Collaborative Watershed Management: A View from the Grassroots

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Abstract

To date, research on collaborative watershed management has paid scant attention to the role of grassroots stakeholders, who are the people that actually use natural resources. This paper argues cooperation from grassroots stakeholders is necessary for the success of collaborative management, and outlines three theoretical perspectives to explain cooperation. The validity of these theoretical perspectives is tested using a survey of farmer participation in the Suwannee River Partnership in Florida. The findings suggest farmers' perceptions of policy effectiveness are largely driven by economic considerations, while participation in collaborative management is linked to social capital.

Key Words

Collaboration, cooperation, collaborative policy, watershed management, environmental policy, agricultural policy, water policy, best management practices

Collaborative Watershed Management: A View from the Grassroots

The last two decades have witnessed the emergence of collaborative watershed management as a new paradigm in environmental policy (Lubell et al. 2002). Instead of the centralized, command-and-control policies that characterized environmental legislation of the 1970s, collaborative management is designed to facilitate consensus and cooperation among competing stakeholders at the watershed level. In the view of some analysts (John 1994; Kenney et al. 2000; Marsh and Lallas 1995; Weber 1998; Woolley and McGinnis 1999; Yaffee 1998), collaborative management is a potential remedy to many of the pathologies of existing regulations, which have led to costly conflict and left many environmental problems unresolved. In particular, collaborative management is seen as an alternative to regulation for solving environmental problems associated with non-point source pollution from urban and agricultural runoff, and also habitat loss.

A variety of researchers are now empirically examining the attitudes and behaviors of stakeholders involved with collaborative management (Leach, Pelkey, and Sabatier 2002; Lubell 2003, 2004; Woolley and McGinnis 1999; Yaffee et al 1997). However, these researchers have focused almost exclusively on the policy elites who are generally involved with resource planning and political bargaining, such as interest group leaders, elected officials, bureaucrats, and partnership staff. There often seems to be an implicit assumption that if policy elites forge a consensus and produce some type of watershed management plan, that plan will naturally be implemented. However, once the plan is written, a wide variety of implementation behaviors must occur to ultimately affect watershed outcomes. The potential disjuncture between planning and implementation is one reason many environmental groups deride collaborative management

as symbolic policy (Lubell 2004). These criticisms suggest that cooperation among policy elites is a necessary—but not sufficient—condition for the success of collaborative management.

This paper argues that another necessary condition for successful collaborative management is cooperation from "grassroots stakeholders". In contrast to policy elites, grassroots stakeholders are the people who actually consume natural resources—the fishers, the farmers, the water diverters, the loggers, and other species of what Ostrom (1990) calls "appropriators". The immediate cause of most environmental problems are the resource decisions of grassroots stakeholders—how much they take from the environment, using what technologies, and the amount and nature of substances they put back into the environment. From the substantive perspective, the success of collaborative management depends on changing the resource-use behaviors of grassroots stakeholders in sustainable directions. From the policy sciences perspective, ignoring the views and behaviors of grassroots stakeholders risks serious misunderstanding about the relationship between governance institutions and policy outcomes. Hence, this paper attempts to put grassroots stakeholders directly under the social science microscope.

I will examine the view from the grassroots using an attitude survey of farmers involved in the Suwannee River Partnership in Florida. The Suwannee River originates in the Okefenokee Swamp of Georgia and runs generally north to south for 235 miles, through the panhandle of Florida and into the Gulf of Mexico. The Suwannee is currently exceeding state water quality standards for the nitrate form of nitrogen, and is listed on Florida's 303(d) list of impaired waters. Non-point source pollution from farming is primarily blamed for elevated nitrates in the river (Hornsby and Mattson 1998). Formally established in 1999 through a Memorandum of Understanding, the heart of the partnership is the collaborative implementation of several

conservation programs, the most important of which are USDA's Environmental Quality Incentive Program and Public Law 566 Small Watershed Program. Both of these programs offer individual farmers cost-share assistance in return for implementing a nutrient management plan on their farms. The Partnership involves forty-two local, state, and federal agencies, and agricultural interest groups, making the Partnership an excellent laboratory for the study of collaborative management.

Instead of focusing on cooperation among policy elites, my primary research task is to explain farmer cooperation with the Partnership. Cooperation is defined as farmer participation in Partnership activities and attitudinal support for the implementation of best management practices. Farmers participate in the Partnership at two levels. First, representatives of agricultural interest groups like the Florida Farm Bureau and some individual farmers participate in the regular meetings of the Steering Committee and Technical Working Groups, which plan the various conservation activities of the Partnership. The second—and largest—venue is direct participation in the conservation programs, which can take a variety of forms ranging from informal contacts to development of on-farm management plans. The second level is the main focus of this analysis. Some farmers do participate in both levels of the Partnership, crossing the sometimes-fuzzy boundary between policy elites and grassroots stakeholders. These farmers provide a critical nexus for the development of collaboration.

Of course, there are always limits to the generalizability of a quantitative case study. Statistically speaking, the findings of this paper apply at best to the population of farmers in the Suwannee Basin. However, my interactions with farming communities in New York, Florida, and California suggest the relationships between agriculture and government found in the Suwannee may be similar in other collaborative partnerships. These relationships largely reflect

Jeffersonian values of land stewardship, local decision-making, and self-reliance; these values are found in the majority of American agricultural communities. The management strategies of collaborative partnerships provide evidence for this claim—when agriculture is involved, there is almost always a voluntary, cost-share conservation program. Even if further research does not substantiate the Suwannee findings, at least policy scientists can start asking the right questions about the grassroots view of collaborative management.

Explaining Farmer Cooperation in the Suwannee Partnership

I divide cooperation into two essential elements: 1) perceptions of the effectiveness of practices recommended by the partnership, and 2) farmer participation in partnership activities. Effectiveness beliefs and participation are linked together, and both are necessary for the success of collaborative management. If farmers do not think partnership policies are effective, they are much less likely cooperate, and more likely to engage in political strategies designed to weaken those policies. Participation is the behavioral manifestation of cooperation, and allows farmers to learn about sustainable practices and actually put those practices on the ground through completion of water management plans.

I outline three theoretical perspectives to explain farmer cooperation: economics, social capital, and social values. The economic perspective focuses mainly on farmers' perceptions of the economic return for implementing BMPs. The social capital perspective views collaborative management as a collective-action problem, and emphasizes the development of trust and norms of reciprocity. The social values perspective argues that individuals adhere to a fundamental set of social values that shape their perceptions of public policies. In my interviews with Suwannee farmers and policy elites, elements from all three of these perspectives were mentioned as explanations for farmer cooperation. Even within the agricultural community, there is a diversity

of opinion. As I will discuss in more detail, all three perspectives reflect well-developed social science theories, and my analyses may suggest one perspective has superior explanatory power. However, it is more likely that each theoretical perspective complements the others, and understanding farmer cooperation requires consideration of multiple factors.

The Economic Perspective

The economic perspective on farmer cooperation is largely built on rational choice models, which posit humans always choose behaviors perceived to have the highest benefit-cost ratio. Economic viability is a central concern of the agricultural community. Farmers tend to resist any type of government policy that they believe will increase their production costs, and are more likely to accept government policies that provide financial incentives. The case of agricultural subsidies is well known. Similarly, most BMP programs emphasize cost-sharing arrangements that provide financial assistance to participating farmers. The Partnership coordinates cost-share programs from USDA's EQIP program and Public Law 566.

BMP programs also emphasize the potential ability of BMP to increase production efficiency. Recommended practices often reflect a philosophy of reducing resource inputs; for example, reducing the amount of water used per acre, pounds of fertilizer, or amount of pesticides. Sometimes these practices require substantial sunk costs, as in the case of installing drip irrigation to replace pivot irrigation. Other times, there is simply a knowledge deficiency, as when soil testing shows the nutrient requirements of soil are much less than a farmer believed. In many cases, farmers report being surprised at how much money they save once they start using input-reducing BMP. Realizing the benefits and minimizing the costs of BMP implementation requires sufficient on-the-ground information be available to farmers. Providing

information is one of the main functions of the Partnership, and of agricultural outreach programs in general.

Another important economic consideration is the threat of future regulations, and the possibility that voluntary conservation could provide regulatory relief. All over the country, in many different environmental policy arenas, the hammer of future regulation is an important motivation for current collaboration. In the Suwannee River, the regulatory hammer is the possible development of a Total Maximum Daily Load (TMDL) for nitrates if the river continues to violate numerical water quality standards. If the Partnership can demonstrate with "reasonable assurance" to EPA and the FLDEP that Partnership activities will eventually improve water quality, then the TMDL process can be circumvented. Hence, the regulatory hammer forces farmers to have a collective economic interest in improving Suwannee water quality.

The economic approach is closely related to the theoretical arguments developed by Ted Napier and his colleagues (Napier and Camboni 1988; Napier et al. 1984; Napier, Threan, and Camboni 1988; Naper, Threan, and McClaskie 1988; Napier, Camboni, and Thraen 1986; Napier and Tucker 2001). Napier's team combines two theoretical explanations of farmer conservation behavior, the diffusion-innovation model (Rogers 1983) and farm structure model. The diffusion-innovation model focuses on farmers' evaluations of the benefits and costs of adopting conservation or general agricultural practices used by other farmers. The farm structure model looks at the economic constraints imposed by farm size and economic health, and generally argues larger and more economically viable farms are more capable of assuming the risks of new behaviors. These risks can be reduced by farmers who are members of a producer association or contract with a larger corporation, where the centralized organization achieves economies of scale in information distribution and also exerts control on member behavior. To the extent a

diffusion-innovation model applies, cooperation is very similar to the adoption of any farm technology.

Napier et al. have developed an enviable survey research infrastructure, including hundreds of in-person interviews of farmers conducted by local volunteers. Surprisingly, despite two decades of intensive and careful data collection, the empirical results provide little support for either the diffusion-innovation or farm structure models. Most of the variables are inconsistent predictors of conservation *behavior* across models, and many of the models explain only a small amount of variance (although I think the researchers are expecting too much from survey research). The papers often conclude with a call for a new theoretical perspective to explain conservation behavior. On the other hand, attitude variables from the diffusion-innovation model do a fairly good job of explaining *attitudes* towards soil conservation programs (Napier and Camboni 1988). These empirical findings underscore the often-tenuous relationship between attitudes and behaviors found in other research, which is also manifest in the results here.

The Social Capital Perspective

The social capital perspective views voluntary partnerships as a collective-action problem. Farmers have a collective interest in reducing water pollution either because they value clean water resources, or because clean water will prevent further regulatory action. However, the defining characteristics of non-point source pollution from agricultural runoff are the difficultly identifying which farms are contributing contaminants to the river, and that the overall pollutant load represents the cumulative effects of many on-farm decisions. Hence, one farmer's conservation practices will only have a small influence on the overall water quality in the watershed. A strategic farmer prefers to free-ride on the conservation practices of others,

avoiding the individual costs of BMP implementation and enjoying the benefits provided by his neighbors (Hardin 1982; Olson 1970; Ostrom 1990). The free-riding strategy is often coupled with a denial that runoff from a particular individual's farm is contributing to the water quality problems. If all farmers follow this strategy, then the rate of BMP implementation is much lower than required for economic efficiency or environmental sustainability.

Solutions to this problem focus on the repeated interactions among farmers in multiple social arenas, and also the repeated interactions between farmers and the government officials who are involved with BMP programs. Repeated interactions allow for the development of "social capital", in particular norms of reciprocity, trust, and networks of civic engagement (Coleman 1990; Putnam 1993; Schneider et al. 2003; Ostrom 1990). Norms of reciprocity create the expectation that cooperation will be returned by other people in a group (Runge 1984). This belief directly parallels the concept of "personal influence" emphasized in the collective interest model developed by Finkel and Muller (1998; Finkel, Muller, and Opp 1989). The collective interest model posits that cooperation is positively correlated to the perceived total value of some collective good (e.g., improved water quality) multiplied by the perceived probability of personal influence on the provision of that good. Hence, farmers who believe that implementing BMP on their farms will positively affect the likelihood of other farmers implementing BMP, are more likely to participate and view BMP polices as effective.

Norms of reciprocity are supported by the attitude of trust, which reflects beliefs that other parties in a social exchange relationship will fulfill their commitments. Trusting relationships between government officials and farmers, and among farmers, are both important. Government officials are asking farmers to implement BMP in exchange for promises of cost-share money, accurate information, and perhaps regulatory relief. If farmers do not trust

government officials to live up to these commitments, they are much less likely to cooperate. Trust among farmers is also important because if one farmer does not trust other farmers to implement BMP, they will feel their own participation is less valuable. Overall, the development of social capital helps facilitate long-term cooperation in situations where short-term cooperation is predicted to fail.

It should be noted that the social capital perspective is not at all contradictory to the economic perspective, but it does emphasize different variables. The social capital perspective assumes that cooperation has long-term economic benefits that come either from improving water quality or avoiding regulatory intervention. In other words, cooperation is in the long-term economic self-interest of farmers. These benefits can only be achieved if enough social capital develops to support cooperation over time. The development of social capital may outweigh the more short-term economic benefits of cost-share provisions or increases in farm efficiency from BMP implementation.

The Belief System Perspective

Like all people, farmers have belief-systems comprised of a range of social values towards the environment, government, and society in general. According to Sabatier and Jenkin-Smith's (1993) Advocacy Coalition Framework, these social values are integrated into fairly cohesive belief-systems, where more fundamental "policy-core beliefs" constrain the formation of more immediate "secondary beliefs" about attitude objects in a policy subsystem (Hurwitz and Peffley 1987). The ACF, drawing from theories of social cognition, argues that people tend to discount information about an attitude object that is inconsistent with their core beliefs, and accept information that is consistent with their core beliefs. Of particular concern here are how fundamental social values affect perceptions about BMP effectiveness. Hence, to the extent the

governance institutions of the Suwannee Partnership and the concept of Best Management Practices is consistent with farmers core beliefs, they should view the BMP program as effective (Lubell 2003). While the ACF does not explicitly consider the effects of core beliefs on behavior, one can extend the logic of the ACF and hypothesize that policy-core beliefs should have an influence on the behaviors associated with a particular attitude object.

Perhaps the two most studied policy-core beliefs in the ACF literature are views on the proper role of government in regulation of private rights, and environmental ideology. The former, which I will label economic conservatism, varies between people who think the government should heavily regulate economic activity to prevent undesirable externalities, versus people who believe government should not interfere in economic activities. Environmentalism measures the extent to which people value environmental amenities, or feel that human activities threaten environmental values. In the context of command-and-control policies, these two values are often in conflict. However, in the context of collaborative partnerships and voluntary BMP programs, the idea is often forwarded that what is good for the economy is also good for the environment (a core component of rhetoric on sustainable development). To the extent this argument is correct, I hypothesize positive relationships between perceptions of BMP effectiveness/participation, and both economic conservatism and environmentalism.

In addition to the usual suspects, I also examine the policy-core beliefs of land stewardship and policy inclusiveness. The agricultural community hangs many policy positions on the hook of land stewardship, arguing that farmers naturally care about their land because land is the basis for their livelihood. Hence, government and environmentalists should trust the agricultural community to voluntarily protect environmental values. The concept of land

stewardship is not a figment of agricultural lobbyists' imagination. A comment by one survey respondent is illustrative: "We as land owners are morally bound to utilize BMP's and practice stewardship of our land. Those of us who were privileged to grow up on a farm have a greater appreciation of the land and its importance to mankind than those who buy land to escape the urban areas." Land stewardship has a long history in the ideology of the agricultural community, with roots going back to Jeffersonian values of small-scale agriculture. Hence, farmers who subscribe to the ideology of land stewardship are more likely to view BMP as effective and participate in the program.

Policy inclusiveness refers to the belief that public participation in policy decisions should be maximized. Inclusiveness is one of the basic tenets of collaborative management, which generally seeks to forge consensus among all stakeholders. Previous research on collaborative policy found that policy elites committed to the concept of inclusiveness are more likely to believe collaborative management is effective (Lubell 2003). Expanding this hypothesis to the grassroots, I expect farmers committed to inclusiveness are more likely to view BMP as effective and participate in the Partnership.

Research Design and Analysis: The Suwannee River Partnership Farmer Survey

The basic strategy of the research was to mail public opinion surveys to all farmers in the Suwannee Basin that were potential targets for the Suwannee River Partnership. The survey measured their participation in the Partnership, their views about BMP effectiveness, and a variety of independent variables associated with the three perspectives on farmer cooperation discussed above. By far the most difficult part of research was acquiring an appropriate sample frame. I relied on a local agricultural interest group and two government agencies (names

withheld to protect privacy) to provide lists of Suwannee farmers, and to identify currently active farmers.

After eliminating as many overlapping respondents as possible from the three sources of farmer names, the total sample size was 383 farmers. Of these, 34 were no longer farming and therefore not eligible, and 50 had confirmed (i.e., post office returns or disconnected telephones) bad contact information. From the effective sample size of 299 farmers, 83 completed the survey, for a total response rate of 28%. There are two important logistical reasons for the low response rate. First, many of the farmers had the same surnames, and it was impossible to distinguish between several members of a same family operating one farm, several members of the same family operating multiple farms, and simply people with the same surnames operating different farms. In the case of the same family operating a single farm, it is often the case that only one or two family members are the active decisions makers. Hence, the number of eligible respondents is likely smaller than the actual sample size.

Second, it is unknown whether the survey even reached 183 farmers in the sample because it was never returned. Obviously, some of these farmers merely declined participation and threw out the survey. However, it is likely that a substantial number did have bad contact information. Most of the respondents live in very rural areas, where road names and telephone extensions are frequently changing. At the same time, the agricultural lists are not regularly updated unless someone sends in a change of address form.

Nevertheless, even with the difficult nature of the population taken into account, the low survey response raises questions of selection bias. The safest assumption is that the survey respondents are people with higher than average levels of participation in the Suwannee Partnership. Less active or dissatisfied farmers are most likely underrepresented. Visual

inspection of the survey respondents suggests that many of the farmer opinion leaders in the Suwannee area did respond to the survey. Anecdotal evidence suggests opinion leaders provide important cues for farmers to respond environmental policy. Hence, one could argue that the survey measures the opinions of the most important group of farmers with respect to public policy.

Survey information can be compared to the 1997 Agricultural Census to get a better idea of the representativeness of the sample. In terms of farm characteristics, the respondents can be labeled middle-sized agribusiness. Most of them are not the Jeffersonian yeoman farmers, with very small farms and local markets, but they are not as corporate as a really big agriculture state like California. The largest farm reports a total 2,773 acres, while the smallest is a hobby farmer with only 10 acres. The Suwannee respondents own or rent an average of 354 acres. The average size is substantially larger than the average farm size in Suwannee County of 189 acres, slightly larger than the Florida average of 300 acres, but slightly smaller than the California average of 374 acres (1997 USDA Agricultural Census). However, 62% of the respondent farms are smaller than the Florida average, and if the 5 farms over 1000 acres are eliminated, the average farm size is 244 acres. Most of the respondents appear to be making a lower-middle class to middle class income; 50% of respondents report annual gross farm earnings of $100,000 or higher, and 23% report earning higher than $400,000.

The main product targets of the Suwannee Partnership are fairly well represented. Twenty-five percent of the respondents are beef cattle or dairy producers, 47% are poultry producers, and 27% are some type of row crop producer. The row crop producers are probably under-represented, because the Suwannee Partnership had an early focus on the better-organized dairy and poultry producers. Indeed, all of the poultry producers report they are contractors for

Goldkist Farms, and almost all of the dairy producers are members of the Sunshine State Milk Producers. Goldkist and Sunshine State provide organizational umbrellas for their members, and are particularly important players in agricultural policy, because they provide policy elites that represent large sectors. As the data analysis will demonstrate, these agricultural organizations are key players in implementation as well, because the farmers look to their representatives for behavioral cues.

The personal characteristics of the farmers are quite homogenous. Ninety-one percent are males and 94% are white. These percentages are not much different than those reported by the 1997 Agricultural Census in Suwannee County: 85% of Suwannee operators are male, and 97% are white. These respondents reported an average of 28 years in the agricultural business. Fifty-three percent have at least some college education, 38% have only high school degrees, and 9% did not graduate high school. It is fair to say the respondents are the main income earners in the agricultural economy of Suwannee County, and probably are making a better living from farming than some of the smaller operations. These results are not surprising, given the focus of the Suwannee Partnership on the opinion and business leaders of the agricultural sector.

Variable Construction

Unless otherwise noted, all variables are 7-point Likert-scale agree/disagree questions, where higher numbers correspond to agreement. Some variables are scaled by averaging across multiple items, while others are individual items; scale items will note reliability in parentheses. All survey questions are listed in Appendix A.

The analysis considers two dependent variables, *perceived BMP effectiveness* and *partnership participation*. BMP effectiveness (Cronbach's $\alpha = .80$) is a 4-item scale that measures whether the farmer believes BMP will improve the environmental health of the

Suwannee River, including farm-level outcomes. It is important to note that effectiveness focuses on environmental outcomes, which is generally the central concern of environmental scientists. Participation is a count of the number of partnership activities in which the farmer has participated. The survey offers eight possible activities, ranging from meeting with Partnership representatives to development of an on-farm water management plan. With the exception of visits from the Mobile Irrigation lab, the participation level in each activity is from 38% to 66% of the farmers who indicate any type of partnership participation. Attending meetings and talking with Partnership representatives are the most frequent activities, and attending BMP training sessions the least. The mean value of effectiveness is 4.3, the mean number of partnership activities is 3.0, and the Pearson's correlation between the two variables is $r = .30$ ($p<.05$). The significant correlation between the variables reinforces their meaning as two aspects of farmer cooperation.

The economic perspective considers seven variables. *Farming efficiency* is the belief that BMP can make farming more cost-effective, for example by reducing production inputs. *Cost-share programs* is the belief that the effectiveness of BMP programs depends on the availability government cost-share funding. *Information* is the belief that adequate information is available about BMP to facilitate implementation. *Regulatory relief* is the belief that implementation of BMP reduces the likelihood of future government regulation. *Farm size* is a 5-point self-assessment of farm size relative to other Suwannee agricultural operations, ranging from 1= much smaller than average to 5= much larger than average. *Farm economic status* is a 5-point self-assessment of financial health compared to 5 years ago, ranging from 1= much better off to 5= much worse off financially. *Farm cooperative* is a [0,1] dummy variable that equals one if the farmer is a member of an agricultural cooperative, the most important of which in the

Suwannee are Sunshine State Milk Producers (dairies) and Goldkist Farms (poultry). The farm structure items are designed to test the idea that larger, more wealthy, and better-networked farms are more likely to have the economic flexibility to participate in BMP programs, while avoiding asking specific factual questions about the farming operations (e.g., annual income), which farmers are reluctant to answer.

The social capital perspective examines five variables. *Expected reciprocity* is a two-item scale measuring the belief that BMP implementation on the respondent's farm will increase the probability that other farmers will implement BMP. *Local government trust* is a 4-item scale (Cronbach's $\alpha = .90$) combining trust in the county health department, the soil and water conservation district, the Suwannee River Water Management District, and the Natural Resources Conservation Service. These four agencies are the main promoters of the Suwannee Partnership, and traditionally focus on local water-use policy. *Regulatory agency trust* (Cronbach's $\alpha = .89$) is a two-item scale combining trust in the US Environmental Protection Agency and the Florida Department of Environmental Protection. *Agricultural trust* (Cronbach's $\alpha = .78$) is a two-item scale measuring trust in other farm operations and agricultural trade associations. *Generalized trust in government* is a question from the General Social Survey that measures diffuse trust in government broadly defined. Farmers appear to trust the agricultural community (mean=4.5) and local governments (mean=4.5) about equally, and regulatory agencies the least (mean= 3.2). This is consistent with the idea that farmers have common interests with other farmers, farmers are the main constituency of local government agencies, and regulatory agencies are seen as a source of costly rules.

The social values perspective examines four variables. *Economic conservatism* is the belief that government regulations are too tough on economic interests. *Environmentalism* is a

two-item scale (Cronbach's α= .74) measuring the beliefs that economic development should be favored over environmental protection and human progress is not harming the environment; higher numbers represent less commitment to environmental values. *Stewardship* is a two-item (Cronbach's α=.67) scale measuring the perception that farmers have a responsibility to protect the land and human health. *Inclusiveness* is a single question about the appropriateness of maximizing public participation in policy decisions. Table 1 presents descriptive statistics for all variables in the analysis.

[INSERT TABLE 1 ABOUT HERE]

Analysis Results

Given the small sample size and the usual problem of missing data in survey research, it is not feasible to use a single multivariate test of all the variables from each of the theoretical perspectives. I use two strategies to address this problem. First, I use the multiple imputation methods described by Schafer (1997) to replace missing data on the attitude variables. The multiple imputation method combines statistical estimates from several imputed datasets, which takes into account uncertainty in parameter estimates and standard errors. Second, I estimate separate OLS regression models for each theoretical perspective. Then, I estimate a comprehensive OLS model that simultaneously tests the significant variables from each separate OLS model. The comprehensive model tests the robustness of relationships observed in the more restricted models, while minimizing the risk of multicollinearity.

[**INSERT TABLE 2 ABOUT HERE]**

Table 2 reports results from the tests of the economic perspective. The coefficients for farming efficiency, information, and cost-share programs are positive and significant in the

perceived effectiveness model.[1] Information, farm size, and membership in a producer association are significant in the participation model. Surprisingly, despite the explicit role of TMDL as a motivator of the Partnership, the prospect of regulatory relief decreases perceptions of effectiveness. These results suggest the farmers' views of BMP are especially sensitive to issue of production costs—they support BMP that increase production efficiency and include government financial aid. These economic considerations are not nearly as important for partnership participation, where larger farms that are members of a producer association appear to have more opportunities for participation. The large size of the producer association estimate reiterates the ability of these organizations to influence individual behavior, and also the importance of building collaborative relationships with agricultural interest groups. Information plays a key role in both aspects of cooperation—if farmers do not know about the existence of a particular BMP, or how it works, they are not likely to view it is effective. The same can be said for participating in a collaborative partnership.

[INSERT TABLE 3 ABOUT HERE]

Table 3 reports results from the analysis of the social capital perspective. Expected reciprocity has a large positive influence on both perceived effectiveness and participation. This finding emphasizes the collective action aspect of the Suwannee Partnership and water conservation programs in general—these programs will only succeed with cooperation from grassroots stakeholders. And the benefits of cooperation only occur if others in the group reciprocate cooperation on the part of a particular individual. Farmers appear to be keenly aware

[1] Given the small sample size, I use a 90 percent confidence interval to establish the critical value for rejecting the null hypothesis of zero relationship.

of this issue, suggesting an important function of collaborative management should be to enhance expectations of reciprocity and personal influence.

Trust in local government also displays a positive influence on participation, but none of the trust measures influence perceived effectiveness. In the context of collaborative management, the interaction between local government representatives and grassroots stakeholders is the crucible in which social capital is formed. Local government officials are the bearers of policy promises, who communicate expectations about political agreements to farmers and agricultural interest groups. Local government officials are more likely to reflect local values, making them a particularly important locus of interaction. Trust in the agricultural community has little effect because most farmers already largely trust their colleagues, so there is really no variance in that attitude to provide a causal push on conservation behavior. As for regulatory agencies, farmers apparently continue to feel distant enough from these officials that trust does not enter their decision calculus. Again, perhaps trust in regulatory agencies becomes more important in the context of interactions among policy elites, for example, Farm Bureau representatives and FLDEP officials.

[INSERT TABLE 4 ABOUT HERE]

Table 4 tests the social values perspective. The results here are more mixed than the other two perspectives. The traditional values of conservatism and environmentalism have no effect in either model. Stewardship and inclusiveness positively influence perceptions of effectiveness, at about the same magnitude. Overall, the social values variables explain very little variance in the measures of cooperation, suggesting the Advocacy Coalition may need to be revised to understand how strongly belief constraints operate among grassroots stakeholders.

One possible explanation is that the degree of belief constraint is an increasing function of political awareness and involvement (Zaller 1992).

[INSERT TABLE 5 ABOUT HERE]

Table 5 reports the OLS coefficient estimates from an integrated model that includes all significant variables in tables 1-3. Farming efficiency, regulatory relief, and stewardship all become insignificant in the effectiveness model. The variables that remain significant have more to do with the farmer's relationship with government, which implies that farmers heavily emphasize the cost-share and outreach activities of the local government agencies that promote BMP. Only information drops from the participation model. Interestingly, combining the economic and social capital variables explains about the same amount of variance in the full participation model, as just the social capital variables alone (Table 2). On the other hand, the combination of variables significantly increases the explanatory power of the perceived effectiveness model, relative to earlier models. Perceived BMP effectiveness is strongly predicted by both social capital and economic variables, but social capital variables are relatively more important for participation.

Two generalizations stand out from these results of these analyses. First and foremost, expectations of reciprocity are a driving force in farmer cooperation. Given the collective action problem associated with improving water quality through BMP implementation, there are no benefits from cooperation by a single farmer unless that farmer believes his behavior will affect others. Cascades of reciprocal behavior will increase the probability of providing the public good of improved water quality, making the benefits of cooperation appear to outweigh the costs. These results are entirely consistent with the collective interest model of cooperation proposed by Finkel, Muller, and Opp (1989) and Runge's (1984) analysis of expectations.

Second, collaborative management appears to be a somewhat bifurcated process. One part of collaborative management consists of getting people involved in partnership activities that revolve around interactions with government officials and other policy elites. Policy practitioners often talk about this as "buying-in" to a process. Social capital variables are very important for this stage, including trust in local government officials. Participation is also facilitated by economic factors that represent integration into market structures, like producer association membership. But once farmers buy into a collaborative process, which ostensibly means deciding that participation of some type is a good thing, they become more concerned with the economics of BMP implementation. In other words, the initial decision to cooperate places a greater emphasis on social capital, but once that decision is made, farmers search for information that will allow them to select the least costly form of cooperation available. Obviously, these two facets of the calculus of cooperation will have reciprocal influences on one another over time.

Conclusions: Implications for Collaborative Management

The results of the analysis suggest the view from the grassroots has important implications for several aspects of collaborative management. Most importantly, my central argument is that collaborative management requires cooperation from grassroots stakeholders. Cooperation entails a behavioral component of participation in a collaborative partnership or other watershed management activity, and attitudinal support for particular sets of policies. Cooperative attitudes and behaviors are both necessary, but not sufficient, to produce cooperation in the context of collaborative management. For farmers, participation is driven largely by expectations of reciprocity from other farmers and trust in local government agencies. Once participation is secured, cost considerations and social values become more important in

how they view the effectiveness of various policy options. In the context of collaborative management, there should be an early emphasis on social capital, followed by a demonstration of cost-effectiveness, and information and cost-share provisions from local agencies.

Evaluations of equity and efficiency are also affected by these results. Partnership (and survey) participation is skewed towards larger and more economically viable farms. Hence, many smaller farms may not contribute an equal amount of effort to partnership activities. If all farms contribute a fairly equal amount of nitrates to the Suwannee basin, then the larger farms might complain about an unfair distribution of costs. However, they may also be willing to tolerate free-riding from smaller farms in order to secure the benefits of cooperation—Olson (1970) might call the larger farms a privileged group. But the distribution of effort might seem more equitable if larger farms also contribute a disproportionate amount of nitrates to the river. Evaluating the equity of equal versus proportionate levels of cooperation is a venerable dilemma in distributive justice (Hardin 1982), and may even be impossible to solve even with perfect information about the nitrate runoff from every farm.

Efficiency evaluations must take into account the appropriate balance between private conservation expenditures and public cost-share money. Clearly, cost-share money is an important motivation when farmers choose among alternative BMP strategies. Some environmentalists would argue that farmers should pay for all of the conservation measures, while some conservatives would argue the public should pay for everything. Striking a balance between these two extremes must include an evaluation of how much conservation is achieved for each dollar of cost-share money. That evaluation should include not only a technical assessment of BMP effectiveness, but also the increased motivation for BMP adoption that cost-share money provides.

The motivating role of local government trust highlights the importance of intergovernmental politics. The interaction between grassroots stakeholders and local government agencies is one important nexus for securing cooperation. These local agencies essentially act as mediators between the grassroots stakeholders and the broader intergovernmental milieu. In the Suwannee case, the broader intergovernmental milieu includes regulatory agencies like the EPA and FLDEP that are generally not trusted by farmers. Hence, the first step is for the local agencies and the regulatory agencies to coordinate their goals and policies in a mutually acceptable manner. The intergovernmental coordination would include integration of legislative and judicial standards into coordinated programs. The local agencies then become vectors for delivering policy information to grassroots stakeholders, and are more effective at securing cooperation. If the FLDEP approaches a farmer and says, "To meet water quality objectives, you need to implement BMP on your farm", the farmer is more likely to resist. However, if the local conservation district or Suwannee River Water Management District approaches the farmer with the same plea, it is more likely to work.

Lastly, collaborative management requires feedback about the effectiveness of policy implementation activities for solving water problems, and mechanisms for adjusting policies in light of new information. Uncertainty about effectiveness decreases as the focus of inquiry moves along a chain of causality from attitude change, to behavior, to environmental outcomes. If one observes positive attitudes towards BMP, there is no guarantee that cooperative behaviors will ensue. Similarly, if one observes cooperative behavior, there is no guarantee that environmental outcomes will improve. The cooperative behaviors, for example the types of BMP implemented on the farms, may not have a large effect on environmental outcomes. Hence, the scope of inquiry in this analysis is necessarily limited, and more research effort is

needed to understand the links between attitudes, behaviors, and putting effective conservation practices on the ground. Interestingly, the "reasonable assurance" concept embedded in the Florida water code reflects this uncertainty as applied to the Suwannee. Currently, the reasonable assurance documentation is based on estimates of farmer participation in the partnership. For the Suwannee Partnership to become a sustainable experiment in collaborative management, reasonable assurance will have to become more focused on watershed outcomes as BMP and monitoring technology diffuses and matures.

Appendix A: Variable Construction

Dependent Variables

Participation

Are you familiar with the Suwannee River Partnership, which is also known as the Suwannee River Nutrient Management Working Group?

If yes, what activities have you participated in?

- I have met with representatives of the Suwannee Partnership
- I have attended meetings/presentations of the Suwannee River Partnership
- I have agreed to have my well sampled for contaminants
- I have had the Mobile Irrigation Lab visit my farm
- I have signed a letter of intent to develop a conservation/nutrient management plan on my farm.
- I have started developing a conservation/nutrient management plan on my farm.
- I have implemented a conservation nutrient management plan on my farm.
- I have attended BMP training sessions offered by the County Extension Service or Water Management District.
- I have not participated in the Middle Suwannee Partnership.

Variable sums up "yes" answer to any of activities. Respondent coded as zero if they have not heard of partnership or have not participated in any activity.

BMP Effectiveness: Average score on following questions (Disagree=1, Agree=7)

- BMP substantially improve the environmental health of the Middle Suwannee River.
- Implementing BMP on my farm will greatly reduce the quantity of nutrients entering the Middle Suwannee River.
- Implementing BMP on my farm will greatly improve the overall quality of water entering the Middle Suwannee River.
- Implementing BMP on my farm will greatly reduce threats to human health caused by excess nutrients.

Independent Variables: Economic Perspective

Farming Efficiency

BMP make farming practices more cost-effective (1=Disagree, 7= Agree).

Cost-Share Programs

Government cost-share programs are necessary to effectively implement BMP. (1=Disagree, 7= Agree)

Information

There is a great deal of information available about how to effectively implement BMP (1=Disagree, 7= Agree)

Regulatory Relief

Implementing BMP on my farm reduces the likelihood of future government regulations. (1=Disagree, 7=Agree)

Farm Size

In comparison to other agricultural operations in your area producing similar products, would you say the size of your operation is: 1= Much smaller than average, 2= Smaller than average,

3= About average, 4=Larger than average, 5= Much larger than average.

Farm Economic Status

We are interested in the financial health of your farming operation. Compared to your financial situation five years ago, would you say that your farming operation today is: 1= Much better off, 2= Somewhat better off, 3= About the same, 4= Somewhat worse off, 5=Much worse off.

Producer Association

Is your farm a member of, or contracted with, an agricultural producer association, corporation, or cooperative that delivers the product of your farm to the market? (1= Yes, 0= No)

Independent Variables: Social Capital Perspective

Expected Reciprocity: Average score on following questions

- If I implement BMP on my farm, the probability that other farmers will implement BMP will greatly increase (1=Disagree, 7= Agree)
- Implementing BMP on my farm will have no effect on the behavior of other farmers (reverse coded; 1=Agree, 7= Disagree)

Trust Questions

There are many different organizations involved in farm policy, ranging from the federal government to your neighboring farm operations. In general, when thinking about each organization below, would you say you completely trust them, completely distrust them, or are you somewhere in between? (1=Complete distrust, 7= Complete trust).

- Local Government Trust: Average of answers for County Health Department, Soil and Water Conservation District, Suwannee River Water Management District, Natural Resources Conservation Service.

- Farm Industry Trust: Average of answers for agricultural trade associations/interest groups and "other farm operations in the Middle Suwannee River".
- Regulatory Agency Trust: Average of answer for Florida Department of Environmental Protection and U.S. Environmental Protection Agency.

Generalized Trust in Government

You can always trust the government to do what is right. (1=Disagree; 7=Agree)

Independent Variables: Social Values Perspective

Economic Conservatism

Regulations to protect the environment are already too tough on business (1=Disagree, 7= Agree)

Anti-Environmentalism: Sum of following questions (1=Disagree, 7= Agree)

- In situations where there are close calls between economic development and protecting the environment, it is more important to protect economic development.
- People worry too much about human progress harming the environment.

Stewardship: Sum of following questions (1=Disagree, 7= Agree)

- Farmers have a duty to protect the health of the land.
- Farmers have a responsibility to protect human health.

Inclusiveness

Maximizing the scope of public participation in policy decision-making improves effectiveness (1=Disagree, 7= Agree)

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Table 1: Descriptive Statistics

Measures of Cooperation	
Perceived BMP Effectiveness	4.21 (1.55)
Partnership Participation	3.02 (2.66)
Economic Perspective	
Farming Efficiency	4.28 (2.02)
Cost-Share Programs	5.59 (2.04)
Information	4.43 (1.90)
Regulatory Relief	4.60 (2.14)
Farm Size	2.73 (.94)
Farm Economic Status	3.06 (1.25)
Agriculture Coop	.63 (.48)
Social Capital Perspective	
Expected Reciprocity	3.98 (1.72)
Local Government Trust	4.53(1.53)
Regulatory Agency Trust	3.24 (1.66)
Farm Industry Trust	4.45 (1.44)
Generalized Trust in Government	1.77 (1.12)
Social Values Perspective	
Economic Conservatism	4.61 (1.55)
Environmentalism	3.94 (1.67)
Stewardship	5.96 (1.38)
Inclusiveness	4.29 (2.09)

Note: All entries are mean values for each variable, with standard deviation in parentheses.

Table 2: Testing the Economic Perspective

	Perceived BMP Effectiveness	Partnership Participation
Independent Variables		
Farming Efficiency	.19 (.11)*	.06 (.17)
Cost-Share Programs	.24(.09)*	.14 (.15)
Information	.23 (.10)*	.28 (.17)*
Regulatory Relief	-.17 (.09)*	-.08 (.17)
Farm Size	.03 (.20)	.51(.33)
Farm Economic Status	.18 (.14)	-.32(.24)
Agriculture Coop	.56 (.40)	1.75 (.59)*
Constant	.92 (1.07)	-.51 (1.84)
Model Fit	Adj. R^2=.29	Adj. R^2=.16
	F (7, 69) = 5.42*	F (7, 69)= 3.16

Notes: All entries are unstandardized, imputed OLS regression coefficients, standard errors in parentheses. *Reject null hypothesis of regression coefficient=0, p<.10.

Table 3: Testing the Social Capital Perspective

	Perceived BMP Effectiveness	Partnership Participation
Independent Variables		
Expected Reciprocity	.49 (.12)*	.49 (.23)*
Local Government Trust	-.09 (.20)	.97 (.37)*
Regulatory Agency Trust	.02 (.15)	-.27 (.26)
Farm Industry Trust	-.15 (.17)	-.14 (.30)
Generalized Trust in Government	.10 (.20)	-.10 (.20)
Constant	3.41 (.83)*	-1.39 (1.48)
Model Fit	Adj. R^2=.29	Adj. R^2=.29
	F (5, 50) = 4.06*	F (7, 69) = 5.42*

Notes: All entries are unstandardized, imputed OLS regression coefficients, standard errors in parentheses. *Reject null hypothesis of regression coefficient=0, p<.10.

Table 4: Testing the Social Values Perspective

	Perceived BMP Effectiveness	Partnership Participation
Independent Variables		
Economic Conservatism	.15 (.14)	-.36 (.23)
Environmentalism	-.13 (.12)	-.13 (.20)
Stewardship	.20 (.12)*	.08 (.24)
Inclusiveness	.18(.09)*	-.05 (.24)
Constant	2.01 (1.10)*	4.89 (2.15)*
Model Fit	F=3.25 (4, 78)*	F= 1.01 (4, 78)
	Adj. R^2=.09	Adj. R^2=.01

Notes: All entries are unstandardized imputed OLS regression coefficients, standard errors in parentheses. *Reject null hypothesis of regression coefficient=0, p<.10.

Table 5: Integrated Models for BMP Effectiveness and Partnership Participation

Perceived BMP Effectiveness		Partnership Participation	
	Coefficients		Coefficients
Economic Perspective		Economic Perspective	
Farming Efficiency	-.01 (.09)	*Information*	.19 (.15)
Information	.16 (.09)*	*Agriculture Coop*	1.61 (.55)*
Regulatory Relief	-.08 (.08)	*Farm Size*	.52 (.29)*
Cost-Share Programs	.23 (.07)*	Social Capital Perspective	
Social Capital Perspective		*Expected Reciprocity*	.52 (.18)*
Expected Reciprocity	.37 (.11)*	*Local Government Trust*	.32 (.17)*
Social Values Perspective			
Stewardship	-.02 (.12)		
Inclusiveness	.25 (.09)*		
Constant	.20 (.80)	Constant	-3.71 (1.35)*
Model Fit	F(7, 75)= 8.26*	Model Fit	F= (5, 64)=6.00*
	Adj. R^2=.38		Adj. R^2=.27

Notes: All entries are imputed, unstandardized OLS regression coefficients, standard errors in parentheses. *Reject null hypothesis of regression coefficient=0, p<.10.