

Notes from the 2018 Bog Learning Network Meeting

Day 1 (March 13, 2018) only -- Day 2 was cancelled due to snow
Meeting is not being recorded this year.

Introduction of BLN Steering Committee

Adam Warwick – chair of the BLN, TNC NC

Carrie Radcliffe - Atlanta Botanical Garden, GA Plant Conservation Alliance

Gabrielle Grater – NC Wildlife Resources Commission

Claiborne Woodall – VA Natural Heritage Program

Rebekah Reid – US Fish and Wildlife Service

Lauren Reker – MountainTrue, KD Ecological Services

Mincy Moffet – GA DNR

Supported by Jennifer Lamb – TNC NC

1:15 Monitoring and Management of Phineas Fen (Cutshaw Bog)

Chris Stoehrel, Wildlife Biologist, Cherokee National Forest

The area is a series of 4 wetlands north of Rich Mountain. Phineas Fen is one of these. Divided by Forest Road 93, which gets full of sediment. Early land ownership by mining company and then condemned and bought by FS. Thinned in the 1970's. There is an excessive amount of white pine and a French drain project. Designated as a rare community by USFS. Bird Survey monitoring since 1996. Previous BLN meeting (2013) made management recommendations. Current issues: Sedimentation, NNIS, upland hardwood conversion, woody encroachment, head-cutting caused by channelization of water, bears destroying hydrologic wells.

Objectives: Water Quality – Reduce/eliminate sedimentation, raise water table/expand wetland size. Protect rare spp. Maybe reintroduce turtles. Increase game spp. Allow for education and interpretive trail because has a flat road and easy access.

Last year held Bio Blitz – did CVS level 5 surveys – Brenda Wichmann and Caitlin Elam counted 50 species in the two CVS plots. Did Aquatic Data Survey, Bird survey, Amphibians/ reptiles Survey and also 25 fruiting bodies of mushrooms photographed but didn't have the expertise to identify. All ground-fed, channelization and head-cutting is draining the fen out. Soils – 60 samples done, sandy loam and loam.

Management plan reviewed quickly and available – removing French drain, decommission road, retain berm under the road, create appropriate spillways, place wood in the stream to dam up current trenches, trying to avoid having to put in an earthen dam. They need to have expertise on how to go about the head-cut under control. Light discussion on role of beaver in wetlands.

1:30 Plant Propagation agreement between Cherokee NF and Overhill Gardens

Chris Stoehrel, Wildlife Biologist, Cherokee National Forest (for Mark Pistrang)

Works on the north zone of the Cherokee NF and does some of the planning and planting of these native plants. They wanted to find a way to revegetate restored areas. Previously they were using less specific seeds and now want to revegetate with native seed specific to native ecotype. There wasn't a market for these and very few places to purchase, so now trying to collect on the Cherokee specifically in TN. Initially started with 8 species. They wanted species

that were beneficial for pollinators and perennials. They gave the nurseries a list of 14 species and then he wanted one thousand plants of 7 species. This was started in 2014. They are now contracting with Overhill Gardens Native Nursery. The first year they collect seed. The second year they propagate the seed. Any extra over the order from USFS, they are allowed to sell commercially. Can call and discuss with owner Avi Aski for orders. Right now just doing perennial, herbaceous plants. Recently they were able to provide some blueberry and other shrubs. Another place, Carolina Native Nursery, collects native seed and grows on NC side, in Burnsville. Prices from Overhill are, so far, less expensive than non-native plant nursery. One of the issues is having plants available for delivery vs. when they can use them. They have lost some plants and seed due to storms. They are using a local High School 4-H club to help take care of the plants in between nursery establishment and when USFS can get into the ground. They may use AmeriCorps NCCC teams to help take care of these and get all plants into the ground at one time. They have had some plants overwinter before being put in the ground. They were originally doing more dryland sites but are shifting to some facultative wetland species and more wetland spp. Turning plants over to ABG also an option, for them to propagate. Southern Appalachian Germplasm project created additional native seed using Roundstone Seed Co.

Q: What permits are needed? Commercial permits would be necessary.

Q: Do you use a cost-share or vendor agreement with Overhill? Vendor agreement. Cost-share agreements can be used. Volunteers provide time as match, USFS puts up \$ for the materials. Chris would like to continue to have help watching after the plants in the Greenhouse. Mark Pistrang came up with the idea to do this cost-share.

1:45 Fire History in WNC, Case Study at Panthertown Valley

Mandi Miller, UNCA

Undergraduate research under Dr. Emily Coffey. Overview of the importance of fire. Did research in the bogs to determine frequency, severity, and size of fires. They want to give this data to USFS and TNC. Went to White Oak Bog and Pink Beds. They also collected at Panthertown. Radiocarbon samples completed to date the cores. They counted macro vs. micro charcoal pieces. Macro indicate localized fire (fire in bog), micro indicate local fire. They did experiments to see how they should process the core. They are still waiting on calibration and cannot give exact years of fires yet. They got 5616 year core from Panthertown. Fires in the past 1000 years and Fires around the 5000 year range. Fires were part of the wetland bog system in the past. Showed at least from two ages of fires that were pre-European settlement – at 500 years and 5000 years. Was there a gap in between?

Smaller charcoal – micro can fly in from areas further away. Macro pieces – indicate a fire right inside the bog. They will look at the pollen records as well but that hasn't been done yet. They did a full soil profile description as well and it will be published in Undergraduate Research Study. There are additional folks at WCU and historical. Dr. Coffey now working at Atlanta Botanical Garden and will bring a protocol for this soil core research to GA bogs and beyond.

Biodiversity of Testate Amoeba in Western North Carolina

Madeline Scheer, UNCA

Testate amoeba (TA) are abundant microorganisms. Part of the nutrient recycling. Proxy for environmental acidity and other land use changes over time. Sphagnum is where the TA reside.

In Panthertown two TA were abundant on the sphagnum. Took 16 samples in November 2016. Vegetation surveyed at sample sites, Depth to water table, sphagnum and soil collected, TA identified. Examined biodiversity, used PCA statistical methods, and DCA. 42 taxa found, including 15 genera, 7 families and 30 species. Three genera accounted for over 63% of the diversity. Diversity similar to Shannon's diversity curve. Carbon, PH, and depth to water table all helped describe the species richness and usage of areas by different species. Saw potential evidence of 2016 drought and stress in the relative abundance and location of ameoboma across the landscape. These TA are the top predators of their micro-ecosystem.

2:00 Restoring Southern Blue Ridge Mafic Fens and Woodlands in VA: 2 Decades of Active Management at Big Spring Bog and Grayson Glades SNA Preserves

Claiborne Woodall, Southwest Regional Supervisor and Natural Areas Steward, VA NHP
He is based out of Abington, VA and works with prescribed fire and stewardship in VA. VA NHP has 63 preserves totaling 56K acres to steward, with 15 stewards to work on their natural areas. He manages the preserve in southeast VA over into Ridge and Valley areas. One third of the sites have public access. Prescribed fire management an important part of what they do. Number of plants and systems are fire-adapted. Speaking today about two of their smaller preserves – Big Spring Bogs and Grayson Glades. Area is historically called the Glades. At 2500 feet near the Blue Ridge Parkway. Melting pot of northern and southern spp. Influenced by cold weather and New River Valley drainage. These are Mafic Fens and Woodlands. Support one of the highest concentrations of natural heritage resources. They would historically have been kept open via various disturbance regimes- fire, beavers, grazing etc. Very fragmented by development and small residentials, farms, etc., with ditching and draining. Big Spring Bog supports 16 rare plants with high biodiversity. In 2000 it was closed canopy with very small open area. It had succeeded rapidly since inventory in 1980's with rose, maple, and white pine. They needed to take action. They used a WHIP grant/contract for mechanical opening and prescribed fire. Established monitoring plots similar to those used today by Fire Learning Network. They had to control NNIS, rose, bittersweet, *Microstegium* (first found in 1980's in VA.) Used Post herbicide at .25%, low concentration. In 2006 started RX fire, which was higher intensity at that time. Sites been burned four times since 2006. Rare species present. Management objective was to expand area for understory rare plants. Showed photos of the areas becoming much more open over time with this introduced fire. Some areas have had a large increase in ferns. After 3-4 burns they saw pitch pine regeneration. Expanded from .2 acre to 4 acres of open fen. Tree shrub cover reduced by 75%. Stiltgrass less than 10% cover. Five species they couldn't find in 2000 have re-appeared.

Grayson Glades: Took lessons from Big Spring Bog and started to apply there. Much more open when purchased. Very open, history of grazing. Some coastal plain disjuncts. Burned in 2016. NNIS Himalayan rubus is there. Reduced Alder, increased *Sanguisorba*. Opening up the canopy.

Next steps: herp survey, monitor ground water, NNIS detection, cranberry not flowering or fruiting since 1980's, climate change implications. Deer density could possibly be impacting. Soil is mineral soil and 24 inches to a gravel substrate. All the burns have taken place in April. They have not been spraying the *Microstegium* since 2012. They noticed more competition from native grasses and sedges that could now outcompete the *Microstegium* after fire.

2:30 Bog Ecology Review

Mike Schafele, Terrestrial Ecologist, NC Natural Heritage Program

He spends time thinking about Bogs vs. Fens. There is this definition that Bogs are ombrotrophic/rain-fed vs. minerotrophic/groundwater-fed. He wanted to take northern species and tried to show which were bog or fen but “failed” because these are ambiguous between fens and bogs. Bogs and fens are not always a broad kind of site with zones that are fen or bog. You have a lot of zoned wetlands with different name and different vegetation. Conditions can be mixed even within several square meters. With pH changing from the top of hummocks to the bottom of hummocks. There is also idea that these could evolve into one another over time. For example - with change in water table. For example - Welsh bog moved from marsh to rich fen to poor fen to bog to fen to bog to rich fen over 10,000 years. Change were slow here and caused by climate changes and bronze-age people moving in for farming. What can we get out of that? The flora we share with the north has a mix of bog, fen, and ambiguous species. Could we look for a bog zones and fen zones in our mountain wetlands? Rising as well as falling water table may have negative consequences for bogs. Cattle grazing may have broken up hummocks.

Succession – A lot of studies found that successional stage is not just direction but is cyclical. We get differentiation and climax as a pattern more often on the landscape, rather than just being directional. For example the succession of open water glacial kettle holes turning to bogs and then forest. Paludification – drier land turns into peatland and then once soil is saturated and nutrients get locked up. The peat builds up and fen and can turn into a bog. Dependent on a northern climate more often. Large scale paludification also has happened on the coastal plain.

Succession has been rehabilitated by adding more facts and modifying the theory. Newer bog climax model of kettle holes shows succession does not lead to mesophytic forest.

Paludification eats away at forest on its edges, may lead to expansion of bogs. How does this apply to southern Appalachian mountains? White oak bottoms has had peat in it for 14,000 years, how to explain this? In the north, bogs and fens tend to be climax communities or stages in a slow primary succession and they are not early successional communities. Northern species in our open bogs suggested that southern bogs are not early successional.

Universal adaptive strategy theories: J.P Grime

Three primary strategies. 1 – competitiveness – grow large, hang on, dominate

2 – stress tolerance – correlated with long life span, ie. *Juncus trifidus* (rock outcrops/ bogs)

3- Ruderal – maximize reproduction, fast growth. ie. *Stellaria media*

Any species can have any mix of these.

Conservatism – limited ability to deal with disruption or to invade new habitat. Coefficient of conservatism helps you use a species list or quantitative way to rate sites. These may need more protection? Higher numbers – 10 out of 10 is often bog plants.

Stress-tolerating species and high conservatism spp. are found in bogs. That tells us they have been there for a very long time. They need stress to outcompete generalist species.

Classification of Southern bogs – Brenda Wichmann did multivariate analysis, ordination and dendrograms of the bog communities. Disturbed bogs are areas that had had recent disturbance but were still intact. The successional vegetation was more homogeneous.

4th approximation classification has 10 mountain bogs and fens. As a manager your bog has already been classified and you don't need to classify to have it be helpful. It can be used to help compare to different types for reference site information.

NC Division of Water resources is using C values and publishing these. It's on the [Southeast Wetlands Workgroup website](#). Higher C values – many of these type of species tells you that your restoration is working. It also tells you that plants with a higher C values may need to be protected more.

Q: Gabrielle asked about multiple sites where the bog is adjacent to an old pond. When she first saw those old ponds they were wide open water and now they are closing in. She sees ponds turning into bogs. Rock quarries turning into bogs. How do these fit in? For example, Ida's bog was part rock quarry and part of it was still a bog and then it spread back over the old rock quarry area. Mike thinks there was most likely a bog nearby when a bog "pops up." He thinks there had to be a local seed source. Dr. Wilcox said large flooding events can change these ponds that are overgrown back to ponds. If there is a deposit of sediment over a natural floodplain should it be removed if it's on top of the wetland soil? Mike says possibly but make sure that hydrology is in place.

Gabrielle is managing with lower-quality sites that are surrounded by habitat fragmentation. What can we do? Mike says we can take what we can get in and do the best that we can. Should we bring in other plants in since nearby plants don't exist anymore? Carrie at ABG says they did try to bring in federally listed species, when appropriate. Mike is saying think about what kind of site it is - we have limited reference conditions but think about what could have been there in as similar a site as you can.

Q: Clint asked about disturbance communities. Is it plausible that these patch fens and bogs meet that definition that they are climax given a consistent disturbance regime? Mike says it's possible but unlikely for most of our southern Appalachian bogs. Characteristic species are not ruderal. We are in a conundrum. He thinks the most likely reason why these bogs are getting out of whack in the last 30 years is because of grazing. It might be worthwhile to look at northern bogs to see how they respond to grazing. We need to figure out how to keep the woody vegetation out without causing as much disturbance. He thinks hand removal better than grazing. He's unsure about fire in bogs. Possibly those that are graminoid dominated and tied to the upland it may be more possibly tied to fire. The C- species are not tied to fire in other locations so he's unsure that they would be in bogs as well. He thinks the argument against grazing in intact bogs is clear.

Clint said Doug Ogle felt that the fire effects were positive but didn't necessarily agree that it was fire adapted in the past. It may be the best tool that we have to get the results we want. Grazing debate: is there an animal that would get less nitrogen impact? If it's heavily altered then maybe try the grazers like goats because they are lighter. Mike thinks that cows have the greatest impact.

Be careful releasing more nutrients with fire.

In Bluff Mountain Fen and Eller Seep have shallow soil and may be more adapted to fire? Mineral soil and fire needs to be considered. She doesn't think fire would be a regular occurrence with a deep organic soil.

Q: What are your 2-3 take home messages? Mike says to try to minimize disturbance. Keep stressful low-nutrient conditions as long as the trees aren't coving them up. In the long run it's the best chance to let them re-find their own stability.

Innovative Mgmt Panel Presentation and Discussion:

Bogs and Hogs...Management beyond corral traps

Carrie Radcliffe, Restoration Coordinator, ABG and Mountain Bog Project Coordinator, GPCA
Her role is coordinating rare species management on behalf of GPCA. South Carolina is having more problems with hogs in rare plant sites as well. Doing trapping, cameras, in person monitoring, physical exclosures. They have volunteers who re-plant rare plants that have been dug up. If they have cell service they can put up a game camera with remote possibility. They also have more heavy duty exclosures and intensive trapping. Working with DNR and different FS districts to help address these. They are safeguarding ex situ when needed. They had sounder of 17 hogs that went to the same site three times in six weeks and disturbed pitcher plants. Doing flat hog fencing that *Sarracenia rubra* can grow through. Also have done fort style brush exposures. Tried not to put the brush too close to the rare plants because don't want to add nutrients.

Using M.I.N.E gates and camera with portable trapping season. It will be installed after trapping season is over.

Systemized Herbivory to Manage Woody Encroachment and Non-native Vegetation

Lauren Reker, Owner, KD Ecological Services & NNIS Coordinator, Mountain True
Systemized herbivory is strategic application of livestock forage for vegetation goals. Used for bald maintenance, NNIS mgmt., agroforestry, fire fuel reduction, wetland restoration etc. Grazers – cattle sheep horses consume grass and forbs. Browsers consume wood stemmed vegetation – goats and deer. Cows don't mind getting their feet wet. Goats are averse to water, and less likely to pollute water. Intensive applications are less than 1 month with moderate to high stocking density. Used on sites with high percent cover of unwanted target species. Case study in McClure's bog – goats were used to reduce NNIS in specific area in less than 30 days.

Using Herbicides of Undesirable Woody Vegetation

Thomas Floyd, Biologist, GA DNR

Due to habitat fragmentation and degraded sites he used the tools given. How do we proceed? Manual woody removal is a very labor intensive. He did robust study to look at the most efficient and effective way to keep these site open in northern GA. They did three treatment of: triclopyr stump application, burn, torch of cambium. Stem count increased in the control plots. Herbicide gave 98% reduction. Torch decreased somewhat. Fire decreased stem count. Herbicide was most effective by far, then fire, then torch. Hopefully after herbicide use it could be maintained by fire.

Controlled Burning in Wetlands

Adam Warwick Stewardship Manager, TNC

Eller Seep is one place he has burned. Low mountain seepage bog. Dominated by graminoids. Coastal plain disjunct species. Flowering has increased each year since TNC burning. Long history of the site burning pre-TNC ownership. Upland ridges around Eller Seep are fire-adapted ecosystems. It's a south facing slope. Burned annually from 1908 to 1972. Gabby used fire to try to reduce Reed Canary grass at Shady Valley but it didn't work well to control it.

Fire's been more successful in treating multiflora rose where you have nice leaf litter below it. Spring prescribed burns can reduce Japanese honeysuckle, works best when you add herbicide as well. Fire utility really depends on the site itself and must be evaluated individually.