Stream Health:

Principles for Phase III Watershed Implementation Plans

Protecting streams for Human Health, Economic Development, and Infrastructure

Protecting and improving stream health is a vital part of restoring the Chesapeake Bay and providing human health and economic services for the watershed and local communities. Stream bank erosion caused by increased stormwater runoff resulting from land use change and poor management practices is a significant source of sediment and nutrients to the Bay. Locally, stream erosion and degradation results in loss of land, loss of habitats and species, safety hazards and impacts to infrastructure like utilities, roads, and buildings.

Streams that are deeply incised or disconnected from their floodplain can be a public safety hazard and increase downstream flooding. Furthermore, these channelized streams do not connect with other groundwater sources, leaving stagnant pools, or preventing pollutants from being removed as the water flows through the soil. Current stream restoration techniques can help remove falling and drowning hazards, purify the water as by allowing groundwater reconnection, as well as incorporating floodplain areas to create habitat to foster healthy ecosystem food chains that prevent overabundance of nuisance insects.

Stream restoration projects and naturally healthy streams can become an economic cornerstone of a community. Protecting stream valleys as parks is often a valuable way to use open space that would otherwise be too difficult for traditional development. These parks can enhance surrounding property values, create a sense of community identity, or offer recreational destinations, especially for hunting or fishing. These activities foster economic growth and development, as well as provide opportunities for individuals to invest in their communities.

Current stream restoration techniques highlight the importance of reconnecting a stream to its floodplain. This is accomplished by creating areas where the stream can safely spill over the banks in high water situations. This design helps to provide flood protection for surrounding infrastructure and keep water away from homes and businesses. Furthermore, the designed channels often take into account protection of buried utilities and roads that cross the channels. Additionally, these projects provide an excellent opportunity for development of passive recreational facilities including walking paths, playgrounds, or nature centers. Restoration projects can effectively be designed to protect local infrastructure and enhance communities.

Best Management Practices with Stream Health in Mind

Stream health is a reflection of the biological, chemical and physical conditions of the stream and riparian corridor. Incorporating the protection or restoration of streams through effective land use policies and stormwater management does not necessarily require a wholesale change in implementation. There are many best management practices (BMPs) that address the Bay TMDL, stream vulnerability, and other Chesapeake Bay Program outcomes. Evaluating projects for stream health vulnerabilities and developing a range of strategies to offset those vulnerabilities will increase effectiveness of BMPs, decrease maintenance costs, and still help to ensure you are meeting the Chesapeake Bay TMDL requirements into the future. See the table below for BMPs that have several co-benefits* (the goal is to integrate various BMPs that will address the stressors affecting stream health).

Best Management Practice	Stream Health	Co-Benefits				
		Brook Trout	Healthy Watersheds	Forest Buffers	Flood Control/ Mitigation	Protected Lands
Ag Stream Restoration	**5.0**	3.0	1.0	1.0	0.0	1.0
Alternative Water System	**5.0**	2.0	3.0	1.0	0.0	1.0
Forest Harvesting Practices	**4.0**	2.0	3.0	3.5	2.5	0.5
Forest Conservation	**4.0**	4.0	5.0	3.5	3.5	5.0
Ag Forest Buffer	**4.0**	4.5	4.0	5.0	3.5	3.5
Urban Forest Buffers	**4.0**	5.0	3.5	5.0	3.5	3.5
Urban Stream Restoration	**3.5**	4.0	4.0	3.0	3.5	3.0

*Values were taken from the Quantification of BMP Impact on the Chesapeake Bay Program Management Strategies study by Tetra Tech and are based on the best professional judgement of subject matter experts. Appendix E. Final Impact Scores evaluates BMP effects on outcomes on a scale of +5 (very beneficial) to -5 (very harmful). **This table shows select BMPs that scored a 3 or higher for the Stream Health Outcome, however, not all of these BMPs would merit the score of +3 for all projects. Closer evaluation of project site designs, including those from BMPs shown in the above table, is warranted when interpreting these scores.**

Guiding Principles for Incorporating Stream Health

WIP Development

1. Know where your healthy streams are, and work towards identifying those that are restoration priorities.
2. Capitalize on co-benefits: select BMPs that also protect healthy streams and increase land conservation
3. Account for and consider existing stressors: integrate future population growth and land-use changes
4. Align with existing climate resiliency plans (i.e. hazard mitigation plans, floodplain management programs)
5. Engage Partners – work with government agencies, elected officials, and NGOs to incorporate updated data and conservation efforts into existing WIPs

WIP Implementation

1. Reduce vulnerability - design BMPs to reduce land use change, increase land protection, reduce wildfires, and reduce water demand and withdrawals
2. Build in flexibility and adaptability - allow for adjustments in BMP implementation in order to consider a wider range of potential uncertainties and a richer set of response options
3. Adaptively manage - Allow for changes over-time as new data regarding stream health and restoration processes becomes available

Tools and Resources

Chesapeake Progress: Stream Health Outcome
Stream Health Mapper

Chesapeake Bay Program, Scientific and Technical Advisory Committee: Stream Restoration Design Workshop – 2014 Workshop Report

Maryland Biological Stream Survey (MBSS): Probability-based Random Design Stream Surveying

Relevant Literature:

Harman, W., R. Starr. 2011. Natural Channel Design Review Checklist. US Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD and US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Wetlands Division. Washington, D.C. EPA 843-B-12-005

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.

Palmer, M.A., Hondula, K.L. and Koch, B.J., 2014. Ecological restoration of streams and rivers: shifting strategies and shifting goals. *Annual Review of Ecology, Evolution, and Systematics*, *45*, pp.247-269.

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