

MANAGING THE QUALITY OF URBAN STREAMS IN GEORGIA

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Abstract. This paper summarizes the impacts of urbanization on stream quality in Georgia, discusses urban stream assessment and control activities and their implications for future management, and presents the consequent urban stream management strategy recommended by the Community Stream Management Task Force (1990), a broad-based, independent task force commissioned to assist the Environmental Protection Division (EPD) of the Georgia Department of Natural Resources (DNR) in developing an effective approach to the protection and reclamation of urban waterbodies.

IMPACT OF URBANIZATION ON STREAMS

Studies of urban streams in Georgia (Mikalsen, 1989) reveal that urbanization has inevitably led to the physical deterioration of streambeds and adjacent riparian corridors and degraded water quality, causing the reduction or elimination of aquatic habitats, the degradation of aquatic communities, and the impairment of beneficial stream use, generally for fishing: Propagation of fish, shellfish, game and other aquatic life.

Types of Impacts. The typical impacts of urbanization on streams are summarized in Table 1. The intensity of the impact tends to be a function of the degree of urbanization (Schueler, 1991), a conclusion supported by a metropolitan Atlanta study (Benke, *et al.*, 1981) which showed that biological degradation was positively related to the degree of urbanization.

The nature of the impact varies with the development stage. In the early stage, sedimentation due to construction and channel enlargement leads to increased solids and turbidity. The alteration of aquatic habitats and increased water temperature, caused by the typical removal of nearstream vegetation, lower oxygen solubility and increase nutrient release rates. As development occurs, sedimentation continues and water quality deteriorates as increased stormwater runoff more efficiently conveys the increasing variety of contaminants deposited on land surfaces into surface waters. In the final phase, characterized by aged commercial, industrial, and residential development, streams have become virtually lifeless with only a few

species of tolerant organisms capable of surviving the elevated levels of metals, hydrocarbons, solids, and nutrients and degraded physical conditions.

Status of Urban Streams in Georgia. As a whole, urban streams are the most degraded and disturbed aquatic systems in Georgia. A statewide investigation of nonpoint sources of water pollution (Georgia EPD, 1985)

Table 1. Major Stream Impacts Caused by Urbanization (Schueler, 1991)

Changes in Urban Stream Hydrology

- Increase in Magnitude and Frequency of Severe Floods
- Increased Frequency of Erosive Bankfull Floods
- Increase in Annual Volume of Surface Runoff
- More Rapid Stream Velocities
- Decrease in Dry-Weather Baseflow in Stream

Changes in Urban Stream Morphology

- Stream Channel Widening and Downcutting
- Increased Streambank Erosion
- Shifting Bars of Coarse-Grained Sediments
- Elimination of Pool/Riffle Structure
- Imbedding of Stream Sediments
- Stream Relocation/Enclosure or Channelization
- Stream Crossings Form Fish Barriers

Changes in Urban Stream Water Quality

- Massive Pulse of Sediment During Construction Stage
- Increased Washoff of Pollutants
- Nutrient Enrichment Leads to Benthic Algal Growth
- Bacterial Contamination During Dry and Wet Weather
- Increase in Organic Carbon Loads
- Higher Levels of Toxics, Trace Metals, Hydrocarbons
- Water Temperature Enhancement [Increase]
- Trash/Debris Jams

Changes in Stream Habitat and Ecology

- Shift from External to Internal Stream Production
- Reduction in Diversity of Aquatic Insects
- Reduction in Diversity and Abundance of Fish
- Destruction of Wetlands, Riparian Buffers, and Springs

revealed that streams draining developed urban basins were much more severely degraded than streams impacted by agriculture and commercial forestry activities. The beneficial uses of four of the five urban streams investigated were "severely impaired." Subsequent studies of urban streams (Georgia EPD, 1986; Atlanta Regional Commission, 1986a, 1986b, 1987a, 1987b, 1988, and 1989; LaGrange, 1991; Cobb County, 1991; and others) have consistently found that urban streams do not or only partially support their designated uses. The 1990-91 assessment of water quality in Georgia (EPD, 1992) revealed that approximately two-thirds of the nearly 1600 miles of streams and rivers in the State which did not support their designated beneficial use (where monitoring data or an adequate basis of evaluation were available) resulted from urban stormwater runoff and urban and industrial nonpoint sources of pollution. These degraded urban streams are not just a large-city problem; they are found in developed and developing areas throughout the State and nation. As pointed out by the Community Stream Management Task Force (1990), the problem will continue to intensify and expand in Georgia as urban areas age and expand to accommodate the 1.25 million population increase expected by the turn of the century...*unless urban stream quality can be effectively managed.*

RECENT MANAGEMENT ACTIVITIES

Since the 1985 Statewide Nonpoint Source Impact Assessment Study, EPD has placed increasing emphasis on managing pollution sources affecting urban streams and nonpoint sources of pollution. A summary of subsequent activities or developments pertinent to urban stream assessment and management follows.

Major Studies or Investigations

EPD (1986) conducted an intensive investigation of four urban streams to determine the causes of their failure to support beneficial use and identify corrective actions.

A series of investigations of Flat Creek, a tributary to Lake Lanier (EPD, 1988a; Task Force, 1988; Merritt, 1989; and EPD, 1988b) revealed that corrective actions including periodic stream inspections, monitoring, conferences with business and industry, and enforcement activities could lead to statistically significant improvements in the quality of a highly degraded urban stream. However episodic events such as spills and urban stormwater runoff continue to adversely affect the creek.

A series of previously cited Atlanta Regional Commission (ARC) studies, funded by a grant from EPD, demonstrated stream assessment and problem correction approaches in the metropolitan Atlanta area. An intensive survey of the Arrow Creek drainage basin (ARC, 1988a)

failed to reveal potential causes of elevated fecal coliform levels found during base and storm flow conditions.

A series of sanitary surveys were conducted by EPD during 1990-91 to identify causes of elevated fecal coliform densities in streams not fully supporting beneficial uses. These surveys disclosed and corrected numerous sources of bacteria, but did not lead to sufficient reductions in bacterial densities to affect beneficial use impairment. Extensive urban stream surveys (LaGrange, 1991; Cobb County, 1991; and Douglasville-Douglas County Water and Sewer Authority, 1991) reveal that metals concentrations and bacterial densities in urban streams frequently exceed State criteria.

Local Stream Quality Management

Local stream quality protection programs or activities are conducted in Cobb, Douglas, DeKalb, and Gwinnett counties and the Cities of Columbus, Gainesville, and LaGrange. The City of Atlanta discontinued investigation of water quality complaints in 1985, but is now conducting a prototype citizen-based monitoring program in two of its neighborhood planning units.

Citizen monitoring programs have been established in Alpharetta, Roswell, and Gwinnett counties. ¹Local programs have been instigated by general public support or concerns over specific waterbodies, the initiative of local elected officials or staff, and EPD enforcement action or encouragement. The programs may include stream monitoring, stream surveys, periodic inspections, and complaint resolution or referral to EPD. Columbus trains its field personnel to identify and report drainage and water quality problems to its citizen complaint center. EPD has supported (with federal grants) and encouraged the development and continuation of local programs.

Local governments which operate sewerage systems are responsible for detecting and correcting sewer leaks and spills or system failures, one of the common causes of urban stream contamination. Georgia Rules and Regulations set forth procedures for correcting and managing sewage spills. As required by Georgia Senate Bill 196, the cities of Atlanta, Augusta, Albany, Cedartown, Columbus, and Rome are, developing plans to eliminate or treat combined sewer overflows.

Regulations for the permitting of stormwater discharges, resulting from 1987 amendments to the Federal Clean Water Act, require that large (Cobb, DeKalb, Clayton, Fulton, and Gwinnett counties) and medium-sized communities (Augusta, Columbus, Macon, Savannah and their respective counties) systems prepare and submit a two-part permit application which identifies and characterizes stormwater discharges, identifies existing and potential structural and nonstructural controls to reduce discharges, and establishes a management strategy, including an assessment of the performance of management practices. EPD developed a Stormwater Discharge Strategy, conducted workshops to inform affected jurisdictions and organi-

zations of permit requirements, and partially funded ARC's preparation of a model stormwater ordinance. Large systems submitted their part II permit applications during November, 1992, while medium-sized systems submitted part II applications by May, 1993.

The U.S. Environmental Protection Agency (EPA) is currently forming a working group to develop stormwater permitting strategy for small (less than 100,000 population) systems. Current Federal law allows smaller communities to obtain stormwater permits until October, 1994.

Local erosion and sedimentation control ordinances adopted by most cities and counties in Georgia, pursuant to the Georgia Erosion and Sedimentation Control Act, also serve to protect local water quality. A 1989 amendment to the Act requires the maintenance of a 25' undisturbed natural vegetative buffer between flowing streams and regulated land disturbing activities.

Water quality complaints in jurisdictions without a local program and emergency situations are respectively handled by EPD regional offices and the EPD Emergency Response Team.

Land Management and Water Quality Protection

While the Georgia Water Quality Control Act assigns EPD the responsibility for protecting the quality and quantity of the State's water resources, the Georgia Constitution assigns the power to manage and regulate the land uses and activities which may adversely affect those waters to local governments. Major State laws and activities which have bridged the gap between land and water quality management are described below.

The 1973 Metropolitan River Protection Act was enacted to protect water quality, recreation values, and private property rights; control flooding, siltation and the intensity of development; and provide for comprehensive planning and the location and design of land uses (ARC, 1992c) in the Chattahoochee River Corridor from Buford Dam to Peachtree Creek. Local governments are responsible for implementing the Corridor Plan by reviewing and permitting development projects, controlling land disturbing activities, and enforcing Plan restrictions. The Plan limits land disturbing activity and impervious surfaces within six local vulnerability categories, limits floodplain development, requires 50' vegetative buffers and prohibits structures within 150' of the river, and requires buffers along the banks of most flowing streams in the corridor.

A recent ARC assessment (partially supported by an EPD grant) of tributary buffer zone ordinances in the Corridor (ARC, 1992a) was conducted to evaluate the ordinances and evaluate the extent of compliance. Another ARC study (partially supported by an EPD grant) which evaluated the effectiveness of watershed protection for this segment of the river was completed in December, 1992.

When considering requests for water withdrawal permits for new drinking water reservoirs, EPD has

worked with local governments to enact measures to protect the quality of the reservoir. These efforts have led to the local adoption and enforcement of watershed protection ordinances which typically require stream and reservoir buffer zones and restrict the type and location of land activities. Clayton, Douglas, Fayette, Henry, Newton, and Rockdale counties have adopted watershed protection ordinances.

The Georgia Comprehensive Planning Act of 1989, administered by the Department of Community Affairs (DCA), asserts the interest of the State "...in establishing minimum standards for land use in order to protect and preserve its natural resources, environment, and vital resources" and provides for the establishment of minimum standards and procedures with respect to natural resources, the environment, and vital areas which shall be used by local governments in developing, preparing, and implementing comprehensive plans in accordance with the Act. DNR was authorized to promulgate minimum standards including, but not limited to, protection of water supply watersheds, wetlands, and groundwater recharge areas. Guidelines for the above elements have been developed by DNR, ratified by the General Assembly, and incorporated into the minimum standards and procedures for preparing and implementing comprehensive plans. Communities which do not prepare an acceptable comprehensive plan may not be eligible for certain grant programs.

The Mountain and River Corridor Protection Act of 1991 establishes and sets requirements for protecting a 100' natural buffer on either side of a river with a mean annual flow of at least 400 cubic feet per second. It requires that local governments identify such river corridors and adopt river protection plans as part of the planning process required by the Georgia Comprehensive Planning Act. DNR has developed criteria for local river corridor protection.

EPD Urban Stream Management Activities

Since 1986, EPD has actively encouraged and supported local water quality management programs. EPD has: 1) developed and made presentations to encourage local officials to establish or expand local programs which led to the establishment of one program and the expansion of another; 2) provided technical assistance to local programs, sponsored an ARC workshop for local water quality management, supported ARC - local government demonstration stream studies in the Atlanta metropolitan area; and 3) developed an urban waterbody grant program which has supported water quality monitoring or management by seven cities and counties and supported four local government-sponsored citizen monitoring programs.

EPD has established, funded, and filled a statewide citizen monitoring coordinator position and let a contract for the development of an urban stream education program. The education program will be carried out by a

newly hired Educational Coordinator who will also be responsible for providing technical assistance to local governments.

In 1988, EPD appointed an independent task force, chaired by Mr. Al Crace, the City Manager of Gainesville, to assist and advise EPD in the development of a cooperative, coordinated, and effective approach to the protection and reclamation of urban water resources. The Community Stream Management Task Force (1990) produced the recommended comprehensive strategy for managing urban streams summarized in the next section.

EPD has begun to address the problem of deteriorating streambanks, which are a major source of stream sediment loads in developing and developed areas. EPD has financed and participated in the development of a streambank stabilization manual, initiated and entered into a contract with DeKalb County to develop and demonstrate vegetative streambank stabilization practices, and participated in the development of a Georgia Conservancy video on the value of riparian corridors.

EPD has funded and worked with ARC to prepare a manual of best management practices for urban streams. This document, entitled "Protecting The Community's Streams: A Guidebook for Local Governments in Georgia" may be obtained from the author.

Other significant impending projects are the development of guidelines for the protection of urban streams and an urban best management practice demonstration project which will involve the development of a prototype watershed assessment and management approach.

IMPLICATIONS OF URBAN STREAM STUDIES AND ACTIVITIES FOR FUTURE MANAGEMENT

Major implications of recent urban stream studies and activities for the development of future management studies are described and justified in Table 2.

A STRATEGY FOR MANAGING URBAN STREAMS

The Community Stream Management Task Force has recommended a comprehensive strategy for the management of Georgia's urban streams in their report "We All Live Downstream." Their recommendations have served as a guide to the evolution of a long-term approach to the protection of urban streams in Georgia. The Task Force (1990) asserts:

"Degraded urban streams are not an inevitable consequence of growth and development. They are a product of human abuse and neglect. Urban streams can be restored and protected from deterioration: it is a matter of making a collective decision to do so and developing the means and organization to accomplish the task. But the solution does not rest solely with State government, or Regional Development

Centers, or local governments, or business and industry, or the general public.² The quality of urban streams is a reflection of our activities in cities and our stewardship of a common natural resource, and the effective management of urban streams must be a mutual responsibility. For, after all, we all live downstream."

The development of an effective approach to the management of urban streams in Georgia, including the necessary integration of land and water quality management and evolution of comprehensive watershed planning and management at the local level, will require a **cooperative partnership** between State government and local government, Regional Development Centers, business and industry, and an informed and supportive public. This cooperative partnership will not just happen: there must be an impetus to act. The roles of each of the partners must be cultivated and accepted. A new and effective institutional structure must be constructed and sustained. This will require conviction, strong leadership, and an effective, comprehensive, long-term plan of action. This is the purpose of the master strategies proposed by the Task Force.

The Task Force recommended nine master strategies to forge the comprehensive approach and cooperative partnership necessary to effectively manage the quality of urban streams in Georgia. Each master strategy includes a statement of objectives, recommends major actions, and suggests responsibilities for accomplishing the major elements of a comprehensive, statewide urban stream quality management program. Master strategies address the education necessary to develop official and citizen support for urban stream management and train governmental personnel; management activities to implement a comprehensive urban stream quality management program; and support activities such as voluntarism and citizen participation, research and technical assistance, and financing.

Implementation of Master Strategies

The successful implementation of the master strategies will require the support and cooperation of key groups and organizations with interests in stream quality management and the development of an appropriate institutional structure. The Task Force recommends preparation of a video presentation regarding stream problems and management solutions; presentation and discussion of the recommended strategy with the DNR Board, key legislative committees, and the DCA; presentations to statewide organizations; incorporation of recommended work items into the EPD annual program planning process and grant program; formation of an Intergovernmental Technical Committee to assist and provide guidance in the implementation of the master strategies; and a progress review.

The Task Force has presented their recommendations to DNR, and a presentation was made to the DNR Board

TABLE 2. Implications of Urban Stream Studies and Activities for Management

Observations	Implications
<p>Urban streams throughout the State suffer from degraded chemical, physical, and biological conditions and do not support their designated beneficial uses. The urban areas of the State will continue to age and expand to accommodate increasing population growth.</p>	<p>Unless effectively managed, the intensity and extent of urban stream degradation in Georgia will continue to increase.</p>
<p>Urban stream conditions are but a barometer of activities and conditions in the contributing drainage basin. Contaminants generated by land activities may be discharged directly to waters or deposited on land surfaces and subsequently transported with stormwater runoff. The sources of contamination may be the result of individual actions, the activities of business and industry, or even governments. However, EPD is vested with the responsibility for managing water quality while local governments are generally responsible for managing land use and land activities. While specific pieces of state legislation have interrelated land and water quality management, environmental protection guidelines adopted pursuant to the Georgia Comprehensive Planning Act address only water supply watersheds, wetlands, and groundwater recharge areas... not surface water quality.</p>	<p>Effective management of urban stream quality will require a cooperative partnership between layers of government, the private sector, and the general public. Urban streams cannot be effectively managed with the "top-down" regulatory solution which has been successfully applied to the management of point sources of pollution. Cooperation with the Department of Community Affairs, Regional Development Centers, and local governments will be necessary to integrate land and water quality management and build the supporting institutional structure.</p> <p>The control of many of the sources of urban stream contamination, just as with solid waste recycling, will require changes in habits for individuals, businesses and industries and governments. Education will be a key to achieving behavioral changes.</p> <p>Thus, the approach must be "bottom up" and that will require an informed public and broad-based coalitions to generate support for local and State action.</p> <p>Finally, urban streams must be managed as watersheds ... not on the basis of political jurisdictions.</p>
<p>The nature of the problem of urban streams varies with the phase of land development.</p>	<p>In the early phase of development a preventive management approach (erosion and sediment control, subdivision regulation, drainage policies) should be employed. In developed areas emphasis should be placed on stream protection through surveillance, problem correction, and waste management. In later stages emphasis should be placed on stream restoration and retrofitting best management practices.</p>
<p>A piecemeal approach to controlling the quality of urban streams will not achieve substantial improvements in the quality of urban streams. Despite a complex series of regulations, programs, and controls on urban development in the Washington, D.C. metropolitan area (Schueler, 1991), the success of these measures "... has been less than anticipated." In Georgia local erosion and sedimentation control, demonstration stream studies, local programs, EPD complaint investigations, and sanitary surveys have led to identification and control of individual sources of pollution, but not sufficient improvements to restore the beneficial use of urban streams. While such programs respond to specific problems, they do not address, in a coordinated and comprehensive manner, the varied processes and activities which influence urban streams over the entire development cycle.</p>	<p>Effective management of urban stream quality will require development of a coordinated state-wide approach, and comprehensive watershed planning and management at the local level. This will involve developing the tools and institutional structure to support and encourage local stream protection as well as the development, dissemination, and refinement of comprehensive watershed protection planning and management strategies and procedures.</p> <p>Since there is limited information on the effectiveness of comprehensive urban stream management programs, it will be prudent to establish pilot comprehensive urban stream management programs, continuously monitor and evaluate the effects of local programs, and evolve management approaches. Monitoring will be necessary to evaluate the effects of management activities.</p>
<p>The implementation of a comprehensive urban stream management approach will require strong encouragement and support from the State level. Local governments are beset with increasing responsibilities and limited resources. Despite the emergence of local programs, there is a question of the responsibility and authority of local governments to manage water quality. Even the local programs which have developed do not employ a comprehensive management approach. EPD can investigate water quality problems in urban areas, but does not have the resources or authority to establish comprehensive local stream quality management programs.</p>	<p>A comprehensive urban stream management approach will not occur without strong and continuing support from EPD; however comprehensive stream management programs can be established only by local governments.</p> <p>First, the question of local authority to engage in water quality management should be resolved and expressed by State legislation; then it will be necessary to devise and implement a strategy to encourage local establishment of comprehensive stream management programs. Guidelines for developing such programs should be incorporated into the planning process established by the Georgia Comprehensive Planning Act.</p>
<p>Financial support for stream management and local resources are limited.</p>	<p>Maximize the use of available resources by integrating watershed planning and management activities into ongoing functions and optimizing use of Federal Section 319 grant funds. Alternative sources of resources such as the Revolving Trust Fund and the establishment of utility districts should be explored.</p>
<p>Urban streams are degraded by complex, interrelated processes and activities. Physical changes such as accelerated sedimentation, altered stream hydrology, and the removal of riparian vegetation influence water chemistry and in concert affect the aquatic community. Contaminants generated by myriad land activities are more efficiently conveyed to surface waters through "improved" drainage systems. Major sources of stream degradation are physical changes in the stream channel, discharges conveyed with stormwater runoff or combined sewer overflows, and a diverse collection of other sources -- disposal of waste oil, unauthorized discharges, spills and accidental discharges of wastes, unsanitary land use practices, land disturbing activities, surcharging sanitary sewer manholes, leaking sanitary sewers, possible cross-connections between sanitary and storm sewer systems -- all contributing significantly to pollution.</p>	<p>Comprehensive management of urban streams should address the physical aspects of the stream channel and the riparian corridor as well as the sources and pathways for stream contamination. Such management should encompass drainage policies and flood management, protection of the riparian corridor, source control of wastes, management of conveyance systems, control of discharge points, and control of illicit discharges and other sources of contamination. Water quality management objectives and practices should be incorporated into municipal functions and activities pertaining to the above activities. The management of urban streams must be as comprehensive and interrelated as the causes of degradation.</p>

TABLE 2. Continued

<p>Urban sources of stream degradation tend to be varied, diffuse, intermittent, recurrent, and have composite effects. In comparison to discharges from wastewater treatment plants, these sources are located throughout the drainage basin and tend to be intermittently discharged or conveyed as time-variant loads with stormwater runoff rather than released at a relatively constant rate. The sources of pollution are varied and conveyed to waters by various mechanisms. Many of the sources tend to reoccur, despite corrective actions. Finally many urban stream contamination problems, notably elevated hydrocarbon levels, are the result of diffuse, seemingly minor individual sources.</p>	<p>The varied, complex, random, and spatially and temporally variant nature of urban sources of pollution renders mathematical modelling and consequently the evaluation of cause and effect relationships much more difficult than with point source models. It will be difficult to develop models to evaluate the impacts of specific management practices or programs on water quality, instead the effects of management programs on stream conditions must be monitored and evaluated.</p> <p>The identification and correction of urban pollutant sources is labor-intensive. It can involve periodic stream monitoring, stream or drainage basin surveys, and investigations to identify sources of contamination. Follow up inspections will be necessary to assure that corrective actions have been taken. Stream quality management will be a continuing activity which will depend on local initiative and participation.</p> <p>Voluntary groups may be employed to conduct labor-intensive activities such as monitoring surveys and surveillance.</p>
<p>The varied impacts of urbanization -- sedimentation, habitat destruction, nutrient enrichment, adverse effects on biological communities -- and the intermittent, time variant nature of urban sources of pollution are not adequately reflected by current water quality standards. Criteria for fecal coliform densities and metals concentrations may be unrealistic for urban streams.</p>	<p>Procedures for evaluating sediment impacts, habitat damage, alteration of aquatic communities, and nutrient enrichment should be included in urban stream assessment procedures and evaluated for incorporation into water quality standards. Consideration should be given to development of standards or criteria based on the probability of exceeding a certain level. An evaluation of the quality which can be achieved in urban streams should be conducted and established as a goal for local urban stream management programs.</p>

during 1992. Copies of the Task Force report have been distributed to interested organizations and during a series of local government seminars conducted during 1992. The video has been funded and a contractor selected to prepare the video during 1993. Work items recommended by the Task Force have, as subsequently discussed, been incorporated into the EPD annual program and grant process. The Intergovernmental Technical Committee should be formed in 1993.

Education Strategies

Education is the common denominator of all master strategies. A comprehensive, targeted, and continuing education program will be necessary to make the public and local officials aware of the problems of contaminated urban streams and the necessity for comprehensive watershed management, train local personnel responsible for program implementation, induce changes in individual and corporate behavior which contributes to stream contamination, and foster voluntary citizen support.

Community and citizen education should raise the individual and corporate level of awareness of how nonpoint source pollution affects water quality, promote responsible behavior, and distribute information on effective actions to reduce water quality impacts. A carefully planned program should target specific audiences--individuals, business and industry, the school system, and trade groups. The program should be carried out by EPD in coordination with Regional Development Centers (RDCs).

EPD has funded and retained a contractor to prepare a comprehensive urban stream education plan and program which will be completed by December 1993. An Educational Coordinator position has been created and funded with a Section 319 grant. This position will implement the education program, encourage and support RDC programs, develop and deliver a standard presentation to local governments, and develop an annual award program for outstanding efforts to protect or rehabilitate urban streams.

Intergovernmental education includes 1) education of elected and appointed officials regarding the need for local stream management programs; and 2) the continuing education and training of officials conducting stream management programs. In the former case, DNR in association with organizations such as the Georgia Municipal Association and the Association of County Commissioners of Georgia should carry out statewide educational efforts and encourage and support RDC educational programs. The continuing technical training of officials operating stream management programs should be developed and coordinated by an Intergovernmental Technical Committee composed of representatives of EPD, regional, and local governments.

As recommended by the Task Force, pertinent technical information is regularly distributed to a network of individuals interested in stream quality management and a presentation on urban streams has been developed and regularly presented to the Level II Erosion and Sedimentation Seminar for Local Program Officials.

Other Task Force recommendations -- development of an Intergovernmental Technical Committee, a certified training program for local officials, presentations of stream management programs to statewide organizations and local officials, an RDC educational program, and a technical clearinghouse -- will be accomplished by the Education Coordinator.

Management Strategies.

Management strategies recommend that: 1) the impetus for local stream quality management be incorporated into the local comprehensive planning guidelines set forth by the Georgia Comprehensive Planning Act; 2) performance standards and regulations be adopted to set forth minimum guidelines and objectives for the protection of urban streams; 3) local actions plans be developed; and 4) a State and regional organization be devised to support urban stream management.

Community Nonpoint Source Planning. The most effective means of fostering the adoption of comprehensive, coordinated programs to manage the effects of urbanization on water quality is through the comprehensive community planning process established by the Comprehensive Planning Act. Local governments, however, must have clear and sufficient authority to carry out comprehensive stream management programs, and the flexibility to devise the most effective local approach.

The Task Force recommended that the elements of a comprehensive plan be amended to specifically recognize surface water protection from adverse impacts of land activities as a component of the natural and historical resources element of a local community plan. The Task Force also recommended that the question of the authority of local governments to manage the quality of streams be evaluated. A 1992 Georgia Senate Resolution called for the formation of a committee to evaluate local authority to enforce environmental laws and regulations, but this committee was never established.

Performance Standards/Regulation. Once urban stream programs are initiated statewide, performance standards should be developed to establish minimum guidelines for protection of local streams. These standards should set forth acceptable conditions for urban streams and recommend actions needed to restore and protect urban streams. Local governments should be intimately involved in the development of such standards. These performance standards should be flexible and address planning and management on a watershed basis, water quality objectives, local land use management activities, and monitoring and assessment procedures to identify problems and evaluate progress toward attainment of water quality objectives.

EPD has solicited and received a federal grant to develop performance criteria for the protection of urban streams which would serve as guidelines for local governments. These guidelines will be developed in cooperation with local governments. The contract for this two-year project will be let in early 1993.

Local Action Plans. Once committed to stream management, local government will need to develop stream quality management programs. Stream management will require a capacity for stream monitoring, planning and management and enforcement. EPD should support local plans with intergovernmental education, the development of planning and management approaches, and technical assistance.

State and Regional Organization for an Emerging Mission. The Task Force recommended that the various functional responsibilities within EPD which pertain to urban stream management be coordinated to assure a comprehensive, integrated approach to urban stream management. The Task Force (1990) noted that "[e]fforts to promote an effective integrated approach at the local level should also include a corresponding effort to integrate functional responsibilities and devise a comprehensive approach at the State level."

The Task Force (1990) also recommended that EPD fund a position responsible for local and regional technical assistance and that:

"[a] network of environmental specialists or planners should be developed to help implement the natural resources and environmental planning requirements of HB 215 [the Comprehensive Planning Act] and provide technical assistance to local stream management programs. These positions should be at the discretion of each Regional Development Center, with provision made for statewide coordination, and contingent on full funding of HB 215 or a Section 319 [Federal Nonpoint Source] grant."

EPD has transferred the Erosion and Sedimentation Control Program into the Water Protection Branch. EPD has, as previously discussed, funded and hired a Statewide Educational Coordinator who will evaluate the potential for RDC stream quality management education and technical assistance programs and make recommendations to EPD management during 1993.

Support Strategies

These strategies support the development and continuation of local stream management programs.

Voluntarism and Citizen Participation. The Task Force (1990) recommended the development of a statewide program to encourage and support citizen monitoring and waterbody adoption programs and noted that "[c]itizen participation and voluntarism promote individual responsibility for water resources, educate people about the use

and protection of water resources, provide information which could not be collected by limited governmental staffs, and provide citizens with more access to their government."

Urban stream management practice guidelines have been prepared by ARC (1992b) with the assistance and financial support of EPD. Over 1200 copies of forms describing symptom and sources of stream contamination with a listing of numbers to call to report problems has been developed and distributed to individuals and local governments throughout the State. EPD will develop and disseminate guidelines for comprehensive stream assessment and management; the Educational Coordinator will provide technical assistance, training, and technology transfer to local governments.

The development of a statewide water quality laboratory quality assurance/certification program, another Task Force recommendation, has not yet been evaluated.

Financing. The Task Force stated that it would be necessary to identify and secure additional funds to support comprehensive urban stream management. Among the possible additional sources of resources they identified were reallocation of existing resources, the potential use of discretionary funds and the State Revolving Fund, service charges added to water and sewer bills, and the formation of utility or stream management districts. Little consideration, beyond the use of Federal nonpoint source management grant funds, has yet been given to financing comprehensive stream management. The consideration of costs and sources of revenue must be an important component of the development of the overall urban stream management strategy.

CONCLUSION

The Master Strategies recommended by the Task Force provide a comprehensive long-term guide to the protection of urban streams in Georgia. If successfully implemented, the number of stream miles impaired by urbanization will be rapidly decreasing as the State population reaches 7.5 million in the year 2000, and measures will be in place to prevent future urban stream degradation.

Local Authorities. The Atlanta program was discontinued when a municipal court held that the City could not invoke a pretreatment ordinance to fine an industry for stream contamination because the State Water Quality Control Act did not clearly convey "an intent to delegate the power to control discharge into natural streams." (City of Atlanta v. Cushman, 1985) This ruling is not detrimental to ordinances such as those used in Gainesville and Columbus which are based on a nuisance or public health foundation.

An EPD amendment to the Act which would preclude local governments from enacting ordinances with fines or civil penalties for the discharge of pollutants was considered but not passed during the 1986 session of the Georgia General Assembly. A 1992 Senate Resolution 511 called for the establishment of a committee to evaluate local authority to enforce environmental laws by December 1, 1992, but the committee was never formed.

Roles of Partners. The Task Force suggests that the role of State government (DNR with the support of the Department of Community Affairs) is to facilitate and coordinate statewide urban stream quality management and educational activities, provide technical assistance and encouragement to local programs, support a network of regional environmental specialists or planners, and coordinate research and technical assistance necessary to support local programs. A proposed network of regional environmental specialists or planners, associated with Regional Development Centers, would be responsible for conducting regional environmental planning, coordinating local environmental management, and promoting and assisting in the development of local stream management programs. Local government would be responsible for developing and implementing local urban stream management programs. Citizens would provide the local support for those programs and engage in stream watch activities to support local government staffs. Business and industry, particularly trade associations, would be involved in educational activities and pollution prevention programs.

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