

***Wetland Restoration for Endangered Species Recovery. A Multi-disciplinary Study of Big Meadow Bog, Brier Island, Nova Scotia.* Hill, Nicholas M., Hines, Sarah & O'Driscoll, Nelson J. (Eds.). 2024. Springer Nature, Cham Switzerland. 353 pp. ISBN 978-3-031-71343-9.**

Whipple Point on Brier Island is the westernmost point of Nova Scotia, forming a boundary between the Bay of Fundy to the north and east and The Gulf of Maine to the west. The island itself is small, only about 1600 hectares, a fractured extension of the North Mountain of the province, which is such a notable feature of Digby, Annapolis and Kings Counties. The bones of the island are two ridges of Jurassic basalt (overlaid by thin post-glacial sediments) between which is a depression that is shown by coring to have been a shallow marine passage that dried and became colonized by land plants, went through a treed phase, and eventually became a freshwater wetland dominated by peat-forming *Sphagnum* mosses. This is the Big Meadow Bog.

Brier Island is best known now for its whale-watching tours, but naturalists have visited it regularly since at least the 1950s (irregularly since the late 19th century) because it is an important landfall for migrating birds, especially in autumn, and because of rare or uncommon plants such as the curly-grass fern *Schizaea pusilla* and dwarf birch *Betula michauxii*, along with stunning displays of orchids in early summer. In 1921 and again in 1922 the Harvard botanist M.L. Fernald (1873-1950) came to Digby Neck for very short visits to look for a botanical rarity, the Golden Crest *Lophiola aurea*, which he located near Little River close to the end of Digby Neck. But he did not venture beyond Freeport on Long Island (the island just northeast of Brier Island) or he would have made a stunning discovery, the presence on Brier Island of Eastern Mountain Avenas, *Geum peckii*, described and known previously only from high elevations in the White Mountains of New Hampshire. In 1949, Albert E. Roland and E. Chalmers Smith (authors of *The Flora of Nova Scotia*), discovered this Avenas, mainly around the Big Meadow Bog and nearby smaller *Sphagnum*-dominated bogs on Brier Island. It was this discovery and its implications that led to this book.

After years in a near pristine state, in 1958 to 1960 the Big Meadow Bog was ditched and partially drained, in a short-lived attempt at agriculture. The outcome was catastrophic to this natural ecosystem. Hill and Denton (in the second chapter) describe the outcome:

“...the water flow controlled by the million cubic meters of peat were [sic] lost. This led in the loss of the low shrub margins (the lagg), the blocking of the access to the bog by alder thicket, the fertilization of the whole bog by Herring Gulls, the overgrowth of the bog by tall thorns, and the loss of community traditions: berry picking, duck hunting, and walking to Pond Cove. It also resulted in more intense water flows after heavy rains as the outflow was not regulated by migration through peat but rather flowed through ditches. The addition of gull guano also resulted in poor water quality and high nutrients (the bog is now classed as “hyper-eutrophic”).”

I can vouch for this from my memory of walking about 1970 from Westport along one of the drainage ditches southwestward to Pond Cove. It was tough going in brambles and occasional rose thickets, but not impossible. A few years later it had become impossible, at least without heroic measures to cut away the undergrowth, and I never tried again. What had been a raised bog with its marginal fen (the lagg) was becoming a wilderness of adventitious plants responding to drainage and nutrient enrichment. And it had been colonized by Herring Gulls that added enormously to the sparse nutrients present in the drying bog.

By the late 1980s it became clear that the alteration of the bog by ditching was threatening the Avens. This was noted in a 1986 status report to COSEWIC (the Committee on the Status of Endangered Wildlife in Canada) and in a series of reports and proposals that followed in the next two decades. After much deliberation and planning, the brave but risky decision was made to attempt to restore the bog to its pre-ditching state. In this, as the editors state, “the key factor was the will and interest of researchers, government and non-government conservation practitioners, and the local community on Brier Island; this was the overarching catalyst driving conservation focused on the Eastern Mountain Avens.”

This monograph is an extensive and intensive account of the environmental setting in which the work took place, an account of attempts to restore the water levels of bog (and critically of the marginal lagg in which the Avens is most favored), and the preliminary results (into 2024) of attempting to restore the water level in the bog and its margins. The main action was to block the drainage ditches, using 123 dams, harvested from the bog’s own peat. For the most part water level was restored in the main part of the bog and in the surrounding

lagg, but it was difficult to control the nutrient loading of the bog caused by the hundreds of Herring Gulls nesting in part of the area. It became clear too that there was a complex relation between the water level and the success of the Avens – not too wet, as in the bog itself, but not too dry either - restricting its favored area to the marginal lagg. Nutrient levels remained high and the problem remained – not resolved to date – of what to do about the hyper-eutrophication caused by the gull faeces. Another problem is that the climate may be becoming unsuitable for the Avens' growth – Brier Island is the most rapidly warming of any studied location in Nova Scotia, an average of 2°C since 1990. It may be necessary to find another location for the species, using seeds stored in the seed-bank at Acadia University and proven culture and transplantation techniques. A critical and essential part of the restoration, as far as it has gone and for the future, was the buy-in of the Brier Island community, partly through the formation (in 2017) of a thriving Brier Island Trails Committee and its planning and building of a boardwalk (with interpretive signs) well into the restored area. The Big Meadow Bog boardwalk is now a major attraction to local people and to an increasing number of visitors.

It is not easy to review a monograph of this scale. There are 55 authors and 17 chapters (14 of which are scientific papers). However, three chapters (1, 2 and 17) are more general, introducing the bog, placing it in a community context, and comprehensively summarizing the scientific results of a remarkable and adventurous project. There is no index – it would have been a herculean, although very useful, task to prepare one. Typos are common throughout (none crucial, happily); it is clear that a good editorial proofreading didn't happen. A major problem is the very high cost, typical of all Springer publications, of this remarkable book. These quibbles aside, this massive work on the Big Meadow Bog of Brier Island is a tour de force in the literature of environmental remediation. It will be required reading by wetland ecologists and naturalists for a long time.

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