

POSTER ABSTRACT

Lessons Learned After a Decade of Urban Watershed Management

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Pinellas County became involved in watershed management in the late 1980s, and through collaborative efforts with the Southwest Florida Water Management District (SWFWMD) and several cities, four watershed plans have been completed to date. Each watershed plan has been funded jointly through cooperative agreements among local and regional governments. A private contractor has completed each watershed plan. The local government jurisdiction covering the largest percent area of a given basin assumed the lead role in the planning process and management of the lead consultant. SWFWMD funded 50% of each plan and played a strong technical role in the development of each plan. Pinellas County, SWFWMD, and the City of Clearwater, have been the main players with only SWFWMD and Pinellas County having involvement in all four plans.

Pinellas County has been divided into 52 drainage basins based on topography and historic drainage patterns. County comprehensive plan goals include the development of watershed plans to correct problems in County waters. The planning process among these four distinctly different watersheds has resulted in a wide variety of recommended solutions and important lessons have been learned with regard to common elements key to the successful development of any comprehensive watershed planning effort.

Although much has been learned since developing our first watershed plan, many challenges must be faced as new plans are completed and implemented. It is hoped that this sharing of our experiences will benefit others who may wish to begin their own proactive watershed management initiatives.

The goals and objectives for all our plans have focused on numerous common elements including: the identification of causes and sources of flooding, water quality degradation of receiving waters, and habitat loss; as well as public education on the causes and solutions of watershed problems. One of the most important considerations in plan development is to involve all the stakeholders, both public and private, in as much of the planning process as possible.

Pinellas County involvement in completed watershed plans, in order of completion, include the basins of Allen's Creek, Alligator Creek, Lake Tarpon, and Lake Seminole. Planning initiatives for Allen's Creek began in the late 1980s, while the Lake Seminole watershed plan was completed in early 2001. The process used to develop each watershed plan and the major plan findings and recommendations will be compared and contrasted among plans to emphasize the mistakes, successes, and unresolved issues encountered.

Due to the obvious physical and hydrological differences between creeks and lakes, priority planning tasks varied between creeks and lakes. For example, creek planning tasks focused on shoreline erosion, channel alterations, flooding, lack of oligohaline habitat, and last but not least, dealing with private ownership issues. Since creeks often cover many linear miles, the issues affecting headwater landowners can be much different than those affecting landowners downstream. Rallying support throughout the planning process is challenging since the resource to protect varies greatly depending

upon who you are and where you live. In Lakes, emphasis was placed on quantifying internal and external pollutant loadings as well as water body nutrient budgets, water level fluctuation, aquatic vegetation control, and recreational user conflicts. In some respects garnering public support is less challenging in lakes since the resource to protect looks similar and is more universally recognizable to most lakeside residents and other affected stakeholders. On the other hand, it can be more challenging because of user conflicts such as those between personal watercraft users and fisherman.

Even though the emphasis on certain watershed features varied, planning elements and tasks emerged common to both creeks and lakes. First and foremost is the overwhelming need to involve all stakeholders throughout the process and to maintain public interest throughout the duration of the project. Another common and critical component is to avoid working in a vacuum, and instead seek out the experiences of others through proactive networking with the growing list of organizations and knowledgeable individuals devoted to the science of watershed management.

As plans are completed and the implementation phases begin in our watersheds, many new, challenging, and unresolved issues have emerged. The planning process in each watershed has presented a different set of challenges and degrees of public interaction, yet our experiences have resulted in a common formula aimed at effective watershed management.

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WATERSHED MANAGEMENT IN PINELLAS COUNTY

Pinellas County was among the first local governments in the United States to adopt a program of watershed management planning. Initial work on our first watershed plan, the Allen's Creek plan, began in 1987, followed closely by initiation of the Lake Tarpon planning process.

The County, in 1987, formally adopted major revisions to its Local Government Comprehensive Plan (LGCP), which would require County staff to:

- * **Prioritize the waters and watersheds within the County in terms of their need for management on a watershed basis.**
- * **Develop watershed management plans for priority waters.**
- * **Proceed with implementing the recommendations of the watershed management plans.**
- * **Monitor to detect trends or improvements in the quality of our waters.**

Pinellas County's watershed plans are, by mandate of the LGCP, holistic, in that they must include not only flood management goals, but also water quality and habitat improvement goals and projects. Funding for all of those projects is provided for in the County's long term Capital Improvement budget.

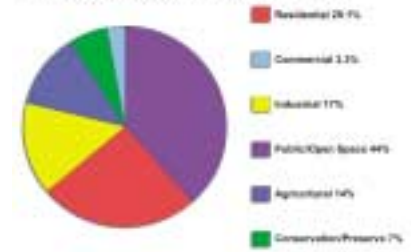


Lake Tarpon

Lead Agency: Pinellas County Environmental Management
Planning Process Initiated: 1987
Watershed Area: 14,325 acres
Lake Area: 2,534 Acres
Lake Mean Depth: 7.3 feet
Lake Volume: 19,155 acre-feet
Recreational Uses: Fishing, Personal Watercraft, Skiing
TSI: 59 (1996-97)
TSI Reduction Goal: 55
Most Pressing Issue(s): Preserve Existing Water Quality
Highest Priority BMPs Recommended: Construct Enhanced Stormwater Treatment Facilities; Remove Septic Tanks.
Full Plan Implementation Cost: \$19.4 Million (over 10 years, including O&M)



Lake Tarpon Watershed Land Use

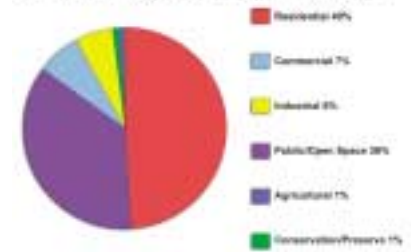


Alligator Creek

Lead Agency: City of Clearwater Environmental
Planning Process Initiated: 1995
Watershed: 5691 acres (2005 acres in unincorporated Pinellas County)
Most Pressing Issue(s): Flooding, Creek/Tributary Erosion
Highest Priority BMPs Recommended: Floodplain Restoration; Creek/Channel Improvements
Full Plan Implementation Cost: \$25.7 Million (over several years, excluding O&M)



Alligator Creek Watershed Land Use

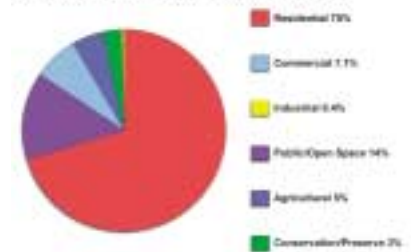


Allen's Creek

Lead Agency: Pinellas County Environmental Management
Planning Process Initiated: 1987
Watershed Area: 4,682 acres
Most Pressing Issue(s): Creek Water Quality
Highest Priority BMPs Recommended: Stormwater Treatment Facilities; Septic Tank Removal; Habitat Restoration/Creation
Full Plan Implementation Cost: \$23.0 Million (over several years, excluding O&M)



Allen's Creek Watershed Land Use

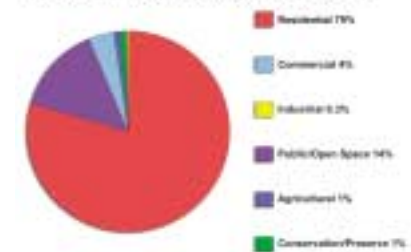


Lake Seminole

Lead Agency: Pinellas County Environmental Management
Planning Process Initiated: 1989
Watershed Area: 3480 acres
Lake Area: 684 Acres
Lake Mean Depth: 5 feet
Lake Volume: 3,420 acre-feet
Lake Residence Time: ~72 days
Recreational Uses: Fishing, Boating, Personal Watercraft
TSI: 86 (1999)
TSI Reduction Goal: 65
Most Pressing Issue(s): Cultural Eutrophication
Highest Priority BMPs Recommended: Construction of Regional In-line Alum Injection Treatment Facilities
Full Plan Implementation Cost: \$13.8 Million (over 10 years, including O&M)



Lake Seminole Watershed Land Use



Watershed Management Plans

Lessons Learned After a Decade of Urban Watershed Management

by
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COMMON PINELLAS COUNTY WATERSHED PLANNING ELEMENTS

PLANNING PROCESS	ISSUES ADDRESSED	ASSESSMENT TOOLS
Establish WMP Team/Stakeholders	Flooding Control	Geographic Information Systems
Perform Diagnostic	Erosion	Modeling
Evaluation/Characterization	Pollutant Loading to Waterbodies	– SWMM
Identify Issues	Water Quality	– WASP
Determine Level of Service Goals	Sediment Quality	– Box
Develop Strategies to Address	Fisheries	Monitoring
Issues/Goals	Aquatic Vegetation	– Water Quality
– Structural/Non-structural BMPs	Wetland Habitat	– Sediments
Establish Measurements of Success	Upland Habitat	– Groundwater
Establish Monitoring Program	Recreation	– Atmospheric Deposition
Obtain Plan Approval by	Aesthetics	– Fisheries
Policymakers	Wildlife	– Aquatic Vegetation
Implement BMPs	Public Education	User Surveys
		Paleolimnology

WATERSHED PLANNING FOR LAKES VERSUS CREEKS

LAKES

USER GROUPS EXIST AND EASY TO DEFINE

- Fishing Clubs
- Personal Watercraft Groups
- Skiing Clubs
- Lakeshore Homeowner Associations
- Lake Environmental Organizations

LAKE RESOURCE EASY TO IDENTIFY BY PUBLIC

HIGH ECONOMIC VALUE

- Center of Recreational Activity
- Regional Amenity

PREDICTIVE LAKE WATERBODY WATER QUALITY MODELING RELATIVELY EASY

LARGER LAKES USUALLY PUBLICLY OWNED

- Restoration and BMP Implementation on Public Property
- Relatively Easy

SEVERAL FUNDING SOURCES AVAILABLE

PROFESSIONAL LAKE MANAGEMENT ORGANIZATIONS READILY AVAILABLE

CREEKS

FEW IF ANY USER GROUPS EXIST

CREEK RESOURCE DIFFICULT TO IDENTIFY AND DEPENDS GREATLY UPON LOCATION

MINIMAL ECONOMIC ATTRIBUTES

- Fewer Recreational Opportunities
- Limited to Creekside Property Owners

PREDICTIVE CREEK WATER QUALITY MODELING COMPLEX, DIFFICULT, AND UNRELIABLE

CREEK BOTTOMS OFTEN OWNED PRIVATELY

- Restoration of Private Property Using Public Funds
- Limited/Restricted

FUNDING SOURCES LIMITED

PROFESSIONAL CREEK/TRIBUTARY MANAGEMENT ORGANIZATIONS LACKING

WATERSHED PLANNING ISSUES TO OVERCOME

These are a few of the many important issues you will need to consider:

NETWORKING VERSUS REINVENTING

You can avoid a lot of headaches and wrong paths if you'll take advantage of the experiences that others have had.

PUBLIC/CITIZEN INVOLVEMENT

Educate citizens about what is good and bad for their waterbody and show interest in what citizens want for management goals. You absolutely must keep them involved and give them a sense that their participation is valued.

AGENCY INVOLVEMENT

Take advantage of expertise offered by state and regional agency staff. It is extremely important to understand what each agency will support or approve when it comes time to get permits.

FUNDING

There are a number of formulas you could use to determine county and city share of funding for watershed plans and projects. Determine how funding will be shared early on in the process.

HABITAT EXPECTATIONS

You need to have some idea as to what could be expected from your waterbody under ideal conditions. Your lake, for example, may have always been eutrophic, even under predevelopment conditions.

USER CONFLICTS

This is an important issue in lakes. Stakeholder groups who use the lake for different purposes often have different expectations and goals for the waterbody.

PROPERTY ACQUISITION

If your watershed plan is going to require land for stormwater treatment and habitat, it is advisable to identify those needs as early as possible and go ahead with land acquisition while the land is still available.

PUBLIC EDUCATION

As new residents move into the watershed there is a need for continuous effort to educate them. Often the best way to educate adult citizens is to educate their children in the public schools.

SINGLE ISSUE GRIDLOCK

Don't get hung up on the over analysis of a single perplexing issue that may not affect the overall plan recommendations regardless of the issue outcome. Keep your eye on the big picture.

PERFECT PLAN SYNDROME

There is no such thing as the perfect plan. Don't be afraid to move ahead with recommended improvements before you have a perfect plan.

MODELING

Don't overemphasize the need for sophisticated models. The main use of a model is to evaluate whether certain alternatives or combinations of alternatives will achieve your goal. This decision can often be based on more simple "desktop" calculations.

LESSONS LEARNED!

What have we learned from our experience?

We have now completed four watershed management plans. A variety of approaches were taken in the planning process for the four plans, including such things as our method for public participation and our approach toward modeling. As we embark on the development of our fifth watershed plan, that of the Cross Bayou basin, we hope to take advantage of some of the things we have learned along the way. A few of the more important include:

- * **CONCENTRATE YOUR EFFORTS** where there is the greatest opportunity. A watershed that is totally built out offers little opportunity for habitat creation and little available land for constructing ponds.
- * **DON'T OVERLOOK NEWER TECHNOLOGIES FOR STORMWATER TREATMENT**, such as in-line alum injection. They require very little land (can often be located in right-of-ways) and are cheaper to build. On the other hand, be aware that the higher tech options often require higher ongoing operation and maintenance costs.
- * **INVOLVE STAKEHOLDERS FROM DAY ONE**. Get the citizens involved, and keep them involved with such things as cleanup days, wetlands planting, and committee participation. The citizens must feel that they are involved in the fate of their water, and must trust that their local government staff has their best interest at heart. If you don't do this, you'll wish you had.
- * **STANDARDIZE YOUR METHODS AMONG WATERSHEDS**. Standardize such things as which models are used, how land-use types are aggregated for modeling, and so on. We don't want our staff to use a different model for every single watershed in the County.
- * **COLLECT DATA TO MATCH YOUR MODELING NEEDS**. During the diagnostic phase, make sure some data are collected in a manner that they can be used to validate model predictions.
- * **DEVELOP YOUR INHOUSE CAPABILITIES**. Our staff is now able to complete many of the tasks previously performed by consultants, at considerable savings to the public. Government staffs can carry out many tasks such as diagnostics, resource characterization, basin boundary identification, and land-use aggregation, before hiring consultants.
- * **ADOPT GENERAL PLAN RECOMMENDATIONS COUNTYWIDE OR CITYWIDE**. Some of the things recommended by consultants in the earlier plans should simply be adopted countywide (or citywide), and not included in future contracts with consultants. One such example is the need for ongoing public education and involvement; we can stop paying consultants to tell us we need to do it, and just do it everywhere.
- * **UPDATE STAKEHOLDERS FREQUENTLY TO KEEP THEM ON BOARD**. Make sure that you have buy-in from state agencies, citizens, and the Board of County Commissioners or City Commissioners at all times. This may mean periodically briefing the Board on plan progress.
- * **DEVELOP MEANINGFUL GOALS**. Define goals meaningful to stakeholders that are measurable before and after monitoring.

Watershed Management - What We Have Learned

Donald D. Moores, Administrator
Environmental Resource Management Division
Pinellas County Dept. of Environmental Management

Presented at the third Bay Area Scientific Information Symposium, BASIS 3
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Watershed Management - What We Have Learned¹
Donald D. Moores, Administrator
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Background

In the late 1980s, Pinellas County became involved in watershed management. The first basin for which management planning began was the Allen's Creek Basin. The County was included in a threatened lawsuit over the water quality of the stream, and entered an agreement with the State of Florida Department of Environmental Regulation and the two cities who share the watershed, to conduct an intensive study of the stream and develop a corrective.

Shortly afterward, concerns over the condition of the unincorporated County's two largest lakes, Lake Tarpon and Lake Seminole, led the Board of County Commissioners to mandate similar studies and watershed management plan development in those basins.

Pinellas County also included in its Comprehensive Plan goals to correct problems in County waters by the development of watershed management plans. These plans were not to address simply drainage as in past plans, but also to address problems with water quality and wildlife habitat.

Pinellas County Watersheds

Pinellas County has been divided into 52 drainage basins based on topography and historic drainage patterns. Originally, most of these were drained by small tidal streams ranging from about 2 miles to about 10 miles in length; a few of the basins were coastal basins which do not appear to have had distinct drainage channels.

In contrast to many other Florida Counties, Pinellas has relatively few lakes. According to Gant (1987), there are 30 natural lakes listed for the county, but less than ten are 20 acres or larger.

Pinellas County is dominated by small streams, with 45 streams and 68 tributaries. Some of these streams have been more seriously altered than others; in general, those in the more urbanized areas of the county, particularly those areas that became urbanized earlier, have received the greatest alteration. In the older areas, many of the original streams have been channelized for drainage improvement, and hard lined, or walled. Some, in fact, have been totally replaced by underground storm sewer systems.

Many streams and stream segments in those areas developed more recently show much less effect of alteration, since modern development practices and regulations call for preservation of

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wetlands, onsite stormwater treatment, and minimal alteration to stream channels. As might be expected, these streams tend to display higher water quality than those in older, more highly urbanized areas.

The purpose of this report is to discuss some of the specific issues which we have encountered in attempting to manage urban watersheds in Pinellas County. It is primarily intended as a means of sharing what we have learned with others who may wish to begin managing their urban streams and lakes.

Networking vs. Reinventing

When embarking on a new experience, it is always wise to first find out what we can learn from others. We have unfortunately found a deficiency in shared information on urban stream management. Although the recent widespread use of the Internet has made it possible to obtain information more readily, there does not appear to be a single clearinghouse for urban stream management issues.

By contrast, there is considerable information available concerning lake management. Most of what we have learned about watershed management was learned from conferences and symposia hosted by the North American Lakes Management Society (NALMS) and its state and regional chapters. NALMS has existed 16 years, and in that time the state-of-the-art of lake and watershed management has grown precipitously. This is primarily due to the avenue provided by NALMS for sharing of information among researchers and professional lake managers.

No similar organization exists for urban streams. While there are a few professional organizations dealing with stream management, most available information on stream watershed management deals with watersheds in agricultural areas, or trout stream management. Urban streams comprise an entirely separate class of streams with their own special characteristics, problems and issues. What follows is a discussion of some of those issues. It is hoped that further refinement of urban stream management issues will continue, as well as the process of information sharing.

Drainage modifications and their effects

As mentioned previously, most urban streams, particularly those in older urbanized areas, have been altered to some extent to “improve” drainage (i.e., to get rid of surface water sooner after a rain event, and to make more marginal land able to be developed without fear of flooding). No urban stream has totally escaped alteration: road crossings act as partial controls, affecting flow, and land areas have been hardened and drained by ditches or culverts, generally accelerating the rate of runoff from the drainage basin. These drainage modifications have several impacts on the natural history and water quality of streams. In general, our observation has been that loss of habitat has much more to do with whether tidal streams are functional, than water quality. Animals may be able to exist in less than optimal water quality, but physical habitat is absolutely essential.

Effect of drainage and channel alteration on oligohaline areas

This particular problem is peculiar to urbanized areas adjacent to saltwater bodies, where streams are partly tidal. In the Tampa Bay area, as elsewhere, a great deal of the highly productive estuarine system historically existed in its numerous small tidal streams. A number of species of finfish and shellfish of sportfishing or commercial importance depend upon the low salinity environment provided by tidal streams to complete early stages of their development. Among these are red drum and snook (Edwards, 1991; Clark, 1991; and Peebles, et al, 1991).

The modifications which have probably had the greatest impact on these species' habitats are shoreline hardening, drainage improvements which accelerate runoff, and controls (either weirs or road crossings). Shoreline hardening, seawalls, and creation of distinct stream margins by dredging and filling have resulted in elimination of the physical habitat (primarily consisting of mangrove or black rush in the Tampa Bay area) preferred by the affected species in areas where otherwise the salinity regime is appropriate. Weirs and other controls result in a sharp line of demarcation between segments of higher salinity and completely fresh water, eliminating the zone of low salinity, or oligohaline zone. Thus, species which must rely on oligohaline habitats are unable to proceed farther upstream than the control. Finally, drainage acceleration results in eliminating baseflow from the stream, so that the tidal portion remains higher in salinity than is optimal except immediately following a rain event, when the stream becomes completely fresh for a short time (Zarbock, 1991).

Effect of drainage on base flow and peak flow of freshwater portions

A more common situation which affects all urban streams, and not just those in coastal communities, is the effect of drainage modifications on bank storage, baseflow and peak flow of freshwater streams (Zarbock, 1991). In Florida, stream fauna are adapted to a distinct rainy season and a nonrainy season. Species which predominate in streams during the dry season tend to be those adapted to, and requiring, low flows for survival (including such examples as web-spinning caddisflies whose webs would be swept away by unseasonable increases in flow). Species predominating in the wet season, by contrast, are those that favor higher velocities. Hydrologic modifications that have tended to lower baseflow and increase post storm event velocities have had significant impacts on stream biota. Unfortunately, this is very poorly documented in stream invertebrate studies.

What is status of knowledge?

This brings us to the limited knowledge of many of the impacts of urbanization on streams. In the absence of a central clearinghouse, or urban stream management organization, for the sharing of knowledge and experience, it is difficult to even find out what is known. Scientific literature may contain information on the biota of streams which might happen to be urban, but not be easily identified as a source of urban stream issue information. Most information on management probably exists as consultant reports to the particular city or county that hired them, but is not disseminated widely among the urban stream management community.

How do streams, and hence management techniques, vary geographically? NALMS has found regional differences among the kinds of lakes and their manner of formation which significantly affect the types of problems encountered and ways of dealing with them. The Tennessee Valley Authority, for example, has provided a great deal of information about ecological conditions in reservoirs, which tend to be the dominant type of lake in that region. Little is known about geographical variation in types and ecological conditions of urban streams.

Other stream management issues

- Instream management techniques - Generally speaking, watershed management techniques don't differ much from lake watersheds to stream watersheds, at least in terms of managing runoff and other watershed issues. Techniques for improving water quality and habitat in the stream itself, however, will differ from those for lakes, or for wild trout streams.

- Property ownership - Many urban streams have had adjacent properties platted to the center of the channel, and are therefore in private ownership. This fact creates a number of significant issues. How does one manage a stream whose channel is partly in private ownership? If shoreline hardening and loss of habitat is a problem, how do we get stream bank owners to agree that removal of seawalls and restoration of wetlands is desirable? How do we go about creating habitat, at the taxpayers' expense, on privately owned stream banks, even if the stream bank owner agrees? If we aren't going to restore habitat to the stream, why bother treating stormwater to improve the water quality of a stream that is basically a concrete-lined stormwater conveyance?

- Public support - Most people are unaware that they even live in a stream watershed. As they drive the city streets, every time the road dips between two adjacent hills, they are crossing a stream channel, yet most people don't even notice it. Except for those that live directly on one of the channels, many citizens don't even know that the channel exists. Since the stream is largely in private ownership, citizens in a stream watershed who can't use the stream for recreation, or even see it, may not feel any connection to the stream or have any interest in protecting it. Conversely, lake bottoms are usually for the most part in public ownership, and public access is often provided for recreation. Citizens who live in the vicinity of a large public lake generally will have no problem understanding that their runoff goes to the lake, and can at least appreciate the need to take protective measures. Getting the involvement and commitment of the community in protecting urban streams is considerably more difficult.

Public Involvement

How do we get public involvement? When should we approach the public? What has been done successfully elsewhere? One thing experience has taught us is that major plans and projects will probably not succeed without public acceptance of what you're doing. Sooner or later you're going to want to construct something, perhaps a detention pond or a wetland, and don't want to run into a wall of opposition. Furthermore, if the public generally lacks a feeling of trust in its local government, it really doesn't matter what the project is, how good it is, or how noble the cause; someone is very likely to oppose it, and mobilize popular opinion against it. It is important to start building an atmosphere of trust from the very beginning, rather than waiting until you have a project you want to

complete to start communicating, otherwise you may experience having to start your planning all over again.

We need to get public input on issues and problems they perceive, as well as educate them to those we, as professionals, perceive. There is often a tendency of government employees to view the public hearing process as simply a way to inform the public about what we're planning to do, or to try to implant some change in attitude or opinion in the public mind. If the public doesn't like wetlands, we feel it is our obligation to get them to start liking wetlands, and start disliking seawalls and bulkheads. To a certain extent, there is some validity in providing public environmental education; after all, we are presumably the experts that have been hired to represent the public's interest in environmental affairs, but communication has to be two-way thing, or it isn't effective communication. We need to show from the outset that we are interested in what the people think, and let them know that we want to do things in a way that they will like.

There are a variety of ways to enlist the public and get them involved in what you are planning. The recent satellite uplink of the special plenary session of the conference Watershed-96 was enlightening in terms of the variety of ways in which public involvement was accomplished. Of paramount importance is to get people to have some sense of ownership in their urban stream or lake. As mentioned before, urban streams are often mostly invisible to the general public, while lakes are less so. Such public involvement projects as letting citizens paint "Don't Dump - Drains to Creek" on storm drain inlets, or hosting shoreline trash cleanups, citizen water quality monitoring, removal of exotic vegetation, and planting of wetland plants are all extremely valuable ways to get the public to begin to understand the need to protect their stream or lake.

Timing is important if you are planning to lead into something more serious, like the development of a watershed plan for your urban stream. While you want to engage in citizen activities long enough for a sense of involvement to develop, you don't want to do it so far in advance of your plans that all the initial fervor has died down, and many of your original activists have moved away.

To Committee or not to Committee?

Once you begin to think about developing a watershed plan, you need to begin thinking about how to provide for public input into the planning process. How long the process is going to take is a serious issue; based on our experience people get tired of committee meetings and stop participating if no progress is evident.

Why have a committee in the first place? Committees make your project take longer, require you to spend time educating the laypeople on the committee and bringing them around to the realization of facts you were aware of from the start, and they don't always go the way you would have if you were able to just get about your work. This sometimes seems to be the attitude of government employees who forget whose benefit they were hired to protect in the first place.

It should be clear by now, however, that if you want to succeed, you should be providing a serious mechanism for getting stakeholders involved in the planning process. Notice that we have stopped using the word "public" and begun using the word "stakeholders". The public, in general, are cer-

tainly stakeholders, not only in what happens to their stream or lake, and the quality of life in their community, but also in how their tax dollars are spent. Other cities, state, federal, and regional governmental agencies are also stakeholders that you're going to have to deal with sooner or later, and just like the public, it is important to begin developing a sense of trust and cooperative involvement among all the entities that have some kind of interest, regulatory or otherwise, in your water body. It is important to have the stakeholders pulling together instead of apart; you want everyone working toward the same goal, and not to have one stakeholder group intervening in the activities planned by the rest.

Agency representatives

To begin with, let us discuss agency participation on advisory or planning committees. The first thing to realize is that if you can get the agencies to participate actively, you are extremely lucky; agencies have enough meetings to participate in, and have many more counties and cities in their jurisdictional area than yours. As a result, they may either send the most expendable members of their staff, or tend not to come at all.

This is fortunately not always true. In Pinellas County, we have been extremely fortunate to have continued long term involvement from a several agencies. To a certain extent, our success may stem from the fact that there weren't many competing watershed plan committees when we began. At some point, we need to understand that the ability of state and regional agencies to participate in committee meetings will become limited and that this doesn't reflect a lack of concern on their part, just a shortage of people.

Agencies that may have a stake in your stream or lake include the Florida Game and Freshwater Fish Commission; the Florida Department of Environmental Protection, both from a wetland regulatory and aquatic plant management permitting position; and the water management districts, from several perspectives including cooperative funding, wetland regulatory functions and the SWIM program. The US Army Corps of Engineers is also a stakeholder, but one which you are unlikely to be able to get involved up front, because of their even larger area of jurisdiction.

Why do we want to get agencies' representatives to participate in our planning and advisory committees? For one thing, we need to bounce ideas off them. Their staff are a valuable resource and are highly trained and possess valuable experience in various technical areas which are extremely relevant. They can share ideas with us that have been tried elsewhere.

We also need to know their agencies' policies with regard to our plans. We need to know when something we are planning will require a permit, and whether the idea we have is likely to be acceptable to permit reviewers. To this end, the people that are sent to represent the agency need to be able to speak for their agency on matters of policy, or at least have the ability to get policy decisions from their agencies back to the committee in a timely fashion. It is important that, wherever possible, commitments be as binding as possible, or made in writing if they are likely to affect the project significantly.

It is desirable for the agency person to be one who is able to make decisions on policy matters. Of

course that means getting someone in a more responsible position, such as a regional administrator, and you are unlikely to get this. Some agencies have people especially assigned to the job of serving as liaison between various governmental agencies, and these are the most likely to be assigned. Unfortunately, these people tend to be spread very thin, and they may not be the ones with the particular expertise that would be most useful to your project.

Do agency representatives always represent their agency, or their own private biases? When they participate in discussion, are they always reflecting the policy of their agency, or just talking “off the cuff” from a personal point-of-view? This is a serious philosophical issue: you want to be able to take advantage of the technical expertise that agency representatives can provide, but it is important to know when they are expressing an agency policy position rather than a technical or scientific judgement, or a personal opinion. As mentioned before, you want the comfort of knowing that your agency representative is actually taking your policy questions up with management and getting official positions and not simply making up policy on the fly. If you are heading a watershed committee, it will be your responsibility to make sure you get significant policy positions clearly identified as such, and make sure you know which is which.

Citizen representatives

The important consideration in getting public involvement on your advisory committee is to get people who can truly represent “the public”. To a certain extent, a single individual on a committee may still serve as a surrogate for the public to get a feel for whether the public is likely to welcome a particular idea. The problem is that, after a certain time in being involved with the committee, a citizen member will become much more technically sophisticated than the general public, and may no longer reflect a good measure of public attitude.

Factors to consider in soliciting citizen participation include:

- Are there well-defined organizations? In the case of lakes, there are often lake associations, or homeowner associations for large housing developments in the watershed. Such organizations may sometimes be hard to identify in the case of steams, which tend to be less cohesive. Other potential stakeholder organizations, especially for lakes, include environmental organizations and fishing clubs.
- How well do they represent their organization? You hope that group representatives will keep their members aware of progress and plans that are being made, and will seek their organizations’ feedback on issues that affect them.

If no organization, then what?

- One option is to have the city council or county commission appoint representatives to the committee. We have had experience with this approach in the Lake Seminole project.
- Individual environmental activists, while not representing a group, may be willing to organize people into an interest group.
- Some communities have community-wide environmental advisory boards whose members can serve to provide contact with the public. Pinellas County has not had any experience with this approach.

Money

What sources of funding are available for watershed planning? This is an area where it may be advisable to consider what has been done elsewhere. Sources of funding are as varied as imagination allows. In Pinellas County, because watershed management planning is mandated by our comprehensive plan, funding of watershed planning efforts is supported through the Capital Improvement Program. We have also benefited greatly, particularly in the implementation of projects, from the largess of a generous and enlightened water management basin board. Since our waters either are, or directly affect, SWIM waters, the SWIM program has provided either funds or technical assistance in several instances. Likewise, the Tampa Bay National Estuary Program has been able to assist in projects which affect Tampa Bay.

As more and more organizations get into the watershed management planning business, competition for funds may be greater, and more innovative ways of funding may need to be sought. In many communities, stormwater utility fees are used for watershed planning and implementation of projects.

What are the tangible benefits of watershed management?

It is fairly easy to estimate the cost of developing watershed plans, or of creating wetlands and stormwater treatment facilities. It is considerably more difficult, however, to put a dollar figure on the benefits that are expected. Such benefits include many intangibles such as improved fisheries, improved sportfishing and ancillary benefits (boat rentals, tackle, bait, etc.), aesthetic improvement to the waterfront, associated improvement in the value of waterfront property, increased recreational potential, and so on. Putting a dollar value on these benefits is at best very difficult.

It is also very difficult to convince lakefront or stream or lakefront owners about the benefits of allowing aquatic vegetation to proliferate on their bank. The benefits of such vegetation are felt in terms of improved wildlife utilization, improved fisheries, and so on. To the homeowner, vegetation is more likely to be viewed as a nuisance, minimizing navigable access from their dock, or blocking their view of the water (although sometimes, people who have dense stands of exotic vegetation on their property don't want to lose it because of the privacy that it affords).

The aesthetics of management also is an issue: people may object to the creation of a stormwater detention pond in their neighborhood despite the proven benefit of ponds in treating stormwater. They may object to creation of wetlands or other habitat improvements; many homeowners don't want rabbits or squirrels in their yards, and even try to eradicate them. The chance of getting the average citizen to appreciate the benefits of having snakes in their garden is extremely slim.

Interjurisdictional coordination when the stream or lake is in more than one jurisdiction

Watersheds rarely are consistent with jurisdictional boundaries (except in the case of water management districts). Getting adjacent municipalities who share a stream or lake to participate in plan development is relatively easy. The problem comes when it is time to pay for improvements. When a problem (e.g., poor water quality) is generated from the upstream municipality, but the benefit of

improvement is in the downstream municipality, it may be difficult to decide who will pay what share of the improvement project. When all the subbasins contributing the highest pollutant load to a lake are in the same municipality, how does one equitably allocate the share of the cost of improvements among the participants? These issues have provided a serious challenge to our imagination. In some cases, it has been appropriate to allocate the shares in terms of the relative contributing drainage area to be treated. In other cases, this may not be equitable, and other formulas have to be used.

Regulatory issues

Watershed management has several regulatory implications. First is the fact that the regulations requiring large and medium sized municipalities to obtain an NPDES permit for their municipal storm sewer systems (40CFR Part 122) explicitly recognizes development of management programs on a watershed-specific basis as an acceptable way to approach stormwater management. Of issue is the question of just how specific one wants to be in their NPDES permit regarding their watershed plans. In other words, it is entirely possible that one's NPDES permit conditions might be written so as to mandate implementation of every recommendation contained in the plan, thus eliminating the local government's options or flexibility, and essentially turning the plan into a regulatory mandate. If this begins to happen in NPDES, it will severely affect the willingness of local governments to develop plans.

A second area of regulatory significance is the development by the water management districts of pollutant load reduction goals, and of minimum flows and levels, for district waters. Clearly both of these items are essential parts of the planning process for water bodies, and the desire would be to have those goals developed as part of a watershed planning process adopted by the water management district. Thus there needs to be close interaction with the water management district in the development of these aspects of any watershed plan.

Finally, whether explicitly discussed in the local government comprehensive plan or not, development of a watershed management plan will probably carry out many of the goals and objectives of the comp plan. The issue here is whether or not the local government wants to officially adopt watershed plans as a part of their comp plan, or simply refer to them as supporting completion of a plan element. Formal adoption as a part of the comp plan would, again, tend to reduce the local government's flexibility, and would run the risk of having the Department of Community Affairs viewing the minute aspects of the watershed plan in terms of compliance.

Habitat expectations

This may be an issue that is peculiar to the type of watersheds that predominate in Pinellas County and possibly other coastal counties. Our watersheds typically are drained by short streams, varying in length from about two to about ten miles. Typically the downstream portion of these streams is tidal, sometimes as much as half the total length of the stream. They have been urbanized long before agencies began studying them. As a result, little is known about the typical biota of this type of stream in a natural condition. There is little technical basis for knowing whether we can expect an urban stream to support such things as bass or bluegills if we don't know whether the stream histori-

cally supported them. From what we have observed, stream drift fauna, which are extremely important in most stream communities, are relatively depauperate in these short-run streams. Much more study specifically oriented toward the biota of coastal streams is needed. Also needed is a sharing of any successes that might have been experienced in restoring predevelopment biological conditions to such systems.

Other sources of problems

We are becoming increasingly aware that there are other sources of water quality problems in watersheds besides stormwater runoff. In the Allen's Creek watershed, we estimate that seepage from septic tanks may contribute from 50 to 80 per cent of the total nutrient load to the creek (Andersen, et al, 1996). Groundwater seepage has traditionally been overlooked in stream and lake studies, and is almost never monitored. In fact, there is no well-established procedure for monitoring groundwater seepage.

Atmospheric deposition is another new issue in watershed management. In lakes and estuaries, atmospheric deposition directly onto the surface of the water body may comprise as much as 30 to 40 per cent of the total nutrient load. Local governments in the Tampa Bay area, working with the Tampa Bay NEP, are working toward attempting to define what portion of the load contained in runoff came from atmospheric deposition. How one manages watersheds partly depends on the answer to this question. For example, BMPs such as fertilizer management may be totally ineffective if the majority of runoff load from the watershed turns out to be of atmospheric origin. In such a case, the local government would be left with structural BMPs (e.g., treatment systems) as a solution.

Water quality improvement in streams

Leaving aside watershed management, little is known about innovative instream techniques that can improve water quality. Much research has been done on stream restoration techniques for trout habitat, for example, but little research exists on instream water quality improvement techniques.

Use conflicts

Whatever the problems with an urban watershed or waterbody, and whatever the causes, one factor that you will have to deal with is conflicts between different users of the resource. Lake Tarpon provides a perfect illustration: lakefront homeowners and management agencies alike favor lowering boat speeds within a certain distance from shore, and particularly in the outfall canal, to minimize shoreline erosion; agencies, however, favor increasing the littoral vegetation to combat erosion, while homeowners would like to see vegetation eliminated; water ski clubs object to limiting boat speeds near shore because they prefer skiing in the calmer waters there, and especially in the outfall canal; fishermen support restricting skiing from the canal, but don't want speed limits imposed on themselves; most lake users want hydrilla (and just about any other submergent vegetation) eliminated or greatly reduced; fishermen on the other hand claim that hydrilla greatly increases fishing success and object to its elimination. In just about any area that one chooses to conduct some sort of management, there are likely to be conflicts between various user groups as to their preferences.

How have these conflicts been resolved elsewhere? In some states, large waterbodies have been zoned into fishing areas, skiing areas, etc. Whether it is appropriate, let alone legal, to preclude groups of people from using a portion of a public water body recreationally is a good issue for further exploration.

Condemnation for treatment for water quality

If your plan is to provide stormwater treatment or restore habitat in an urban setting, you will undoubtedly need to acquire property to build ponds or habitat. Rarely will you find available vacant property just in the right spot to create a detention pond; often you won't find any available vacant property at all in a highly urbanized watershed. What happens when you need to build a pond and can't find a willing seller? To our knowledge, condemnation has never been attempted in order to obtain property for water quality improvement. There remains a serious concern as to whether condemnation for this purpose would even be legal, assuming one wanted to do it. Condemnation of streambank properties for floodplain habitat restoration would be orders of magnitude more difficult.

In Pinellas County, the direction we have taken is that we will not even consider condemnation. If a parcel is offered freely for sale to the county, and is adequate (right size and location), and appropriate for use as a pond or wetland (a pond or wetland may not be appropriate right in the middle of a typical subdivision), then the county will attempt to purchase and develop the site. We have been lucky in several cases, and have been able to obtain joint funding from adjoining municipalities and the water management district for restoration activities at county-purchased sites. We will have to be willing to accept the best we can hope to achieve in some watersheds, and in others where we have more opportunities (i.e., vacant land), to try to do even more.

Wrapping up

We haven't provided many answers; we have only begun in this discussion to touch on some of the more significant issues. It seems that the longer we are engaged in watershed planning, the more issues surface that we wish we had thought of earlier. The technical issues are generally fairly straightforward, although more emphasis is probably needed in seeking stormwater treatment alternatives that aren't land-intensive for urban areas; the really sticky issues are the social and philosophical ones, and unless you are able to take advantage of the experience of others through networking or professional organizations, you're probably going to have to come up with your own solutions tailored to your particular situation and stakeholder perceptions.

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