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Comparison of Water Quality Program Efforts for Non-Governmental Organizations Within Northern Gulf of Mexico Watersheds

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Abstract: Non-governmental organizations concerned with water quality issues within the Northern Gulf of Mexico were surveyed to compare their program differences. The objectives of the study were to determine the extent of water quality programs and priority program emphasis for non-governmental organizations in the Northern Gulf of Mexico. The study utilized a methodology that identified the program elements of four different watersheds in four southeastern states. The results demonstrate that evaluating non-governmental program efforts in a region reveals targeted priorities that may help to define future program needs.

Introduction

The identification of program priority needs and community program assessment are important elements for Extension professionals. As articulated in the 2007 *Journal of Extension* article, "The Extension Hedgehog", the development of education programs must begin with a thorough review of existing efforts (McGrath, Conway, & Johnson, 2007). This article explores a method to determine primary program areas for existing water quality efforts of selected non-governmental organizations (NGO's) in Northern Gulf of Mexico watersheds.

Previous studies of effective water quality programs have highlighted the critical role of NGO's in regional watershed efforts (Koehler, 2001; Wiley & Canty, 2003). While the targeted activities of nonprofit organizations may vary according to the priorities of watershed concerns, involving the public as part of an open planning process has led to increased support and cooperation for regional watershed plans and policies (Wiley & Canty, 2003).

For example, a study of national watershed organizations was conducted for the Save San Francisco Bay Association (Koehler, 2001). Entitled *Putting It Back Together: Making Ecosystem Restoration Work*, the report mentions that engaging stakeholders and the public in all planning issues is a key step for a successful watershed. The Smart Watershed Benchmarking Tool, drafted by the Center for Watershed Protection (2008), provides a standardized ranking system for watershed managers to be able to assess their watershed programs. The guidelines in this document recommend the development of watershed education programs for public involvement and neighborhood consultation as effective methods to affect public behavior.

Problem Statement and Purpose of Study

The study reported here was part of a larger grant to assess the impact of water quality ordinances, outreach, and code enforcement within targeted watersheds of the Northern Gulf of Mexico. Specifically for the outreach portion, our task was to identify the NGO's working within select watersheds, to develop and conduct surveys of all active NGO programs, and to highlight areas of program emphasis.

The questions that we posed to conduct our task of determining existing program area efforts are:

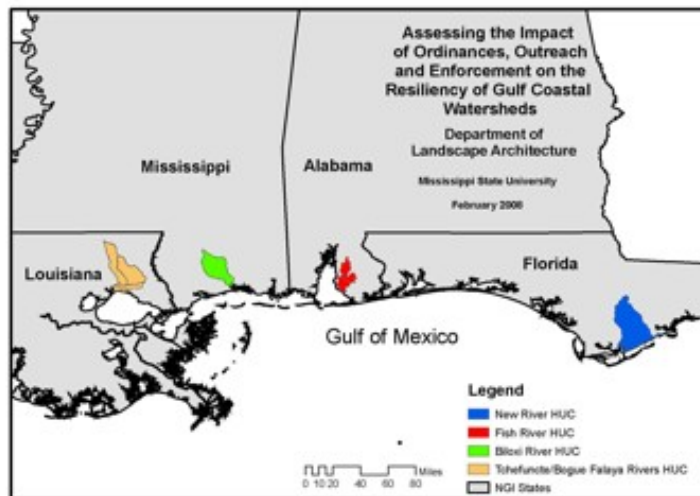
1. How does one identify what program activities are occurring in regional watersheds?
2. How do we determine the trends of program efforts in watersheds with multiple program types?

Methods

Study Setting

Our approach was to develop a method that surveys and identifies watershed program efforts for multiple watersheds in a region in order to compare program priorities. This will allow for a larger view of understanding regional watershed programming and possibly identify areas for future programming needs. Four watersheds within the Northern Gulf of Mexico were identified as sample study areas. One watershed was selected in each coastal state. They included 1) the New River/Apalachicola River in Florida, 2) the Fish River in Alabama, 3) the Biloxi River in Mississippi, and 4) the Tchefuncte and Bogue Falaya Rivers in Louisiana (Figure 1). These watersheds were selected because they may show differences in program areas between states, and each had readily available environmental data. For population comparison, U.S. Census population data (2000) for the counties these watersheds are located in were New River/Apalachicola (54,273), Fish River (140,415), Biloxi River (189,601), and Tchefuncte/Bogue Falaya (191,268).

Figure 1.
Locations of Watershed Case Study Areas by State



To identify all possible NGO groups with active involvement in the targeted watersheds, telephone interviews were conducted in each state with water quality educators (state agency), NGO groups, and state and federal water quality agencies. All contacts were provided with a list of active organizations and queried for additional organizations not on the list. An Excel spreadsheet was created with NGO listings by watershed and contact information. Existing programs acknowledged by individual organizations in watersheds were tabulated by category, and frequency analysis was conducted to summarize watershed program efforts by state. A survey instrument for telephone interviews was developed to determine the structure, goals, and active program areas of each NGO. Categories were determined by program efforts currently utilized within the study region. The structured surveys included the following questions regarding areas of program emphasis and partnerships:

- Does the organization conduct programs directly within the watershed?
- Is the organization a 501©3 non-profit status?
- Does the organization work with other federal, state, local, or NGO partners?
- Does the watershed have a management plan?
- Does the organization draft or support local, state, or federal water quality ordinances?
- Does the organization manage lands (privately owned, leased, or provides management services), conduct land or wetland restoration projects (privately owned, leased, or provides restoration services), assist in conservation easements (for landowners), review/comment on proposed development plans, monitor water quality (organization or by volunteer), conduct public education programs (in schools or public programs) or any other conservation programs?

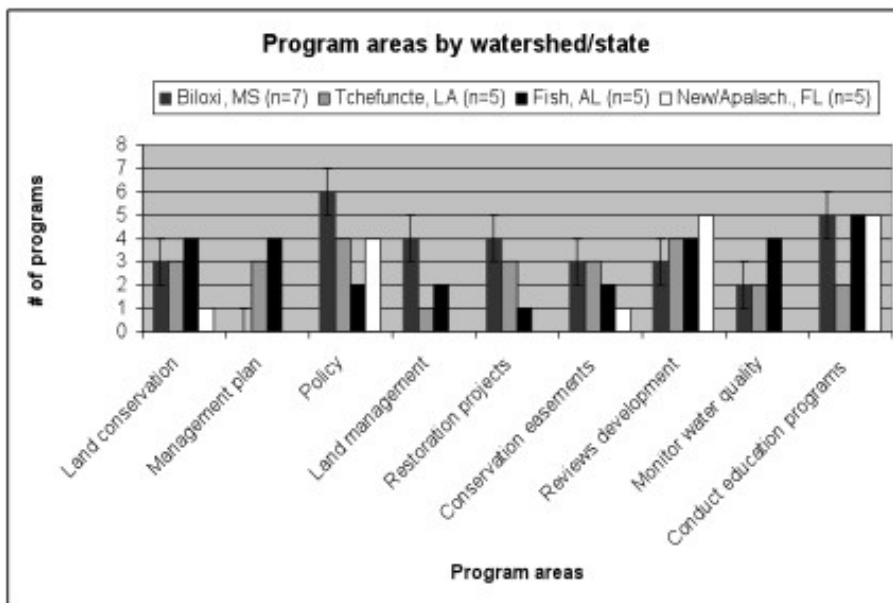
Telephone surveys with NGO representatives were conducted from May to August 2007.

Results

Twenty-two environmental organizations that directly work within the four watersheds were identified, and all identified contacts completed the survey information. Twenty-one were non-profit organizations, and there was one private corporation that conducts watershed programs. Seventeen responded as being 501©3 corporate status. All respondents reported active partnerships with other federal, state, or local organizations. Seven groups were identified and surveyed in the Biloxi watershed (Mississippi); five within the Tchefuncte/Bogue Falaya rivers (Louisiana); five in the Fish River watershed (Alabama); and five in the New River/Apalachicola (Florida). Four groups were local or state affiliates of national organizations (National Audubon Society, National Wildlife Federation, Sierra Club, The Nature Conservancy). The remainder were local independent conservation groups specific to their individual watershed.

Responses to survey question program areas by state are displayed in Figure 2.

Figure 2.
Actual Responses to Program Areas by Watershed



The responses from the survey reveal that environmental organizations are present and play an active and important role within each of the identified test watersheds of the Northern Gulf Coast. The four most frequent responses to program areas for all watershed organizations include: conducting education programs (17), working with policy issues (16), reviewing development plans (16), and the conservation of land (11) (Table 1). The results using actual numbers of responses show that the program types conducted within watersheds vary across the Gulf Coastal region.

Using total responses as a metric reveals the most frequent numbers for individual program areas but does not allow for easy comparison of all program variables. To compare all program types to watershed locations, CANOCO 4.55 (ter Braak & Šmilauer, 2002) was used to run a Detrended Correspondence Analysis (DCA).

DCA is an ordination method that utilizes all variables to show tendencies similar to cluster or component analysis used by other popular statistical softwares. DCA is an indirect gradient analysis technique commonly used to put species data from ecological communities in order so that a researcher can determine the underlying factors responsible for how they are distributed. The researcher uses what he knows about the given environmental situation to determine why the patterns of distribution seen in the data exist.

In the study reported here, program foci are like species, and we attempt to describe why the different programs exist in the varying policy frameworks seen in the four states. In this case, we compared all program type responses to one another and then determine post hoc why the different strategies are being used in a given state/watershed. DCA provides the following opportunities as an analysis model:

1. Visualizes multiple dimensions simultaneously.
2. Can ideally represent important and interpretable associations.
3. Statistics are enhanced when responses are viewed in aggregate because of redundancy.
4. Ordination reduces "noise" in statistical evaluations.

Results from the study were entered into an Excel spreadsheet, and spreadsheet data was entered into the CANOCO software. DCA provides a graph that displays spatially all program variables, and the proximity of variables to each other signifies correlation.

As shown in Figure 3, each watershed shows a stronger significance (nearness) toward some program areas than others.

Figure 3.
DCA Results of Program Areas to Watersheds

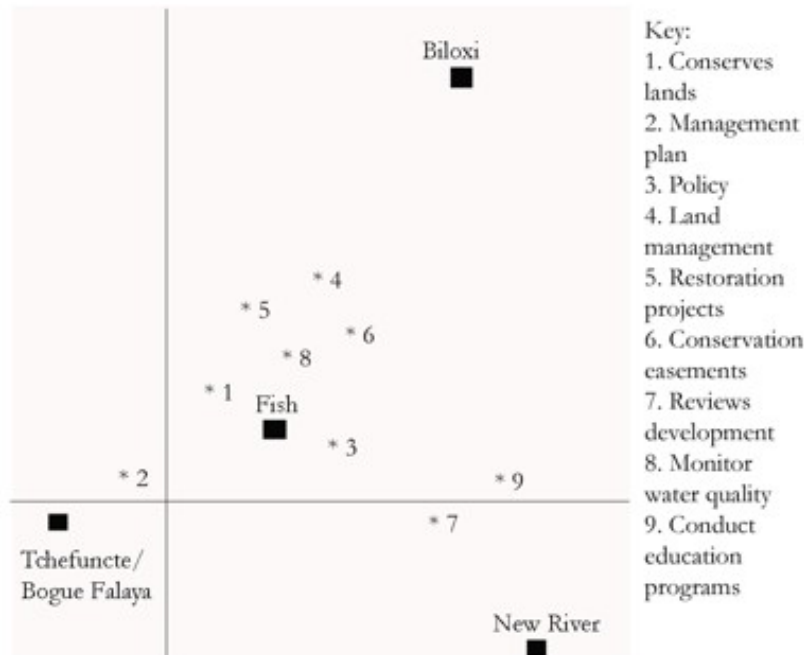


Figure 3 displays the program types that have the strongest correlations to watershed locations. The NGO's working within the Tchefuncte/Bogue Falaya (LA) watershed are most closely correlated with the development of watershed management plans (#2); the Biloxi (MS) NGO's efforts tend towards land management, restoration projects, and conservation easements (#s 4,5,6); the New River/Apalachicola (FL) NGO's are aligned near the review of development and education programs (# 7,9); while the Fish River (AL) organizations are more centralized toward all program areas, with most highly correlated with conserving land, making policy, and monitoring water quality (#s 1,3,8).

The DCA biplot (Figure 3) graphically summarizes the correlations in Table 1. Comparisons of all variables and locations are simultaneously evaluated in the analysis. Axis 1 (the x-axis in Figure 3) is dominated by the program elements Conduct Education Programs, Affect Policy, Reviews Development, and Conservation Easements. The watersheds most concerned with these activities are the New River and the Biloxi. The Tchefuncte River watershed is negatively correlated with these program elements, meaning that by comparison to the other watersheds, there is a low proportion of NGOs engaged in these types of efforts in that watershed. The second axis (the y-axis in Figure 3, or second column in Table 1) is a Land Management and Restoration Project axis, and these elements are correlated positively with the Biloxi watershed and negatively correlated with the New and Tchefuncte basins. Management Planning, Water Quality Monitoring, Conduct Education Programs and Reviews Development are positively correlated with the third DCA axis (third column Table 1). The Biloxi River NGOs are negatively associated with these programs, while the Fish and New River groups are active in these areas.

Table 1.
Correlation Coefficients Between DCA Axes, Watersheds, and Program Elements

Watershed	Axis 1	Axis 2	Axis 3
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Biloxi	1.2131	1.6149	-0.7217
Tchefuncte	-0.5631	-0.1106	0.2581
Fish	0.5279	0.2501	1.4169
New	2.0799	-0.9246	1.0414
Program Elements			
Land Conservation	0.4075	0.2948	0.3707
Management Planning	0	0.0756	0.8562
Affect Policy	0.8879	0.2357	0.3473
Land Management	0.6252	0.8148	0.1792
Restoration Projects	0.4068	0.7217	0
Conservation Easements	0.8096	0.5148	0.3546
Reviews Development	0.8808	0	0.6582
Monitor Water Quality	0.4958	0.5138	0.6922
Conduct Education Programs	1.1246	0.1523	0.6772

Discussion and Implications

The variation in programs between watersheds may be due to the uniqueness of watershed land uses and may provide some speculative rationale for the differences in program efforts. The New River/Apalachicola (FL) watershed contains large portions of the Apalachicola National Forest and the Tate's Hell State Forest. Because of the extent of these national and state lands, efforts in regards to restoration, conservation, and management may be precluded within that watershed, allowing for development review and education. Similarly, in Alabama, the Weeks Bay National Wetland Estuarine Reserve lies within the Fish watershed, perhaps providing more central focus for broadly diverse efforts without a primary focus. In the rapidly growing population areas within the Tchefuncte and Bogue Falaya (LA) watersheds, watershed management may be a more priority issue. With the large amount of lands in private holdings within the Biloxi watershed (MS), land management, restoration efforts, and conservation easements may be one avenue of working with landowners to improve water quality and riparian habitat.

The frequency results reveal that the area of focus for program efforts in the Northern Gulf of Mexico lie in the areas of policy (73% of total programs), education (77%), and development review (73%). The lowest responses for program areas in this region identified management planning (32%), land management (32%), water quality monitoring (36%), and restoration projects and implementation (36%). The overall efforts in this region reflect priorities in broad based objectives such as policy and education and less responsive to site-specific actions.

Evaluating existing programs to determine watershed efforts is an important part of constructing new program priorities. The results from our study indicate that programs can vary regionally across watersheds due to individual issues. Assessing program priorities in a regional light helps to determine real and perceived program needs for separate watersheds. Creating an inventory of existing programs allows for an understanding of watershed priorities and reveals which efforts are already being implemented.

Understanding individual watershed efforts reveals opportunities to diversify program types and stakeholders not yet addressed.

A method that includes surveying and identifying watershed program efforts for multiple watersheds in a region and comparing their program priorities allows for a larger view of understanding regional watershed programming, and identifies areas for future programming needs. To avoid duplication of program efforts, Extension personnel involved in the development of programs in a watershed should evaluate non-governmental organization program efforts within their watershed and adjacent watersheds. Looking at precedents of program types and stakeholders in other regions will help define new areas for program improvement.

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