



Strong west winds may have blown seeds of false heather to start an isolated population atop North Fork Mountain.

Dave Fataleleh



Bog rosemary is found in West Virginia only in Cranberry Glades.

PJ Harmon



Cranberry Glades

Ron Snow



American larch, also known as tamarack.

Forestry Commission, England, UK

Living on the Edge

By Paul J. Harmon and Larry E. Morse

High atop the southern ridge of North Fork Mountain in Pendleton County lives false heather, also called sand heather or woolly hudsonia. It's a dark grey-green, densely woolly, low-mounded shrub with bright yellow flowers. False heather thrives only in soil that is mostly sand, and it is shade intolerant so it needs lots of sun. It is most abundant on coastal and lakeshore sand dunes and inland sand plains from North Carolina to Labrador, and west through the Great Lakes region well into central Canada.

False heather grows on North Fork Mountain in two nearby sites in sandy soil in crevices and depressions on the eroding surface of a nearly flat outcrop of Tuscarora quartzite, a rock that weathers to white sand. On North Fork Mountain, prevailing westerly winter winds blast through gaps in the rocky cliffs, keeping woody vegetation dwarfed. It even scours some of the false heather plants with sand or ice crystals. Where the plants find white sand with little vegetation between blocks of quartzite rocks, they find conditions similar to shifting beach dunes. Botanist Larry Morse, one of the authors, studied false heather (and the two other species of sand heather) while at Harvard University. He found this small, isolated population on North Fork Mountain to be the most peculiar of all.



Elizabeth Byers

False heather.

Ecologist Rexford Daubenmire, in his 1978 book *Plant Geography*, defined disjunction as “the occurrence of potentially interbreeding populations separated by a distance exceeding the extreme limits of gene flow.” That means that this disjunct population of false heather is too far from the next nearest occurrence of the species for its seeds or pollen to make contact. So how far away are the next nearest false heather populations? The two small patches on North Fork Mountain are only 2.5 miles apart, close enough for seeds to travel on rare occasion. In a geographic distribution map of the species, Morse shows the small outliers there are more than 186 miles from plants on the Virginia coast, and more than 331 miles from the next closest record in northwestern Ohio, near Lake Erie. There's little likelihood that regular gene flow is occurring with those populations!

Why is such a specialized plant growing so very far from its next nearest populations? What are the odds that the seeds of a species with such specific growing requirements found their way to the isolated patches of exposed sand on North Fork Mountain? False heather's fruits are deciduous, dropping unopened capsules that are somewhat wind-borne. In open areas, Morse found that the fruits are blown short distances in mild weather by air currents near the ground. Later, the

capsules open, releasing the rounded seeds, each about the size of a large sand grain but much lighter than sand. These seeds can be further dispersed by the wind, since they are moved even more readily than dune sand. It's presumed that the long-distance dispersal of false heather is possible. During tornados, hurricanes, or other large storm events its seeds could be dispersed hundreds of miles away from the parent plant.

Part of the explanation for false heather's distribution involves the 15 or more advances and retreats of continental glaciers across North America during the Pleistocene ice ages. During mid-glacial periods, climates were cooler, winds increased, and snowfall in Canada and other boreal regions exceeded snowmelt for thousands of years, producing great continental glaciers that spread outward, reaching central Pennsylvania in our region. As the ice sheets advanced, vegetation under the ice was destroyed, and vegetation near the ice was greatly altered, with some highly dispersible species spreading ahead of the advancing ice. Following each glacial period, there was an inter-glacial period when the glaciers retreated due to thousands of years of higher temperatures that melted the ice. As the leading edge of the ice sheet melted, streams carried rock, sand and mud, depositing them in vast open areas that undoubtedly were good

habitat for the false heather.

While none of the ice sheets covered what is now West Virginia, there certainly were impacts upon the flora and vegetation south of the edge of the ice sheets as the climatic changes occurred. Plants responded to the climatic changes, many retreating south in mid-glacial periods, and migrating north during interglacial periods. In the Southern Appalachians, mid-glacial climates were more severe than present conditions, and areas of tundra with intense frosts existed on many Appalachian summits as well as in some lower areas.

It's likely that false heather may have occurred in numerous places in mid-glacial times where it does not now grow. It may have arrived on the West Virginia mountain ridge relatively recently during a mid-glacial period, or, it may have persisted there since before the ice ages. One good possibility is that the seeds of false heather arrived at the isolated sandy patches on North Fork Mountain on strong west winds from false heather populations at the margin of the melting Wisconsin glacier north of what is now Cincinnati, Ohio.

What other vascular plants of West Virginia have disjunct populations in our state? American larch or tamarack is another predominantly northern species, native to West Virginia at Cranesville Swamp in Preston County. This frost-pocket wetland is the southernmost locality for larch, the next nearest being approximately 60 miles northeast at Finzel Swamp in Maryland. Balsam fir, also called "blister pine" by mountaineers, is a widespread cone-bearing tree (conifer) of central and eastern Canada, occurring southward in the Appalachians to Blister Run Swamp in Randolph County, West Virginia. Both larch and balsam fir were once very abundant in the Ohio Valley, based upon the amount of their pollen seen in layers of peat that date back to the time the last ice sheet withdrew. Current Appalachian populations of these conifers may have established during a glacial period; or they might be even more ancient.



Leah Ceperly

Balsam fir trees may have been pushed south from Canada by the advance of glaciers.

jumps to the isolated population at Cranberry Glades in southern Pocahontas County.

Several species which are similarly widespread in the boreal habitats of Canada and the glaciated Appalachians, skip most of Pennsylvania, and reappear in the High Alleghenies, with their southernmost populations in Pocahontas County. These include oblong-fruited service-berry, creeping snowberry, small cranberry, and swamp red currant. Mountain holly, also predominantly a northern boreal species, is known especially from higher elevation sites in the northern mountain counties of West Virginia and is at its southernmost distribution in Pendleton County.

Throughout the Pleistocene glacial and inter-glacial periods, plant species responded at different rates to changes in environmental variables. As a result, there are some species whose primary distribution is to the south of West Virginia, and whose occurrence in the Mountain State is the species' northernmost extension of its range. For example, Ohio botanist Alison Cusick found southern mountain cranberry along the Cheat River in Preston County, making this the northernmost known occurrence for the species.

Species on the edge of their ranges are of conservation interest because they often have unique genetic makeup worthy of conserving, and because the communities they live within are some of the most fascinating pieces of our inherited natural diversity!



Elizabeth Byers

Mountain Holly

Bog rosemary, known in West Virginia only from Cranberry Glades, is a remarkable shrub with pink bell-like flowers and tiny leaves with short, soft hairs on their lower surfaces. The small leaves and hairs help to slow water loss in dry winter winds. It's widespread in boreal habitats across Canada, occurs south to northern Illinois, Indiana, Ohio and Pennsylvania, then

P. J. Harmon is a Wildlife Resources Section botanist stationed in Elkins.

Dr. Larry Morse, formerly chief botanist for The Nature Conservancy and NatureServe, is a consulting botanist and environmental educator in Washington, D.C.