GUIDELINES FOR DEVELOPMENT OF WATERSHED PROTECTION PLANS IN GEORGIA

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REFERENCE: Proceedings of the 1989 Georgia Water Resources Conference, held May 16 and 17, 1989, at The University of Georgia. Kathryn J. Hatcher, Editor, Institute of Natural Resources, The University of Georgia, Athens, Georgia, 1989.

INTRODUCTION

Recently, water supply planning in Georgia has come to be seen as a two-part process: 1) providing the quantity required to meet projected demand; and 2) planning for watershed management to protect water quality. This perspective was clear in a 1987 report on Georgia's Water Resources Management Strategy released by the Office of the Governor. This report called for the creation of 31 public fishing and water supply reservoirs north of the Fall Line in Georgia. Development of the water supply reservoirs is based on the expectation that these water sources were "to be protected by implementation of effective land management measures..."

In response to the increased emphasis at the state level, local officials in Georgia have demonstrated a growing understanding of the need for watershed protection. However, our work with the Northeast Georgia Water Supply Task Force has shown that many local officials have limited understanding of water quality protection techniques and methods for planning watershed management programs. Yet, these officials will be responsible for developing and implementing the management programs emphasized by the state. The disparity demonstrates the need for clear guidelines for development of watershed protection programs at the local level.

This paper presents guidelines intended for planning at the local level. We began development of the guidelines with a survey of existing watershed protection programs in the Southeast; a summary of techniques used in selected programs was presented in Cowie and Cooley (1988). We also evaluated watershed protection planning processes developed in other states, looking in particular for adaptation to conditions specific to Georgia (NY DEC, 1986; Burby et al., 1983; Blackman and Blaha, 1981). Finally, we looked at proposed water supply watersheds in Northeast Georgia and refined the guidelines through case study.

STUDY WATERSHEDS

Twenty-two watersheds have been identified as potential water supply sources in Northeast Georgia (US COE, 1987). General characteristics of thirteen of these drainage basins have been summarized (Cooley and Cowie, 1987). Drainage area of the thirteen watersheds ranges from 1 to 145 mi^2. Although some watersheds have significant urban areas, the majority are predominantly rural. Portions of the watersheds are in areas currently experiencing rapid growth, while others are in areas with significant growth projected for the near future. These watersheds were used for preliminary elaboration of a planning process. To further refine the process, we conducted detailed analysis of three of these watersheds. Two of the watersheds, Parks and Little Curry Creeks, are offstream storage project designed to store water from the North Oconee River. The basins are relatively small, with drainage areas of 2.9 and 7.8 mi^2, respectively. A project also has been proposed for the mainstem of the North Oconee River itself. The North Oconee project would define a relatively large watershed with a drainage basin of 145 mi^2. In our presentation we use examples from the study watersheds to illustrate various steps in the planning sequence describe below.

PLANNING PROCESS

Planning for watershed protection is triggered by identification of a problem: a projected or current water supply deficit. A general solution statement is "develop a plan to meet the estimated demand and to protect the quality of the source". Actions to reach this general solution follow two tracks: 1) a detailed engineering study; and 2) a detailed watershed protection study. In our study, we are not dealing with the first track. Our proposed process for the second track is diagrammed in Figure 1; major steps are described in

subsequent sections of the paper. The planning process is intended to be adaptable to most water supply watersheds in north Georgia.

Watershed protection programs are aimed at management of human activities in order to protect water quality. The planning process begins with a preliminary statement of objectives. The general goal of most programs is to rely on low technology solutions that protect the integrity of the natural environment. It is critical that these solutions be defined on a watershed-specific basis. An additional objective to consider at this stage is interim regulations to manage development while controls appropriate for the specific watershed are defined (Burby et al., 1983).

Watershed Assessment

The key to an effective site-specific program is assessment of watershed conditions in three areas: environmental features, development and growth patterns, and local goals and institutional structures. The inventory of environmental features follows conventional environmental analysis procedures (NY DEC, 1986) and is intended to suggest limitations that natural conditions can place on human activities.

Assessment of development and growth patterns includes recent changes and projections for the future. The assessment of development and growth patterns will be used to indicate portions of the watershed or human activities that need to be targeted by management efforts (Burby et al., 1983).

Finally, local goals and institutional structures need to be considered. The purpose here is two-fold. First, water quality protection provided by the current regulatory framework should be evaluated. Zoning, erosion control, stormwater management, and subdivision ordinances can all provide *de facto* protection. While *de facto* protection has generally not been as effective as programs designed specifically for watershed protection (Burby et al. 1983), existing management structures provide the base for program development.

Second, watershed protection should be part of a municipality's overall planning process. A watershed protection plan should reflect existing statements of desired use patterns in the watershed, when these are compatible with water quality goals. Statements of desired use that may exist for a particular watershed include a comprehensive plan, as well as plans for land use, stormwater management, and transportation.

It is important to begin the public education and involvement process at this point. Landowners who will be affected and those who rely on public water systems need to understand the importance of watershed protection. In addition, public input is critical for understanding local goals and for refining statements of the objectives of watershed management (Figure 1).

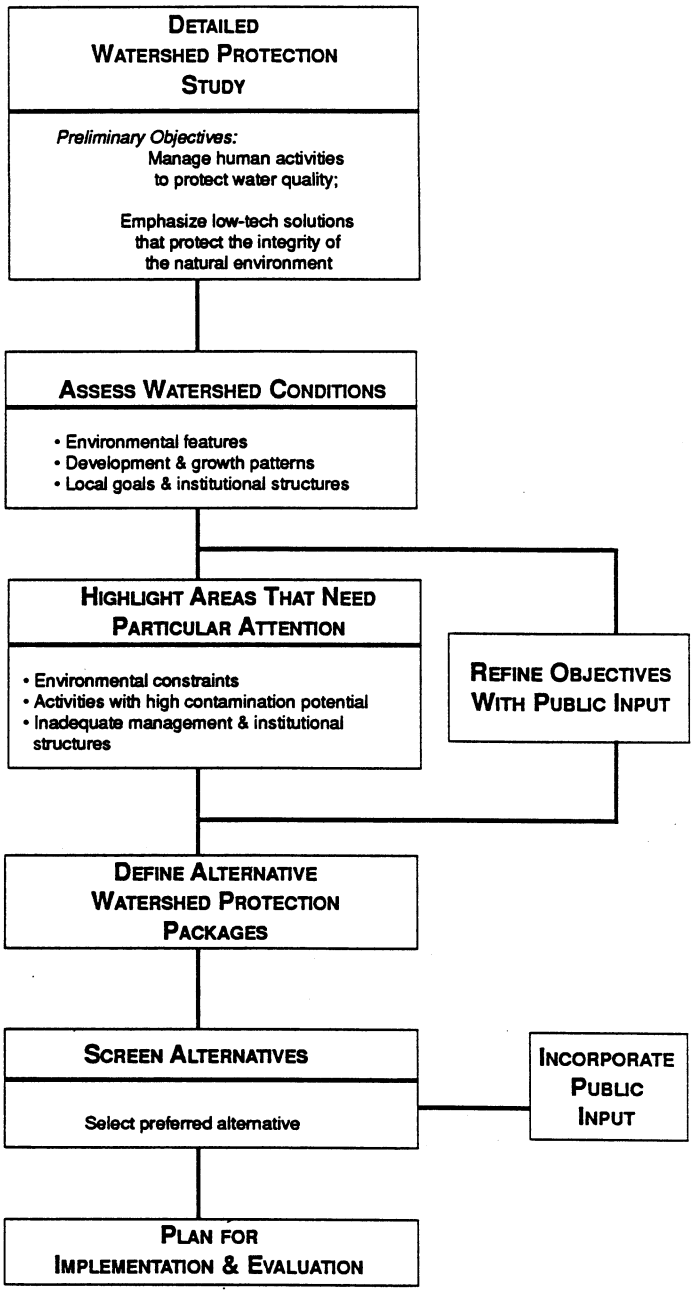

Figure 1. Watershed Protection Planning Process

Highlight Specific Areas

Result of the watershed assessment should be used to highlight areas that need particular attention. These critical areas can be defined in several ways. First, environmental conditions should be evaluated. Areas in proximity to the water source should be flagged. For reservoirs, this includes the portion of the watershed that provides direct drainage to the reservoir. Critical areas defined by low time of travel to the water source may also include corridors along the source stream and major tributaries.

Off-stream storage projects require consideration of two drainages. Most of the direct watersheds will be fairly small. For these small watersheds, the entire drainage basin becomes a critical area. Corridors along the mainstem and its major tributaries should also be considered critical areas for management.

Other natural conditions in the watershed can be used to define tracts which need particular attention in the planning process. Areas with slopes greater than 15%, for example, are particularly susceptible to increased runoff during and after development. Some soil types within the watershed may also pose development constraints due to wetness or susceptibility to erosion. Activities in susceptible areas can be managed through runoff controls, specific limitations, or overall prohibition. Similarly, areas which provide water quality benefits, such as unaltered wetlands, should be highlighted for protection. Degraded wetlands could be targeted for restoration activities to provide additional water quality benefits.

Second, human activities in the watershed (current and projected) should be evaluated for contamination potential. Existing areas of intense development can be a source of increased runoff and contaminant loading into water sources. The protection plan may need to incorporate components directed at managing runoff from these areas. Compatibility of projected growth with water quality protection goals also should be assessed. Management efforts may need to be directed toward changing projected development conditions.

Finally, deficiencies in the existing management structure should be noted. Control ordinances may exist but not be strong enough, or may exist but not be enforced. Part of the final watershed protection program may include codifying a stronger erosion and sedimentation ordinance, for example. Or, the program may include improved enforcement measures for existing ordinances.

Refine Objectives With Public Input

After completing the assessment of watershed conditions, the objectives of the watershed protection plan should be refined. First, the water quality goals should be combined with existing statements of desired uses in the watershed, including the land use plan, the comprehensive plan for the county, the transportation plan, and the stormwater management plan. At this stage, public participation and input are critical and essential. The public needs to be genuinely involved in the definition and selection of any plan. Without public participation, the probability of plan implementation is greatly reduced.

Depending on watershed conditions, objective statements may be oriented toward several management levels. One level of management would be oriented toward an overall land use pattern or development level. A principal objective under this level of management would include managing the land use pattern of the watershed for water quality protection through such means as guiding development to the higher areas of the watershed, limiting overall watershed imperviousness to some overall limit, maintaining the rural residential character of the watershed, or limiting the overall population of the watershed.

A second level of management would be oriented toward specific land uses. Objectives could include providing for control of the quantity and quality of runoff from silvicultural activities, agricultural activities, commercial and industrial uses. In addition, land uses that might lead to the discharge of toxic substances into watershed streams could be prohibited, while low- or moderate-density suburban development would be continued with concomitant water quality protection.

A third level of management would be the site-specific. Objectives at this level could include allowing development as determined by a site suitability index, maintaining runoff characteristics at a predevelopment level, and managing runoff from the existing development.

Regardless of the management level chosen, public involvement in the refining of objectives is obviously essential. In north Georgia, establishing prohibitions on what a person does with their land is extremely difficult, to say the least. Thus, the public needs to be involved in the decision-making process as early as possible, and also needs to be educated as to the importance of watershed protection.

Define Alternative Packages

The results of the previous steps should be synthesized to define alternative management packages. A variety of management tools exist; summaries can be found in earlier publications (Cowie and Cooley, 1988; Burby et al., 1983). Before selecting alternative sets of management tools, target contaminants should be considered. Estimates of loading rates for various contaminants can be calculated to assess critical pollutants (Blackman and Blaha, 1981). For the majority of watersheds in north Georgia, sediment and phosphorus will be among the critical contaminants. Management tools selected for the alternative packages will depend on the primary sources of the sediment, phosphorus or other pollutant.

Toxic compounds should also be considered among critical contaminants. If there are not any significant sources in the watershed, a priority of the management plan should be to limit future use of toxics. One way to state this limitation is to prohibit activities that "use, sell, store or produce any toxic chemical, waste or product" in the protected areas (Henry County Zoning Ordinance 1983). If potential sources exist, such as major transportation corridors, other actions should be considered for the management plan. Actions incorporated in the alternative plans may include stormwater and spill management structures as well as emergency response planning.

Additional factors to consider in development of alternative programs include natural constraints, current development conditions, growth patterns, local goals and institutional constraints. Watershed conditions will determine the management level(s) chosen. If land use in the watershed is

predominantly rural-agricultural and the local goal is to maintain these conditions, managing the land use pattern would be an appropriate solution. Possible tools include large lot zoning, commercial and industrial prohibitions, and programs to encourage the use of agricultural best management practices. For a watershed with limited development but local plans for significant growth, however, site-specific management may be a better solution. Allowing development based on lot suitability can reach both water quality and local planning goals. For this approach to be implemented effectively, significant institutional structures are required. Finally, large watersheds with a variety of environmental and development conditions will probably require management at more than one level. Possible tools for watersheds of this type include restrictions on development in stream corridors, vegetative buffer requirements, stormwater management specifications for existing development, and zoning to guide new development to acceptable portions of the watershed.

The complexity of the final program will depend on local goals, institutional structures, and the complexity of development and natural constraints in the watershed. Fairly simple approaches are both feasible and effective for areas with limited development. While the simpler approaches can also be applied to watersheds with more complex land use patterns, the restrictions may be viewed as too rigid. Programs that incorporate a complex mix of tools and management strategies can allow flexibility in development. The trade-off is an increase in the institutional structures and investment required for effective implementation of water quality protection measures.

Screen Alternative Packages

As the alternative watershed protection packages are developed, the participation of local government officials is essential. The political feasibility of each package needs to be tested first with elected and appointed officials and then with the general public. The alternative plans that are developed need to be analyzed for consistency with the objectives that were developed in the earlier steps of the planning process and for consistency with any regional and state plans. For each alternative package developed, trend-based conditions need to be compared with the management practices to assure that adequate protection is provided.

Also, it is important to remember that benefits in addition to water quality will be provided by the protection plans. Benefits to wildlife, vegetation, and recreational resources should be assessed and made a part of the screening of alternatives. Again, public input needs to be an integral part of this process.

Depending upon the complexity of the alternative plans that are developed, different techniques can be applied for the selection of a final package. Approaches can include numerical ranking of the alternatives, cost-benefit analysis, decision conferences, and modified environmental impact assessment techniques. We discuss these approaches in more detail in our presentation.

CONCLUSIONS

Watershed protection is an integral part of water supply planning and should be viewed as parallel to the conventionally recognized engineering analysis. The best solutions for watershed protection are low technology solutions and use the natural functions of the landscape or watershed.

The planning process we have defined here is somewhat idealized. We realize that it will not work in all political environments. However, the process is presented in the belief that much of it can be applied to real watershed problems in Georgia. Based on our experience working with local governments in north Georgia, the process, while idealized, is adaptable to many of the situations in north Georgia and well worth pursuing if considered early in the overall water supply planning process.

ACKNOWLEDGMENTS

The work reported here was supported in part by funds provided by the U.S. Department of Interior as authorized by the Water Resources Research Act of 1984 (P.L. 98-242).

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