Buffalo River Area of Concern: A Case Study for Building Partnerships to Address Local Environmental Problems

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The Buffalo River

The Buffalo River flows along the southern boundary of the City of Buffalo and its watershed includes both agricultural and urban areas. As the Buffalo River enters Buffalo on its way into Lake Erie, the riverbanks are lined with active and abandoned industrial sites. A bird's eye view of the river (rt. middle figure) shows the prominent grain elevators (only the lowermost grain elevators are still in use today) and the numerous tight meanders. Until fairly recently, numerous industries, including chemical, steel, and oil refining, routinely discharged metals and organic compounds into the river. Today, most of the industry either has shut down or decreased production, and all operating facilities are subject to stricter environmental controls. The legacy of the past has led to the destruction of habitat, poor water quality, and the deposition of contaminated bottom sediments, and has resulted in the lower 9.2 km of the Buffalo River being included in the list of Canadian-United States Areas of Concern (AOC). For each AOC, a remedial action plan (RAP) is developed identifying the impairments and outlining measures to be taken to restore the beneficial uses of the river/harbor. In the US, the EPA is the agency responsible for coordinating and assisting the eight Great Lakes States in preparing RAPs and in New York State, the Department of Environmental Conservation (DEC) is the lead agency in the development of the Buffalo River RAP. The Buffalo River RAP committee was formed in 1986. In 1989, the Stage I RAP was submitted to the IJC (International Joint Commission) for review. Several months later, the Buffalo River Remedial Advisory Committee (RAC) was appointed to advise and assist the NYS Department of Environmental Conservation (DEC) in the implementation of the RAP.

Figures: *top left:* historic view taken near the mouth of the Buffalo River; *middle left:* active grain elevators line the lower portion of the river; *bottom left:* a metal reclamation yard located along the banks of the river; *top right:* view of the meandering Buffalo River, the Buffalo River AOC begins just below the convergence of the two creeks; *middle right:* aerial view of the river; *bottom right:* an upstream industry (Buffalo Color Corp) that is presently inactive.

Background

The Buffalo River AOC extends from the mouth of the Buffalo River (where it discharges into Lake Erie) upstream 9.2 km (Note: the upper limit of the AOC is considered the portion of the river influenced by flow reversals related to the movement of Lake Erie waters—see below). Within the AOC, the Buffalo River is a navigable channel maintained by the U.S. Army Corps of Engineers to a depth of 22 feet below low lake level datum. The gradient of the river is very low and for much of the year, flow velocities are much less than 10 cm/sec. The river is fed by three tributaries (Cazenovia Creek, Buffalo Creek, and Cayuga Creek), as well as from water pumped from Lake Erie to upstream industries (this has recently been greatly reduced). During periods of persistent strong winds along the long axis of Lake Erie, lake waters are forced upstream into the river and reverse flow ("estuarine" character) is common. This bidirectional flow regime becomes a factor when considering sediment transport pathways and contaminant movement, as both upstream and downstream flow paths are possible.

Because of the reduced water quality, contaminated sediments, and loss of habitat, the Buffalo River has a number of identified impairments, including:

- Restrictions on fish and wildlife consumption
- Fish tumors and other deformities
- Degradation of benthos
- Restrictions on disposal of dredged sediment
- Loss of fish and wildlife habitat

The goals of the RAP include the restoration of water quality and meeting the objectives of the Great Lakes Water Quality Agreement (e.g., elimination of the discharge of persistent toxic substances). The restoration of the river has brought together federal, state, county, and local agencies and universities. Another important partner has been the Friends of the Buffalo River (recently expanded and renamed the Friends of the Buffalo-Niagara Rivers). The FOBR formed in 1988 as an outgrowth of the citizen group involved in the development of the Buffalo River Remedial Action Plan (RAP). Several of the members in the FOBR also were appointed to the NYS DEC Remedial Advisory Committee (RAC) thus the FOBR has provided technical input and advice to county, state, and federal agencies, taken a leadership role in habitat restoration efforts, establishment of a greenway trail and setback along the river, and has coordinated regional education and outreach efforts. The expanded role of the group is reflected in its recent name change to FBNR and recently the group was awarded a contract with the EPA to reactivate and expand the BR RAC. This is the first non-governmental agency appointed to coordinate implementation of a Great Lakes RAP.

Partnerships in Action

Over the past 15 years, there have been a number of significant projects undertaken by federal, state, and local agencies. In many of these projects, SUNY-Buffalo, SUNY-Buffalo State, and the FBNR played active roles in sampling and analysis of sediments and water, delineation of habitat and aquatic biota, and community outreach and education. These groups have also gained credibility and their technical input is usually requested both in identification of priority projects and in the design of projects. The development of a greenway plan and requirement for a 100' setback has been notable accomplishments of the FOBR (FBNR). The initial greenway plan dates back to 1993 and only recently (2001) has the 100' setback been passed. More recently, the NYS Department of Environmental Conservation awarded ~$170K to the FBNR for a habitat restoration study.

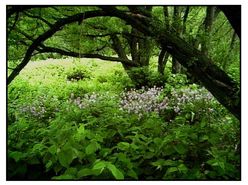
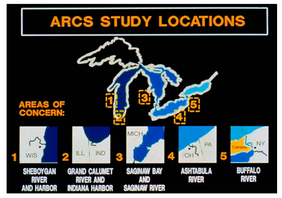
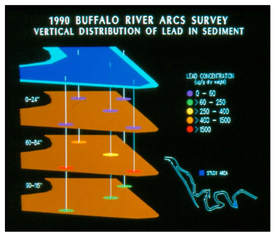


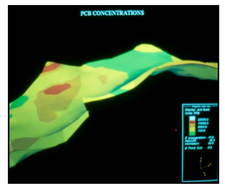
Figure above: Greenway plan map for the Buffalo River

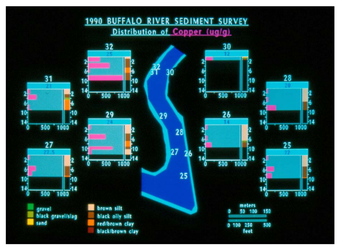




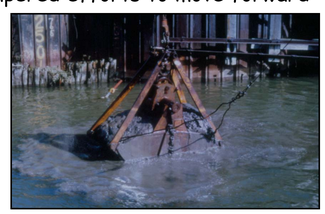
Examples of Partnering and Projects

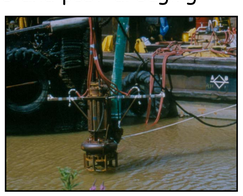
EPA ARCS program: In 1989, the EPA implemented the Assessment and Remediation of Contaminated Sediments (ARCS) program, designed to develop guidelines for evaluating remediation options which are broadly applicable to all AOCs. The Buffalo River was designated one of the five ARCS study locations. One ARCS demonstration project involved extensive sediment sampling (vibracoring) and chemical analysis of metals and organic compounds. Vertical profiles allowed for delineation of 'hot spots' and determination of depth to uncontaminated sediment. Results confirmed that sediment contamination levels actually increased with depth and that no 'clean' layer was penetrated. Also, two adjacent cores often displayed different vertical profiles, making lateral correlations of contaminant horizons not possible. This complexity makes it difficult to say with certainty how much sediment needs to be removed in order to cleanup a section of the river. This finding has hampered efforts to move forward with sediment remediation.

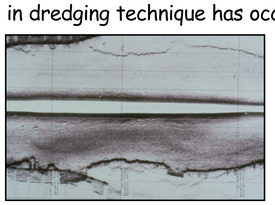


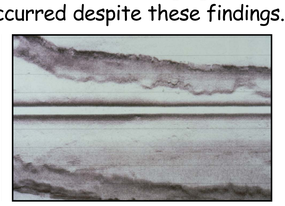


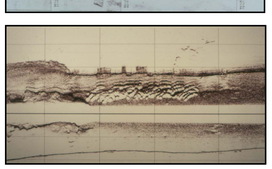
Environmental Dredging: Because the Buffalo River is classified as a navigational channel, it is subjected to routine maintenance dredging. In part, as a consequence of citizens' concerns raised over the use of open-bucket dredging and a desire to explore alternative methodologies, an environmental dredging conference was held in Buffalo in 1992 and an environmental dredging demonstration project undertaken. Three techniques were considered: open-bucket, closed-bucket, and suction dredging. Pre-and post-dredging side scan sonar surveys of the river bottom were done to assess changes in bottom morphology as a result of the dredge technique. Despite heavy rains that coincided with the demonstration project, the resuspension of sediment was consistent with the predictions—greatest amount of sediment resuspension occurred with open bucket dredging, the least with suction dredging. For economic reasons, no change in dredging technique has occurred despite these findings.

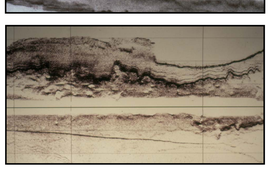












Figures: *left top:* pre-dredging side scan sonar; *right top:* slumping of sediment following navigational dredging; *left bottom:* side scan sonar record showing bottom morphology resulting from suction dredging; *right bottom:* side scan sonar record showing bottom morphology resulting from open and closed bucket dredging