ASHOKAN WATERSHED STREAM MANAGEMENT PROGRAM

Winter 2019

Esopus Creek NEWS

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Esopus • Birch • Bushnellsville • Fox Hollow • Peck Hollow • Broadstreet Hollow • Woodland Valley • Stony Clove • Beaver Kill • Little Beaver Kill • Traver Hollow • Bushkill

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HEALTHY, FORESTED STREAMS ARE GOOD MEDICINE

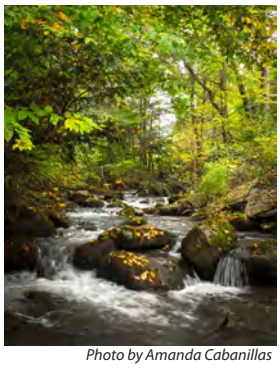


Photo by Amanda Cabanillas

In 2005, Richard Louv's book *Last Child in the Woods: Saving our Children From Nature-Deficit Disorder* ignited a firestorm of concern about the idea that all of us, but especially children, are spending less time outdoors. In response, multiple institutions created programs in local parks and schools designed to reconnect children with nature.

But do nature exposure programs achieve any tangible benefits? Recently, a slew of studies have proven that nature affects our physiology, our emotional well-being, and our ability to think. These studies take advantage of new tools in brain science and they indicate that nature is not a luxury, but rather a necessity for human health. Here are a few examples cited in a 2017 book *The Nature Fix* by Florence Williams:

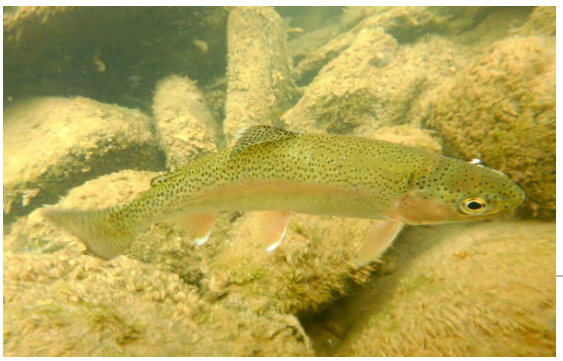
- American researchers are exploring the theory that nature acts like an advanced drug, a sort of smart pill that allows brains to recover more quickly from stress, no matter the source of the stress.
- Amazingly, inhaling the chemicals released by trees during a walk in the woods can reduce stress fifty-three percent and lower blood pressure by five to seven percent.
- Korean researchers found that immune-boosting killer T cells of women with breast cancer increased after a two-week forest visit and stayed elevated for fourteen days.
- After eleven- and twelve-year-olds who qualified as borderline technology addicts took two-day trips to the forest, researchers found both lowered cortisol levels and significant improvements in measures of self-esteem. The benefits lasted for two weeks.
- Multiple studies found that being able to view nature through a window supports increased worker productivity, less job stress, higher academic grades and test scores, and less aggression. Viewing nature releases natural opiates in the brain.
- Finnish studies show a thirty-to-forty minute walk is enough for physiological changes and mood changes and probably for improved attention.
- Dutch studies have shown remarkable mental and physical health benefits of living within half a mile of green spaces, including reductions in diabetes, chronic pain and even migraines.
- Spending more time outdoors is emerging as an important tool for regaining lost physical and mental health, such as for veterans with PTSD.

By now, you may be feeling lucky to live near or regularly visit the abundant forests and beautiful streams of the Catskills. But let's look closer at the importance of being outside in nature for children in particular. According to research by the Outdoor Foundation, participation in outdoor activities has declined, and has declined the most, by 15 percent, among six-to-twelve-year-olds between 2006 and 2014.

That's important because when kids go outside, they start moving. As reported by Williams, a large meta-analysis of dozens of studies concluded that physical activity in school-aged children (4-18) increases performance in brain function: perceptual skills, IQ, verbal ability, mathematic ability, and academic readiness. The effect was strongest in younger children.

The latest science is clear – getting outside on a forested trail, going to a river, and engaging in learning outdoors are good for our brains and overall health.

Are invasive fish harming Rainbow Trout in the Ashokan Reservoir?



Imagine standing in the sun and seeing a flash of silver beneath the surface of the water. If you are upstream of the Ashokan Reservoir, you may have glimpsed Oncorhynchus mykiss or the Rainbow Trout.

Photos by Ed Ostapczuk

Rainbow Trout have thrived in the upper Esopus Creek since their introduction in the 1880s and now reproduce on their own as a wild population in the Ashokan Reservoir and its tributaries.

Anglers, however, reported a decline in Rainbow Trout populations in the 2000s. Quantitative fish surveys conducted annually by the U.S. Geological Survey (USGS) at nine sites on the main stem and tributaries of the upper Esopus Creek from 2009 to 2013 showed the mean density of Rainbow Trout populations declined from 114 to 17 fish per 0.1 hectare during the period. The NYS Department of Environmental Conservation (DEC) also observed a decreased number of fish captured in the Ashokan Reservoir by 2013.

Fortunately, the density and biomass of Rainbow Trout in annual surveys has significantly improved since 2015. But fisheries managers were left wondering if the worrisome population decline was normal, or if a new threat to Rainbow Trout had emerged.

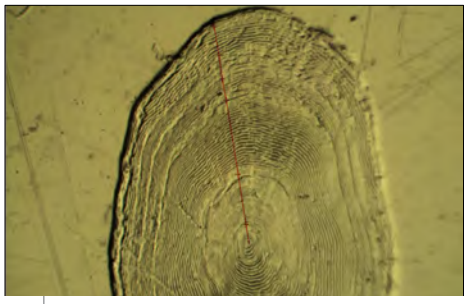
Around the world, trout populations can be permanently changed by long-term disturbances like un-abated habitat degradation or damming and nonnative species introductions. One potential explanation for the Rainbow Trout decline was establishment of two non-native fish species introduced to the Ashokan Reservoir.

In the Esopus Creek, Rainbow Trout move between cold, high tributaries of the upper Esopus Creek where they spawn, and the Ashokan Reservoir. Once in the reservoir, trout enjoy an abundance of forage fish and a more stable habitat than the river.

The Alewife was introduced to the reservoir in the 1970s and White Perch in the 2000s. Neither species is native to the upper Esopus Creek and both could potentially change the type and abundance of food available to other fish.

To help determine if the introductions negatively affected Rainbow Trout, the Ashokan Watershed Stream Management Program (AWSMP) funded researchers from the USGS to look at the rate of Rainbow Trout growth and other indicators of health using a suprising tool — fish scales.

Like most fish, Rainbow Trout have scales, which are actually hard plates that protect the skin from injury. As fish grow in length the scales expand in size as well. Fish scales provide an effective way to age short-lived fish living in regions with distinct seasons. The concept works similarly to determining the age of a tree from tree rings. A hard ridge appears on the scale when fish are growing slowly during winters – the ridge is called an annuli – and the number of annuli can be read as the number of winters the fish survived.



A fish scale seen under a microsope. Photo courtesy of USGS.

The NYS DEC has been archiving scale samples from Rainbow Trout in the Ashokan Reservoir since 1952. Using historical scales, researchers calculated the age and body lengths of Rainbow Trout and measured their growth rate. The samples were divided into three periods: pre-Alewife and White Perch introduction, post-Alewife introduction, and post-White Perch introduction.

Surprisingly, the analysis showed that Rainbow Trout growth *increased* during the period after introduction. The relative weight of sampled fish also increased. After reviewing published studies for similar fisheries, USGS researchers concluded Rainbow Trout growth in the Ashokan Reservoir and the upper Esopus Creek was similar to other North American populations.

Together, these results suggest the decline of Rainbow Trout populations in the Ashokan watershed was not directly related to reduced growth or starvation following the establishment of Alewife or White Perch. Other changes in the watershed and its ecology may have affected the growth and condition of Rainbow Trout.

Knowing these results, future research and management may focus on identifying, studying, and protecting areas where Rainbow Trout spawn. The good news for managers and anglers is that protecting or enhancing spawning habitats is easier to achieve than controlling populations of small invasive fish in a large reservoir.

The study was conducted by Scott George and Barry Baldigo of the U.S. Geological Survey, Mike Flaherty of the NYS Department of Environmental Conservation, and Eileen Randall of Eco-Logic. A peer-reviewed article on the study was published in the the North American Journal of Fisheries Management. For more information see: https://doi.org/10.1002/nafm.10203.

THE 'LONG PRO' VIEW OF STREAMS

It's a cool stream management term and a useful tool for tracking how stream beds change over time - it's the 'long pro' (short for longitudinal profile). A longitudinal profile is a lot like looking at your friend from the side - you notice their magnificent nose and ask, how steep is the "slope" on that profile? Well streams have ups and downs, and changes in slope (a measure of steepness) like a human profile.

Starting from the highest elevation and flowing down valley, streams lose elevation in fits and starts. At some points the channel bed is highly sloped and water flows fast, or maybe drops abruptly in a waterfall. At other points along the profile, the channel bed is bottomed out and water temporarily pools.

Long pros are created by walking the deepest part of the stream (called the 'thalweg'). Elevation is measured at the top and bottom of channel features such as riffles and pools, at their maximum depth, and at other points of interest to capture slope.

After the elevation data is graphed, you can calculate the slope of riffles, pools, and specific reaches and gather other key information such as pool depth. AWSMP surveyed a total of 2.4 miles of longitudinal profiles over 8 stream project sites during 2018.

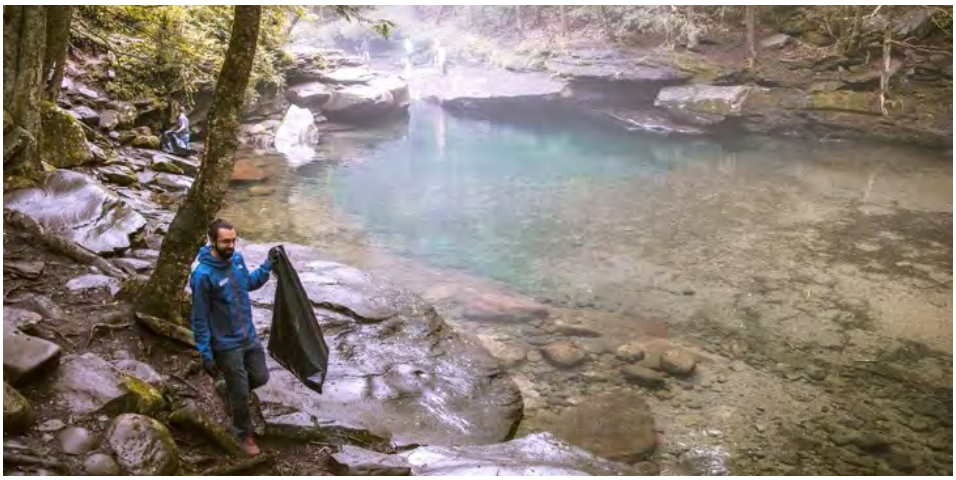
By annually repeating the same longitudinal profile at stream restoration sites, we can track which areas are stable versus where the channel bed is building up (aggradation) or cutting down (degradation).

It is common for riffles and pools to further develop after project construction as the stream experiences larger flows that mobilize stream sediment. This may involve shifts in feature type, changes in depth, or channel features becoming more distinct and diversified.

If you see AWSMP field crews running a really long tape down the center of a stream, they are capturing a long pro.

A longitudinal profile of Stony Clove Creek at Wright Road, where a stream restoration project was constructed in 2015. The longitudinal profile is a sideways view of the stream with the lower line representing the channel bottom and the upper line the water surface. Riffles are where the two lines are close together and parallel. The lines separate at pools - with the greatest separation being the maximum depth. A detailed longitudinal profile can even pick out runs and glides, which are the transitional features between riffles and pools.

FIELD NOTES



Andy Mossey, a Blue Hole Steward from May-October 2018 removes trash at the popular swimming hole in Peekamoose Valley.

What is the capacity of a resource that is heavily used for recreation? That's a monitoring and management question public land managers grapple with according to Dr. Chad Dawson, keynote speaker at the 2018 Catskill Environmental Research & Monitoring (CERM) conference held at Belleayre in October. Dawson is Professor Emeritus of Recreation Resources Management at the SUNY College of Environmental Science & Forestry (ESF).

One tool for managing heavily used recreational areas is called "Limits of Acceptable Change" or LACC, developed by the U.S. Forest Service in the 1980s.

This tool identifies critical components of a natural area to be monitored and the desired condition that should be maintained through management.

Aaron Krinsky, a graduate student at ESF, reported on how the NYS Department of Environmental Conservation is using LACC to manage recreation at the Kaaterskill Falls in Greene County. The falls are just one scenic spot in the Catskills that is trending on social media and experiencing heavy visitation. At least 18,000 visited the falls in 2017. Indicators of change were established for trails, parking, vandalism, social experience, enforcement and emergencies, and more. LACC informed recent actions taken by DEC at the falls, including new hardened trails, access points, expanded parking, fencing and on-site controls, kiosks and signage, and enforceable regulations. Similar monitoring is underway at Blue Hole, an in-channel pool in Sullivan County visited by recreationalists.

To see presentations by Dr. Dawson on LACC, and by Bill Rudge and Andy Mossey on stewardship at the Blue Hole, visit the 2018 CERM website: http://ashokanstreams.org/conferences-training/past-conferences/.

2-Day Elevation and Floodproofing Workshop

Municipal officials of the Ashokan Watershed are invited to attend an *Elevation and Floodproofing Workshop* on March 26-27, 2019 at the Emerson Resort in Mount Tremper, NY.

Day 1 of the workshop is a detailed examination of all aspects of the elevation and floodproofing process. Day 2 features a bus tour to local elevation sites. The workshop will be delivered by national experts in floodproofing, elevation and structural moving, along with state and county staff.

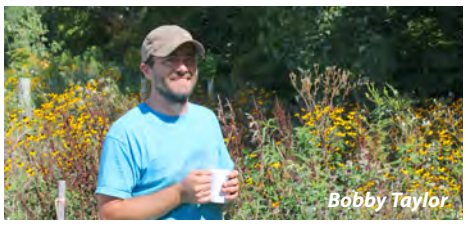
Continuing education credits for Code Enforcement Officials and Certified Floodplain Managers will be provided.

The workshop is free of charge for Ashokan Watershed municipal officials, but space is limited. Contact Brent Gotsch at bwg37@cornell.edu or call 845-688-3047 ext. 3 with questions.

Native Beetles Munch Down Willows

Last summer, Ashokan Stream Buffer Coordinator Bobby Taylor noticed that willow shrubs along the Bushkill in West Shokan were completely bare of leaves. The "culprit" was a native beetle from a family of *Chrysomelid* leaf beetles. Leaf beetles are major consumers of willow shrubs in the United States. Their populations can explode depending on predator populations and the weather. Willow leaf beetles defoliate their host plants over a season and then die back. The willows typically survive. For more information on willow leaf beetles, see this fact sheet: https://bit.ly/2WGKT15.

For more information on willows, visit Cornell's Willowpedia: http://willow.cals.cornell.edu.

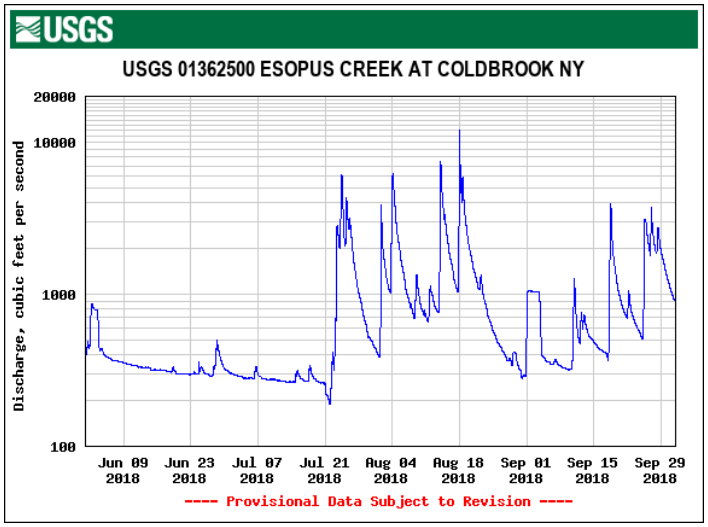


If your Ashokan watershed stream buffer is looking unhealthy and you have questions, contact Bobby Taylor of Ulster County Soil & Water at bobby.taylor@ashokanstreams.org or (845) 688-3047 x6.

Good for fish and fungi

During the summer months when stream flows are typically at their lowest, the Esopus Creek in 2018 was a lush, flowing oasis for everything that loves wetness. Stream flows at the USGS monitoring gage at Coldbrook spiked in July and remained high into fall - discharges are shown on the graph at right.

According to the Northeast Regional Climate Center at Cornell University, summer precipitation was 122% of normal for the region. August precipitation was 135% of normal. The exceptional wetness continued into autumn. In fact, the Northeast had its wettest autumn since 1895. Although the wet summer and autumn negatively affected agriculture, it was certainly good for aquatic life and other organisms. Enjoy the diverse array of mushrooms and fungi (photos below) observed by AWSMP's stream assessment crew as they surveyed Lost Clove and Hatchery Hollow Brook in the upper Esopus Creek.



Streamflow discharge for the upper Esopus Creek from June to September 2018 measured at Coldbrook, NY.

Photos by Allison Lent

Climate Data Source:
http://www.nrcc.cornell.edu/services/reports/reports.html

Winter Water Cycle

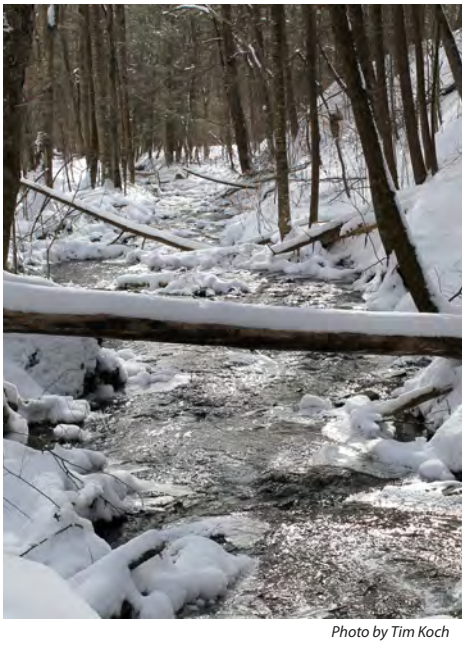


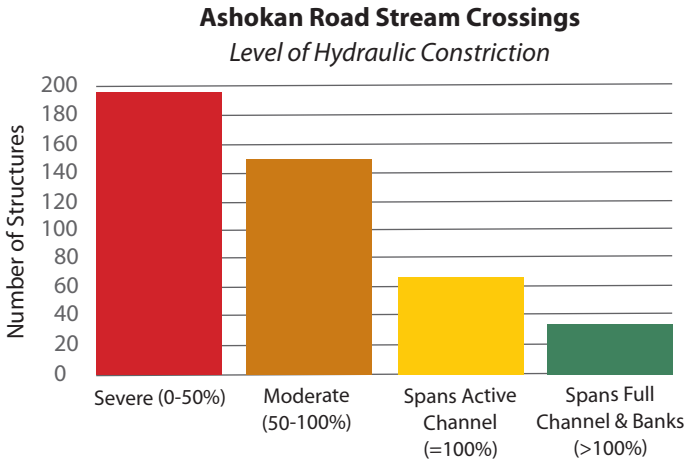
Photo by Tim Koch

We all learned about the water cycle in school. Water falls to the ground as precipitation where it is either used by plants (transpiration), evaporated from the surface, infiltrates into the ground, or runs off into streams and rivers. But what happens in the winter? All the plants are dormant, the soil is frozen, and the air is cold. It was very cold on a mid-January day with knee deep snow along Rochester Hollow Creek (left), yet the stream was still running.

In the winter, billions of gallons of water are stored in snow and ice. During long cold spells when the temperature doesn't get above freezing, a lot of the running water we see in stream channels is actually groundwater, similar to how streams continue flowing during summer droughts. It's not until temperatures get above freezing that all that water stored as ice and snow will need some place to go. When it does melt, it quickly runs off over the frozen ground to the nearest stream channel.

With the water cycle being dominated by surface runoff at this time of year, it is common to see the highest annual stream flows in the later winter or early spring. The combination of rainy spring weather, melting snow, soil that is still frozen, and plants that are still asleep means that most of the water becomes runoff, and the streams run high.

CONSTRICTION — AN "UNDER-SIZED" PROBLEM



There are so many road-stream crossings in the Ashokan Watershed, over 600 total, it's easy to not think about them. At road-stream crossings, streams flow through culverts (less than 20 feet in width) or bridges that lie beneath the road surface.

Many of these crossings were damaged or completely washed away during the flood of record that Tropical Storm Irene created in 2011. That happened partly because the culvert or bridge inlets were narrower than the active channel and they constricted stream flows during the flood.

Constricted streams can create a number of problems. Upstream of a constricted bridge or culvert, sediment deposition, debris clogging, and increased flood hazards are the primary concern. The principal issues downstream are an increased chance of severe erosion, undermining of bridge support structures, and aquatic habitat fragmentation. If you have ever encountered a locally flooded roadway it is likely due to an undersized, or hydraulically constricted culvert or bridge.

Town, county, and state highway departments closely monitor the condition of culverts and bridges within their jurisdictions. They are replaced when needed and on-site assessment and computer modeling may be used to determine whether a road-stream crossing structure should be, or can be enlarged.

To help highway departments identify structures most affected by constriction, AWSMP staff assessed over 400 watershed culverts and bridges in 2018. The degree of constriction was calculated for each location. Constriction is calculated by measuring the width of the culvert or bridge inlet, dividing that number by the width of the stream, and multiplying the result by 100 to generate a percentage. A severely constricted culvert or bridge can pass only 50% or less of the active channel flow (see graph at left).

Of the 446 structures assessed this summer, 346 (78%) were severely or moderately constricted. AWSMP is working with local highway departments who want to "upsize" their culverts and bridges. Resizing these structures greatly reduces flood risks and annual maintenance costs, while water quality, structure longevity, and aquatic habitat are substantially improved.

Improving Culvert Capacity in the Town of Olive

In 2015, the Town of Olive hired Woidt Engineering & Consulting to conduct a Local Flood Analysis for the hamlets of Boiceville and West Shokan. The Local Flood Analysis identified flood mitigation actions that were feasible and cost-effective, including under-sized culverts that are constricting flows and causing flood hazards.

Several road-stream crossings were identified as priority flood hazards within the Olive hamlets. Those crossings are at-risk of loss or being overtopped due to constriction (described in the article above). While no crossing can be made completely resistant to loss or flooding, crossings can be more resilient at a wider range of flows.

To address the culvert, the Town of Olive hired consulting firm Milone & Macbroom, Inc. with funding from the AWSMP to develop new designs for the crossings. Funding is also available from the AWSMP to help construct the new crossings with an approved design.

A road-stream crossing on Upper Boiceville Road can be overtopped starting at the 1 in 50-year return interval flood. Flooding makes the road impassable and could damage the crossing and close the road until it is repaired or replaced. Upper Boiceville Road is the auxiliary north to south traffic corridor if State Route 28 is impassable and closure of Upper Boiceville Road could cause lengthy detours.

Two crossings near the intersection of DeSilva Road and State Route 28 are under-sized —a pipe culvert crossing under DeSilva Road and an existing arch culvert under the terminus of Old Route 28. DeSilva Road connects Upper Boiceville Road and State Route 28.

In West Shokan, the Dry Brook, a tributary to the Bushkill passes through a culvert underneath Burgher Road. The culvert is frequently inundated isolating seven homes north of the crossing. The road is submerged during the 1 in 50-year flow event by 1.3' of water.

The town is seeking project designs that reduce constriction at these sites and increase the amount of water, sediment and large wood that can pass through the crossings. Engineers will explore concepts to pass a range of flows, including the 1in 50-year and 1 in 100-year flood events or larger, before initiation of a detailed design phase.

For more information on flood mitigation in the Town of Olive, visit https://town.olive.ny.us.

Photos of road-stream crossings in the Ashokan Watershed taken during summer 2018 by Amanda Cabanillas, Geomorphic Field Technician for the AWSMP.

Esopus Creek News

AWSMP UPCOMING EVENTS

Snow Shoe Stream Walk

If conditions are right, we'll hold a snow shoe stream walk in March. Check our website at www.ashokanstreams.org or follow the AWSMP on Facebook for event date and time!

Call the AWSMP at (845) 688-3047 to register, or for more information

Saturday, May 19

Family, Fun & Fish Day! At Kenneth Wilson Campground in Mt. Tremper, 1-3pm. Bring the entire family and learn how to fish!

Summer 2019

Stream snorkeling returns! Sign up for event notices by emailing info@ashokanstreams.org.

Ashokan Watershed Stream Management Program

Cornell University Cooperative Extension Ulster County

Soil and Water Conservation District

NYC Environmental Protection

Ashokan Watershed Stream Management Program
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