

MICHELIN SAND BARRENS RESTORATION PROJECT

DECEMBER 2024 STATUS REPORT



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INTRODUCTION

Michelin is the largest private employer in Nova Scotia and the Annapolis Valley. The Michelin – Waterville plant employs over 1,500 people, contributing not only to the economy but to the greater community as well. The company is committed to contributing to the local communities through financial support of social causes and improving the environment. As a global corporation, Michelin has set ambitious environmental goals for 2030, one being to have a biodiversity plan adapted to local issues for manufacturing and research facilities such as Michelin – Waterville CA3. To support this goal, an environmental assessment was completed for CA3 in 2023, identifying the nearby sand barrens ecosystem along with several keystone species inhabiting the sand barrens.

The Michelin – Waterville site is located on a portion of the Annapolis Valley Sand Barrens, which is an important and unique ecosystem in the region. These sandy ecosystems, illustrated by a lack of trees and dominated by low-lying shrubs, are home to many important plant species, some of which are listed as Species at Risk. Several of the keystone species of sand barrens include Broom Crowberry, Bearberry, Golden Heather and Rockrose. Notably, only 3 percent of the original sand barrens remain in the area, making them a focal point for conservation.

Since 2023, Michelin has partnered with Acadia University and the K.C. Irving Environmental Science Centre on a few occasions, including working on seed packages for Michelin employees in celebration of Earth Day. The most recent collaboration between the groups has been focused on the restoration of the sand barrens ecosystem surrounding the CA3 facility. In September 2024, Michelin hired a researcher based out of the K.C. Irving Environmental Centre to begin studying various native sand barren plant species to better understand germination conditions required for each plant. The objective of this project is to develop germination protocols for select native species with the goal of growing native sand barrens plants on a largescale level to restore the rare habitat. So far, the project has seen encouraging results as there has been germination from over half of the plant species.



EXECUTIVE SUMMARY

Michelin has partnered with Acadia University and the K. C. Irving Environmental Science Centre to assist with their restoration efforts of the sand barrens. Together with staff at Michelin, a team from the K.C. Irving Centre developed a plan to better understand the germination protocols of several important sand barrens plant species. The researchers conducted over 100 experimental trials with seeds or branch cuttings from the selected species of interest, to see which trial conditions yielded the highest germination rates. With a better understanding of germination requirements and protocols, Michelin could explore a large-scale propagation project to grow and plant sand barrens species around CA3 to restore the local sand barrens ecosystem, contributing towards Michelin's corporate biodiversity goals.

Presently, there has been germination from over half of the selected species, with the highest success coming from Poverty Grass, Flattened Oatgrass and Large Pod Pinweed. These results are encouraging, especially given the trials that germinated in under two weeks, showing that large-scale propagation efforts would be possible.

Over the next four months, germination trials will continue. An academic paper will be written and submitted for publishing regarding the project objectives, methodologies and results, filling in research gaps that exist for many of these uncommon sand barrens species. Additionally, a final report will also be completed for Michelin summarizing the end results of the project.



Goldenrod and Silverrod at Michelin



Researcher in labroatory

WHY THIS RESEARCH MATTERS

Species native to the Annapolis Valley Sand Barrens are not your regular garden plants. These species are difficult to grow, and are rarely sold at local garden nurseries. This information poses challenges when individuals or organizations are looking to restore sand barrens habitat, as the species are few and far between to find as mature plants, and lack the propagation information to grow them yourself.

This project aims to address one of these challenges by developing propagation protocols for over 20 native sand barren species, so that individuals, organizations, or nurseries can successfully grow these important, and unique plants. Further, Michelin hopes to partner with a local nursery to grow enough plants to restore sand barrens areas surrounding the Michelin - Waterville facility. The restoration work will also improve biodiversity surrounding Michelin, an impact that Michelin staff are hoping to measure to be able to show the quantifiable effect of the sand barrens restoration project.



Sand Violets



Bearberry



Broom Crowberry



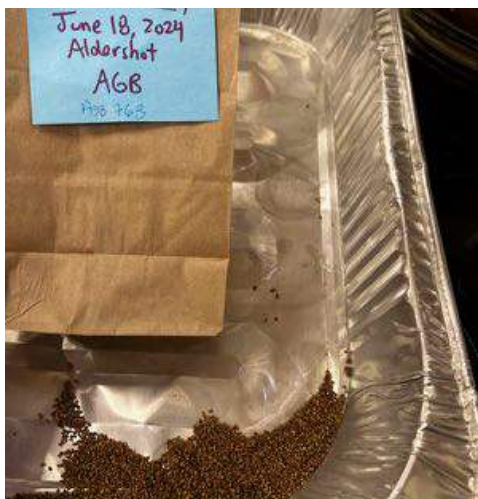
Golden Heather

PROJECT OVERVIEW

During the summer of 2024, the research team from the K.C. Irving Environmental Science Centre began collecting seeds in preparation for the Michelin Sand Barrens Restoration project commencing in September 2024. Thirteen native plant species were originally selected for germination trials, however as trials began, more species were added to the list as time allowed.

As of November 2024, twenty species native to the Annapolis Valley Sand Barrens have been selected for this study, where keystone species and early successional species were prioritized. These species tend to be ground-dwelling and cover large areas and/or grow on very dry bare sand. This suite of species best mimics sand barrens after major disturbances (e.g., fire) and before larger woody species begin to outcompete those initial, ground-dwelling, early successional species. They produce the most ecological value for the diversity of species that depend on this habitat type, such as Rockrose (*Crocyanthemum canadense*) or Earth Star (*Astraeus hygrometricus*).

To develop this priority list, expert botanist at the K.C. Irving Centre, Alain Belliveau provided a list of species commonly found in early successional sand barrens, based on many days of fieldwork in this habitat type in Nova Scotia, on data from the Atlantic Canada Conservation Data Centre, and on information in *The Annapolis Valley Sand Barrens: An Introductory Guide* (CARP, 2021).



Seed collection



Map of species collection locations across the Annapolis Valley, NS

PROJECT OVERVIEW

Some species were removed from the list based on seed collection feasibility issues, such as land ownership, inadequate location information, or inadequate seed quality at the time of collection. Ultimately 20 species were chosen for this project.

For each species, several germination trials were conducted based on supporting evidence from a literature review, local knowledge holders, and academics, to understand the impact of different germination conditions and pretreatments on seed germination. Over 100 trials have been conducted over the 20 native species. The number of trials varied for each species, such as Northern Blackberry where 13 trials were done, versus 7 trials that were conducted for Broom Crowberry.



Trials in cold stratification



Seeds germinating in trial

Germination trials began in late September 2024, with seed and branch cutting collections continuing through October as plants become ready to drop seed. Experimental trial conditions were determined based on a literature review, some involving pretreatments and stratification periods to break a critical barrier to germination called dormancy.

PROJECT OVERVIEW CONT.

As these species are unique to small portions of northeastern North America, germination requirements are widely unknown. The research used two different methods to replicate the natural factors that break seed dormancy in nature. The first was scarification using gibberellic acid or sandpaper, while the second method was warm or cold stratification periods.

Seed dormancy is a natural occurrence, normally broken by factors such as an animal's digestive system or cold outdoor temperatures. Meeting these requirements indicates to a seed that it is time to germinate and grow.

Gibberellic acid helps to break down the outer coating of a seed to allow for water to penetrate and encourage germination, mimicking animal digestion. Warm stratification, which mimics spring, involves storing seeds in a dark, warm and humid setting, while cold stratification, utilizes a cold environment, such as a fridge, where seeds will rest for a period of time, mimicking winter. The duration of a stratification period could last anywhere from 30 days to 90 days for this project. Both methods of using gibberellic acid and stratification in the trials have the goal of breaking seed dormancy, increasing the likelihood of germination.

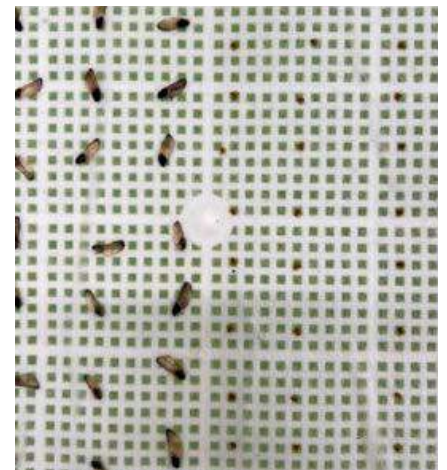
Each seed germination trial involved one or a combination of scarification or stratification, and records were kept to learn which combinations yielded the highest rates of germination. As trials continue to wrap up and results are finalized, the K.C. Irving Centre research team will share germination data with Michelin, so the company can move forward with outsourcing large-scale native plant propagation to support future sand barrens restoration.



Jack Pine tree



Baking pinecones to release seeds



Jack Pine seeds (left) in trial

GERMINATION PROTOCOLS



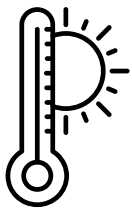
STEP ONE - COLLECTION & PREPARATION

Species were collected from across the Annapolis Valley Sand Barrens, which includes the Michelin - Waterville barrens. After collection, seeds would be prepared for trials by removing excess plant material, while branch cuttings would be kept cool and moist.



STEP TWO - PRETREATMENT

If required, pretreatments occur following seed preparation. Pretreatments included scarification with sandpaper or gibberellic acid treatment, sanitizing protocols, and warm or cold stratification periods.



STEP THREE - PROPAGATION ROOM

With the exception of a handful of trials, the vast majority of trials were executed in a covered plastic tray on moist paper towel which were kept in an indoor propagation room. The moist, covered environment provided ideal conditions for germination, and allowed for easy observations to be made.



STEP FOUR - GERMINATION AND OUTPLANTING

Once seeds had adequate germination, where both the stem and roots were visible, seeds would be outplanted into suitable soil, where they would be carefully observed and tended to ensure continued maturation.

NEXT STEPS

The results of the experimental trials are not yet available as various trial conditions continue to be refined to best understand the optimal growing conditions for both seeds and branch cuttings. However, as trials close, meaning all seeds have either germinated or died, the results will become available for the research team to analyze and compile into a list of germination protocols.

As these germination protocols are developed, the project will progress from the lab towards the sand barrens restoration work at Michelin - Waterville. To help guide the restoration work, a propagation management plan will be developed with the help of staff from the K.C. Irving Environmental Science Centre, based on native plant availability at nurseries and germination requirements, to determine which species can be outplanted into the grounds at Michelin and when.

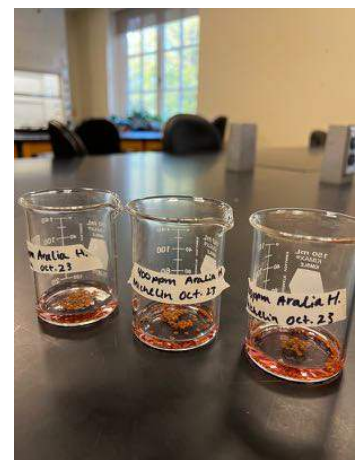
The objective of this project has not only been to restore an endangered, unique ecosystem, but also to have a positive impact on the Michelin - Waterville community and the surrounding communities on a larger scale. By sharing knowledge with Michelin employees on the importance of sand barrens, while visually making a positive change through the restoration project within the local community. As this work continues, we hope to see it have a lasting impacts on biodiversity and the Valley Proud community.



Tending Bearberry cuttings



Michelin team visiting the K.C. Irving Centre



Seeds in GA3 pretreatment

