS PPF curve. Because of the high level of controversy surrounding the JBEMP issues and the recent failure of the Jackson Bison Environmental Assessment, public involvement will play a crucial role in the development of a successful EIS.

The JBEMP/EIS planning team anticipates incorporating public comments to develop the management issues and alternatives. The public involvement strategy is expected to incorporate the interests and perspectives of numerous local, regional, and national stakeholder groups. Expected interested stakeholder groups include agricultural and ranching interests; hunting and outfitting; businesses involved with tourism; environmental and wildlife conservation; animal

rights; the research and education community; Native American tribes; and federal, state, and local government officials (U.S. Institute 2000). Three public pre-scoping meetings were held in Jackson, Wyoming in the spring of 2001. Public pre-scoping meetings were also held in Riverton, Casper, Cheyenne, and Rock Springs. The pre-scoping process ended in May 2001. The official scoping process and meeting were held in July 2001. The timeline calls for the Draft Plan/EIS to be available to the public in February 2003, and the Final Plan/EIS finished in April 2004.

3.5 Model Application to the Case Study

The LIAM was used in conjunction with AHP to apply the theoretical public choice model to the JBEMP/EIS decision making process. Figure 9 depicts the sequence of the three major steps involved in designing this framework. Data was collected by personal interviews with stakeholder representatives. The LIAM analysis provided the role and power levels needed to determine each stakeholder's level of influence. Two AHP surveys were administered to determine: 1) each stakeholder's influence weights (μ_i, equation 3); and 2) each stakeholder's preference weights (λ_{ij}, equation 1) for the management objectives. Each stakeholder representative was asked to complete the LIAM analysis and both of the AHP surveys. Personal interviews are ideal for conducting AHP studies because the paired comparison questions can be confusing, and the AHP is intended to be an interactive decision tool (Page 1997).

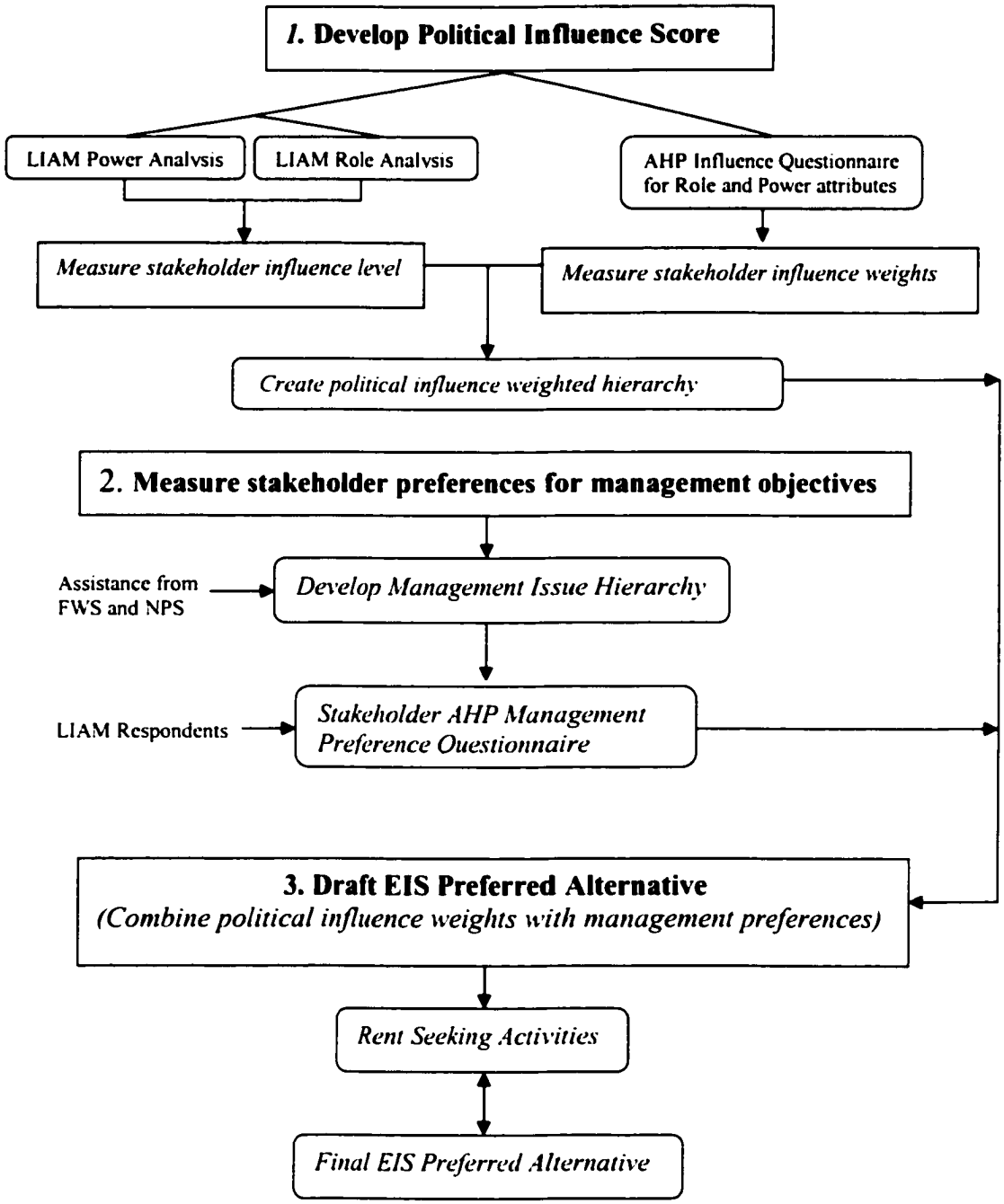


Figure 9. Model Application Framework

3.5.1 Step 1: Developing the Political Influence Score

The LIAM uses a questionnaire to measure respondent knowledge about a stakeholder's likely role and sources of power in the natural resource conflict (Lamb et al.1993). A stakeholder's type and level of role and power will determine its likely influence over the outcome. In order to measure the political influence of a particular stakeholder, two pieces of information must be known. First, the stakeholder's level for each attribute comprising the overall role and power must be determined (Role $Type_i$, $Power_i$, equation 3). Having each stakeholder answer a LIAM self-assessment questionnaire provided the information needed to determine these levels. Secondly, the overall weight each role and power attribute has in determining influence must be known. The methods for both of these tasks are described below.

Measuring Stakeholder Influence Level

LIAM Organizational Roles

The LIAM categorizes organizational behavior in two distinct dimensions, which are the result of organizational preferences for the outcome and preferences for the process in which the outcome is generated. A stakeholder's preference for the actual outcome is linked to its traditional values or goals (Wilds 1988). In this regard, the LIAM will categorize a stakeholder as either an advocate or a guardian. A stakeholder's preferred type of process for resolving the conflict is related to the resources it has available to influence the outcome (Wilds 1990). The LIAM categorizes this preference as a broker or an arbitrator.

Within the LIAM organizational role categories (outcome and process), the LIAM organizational role types (advocate, guardian, broker, and arbitrator) have several distinguishable attributes (Figure 10). The model contains a library of questions associated with each attribute

for all roles (Appendix A). The software randomly selects one question for each attribute to construct a unique questionnaire for each respondent. The respondent is asked to select the response choice that most accurately reflects the degree to which the statement can be applied to the organization being analyzed (Wilds 1990). The set of possible responses are coded on a 5-point Likert scale ranging from strong agreement to strong disagreement. The questions relating to a particular role are scored, added, and averaged to calculate an index for each of the four roles.

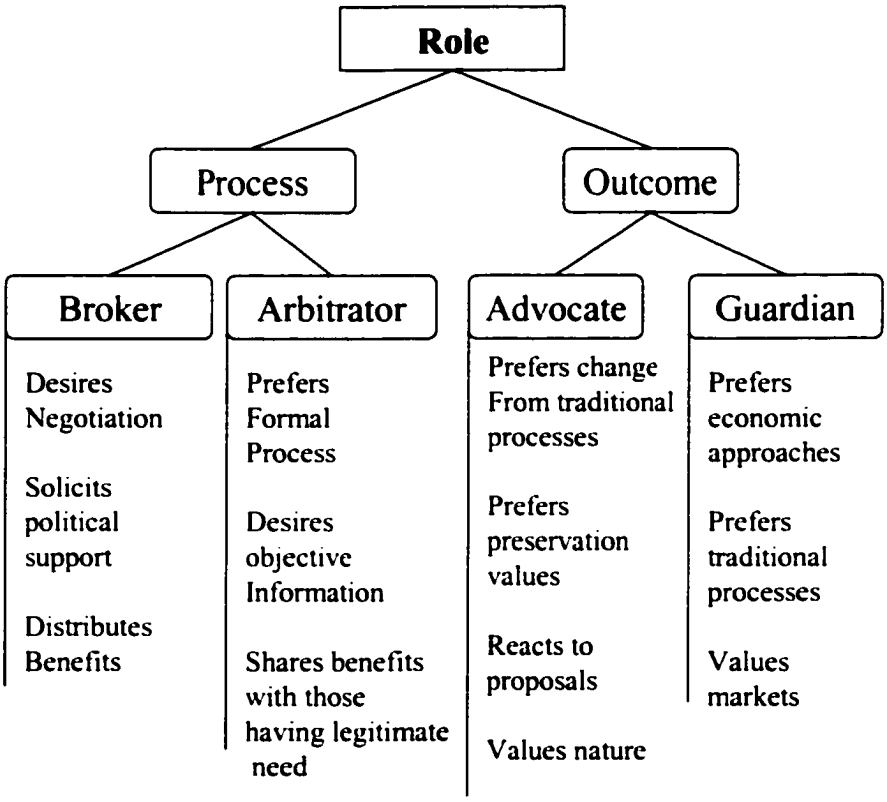


Figure 10. LIAM Role Attributes

The LIAM allows for the fact that most organizations will have characteristics for more than one role type in each dimension (Wilds 1990). To determine the dominant role type in each preference dimension, the advocate-guardian scores are separated from the broker-arbitrator

scores. For the advocate-guardian dimension, the lower score is subtracted from the higher score. The result represents a measure of perceived organizational preference for one type of outcome to the other (Wilds 1990). Likewise, the lower score is subtracted from the higher score for the broker-arbitrator dimension with the result representing the degree to which an organization prefers one set of procedure to the other (Wilds 1990). The combined roles that describe a stakeholder's expected behavior pattern are defined by its location in both dimensions at once (Wilds 1990).

The combined role results are displayed on a "role map" (Figure 11). A stakeholder that holds more extreme preferences will lie farther out on the role map than a stakeholder with moderate preferences. Depending on its role scores and placement on the role map, a stakeholder is classified as a moderate advocate-broker, an extreme guardian-arbitrator, or some other combination. The role map contains 16 sub-quadrants for expected behaviors. The model provides a written description of behavioral descriptions associated with each sub-quadrant (Appendix B). Analysts use the role map and behavioral descriptions to understand the interaction of the various stakeholders (Lamb et al. 1999).

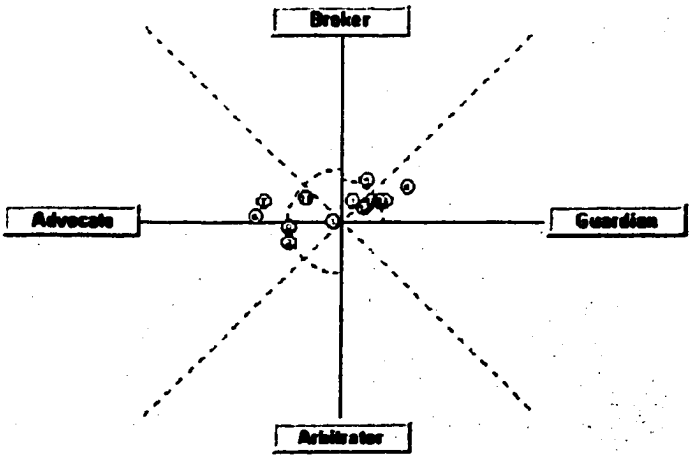


Figure 11. LIAM Role Map (dashed lines indicate sub-quadrant boundaries)
Source: Lamb et al. 1999

LIAM Organizational Power

The three LIAM power measures (resource, information, and support) have several distinct attributes that are measured to characterize an organization's level of power (Figure 12). Just as it does for organizational role, the LIAM randomly selects a question from the library for each power attribute for each respondent's survey (Appendix A). The questions relating to a particular type of power are scored, added, and averaged to calculate an index for each power type. The LIAM reports the scores in a bar graph and table.

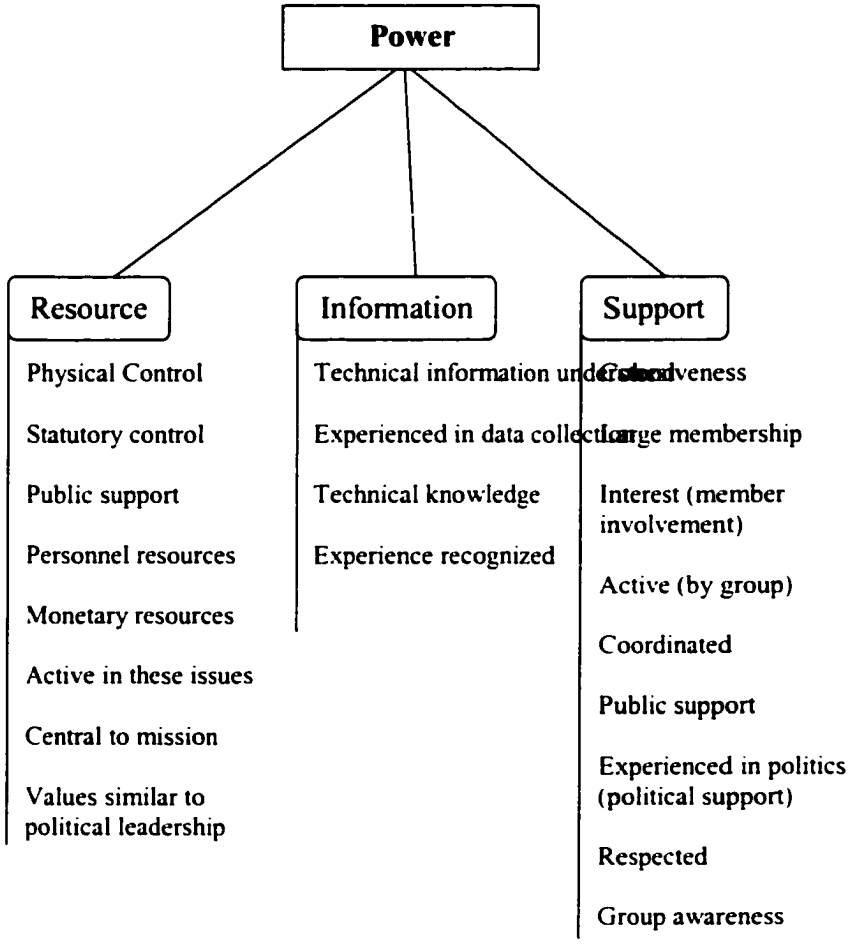


Figure 12. LIAM Power Attributes

Measuring Stakeholder Influence Weights

The AHP Influence Questionnaire

The LIAM assumes that all attributes relating to a particular role or power type have equal weight. For example, in determining a stakeholder's level of resource power, the stakeholder's level of physical control of the resource is equally important as its level of public support. To determine if this is correct, the AHP method was used to determine the influence weights (μ_i, equation 3) for each of the role attributes (Figure 10) and power attributes (Figure 12). The role and power objectives were also weighted in order to determine the overall influence score.

The AHP, developed by Satty (1980), is one of the most powerful and popular multiple criteria decision making models. The AHP is a formal and scientific decision method that aids in the formulation and analysis of complex decision problems by breaking the decision problem down into separate interrelated parts, which when aggregated, form a rational conclusion (Harker 1987; Page 1997). The AHP allows decision makers to model a complex problem in a hierarchical structure showing the relationships of the goal, objectives (criteria), sub-objectives, and alternatives. A hierarchy provides an effective way to visualize and conceptualize a large and detailed problem by breaking the problem down into all of its related parts. This allows decision makers to view the application of data, experience, insight, and intuition in a logical and thorough way. The software program Expert Choice (2000) was used to construct and analyze the hierarchy weighting.

AHP is used to derive priorities based on sets of pairwise comparisons to evaluate the tradeoffs between multiple objectives. According to Forman and Peniwati (1998), the AHP is based on a human being's intrinsic ability to structure perceptions or ideas hierarchically,

compare pairs of similar things against a given criterion, and judge the intensity of the importance of one thing over the other. The AHP modeling framework then synthesizes all the judgments in the hierarchical framework to obtain the overall priority of the separate interrelated parts. A detailed explanation of the structure and computations that comprise the AHP is provided in Appendix C.

Create Political Influence Weighted Hierarchy

Combining the AHP weighted political influence hierarchy weights (α_i, Equation 3) from the AHP influence hierarchy with the role and power levels (Role $Type_i$, $Power_i$, Equation 3) provided by the LIAM forms the stakeholder political influence score μ_i (Equation 3). This score gives measures that can be used for comparing the political influence between the stakeholders. All stakeholders completing the LIAM workshop will be asked to fill out the LIAM AHP survey to weight the influence hierarchy (Appendix D). The following is an example of how the LIAM and the AHP will be combined to form the political influence score.

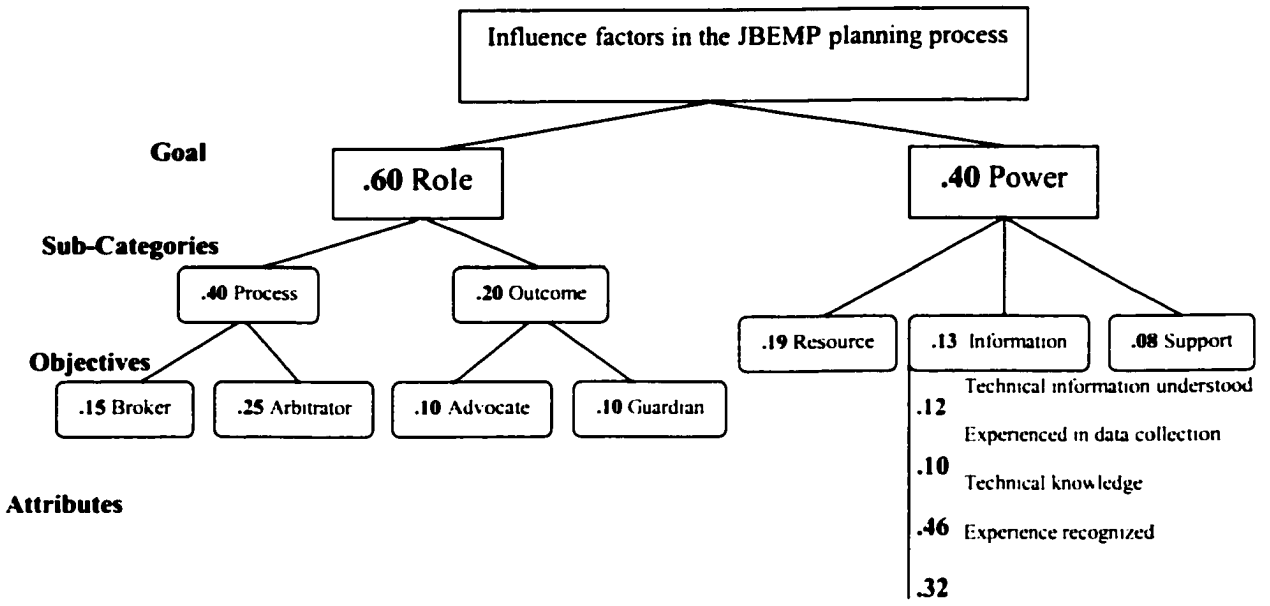
The LIAM role and power attributes form the political influence hierarchy (Figure 13). From the LIAM, we know the *level* of each attribute under the role and power categories for each stakeholder's self assessment (LIAM score as shown in Table 1 below). The software randomly selects one question for each role and power attribute to construct a unique questionnaire for each stakeholder. The stakeholder is asked to select the response choice that most accurately reflects the degree (level) to which the statement can be applied to their organization. For example, when determining the level of information power, stakeholder *Y* selected the attributes levels of 0,1, 3, and 1, for the attributes; technical information understood. experienced in data collection, technical knowledge, experience recognized, respectively. The questions relating to

each role or power category are scored, added, and averaged to calculate an index for each of the four roles and three power categories. All attributes are weighted equally. Stakeholder *Y*'s score for information power is (0+1+3+1)/4 = 1.25

Table 1. Example LIAM self assessment results (scale from 0 - 4):

Stakeholder *Y*	Category	Score
	Broker:	3
	Arbitrator:	1.33
	Advocate:	0.5
	Guardian:	3.67
	Resource Power:	1.38
	Information Power:	1.25
	Support Power:	3.33

To determine whether the LIAM assumption that all attributes relating to a particular role or power type have equal weight is accurate, the AHP was used to measure the priority *weights* of the LIAM role and power attributes and objectives. In Figure 13, the overall aggregate AHP comparison from all stakeholders resulted in role having 60 percent and power 40 percent of the influence in the JBEMP planning process. Resource power represents 19 percent, information power 13 percent, and support power 8 percent of the overall 40 percent power influence. For information power, the weights derived from the comparison for the attributes: understanding technical information; data collection experience; technical knowledge; and experience recognized are .12, .10, .46, .32, respectively. These values sum to one. To simplify this example only the attributes of information power are displayed.



Information Power	LIAM Score	AHP Weight
Understanding tech. info	= 0	* 0.12 = 0.0
Data collection experience	= 1	* 0.10 = 0.1
Technical knowledge	= 3	* 0.46 = 1.38
Expertise recognized	= 1	* 0.32 = 0.32

New AHP weighted Information power level = 1.8

Figure 13. Example of AHP weighted political influence hierarchy

According to this hypothetical AHP, weighting is unequal. Because technical knowledge has a high AHP influence weight and Stakeholder *Y* responded that its organization has a high level of technical knowledge, Stakeholder *Y*'s Information Power score increased from 1.25 to 1.8.

The next step is to plug the new AHP weighted information level into the information power objective. The AHP survey resulted in priorities of .19, .13, and .08 for Resource, Information, and Support power, respectively. This means when determining which sources of power influence the JBEMP planning process, information power comprises 13 percent of the 40 percent of the overall power influence on the decision. Stakeholder *Y*'s information power

influence is 1.8 * .13 = .234. The same series of steps must be taken for the other two power categories, each of the four role types, and the two role sub-categories (process and outcome).

After the objective influence is determined for each of the role and power categories, the role categories are summed to determine the role score and the power categories are summed to determine the power score. The role score is then multiplied by the AHP goal priority weight for role (0.60) to determine the role influence of Stakeholder *Y*. The power score is multiplied by the AHP goal priority weight for power (0.40) to determine the power influence. The role and power influences are summed to determine the overall influence of Stakeholder *Y*. Table 2 fills in the rest of the numbers to illustrate this example of determining Stakeholder *Y*'s overall political influence score.

Table 2. Determining the political influence score for Stakeholder *Y*.

Stakeholder Influence	Original LIAM Level	AHP Weighted LIAM Level		AHP Objective Weights	Objective Influence	Role Sub-category Weights		Sum of Role Sub-category Attributes		Role Sub-category Influence
Broker	3	2.83	•	0.15	0.42					
Arbitrator	2.8	3.67	•	0.25	0.92					
Advocate	0.5	2.05	•	0.10	0.21					
Guardian	3.67	3.08	•	0.10	0.31					
Process						0.4	•	(.42 + .92)	=	0.537
Outcome						0.6	•	(.21 + .31)	=	0.308
Role Score										**0.845**
Resource	1.38	2.8	•	0.19	0.53					
Information	1.25	1.8	•	0.13	0.23					
Support	3.33	3.4	•	0.08	0.27					
Power Score					**1.04**					
Role Influence		0.845	•	0.6	=	0.507				
Power Influence		1.04	•	0.4	=	0.415				
Influence (μ_i) *in JBEMP process*						**0.922**				

3.5.2 Step 2: Measure Stakeholder Preferences for Management Objectives

Develop Management Issue Hierarchy

Due to the EIS planning team time frame, the Jackson Elk and Bison Management issues and alternatives will not be developed until March 2002. For the purposes of this study, the Jackson elk and bison herd management situation assessment report prepared by the U.S. Institute for Environmental Conflict Resolution (U.S. Institute, 2000) were used along with the assistance of the EIS planning team to determine the relevant management issues. The intent of the report was to provide a sense of the range of interests and concerns about the management of the Jackson herds and to recommend options for developing a public involvement strategy.

The U.S. Institute interviewed approximately 130 individuals representing a broad array of interests from the local, regional and national levels. These stakeholder groups included agricultural and ranching interests; hunting and outfitting; businesses involved with tourism; environmental and wildlife conservation; animal rights; the research and education community; Native American tribes; and federal, state, and local government officials (U.S. Institute 2000). People interviewed were asked to describe the current herd management situation and their concerns and visions for the future.

The four main issues that were raised throughout the interviews were disease management, herd size, winter feeding on the NER, and interagency and intergovernmental relations. The major areas of disagreement identified centered on the application of specific management tools (US Institute 2000). Explicit disagreement focused on; the continuation of the feed grounds, the effectiveness of vaccines, and sport hunting to control elk and bison populations. An issues hierarchy was constructed to assist in visualizing and conceptualizing the management issues and preferences of the stakeholders. The issue hierarchy is displayed in

Figure 15. Each management strategy included in the issue hierarchy represents an objective (j = 1,2,...J) in Equation 1.

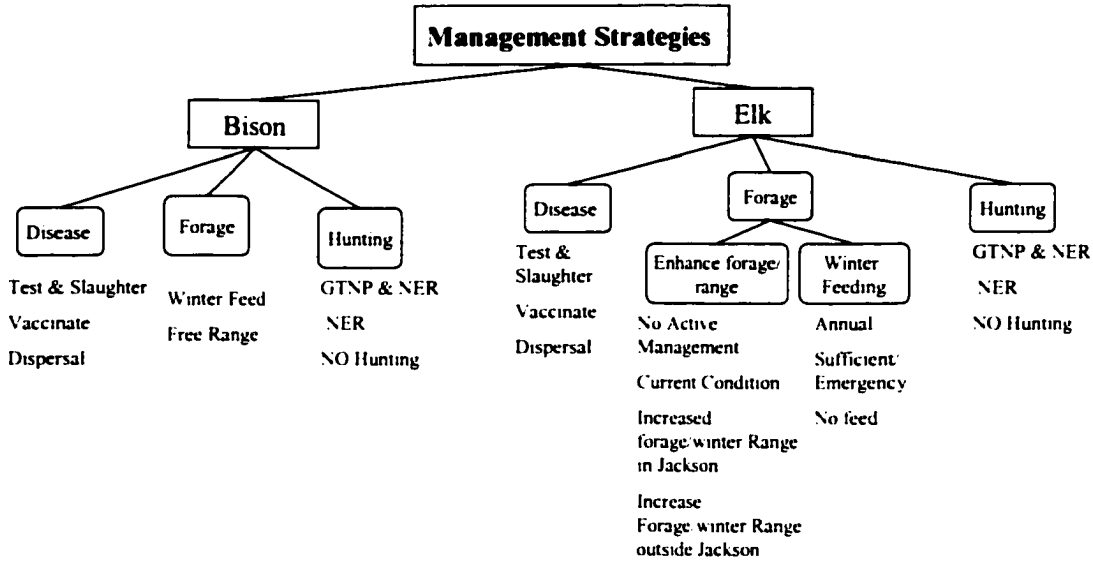


Figure 15. Issue Hierarchy

Stakeholder AHP Management Preference Questionnaire

Stakeholders participating in the LIAM workshop were asked to fill out the AHP pairwise comparison survey to measure their preferences for the management objectives. The AHP Management Preferences Questionnaire is provided in Appendix E. The pairwise comparisons provided the relative importance weighting of the management objectives. This will provide the individual utility weights, λ_{ij} (equation 1), which allowed me to derive the 'average' equal influence, K_{eq} (equation 2), of the individual weights for management preferences.

Typically a stakeholders' choice in management alternative, (k = 1,2....K), would reveal where their preference would lie along the PPF_{Joint}. Because alternatives were not available, each stakeholder's AHP management preference survey responses were used to place each stakeholder on the PPF_{Joint} curve. While there are an unlimited of possible preference

combinations, there will be a limited number of management alternatives included in the JBEMP EIS. Hypothetical management alternatives (Table 3) were created to show possible outcomes for the JBEMP for the two objective proxies, natural regulation and managed land use management practices. If stakeholders' management preference weightings match a hypothetical management alternative, this determined their placement along the PPF_{Joint} curve (Figure 16). Stakeholders with preferences that did not match an alternative fell on the PPF_{Joint} curve in between the management alternatives most closely matching their management preferences.

Table 3. Hypothetical Elk and Bison Management Alternatives.

Management Category	Options	Extreme Natural		Moderate Natural		Moderate Managed		Extreme Managed
Disease	Dispersal	X	X	X	X	X		
	Vaccinate					X	X	
	Test & Slaughter							X
Winter Feeding	Annual						X	X
	Sufficient				X	X		
	No Feed	X	X	X				
Hunting	Both GTNP & NER			X		X	X	X
	NER Only		X		X			
	No Hunting	X						
Placement of PPF_{Joint} Curve		**A**	**B**	**C**	**D**	**E**	**F**	**G**

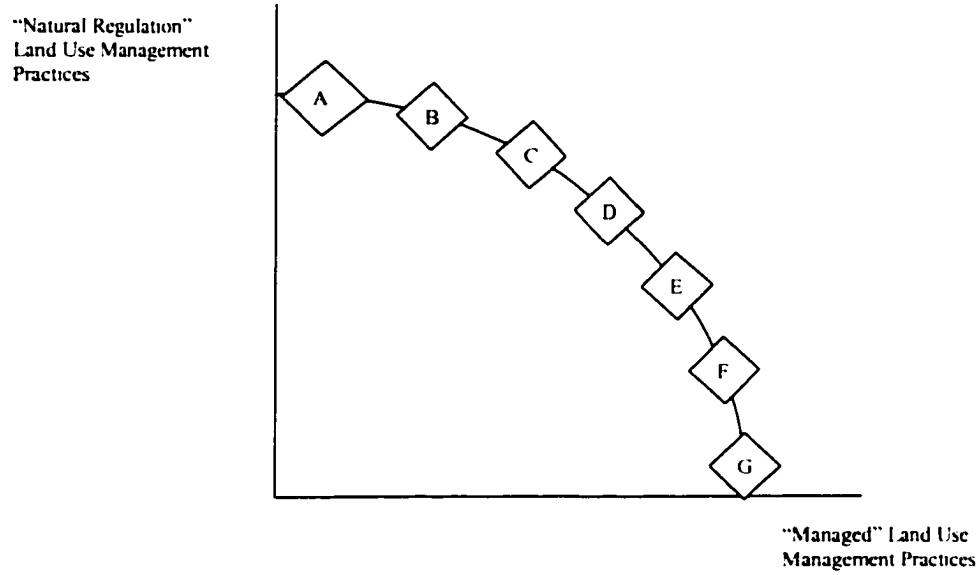


Figure 16. Placement of Hypothetical Alternatives along the PPF_{Joint}.

All of the hypothetical management alternatives are considered to be realistic management options. As shown in Table 3, Alternative A, contains the most natural regulation management options (Point A in Figure 16) with the highest possible amounts of dispersal, no winter-feeding, and no hunting. Alternative G, contains the most managed management options (Point G in Figure 16) with the highest possible amounts test & slaughter, annual winter feeding, and hunting on both the refuge and the park. Alternatives B through F contain combinations of natural and managed management options, with higher amounts of natural regulation management options toward the y_1 axis and higher amounts of managed management options toward the y_2 axis (Figure 16).

3.5.3 Step 3: Draft EIS preferred alternative (*Combine Political Influence Weights with Management Preferences)*

The next step was to combine each stakeholder's political influence score (μ_i, equation 3), with their individual utility preference weights for management objectives (λ_{ij}, equation 1). This produced an influence weighted issue preference hierarchy for each stakeholder. This allowed for influence comparisons to be made between stakeholders and also to the influence weighted 'average' outcome preference. The draft EIS preferred alternative, K_{PI} (equation 5), would be the average of the summed individual politically influenced weighted utility preference functions.

Rent Seeking Activities

There will be certain issues in the decision (hunting, feeding, and vaccination) that certain stakeholders are more willing to fight over if the outcome looks unfavorable. The LIAM measures the degree to which a stakeholder is willing to use their elements of power to force an

outcome that is favorable to its own position, but this measurement is for the overall JBEMP planning process and is not issue specific. To try to determine which issues are more important or more likely to be contested, the results from the AHP management preferences survey were used to create proxies for the policy benefit, $b_{ij.}$ and the policy cost, $d_{K^{\bullet}i.PI.}$ (Equation 6), associated with each management alternative. This helps determine which way on the PPF_{Joint} curve (Figure 16) will rent seeking activities by stakeholder, move the decision.

Final EIS Preferred Alternative

Trying to determine the final outcome is beyond the scope of this study. However, information from the previous stages shows how close each stakeholder's preferences are to the Draft EIS management options and how strong their preferences are for each management issue. Predicting the level of stakeholder rent seeking gives an indication of how favorable the Draft EIS outcome will be and which management options stakeholders will try to change.

Chapter 4: Results

A list of stakeholder organizations actively involved in the EIS process was provided by the EIS planning team. This list was used to create the initial stakeholder interview list for this study. Additional stakeholders were added to the list during the interview process when additional important stakeholder organizations were identified. The thirty stakeholder organizations interviewed included federal and state resource management agencies; tribal representatives; local government representatives; national, state, and local environmental organizations; state and local agricultural/ranching representatives; hunting organizations; and local outfitting organizations (Table 4).

At least one representative from each of the thirty organizations was interviewed. Whenever possible, more than one representative from an organization was interviewed, especially within the most actively involved agencies: the USFWS, NPS, and the WGFD. Because it was not possible to interview more than one representative from every organization, only the responses of one representative from each organization was included in this study. This was done instead of aggregating within the organizations in order to keep the method of comparison consistent across all organizations. When more than one stakeholder from each organization was interviewed, the stakeholder chosen for inclusion in this study was the person considered to be the top representative in the JBEMP process.

Table 4. List of Stakeholder Organizations Interviewed.

Government	**Economic Interests**
Federal	*Business*
Animal and Plant Health Inspection Service (APHIS)	Dubois Chamber of Commerce (DCC)
Bureau of Land Management (BLM)	Jackson Hole Chamber of Commerce (JHCC)
National Park Service (NPS)	*Hunting & Outfitting*
U.S. Fish & Wildlife Service (FWS)	Dubois Outfitters Association (DOA)
U.S. Forest Service (USFS)	Elk For Tomorrow (EFT)
State	Foundation for North American Wild Sheep (FNAWS)
Wyoming Game & Fish Commission (WGFC)	Jackson Hole Outfitters Association (JHOA)
Wyoming Game & Fish Department (WGFD)	Wyoming Hunters Association (WHA)
Office of Federal Lands Policy (OFLP)	*Agricultural*
Local	Ranchers (RCH)
Teton County Commissioners (TCC)	Wyoming Farm Bureau (WFB)
Town of Jackson (TOJ)	
	Environmental Interests
Tribal	*Animal*
Shoshone Business Council (SBC)	Buffalo Field Campaign (BFC)
Inter Tribal Bison Cooperative (ITBC)	Fund for Animals (FUND)
	Conservation
	Defenders of Wildlife (DOW)
	Greater Yellowstone Coalition (GYC)
	Jackson Hole Conservation Alliance (JHCA)
	Northern Rockies Conservation Cooperation (NRCC)
	Sierra Club (SC)
	Wyoming Outdoor Council (WOC)
	Wyoming Wildlife Federation (WWF)

Personal interviews were conducted in Jackson Hole, Dubois, Riverton, Laramie, and Cheyenne, Wyoming. The length of each interview ranged from 1 hour to 3 hours depending on how long each stakeholder wanted to discuss bison and elk related issues. Stakeholder representatives were asked to fill out the three surveys; the computerized LIAM questionnaire, the LIAM weighting AHP survey, and the management issues AHP survey. The survey results are applied to the theoretical public choice model presented in chapter three. The survey results will be described in order of the model application steps depicted in Figure 8.

4.1 Step 1 Results: The Political Influence Score

Stakeholders were given a brief (approximately ten minutes) explanation of the LIAM before filling out the computerized LIAM questionnaire. Stakeholders were asked to complete the questionnaire as a self-assessment for their organization. Most of the stakeholders thought that the LIAM survey was easy to understand and complete. The only difficulty some had was with the uncertainty of the meaning of some of the LIAM questions or how to relate what a question was asking to the specifics of the JBEMP process. After completing the survey, respondents were shown the placement of their organization on the LIAM role map and given a brief explanation of their results. Respondents were given the option of reviewing their answers if they felt their original responses did not accurately reflect their organization. Only two respondents chose to review their responses.

Original LIAM Role Scores

The LIAM allows for the fact that most organizations will have characteristics for more than one role type in each dimension (Wilds 1990). To determine the dominant role type in each preference dimension, the advocate-guardian scores are separated from the broker-arbitrator scores. For the advocate-guardian dimension, the lower score is subtracted from the higher score. The result represents a measure of perceived organizational preference for one type of outcome to the other. Likewise, the lower score is subtracted from the higher score for the broker-arbitrator dimension with the result representing the degree to which an organization prefers one set of procedure to the other. A stakeholder that holds more extreme preferences will lie farther out on the role map than a stakeholder with moderate preferences. The role map (Figure 17) displays the difference in preference for outcome (the advocate-guardian scale) and

preference for process (the broker-arbitrator scale) among the various stakeholder organizations for the JBEMP process.

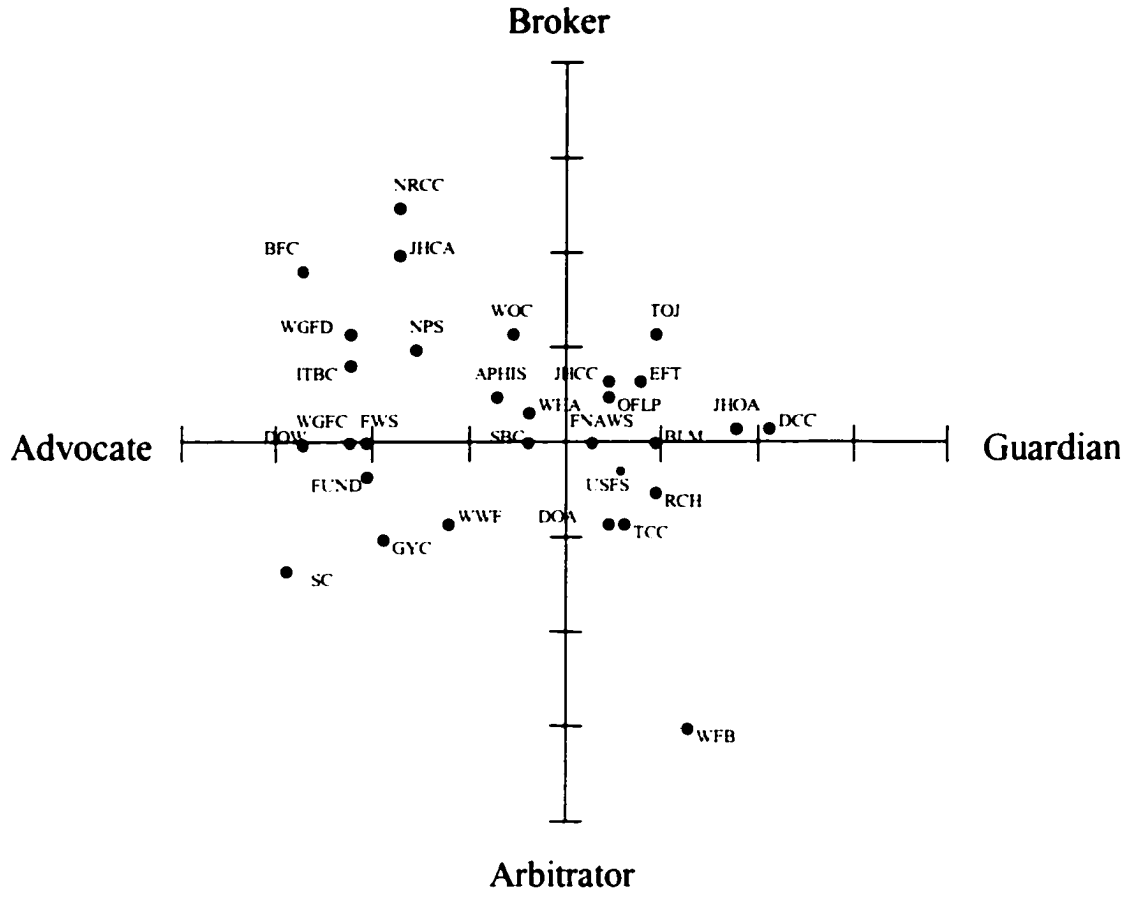


Figure 17. Original LIAM Role Map for the JBEMP Process.

For the JBEMP preference for outcome, the advocate role dominates for seventeen of the thirty stakeholder organizations (Figure 17). Many of the advocates fall farther into the extreme region than the stakeholders with dominant guardian roles Reviewing the LIAM questionnaire response results (Appendix F), many of the dominant guardians also had high advocate scores because of high self ratings for the advocate characteristic questions about resource preservation

and reacting to proposals. Most of the dominant advocate roles had low guardian scores. This indicates that both sides feel strongly about preserving the resources and always having to react to others (advocate characteristics in the LIAM model) in the JBEMP situation, but do not have much in common in the characteristics that define a guardian. For example, members of the Wyoming Hunters Association (WHA) typically define their organization as strong guardians in the JBEMP because the organization believes in continuing the traditional feeding and hunting programs as well as the current elk herd size objectives. However, on the LIAM role map the WHA's dominant role is an advocate-broker (Figure 17). Looking at the WHA's LIAM survey results (Appendix F), their organization felt strongly about the guardian characteristic of preserving traditional processes but did not rate the guardian characteristics of preserving economic approaches and valuing markets as important to the WHA in the JBEMP process. The advocate characteristics of preserving resource values and reacting to proposals were rated as extremely important to the WHA organization for the JBEMP process. These high ratings of advocate characteristics made the WHA advocate role more dominant than the guardian role for the JBEMP process. This helps explain how some organizations expected to be guardians fall on the advocate side and why the guardians do not have as extreme role positions as the advocates.

For the JBEMP preference for process, more stakeholders tended to have dominant broker roles than arbitrator roles. Of the dominant brokers, many of the extreme advocates were also extreme brokers. The more dominant guardians tended to be moderate for both the broker and arbitrator roles. The Wyoming Farm Bureau (WFB) was the only extreme arbitrator. The WFB's LIAM survey results (Appendix F) show that their organization had a low score for willingness to negotiate (an LIAM broker characteristic) and strongly prefers an objective process and desires objective information (LIAM arbitrator characteristics) in the JBEMP

process. While all the environmental interests (NRCC, WOC, BFC, JHCA, FUND, SC, GYC, WWF, and DOW) have dominant advocate roles, the organizations are split evenly between the broker and arbitrator roles with the Defenders of Wildlife (DOW) falling in the middle.

LIAM Organizational Power Scores

Survey results for the three LIAM power measures (resource, information, and support) are displayed in Figure 18. For the JBEMP process, the DOW was the only organization with self-assessment scores above 3.0 for all three types of power. The DOW representative rated the DOW as having high levels of the resource power attributes: central to mission, active in these types of issues, and physical control. Ten organizations scored above 3.0 for information and support power. Only three organizations had resource power scores above 3.0.

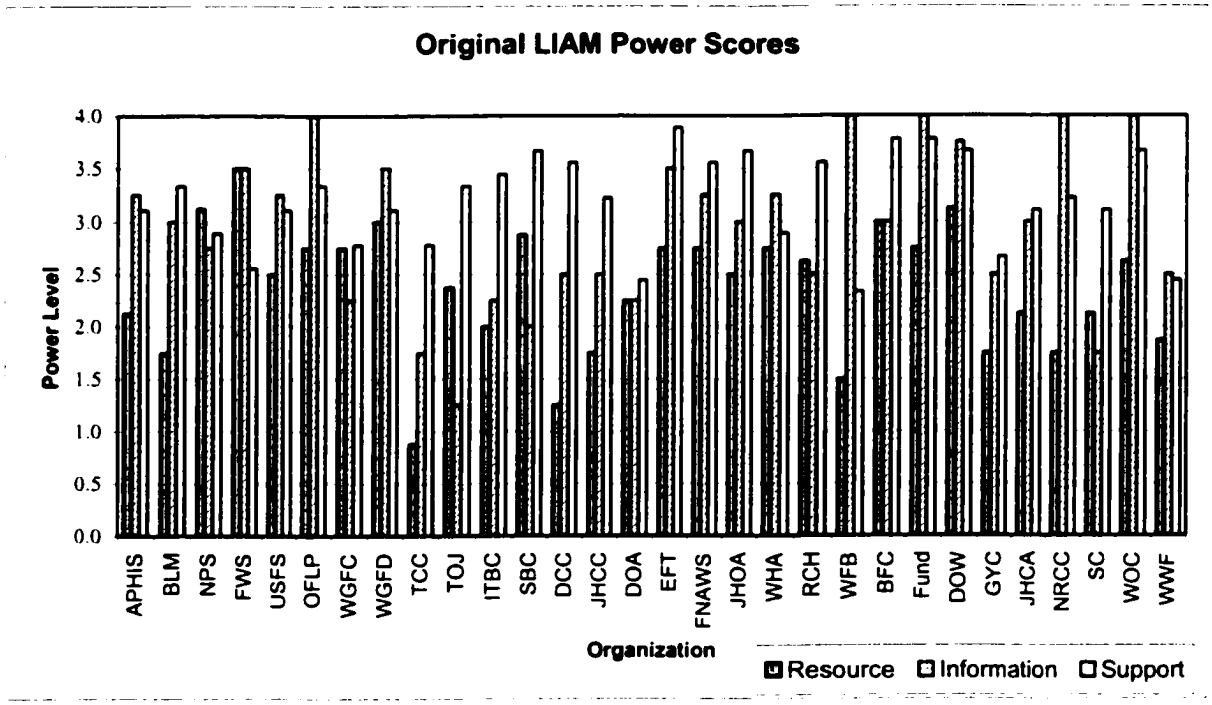


Figure 18. LIAM Power Scores.

The joint EIS planning team agencies, the FWS and NPS, had the highest resource power scores followed by the DOW, WGFD and the BFC (Figure 18). The only low score for the FWS and NPS within the resource power attribute questions was regarding the level of personnel resources involved with the JBEMP issue (Appendix F). The Teton County Commissioners (TCC) had the lowest resource power score followed by the Dubois Chamber of Commerce (DCC), the WFB, and the Jackson Hole Chamber of Commerce (JHCC). All of the Hunting & Outfitting organizations had resource power scores of 2.25 and higher (Figure 18). Five of the seven conservation organizations had resource power scores in the range of 1.8 to 2.1.

Many of the federal, state, economic, and environmental organizations had high levels of information power. The OFLP, WFB, FUND, NRCC, and the WOC scored at the maximum of 4.0 (Figure 18). Four environmental interests organizations had information power scores above 3.5. The Town of Jackson (TOJ) had the lowest information power score followed by the TCC, Sierra Club (SC), and the Tribal organizations. Four economic interests organizations had information power scores at or below 2.5.

All organizations had moderate to high levels of support power, the lowest support power score was a 2.33 for the WFB (Figure 18). The FWS had a support power score of 2.56, the lowest score among the government agencies. Support power scores for the tribal organizations ranged from a 3.44 to 3.67. Five of the economic interests organizations and four of the environmental interests organizations had support power scores of 3.5 or higher.

The role and power scores from the LIAM analysis give the information needed to measure the stakeholder influence level (Figure 9). This information will be combined with the influence weights developed from the LIAM AHP weighting questionnaire (Appendix D) to create the political influence scores.

4.1.2 Stakeholder Influence Weighting Results

The LIAM AHP Weighting Survey

At first, the LIAM AHP weighting survey was difficult for respondents to understand. The purpose of the survey was to determine how important the different LIAM role and power attributes are in the JBEMP decision making process. Before each respondent filled out the survey, I explained the purpose of the survey and asked them to answer in terms of what they thought was driving the decision process and what will determine the final outcome instead of what is important to their organization or what they would like to see happen. As soon as the respondent understood that this was about the decision process and not about their organization, filling out the survey was not as challenging.

Respondents had the hardest time with the attribute level questions for the role characteristics. Many commented that some Guardian and Advocate characteristics were very similar and hard to distinguish between. The power attribute questions were not as difficult to answer because most of the respondents had strong beliefs on what was important in determining power. Most respondents also had very strong opinions about the upper role and power hierarchy level comparisons as well as the comparison between the importance of role and power for determining the JBEMP outcome.

Weighting of the Role and Power Attribute Level

According to Saaty (1980), an individual cannot accurately evaluate more than seven elements at the same time. Therefore, the number of elements in a pairwise comparison cluster should not exceed seven. When more than seven elements must be included for a complete hierarchy, the AHP software uses the rating technique to weight the cluster of elements. Because

there were more than seven attributes for the resource and support power objectives, respondents were asked to rate the attributes instead of comparing between attributes (Figure 19). Pairwise comparison questions were used to weight the LIAM Goal, Sub-Categories, and Objectives as explained in Figure 13. Figure 20 provides an example of a pairwise comparison survey question, the entire LIAM AHP influence weighting questionnaire is in Appendix D.

EVALUATION CRITERIA	**IMPORTANCE SCALE**				
Organizational Orientation: *Preference for Outcome*	Extremely	Considerably	Significantly	Somewhat	Not Important
Guardian Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's Guardian orientation?***				
Prefers Economic Approaches/Progress	5	4	3	2	1
Prefers Traditional Processes & Resource Uses	5	4	3	2	1
Values Markets	5	4	3	2	1
Advocate Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's Advocate orientation?***				
Prefers Change From Traditional Processes	5	4	3	2	1
Promotes Resource Preservation & Noncommercial Uses	5	4	3	2	1
Reacts to Projects Planned by Others	5	4	3	2	1
Emphasizes Importance of Natural Systems	5	4	3	2	1

Figure 19 . Example of the LIAM Attribute Rating Questions

Please Select			**JUDGMENT INTENSITY SCALE**				
Organizational Orientation: *Preference for Outcome*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important
Guardian	or	Advocate ➡	1	2	3	4	5

Figure 20. Example of an LIAM Pairwise Compairison Question

Results from the LIAM AHP weighting questionnaire identify the role and power types and attributes each stakeholder organization considered to be the most influential in the JBEMP process. This information can be used for comparisons between the original LIAM equal

weighting results and the new individual influence weightings, the aggregation of similar organizations (Table 4), and the aggregation of all organizations. The results of these comparisons will be depicted in the following sections.

Influence Weighting Results

For the goal level comparison between organizational role and organizational power, the results displayed in Table 5 show that the respondents were almost equally split between the importance of role and power in the JBEMP. Twelve organizations considered role to be more important, eleven organizations considered power to be more important, and seven organizations stated that role and power are equally important in determining the JBEMP outcome (Table 5). Of the twelve stakeholders that thought role was more influential than power, seven had dominant role types that included the role they thought would prevail. Only four of the eleven stakeholders that thought power was more important had dominant power types that matched what they thought would win.

The importance of role and power was split within the federal agencies, with three out of the five considering role as most important (Table 5). The joint leads of the EIS planning team were split with the NPS stating role and the FWS stating power would be more influential. Both tribal organizations considered role to be strongly more important. Among the economic interests, all of the business and hunting & outfitting organizations considered role to be of equal or greater importance than power (Table 5). Both agricultural interests thought power was most important. All of the environmental interests except the SC considered power to be of equal or greater importance than role (Table 5).

Table 5. Stakeholders' Dominant Role and Power Types and what will determine the JBEMP Outcome.

	Stakeholder Dominant Role Type	Stakeholder Ratings of Important Influences				Stakeholder Dominant Power Score
		Most Important Role Type	Role Importance Weight	Power Importance Weight	Most Important Power Type	
APHIS	broker	advocate/guardian	**0.75**	0.25	information	information
BLM	guardian	arbitrator	0.10	**0.90**	support	support
NPS	advocate	advocate	**0.88**	0.13	information	resource
FWS	advocate	advocate	0.31	**0.69**	resource	resource/info
USFS	guardian	arbitrator	**0.88**	0.13	information	information
OFLP	broker	arbitrator	**0.83**	0.17	resource	information
WGFC	advocate	guardian	0.13	**0.88**	resource	resource/support
WGFD	advocate	advocate/guardian	0.25	**0.75**	support	information
TCC	arbitrator	broker/arbitrator	*0.50*	*0.50*	resource/info	support
TOJ	broker	guardian	**0.88**	0.13	resource	support
ITBC	advocate	arbitrator	**0.90**	0.10	information	support
SBC	advocate	guardian	**0.90**	0.10	information	support
DCC	guardian	advocate	*0.50*	*0.50*	support	support
JHCC	broker	guardian	**0.83**	0.17	all equal	support
DOA	arbitrator	guardian	*0.50*	*0.50*	information	support
EFT	guardian	advocate/broker	*0.50*	*0.50*	info/support	support
JHOA	guardian	guardian	**0.83**	0.17	information	support
FNAWS	guardian	advocate	**0.75**	0.25	resource	support
WHA	advocate	guardian	**0.88**	0.13	resource	information
RCH	guardian	broker	0.13	**0.88**	support	support
WFB	arbitrator	arbitrator	0.17	**0.83**	support	information
BFC	advocate	advocate/guardian	0.10	**0.90**	information	support
Fund	advocate	arbitrator	0.17	**0.83**	resource	information
DOW	advocate	broker/arbitrator	0.17	**0.83**	resource	information
GYC	advocate	advocate/guardian	*0.50*	*0.50*	resource	support
JHCA	broker	guardian	*0.50*	*0.50*	support	support
NRCC	broker	arbitrator	0.13	**0.88**	resource	information
SC	advocate	arbitrator	**0.83**	0.17	support	support
WOC	broker	advocate	*0.50*	*0.50*	all equal	information
WWF	advocate	advocate	0.17	**0.83**	resource	information

Role Influence

Twenty-two stakeholders considered one type of role to be the most important (Table 5). A summary of the role weighting results is provided in Table 6. Eight stakeholders felt that the

decision would come down to the guardians, six thought it would be the advocates, eight thought it would be the arbitrators, and only one thought it would be the brokers (Table 6). Seven stakeholder organizations considered two role types to be equally important, with four considering preference for outcome (advocate/guardian) scale and two considering the preference for process (arbitrator/broker) scale. The DOW was the only organization that considered one role type from each scale, the broker/arbitrator role type, to be important (Table 5). Overall, eighteen stakeholders felt that a preference for outcome role type was most important, and eleven stakeholders felt a preference for process role type would determine the outcome.

Table 6. Role Weighting Summary (two role types means equal weight was given to both)

Role Type	Most Important Role Type	Had a Dominate Role Type Same as what was Considered to be the Most Important Role Type	Weighed Role More Important than Power
Advocate	6	4	2
Guardian	8	4	5
Arbitrator	8	4	4
Broker	1	0	0
Advocate/Guardian	4	----	1
Broker/Arbitrator	2	----	0
Advocate/Broker	1	----	0

Half of the stakeholders that thought guardians would prevail had dominant advocate role types (Table 6). One-third of the stakeholders that thought advocates were more important had dominant guardian role types. This could mean that the guardians have more confidence in prevailing than the advocates. However, only one environmental interest group, the Jackson Hole Conservation Alliance (JHCA), thought guardians would prevail (Table 5). Two economic

interest groups, the DCC and the Foundation for North American Wild Sheep (FNAWS), considered the advocates to be the most influential in the JBEMP (Table 5). Half of the stakeholders that thought arbitrators would prevail had dominant role types that did not include the arbitrator role (Table 6). The WFB, an extreme arbitrator, was the only economic interest group that thought arbitrators were most important (Table 5). The Rancher (RCH), a guardian-arbitrator, was the only one that thought brokers would prevail (Table 5).

Power Influence

Twenty-six stakeholders considered one type of power to be the most influential (Table 5). A summary of the power weighting results is provided in Table 7. Eleven stakeholders felt that the most important power type would be resource power, eight thought it would be information power, and seven thought it would be support power (Table 7). Only two stakeholder organizations considered two power types to be equally important, the TCC felt that both resource and information power were important and the Elk for Tomorrow (EFT) felt that information and support power were important (Table 5). The JHCC and the WOC considered all three types of power to be equally important for the JBEMP (Table 5).

Table 7. Power Weighting Summary

Power Type	Most Important Power Type	Had a Dominate Power Type Same as what was Considered to be the Most Important Power Type	Weighted Power More Important than Role
Resource	11	2	6
Information	8	2	1
Support	7	5	4
All Equal	2	----	0
Resource/Information	1	----	0
Information/Support	1	----	0

Of the eleven stakeholders that considered resource power to be the most important, six considered power more influential than role type, and only two out of the eleven actually had resource power as their dominant type of power (Table 7). The Wyoming Game and Fish Commission (WGFC) thought that power was more important than role, considered resource power to be the most influential power type, and had resource power as the dominant power score (Table 5). The FWS was the only Federal agency that considered resource power to be the most influential. While none of the environmental interests stakeholders had a dominant resource power score, more than half felt that resource power would be the most influential type of power in the JBEMP (Table 5).

Of the eight stakeholders that considered information power to be the most important, the Buffalo Field Campaign (BFC) was the only organization that considered power to be more important than role (Table 5). Three of the five federal agencies and both tribal organizations considered information power to be the most influential. APHIS and the USFS were the only organizations with information power as their dominant type and considered information power to be the most influential.

Of the seven stakeholders that considered support power to be the most important, four considered power to be more important than role, and five out of the seven actually had support power as their dominant type of power (Table 7). Both agricultural organizations considered support power to be the most influential (Table 5). The BLM and RCH thought that power was more important than role, considered support power to be the most influential power type, and had support power as their dominant power score (Table 5).

New Influence Weighted LIAM Role Map

The results displayed on the original LIAM role map (Figure 17) assume that all attributes relating to a particular role have equal weight. Results from the LIAM AHP influence weighting of the role type attributes can be used to develop new role type scores by creating individual influence weights from each stakeholder's importance ratings combined with their original LIAM survey results (weight of each attribute no longer equal). A stakeholder's new role attribute weighting scores will indicate how important each role attribute characteristic is for the JBEMP process. For example, the guardian attribute characteristics of: prefers economic approaches; prefers traditional processes; and values markets were weighted by the BLM as not important (a score of 0), extremely important (a score of 4), and not important (a score of 0) respectively for the three attribute characteristics (Appendix F). The scores within each role type category were summed and normalized to keep consistent with the LIAM equal weighting technique. The BLM's new influence weights for the guardian attributes are 0,1,0 (0/4,4/4,and 0/4, respectively) instead of .33, .33, .33 with the equal weighting. Combining this new weighting with the computerized LIAM survey results in new role scores. This new role score can be thought of as a role self-perception because it combines the role characteristics each stakeholder thinks is important in the JBEMP and the levels of role characteristic that they actually have. Table 8 shows how stakeholders' role types change with the influence weighting.

Substituting the role attribute weighting from equal to the AHP influence weighting altered the dominant role types of seventeen stakeholders (Table 8). Six stakeholders reversed dominant role types. For example, the role type for APHIS changed from the broker-advocate sub quadrant to the advocate-broker sub quadrant meaning that the advocate score is now higher than the broker score (Table 8). The LIAM sub quadrant descriptions are provided in Appendix

B. Eleven stakeholders actually changed one of their dominant roles. For example, the USFS changed from a guardian-arbitrator to arbitrator-advocate. Figure 21 displays the results of the new individual influence weighted role map.

Table 8. Change in Role Map Placement with Individual Influence Weighting

	Role Map Placement	
	LIAM Equal Weighting	Change with Individual Weighting
APHIS	broker-advocate	advocate-broker
BLM	guardian	no change
NPS	advocate-broker	no change
FWS	advocate	advocate-arbitrator
USFS	guardian-arbitrator	arbitrator-advocate
OFLP	broker-guardian	advocate-broker
WGFC	advocate	arbitrator-advocate
WGFD	advocate-broker	no change
TCC	arbitrator-guardian	no change
TOJ	broker-guardian	no change
ITBC	advocate-broker	no change
SBC	advocate	advocate-broker
DCC	guardian-broker	arbitrator-guardian
JHCC	broker-guardian	guardian-broker
DOA	arbitrator-guardian	no change
EFT	guardian-broker	broker-guardian
JHOA	guardian-broker	no change
FNAWS	guardian	guardian-arbitrator
WHA	advocate-broker	broker-guardian
RCH	guardian-arbitrator	arbitrator-advocate
WFB	arbitrator-guardian	no change
BFC	advocate-broker	no change
FUND	advocate-arbitrator	no change
DOW	advocate	advocate-broker
GYC	advocate-arbitrator	advocate-broker
JHCA	broker-advocate	advocate-broker
NRCC	broker-advocate	no change
SC	advocate-arbitrator	arbitrator-advocate
WOC	broker-advocate	advocate-broker
WWF	advocate-arbitrator	no change

Note: Each Stakeholder is placed on the role map based on their dominant role types in each role dimension (outcome and process). The highest role type score is the first role type listed. The combined roles that describe a stakeholder's expected behavior pattern are defined by its location in both dimensions at once. If only one role type is listed, the role type scores in the second dimension were equal resulting in no score for that dimension.

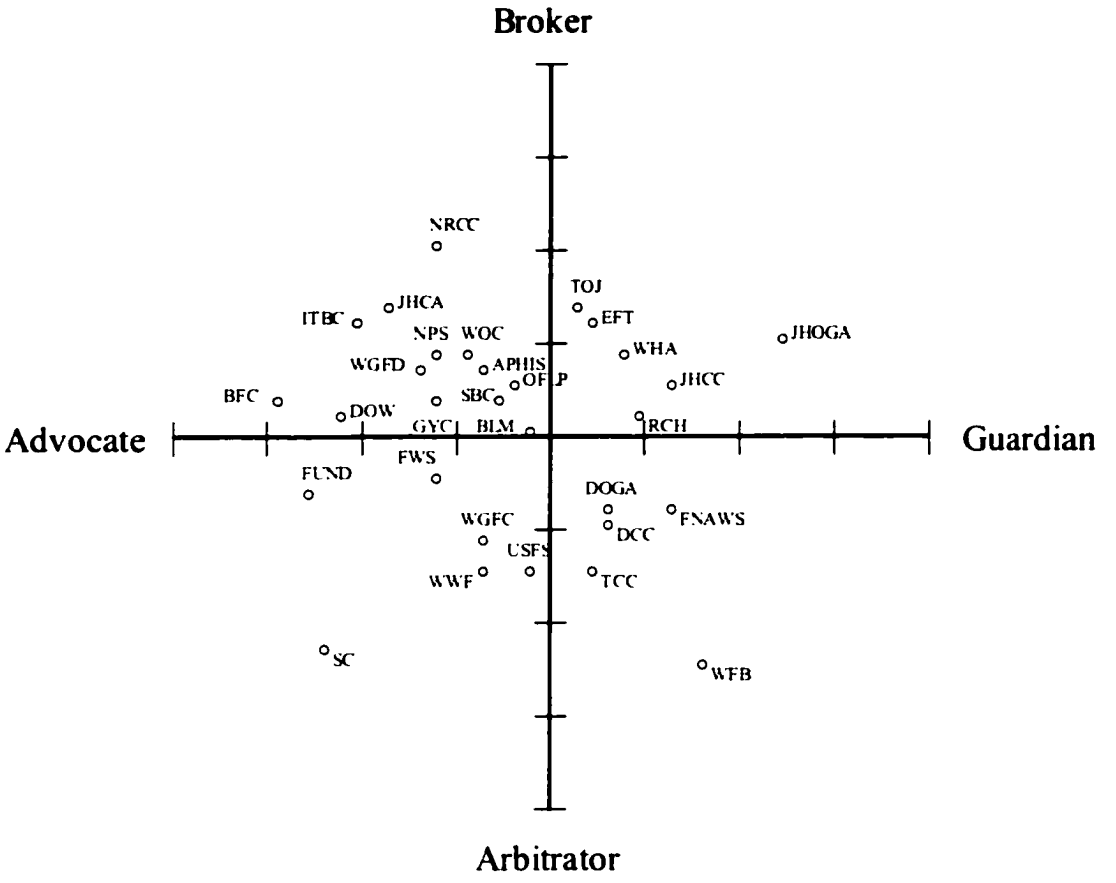


Figure 21. New LIAM Individual Influence Weighted Role Map.

With the new individual influence role attribute weighting (Figure 21), the number of stakeholders with an advocate role increased from seventeen to nineteen as compared to the original LIAM role map (Figure 17). However, more advocates are now closer to the center and less fall into the extreme region. This would mean that a stakeholder gave low weight (on the AHP weighting survey) to advocate characteristic(s) that they had high levels of on the LIAM computerized survey. The number of stakeholders with advocate/broker roles increased from nine to eleven, while the advocate/arbitrator roles decreased from six to four.

4.1.3 Who determines the outcome?

The original plan was to aggregate the influence weighting scores of all stakeholders and use the average to predict what will influence the preferred draft EIS alternative. As depicted in Table 5, there was a large variation of the importance of role and power among the stakeholder organizations. For the overall aggregation influence weighting, the summed average across all stakeholders (column "Stakeholder Average") in Table 9, the large variation in scores across all stakeholders diluted the extreme difference in weighting between stakeholders (as shown in Table 5) for the importance of role and power in the JBEMP. Because of this, the "Stakeholder Average" aggregation closely resembles the LIAM Equal Weights (all role and power attributes have equal influence) influence weighting (Table 9). The same was true among the agencies involved on the planning team, the joint leads were split with the NPS stating role and the FWS stating power would be more influential. However, interesting role and power influence patterns emerge when groups with similar interests are clustered (Table 9).

Table 9. Aggregation of Influence Weights

	LIAM Equal Weights	Stakeholder Average	Govt.	*Federal*	*State*	*Local*	Tribal	Econ. Interests	*Business*	*Hunt & Outfitting*	*Agricultural*	Environ. Interests	*Animal*	*Conservation*
Broker	0.13	0.12	0.17	0.15	0.14	0.28	0.23	0.10	0.04	0.10	0.05	0.06	0.01	0.07
Arbitrator	0.13	0.11	0.11	0.12	0.06	0.16	0.35	0.07	0.05	0.04	0.08	0.08	0.06	0.07
Advocate	0.13	0.16	0.15	0.16	0.09	0.17	0.05	0.22	0.30	0.24	0.02	0.11	0.04	0.12
Guardian	0.13	0.15	0.18	0.13	0.32	0.11	0.28	0.18	0.30	0.34	0.00	0.06	0.03	0.07
Process	0.25	0.22	0.28	0.27	0.20	0.44	0.57	0.17	0.09	0.14	0.12	0.14	0.07	0.14
Outcome	0.25	0.31	0.33	0.29	0.41	0.29	0.33	0.40	0.61	0.58	0.02	0.17	0.07	0.19
Role	**0.50**	**0.54**	**0.61**	**0.56**	**0.61**	**0.73**	**0.90**	**0.58**	**0.69**	**0.72**	**0.15**	**0.31**	**0.13**	**0.33**
Resource	0.17	0.20	0.14	0.09	0.24	0.12	0.01	0.16	0.09	0.10	0.29	0.38	0.45	0.36
Information	0.17	0.13	0.14	0.17	0.08	0.10	0.08	0.13	0.05	0.13	0.12	0.09	0.25	0.09
Support	0.17	0.14	0.12	0.18	0.07	0.05	0.01	0.14	0.17	0.05	0.45	0.23	0.16	0.22
Power	**0.50**	**0.46**	**0.39**	**0.44**	**0.40**	**0.27**	**0.10**	**0.43**	**0.31**	**0.28**	**0.86**	**0.69**	**0.87**	**0.67**

Political Influence Scores

Because the final outcome is unknown, it is not possible to determine which group's influence scores most accurately predicts what is important in determining the JBEMP outcome.

For the purposes of my analysis, the LIAM Equal Role and Power Weights (all role and power attributes and objectives are equally important) will be used to build the political influence scores to predict the draft EIS outcome (Table 10). To get an idea of how sensitive the decision outcome is if role and power did not have equal influence, dominant role and dominant power weighting scores will also be used to create role dominated political influence scores for the different role types (where the weights are arbitrarily set at 90% Role Influence and 10% Power Influence), and power dominated political influence scores for the different power types (where the weights are arbitrarily set at 10% Role Influence and 90% Power Influence) .

To predict how the role and power influences the outcome, six political influence scores were constructed for each stakeholder to represent various levels of role and power importance (Table 10). The LIAM Equal Role and Power Weighting scores signify that all role and power attributes and objectives have equal importance. The Role-Guardian and Role-Advocate weighting scores signify a role dominated outcome where role type is more influential than power. The Role-Guardian weighting represents guardians having the most influence. The Role-Advocate weighting indicates that the advocates are the most influential. Three power dominated weighting scores are developed to represent each of the three power types (Power-Resource, Power-Information, and Power-Support) having the most influence. The weighting associated with each of the six political influence scores are displayed in Table 10. Combining each stakeholders' role and power level results (Appendix F) from the LIAM computerized questionnaire with each of the political influence weighting scenarios (Table 10) forms the stakeholder political influence score μ_i (Equation 3) for each of the six different influence scenarios. Figure 13 and Table 2 provide examples of how the political influence

hierarchy scores are constructed. The resulting political influence scores are displayed in Table 11.

Table 10. Influence Weights used to create the Political Influence Scores

Stakeholder Influence Score	Equal Role and Power Weighting	Role-Guardian Dominant	Role-Advocate Dominant	Power-Resource Dominant	Power-Information Dominant	Power-Support Dominant
Broker	0.125	0.05	0.05	0.04	0.04	0.04
Arbitrator	0.125	0.05	0.05	0.04	0.04	0.04
Advocate	0.125	0.05	0.75	0.01	0.01	0.01
Guardian	0.125	0.75	0.05	0.01	0.01	0.01
Process	0.250	0.10	0.80	0.08	0.08	0.08
Outcome	0.250	0.80	0.10	0.02	0.02	0.02
Role	**0.500**	**0.90**	**0.90**	**0.10**	**0.10**	**0.10**
Resource	0.167	0.04	0.04	0.80	0.05	0.05
Information	0.167	0.03	0.03	0.05	0.80	0.05
Support	0.167	0.03	0.03	0.05	0.05	0.80
Power	**0.500**	**0.10**	**0.10**	**0.90**	**0.90**	**0.90**

The six political influence scores were constructed for each stakeholder to represent various levels of importance role and power could have in determining the outcome. Each organization has six political influence scores; each score represents an organization's political influence percentage between 0% and 100% for the given weighting scenario (Table 11). For example, if all role and power attributes and objectives are equally important in determining the outcome, APHIS would have a 67% political influence score and BLM would have a 72% political influence score. If the role type characteristics defining a guardian (prefers economic approaches, prefers traditional processes, and values markets) are most important in determining the outcome, the political influence of APHIS is 34%, while the BLM has a 91% influence score (Table 11).

Table 11. Political Influence Scores associated with the Different Role and Power Dominated Influence Weights

Political Influence Scores	Equal Role and Power	**Role-Guardian Dominant**	Role-Advocate Dominant	**Power-Resource Dominant**	Power-Information Dominant	**Power-Support Dominant**
APHIS	0.67	**0.34**	0.50	**0.55**	0.77	**0.76**
BLM	0.72	**0.91**	0.69	**0.46**	0.72	**0.80**
NPS	0.70	**0.34**	0.75	**0.78**	0.70	**0.73**
FWS	0.72	**0.10**	0.63	**0.86**	0.85	**0.66**
USFS	0.69	**0.42**	0.31	**0.64**	0.78	**0.77**
WGFC	0.65	**0.35**	0.78	**0.69**	0.59	**0.69**
WGFD	0.75	**0.18**	0.75	**0.75**	0.85	**0.78**
OFLP	0.79	**0.61**	0.96	**0.78**	0.80	**0.78**
TCC	0.48	**0.91**	0.38	**0.25**	0.41	**0.65**
TOJ	0.63	**0.91**	0.61	**0.60**	0.41	**0.80**
SBC	0.72	**0.75**	0.81	**0.72**	0.58	**0.89**
ITBC	0.61	**0.34**	0.94	**0.52**	0.59	**0.83**
DCC	0.61	**0.82**	0.31	**0.35**	0.62	**0.84**
JHCC	0.63	**0.75**	0.62	**0.46**	0.62	**0.78**
DOA	0.63	**0.83**	0.75	**0.56**	0.57	**0.61**
EFT	0.86	**0.99**	0.81	**0.70**	0.86	**0.95**
FNAWS	0.81	**0.91**	0.87	**0.70**	0.80	**0.87**
JHOA	0.75	**0.99**	0.56	**0.64**	0.75	**0.89**
WHA	0.72	**0.59**	0.75	**0.69**	0.78	**0.72**
RCH	0.70	**0.74**	0.50	**0.67**	0.66	**0.87**
WFB	0.63	**0.66**	0.38	**0.40**	0.86	**0.58**
BFC	0.77	**0.27**	0.94	**0.76**	0.77	**0.93**
FUND	0.85	**0.43**	0.94	**0.71**	0.95	**0.93**
DOW	0.83	**0.27**	0.94	**0.79**	0.91	**0.91**
GYC	0.59	**0.35**	0.81	**0.45**	0.60	**0.65**
JHCA	0.65	**0.26**	0.69	**0.55**	0.72	**0.76**
NRCC	0.74	**0.51**	0.94	**0.47**	0.90	**0.78**
SC	0.60	**0.27**	0.99	**0.54**	0.49	**0.75**
WOC	0.81	**0.59**	0.75	**0.67**	0.94	**0.90**
WWF	0.59	**0.51**	0.81	**0.48**	0.60	**0.60**

The difference in political influence scores has to do each stakeholder's responses to the computerized LIAM questionnaire. If a stakeholder rated their organization as having low levels for all the attribute questions within a particular role or power type, then their organization will have a corresponding low political influence score when the role or power type they scored low in is what is dominant in determining the outcome. If a stakeholder rated their organization as having high levels for all the attribute questions within a particular role or power type, then their organization will have a corresponding high political influence score. For example, APHIS's levels for the guardian attribute characteristics of: prefers economic approaches; prefers

traditional processes; and values markets were 1,1,2 (1/4,1/4,and 2/4, respectively) resulting in a guardian role type score of 1.33 (Appendix F) and a political influence score of 34% (Table 11) when the guardian role is dominant in determining the outcome. BLM's levels for the guardian attribute characteristics were 4,4,3 (4/4,4/4,and 3/4, respectively) resulting in a guardian role type score of 3.67 (Appendix F) and a political influence score of 92% (Table 11) when the guardian role is dominant in determining the outcome.

The political influence scores for the role-guardian dominant influence weighing have the most extreme variation between the stakeholders with the scores ranging from 10% for the FWS and 99% for JHOA and EFT and thirteen organizations having scores below 50% (Table 11). Only four organizations have political influence scores below 50% for the role-guardian dominant influence weighing. As previously explained in the description of the original LIAM role map placement (Figure 17), many of the dominant guardians also had high advocate scores because of high self ratings for the advocate characteristic questions about resource preservation and reacting to proposals. Most of the dominant advocate roles had low guardian scores (Appendix F). The extreme variation for the role-guardian dominant influence weighing and lack of variation for the role-advocate dominant influence weighing can be explained by the actuality of dominant guardians also having high advocate role scores and dominant advocates not having high guardian scores.

Most stakeholders have high political influence scores across all three of the power type dominant influence weighting scenarios (Table 11). As previously explained in the original LIAM power type results, most stakeholders had high levels of information and support power while not as many had high resource power (Figure 18). The power type influence results in Figure 18 correspond to the political influence weighting results in Table 11.

Because the LIAM computerized questionnaire was answered as an organizational self assessment, some or all of the recorded role and power levels might not reflect reality. In other words, a stakeholder's self perception of their organization's role and power in the JBEMP could be quite different than how others would view the role and power of the organization.

4.2 Step 2 Results: Stakeholder Preferences for Management Objectives

Stakeholder AHP Management Preference Survey

All respondents were very familiar with the management issues and did not have difficulties understanding the survey. The first section of the survey asked about the management strategies (Figure 14) to determine each stakeholders' choice in management alternative, (k = A, B...G). To provide additional information for the EIS planning team, sections were added to the survey to ask about preferences for elk and bison management objectives and herd size (Appendix E). Many of the respondents stated that they were pleased to provide this type of information in hope that it would be used in future planning efforts.

Typically, all objectives and attributes included in an AHP analysis are assumed to have at least a small level of value to all parties involved. In this situation, some of the more extreme environmental and economic stakeholders were exceptionally opposed to particular strategies included in the survey. For example, some respondents would weight the no hunting options as absolutely more important and not answer the question where hunting was allowed in both choices. On the other side, respondents would only answer the question where annual feeding could be weighted as most important and would not give an answer for the choice between sufficient or no winter feeding. This creates a problem within the AHP model because the model gives weight to all categories even in this type of situation. So a respondent who is adamantly

opposed to hunting would have a small amount of weight showing for allowing hunting on Grand Teton and the National Elk Refuge. To account for this, the data were adjusted from a 5-point scale to a 99-point scale. This enables the AHP to more accurately reflect what the stakeholders actually meant by dividing the discrete units into smaller portions. This was done only in the extreme situations when a stakeholder would not weight a particular strategy.

Matching the AHP Weighting Results with the JBEMP PPF_{Joint} curve

The mandates, environmental regulations, and current budget allocations of the EIS planning team agencies will restrict and establish the boundary and location of the JBEMP PPF_{Joint} curve. For the given fixed resource level, various quantities of natural regulation (O_2) and managed (O_1) land use management practices can be produced. Assuming diminishing marginal returns, as more X is used to produce one type of land use practice less is available to produce the other type of land use practice.

Conceptually, the JBEMP PPF_{Joint} curve will have a limited number of management alternatives that can be produced (Figure 22). Each stakeholder's preference ratio will determine his or her placement on the JBEMP PPF_{Joint} curve. Some stakeholders will have management activities preferences that will exactly match an available management alternative as shown by the preference ratio for Stakeholder A in Figure 22. Other stakeholders will have management preferences that fall in between two of the available management alternatives (Stakeholder B in Figure 22) and thus must choose which alternative best matches their preferences or fight for the creation of a new alternative that exactly matches their preferred management activities.

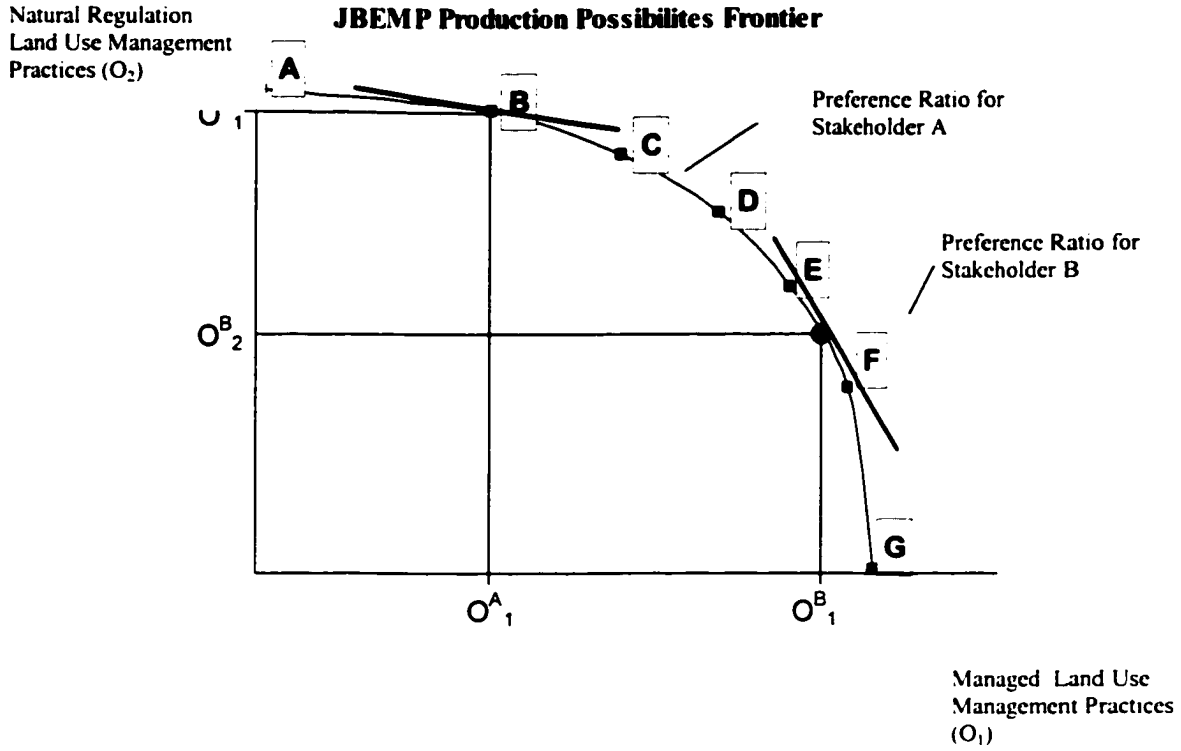


Figure 22. Constructing the JBEMP PPF.

The amount of welfare Stakeholder$_i$ receives at their preferred management alternative, $U_i = \lambda_{i1} O_1 + \lambda_{i2} O_2$, can be used to determine the tradeoff in preference between O_1 and O_2 for Stakeholder$_i$ by solving for O_2.

$$O_2 = \frac{U_i}{\lambda_{i2}} - \frac{\lambda_{i1}}{\lambda_{i2}} O_1$$

where $\frac{\lambda_{i1}}{\lambda_{i2}}$ = preference ratio for Stakeholder$_i$, and $\frac{U_i}{\lambda_{i2}}$ = the O_2 intercept for Stakeholder$_i$

The preference ratio, $\frac{\lambda_{i1}}{\lambda_{i2}}$, for each stakeholder can be constructed from the AHP management preference survey. Results from the management preference survey are presented in Table 12 for the elk management strategies and Table 13 for the bison management strategies.

The AHP weighting produces two types of scores: global and local. Global scores include the weighting of the complete hierarchy, the results of the entire hierarchy sum to one. Figure 13 is an example of global weighting. Local scores include only the hierarchy row scores, the results of each row (cluster of pairwise comparison questions) sum to one. In Tables 12 and 13, the overall categories of Disease, Forage and Hunting sum to one. The management options within each category also sum to one. For example, for overall importance APHIS weighted disease, forage, and hunting as 78%, 18%, and 4%, respectively, summing to one. Within the disease management category, APHIS weighted dispersal, vaccination, and test & slaughter as 78%, 11%, and 11% respectively, which also sums to one. The hypothetical alternatives include different amounts of management options and not the overall category importance weight. Local scores of the management options will be used to determine stakeholders' preferred management alternative. The overall importance weights will be used later to predict rent seeking behavior.

Because of the complexities and different issues surrounding managing bison and elk for disease, feeding, and hunting, the PPF and management alternatives had to be separated for bison management and elk management activities. Many of the stakeholders wanted to continue feeding the elk but not the bison and several wanted to use vaccination and test & slaughter to manage disease in the bison herd but not for the elk herd. Given the different feasible management alternatives between species, it was not possible to combine the management preferences for the bison and the elk management activities together on the same PPF.

Table 12. Elk Management Preference Weighting Results

	Elk Management Strategies											
	DISEASE	Dispersal	Vaccinate	Test & Slaughter	**FORAGE**	Annual	Sufficient/Emergency	No Feed	**HUNTING**	Both GT/NER	Only NER	No Hunting
AHPIS	**0.78**	0.78	0.11	0.11	**0.18**	0.00	0.04	0.95	**0.04**	0.74	0.20	0.06
BLM	**0.82**	0.98	0.01	0.01	**0.09**	0.02	0.97	0.01	**0.09**	0.47	0.47	0.07
NPS	**0.54**	0.94	0.05	0.01	**0.08**	0.07	0.90	0.04	**0.38**	0.43	0.43	0.14
FWS	**0.18**	0.77	0.17	0.05	**0.75**	0.15	0.76	0.09	**0.06**	0.63	0.30	0.06
USFS	**0.19**	0.98	0.01	0.01	**0.76**	0.17	0.79	0.05	**0.05**	0.33	0.33	0.33
OFLP	**0.74**	0.13	0.81	0.06	**0.06**	0.75	0.21	0.04	**0.20**	0.78	0.18	0.04
WGFC	**0.04**	0.01	0.98	0.01	**0.21**	0.78	0.21	0.00	**0.75**	0.95	0.04	0.00
WGFD	**0.20**	0.61	0.38	0.00	**0.20**	0.30	0.63	0.06	**0.60**	0.95	0.04	0.00
TCC	**0.13**	0.71	0.14	0.14	**0.17**	0.19	0.73	0.08	**0.69**	0.47	0.47	0.07
TOJ	**0.05**	0.18	0.81	0.01	**0.77**	0.69	0.26	0.05	**0.18**	0.95	0.04	0.00
SBC	**0.05**	0.80	0.09	0.11	**0.18**	0.05	0.19	0.76	**0.77**	0.74	0.11	0.15
ITBC	**0.14**	0.98	0.01	0.01	**0.58**	0.01	0.01	0.98	**0.28**	0.98	0.02	0.00
DCC	**0.44**	0.18	0.75	0.06	**0.49**	0.77	0.22	0.01	**0.08**	0.80	0.11	0.09
JHCC	**0.33**	0.13	0.75	0.12	**0.33**	0.93	0.07	0.00	**0.33**	0.95	0.04	0.00
DOA	**0.19**	0.00	0.09	0.91	**0.05**	0.95	0.04	0.00	**0.76**	0.95	0.04	0.00
EFT	**0.33**	0.01	0.98	0.01	**0.33**	0.85	0.15	0.00	**0.33**	0.98	0.01	0.01
JHOA	**0.18**	0.15	0.80	0.05	**0.30**	0.80	0.20	0.01	**0.52**	0.95	0.04	0.00
FNAWS	**0.05**	0.75	0.18	0.06	**0.69**	0.19	0.81	0.00	**0.26**	0.58	0.28	0.14
WHA	**0.33**	0.05	0.80	0.15	**0.33**	0.98	0.01	0.01	**0.33**	0.98	0.01	0.01
RCH	**0.06**	0.24	0.70	0.06	**0.49**	0.74	0.25	0.00	**0.45**	0.95	0.04	0.00
WFB	**0.13**	0.08	0.73	0.20	**0.65**	0.74	0.20	0.06	**0.22**	0.95	0.04	0.00
BFC	**0.06**	0.95	0.04	0.00	**0.45**	0.01	0.01	0.98	**0.49**	0.09	0.45	0.45
FUND	**0.04**	0.98	0.01	0.01	**0.78**	0.02	0.07	0.91	**0.18**	0.01	0.01	0.98
DOW	**0.24**	0.98	0.01	0.01	**0.70**	0.06	0.24	0.70	**0.06**	0.60	0.20	0.20
GYC	**0.58**	0.98	0.01	0.01	**0.28**	0.07	0.32	0.60	**0.14**	0.10	0.68	0.23
JHCA	**0.47**	0.98	0.01	0.01	**0.47**	0.00	0.04	0.95	**0.05**	0.11	0.11	0.78
NRCC	**0.47**	0.81	0.06	0.13	**0.47**	0.07	0.71	0.22	**0.07**	0.43	0.43	0.14
SC	**0.23**	0.98	0.01	0.01	**0.69**	0.16	0.77	0.08	**0.08**	0.01	0.98	0.01
WOC	**0.14**	0.98	0.01	0.01	**0.58**	0.00	0.95	0.04	**0.28**	0.50	0.50	0.00
WWF	**0.14**	0.98	0.01	0.01	**0.58**	0.08	0.19	0.73	**0.28**	0.74	0.25	0.00

Table 13. Bison Management Preference Weighting Results

	Bison Management Strategies										
	DISEASE	Dispersal	Vaccinate	Test & Slaughter	**FORAGE**	Feed	No Feed	**HUNTING**	Both GT/NER	Only NER	No Hunting
AHPIS	**0.78**	0.00	0.50	0.50	**0.18**	0.10	0.90	**0.04**	0.95	0.04	0.00
BLM	**0.52**	0.56	0.15	0.29	**0.30**	0.50	0.50	**0.18**	0.48	0.41	0.11
NPS	**0.69**	0.74	0.20	0.06	**0.08**	0.17	0.83	**0.23**	0.14	0.71	0.14
FWS	**0.06**	0.77	0.17	0.05	**0.74**	0.17	0.83	**0.21**	0.07	0.79	0.14
USFS	**0.06**	0.98	0.01	0.01	**0.74**	0.88	0.12	**0.20**	0.33	0.33	0.33
OFLP	**0.78**	0.06	0.74	0.20	**0.04**	0.13	0.87	**0.18**	0.78	0.18	0.04
WGFC	**0.17**	0.00	0.80	0.19	**0.05**	0.75	0.25	**0.77**	0.78	0.21	0.00
WGFD	**0.43**	0.78	0.11	0.11	**0.43**	0.75	0.25	**0.14**	0.74	0.25	0.00
TCC	**0.11**	0.45	0.45	0.09	**0.11**	0.83	0.17	**0.78**	0.70	0.24	0.06
TOJ	**0.04**	0.05	0.17	0.79	**0.18**	0.83	0.17	**0.78**	0.63	0.30	0.06
SBC	**0.17**	0.79	0.17	0.05	**0.79**	0.10	0.90	**0.05**	0.80	0.11	0.09
ITBC	**0.14**	0.98	0.01	0.01	**0.58**	0.10	0.90	**0.28**	0.98	0.01	0.01
DCC	**0.45**	0.20	0.74	0.06	**0.45**	0.87	0.13	**0.09**	0.76	0.19	0.05
JHCC	**0.16**	0.41	0.48	0.11	**0.19**	0.13	0.87	**0.66**	0.94	0.06	0.00
DOA	**0.79**	0.00	0.10	0.90	**0.17**	0.90	0.10	**0.05**	0.95	0.04	0.00
EFT	**0.14**	0.33	0.33	0.33	**0.28**	0.10	0.90	**0.58**	0.95	0.04	0.00
JHOA	**0.15**	0.08	0.49	0.44	**0.07**	0.25	0.75	**0.79**	0.78	0.21	0.00
FNAWS	**0.33**	0.72	0.23	0.05	**0.33**	0.88	0.12	**0.33**	0.50	0.50	0.00
WHA	**0.09**	0.01	0.98	0.01	**0.09**	0.50	0.50	**0.82**	0.98	0.01	0.01
RCH	**0.09**	0.18	0.75	0.06	**0.17**	0.83	0.17	**0.74**	0.78	0.21	0.00
WFB	**0.74**	0.00	0.95	0.04	**0.06**	0.75	0.25	**0.20**	0.95	0.04	0.00
BFC	**0.04**	0.98	0.02	0.01	**0.78**	0.10	0.90	**0.18**	0.00	0.50	0.50
FUND	**0.18**	0.98	0.01	0.01	**0.78**	0.10	0.90	**0.04**	0.01	0.01	0.98
DOW	**0.24**	0.98	0.01	0.01	**0.70**	0.13	0.87	**0.06**	0.60	0.20	0.20
GYC	**0.58**	0.98	0.01	0.01	**0.28**	0.13	0.87	**0.14**	0.10	0.68	0.23
JHCA	**0.47**	0.98	0.01	0.01	**0.47**	0.10	0.90	**0.05**	0.01	0.01	0.98
NRCC	**0.47**	0.75	0.18	0.06	**0.47**	0.17	0.83	**0.07**	0.13	0.65	0.22
SC	**0.08**	0.71	0.14	0.14	**0.77**	0.13	0.87	**0.16**	0.01	0.98	0.01
WOC	**0.09**	0.98	0.01	0.01	**0.82**	0.50	0.50	**0.09**	0.98	0.01	0.01
WWF	**0.14**	0.98	0.01	0.01	**0.58**	0.13	0.87	**0.28**	0.12	0.87	0.01

Elk management alternatives are displayed in Table 14. Alternatives for managing bison are displayed in Table 15. The elk management alternatives include a Sufficient/Emergency feeding option. This option was not included in the bison management preference questions and alternatives because the EIS team did not consider it to be a feasible alternative. Because it is

possible to combine techniques such as dispersal and vaccination, a management category can include more than one management option. An alternative that includes hunting in Grand Teton and the NER as well as hunting only on the NER can represent an alternative that allows hunting on both places but at reduced or limited level on Grand Teton. The alternatives are the same for bison and elk alternatives A, B, F, and G but vary for D, E, and F where different combinations of disease, feeding, and hunting management strategies are used. All of the hypothetical alternatives are considered to be realistic management options.

Table 14. Hypothetical Alternatives for Managing the Jackson Elk Herd

Management Category	Options	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Disease	Dispersal	X	X	X	X	X		
	Vaccinate					X	X	
	Test & Slaughter							X
Forage	Annual					X	X	X
	Sufficient Emergency				X	X		
	No Feed	X	X	X				
Hunting	Both GTNP & NER			X	X	X	X	X
	NER Only		X		X			
	No Hunting	X						

Table 15. Hypothetical Alternatives for Managing the Jackson Bison Herd.

Management Category	Options	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Disease	Dispersal	X	X	X	X			
	Vaccinate			X	X	X	X	
	Test & Slaughter					X		X
Forage	Feed				X		X	X
	No Feed	X	X	X		X		
Hunting	Both GT/NER				X	X	X	X
	Only NER		X	X	X			
	No Hunting	X						

Since stakeholders' were able to select varying amounts of each management option (Tables 12 and 13), indexes were developed in order to match stakeholders' preference weightings with the placement of the management alternatives on the PPF_{Joint} curve. Because it is possible to combine management options that are considered natural with options that are considered managed, each management alternative has a natural and a managed index score to represent the amount of natural regulation and managed land use services included in each alternative. I start by assuming that the given fixed resource level, X, equals 300. Therefore, a maximum of 300 points is allowed for the maximum natural index score and the maximum managed index score. Alternative A, contains the most natural regulation management options with the highest possible amounts of dispersal, no winter-feeding, and no hunting. Even though there is a possible total of 300 points for each index, the AHP model requirement of giving a small amount of weight to all management options limits the most natural and the most managed score to 294 points (98 points each for the three natural attributes). Alternative G contains the most managed management options with the highest possible amounts test & slaughter, annual winter feeding, and hunting on both the refuge and the park. Alternatives B through F contain combinations of natural and managed management options, with higher amounts of natural regulation management options toward the natural regulation land use management axis and higher amounts of managed management options toward the managed land use management axis.

Stakeholder Placement on the Elk Management PPF.

The PPF Indexes for the elk management alternatives are shown in Table 16. The natural and managed PPF index scores for each management alternative can be used to draw the PPF_{Joint} curve. The tangency slope of each PPF index score for each policy alternative gives the

associated preference ratio for each alternative (Table 16). Because stakeholders were able to choose any amount of each management option (Tables 12 and 13), some stakeholders preferences do not match up with a management alternative. For example, the BFC prefers an equal amount of elk hunting on the NER and no elk hunting. Because there is not a management alternative that matches this preference, the BFC will fall somewhere in between Alternative A and Alternative B. To determine the preference ratios of stakeholders that do not match up with a management alternative, a separate preference index will be developed to determine the placement of all stakeholders on the PPF.

Table 16. PPF Indexes for Elk Management Alternatives

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Management Category	**Options**	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed
Disease	Dispersal	98	0	98	0	94	0	95	0	89	0	26	0	1	0
	Vaccinate	0	1	1	1	1	5	1	3	15	30	29	75	1	0
	Test & Slaughter	0	1	0	1	0	1	0	3	0	11	0	10	0	98
Winter Feeding	Annual	0	1	0	4	0	4	0	6	0	31	0	81	0	98
	Sufficient Emergency	0	1	14	22	14	22	44	58	44	58	8	16	1	0
	No Feed	98	0	90	0	89	0	15	0	1	0	4	0	1	0
Hunting	Both GTNP & NER	0	1	0	2	0	85	0	85	0	88	0	90	0	98
	NER Only	0	1	22	45	26	58	47	65	25	36	3	12	1	0
	No Hunting	98	0	59	0	30	0	18	0	1	0	5	0	1	0
	PPF Placement	**294**	**6**	**284**	**75**	**254**	**175**	**220**	**220**	**175**	**254**	**75**	**284**	**6**	**294**

The preference index percentages in Table 17, relate how the percentage of each management activity is placed within the natural and the managed preference index. Because dispersal is a management activity completely related to natural regulation land use practices, 100% of each stakeholder's dispersal preference is allocated to the natural preference index. The opposite is true for the test & slaughter strategy placing 100% into the managed preference index. Preference percentages are divided accordingly for management strategies that contain a mix a natural and managed land use practices. While vaccination, sufficient winter feeding, and

hunting only on the NER are primarily managed land use practices, these options are not as extreme as the 100% managed land use practices and thus provide some natural land use practices as well.

Table 17. Preference Index Percentages

Preference Index	Natural	Managed
Dispersal	100%	0%
Vaccinate	25%	75%
Test & Slaughter	0%	100%
Annual	0%	100%
Sufficient/Emergency	40%	60%
No Feed	100%	0%
Both GT/NER	0%	100%
Only NER	25%	75%
No Hunting	100%	0%

The next step is to use the preference index percentages along with each stakeholder's preference survey scores (Table 12) to derive the preference ratios needed for placement on the PPF. For the elk management alternatives, twenty stakeholders had management preference scores that matched a management alternative and ten stakeholders had scores that fell in between management alternatives. Even though stakeholders match an alternative, each stakeholder's preference weights will not be an exact match with other stakeholders' preference weights within the same alternative. For example, the BLM, WOC, and NPS had preferences that matched Alternative D. Table 14 shows that the elk forage management strategy for Alternative D is sufficient/emergency winter feeding. While all three organizations strongly preferred sufficient feeding, the amount of preference weighting varied from 90% and 97%. The NPS elk preference weighing resulted in scores of 90% for sufficient feeding, 6% for annual feeding, and 4% for no feeding. The WOC elk preference weighting resulted in scores of 95% for sufficient feeding, 1% for annual feeding, and 4% for no feeding. The BLM elk preference

weighting resulted in scores of 97% for sufficient feeding, 2% for annual feeding, and 1% for no feeding.

Within each alternative, each stakeholder must have identical preference ratios in order to land on the same point on the PPF. In order to provide identical preference ratios for each alternative, stakeholders' preference scores within each alternative will be averaged. The averaged preferences scores for the elk management alternatives are presented in Table 18.

Table 18. Averaged Preference Scores for the Elk Management Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Dispersal	**0.98**	**0.98**	**0.88**	**0.93**	**0.70**	0.26	0.00
Vaccinate	0.01	0.01	0.05	0.04	**0.20**	**0.71**	0.09
Test & Slaughter	0.01	0.01	0.06	0.03	0.10	0.03	**0.91**
Annual	0.02	0.02	0.04	0.06	**0.21**	**0.75**	**0.95**
Sufficient/Emergency	0.03	0.09	0.11	**0.91**	**0.73**	0.21	0.04
No Feed	**0.95**	**0.89**	**0.86**	0.02	0.06	0.04	0.00
Both GT/NER	0.01	0.05	**0.83**	**0.47**	**0.85**	**0.85**	**0.95**
Only NER	0.01	**0.65**	0.15	**0.47**	0.13	0.10	0.04
No Hunting	**0.98**	0.29	0.02	0.05	0.02	0.05	0.00

The preference ratios for the twenty stakeholders that had management preference scores matching a management alternative can be derived by taking the preference index percentages (Table 17) times the averaged preference scores for the management alternatives (Table 18). The results are displayed in Table 19. The natural and managed preference total from Table 19 for each alternative allows me to develop the preference ratio needed to place stakeholders on the PPF curve. Table 20 provides the management alternative preference ratios. Because the preference ratio must hit the PPF at the exact place each alternative lies on the PPF, the preference ratio will be the same as the slope ratio for the PPF index (Table 16).

Table 19. Deriving the Preference Ratio needed to Determine Stakeholder Placement on the Elk PPF.

Management Activity	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed
Dispersal	0.98	0.00	0.98	0.00	0.88	0.00	0.93	0.00	0.70	0.00	0.26	0.00	0.00	0.00
Vaccinate	0.00	0.01	0.00	0.01	0.01	0.04	0.01	0.03	0.05	0.15	0.18	0.53	0.02	0.07
Test & Slaughter	0.00	0.01	0.00	0.01	0.00	0.06	0.00	0.03	0.00	0.10	0.00	0.03	0.00	0.91
Total	**0.98**	**0.02**	**0.98**	**0.02**	**0.90**	**0.10**	**0.94**	**0.06**	**0.75**	**0.25**	**0.44**	**0.56**	**0.03**	**0.97**
Annual Feeding	0.00	0.01	0.00	0.02	0.00	0.04	0.00	0.06	0.00	0.21	0.00	0.75	0.00	0.95
Sufficient/Emergency	0.00	0.01	0.04	0.05	0.04	0.07	0.36	0.55	0.29	0.44	0.08	0.13	0.01	0.03
No Feed	0.98	0.00	0.89	0.00	0.86	0.00	0.02	0.00	0.06	0.00	0.04	0.00	0.01	0.00
Total	**0.98**	**0.04**	**0.93**	**0.07**	**0.90**	**0.10**	**0.38**	**0.61**	**0.35**	**0.65**	**0.12**	**0.88**	**0.02**	**0.98**
Both GT/NER	0.00	0.01	0.00	0.05	0.00	0.83	0.00	0.47	0.00	0.85	0.00	0.85	0.00	0.95
Only NER	0.00	0.01	0.16	0.49	0.04	0.11	0.12	0.35	0.03	0.10	0.03	0.08	0.01	0.03
No Hunting	0.98	0.00	0.29	0.00	0.02	0.00	0.05	0.00	0.02	0.00	0.05	0.00	0.00	0.00
Total	**0.98**	**0.02**	**0.45**	**0.54**	**0.06**	**0.94**	**0.17**	**0.82**	**0.05**	**0.95**	**0.08**	**0.93**	**0.01**	**0.99**
Preference Totals	***0.98***	***0.02***	***0.79***	***0.21***	***0.62***	***0.38***	***0.50***	***0.50***	***0.38***	***0.62***	***0.21***	***0.79***	***0.02***	***0.98***

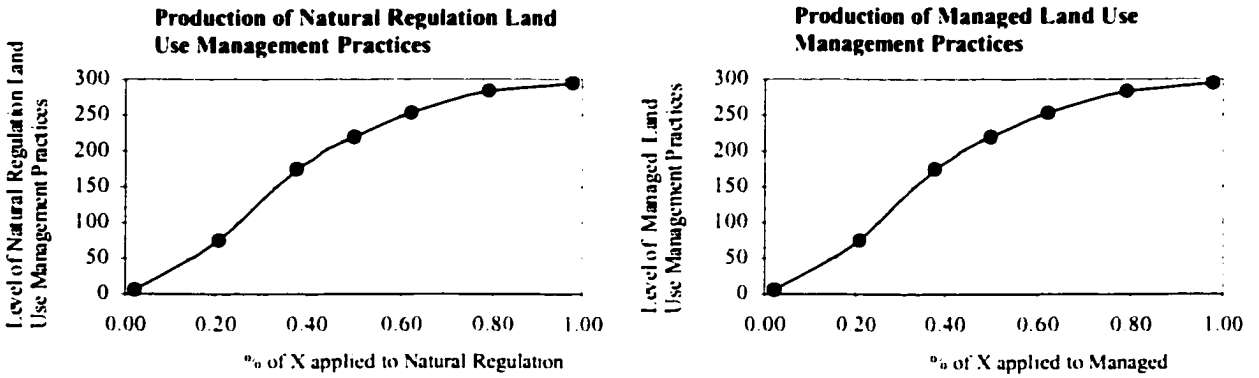
Table 20. Management Alternative Preference Ratios.

	Preference Index			PPF Index		
	Natural	Managed	**Ratio**	Natural	Managed	**Ratio**
Alternative A	0.98	0.02	**49.0**	294	6	**49.0**
Alternative B	0.79	0.21	**3.8**	284	75	**3.8**
Alternative C	0.62	0.38	**1.5**	254	175	**1.5**
Alternative D	0.50	0.50	**1.0**	220	220	**1.0**
Alternative E	0.38	0.62	**0.7**	175	254	**0.7**
Alternative F	0.21	0.79	**0.3**	75	284	**0.3**
Alternative G	0.02	0.98	**0.02**	6.00	294	**0.02**

In order to construct the JBEMP PPF_{Joint} curve, the natural regulation and managed production functions are needed to derive the product transformation curve. From the Preference Ratios and the PPF Index, I derived the production functions (Table 21) and product transformation curve (Figure 23) to match the hypothetical management alternatives.

Table 21. Production Functions for the Given Fixed Resource Level X.

% of X applied to Natural Regulation	Level of Natural Regulation Land Use Practices	% of X applied to Managed	Level of Managed Land Use Practices	Alternative
0.98	294	0.02	6	A
0.79	284	0.21	75	B
0.62	254	0.39	175	C
0.50	220	0.50	220	D
0.39	175	0.62	254	E
0.21	75	0.79	284	F
0.02	6	0.98	294	G



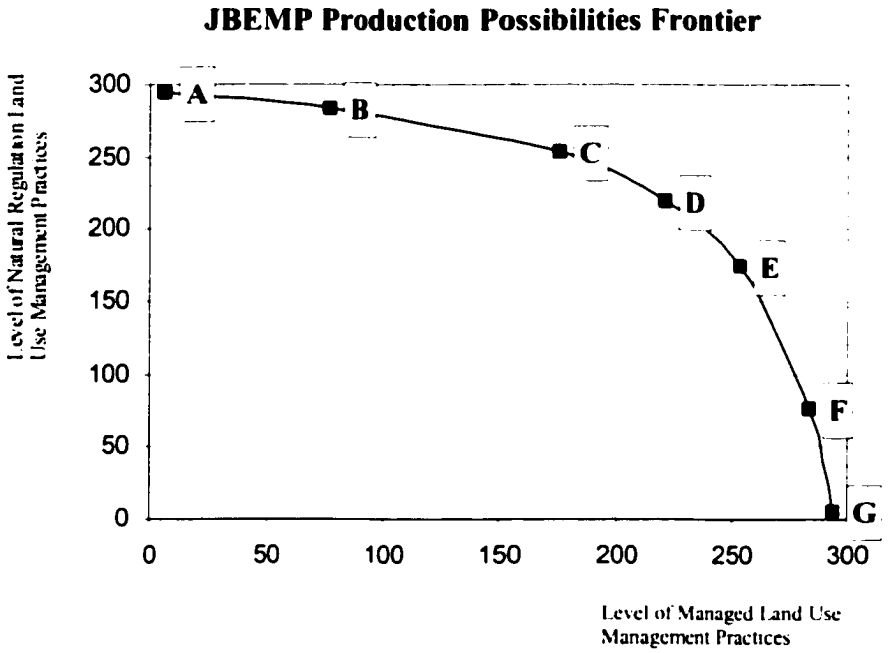


Figure 23. Deriving the Product Transformation Function from the Natural Regulation and Managed Production Functions

Elk PPF Placement for Stakeholder Preferences that do not Match an Alternative

The preference ratios for the ten stakeholders that did not have management preference scores matching a management alternative can be derived by multiplying the preference index percentages (Table 17) with each stakeholder's management preference scores (Table 22). The preference ratio results needed to place the Stakeholders on the PPF are displayed in Table 23.

Table 22. Management Preference Scores for Stakeholders that did not Match a Management Alternative.

	JHCA	BFC	DOW	USFS	SC	NRCC	WGFD	RCH	TOJ	WFB
Dispersal	0.98	0.95	0.98	0.98	0.98	0.81	0.61	0.24	0.18	0.08
Vaccinate	0.01	0.04	0.01	0.01	0.01	0.06	0.38	0.70	0.81	0.73
Test & Slaughter	0.01	0.00	0.01	0.01	0.01	0.13	0.00	0.06	0.01	0.20
Annual	0.00	0.01	0.06	0.17	0.16	0.07	0.30	0.74	0.69	0.74
Sufficient/Emergency	0.04	0.01	0.24	0.79	0.77	0.71	0.63	0.25	0.26	0.20
No Feed	0.95	0.98	0.70	0.05	0.08	0.22	0.06	0.00	0.05	0.06
Both GT/NER	0.11	0.09	0.50	0.33	0.01	0.43	0.95	0.95	0.95	0.95
Only NER	0.11	0.45	0.25	0.33	0.98	0.43	0.04	0.04	0.04	0.04
No Hunting	0.78	0.45	0.25	0.33	0.01	0.14	0.00	0.00	0.00	0.00

Table 23. Preference Ratios for Stakeholders that did not Match a Management Alternative.

	Natural	Managed	Ratio
JHCA	0.85	0.15	*5.67*
BFC	0.81	0.19	*4.26*
DOW	0.70	0.30	*2.33*
USFS	0.70	0.30	*2.33*
SC	0.64	0.36	*1.78*
NRCC	0.59	0.41	*1.44*
WGFD	0.34	0.66	*0.52*
RCH	0.22	0.78	*0.28*
TOJ	0.17	0.83	*0.20*
WFB	0.12	0.88	*0.14*

Now that the preference ratios for all stakeholders are known, Table 24 shows how the stakeholders placed within and between the elk management alternatives. The FUND was the only stakeholder to place in the alternative allowing the most natural regulation land management practices and the DOA was the only stakeholder to place in the alternative allowing the most managed land management practices. Twenty three of the thirty stakeholders placed in

or between the alternatives (C through G) that allow hunting in both the Grand Teton and the National Elk Refuge. Eighteen of the thirty stakeholders placed in or between the alternatives (D through G) that allow either sufficient or annual winter feeding. Eighteen of the thirty stakeholders placed in or between the alternatives (A through E) where dispersal is the main disease management strategy. Figure 24 shows the stakeholder placement for the elk management PPF_{Joint} curve.

Table 24. Stakeholder Placement for the Elk Management Alternatives

Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G
FUND	*JHCA*	**GYC**	*DOW*	**WWF**	*NRCC*	**NPS**		**TCC**	*WGFD*	**OFLP**	*TOJ*	**DOA**
	BFC		*USFS*	**ITBC**		**BLM**		**FNAWS**	*RCH*	**JHOA**	*WFB*	
			SC	**SBC**		**WOC**		**FWS**		**JHCC**		
				APHIS						**WGFC**		
										WHA		
										EFT		
										DCC		

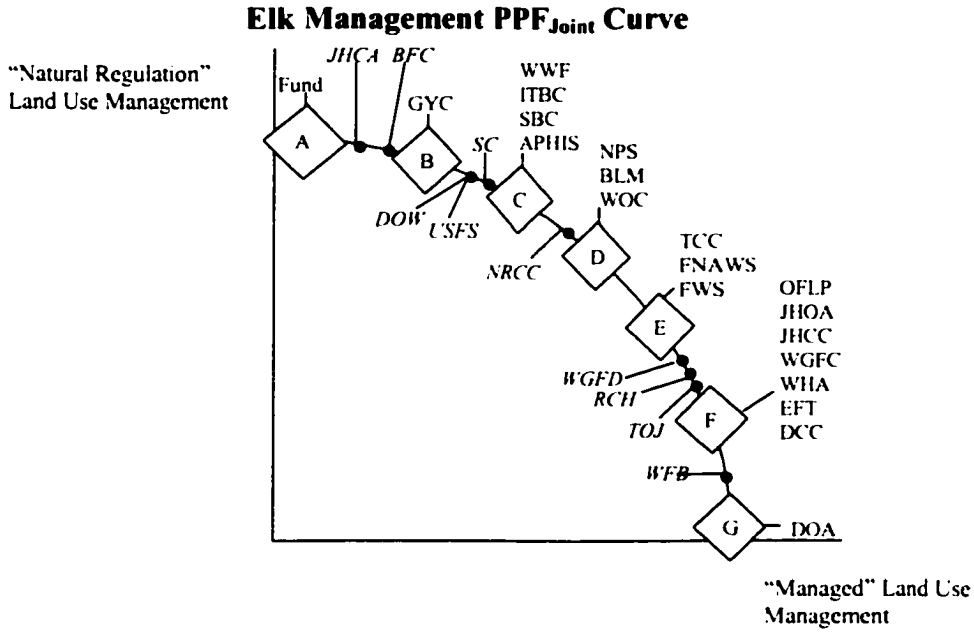


Figure 24. Stakeholder Placement on the Elk Management PPF_{Joint} Curve

Stakeholder Placement on the Bison Management PPF_{Joint} Curve.

The same series of steps used to determine stakeholder placement on the elk management PPF_{Joint} curve, can be used to place stakeholders on the bison management PPF_{Joint} curve. The PPF Indexes for the bison management alternatives are shown in Table 25. The natural and managed PPF Placement scores can be used to draw the bison management PPF_{Joint} curve.

Table 25. Indexes for Bison Management Alternatives

	A		B		C		D		E		F		G	
	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed
Dispersal	98	0	98	0	95	0	92	0	25	0	15	0	1	0
Vaccinate	0	1	1	2	10	70	29	60	34	76	39	90	1	0
Test & Slaughter	0	1	0	2	0	1	0	1	0	60	0	0	0	98
Annual	0	2	0	5	0	1	0	86	0	9	0	90	0	98
No Feed	98	0	95	0	96	0	66	0	98	0	13	0	2	0
Both GT NER	0	1	0	2	0	16	0	53	0	83	0	90	0	98
Only NER	0	1	48	65	43	87	15	20	17	26	9	14	1	0
No Hunting	98	0	42	0	10	0	18	0	1	0	0	0	1	0
PPF Placement	**294**	**6**	**284**	**76**	**254**	**175**	**220**	**220**	**175**	**254**	**76**	**284**	**6**	**294**

For the bison management alternatives, twenty stakeholders had management preference scores that matched a management alternative and ten stakeholders had scores that fell in between management alternatives. Stakeholder preference scores within each alternative were averaged to provide identical preference ratios. The preference ratios for the twenty stakeholders that had management preference scores matching a management alternative can be derived by taking the preference index percentages (Table 17) times the averaged preference scores for the bison management alternatives (Table 26). The results are displayed in Table 27. The bison management alternative preference ratios and production functions are the same as the elk management alternative preference ratios (Table 20) and production functions (Table 21).

Table 26. Average Preferences Scores for the Bison Management Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Dispersal	**0.98**	**0.98**	**0.73**	**0.84**	0.12	0.15	0.00
Vaccinate	0.01	0.01	**0.19**	**0.17**	**0.51**	**0.76**	0.05
Test & Slaughter	0.01	0.01	0.09	0.01	**0.37**	0.09	**0.95**
Annual	0.04	0.05	0.20	**0.60**	0.14	**0.78**	**0.96**
No Feed	**0.96**	**0.95**	0.80	0.40	**0.86**	0.22	0.04
Both GT/NER	0.01	0.02	0.12	**0.44**	**0.87**	**0.82**	**0.96**
Only NER	0.01	**0.73**	**0.79**	**0.44**	0.12	0.17	0.04
No Hunting	**0.98**	0.26	0.09	0.12	0.01	0.01	0.00

Table 27. Deriving the Preference Ratio needed to Determine Stakeholder Placement on the Bison PPF.

Management Activity	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed
Dispersal	0.98	0.00	0.98	0.00	0.73	0.00	0.84	0.00	0.12	0.00	0.15	0.00	0.00	0.00
Vaccinate	0.00	0.01	0.00	0.01	0.05	0.14	0.04	0.13	0.13	0.39	0.19	0.57	0.01	0.04
Test & Slaughter	0.00	0.01	0.00	0.01	0.00	0.09	0.00	0.01	0.00	0.37	0.00	0.09	0.00	0.95
Disease Total	**0.98**	**0.02**	**0.98**	**0.02**	**0.78**	**0.23**	**0.88**	**0.14**	**0.25**	**0.75**	**0.34**	**0.66**	**0.02**	**0.99**
Annual Feeding	0.00	0.04	0.00	0.05	0.00	0.20	0.00	0.60	0.00	0.14	0.00	0.78	0.00	0.96
No Feed	0.96	0.00	0.95	0.00	0.80	0.00	0.40	0.00	0.86	0.00	0.22	0.00	0.04	0.00
Forage Total	**0.96**	**0.04**	**0.95**	**0.05**	**0.80**	**0.20**	**0.40**	**0.60**	**0.86**	**0.14**	**0.22**	**0.78**	**0.04**	**0.96**
Both GT/NER	0.00	0.01	0.00	0.02	0.00	0.12	0.00	0.44	0.00	0.87	0.00	0.82	0.00	0.96
Only NER	0.00	0.01	0.18	0.55	0.20	0.59	0.11	0.33	0.03	0.09	0.04	0.12	0.01	0.03
No Hunting	0.98	0.00	0.26	0.00	0.09	0.00	0.12	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Hunting Total	**0.98**	**0.02**	**0.44**	**0.57**	**0.29**	**0.71**	**0.23**	**0.77**	**0.04**	**0.96**	**0.06**	**0.94**	**0.01**	**0.99**
Preference Score	**0.98**	**0.02**	**0.79**	**0.21**	**0.62**	**0.38**	**0.50**	**0.50**	**0.38**	**0.62**	**0.21**	**0.79**	**0.02**	**0.98**

Bison PPF Placement for Stakeholder Preferences that do not Match an Alternative

The preference ratios for the ten stakeholders that did not have bison management preference scores matching a management alternative are produced by multiplying the preference index percentages (Table 17) with each stakeholder's management preference scores (Table 28). The preference ratio results needed to place the Stakeholders on the Bison PPF are displayed in Table 29.

Table 28. Management Preference Scores for Stakeholders that did not Match a Management Alternative

Management Activity	BFC	DOW	ITBC	SBC	USFS	BLM	JHCC	WOC	WHA	TOJ
Dispersal	0.98	0.98	0.98	0.79	0.98	0.56	0.41	0.98	0.01	0.05
Vaccinate	0.02	0.01	0.01	0.17	0.01	0.15	0.48	0.01	0.98	0.17
Test & Slaughter	0.01	0.01	0.01	0.05	0.01	0.29	0.11	0.01	0.01	0.79
Annual	0.10	0.13	0.10	0.10	0.88	0.50	0.13	0.50	0.50	0.83
No Feed	0.90	0.87	0.90	0.90	0.12	0.50	0.87	0.50	0.50	0.17
Hunt both GT/NER	0.00	0.50	0.98	0.80	0.33	0.48	0.94	0.98	0.98	0.63
Hunt only NER	0.50	0.25	0.01	0.11	0.33	0.41	0.06	0.01	0.01	0.30
No Hunting	0.50	0.25	0.01	0.09	0.33	0.11	0.00	0.01	0.01	0.06

Table 29. Preference Ratios for Stakeholders that did not Match a Management Alternative

	Natural	Managed	Ratio
BFC	0.85	0.15	*5.67*
DOW	0.81	0.19	*4.26*
ITBC	0.70	0.30	*2.33*
SBC	0.70	0.30	*2.33*
USFS	0.64	0.36	*1.78*
BLM	0.59	0.41	*1.44*
JHCC	0.34	0.66	*0.52*
WOC	0.22	0.78	*0.28*
WHA	0.17	0.83	*0.20*
TOJ	0.12	0.88	*0.14*

Table 30 shows how the stakeholders placed within and between the bison management alternatives. The FUND and the JHCA placed in the alternative allowing the most natural regulation land management practices. The DOA was the only stakeholder to place in the alternative allowing the most managed land management practices. Sixteen of the thirty stakeholders placed in or between the alternatives (D through G) that allow bison hunting in both the Grand Teton and the National Elk Refuge (Table 30). Seventeen of the thirty stakeholders placed in or between the alternatives (A, B, C, and E) with the forage management strategy of no winter feeding. Seventeen of the thirty stakeholders placed in or between the alternatives (A through D) where dispersal is the main disease management strategy (Table 30). Figure 25 shows the stakeholder placement for the elk management PPF_{Joint} curve.

Table 30. Stakeholder Placement for the Bison Management Alternatives

Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G
FUND	*BFC*	**GYC**	*ITBC*	**FWS**	*BLM*	**FNAWS**		**OFLP**	*JHCC*	**DCC**	*WHA*	**DOA**
JHCA	*DOW*	**WWF**	*SBC*	**NPS**		**WGFD**		**JHOA**	*WOC*	**RCH**	*TOJ*	
			USFS	**SC**		**TCC**		**APHIS**		**WFB**		
				NRCC				**EFT**		**WGFC**		

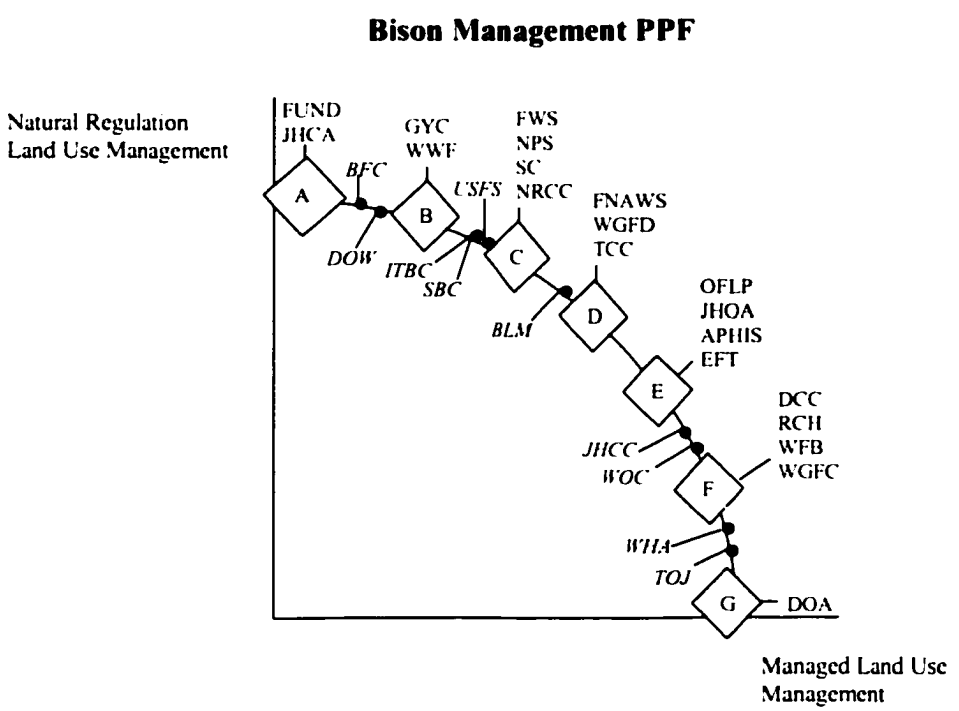


Figure 25. Stakeholder Placement on the Bison Management PPF_{Joint} Curve

Elk and Bison Management Average (equal influence) Outcome

The equal influence average (no political influence weighting) outcome (Figure 5) preference results for the elk and bison management are displayed in Table 31. The equal influence average results represent Buchanan's claim of no rent seeking if all stakeholders have equal influence. This equal influence outcome is not the same as the equal role and power political influence weighting in Table 10. For the equal role and power political influence

weighting, the weight of the role and power attributes and objectives are equal, but not each stakeholder's level of role and power (from the LIAM computerized survey results).

Table 31. Equal Influence Average Elk and Bison Management Outcomes

Management Strategies	Elk Equal Influence Average	Bison Equal Influence Average
Dispersal	0.60	0.55
Vaccinate	0.32	0.30
Test & Slaughter	0.08	0.15
Annual Feeding	0.35	0.40
Sufficient Feeding	0.37	-----
No Feed	0.28	0.60
Hunt both GT:NER	0.63	0.56
Hunt only NER	0.23	0.30
No Hunting	0.13	0.14

Because the equal influence preference weights are spread out between the management options, the elk and bison equal influence management option preference weights do not match the outcomes of the management alternatives. For the elk winter feeding management options, the preference weight is spread between all management options. A realistic management option cannot include both annual and no winter feeding.

Even though the equal influence average does not create a reasonable management alternative, it does show the average of preferences across all stakeholders. Overall, stakeholders would prefer dispersal, some amount of vaccination, and hunting. The biggest division in preferences is for the winter feeding options for the elk and bison. This could be an indicator for what the highest amount of disagreement will be between stakeholder organizations. The low overall scores for test and slaughter and no hunting can help rule out management options that are not considered favorable.

4.3 Step 3 Results: Draft EIS Preferred Elk and Bison Alternatives

The final step in the model application framework (Figure 9) is to combine each stakeholder's political influence score (μ_i, equation 3) with their management preference weights to determine the draft EIS management alternative. The draft EIS preferred alternative, K_{PI} (equation 5), is the average of the summed individual political influence weighted management preference weights. The original plan was to aggregate the influence weighting scores of all stakeholders and use the average to predict what will influence the preferred draft EIS alternative. As depicted in Table 5, there was a large variation of the importance of role and power among the stakeholder organizations. For the overall aggregation influence weighting, column "Stakeholder Average" in Table 9, the large variation in scores across all stakeholders diluted the extreme difference in stakeholder weighting (Table 5) between the role and power attributes.

Because the factors that influence the final outcome are unknown, six political influence scores were constructed for each stakeholder to predict how sensitive the outcome is to various levels of role and power influence (Table 10). Stakeholder political influence scores associated with the different role and power dominated influence weights are displayed in Table 11. To determine the political influence weighted outcomes, each stakeholder's management preference weighting results (Tables 12 and 13) are multiplied by each of their political influence scores. The sum of all stakeholders' new political influence weighted preferences is averaged to determine the outcome for each of the six political influence scores. For example, the political influence scores for the FWS are 72% for equal role and power influenced outcome, 10% for role-guardian dominant influenced outcome, 63% for role-advocate dominant influenced outcome, 86% for a power-resource dominant influenced outcome, 85% for a power-information dominant influenced outcome, and 66% for a power-support dominant influenced outcome

(Table 11). To determine the role-guardian dominant influenced outcome for the elk management strategies, the FWS's role-guardian dominant influence score of 10% is multiplied by the FWS elk management preference weights (Table 12). The same is done for all other stakeholders. Summing and taking the average of all stakeholders' new role-guardian dominant weighted management preference weights determines the role-guardian dominant influenced outcome.

Determining the Draft EIS Elk Management Alternative

The average elk political influence weighted outcomes are presented in Table 32. For the elk management political influenced weighted outcomes, the outcome for equal role and power influence and the outcomes for all three of the dominant power types (resource, information, and support) are almost identical with outcomes varying by 1% or less. The role-advocate dominant outcome varied slightly, with 3%-4% higher levels of natural (dispersal, no feeding, and no hunting) management practices. The role-guardian dominant outcome had the highest level of variation with reductions in dispersal, no feeding, no hunting and increases in vaccination, annual feeding, and hunting on both GT/NER (Table 32).

Table 32. Political Influence Weighted Elk Management Outcomes.

Management Activity	Equal Role and Power	Role-Guardian Dominant	Role-Advocate Dominant	Power-Resource Dominant	Power-Information Dominant	Power-Support Dominant
Dispersal	0.61	0.51	0.64	0.61	0.61	0.61
Vaccinate	0.32	0.40	0.29	0.32	0.31	0.32
Test & Slaughter	0.08	0.10	0.08	0.07	0.07	0.07
Annual Feeding	0.35	0.44	0.32	0.35	0.34	0.35
Sufficient Feeding	0.37	0.36	0.36	0.37	0.37	0.36
No Feed	0.28	0.20	0.32	0.28	0.29	0.29
Hunt both GT/NER	0.63	0.70	0.60	0.63	0.62	0.63
Hunt only NER	0.23	0.20	0.25	0.23	0.23	0.23
No Hunting	0.14	0.10	0.15	0.14	0.15	0.14

The difference in political influence has to do with each stakeholder's responses to the computerized LIAM questionnaire. Most stakeholders have high political influence scores across all three of the power type dominant influence weighting scenarios (Table 11). Many of the dominant guardians also had high advocate scores because of high self ratings for the advocate characteristic questions about resource preservation and reacting to proposals. However, most of the dominant advocate roles had low guardian scores (Appendix F). Because most stakeholders had medium to high scores for the advocate role and all three power types, this can help explain why the role-guardian dominant outcome is the only political influence outcome with different results.

Another explanation for the closeness in the political influence weighted outcomes is that in a collaborative natural resource decision making process, there will be a negotiated solution with the outcome landing somewhere in the middle. Because the outcome looks the same under most of the political influence weightings, no one or group of stakeholders has enough power or role characteristics to drastically change the outcome. In order to alter the outcome, a stakeholder would have to have an exceptionally high level of influence or would have to go outside the Public Choice Type 2 Action and fight (sue) to get the property rights changed (Type 1 Public Choice Action).

Preference ratios for each of the political influence weighted elk management outcomes can be produced by multiplying the preference index percentages (Table 17) with each of the influence weighted management preference scores (Table 32). The preference ratio results needed to place the influence-weighted outcomes on the PPF are displayed in Table 33. For comparison, the equal influence (no weighting) average is also included in Table 33.

Table 33. Preference Ratios for Determining the PPF Placement for Political Influence Elk Outcomes.

	Equal Influence Average (no weighting)		Equal Role and Power (Draft EIS Alt.)		Role-Guardian Dominant		Role-Advocate Dominant		Power-Resource Dominant		Power-Information Dominant		Power-Support Dominant	
	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed
Dispersal	0.60	0.00	0.61	0.00	0.51	0.00	0.64	0.00	0.61	0.00	0.61	0.00	0.61	0.00
Vaccinate	0.08	0.24	0.08	0.24	0.10	0.30	0.07	0.22	0.08	0.24	0.08	0.23	0.08	0.24
Test & Slaughter	0.00	0.08	0.00	0.08	0.00	0.10	0.00	0.08	0.00	0.07	0.00	0.07	0.00	0.07
Disease Total	**0.68**	**0.32**	**0.69**	**0.31**	**0.60**	**0.40**	**0.71**	**0.29**	**0.69**	**0.31**	**0.69**	**0.31**	**0.69**	**0.31**
Annual Feeding	0.00	0.35	0.00	0.35	0.00	0.44	0.00	0.32	0.00	0.35	0.00	0.34	0.00	0.35
Sufficient/Emergency	0.15	0.22	0.15	0.22	0.14	0.21	0.14	0.22	0.15	0.22	0.15	0.22	0.14	0.22
No Feed	0.28	0.00	0.28	0.00	0.20	0.00	0.32	0.00	0.28	0.00	0.29	0.00	0.29	0.00
Forage Total	**0.43**	**0.57**	**0.43**	**0.57**	**0.35**	**0.65**	**0.46**	**0.54**	**0.43**	**0.57**	**0.43**	**0.57**	**0.43**	**0.57**
Hunt both GT/NER	0.00	0.63	0.00	0.63	0.00	0.70	0.00	0.60	0.00	0.63	0.00	0.62	0.00	0.63
Hunt only NER	0.06	0.17	0.06	0.17	0.05	0.15	0.06	0.19	0.06	0.17	0.06	0.17	0.06	0.17
No Hunting	0.13	0.00	0.14	0.00	0.10	0.00	0.15	0.00	0.14	0.00	0.15	0.00	0.14	0.00
Hunting Total	**0.19**	**0.81**	**0.20**	**0.80**	**0.15**	**0.85**	**0.21**	**0.79**	**0.20**	**0.80**	**0.21**	**0.79**	**0.20**	**0.80**
Preference Scores	**0.43**	**0.57**	**0.44**	**0.56**	**0.37**	**0.63**	**0.46**	**0.54**	**0.44**	**0.56**	**0.44**	**0.56**	**0.44**	**0.56**

As shown in Table 33, the equal role and power outcome and the three power dominant outcomes all have the same preference ratio that only varies by 1% from the equal influence (no weighting) average outcome. For placement on the PPF, the equal role and power outcome and the three power dominant outcomes fall exactly in between management alternatives D and E, the equal influence weighting falls a point closer to alternative E, and the role-advocate dominant preference ratio falls closer to alternative D. The role-guardian dominant preference ratio almost matches Alternative E.

Because the importance of role and power in the JBEMP is not known, the equal role and power political influence average will be used to predict the Draft EIS outcome. The equal role and power outcome (Table 33), now the Draft EIS alternative, falls exactly in between management alternatives D and E (Table 19). However, the outcome associated with the Draft EIS (Table 32) more closely matches Alternative E (Table 18). Therefore, Alternative E will be

used to represent the draft EIS elk management alternative. Figure 26 shows the PPF_{Joint} curve placement for the political influence weighted elk management outcomes.

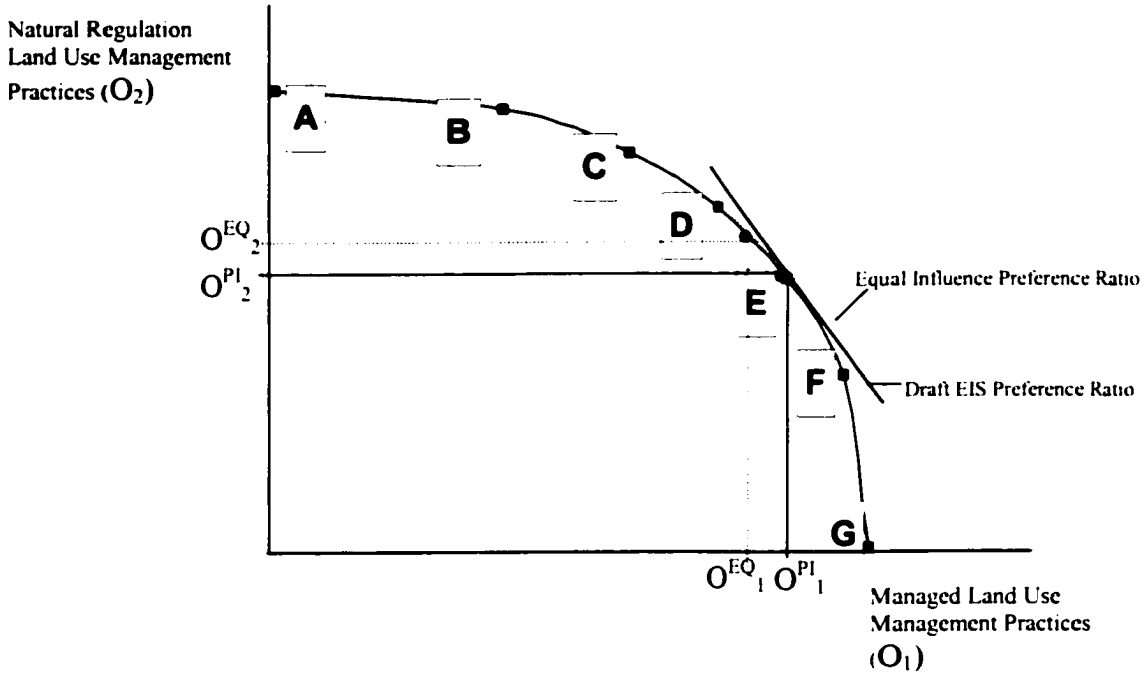


Figure 26. Preference Ratios for the Political Influence Weighted Elk Management Outcomes.

Determining the Draft EIS Bison Management Alternative

The average bison political influence weighted outcomes are presented in Table 34. For the bison management political influenced weighted outcomes, the outcome for equal role and power influence and the outcomes for all three of the dominant power types (resource, information, and support) vary by 6% or less (Table 34). The bison power-support dominated outcome has a slightly higher variation, with more vaccination, annual feeding, hunting both the GT/NER. The role-advocate dominant outcome resulted in higher levels of dispersal, no feeding, and hunt only NER management practices. The role-guardian dominant outcome had

the highest level of variation with reductions in dispersal, no feeding, hunt only NER, and increases in vaccination, test and slaughter, annual feeding, and hunting on both GT/NER (Table 34). No winter feeding is the dominant bison forage management option under all political influence weighted outcomes.

Table 34. Political Influence Weighted Bison Management Outcomes.

Management Activity	Equal Role and Power	Role-Guardian Dominant	Role-Advocate Dominant	Power-Resource Dominant	Power-Information Dominant	Power-Support Dominant
Dispersal	0.47	0.40	0.52	0.50	0.50	0.45
Vaccinate	0.35	0.40	0.32	0.33	0.34	0.37
Test & Slaughter	0.17	0.20	0.16	0.17	0.16	0.17
Annual Feeding	0.40	0.44	0.38	0.38	0.39	0.42
No Feed	0.60	0.56	0.62	0.62	0.61	0.58
Hunt both GT/NER	0.52	0.59	0.46	0.49	0.50	0.55
Hunt only NER	0.34	0.27	0.37	0.33	0.33	0.34
No Hunting	0.14	0.14	0.17	0.18	0.17	0.11

There is more variation in the bison management political influence preference ratios (Table 35) than there was for the elk management political influence preference ratios (Table 33). While all options have a 51% or higher managed preference score, the role-guardian dominant and power-support have the highest amounts of managed preference scores. The equal influence, role-advocate, power-resource, and power-information are all close to an equal split between natural and managed preference scores. For placement on the PPF, all of the political influence weighted bison management outcomes fall in between management alternatives D and E. The role-guardian dominant preference ratio almost matches Alternative E (Table 34). The preference ratio results needed to place the influence-weighted outcomes on the PPF are displayed in Table 35. For comparison, the equal influence (no weighting) average is included in Table 35.

Table 35. Preference Ratios for the PPF Placement of the Political Influence Bison Outcomes.

Management Activity	Equal Influence Average		Equal Role and Power (Draft EIS Alt.)		Role-Guardian Dominant		Role-Advocate Dominant		Power-Resource Dominant		Power-Information Dominant		Power-Support Dominant	
	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed	Natural	Managed
Dispersal	0.55	0.00	0.47	0.00	0.40	0.00	0.52	0.00	0.50	0.00	0.50	0.00	0.45	0.00
Vaccinate	0.07	0.22	0.09	0.26	0.10	0.30	0.08	0.24	0.08	0.25	0.09	0.26	0.09	0.28
Test & Slaughter	0.00	0.15	0.00	0.17	0.00	0.20	0.00	0.16	0.00	0.17	0.00	0.16	0.00	0.17
Disease Total	**0.62**	**0.38**	**0.56**	**0.44**	**0.50**	**0.50**	**0.60**	**0.40**	**0.58**	**0.42**	**0.58**	**0.42**	**0.55**	**0.45**
Annual Feeding	0.00	0.40	0.00	0.40	0.00	0.44	0.00	0.38	0.00	0.38	0.00	0.39	0.00	0.42
No Feed	0.60	0.00	0.60	0.00	0.56	0.00	0.62	0.00	0.62	0.00	0.61	0.00	0.58	0.00
Forage Total	**0.60**	**0.40**	**0.60**	**0.40**	**0.56**	**0.44**	**0.62**	**0.38**	**0.62**	**0.38**	**0.61**	**0.39**	**0.58**	**0.42**
Both GT/NER	0.00	0.56	0.00	0.52	0.00	0.59	0.00	0.46	0.00	0.49	0.00	0.50	0.00	0.55
Only NER	0.07	0.22	0.08	0.25	0.07	0.20	0.09	0.28	0.08	0.25	0.08	0.25	0.09	0.26
No Hunting	0.14	0.00	0.14	0.00	0.14	0.00	0.17	0.00	0.18	0.00	0.17	0.00	0.11	0.00
Hunting Total	**0.22**	**0.78**	**0.22**	**0.78**	**0.21**	**0.79**	**0.26**	**0.74**	**0.26**	**0.74**	**0.25**	**0.75**	**0.20**	**0.80**
Preference Scores	**0.48**	**0.52**	**0.46**	**0.54**	**0.42**	**0.58**	**0.49**	**0.51**	**0.49**	**0.51**	**0.48**	**0.52**	**0.44**	**0.56**

Just the same as with the elk management Draft EIS outcome, the equal role and power political influence average will be used to predict the Draft EIS bison management outcome. The equal role and power outcome (Table 35), now the Draft EIS alternative, falls in between management alternatives D and E (Table 27). The outcome associated with the Draft EIS (Table 35) more closely matches Alternative D for the disease and hunting management options, and more closely matches Alternative E for the Forage management options (Table 25). The preference difference is larger between the Draft EIS outcome and the disease and hunting management options for Alternative E than the distance between the Draft EIS outcome and the forage management options for Alternative D. The Draft EIS has a forage management option of 40% feed, 60% no feed. The forage management option for Alternative D is 60% feed, 40% no feed. Because both the Draft EIS and Alternative D forage options are close to a 50% feed and 50% no feed split, the most likely management strategy would be a sufficient feeding program for both the Draft EIS and Alternative D. With this sufficient feeding forage management

strategy, Alternative D will be used to represent the Draft EIS bison management alternative. Figure 27 shows the PPF_{Joint} curve placement for the political influence weighted elk management outcomes.

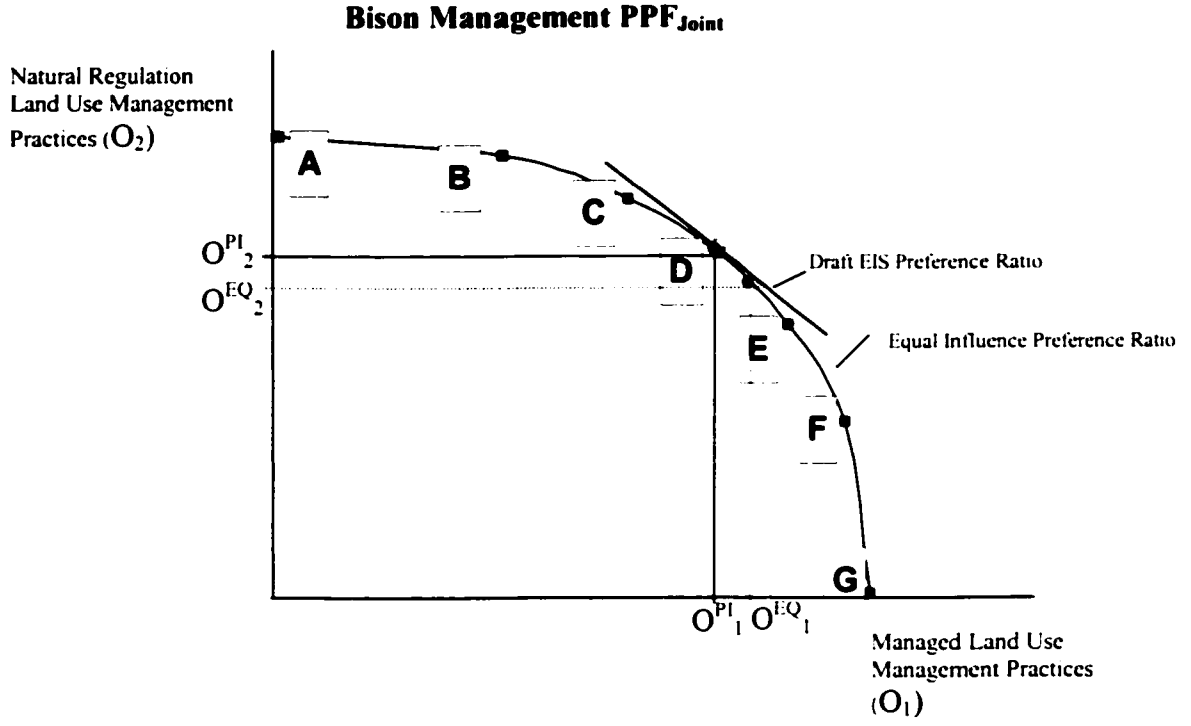


Figure 27. Preference Ratios for the Political Influence Weighted Bison Management Outcomes.

4.3.1 Stakeholder Rent Seeking

Political influence is not a fixed level by the political process; it can be expanded by expenditures of time and money to exert political pressure. As previously discussed, within the boundaries of the JBEMB PPF, each stakeholder will choose their level of rent seeking based on:

1) the distance between what they prefer (e.g. stakeholder A in Figure 5) and the draft EIS alternative allocation (e.g. average with political influence in Figure 5). This is the ***policy cost*** of not getting everything they wanted.

2) the importance (magnitude of preference) of policy issues. This is the ***policy benefit*** of getting their preferred allocation

3) the level of rent seeking of other stakeholder groups.

The amount of political pressure (rent seeking) from stakeholder group$_i$ will be a function of

$$p_{ij} = f(b_{ij}, d_{K^*_i, PI}, \sum_{l \neq i}^{L} d_{K^*_l, PI})$$

where

K^*_i = preferred alternative for stakeholder $_i$

b_{ij} = policy benefits (magnitude of preference) stakeholder $_i$ receives from management objective j

$d_{K^*_i, PI}$ = the utility distance (policy cost) between the allocation level of the Draft EIS policy allocation and stakeholder $_i$'s preferred policy allocation.
Where $d_{K^*_i, PI} = V_{K^*_i} - V_{PI}$

$\sum_{l \neq i}^{L} d_{K^*_l, PI}$ = pressure or rent seeking from other stakeholder groups.

For simplification, when determining the amount of rent seeking effort for stakeholder$_i$, the level of rent seeking of other stakeholder groups will be ignored. The results from the AHP management preferences survey can be used to create proxies for b_{ij} and $d_{K^*_i, PI}$. The importance weight each stakeholder gave to the overall management strategies categories of disease management, forage management, and hunting (Table 12) will be used to represent the magnitude of preference needed for b_{ij}.

For example, the preferred elk management strategies for APHIS are dispersal (78%), no feeding (95%), and hunting on both GT/NER (74%). The overall category importance weights for APHIS are 78% for disease, 18% for forage, and 4% for hunting. Even though APHIS has a strong preference for no feeding over sufficient and annual feeding, and hunting on both GT/NER over no hunting and hunting only the NER, the overall categories of forage management and hunting are not as important the APHIS as is the category of disease management. If the preferred elk management strategies of APHIS do not match the Draft EIS alternative, the overall category preference weights (b_{ij}) indicate that APHIS will be more

inclined to spend time and effort rent seeking on the disease management (78%) strategy, rather than the forage (18%) or hunting (4%) management strategies. Since APHIS manages disease, this conclusion shows that the AHP model worked well.

The actual point difference between stakeholder$_i$'s preferred management strategies preference weighting scores and the preference weighting scores of the Draft EIS preferred alternative will be used as a proxy to develop the policy cost ($d_{K \bullet i\_PI}$). Table 36 provides an example of how the policy cost is calculated. By multiplying the magnitude of policy benefit (b_{ij}) for each of the overall management categories by the policy cost ($d_{K \bullet i\_PI}$), of the management options within the management category, a rent seeking score (p_{ij}) can be calculated for each stakeholder.

Table 36. Calculating the Stakeholder Rent Seeking Score (p_{ij}).

		APHIS				WGFD				WWF			
Elk Management	Draft EIS preferred Alt. (D)	Preferred Alt	Policy Benefit (% Magnitude)	Policy Cost (# points)	Rent Seeking (Benefit*Cost)	Preferred Alt. (D)	Policy Benefit (% Magnitude)	Policy Cost (# points)	Rent Seeking (Benefit*Cost)	Preferred Alt	Policy Benefit (% Magnitude)	Policy Cost (# points)	Rent Seeking (Benefit*Cost)
DISEASE			**0.78**				**0.43**				**0.14**		
Dispersal	**0.84**	0.00		0.84	0.65	0.84		0.00	0.00	0.98		0.14	0.02
Vaccinate	**0.17**	0.50		0.33	0.26	0.17		0.00	0.00	0.01		0.16	0.02
Test & Slaughter	**0.01**	0.50		0.49	0.38	0.01		0.00	0.00	0.01		0.00	0.00
Disease Total				*1.66*	*1.29*			*0.00*	*0.00*			*0.30*	*0.04*
FORAGE			**0.18**				**0.43**				**0.58**		
Annual	**0.60**	0.10		0.50	0.09	0.60		0.00	0.00	0.13		0.47	0.27
No Feed	**0.40**	0.90		0.50	0.09	0.40		0.00	0.00	0.87		0.47	0.27
Forage Total				*1.00*	*0.18*			*0.00*	*0.00*			*0.94*	*0.55*
HUNTING			**0.04**				**0.14**				**0.28**		
Both GTNER	**0.44**	0.95		0.51	0.02	0.44		0.00	0.00	0.12		0.32	0.09
Only NER	**0.44**	0.04		0.40	0.02	0.44		0.00	0.00	0.87		0.43	0.12
No Hunting	**0.12**	0.00		0.12	0.00	0.12		0.00	0.00	0.01		0.11	0.03
Hunting Total				*1.04*	*0.04*			*0.00*	*0.00*			*0.86*	*0.24*
Total				**3.69**	**1.52**			**0.00**	**0.00**			**2.10**	**0.83**

Note: The policy cost score is the absolute value (Draft EIS Alt. – Stakeholder's Preferred Alt.)

For example, since Alternative D was selected as the draft EIS bison management alternative, the policy cost for APHIS can be determined by the point difference between Alternative D and APHIS's preferences for the bison management alternative (Table 13). The policy cost for the WGFD is zero because the WGFD preferred bison management alternative

(Alternative D) is the same as the draft EIS bison alternative. The policy cost for the WWF will be the point difference between Alternative D and WWF's preferences for the bison management alternative (Table 13).

For the Draft EIS Alternative (D), the APHIS policy cost and rent seeking scores are higher than WWF and the WGFD (Table 36). The WGFD policy cost and rent seeking scores equal zero because in this scenario, the draft EIS alternative is the same as the WGFD preferred alternative. APHIS has the highest policy benefit for disease management (78%) while WWF has a high policy benefit for forage management (58%) and hunting (28%). With a high policy benefit on disease management (78%), APHIS has a high rent seeking score because the draft EIS disease management option of 84% dispersal is substantially different than the APHIS preferred alternative of 50% vaccination and 50% test and slaughter. The draft EIS strategy for forage and hunting is not similar to the APHIS preferred alternative, however the low policy benefit APHIS placed on these categories results in low rent seeking scores for the forage and hunting management strategies (Table 36).

The policy costs and rent seeking scores for each stakeholder will vary depending on which alternative is selected as the Draft EIS. Each stakeholder's policy benefit weighting will always stay the same no matter which alternative is chosen as the Draft EIS. Table 37 shows the stakeholder rent seeking scores associated with each elk management alternative and the equal influence outcome.

Table 37. Associated Rent Seeking Scores for the Elk Management Alternatives.

	Level of Rent Seeking associated with each Alternative							
	A	B	C	D	**E (Draft EIS)**	F	G	Equal Influence
AHPIS	0.40	0.40	0.00	0.59	**0.47**	1.27	1.60	0.57
BLM	0.34	0.24	0.38	0.00	**0.57**	1.39	1.86	0.77
FWS	1.49	1.36	1.23	0.31	**0.00**	1.13	1.57	0.67
NPS	0.83	0.46	0.50	0.00	**0.61**	1.16	1.55	0.60
USFS	1.44	1.32	1.32	0.24	**0.24**	1.21	1.63	0.81
OFLP	1.74	1.65	1.23	1.39	**0.99**	0.00	1.35	0.83
WGFC	1.94	1.80	0.62	1.10	**0.46**	0.00	0.15	0.71
WGFD	1.68	1.56	0.60	0.83	**0.24**	0.44	0.62	0.52
TCC	1.64	0.92	0.82	0.14	**0.00**	0.88	1.14	0.50
TOJ	1.81	1.69	1.36	1.26	**0.84**	0.14	0.50	0.68
ITBC	0.58	0.62	0.02	1.41	**1.22**	1.36	1.42	1.11
SBC	1.37	1.13	0.05	0.84	**0.46**	0.48	0.73	0.39
JHCC	1.85	1.77	1.18	1.43	**0.93**	0.00	0.54	0.91
DCC	1.75	1.67	1.45	1.40	**1.04**	0.00	0.93	0.81
DOA	1.95	1.83	0.61	1.17	**0.54**	0.51	0.00	0.86
EFT	1.93	1.85	1.29	1.49	**1.03**	0.00	0.69	1.00
FNAWS	1.76	1.52	1.32	0.29	**0.00**	1.02	1.34	0.65
JHOA	1.88	1.76	0.91	1.22	**0.68**	0.00	0.40	0.77
WHA	1.91	1.88	1.29	1.53	**1.03**	0.00	0.55	1.02
RCH	1.90	1.77	1.02	1.18	**0.67**	0.14	0.31	0.71
WFB	1.83	1.72	1.30	1.36	**0.90**	0.11	0.46	0.78
BFC	0.55	0.28	0.84	1.26	**1.60**	1.67	1.84	1.20
FUND	0.00	0.27	0.43	1.71	**1.69**	1.74	1.89	1.31
DOW	0.44	0.33	0.29	1.01	**1.06**	1.34	1.77	0.78
GYC	0.40	0.00	0.45	0.49	**0.84**	1.42	1.87	0.77
JHCA	0.04	0.12	0.26	1.00	**1.19**	1.63	1.92	1.06
NRCC	0.96	0.84	0.72	0.31	**0.33**	1.30	1.65	0.59
SC	1.35	1.17	1.25	0.31	**0.34**	1.29	1.70	0.85
WOC	1.63	1.26	1.21	0.00	**0.54**	1.29	1.63	0.94
WWF	0.81	0.57	0.02	1.01	**0.93**	1.09	1.40	0.70
Total	38.19	33.74	23.96	26.26	21.45	24.04	34.98	23.90

The results from Table 37 indicate that the Draft EIS alternative has the lowest associated level of stakeholder rent seeking. This means that out of the seven possible management alternatives, the Draft EIS alternative will have the least amount of rent seeking and thus, is the best negotiated solution. Alternative C has the second lowest amount of associated stakeholder

rent seeking making it the second best outcome scenario. Alternative A would be the most highly contested outcome.

The Draft EIS elk outcome (K_{PI}) has less associated rent seeking than the equal influence elk outcome (K_{EQ}). This result is contrary to Buchanan's (1980) claim that it would not be rational for stakeholders to invest resources in rent seeking behavior if all stakeholders are granted an equal share of the economic rents (Figure 5). However, if K_{EQ} was an actual outcome, it would have the second lowest amount of associated stakeholder rent seeking. Table 38 shows the level of rent seeking for the management categories within the Draft EIS elk management alternative.

Of the 21.45 total rent seeking effort score for the Draft EIS elk alternative outcome, 11.95 (56%) of the rent seeking effort score will be spent on issues dealing with forage management (Table 38). The highest rent seeking stakeholder scores (Table 38) are for stakeholders that strongly preferred (had a high policy benefit score) for the no winter feeding management option (Table 12). Having Alternative E as the Draft EIS elk management outcome would have the lowest overall level of rent seeking (Table 37). However, for the management options comprising the Draft EIS, stakeholders will be spending time and effort rent seeking for a reduction in the winter feed program.

Table 38. Stakeholder Rent Seeking Effort Scores for the Draft EIS Alternative (Alt. E).

Level of Rent Seeking by Management Category				
	Disease Management	Forage Management	Hunting Management	Total Rent Seeking
AHPIS	0.14	0.32	0.01	**0.47**
BLM	0.46	0.04	0.07	**0.57**
FWS	0.00	0.00	0.00	**0.00**
NPS	0.26	0.03	0.32	**0.61**
USFS	0.11	0.09	0.05	**0.24**
OFLP	0.90	0.06	0.03	**0.99**
WGFC	0.07	0.23	0.16	**0.46**
WGFD	0.07	0.04	0.12	**0.24**
TCC	0.00	0.00	0.00	**0.00**
TOJ	0.06	0.74	0.04	**0.84**
ITBC	0.08	1.08	0.07	**1.22**
SBC	0.01	0.25	0.20	**0.46**
JHCC	0.38	0.48	0.07	**0.93**
DCC	0.48	0.55	0.01	**1.04**
DOA	0.31	0.07	0.16	**0.54**
EFT	0.52	0.42	0.09	**1.03**
FNAWS	0.00	0.00	0.00	**0.00**
JHOA	0.21	0.36	0.11	**0.68**
WHA	0.43	0.51	0.09	**1.03**
RCH	0.06	0.52	0.09	**0.67**
WFB	0.16	0.69	0.05	**0.90**
BFC	0.03	0.83	0.74	**1.60**
FUND	0.02	1.32	0.35	**1.69**
DOW	0.13	0.90	0.03	**1.06**
GYC	0.33	0.30	0.20	**0.84**
JHCA	0.27	0.85	0.08	**1.19**
NRCC	0.13	0.15	0.06	**0.33**
SC	0.13	0.07	0.14	**0.34**
WOC	0.08	0.26	0.21	**0.54**
WWF	0.08	0.78	0.07	**0.93**
Total	**5.90**	**11.95**	**3.60**	21.45

Table 39 shows the stakeholder rent seeking scores associated with each bison management alternative and the equal influence outcome. The results from Table 39 indicate that Alternative E has the lowest associated level of stakeholder rent seeking. Alternative C has the second lowest amount of associated stakeholder rent seeking and Alternative D, the Draft EIS Alternative has the third lowest level of associated rent seeking effort.

Table 39. Stakeholder Rent Seeking Scores for the Bison Management Alternatives.

	Level of Rent Seeking associated with each Alternative							
	A	B	C	**D (Draft EIS)**	E	F	G	Equal Influence Outcome
AHPIS	1.62	1.61	1.23	**1.51**	0.00	0.89	1.01	0.99
BLM	0.88	0.80	0.47	**0.37**	0.74	0.86	1.05	0.23
FWS	0.32	0.21	0.00	**0.69**	0.21	1.07	1.38	0.43
NPS	0.99	0.44	0.00	**0.42**	1.42	1.43	1.98	0.63
USFS	1.30	1.26	1.07	**0.45**	1.23	0.28	0.29	0.78
OFLP	1.83	1.76	1.32	**1.38**	0.00	0.25	1.30	0.88
WGFC	1.88	1.57	1.30	**0.82**	0.31	0.00	0.55	0.56
WGFD	1.95	1.65	1.28	**0.00**	1.25	0.69	1.16	0.71
TCC	1.57	1.24	1.01	**0.00**	0.46	0.24	0.57	0.32
TOJ	0.69	0.58	0.47	**0.22**	0.37	0.14	0.17	0.24
ITBC	0.62	0.60	0.67	**0.93**	0.35	1.11	1.29	0.70
SBC	1.53	1.35	1.22	**1.35**	0.41	1.40	1.90	0.91
JHCC	0.86	0.82	0.67	**0.64**	0.14	0.41	0.58	0.41
DCC	1.61	1.57	1.22	**0.87**	0.96	0.00	0.92	0.87
DOA	3.31	3.25	2.78	**2.30**	1.22	1.52	0.10	1.94
EFT	0.86	0.83	0.72	**0.76**	0.00	0.59	0.65	0.49
FNAWS	1.23	0.97	0.67	**0.00**	1.09	0.61	0.89	0.54
JHOA	1.31	1.09	0.89	**0.63**	0.00	0.22	0.43	0.39
WHA	0.91	0.90	0.77	**0.53**	0.22	0.20	0.28	0.42
RCH	1.30	1.10	0.92	**0.51**	0.37	0.00	0.36	0.43
WFB	1.97	1.95	1.57	**1.47**	0.76	0.00	1.37	1.19
BFC	0.57	0.32	0.58	**1.22**	0.98	1.93	2.35	1.05
FUND	0.00	0.34	0.57	**1.14**	0.73	1.71	2.04	0.92
DOW	0.21	0.17	0.30	**0.77**	0.47	1.34	1.68	0.60
GYC	0.25	0.00	0.38	**0.54**	1.23	1.53	1.84	0.79
JHCA	0.00	0.12	0.43	**0.71**	0.96	1.53	1.85	0.78
NRCC	0.43	0.34	0.00	**0.52**	0.71	1.23	1.68	0.47
SC	0.33	0.20	0.00	**0.84**	0.26	1.23	1.55	0.56
WOC	1.30	1.28	1.02	**0.49**	0.80	0.70	0.95	0.48
WWF	0.65	0.00	0.20	**0.84**	0.67	1.38	1.71	0.76
Total	32.27	28.32	23.72	22.88	18.32	24.48	33.89	20.43

Table 40 shows the level of rent seeking for the bison management categories within the Draft EIS alternative and Alternative E (the alternative with the lowest rent seeking effort). Of the 22.88 total rent seeking effort score for the Draft EIS alternative outcome 38% of the effort is spent on issues dealing with forage management, 35% of the effort is spent on issues dealing with disease management, and 28% of the effort is spent on issues dealing with hunting

management. Of the 18.31 total rent seeking effort score for the alternative E outcome 48% of the effort is spent on issues dealing with disease management.

Table 40. Stakeholder Rent Seeking Scores for the Draft EIS Alternative (Alt. D) and Alternative E.

Level of Rent Seeking for the Draft EIS Alternative (Alt D)					*Level of Rent Seeking for Alternative E*			
	Disease Management	Forage Management	Hunting Management	Total Rent Seeking	*Disease Management*	*Forage Management*	*Hunting Management*	*Total Rent Seeking*
AHPIS	1.28	0.18	0.04	**1.51**	*0.00*	*0.00*	*0.00*	***0.00***
BLM	0.30	0.06	0.01	**0.37**	*0.46*	*0.22*	*0.07*	***0.74***
FWS	0.01	0.64	0.05	**0.69**	*0.08*	*0.03*	*0.10*	***0.21***
NPS	0.12	0.07	0.23	**0.42**	*0.86*	*0.00*	*0.56*	***1.42***
USFS	0.02	0.41	0.02	**0.45**	*0.10*	*1.08*	*0.05*	***1.23***
OFLP	1.21	0.04	0.14	**1.38**	*0.00*	*0.00*	*0.00*	***0.00***
WGFC	0.29	0.02	0.51	**0.82**	*0.10*	*0.07*	*0.14*	***0.31***
WGFD	0.00	0.00	0.00	**0.00**	*0.57*	*0.52*	*0.16*	***1.25***
TCC	0.00	0.00	0.00	**0.00**	*0.07*	*0.15*	*0.23*	***0.46***
TOJ	0.07	0.08	0.07	**0.22**	*0.03*	*0.25*	*0.08*	***0.37***
ITBC	0.04	0.58	0.30	**0.93**	*0.23*	*0.05*	*0.06*	***0.35***
SBC	0.02	0.79	0.55	**1.35**	*0.22*	*0.07*	*0.12*	***0.41***
JHCC	0.13	0.18	0.33	**0.64**	*0.09*	*0.01*	*0.05*	***0.14***
DCC	0.57	0.25	0.05	**0.87**	*0.28*	*0.66*	*0.02*	***0.96***
DOA	1.42	0.10	0.78	**2.30**	*0.84*	*0.25*	*0.13*	***1.22***
EFT	0.13	0.28	0.34	**0.76**	*0.00*	*0.00*	*0.00*	***0.00***
FNAWS	0.00	0.00	0.00	**0.00**	*0.40*	*0.49*	*0.20*	***1.09***
JHOA	0.22	0.05	0.36	**0.63**	*0.00*	*0.00*	*0.00*	***0.00***
WHA	0.15	0.02	0.36	**0.53**	*0.08*	*0.06*	*0.08*	***0.22***
RCH	0.12	0.08	0.31	**0.51**	*0.06*	*0.23*	*0.08*	***0.37***
WFB	1.23	0.02	0.23	**1.47**	*0.65*	*0.07*	*0.04*	***0.76***
BFC	0.01	0.78	0.43	**1.22**	*0.07*	*0.07*	*0.84*	***0.98***
FUND	0.05	0.78	0.31	**1.14**	*0.31*	*0.07*	*0.35*	***0.73***
DOW	0.07	0.67	0.03	**0.77**	*0.41*	*0.03*	*0.03*	***0.47***
GYC	0.18	0.27	0.09	**0.54**	*1.01*	*0.01*	*0.21*	***1.23***
JHCA	0.14	0.47	0.09	**0.71**	*0.82*	*0.04*	*0.10*	***0.96***
NRCC	0.07	0.40	0.04	**0.52**	*0.59*	*0.02*	*0.10*	***0.71***
SC	0.02	0.73	0.09	**0.84**	*0.09*	*0.03*	*0.14*	***0.26***
WOC	0.03	0.16	0.30	**0.49**	*0.16*	*0.58*	*0.06*	***0.80***
WWF	0.04	0.55	0.24	**0.84**	*0.23*	*0.02*	*0.42*	***0.67***
Total	**7.94**	**8.65**	**6.29**	22.88	*8.81*	*5.09*	*4.41*	*18.32*
% of Total	35%	38%	28%		*48%*	*28%*	*24%*	

For the Draft EIS alternative, the highest rent seeking stakeholder scores (Table 40) are for stakeholders that strongly preferred (had a high policy benefit score) a higher level of vaccination and no winter feeding (Table 13). For Alternative E, the highest rent seeking stakeholder scores (Table 40) are for stakeholders that strongly preferred (had a high policy benefit score) more dispersal and less test and slaughter (Table 13). Neither the Draft EIS nor Alternative E gives the lowest possible amounts of rent seeking across all three categories. Combining the disease management (dispersal and vaccination) and the hunting management (both GT/NER and NER only) option of the Draft EIS with the forage management (no feeding) option of Alternative E would give a lower rent seeking score. The new rent seeking score would be 7.94 for disease management, 5.09 for forage management, and 4.41 for hunting management. This gives an overall rent seeking score of 17.44, which is lower than the scores associated with the Draft EIS, Alternative E, and the equal influence (K_{EQ}) outcome (Table 39).

Chapter 5: Conclusions

Natural resource management decisions are complicated by multiple property rights, multiple management objectives, and multiple stakeholders with varying degrees of influence over the decision making process. In order to make efficient decisions, managers must incorporate the opinions and values of the involved stakeholders as well as understand the complex institutional constraints and opportunities that influence the decision making process. Often this type of information is not understood until after the decision has been made and the first round of litigation has begun. This results in a considerable amount of wasted time and effort, often taking years until a final decision can be made and the management agencies can focus on managing the resource.

The purpose of this dissertation was to show how institutional frameworks and stakeholder involvement influence the various phases of the resource management decision-making process. Knowing stakeholders' preferences for management outcomes, what the institutional system looks like, and how stakeholders are likely to react to the different management options **before** the decision is made can assist and improve the decision makers' understanding of the decision process and lead to a collaborative decision that includes the preferences of all stakeholders. This significantly increases the overall efficiency of the natural resource decision-making process and reduces the risk of having the process sent into litigation.

A theoretical public choice model was developed to model the five Stages of a Natural Resource Management (NRM) decision-making process. The first stage is the determination of

property rights which was generalized into two different types of public choice actions: Type 1) there can be a fight between agencies and involved stakeholder groups for control of the process; or Type 2) there can be an interagency agreement and cooperative effort between the involved agencies. My dissertation focused on what happens during the Type 2 public choice action when an interagency agreement is formed in Stage One of the resource decision-making process. During the second stage, stakeholders select their preferred management alternative along the production possibilities frontier (PPF_{Joint}) established by the mandates, environmental regulations, and current budget allocations of the NRM agencies. During stage three of the NRM decision-making process, the NRM agencies select the Draft EIS alternative based on the average of the summed political influence weighted preferences of all stakeholders. In stage four, stakeholders not satisfied with the Draft EIS alternative can rent seek to try to force a more favorable outcome. In stage five, the final decision outcome is selected based on the draft EIS alternative and the rent seeking activities of all stakeholder groups.

The LIAM was used in conjunction with the AHP to apply the theoretical public choice model to the JBEMP decision-making process. There were three main steps involved in applying this framework:

1) Develop the Political Influence Score
2) Measure Stakeholder Preferences for Management Objectives
3) Selection of the Draft EIS Alternative (Step 1 +Step 2)

Political Influence

The LIAM computerized questionnaire provided the role and power levels needed to determine each stakeholder's level of influence. The LIAM AHP survey was used to determine which role and power attributes each stakeholder thought would be the most important in

determining the JBEMP outcome. The LIAM AHP survey resulted in stakeholder responses that were almost equally split between the importance of role and power in the JBEMP. Twelve organizations considered role to be more important, eleven organizations considered power to be more important, and seven organizations stated that role and power are equally important in determining the JBEMP outcome. Among the economic interests, all of the business and hunting & outfitting organizations considered role to be of equal or greater importance than power. All of the environmental interests except the SC considered power to be of equal or greater importance than role.

Because the final outcome is unknown and there was such a large variation of the importance of role and power among the stakeholder organizations, the LIAM Equal Role and Power Weighting (all role and power attributes and objectives are equally important) was used to build the political influence scores to predict the Draft EIS outcome. To show how sensitive the JBEMP outcome would be if role and power did not have equal influence, five (two role dominant and three power dominant) political influence weighting scores were also constructed. Combining each stakeholder's role and power level results from the LIAM computerized survey with each of the political influence weighting scenarios formed the stakeholder political influence score for each of the six different weighting scenarios.

Stakeholder Preferences for Management Objectives

Results from the AHP management preferences survey were used to determine each stakeholder's preference weights for the management objectives. While there are an unlimited number of possible preference combinations, there are a limited number of JBEMP management alternatives. Preference ratios were developed for each stakeholder's preference tradeoff between natural regulation and managed land use practices. Most stakeholders had preferences

that matched a management alternative. The stakeholders that did not match an alternative fell on the PPF_{Joint} in-between two of the available management alternatives. The preference ratios were used to determine the placement of each stakeholder on the PPF_{Joint} curve (stage two of the NRM planning process).

The Draft EIS Alternative

The results from the stakeholders' political influence scores and management preferences were combined to determine the Draft EIS outcome. For the elk and bison Draft EIS alternatives, the Equal Role and Power political influence outcomes fell in between alternatives D and E. The outcome associated with the elk Draft EIS alternative more closely matched Alternative E. Alternative E was also the best outcome for minimizing the likelihood of stakeholder rent seeking activities. The outcome associated with the bison Draft EIS alternative, more closely mated Alternative D for the disease and hunting management options and more closely matched Alternative E for the forage management options. Alternative D was chosen to represent the Draft EIS alternative for Bison because the preference was larger between the bison Draft EIS outcome and the disease and hunting management options for Alternative E than the distance between the Draft EIS outcome and the forage management options for Alternative D. However, neither the Draft EIS nor Alternative E gave the lowest possible amounts of rent seeking across all three management categories. Combining the disease management (dispersal and vaccination) and the hunting management (both GT/NER and NER only) option of the Draft EIS with the forage management (no feeding) option of Alternative E would produce the best outcome for minimizing the likelihood of stakeholder rent seeking activities.

Results show that for a collaborative JBEMP decision-making process, there will be a negotiated solution with the outcome landing somewhere in the middle. Because the outcome looks the same under most of the political influence weightings, no one or group of stakeholders has enough power or role characteristics to drastically change the outcome. In order to alter the outcome, a stakeholder would have to have an exceptionally high level of influence or would have to go outside the Public Choice Type 2 Action and fight (sue) to get the property rights changed (Type 1 Public Choice Action).

5.1 Suggestions for Future Research

Using the Computerized LIAM Survey in One-on-One Interviews

Typically the LIAM is used in workshop setting where participants are given a half-day introduction and explanation of the LIAM. Participants then work in groups of three to analyze the organizational behavior of other organizations involved in the natural resource decision process. The LIAM model contains a library of questions associated with each attribute for all roles and power types. The software randomly selects one question for each attribute to construct a unique questionnaire for each respondent. Having a unique questionnaire works very well in the workshop setting where participants are completing the LIAM survey multiple times in a row and have a good understanding of the LIAM. Because participants work in groups, they can discuss the meaning of a question if one or more participant doesn't understand how to answer the question.

For my survey, stakeholders were only given a brief (approximately ten minutes) explanation of the LIAM and had to complete the survey on their own instead of in a group. Most stakeholders stated that the questionnaire was easy to understand. I was often asked to

explain questions stakeholders were uncertain of the meaning or how to relate what the question was asking to the specifics of the JBEMP process. Most stakeholders discussed the rationale of their answers as they filled out the survey. It seemed as if some of the questions were being misinterpreted more than others. For example, the LIAM asks one of the following three questions to determine an organization's level of experience in collecting and distributing data:

1) This organization is actively involved in the collection and distribution of information concerning actions of this type.

2) This organization will provide scientific and/or technical information regarding this issue to decision makers involved.

3) This organization isn't dependent on other agencies/groups for data on this issue.

Many of the respondents that were asked the third version of the question misinterpreted the question to be asking if data from their organization was the only data needed for the JBEMP process. To avoid the question misinterpretation problem with one-on-one interviews in future studies each stakeholder should be asked the same set of questions. The questions should be tailored to fit the situation as much as possible without changing the meaning of what the question is supposed to be asking. Considering that the introduction and explanation of the LIAM was so brief, I feel that overall this part went very well.

Because stakeholders filled out the LIAM as a self-assessment, it was possible for stakeholders to overstate their actual role and power attribute levels. Future research could be done to cross reference each stakeholder's self-perception of their organizational role and power with the organization's mission statement, media accounts of activities related to the JBEMP, and other written material such as written comments submitted to the EIS planning team.

The LIAM AHP Survey

Results of the LIAM AHP weighting survey identify the role and power types each stakeholder organization considered to be the most influential in the JBEMP process. This information was used for comparisons between the original LIAM equal weighting results and the new individual influence weightings, the aggregation of similar organizations, and the aggregation of all organizations. Future research could include repeating the survey with the same stakeholders after the Draft EIS is published to see if stakeholder perceptions of role and power influence change. This survey could also be used for other types of natural resource decisions to look at the consistency of the perception of role and power across different resource decision making processes.

AHP Management Preferences Survey

Because management alternatives will not be developed by the Interagency planning team until 2002, the management preferences survey had to compare preferences between individual management strategies instead of preferences between management alternatives. Because each alternative contains a fixed set of management strategies, each stakeholder will have to choose their preferred alternative based on which alternative best matches their preferred strategies. Future research should include repeating the survey with the same stakeholders after the Draft EIS is published to see how close each stakeholder's preferences for individual management strategies match his or her preferences for the strategies that form the management alternatives.

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APPENDIX A: LIAM ROLE AND POWER MEASURE QUESTIONS:

Role Analysis Questions

General Questions

Listed below are categories of organizations usually involved in this kind of issue. In the space provided, please type the number that best describes the organization you are analyzing? Enter a 0 if no category fits.

Please list below the names or acronyms of the other important organizations involved in this issue:

List below those organizations or groups that are likely to support the organization you are presently assessing (You must answer this question for the software to work properly):

The first step is to define the problem in your own words, from the perspective of the organization that you are evaluating. What major issues are involved, according to this organization?

What immediate goals would this organization like to achieving this instance (both officially and unofficially)?

What long-term goals would your organization like to see achieved in this and similar instances (both officially and unofficially)?

Broker Role

-Preference for negotiation

1) Does this organization typically try first to negotiate disputes with other parties in actions similar to this one?*

2) Does this organization attempt to build a consensus in solving problems that arise in actions similar to this?

3) This organization will promote a negotiated solution in this conflict:

-Attention to political considerations

4) In decision-making similar to this, does this organization prefer to include political considerations?

5) In actions like this one, does this organization tend more to seek backing from politicians than from participating groups?*

6) In this particular action, this organization will solicit political support.

-Distribution of benefits

7) This organization tries to find enough benefits in a project or policy to satisfy the needs of cooperating participants.

8) Does this organization tend to offer a share of the ultimate benefits to each of the organizations involved in negotiated actions of this type?*

9) This organization will attempt to meet the needs of the various participants who join in a negotiated solution to this action.

Arbitrator Role

-Preference for formal processes

10) In actions like this one, does this organization prefer formal, structured decision processes?

11) This organization would prefer to participate in formal hearings, in actions such as this one, rather than in less-structured negotiations.*

12) This organization would welcome a court-like decision handed down for this particular dispute.

-Preference for objective supporting, technical information

13) This organization prefers the support of an objective, scientific community in this particular action, rather than relying on political backing.

14) This organization prefers to use only technical, scientific, and "objective" considerations in making decisions in issues such as this.

15) This organization considers technical/scientific information more legitimate than political information for making decisions in actions such as this.*

-Preference for parties to demonstrate a need

16) This organization tries to direct the benefits of a project toward those participants with the most clearly demonstrated needs.*

17) In this action, this organization will attempt to sort out those participants who have legitimate needs from those who do not.

18) Does this organization tend to exclude those parties with the least legitimate need from having a share of the ultimate benefits in this kind of dispute?

Advocate Role

-Preference for change in traditional behaviors

19) Does this organization urge change from "traditional" land, wildlife, or water resource management practices in actions such as this?*

20) Does this organization attempt to modify the plans of project builders or policy proponents in actions such as this?

21) This organization will attempt to shift the focus, in this particular action, away from economic development concerns.

-Preference for preservation of natural resources

22) Does this organization promote the preservation of land, wildlife, or water in projects such as this?*

23) This organization will be seen by others as "protectionist" of land, wildlife, or water resources in this particular action:

24) This organization typically promotes noncommercial uses of land, wildlife, or water resources in actions such as this.

-Usually reacts to proposals by others

25) Does this organization typically react to projects or policies planned by others, rather than initiating their own actions?*

26) Does this organization frequently offer critical comments or intervene in actions such as this?

27) This organization would likely be contacted by decision-makers to fulfill requirements for environmental consultation in this particular action.

-Emphasizes value of nature

28) This organization typically emphasizes the importance of natural systems in actions such as this.

29) This organization will argue in terms of ecological values in this particular action.*

30) This organization generally urges the preservation of the "natural environment" in actions such as this.

Guardian Role

-Preference for economic approach

31) This organization prefers an economic approach, such as benefit/cost analysis, in decision-making actions of this type.*

32) Does this organization typically focus on the importance of the economy in actions such as this?

33) This organization will speak in terms of the need for economic progress in this action.

-Preference for private ownership and traditional decision-making

34) In the past, has this organization generally defended private ownership or pro-development values in similar actions?*

35) This organization expects all the players in this action to believe in traditional patterns of resource use.

36) Typically, this organization sees conventional water, wildlife, or land use goals as right.

-Prefers market for model of decision-making

37) This organization tends to believe people should win in "people versus critters" conflicts such as this.

38) This organization will argue in terms of economic progress in this action:*

39) In actions such as this one, this organization urges primary consideration of market values.

-Directs the use of resources, manages land, or has physical control
40) Does this organization typically direct the use of this type of resource?

41) This organization manages the particular kinds of land, wildlife, or water resources at issue in this dispute.*

42) This organization typically has PHYSICAL control of land, wildlife, or water resources in similar actions.

Power Measure Questions

Resource Questions
-Physical control of the resources
40) Does this organization typically direct the use of this type of resource?

41) This organization manages the particular kinds of land, wildlife, or water resources at issue in this dispute.

42) This organization typically has PHYSICAL control of land, wildlife, or water resources in similar actions.

-Statutory control of the resources
43) This organization has statutory control to the following degree:

44) This organization has statutory control to the following degree:

45) This organization has statutory control to the following degree:

-Support from general public
46) This organization and its goals have a high level of general public support.*

47) On this issue, this organization closely reflects popular opinion, as you understand it.

48) In this particular action, the values of this organization have a high degree of public backing.

-Personal resources
49) How many personnel has this organization assigned to this particular project?

50) What size of personnel team has this organization assigned to this action?

51) How many personnel does this organization typically assign to actions of this type?*

-Monetary resources
52) This organization has the following monetary resources available to it for this project:

53) This organization typically has financial backing available to the following degree:*

54) This organization generally has a high level of fiscal resources available to it.

-Active in these types of issues

55) This organization is generally associated with this type issue.

56) This organization is likely to become actively involved in this action.

57) This organization is usually quite active in this type of issue.*

-Central to mission

58) To what degree is this issue central to the goals of this organization?

59) Actions of this type are typically central to the mission of this organization.

60) The issues raised in this type of action are extremely important to this organization.*

Information Power

-Technical information I easily understood

Please answer the next question in terms of the level of government you think will have the greatest real influence on this action.

61) How closely does this organization reflect the current policy objectives of the most influential level of government in this issue? (A list of government levels is shown below)

62) The goals of this organization reflect the current policy objectives of the level of government most likely to control the outcome of this action (To answer this question, please refer to the Levels of government listed below. Answer the question after you decide which level of government is most likely to control).

63) The values of the organization being assessed are quite similar to those of the level of government most closely concerned with this issue. (See levels of government below)*

64) The information provided by this organization in actions of this type is easily understood by decision makers.

65) This organization typically generates data that are clear and precise in actions of this type.*

66) This organization will provide explicit data to decision makers or participants in this action.

-Experienced in collecting and distributing data

67) This organization is actively involved in the collection and distribution of information concerning actions of this type.*

68) This organization will provide scientific and/or technical information regarding this issue to decision makers involved.

69) This organization isn't dependent on other agencies/groups for data on this issue.

-Has technical knowledge
70) This organization has available to it a highly technical body of knowledge regarding this action.*

71) This organization has a well-developed analytical and data-collecting system at its disposal.

72) This organization uses technical and/or scientific data in decision-making actions such as this.

-Expertise is recognized
73) This organization is highly respected for the quality of information it generates in actions of this type.*

74) This organization is generally considered an expert information gatherer and disseminator in actions of this type.

75) Does this organization have a high level of expertise in its own field?

Support Power or Constituency Support
-Cohesiveness
76) To what degree do the groups listed below tend to work together in issues such as this?*

77) How cohesive are the groups listed below in pursuing goals on issues such as this?

78) How much do you expect the groups listed below to stick together in this particular issue?

-Large membership
79) How large is the total combined membership of the groups that support the organization you are analyzing?*

80) Added together, these supporting groups represent a very large number of people.

81) How large a membership do these supporting groups have, collectively?

-Intense interest in the issue
82) What portion of these support groups' members would you expect to get involved in this issue?*

83) Support organizations tend to become intensively involved in actions such as this.

84) Of the active members of these support groups, how many would you anticipate will become involved in this action?

-A record of activity in the issue
85) How often do these groups become active in issues such as this?*

86) When issues such as this one arise, you can expect these support groups to get actively involved.

87) These support groups almost always take part in issues such as this one.

-A record of being well coordinated
88) To what degree are support groups well organized concerning issues such as this?*

89) The organizations listed below will be well coordinated in this particular action.

90) Generally, the membership of each support group tends to be well coordinated in issues such as this.

-The support of the general public
91) How much general public support will these groups be likely to generate for their position in this action?*

92) These support groups are likely to generate strong public support for their position in this action.

93) Support groups reflect the opinion of the general public regarding this issue.

-Experience in politics
94) To what degree do these support groups have political expertise?

95) How well have these support groups used political tactics in disputes such as this one?

96) These support groups generally have good political skill regarding issues such as this one.

-Prestige and respect
97) To what degree are these support groups considered prestigious?

98) The memberships of these support groups are typically composed of individuals who are highly respected.*

99) These support groups will command a high degree of respect in this action.

-A record of awareness of the issue
100) To what degree are these groups aware of this particular issue?

101) Typically, these support groups quickly become aware of these types of issues soon after they arise.

102) These support groups tend to keep up with issues of this type.*

APPENDIX B: LIAM SUBQUADRANT DESCRIPTIONS

QUADRANT ROLE TYPE

A: MODERATE ADVOCATE-BROKER:

Is protective of environmental and noneconomic values, and will join forces with others to resist proposals 'or projects that threaten those values. Will cooperate in efforts to change the ways in which resources have been used and managed in the past, and will contribute to crusading efforts initiated by others on behalf of the environment. Will use scientific and technical data to support its position. Prefers a negotiated outcome in which decisions are a result of bargaining among players. Thus, it will not resist efforts to keep or push the conflict into the distributive arena. Will be somewhat open to compromise.

B: MODERATE BROKER-ADVOCATE:

Will cooperate in efforts to keep or push the decision into the distributive arena, where the outcome is a negotiated or brokered one. Will not resist efforts to change the traditional ways in which resources have been used and managed in the past, but will prefer to build a political coalition to bring about such changes and to protect environmental and nontraditional values. Thus, will use technical and scientific data in combination with political and economic information to support its position. Will avoid taking absolute positions in bargaining situations and will readily compromise.

C: MODERATE BROKER-GUARDIAN:

Will cooperate in efforts to keep or push the decision into the distributive arena, where the outcome is a negotiated or brokered one. Will not resist efforts to prevent change in the traditional use and management of resources, but will prefer to build a political coalition to stop such changes and to protect economic and developmental values. Thus, will use economic, political, and constituency information to support its position. Will avoid taking absolute positions in bargaining situations and will readily compromise.

D: MODERATE GUARDIAN-BROKER

Will cooperate in efforts to prevent change in the traditional use and management of resources, but prefers to join a political coalition to resist change and protect its own economic and constituency interests. Thus will use economic analysis (such as cost

benefit) and constituency information to support its position. Will not resist efforts to keep or push the conflict into the distributive arena, where the outcome is a negotiated or brokered one. Will avoid taking positional stands in bargaining situations and is somewhat open to compromise.

E: MODERATE GUARDIAN-ARBITRATOR:

Will cooperate in efforts to prevent change in the traditional use and management of resources, and will contribute to campaigns seeking to protect economic and constituency values. Prefers, however, to operate in the regulatory arena, where decisions are objectively made by an arbitrating organization based on evidence presented by all sides to the dispute. Thus, prefers and will use scientific and technical data to support its position. Will tend to be somewhat demanding in bargaining situations and not very open to compromise.

F: MODERATE ARBITRATOR-GUARDIAN:

Will cooperate in efforts to keep or push the conflict into the regulatory arena, where decisions are objectively made by an arbitrating organization based on evidence presented by all sides to the dispute. Prefers and will use economic information (such as cost-benefit analyses) to support its position. Will not resist efforts to prevent change in the traditional use and management of resources, and will not resist campaigns initiated by others on bahalf of economic and constituency values. Will take positional stands in bargaining situations, however, and will not be very open to compromise.

G: MODERATE ARBITRATOR-ADVOCATE:

Will cooperate in efforts to keep or push the decision into the regulatory arena, where decisions are made by an arbitrating organization based on evidence presented by all sides to the dispute. Prefers and will use technical and scientific data to support its position. Will not resist efforts to initiate changes in the ways in which resources have been used and managed in the past, and will not resist campaigns to protect environmental values. Will tend to be somewhat demanding in bargaining situations and not be very open to compromise.

H: MODERATE ADVOCATE-ARBITRATOR:

Will cooperate in efforts to protect environmental and nontraditional values, and will contribute to campaigns to protect such values and to initiate changes in the ways in which resources have been traditionally used and managed in the past. Will not resist efforts to keep or push the conflict into the regulatory arena, where decisions are made by an arbitrating organization authorized to make the decision based on evidence presented by all sides to the dispute. Prefers and will use scientific and technical data to document its position. Will be somewhat demanding in bargaining situations and will not be very open to compromise.

I: EXTREME ADVOCATE-BROKER

Will frequently speak out—in the media, at public meetings and the like—on behalf of environmental values, and will strongly push for changes in the traditional ways in which resources have been managed and used in the past. Will employ crusading techniques to protect the environment from the crises it feels are approaching, and will actively solicit support from other groups in these values, however, will argue for compromise, and willingly participate in negotiation. Will cooperate in efforts to keep or push the conflict into the distributive arena, where decisions are the result of bargaining. Is likely to have a close
relationship with the potential broker in a conflict. Exhibits a strong belief in the correctness of its worldview. Is apt to utilize political and economic information and to take absolute positions in bargaining situations.

J: EXTREME BROKER-ADVOCATE:

Will actively seek support for a negotiated solution, which is the result of bargaining and compromise, and will lead attempts to keep or push the conflict into the distributive arena. Is likely to be in the position to actually broker the decision itself, because it tends to have physical or legal control over the resources in question. Will solicit support from the general public and controlling politicians for its position, and will actively seek to build a political coalition on behalf of environmental values and to initiate changes in the ways in which resources have been traditionally used and managed. Jealous of its brokering role, this
organization will attempt to integrate the parties and positions in bargaining situations. Will be keenly interested in all types of information in a dispute, but will prefer information that demonstrate the benefits to be derived for all parties from changes proposed by advocates or recommendations that protect the environment. Will avod taking positional stands and will be open to compromise, at least where some means for resource protection or regulation is included in the outcome.

K: EXTREME BROKER-GUARDIAN:

Will actively seek support for a negotiated solution, which is the result of bargaining and compromise, and will lead attempts to keep or push the conflict into the distributive arena. Is likely to be in the position to broker the decision itself, because it will tend to have physical or legal control over the resources in question. Will solicit public, political, and constituency support for its position, and will actively seek to build a political coalition to resist changes in the ways in which resources have been traditionally used and managed in the past, and to protect its own economic interests and those of its substantial constituency. Will be jealous of its broken' ng role and thus will attempt to integrate the parties and positions in bargaining situations. Will be interested in all types of information in a dispute, but prefers information that is of an economic or political nature. Will avoid taking absolute positions and will actively promote compromise in bargaining situations.

L: EXTREME GUARDIAN-BROKER:

Will actively promote its own economic interests and the interests of its substantial constituency, which it is obligated to protect. Thus, it will strongly resist proposed changes in the ways in which resources have been used and managed in the past, especially when these changes threaten those interests. Strongly believes in a world view that promotes "economic progress" over "environmental values" and wi.ll actively crusade to have those values protected in the decision outcome. Will seek to put together a political coalition on behalf of those values and cooperate in efforts to keep or push the conflict into the distributive arena. Is likely to have a close relationship with the potential broker, and will use economic and political data to influence the outcome. Will take absolute positions in bargaining situations, but will be willing to compromise, at least where some of its economic interests and those of its constituency are protected.

M: EXTREME GUARDIAN-ARBITRATOR:

Will actively promote its own economic interests and that of its substantial constituency, which it feels obligated to protect. Thus, will strongly resist changes that threaten those interests'. Strongly believes in a worldview that promotes "economic progress" over "environmental values" and will use economic and constituency information to support its position. Will actively crusade on behalf of its worldview. Will cooperate in efforts to keep or push the conflict into the regulatory arena, however, where decisions are made by an arbitrating organization based on evidence presented by all sides to the dispute. Will take absolute positions in bargaining situations and not be open to compromise.

N: EXTREME ARBITRATOR-GUARDIAN:

Will actively seek support to keep or push the conflict into the regulatory arena, where the decision is made by an arbitrating organization based on evidence presented by all sides to the dispute. Is likely to be in a position to arbitrate the decision itself. Will thus solicit information from all sides of the dispute, and will be more interested in technical and scientific information than political facts, especially when these data support its own economic interests and those of its constituency. Will resist attempted changes in the traditional ways in which resources have been used and managed in the past, and will not obstruct crusading campaigns that promote "economic progress" over "environmental protection." Will take strong positional stands in bargaining situations and not be open to compromise. May threaten litigation or actually "try" the case.

0: EXTREME ARBITRATOR-ADVOCATE:

Will actively seek support to keep or push the conflict into the regulatory arena, where the decision is made by an arbitrating organization based on evidence presented by all sides to the dispute. Is likely to be in a position to arbitrate the decision itself. Will thus solicit information from all sides of the dispute, and will be more interested in technical and scientific information than political facts, especially when these data support environmental protection efforts. Will attempt to change the traditional ways in which resources have been used and managed in the past, and cooperate in crusading campaigns

promote "environmental protection" over "economic progress." Will take strong positional stands in bargaining situations and not be open to compromise. May threaten litigation or actually "try" the case.

P: EXTREME ADVOCATE-ARBITRATOR:

Will frequently speak out—in the media, at public meetings and the like—on behalf of environmental values and will lead efforts to change the traditional ways in which resources have been used and managed in the past. Will employ crusading techniques to protect the environment from the crises it feels are approaching, and generate and use scientific and technical data to support its position. Strongly believes in the correctness of its environmentally protective world view, and will join efforts to keep or push the conflict into the regulatory arena, where the decision is made by an arbitrating organization based on evidence presented by all sides to the dispute. Will take absolute positions in bargaining situations and not be open to compromise.

Appendix C: Description of the AHP. Source: Page et al. 1999.

DESCRIPTION OF THE ANALYTIC HIERARCHY PROCESS (AHP)

The Analytic Hierarchy Process is a formal and scientific decision method that aids the formulation and analysis of complex decision problems by breaking the decision problem down into separate interrelated parts, which when aggregated form an analytic and rational conclusion. Used as a decision tool by analysts, AHP evaluates takeoffs between multiple objectives, and determines a set of compromised solutions for a decision problem (Saaty, 1994). To better understand AHP, it is necessary to explain its three defining concepts (Harker):

Analytic - This decision model uses mathematics and logic to reason a choice, which also provides its scientific basis.

Hierarchy - The structure of a decision problem is formulated as a hierarchy that breaks a problem down into smaller, more manageable segments. These segments describe the components influencing a decision in more detail. The segments, or levels, of the hierarchy consist of elements that are either goals, objectives, criteria, sub-criteria or alternatives (Saaty and Alexander). The hierarchy also incorporates weights and preference values, which are assigned to each element at each level by the decision maker. The elements and weights in the hierarchy are used to allocate resources or determine a most desired activity (Saaty, 1977).

Process - The process relates to the time it takes the decision maker(s) to gather information, negotiate with other interested parties, and think about the complete problem. AHP is an iterative process of learning, debating and revising priorities. Its particular construction and evaluation are intended to be an aid in making the decision process more effective by focusing attention on the relevant parameters determined by the decision maker(s) in the hierarchy structure.

The AHP aims at achieving several objectives. As described by Harker (1988), AHP approaches a decision problem with the intent to assist a decision maker in,

1. better understanding a problem and its many interrelating parts,
2. determining where more information is needed to make a completely informed decision,
3. determining prominent areas of disagreement or conflict, and
4. giving a decision maker scientific evidence to communicate to others their rationality in choosing a particular action or alternative.

Satisfaction of these objectives should be considered necessary actions to obtain before deciding upon a solution to any given problem. Satisfying the fourth objective is of particular importance for managers or policy makers who are often asked to justify the rationale of their actions to the public.

The AHP is based on four axioms, or theoretical assumptions. The four axioms are as follows (Harker):

Axiom 1: *(Reciprocal Axiom)* An individual is asked to make a series of pairwise comparisons

between two alternatives or criteria, A and B. The purpose of paired comparisons is to assist in eliciting an individual's relative preference for one attribute over another. AHP assumes that preferences are not consistent or transitive. Therefore, it uses reciprocal preference values between paired comparisons to decrease the amount of inconsistency in a series of judgements. For example, if an individual prefers criteria A 'x' times as much as criteria B, then the reciprocal property should also be true that criteria B is 1 / 'x' as much preferred as criteria A. This is the case for all criteria and attributes that are compared. Mathematically this is represented as:

$$a_{ij} = 1/a_{ji}$$

where a is the value assigned and i and j are the elements being compared.

Axiom 2: *(Homogeneity Axiom)* It is too difficult for the mind to compare widely different attributes (RW Saaty). Therefore, the attributes at each hierarchic level in the decision model should be grouped into common clusters to decrease the chance that one attribute is considered to be infinitely better than another. If an alternative is infinitely preferred to another, than there is no need for a multiple objective decision tool. To make a comparison more meaningful and less abstract, bounds are placed on the judgment scale used to evaluate the attributes that influence a decision.

Axiom 3: *(Hierarchy Dependence Axiom)* A decision problem can be formed as a hierarchy, which breaks a problem down into interrelated levels. Preferences can be determined for each element defining each decision level using this hierarchical structure.

Axiom 4: *(Expectations Axiom)* All the criteria and alternatives influencing a decision must be included in the hierarchy. Even expectations that may seem irrational should be included. This axiom does not assume rationality on the part of the decision maker.

Axioms 1 and 2 are necessary for setting up a decision problem and eliciting judgments from a decision maker. AHP recognizes that in reality, people are not consistent in their judgements. Therefore, AHP does not require judgements to have ordinal consistency, which means judgements need not be transitive. The purpose of axioms 1 and 2, therefore, help to maintain better consistency in an individual's set of qualitative responses (Saaty, 1977). Axioms 3 and 4 are important for describing the task of formulating and solving a decision problem.

PAIRWISE COMPARISONS: THE POSITIVE RECIPROCAL MATRIX

The decision maker assign a preference value of 1 to 9 to the dominant attribute in the pairwise comparison. This value is incorporated into a positive reciprocal matrix. A positive reciprocal matrix is composed of the relative preference values assigned to the dominant attribute, (1,2,3,4,5,6,7,8,9), and their reciprocal values (1/1,1/2,1/3,1/4,1/5,1/6,1/7,1/8,1/9). A reciprocal matrix is technically represented as:

$$\begin{bmatrix} & [j=1 & j=2 & \ldots. & j=n] \\ [i=1] & a_{1,1} & a_{1,2} & \ldots. & a_{1,n} \\ [i=2] & a_{2,1} & a_{2,1} & \ldots. & a_{2,n} \\ . & . & & & \\ . & . & \ldots. & \ldots. & \ldots. \\ . & . & & & \\ [i=n] & a_{n,1} & a_{n,2} & \ldots. & a_{n,n} \end{bmatrix}$$

where a is the relative preference value of a paired comparison. The importance of the i^{th} row attribute is compared to that of the j^{th} column attribute, returning the value a_{ij}. If the i^{th} attribute is considered to be more important than the j^{th} attribute then a_{ij} will be a value from 1 to 9. If, on the other hand, the i^{th} attribute is less important than the j^{th} attribute, a_{ij} will be a reciprocal value of 1/9 to 1. Once the value of a_{ij} is determined, the reciprocal value $1/a_{ij}$ can be placed at the opposite position in the matrix.

Following the National Park example developed in the report, pairwise comparisons need to be made for the second level objectives, ***Activities***, ***Tourisits***, ***Species***, and ***Community***, with respect to their importance toward achieveing the goal of selecting a National Park to perform an enivornmental assessment. A reciprocal positive matrix is set up with each objective listed on the top of the matrix as well as along the left side of the matrix. The title of the matrix, in this example the goal, indicates the factor upon which the objectives are being compared. From the preferences of the decision maker revealed through the series of pairwise comparisons, a positive reciprocal matrix is completed as follows:

Positive Reciprocal Matrix Comparing Objectives

Selecting a National Park	Activities	Tourists	Species	Community
Activities	1	1/6	1/8	1/2
Tourists	6	1	1/4	6
Species	8	4	1	8
Community	2	1/6	1/8	1

When analyzing the pairwise comparisons in the reciprocal matrix, the row attribute is always assumed to be the dominant attribute in the comparison. Therefore, to read the matrix one would assess that the row attribute is more dominant than the column attribute if the value in the corresponding cell is a number between 1 and 9, or a value greater than 1. If the number is a reciprocal number between 1/2 and 1/9, or is a value that is less than 1, then one would assess the row attribute to be less dominant than the corresponding column attribute. Therefore, in the example matrix above, the decision maker determined the relative importance of the first row (i=1) attribute, ***Activites***, to the fourth column (j=4) attribute, ***Community***, to be slightly less than equally important to the decision of which National Park to assess, which is represented in the value 1/2. On the other hand, when comparing the second row attribute, ***Tourists***, to the fourth column attribute, ***Community***, the decision maker determined the relative importance of ***Toursist*** as slightly less than strongly important to the decision, which is represented in the value 6. Following the reciprocal rule (Axiom 1), the importance of ***Community***, row 4, when compared to ***Activities***, column 1, is the reciprocal value 2, which is depicted in the opposite bottom left corner of the matrix. Similarly, the importance of ***Community***, row 4, when compared to ***Tourists***, column 2, is the reciprocal value 1/6, which is depcited in the opposite position in the matrix. The reciprocal process is followed for each pairwise comparison to decrease the chance of inconsistent judgements. Therefore, only n(n-1)/2 pairwise comparisons are necessary to complete a reciprocal matrix, where n is the total number of attributes to be compared under a goal or objective. In this example n = 4, thereby requiring six comparisons (in bold and boxed text) to complete the matrix above. The comparisons for this matrix are as follows:

Activities	vs.	Tourists
Activities	vs.	Species
Activities	vs.	Community
Tourists	vs.	Species
Tourists	vs.	Community
Species	vs.	Community

Interpretting the Matrix

Remembering the row attribute, i, is initially assumed to be the dominant attribute in the comparison, the first set of paired comparisons will utilize the first row's relative importance of ***Activities*** to ***Tourists***, ***Species***, and ***Community***. The reciprocal matrix reveals that ***Activities*** is relatively strongly less important as ***Tourists*** when determining the a National Park to assess, which is depicted in the numberic value 6. Continuing across row 1, the matrix reveals that ***Activities*** is demonstratedly less important than ***Species*** by a magnitude of 1/8 and only slightly less than equally important to ***Community*** by a magnitude of 1/2. The reciprocal values to the ***Activities*** comparisons are represented in column 1. This column shows that ***Tourists*** is strongly more important than ***Activites***, ***Species*** is demonstratedly more important than ***Activites***, and ***Community*** is near equally as important as ***Activites***. After the first row of comparisons are complete, the second row items are compared. However, only the items not yet compared in a pairwise comparison should be evaluated. Therefore, only the relative importance of ***Tourists*** to ***Species*** and ***Community*** are compared, since the relative importance of ***Tourists*** to ***Activites*** was evaluated in the row above. The relative dominance and magnitudes are evaluated for the items of each row using the 1-9 scale and reciprocal values are used to fill out the rest of

the matrix. The diagonal of the matrix represents the paired comparison of an attribute with itself. This is equal to 1 since the relative importance of something to itself is equal.

As a side note, notice each element is assigned a positive value. If a decision maker considers an element to have a value of zero or less it should be removed from his (her) decision hierarchy before calculations are made. If one element is infinitely more important than the others, such as the case when a decision maker always wants to buy the least expensive car, AHP is not the best decision tool to use.

Once relative comparisons of the objectives have been assessed, the alternatives need to be compared based on their ability to satisfy an objective at the level above. Similar to the objective comparisons, the decision maker is asked "Which alternative better satisfies the specified objective and by how much more?" The same scale used for the objective comparisons will also be used for the alternative comparisons, i.e. the 1 to 9 scale described above. The results of the relative comparisons are put into a positive reciprocal matrix, as described previously. A separate matrix is constructed for each objective against which the alternatives are being compared.

In the National Park example, the decision maker is asked to compare the relative value of ***Yosemite*** to ***Yellowstone***, ***Rocky Mountain*** and ***Grand Teton*** National Parks when considering the ***Activities*** objective. A pairwise comparison question might ask, "Which National Park is most effected by the activities conducted in the park, ***Yosemite*** or ***Yellowstone***? Using the 1 to 9 scale, how much more affected is the specified park over the other park?" Using the 1 to 9 scale rather than an absolute difference in the number of activities conducted in each park allows the evaluator to include their subjective values regarding how the difference in activites between alternatives can affect the park, with respect to needing an environmental assessment performed. The response is represented in a four by four matrix. The ***Activites*** matrix is displayed below. The values in the cells of the matrix are interpretted in the same manner as the objective comparison matrix described above. A separate matrix is depicted below for Activities, Tourists, Species and Community, respectively. When making the relative comparisons, the decision maker is aware the specific information regarding the activities conducted, the number of tourists visiting, the species to be evaluated and monitored and the level of concerns from the surrounding community for each park that is necessary to accurately evaluate each alternative.

Alternative Comparison Matrix, wrt Activities

	Yosemite	Yellowstone	Rocky Mt	Grand Teton	Priority
Yosemite	1	2	5	8	0.510
Yellowstone	1/2	1	4	7	0.329
Rocky Mt.	1/5	1/4	1	4	0.116
Grand Teton	1/8	1/7	1/4	1	0.045

Alternative Comparison Matrix, wrt Tourists

	Yosemite	Yellowstone	Rocky Mt	Grand Teton	Priority
Yosemite	1	1/2	7	5	0.361
Yellowstone	2	1	7	4	0.486
Rocky Mt.	1/7	1/7	1	2	0.072
Grand Teton	1/5	1/4	1/2	1	0.081

Alternative Comparison Matrix, wrt Species

	Yosemite	Yellowstone	Rocky Mt	Grand Teton	Priority
Yosemite	1	1/3	4	6	0.301
Yellowstone	3	1	4	6	0.528
Rocky Mt.	1/4	1/4	1	3	0.116
Grand Teton	1/6	1/6	1/3	1	0.055

Alternative Comparison Matrix, wrt Community

	Yosemite	Yellowstone	Rocky Mt	Grand Teton	Priority
Yosemite	1	1	6	7	0.432
Yellowstone	1	1	6	4	0.396
Rocky Mt.	1/6	1/6	1	5	0.118
Grand Teton	1/7	1/4	1/5	1	0.054

The positive reciprocal matrices, comprising of the subjective values assigned by the decision maker through the pairwise comparisons, are now used to calculate objective priorities for the factors in the decision hierarchy.

CALCULATING PRIORITY WEIGHTS

One of the useful aspects of AHP is its ability to take the subjective values from the pairwise comparisons, and convert them into objective ratio measurements. When deriving objective weights it is important to obtain ratios that reveal the dominance of an attribute as well as meaningful magnitudes of dominance. By normalizing the sum of preferences for each i^{th} attribute in a paired comparison reciprocal matrix, the subjective values are

combined to create an objective value for the attribute being evaluated. These objective values are ratio numbers (Saaty, 1977). The normalized ratio values are called **eigenvalues**, which, by definition, establish the priority as well as the magnitude of dominance between the elements being compared. They are cardinal values. The set of objective eigenvalues for a matrix create an **eigenvector**. A matrix eigenvector is calculated by taking the geometric mean of the ratings assigned to attributes, through pairwise comparisons, at one hierarchic level. The geometric mean is the final attribute rating. A geometric mean is like a simple mean, but rather than weighting all items equal, the geometric mean allocates less weight to low and high outlying values. It has been shown to be a more accurate measurement than the simple average as well as the adjusted average, which drops out a certain number of observations from the bottom and top of the set of values before averaging (Page). In different experiments, "evidence suggests that the eigenvector approach is a theoretically and particularly proven method for estimating (cardinal) weights" (Harker, pg.12). The geometric mean formula that caluclates eigenvalues, or attribute weights, can be represented by the following equation:

$$W_i = \left(\prod_{j=1}^{n} a_{ij} \right)^{1/n}$$

where a is the preference rate of 1/9 to 9; i is the row attribute; j is the column attribute; and n is the number of attributes in a matrix. Therefore, the geometric mean is simply the product of the values in a specific attribute row raised to the power of one over the number of observations in that row. Each row mean in a matrix is normalized by the total of all rows' geometric means. This weighted value represents an objective priority weight for the corresponding attribute in that row of the matrix.

Consider the objective matrix recreated below. To calculate the priority weight for the *Activities* objective the following calculation is made,

$$\text{Geometric Mean}_{\text{Price}} = (1 \times 1/6 \times 1/8 \times 1/2)^{1/4} = 0.318$$

The same calculation is conducted for each row attribute, i, i.e. *Tourists, Species* and *Community* Then the **Geometric Means** for all attributes are summed to give a **Total**. The **Total** is used to normalize the **Geometric Mean** for each attribute. The normalized value is called the **Priority Weight**, which is a ratio value. The priority weight for the attribute *Activities* will therefore become:

$$\text{Priority Weight}_{\text{Price}} = 0.318 / 6.500 = 0.048$$

The same calculations are conducted to derive the results for all objectives in the Table below.

Derived Priorities Using the Values in the Objective Matrix

	Activities	Tourists	Species	Community	Geometric Mean[a]	Total[b]	Priority Weight[c]
Activities	1	1/6	1/8	1/2	0.318		0.048
Tourists	6	1	1/4	6	1.731		0.266
Species	8	4	1	8	4.000		0.617
Community	2	1/6	1/8	1	0.451	6.500	0.069

[a] Geometric Mean is the sum of the i^{th} row carried to the 1/n power, where n = the number of attributes in the matrix.

[b] Total is the sum of the Geometric Means calculated for each row attribute.

[c] Priority Weight is the normalized Geometric Mean for each attribute, i.e. the ith row's Geometric Mean divided by the Total.

Each matrix created at each level of the decision hierarchy is used to calculate the priority weights for all attributes using the calculations described above.

In addition to calculating the priority weights for each objective attribute, a final set of priority weights need to be calculated for each of the alternative comparison matrices. The same calculations described above are carried out for the alternative priority weights for each objective attribute. The normalized priority weights for the alternatives with respect to a specified objective have been calculated and are displayed in the right column of the above objective matrices.

CONSISTENCY INDEX

After the priority weights for each factor in the decision hierarchy are calculated, it is important to determine how consistent the decision maker's judgements were when responding to the pairwise comparisons. In AHP, consistency means that there is transitivity in the responses and that the strength of preferences is also transitive throughout a sequence of comparisons (Saaty, 1990). AHP assumes people to be inconsistent in their judgements. Therefore uses reciprocal values between a pairwise comparison to attempt to decrease the amount of inconsistency performed by an evaluator. However, this will not completely guard against inconsistent judgements. Therefore, to determine the consistency of the evaluator's responses a consistency index is calculated. The consistency index (CI) statistically tests the significance and internal validity of a respondent's relative ratings by measuring the chance that the responses were given at random (Bahmani, et al.; and Saaty, 1977). The developers of AHP created this statistical index (Saaty, 1977).

The consistency index is computed in three steps (Harker). First, the maximum eigenvalue of each matrix, λ_{max} . is calculated, i.e.:

$$\lambda_{max} = \left(\sum_{j=1}^{n} a_{ij} w_j \right) \Big/ w_i \qquad \text{for all i = 1....n}$$

where a_{ij} is the preference value in row i column j of a specific attribute or objective matrix; w_j is the priority weight, or eigenvalue, for the jth column attribute; w_i is the priority weight for the ith row attribute; and n is the number of attributes in the matrix. In words, each factor's priority weight is multiplied by the factor's corresponding preference value, in column j, from a specified row, i, of the original matrix, A_i. Typically the first row's ordinal values are used for a_{ij}. The ordinal values can be from any row, however, all ordinal values must come from the same row. The sum of the products of the row attribute value and its corresponding column priority weight are then divided by the priority weight of the specified ith row attribute in the matrix, or the first row if that is the row of preference values used.

Using the objective comparison matrix in the example above, λ_{max} is calculated to be,

$$\frac{(1*0.048) + (1/6*0.266) + (1/8*0.617) + (1/2*0.069)}{0.048} = 4.249$$

λ_{max} is necessary for calculating the consistency ratio (CR) whose equation is as follows:

$$CR = (\lambda_{max} - n)/(n-1)$$

Or for our example:

$$CR = \frac{(4.249 - 4)}{4 - 1} = .083$$

Finally, the CI is calculated as :

$$CI = CR/RI$$

where RI is a random consistency index.

The RI is a statistical probability derived from a sample of 500 randomly generated reciprocal matrices. The RI tests the chance that a matrix is randomly designed for several different sized matrices (RW Saaty). The random consistency index describes a probability chart as follows (RW Saaty; and Harker):

if n =	1	2	3	4	5	6	7	8	9	10
then RI =	0	0	.58	.90	1.12	1.24	1.32	1.41	1.45	1.49

A CI of less than 10% implies that the responses are significantly different from a random response. However, in practice, CI's of less than 20% are deemed acceptable (Scitor Corporation; and Saaty and Kearns). If a CI is between 10 and 20 percent the analyst should consider having the decision maker modify their pairwise comparison responses to get a CI closer to 10% or less. If the CI is greater than 20 percent, the decision maker needs to reconsider their responses, perhaps get more information to make their judgements more consistent. For the matrix above, the consistency index is 0.083/0.90, or 0.092.

The weighting calculations and CIs are calculated for each of the alternative comparison matrices. After the weights for each attribute under a criterion have been determined and the CI's are acceptable, the attribute values in the decision hierarchy are aggregate into an overall composite scenario.

Composite Matrix for Selecting a National Park to Perform an Environmental Assessment

Attribute	Attribute Weights	Alternative Weights			
		Yosemite	Yellowstone	Rocky Mountain	Grand Teton
Activities	*0.048*	0.510	0.329	0.116	0.045
Tourists	*0.266*	0.361	0.486	0.072	0.081
Species	*0.617*	0.301	0.528	0.116	0.055
Community	*0.069*	0.432	0.396	0.118	0.054
Synthesis	*1.000*	0.336	0.498	0.104	0.061

COMPOSITE SOLUTIONS

The priorities calulated for the objective crieria and the alternatives, which are displayed in the matrices above, are compiled into the composite matrix below. Using matrix algebra, the composite matrix is used to compile the factor priorities for the purpose of calculating the overall weighted priority for each alternative in the row heading.

To determine the weighted priority for each decision alternative, the specific priority for each park is multiplied by the priority of that objective with respect to achieving the goal of selecting a National Park to perform an environmental assessment. For example, the overall weighted priority of ***Yosemite*** is calculated by multiplying the objective weights by their respective priority weight for the ***Yosemite*** alternative, and summing these results, e.g.,

$$\textit{Yosemite} = (0.510*0.048) + (0.361*0.266) + (0.301*0.617) + (0.432*0.069) = 0.336$$

The same calculation isconducted for the other alternatives to derive each of their relative priority values based on the set of objectives and their value to the overall decision.The alternative priorities in the composite matrix reveal that Yellowstone N.P. is the best park to select for performing an environmental assessment, followed by ***Yosemite, Rocky Mountain*** and ***Grand Teton*** National Parks, respectively.

This methodology describes how developing a hierarchy can be a useful tool for the decision maker to organize a decision problem into a comprehensive format and then use that hierarchy structure to assign values to the attributes that influence the decision. The Analytic Hierarchy Process provides the forum necessary for individuals and groups to make a well informed decision. The example in this section reveals one basic way to construct a hierarchy. However, there are several possibilities of constructing a hierarchy depending on the complexity of the decision problem.

Appendix D: LIAM Stakeholder Survey

Questionnaire for Evaluating Organizational Assets and Orientations

The purpose of this questionnaire is to evaluate how important you think organizational assets and orientations are in decision-making processes such as the National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan. This questionnaire will be used for research at Colorado State University about how groups interact in complex environmental management decisions involving public resources. The survey does **not** reflect the views of the planning team or the involved agencies. However, the information will help you express your views, relative to other groups, in the planning process.

You will be asked a series comparison questions to incorporate your knowledge and values into the evaluation of organizational assets and orientations.

There are two parts to each question.

(1) To identify your preference in a series of questions that compare one goal to another, ***and***

(2) To determine how strong your preference is.

For Example: You have been asked to evaluate your preference for eating different fruit. To determine your preference for fruits, a pairwise comparison question would ask you:

(a) Which fruit do you prefer based on taste, an Orange or an Apple? **(Circle your preference.)**

(b) How much more do you prefer that fruit based on a 1 to 5 scale (where the scale has a specific meaning related to the extent of the preference)? **(Circle a value from 1 to 5).**

Please Select Your Preference			**JUDGMENT INTENSITY SCALE**					
Taste			Equally Perferred	Slightly More Preferred	Moderately More Preferred	Strongly More Preferred	Absolutely More Preferred	Indifferent
Orange	or	Apple ➡	1	(2)	3	4	5	1
Interpretation: *Based on taste, an apple is* ***slightly more preferred*** *than an orange*								

By asking a series of comparison questions, we can determine what you think is important and why. For example, if we were to ask questions like that in the example above for flavor, texture, and nutritional value, we could rank your preference for different baskets of fruit with varying combinations of each fruit.

Evaluation of Organizational Assets and Orientations

The Legal Institutional Analysis Model describes organizations in terms ***assets*** and ***orientations***.

Organizational Assets: Assets help an organization achieve its objectives. The assets of an organization are determined by its resources, information and expertise, as well as its level of outside support. Organizational assets are divided into the following types:

> ***Resource Assets:*** Refers to an organization's legal authorities, financial backing, available personnel, support from the general public, level of activity in the issue, centrality of the issue to the organizational mission, and similarity of values between the organization and political leaders.
>
> ***Information Assets:*** Refers to the ability of an organization to process information, and the ease with which an organization's expressed opinions and policies can be understood. Possessing information assets means an organization has special expertise, can explain its technical conclusions, and is respected for its knowledge.
>
> ***Support Assets:*** Refers to an organization's constituency in terms of its size, cohesiveness, interest, and reputation of groups of supporters. Constituency refers to either political support such as that received from elected officials, or public support such as that from organized interest groups.

Organizational Orientation: Orientation assesses an organization's likely behavior in natural resource decision processes. Organizational behavior is divided into two different categories: preference for type of outcome and preference for type of process. An organization's preference for outcome is based its traditional values and goals. In this regard, an organization is categorized as either an advocate or a guardian. An organization's preference for process is related to the resources it has available to influence the outcome. In this regard, an organization is categorized as a broker or an arbitrator.

Preference for Outcome: (Based on Organizational Mission and Values)

> ***Guardian:*** An organization that seeks to protect the status quo by relying on traditional decision processes. Guardian organizations usually promote the consideration of market values and economic processes in determining how decisions are made or resources are allocated.
>
> ***Advocate:*** An organization that will demand change in traditional decision processes and the status quo of natural resource management. Advocate organizations react to proposals from others and rely on fairness and justice arguments and data analysis to advance their position. Advocates often prefer preservation values and are less attuned to arguments for development or economic progress.

Preference for Process: (Based on an Organization's Ability to Influence the Outcome)

> ***Broker:*** An organization that prefers a negotiated solution through tradeoffs and bargaining. Brokers have the ability to facilitate bargaining and determine how benefits are distributed. A Broker's strategy is to guide the decision making process in order to maintain the balance-of-power.
>
> ***Arbitrator:*** An organization that prefers a neutral body to solve the conflict in an objective court-like manner. Arbitrators typically have statutory authority to: (1) establish management plans or regulations, (2) establish the guidelines for preparing plans, or (3) direct the implementation of plans undertaken by others. Arbitrators rely on data collected by others and make authoritative allocations after hearing evidence from all sides.

We would like to ask you about the importance of an organization's orientation and assets in land management decision-making processes such as the National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan.

Part 1: Organizational Orientation

Organizational Orientation is divided into two different categories: **preference for outcome** (based on organizational mission and values) and **preference for process** (based on ability to influence the outcome).

Preference for Outcome

For land management decision-making processes such as the Bison and Elk Management Plan, how important are each of the identified **organizational orientations (Preference for Outcome)** ***characteristics***? Please rank each characteristic by level of importance.

EVALUATION CRITERIA	**IMPORTANCE SCALE**				
Organizational Orientation: *Preference for Outcome*	Extremely	Considerably	Significantly	Somewhat	Not Important
Guardian Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's Guardian orientation?***				
Prefers Economic Approaches/Progress	5	4	3	2	1
Prefers Traditional Processes & Resource Uses	5	4	3	2	1
Values Markets	5	4	3	2	1
Advocate Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's Advocate orientation?***				
Prefers Change From Traditional Processes	5	4	3	2	1
Promotes Resource Preservation & Noncommercial Uses	5	4	3	2	1
Reacts to Projects Planned by Others	5	4	3	2	1
Emphasizes Importance of Natural Systems	5	4	3	2	1

Which type of **organizational orientation (Preference for Outcome)** do you think is relatively more important for land management decision-making processes such as the Bison and Elk Management Plan?

Please Select			**JUDGMENT INTENSITY SCALE**				
Organizational Orientation: *Preference for Outcome*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important
Guardian	or	Advocate ➡	1	2	3	4	5

Preference for Process

For land management decision-making processes such as the Bison and Elk Management Plan, how important are each of the identified **organizational orientations (Preference for Process)** ***characteristics***? Please rank each characteristic by level of importance.

EVALUATION CRITERIA	IMPORTANCE SCALE				
Organizational Orientation: *Preference for Process*	Extremely	Considerably	Significantly	Somewhat	Not Important
Broker Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's Broker orientation?***				
Desires Negotiation	5	4	3	2	1
Solicits Political Support	5	4	3	2	1
Distributes or Shares Project Benefits	5	4	3	2	1
Arbitrator Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's Arbitrator orientation?***				
Prefers Formal Structured Decision Processes	5	4	3	2	1
Desires Objective Technical & Scientific Information	5	4	3	2	1
Shares Benefits With Those Having Legitimate Need	5	4	3	2	1

Which type of **organizational orientation (Preference for Process)** is relatively more important for land management decision-making processes such as the Bison and Elk Management Plan?

Please Select			JUDGMENT INTENSITY SCALE				
Organizational Orientation: *Preference for Process*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important
Broker	or	Arbitrator ➡	1	2	3	4	5

Comparing Organizational Orientation Categories

For land management decision-making processes such as the Bison and Elk Management Plan, which category of **organizational orientation** is relatively more important, *preference for outcome* or *preference for process*?

Please Select			JUDGMENT INTENSITY SCALE				
Organizational Orientation			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important
Preference for Outcome	or	Preference for Process ➡	1	2	3	4	5

Part 2: Organizational Assets

For land management decision-making processes such as the Bison and Elk Management Plan, how important are each of the identified **organizational asset *characteristics***?

Please rate each characteristic by level of importance.

EVALUATION CRITERIA	IMPORTANCE SCALE				
Organizational Assets	Extremely	Considerably	Significantly	Somewhat	Not Important
Resource Asset Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's level of Resource Assets?***				
Physical Ownership or Control of the Land and/or Wildlife	5	4	3	2	1
Legal Authority	5	4	3	2	1
Public Support	5	4	3	2	1
Personnel Resources (By Number and Expertise)	5	4	3	2	1
Financial Resources	5	4	3	2	1
Actively Involved in this Type of Issue	5	4	3	2	1
Central to Organizational Mission	5	4	3	2	1
Values Similar to Current Political Leadership	5	4	3	2	1
Information Asset Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's level of Information Assets?***				
Technical Information is Easily Understood	5	4	3	2	1
Experienced in Data Collection	5	4	3	2	1
Technical Knowledge	5	4	3	2	1
Experience is Recognized	5	4	3	2	1
Support Asset Characteristics	***Evaluation Question: How important is each characteristic when determining an organization's level of Support Assets?***				
Group Members Tend to Stick Together	5	4	3	2	1
Large Membership	5	4	3	2	1
Groups are Interested in this Issue	5	4	3	2	1
Active in Issue	5	4	3	2	1
Well Coordinated	5	4	3	2	1
Public Support	5	4	3	2	1
Political Expertise	5	4	3	2	1
Groups are Respected by Political Leaders and the Public	5	4	3	2	1
Issue Awareness	5	4	3	2	1

For land management decision-making processes such as the Bison and Elk Management Plan, which types of **organizational assets** do you think are most important?

Please Select			JUDGMENT INTENSITY SCALE				
Organizational Assets			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important
Resource Assets	or	Information Assets ➡	1	2	3	4	5
Resource Assets	or	Support Assets ➡	1	2	3	4	5
Information Assets	or	Support Assets ➡	1	2	3	4	5

Part 3: Comparing Organizational Orientation and Assets

For land management decision making processes such as the Bison and Elk Management Plan which do you think is more important, an organization's **orientation or assets**?

Please Select			JUDGMENT INTENSITY SCALE				
Organizational Measures			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important
Organizational Orientation	or	Organizational Assets ➡	1	2	3	4	5

Thank you for your time and effort in completing this questionnaire. Please list any comments or suggestions below.

Appendix E
Questionnaire for Evaluating the Bison and Elk Management Issues

The purpose of this questionnaire is to evaluate how important you think various management issues are associated with the National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan. These issues have been identified from your responses to the Situation Assessment report and pre-scoping meetings. This questionnaire will be used for research at Colorado State University about how groups interact in complex environmental management decisions involving public resources. The survey does **not** reflect the views of the Planning team or the involved agencies. However, the information will help you express your views, relative to other groups, in the planning process.

You will be asked a series comparison questions to incorporate your knowledge and values into the evaluation of the management issues associated with the National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan. There are two parts to each question.

(1) To identify your preference in a series of questions that compare one goal to another,

and

(2) To determine how strong your preference is.

For Example: You have been asked to evaluate your preference for eating different fruit. To determine your preference for fruits, a pairwise comparison question would ask you:

(a) Which fruit do you prefer based on taste, an Orange or an Apple? **(Circle your preference.)**

(b) How much more do you prefer that fruit based on a 1 to 5 scale (where the scale has a specific meaning related to the extent of the preference)? **(Circle a value from 1 to 5).**

Please Select Your Preference			**JUDGMENT INTENSITY SCALE**					
Taste			Equally Perferred	Slightly More Preferred	Moderately More Preferred	Strongly More Preferred	Absolutely More Preferred	Indifferent
Orange	or	(Apple) ➡	1	(2)	3	4	5	1
Interpretation: *Based on taste, an apple is* ***slightly more preferred*** *than an orange*								

By asking a series of comparison questions, we can determine what you prefer and why. Since no policy gives everybody everything that they want, we need a way to determine what gives you the most of what you want. For example, if we were to ask questions like that in the example above for flavor, texture, and nutritional value, we could rank your preference for different baskets of fruit with varying combinations of each fruit.

Thank you for your time and effort in completing this questionnaire to prioritize the Jackson bison and elk management issues.

***Section 1**: General Management Strategies for the Jackson Elk and Bison Herds*

We would like to ask about your preferences for three types of general management strategies for the Jackson herds.

Disease Management: This concerns how to deal with disease transmission, spread, and prevalence in the Jackson herds. Management activities could include one or more of the following: *vaccination, test & slaughter,* and *dispersal* (e.g., management that leads to increasing the distribution of animals over the landscape, thereby reducing the amount of concentration and disease risk).

Forage Management: Forage management activities are divided into two categories: Supplemental Feeding and Enhance Forage and/or Increase Winter Range.

***Supplemental Winter Feeding*:** This concerns the winter feeding program on the National Elk Refuge. Management activities include one or more of the following scenarios:

Annual Winter Feeding: This scenario is the current or increased feed program on the National Elk Refuge. Under the existing program, a sufficient amount of alfalfa pellets are distributed to meet the maintenance requirements of all elk and bison that show up on the feedgrounds.

Sufficient/Emergency Winter Feeding: This scenario involves only feeding elk to the extent that an adequate amount of forage is not available on enhanced native winter range and in designated pastures in Jackson Hole.

No Winter Feeding: This scenario is the elimination of the feed program on the National Elk Refuge.

***Enhance Forage and/or Increase Winter Range*:** This concerns the quality and/or quantity of vegetative forage for the Jackson Herds. Management activities include one or more of the following scenarios:

No Active Forage Management

Current Conditions: This program is the current forage enhancement program on the National Elk Refuge. Current management activities include prescribed burning, irrigation, harrowing, and the use of fertilizers.

Enhanced Forage and/or Increased Winter Range in Jackson Hole: This scenario involves increasing the forage quality and/or quantity on pastures and other areas on the National Elk Refuge through increased irrigation, prescribed burning, and other measures, and involves increasing the acreage of suitable winter grazing habitat on native winter ranges on the National Elk Refuge and surrounding lands in Jackson Hole.

Enhanced Forage and/or Increased Winter Range Outside of Jackson Hole: This scenario includes everything from the 'Enhanced Forage and/or Increased winter range in Jackson Hole' scenario as well as the restoration of traditional migrations out of the Jackson Hole area to traditional wintering areas, especially those in the Green River basin. This scenario assumes that sufficient forage would be available, or made available to the herd.

Manage with Hunting: Use hunting as a management tool to control the herd populations. Management activities include one or more of the following scenarios:

Allow Hunting on Grand Teton & the National Elk Refuge: Under this scenario hunting is allowed as a management tool to control the Jackson herds on Grand Teton National Park and the National Elk refuge. Hunting on surrounding Forest Service, State, and private lands would continue.

Allow Hunting Only on the National Elk Refuge: Under this scenario hunting is allowed as a management tool to control the herd population on the National Elk refuge. Hunting would not be allowed on Grand Teton National Park. Hunting on surrounding Forest Service, State, and private lands would continue.

No Hunting: Hunting would not be allowed on Grand Teton National Park and the National Elk refuge. Hunting on surrounding Forest Service, State, and private lands would continue.

Management Strategies for the Jackson Elk Herd

Thinking ***only*** about **the Jackson Elk Herd**, which ***general management strategy*** is relatively more important to you?

Please Indicate Your Preference			**JUDGMENT INTENSITY SCALE**					
Jackson Elk Herd *General Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Disease Management	or	Forage Management	1	2	3	4	5	I
Disease Management	or	Manage with Hunting	1	2	3	4	5	I
Forage Management	or	Manage with Hunting	1	2	3	4	5	I

For the **Jackson Elk Herd,** which ***Disease Management Strategy*** would you like to see emphasized?

Please Indicate Your Preference			**JUDGMENT INTENSITY SCALE**					
Jackson Elk Herd *Disease Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Dispersal	or	Vaccination	1	2	3	4	5	I
Dispersal	or	Test & Slaughter	1	2	3	4	5	I
Vaccination	or	Test & Slaughter	1	2	3	4	5	I

Should the ***Disease Management Strategy*** **for the Jackson Elk Herd** focus on *minimizing the effects of disease* or should the herd be *completely disease free*?

Please Indicate Your Preference			**JUDGMENT INTENSITY SCALE**					
Jackson Elk Herd *Focus of Disease Management Strategy*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Minimize the Effects of Disease	or	Completely Disease Free	1	2	3	4	5	I

For the **Jackson Elk Herd,** which ***Forage Management Strategy*** would you like to see emphasized?

Please Indicate Your Preference			**JUDGMENT INTENSITY SCALE**					
Jackson Elk Herd *Forage Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Supplemental Winter Feeding	or	Enhance Forage and/or Increase Winter Range	1	2	3	4	5	I

For the **Jackson Elk Herd,** which ***Supplemental Winter Feeding Scenario*** do you prefer?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Elk Herd *Forage Management Strategies:* **Supplemental Winter Feeding**			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Annual Winter Feeding	or	Sufficient/Emergency Winter Feeding	1	2	3	4	5	I
Annual Winter Feeding	or	No Winter Feeding	1	2	3	4	5	I
Sufficient/Emergency Winter Feeding	or	No Winter Feeding	1	2	3	4	5	I

To ***Enhance Forage and/or Increase Winter Range***, which management scenario would you prefer **for the Jackson Elk Herd**?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Elk Herd *Forage Management Strategies:* **Enhance Forage and/or Increase Winter Range**			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
No Active Forage Management	or	Current Condition	1	2	3	4	5	I
No Active Forage Management	or	Enhance Forage and/or Increase Winter Range in Jackson Hole	1	2	3	4	5	I
No Active Forage Management	or	Enhance Forage and/or Increase Winter Range Outside of Jackson Hole	1	2	3	4	5	I
Current Condition	or	Enhance Forage and/or Increase Winter Range in Jackson Hole	1	2	3	4	5	I
Current Condition	or	Enhance Forage and/or Increase Winter Range Outside of Jackson Hole	1	2	3	4	5	I
Enhance Forage and/or Increase Winter Range in Jackson Hole	or	Enhance Forage and/or Increase Winter Range Outside of Jackson Hole	1	2	3	4	5	I

To ***Manage Elk with Hunting***, which management scenario would you prefer?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Elk Herd *Manage with Hunting*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Allow Hunting on Grand Teton & the National Elk Refuge	or	Allow Hunting Only on the National Elk Refuge	1	2	3	4	5	I
Allow Hunting on Grand Teton & the National Elk Refuge	or	No Hunting	1	2	3	4	5	I
Allow Hunting Only on the National Elk Refuge	or	No Hunting	1	2	3	4	5	I

Now we would like to ask if your preferences for what you would like to see emphasized in a Forage Management Strategy would change for the following scenarios.

If enhancing winter forage and/or increasing winter range and stopping the feeding program on the National Elk Refuge resulted in significantly fewer elk in the herd, which **Forage Management Strategy for the Jackson Elk Herd** would you like to see emphasized?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Elk Herd *Forage Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Supplemental Winter Feeding	or	Enhance Forage and or Increase Winter Range	1	2	3	4	5	1

If it were possible to sustain a desired population size under either strategy in most years, which **Forage Management Strategy for the Jackson Elk Herd** would you like to see emphasized?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Elk Herd *Forage Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Supplemental Winter Feeding	or	Enhance Forage and or Increase Winter Range	1	2	3	4	5	1

Management Strategies for the Jackson Bison Herd

Thinking ***only*** about **the Jackson Bison Herd**, which ***general management strategy*** is relatively more important to you?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Bison Herd *General Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Disease Management	or	Forage Management	1	2	3	4	5	1
Disease Management	or	Manage with Hunting	1	2	3	4	5	1
Forage Management	or	Manage with Hunting	1	2	3	4	5	1

For the **Jackson Bison Herd,** which ***Disease Management Strategy*** would you like to see emphasized?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Bison Herd *Disease Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Dispersal	or	Vaccination	1	2	3	4	5	1
Dispersal	or	Test & Slaughter	1	2	3	4	5	1
Vaccination	or	Test & Slaughter	1	2	3	4	5	1

Should the **Disease Management Strategy for the Jackson Bison Herd** focus on minimizing the effects of disease or should the herd be *completely disease free*?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Bison Herd *Focus of Disease Management Strategy*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Minimize the Effects of Disease	or	Completely Disease Free	1	2	3	4	5	1

For the **Jackson Bison Herd,** which ***Forage Management Strategy*** you like to see emphasized?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Bison Herd *Forage Management Strategies*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Supplemental Winter Feeding	or	No Winter Feeding ➡	1	2	3	4	5	1

To ***Manage Bison with Hunting***, which management scenario do you prefer?

Please Indicate Your Preference			JUDGMENT INTENSITY SCALE					
Jackson Bison Herd *Manage with Hunting*			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Allow Hunting on Grand Teton & the National Elk Refuge	or	Allow Hunting Only on the National Elk Refuge ➡	1	2	3	4	5	1
Allow Hunting on Grand Teton & the National Elk Refuge	or	No Hunting ➡	1	2	3	4	5	1
Allow Hunting Only on the National Elk Refuge	or	No Hunting ➡	1	2	3	4	5	1

Section 2: Bison and Elk Management Preferences

Below we would like to ask about your preferences for the resources you would like to see emphasized in the National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan. Do you feel that it is relatively more important for management to address the needs of **elk** or **bison**?

Please Indicate Your Preference			**JUDGMENT INTENSITY SCALE**					
Management Needs			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Elk	or	Bison ➡	1	2	3	4	5	1

For issues related to **managing elk**, do you feel that it is more important for the Plan to address elk management on Grand Teton National Park or on the National Elk Refuge?

Please Indicate Your Preference			**JUDGMENT INTENSITY SCALE**					
Managing Elk			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Managing Elk in Grand Teton	or	Managing Elk on the National Elk Refuge ➡	1	2	3	4	5	1

For issues related to **managing bison**, do you feel that it is more important for the Plan to address bison management on Grand Teton National Park or on the National Elk Refuge?

Please Indicate Your Preference			**JUDGMENT INTENSITY SCALE**					
Managing Bison			Equally Important	Slightly More Important	Moderately More Important	Strongly More Important	Absolutely More Important	Indifferent
Managing Bison in Grand Teton	or	Managing Bison on the National Elk Refuge ➡	1	2	3	4	5	1

Thank you for your time and effort in completing this questionnaire. Please list any comments or suggestions below.

APPENDIX F: COMPUTERIZED LIAM SURVEY RESPONSES

	APHIS	BFC	BLM	DCC	DOA	DOW	EFT	FB	FUND	FNAWS	FWS
Guardian Characteristics											
Prefers economic approaches 31-33	1	2	4	3	3	1	4	3	2	3	0
Prefers traditional process 34-36	1	0	4	4	4	1	4	1	0	4	1
Values markets 37-39	2	1	3	3	3	1	4	4	3	4	0
Advocate Characteristics											
Prefers change form traditional process 19-21	2	4	2	0	2	3	4	4	4	2	3
Prefers preservation values 22-24	0	4	2	2	3	4	4	0	4	4	2
Reacts to proposals 25-27	4	3	4	1	4	4	1	2	3	4	2
Values nature 28-30	2	4	3	2	3	4	4	0	4	4	3
Broker Characteristics											
Desires Negotiation 1-3	4	4	4	3	4	3	4	0	3	3	3
Favors political Considerations 4-6	0	4	4	2	3	2	4	1	4	3	1
Distributes Benefits 7-9	4	2	4	3	2	3	4	1	2	4	2
Arbitrator Characteristics											
Prefers Formal Process 10-12	2	2	4	3	4	1	4	4	3	3	3
Desires Objective inforamation 13-15	4	2	4	2	3	3	2	4	3	4	3
Desires documatnation of legitimate need 16-18	0	0	4	2	4	4	4	3	4	3	0
Resource Power Characteristics											
Physical control 40-42	0	4	4	1	4	4	2	0	0	3	4
Statutory control 43-45	3	0	0	0	0	3	2	0	3	2	4
Public support 46- 48	3	3	2	3	4	2	4	2	4	3	3
Personnel resources 49-51	1	2	0	1	1	2	3	1	1	2	1
Monetary resources 52-54	2	4	0	0	1	3	3	1	4	2	4
Active in these issues 55-57	3	4	4	2	3	4	4	4	4	4	4
Central to mission 58-60	3	3	3	1	2	4	4	3	4	3	4
Values similar to political leadership 61-63	2	4	1	2	3	3	0	1	2	3	4
Information Power Characteristics											
Technical information understood 64-66	4	4	4	4	1	4	2	4	4	3	3
Experienced in data collection 67-69	1	0	4	2	0	3	4	4	4	3	4
Technical knowledge 70-72	4	4	0	0	4	4	4	4	4	3	3
Experience recognized 73-75	4	4	4	4	4	4	4	4	4	4	4
Support Power Characteristics											
Cohesiveness 76-78	3	3	4	4	3	3	4	2	4	3	3
Large membership 79-81	4	4	1	4	2	4	4	1	4	3	2
Interest (member involvement) 82-84	2	4	4	3	4	3	4	2	2	4	1
Active (By Group) 85-87	4	4	4	4	4	4	3	3	4	3	3
Coordinated 88-90	3	3	2	4	1	4	4	2	4	3	3
Public Support 91-93	2	4	4	4	1	4	4	3	4	4	2
Experienced in Politics 94-96	3	4	4	2	2	4	4	3	4	4	2
Respected 97-99	3	4	3	4	3	3	4	2	4	4	3
Group Awareness 100-102	4	4	4	3	2	4	4	3	4	4	4
Broker Score	2.67	3.33	4.00	2.67	3.00	2.67	4.00	0.67	3.00	3.33	2.00
Arbitrator Score	2.00	1.33	4.00	2.33	3.67	2.67	3.33	3.67	3.33	3.33	2.00
Advocate Score	2.00	3.75	2.75	1.25	3.00	3.75	3.25	1.50	3.75	3.50	2.50
Guardian Score	1.33	1.00	3.67	3.33	3.33	1.00	4.00	2.67	1.67	3.67	0.33
Resource Power Score	2.13	3.00	1.75	1.25	2.25	3.13	2.75	1.50	2.75	2.75	3.50
Information Power Score	3.25	3.00	3.00	2.50	2.25	3.75	3.50	4.00	4.00	3.25	3.50
Support Power Score	3.11	3.78	3.33	3.56	2.44	3.67	3.89	2.33	3.78	3.56	2.56

	GYC	ITBC	JHCA	JHCC	JHOA	NPS	NRCC	OFLP	RCH	SBC
Guardian Characteristics										
Prefers economic approaches 31-33	2	2	2	3	4	0	1	2	3	2
Prefers traditional process 34-36	1	2	1	2	4	3	3	2	4	4
Values markets 37-39	1	0	0	4	4	1	2	2	2	3
Advocate Characteristics										
Prefers change form traditional process 19-21	3	3	3	3	0	1	4	2	1	1
Prefers preservation values 22-24	4	4	3	2	4	4	3	1	3	4
Reacts to proposals 25-27	3	4	1	3	4	4	4	2	2	4
Values nature 28-30	3	4	4	2	1	3	4	2	2	4
Broker Characteristics										
Desires Negotiation 1-3	3	3	3	3	3	3	4	4	4	2
Favors political Considerations 4-6	2	0	4	4	2	2	4	2	2	4
Distributes Benefits 7-9	2	3	3	2	3	4	4	4	1	3
Arbitrator Characteristics										
Prefers Formal Process 10-12	3	1	0	3	2	2	0	4	1	3
Desires Objective inforamation 13-15	3	2	3	2	2	3	0	4	4	3
Desires documatnation of legitimate need 16-18	4	0	1	2	3	1	4	0	3	3
Resource Power Characteristics										
Physical control 40-42	0	3	0	0	1	4	0	4	3	4
Statutory control 43-45	0	0	0	0	0	4	1	4	3	4
Public support 46- 48	2	2	3	4	4	3	3	3	4	3
Personnel resources 49-51	2	1	3	2	4	1	1	1	0	1
Monetary resources 52-54	3	2	2	2	0	3	0	0	0	2
Active in these issues 55-57	3	4	4	2	4	3	4	4	3	4
Central to mission 58-60	4	4	4	3	4	3	4	4	4	4
Values similar to political leadership 61-63	0	0	1	1	3	4	1	2	4	1
Information Power Characteristics										
Technical information understood 64-66	3	1	4	4	4	3	4	4	3	3
Experienced in data collection 67-69	3	3	1	2	4	1	4	4	1	3
Technical knowledge 70-72	2	3	4	2	0	3	4	4	2	0
Experience recognized 73-75	2	2	3	2	4	4	4	4	4	2
Support Power Characteristics										
Cohesiveness 76-78	2	3	4	3	4	1	2	4	3	4
Large membership 79-81	4	4	3	3	4	4	4	3	4	3
Interest (member involvement) 82-84	3	3	3	4	4	4	4	4	3	4
Active (By Group) 85-87	2	4	4	3	4	4	4	4	4	4
Coordinated 88-90	2	3	2	3	4	1	1	4	2	4
Public Support 91-93	3	4	3	4	4	4	3	1	4	4
Experienced in Politics 94-96	2	4	4	2	3	4	4	2	4	4
Respected 97-99	3	3	3	4	2	1	3	4	4	2
Group Awareness 100-102	3	3	2	3	4	3	4	4	4	4
Broker Score	2.33	2.00	3.33	3.00	2.67	3.00	4.00	3.33	2.33	3.00
Arbitrator Score	3.33	1.00	1.33	2.33	2.33	2.00	1.33	2.67	2.67	3.00
Advocate Score	3.25	3.75	2.75	2.50	2.25	3.00	3.75	1.75	2.00	3.25
Guardian Score	1.33	1.33	1.00	3.00	4.00	1.33	2.00	2.00	3.00	3.00
Resource Power Score	1.75	2.00	2.13	1.75	2.50	3.13	1.75	2.75	2.63	2.88
Information Power Score	2.50	2.25	3.00	2.50	3.00	2.75	4.00	4.00	2.50	2.00
Support Power Score	2.67	3.44	3.11	3.22	3.67	2.89	3.22	3.33	3.56	3.67

	SC	TCC	TOJ	USFS	WGFC	WGFD	WHA	WOC	WWF
Guardian Characteristics									
Prefers economic approaches 31-33	1	2	4	4	2	1	2	2	2
Prefers traditional process 34-36	2	2	4	1	1	0	3	4	2
Values markets 37-39	0	2	3	0	1	1	2	1	2
Advocate Characteristics									
Prefers change form traditional process 19-21	4	2	2	1	3	2	3	0	2
Prefers preservation values 22-24	4	1	4	0	4	4	4	4	4
Reacts to proposals 25-27	4	2	1	1	3	3	4	4	3
Values nature 28-30	4	1	4	3	4	3	1	4	4
Broker Characteristics									
Desires Negotiation 1-3	3	4	4	3	4	4	3	4	3
Favors political Considerations 4-6	0	1	4	1	1	3	2	1	3
Distributes Benefits 7-9	3	3	4	3	3	3	3	4	1
Arbitrator Characteristics									
Prefers Formal Process 10-12	3	4	3	3	2	1	2	1	2
Desires Objective inforamation 13-15	4	4	2	2	2	2	2	4	3
Desires documatnation of legitimate need 16-18	3	2	3	3	4	3	3	0	4
Resource Power Characteristics									
Physical control 40-42	0	2	3	4	4	3	2	0	1
Statutory control 43-45	2	0	1	0	2	4	3	0	0
Public support 46- 48	2	2	4	3	3	3	4	3	2
Personnel resources 49-51	1	0	0	0	1	1	2	3	1
Monetary resources 52-54	2	0	1	1	1	2	3	4	1
Active in these issues 55-57	4	0	3	4	4	4	3	4	4
Central to mission 58-60	4	1	4	4	4	4	3	4	4
Values similar to political leadership 61-63	2	2	3	4	3	3	2	3	2
Information Power Characteristics									
Technical information understood 64-66	2	2	3	4	1	4	4	4	2
Experienced in data collection 67-69	0	0	1	3	0	4	3	4	0
Technical knowledge 70-72	3	3	1	3	4	3	2	4	4
Experience recognized 73-75	2	2	0	3	4	3	4	4	4
Support Power Characteristics									
Cohesiveness 76-78	4	2	2	3	3	3	3	4	1
Large membership 79-81	4	4	4	4	2	3	2	4	4
Interest (member involvement) 82-84	2	1	4	4	1	4	2	4	2
Active (By Group) 85-87	4	4	4	4	3	4	3	4	4
Coordinated 88-90	4	3	3	1	2	3	3	4	1
Public Support 91-93	2	2	2	4	4	2	4	3	2
Experienced in Politics 94-96	3	3	4	2	3	3	1	2	2
Respected 97-99	2	3	3	2	4	2	4	4	2
Group Awareness 100-102	3	3	4	4	3	4	4	4	4
Broker Score	2.00	2.67	4.00	2.33	2.67	3.33	2.67	3.00	2.33
Arbitrator Score	3.33	3.33	2.67	2.67	2.67	2.00	2.33	1.67	3.00
Advocate Score	4.00	1.50	2.75	1.25	3.50	3.00	3.00	3.00	3.25
Guardian Score	1.00	2.00	3.67	1.67	1.33	0.67	2.33	2.33	2.00
Resource Power Score	2.13	0.88	2.38	2.50	2.75	3.00	2.75	2.63	1.88
Information Power Score	1.75	1.75	1.25	3.25	2.25	3.50	3.25	4.00	2.50
Support Power Score	3.11	2.78	3.33	3.11	2.78	3.11	2.89	3.67	2.44