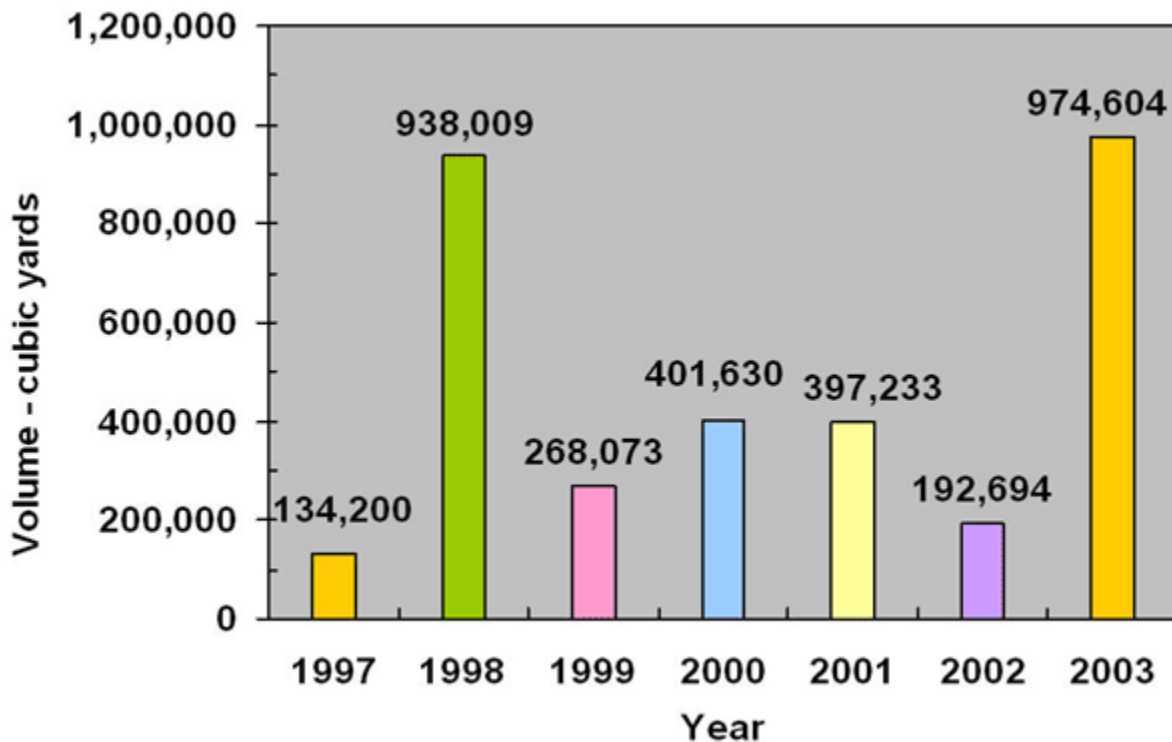


Remediation of Existing PBT Sediment Deposits
White Paper for GLRC PBT Reduction Strategy Team by Gina Bayer/CH2M HILL

Reducing persistent bioaccumulative toxins (PBTs) in the Great Lakes Basin necessitates a 2-prong approach; reducing ongoing external watershed and atmospheric loads, and mitigating existing sediment sinks of PBTs. Lake-wide mass balance modeling efforts demonstrate the current rate of reduction of banned and restricted chemicals, such as PCBs, in open water and fish are being controlled by surficial sediment feedback through resuspension processes, rather than watershed or atmospheric load reductions. According to the *Status of Restoration Activities in Great Lakes Areas of Concern: A Special Report* (Report of the International Joint Commission, April 2003), work to remediate sediments is ongoing in 14 of the 26 United States-only AOCs, at a cost of \$160 million. The USEPA estimates that in the years 1997 through 2003, over 3.3 million cubic yards of contaminated sediment have been removed from the U.S. Great Lakes Basin. The following graph shows the progress of sediment removal; the USEPA anticipates the rate of sediment remediation activities will accelerate with the availability of Great Lakes Legacy Act funding opportunities. The estimated associated mass of PBTs removed by these removal actions are 596 tons of PCB, 519 tons of DDT in the U.S. In Canada, 34,000 cubic yards of sediment have been removed through 2002, removing 3 tons of benzo(a) pyrene, and 43 pounds of mercury (Great Lakes Binational Toxics Strategy, 2003).

Yearly volume of sediment removed from U.S. Great Lakes Basin



As of January 2005, USEPA Great Lakes National Program Office (GLNPO) has estimated there are 76 million cubic yards of contaminated sediment in the AOCs to be remediated, at a cost estimated between \$1.6 billion and \$4.4 billion. This estimate required by the Great Lakes Strategy 2002 and the Great Lakes Legacy Act is updated biennially. The estimate does not differentiate between likely funding sources, i.e., PRPs vs. government funds.

The wide range in the projected remediation cost is reflective of the cost differential between the basic approaches used to cleanup contaminated sediment. The three basic remedies are monitored natural recovery (MNR), capping, and dredging. At many sites a combination of these approaches will be implemented.

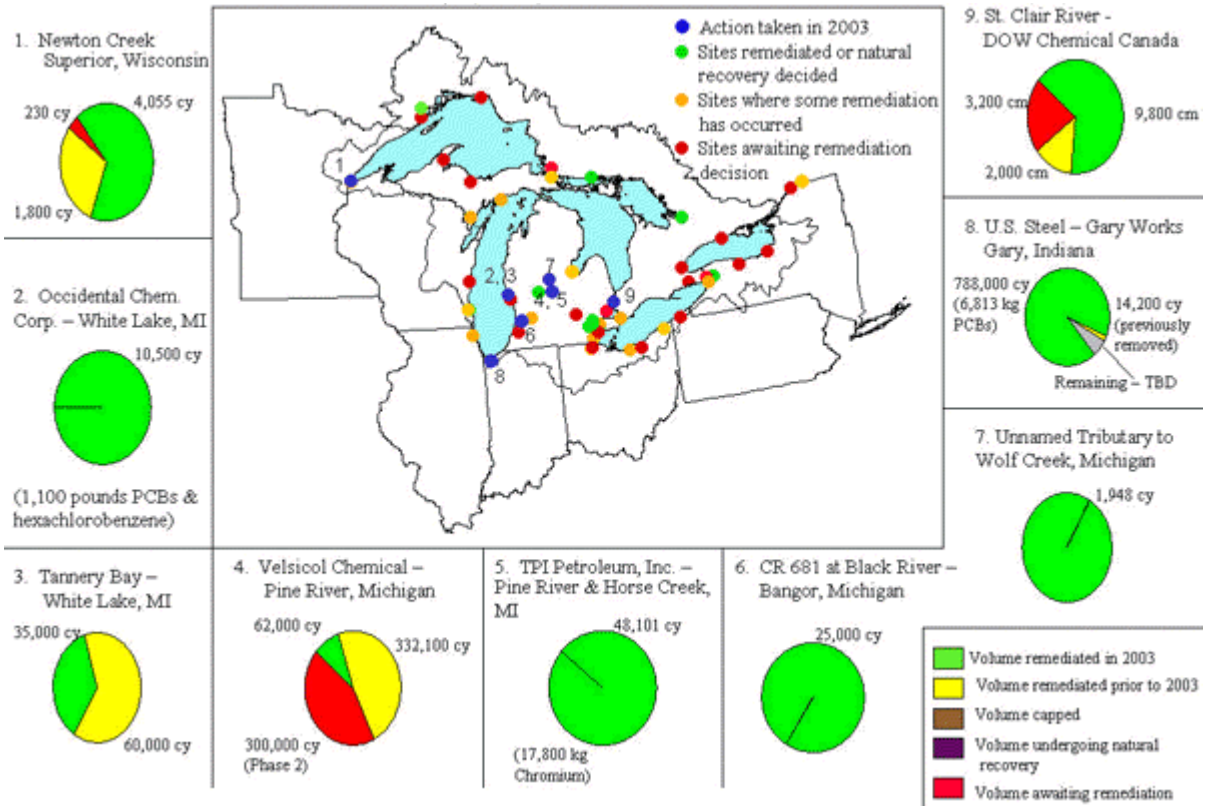
MNR is the least expensive remedy, but is likely to require more extensive and prolonged long-term monitoring. MNR uses known, ongoing, naturally occurring processes to contain, destroy, or otherwise reduce the bioavailability or toxicity of contaminants in sediment. Although burial by clean sediment is often the dominant process relied upon for natural recovery, multiple physical, biological, and chemical mechanisms frequently act together to reduce risk. MNR can be effective for low-risk sites or portions of sites where surface sediment contaminant concentrations approach surface sediment cleanup goals, and the long-term stability of the sediment bed is not a concern.

Capping refers to the placement of a subaqueous covering or cap of clean material over contaminated sediment that remains in place. Caps are generally constructed of clean sediment, sand, or gravel, but can also include geotextiles, liners, or the addition of material such as organic carbon to attenuate the flux of contaminants. A cap reduces risk by physically isolating the contaminant from the aquatic environment; by stabilizing the contaminated sediment thus preventing resuspension and transport to other sites. Additionally, capping the sediments reduces the movement of dissolved and colloiddally transported contaminants. Capping is typically much less expensive than environmental dredging but because contaminants are left in place, caps generally require long-term monitoring, and the risks of contaminant breakthrough or resuspension persist.

Dredging is typically the most expensive remedy, but results in the greatest mass removal from the aquatic environment. Currently it is the most common means of sediment remediation in the Great Lakes Basin. Removal can also be accomplished through excavation in the dry, after the water body or portion of the water body has been diverted or drained. Dredging and excavation in the dry are typically the most complex remedial approach, the components of which include removal, staging, de-watering, water treatment, sediment transport and possibly treatment, re-use, or disposal. The relatively short-term risk reduction benefits of dredging can be compromised by high surface sediment residuals and long-range transport of sediments resuspended during dredging.

The following figure shows the status of sediment remediation in the AOCs through 2003.

Great Lakes Sediment Remediation Status at End of 2003



Source: www.epa.gov/grtlakes/sediment/remed