DEMONSTRATING THAT MANAGEMENT OBJECTIVES WILL BE ACHIEVED IN ROCKDALE COUNTY, GEORGIA

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Abstract. Rockdale County GA performed a watershed assessment to develop a management plan that will provide for water quality protection while achieving other local objectives, including expansion of water supply and wastewater treatment capacity. The project team applied an innovative planning process that links management objectives, assessment information, predictive modeling tools, and stakeholder participation to tailor management to risks. For each management objective, the County established one or more measurable quantities (indicators) to assess current condition and the risk of not meeting the objective in the future. The use of a target (i.e., the value that the County wants to achieve) for each indicator provided a basis for identifying significant risks and for evaluating which management options best achieve the targets. Quantitative models that predict the indicators provided the tools to support both watershed assessment and management planning. The results provided an effective means for the County and stakeholders to evaluate management options, and achieve a higher degree of confidence that the selected plans will be successful.

INTRODUCTION

Rockdale County, Georgia, is a part of the fast-growing Atlanta metropolitan area and contains portions of five watersheds within its jurisdiction (Figure 1). The rapid development in the area creates numerous challenges for the County, including expanding drinking water supplies and wastewater treatment capacity to meet the needs of a growing population, maintaining water quality in County streams and downstream Jackson Lake, and minimizing flooding risks. To face these challenges effectively, Rockdale County began developing a watershed management plan in May of 1999.

Watershed planning is becoming more common as a means for local governments and utilities to establish a framework for making cost-effective decisions on management practices that will protect water quality and minimize adverse flow impacts. However, many watershed plans being generated appear to be too general to evaluate whether they will be successful. A typical approach is for consultants to identify existing and future problems (for example, flow peaks, sediment and nutrients associated with increased runoff in rapidly urbanizing areas), and then prescribe general BMPs to control runoff and pollutant loading. The problem with this approach is that it is often unclear whether the prescribed actions will actually achieve desired results. Reliance on post-plan monitoring to determine success poses risks of potentially expensive mistakes and irreparable damage to water resources. Indeed, it is useful to have more confidence when developing the plan that it will achieve stakeholder objectives. Rockdale County GA used an approach that demonstrates it will achieve important objectives through its watershed management plan.

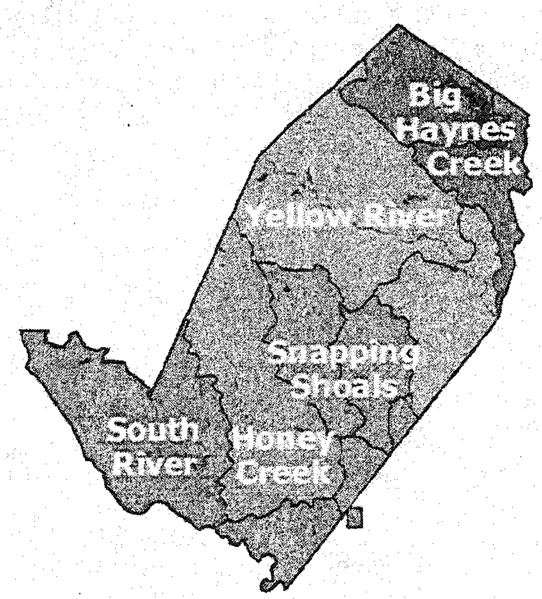

Figure 1. Watersheds draining Rockdale County.

ASSESSMENT AND PLANNING APPROACH

The project consulting team worked closely with County staff and a 23-member Stakeholder Committee to clarify objectives, including those that go beyond water resource protection. Indicators and targets (summarized in Table 1) were established for the water quality and flood control objectives collectively.

Existing GIS-based data (land use/land cover, soil, hydrography, etc.), water quality information, and newly collected monitoring data (physical habitat, benthic macroinvertebrates, fish, and selected water chemistry) were assessed to identify existing problems and threatened areas. Key to the assessment process was the development of watershed and water quality models to predict future watershed conditions for estimated changes in population, land use and point- and non-point source loading. Models constructed for Rockdale County include: (1) watershed models that simulate the flow of water and loading of sediment, nutrients, metals, and fecal coliform from the land surface to Rockdale County's streams, (2) stream dissolved oxygen models that evaluate the impacts of oxygen-demanding wastes on instream oxygen concentrations during critical periods of low flow and high temperature, and (3) watershed runoff and stream flood hydrograph models that simulate the velocities and water elevations expected in streams during significant rainfall events. The models were applied to existing conditions and for population and land use projected to the year 2020.

County staff and the Stakeholder Committee were presented with results that indicated where current management regulations, policies, and practices are not predicted to achieve objectives through the year 2020. Key parameters/stressors of concern were identified. The project team worked with the Stakeholder Committee and County staff to craft candidate management scenarios to address these concerns. The watershed and water quality models were then used to predict how well each management scenario would perform in terms of achieving targets and objectives. Evaluation of the modeling results along with other decision criteria (e.g., cost, public acceptability) helped the Stakeholder Committee identify a preferred management strategy, which was then discussed in a variety of public forums to help refine the plan. Based on public input, the plan will be revised and an implementation strategy developed by Spring 2001. Presentation of the final watershed management plans for approval and adoption by the Rockdale County Board of Commissioners is planned for this summer.

RESULTS

Based on analysis of monitoring and modeling information, the County identified high-priority issues in for ten subwatersheds. Figure 2 indicates by subwatershed which parameters currently do not meet targets or are at high risk of not meeting targets through 2020. The risks are all associated with potential nonpoint source runoff and pollutant loading.

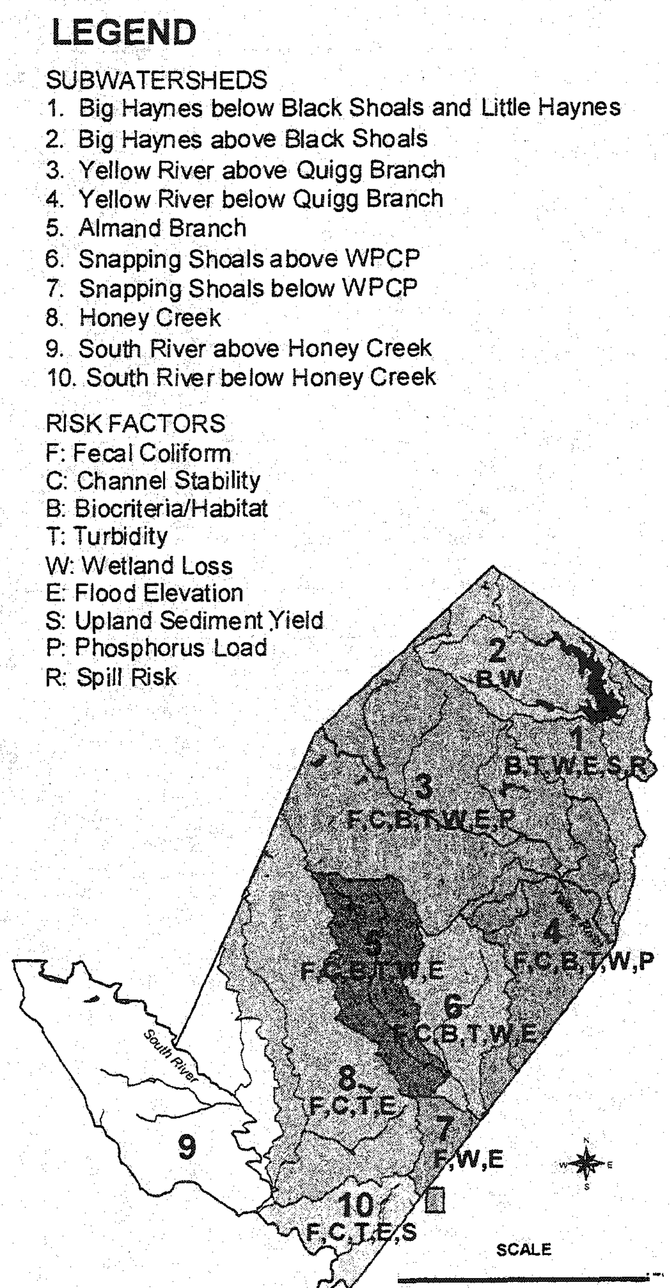

Figure 2. High risk factors in Rockdale watersheds.

Table 1. Targets for Water Quality Indicators to Meet Water Quality Objectives in Rockdale County, GA

Parameter	Target	Basis
Copper	less than 4.6 μg/L dissolved	water quality standard
Lead	less than 13.9 μg/L dissolved	water quality standard
Zinc	less than 35.4 μg/L dissolved	water quality standard
Dissolved Oxygen	greater than 5 mg/L	water quality standard
Coliform	geometric mean < 500/100 mL	water quality standard
Temperature	less than 90° F	water quality standard
Stream Shading	25% or better coverage within 50 feet by forested riparian areas	temperature model
Base Flow	not greater than a 10% decrease in lowest predicted 7-day average flow and less than a 1% increase in frequency of time during which flows are less than 30% of existing average flow	interpretation of Wildlife Resources Division recommendations
Channel Stability	streams contain 40% or less by length erosive reaches and 40% or greater stable reaches	stream power analysis
Upland Sediment Yield	sediment yield less than 0.4 ton/acre	current average or better
Biocriteria Existing	fair or better rating	benthos score
Biocriteria Future	fair or better rating	best professional judgment
Spill Risk	minimize risk	best professional judgment
Wetland Loss	no net loss from current conditions	best professional judgment
Chlorophyll *a* in water supply reservoir	summer average concentration of less than 13 μg/L	target from Black Shoals Lake Study
Phosphorus Load Downstream	no net increase in phosphorus export	GA EPD requirement
Turbidity	minimize human sources (i.e., above levels caused by natural sources)	best professional judgment
Flood Elevation	overtopping of roads by less than 0.5 foot during 25-year flow	best professional judgment

The project team examined five general approaches to manage nonpoint source pollution:

1) *Shaping growth* by redirecting the type and intensity of development (i.e., limiting public service areas, zoning, and public land acquisition).

2) *Managing growth* by governing what can happen onsite (density allowances, impervious surface limits, design standards for roads, stream buffer requirements)

3) *Mitigating impacts through structural controls* (e.g., storm water ponds)

4) *Monitoring and enforcement* (e.g., inspections to ensure maintenance of septic systems, sanitary sewers and pump stations, BMPs)

5) *Education* including outreach programs to increase citizen awareness and action, and to promote good environmental stewardship.

Using various combinations of these approaches, the County and project team crafted three distinct management scenarios focused on addressing new development (the biggest threat to future water quality) to evaluate:

Scenario 1 involved a more traditional stormwater control approach emphasizing structural controls such as wet detention ponds.

Scenario 2 emphasized non-structural options including large lot and clustered housing with dedicated open space outside the sewer service area.

Scenario 3 was based on establishing performance standards that developers must meet.

The modeling tools were used to test combinations of options (and sensitivity of results to key assumptions) under each scenario to achieve equal levels of water quality protection. For example, Figure 3 illustrates that the proposed scenarios meet a phosphorus target of no increase in total loading from existing (1995) conditions in the Yellow River Basin above Lake Jackson. Selection of a preferred approach could then be based on other key decision criteria such as the degree of public acceptability and cost. Ultimately, the Stakeholder Committee and County staff selected Scenario 3 as the preferred approach based on its equivalent level of protection while providing flexibility to the development community. At the core of the preferred management approach are performance standards for new development that were demonstrated through modeling to achieve desired objectives for key indicators (phosphorus, sediment, and copper). A relatively simple spreadsheet model has been developed to evaluate the effectiveness of proposed best management practices for new developments, and the County is already piloting a program that makes developers aware of low-impact design opportunities early on in the site planning process.

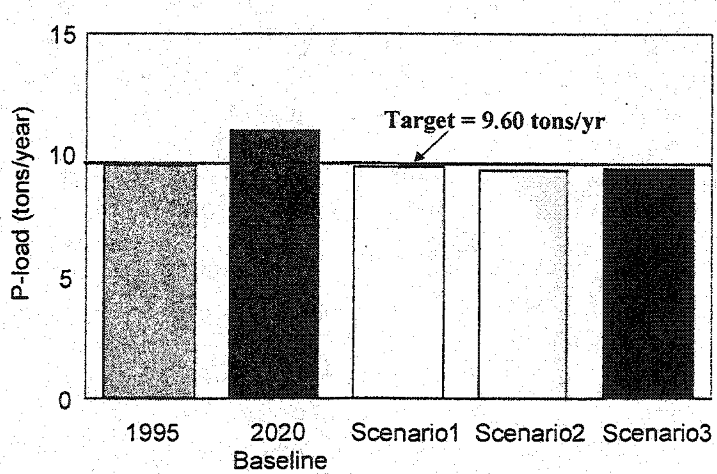

Figure 3. Comparing effectiveness of alternative management scenarios in meeting phosphorus loading targets in the Yellow River Basin.

CONCLUSIONS

The Rockdale County study demonstrates how indicators, targets, and predictive modeling can be used to focus management on significant risks. The method also provides decision-makers with a means for evaluating cost effectiveness and testing sensitivity to key assumptions, and it supports communication of the rationale for new management efforts. Overall this approach provided the County with a higher degree of confidence for the success of its plan.