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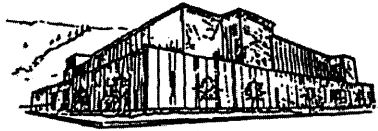
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TOWARDS A MORE COMPREHENSIVE UNDERSTANDING OF TRUST:
EXPLORING THE PUBLIC'S TRUST IN NATURAL RESOURCE MANAGEMENT

by

Adam J. Liljeblad

B. Sc. University of Alaska Fairbanks, 2003

presented in partial fulfillment of the requirement for the degree of

Master of Science

University of Montana

May 2005



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Towards a more comprehensive understanding of trust: Exploring the public's trust in natural resource management

Chair: William T. Borrie 

As natural resource management agencies become increasingly cognizant of the importance building and maintaining relationships with the public in order to increase public acceptability of their management decisions, the public's trust in those agencies is likely to become a long-term indicator of managerial success. This study uses a community-wide assessment of public trust in the U.S. Forest Service's ability to make fire management decisions that take local values into consideration. While numerous studies have evaluated the public's trust in resource management agencies, none known have attempted to take a comprehensive look at trust and its contributors. This study seeks to help fill that void. Based on a review of current trust literature, fourteen attributes that were believed to contribute to trust were identified. These attributes were organized into three hypothesized dimensions of trust: the norms and values the public shares with resource management agencies, the public's willingness to endorse agencies to act on their behalf, and the public's perception of agencies' efficacy. From that three-dimensional model, a comprehensive measure of trust was developed. Based on the results of that measure (N=1152), the dimensions and attributes of trust were empirically examined using common multivariate statistical procedures, as well as structural equation modeling. Simplifications to the trust measure for easier assessment of public trust levels were also examined. The hypothesized three-dimensional model of trust was found to be an effective means of conceptualizing and measuring trust, and although they did not provide the same breadth as the full trust measure, simplifications to the measure were found to be more than 90% accurate at predicting respondents trust level despite a 65% reduction in the number of survey items.

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*The aim of every political constitution is, or ought to be,
first to obtain for rulers men who possess most wisdom to discern,
and most virtue to pursue, the common good of the society; and in the next place,
to take the most effectual precautions for keeping them virtuous
whilst they continue to hold their public trust.*

James Madison, *Federalist Paper No. 57*

Chapter 1: Introduction

Background

The Importance of Trust

Looking back at the evolution of societies, trust has been one of the more important socio-political concepts. It has the potential to permeate nearly every aspect of culture; by gaining an understanding of trust, one gains insight into the interrelationships and dependencies that make our social and political systems function. With this understanding, cultures and communities have the potential to improve upon themselves and become more effective democracies in all their social and political endeavors.

Trust itself is difficult to define, and scholars have come to little consensus on what the term precisely means (Kramer, 1999). Even less agreement can be found on how to identify when trust exists, and how to measure it (Levi, 2000). To some extent, trust is the process by which one accepts assignment of the responsibility to work on certain tasks to other persons, groups, agencies, or institutions (Earle and Cvetkovich, 1995). A strong argument exists, though not uncontested, that we extend trust to others out of calculated self-interest, and that by trusting one another, all parties involved will mutually benefit (Hardin, 1993). Kramer (1999) suggests that “an adequate theory of organizational trust must incorporate more systematically the social and relational underpinning of trust-related choices” (p. 573). Trust has to be conceptualized both as a calculation of risks and benefits, but also more socially, toward other people as well as toward society as a whole. People and organizations tend to react directly and in kind to the amount of trust directed at them (Carnevale, 1995). Thus, if party A extends its trust to party B, B is likely to reciprocate A’s trust, and both A and B can engage in trusting relations. However, if neither party extends its

trust to the other, both A and B are likely to be mutually cautious, and probably unable to readily cooperate.

A number of sources (Hemmingway, 1999; Putnam, 2000) have suggested that current and recent modes of community involvement have led to significant declines in the level of *social capital* in recent decades. People were seen to be less civically engaged, less socially active, and despite the fact that current generations are more tolerant than previous ones, they tend to trust each other less (Putnam, 2000). Informal personal interactions have gradually been replaced with highly structured, formal interactions with others. Meaningful discourse is disappearing, and shallower relationships are becoming the norm. The structure and regulation required in most relationships introduces the inefficiencies brought about by contracts and law to keep parties honest. The healthiest of relationships, however, are built upon a foundation of mutual understanding, honesty, and trust, tend to work more fluidly than formally structured ones, and provide a necessary lubrication for the social frictions of everyday life (Putnam, 2000). The most pervading of these social building blocks is trust, which has direct implications on the economic well being of a nation and its ability to compete (Fukuyama, 1995).

Many have argued that the United States is currently experiencing a period of widespread political malaise and disengagement – due to the fact that levels of social capital and trust are astonishingly low (Putnam, 2000). One only has to look as far as Dale Bosworth, the Chief of the U. S. Forest Service, and his response to comments about the then yet-to-be enacted 2003 Healthy Forests Initiative. Bosworth claimed that the initiative was an “opportunity to build trust,” and that “maybe this legislation will give us a chance to show that [the Forest Service is] a professional organization – that we do care about the land” (Devlin, 2003c). Examples such as this have become increasingly common, and may

indicate that normal means of conflict management within the political system are not functioning properly (Miller, 1974a). A widespread lack of trust hinders relationships of all types.

When abundant, trust can exist in organizational groups ranging in size from the smallest family to the largest nation, and has the potential to fill every possible void in between. Strong relationships tend to be rooted in trust, which spontaneously forms within social groups, creating both social capital and normative reciprocity. The manner in which social associations form within groups depends upon the degree to which these associations exist within communities of shared norms and values, as well as the extent to which they can subordinate their individual interests to those of the larger group. When members of organizations decide that cooperation is in their long-term best interest, they voluntarily enter into expressed or implied contracts of participation, and in doing so, reduce the need for external intervention (Fukuyama, 1995).

In order to be able to capitalize on the benefits and efficiencies of trusting relationships and hopefully reverse some of the trends of societal distrust, it is important to understand the roles that trust plays in a productive society, how it operates, as well as its most important components. This thesis serves to do just that. It reviews the current literature on trust, drawing from multiple disciplines, and taking a broad perspective. Using this review, theories are developed about how trust operates, and its hypothesized construction is detailed. It continues and empirically examines the construction of trust and the relation of its attributes, as well as identifies trust's most predictive attributes. Discussion follows, outlining the implications and potential societal effects of these findings. The story begins, however, by examining trust's roles in interactions between people and organizations.

The Functions of Trust

Trust plays three key roles in interactions between people and organizations. For one, trust is *essential*; it holds the global social fabric together. It cannot be substituted with fear or authoritarianism, but rather has to be based on mutual faith among actors. Without faith that the outcome of a transaction will be equitable, only the foolish would likely participate. Second, trust plays the role of *truth*. When mutually trusting, parties are able to more accurately and honestly assess the extent of their relationships than if they did not trust one another. In low trust organizations, more tends to be hidden than is revealed, while in high trust organizations, all the actors' interests can be known and each party can work from the same page. Individual organizations with trust-based relationships tend to be better performing and more reality-centered than those that rely on force and intimidation, which are inherently inefficient. Third and finally, trust is requisite for *social survival*. By accepting the truth, people can open themselves up to learning and do not have reason to be defensive. In modern, working society, organizations and managers that are unable to make use of the experience, know-how, information, and intelligence of all their members, are prone to failure. It is often forgotten that organizations are, in fact, learning systems and need to be managed in a fashion that liberates rather than restrains people's knowledge (Carnevale, 1995)

Necessity of Civil Society, Cooperation, Interdependence

Putnam (2000) found that trust and community participation are strongly associated: those who actively participate in their community are commonly more trusting and trustworthy than their comparably passive neighbors. Conversely, those who trust others are more prone to community involvement. Regardless of one's opinion of which develops first, trust or civic engagement, or whether they develop simultaneously a substantive link exists

between one's inclination to trust, and one's degree of community involvement. When people are involved in communities, they have more control over the community's direction, and they build relationships with other active members, further strengthening and encouraging honest interactions.

Alternatively, in communities with low levels of civic engagement, the democratic system tends to be severely challenged. Because some of the most basic democratic tenets are participation and majority rule, a democracy cannot survive for long without the support of a plurality of its members. If communities believe they are not being fairly represented and become politically discouraged, a greatly heightened potential exists for political or social revolution (Miller, 1974). Organizations may rely upon force to control public actions and sentiment, but relying on the use of force, in place of trust, to maintain order is less efficient, more costly, and more unpleasant than relying upon mutual coercion or other less socially detrimental means (Putnam, 2000).

Towards a Productive and Economically Healthy Society

Trust plays a key role in productive and economically healthy societies. Virtually all types of economic activity require a social collaboration of one type or another. In the economic world, people support one another because they believe they are members of a community of mutual trust, albeit it is still a community heavily dependent on rules and regulations. Though basing the stability and prosperity of society on law, contract, and economic rationality is necessary, it is critical that these factors be mediated with trust, reciprocity, duty to community, and moral obligation (Fukuyama, 1995). While the former are developed through rational calculation, the latter are developed through social practice and habit.

Communities that rely upon these shared ethical values require less extensive regulation, and fewer contractual agreements or other forceful means of ensuring honesty. An existing moral consensus gives group members a basis for trusting one another (Fukuyama, 1995; Putnam, 2000). The degree of collaboration and involvement needed to create social capital and a moral community cannot be acquired through a rational investment decision. One must become habituated to the moral norms and virtues of a trusting community. However, the community itself has to adopt norms as a whole before trust can become fully generalized among its members (Fukuyama, 1995).

Social Capital

Few would disagree that people's lives are made more productive by the social ties they are able to establish and maintain. That is, they are able to get more done through the cooperation and mutual sharing of their trusting relations with others. The connectedness established between individuals, in terms of social networks and the normative reciprocity and trustworthiness that arise from them is collectively referred to as *social capital*. There is no single way to produce social capital, though it can be created by any number of possible mechanisms in part or all of a society. Regardless, social capital has the effect of helping people resolve collective problems more easily, allows communities to function with less internal friction, and makes people more aware of their interconnectedness (Putnam, 2000). Two main components of social capital can be identified: organizational capital and human capital.

Organizational capital refers to the collective knowledge people share among organizations, governments, and other individuals. *Human capital*, on the other hand, refers to the unique skills and expertise possessed by individuals (Fukuyama, 1995). The combination of organizational and human capital determines the degree to which a

community or society can collaborate and cooperate to achieve mutual benefit. Social capital differs from other forms of capital since it tends to be created and transmitted through cultural mechanisms such as religion, tradition, and historic habit. Thus, it is through active cultural mechanisms that social capital can be nurtured and allowed to grow.

Changes in a society's level of social capital can have major implications on the nature of the society itself. Societies with high levels of social capital are better able to innovate organizationally than those with low levels, since the corresponding high levels of trust permit a wider variety of social relationships to emerge. Those fraught with low levels of social capital, however, are capable of cooperation only under a system of formal rules and regulation. The most useful kind of social capital is frequently not one's ability to work under the authority of a conventional community or group, but rather one's capacity to form new relations and to cooperate within new terms of reference (Fukuyama, 1995).

Enduring Social Relationships, Social Connections, and Social Capital

The ability of individuals or organizations to associate with one another depends on the degree to which they can suspend their own interests and integrate with the norms and values of the larger community. Since shared values are requisite for trust (Fukuyama, 1995), as mutual trust thrives, so does the rest of the exchange (Robinson, Kraatz, & Rousseau, 1994). A healthy and vibrant civil society is required for the vitality of political & economic institutions (Fukuyama, 1995).

As one would expect, trust is not a black-and-white characteristic. People can not only have varying degrees of trust in different people, but they can also have varying degrees of trust in the same person to do different tasks (Blackburn, 1998). We may trust one auto mechanic over another to repair our car's transmission, but would likely trust neither auto mechanic to perform our dental work. Much the same, we may trust one National Forest fire

manager to orchestrate a controlled burn, but not another. The types of trusting relationships people get involved with can vary highly as well. People develop *thick* relationships with high degrees of trust and mutual reliance with close friends and business partners. These relations are very different from the *thin* relationships reflecting little mutual dependence, such as those developed through casual interactions with those we regularly pass in the hallway or with the familiar cashier at the grocery store. Thick trust tends to be far stronger and more stable than the weaker, more fleeting, thin trust. Despite the fact that thin trust cannot be relied upon to the same extent that thick trust can, Putnam (2000) asserts that thin trust may in fact be more important than thick trust because it extends our *radius of trust* beyond the groups of people that we know personally. However, with declining social capital and a decreased willingness to trust those we do not know well, comes the likelihood of a decreasing radius of trust and a reduced ability to count on thin trust.

Distrust

Up to this point, trust has been discussed as being a predominantly positive aspect of relationships. Normatively speaking, however, trust is neither good nor bad; neither a virtue nor a vice. Both trusting and not trusting can have benefits. *Distrust* is generally thought of to be this complement of trust, in which one either has grounds for trust or grounds for distrust. Trust and distrust exist on a continuum, each holding steady as anchors at opposite ends. Without a reason for distinction between trusting someone and distrusting them (perhaps because one just met them), it could be said that one simply has a *lack* of trust (Levi, 1998).

There are four primary reasons for people to distrust rather than trust 1) the circumstances of an established relationship have changed; 2) a party falsified their situation for individual gain; 3) the potential outcome of a situation may have changed; and/or 4) the

parties did not fully understand or express their desires, intentions, and expectations.

Distrust needs only to be based on a small portion of any of these factors whereas to be full, thick trust requires a thorough knowledge of other parties' incentives (Hardin, 2003). Thus, distrust comes much more easily than trust.

In certain situations, active distrust may, in fact, be more appropriate than trust or even a lack of trust (Levi, 1998). Trusting the malevolent or incompetent may very well prove to be foolish or harmful (Hardin, 2000). When fundamental interests conflict, as may occur between some employees and managers, or when citizens are concerned about protecting themselves from intolerant majorities or incursions of state power, there tends to be good reason for parties to be wary of each other. This wariness, or distrust, may even be a contributor to efficient organization.

Many governments are built around a foundation of distrust. The U. S. Government, for example, has produced a lasting government organized around distrust by an elaborate system of checks and balances (Kemmis, 1990; Levi, 1998), which have been incorporated into governing documents such as the Constitution, or the Administrative Procedures Act. In his *Federalist Paper* No. 51, James Madison clearly stated the reason for this organization:

“If men were angels, no government would be necessary. If angels were to govern men, neither external or internal controls on government would be necessary. In framing a government which is to be administered by men over men, the great difficulty lies in this: you must first enable the government to control the governed; and in the next place oblige it to control itself. A dependence on the people is, no doubt, the primary control on the government but experience has taught mankind the necessity of auxiliary precautions.” (p. 322)

Without trust, interaction can only occur under a system of formal rules & regulation as Madison indicates. These methods, however, are inherently inefficient, as resources must be expended in order to negotiate, litigate, and enforce them, frequently through coercive means (Fukuyama, 1995; Kramer & Tyler, 1996). Even in distrusting situations, people want

to have confidence in the outcome of relationships, so they introduce transactions which have costs like lawsuits, contracts, and arbitration to maintain their confidence. As Fukuyama (27-28) states “widespread distrust in a society, in other words, imposes a kind of tax on all forms of economic activity, a tax that high-trust societies do not have to pay.” An example of this can be found in contract negotiations between striking union employees and their employers. Because the employees do not trust employers to look after their interests, and negotiations break down, employees seek to increase the costs to employers, and force them to ensure their needs as employees are met.

Distrust is one of the major motivating forces behind land zoning and land trusts. In land zoning, parties simply do not trust one another sufficiently to follow communal norms, and the actions of one individual going against these norms can subvert the best actions and intentions of others. Land use zoning is, therefore, a regulatory approach to provide a predictable framework for use and development of land. It is a clear signal by the community of what behavior is considered acceptable and what is not. If community members consistently abided by social norms and values, who knows how much time, effort, and money could be saved by city councils, planning commissions, lawyers, and general citizens. Land trusts, on the other hand, exist because current owners of a given parcel of property cannot be confident that future owners will have the same values for the land that they do, and they generally want to ensure that the parcel remains more-or-less in its current state. They cede a portion of a parcel’s property rights, generally the right to develop or subdivide, to an independent party who guarantees to hold those rights in trust for a predetermined period of time. Doing this provides a means for current owners to ensure that the parcel is maintained according to their values.

Trust and Government

Trust in Government?

The trust that people place in individuals is notably distinct from that which they can place in government (Hardin, 1998, 1999, 2000; Putnam, 2000). Interpersonal, trusting relationships tend to be far richer and more directly reciprocal than the relationship a citizen can have with government (Hardin, 2000). In part, this is because governments are of such immense scale and have so many potential actors that can influence them, that governments cannot *specifically* be trusted, and one cannot have a truly reciprocal relationship with them¹. Distinct associations are required for trusting relations; most of the time government cannot be concerned with relationships between specific parties. There are, however, a few notable exceptions such as world leaders and international terrorists. Because individuals such as these have the power and influence to affect entire nations, in this instance, it is in government's interest to be concerned with people such as these. Thus, unless a person happens to be a world leader, international terrorist, or the like, they should not speak of specifically having "trust" in government. References to fluctuations in trust should be viewed, rather, in terms of increased or decreased *confidence* that government will perform as expected, or the extent to which the government can be considered to be trustworthy (Hardin 2000; Levi 1998). Confidence in government or in a governmental agency tends to be based upon one's generalizations of the institution's previous behavior and predictions of future actions (Hardin, 2000). The extent of confidence placed in an institution, obviously, will depend on the government or agency, and can range from absolute certitude to utter cynicism (Miller 1974a), and has broad implications on the society it governs.

¹As Hardin (1999) suggests, to say that one *should* trust government, implies that one *can* trust government. He states "typical citizens cannot be in the relevant relation to government or to the overwhelming majority government officials to be able to trust them except by mistaken inference" (23-24). Essentially, government is simply so massively large and immensely elaborate, that one cannot possibly know everything necessary to make a decision to trust government as a whole.

As mentioned previously, the U. S. Government was constructed on a foundation of low trust. According to Carnevale (1995), low trust is both the “cause and consequence of [governmental] arrangement and management practices that strangle individual achievement and institutional accomplishment” (p. 3). Because government agencies tend not to trust the judgment of individual public servants, most times individual employees cannot make even minor changes that they believe would make government perform better. Government has become excessively reliant on bureaucratic organizational arrangements. In this typically hierarchical organization, roles are defined narrowly to maximize control, with ends frequently subordinate to means (Carnevale, 1995). Because of this, employees are constrained to specific roles, and non-traditional forms of problem solving are discouraged. Hierarchies, however, are necessary because not all people can be consistently trusted to behave according to normative ethics and contribute their fair share to an institution (Fukuyama, 1995).

Government, occasionally, is central to establishing levels of trust among citizens that would otherwise not be possible. Government can make possible a broad range of social, political, and economic transactions that are otherwise difficult to create. Critical to doing so is its use of coercion, rightly understood and used. Moreover, some reasons exist to believe that democratic institutions may be even better at producing generalized trust than non-democratic institutions, in part because they are better at restricting the use of coercion to tasks that enhance trust rather than to those that undermine it. Democratic institutions are more likely to encourage social programs or economic benefits that help build trust than non-democratic ones. Depending, however, on the nature and personnel of government agencies, agencies may sometimes be responsible for the destruction of interpersonal trust, either directly or by destroying the institutions that support it (Levi, 1998). Trust in the

institution has additional consequence for governance: not only does it affect the level of the public's tolerance of the administration, but it also affects the extent to which the public is willing to comply with governmental demands and regulations. Destruction of trust in government may lead to widespread antagonism toward policy and even active resistance, and may be one source of increased social distrust (Levi, 1998).

When feelings of powerlessness and normlessness accompany hostility toward political and social leaders, the institutions of government, and the administration as a whole, simply replacing the administrators of questionable systems will have little, if any, effect on restoring confidence in government or the political system (Miller, 1974a). To reduce or eliminate the trust-destroying components of government bureaucracy, government needs to be made more flexible and adaptable to change in order to increase levels of trust and social capital. However, the ability of institutions to move from large hierarchies to smaller, more flexible networks is dependent upon the degree of trust and social capital already present in broader society (Fukuyama 1995). This catch-22 makes increasing confidence in government difficult, but not impossible. Small, incremental changes over a long period of time must be made to have an effect on trust. Further complicating this notion is the fact that in order for trust to be built, citizens must have faith in the competence of government to build this trust (Levi, 1998). Simply restoring trust in authorities does not guarantee that conflicts with government will be resolved (Tyler & DeGoey, 1995). Not only must government behave trustworthily, society as a whole must as well (Levi, 1998). Government cannot be expected to extend their trust to society as a whole if society is not deserving of that trust. Without reciprocal trust like this, little progress can be made towards resolving societal and governmental tensions.

In order to help build this trust, sacrifices have to be made both by governments and the public. Current bureaucratic organization does not typically permit sacrifice and adaptability, as these, if used maliciously, could potentially allow Federal goals to be usurped by individual ones. New mechanisms are needed to encourage non-traditional problem solving, and help ensure that both the means and ends of governmental actions are appropriate and do not stifle trust, while ensuring they are not misused.

Previous Studies of Trust in Natural Resource Management

Focus on relationships

In the management of public resources, a number of researchers (Borrie, Christensen, Watson, Miller, & McCollum, 2002; Borrie & Watson, 2003; McCool & Guthrie, 2001; Shindler & Aldred-Cheek, 1999) have suggested that in order to increase the public acceptability of management actions, federal agencies need to focus on improving and maintaining the relationships that exist between agencies and the public. The desire for relationship-oriented management goes far beyond the whims of researchers. Dale Bosworth, chief of the U.S. Forest Service, commented that he would sincerely like “the Forest Service to be a highly respected, highly valued, trustworthy organization,” and that “the Forest Service needs to rebuild relationships both inside and outside of the agency” (Devlin, 2001). The ends-based agency management of years past has been an impediment to effective resource management, as well as to the accomplishment of agency goals and mandates. Lachapelle, McCool, and Patterson (2003) identified a lack of trust as a primary barrier to the creation of effective natural resource management plans. They contend that participants need to have trust in the process used to create the management plan, as well as

in the people who help to create it. Natural resource management “plans are a type of social contract between governments and those affected by government decisions” (p. 486). This suggests that any violation of that social contract—that trust—will have direct implications on the level of trust between the public and managers. In a later work, the authors consider the concept of “ownership” in natural resource planning, and suggest that in order to be more effective managing natural resources, agencies and the public have to “collectively define, share, and address problem situations with an implicit redistribution of power” (Lachapelle & McCool, 2005, 283). They suggest that by ensuring that all those involved with or affected by an action have ownership in its process, outcome, and distribution, natural resource disputes can be more easily resolved.

A good deal of research has gone into studying trust in public resource management. Obviously, the arena where trust is of greatest concern is not in the implementation of non-controversial management decisions, but rather on those related to divisive, contentious issues. These issues include the funding of public land management (Borrie et al., 2002; P. L. Winter, Palucki and Burkhardt, 1999), endangered species (Cvetkovich & P. L. Winter, 2003), planning (Beierle, & Konisky, 2000; Lachapelle & McCool, 2005; Lachapelle, McCool, and Patterson, 2003; Stein & Harper, 2003), and forest fire and fuels management (Bright, Vaske, Kneeshaw, & Absher, 2002; Shindler, 1997; Shindler, Brunson, & Stankey, 2002; Shindler & Reed, 1996; Shindler & Toman, 2003; United States Forest Service, 2002; Vogt, G. Winter, and Fried, 2002, G. Winter, Vogt, & McCaffrey, 2004; G. J. Winter, Vogt, & Fried, 2002; P. L. Winter, 2002; P. L. Winter & Cvetkovich, 2003). Trust has been noted to be an important component contributing to the acceptance or effective implementation of natural resource management decisions in all these contentious issues.

A Look at Public Trust in the Management of Forest Fuels and Fires

As suggested by the copious list of recent references related to fire management, the social impact of fire and fuels management caught the attention of researchers and agency officials. But fire and fuels management has also been drawn into the perceptual view-shed of the American public and Federal legislators, with numerous high profile, catastrophic wildfires recently occurring in the Western United States. A recent piece of Federal legislation, the Healthy Forests Restoration Act of 2003, was enacted in an attempt to reduce the impact of these catastrophic fires through the reduction of excess forest fuels (USDA/USDOJ, 2003). While the act is supported by Federal agencies and many members of the timber industry, others, including environmental groups, oppose the act because they believe the Forest Service has not been completely honest about their intentions over the use of the act, and view it as a thinly veiled attempt to increase timber harvests on public lands. One group believes that by implementing the act, the Forest Service has “hijack[ed] important concepts like fuels reduction to disguise traditional timber sales” (Trachtman, 2003). Members of environmental groups believe that the Forest Service has reneged on its promises to perform certain actions so many times, and on so many accounts, that it can no longer be trusted (Devlin, 2003a). Western politics have long been fraught with distrust (Kemmis, 1990), and members of the Forest Service seem to be well aware of the effect that their actions, as well as those of timber companies, have on public perception. One Forest Service manager commented that she believes “people lost trust because of past actions by the Forest Service and the [timber] industry. We just didn’t do things right all the time, and we lost credibility as professionals” (Jamison, 2004, A1). Members of the conservation movement contend that “the public wants to be able to trust the [Forest Service]. But if the agency can’t prove they are doing the right thing, then I think the public is willing to have

the courts step in” (Devlin, 2003b). Not until the Forest Service is managed with a high degree of professionalism, founded on credible forest policy, some believe, will they “be able to move past this era of forest management designed by lawsuits” (“It’s Hard to Trust”, 2004).

Not all agree with these statements, however. As noted earlier in this thesis, shortly before the Healthy Forests Restoration Act was implemented, Forest Service Chief Dale Bosworth, commented that implementing the Act provided an “opportunity to build trust” with an ever-skeptical public and that “maybe this legislation will give us a chance to show that we are a professional organization—that we do care about the land” (Devlin, 2003c). Judging by the number of lawsuits filed, and the negative attitudes reported in the press, Bosworth’s ideals have apparently not yet fully come to fruition.

Numerous studies (for example: Cvetkovich and P. L. Winter, 2001; Shindler and Toman, 2003; G. Winter, Vogt, and Fried, 2002; G. Winter, Vogt, and McCaffrey, 2004; P. L. Winter and Cvetkovich, 2003) have acknowledged how crucial trusting relationships between citizens and Federal agencies are to the successful implementation and acceptability of large-scale fire and fuel management projects. The level of the public’s trust in agencies has an effect on their perceptions and support of fire management actions, which has implications for the successful implementation of future fire management. In addition, the level of public trust also has implications for any communication and collaboration between agencies and the public that may occur in the future.

For the most part, the research that has been conducted (for example: Shindler and colleagues, and G. Winter and colleagues) have taken only cursory glances at trust in fire and fuels management, simply asking whether a party trusts an agency’s fire or fuels management. Other research, by P. L. Winter and colleagues, Borrie et al. (2002), as well as

by Bright et al. (2002) goes beyond the scope of other studies and used items they believed to be proxies of trust to measure it. The work of P. L. Winter and colleagues, and Borrie et al. (2002) is based upon the *Salient Values Similarity* (SVS) model presented by Earle and Cvetkovich (1995), in which the authors presume trust to be a function of the norms and values the public shares with managing agencies. Bright et al. (2002), on the other hand presume trust to be a function of an agency's competence and effectiveness at accomplishing certain actions. As will be shown later, this thesis takes a more holistic approach to understanding trust.

Impetus for Study

Following the severe forest fires in Western Montana in 2000, the Bitterroot National Forest commissioned a social survey to help gain a representative understanding of how residents of Ravalli County, Montana viewed the Bitterroot National Forest, and how they preferred it to be managed (Bureau of Business and Economic Research [BBER], 2001). One proposition that arose from responses to the survey was that some Bitterroot residents had a lack of trust of the U. S. Forest Service. It was not clear how pervasive this lack of trust was, nor whether it was limited in scope to: the agency's management of fire, a general lack of trust in the U. S. Forest Service, to lack of trust in specific Bitterroot National Forest management actions, including fire response, or some other factor. Additionally, a thorough empirical analysis of trust had not been conducted in the context of public resource management, and few are known to exist in the mainstream trust literature, and even those are limited in scope (for example: Poortinga & Pidgeon, 2003; Siegrist, Cvetkovich, & Roth, 2000).

In order to gain insight into the causes and consequences of a lack of trust, as well as to gain a more thorough understanding of the extent of Ravalli County residents' trust in the Bitterroot National Forest, a subsequent study was initiated, and provides the foundation for this thesis (see Liljeblad, Borrie, & Watson, 2005). Both that U.S. Forest Service study and this thesis are based on the same data set, but the methods, results, and discussion are distinctly different. The Forest Service report includes simple descriptive statistics of the survey items as responded to by Ravalli County residents, as well and some preliminary analysis of the data suggesting trends in respondent's answers to the survey items. Simply, it contains information about respondent's attitudes about fire and fuels management on the Bitterroot National Forest. This thesis, however, takes a broader view and uses the same data get a better understanding about the idea of trust in the context of natural resource management. To begin understanding trust, first, one needs to know what it is.

Definitions of Trust

To say that one trusts something, or that one has trust in an entity, says little of the nature of the relationship between the individual and whomever they happen to be trusting. Because the meaning of trust can be so varied, and may in fact be context specific, it is nearly impossible to develop a single definition (Kramer, 1999; Levi, 1998). Instead, I propose several dimensions that may or may not exist in trusting relationships. The strength of these dimensions indicates not only one's degree of trust, but the presence or absence of each dimensions' components also provides more specific indicators of changes in relationships that affect trust.

Specific definitions of trust will be introduced shortly, but in general most authorities acknowledge trust to be a complex (or even multiplex) phenomenon vastly open to

interpretation (for example: Ganesan and Hess, 1997; Kramer, 1999; Levi, 2000; Rousseau, Sitkin, Burt, and Camerer, 1998). One-dimensional portraits of trust, such as the SVS model offered by Earle and Cvetkovich (1995), may be overly simplistic, and not able to effectively represent the complexity of trust as an attitude. Moreover, the more complex the objectives for measuring trust are, the less fitting a uni-dimensional approach will be, because it is likely unable to effectively account for trust's intricacies and it will tend to yield little insight or feedback on the internal dynamics of trust. The expanded palette of attitudes that comes with viewing trust multi-dimensionally (for example: Ganesan and Hess, 1997; Johnson, 1999; Rousseau, et al., 1998), I believe, gives a more valid and reliable portrayal of trust.

As noted earlier, in general, trust is the process by which one accepts the assignment of responsibility to work on certain tasks to other persons, groups, agencies, or institutions (Earle & Cvetkovich, 1995). With the use of a modifier, one can clarify the scope of what is "trust" means. Suddenly what was simply "trust" is refined to refer to political trust, social trust, interpersonal trust, organizational trust, one of seemingly innumerable specific types of trust, or even trust at its broadest scale: generalized trust. Classifying trust in this manner however, sets the context for a relationship, rather than defining it. I propose that there are three dimensions of trust, each with a series of components that are present in varying degrees in every trusting relationship. The three dimensions are shared norms and values, willingness to endorse, and perceived efficacy.

Shared Norms and Values

Francis Fukuyama, one of the best known commentators on trust, claims that "trust is the expectation that arises within a community of regular, honest, and cooperative behavior, based on *commonly shared norms*, on the part of other members of that community" (p. 26) [emphasis added]. He contends that common norms can refer to complex value

questions, such as “the nature of God or justice,” but that norms can also include more tangible ones such as professional standards, ethics, or codes of behavior (1995).

The extent to which communities that have shared norms and values and are able to place those shared goals above individual ones, is heavily mediated by the extent to which its members can relate to others. The establishment of formal contracts and choosing to act within one’s self interest are important ways of *cautiously* relating to others. However, an agreed upon moral standard gives members of the group a basis for mutual trust, negating the need for extensive contractual and legal regulation (Fukuyama, 1995). In essence, when we trust one another and have a shared ethic, we can operate outside of the arena of formal rules and regulations; we trust that other parties will not act maliciously. This provides escape from regulatory oversight, accounting and control, and leads to greater flexibility, responsiveness and efficiency of action. Thus, to benefit from these efficiencies, individuals and organizations may tend to invest a good deal of resources into building and strengthening trusting relationships, as they are very easy to destroy, but quite difficult to construct (Levi, 1998). Based on a review of mainstream social science and trust literature, Box 1 shows the six dominant attributes extracted from or identified in trust literature for the shared norms and values dimension. Key Terms and phrases for each dimension are underlined.

Box 1: Attributes for Shared Norms and Values:

- ❖ *Integrity* (Citrin and Muste, 1999): Implies that people and organizations conduct themselves with honesty, morality, good character, and honor. Any and all of their actions are conducted in this manner
- ❖ *Worthy of Pride* (Citrin and Muste, 1999): Implies that people and organizations conduct themselves in a manner that is respectful and highly regarded. It refers to the type of pride that one would have in the accomplishments of their child, partner, or close friend.
- ❖ *Compassionate and Understanding* (Citrin and Muste, 1999): People or organizations are sympathetic and concerned with the welfare of others. Their actions reflect and exemplify it. Especially in threatening situations, behaving with compassion and understanding can be crucial, as it shows concern for others' well being.
- ❖ *Agreement* (Institute for Social Research, 1999): A belief that parties have parallel objectives which can be implemented through normatively appropriate means. It implies that people or organizations are oriented in corresponding directions and are fully aware of it.
- ❖ *Procedural Justice* (Mason, House, and Martin, 1985): A fair, equitable process developed through legitimate means. It implies that relations with all people or organizations will be consistent, just, and impartial.
- ❖ *Responsiveness* (Citrin and Muste, 1999): Receptiveness and ability to adapt to meet changing needs and circumstances. As situations change, parties will change along with them, ensuring to the best extent practicable that everyone's needs are met.

Willingness to Endorse

One common component of most any conception of trust is that people voluntarily trust others only if they feel the other party is worthy of being trusted. That is, people are likely to trust others only to the extent that they believe their interests will be respected, that other parties will act in a trustworthy manner, and they can be confident that their trust will be reciprocated by those involved. Collectively, these three factors are part of *willingness to*

endorse, the hypothesized second dimension of trust. Willingness to endorse refers to a citizen's decision to voluntarily comply with demands from individuals or organizations *only* if they perceive the other parties to be trustworthy and are satisfied that other citizens are acting reciprocally. Because they have confidence in the range of potential actions or outcomes, know that their voice will be acknowledged, and that others are behaving in a manner deserving of trust, people are more willing to endorse the actions of others. Box 2 shows the three dominant attributes extracted from or identified in trust literature in the willingness to endorse dimension.

Box 2: Attributes for Willingness to Endorse

- ❖ *Trustworthy behavior* (Citrin and Muste, 1999): Conducting one's self in a manner that warrants the trust of others. Implies that people have a reason to trust, rather than relying upon blind faith.
- ❖ *Political Inclusion* (Mason et al., 1985): Having a say or role in relevant decision-making processes in an arena where one's interests are valued. This means that the needs of people or organizations are heard and acknowledged. It does not necessarily imply that their needs are met—only recognized
- ❖ *Confidence* (Institute for Social Research, 1999): Being able to act with faith, certainty, or assurance, because one “knows” that a certain outcome or range of outcomes can be expected.

Perceived Efficacy

The third hypothesized dimension of trust is perceived efficacy, or what people believe they know about how others will act, as well as other's capacity to act. Trust begins to form among parties when each acts in a manner the other expects (Fukuyama, 1995). Expectations are inherently perceptual and are derived from implicit or explicit promises of future exchange or reciprocity among parties (Blackburn, 1998). Each party in a relationship possesses his or her own understanding of the mutual obligations that define a relationship. Based on that expectation, parties begin to rely upon others to behave in a particular

manner. In doing so, they tend to rely upon other people to do certain things, but not to do others. Unless circumstances have recently changed, parties expect others to do what they've always done. Box 3 shows the attributes extracted from or identified in trust literature for the perceived efficacy dimension.

Box 3: Attributes for Perceived Efficacy

- ❖ *Competence* (Miller, 1974): The ability of people or organizations to effectively implement their skills, knowledge, or expertise in a given arena. It implies that they have the wherewithal to get something done right the first time.
- ❖ *Reliability* (Fukuyama, 1995): The extent to which a party can be counted upon to perform a given function, or behave in a certain manner. People or organizations do not behave in unexpected or inconsistent manners
- ❖ *Previous Experience* (Fukuyama, 1995): Earlier interactions parties have with others that color their attitudes of consistency and familiarity. It can be based on interactions that people or organizations have had in similar circumstances, or with similar parties.
- ❖ *Effectiveness* (Citrin and Muste, 1999): The ability of people or organizations to successfully accomplish goals and have an impact on a given object. It implies they are able to do what they intended to do.
- ❖ *Uncertainty* (Mason et al., 1985): The grades of knowability associated with engaging in a relationship with certain parties or performing certain actions. The greater the uncertainty involved in a relationship, the more hesitant people may be to trust.

Attributes of Trust

The 14 attributes identified across the three hypothesized dimensions of trust are believed to be contributors to a person's trust in other people or in organizations. That is to say, the attributes help define the reasons people trust or distrust others. They are not requisite for trust, but rather, they reflect the different motivations people have for trusting.

An example is in order to better illustrate this. Much as private property rights are frequently thought of as a “bundle of sticks,” trust can as well. In private property rights, each stick in this metaphorical bundle represents a specific property right, such as the right to exclude others, the right to sell the property, or surface rights, among others. Each stick contributes to one’s overall private property rights, but no stick specifically defines the bundle. Like these property rights, trust can also be viewed as a bundle of sticks, with each of the 14 attributes representing a stick. Not all 14 sticks are required to make this bundle called “trust,” but a number of sticks must be present in order physically have a bundle. Most would agree that one stick does not a bundle make, and two likely also cannot form a bundle. But what about three sticks? Or five? Or eight? How many are really needed to form a bundle? The exact answer is nebulous, both in property rights and in trust.

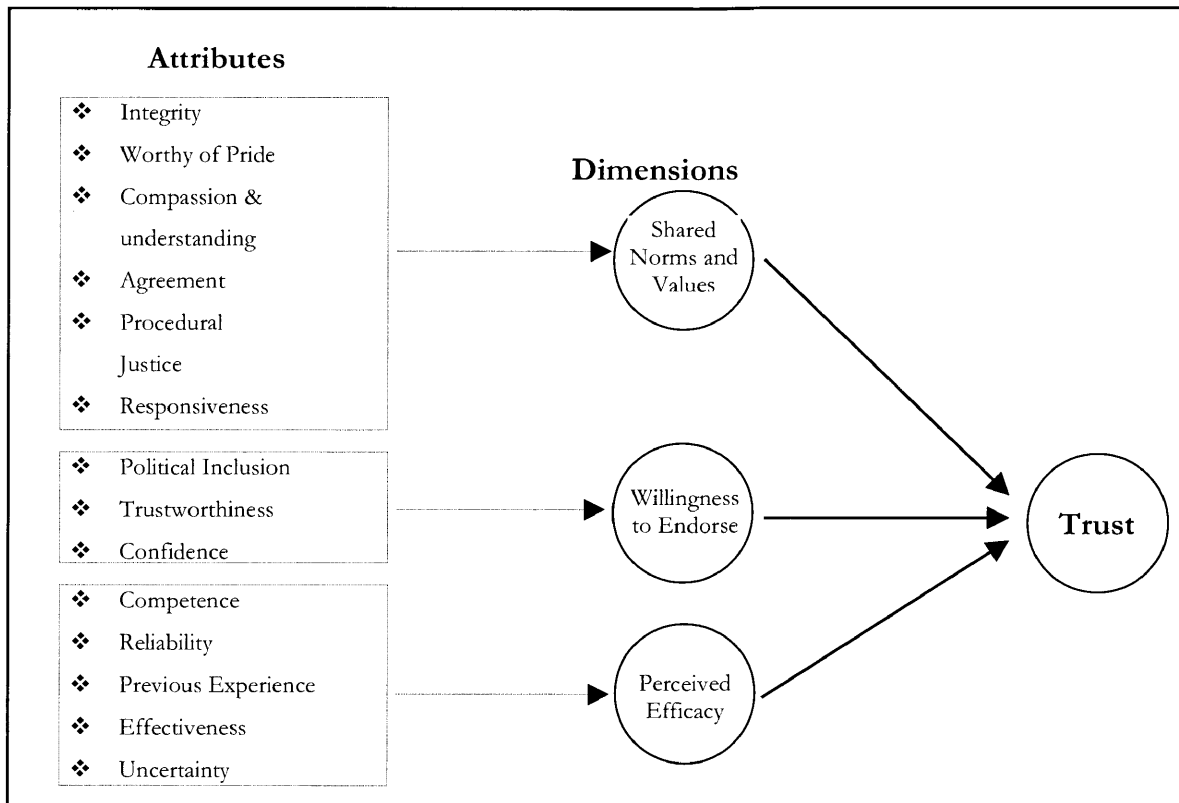
Regardless of the specific number of sticks needed to form a bundle, attributes from each dimension of trust are likely necessary to form a cohesive bundle. One may be able to get by with the “competence” stick from the Perceived Efficacy dimension, if one has an “effectiveness” stick from the same dimension, but neither could likely serve in place of the “compassion and understanding” or “procedural justice” sticks from the Shared Norms and Values dimension. That is to say, the three dimensions of trust need to be represented if a full view of trust is desired.

Summary

Despite the acknowledged variability in defining trust, I hypothesize that it is composed of three common elements: First, trust is built upon a series of shared norms and values, which provide a general basis for people and organizations to be able to trust one another. Second, people and organizations trust one another when they can be certain that the other parties are acting on their behalf, and they can expect trustworthy, reciprocal

behavior from the others. Third, parties can be expected to behave as they have in previous encounters and, given a choice, people and organizations will trust those they can rely upon and with whom they have had previous positive experiences. Collectively, the attributes in each dimension contribute to trust, and each dimension need to be represented if a complete understanding of trust is desired. The following figure [Figure 1] shows a hypothesized causal diagram of trust. Each group of components on the left contributes to one of the three trust dimensions, which in turn contribute to an individual or group's level of trust.

Figure 1: Hypothesized Causal Diagram of Trust



Project Justification

As Federal agencies become more cognizant of the importance of collaboration through all stages of resource management decision making, public trust is likely to become a long-term indicator of success of the agency's ability to protect or restore relationships between the public and public lands (Machlis, Kaplan, Tuler, Bagby, and McKendry, 2002). This project uses a community-wide assessment of public trust in the Forest Service's ability to make fire and fuel treatment management decisions that consider local values in meeting public purpose mandates of public lands. While the management of most any natural resource tends to be contentious on its face, fire and fuels management adds an increased potential for conflict. While timber sales may have aesthetic, ecological, and economic impacts, depending on how it is applied, fire management can not only have the same impacts, but directly threaten the lives and livelihood of entire communities if a fire gets out of hand or burns where it was not intended to. This makes fire and fuels management an excellent context in which to study trust. This analysis of trust can serve as the foundation to measure success of a long-term, landscape-level ecosystem management project that assesses and maps meanings attached to the landscape, models long-term effects of fire on the landscape, and collaborates with local citizens and conservation groups to manage fuel hazards in the Bitterroot Valley. The findings from this project can provide input to collaborative planning direction for other fuel management programs specifically and Federal agency management generally, across the United States.

Objectives

In order to have an impact on how public resource managers measure trust, this study has four objectives:

- Create a comprehensive model for the measurement of the public's trust in a federal resource management agency, within the context of a specific issue;
- Describe and empirically examine the dimensionalization of trust;
- Investigate the dimensionality of trust as a latent variable, and test the fit of the proposed causal model to describe it;
- Propose and empirically examine simplification of the comprehensive trust measure.

Using a review of current trust literature, a comprehensive model for measuring trust in fire and fuels management of the Bitterroot National Forest was constructed and implemented as a survey of Ravalli County, Montana residents. The dimensionalization of trust was examined, seeking to determine how reliable it was, and whether the dimensions could be analytically separated into different factors. Market segmentation was then used to determine if survey respondents could be separated into different levels of trust. Using structural equation modeling, the proposed dimensionalization of trust was examined, with inquiry into the importance of separating trust into different dimensions. The relative importance of trust's contributing attributes was examined and a simplified measure of trust was created. Additionally, an alternative model of trust was compared to the hypothesized model, and their measurement effectiveness was compared.

Chapter 2: Methods

Measurement of Trust

All forms of trust exist in relation to specific objects, and people respond differently to different forms of trust in different circumstances. Focusing on the relationships of trust that exist between government and communities, *political trust* is a complex phenomenon, and as such, its type and measurement have been greatly debated. Political trust is not an entity unto itself, but rather is a reflection of one's support for a given politician, political group, process or institution. In order to fully reflect these attitudes toward government, the reasons for trusting must also be identified (Citrin and Muste, 1999). However, little consensus exists about crucial conceptual issues such as what political trust means specifically (Kramer, 1999; Levi, 1998), or what attributes are most important (Citrin & Muste, 1999). Because of this conceptual divergence, innumerable methods exist for measuring trust in government, each framed in different ways (Ulbig & Alford, 2001; Citrin & Muste, 1999). Nonetheless, in order to develop our understanding of the sources and implications of political trust, an accurate method must be chosen to measure it.

Though it is frequently done, to get a thorough understanding of trust, more is required than simply to ask whether citizens agree or disagree with government actions, or a few questions targeting trust in a specific agency (see: Davis, 1978; Earle & Cvetkovich, 1998; Miller, 1974; P. L. Winter, Palucki, & Burkhardt, 1999). Trust is a multidimensional phenomenon (Ganesan & Hess, 1997; Johnson, 1999; Rousseau, Sitkin, Burt, and Camerer, 1998), and should be measured as such. In light of trust's multi-dimensionality, attempting to measure trust without a thorough understanding of its complexity provides a number of

implications on the validity of trust measures. Four potential limitations exist on measuring trust using a single dimension. First, trust may not be cognitively accessible directly by survey respondents. Second, it may be impossible to condense all the attitudes of trust into a single response. Third, some survey questions about trust are open to strategic responding. Finally, a uni-dimensional measure of trust may provide insufficient content validity. Therefore, it may not in fact be possible to validly and precisely measure trust directly. Rather, it is possible to measure trust indirectly by measuring the contributors to each dimension. Much as multiple attributes should be used to measure intelligence, through tests such as the Intelligence Quotient (IQ) test, multiple attributes should also be used to measure trust. Because the components of both trust and intelligence are more tangible than the phenomena themselves, they can be measured in an easier manner. By identifying the most relevant components, an accurate measure of complex phenomena such as these can be made (Citrin and Muste, 1999). This study measures trust by quantifying the attributes of trust via a survey.

Another potential issue regarding the measurement of trust is whether conducting a public survey of trust levels will have an effect on the public's trust levels. Upon completion of a survey, a respondent may believe that because trust is being measured in depth, that an agency or organization is seeking to determine trust levels and potentially seek to help improve them by changing their resource management techniques. In itself, this could have a positive short-term affect on trust, because it reflects that the organization is concerned with not only how they operate, but also how their actions are perceived. However, in the long-term, this one-time measure could be a detriment to trust if the organization's management does not change because the trust that people granted the agency when they first responded

to the survey would have been violated because nothing that they thought might be done was actually implemented.

Trust Measures

In the constructed survey, questions from previous trust studies (Davis, 1978; Greenberg and Williams, 1999; Institute for Social Research, 1999; Muller and Jukam, 1977; Mason, House, and Martin, 1985; Miller, 1974; Smith, 1981; Selnes, and Sallis, 2003) were matched with previously identified attributes in each trust dimension, and were adapted to the context of fire and fuel management in the Bitterroot National Forest. When survey items were not available from these sources, new survey items were proposed, to ensure all theorized attributes were included, and are labeled as such in Boxes 1-3. Items were also included to measure residents' opinions of general management of the Bitterroot National Forest. On a larger scale, looking at the U. S. Forest Service in general, the Salient Values Similarity trust model developed by Earle and Cvetkovich (1995), modified by P. L. Winter et al. (1999) and Borrie et al. (2002), was also included. All questions are shown in Boxes 4 a-c and 5 b. The entire survey instrument is attached as an appendix. Early work by Cvetkovich, P.L. Winter, and colleagues (Earle and Cvetkovich, 1995; P. L. Winter, Palucki & Burkhardt, 1999) used a single trust question in addition to a five-item Salient Values Similarity (SVS) scale. This SVS scale evaluates the perceived concordance of values, direction, goals, views, actions, and thoughts that respondents have with the U. S. Forest Service, and uses those five items, combined to with a single item directly asking about trust, as trust scale. Their later work, however (Cvetkovich & P. L. Winter, 2003; Cvetkovich, & P. L. Winter, 2004; P. L. Winter, 2002; P. L. Winter & Cvetkovich, 2003), reduces the scale to a single trust item, plus three items evaluating concordance of respondent's values, goals and

views with those of the Forest Service. The scale reduction occurred because of high inter-item correlations in the five-item scale. Responses were sufficiently similar among the scale that two items could be removed (P. L. Winter, Personal Communication, 4/13/05). A scale similar to the five-item SVS scale, and excluding the single trust question, as presented by Borrie et al. (2002), was used in this study.

Box 4a: Survey Items for Shared Norms and Values

[Integrity] *When managers of the Bitterroot National Forest speak on television, radio, in newspapers, or at public meetings about forest fires, how often, if at all, do they tell the truth?* (Muller and Jukam, 1977)
Always (4) to Never (1)

[Worthy of Pride] *Would you say that you are proud of the way fire is managed on the Bitterroot National Forest, or that you can't find too many things about the fire management to be proud of?* (Mason, House, and Martin, 1985)
Proud of fire management (1); Can't find too many things to be proud of (0)

[Compassion & Understanding] *I believe the Bitterroot National Forest staff demonstrates a general attitude of compassion when fighting fires.* (Selnes, and Sallis, 2003)
Strongly agree (4) to Strongly disagree (1)

[Agreement] *Generally speaking how satisfied are you, if at all, with the way the Bitterroot National Forest staff deals with fires?* (Institute for Social Research, 1999)
Very satisfied (4) to Very dissatisfied (1)

[Agreement] *Generally speaking how satisfied are you, if at all, with the way the Bitterroot National Forest staff deals with forest fuels?* (Institute for Social Research, 1999)
Very satisfied (4) to Very dissatisfied (1)

[Procedural Justice] *How often, if at all, do you think fires on the Bitterroot National Forest are managed according to a fair process?* (Created)
Always (4) to Never (1)

[Responsiveness] *Managers on the Bitterroot National Forest respond to the needs of local residents when fighting fires.* (Selnes, and Sallis, 2003)
Strongly agree (4) to Strongly disagree (1)

[Shared Norms and Values] *To what extent, if at all, does the Bitterroot National Forest share your values about fire management?* (Earle and Cvetkovich, 1995)
Completely (5) to Not at all (1)

Box 4b: Survey Items for Perceived Efficacy

- [Competence]** *Based on your observations and experiences what portion, if any, of the people who manage forest fires in the Bitterroot National Forest know what they are doing?* (Miller, 1974)
All (4) to None (1)
- [Reliability]** *I find the Bitterroot National Forest staff to be reliable when managing fires.* (Muller and Jukam, 1977)
Strongly agree (4) to Strongly disagree (1)
- [Reliability]** *I find the Bitterroot National Forest staff to be reliable when managing forest fuels.* (Muller and Jukam, 1977)
Strongly agree (4) to Strongly disagree (1)
- [Previous Experience]** *In the past how pleased, if at all, have you been with the way fires in the Bitterroot National Forest were managed?* (Created)
Very pleased (4) to Very displeased (1)
- [Effectiveness]** *In your community, how would you rate the effectiveness of Bitterroot National Forest fire managers in dealing with fire-related issues?* (Created)
Excellent (4) to Poor (1)
- [Effectiveness]** *When fighting fires, do you think that the Bitterroot National Forest staff generally:* (Miller, 1974)
Wastes a lot of the money (3); Wastes some money (2); Doesn't waste very much money (1)
- [Uncertainty]** *How sure, if at all, have you felt that forest fires threatening your community or your property would be put out in time?* (Created)
Very sure (4) to Very unsure (1)
- [Uncertainty]** *To what extent, if at all, do you agree or disagree with the following statement: Science can settle differences of opinion about the risks and benefits from forest fires?* (Greenberg and Williams, 1999)
Strongly agree (4) to Strongly disagree (1)

Box 4c: Survey Items for Willingness to Endorse

- [Political Inclusion]** *How much attention, if any, have Bitterroot National Forest managers paid to what people think when managers decide what to do about forest fires?* (Mason, House, and Martin, 1985)
A good deal of attention (3) to Not much attention (1)
- [Trustworthy]** *Residents of the Bitterroot Valley say that the Bitterroot National Forest staff is trustworthy when fighting fires.* (Selnes, and Sallis, 2003)
Strongly agree (4) to Strongly disagree (1)
- [Confidence]** *How much, if any, confidence do you have in wildland fire fighters in general? Do you have?* (Smith, 1981)
Complete confidence (4) to No confidence at all (1)
- [Confidence]** *What about fire managers in the Bitterroot National Forest? Do you have?* (Smith, 1981)
Complete confidence (4) to No confidence at all (1)
- [Willingness to endorse]** *Considering that the Bitterroot National Forest is managed on behalf of everyone, how satisfied are you, if at all, with fire management in the Bitterroot National Forest?* (Institute for Social Research, 1999)
Very satisfied (4) to Very dissatisfied (1)

Box 5: Survey Items for USFS general management

General Management of the U. S. Forest Service

The USDA Forest Service supports my views.

Supports my views (5) Opposes my views (1)
(Earle & Cvetkovich, 1995)

The USDA Forest Service has similar goals to mine.

Has similar goals to mine (5) Has different goals than mine (1)
(Earle & Cvetkovich, 1995)

The USDA Forest Service thinks like me.

Thinks like me (5) Does not think like me (1)
(Earle & Cvetkovich, 1995)

The USDA Forest Service shares my values.

Shares my values (5) Does not share my values (1)
(Earle & Cvetkovich, 1995)

The USDA Forest Service is like me.

Is like me (5) Is not like me (1)
(Borrie et al. 2002)

Citrin and Muste (1999) identified several methodological guidelines for the evaluation of existing trust scales and the construction of new ones. These guidelines were followed when designing the survey instrument, as well as when creating new survey items.

- Specify the attitude object (agency, institution, leader, etc.) as clearly as possible;
- Evaluate the attitude object according to appropriate normative standards;
- Incorporate items referring to competing systems of governance when measuring support of a given regime;
- Use a multi-format approach when constructing items to minimize the influence of response sets inherent in yes-no formats;
- Test predictions across a broad range of political theories including attitude-behavior reactions to strengthen evidence of validity.

In addition, Bianco (2000) theorized that survey responses may be colored by previous statements about the trustworthiness of elected officials, and believed the specific context of trust survey questions to be important. To prevent this, question ordering must also be examined prior to survey implementation. Citrin and Muste (1999) also suggested

that test-retest data be collected to ensure that enduring attitudes are reflected, rather than fleeting emotional responses.

To do this, the object in each question was specified as clearly as possible, ensuring it fit the intended context, the government agency, or portion of government agency was clearly stated, questions were asked in multiple formats, across multiple attitudes. Additionally, before final sampling, the influence of question ordering was examined, and sections of the survey were re-ordered to limit order effect. Because of the monetary and temporal restraints of this study, it was not possible to collect test-retest data

Sample Area

The sample population was defined as all households with a functional telephone in Ravalli County, Montana, encompassing the regions around and towns of Stevensville, Hamilton, Victor, Darby, Sula, and Alta. 2000 US Census data indicates approximately 14,289 people live in the county subdivisions encompassing these towns. A map of the region is shown in figure 2.

Sample Methodology

A telephone survey of Ravalli County (Figure 2), Montana residents was administered in May - June, 2004 by the University of Montana's Bureau of Business and Economic Research (BBER) using a random-digit dial process. A Kish table was used to randomly select respondents within households (Kish, 1949). Previous application of this method on a multi-state project yielded a 52.4% response rate (Borrie et al., 2002), though application of this method in the Bitterroot Valley post-fire assessment previously yielded an 87% response rate (BBER, 2001). Community residents have shown sincere interest in fire

Figure2: Study Area Location Map

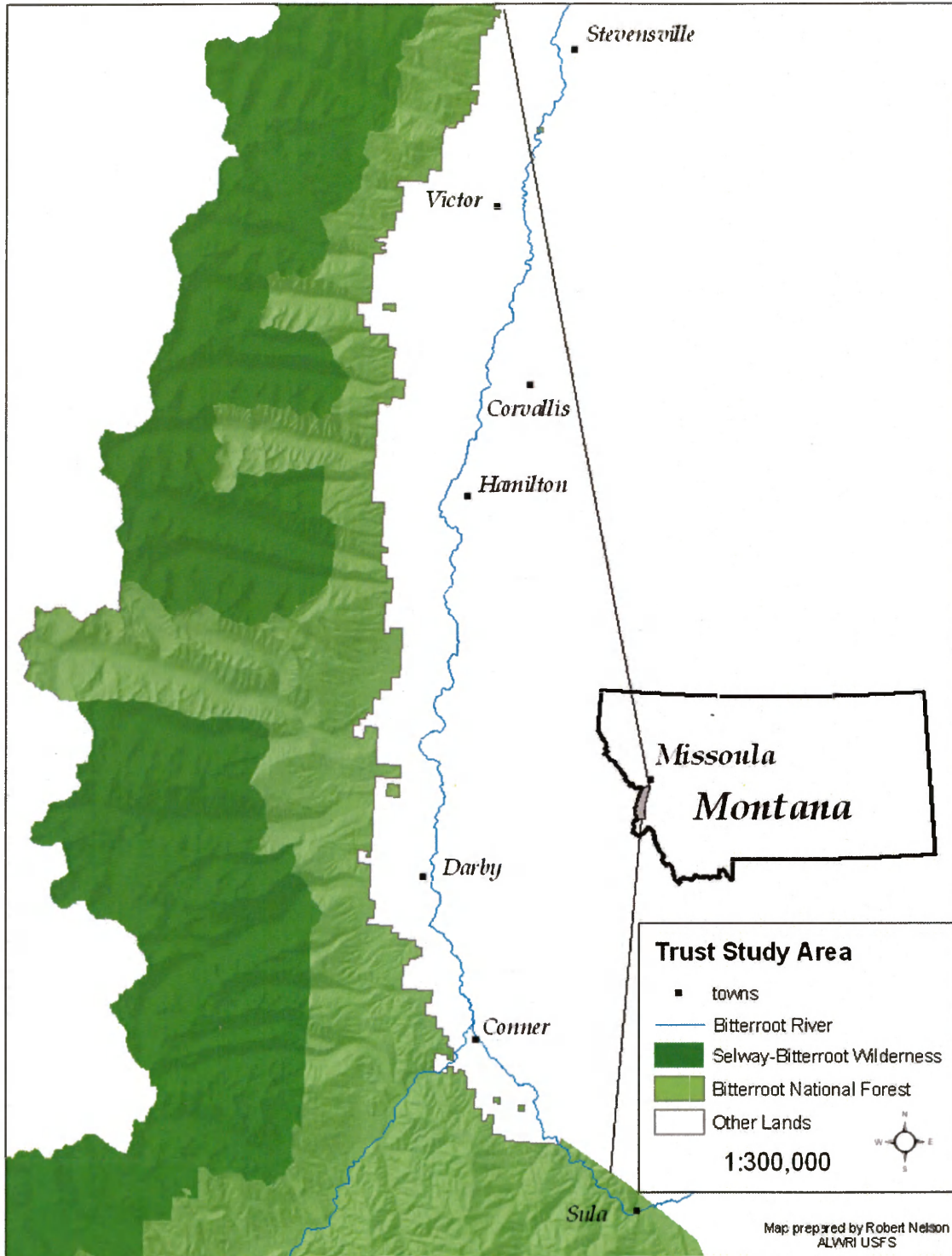


Figure 2: Study Area Location Map

and fuels management, and high levels of cooperation were anticipated for the study. This stands in contrast to other surveys, which have experienced significant reductions in response rate over the last several years (Curtin, Presser, and Singer, 2005).

10 pre-pilot-tests were conducted with graduate students and faculty at the University of Montana College of Forestry and Conservation, as well as with researchers at the Aldo Leopold Wilderness Research Institute, to help refine the survey and ensure that the survey items were clear and addressed the relevant issues related to fire and fuels management. All participants were at least generally familiar with fire management issues on the Bitterroot National Forest. As part of further survey development, cognitive interviews were conducted by BBER with four residents of the Bitterroot Valley. The cognitive interviews used both concurrent thinkalouds and concurrent probes in order to investigate respondents' thought processes when answering the survey, and to explore potential problems with survey questions (Sudman, Bradburn, and Schwartz, 1996). Changes clarifying survey items were made after cognitive interviews suggested problems with question wording. After refinement of the survey based on the results of the cognitive interviews, telephone interviewers conducted a pilot test of the survey to approximately 100 residents of Lolo, Montana, to examine question wording, question order, and technical implementation of the survey. Question order was determined to influence results, so the survey items were subsequently ordered to have the least influence on Bitterroot National Forest fire and fuels management questions.

The assessment following the fires of 2000 divided the Bitterroot region of Ravalli County, Montana, into three separate sampling areas based upon hypothesized differences in population (BBER, 2001). To assist in comparison between this survey and the earlier survey, those boundaries were preserved. The North region is centered around Stevensville,

the central region includes Hamilton and Victor, and the South region contains Darby, Sula, and Alta. The methodology used to estimate the statistically relevant sample sizes for each region in the 2000 post-fire assessment was based on conservative estimates of variation of the known population sizes, with desired accuracy of $\pm 5\%$ and 90% confidence. Data from the 2000 Census were used to estimate desired sample sizes for the current project. The final sample was, thus, not collected directly to represent Ravalli County's population distribution proportionately. Consequently, in order to faithfully represent the population of Ravalli County, data were weighted based upon the following formula:

$$W_r = \frac{\left(\frac{R_p}{T_p}\right)}{\left(\frac{R_s}{T_s}\right)}$$

where W_r is the weight for each region, T_p is the total population size, T_s is the total sample size, R_s is the size of the sample from each region, and R_p is the size of the population in each region. Weighting data are included, along with regional characteristics in Table 1.

Table 1: Regional Characteristics, Sample Sizes, and Sample Weighting

Sample Area	Telephone Exchanges	No. Households*	% Households	Required Sample Size	Actual Sample Size	% Sample	W_r
North	777 363; 375;	4601	32.20%	355	393	34.11%	0.943866
Central	642; 961	8353	58.46%	367	396	34.38%	1.700583
South	349; 821	1335	9.34%	298	363	31.51%	0.296500
Total		14289	100.00%	1020	1152	100.00%	1.000000

* Based on 2000 U. S. Census Data;

Statistical Analyses

The following statistical approaches were used to investigate the measurement of trust: Reliability analysis was used to ensure that the measurement scales are internally consistent; factor analysis was used to group variables so they could be used in cluster analysis, which was used to separate respondents into groups based on their level of trust; structural equation modeling was used to explore the relationships between the observed variables and variables that are not directly observable, such as trust and each of its dimensions, but also to determine the most important attributes of trust. Combined, these analyses helped contribute to a greater understanding of trust, and how its components are related.

Reliability Analysis

No matter how hard a researcher may try to eliminate error in surveys, error is ever-present and cannot be completely removed—only reduced. Random and systematic errors are present in even the best designed studies. If the same people are studied at different times, their results from one test will never exactly be duplicated in a second test, but will rather at best tend to be consistent with the first. One who rates high in a category on the first test will tend to rate high in the same category on the second test, and so on. *Reliability* refers to this consistency in repeated measures of the same phenomenon. The more consistent the results given by repeated measures, the more reliable they are; the less consistent they are, the lower the scale's reliability. Reliability Analysis attempts to calculate this degree of consistency, and provides an estimated measure of it in repeated measures of the same phenomenon over time. A number of methods exist for assessing reliability of empirical measurement. In the test-retest method, the same test is given to the same subject at different times, and their correlation can be calculated, and provides the estimate of

reliability. In the alternative-form method, two different forms of the same test are given to subjects at different times, and the correlation, again, provides the estimate of reliability. The split-halves method requires a single test administration, in which the test is divided in halves, and the scores are correlated, and their reliability assessed through a correction applied to the correlation. The last form of reliability assessment (and the one adopted in this study), is the internal consistency method, or Cronbach's alpha. This method is generally perceived to be most popular, as it provides for an accurate, conservative, unique measure of reliability, in a single test application. While more computationally elaborate than other methods, it virtually eliminates the chance of systematic error between measures. A scale's internal consistency is calculated as $\alpha = N\bar{\rho}/[1 + \bar{\rho}(N - 1)]$, where $\bar{\rho}$ is equal to the mean inter-item correlation, and N is the total sample size. Values range from 0.0 to 1.0 with lower values indicating poor internal consistency and higher values indicating good internal consistency. Adding an item to a scale can improve a scale's reliability in most instances, but if adding an item has a detrimental affect on the inter-item correlations, reliability will decrease (Carmines & Zeller, 1979)

Factor Analysis

Factor analysis is a means of reducing the dimensionality of a series of observed variables. But, it can be used to summarize patterns of correlations among the variables, provide an operational definition for an underlying phenomenon, or test theories about the nature of the phenomenon. In this application, it is being used as a means to obtain results necessary for other analysis. Generally speaking, factor analysis helps researchers uncover which variables in a study form logical subsets of variables and which are relatively independent of one another. Factors are interpreted based on the meaning of the particular combination of highly correlated observed variables in each. Good factor analyses make

logical sense, while bad ones do not (Tabachnik & Fidell, 2001). For example, one would expect to find observed variables measuring civic engagement, volunteerism, and social activism in one factor, and variables measuring relaxation and recreation in another.

There are two primary types of factor analysis: exploratory and confirmatory.

Exploratory factor analysis is usually performed in the early stages of analysis to describe and summarize data by grouping together correlated variables. It is made without any a priori assumptions about relationships between variables, and is used to generate hypotheses about underlying phenomena. *Confirmatory* factor analysis, on the other hand, is used to confirm a priori assumptions about the relationships between variables and phenomena that are otherwise unobservable. In recent years, this has been most frequently done through structural equation modeling, which will be discussed at length in a subsequent section. Regardless of the type, exploratory and confirmatory factor analyses have much in common (Tabachnik & Fidell, 2001), and will be discussed concurrently.

Factor Analysis is conducted on correlation matrices between variables. The *observed correlation matrix* is the correlation matrix produced from the observed variables. The *reproduced correlation matrix* is the correlation matrix of factors. The *residual correlation matrix* is the difference between observed and reproduced matrices. A good factor analysis has a close fit between the observed and reproduced matrices, as indicated by small residual correlations (Tabachnik & Fidell, 2001). Another matrix is produced showing *communalities* for the analysis, or the proportion of variance each item explains. Generally speaking, one only wants to include variables with extracted communalities of greater than about $|0.4|$.

Another set of matrices are those related to *factor rotation*. These matrices are produced during the analysis and interpreted as a part the solution. In factor rotation, the solution of two or more factors is made more interpretable, without changing the underlying

mathematical properties. Two types of rotation, orthogonal and oblique, improve the interpretability. *Orthogonal* rotation rotates factors so that they are uncorrelated with one another, and produces a *loading matrix*. A loading matrix shows correlations between observed variables and factors. The size of the loadings indicates the strength of the relationship between each observed variable and each factor. Interpretation occurs by looking at these matrices. *Oblique* rotation creates correlations between the factors. It outputs a *factor correlation matrix*, showing the correlations among the factors, as well a *structure matrix* showing correlations between factors and variables, and a *pattern matrix* showing unique relationships (Tabachnik & Fidell, 2001). A wide variety of orthogonal and oblique rotations exist, and vary by software package. The reader is urged to consult alternate sources for descriptions of different rotation techniques.

Factor analysis requires fairly large sample sizes (in excess of 300 or so), but data with several high loading variables may reduce that requirement substantially. Cases with missing data must have missing values estimated, or deleted, or must allow for the analysis of a pairwise correlation matrix. When summarizing or describing relationships among variables, factor analysis has no distributional requirements. However, when statistical inference is used to determine the number of factors, data are assumed to be multivariate normal (Tabachnik & Fidell, 2001).

A number of analytical methods exist for conducting factor analyses, each with its own purpose. *Principal components analysis* and *principal factors* extract maximum variance from the data set with each component. *Image factor extraction* distributes among factors the variance of an observed variable that is reflected by other variables. *Maximum likelihood* factor extraction calculates loadings that maximize the probability of sampling the observed correlation matrix from a population. *Unweighted least squares* minimize the squared

differences between the observed and reproduced correlation matrices. Like unweighted least squares, *generalized least squares* minimize the squared differences between the observed and reproduced correlation matrices, but generalized least squares weights the cases in favor of those with substantial shared variance. This results in variables that are not as strongly related to other variables in the set being not as important to the solution. Another type of extraction, *alpha factoring* attempts to maximize the internal consistency of factors (Tabachnik & Fidell, 2001).

Maximizing the number of factors extracted maximizes both the fit and proportion of variance explained by the factor solution; this maximization, however, decreases parsimony. Parsimony suggests that the simplest solution is the preferable one. However, parsimony does not always beget fit. Thus, one should seek a balance between fit and model simplicity. One quick check to determine adequacy of the number of factors is if the number of factors with eigenvalues over 1 is somewhere between the number of variables divided by 3, and the number of variables divided by 5, then the number of factors is probably reasonable. This criterion tends to be most useful when there are fewer than 40 variables, and the sample size is large. At other times it may over- or under-estimate the number of factors. A second criterion is a scree test of eigenvalues plotted against factors. Just before the slope of the graph noticeably shallows, the number of factors is probably adequate. Scree tests are subjective by nature, and usually accurate to within in one or two factors. A third criterion that can be used to determine the number of factors is to examine the values in the residual correlation matrix. A good analysis has small residuals. Several moderate (about 0.05 to 0.10) or a few large (greater than about 0.10) suggest that there may be another factor (Tabachnik & Fidell, 2001).

Because computation of factor analyses requires complete cases with no missing variables, and there was concern about maintaining a high N size, known values were used to estimate the missing values using multiple regression. This analysis treated each variable with missing data as the criterion, and all other Bitterroot National Forest fire and fuels management variables in the same dimension as predictors. Estimated values were distributed around the mean in a normal pattern. Using this method allowed for a more accurate prediction of missing values than simply assigning the mean value to the missing data. It provided for more degrees of freedom and statistical power than if the case with missing data were eliminated from the analysis (Hair, 1998).

Cluster Analysis

Cluster analysis is a means of sorting data cases into categories, in which the included cases share patterns on how they relate to particular variables. Members of one group, for example, may rate highly on one variable, while members of second group rate low on the same variable. Cluster analysis makes these patterns and associations known (Anderberg, 1973). A number of hierarchical and non-hierarchical clustering methods are available to researchers. The main distinction between the two is that hierarchical clustering uses a similarity matrix to construct a nested set of clusters, wherein each level is assigned a rank. In non-hierarchical cluster analysis, cases are iteratively partitioned into multiple clusters based on the case proximity to a cluster's centroid (mean), refining the centroid's location with each subsequent iteration. Non-hierarchical methods do not require use of the similarity matrix, so more complex problems can be studied, with greater ease (Lorr, 1983).

K-means cluster analysis is a type of non-hierarchical cluster analysis that allows users to define the number of clusters, *k*, a priori. It uses nearest centroid sorting, in which the first *k* cases are chosen as starting cluster centroids, and data are iteratively assigned to one

of k centroids based on their proximity, with cases assigned to the centroid to which they have the smallest Euclidean distance. Each iteration refines the cluster center, making its location a reflection of the cluster as a whole, rather than simply the initial seed. Once all cases have been assigned, iterations continue, reassigning cases to different clusters as necessary. The analysis is said to converge when subsequent iterations yield no change in centroid location (Anderberg, 1973).

Because it is impossible to specify a null hypothesis in cluster analysis, and multivariate sample distributions tend to be very complex, it is a challenge to identify the appropriate number of clusters in any cluster analysis. There exist few workable cut-off criteria for determining the appropriate number of clusters for a given data set, and most are based on subjective heuristics such as looking for “cuts,” or “jumps” in data plots, or looking at scree plots (Aldenderfer & Blashfield, 1984).

Attributes to be included in a cluster analysis must be chosen carefully, or meaningless clusters may be created. People who share similarities on one set of attributes do not necessarily share them with respect to another set of attributes. They may be alike with respect to their environmental attitudes, but differ highly with regards to their personality, hair style, or beverage preference. Variables thought to be measuring the same phenomenon should be included in the analysis, and those thought to confound the phenomenon should be excluded. When a large number of attributes are included in the analysis, it may be worthwhile to reduce the dimensionality of the analysis. Methods such as factor analysis (which will be discussed in detail next), provides a means to do this. While cluster analysis reduces the dimensionality of *cases*, factor analysis reduces the dimensionality of *variables*, creating a more parsimonious representation of the data, based on easily understandable representations of variables. *Factor scores*, or measures of the factors, are

weighted linear composites of the variables that best define a factor. The greater the number of positively correlated variables that are combined into these composite variables, the more reliable the composite. In addition to improving reliability, the reduced dimensionality of factor scores also helps make clusters easier to understand and potentially more meaningful than a massive agglomeration of individual variables. Using factor scores, rather than individual variables, in a cluster analysis, provides a means to both improve the reliability of, and increase the understandability of the clusters (Lorr, 1983).

Structural Equation Modeling

Structural equation modeling (SEM) is a means of exploring the relationships between one or more independent variables and one or more dependent variables, any of which can be either continuous or discrete. It combines multiple regression with exploratory factor analysis to provide answers to questions not otherwise analytically possible. There are many forms of SEM, some of which are better known than others. *Path analysis* is a structural model for dependent variables. It allows diagramming of the relationships between these variables, with statistical estimates of their direct and indirect effects calculable.

Most types of SEM, however, involve describing and analyzing the relationship(s) related to one or more *latent variables*. A latent variable is a variable that cannot be directly observed, but rather assessed using a number of indicator or proxy variables. That is, researchers suspect there is a higher order variable that cannot be directly measured, but can be located from the variables that are measured. *Confirmatory factor analysis*, for instance, is a common statistical technique among researchers, available in most common statistical packages, though few are likely aware that it is a SEM technique. Confirmatory factor analysis analyzes the relationships between latent variables (factors) and their dependent variables, and accounts for the unique variance of each dependent variable. *Structural*

Regression is another type of SEM, related to path analysis and confirmatory factor analysis. Like path analysis, structural regression allows hypotheses about direct and indirect causal effects to be tested. In addition, like confirmatory factor analysis, it allows for a measurement component representing observed variables as indicators of underlying latent variables. Each of these SEM methods, path analysis, confirmatory factor analysis, and structural regression, have a number of more complex analytical options, and are representative of only the most basic types of SEM models.

Because all the variables useful in conceptualizing trust that could be useful in structural modeling are categorical (i.e. they are not continuous variables, but measured with two to five categories), EQS version 6.1 (Bentler, 2005a) was used. SEM software packages generally use linear models which, on their own, do not effectively describe the relations among categorical variables. EQS, however, transforms categorical variables as a function of underlying continuous, normally distributed variable, using polychoric and polyserial correlations. This allows categorical variables to be analyzed by SEM packages, like EQS, using a linear model (Bentler, 2005b). Although the data were univariate normal, they had multivariate kurtosis which required special analysis. Arbitrary Generalized Least Squares (AGLS) analysis was used, because it has no distributional assumptions about the data. It estimates any skew and kurtosis in the raw data, thus making transformations or bootstrapping unnecessary (Kline, 2005).

In order to determine how well given models fit the data, structural equation models use fit indices. Dozens of these indices exist, and some work better in different situations than others. They tend to be contentious and have elicited numerous statistical debates. Additionally, for the most part, their sampling distributions may not be known, so guidelines

concerning appropriate values for good fit are just that. See Kline (2005) for a good review of the caveats associated with fit indices.

Hu and Bentler (1999) suggest several combinational cutoff values rules-of-thumb for fit indices. The authors pair different fit indices together in a manner such that the weaknesses of one fit index are the strengths of the other index, and vice versa. The ones most applicable to this analysis are CFI > .96, and SRMR > .09, RMSEA lower 10% CI < .05, and SRMR < .06. No rule-of-thumb cutoff values were identified for the A-CCFI, but Bentler (2005b) notes that on a scale of 0.0 to 1.0, the value should be maximized. The author continues, and recommends assessing the Yuan-Bentler corrected AGLS test statistic, and Yuan-Bentler AGLS F-statistic whenever analyses using AGLS are conducted.

Chapter 3: Results

Sample Characteristics

1690 distinct contacts were made with qualified respondents in Ravalli County, Montana in May-June 2004. Including those that rescheduled appointments with interviewers multiple times but never completed a survey, slightly more than 1/4 of all attempted calls were refusals. In addition, about 5% of all households contacted were considered “valid, but non-interviewable,” because respondents were incapable of completing the survey during the sampling period due to illness, previously scheduled vacations, or other factors uncontrollable by interviewers. Excluding these, 1164 surveys were completed. Twelve completed surveys were lost to a corrupted data file, yielding 1152 usable surveys with a final response rate of 68%.

Sociodemographics

The overall sample was closely split across gender, with 48.6% male, and 51.4% female, similar to proportions identified in the 2000 U. S. census for Ravalli County (49.7% and 50.2%, respectively). The age of respondents ranged from 18 to 91 years in age, with a mean age of 51.66 years (SD = 16.81). On average, residents lived in Ravalli County for 19.17 years (SD = 16.52), including a maximum of 91 years, and a minimum of less than one year. These results are presented in Table 2.

Table 2: Respondent age, number of years in Ravalli County, and number of years in Montana.

	Mean	Median	Std. Dev.
Age	51.66	52.00	16.81
Years in Ravalli County	19.17	14.00	16.52
Years in Montana	26.23	21.00	20.38

Nearly 95% of respondents have at least a high school diploma or GED. More than a quarter have graduated from college, and less than 10% possess a graduate degree. In the sample, nearly two-thirds of households have an annual income of between \$20,000 and \$75,000. Data from the 2000 U. S. census closely mirrors this distribution, though relative to census data, higher incomes were slightly over-sampled and lower incomes slightly under-sampled. Survey data on gender, education, and income, with Census data for comparison are presented in Table 3.

Table 3. Respondent gender, education, and income.

		Sample		Census ^a		Percentage Differential ^b
		n	%	n	%	
Gender	Male	559	48.6	17,951	49.8	1.2
	Female	593	51.4	18,119	50.2	-1.2
	Total	1152	100.0	36,070.0	100.0	
Education	Less than High School	62	5.5	3031	12.4	6.9
	High School Grad or GED	473	41.8	7738	31.6	-10.2
	Some college	279	24.7	8200	33.5	8.8
	College Graduate	208	18.4	3897	15.9	-2.5
	Graduate Degree	110	9.7	1631	6.7	-3.0
	Total	1132	100.0	24497	100.0	
Income	> \$100,000	75	8.1	956	6.7	-1.4
	\$75,000-\$99,999	72	7.8	710	5.0	-2.8
	\$50,000-\$74,999	200	21.7	2210	15.5	-6.2
	\$35,000-\$49,999	171	18.5	2696	18.9	0.4
	\$20,000-\$34,999	229	24.9	3809	26.7	1.8
	\$15,000-\$19,999	60	6.5	1291	9.1	2.6
	\$10,000-\$14,999	69	7.5	1171	8.2	0.7
	< \$10,000	46	5.0	1416	9.9	4.9
	Total	922	100.0	14259	100.0	

^a Data taken from 2000 U. S. Census. Comparisons are between survey respondents and residents of Ravalli county. ^b Differential is calculated by subtracting survey percentage from census percentage.

Scale Reliability

Analyses of internal consistency were conducted on all survey items related to Bitterroot National Forest fire and fuels management using the reliability analysis function in

SPSS 10.0. Reliability analysis was conducted on all the items together, as well as broken down by each of the three hypothesized trust dimensions. For all 21 Bitterroot National Forest trust items together, Cronbach's alpha, the measure of internal consistency, was 0.9542, indicating very high scale reliability. The corrected item-total correlation (CITC) for these items ranged from 0.5972 to 0.8294, indicating moderate to strong positive correlations between each item and the scale as a whole. The only item with a low CITC was the question *"to what extent, if at all, do you agree or disagree with the following statement: Science can settle differences of opinion about the risks and benefits from forest fires?"* which had a CITC of .3198, indicating it was not strongly correlated with the scale as a whole. The deletion of any of the scale items lowered the scale's alpha level from 0.9542 to between 0.9335 and 0.9502, indicating all items positively contributed to the scale's reliability. The only exception to this was the same "science" item (above), whose removal increased the scale's alpha to 0.9561, indicating that it had a negative effect on the scale's reliability.

For the eight items in the Shared Norms and Values dimension (Box 4a), Cronbach's alpha was 0.8864 (N = 717), indicating good scale reliability. CITC values ranged from between 0.5613 and 0.7644, indicating moderate to strong positive correlations between each item and the dimension. Deleting any item reduced the alpha level, from 0.8864 to between 0.8644 and 0.8824, indicating all items positively contributed to the dimension's reliability.

For the five items in the Willingness to Endorse dimension (Box 4b), Cronbach's alpha was 0.8409 (N = 893), indicating good scale reliability. CITC values ranged from between 0.5744 and 0.7307, indicating moderate to strong positive correlations between each item and the dimension as a whole. Deletion of any item lowered the alpha level from 0.8409 to between 0.7842 and 0.8270, indicating all items positively contributed to the dimension's reliability.

For the eight items in the Perceived Efficacy dimension (Box 4c), Cronbach's alpha was 0.8704 (N = 831), indicating good scale reliability. CITC values ranged from 0.5613 to 0.7644, indicating moderate to strong positive correlations between each item and the dimension. The only exception was the same "science" question from previous analyses, which had a CITC of 0.3347. Deletion of any item reduced the dimension's alpha level from 0.8704 to between 0.8387 and 0.8613, indicating the items contributed positively to the dimension's reliability. The only exception was the "science" item (above), whose deletion increased the dimension's alpha to 0.8845, indicating it negatively contributed to the dimension's reliability.

All the scales proved to have high reliability, with reductions in it upon the deletion of any items. This indicated that both the unidimensional scales, and each of the three dimensions were internally consistent, that is, respondents are tending to answer the items in each scale similarly. Thus, they can be used for factor analysis and structural equation modeling.

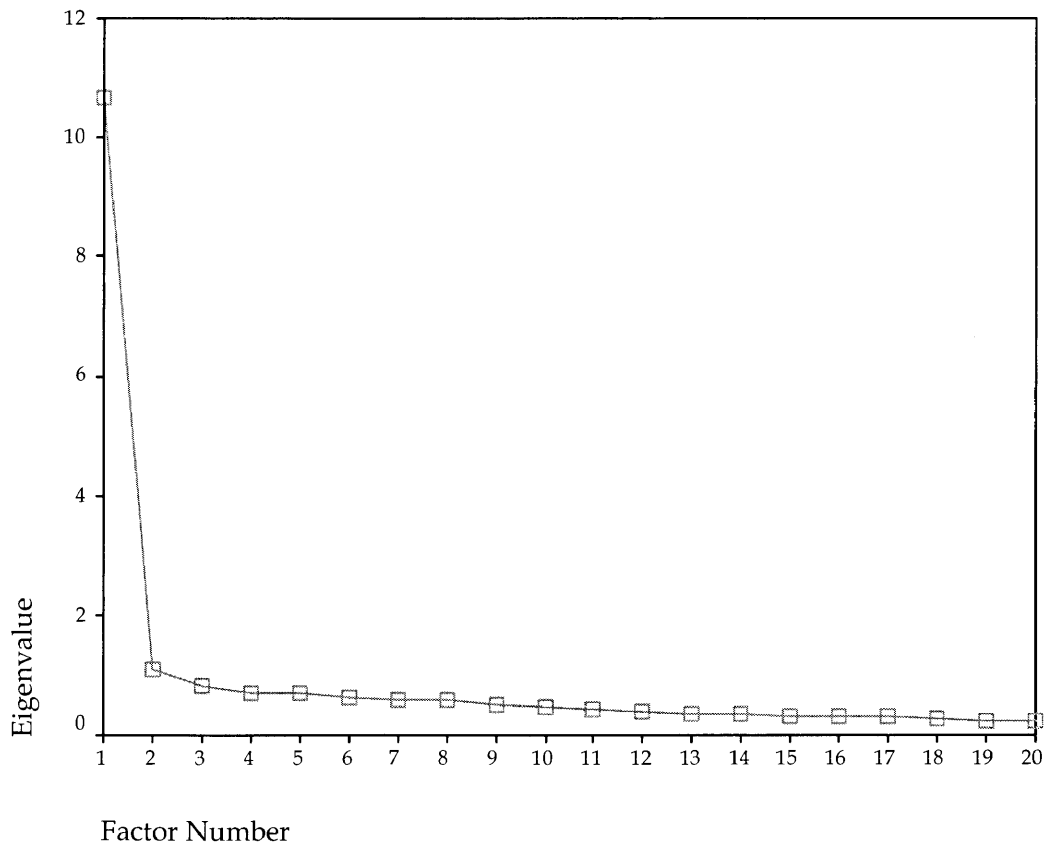
Scale Factor Analysis

Factor analyses were conducted on Bitterroot National Forest fire management variables in order to reduce the complexity of variables, and simplify them into a few factors. Using the data set that had missing values imputed for all Bitterroot National Forest fire and fuels management items, the sample size for all factor analyses was N = 1151.

Following estimation of missing variables, a generalized least squares, exploratory factor analysis with Varimax rotation was conducted on all 21 Bitterroot National Forest fire management trust items, extracting only eigenvalues over 1.0. Varimax rotation simplifies factors by maximizing the variance in factor loadings (Tabachnik & Fidell, 2001). Extracted

communalities, or the proportion of variance explained by each variable, ranged from .386 to .749. The only exception was “*to what extent, if at all, do you agree or disagree with the following statement: Science can settle differences of opinion about the risks and benefits from forest fires?*” which had an extracted communality of 0.177, indicating it explained little variance. This item was dropped from the analysis and the factor analysis was rerun. Extracted communalities on the second run ranged from 0.386 to 0.748, indicating moderate to high proportions of variance were explained by the variables. Two factors were extracted, but the second factor contained only a single item with a factor loading, greater than $|0.4|$. A scree test strongly indicated the presence of no more than one major factor, and is shown in Figure 3.

Figure 3: Scree Test



Thus, the analysis was run a third time, forcing a single factor, without inclusion of the science item mentioned above. Because factor rotation requires multiple factors, no rotation was performed. The single factor explained 53.367% of the variance, with factor loadings ranging from 0.549 to 0.845, indicating strong relationships between each variable and the factor as a whole.

Following the same methodology, additional factor analyses were run on the items in each of the three trust dimensions, extracting only eigenvalues greater than 1.0. Factor scores were saved for each dimension to allow for their use in further analyses. On the eight items in the shared norms and values dimension, communalities ranged from 0.404 to 0.687, indicating a moderate proportion of variance explained by each variable. One factor explained 55.841 percent of the dimension's variance, and factor loadings ranged from 0.585 to 0.813, indicating moderate to strong relationships between the variables and the dimensions as a whole.

For the five items in the willingness to endorse dimension, extracted communalities ranged from 0.450 to 0.707, and a single factor explained 61.375% of the variance. Factor loadings ranged from 0.643 to 0.836, indicating moderate to strong relationships between variables and the dimension as a whole.

For the seven items in the perceived efficacy dimension, extracted communalities ranged from 0.380 to 0.735, indicating moderate to high levels of variance explained by each variable. A single factor explained 60.138% of the variance, and factor loadings ranged from 0.603 to 0.852, indicating moderate to strong relationships between variables and the dimension as a whole.

Table 4: Factor Analysis Means, Standard Deviation, Extracted Communalities, and Factor Loadings

Dimension	Attribute	Mean	SD	Single Dimension		Individual Dimensions ^a	
				Extracted Communalities	Factor Loadings	Extracted Communalities	Factor Loadings
Shared Norms and Values	Agreement: Fires	2.66	0.98	0.717	0.789	0.672	0.781
	Agreement: Fuels	2.25	0.89	0.741	0.693	0.485	0.635
	Integrity	2.88	0.65	0.587	0.708	0.548	0.703
	Compassion & Understanding	3.35	0.80	0.626	0.662	0.595	0.704
	Responsiveness	3.21	0.82	0.616	0.669	0.597	0.701
	Worthy of Pride	0.90	0.46	0.414	0.549	0.404	0.585
	Procedural Justice	2.73	0.69	0.682	0.799	0.687	0.813
	Shared Values	3.15	1.11	0.574	0.735	0.580	0.746
Willingness to Endorse	Willingness to Endorse	2.57	0.90	0.730	0.800	0.568	0.742
	Confidence: Fire Fighters	3.08	0.71	0.450	0.574	0.458	0.643
	Confidence: Fire Managers	2.66	0.81	0.676	0.793	0.707	0.836
	Political Inclusion	1.93	0.68	0.454	0.656	0.450	0.657
	Trustworthiness	3.13	0.85	0.665	0.740	0.562	0.733
	Previous Experience	2.66	0.98	0.557	0.705	0.507	0.700
Perceived Efficacy	Competence	2.65	0.74	0.640	0.763	0.608	0.770
	Uncertainty	2.75	0.99	0.386	0.589	0.380	0.603
	Reliability: Fuels	2.46	0.93	0.711	0.746	0.735	0.852
	Reliability: Fires	2.92	0.83	0.748	0.845	0.545	0.724
	Effectiveness: Managers	2.58	0.85	0.676	0.808	0.693	0.827
	Effectiveness: Fire Fighters	1.76	0.70	0.427	0.623	0.415	0.637

^a Individual dimensions shown together for table simplification. Analyses were conducted separately.

All factor analyses indicated that the items belonged in the factors they were in. Extracted communalities and factor loadings for each analysis fell within the range of analytical guidelines. The only exception was the *uncertainty* variable, which had extracted communalities of .386 and .380 for the 20-item factor and dimension-specific factor, respectively. The values were less than the cutoff criterion of about |0.4|, but because they were still fairly close to it, the question was retained for analysis. Data for all factor analyses is shown in Table 4.

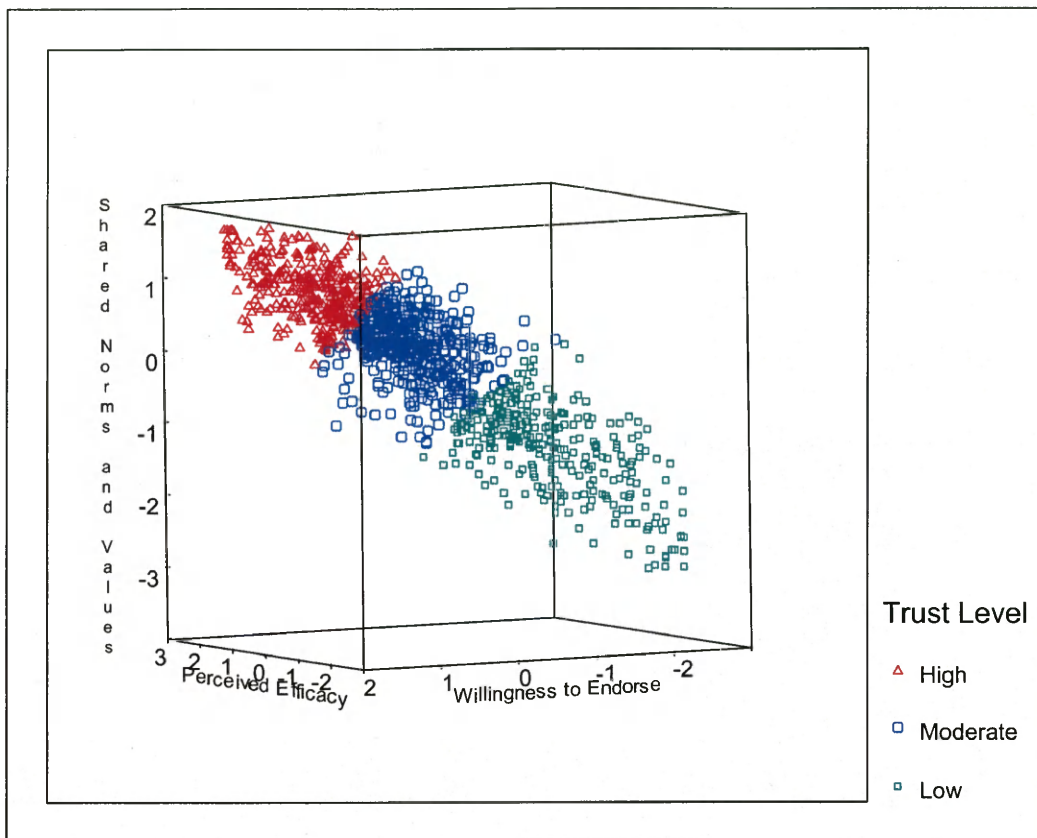
Respondent Segmentation

A k -means cluster analysis was conducted on the factor scores for each of the three trust dimensions. Multiple cluster sizes from $k = 2$ to $k = 8$ were evaluated, and it was found that increases or decreases in number of clusters resulted in similar proportions of trusting versus distrusting respondents, negligible discrimination between groups and uneven cluster sizes. A three-cluster solution that had individually distinguishable clusters when plotted, and similar numbers of cases in each cluster was chosen as the best fit to the data. Each cluster has similar values in cluster centers in each dimension, suggesting that they are internal consistent. Based on the cluster center locations, cases were divided into groups of different trust levels. The cluster with the lowest cluster center values became “low trust,” the cluster with the highest cluster center values became “high trust,” and the middle cluster became “moderate trust.” Cluster centers for each of the dimensions are shown in Table 5. A scatter plot of factor scores for each of the three dimensions plotted against one another is shown in Figure 4. In the figure, a distinct gap can be seen between moderate and low trust clusters, and it can be seen that there is no overlap between high and moderate trust clusters, suggesting satisfactory cluster distinguishability.

Table 5: Cluster center location for trust factor scores

	Low Trust	Moderate Trust	High Trust	Total
Factor score for shared norms and values	-1.20071	0.13168	0.90372	-
Factor score for willingness to endorse	-1.14702	0.06752	0.92401	-
Factor score for perceived efficacy	-1.21814	0.09796	0.96147	-
Number of cases	304	483	362	1149

Figure 4: 3-Dimensional Cluster Membership Scatterplot



Cases were successfully clustered into groups of respondents based on their trust level. Clusters will be used in future analysis, specifically for testing the validity of simplified trust scales developed through latent variable modeling.

Latent Models

A series of structural equation models were used to explore the relationships among different observed and latent variables. First, the fit of the hypothesized causal model will be examined to determine how well the relationships expressed reflected patterns in the data. Next, the three dimensional model will be compared to a unidimensional representation of trust and their fit relative to one another will be tested. The strength of each item in the

unidimensional model will be examined, and simplifications of the model will be explored. Finally, the three dimensional model will be compared to another conceptualization of trust.

3-Dimensional Model

A generalized least squares (GLS) hierarchical structural equation model with arbitrary GLS (AGLS) non-normal estimation correction was conducted on the correlation structure of the hypothesized dimensionalization of trust shown in Figure 1, using the Structural Equation Modeling program EQS 6.1 (Bentler, 2005). The three dimensions of trust, and trust itself were latent variables, and each survey item as an observed variable [Figure 5]. As indicated in Tables 6a-b, all fit and test statistics suggested the model fit the data very well.

Figure4: 3 Dimension BNF Model Confirmatory Factor Analysis

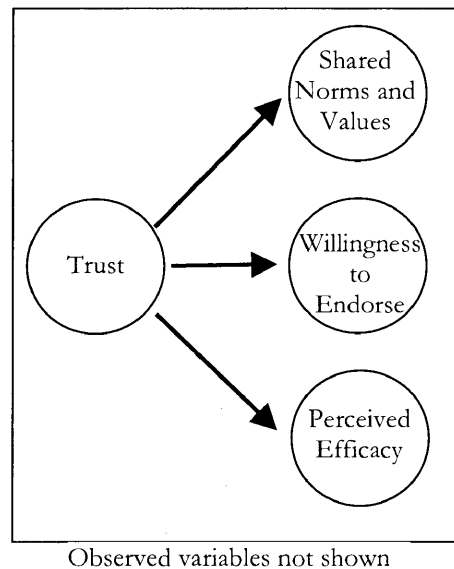


Table6a: Fit indices for 3 Dimensional BNF Model

Fit index	Value	Lower 10% CI	Upper 10% CI
Comparative fit index (CFI)	.972	-	-
Root mean-square error of approximation (RMSEA)	.047	.042	.051
AGLS corrected comparative fit index (A-CCFI)	.985	-	-

Table 6b: Test statistics for 3 Dimensional BNF Model

Test	Statistic	DF1	DF2	p-Value
Yuan-Bentler Corrected AGLS Test Statistic	380.395	-	-	.00000
Yuan-Bentler AGLS F-Statistic	2.996	163	986	.00000

For the most part, all items load strongly on the trust dimensions, with moderate loading only occurring when the context of specific questions were changed from “fire management” to “fuels management”, or from “fire managers” to “fire fighters.” The standardized path coefficients from each dimension to trust were very high, suggesting that the dimensions are very highly strongly related to one another. The path coefficients, error terms, and proportion of variance explained (R^2) are shown in 7.

Table 7: Standardized Path Coefficients, Error, and R^2 Values for Trust Items

		Dimension ^a	Standardized path coefficient	Error	R^2
Attributes	Agreement: Fires	SNV	0.930	0.369	0.864
	Agreement: Fuels	SNV	0.888	0.461	0.788
	Integrity	SNV	0.860	0.510	0.740
	Compassion & Understanding	SNV	0.908	0.418	0.825
	Responsiveness	SNV	0.867	0.498	0.752
	Worthy of Pride	SNV	0.703	0.711	0.494
	Procedural Justice	SNV	0.917	0.399	0.841
	Shared Values	SNV	0.868	0.496	0.754
	Willingness to Endorse	WE	0.940	0.341	0.884
	Confidence: Fire Fighters	WE	0.762	0.648	0.580
	Confidence: Fire Managers	WE	0.925	0.380	0.856
	Political Inclusion	WE	0.829	0.559	0.688
	Trustworthiness	PE	0.921	0.390	0.848
	Previous Experience	PE	0.833	0.553	0.695
	Competence	PE	0.883	0.470	0.779
	Uncertainty	PE	0.921	0.389	0.848
	Reliability: Fuels	PE	0.704	0.710	0.496
	Reliability: Fires	PE	0.971	0.237	0.944
	Effectiveness: Managers	PE	0.920	0.392	0.846
	Effectiveness: Fire Fighters	PE	0.789	0.615	0.622
Dimensions	Shared Norms and Values	-	0.997	0.078	0.994
	Willingness to Endorse	-	0.987	0.162	0.974
	Perceived Efficacy	-	0.992	0.125	0.984

^a SNV = Shared Norms and Values; WE = Willingness to Endorse; PE = Perceived Efficacy

χ^2 Difference Test

A χ^2 difference test was performed on the three dimensions of trust to compare the fit of the three dimensional model of trust to a uni-dimensional model to determine if the models had identical fit. The χ^2 difference test tests the null hypothesis that the two competing models have identical fit (Kline, 2005). A GLS confirmatory factor analysis, with AGLS non-normal estimation correction was performed on the correlation structure of each model for the χ^2 difference test. The correlations between each of the three dimensions were first fixed at 1.0, (See Figure 6) forcing the notion that the three dimensions were perfectly correlated and thus could be replaced by a single dimension. A second analysis was then run with the correlations allowed to vary independently. The χ^2 value and degrees of freedom from

Figure 6: χ^2 Difference Test

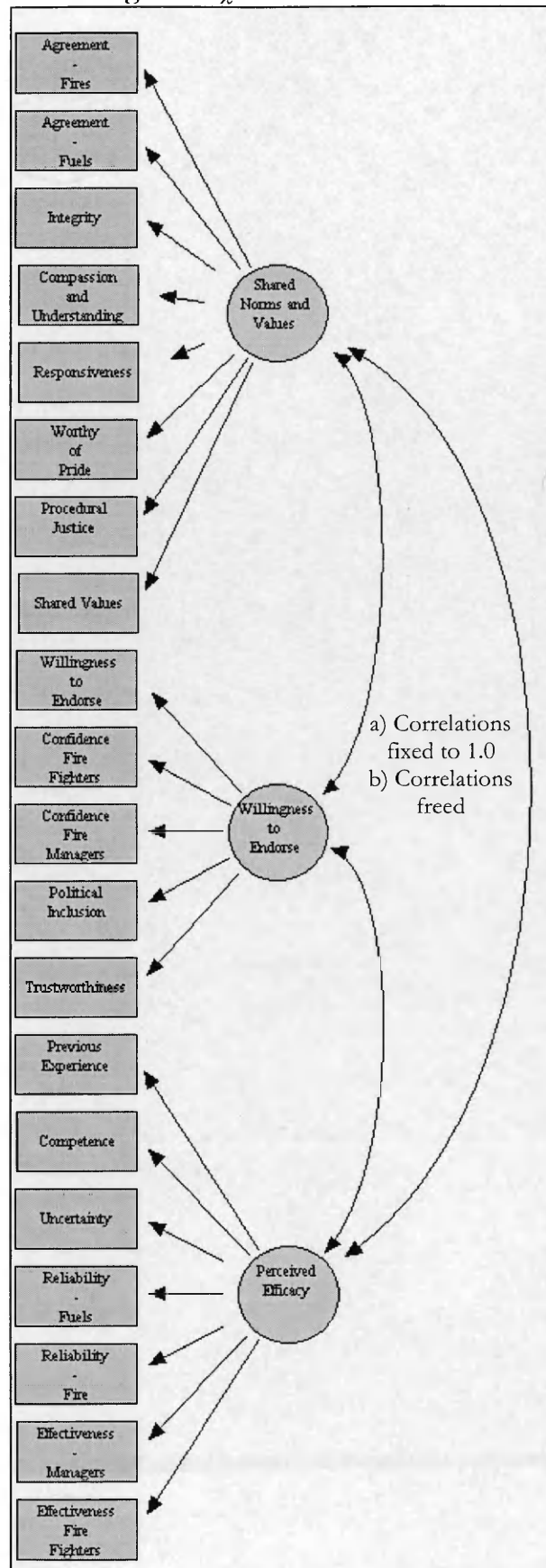
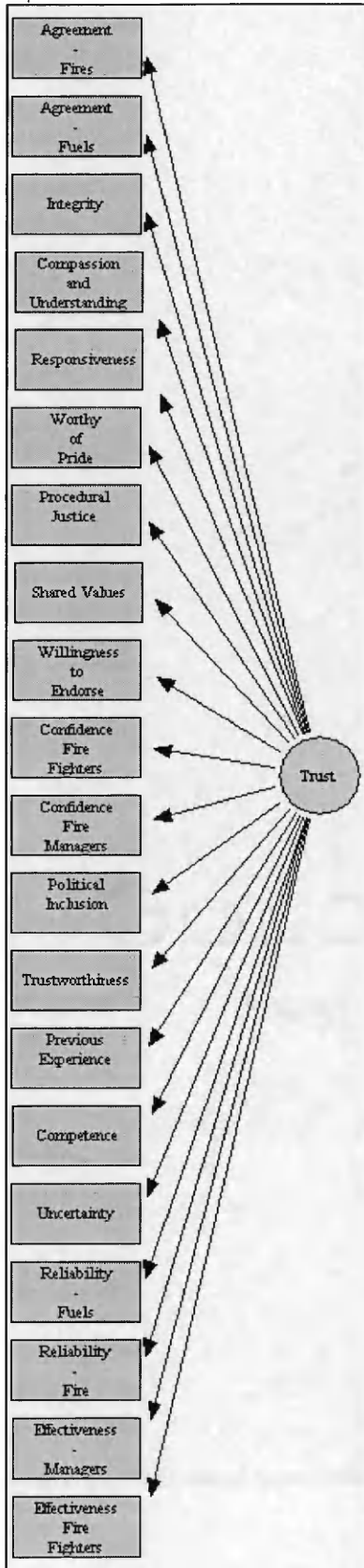


Figure 7: Uni-dimensional representation of trust



the free model, $\chi^2_{(free),164} = 568.058$, were subtracted from the χ^2 value and degrees of freedom from the fixed model, $\chi^2_{(fixed),169} = 589.093$, resulting in a $\chi^2_{(diff.),5} = 21.035$.

Because $\chi^2_{(.05),5} = 11.020$, the null hypothesis that the models were identical was rejected, suggesting that the three dimensional model fits the data better than forcing the items into a uni-dimensional model. Although the three dimensional model fits the data significantly better than the uni-dimensional model, the statistical difference may be of no practical importance. The relatively close χ^2 values between the one- and three- dimensional models suggest that although the more complex model fits better, it is only *slightly* better fitting than a uni-dimensional model. Thus, there is reason to believe that the models could be used somewhat interchangeably.

Model Simplification

To determine the items with the most influence on trust, a Wald test was conducted to evaluate the effect of removing individual items from the scale one at a time. Using a p -value of .01, in the test, variable paths are fixed to zero, and the effect of their forced “absence” from the scale is evaluated, to determine if any variables are extraneous to

the model (Kline, 2005). The Wald test suggested that all variables were relevant to the analysis, and that the removal of any items would have a negative effect on the model. However, a reduction of items was considered necessary for future research applications provided that an acceptable level of accuracy could be maintained². Thus, efforts to simplify the scale continued.

To determine the least influential variables, a generalized least squares confirmatory factor analysis with arbitrary generalized least squares (AGLS) non-normal estimation correction was conducted on the uni-dimensional representation of trust shown in Figure 7. Two groups of variables with the highest standardized path coefficients (i.e. items with the strongest correlations between each item and the model as a whole) were retained in the model. One group contained six variables; the other contained the same six variables in addition to a seventh. Fit indices and test statistics are shown in Table 8 a-b. Standardized path coefficients, error terms, and R² for all items are shown in Table 9.

Table 8a: Fit indices for 1-Dimensional BNF Model

Fit index	Value	Lower 10% CI	Upper 10% CI
Comparative fit index (CFI)	.971	-	-
Root mean-square error of approximation (RMSEA)	.047	.042	.051
AGLS corrected comparative fit index (A-CCFI)	.985	-	-

Table 8b: Test statistics for 1-Dimensional BNF Model

Test	Statistic	DF1	DF2	p-Value
Yuan-Bentler Corrected AGLS Test Statistic	389.431	-	-	.00000
Yuan-Bentler AGLS F-Statistic	2.976	169	980	.00000

² Research currently underway by the USDA Forest Service Rocky Mountain Research Station Bitterroot Ecosystem Management Research Project required simplified trust measure, so scale reduction was pursued.

Table 9: Standardized Path Coefficients, Error, and R² Values

Attribute	Standardized path coefficient	Error	R ²
Agreement: Fires	0.930	0.369	0.864
Agreement: Fuels	0.888	0.461	0.788
Integrity	0.860	0.510	0.740
Compassion & Understanding	0.908	0.418	0.825
Responsiveness	0.867	0.498	0.752
Worthy of Pride	0.703	0.711	0.494
Procedural Justice	0.917	0.399	0.841
Shared Values	0.868	0.496	0.754
Willingness to Endorse	0.940	0.341	0.884
Confidence: Fire Fighters	0.762	0.648	0.580
Confidence: Fire Managers	0.925	0.380	0.856
Political Inclusion	0.829	0.559	0.688
Trustworthiness	0.921	0.390	0.848
Previous Experience	0.833	0.553	0.695
Competence	0.883	0.470	0.779
Uncertainty	0.921	0.389	0.848
Reliability: Fuels	0.704	0.710	0.496
Reliability: Fires	0.971	0.237	0.944
Effectiveness: Managers	0.920	0.392	0.846
Effectiveness: Fire Fighters	0.789	0.615	0.622

Items with the highest factor loadings, lowest standard errors, and highest R² values were retained for analysis, though these metrics were always positively related with one another. The decision was made to exclude variables with standardized path coefficients below than 0.90. Two models were retained for further evaluation. One scale contained seven items, and included the variables related to agreement with fire management, procedural justice, willingness to endorse, confidence in fire managers, trustworthiness, effectiveness of fire management, and reliability. The six item scale was identical to the seven item scale, with the exception of a question regarding *trustworthiness* (which was in the seven item scale, but not in the six item scale).

Table 10a: Test statistics for 6 and 7 item scales

Test	7 Items				6 Items			
	Statistic	DF1	DF2	p-Value	Statistic	DF1	DF2	p-Value
Yuan-Bentler Corrected AGLS Test Statistic	389.431	-	-	.00000	47.118	-	-	.00000
Yuan-Bentler AGLS F-Statistic	2.976	169	980	.00000	6.104	8	1141	.00000

Table10b: Fit indices for 6 and 7 item trust scales

Fit index	7 Item			6 Item		
	Value	Lower 10% CI	Upper 10% CI	Value	Lower 10% CI	Upper 10% CI
Comparative fit index (CFI)	.971	-	-	.990	-	-
Standardized root mean residual (SRMR)	.060	-	-	.038	-	-
Root mean-square error of approximation (RMSEA)	.071	.057	.085	.067	.050	.085
AGLS corrected comparative fit index (A-CCFI)	.987	-	-	.991	-	-

A second factor analysis was run on the seven and six item scales, to ensure the relationships between items did not shift extensively upon removing the remainder of the questions. Selected fit indices and test statistics for the seven items are shown in Table 10a-b. The items, dimensions, factor loading, standard error, and R^2 values are shown for each of the retained items in Table 11.

The fit indices for both scales fell within the rule-of-thumb boundaries outlined in Hu and Bentler (1999), with the exception of RMSEA on the seven item scale. Fit improved noticeably upon dropping the single item. However, because the fit indices for both scales were already fairly high, and cutoff values are based on guidelines rather than hard-and-fast rules, and can be highly contentious (Kline, 2005), the definitive importance of the difference between model fit is not known, though it is likely of practical insignificance

Table 11: Retained Trust Items

Dimension	Attribute	Item	7 Item			6 Item		
			Factor Loading	SE	R ²	Factor Loading	SE	R ²
Shared Norms and Values	Agreement	<i>Generally speaking, satisfied are you, if at all, with how BNF staff deals with fires?</i>	.862	.508	.742	.859	.513	.737
	Procedural Justice	<i>How often, if at all, do you think fires on the BNF are managed according to a fair process?</i>	.859	.513	.736	.861	.508	.742
Willingness to Endorse	Willingness to Endorse	<i>Considering that the BNF is managed on behalf of everyone, how satisfied are you, it at all, with fire management in the BNF?</i>	.875	.483	.766	.873	.488	.762
	Confidence	<i>How much confidence, if any, do you have in fire managers in the BNF?</i>	.850	.526	.723	.841	.541	.707
	Trustworthiness	<i>Residents of the Bitterroot say the BNF staff is trustworthy when fighting fires.</i>	.818	.576	.668	-	-	-
Perceived Efficacy	Effectiveness	<i>In your community, how would you rate the effectiveness of BNF fire managers in dealing with fire-related issues?</i>	.865	.502	.748	.859	.512	.737
	Reliance	<i>I find the BNF staff to be reliable when managing fires.</i>	.935	.354	.875	.897	.442	.805

To summarize, both models fit fairly well, though the six item scale fit slightly better than the seven-item scale, but the practical significance of the fit was unknown. Thus, further analysis was needed to select between the six and seven item scales.

To assess the validity of each scale, a *k*-means cluster analysis was conducted on each of the factor scores saved from analysis of the six and seven item scales, and compared to the clusters created from analysis of the factor scores from the three trust dimensions. Accuracy was based on the proportion of cases each scale was able to correctly classify based on trust level. It was calculated by dividing the total percent incorrectly classified by the total percent correctly classified. The seven item scale correctly predicted cluster membership for 92.0% of cases, while the six item scale correctly predicted cluster membership for 88.8% of cases. Cross validation tables for each analysis are shown in table 12a-b.

Table 12a: Cross validation for seven item scale

		Clusters for seven item scale			
		Low Trust	Moderate Trust	High Trust	Total
Original 3-Dimension Clusters	Low Trust	95.1%	2.9%	0.0%	
	Moderate Trust	4.9%	89.3%	6.5%	
	High Trust	0.0%	7.8%	93.5%	
	Total Correct	95.1%	89.3%	93.5%	92.0%

Numbers in bold indicate correct classification for each cluster

Table 12b: Cross validation for six item scale

		Clusters for six item scale			
		Low Trust	Moderate Trust	High Trust	Total
Original 3-Dimension Clusters	Low Trust	92.1%	6.0%	0.0%	
	Moderate Trust	7.9%	87.7%	10.8%	
	High Trust	0.0%	6.3%	81.2%	
	Total Correct	92.1%	87.7%	81.2%	88.8%

Numbers in bold indicate correct classification for each cluster

In the seven-item model, replacing the agreement and reliability questions with identically worded questions containing the word “fuels” instead of “fires” reduces fit noticeably (For example, RMSEA lower 10% CI increased to .080, and SRMR increased to .088, well beyond the recommended guidelines). A cross-validation of these items indicated decreased scale validity, correctly classifying items only 80.9% of the time. These changes are not recommended, but it demonstrates that there may be contextual limitations of the survey items and investigation at a later date is warranted.

Salient Values Similarity Model

In order to compare the effectiveness of two different models of trust, a structural equation model was constructed comparing a modification of the SVS trust model to the BNF model developed in this thesis. A generalized least squares (GLS) hierarchical structural equation model, with arbitrary GLS (AGLS) non-normal estimation correction was performed on the combined model of trust (Box 5), with the models linked in covariance. Model fit was excellent, falling well within cutoff guidelines for CFI, RMSEA, and A-CCFI, as well as test statistics for the Yuan-Bentler Corrected AGLS Test statistic and Yuan-Bentler AGLS F-Statistic. Fit index and test statistic data are shown in Table 13a-b

Table 13a: Fit indices for SVS & BNF Models

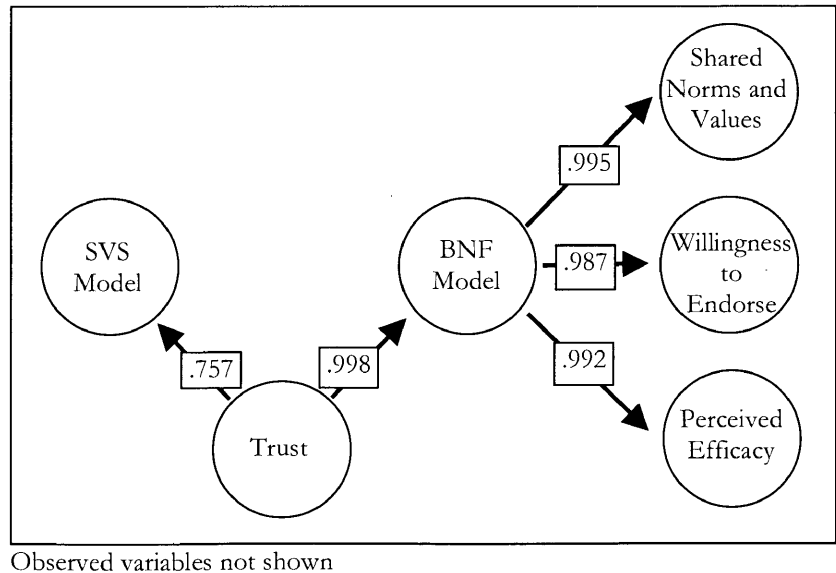
Fit index	Value	Lower 10% CI	Upper 10% CI
Comparative fit index (CFI)	.978	-	-
Root mean-square error of approximation (RMSEA)	.042	.039	.045
AGLS corrected comparative fit index (A-CCFI)	.992	-	-

Table 13b: Test statistics for SVS & BNF Models

Test	Statistic	DF1	DF2	p-Value
Yuan-Bentler Corrected	473.866	-	-	.00000
AGLS Test Statistic				
Yuan-Bentler AGLS	2.332	266	883	.00000
F-Statistic				

The covariance between the models was 0.619, suggesting that although the models measure similar phenomena, different processes are at work. A second analysis was conducted, with the three dimensional model and SVS model loading on trust as a single, higher-order factor (Figure 8). In the second analysis, the standardized path coefficient from trust to the Bitterroot National Forest model was 0.998, while the standardized path coefficient from trust to the SVS model was 0.757. Again this suggests that both models are measuring similar phenomena. Both models loaded highly on trust, but as shown in the figure, the Bitterroot National Forest model loaded on it to a much greater extent than the SVS model, suggesting that the Bitterroot National Forest model captures notably attributes of trust that the SVS model does not. This suggests that although a narrow, one dimensional representation does measure trust, to get a thorough understanding of all the attributes of trust at work, a more complex model that addresses attributes multiple dimensions needs to be used. Trust is a complex entity and needs to be measured as such

Figure 8: SVS Model and 3 Dimension BNF Model Hierarchical Structural Equation Model



Results Summary

Based on the analyses conducted, all the trust scale items were found to be internally consistent. With that finding, factor analyses were conducted on all the items together, as well as on the individual dimensions of trust. Results indicated that although the dimensions did not form separate factors, when analyzed separately all the items in each dimension grouped into single factors. This meant that when analyzed separately from the other dimensions, all the shared norms and values items grouped into a single factor, all the contingent consent items grouped into a single factor, and all the perceived knowability items grouped into a single factor. Factor scores were saved from each trust dimension and used as the basis for respondent segmentation through a cluster analysis. Based on that analysis, respondents were divided up into low, moderate, and high trust groups. A series of latent variable models were then examined using structural equation modeling. In these analyses, the three-dimensional representation of trust was found to fit the data well, although a χ^2 difference test suggested that this fit was only slightly better than that of a uni-dimensional representation. Model simplification was explored and two different reduced item pools were suggested. The three-dimensional model of trust was then compared to a modification of the competing SVS model. Although both models were found to be strongly related to the notion of trust, the BNF model was found to be much more strongly related to trust. This suggests a more comprehensive portrayal of trust is better able to capture the complex nature of trust.

Chapter 4: Discussion & Implications

Models of Trust

One of the primary objectives of this study was to adequately measure a certain community segment's level of trust in a government natural resource agency. Each of the above results helps illuminate this question of how best to measure trust. It seems that many early trust studies were rooted around a variant of the question: *To what extent do you trust A to do B?*, with a few supplemental questions to round out the measure (for example: Mason, House, & Martin, 1985; Miller, 1974; Muller & Jukam, 1977). These early views laid a useful foundation for studying trust, but it seems they were not adequately equipped to deal with trust's complexity. While knowledge about trust has progressed beyond this more simplistic view in recent decades, the use of simplistic surveys like this still occurs (for example: Shindler, & Toman, 2003; G. Winter, Vogt, & McCaffrey, 2004). Other recent research inquiry into trust has been more promising. Most influential in this thesis have been the work of Selnes and Sallis (2003), Citrin and Muste (1999), and Earle and Cvetkovich (1995). Citrin and Muste suggest that trust should be measured on the basis of more than a single item, and regarding more than one object. Doing so provides a check of content validity as well as a cross validation. The authors outline eight attributes on which trust can be measured (see Boxes 1-3 for some of them). Five of the eight attributes they suggested were classified in the *Shared Norms and Values* dimension in this thesis. The notion of shared values also forms the foundation of work based on the SVS model by Earle and Cvetkovich. Peculiarly, there is no overlap between the attributes recommended by Citrin and Muste and the questions recommended by Earle and Cvetkovich, each appearing to measure different

aspects of shared values. The five items used by Selnes and Sallis tapped into four different attributes, in three dimensions, only one of which was based on shared values.

Although Citrin and Muste's (1999) work provided a reasonable framework for beginning to understand trust, it was lacking many of the attributes other trust scales mentioned. The work by Selnes and Sallis (2003) helped provide some perspective to this and broaden the idea of trust. As the reader should be well aware by now, this study goes beyond the scope of what all the trust measures identified up to this point have done, and posits a series of attributes that are believed to contribute to trust. The reason for this significant expansion of traditional empiricism is rooted in optimism of the author—the hope that if federal resource managers better understand the attributes on which people do or do not trust them, they can better attempt to maintain the public's trust, and thus, likely increase the effectiveness of natural resource management. This broad perspective is important because not only does it indicate that agencies are or aren't trusted, it indicates which attributes add to trust in that specific set of circumstances. If, for example, a subsequent study some months from now shows that the public's perception in say, the *procedural justice* of an agency process is low, managers can rest assured that unless the situation changes, the action will probably have a detrimental effect to the public's trust. However, if resource managers attempt to alter their future actions so that what they do is perceived as being more fair and equitable, it will tend to positively affect the perceived procedural justice, and likely increase the public's trust. Thus, a better dimensionalization of trust provides a more informative and more accurate measure of trust.

Dimensionalizing Trust

As an initial step to further understanding the empirical structure and inter-relationship of all the attributes of trust, this thesis examined the dimensional construction of trust, using factor analysis, cluster analysis, and latent variable modeling.

Data Reduction

In the factor analysis, the trust scale items factored into a single dimension, with moderately-strong factor loadings. Factor loadings are measures of the correlation between individual items and the scale as a whole. The strength of the factor loadings amongst all 20 items suggests that they all contribute substantively to the trust measure. It supports the notion that the items are distinct, yet contribute towards the same phenomena, since they did not separate out into multiple factors. This does not provide empirical support for the notion that there are three separate dimensions of trust, although the attributes' organization into dimensions based on their logical similarity still retains its theoretical basis.

However, the χ^2 difference test conducted on the structural models to see if the three-dimensional model fit the data better than a unidimensional model suggested that the three-dimensional model had a better fit, and there was, therefore, an empirical basis for using it. However, because the χ^2 values were fairly close for the two models, the test suggests that although the three-dimensional model does fit better, it may be of no realistic importance. The larger implications of this are that no single trust dimension is more important than the others. The same relationship is indicated by the standardized path coefficients in the three-dimension structural model (Table 6). In that model all coefficients are very close to one, reflecting the suggestion they are very highly related. Because no one dimension is more important than any other dimension, it is important that components of

all three dimensions are included in any empirical measure of trust. Failing to do so would lead to an inaccurate and incomplete representation of trust.

Segmentation

Being able to segment users into groups based on their level of trust provides opportunities for resource managers to focus their trust-building energy the segments of the population that need it most. As Liljeblad et al. (2005) found in an analysis of the same data set, those that were grouped into low trust categories tended to respond strongly on the “distrusting” end of most survey items. Conversely, those that were grouped into high trust levels tended to respond strongly or moderately on the “trusting” end of survey scale items. This suggested that those that were grouped as low trust genuinely had lower trust levels than those that were grouped as high trust. Managers could use that information to help monitor trust levels and alter management techniques based on those findings. If, for instance, resource managers learn that members of population ‘A’ tend to segment into high trust groups, that members of population ‘B’ tend to segment into low trust groups, and further analysis suggested which attributes of trust were most important to that particular set of circumstances. Natural resource managers would have the information necessary to positively affect the trust levels of both groups, *for a greater public purpose*—that is, increasing the acceptability of management actions. Managers could focus much of their attention on population B, the low trust population to ensure that their needs are met, and that the attributes that that group considers most important are looked after and respected. Because population A was already high trust, less would need to be done to maintain their trust levels, but managers need to be sure that whatever they do to meet the needs of population B does not hurt the trust of population A.

Borrie et al. (2002) suggest resource managers focus on building and maintaining these relationships as a component of marketing for a public-purpose in all of their management actions. That is, managers need to focus on trust, commitment, and social responsibility when utilizing marketing principles in natural resource management. Doing so, would help managers achieve their public purpose mandates.

Population segmentation such as this is a component of most any glimpse into public purpose marketing (Bright, 2000). It provides the bridging mechanism between simply having useful information about the characteristics of certain populations, and being able to benefit from the use of it (Kotler & Zaltman, 1971). To be fully effective in the context of natural resource management, however, social marketing needs to incorporate “trust, commitment, social responsibility and support for public purpose” (Watson and Borrie, 2003, 31). Focusing on these areas helps ensure that public resource agencies are perceived to be fostering, rather than undermining the relationships between the agency and the public. Additionally, it allows limited energy and resources to be focused in the areas where they will be the most effective.

Trust as a latent variable

The importance of viewing trust comprehensively has been shown, but are all of the 20 items used in this measure the items necessary to obtain a comprehensive measure of trust? As mentioned before, both the three-dimensional and one-dimensional models of trust had good fit, suggesting that both models did a good job of accurately reflecting the relationships between trust and the three dimensions as latent and the survey items as observed variables. The results suggest that trust is likely to be a complex entity, with a number of attributes in multiple dimensions playing important roles. Thus, if one views trust

through a narrower lens, the portrait of trust obtained will not provide as complex an insight into trust as the broad perspective the causal model suggests. All the standardized path coefficients in both models had moderate to strong values, suggesting the items played an important role in the model. This notion is supported by the Wald test's failure to recommend any items for removal. The Wald test suggests the removal of any variables that do not significantly contribute to the model at a pre-specified p -value. Even at a p -value of .01, the most stringent criterion EQS would calculate, no items were suggested for removal. However, this may have been because any irrelevant variables had already been removed through reliability analysis or factor analysis. The results of all the analyses suggest that the included variables were important to determining respondents' trust levels. Although the Wald test and factor analysis results that all observed variables were significant to the model, a simplification of the scale was explored, with reductions in accuracy assumed to be inevitable. It was assumed, however, that whatever reductions in accuracy were to occur could be limited through the selection of the most appropriate variables. These simplified scales will be discussed shortly.

The structural model presented in Figure 7 relates the SVS trust model to the three-dimensional model developed in this thesis. The three dimensional model of trust has a standardized path coefficient of nearly 1.0, indicating that it is very strongly related to trust³, while the SVS model had a standardized path coefficient of only 0.76, suggesting a weaker, but still fairly strong measure of trust. However, the difference in strength between the standardized coefficients of the SVS model and the BNF model suggests that the two

³ Empirically, standardized path coefficients can be greater than 1.0, and are not uncommon. Values much greater than 1.0, however, indicate that there may be a problem with multicollinearity (Jöreskog, 1999).

models probably represent the data differently. This difference may be due to divergence of the complexity and context of the two models. While the SVS items were focused exclusively on shared values, the BNF model included shared values as only one of three dimensions, suggesting that the other dimensions contributed strongly to a more holistic view of trust. Thus, any future analysis should include items from these dimensions to ensure trust is comprehensively represented. While the modified SVS measure appears to adequately measure trust, the BNF model is more comprehensive. In order to determine specifically the strength of each of the attributes in a relationship, all of the attributes need to be measured in each of the three dimensions. This provides insight into trust that other means of measuring trust are incapable of achieving. However, if only a general assessment of public attitudes is needed, simplifications of the trust measure can be used.

Simplifications of trust scales

The simplified trust measures developed in this thesis may have broad-reaching implications on how trust is measured by resource managers in the future. Six items correctly predicted respondent's trust level nearly 89% of the time, and seven items correctly predicted it 92% of the time. Both scales include items from all three dimensions (See Table 11a-b for review). Aside from the 3% difference in classification, the only difference between the two items is that the seven item scale contains an item related to *trustworthiness*. The distinction between trustworthiness and trust is an important one. Trustworthiness implies that one has motivation for trusting—that the others are worthy of being trusted—while trust simply refers to an aspect of a relationship (Hardin, 2002). It provides a distinction between having a reason to trust and simply trusting. Because the simplified scale includes the important trustworthiness item, and correctly classifies respondents' trust levels

92% of the time, despite a 65% reduction in the number of items, *the seven item scale is preferable*. It must be noted that neither the six-, nor the seven-item scale should be considered to be simplifications of the *model* of trust, but rather, simplifications of the *measure* of trust. These simplified measures do a good job of approximating trust levels, but cannot provide the breadth of insight into a particular relationship that the full trust measurement instrument does.

Because of the suggestions for an effective reduction in the item pool for this study, measures of trust in agency management could be made much more easily and frequently. Managers could conceivably distribute the scale on postage-paid cards, or quickly survey people on the street or on the telephone. Levels of trust could be measured at different intervals throughout a collaborative process, before, during, and after implementation of a management plan, or at any number of imaginable times agencies seek to determine how the public is responding to their actions. A large number of people could be sampled quickly and easily. Thus, I believe the seven item scale may have great utility and simple accuracy for natural resource management.

Limitations to reduced item pool

Although these reduced item pools appear to have promise, they should be used with caution. No specific research has been done on their contextual applications or their consistency amongst the same people over time. Simply, because they are based on an analysis indicating which attributes of trust were most important to one set of respondents at one point in time, the scale may not be wholly valid beyond the context of the original survey.

Because most attributes of trust are likely to vary by object and attribute (Citrin & Muste, 1999), and trust level can vary by location (Liljeblad et al., 2005; P. L. Winter &

Cvetkovich, 2003) there are likely different attributes of trust that would be more appropriate to measure in different contexts and in different locations. For example, *reliability*, *effectiveness*, and *procedural justice*, among others, emerged as the most important attributes of trust with regard to fire management on the Bitterroot National Forest. However, if the context were changed to the management of, say, wild salmon stocks in Alaska, *responsiveness*, *uncertainty*, and *political inclusion*, none of which were in the reduced pool in this study, could potentially turn out to be most important in that situation.

One potential scale limitation related to differences in attributes occurring in changing the context of attributes in the seven-item scale. On the *agreement* and *reliability* attributes in the full 20-item scale, the same questions were asked twice, each time centered on a different action. The first time the question was asked, it referred to fire management, while the second time it was asked it referred to fuels management. Switching the actions on those two attributes in the seven item pool reduced the correct classification respondents' trust levels from 92% to less than 81%. This raises the question of whether the objects in the reduced pool can be changed. The large difference between correct classification rates suggests a number of possibilities. First, ordering bias may have contributed to large differences in how the items were responded to and, thus, how they contributed to the scales. If, for instance, an item about *fuel* management that a respondent had a very strong opinion about was asked immediately before a *fire* management question, which the respondent had little opinion about, the stronger opinion could inflate the person's response to the item which they had little opinion about. Second, most of the questions on the survey reflected fire management, rather than fuels management. It may, in fact, be the case that fire management and fuels management are psychologically separate concepts, which people respond to very differently. Thus, the abundance of fire questions over fuel questions

skewed the classification of respondents. Third, the scale may not be robust enough to respond to partial changes of context. Fourth, it could be a combination of any the above reasons, or fifth, some unknown reason. Myriad limitations of object, attribute, and context may potentially exist for the reduced trust scale, though what they are is uncertain. How to deal with these potential limitations will be discussed shortly.

Managing for Trust

The challenges of managing for a notion as abstract as trust are not small. The myriad ways of portraying and affecting trust present a challenge to even the most efficient, streamlined organization. In order to put the knowledge about trust to use, it would take a solid grounding on the causes of trust, a thorough understanding of how one's actions and intentions are perceived by and affect others, plus a level of perseverance, organization, and know-how of how to actually change people's attitudes. These challenges would prove daunting to most, but when combined with the inflexible and excessively bureaucratic systems Federal agencies work within, the task seems nearly insurmountable.

All employees of federal agencies that interact with the public have an influence on the public's perception of agencies. By exemplifying the attributes of trust identified in this thesis, every action by a federal employee could potentially be a trust-building or trust-maintaining action. Some employees, however, have more power and impact on the public's perceptions than others, so trust-building actions by these more influential people are likely most important. These employees, the ones directly responsible for implementing government actions, frequently have sufficient flexibility such that they have a measurable impact on trust. Although it is unlikely the rules and regulations these managers have to implement will ever significantly decrease in stringency or number, mid-level managers'

seemingly otherwise inconsequential actions can be beneficial or detrimental to the public's trust.

Take, for example, two opposing ways of accomplishing the same U. S. Forest Service management goal: making a management decision using a collaborative team. In the first case, one could imagine a district ranger starting a collaborative planning process that rushes through the process--not allowing collaborative members sufficient time to build trust, limits which interests can be involved, continuously changes the ground rules of the process, and refuses to implement the decision the collaborative team came up with. Imagine, then, another district ranger working with the same collaborative team who allows ample time for members to build trust, makes sure that all interests are represented at the table, maintains meaningful, effective ground rules, and implements the decision the collaborative team comes up with. There is little question as to whose actions would likely engender the most trust. The second manager takes a much more trust-friendly approach, and has a far better chance of building, or at least maintaining, the public's level of trust.

Focusing on relationships between individual employees and the public, however, is not necessarily enough to affect major change in agency perception. Acting on their own, individual employees will unlikely all seek to act in a manner that maximizes trust. It is important for organizations to pay attention to all *internal* and *external* relationships they have (Morgan & Hunt, 1994). In a larger, more formal arrangement, trust must also be managed for perhaps as a component of an agency's public purpose marketing strategy. As Watson and Borrie (2003) state, "public land management agencies have been entrusted not only with the stewardship of the land but also the public purpose and mandate for that land (p. 31)." Morgan and Hunt found that trust and commitment to a relationship were the primary mediating variables in social marketing. In other words, in order for social marketing to be

successful, agencies must show that they are committed to maintaining a trusting relationship with the public. If an agency does not take a united front, and some actions are seen as being trust-generating, while others are perceived as trust-destroying, their commitment to maintaining the relationships with the public can easily be called into question, and trust will likely be lost.

Recent research has suggested that consistency of agency actions with public values is important to maintaining trust. The more that agency actions are in concordance with public values, the more the public is likely to trust the agencies. The further those actions are from public values are, the less the public is likely to trust them. However, if the public perceives the value inconsistency to be justified, the divergence between values and action is less detrimental to trust (Cvetkovich & P. L. Winter, 2004). Imagine that, in order to limit the spread of a very large forest fire, land managers set fire to the area encompassing a large lakefront park that many members the public use regularly, and most of the public values highly. Most times an action such as this would likely destroy the public's trust in land managers, because the managers "ruined" an area the public valued highly. However, if that management-ignited fire around the lake prevented the massive forest fire from spreading into a residential area immediately adjacent, people would likely not distrust managers anywhere near as much. While one thing they valued (the park) was "destroyed", something else they likely valued even more (their lives, homes, and livelihoods) was preserved. This distinction is important. It implies that even if agencies act in a manner that damages the public's trust in them, if they provide *legitimate* justification for their actions, or are even perceived to have legitimate justification, the public lets them off the hook. Hardin (2003) suggests that changes in the circumstances of a relationship are grounds for distrust. However, as this new research by Cvetkovich and P. L. Winter suggests, it all comes down

to whether the public perceives the change to be justified--in this case, the loss of a valued park was justified when compared to losing countless homes.

Adaptive Trust Management

A note of caution to managers is warranted, however. The simplified trust measure developed in this thesis presents the opportunity for efficient, frequent evaluations of trust. With this measure, managers could readily make small changes in their behavior and actions upon the release of trust monitoring results in order to help manage for trust. This approach, however, should be used carefully. Managers must be careful to ensure that their monitoring and alteration of their behavior and management practices to benefit trust does not become “adaptive trust management.” If this were to occur, natural resource managers would continually revisit each of their actions, examining the actions’ influence on public trust and changing it if trust levels decrease. While this response-based approach to trust management may initially seem like a good idea, it is not likely to build trust over the long term. If one recalls the five attributes of trust in the Perceived Efficacy dimension (Box 3), this framework works against all of the five attributes. Public’s *previous experience* with constantly changing management methods and the *uncertainty* related to future actions, suggests that managers are not sufficiently *competent to reliably or effectively* manage trust levels. While one has to appreciate the irony in not trusting an agency to manage for trust, it suggests that an adaptive management framework for trust is likely not appropriate. Rather, trust management should be incorporated into an agency’s long-term public-purpose marketing strategy, where it can be nurtured over time and allowed to grow. Doing this, allows managers to make a long-term investment in the public, that, if properly fostered, can provide long-term payoffs in effective resource management

Building trust

Trust is an indicator of good public process, suggesting that managers have done their job well when it comes to both involving the public, as well as the accomplishment of agency goals (P. L. Winter, et al., 1999). It suggests that managers have taken the needs and concerns of the public into consideration when deciding what to do. Managers, however, cannot simply be told “do these things and you will gain the public’s trust.” They need to behave in a manner that strengthens and maintains trust. Agencies cannot focus on bureaucratizing trust and treating its attributes as merely criteria on checklist that must be met before agencies can move on to the next stage of management or project. The attributes do not provide a prescription for trust, but rather are indicators that help contribute to an understanding of its relative strength.

Natural resource managers can build trust by ensuring that they are behaving in a manner that gives the public reason to trust them. Since trusting involves reciprocity, not only does the public need to be able to trust agencies, agencies also need to be able to trust the engaged members of the public. The latter is challenging—and can potentially be threatening—for agencies to do, but it needs to be done if a truly trusting, reciprocal relationship is ever to exist between natural resource agencies and the public. Resource agencies can begin putting trust in the public by first trusting them with minor decisions, such as coming up with small resource management plans through collaborative processes. Reciprocally, the public can trust agencies more when they see that the plans they developed are effectively implemented. This reciprocal relationship can be allowed to grow and strengthen as each group entrusts one another with larger and larger tasks, extending the boundaries of their relationship. The challenge comes with agencies extending trust beyond minor decisions, such as localized resource management actions.

However, given that the U.S. Government is constructed around a Madisonian system of checks and balances, problems arise with the idea of allowing agencies to grant major decisionmaking power to the public. Under the current system, this would simply be untenable because current laws do not allow devolution of federal powers to the public. Additionally, given this procedural republic, the question arises as to whether trust can even be built in sea of intentional distrust. The attributes of trust seem to almost become meaningless if the system they reside within does not allow for them to be fostered. Further, granting complete trust within a system of management as complex or important as U.S. natural resource management can potentially dangerous. If the system of checks and balances is disabled, agency power can be abused and natural resource decisions can be made that benefit those with the decisionmaking power, rather than the public as a whole. These cautions aside, natural resource managers should still grant a degree of trust to the public, to help increase the acceptance of natural resource decisions.

Implications for increasing or decreasing trust levels

While for the most part, this thesis has focused on trust in one particular branch of the U. S. Government, there is an important extension beyond the specific agency and management context. Having high levels of trust among both community members and federal agencies has broad implications on their future relations. Sztompka (1999) suggests that infusing trust into communities has five distinct functions. First, it encourages social interactions of all types, helping to build social capital and stimulating civic engagement. This means that community and agency members are likely to agree to work together, seek to maintain their relationships, and work toward a common good. Second, it allows people to

communicate openly and avoid “groupthink”. Because people are less concerned about being judged and know that what they say will be listened to and respected, they are more likely to speak up if they disagree with a direction the agency or community is heading. Third, it encourages the tolerance or acceptance of different cultures, ideologies, and individuals, because it allows them to be perceived as non-threatening. Everyone’s viewpoints are considered valid and valuable because they are not intended to harm or alter the lives or lifestyle of others. Fourth, living within a culture of trust strengthens people’s bonds with all aspects of their community, contributes to their identity, and generates collective solidarity, which leads to cooperation, reciprocal help and sacrifice. It helps people to realize common goals that both community members and agencies share. Because people and agencies believe they are working together, they are less likely to attempt to subvert a process. Finally, when present throughout a community, trust significantly lowers transaction costs and increases cooperation. Lawsuits and contractual agreements are unnecessary because people are working toward common goals and in a common direction. Thus, the gaining of trust has many socially productive and reinforcing benefits, in general. It is a worthy goal for government in many ways.

Alternatively, relationships between agencies and community members which are rooted in distrust create a much more challenging, inefficient means of existence. First, communities of distrust erode social capital, leading to social fragmentation, the breakdown of interpersonal networks, and isolation. Community members do not want to work together or get to know one another, let alone work harmoniously with federal agencies. Next, distrust closes channels of communication, leads to isolation and encourages pluralistic ignorance. People and agencies get set in their ways of doing or considering things and tend to be closed to new alternatives, even if they are steering themselves toward a cliff-edge.

Third, it encourages defensive behavior, hostile stereotypes, and the spreading of rumors. Community members and agencies simply don't want to work together; rather than cooperate, they tend to sit around and talk about one another behind their backs. Fourth, it alienates and uproots individuals' connections to a place. If people or agencies feel like they have no tie to an area, they are less likely to be concerned with how agencies manage it or what other community members do to it. Finally, distrust tends to spread from outside relations to interpersonal relations, increasing the need for constant vigilance (Sztompka, 1999) If people do not trust one another or the federal agencies, they evaluate every action or intention of the other, scrutinizing and criticizing them. Thus, there is a tendency toward strict, negotiated contractual agreements when cooperation is necessary and toward lawsuits when it is not.

The Context of Trust

Fire and fuel management in the Bitterroot National Forest proved to be an excellent context in which to study trust. All forms of natural resource management tend to be inherently contentious, each with different ecological, social, and economic implications. Because of the risk it poses to people, fire and fuels management, however, affects people lives and livelihoods in ways that other forms of resource management cannot, and this is likely to affect trust differently than other forms of resource management. The Western United States are no stranger to threats of forest fire, and its residents, both current and historic, have been dealing with fire for centuries. In addition to having a long history of dealing with fire, Western residents may very well have different levels of trust than other communities. As Kemmis (1990) acknowledges, Western politics have long been fraught

with distrust. This suggests that perhaps Western residents are somewhat less trusting in general than residents in other parts of the country. These assertions lead one to question the effect that studying trust in the Western U.S., had on the results of this study, as well as on the breadth of their generalizability.

If this study were to be repeated with a different population of respondents, or regarding a different subject the results of this research could very well be different. The attributes that were identified as the most important contributors to trust in this study could turn out to be less important if the context were changed. Also, it means that these results likely cannot be *fully* generalized across different populations and different subjects.

Differences could occur between comparing the results of this study to objects as broad as oil drilling in the Arctic National Wildlife Refuge, or objects more similar to the original subject, such as timber harvests in the Bitterroot National Forest. Despite this potential for differences, there are bound to be contextual similarities that make this study usable and generalizable throughout the field of natural resource management. Just because the particular circumstances of a situation are not identical to the situation this measure was developed in does not mean that it is not cannot be applied to other situations. A large, random sample was taken from a diverse population of Westerners. Thus, much of what was learned about respondents' trust levels can be thought to be representative of similar populations. Additionally, specific insights can be gleaned, by looking to some of the more general ideas the results of this study support, such as the three-dimensional structure of trust, as well as the relation of that three-dimensional model to the SVS model of trust.

While these contextual limitations do not provide support for a universal theory of trust, the results are none the less valuable. They provide a better understanding of trust in the context of natural resource management than has previously been unavailable in the

field. Although the results may not be completely generalizable beyond their original context, much can be gleaned from them, and the model they resulted from provides a useful framework for examining trust further.

Future Research

While the importance of trust in all types of relationships is clear, scientists have been unable to create a universally accepted way of defining it (Kramer, 1999), let alone measuring it. In an ideal world, a perfect scale would be developed in one survey application, and all the necessary information would be collected at once. Acknowledging that this is far from a perfect world, and a number of possible limitations have already been noted, additional research is recommended. The approach to measuring trust in this thesis has been far broader than most, as it attempts to capture as many of trust's attributes as possible, though precisely how thorough and accurate the framework is uncertain. Future research should be conducted in a manner that helps to unravel this mystery, and determine if this broader, more comprehensive view of trust is sufficiently effective, accurate, and efficient. Some tentative research directions are now suggested.

Extensive research should be done to examine the contextual limitations of the full scale. Doing so would not only benefit the scale and its future use, but also contribute to knowledge about trust. Insight could be gained into how the scale holds up with different combinations of object, function, and format, but also what attributes of trust are most important in a variety of contexts. Items in Shared Norms and Values dimension may be more important in one situation, while items in the Perceived Efficacy dimension may be more important in another. Items from all three dimensions may be equally important in

other situations. The reduced scale should also be examined to determine the contextual limitations of trust.

Further research into item scaling would also be helpful. If the full item pool were standardized with the same scale or number of scale points, without negatively affecting accuracy, a trust index could be calculated. As it is, using categorical response options, as was the case in this thesis, placed analytical constraints and burdens on researchers. Creating an index would provide an easy way to generalize trust levels across different segments of the population. The index could be calculated as simply as summing or averaging the items, and possibly as complex as or more complex than multiple regression. It would also be helpful to compare the trust scale developed in this thesis to additional trust scales beyond the SVS model. Much can be learned by the examination of alternative trust scales, and more effective ways of measuring trust could be developed. Additional analysis could also be conducted on this data set. A number of relationships were not examined, such as how trust in fire and fuels management affects the level of trust in forest management in general, or how individual cynicism affects trust in fire management. Examining these relationships could provide insight into the differences between different levels of trust, be they in forest managers, the U. S. Government in general, or other people.

It would also be immensely valuable to gain insight into how to integrate trust management or public-purpose marketing strategies into agency management objectives, as well as into society as a whole. Simply knowing about trust is not enough to positively affect society. It has to be implemented by managers and engrained into society's basic beliefs to be of the greatest long-term benefit. The application of the theoretical and empirical insights of this thesis will inform that change, and hopefully help lead to its implementation.

Conclusions

Without a doubt, trust is an effective measure of an agency's public process. It allows agencies to assess how well they are doing in the public's eyes. With knowledge about the components of trust, agencies can figure out how to improve and better meet their public purpose mandates. But simply knowing about the public's levels of trust is not enough to actually have an impact on it. Morgan and Hunt (1994, 31-32) state that "to the manager, understanding the process of making relationships work is superior to simply a 'laundry list' of antecedents of important outcomes." In order for any knowledge about trust to actually have an effect on its intended source, the knowledge actually needs to be put into practice. Most of the trust literature however, is in academic format. Managers and the general public need to have an easy, understandable way to learn about trust. Whatever it is, it has to be complex enough to be useful, but it must be simple enough that people will utilize it. After all, what good is knowing about something as socially important as trust, if it can't be put into practice? And what good is attempting to put it into practice if people don't trust organizations to affect something as important as trust?

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Appendix: Survey Instrument

INTRODUCTION

Hello, my name is [INSERT YOUR FIRST AND LASTNAME].
I'm calling from The University of Montana (here) in Missoula. We're doing a survey to find out what residents of Ravalli County think about forest fire management in the Bitterroot National Forest on behalf of researchers at the University of Montana.

First, though, I need to be sure I have dialed the right number. Is this 999-9999?

In order to do the survey, I have to follow a specific selection procedure. For this survey only people aged 18 and older are to be interviewed. So of all the people living in your household, including yourself, how many are 18 years of age and older?
ENTER NUMBER

And how many of these persons are female? ENTER NUMBER

According to the selection procedure, I need to interview _____. Is he/she available? Or is that you?

READ THE FOLLOWING CONFIDENTIALITY STATEMENT TO ALL RESPONDENTS:

Before we start, I want to assure you that this interview is completely confidential and voluntary. If we should come to a question you don't want to answer; just let me know and we'll go on to the next question. This interview should take about 12 minutes.

11. How old were you on your last birthday?

Years _____

IF UNDER THE AGE OF 18 TERMINATE THE INTERVIEW.

PERSONAL EXPERIENCE WITH FIRE IN THE BITTERROOT

The first group of questions asks about how you, personally, have been affected by fires in the Bitterroot.

A1. How much have you, personally, been affected by smoke from fires in the Bitterroot? Would you say you were not at all affected, somewhat affected, or very affected by smoke from fires in the Bitterroot?

Very	3
Somewhat	2
Not at all	1
DK	8

A2. During fires in the Bitterroot, have you, personally ever been:

	Yes	No	DK
a. Evacuated from your home	1	0	8
b. Told to prepare to evacuate, but not required to	1	0	8
c. Told to evacuate but chose not to	1	0	8

A3. Some people have lost work hours or found that their businesses lost money due to fires in the Bitterroot. Other people worked more hours or found that their businesses were busier. Which of the following has ever applied to you, personally, as a result of fires in the Bitterroot?

	Yes	No	DK
a. I lost hours at work	1	0	8
b. I worked more hours	1	0	8
c. My business or employer lost money	1	0	8
d. My business or employer made more money than usual	1	0	8

A4. Have you, yourself, ever worked in a job that helped to fight fires in the Bitterroot? Examples of these jobs include working on a fire crew, fire camp support staff, local law enforcement, or local emergency services.

Yes	1
No	0
DK	8

FIRE MANAGEMENT IN THE BNF

The next group of questions asks about fire management in the Bitterroot National Forest.

C1. Generally speaking how satisfied are you, if at all, with the way the Bitterroot National Forest staff deals with fires?

Very satisfied	4
Somewhat satisfied	3
Somewhat dissatisfied	2
Very dissatisfied	1
DK	8

C2. Generally speaking how satisfied are you, if at all, with the way the Bitterroot National Forest staff deals with forest fuels? IF NECESSARY, FOREST FUELS ARE LIVING OR DEAD PLANTS THAT ARE FOUND IN WOODED AREAS.

Very satisfied	4
Somewhat satisfied	3
Somewhat dissatisfied	2
Very dissatisfied	1
DK	8

C3. Considering that the Bitterroot National Forest is managed on behalf of everyone, how satisfied are you, if at all, with fire management in the Bitterroot National Forest?

Very satisfied	4
Somewhat satisfied	3
Somewhat dissatisfied	2
Very dissatisfied	1
DK	8

C4. In the past how pleased, if at all, have you been with the way fires in the Bitterroot National Forest were managed?

Very pleased	4
Somewhat pleased	3
Somewhat displeased	2
Very displeased	1
DK	8

C5. How much, if any, confidence do you have in wildland fire fighters in general? Do you have?

Complete confidence	4
Quite a lot of confidence	3
Not very much confidence	2
No confidence at all	1
DK (9)	8

C6. What about fire managers in the Bitterroot National Forest? Do you have? IF NECESSARY, FIRE MANAGERS ARE TRAINED SPECIALISTS ENGAGED IN FIRE MANAGEMENT. EXAMPLES INCLUDE: STATE OR FEDERAL FIRE SPECIALISTS, INCIDENT COMMAND TEAMS, OR FOREST PLANNERS.

Complete confidence	4
Quite a lot of confidence	3
Not very much confidence	2
No confidence at all	1
DK	8

C7. Based on your observations and experiences what portion, if any, of the people who manage forest fires in the Bitterroot National Forest know what they are doing?

All	4
Most	3
Less than half	2
None	1
DK	8

C8. In your community, how would you rate the effectiveness of Bitterroot National Forest fire managers in dealing with fire-related issues?

Excellent	4
Good	3
Fair	2
Poor	1
DK	8

C9. How sure, if at all, have you felt that forest fires threatening your community or your property would be put out in time?

Very sure	4
Somewhat sure	3
Somewhat unsure	2
Very unsure	1
DK	8

C10. How much attention, if any, have Bitterroot National Forest managers paid to what people think when managers decide what to do about forest fires?

A good deal of attention	3
Some attention	2
Not much attention	1
DK	8

C11. When managers of the Bitterroot National Forest speak on television, radio, in newspapers, or at public meetings about forest fires, how often, if at all, do they tell the truth?

Always	4
Mostly	3
Less than half of the time	2
Never	1
DK	8

For each of the following phrases please tell us to what extent you agree or disagree.

C12. I find the Bitterroot National Forest staff to be reliable when managing fires.

Strongly agree	4
Somewhat agree	3
Somewhat disagree	2
Strongly disagree	1
DK	8

C13. I find the Bitterroot National Forest staff to be reliable when managing forest fuels. IF NECESSARY, FOREST FUELS ARE LIVING OR DEAD PLANTS THAT ARE FOUND IN WOODED AREAS.

Strongly agree	4
Somewhat agree	3
Somewhat disagree	2
Strongly disagree	1
DK	8

C14. Residents of the Bitterroot Valley say that the Bitterroot National Forest staff is trustworthy when fighting fires.

Strongly agree	4
Somewhat agree	3
Somewhat disagree	2
Strongly disagree	1
DK	8

C15. I believe the Bitterroot National Forest staff demonstrates a general attitude of compassion when fighting fires.

Strongly agree	4
Somewhat agree	3
Somewhat disagree	2
Strongly disagree	1
DK	8

C16. Managers on the Bitterroot National Forest respond to the needs of local residents when fighting fires.

Strongly agree	4
Somewhat agree	3
Somewhat disagree	2
Strongly disagree	1
DK	8

C17. When fighting fires, do you think that the Bitterroot National Forest staff generally:

Wastes a lot of the money	3
Wastes some money	2
Doesn't waste very much money	1
DK	8

C18. Would you say that you are proud of the way fire is managed on the Bitterroot National Forest, or that you can't find too many things about the fire management to be proud of? IF NECESSARY, PRIDE IN A FOOTBALL TEAM OR PRIDE IN ONE'S COUNTRY.

Proud of fire management	1
Can't find much too many things	0
DK	8

C19. How often, if at all, do you think fires on the Bitterroot National Forest are managed according to a fair process?

Always	4
Mostly	3
Less than half of the time	2
Never	1
DK	8

C20. To what extent, if at all, does the Bitterroot National Forest share your values about fire management? Please rate the extent to which the Bitterroot National Forest shares your values on a scale from one to five where one is not at all and five is completely.

Completely	5
	4
	3
	2
Not at all	1
DK	8

C21. To what extent, if at all, do you agree or disagree with the following statement: Science can settle differences of opinion about the risks and benefits from forest fires?

Strongly agree	4
Somewhat agree	3
Somewhat disagree	2
Strongly disagree	1
DK	8

GENERAL MANAGEMENT OF THE BITTERROOT NATIONAL FOREST

The next section changes from asking about fire management to focusing on the Bitterroot National Forest's general management practices.

D1. How satisfied are you, if at all, with the overall management of the Bitterroot National Forest?

Very satisfied	4
Somewhat satisfied	3
Somewhat dissatisfied	2
Very dissatisfied	1
DK	8

D2. In the past how pleased, if at all, have you been with the way the Bitterroot National Forest in general was managed?

Very pleased	4
Somewhat pleased	3
Somewhat displeased	2
Very displeased	1
DK	8

D3. How much, if any, confidence do you have in managers of the Bitterroot National forest in general? Do you have?

Complete confidence	4
Quite a lot of confidence	3
Not very much confidence	2
No confidence at all	1
DK (9)	8

D4. To what extent, if at all, does the Bitterroot National Forest share your values about managing the Bitterroot National Forest in general? Please rate the extent to which the Bitterroot National Forest shares your values on a scale from one to five where one is not at all and five is completely.

Completely	5
	4
	3
	2
Not at all	1
DK	8

GENERAL MANAGEMENT OF THE USDA FOREST SERVICE

The next group of questions asks about the USDA Forest Service and its general management practices.

Please rate each of the following phrases on a scale of 1 to 5, where five means the phrase represents what you believe and one means that the phrase does not. The USDA Forest Service:

E1. Supports my views.

Supports my views	5
	4
	3
	2
Opposes my views	1
DK	8

E2. Has similar goals to mine.

Has similar goals to mine	5
	4
	3
	2
Has different goals than mine	1
DK	8

E3. Thinks like me.

Thinks like me	5
	4
	3
	2
Does not think like me	1
DK	8

E4. Shares my values.

Shares my values	5
	4
	3
	2
Does not share my values	1
DK	8

E5. Is like me.

Is like me	5
	4
	3
	2
Is not like me	1
DK	

GENERAL MANAGEMENT OF THE FEDERAL GOVERNMENT

The next few questions ask about the general management of the Federal Government.

F1. Now what about the government in general? Do you think the federal government:

Wastes a lot of the money	3
Wastes some money	2
Doesn't waste very much money	1
DK	8

F2. How much of the time, if at all, do you think you can trust the government in Washington to do what is right? Please rate how much of the time on a scale from 1 to 5 where one is none of the time and five is all of the time.

All of the time	5
	4
	3
	2
None of the time	1
DK	8

[General Trust]

TRUSTWORTHINESS OF PEOPLE IN GENERAL

For the next group of questions we are shifting focus from asking about the federal government to asking about the trustworthiness of people in general.

B1. Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?

Try to be helpful	1
Just look out for themselves	0
DEPENDS	2
DK	8

B2. Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?

Would take advantage of you	1
Would try to be fair	0
DEPENDS	2
DK	8

B3. Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?

Most people can be trusted	1
Can't be too careful	0
OTHER, DEPENDS	2
DK	8

DEMOGRAPHICS

These last few questions are for classification purposes only.

G1. All together, how many years have you lived in Ravalli County?

Years _____

G2. Is this location in Ravalli County your primary residence?

Yes 1
No 0

G3. All together, how many years have you lived in Montana?

Years _____

G4. What is the zip code of your primary residence?

Zip Code _____

G5. Do you live?

In town 3
On the edge of town 2
Outside of town 1
DK 8

G6. Is the place you live?

In a forested area 3
On the edge of a forested area 2
Outside a forested area 1
DK 8

G7. Do you live within one half mile of the boundary of the Bitterroot National Forest? READ ALL RESPONSE OPTIONS INCLUDING "NOT SURE."

Yes 1
No 0
Not sure 8

G8. What is the highest degree or level of school you have completed?

Grades 1-8 (elementary)	1
Grades 9-12 (some high school but no diploma)	2
Grade 12 or GED (high school graduate)	3
College 1 year to 4 years (Some college or technical school, but no degree)	4
College 1 to 4 years (Associate degree)	5
College 4 years or more (College graduate, BA, MB, JD, MD, PhD)	6

G9. Which of the following categories best describes your total household income from all sources in the year 2003, before taxes and other deductions? This includes money from jobs, net income from business, farm or rent, pensions, dividends, interest, social security payments, and other money income received by members of this household who are 15 years of age or older. If you are self-employed or own your own business, please report your net income.

100,000 dollars or more	1
Between 50,000 and 100,000 dollars	2
Between 50,000 and 75,000 dollars	3
Between 35,000 and 50,000 dollars	4
Between 20,000 and 35,000 dollars	5
Between 15,000 and 20,000 dollars	6
Between 10,000 and 15,000 dollars	7
Under 10,000 dollars	8
DK	98
Refused	99

G10. Besides this phone number, do you have other telephone numbers in your household, such as fax or data lines, a children's or business line? Do not include cell phones.

Yes	1 GO TO G11
No	0 SKIP TO G12
This phone number is not the respondent's	3 SKIP TO G12
DK	8 SKIP TO G12

G11. How many of these telephone numbers are connected to phones that can be answered by a person?

RECORD EXACT NUMBER (RECORD "UNSURE/DK" AS 88)

G12. Have you or other members of your household ever worked for the USDA Forest Service?

Yes	1
No	0
Others in Household	2

G13a. Could you tell me whether or not you are a member of an organization that has as one of its interests the management of the Bitterroot National Forest?

Yes	1	Go to G13b
No	0	Skip to G14
DK	8	Skip to G14

G13b. What is the name of that organization?

G14. Do you have any comments?

G15. That is all of the questions we have. Thank you very much for your assistance!

G16. After interview record respondent's gender

0	Female
1	Male