New Opportunities: New Native Brook Trout Streams, A New Wilderness

Stream Restoration - Lining

Donald C. Gasper
Fish Biologist
WV DNR - Retired
4 Ritchie Street
Buckhannon, WV 26201

Many reaches of the high Appalachians from Maine to Georgia consist of hard geological strata that resist erosion by water. Softer strata between these hard caps have been eroded to form today's valleys. Many of the beautiful, steep streams that drain the heights of West Virginia's Monongahela National Forest and the counties just to the west of it contain few nutrients or much of anything dissolved in their pure waters.

They are not rich or very productive. A stream beginning to be rich may have a conductance of 50 m/c. (A measure of chemically available things in the flow.) These streams are generally half that and they are not enough buffered. Consequently these streams are able to alter today's Acid Rain only a little, and they take on its acid character. The rain and snow has had a conductance averaging 35 and roughly a pH of 4.3 in this area for the last 50 years. These streams may run pH 5.3. It is neutralized to this extent by the watershed, but at the expense of soil nutrient reserves. Generally half the acid is neutralized by the soil; the other half is carried away in the stream flow.

Acid Rain's accumulative effect is that it is impoverishing further the undeveloped soil and hard geologies of these mountains. These are among our prettiest, and historically most important trout streams. Over 1/4 of all West Virginia's trout streams are at risk. Fish-loss is occurring in the purest of them, and it is a permanent loss.

We must stop Acid Rain. It comes mostly from dirty power plants and dirty cars. Until we do greatly clean-up our air, there is one thing that can be done to prevent further fish loss in some streams. We can put limestone in them. It is fairly expensive, and must be continuously added (at least annually) from now on, and of course, we cannot afford to lime all streams.

Beginning with attempts to add limestone in the Otter Creek drainage on the Monongahela National Forest 40 years ago, the W.V. Division of Natural Resources has been devising methods to add richness and alkalinity to neutralize Acid Rain in acidifying landscapes and streams.

Otter Creek itself was neutralized off and on by various experiments and by a pioneering neutralization station. Then about 20 years ago a larger station was built that has been continually operating to the extent that the remanent Native Brook Trout population from the headwaters above the acid Condon Run and two small tributaries far below have moved throughout the entire twelve miles of Otter Creek. Today, and for the last ten years, it is populated with perhaps 5,000

7 inch-plus Native Brook Trout, Quite a number are 9 and 10 inches.

The D.N.R. has since limestone treated the Cranberry River, as most know. Like Otter Creek, also a Wilderness Area, and undisturbed since the logging of the original forest, it had been acidifying from the 1940s to 1980 by Acid Rain. In 1986 the only fish in the main stem was below the gate and campground, and in the richer 10 mile long "South Fork". The Cranberry treatment began with two stations about 1990 and has been continuous. Stocked trout can live year-round now and they can be stocked anytime in the springtime - when before liming, it was often too acid to stock. Cranberry's large Dogway Fork had no fish in it except near a small lower seep. It was treated in its headwaters by truck dumping sandsized limestone fines directly into the stream channel, and today these Native Brook Trout are found throughout the stream year-round. Always a beautiful stream, it is now a remote nine mile long Native Brook Trout fishery.

Another big station was built above Blackwater Falls and its Canyon to neutralize a trace of mine acid and Acid Rain.

Also a number of beautiful little Brook Trout streams have been chemically "restored" to an earlier richness that Acid Rain had leached away in the last 50 years. Acid Rain and Snow in the last fifty years has amounted to over a ton/acre of Sulfuric Acid at pH 4.3. It is even more on our mountain tops, perhaps 4 X more.

In some of these important trout streams "fish-loss" was complete. In others only the most acid tolerant species of fish, our Native Brook Trout remained. They too, may have disappeared from the naturally more acid headwaters and were about to be eliminated entirely from the drainage.

To save these "races" of Native Brook Trout, the W.V. D.N.R. has now placed limestone fines in the headwater channels of a number of streams. Mill Creek in Kumbrabow State Forest and Red Run of Dry Fork in Tucker County also were treated. These have become good fishable Native Brook Trout populations. The accessible North Fork of Cherry along Highway 39 above Richwood, was treated and its remanent spawning population now is populating the entire stream. It can now be stocked anytime with catchable-sized trout, as it has traditionally, but now without acid shock and loss. The South Fork of Cherry also has been treated. There are other smaller streams too, all pretty that now support Native Brook Trout. In all D.N.R. is working to restore over 150 miles of mostly trout streams with limestone fines.

It is costly and must be maintained but the opportunity to catch or see these beautiful trout in such beautiful streams is a priceless enhancement of our outdoor opportunity and everyone's way of life.

The consequences of the technique of limestone fine enrichment and neutralization has now been carefully reviewed. It is effective and safe. It is the "quick-fix" for acidified aquatic resources. It is safe to use extensively without reservation. It has long been known that you can not "over-dose" with limestone.

Many cautious citizens, with a necessary skepticism because of their regard for these streams, will be glad to finally learn their eternal vigilance is no longer needed in this case.

The concern has always been that as Acid Rain washes dissolved toxic aluminum from the watershed into the lime enriched stream that aluminum will settle out and build up. Would this accumulation then become dissolved again if the treatment stopped - thus forming an enormous slug through the stream and even larger streams below? The answer, lucky for us, is no. As the limed stream has a pH well above 5, aluminum from hill-slope seeps and tributaries will settle out; but the limed stream would have to have its treatment stopped and reacidify to even below pH 4.0 to redissolve the deposited aluminum. The untreated stream would never be that acid; never be acid enough to redissolve the deposited aluminum. Many of us have seen the white aluminum deposit on stream beds where an acid flow meets an alkaline one. We have also noted it does not accumulate much, and at times is gone. We had assumed it was redissolved, but this was wrong. Once the toxic dissolved aluminum is deposited as a solid, it stays that way. The deposit is physically moved downstream - never to be chemically active again. As with any deposit it is physically scoured by sand and gravel as they move downstream. It is safe.

It is effective. Limestone is calcium carbonate. The carbonate neutralizes the acid. With Sulfuric Acid it is one to one. The calcium is a needed nutrient and it also off-sets the toxic effect of some the toxic aluminum directly. Also with the acid neutralization (the pH higher) a lesser portion of the total dissolved aluminum is in its toxic form. Also the greatest exposures occur on water rises and they are of shorter duration "episodes". Finally, with dissolved limestone in the water episodes excursions are not as great - they are dampened. Toxic exposures are shorter and not as severe.

Physiologically Brook Trout have a need for calcium. They can use more dissolved calcium for body building (bones, etc., like ourselves) than dietary calcium. They will elevate their metabolic rate (work) to get dissolved calcium when held in water with low calcium levels as though they were in 15 F warmer water. This is a great stress on trout. Dissolved Calcium then is needed by Brook Trout for its normal metabolism.

Fish Biologists also know that just as they have seen streams become more acid over the years, and the less acid tolerant fish species drop out, and finally only the Brook Trout remain - that when limed and they reverse the acidity, those fish species that compete with the Brook Trout will return. Here and there, for perhaps ten years, they have found that the Brook Trout in stream reaches (sometimes 10 miles long) that are too acid for other fish, do astonishingly well without competition from other fish. They are fast growing with fair numbers that provides more fishing than historically. When it continues to acidity to the point where their own reproductive success becomes limited, even the competition among themselves is reduced. However in just a few more years even the Brook Trout will die out.

If because of acidity the Creek Chub has left the stream it is important that this competitor and predator on Brook Trout be prevented from re-entry after liming. In the warmer, lower end of our Brook Trout streams the Creek Chub is favored and dominates. The limed stream is, of course, no cooler. True "reclamation" demands "restoration" to the original "Brook Trout only"

fish populations that existed in the cooler streams of the original forest. We find today if the headwater stream is cool enough no other fish species is present. Trout Biologists also know where they have eliminated the other fish species, the Brook Trout have been able to inhabit the warmer, lower stream reach that is other-wise Creek Chub dominated with only a few larger Brook Trout present in the spring. Creek Chubs and other fish species should not be allowed to return to streams made again inhabitable by liming. This is a great opportunity, a historical opportunity, to re-introduce if necessary Native Brook Trout from the same drainage and gene pool; or to simply allow the remaining acid tolerant Brook Trout population to expand into the lower, warmer reach. This bigger water has much more productivity and security for a more robust population.

It is ironic that the Creek Chub is a "cool-water" fish with a very limited range of longitudinal distribution in a stream. They are not present when it warms only a little more. They are shortly replaced downstream by the Horneyhead Chub - without overlap. They are not found in any stream much over 50' wide. It would be fortunate if all the Creek Chubs were eliminated down to where the stream was this wide and warm, then there would be no reinvasion by Creek Chubs after liming. This could have been done quite easily on a number of larger limed streams - but it is too late - they have returned. In some places a waterfall would, and does, prevent re-entry. This is so important a consideration that barriers (culverts, dams, etc., to upstream movement of Creek Chubs and even Brown Trout, should be part of the plan. Also if a barrier is needed, no respectable plan should be submitted without the provision, plans and funds for it.

Finally, the usefulness of adding sand-sized limestone in the headwater beds of these trout streams that are naturally without its own limestone geology is just emerging. The fish-loss we have found to date may be just the "tip of the iceberg". It will be needed in an incredible number of streams; because rather than "recovery", as we clean up our air and Acid Rain becomes less acid and active in dissolving out nutrients from now impoverished soils, fewer nutrients than ever before will be delivered to our streams. Fish did not return to a river in Norway as expected after such a clean-up because of too few nutrients - or "low ionic strength" (conductivity) to use the words of Joan Baker in the 1990 N.A.P.A.P. Report[1]. Some fish populations today persist only because of the accelerated leaching of Acid Rain providing the nutrient levels needed to sustain them - they are "hooked on Acid Rain".

Sand-sized limestone additions will be extensively needed - a plausible explanation and reasonable expectation exists. It is an effective safe "quick-fix" for "restoring" our purest trout streams. It is, however, uncomfortably like taking a headache powder for brain cancer. Watersheds continue to acidify with serious forest health and ecosystem function implications. It is important, of course, that we clean up our air. We now have a little idea of the damage we have done, and the price we must pay. We can not afford to further damage our marvelous and mysterious Eastern Forest Ecosystem of which we are a part. We must stop Acid Rain.

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[1]This has happened here - for a very short time. A decaying hurricane came into West Virginia with a lot of rain, but it was a clean rain. Its conductance was only 5. (Its pH was about 5.) When it was transformed chemically and delivered to trout streams in several counties for 2 or 3 days, the stream conductance was only 11. We could have lost fish in hundreds of streams then.