The Maryland Stream Restoration Association Responds

By Katrina Emery & Jim Gracie

As a non-profit organization that promotes the field of stream restoration through continuing research and education, the Maryland Stream Restoration Association (MSRA) is submitting a counterpoint response in favor of stream restoration. The MSRA executive board felt that Tom Pelton's January 31, 2018 blog post about stream restoration projects and climate change, "Stream 'Restoration' Projects Being Washed Away by Climate Change", was one-sided, with quotes, projects, and rain events that seem to be hand selected to suggest only failure, when instead the field is in a state of growth and innovation. The MSRA recognizes the need to answer various outstanding questions in the science of stream restoration, including the impacts of climate change. However, oversizing channels to handle larger flows or deciding to abandon stream restoration as a solution all together is not the answer. The answer lies in supporting sustainable funding of a holistic scientific monitoring approach to better understand the unknowns.

It wasn't until the mid-1970s that communities and regulators first began to understand the impact that urban and suburban development, spurred by the industrial revolution, was having on local streams and watersheds. Impervious surfaces such as roofs and roads send water (sometimes combined with raw sewage) straight through stormwater pipes and into streams, blowing out stream banks and killing off surrounding stream vegetation and aquatic wildlife. The extra sediment and pollutants then continue downstream to the Chesapeake Bay, where they block light, create algae blooms, and cause dead zones that kill wildlife and impair Bay economies. As research has continued into the ongoing effects of stormwater pollution, the field of stream restoration has developed to address the damage that has already been done by human development.

Pelton's article claims that stream restoration projects do not work because they do not restore streams to the way that they were in the past, though the only way to do that would be to knock down all homes, remove all roads, and reverse development to restore forests, wetlands, and stream valleys to pre-colonial times. Taking reality into account, stream restoration projects instead try to restore some of the ecological functions to the stream, using man-made features that provide immediate resistance to the natural forces. Each restoration project has different goals and priorities for ecological services such as erosion reduction, pollutant removal, and fish or biological habitat improvement, so a project can still be considered successful if it has met realistic uplift goals, even if the stream doesn't look exactly the way it once was.

The science of stream restoration, along with every other infrastructure planning project, will have to adapt to a rapidly changing climate. The increasing strength of storms that is characteristic of climate change will particularly impact our storm sewer infrastructure and the local waterways that will now have to handle all that water. Pelton's article infers that stream restoration designs will fail because of climate change. Stream channels form an equilibrium size that matches the approximate peak annual discharge. If the magnitude of this peak annual discharge changes significantly, the stream channel will adjust to that new discharge. To account for climate change in designing stream restoration projects one would have to know the magnitude of change in the peak annual discharge. In regions where climate change

significantly alters the stable hydrologic regime of streams it will have the same effect on all streams – restored or natural. Current thinking on climate change predicts that climate change will result in more extreme weather events, but as of this time there's been no discernible shift in annual rainfall peaks.

Natural stream channels experience extreme storm events including discharges of higher magnitude than a 100-year flood without widespread or significant damage or adjustment. Natural Channel Design approaches duplicate the morphology of natural streams. If designed and installed properly they maintain their pattern dimension and profile without aggrading or degrading. The Natural Channel Design approach sizes channels to carry the peak annual flow with flood flows dissipated over a floodplain. When streams do not have well-developed floodplains, often the case in urban environments, they are subjected to higher erosional forces in flood flows. Natural Channel Design approaches provide erosion resistant materials for these higher flows when designing streams that do not have access to a floodplain.

When rocks or structures are displaced during high flows, it is usually a consequence of design flaws. These flaws can be rocks that are not sized properly or that get undermined because scour depth was underestimated in the design process. Often large rocks that cannot be moved by flood flows end up being displaced because the substrate under them gets washed out and they roll into the holes that are created by the removed substrate. Also, not getting the design discharge right can result in channel adjustment which causes instability.

Some design approaches, such as regenerative storm conveyance (RSC), use a 100 year discharge as the design discharge. If failures occur with these restoration designs it obviously is not a result of storm events that are too large. Most of the "failures" we have seen with these approaches are a result of cobble being displaced from constructed riffles.

The article also mentions some designs that succeed in rural areas by excavating sediment and creating a wide floodplain. These approaches, also known as legacy sediment removal (LSR), are being applied in various settings. MSRA supports long-term monitoring for restoration projects of all approaches to help teach us more about the success of this approach.

As with any relatively young field of science, or really any field of science at all, there have been technological developments and lessons learned from projects that improve the designs and methods that we use to rehabilitate streams. There is ample scientific evidence that properly implemented stream restoration projects can stabilize stream banks and prevent the erosion that contributes to loss of property and degraded waters in the Chesapeake Bay. Current research focuses on siting the best type of restoration (e.g. Natural Channel Design, RSC, LSR) in the right place, and setting appropriate goals for the existing quality of the stream.

The important thing to keep in mind is that stream restoration is a developing science. New techniques are being tried in hopes of getting better and more lasting results. Squelching innovation and ruling out new approaches will not help further the positive development of the practice. The answer lies in monitoring and measuring the results of different approaches against the goals of the approach. The stream restoration industry has begun doing this with the pooled monitoring program.

The Maryland Stream Restoration Association supports new research and communication in the field of stream restoration to improve the science and practice of restoration. Just as funding for education is an investment in our children's future, funding for restoration projects is an investment in the future of our entire watershed. To find out more about the MSRA and our upcoming events, please visit our website marylandstreamrestorationassociation.org.