

# Chapter 7

## Urban Stream Restoration Plans

### Introduction

**This chapter outlines a strategy for urban stream restoration. It is proposed as a way to start or restart processes of stream restoration for streams whose land use is predominately urban and which, generally, are not attaining current standards. These urban stream restoration plans would be individually tailored to a specific stream or stream segment with the help of substantial public participation. This is expected to result in outcomes which reflect community goals. Traditionally, resources devoted to stream protection have been focused on pollution abatement. While pollution abatement remains a necessary activity, other measures to protect or restore streams can often more effectively restore water quality.**

### I. Background

The Clean Water Plan (CWP) present a framework through which planning to protect and restore water quality in the NEFCO region can occur. The CWP attempts to facilitate the efficient uses of local resources in facility investment, promote responsible management of home and semi-public wastewater treatment systems, ameliorate the impacts of nonpoint source pollution runoff, and protect regionally important water resources.

This issue is part of a larger concern to establish realistic standards for streams. A more comprehensive and legally defensible analyses is needed to facilitate effective planning for urban streams in the NEFCO region, though. Without such an analysis, the CWP needs to support the current stream designation strategy and work within those guidelines.

Future efforts for a regionally endorsed urban stream restoration plan should:

- 1) Be based on a scientific approach and a thorough analyses of costs and benefits. Local impacts need to be considered. The urban stream restoration plan will need to prepare a scientifically defensible mechanism.
- 2) The Urban Stream Restoration Plan will need a detailed analyses of specific streams (or segments of streams) that would be affected.
- 3) The Urban Stream Restoration Plan should also demonstrate how existing rules and designations preclude downstream attainment and how further investment of resources in specific streams will not be cost effective.
- 4) An Urban Stream Restoration Plan should initiate a statewide initiative to examine how stream standards could be more appropriately determined. Other stream segments that

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probably may warrant Restoration Plans and designation may include; rural agriculture; rural and urban flood control, rural recreation, and water supply.

***The value of tailored approaches to guide urban stream restoration***

There is a strong need for initiatives to consider the establishment of reasonable standards for restoring urban streams. Currently, aquatic life water quality standards are based upon reference streams from undeveloped areas. Urban ecosystems, in particular, are at risk from a wide range of stressors beyond point sources of pollutants. Modified land use patterns in urban areas typically impact nonpoint pollutant loads to surface and ground waters, alter the hydrology of a stream, and destroy the biotic and hydraulic functions of stream corridors. While a wide range of significant stream stressors are well documented, we continue to invest our resources in narrow solutions that have little chance of effecting desired change. Pollutants are just one of many factors which affect an ecosystem. Accordingly, our current focus on pollutant reduction may have little connectivity to the full range of factors that affect ecosystems. (Factors that influence ecosystems include interactions between the history of the area, current societal use of the area and a host of biological and non-biological conditions.) Further, it is typical that restoration efforts are applied at a smaller scale than is needed to substantially reverse the stresses that are the root cause of stream degradation.

A range of flexible institutional and technical tools are needed to assist the communities and the region in developing more effective restoration plans. Unfortunately, under the current system local communities seem unable to determine appropriate distribution of resources for stream protection. Local communities currently have little say in making adjustments with respect to ecosystem goals. Expectations in the form of chemical and biological criteria are set at the state and federal level, with little or no tailoring to the full range of regional and local factors.

Despite some seemingly irreversible changes and the failures of our past efforts, there is good reason to believe that, through better management, a large number of urban streams can provide high value to surrounding communities. The character of urban stream problems suggests that we should start with water quality goals and water quality criteria that are tailored to particular circumstances, reflecting both the past modifications of the stream ecosystem and community goals for the stream. Criteria reflecting the characteristics of more natural areas will not always be appropriate. Criteria appropriate for less impacted areas may be prohibitively expensive to obtain (or unattainable at any cost), may require reversing existing land uses, and may be unnecessary to meet community goals.

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Tailored urban standards are proposed as a tool to further the goals of stream restoration. A community process should create standards which consider the characteristic of an urban stream and community values. It is expected that these alternative standards will be more meaningful to the community and serve as a goal against which communities can measure progress. Urban stream standards might ultimately require more stringent or less stringent levels of pollution control. Because these alternative standards would have an urban focus, they should be able to do a better or more efficient job of managing urban streams for desired goals.

***Overview of the need for urban standards to address issues related to bio-criteria and recreational use standards***

There is a pressing need to focus on two areas where urban streams typically fall far short of meeting existing standards -- the biological criteria for aquatic life uses and the bacteria criteria for contact recreational use. A process that sets attainable goals in these areas could greatly further watershed restoration by prompting action as well as focusing attention and resources toward underlying stream problems.

Despite broad scientific agreement that many factors affect attainment of aquatic use standards, current regulatory programs have little choice but to focus on what they have power to control (i.e., point sources) as a means to attain this goal. Much has been written to suggest that at successive levels of urbanization, typically characterized as “percent imperviousness,” natural hydrology patterns and natural stream functions are irreversibly lost. At the same time there is a growing consensus that even if waters meet chemical criteria, they will not meet biological criteria if the natural hydrologic and hydraulic stability is lost, and a reasonably protective stream corridor is absent.

High bacteria levels and CBOD loadings during and following storm events is a second universal problem for urban streams. Added to this problem are the inexact nature of bacteria analysis and the historical format of recreation standards which were first developed for use in regulating public swimming beaches. The physics and hydraulics of water movement and pollutant load transport in urban streams are clearly very different from those in a beach situation. Additionally, the public use of urban streams is quite different from the public use of beaches. In urban streams the flow rate and the concentration of pollutants carried by the water both increase dramatically shortly after a storm event. For small streams most of the pollutant load is washed out of the stream system in less than 24 hours. Beach waters tend to respond to storm events more slowly and tend to recover more slowly.

Beyond the format and construction of the recreational use standard, there is an additional issue that safe bacteria concentrations are not always attainable. Development of criteria

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that are more responsive to stream situations should also deal with the reality that high bacteria spikes during a storm event are virtually uncontrollable. A likely key element for consideration in the development of urban standards for bacteria is defining this spike and developing programs to manage contact recreation during this period to protect public health.

It is widely recognized that high bacteria periods coincide with high drowning risk. In particular, flow rates in urban streams rise particularly quickly and more frequently exceed bank-full flows. Additionally, urban streams are likely to contain a variety of structures such as dams, drop or inlet structures, and abutments which create drowning dangers. Many urban streams are also difficult to exit as they are less likely to have point bars and are more likely to have steep constructed bank walls. Finally, the abundance of culverts and bridge structures along with incised channels lead to a larger number of debris jams which present a safety risk during high water.

A risk management context may be particularly appropriate for recreational use standards. Such an approach can account for management strategies such as prohibition of contact recreation during certain periods to reduce the potential of exposure to pathogens.

### ***Urban stream restoration is a developing science***

There are technical and institutional barriers to developing standards that are more protective of urban streams. At a technical level, barriers include a lack of understanding of the particular mechanisms and issues affecting a particular stream, the impact of potential remedial actions, and the cost-effectiveness of remediation strategies. While the science is developing in these areas, much work remains to identify the practical upper end for stream restoration and to be able to provide cost guidelines for alternative levels of restoration. In the interim, prototype urban stream plans could go forward with the best scientific practices in an attempt to meet goals set by the community. Prototype plans should contain an evaluation component to generate additional information to assist in answering research questions. Collected information will also be helpful in addressing the related problem of high quality streams being degraded by advancing urbanization. Currently there is a lack of quantitative data to help planners understand the impacts of land use decisions or to understand the effectiveness of mitigation techniques.

### ***State and National perspective on standards to address urban concerns***

A substantial portion of the resources invested in water quality attainment across Ohio is spent on solving water pollution problems in urban streams. Based upon this fact alone, there is some logic to the development of standards that more effectively address urban issues.

The United States Environmental Protection Agency (USEPA), as a part of its policy to deal with Combined Sewer Overflows (CSOs), has encouraged states to look at refinement of existing standards as a tool in addressing the issues CSOs. Because USEPA's CSO policy requires that CSOs cause violation of water quality standards, there is a strong need to evaluate whether urban water quality standards can be constructed in a manner which remains protective of public health and eases the enormous financial burden of designing facilities to handle large storms without causing violations of water quality standards. In 1999, USEPA began a study of the difficulties which have prevented states from adopting modified water quality standards.

USEPA's National Risk Management Research Laboratory (NRMRL) has suggested approaching watershed restoration as a risk management activity: "Ecosystem restoration in a risk management context is the science of quantifying the risks, rewards, and levels of certainty associated with the full range of potential outcomes resultant from changes (both intended and unintended) to the landscape caused by land use and to functional connections between habitat".

The Ohio Department of Natural Resources (ODNR), as a part of its nonpoint source management program, has recently proposed the goal of creating processes to assist communities in setting goals for urban watersheds. Ohio EPA has demonstrated this concept by developing a unique standard to support community objectives for the Ship Channel of the Cuyahoga River. The standard sets a specific criteria target to support the community - developed goal of fish passage which allows for upstream spawning. The standard specifically calls out these criteria that are being approached through a phased Total Maximum Daily Load (TMDL) program. The standard discusses involvement of the community in developing creative solutions to the problems that are unique to the ship channel.

Ohio EPA, recognized as a national leader in the collection and regulatory uses of biological metrics, is in a unique position to advance the concept of bio-criteria specific to urban areas. Ohio EPA has begun a data collection program to look for relationships between land use patterns and aquatic performance of streams that would establish what performance levels can be expected from an urban stream.

Additionally, Ohio EPA has held preliminary discussions with interested parties regarding the concepts of urban standards and wet weather standards. One of Ohio EPA's interests is in determining whether standards can be crafted that could be applied to a broad range of locations across the state.

## II. Elements of the Proposed Urban Stream Planning Process

### *A conceptual model for urban stream restoration*

Clearly the process set up by the Clean Water Act (CWA) deserves considerable praise for the clean-up progress that has occurred over the last 25 years. Technology-based treatment standards were a quick way to start the clean-up process. Water quality based effluent standards were the next step in approaching the ultimate goal of fishable and swimmable waters. The current focus on the total maximum daily load approach is an attempt to re-focus pollution abatement efforts to be more in line with a watershed approach to resource management. But these processes all lack the power to relate to community goals and to address some root problems, particularly land use issues, which often determine the health of urban streams. In fact, as discussed below, the current regulatory process seems in many ways to work against a more integrated community process to upgrade the quality of urban streams.

The intractable nature of urban stream degradation suggests that we consider new approaches to guide restoration efforts.

Many of the principles used to guide the development of the proposed urban stream restoration planning process discussed herein originate from the premise that correction of the ills affecting urban streams will ultimately require a strong and flexible community-based process. The process would look at the root causes of stream ecology degradation, consider risk and rewards of various restoration actions and would set flexible long term goals that are well integrated with other community goals. Ideally, attainment of goals would be approached through incremental steps and adjusted over time to keep in touch with changing community needs. The benefits of stream restoration and protection should be emphasized as a driving force for restoration efforts. At the same time, some boundaries and regional support mechanisms would be put in place to support attainment of larger environmental goals, as illustrated in the need to protect or enhance downstream beneficial uses.

### *Model of proposed urban watershed planning process*

A regulatory program that encourages community-developed urban use designations (i.e., stream goals) could be the catalyst for community work to define and address problems at the heart of urban stream impairments. If flexibility is allowed in setting goals, communities are likely to respond with ideas that are efficient in increasing the value of the resource. If resources for pollution abatement could be re-targeted, many communities would likely be interested in addressing the root causes of urban stream problems with measures such as habitat protection, stream restoration and storm water management.

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The expectation of community benefits and local investment in goal setting is likely to encourage the concept of municipal stream stewardship and individual action at the homeowner level. Of course, the end point of this process needs to be the actual recovery of stream benefits. However, experience shows that ecological restoration of urban streams will likely be a slow process under any model. During the restoration period, progress should consider interim achievements and the strength of the processes driving resource protection.

### ***Objectives for an urban stream restoration program***

The following objectives are proposed to guide the restoration of urban streams. A program should:

1. Identify incentives to interest the local community in participating in an urban stream restoration plan.
2. Encourage certain minimum requirements to assure that water quality improvements will be realized.
3. Provide a framework to guide community action for a wide range of stream conditions and a range of community restoration desires.
4. Encourage communities to explicitly examine the value of improved stream quality as a stand-alone benefit and as a factor that furthers other community goals.
5. Encourage communities to address root problems affecting stream health and to consider the range of initiatives that could positively impact stream quality.
6. Encourage consideration of both a community's' specific situation and the protection of downstream uses.
7. Account for the dynamic process of ecosystems, and the non-deterministic nature of restoration activities. This includes understanding potential risks of stream restoration activities.
8. Encourage the establishment of both short and long term stream restoration goals and promote long-term goal attainment through incremental approaches.
9. Encourage the development of plans which explicitly define institutional responsibilities for implementation.

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10. Encourage the shifting of resources to projects which achieve the largest benefits (i.e., balance allocation of resources to a range of potential protective, mitigative, and pollution reduction measures).
11. Provide an adequate time frame for communities to undertake their planned programs and to make reasonable adjustments without the threat of enforcement action when reasonable progress is being made.
12. Strengthen the capabilities of a community to develop and implement stream improvement measures.
13. Integrate action steps with other community goals and programs to gain long-term support for improvements.
14. Provide feedback to facilitate adjustment of strategies and to reinforce continuation of the improvement process.
15. Encourage the re-evaluation of goals to assure that efforts are in fact protecting the larger environment and maximizing benefits to the community.
16. Facilitate networking with the implementation of Phase I and Phase II storm water requirements.

***Logic of Clean Water Act Section 208 planning as a vehicle to manage the development of Urban Stream Restoration Plans***

A central purpose of the proposed urban stream restoration program is to direct resources and attention to solving the most critical problems affecting streams. In many cases the most serious problems affecting urban stream health are associated with land use practices.

In Northeast Ohio most land use planning decisions are controlled at the municipal level. Coordinating land use decisions is particularly complex because of the large number of municipalities that might be included in a watershed. Further, our past history suggests that local communities have often worked against their best interests by ignoring the impact of land use on water resources. Finally, the Clean Water Act itself has little direct authority to regulate land use. Accordingly, the most powerful process for restoration of urban streams is likely one that provides a regional perspective on the value of resources, motivates interests at the local level, and utilizes the authority that is available within the Clean Water Act.

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While facilities planning, as provided for by Section 201 of the Clean Water Act, is traditionally focused on the more narrow question of wastewater treatment facilities, this process could be modified to form the basis for a more holistic look at urban water resource restoration. Facilities plans can also be a mechanism for stating the case for re-evaluation of water quality standards. Based upon review of the merits made in the facility planning document (presumably with substantial consultation with regulatory agencies along the way) the designated regulatory agency could chose to initiate changes to water quality standards. Further, facilities plans are required to be consistent with Section 208 plans and as a result there is a connection with larger regional issues. In other cases, facilities planning may not be an appropriate mechanism. For example, problems might arise with the timing of planning wastewater facilities and planning watershed restoration implementation steps. Another problem that can be anticipated is a lack of correspondence between facilities planning boundaries and the logical planning unit of watersheds.

***Strategy for implementation of an Urban Stream Restoration Plan (USRP) under the auspices of the CWP***

Policies and recommendations to implement the proposed program are presented in Section IV below. The principal elements of the proposed program are illustrated by the following steps in the development and implementation of an “urban stream restoration plan program”.

- A. The group of interested parties, (i.e., the implementing parties) would meet with the appropriate designated areawide planning agency to discuss the designation process and appropriate boundaries for the urban stream restoration plan (USRP). The discussion would also likely review the availability of technical information to support the planning process and the envisioned time frame for the development of an USRP. The planning agency would establish a committee to develop detailed recommendations relative to the designation process and other program elements.
- B. A memorandum would be prepared to notify all interested and affected parties of the proposal to develop an USRP.
- C. The implementing parties would establish the various public processes that would be necessary to guide and support the development of a USRP.
- D. The development of a USRP would follow a planning process that initially focuses on the root causes for the condition of the urban stream segment in question. This would be followed by a community goal-setting process. Alternative sets of actions to restore

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the stream segment to chosen goal levels would be created and evaluated to lead to a recommended set of actions. The product would include an implementation plan outlining responsibilities for achieving both short and long term stream goals. (In some respects the process would be similar to the development of a facilities plan under section 201 of the Clean Water Act. It would differ however in that the focus would be on total stream health, goal setting that considers the broad interests of the community, and alternatives that would include consideration of land use control measures.

- E. With the aid of consultation from appropriate regulatory authorities, the planning process would, as appropriate, generate a proposed specific use designation and appropriate water quality criteria (i.e., proposed water quality standards) to support the goals and implementation schedule for the proposed USRP.
- F. The proposed USRP, including the proposed supporting water quality standards, would be submitted to the designated Clean Water Plan (CWP) planning agency for consideration and adoption as part of the area's CWP. The review process would look at the issue of protection of downstream uses and assure that appropriate best management practices have been included to protect stream health. Additionally, the CWP would consider measures of technical and institutional support for the USRP. The amended CWP would be forwarded to Ohio EPA for incorporation into the state's Water Quality Plan. Incorporation of the amended CWP into the state's Water Quality Plan would likely be accompanied by a schedule for Ohio EPA rulemaking.
- G. Ohio EPA would undertake a rulemaking process to consider the proposed water quality standard component of the proposed USRP. (The state would also consider Total Maximum Daily Loads plan and initiate any associated NPDES permit actions needed to achieve consistency with the plan. It is hoped that the state would also adopt policies that would help to direct available resources to priorities set forth in the USRP.)
- H. The named implementing authorities in the USRP would be responsible for carrying out measures called for in the plan in a coordinated fashion. It is anticipated that a coordinating organization may be designated to provide overall direction to the implementation effort.
- I. During the process of implementation, the designated water quality management planning agency would monitor progress and use its other planning processes to support the goals of the USRP.

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- J. At the local community level, processes would be established to report on implementation progress. Additionally, work would continue on adjusting strategies and adding specificity to the implementation plan for upcoming project efforts and progress monitoring.
- K. At appropriate intervals, specified in the plan, there would be a re-evaluation of the overall goals of the USRP. This is envisioned as a community process similar to the initial process used to establish goals for the USRP. This process might involve formal revisions of the goals of the USRP and, as appropriate, might involve consideration of formal revisions of the CWP and the state's Water Quality Plan. At a minimum, evaluation of future goals should benchmark against the attainment of the fishable/swimmable goals established by the Clean Water Act.

### **III. Issues and Concerns**

This section addresses concerns, issue areas, and specific questions that have been raised during the review and development of the proposed Urban Stream Standards program. Discussion is provided for the following questions:

1. Will the adoption of the proposed concept for urban stream restoration plans result in lower stream quality?
2. What leverage is available to affect land use change? How can the proposed process influence actions to shift resources to priority efforts?
3. Would the urban stream program put urban populations at a higher risk when involved in water contact recreation?
4. How will downstream uses be protected?
5. Is there a danger that interim goals will encourage inefficient projects?
6. Do we have the scientific knowledge to develop more effective goals and criteria?
7. What are the guidelines and constraints under federal law for changing water quality standards?
8. How does the proposed urban streams program differ from obtaining a variance under existing regulations?

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9. What are some possible approaches for regulatory flexibility in water quality standard formats, and in setting schedules for attainment of standards?
10. Under what conditions should the urban streams restoration plan approach be encouraged? When would the approach not be recommended?

**1. Will the adoption of the proposed concept for urban stream plans result in lower stream quality?**

The most often heard concerns are that the program could lead to a lowering of existing urban water quality or will not result in the same level of restoration that would be achieved under existing requirements.

The first concern can be addressed by pointing out that the proposed urban stream program would be limited in applicability to situations where the goal is to improve urban water quality above the existing level. The typical case would be a situation where uses designated by water quality standards have never been attained. Specifically, the program would not apply to efforts to downgrade existing water quality uses, for instance, in the cases of advancing urbanization. Additionally, state anti-degradation rules would not be affected by the proposal.

The concern that the ultimate result of the proposed program will be lower urban water quality may stem from common experience that setting high goals can promote higher performance. However, improved urban water quality is in fact driven by a large number of forces that will be discussed. Further, regulatory approaches may compete with watershed improvement goals targeted to address root problems of urban streams.

Assurances that the program will be protective of urban water quality are evident by looking at the measures driving pollution abatement under the Clean Water Act, safeguards built into the proposed USRP and ways in which the program will have more leverage in the overall protection of stream health.

First consider the multiple approaches for pollution abatement under the Clean Water Act. Under the scenario of urban use standards a basic level of technology-based standards for pollution sources would continue to be a major driving force. A second powerful force is the requirement to abate pollutants to protect existing downstream water quality uses.

The various reviews built into the proposed urban stream program provide a second layer of protection against unjustified lowering of stream goals. USRP's would have to be adopted at a regional level by the designated planning agency and any proposed revisions to water

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quality standards would have to undergo the full scrutiny of formal rule making by Ohio EPA.

However, the most powerful argument that the proposed program will not result in a lower level of restoration is to look at the positive side of the equation. The fact is that existing regulations are not doing a good job of protecting urbanizing stream from continued deterioration. The following points summarize some of the major advantages of the proposed program:

- To the extent allowable and desirable, existing resources can be shifted to tasks such as stream protection and hydrologic management and it may be possible to save important stream features that, if not saved now, will be permanently lost.
- The strengthening of watershed processes and agreements on short term goals may be able to start or restart stream restoration and protection efforts that were stalled by disagreements about long term goals.
- Greater community involvement in goal setting helps to define value more broadly than the goals of the Clean Water Act. For example, an urban perspective may identify that, for safety purposes, a stream corridor should have less vegetation cover than would be optimal for attainment of aquatic use goals. Or, in the interest of compact urban land uses and protection of green spaces in other regional watersheds, it may be desirable to increase the density of development in existing urban areas even though this results in additional stress and may limit the ultimate recovery of the stream.
- Greater community involvement is likely to result in greater compliance with and support for restrictions and projects that may be necessary to protect streams.

Finally, a concern has been raised that urban stream programs could be subject to abuse by entities which seek to participate under the claim of stream enhancement but, in fact, have the single goal of avoiding expenditures for currently mandated pollution abatement. Regulatory authorities should be vigilant about this potential problem. However, the safeguards discussed should be adequate to prevent such problems. Further, Ohio's Water Quality Management Plan provides that any use designation which does not meet the full goals for attainment under the Clean Water Act is subject to review for revision every three years.

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## **2. What leverage is available to affect land use change? How can the proposed process influence actions to shift resources to priority efforts?**

The Clean Water Act contains limited powers to regulate land use for water quality benefits. The state also has limited legislative authority in this respect. A community developed USRP is the best hope for influencing land uses because the plan itself would be rooted in achieving goals which have been set by, and are of importance to, the community.

A central concept behind the proposed urban stream restoration program is that the process of developing a restoration plan should seriously evaluate the best use of all resources being spent on the stream. For instance, the program should encourage discussions with regulatory agencies regarding the benefits and possibilities of deferring pollution abatement projects in favor of using these capital resources for other program elements.

An innovative approach may be to encourage changes in land use practices by making a broader range of projects fundable under existing programs such as the state's State Revolving Loan Fund (SRF) program. This might be accomplished by locally initiated site-specific criteria related to ecological considerations, which can as an option be achieved by land use changes. For example, where stream hydraulic stability is a problem affecting aquatic life, technical criteria might call for a certain degree of stream stability as measured by a particular index. Logical methods for achieving these criteria may be to control storm water discharges or to create buffer areas along streams. Relating projects to stream improvements through criteria is likely to increase the likelihood that these projects would achieve funding assistance under traditional funding programs.

The process of adoption of a proposed USRP as a part of the area's CWP may also offer an opportunity to require consideration of changes in land use practices. Specifically, as a matter of policy, the designated planning agency may consider requiring that certain best management practices related to land use be considered in the development of any USRP which it considers for adoption. Further, as a regional entity, the designated water quality management agency may be in a unique position to leverage support of the goals of adopted urban stream restoration plans.

Finally, one of the most powerful tools in affecting land use is capital to obtain easements or actual ownership of critical natural features that support the integrity of water resources. Ohio is fortunate to have a powerful new program that makes available the capital strength of the state's SRF fund for protection and restoration efforts. The Water Resource Restoration Sponsor program, put into place this year, is designed to assist protection and restoration projects that directly benefit water quality. It accomplishes this objective by offering reduced interest rates on traditional SRF loans when a loan recipient agrees to use

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the financial benefit of the reduced loan rates for the specified restoration/protection efforts. This program can produce substantial capital resources for these efforts. For example the benefit of a zero percent interest rate on a \$10 million dollar loan could be used to fund a restoration or protection effort costing in the range of \$5 million.

### **3. Would the urban stream program put urban populations at a higher risk when involved in water contact recreation?**

This concern is particularly applicable in the specific discussion related to potential new approaches for recreational use criteria. In particular, one idea would be to craft a standard which accepts that traditional criteria for protection of recreational use which cannot be met for some period following a rain event. Acceptance of less stringent criteria in favor of other stream protection efforts could be inferred as tolerating a higher risk for the population that uses urban streams for contact recreation.

Issues raised in the previous paragraph should be openly discussed during the process in which the proposed urban plan is developed. A strong counter argument to the one presented above is that public health and safety is better protected by a more realistic acknowledgment of the safety risks stemming from the hydrologic character of urban watersheds and our limited ability to control high bacteria and CBOD levels during and following rain events. The risk to the public is dependent upon exposure to contaminated water or dangerous hydraulic situations. Accordingly, it would seem that an important element of any plan would be an effective program of education and management of contact recreation.

### **4. How will downstream uses be protected?**

Protection of downstream uses, depending on the particular circumstances, could be a significant issue in the preparation of USRPs. For instance, to what extent does a tailored aquatic use goal do its share in helping to meet downstream aquatic use goals? Would a decreased aquatic use goal for an urban tributary stream like Mill Creek impact attainment of aquatic use goals for the Cuyahoga River? Or, what level of impact would a tailored recreational use standard have on future attainment of bacteria criteria in the Cuyahoga?

In some cases the need to protect downstream uses may limit the ability to create new water quality standards to support the proposed USRP. One option may be to consider expansion of the boundaries of the USRP to include other downstream non-attainment areas. Another approach might be to develop a series of short-term goals that move in the direction of restoring desired beneficial uses.

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Another significant problem may be the lack of data and other needed information to determine if a proposed USRP would impact attainment of downstream uses. For instance, watershed studies and facilities plan improvements are not likely to be complete for all areas contributing to a downstream problem. Further, the science or models used to answer the question of what would be required for attainment may not be available. Finally, even if the source impacts were quantified, developing a reasonably cost-effective mix of solutions to attain water quality standards may still require a very large effort.

In short, it may not always be possible to fully answer all concerns about the potential impact of standards on downstream uses. Where these questions cannot be answered, the best approach may be to acknowledge the problem as an outstanding issue and a reason for future re-consideration of any site-specific urban standard. However, in as much as site-specific urban standards will be driving positive improvements in urban streams, those improvement processes will be working towards correction of current downstream compliance issues.

#### **5. Is there a danger that interim goals will encourage inefficient projects?**

It is possible to envision scenarios in which interim goals drive the construction of facilities that are effective in achieving incremental goals but are not adequate to achieve final goals. For example, a storage facility could be constructed to capture all flows up to a given design storm event. Subsequently, it might be determined that a larger facility was needed to meet ultimate goals.

However, it is typical that engineering decisions for capital-intensive facilities often take into account factors of uncertainty in sizing facilities. In such cases, facilities are often sized to take advantage of price break points. Consideration of the potential for future expansions can be factored into the design decision process. Additionally, it is important to understand that there is an impact of over-sizing a facility. The additional cost of an oversized facility creates a negative effect on resources available to do other projects that could be more cost effective in protection of the health of the stream.

#### **6. Do we have the scientific knowledge to develop more effective goals and criteria?**

Ideally, goal statements (i.e., Use Designations) should be clear and meaningful in defining a future desirable state. Additionally, they should be achievable and constructed to allow measurement of progress towards the goal. Water quality criteria should be scientifically defensible and enforceable while being a good measure of goal attainment.

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One fundamental problem in crafting water quality measures is the natural variability in any ecosystem and the lack of knowledge about effective techniques for ecosystem restoration. Ecosystems are dynamic and single sites are always strongly influenced by stochastic processes<sup>1</sup>. Further, restoration is not a deterministic process. Multiple outcomes are possible and any potential outcome is a function of probability resulting from interacting with initial conditions and restorative manipulations<sup>2</sup>. Thus, at least in the near-term, restoration efforts hold little promise of resembling native ecosystems.<sup>3</sup>

Obviously, being able to achieve the ideal is far from a reality at this time. However, intuitively, the flexibility to develop site-specific criteria should result in goals that make more sense both in terms of community values and in terms of technical measures of stream restoration. Some ideas for alternative criteria are as follows:

- Adapt existing criteria by making changes in the temporal or spatial application of criteria limits. For instance, sampling might be more or less frequent, samples might be composited over a larger spatial area, or the standard might be based on a new statistical parameter that describes a data set.
- Determine compliance based upon the output of models that estimate improvements as restoration activity progress. The initial attributes of the models and procedures for updating the model could be agreed upon at the time of adoption of water quality standards.
- Create unique narrative standards to describe expected characteristics of the watershed as restoration moves forward.
- Condition the applicability of traditional standards with unique spatial and temporal qualifiers. Minimum default standards may also be appropriate.

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<sup>1</sup>Christensen, N.L., Bartuska, A.M., Brown, J.H., Carpenter, S., A'Antonio, C., Francis, R., Franklin, J.F., MacMahon, J.A., Noss, R.F., Parsons, D.J., Peterson, C.H., Turner, M.G., and Woodmansee, R.G. 1996. The report of the Ecological Society of America committee on the scientific basis for ecosystem management. *Ecological Applications* 6:665-691.

<sup>2</sup>U.S. EPA, 1997. Risk Management Research Plan for Ecosystem Restoration in Watersheds. USEPA office of National Risk Management Research Laboratory EPA/600/R-97/078.

<sup>3</sup>Kentula, M.E. 1994. Wetland ecosystems. Pages 21-23 in Symposium on ecological restoration. U.S. EPA Office of Water. EPA/841/B-94/003.

- Use a showing of substantial progress towards some standard as the criterion. In effect, this could be a measure of the effectiveness of the local/regional planning and implementation processes. Compliance could be determined based upon a locally developed progress report.
- Use indices or other holistic measures of ecosystem or stream integrity in place of numeric or narrative criteria. Holistic criteria have particular appeal because they focus on direct measurement of ecosystem health -- the ultimate objective of the restoration effort. The focus on the ultimate objective maximizes a community's options to employ the most effective techniques to achieve desired ends. For example, Ohio EPA could develop a new biological metric which is based upon what is achievable in urban areas. As a second example, criteria could call for a particular state of stream morphologic stability. Still, a third approach might be to adopt a sentinel species.

Admittedly, the science to support total ecosystem restoration is still weak. However, it is proposed that in the interim, prototype urban stream plans could go forward with the best available science in setting goals that are meaningful to both the community and regulatory officials. Prototype plans could contain an evaluation component to generate scientific information to assist in answering research questions related to measurement of ecosystem improvements. Collected information will also be helpful in addressing the related problem of high quality streams being degraded by advancing urbanization. In this area there is currently a lack of quantitative data to help planners understand the impacts of land use decisions or to understand the effectiveness of mitigation techniques.

## **7. What are the guidelines and constraints under federal law for changing water quality standards?**

The Clean Water Act sets goals for the nation's waters in Section 101 (a). In particular, Section 101 states the objectives of the Act are to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Section 101 (a) (1) calls for the elimination of pollutants and Section 101 (a) (2) states that it is the national goal that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July, 1983.

By regulation 40 CFR Part 131, states are required to establish water quality standards that are composed of use designations for various use categories and water quality criteria that are consistent with the goals of the Act. In the early 1970's, use designations consistent with full attainment of the goals of the Act were by default applied to many of Ohio's

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streams. Provisions of the Act 131.10 set out processes and limitations for removing (or revising) uses. Uses that are attainable may not be removed. By definition 131.10 (d) at a minimum, uses are deemed attainable if they can be achieved by the imposition of effluent limits required under Sections 310 (b) and 306 of the Act and cost-effective and reasonable best management practices for nonpoint source control. Sections 310 (b) and 306 refer to the requirements to meet technology based effluent limitations and National Standards of Performance.

Section 131.10 (g) provides that states may remove a designated use which is not an existing use, or establish sub-categories of a use if the state can demonstrate that attaining the designated use is not feasible because of certain enumerated factors related to physical conditions. These factors include: intermittent or low flow conditions or water levels; human caused conditions that can not be remedied; dams and other types of hydrologic modifications that cannot be remedied; physical conditions such as the lack of a proper habitat features. A showing of substantial and widespread economic and social impacts resulting from efforts to attain the uses is also a reason for changing use designations. As a part of the process to remove or modify a use, states must conduct a Use Attainability Analysis. As established pursuant to Section 131.3 (g), a Use Attainability Analysis is a structured scientific assessment of the factors affecting the attainment of the use.

Earlier, this chapter discussed the link between urbanization and the non-attainability of various water quality criteria. Many urban modifications of land use features are responsible for human caused conditions that cannot feasibly be reversed. One example is the existence of a network of storm sewer systems that has culverted most first order streams. Frequently, urban streams contain a wide variety of dams and other structures that have a dominant affect on the health of the urban stream. For example, culverts frequently interfere with aquatic movement. The high quantity of impervious surfaces, which in effect defines most urban areas, have a dramatic effect on both high and low flow hydrology, which in turn triggers other biotic and abiotic changes. Past poor planning has often allowed urban structures to be built at the edge of streams, and stream wetland features to be filled for development. These development acts have in the process destroyed habitat that is critical to stream health.

Based upon the foregoing logic, changes under the regulatory provisions of Section 131.10 (g) should be available based upon the physical consequences of urbanization, as opposed to a social/economic test of substantial and widespread economic and social impact resulting from attempts to attain existing uses. At the same time it is obvious that there will remain some burden to show that these urban features are a prime contributor to non-attainment.

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By regulation, states are responsible for conducting the Use Attainability Analysis. It would be ideal to engage the state and its resources in conducting the Use Attainability Analysis as a part of the community process of understanding impacts and setting new goals. However, in reality Ohio's resource constraints may not allow the agency to take a lead role in the community effort. And in fact, one of the advantages of the proposed program is that it provides a process for communities to take the leadership role in initiating the goals setting process independent of state priorities. Where communities are required to initiate the processes, the final outcome will be contingent on the Use Attainability Analysis that will be conducted by the state prior to, or as a part of, a rule making process to consider new proposed water quality standards. In this case the technical work done by community should be an aid to the state in its effort to conduct a Use Attainability Analysis.

#### **8. How does the proposed urban streams program differ from obtaining a variance under existing regulations?**

The proposed program has a number of similarities with an approach that would seek a variance to the water quality standards. In fact, under Ohio regulations, the valid reasons for obtaining a permanent revision to water quality standards where designated uses have not been attained are the same as those under which a variance may be sought. However, the variance carries the implicit agreement that the ultimate goal is the standard to which the variance is sought. In contrast, the proposed urban stream program envisions a more substantial public involvement process in setting alternative goals that are intended to be translated into water quality standards.

Under Ohio rules, several reasons are given as valid for seeking a change or lowering of designated uses when the existing use cannot be met. These include hydrologic modifications, human-caused conditions that cannot be remedied and physical conditions related to the natural features of the water body. A fundamental premise behind the proposed urban stream program is that certain patterns or densities of urbanization will qualify under a combination of the available options.

Another substantial difference is found in the intent of the Urban Stream Restoration program to affect fundamental change in the health of a stream by attacking the full range of variables that affect stream health. In this process, the program may attempt to shift resources from traditional pollution abatement efforts to alternative approaches such as stream restoration and stream protection. Finally, as discussed above, the proposed program may have equal applicability for a community's desire to develop a program that provides for attainment of goals above those established by current water quality standards.

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**9. What are some possible approaches to achieve regulatory flexibility in water quality standard formats, and in setting schedules for attainment of standards?**

The proposed model of community involvement should in fact be an aid to the creation of goals or use designations that are more meaningful to the community and more protective of the total resource. The key to making goals meaningful to the community is substantially involving it in the creation of the goals. Given this somewhat non-conventional approach, we should expect that tailored use designations would take on a variety of non-conventional forms.

One objective of the proposed urban stream program is to provide flexibility to communities to consider a wide range of options in the creation of USRP's. The inflexible, traditional enforcement process works against this objective. For instance, creating a new bacteria standard that would be more precise could result in the immediate identification of violations of the new water quality standards. This determination could trigger enforcement actions against the very communities who are working to develop new ways to protect public health. Additionally, once a compliance program is set into place under a regulatory framework, the focus is likely to be on reporting and completion with little regard for adjustment of the program to meet new information or understanding of the environmental needs.

A second problem is that an effective restoration strategy would seem to call for a broad spectrum of incremental improvement initiatives in areas that make up an ecosystem (i.e., biotic, abiotic, historical, & societal factors). Thus, restoration activity may be happening on many fronts. Appropriate tracking mechanisms and the time scale to see results may vary widely.

An approach used by Ohio EPA in developing a site-specific standard for the Cuyahoga River Ship Channel provides one possible model for working around this dilemma<sup>4</sup>. The ship channel standard specifically identifies that a phased TMDL approach will be used to attain compliance. The standard also specifically recognizes the necessity to look for innovative ways to achieve compliance with the standard, including elements not specifically related to pollution abatement. Action towards compliance can include studies and prototype experiments. Certain critical NPDES limits are actually set by the Water Quality Standard.

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<sup>4</sup>OAC 3745-1-26 Cuyahoga River

A second tool in setting standards may be to establish a progressive set of achievable criteria. For instance it may be possible to identify changes in runoff hydrology resulting from a proposed series of storm water management projects, or changes in habitat scoring indices that are expected to result from restoration activities. Additionally, it seems that criteria could call out expectations or give credit for putting natural stream features into permanent protection. Obviously, crediting these kinds of effort would be both extremely important and at the same time defy traditional thinking about compliance requirements related to attaining water quality standards.

**10. Under what conditions should the Urban Streams Restoration Plan approach be encouraged? When would the approach not be recommended?**

A principal objective of the proposed urban planning program is to obtain a community perspective in setting non-traditional goals for urban watersheds. Accordingly, an urban stream program may offer a preferred approach whenever community participation is highly valued and innovation in standard setting is a desired outcome. While the primary focus of discussion in this chapter has been on creating new approaches where designated uses have not been obtained, the process should be equally applicable to the situation where a community desires to set a standard which is more protective than what is currently in place.

One of the potential disadvantages of the process is the time and effort to undertake the process that has been outlined. Further, it may not be advisable to undertake an intensive public goal-setting process aimed at setting innovative standards without an adequate database to define stream problems or without a fair understanding of the difficulties of obtaining compliance with minimum requirements.

**IV. Implementation of the Proposed Urban Stream Program**

The area's WQMP recognizes and encourages development of urban stream restoration plans that would include tailored urban standards. Adoption of an urban stream restoration plan would be considered based upon the merits of an individual proposal. Additionally, incorporation of Strategies 8-1 and 8-2 in the area's Clean Water Plan, and subsequent certification by the State, will create additional impetus for Ohio EPA to initiate water quality standard rule-making on urban stream issues. Urban stream restoration plans crafted under this CWP would identify specific stream objectives for enhancement. Typically, these goals would be approached in an incremental fashion and re-evaluated at the end of a specified planning period. A second objective is to strengthen the capacity of the local community to develop and implement measures for stream improvements and to

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help communities realize the full benefit of urban streams as a defining feature of their community.

Analysis of the problems associated with the protection and restoration of urban streams suggest that new models are needed to solve a wide spread problem. A new approach, which shifts some responsibility for decision making to the community level, has been proposed. It is recommended that the policies and recommendations that follow be pursued as an alternate approach for achieving urban stream quality.

**Strategy 7-1: The NEFCO General Policy Board endorses the urban stream restoration plan concept presented in this chapter as an alternative means of improving the water quality for urban streams in Northeast Ohio which are not currently attaining water quality standards.**

**Strategy 7-2: The NEFCO General Policy Board authorizes under its ongoing planning process (See Chapter 10) an urban stream protection planning committee to encourage and guide the development of urban stream restoration plans, including the development of urban standards which would support these plans. The committee is charged with the following:**

- a. Develop suggested processes for review and adoption of Urban Stream Protection Plans by the designated planning agency.**
- b. Help watershed areas identify the basic data needed to prepare USRPs. Facilitate discussions among watershed communities that wish to consider the development of urban watershed plans.**
- c. Develop recommended guidelines for minimum practices in the management of urban streams.**
- d. Conduct discussions with Ohio EPA to develop the appropriate process, if needed, for further state rulemaking to recognize specific urban standards as part of the state's overall water quality management plan.**
- e. Provide reviews and comments upon specific proposals for urban watershed plans/and water quality measures which are proposed for adoption.**
- f. Identify ways that areawide regional planning processes can support the goals identified by a particular urban stream plan.**

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- g. Collect data relative to the cost effectiveness of restoration and protection practices used with an urban stream plan.**
- h. Evaluate the effectiveness of the USRP experience in furthering the protection of urban streams.**
- i. Make recommendations for revisions to the 208 plan concerning the use of USRPs.**
- j. Integrate Urban Stream Restoration Plans with the implementation of Phase I and Phase II storm water requirements.**

**Strategy 7-3: The NEFCO General Policy Board recognizes the need for, and acknowledges intent to encourage research on the effectiveness of protection and restoration techniques in urban settings.**

**Recommendation 7-1: Ohio EPA is requested to evaluate the urban stream restoration plan program presented in this chapter of the CWP.**

**Recommendation 7-2: Ohio EPA is encouraged to participate in research/study efforts to provide practical information relative to cost and effectiveness of protection and mitigation techniques towards improving biological metrics for urban streams and in the evaluation of alternative biological criteria or other types of standards to assist communities in setting goals for urban streams.**

**Recommendation 7-3: Ohio EPA is encouraged to be involved in the development of USRPs in an advisory and consulting role. Further, Ohio EPA is encouraged to participate in the local planning process to review plans and to evaluate rule making actions in a timeframe which facilitates public involvement and protects the momentum of community planning processes described in this chapter.**

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