



Integrated Stream Management Programs Reduce Impacts to Aquatic Habitat

Properly managed stream corridors that achieve a balance between development, water quality, and stream uses can reap a wealth of economic, social, and cultural benefits for communities.

The Problem



As the economic advantages of development and urbanization place increasing demands on land use within stream corridors, streams are not managed comprehensively to protect water quality and beneficial stream uses. Stream management

typically has taken the form of floodplain management, which places emphasis on the protection of individuals and structures from flood hazards. This type of stream management has often neglected the protection and/or the enhancement of aquatic habitat and water quality.

Physical Modifications



Typical physical modifications of stream channels to improve drainage and to reduce flooding of developed areas include:

- straightening of sinuous systems,
- concrete lining of channels (Figures 1a&b),
- replacing open channels with underground culverts,

- dredging existing channels (Figure 2),
- construction of dams and reservoirs, and
- removal of stream bank vegetation.

Development along stream channels also results in the removal of natural buffer strips and zones and the creation of access roads and stream crossings that cause further physical changes to the stream and impact aquatic habitat (Figure 3).



Figure 1a.—Concrete-lined channel (apron).



Figure 1b.—Concrete-lined channel (apron).



Figure 2.—Dredging of channels.



Figure 3.—Riprap—stream crossings.

Statewide Programs



he following are a few examples of selected state programs whose long-term goals are to protect water quality and other uses of their natural water resources through nonpoint source programs that utilize stream corridor management tools.

State of Maryland –

*Nonpoint Source Control Program,
Maryland Office of Environmental Programs,
Baltimore, Maryland*

The State of Maryland has had a number of nonpoint source control implementation programs dating back to the late 1960's and early 1970's. In 1984, the Maryland General Assembly added new programs and modified existing programs. As of 1985, the State of Maryland had 12 different programs regulated at the State or local level as a comprehensive approach to controlling nonpoint source pollution derived from increased development and physical modifications to critical habitat. A brief description of some of these programs is provided below.

■ **Sediment control legislation**—No clearing, grading, or transporting of soil can take place until the developer submits an erosion and sediment control plan to the local soil conservation district for approval. To be granted a local grading or building permit, the developer must specify that he will carry out the plan.

■ **Stormwater control**—The State's stormwater management regulations represent a diversified approach to controlling the hydrologic consequences of urban development rather than focusing on controlling peak flows. Consideration

is given to volume reduction, low flow augmentation, water quality control, and ecological protection.

■ **Shoreline erosion control**—Provides for the abatement of shoreline erosion by identifying critically eroding areas and promoting structural control (i.e., bulkheads and riprap). Less critically eroding areas are stabilized through less expensive vegetative means.

■ **Development of critical areas commission**—Through a State/local partnership, the commission works to develop and adapt protection plans for critical shoreline areas. The ultimate goal is to foster more sensitive development activities to minimize damage to water quality, natural habitat, and scenic values.

■ **Retention of existing forestland**—Existing forests around the Chesapeake Bay and its tributaries are maintained to intercept surface runoff and allow it to infiltrate the soil profile before reaching the receiving water.

■ **Conservation easements**—The State program of acquiring conservation easements encourages private landowners to preserve and protect undeveloped or low density areas.

■ **Dredge and fill projects**—The State water quality certification program pursuant to sections 401 and 404 of the Clean Water Act was expanded to review construction projects for which water quality certificates are required.

■ **Nontidal wetlands program**—The cooperative State and county government program that encourages and assists local governments with the design and implementation of locally administered nontidal wetlands management programs.

- using natural or constructed wetlands as sediment, nutrient, and pollutant filters,
- managing regional detention basins for multiple uses,
 - Dry basins (playgrounds, soccer fields, etc.)
 - Wet basins (wetlands, living lakes, aesthetics)
- providing stricter control on zoning changes, and
- implementing construction and development-related ordinances and laws.

These techniques and many others can be integrated into a stream corridor management program that combines land use planning, engineering controls, and legislative controls.

Successful stream corridor management tools include:

- A land use planning and problem solving framework or approach,
- Local, statewide, and regional policies and regulations for construction, maintenance, erosion control, and zoning, etc.,
- Community education and involvement in stream conservation and protection programs,
- Establishing Best Management Practices (BMPs) for minimizing disturbances to streams (i.e., stream crossing BMPs, stream channelization BMPs, BMPs for dredging and gravel removal),

- Land acquisition for protecting critical areas, for acquiring recreational lands, or for public access,
- Land use controls including zoning, subdivision regulations, and other regulatory techniques,
- Floodplain management and regulations,
- Tax incentives to riparian landowners to protect and enhance stream corridors,
- Development of governmental aid programs,
- Development of special improvement districts,
- Enactment of watershed rules and regulations to protect water supplies and water quality, and
- Establishment of Wild, Scenic, and Recreational Rivers programs.

When some or all of these tools are applied to stream corridor management, natural and diverse habitats are maintained and degradation of water quality is prevented. The aesthetic, recreational, and cultural values of the stream are maintained and possibly enhanced, resulting in both environmental and economic benefits to the community (Figure 5).



Figure 5.—Undeveloped habitat—esthetic and recreational values, and aquatic habitats are preserved.

The Impacts

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he impacts of development and subsequent stream channel modifications on aquatic life and habitat (Figure 4) include:

- physical destruction or impairment of food, shelter, spawning, and nursery habitat,

- physical displacement of species,
- impediments to fish migration,
- loss or reduction in species diversity, and
- changes in species composition.

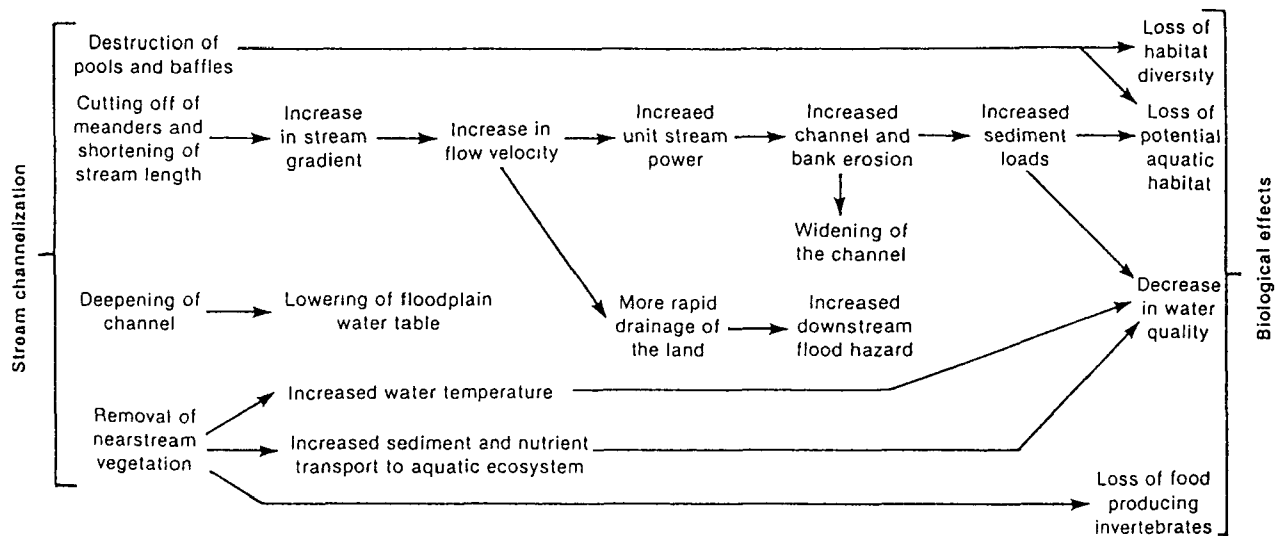


Figure 4.—Effects of channelization on the physical environment and biota of streams (J.R. Karr and I.J. Schlosser, 1978).

The Solution – Integrated Stream Management

A

n integrated or comprehensive stream management program is essential to maintain the balance between urban development, maintenance of water quality, and the protection of aquatic habitat within urbanized watersheds. A

comprehensive corridor management

program places the primary emphasis on water quality protection through the control of nonpoint source pollution (i.e., erosion and sedimentation) and on the protection of natural and cultural resources within the stream corridor. As a result, floodplain management becomes a part of the integrated management of streams.

Comprehensive stream management techniques include:

- identifying critical streams and habitat to manage,
- managing land use along the entire length of a stream both upstream and downstream of the stream reach of interest,
- performing minimal channel re-shaping and straightening,
- implementing bank stabilization measures,
- incorporating physical structures in the channel design to improve habitat,



For further information on Comprehensive Stream Management, contact the New York State Department of Environmental Conservation, Division of Water, Bureau of Water Quality, Albany, New York 12233, or see Stream Corridor Management: A Basic Reference Manual. New York State Department of Environmental Conservation, Albany. 1986, second printing. This project was funded by the U.S. Environmental Protection Agency Office of Water Enforcement and Permits—Water Permits Division and managed by Region V Watershed Management Unit—Water Division. Prepared by Dynamac Corporation, FTN Associates, and JT&A, Inc. For copies of this publication, contact The Terrene Institute, 1000 Connecticut Avenue, NW, Suite 300, Washington, DC 20036, (202) 833-3380.



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