Trust and Cooperation in Watershed Management

Full Research Proposal
Russell Sage Foundation: Initiative on the Study of Trust

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Introduction

What is the role of trust in facilitating cooperation? This is perhaps *the* central question that spans the interdisciplinary literature on trust and society (Cook 2000; Kramer and Tyler 1996; Ostrom 1998). Following Hardin (1990:187), I define *trust* as "encapsulated self-interest, an account in which the truster's expectations of the trusted's behavior depends on rational assessments of the trusted's motivations." Trust is particularly important in interdependent exchange relationships where the utility of person A depends on the strategic choices of person B. Interdependent social exchange relationships entail risk because there is a probability of receiving a bad outcome if trust is misplaced and the trusted individual does not engage in the expected behavior (Williamson 1996). Trust facilitates exchange by allowing actors to make credible commitments to behave in a certain way, even without the monitoring and enforcement services of an outside agent—trust reduces the transaction costs of cooperation (Coleman 1990; Putnam 1993; Granovetter 1985; Kreps 1990).

In this proposal, I intend to answer four central questions about the role of trust in facilitating cooperation in collective-action problems involving the use of common-pool resources (Ostrom 1990):

1. Does trust facilitate cooperative *behavior*? Demonstrating a link between the attitude of trust and actual behavioral outcomes, while controlling for other incentives, is a critical test of the trust=cooperation hypothesis.

2. Is *social* trust between private actors more effective in promoting cooperation than *institutional* trust between private actors and the government? In public policy arenas, the development of social trust may remedy a history of distrust in government personnel or agencies.

3. Does the role of trust change in different *institutional contexts*? Institutional safeguards that monitor and enforce cooperation may minimize the role of trust.

4. What is the *causal relationship* between trust and behavioral expectations? There is probably a reciprocal relationship between trust and behavioral expectations. While past cooperative behavior by a trustee creates trust, trust also creates expectations of cooperative behavior in future exchanges.

To answer these questions, I need a research setting that constitutes a collective-action problem, where cooperation varies and trust is measurable. An ideal setting is provided by the emergence of cooperation in the context of watershed management. Since the late 1980s, environmental policy-makers have been experimenting with decentralized policies designed to address multiple environmental problems in a watershed. Following Ostrom (1990), I view these watershed management institutions as governance institutions for solving collective-action problems involving the use of common-pool resources (CPR). Without effective governance institutions, watershed resources are overexploited and ecosystems are not maintained, leading to undesirable outcomes for both private and public actors. However, the effectiveness of watershed management depends on cooperation from all types of involved "stakeholders". Because each stakeholder has an incentive to free ride on the watershed protection efforts of other actors, cooperation in watersheds captures the essence of a risky social exchange relationship in a collective-action dilemma.

My previous research has already provided some evidence of a link between trust, cooperation, and policy effectiveness in watershed management. One of the most prominent national examples of watershed management is the US Environmental Protection Agency's National Estuary Program (NEP). Estuaries in the NEP conduct a collaborative planning process resulting in the completion of a non-binding resource management plan, which requires voluntary cooperation for implementation. I

conducted a survey of NEP stakeholders in 20 estuaries that asked the following question (see Lubell 2000 for discussion of research design):

> Thinking about the range of contacts you have had with other stakeholders, do you completely trust these stakeholders to fulfill the promises and obligations made on each issue in the context of the partnership, completely distrust them, or somewhere in between? (11-point Likert scale, 0=Completely distrust, 10=Completely trust)

Table 1 reports bivariate correlations between trust and several other beliefs related to cooperation: ability of policies to improve environmental problems, conflict resolution, and stakeholder teamwork. The positive relationship between trust and cooperative beliefs is exactly what would be predicted by the encapsulated self-interest definition, along with many scholars in the social capital and collective action traditions (Coleman 1990; Fukuyama 1995; Levi 1988; Putnam 1993; Ostrom 1994; Taylor and Singleton 1993). These are relatively strong correlations for survey research, and the relationships survive a variety of multivariate specifications. The importance of trust in watershed management mirrors findings in other environmental policy domains (Scheberle 1997; Williams and Matheny 1995).

Table 1: Bivariate Correlations Between Trust and Other Cooperative Beliefs Among NEP Stakeholders

	Problem Improvement	*Conflict Resolution*	*Stakeholder Teamwork*
Trust	.457 (p<.000)	.415 (p<.000)	.286 (p<.000)

Unfortunately, this research has several weaknesses with respect to answering the central questions about trust discussed above. First, there are no behavioral measures of cooperation, only measures of cooperative attitudes. While cooperative attitudes are surely a prerequisite for behavior, they are not sufficient. Second, the NEP survey population consisted of many different types of stakeholders, private and public, from all levels of the federal system. Because they received the same general survey instrument, it was impossible to completely isolate the effects of trust from other calculations about the relevant benefits and transaction costs of cooperation specific to different types of actors. As Williamson (1996) might argue, the influence of trust on cooperation may disappear when other incentives are adequately measured. Third, the previous survey has only a single general measure of trust, which does not distinguish between different interpersonal and institutional attitude objects. Burns and Kinder (2000) argue trust is domain-specific, and thus should be measured with domain-specific questions. Lastly, a cursory knowledge of institutional arrangements in each estuary prevented a compelling comparative institutional analysis of the role of trust. A more thorough understanding of differences between watershed management institutions will provide a more compelling analysis.

The research design proposed here attempts to remedy these problems by focusing on a very narrow class of watershed stakeholders: farmers. Many water quality problems are caused by non-point source pollution from agricultural runoff, which includes pesticides, nutrients from fertilizers, and animal wastes. A primary goal of watershed management is to induce farmers to adopt *best management practices* (BMP), which are changes in farming practices designed to reduce polluted runoff and conserve water. I hypothesize trust will have a direct, positive effect on the probability of BMP implementation, which varies in timing and quality across farmers and thus provides a direct behavioral measure of cooperation. To isolate the causal effects of trust, I will also measure and control for other incentives for BMP implementation and measure social trust between farmers, institutional trust between farmers and government officials, and agency trust between farmers and government agencies.

To investigate the role of institutions, I compare two different watershed management programs in Florida. The Suwannee River Partnership is an archetypal watershed partnership, which relies on voluntary cooperation and financial incentives for BMP implementation. In contrast, the Everglades

BMP program is a unique example of the use of coercive, "command-and-control" rules to generate BMP implementation. The coercive elements of the Everglades BMP program may provide institutional safeguards for cooperation, which may greatly reduce or eliminate the role of trust (Levi 2000; Taylor 1982). Thus, the research setting constitutes a "quasi-experiment" for investigating the relationship between trust and institutional context (Achen 1996).

Section 1 briefly introduces the research setting to give a more concrete idea of collective action in watersheds. Section 2 discusses theoretical considerations behind each of the four main research questions, and develops testable hypotheses. Section 3 will outline the proposed research design, which combines a telephone survey of farmers in each watershed with archival data on each farm to fully assess the role of trust. Section 3 will also discuss the measurement of trust in some detail, and how the data collected can be used to test the hypotheses developed in Section 2.

1. The Research Setting: Collective Action and Best Management Practices in Florida

1.1. Collective Action and Best Management Practices

Cooperation and BMP implementation in watershed management is directly related to the collective-action problems involved with the use of common-pool resources (Cheung 1970; Gordon 1954; Ostrom 1990). Collective-action problems occur when individual action by each of the members of some set of actors leads to an inefficient or Pareto-inferior outcome (Taylor and Singleton 1993). Ostrom (1990) models the resource-use decisions of actors in CPR situations as a Prisoner's Dilemma, the classic example of a collective action problem. CPR appropriators have a choice between using natural resources at a sustainable level (cooperate), or taking as much as they can, as quickly as possible (defect). Unfortunately, because defectors do not experience the social costs of unsustainable behavior, there are always incentives to free ride on the cooperation of others. If all actors defect, they reach the mutually undesirable outcome of overexploitation and possible destruction (e.g., fisheries collapse) of the resource system. The all-defect outcome is what Hardin (1968) describes as the "Tragedy of the Commons."

The environmental problems associated with agricultural runoff have a similar strategic structure. Farmers use the waste assimilation capacity of groundwater and surface water to absorb the excess nutrients (especially phosphorous and nitrogen) contained in field and pasture runoff. These excess nutrients generally come from animal wastes or fertilizer. Because groundwater and surface water basins are non-excludable, farmers do not experience all the social costs of their agricultural practices. Hence, watersheds often experience elevated nutrient levels that exceed federal or state water quality standards. Excess nutrients not only harm fish and wildlife, but can also have direct effects on human health. Farmers have a common interest in preventing water quality deterioration, either because their health and economic welfare depends on clean water, or because polluted water often triggers costly regulations from state or federal authorities.

Thus, the central question is how to encourage farmers to cooperate by installing BMPs that reduce the volume and nutrient content of agricultural runoff. Unfortunately, cooperation is not guaranteed because BMP implementation is subject to the logic of collective action. BMP implementation entails increased production costs, which may injure the competitive position of a farm operation if other farms do not implement BMP. Furthermore, BMP implementation by one farmer would not have a large marginal impact because water quality is a function of the combined agricultural practices of all farmers in the basin. Improving water quality requires BMP implementation by most farmers, and each individual farmer has an incentive to free ride on the efforts of others. As with any common-pool resource situation, free riding by all farmers leads to Hardin's (1968) tragic outcome.

1.2. Florida Watershed Management Institutions

The purpose of watershed management institutions is to provide a set of formal and informal rules that provide incentives for cooperation. The research design described below proposes to study BMP implementation in two watershed management programs in Florida, the Suwannee River Partnership and the Everglades Best Management Practices Program. I will briefly describe these policy arenas to give a more concrete idea of the institutions under consideration in this research.

The Suwannee River Partnership began in 1999 as a signed agreement between a variety of agencies and interest groups, which established the Suwannee River Basin Nutrient Management Working Group. The Partnership was formed to address the problem of elevated nitrate levels in the Suwannee River Basin, particularly in the groundwater used for both irrigation and human consumption. Due to recent litigation under the 1972 Clean Water Act, the Suwannee Basin was potentially subject to regulatory measures under the Total Maximum Daily Loads (TMDL) process. Under Florida state law, a voluntary program like the Partnership can avoid regulatory intervention if water quality in the basin shows sufficient improvement. Hence, besides addressing an imminent water quality problem, a main motivation for the stakeholders is avoiding the inherent conflict of the TMDL regulatory process.

The main goal of the Partnership is to coordinate the development of agricultural BMPs using the cost-share provisions of the Natural Resource Conservation Service's Small Watershed Program, USDA's Environmental Quality Incentive Program, Florida's Surface Water Improvement and Management Act, and section 319 (h) of the 1972 Clean Water Act. The BMP program is essentially implemented as a voluntary contract between the farmer and the relevant government agency, where the farmer agrees to implement BMPs in return for government funding of some portion of the cost (government pays up to 80% of implementation costs). To date, approximately 36/50 dairy farms, 65/134 poultry farms, and 0/300 row crop operations have implemented BMPs. While this distribution across farm types reflects partnership priorities, the variance in the timing, quality, and location of BMP implementation constitutes the measure of cooperation.

The 1994 Everglades Forever Act established the BMP program in the Everglades Agricultural Area (EAA). The EAA is at the north end of the Everglades, directly South of Lake Okeechobee, and is the primary agricultural production area in South Florida. The Everglades Forever Act itself was the legislative manifestation of a settlement to a long-standing lawsuit between the US Government and the state of Florida. The US Government accused Florida of violating its own state water quality laws by not regulating the nutrient content of agricultural runoff released from the EAA into Everglades National Park.

The Everglades BMP program consists of two main elements (South Florida Water Management District 2000). First, each of the approximately 275 "farm-units" in the Everglades Agricultural Area must pay a per-acre agricultural privilege tax to the South Florida Water Management District to support the construction of Stormwater Treatment Areas (STA), which filter nutrients from EAA runoff. The tax rate is tied to BMP implementation; if a farm successfully implements BMP, the tax rate can be lowered to the minimum of $24.89 per acre. Second, each farm must have a stormwater permit that requires an implementation plan for on-site BMP and permit-level water quality monitoring plans. If water releases from the STA do not meet nutrient standards, then the water management district can target individual farms for additional BMP installation. To date, the program has exceeded its nutrient reduction loads and circumvented additional farm-level enforcement. While every farm must have an implementation plan, the variance in the timing and quality of BMP implementation constitutes the measurement of cooperation.

While the goals of these two Florida watershed management programs are nearly identical, they feature two very different institutional structures. The Suwannee River Partnership is based on voluntary cooperation and collaborative decision-making, while the Everglades BMP program relies on the coercion of traditional command-and-control structures. In fact, I am unaware of any other BMP program in the country that uses a permit system like the Everglades. The serendipitous existence of these two very similar watersheds with very different institutions provides an excellent laboratory for studying the role of trust.

2. What is the Role of Trust in Watershed Management?

In this section, I develop hypotheses related to the four main research questions presented in the introduction. The central hypothesis is that trust increases cooperation in the context of watershed management, controlling for other influences such as the perceived benefits and transaction costs of cooperation. However, given the multiple actors and institutions involved in watershed partnerships, there

may be many targets for trust, and trust in some types of actors may be more important than trust in others. Institutional safeguards that monitor and enforce cooperation may reduce the overall influence of trust on cooperation. Lastly, while trust may be conceptualized as an independent variable that predicts cooperation, it is also important to understand the conditions that facilitate trust—trust as a dependent variable. I will discuss measurement issues in the research design section.

2.1. Does trust facilitate cooperative behavior?

Most research on collective action assumes trust increases the likelihood of cooperation. In the context of common-pool resource situations, trust refers to an expectation of reciprocity from other actors (Ostrom 1990). As is well-known, reciprocal strategies that reward cooperation and punish defection are the foundation of cooperation in repeated games (Axelrod 1984). Reciprocal strategies support cooperation because as long the other player is using reciprocal strategies, the rewards of sustained cooperation over time outweigh the short term temptation to defect and risk mutual non-cooperation over the course of the exchange relationship. "Trust is often achieved simply by the continuity of the relation between parties and the recognition by each that what he might gain by cheating in a given instance is outweighed by the value of the tradition of trust that makes possible a long sequence of future agreement."(Schelling 1960: 134-135). As long as the trustor expects the other players to use reciprocal strategies—that is, they are trustworthy—then cooperation is an equilibrium outcome.

In the context of watershed management, this means as long as stakeholders trust other stakeholders to reciprocate cooperation, they should be able to successfully resolve watershed collective action problems. Consistent with encapsulated self-interest, trust depends on a farmer's expectations about the cooperative behavior of other farmers. As I discussed in section 1, the logic of collective action suggests farmers will only find BMP implementation worthwhile if they believe other farmers will also cooperate. The testable hypothesis is that as social trust in other farmers increases, the likelihood of BMP implementation will also increase.

However, isolating the causal effect of trust on cooperation is not that simple. Williamson (1996) argues trust is essentially a vacuous concept once the benefits and transaction costs of collective action are adequately measured. Broadly speaking, the neoinstitutional literature argues cooperation will be forthcoming when actors judge the benefits of cooperation outweigh transaction costs (Libecap 1989; North 1990; Taylor and Singleton 1993). Isolating the influence of trust requires "controlling" for these variables, but these variables are also important in their own right as additional explanations for cooperative behavior.

Based on my initial case study research, farmers appear to perceive five major benefits of BMP. First, BMP may reduce a commonly perceived water quality problem like increasing nitrate concentrations in the groundwater of the Suwannee River watershed. Second, public policies like PL-566 and section 319 of the Clean Water Act offer direct financial contributions in return for BMP implementation. Third, BMP implementation may generate extra profits for the farmer by introducing more cost-effective farming methods that increase profit margins. Fourth, BMP may produce additional products that farmers can sell on the open market. For example, BMP that collect poultry waste in a centralized location often produce a marketable source of phosphorous for fertilizer production. Fifth, successful BMP implementation may forestall a water quality problem that would otherwise trigger regulatory actions by state or federal authorities, which often entail high transaction costs for both farmers and government.

The transaction costs of BMP implementation are related to the direct costs of installing BMP and uncertainty about their effects on farm operations. Farmers who perceive BMP as too expensive or government cost-share as inadequate will be less likely to install BMP. Farmers who are uncertain about the consequences of BMP implementation in terms of their effectiveness, necessity, and overall costs are also less likely to implement BMP. Different types of farmers may also have different types of "transaction resources" for mitigating transaction costs (Heckathorn and Maser 1987). For example, better-educated and younger farmers may feel more comfortable with the technological innovations inherent in most BMP.

Lastly, while these economic considerations play a central role, farmers are not simply rational maximizers of benefit-cost ratios. Sabatier and Jenkin-Smith's (1993) Advocacy Coalition Framework posits that estimates of benefits and costs of various policy tools are embedded in a larger "policy-oriented belief system". Policy-oriented belief systems consist of hierarchically ordered sets of idea elements, where abstract "policy-core" beliefs constrain the formation of "secondary" beliefs about a particular policy arena. Policy-core beliefs represent value priorities and perceptions of adequate policy strategies in a particular policy subsystem, such as agricultural practices in the Suwannee Basin. Secondary-beliefs are evaluations of specific action and policy tools, like whether or not BMPs are effective instruments. In my previous research, I discovered three policy-core beliefs had an important influence on stakeholder evaluations of estuary policy effectiveness: environmentalism, scope of public participation, and market vs. government role in natural resource management. I expect these same policy-core beliefs will also affect the likelihood of cooperation.

2.2. Is social trust more effective than institutional trust?

The previous section argues social trust between farmers increases the likelihood of BMP implementation, controlling for other factors. However, farmers are not the only policy actors in a watershed. Especially in the United States, government organizations from all levels of the federal system are already involved in trying to increase the efficiency of agricultural operations. The most common public policy for BMP involves cost-share arrangements where the government provides grants to farmers in return for BMP implementation. The exchange relationships involved with BMP, then, are not just between farmers playing reciprocal strategies. Exchange relationships between farmers and the government also exist, where the government exchanges grant money and regulatory flexibility in return for BMP implementation. But the government-farmer exchange is still a risky relationship—the government may not provide enough money or still implement coercive regulations, and the farmer may not adequately implement the BMP. The farmer must still trust the government to provide adequate financial and institutional safeguards, and accurately record BMP compliance.

Thus, in addition to other farmers, BMP implementation requires *institutional* trust between the farmer and the involved government personnel who frequently interact with the farmer. Institutional trust may be more important than social trust between farmers when BMP implementation entails a contract between the government and the farmer. For example, officials from USDA's Natural Resource Conservation Service often work directly with farmers to develop BMPs in the context of federal cost-share programs. The testable hypothesis that follows from this argument is that institutional trust should have a larger influence on BMP implementation for farms with cost-share arrangements.

However, there are really two forms of trust involving government. In addition to trust in a specific government official, farmers (and every other policy target) learn to trust or distrust agencies as organizational entities unto themselves. For this type of "agency" trust, the agency is the attitude target, not a particular person. Admittedly, the trustworthiness of an agency is established by the behavior of a series of agency personnel. However, watershed management actors very often make personifying statements like "You can't trust the EPA". Interestingly, in many watershed management institutions, economic interests like farmers often distrust regulatory agencies like the EPA in general, but learn to trust particular individuals within an agency to pursue cooperative arrangements. These trustworthy government officials are perceived as being willing to dispense with "by-the-book" procedures if those procedures reduce opportunities for mutually beneficial exchange. When trustworthy individuals are replaced for whatever reason, the new individuals are assigned the reputation of the agency in general, and often become associated with the old style of regulatory unreasonableness. An interesting hypothesis can be derived from the potential disjuncture between institutional and agency trust. Institutional trust should have a much stronger effect than agency trust on BMP implementation in general, and may have even a stronger influence when the involved government individual comes from a regulatory agency.

In sum, I need to consider three different trust domains in this research: social trust between farmers, institutional trust between farmers and a particular government official, and agency trust between farmers and a government agency. Similar to the differences between neighborhood and workplace trust

examined by Burns and Kinder (2000), I expect the relationship between trust and BMP implementation will vary across these three domains.

2.3. *Does the role of trust change in different institutional contexts?*

Differences between the Suwannee River Partnership and the Everglades BMP Program provide a natural experiment for exploring whether or not the relationship between trust and cooperation changes in different institutional contexts. As I discussed in Section 1.2, the Suwannee River Partnership is based on voluntary cooperation and is similar to the self-governance institutions analyzed by Ostrom (1990). The Suwannee stakeholders design their own rules through the partnership, and are not subject to outside regulations. Indeed, one of the primary goals of the Suwannee Partnership is to avoid coercive regulations by providing an internal solution to declining water quality. As a self-governance institution, the Suwannee Partnership relies heavily on the development of norms of cooperation and reciprocity. As I discussed in section 2.1, trust is a critical ingredient for cooperation in this type of setting.

The Everglades BMP Program, in contrast, is a command-and-control institution that relies heavily on coercion to secure cooperation. Command-and-control regulation provides a range of institutional safeguards that use the coercive power of government to punish non-compliance. Farms are required to have BMP and water quality monitoring plans, and enforcement procedures are triggered if water quality goals are not met. As Levi (2000) contends, cooperation may emerge even in the presence of distrust when institutions provide adequate monitoring and enforcement of contractual arrangements. For example, surely some of the success of interpersonal exchange in the United States is attributable to the presence of a credible judicial system for enforcing property rights (Riker and Weimer 1995). In a cross-cultural study, Yamagishi and Yamagishi (1994) argue Japanese citizens display *lower* levels of interpersonal trust than Americans because the high degree of rule-structured stability in Japanese social relationships reduces behavioral uncertainty. Institutional safeguards may "crowd out" trust as a facilitator of cooperation. The testable hypothesis in this research is that trust plays a much smaller role in predicting cooperation in the Everglades BMP Program in comparison to the Suwannee Partnership.

2.4. What is the causal relationship between trust and behavioral expectations?

Up to this point, I have analyzed trust as an independent variable that predicts cooperation. Based on the encapsulated self-interest definition, the underlying assumption here is that trust is based on the trustor's expectations about the trustee's behavior. In the context of watershed management, expectations about cooperation from other farmers and government are particularly important. In a causal model, trust would be an dependent variable that is predicted by responses to questions like those posed by Kinder and Burns (2000): "Would you say that UNCOOPERATIVE describes the people you work with extremely well, quite well, not too well, or not well at all?" Indeed, Kinder and Burns (2000) run regression models predicting general social trust with beliefs about the behavior of co-workers and neighbors.

However, the relationship between behavioral expectations and trust is in reality reciprocal. The encapsulated self-interest definition is also consistent with the heuristic role of trust proposed by Scholz and Lubell (1998a, 1998b; see also Scholz 1998), which assumes people use trust as an information short-cut to predict the behaviors of others. Hence, in the context of a single survey, trust will also be predictor of behavioral expectations. If the reciprocal causation hypothesis is correct, then structural models that consider both trust and behavioral expectations as endogenous variables should reveal a positive influence of trust on expectations of cooperation, and vice versa.

To explore this hypothesis, I will measure farmers' beliefs about what Bacharach and Gambetta (2000) might call the sort "trust-warranting properties" of other individuals. Levi (2000) divides trust-warranting properties into three sets of behavioral expectations: beliefs about promise keeping, similarity in interests, and competence. Trust is warranted when you believe someone with similar interests is willing and capable of keeping promises—like promising to implement BMP. Burns and Kinder (2000) use a variety of questions that fit into Levi's categories; I will add additional questions as necessary. The next section provides more details about measurement.

3. Research Design, Measuring Trust, and Hypothesis Tests

The basic idea behind the research design extends the methodology used to study stakeholders in the National Estuary Program. As I discussed briefly in the introduction, the NEP study relied on a telephone survey of estuary stakeholders to measure their attitudes towards cooperation, policy effectiveness, beliefs related to the benefits and transaction costs of collective action, and their policy-core values. I propose a similar methodology in this research, but the unit of analysis is the individual farmer instead of the NEP stakeholder. The narrow focus on the farmer allows me to isolate the effects of trust from other estimates of the benefits and costs of BMP implementation.

3.1. Units of Analysis and Sample Population

In the Suwannee River watershed, there are approximately 484 individual farms (row crop, dairy, and poultry). In the Everglades Agricultural Area, there are approximately 270 farm units. In both watersheds (especially in the Everglades where there are some large corporate farms), a single individual may own multiple farms. In this case, the same owner-level data will be applied across multiple farms, a situation that is easily handled using robust standard errors in multivariate analyses. Given economies of scale in research design, intended use of maximum likelihood estimation, and the usual survey response rate issues (that may be exacerbated in rural areas), I will target the entire combined population of 824 farm units.

3.2. Archival Data

One of the main advantages of this research is the availability of farm-level archival data. Both the Suwannee River Partnership and the Everglades BMP program maintain databases of farmers in each area. These databases contain information about the timing and status of BMP implementation, the dollar amount of government cost-share, nutrient loads in water discharges, and farm size. Information about BMP implementation provides the primary behavioral measure of cooperation, which is a significant improvement over previous attitudinal measures. The archival data also has contact information for each farmer for use in the telephone survey. While there is some variance in the quality of the data, the survey instrument can be used to provide missing information about the characteristics of particular farm operations if needed.

3.3. Telephone Survey Data

A telephone survey of every farmer in both watersheds will provide attitudinal measures of cooperation, reported cooperative behavior, trust, policy-core beliefs, and other beliefs that reflect the benefits and transaction costs of collective action. My previous research with NEP stakeholders found telephone surveys provided a substantially higher response rate (58%) in comparison to a mail survey (30%). Despite a slightly higher per-unit cost, telephone surveys are clearly superior.

The NEP survey was conducted by the Indiana University Center for Survey Research (http://www.indiana.edu/~csr/). While I would solicit bids from other survey companies, the NEP survey cost approximately $35.00 (with considerable variance across estuaries, which makes this estimate a best-case scenario) per respondent for a 25-minute interview including pre-survey introductory letter and follow-ups with non-respondents. I expect BMP interview will be about the same length. For 824 respondents, the estimated cost of the BMP telephone survey would be $28,840.

3.4. Measuring Trust

In political science and other disciplines, the measurement of trust has become a particularly controversial issue (Blasius and Thiessen 2001; Burns and Kinder 2000; Couch and Jones 1997). Roughly speaking, the measurement of trust appears to vary along two dimensions as shown in Table 2 below. By phenomenological status, I mean whether or not the researcher believes trust exists as a unique attitude independent of behavioral expectations (i.e., beliefs about trust-warranting properties). Many studies adopt the "indirect" approach, which assumes trust and behavioral expectations are equivalent (Burns and Kinder 2000; Currall and Judge 1995; Parker and Parker 1999; Scheberle 1997). The indirect approach does not emphasize the word "trust" in survey questions. When a survey question does include

the word "trust", the responses are usually lumped together in the same measurement model as the other trust-warranting properties.

Table 2: Strategies for Measuring Trust

		Domain Specificity	
		General	Specific
Phenomenological Status	Direct	NES social trust question	*This proposal
	Indirect	NES "trust-warranting properties" questions	NES 2000 trust pilot *This proposal

The "direct" approach, on the other hand, emphasizes survey questions that ask the respondent to directly characterize the level of trust they have in some attitudinal target. The direct strategy essentially grants trust an independent phenomenological status as a separate attitude with direct causal precedents and consequences. For example, Scholz and Lubell (1998a,b; see also Gibson 2001) assume the attitude of trust acts as decision heuristic that summarizes taxpayers' expectations about the behavior of government and other taxpayers. The direct approach reflects how real people use the word "trust" to describe their everyday social interactions. Trust is not merely a theoretical concept. Trust is a viable attitude that people rely on to make everyday decisions and thus should be directly measured in those terms.

Domain specificity refers to whether the trust questions are targeted at a very broad class of individuals (e.g., "most people" in the NES, "other stakeholders" in my previous research) or a very specific subset. Kinder and Burns (2000) argue that domain-specific questions are better than general questions because they force respondents to focus on the behaviors of specific sets of individuals. Because the criteria for trustworthiness may vary across social domains, domain-specific questions provide less ambiguous answers.

Taken together, I think every study on trust fits into the typology in table 2. Take the current debate over the NES trust questions as an example. The traditional social trust questions in the NES and General Social Survey (see Burns and Kinder 2000 for examples) are direct and general. The NES also contains indirect, general questions about helpfulness and fairness that are targeted at "most people". Burns and Kinder (2000) utilize indirect, specific questions about the "practices and dispositions" of neighbors and coworkers. The NES pilot study does *not* contain direct, specific questions asking whether or not neighbors and coworkers are trustworthy (a mistake in my opinion).

In my research, I propose to use a combination of direct/specific and indirect/specific questions. I believe the proponents of domain-specific questions are correct in their assumption that standards for trustworthiness and the effects of trust on other behaviors vary across domains. My hypotheses about the differential effects of social trust between farmers, institutional trust, and agency trust reflect this assumption. I also believe people use the attitude of trust as a decision heuristic and that it should be measured directly. However, I am also interested in which trust-warranting properties are most important and the reciprocal relationship trust and behavioral expectations, so I need to include questions similar to Burns and Kinder (2000).

I will now quickly outline the survey questions I propose to use as measures of the three types of trust discussed in sections 2.1 and 2.2, the trust-warranting properties discussed in section 2.4. These questions are deliberately designed to avoid the potential response set biases associated with agree/disagree questions, where disinterested individuals just agree with everything (Blasius and Thiessen 2001). The questions are as follows, subject to some revision for the purposes of efficient survey implementation:

a) Farmer Trust

- Thinking about the other farmers in the (watershed name), do you completely trust them to successfully implement the best management practices they have agreed to, completely

distrust them, or somewhere in between? (11-point Likert scale, 0=Completely distrust, 10=Completely trust)

b) Institutional Trust

I will use a social network battery to measure institutional trust, which consists of the following two components:

- Network Solicitation: Think about three government officials on which you have relied most heavily in dealing with BMP issues in the last year. Consider the full range of government officials, including elected or appointed officials from the federal, state, or local level.

- Trust Characterization: How much do you trust this individual to fulfill promises and obligations relating to BMP implementation? (11-point Likert scale, 0=Completely distrust, 10= Completely trust)

c) Agency Trust

To narrow down the number of possible agencies mentioned, this question consists of the following two parts:

- Agency identification: In your opinion, what government agencies have the most influence on water policy in the (watershed name) area? Name up to three.

- Trust characterization: For each of the agencies mentioned, do you completely trust them, completely distrust them, or somewhere in between? (11-point Likert scale, 0=Completely distrust, 10= Completely trust)

d) Trust-warranting Properties

Each of the trust questions identified above will also be paired with the following questions designed to measure the three categories of trust-warranting properties discussed by Levi (2000). Some of these are derived from Burns and Kinder (2000), but for the sake of question simplicity I use the same format for what they call practices and dispositions:

Promise Keeping

- In general, when thinking about (actor) in the (watershed name), would say that they keep their promises all of the time, never, or somewhere in between? (11-point Likert scale, 0=All of the time, 10=Never)

- In general, when thinking about (actor) in the (watershed name), would you say that they are completely honest, completely dishonest, or somewhere in between? (11-point Likert scale, 0=Completely honest, 10=Completely dishonest)

- In general, when thinking about (actor) in the (watershed name), would you say that they are usually very cooperative, very uncooperative, or somewhere in between? (11-point Likert scale, 0=Very cooperative, 10=Very uncooperative)

Interest Similarity

- In general, when thinking about (actor) in the (watershed name), would you say that they have exactly the same values and interests, completely different, or somewhere in between? (11-point Likert scale, 0=Exactly the same, 10=Completely different)

Competence

- In general, when thinking about (actor) in the (watershed name), would you say that they are completely competent in their profession, completely incompetent, or somewhere in between? (11-point Likert scale, 0=Completely competent, 10=Completely incompetent)

4.2. Anticipated Hypothesis Tests

Once the data is collected, I will analyze the role of trust using a variety of multivariate procedures. In general, the dependent variable will be a count of the number, timing, and quality of BMP implementation on a particular farm as collected in the archival data, and also measures of cooperative attitudes from the survey. While the exact model will depend on how the dependent variable is measured, I will test hypotheses related to the first three research questions using equations similar to the following:

- *BMP Implementation/Cooperative Attitudes*= f (Social trust; Institutional trust; Agency Trust; Dummy variable for Everglades BMP Program; Control variables)

If trust facilitates cooperation, then the coefficients for social trust, institutional trust, and agency trust will all be positive and significant. If there are differences across domains of trust, then the coefficients for each of the trust variables will be significantly different from one another. For example, if institutional trust is more important than agency trust, then the coefficient for institutional trust should be larger than for agency trust. If trust is less important in the command-and-control structure of the Everglades, then interaction terms between the Everglades dummy variable and all of the trust measurements will be significant and negative. Significant interactions would mean the role of trust is conditional on institutional context. The control variables include beliefs related to benefits and transaction costs, policy-core beliefs, and farm-level characteristics to capture various economic parameters.

To explore the causal status of trust (question 4), I will use structural models of the following sort:

- *Trust*= f (Trust-warranting properties; Control variables; Exogenous variables for identification)
- *Trust-warranting Properties*= f (Trust; Control variables; Exogenous variables for identification)

If the reciprocal causation hypothesis is correct, then the coefficients for the trust-warranting properties in the top equation will be positive and significant, and the coefficients for trust will be positive and significant in the bottom equation. I will explore a variety of specifications for these models, including combining the trust-warranting properties into a single scale, and entering them separately. I will also run these models separately for different types of actors (e.g. farmers, officials, agencies) to see if the criteria for building trust do indeed vary across domains. The above models do not exhaust the possibilities; I certainly intend to thoroughly explore the data and examine other interesting hypotheses.

Watershed management provides a unique opportunity to study trust and the evolution of cooperation within the United States federal system. The research program I have outlined here will allow me to answer central questions about trust that have not been answered in previous research in environmental policy. The research design includes the most recent advancements in the measurement of trust, behavioral measures of cooperation, and a well-defined institutional comparison. Because the politics of watershed management are similar to many other collective dilemmas, both the findings and methodology of this research should generalize to other policy areas.

Timetable

Research Activity	*Summer 2001*	*Winter 2001 (Assumed December 1 funding)*	*Spring 2002*	*Summer 2002*	*Fall 2002*	*Spring 2003*	*Summer 2003*
Preliminary Case Studies	X	X					
Gathering Archival Data		X	X	X			
Survey Preparation			X	X			
Survey Application				X	X		
Data Analysis					X	X	X
Write-up/Journal Review						X	X

Budget

Personnel	
Principal Investigator: Mark Lubell	
Summer 2002 (2 months @ 1/9*$47,400 9-month salary)	$10,500
Summer 2003 (2 months @ 1/9*$48,822 9-month salary)	$10,840
Fringe benefits @ FSU rate=15.5%	$3307
Graduate Student	
Salary Fall 2001-Spring 2002 Academic Year, Including Summer	$16,000
Salary Fall 2002-Spring 2003 Academic Year, Including Summer	$16,000
Fringe benefits @ .60%	$192
Tuition Waivers @ 1121.49 per semester for 6 semesters	$6729
Total Personnel	$63,568
Research Costs	
Telephone Survey of approx. 824 farmers @ approx. $40 per farmer; subcontract for TBD survey research firm	$32,690
Travel (4 conferences @ $850 plus field research)	$5400
Materials and supplies (@ $1000 per year)	$2000
Total Research Costs	$40,090
Indirect costs @ 15% for Russell Sage	$13,385
Modified total direct cost base: Salaries and benefits, $25,000 of subcontract , travel, materials and supplies= $89, 239	
Total Grant Request	$117,043

Budget Justification

Principal Investigator: Mark Lubell

The PI will receive two months of summer salary in 2002 and 2003. Summer salary for the first year is set at 2/9 of the 9-month salary with a 3% increase in the second year of the budget. The PI will supervise the collection and coding the data, manage the telephone survey contract, conduct case studies, analyze the data, and write-up the results of the project. Approximately 25% of the PI's regular faculty duties will be devoted to the project during regular academic semesters, 50% during the summer.

Graduate Student

One graduate student research assistant will be hired for each year of the project (2001-2002, and 2002-2003 academic years, including summers). Stipends are established at FSU levels covering 20 hours per week during the regular academic year, which will be extended to the summer for this project. However, I am slightly increasing the graduate student stipend over current levels because I intend to hire a very competitive graduate student who might otherwise choose a better-funded institution over FSU. The main responsibility of the research assistant will be cleaning-up and finding missing pieces of the archival data, and then combining the archival data with the survey data once the survey is complete. The research assistant will also manage case study materials and make field visits to each watershed, along with other typical organizational duties.

Telephone Survey

The NEP survey cost approximately $35.00 per respondent on average, with variance across estuaries. Since I am not certain where in the range of costs the Florida partnerships will fall, I add an extra $5.00 per respondent to handle any unforeseen circumstances. While the current cost estimate is based on past performance by the Indiana University Center for Survey Research, I will solicit competitive bids from several survey companies and choose the company that provides the best quality at least price. Based on my previous experience, the telephone survey is the best research instrument for achieving a reasonable response rate.

Travel

The requested travel money will pay for two conferences per year to report research results, at an estimated $400 airfare and $450 lodging and meals. At least one conference will be a national/regional political science association, while leaving room for possible specialty conferences in environmental policy, public policy, or political economy. In addition, I am budgeting $2000 of travel money for field visits to each watershed by my research assistant and myself. The field visits will be used for on-site interviews of farmers, attending watershed management meetings, and interviewing government officials. In my previous research, case study work of this type was critical for designing an effective survey instrument that could be understood by the targeted respondents.

Materials and Supplies

Funds for materials and supplies ($1000 per year) will be used for photocopying, ordering case-study materials, books, data, and miscellaneous office supplies

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