THE MEADOWS OF LITTLE LONG POND NATURAL LANDS

Condensed Version | May 2023 | Tate Bushell, *Director of Natural Lands*

LAND & GARDEN
PRESERVE

The Meadows of Little Long Pond Natural Lands

TABLE OF CONTENTS

The meadows at Little Long Pond natural lands are a collection of open, non-forested areas dominated by perennial herbaceous plants such as flowers, grasses, sedges, and rushes. They total 20 acres, are located directly to the east and west of Little Long Pond and are visible from many points of interest including carriage roads, the Boathouse, and trails. These open areas are unique among the 1,200-acre Little Long Pond natural lands and they are home to thousands of plants and animal species. The meadows are also important to the visitor experience at the natural lands because they provide scenic views, a connection to past land use, opportunities for blueberry picking, and chances to experience wildlife.

The primary characteristic of a meadow is a lack of trees that results in lots of sunlight. Without human intervention virtually

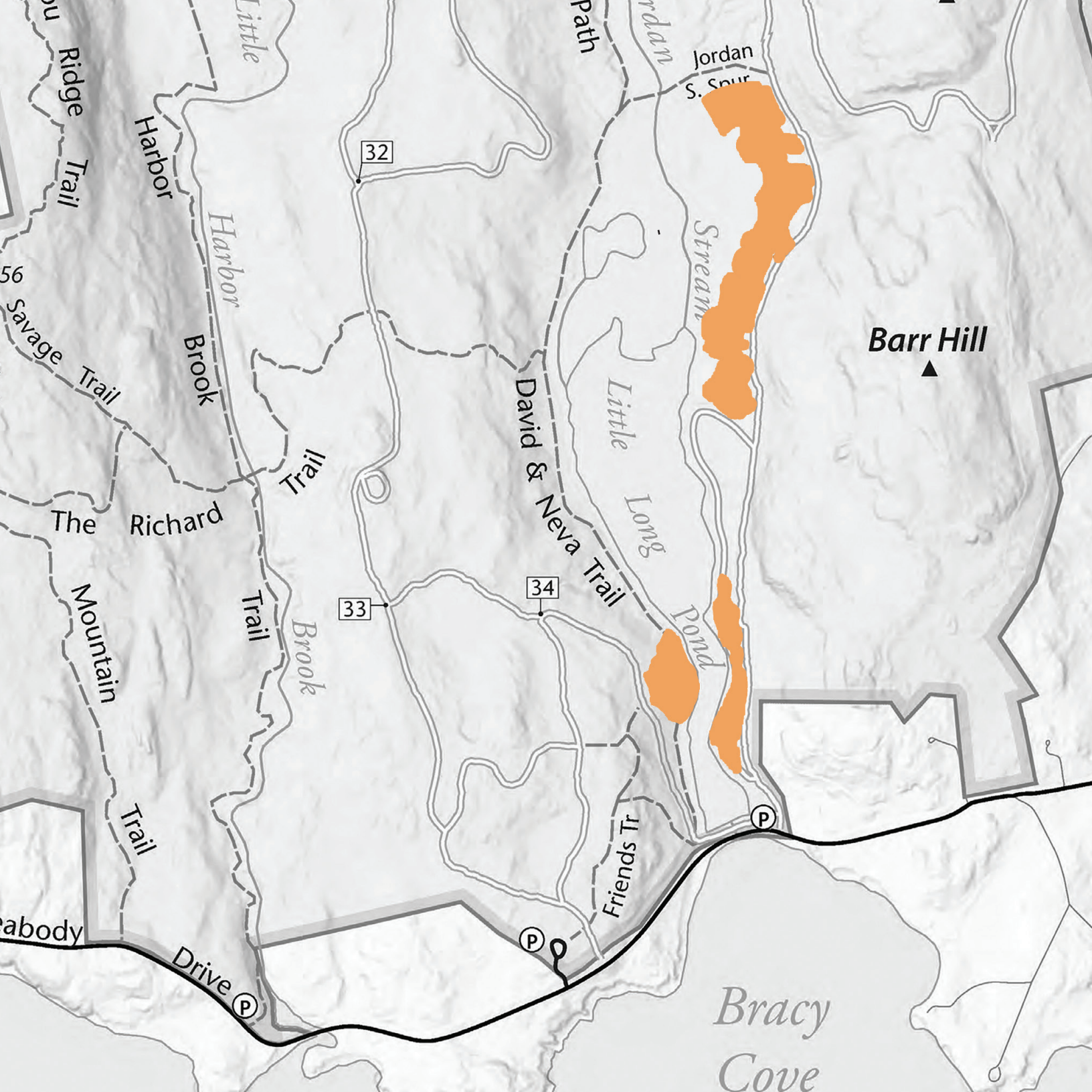
INTRODUCTION

all meadows in the Northeast would slowly transition towards a forest. The meadows at the Preserve's natural lands are kept in an open state by periodic mowing.

The *human history* of the meadows is largely beyond the scope of this document. We know from photographs, maps, and books that these open areas were places where a small number of families once lived and farmed in the 19th century.

This document's main objectives are to provide background information on the meadows and describe 1) the meadows' current conditions; 2) the Land & Garden Preserve's meadow management philosophy and goals; and 3) our current meadow management practices.

INTRODUCTION


Ridge Trail
Harbor
Little
Path
Jordan
S. Spur
32
Harbor Brook Trail
Stream
Barr Hill
56
Savage Trail
Brook
Trail
David & Neva Trail
Little Long Pond
The Richard
Mountain
Trail
33
34
Brook
Trail
Friends Tr
P
eabody
Drive
P
P
Bracy
Cove

In this document we will often refer to the meadows of Little Long Pond natural lands as a singular 20-acre unit ('the meadows') for convenience, but we will also show that this singular unit can be broken into much smaller subunits based on local conditions. Most of the management information is understood and recorded in these smaller subunits and our management can best be visualized as a mosaic or patchwork of small areas and their activities.

Note: In the northeastern United States, there are many names for an open, non-forested, upland ecosystem. What we are calling a meadow at Little Long Pond natural lands might elsewhere be called a *field, old field, prairie, barrens, grassland, hayfield,* or *pasture depending* on the land's exact use and who is using the term.

II. *Some Background on Meadows in Northeast USA*

BIODIVERSITY

Meadows play a significant role in supporting biodiversity and for this reason they have **real conservation value**. There is a vast food web at play:

- Flowers provide nectar and pollen to insects.
- Plant leaves provide food for other insects.
- Plant seeds are eaten by rodents and birds.
- Dense plant cover provides wonderful hiding places for small critters.
- Cold-blooded animals that need a lot of sun (insects, turtles, snakes, etc.) are attracted to the meadow's sunlight.
- Raptors (hawks, falcons & owls) hunt rodents and birds in the open meadow
- Carnivorous mammals (coyote, fox, bobcat) also hunt rodents in the meadow.

In addition to supporting biodiversity directly in the meadows, meadows also contribute to **large-scale landscape diversity**. This simply means that nature requires a diverse network of interconnected ecosystems, and meadows are an important one of them. For example:

- Birds, butterflies, and dragonflies use meadows during their migration.
- Local fox, coyote, deer, bear, and bobcats use meadows as one of the many habitats they need to survive.
- Plant migration of some tree species (taking place over centuries) is facilitated by open meadows.

ARE CONTEMPORARY MEADOWS 'NATURAL'?

Most upland meadows as they currently exist in Northeast USA were once forest ecosystems that were cut down in the 17th, 18th, or 19th century by Europeans for timber and to clear the land for agriculture (Foster, Motzkin, & Slater, 1998). The meadows at Little Long Pond are no exception – they were created when Europeans felled trees and cultivated the land. Upland meadows as we usually think of them were rare before Europeans landed in North America (Oswald, et al., 2020).

David Foster of Harvard Forest and his colleagues have written extensively on New England's changing landscape – from before European settlement through colonization and into the twenty-first century – and they urge conservationists to incorporate a historical understanding into present day land management. They specifically recommend acknowledging that **meadows have their origins in European agriculture** (Foster, 1999; Foster & Motzkin, 2003). Many natural processes are at work in a meadow, but they are not as 'natural' as – for example – a forest. **Regardless of their histories, meadows still play an important role in supporting the beauty and diversity of our landscapes**.

Boathouse Meadow.

The Callahan farm on what is now the ‘West Meadow’.

III. *Past Use of the Meadows at the Little Long Pond Natural Lands*

PRE-EUROPEAN USE

We have not specifically studied the pre-European use of the Little Long Pond natural lands.

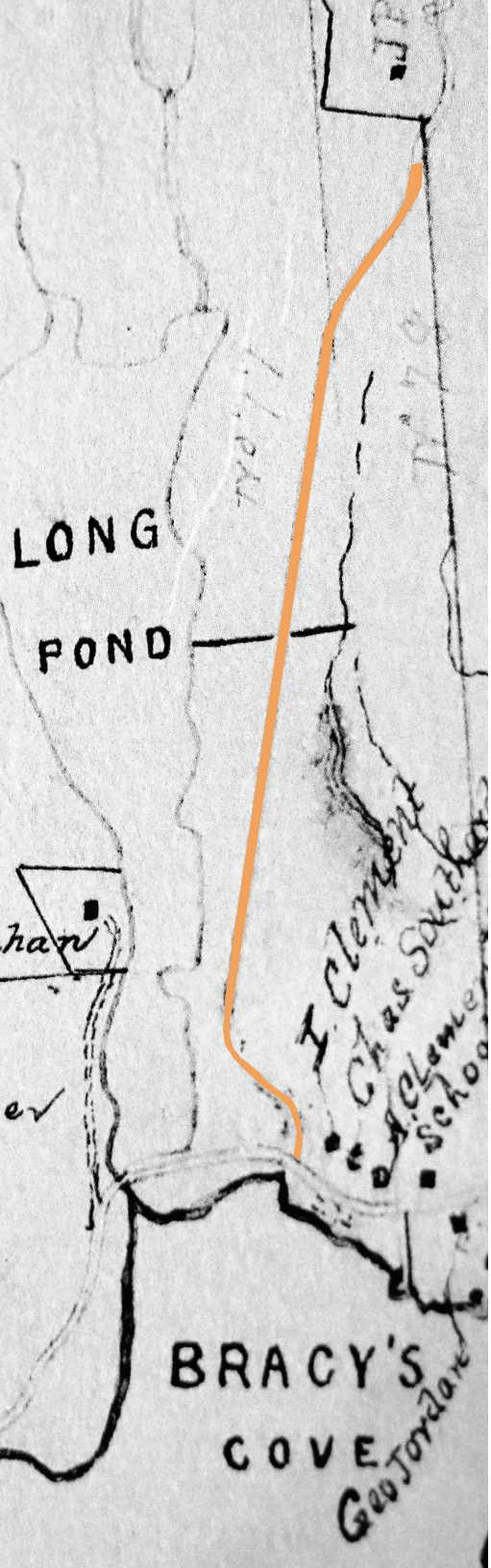
AGRICULTURAL USE

We know from records that the meadows were used as farm fields and that people lived on what we call the natural lands. The 'Callahan farm' was in the small meadow to the west of Little Long Pond and is visible in a photo taken from Barr Hill (date unknown, see previous page). In the photo we can clearly see farm structures, furrows in the field, and that the extent of clearing extended much further north than the present-day meadow.

In 'Little Long Pond, A Field Guide to Four Seasons,' Eliot and Rivers describe the town of 'Long Pond' centered around Bracy Cove that had two schools, a blacksmith, and a general store, and that the town's inhabitants eventually moved to nearby Seal Harbor and Otter Creek in the wake of the Civil War (Eliot & Rivers, 2017). In the meadows east of Little Long Pond there are two distinct stone remains of structures that were likely farm-related structures (i.e., house, barn, shed). A patch of yellow day lilies (*Hemerocallis lilioasphodelus*) grows near each of these two stone remains. Day lilies are native to Asia and in New England are often found near old homestead sites. There was once a road that originated at modern day Peabody Drive/Route 3 that extended north past the farms (see following pages).

Day lilies growing in the meadows east of Little Long Pond. These plants often indicate the site of a farm or old home.


A. H Jordan
H Roberts
Mrs. Savage
A C Savage
Savage's Whf
T. R Freeman
J. F. Smallidge
Jas Clement 2nd
W. Calahan
Stephen Southard
Chas Southard
Bracy
W Smallidge
SEA SIDE HOUSE
J. Clement & Sons
Fish Ho
G. W Brown



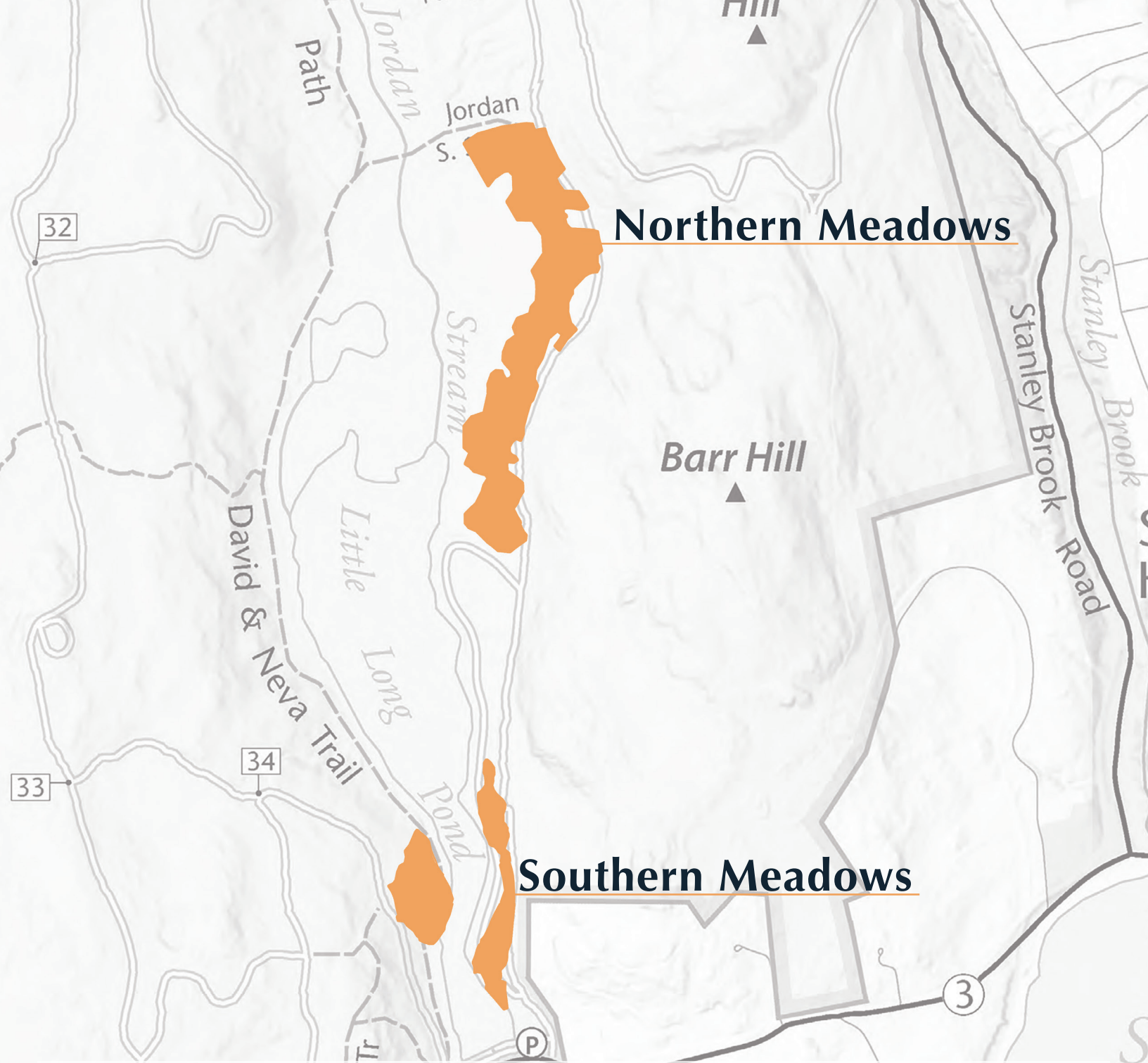
A carriage road now sits on the roadbed shown in the maps.

ROCKEFELLER FAMILY

When the property was owned by the Rockefeller family (early 1900s – 2015), the meadows were kept open by mowing, either for pasture, hay production, or for aesthetic reasons. Recently (1990's – 2015) the meadows were kept open to provide beautiful views and landscape diversity (Doug Hopkins, personal communication, January 2022). Most details regarding the specific mowing regime over the decades are unknown, but we do know that Greenrock Company conducted its annual mowing after the summer to avoid interfering with ground nesting birds (Neva Goodwin, personal communication, January 2022).

IV. *Soils of the Meadows at the Little Long Pond Natural Lands*

There is virtually no bedrock visible in the meadows and all the soils were deposited after the retreat of the most recent continental ice sheet. The northern meadows (north of the Boathouse) are all underlain by silty marine clay (aka 'Presumpscot formation') that was deposited directly into the ocean when sea level was higher than today's sea level, a period after glacial retreat called shoreline submergence. The soil in the southern meadows (south of the Boathouse) is coarser and contains some sand and pebbles.



The northern and southern meadows at Little Long Pond natural lands. The southern meadows are located next to popular sites for visitors (i.e., the Boathouse & water access to the Little Long Pond) and therefore receive more human and dog activity.

V. *Current Conditions of the Meadows at the Little Long Pond Natural Lands*

BACKGROUND

The meadows are heterogeneous in terms of soil characteristics, hydrology, aspect, light conditions, slope, land use history, and current vegetation. The northern meadows are generally larger, more biologically diverse, and wilder looking than the southern meadows.

VEGETATION

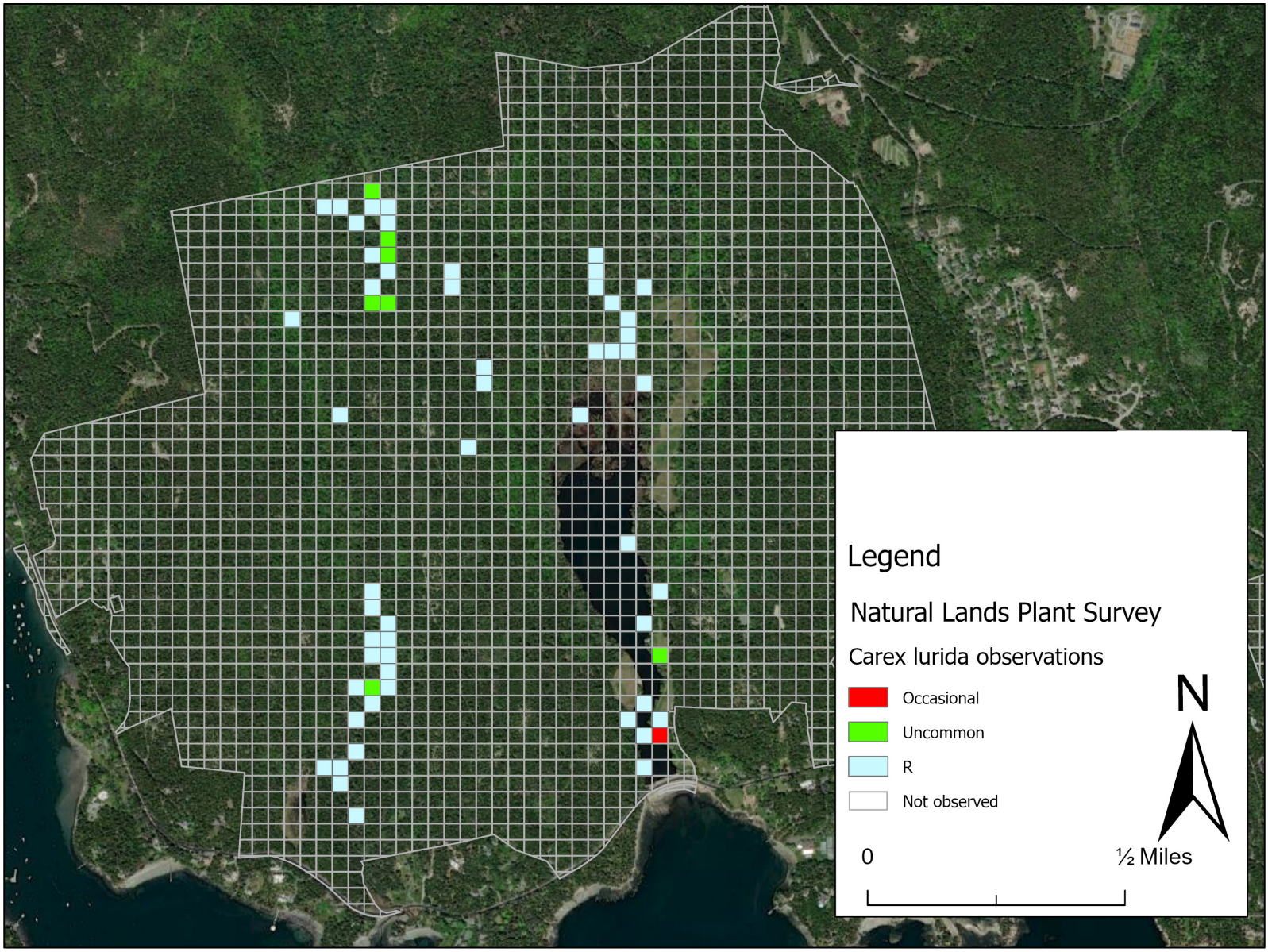
2022 Plant List of the Meadows

As part of a larger plant survey of all the Preserve's natural lands (1,400 acres), The Maine Natural History Observatory conducted a comprehensive plant survey of the meadows in 2022. The survey is being performed within a grid of 50X50 meter cells, which allows us to map the occurrences and abundances of each recorded species (see example on page 14). This plant survey data is an important management resource. Page 15 illustrates some statistics from the 2022 survey showing that the northern and southern meadows are similar in a lot of ways even though they appear rather different. The complete list of plants observed in the meadow can be found at the end of this document.

INVASIVE SPECIES

Each year the natural lands staff actively remove invasive plants from the meadows and maintain a spatial database that tracks their locations (see map on page 16) for example). The most abundant invasive plant species in the meadows are reed

LITTLE LONG POND NATURAL LANDS PLANT SURVEY - grid cell containing *Carex lurida*

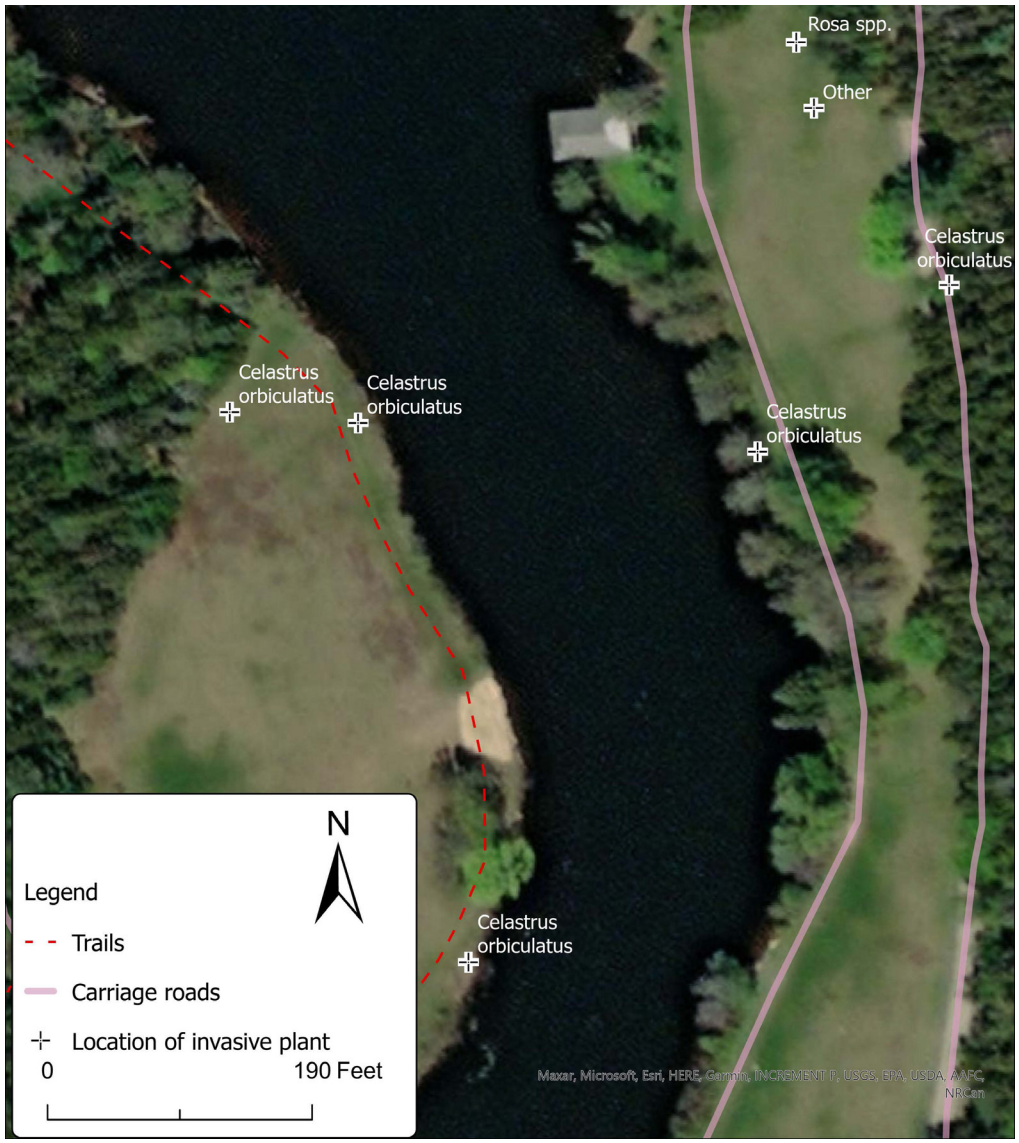


Survey grid cells (50m X 50m) at the Little Long Pond natural lands containing *Carex lurida* (sallow sedge). This is an example of how the plant survey data can be shown on a map.

STATISTICS FOR MEADOW GRID CELLS FROM 2022 PLANT SURVEY
AT LITTLE LONG POND NATURAL LANDS

	Southern meadows	Northern meadows
Number of grid cells	33	46
Number of species	258	258
Average number of species per grid cell	66	64
Maximum number of species in grid cell	102	94
Percent exotic species	36	26
Most widespread non-graminoid exotic species (% of grid cells)	Scorzoneroides autumnalis (97%), Trifolium repens (91%), Pilosella caespitosa (79%), Trifolium pretense (79%), Vicia cracca (76%), and Rhinathus minor (73%)	Pilosella aurantiaca (83%), Scorzoneroides autumnalis (80%), and Ranunculus acris (74%)
Most widespread graminoid exotic species (% of grid cells)	Agrostis capillaris (91%), Festuca filiformis (82%), Anthoxanthum odoratum (79%), Poa pratensis (79%), Festuca rubra (76%), Agrostis gigantea (73%), and Phleum pretense (73%)	Festuca filiforis (89%), Agrostis capillaris (85%), Festuca trachyphylla (85%), Anthoxanthum odoratum (83%), and Agrostis gigantea (78%)
Percent of species documented in only one grid cell	22%	20%
Percent of species documented in only 1 or 2 grid cells	32%	33%

MAP OF INVASIVE SPECIES IN THE SOUTHERN MEADOWS AT LITTLE LONG POND NATURAL LANDS



Natural lands staff keep track of invasive plant management with maps like this.

canary grass (*Phalaris arundinacea*), glossy buckthorn (*Frangula alnus*), Asiatic bittersweet (*Celastrus orbiculatus*), and Japanese barberry (*Berberis thungbergii*). Infestation levels are generally low in the meadows.

RIPARIAN EDGES

The meadows border Little Long Pond, and the unique strip of land directly adjacent to the water requires its own consideration and management. These areas – where land and water meet – are generally seen as valuable habitat for plants and animals. These areas are also very popular among visitors and their dogs. The Preserve found that unfettered access to the pond's edge was resulting in bank erosion — starting in 2020 we erected cedar fencing in certain areas of high visitor traffic. Where fence has gone up erosion has decreased, and natural revegetation has increased. The natural lands staff have planted trees in select areas to increase the pace of bank recovery.

LARGE HARDWOOD TREES

Along the forest/meadow edge and along the carriage road/meadow edge there are large hardwood trees that provide a beautiful alternative to the evergreen backdrop of spruce and fir trees in the forest. These trees are mostly red maple (*Acer rubrum*), yellow birch (*Betula allegheniensis*), white ash (*Fraxinus americana*), red oak (*Quercus rubra*), and sugar maple (*Acer saccharum*), and they have large, open crowns that were able to form because the trees grew up in full sun when the meadows were farms and the landscape had fewer trees in general.

Large, open grown red maple in the northern meadows. Visitors connect to the character of old trees like this one.

Old trees like this are generally great for wildlife because they form holes in the trunk that provide nesting, roosting, or denning sites to a whole host of birds and mammals. Visitors connect with these relic trees because of their unique character and beauty.

CHESTNUT TREE

The American Chestnut Foundation provided eight small (~2' tall) American chestnut trees (*Castanea dentata*) that the Greenrock Company planted in the meadow in 2013. Only one tree remains today. As climate changes and plant breeders continue their efforts to develop a disease resistant American chestnut tree, chestnuts may once again flourish in Maine, including Mount Desert Island and Little Long Pond natural lands.

EXPERIMENTAL BEDS

The Natural Lands staff has created 16 experimental beds in the northern meadows to practice a variety of restoration techniques (for example, seed sowing vs. live planting). The beds are generally small (~150 square feet) and were created by tractor tilling. The locations of the beds are spread widely over the northern meadows to capture variation among the different sections. All beds were established on dry soil (wet areas were avoided) and we tried to capture additional site variation by placing them within different vegetation contexts (short grass vs. bryophyte vs. tall grass) and on different aspects (north facing vs. south facing).

An example of an experimental bed showing two years of plantings. Photo taken June 28, 2022. 2022 plants are in the foreground (small) and 2021 plants are in the background (large).

NOTABLE WILDLIFE

We have not conducted a comprehensive wildlife survey in the meadows. For now, eBird and iNaturalist are fantastic, crowd-sourced natural history platforms where we can learn more about wildlife in the meadows.

A LOOK OVER THE NORTHERN MEADOWS, LOOKING NORTH

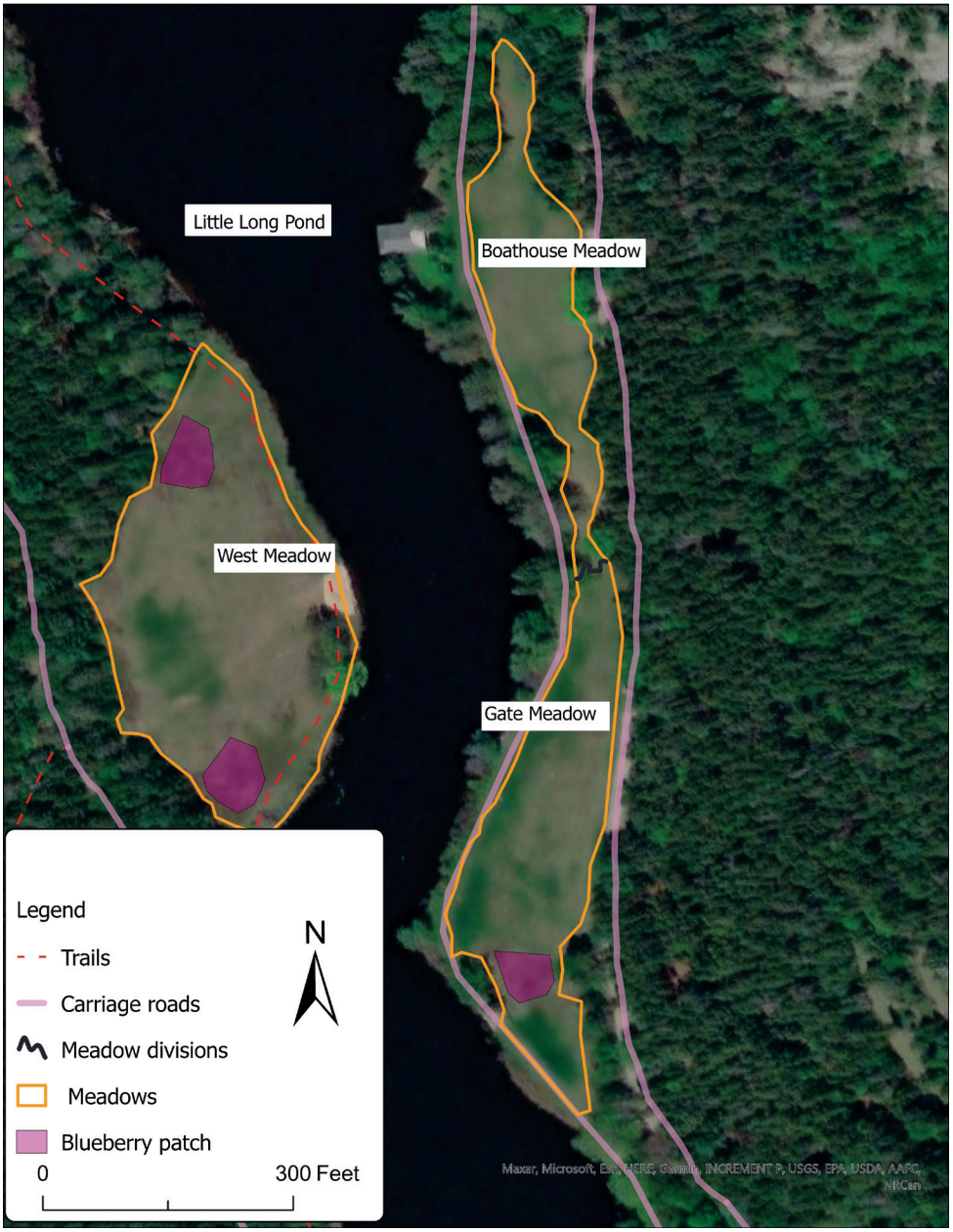
White dash lines highlight the experimental beds. Photo taken October 11, 2021.

VI. *Profiles of individual meadows*

To make managing the meadows easier we have delineated the 20 acres into nine named meadow units. The following sections briefly describe the meadows and present the most immediate management considerations. For the remainder of this document the term 'the meadows' can be understood as all the meadows at *Little Long Pond natural lands*, and where we describe something that is not common to the 20 acres of meadows, we will use the meadows' specific name(s).

SOUTHERN MEADOWS

SOUTHERN MEADOWS



WEST MEADOW

The West Meadow – the only meadow west of Little Long Pond – is one of the most visited meadows at the Little Long Pond natural lands by people and dogs because of its proximity to the carriage road and upper parking lot, and because the David & Neva trail runs through it. This is the highest meadow, and its height provides great views of the pond, the Boathouse, and Pemetic and Cadillac Mountains of Acadia National Park.

When the Land & Garden Preserve took ownership of the Little Long Pond natural lands in 2015 there was only a thin buffer of vegetation between the West Meadow and the pond. This narrow buffer coupled with the tendency for the West Meadow to receive lots of visitors with dogs led to extensive bank erosion along the pond's western shore (illustrated on the following page).

To mitigate this erosion and formalize a water access point the Land & Garden Preserve placed granite boulders where the erosion was worst in 2016. To further protect the pond banks from dog traffic, the Land & Garden Preserve erected a cedar fence along the northern section of the West Meadow in 2020. The primary trail to the water access area descends a steep hill and is currently experiencing soil erosion that will need to be addressed soon.

Erosion in the West Meadow is caused by people and dogs (mostly dogs) entering and exiting the water. This photo was taken in 2016 and is the current location of a granite water access area.

WEST MEADOW

Soil type	silt; dry, sandy, stony
Prominent vegetation patterns	a large swath of native roses (*Rosa spp.*); two decent blueberry patches; narrow riparian edge
Important features	old apple tree; stone remnants of farm structure(s); water access to Little Long Pond
Structures	David & Neva Trail; granite water access area
Greatest uses	water access; recreation (berry picking, hiking, picnicking); views of surrounding areas; wildlife habitat in the riparian zone
Mowing since 2018	2018-2022: not mowed

WEST MEADOW

The West Meadow in the fall when the native rose bushes turn red.

GATE MEADOW

The Gate Meadow is hilly and narrow. It runs between two carriage roads and is therefore crossed frequently by dogs and people. There are clay pipes in the Gate Meadow that bring water from the upper carriage road to the pond. The pipes are old, and their condition is unknown. It may be necessary to replace these drainage pipes in the future, which would require planning and revegetating with native plants.

GATE MEADOW

Soil type	silt; sandy, stony
Prominent vegetation patterns	one large blueberry patch and scattered small blueberry patches suitable for picking; native roses are very abundant near the middle of the meadow.
Important features	select large hardwood trees on perimeter
Structures	clay drainage pipes under meadow
Greatest uses	views of surrounding area; blueberry picking and wildlife habitat in the riparian zone
Mowing since 2018	2018-2020: not mowed Fall 2021: mowed to suppress shrubs coming up; the blueberry patch not mowed Spring 2023: native shrubs (except blueberry) mowed, mostly near the middle of the meadow

GATE MEADOW

The Gate Meadow is narrow and bordered by carriage roads. The tracks visible in the photo were made by staff moving back and forth across the meadow to water plants in the lower ditch. The dark red/green area at the bottom of the photo is a blueberry patch.

BOATHOUSE MEADOW

The Boathouse Meadow is situated on a steep hill to the east of the Boathouse and provides a wonderful view of the pond and Boathouse from the adjacent upper carriage road. Visitors and dogs frequently cross the meadow to get from the lower grass road to the upper stone road and in 2020 the natural lands staff reinforced the common route on the north side of the meadow with granite steps to mitigate the growing erosion issue. The steepness of the Boathouse meadow makes it a poor candidate for any restoration that requires tilling or earth moving. There are patches of early goldenrod (*Solidago juncea*) and black-eyed Susan (*Rudbeckia hirta*) that may slowly spread in the absence of mowing. A mowing in 2021 targeted the center of the meadow and new patches of bayberry (*Morella caroliniensis*) and rose, but intentionally left vegetation along the low (western) edge of the meadow to support the land around the ditch and along the granite steps to discourage visitors and dogs from bypassing the steps and creating a social trail.

The southern end of the Boathouse Meadow is very steep and will be allowed to naturally revegetate with bayberry that will slow water flowing over the meadow and protect the soils from erosion. The north end of the Boathouse Meadow gets very narrow and provides solitude and privacy in an otherwise busy part of the natural lands.

BOATHOUSE MEADOW

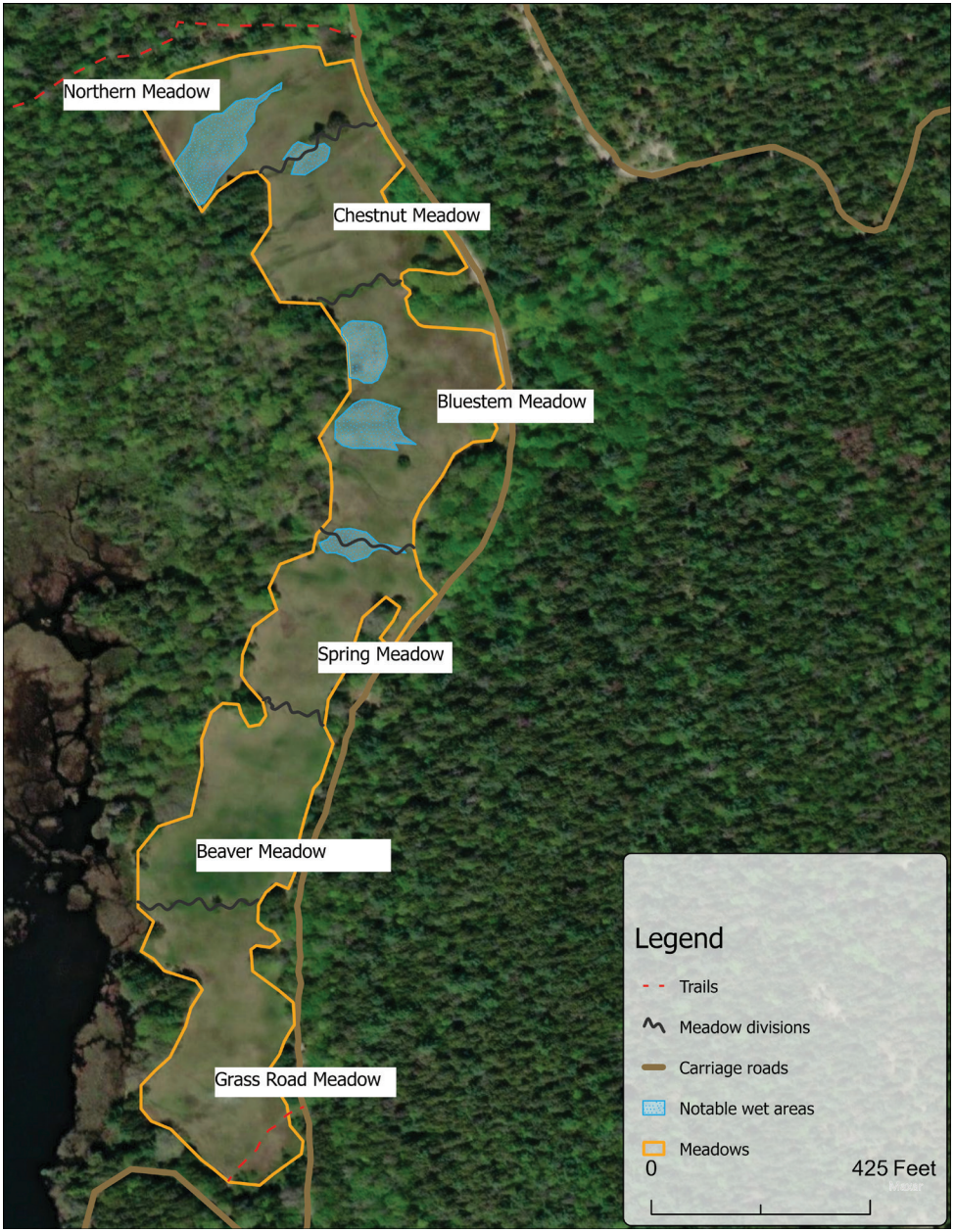
Soil type	silt; dry, sandy, stony
Prominent vegetation patterns	vegetation generally short; patches of early goldenrod and black-eyed Susan; native shrubs (bayberry and rose) scattered throughout
Important features	large hardwood trees on perimeter
Structures	stone steps in meadow connecting two carriage roads
Greatest uses	water access at Boathouse; recreation, views, wildlife habitat, winter sledding
Mowing since 2018	2018-2020: not mowed Fall 2021: mowed to suppress shrubs coming up; areas next to the stone steps and ditch not mowed to encourage growth of plants Spring 2023: same as 2021 mowing

BOATHOUSE MEADOW

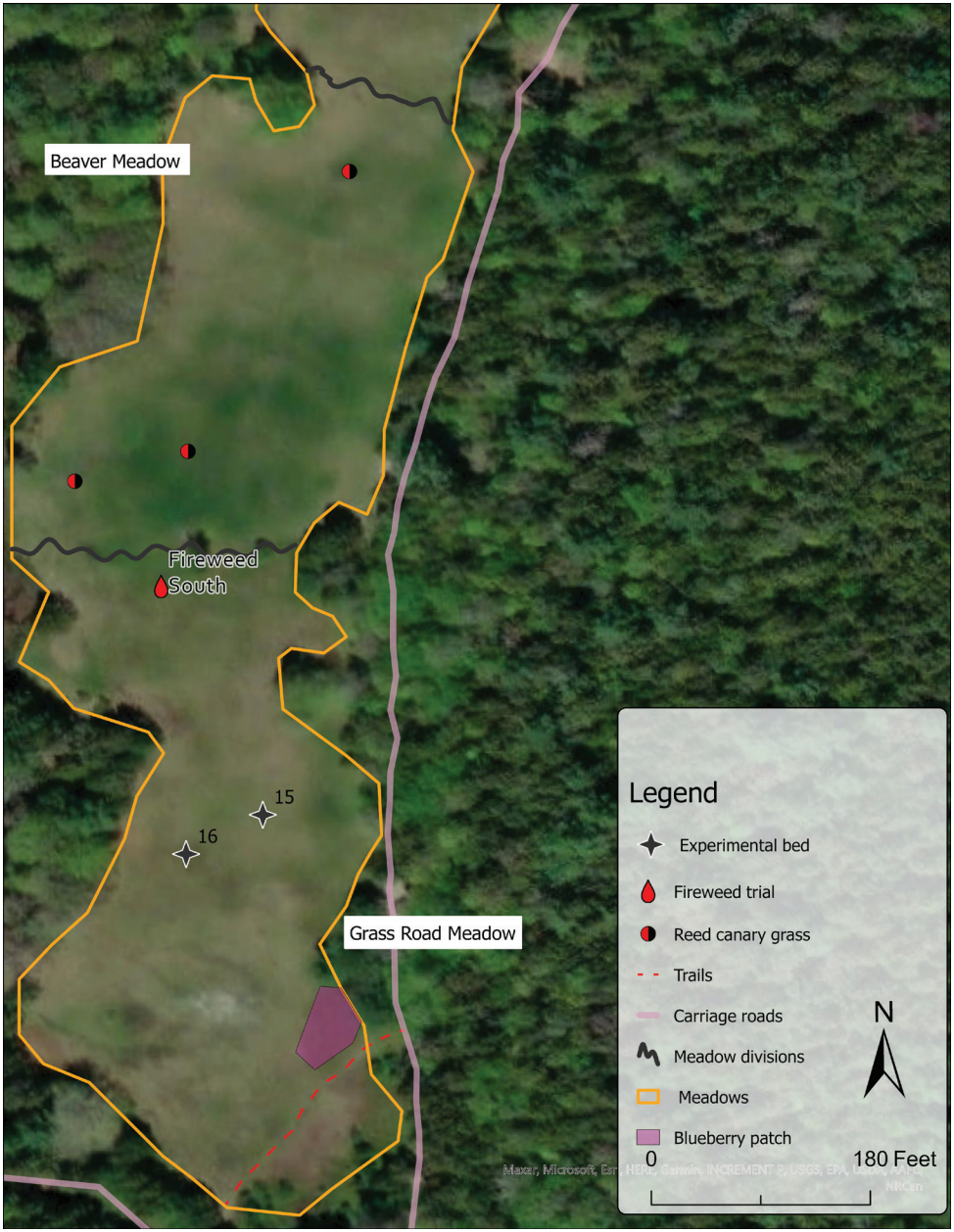
The Boathouse Meadow is very steep. When creating the ditch at the bottom of the Boathouse Meadow, the slope was made even more steep, and this area is prone to erosion. To stabilize this section above the ditch, we are allowing shrubs to grow in.

NORTHERN MEADOWS

NORTHERN MEADOWS



GRASS ROAD MEADOW & BEAVER MEADOW



GRASS ROAD MEADOW

The Grass Road Meadow is the southernmost of the northern meadows. There is a short, well used trail running through the Grass Road Meadow that leads from the nearby grass road to the carriage road (see map below). The largest and earliest experimental plot (#15, created in 2019) is in the Grass Road Meadow and is clearly visible from the carriage road.

GRASS ROAD MEADOW

Soil type	clay; some very wet spots
Prominent vegetation patterns	diverse meadow vegetation with good blueberry patch near the trail
Important features	various giant hardwood trees along the meadow's edge; blueberry patch; experimental beds #15 & #16; fireweed south trail area
Structures	short trail leading from grass carriage road to stone carriage road
Greatest uses	plant and animal biodiversity; blueberry picking; views to the pond
Mowing since 2018	2018-2022: not mowed

GRASS ROAD MEADOW

The Grass Road Meadow shown from the carriage road. Much of the visible grasses are nonnative and are likely the result of agriculture done in the 19th century. Experimental bed #15 is visible. The tall grass in the bed is little bluestem.

BEAVER MEADOW

The Beaver Meadow looks different than the two adjacent meadows due to the abundance of exotic grasses *Dactylis glomerata*, *Elymus repens*, and *Poa pratensis*, which are tall and were likely used as forage grasses in the past. This meadow looks most like a hayfield of all the meadows and in many areas the forage grasses grow in dense homogenous swaths to the exclusion of native plants. Because of this, and because invasive reed canary grass is present, the Beaver Meadow is a good candidate for ecological restoration and plant diversification.

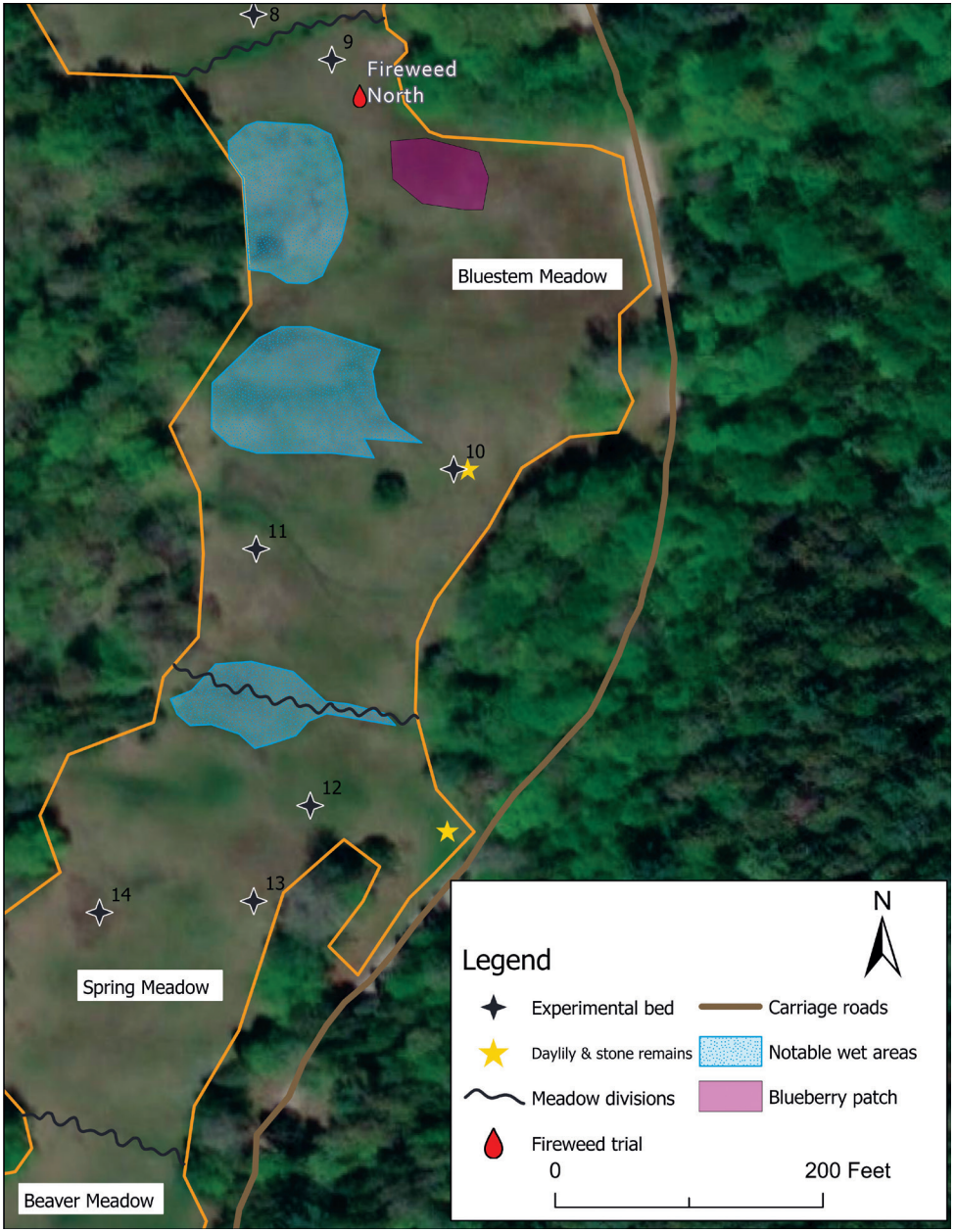
BEAVER MEADOW

Soil type	clay
Prominent vegetation patterns	looks like a hayfield; very low plant diversity in majority of this meadow; three primary patches of invasive reed canary grass (*Phalaris arundanaceae*)
Important features	SE portion of this meadow extremely flat and level with the carriage road; ideal for gaining access to the meadow with a vehicle for mowing, etc.
Structures	none
Greatest uses	great restoration opportunity; plant and animal biodiversity; views to the pond and marsh
Mowing since 2018	2018-2022: no meadow-wide mowing 2019-2022: patches of invasive grass mowed and/or tilled annually since 2019

BEAVER MEADOW

The Beaver Meadow is adjacent to the northern end of Little Long Pond. The nonnative grasses are dense in this meadow.

SPRING MEADOW & BLUESTEM MEADOW



SPRING MEADOW

Live quart-size plants were planted into the Spring Meadow in 2019 with a mix of results shown on the following page. Since annual meadow mowing ceased in 2018, alders (*Alnus spp.*) have started to grow in the wetland at the north end of the Spring Meadow. To keep this area open and to favor the herbaceous plants that are present, Natural Lands staff will periodically remove the alder from this wetland.

SPRING MEADOW

Soil type	clay
Prominent vegetation patterns	diverse meadow vegetation; large wet meadow of sedges and rushes
Important features	experimental beds #12, #13, & #14
Structures	hand-dug spring in the woods, at the bottom of the hill on the west side of the meadow; stone remains of farm structure next to the carriage road
Greatest uses	plant and animal biodiversity
Mowing since 2018	2018-2022: no meadow-wide mowing 2021: small section of woody shrubs (mostly spirea) mowed in 2021 (see photo on page 43)

NATIVE HERBACEOUS SPECIES PLANTED IN THE SPRING MEADOW, SUMMER OF 2019

SPECIES	COMMON NAME	PLANTING LOCATION	NO. OF PLANTS	SOURCE	NOTES
Eutrochium maculata	Joe-Pye weed	Edge of wetland on the north side of meadow	5	Rebel Hill Farm (Liberty, ME)	Did not establish.
Verbena hastata	Blue vervain	Edge of wetland on the north side of meadow	5	Rebel Hill Farm (Liberty, ME)	Bloomed in 2019, alive in 2020 but not alive in 2021. See page 43.
Lobelia cardinalis	Cardinal flower	Directly west of alder patch growing on east side of wetland.	5	LGP, seed from Somesville (MDI) population	This area floods in the spring and draws down – yet remains wet – in the summer. Leaves collect in this area and may have smothered the plants, which bloomed in 2019 and 2020, but not 2021. Plants were no longer alive in 2022. See page 43.
Schizachryium scoparium	Little bluestem	Northeast corner of the meadow, on northwest facing slope, just south of alder patch (mixed with pearly everlasting).	20	LGP, seed from Somesville (MDI) population	Established and alive in 2022. See page 43.
Anaphalis margaritaceae	Pearly everlasting	Northeast corner of the meadow, on northwest facing slope, just south of alder patch (mixed with little bluestem).	20	LGP, seed from Petit Manan National Wildlife Refuge (collected with permission)	Established and alive in 2022. See page 43.
Eutrochium perfoliata	Boneset	Edge of wetland on the north side of meadow	5	Rebel Hill Farm (Liberty, ME)	Did not establish.

All plants were approximately quart size when planted and watered through the first summer.
Source: LGP= grown in Land & Garden Preserve propagation facility from seed.

SPRING MEADOW

Left: Plantings and mowing in the Spring Meadow. Red dashes hightlight the blue vervain, white dashes show the area of little bluestem and pearly everlasting. The area within the blue dashes is mostly spirea and was mowed in 2021. Photo taken August 28, 2019. *Right:* Cardinal flower blooming in the Spring Meadow in 2020.

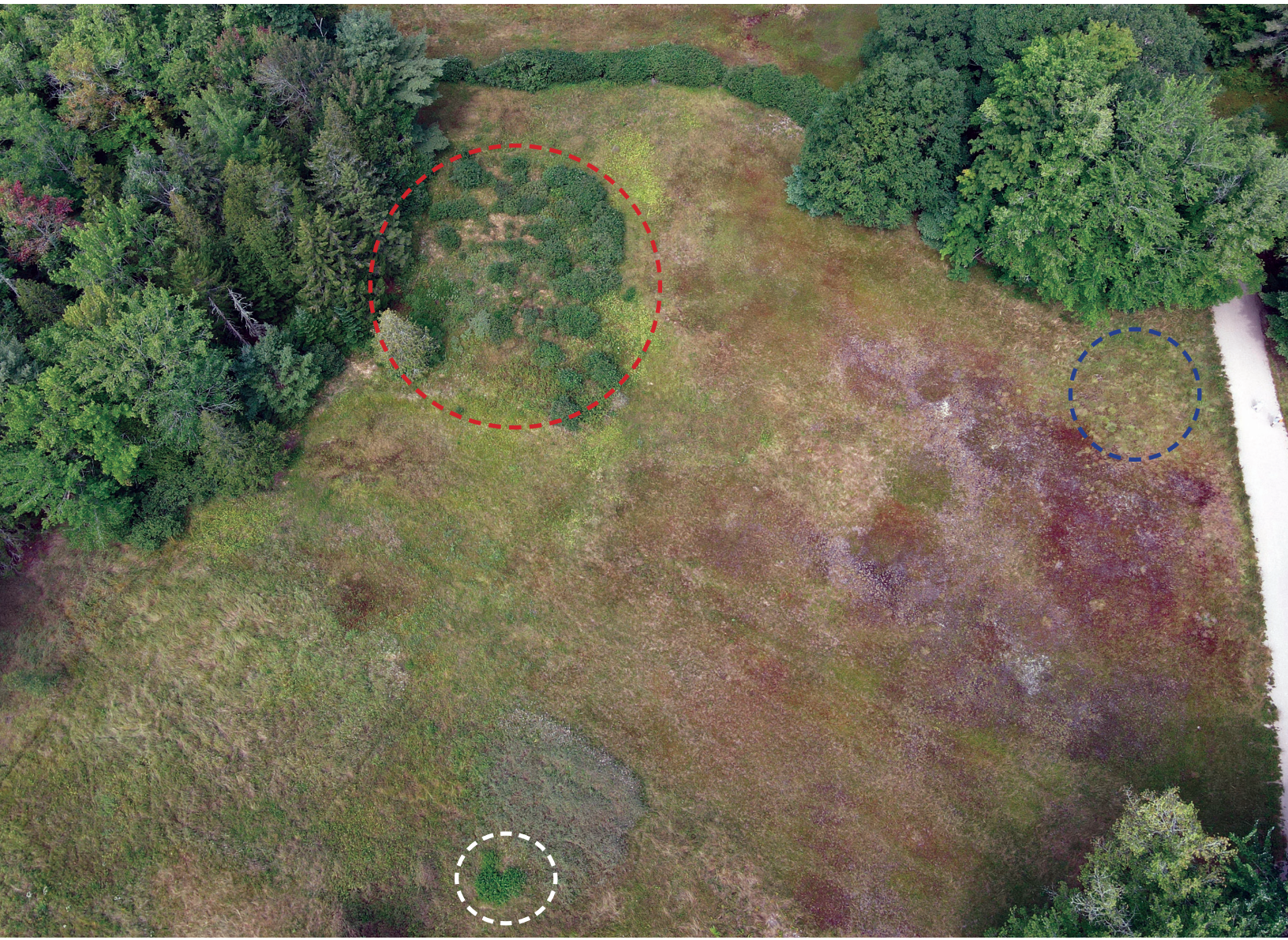
BLUESTEM MEADOW

The Bluestem Meadow is a large meadow with lots of native plant diversity. Due to the presence of a small wetland/peatland complex, there are many plants that are only found in this meadow including bog goldenrod (*Solidago uliginosa*), blue iris (*Iris versicolor*), willows (*Salix spp.*), rhodora (*Rhododendron canadense*), and bog aster (*Oclemena nemoralis*). The Bluestem Meadow is also the only meadow at Little Long Pond natural lands with naturally occurring little bluestem (*Schizachryium scoparium*), a plant that has worked well in our meadow restoration plantings and we are likely to use in the future.

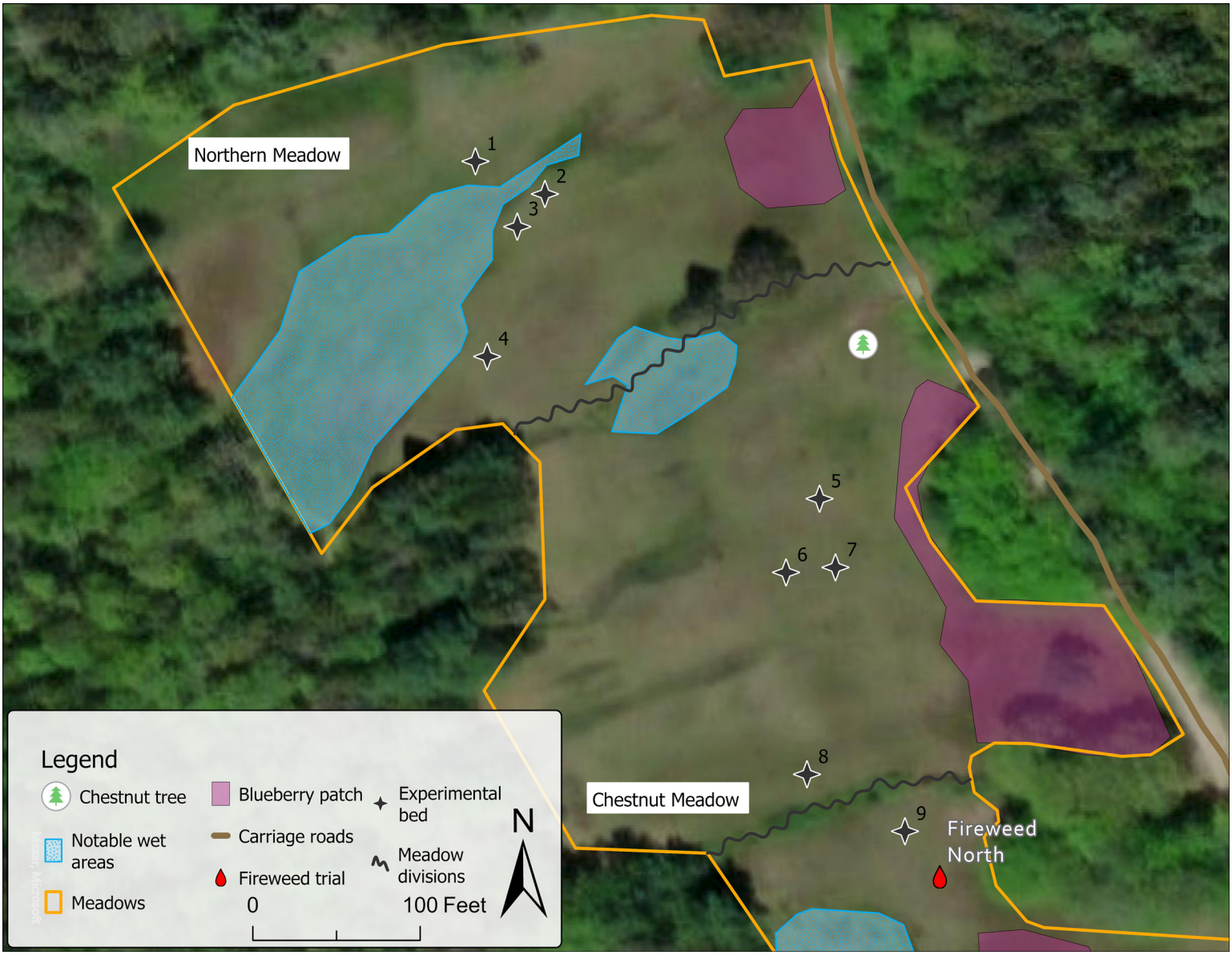
BLUESTEM MEADOW

Soil type	clay
Prominent vegetation patterns	diversity of native plants correlated to diversity of underlying topography and hydrology; some meadow plants found only in this meadow
Important features	small peatland on western edge; patches of willow in drainage; large patch of naturally occurring little bluestem in NE section; experimental beds #9, #10, #11; scattered day lilies remaining from agricultural period; fireweed north trial area
Structures	stone remains of farm structure
Greatest uses	plant and animal biodiversity; views to the pond and marsh
Mowing since 2018	2018 - 2022: not mowed

Patch of willow in the Bluestem Meadow. Two species are present: *Salix petiolaris* (L) and *Salix discolor* (R). Photo taken June 7, 2022.



Drone photo of the Bluestem Meadow taken August 28, 2020. Dashed lines code: Red=peatland complex, Blue=little bluestem patch, White=willow.



Map of the Northern Meadow and the Chestnut Meadow showing notable features.

CHESTNUT MEADOW

A giant red oak tree growing next to the carriage road in the Chestnut Meadow.

The Chestnut Meadow is named for the eight American chestnut trees planted in 2013, of which one is alive. In this meadow there are large swaths of nonnative grasses that we may try to diversify with native plants.

CHESTNUT MEADOW

Soil type	clay
Prominent vegetation patterns	next to carriage road: a large blueberry patch, a patch of American beech (infected with beech bark disease), and three huge red oak trees
Important features	one American chestnut tree; experimental beds #5, #6, #7, #8
Structures	none
Greatest uses	plant and animal biodiversity; blueberry picking
Mowing since 2018	2018-2022: not mowed

CHESTNUT MEADOW

Part of the Chestnut Meadow is shown in the foreground of this photo (everything in front of spruce tree and alders), taken December 8, 2021.

NORTHERN MEADOW

Approximately one-fourth of the Northern Meadow is wetland with tall vegetation (see page 51). This is the northern most meadow at the Little Long Pond natural lands, roughly one mile on the carriage road from Peabody Drive/Route 3/Bracy Cove.

NORTHERN MEADOW

Soil type	clay
Prominent vegetation patterns	one large wetland on the west side of meadow; blueberry patch on the east side next to the carriage road
Important features	experimental beds #1, #2, #3, #4
Structures	none
Greatest uses	plant and animal diversity; blueberry picking
Mowing since 2018	2018-2022: not mowed 2023: spring mowing to remove tree saplings

NORTHERN MEADOW

Drone photo taken of the Northern Meadow, August 28, 2020. The varying colors of the different vegetation communities are starkly visible. The bright, lime-green areas are wetlands and the dark red areas (far left and far right) are blueberry patches. The two chestnut trees visible on the right side of the photo have since died.

NORTHERN MEADOW

Ground view of the Northern Meadow, looking west from the eastern side of the meadow.
The bright green areas are very wet. Photo taken September 20, 2020

VII. *Meadow Management at the Little Long Pond Natural Lands*

GENERAL MANAGEMENT PERSPECTIVE

The meadows are heterogenous in terms of soil characteristics, hydrology, aspect, light conditions, slope, land use history, and current vegetation. To reflect this diversity of conditions, the Preserve does not manage the meadows as a single unit with a single goal. Instead, the Preserve manages the 20 acres of meadows as a variety of smaller landscape features based on their current conditions, surroundings, and management opportunities.

The Land & Garden Preserve maintains its meadows at Little Long Pond natural lands in an open state through periodic mowing to 1) support plant and wildlife species that depend on open areas, 2) to provide visitors with an alternative to the spruce-fir forest, and 3) to provide views of Little Long Pond and the surrounding mountains. While the meadows will be kept open in general, the Preserve will allow some taller plants (small trees and shrubs) to grow in select areas. This will be detailed in the next section.

In essence, meadows are a habitat frozen in time and the natural lands staff recognizes our hand in preventing the meadows from naturally developing into a forest. We are flexible in our thinking about some of the meadow's characteristics and are not trying to recreate a 'perfect', pre-European model of what a meadow *should be*. Staff see the meadows at Little Long Pond natural lands as a venue for regenerative ecological forces and positive visitor experience, regardless of the

exact makeup of its plants. In other words, some of the meadow's characteristics may change over time, but so long as a few general rules are followed, the meadow will continue to be a biological and cultural asset.

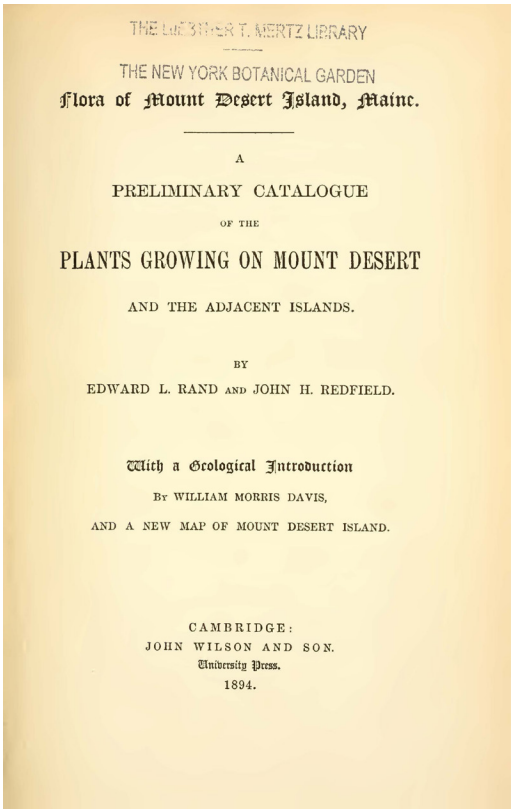
Primary management questions:

How do our meadows compare to other meadows in the area? Are there any plants that are noticeably present in and/or absent from our meadows that need to be addressed?

Natural lands staff visited ten meadows in coastal Maine to compile something of a loose, hybrid reference system. Our meadows on the Little Long Pond natural lands did not stand out from any of these coastal meadows in any major way; all plant communities essentially matched ours. Staff also visited a few inland meadows in the early fall of 2022 (up to 40 miles from the coast) and found the meadows to be like ours, although they did contain a few plants absent from our meadows. Specifically, virgin's bower (*Clematis virginiana*), Lindley's American-aster (*Symphyotrichum ciliolatum*), lance-leafed American aster (*Symphyotrichum lanceolatum*), and wavy-leaved American aster (*Symphyotrichum undulatum*) were observed.

Because these other coastal and inland meadows had similar vegetation to ours, there is no evidence that makes the Preserve staff think that the meadows on the Little Long Pond natural lands need any sweeping management change.

How have our meadows changed over time?



We compared our 2022 plant survey with the plants recorded in *The Flora of Mount Desert Island, Maine* by Edward L. Rand and Harry J. Redfield (1894).

How do we know what was growing specifically around Little Long Pond in the 1890's? 1) the area around Little Long Pond was referenced by name many times in the book (usually as 'Long Pond meadows'). 2) the authors provided notes about each plant's rarity, abundance and habitat and based on these comments we can make an educated guess about which plants were present at or around Little Long Pond. For example, the notes for Joe-Pye weed are: "low grounds, brooksides, and meadows; frequent" (pg.109). Since in the 1890s Joe-Pye weed was frequently observed on MDI, and that it was associated with habitats that are found around Little Long Pond, we can make a loose assumption that it was historically found around Little Long Pond.

Rand and Redfield's book has been used by researchers to show a decline of native plants and an increase in exotic plants on MDI between ca. 1900 and ca. 2000 (MacKenzie, Mittelhauser, Miller-Rushing, & Primack, 2019). The researchers suggest that these declines are probably the result of multiple factors, including deer browse, development, climate change and nitrogen deposition.

Unfortunately, these findings mirror what other researchers have found when they compare plants and animals over time: global diversity is declining. It may be possible to reestablish some of the plants that were once found at the Little Long Pond natural lands (see table on the following page). **The meadows may be a venue where we can increase local biodiversity**.

The meadows north of the Boathouse are better suited to be managed for biodiversity because they are more removed from human and dog activity and their larger size provides greater opportunity for attracting and supporting more wildlife and plant species.

Spirea blooming in the Spring Meadow in 2020.

SPECIES REPORTED BY RAND & REDFIELD ("R&R, 1894")
that have not been documented in Acadia National Park (ANP) since 1980.

SPECIES EXTIRPATED FROM ANP	SPECIES NAME USED IN RAND & REDFIELD	COMMON NAME	PG IN R&R, 1894	NOTES IN R&R (SELECT)	NOTES
**Clematis virginiana*	*Clematis virginiana*	Virgin's bower	75	Thickets; infrequent	Used by natural lands staff in restoration with good results.
**Eutrochium maculatum*	*Eupatorium purpureum*	Joe-Pye weed	109	Low grounds, brooksides, and meadows; frequent	Used by natural lands staff in restoration with mixed results. One very small wild population is found along the Jordan stream.
Lobelia spicata	*Lobelia spicata*	Pale-spiked lobelia	123	Grassy places; frequent. Somesville; Wasgatt Cove; fields above Long Pond; Seal Harbor; Northeast Harbor; Southwest Harbor; Mount Desert	This species is commonly used in meadow restoration projects in northeastern USA.
Symphyotrichum ciliolatum	*Aster lindleyanus Torr. and Gray*	Lindley's American-aster	113	Dry ground; rare	Scheduled for planting in meadows in 2023.
Symphyotrichum ericoides	*Aster ericoides, L.*	Heath American-aster	114	Rare. Wayside, road to Jordan Pond	
**Symphyotrichum lanceolatum*	*Aster paniculatus, Lam.*	Lance-leaved American-aster	114	Moist ground; frequent and widely distributed, especially in the northern part of the island	Grows abundantly along Route 1 in Trenton over damp/ moist soil. Scheduled for planting in meadows in 2023.
Symphyotrichum pilosum var. pringlei	*Aster polyphyllus, Willd.*	Awl American-aster	114	Infrequent and local; in greatest abundance on the mountains. Dog Mt.; Jordan Mt.; Pemetic Mt.; Long Pond meadows; Frenchman Camp; on Hunters Brook, near Frenchman Camp	Frenchman Camp was located near the present day ANP shooting range
Symphyotrichum undulatum	*Aster undulatus*	Wavy-leaved American-aster	113	Rare. Frenchman Camp road	It is unclear which road they are referring to. It is possible that it is the current driveway to the shooting range.

*These species are still present on Mount Desert Island but are uncommon or rare in most areas. Underlines in 'Notes in R&R' column are not in the original text but were added by the author because of direct reference to "Long Pond" (our Little Long Pond).

MANAGEMENT GOALS

Goal: Increase native plants – extent and number of species

The meadows are currently comprised of a diverse mixture of native and non-native plants. Some of the non-native plants such as Queen Anne's lace (*Daucus carota*) have been well established in large parts of North America for over a century and are generally accepted as benign or positive elements of our flora. Other non-native plants can be considered invasive and are the subject of ongoing management.

Two primary goals are to increase the total area of native plants and the number of native plant species in the meadow. This goal is important because native plants are the backbone of our local food webs; they are generally considered to bolster local biodiversity better than non-native plants due to the relationships they have evolved with the native soil food web and native wildlife. While we advocate for native plants and encourage them as much as possible in the meadows, we do not expect to attain a 100% native flora. More native plants are better than less, and we aim to capitalize on opportunities to spread/plant/introduce native plants to the meadows.

Methods for increasing native plant area and number of species:

- Mowing less frequently. For example, there are a few wet areas where willow shrubs were kept very low through annual mowing and in the absence of mowing, they have begun to thrive.
- Strategically timed mowing. For example, many of the nonnative grass are 'cool season' grasses whereas our native grasses are 'warm season' grasses. Mowing during the spring and early summer will negatively impact the nonnative grasses but will not harm the native grasses. This type of targeted mowing may chip away at the strong foothold the nonnative grasses currently have in some meadow areas.
- Plant desirable species in the form of seeding or live plants.

Establishing new species in the meadow will require disturbing the meadow's soil and/or manipulating its current plant composition. Either of these actions can result in conditions that favor the establishment of non-native and invasive plants. We have decided to move slowly with this goal and trial a variety of native plants and establishment methods at small scales. Once we gain confidence in our methods and plant selections we can scale up.

Nearly all the live herbaceous plants used in the meadow plantings are grown from seed at the Preserve's McAlpin Farm facility in Seal Harbor. Most seeds are collected locally by Preserve staff or collected elsewhere in Maine by private collectors or obtained from the Wild Seed Project in Portland, Maine. It is important for the Preserve to obtain seed from local sources (for example, MDI and coastal Maine) and to keep records of where seeds are sourced.

Goal: Reduce presence of invasive plants

The meadows – with their abundant sunshine and history of disturbance – provide an ideal place for invasive plants to become established. To date, we have recorded Japanese barberry, Asiatic bittersweet, glossy buckthorn, and reed canary grass in the meadows. Populations of some of these species (i.e., barberry) were very small and have been eradicated from the meadows, whereas other species (i.e., reed canary grass) will require years of management and site remediation. Where necessary, an herbicide is used under the supervision of a staff member that holds a State of Maine pesticide applicator license. We have found herbicide to be necessary for individual specimens of buckthorn, bittersweet and barberry that are too large to pull entirely from the ground. A very small quantity of herbicide is sprayed onto the woody stem once it is cut.

The Land & Trails staff spend approximately five days each year (mostly July and August) monitoring and treating invasive plants in the meadows. We monitor past management areas to ensure that the target species has been managed effectively, or to conduct follow up actions. We collect spatial data on smartphones using the Arc Collector app

Plant ranges move over time and invasive plants are easily moved by people. We can expect additional invasive plants to be found at the Little Long Pond meadows in the future. One plant – Japanese stiltgrass (*Microstegium vimineum*) – is particularly invasive and could outcompete many of the native plants currently growing in the meadows. In Maine, stiltgrass has only been found

Reed canary grass monoculture in the Beaver Meadow. Photo was taken after herbicide application to the grass in preparation of a restoration seeding. Photo taken November 1, 2022.

in York County, but it is well established in many other eastern states. If stiltgrass were to be found at Little Long Pond natural lands it would need to be managed swiftly before it became well-established and spread. Land & Garden Preserve staff are well positioned to become aware of newly occurring invasive plants on or near Mount Desert Island. Staff regularly communicate with other land managers, gardeners and conservationists around the state and the region. The staff also receive email notices from various state agencies on important topics, including invasive plants.

Goal: Protect/expand riparian areas to minimize erosion

Human visitors and their dogs are common in the West Meadow and the southern meadows, which puts a strain on the meadow's natural resources. The vegetated buffers between the meadows and Little Long Pond ('riparian areas') are critical for stabilizing its banks, maintaining clean water, and supporting pond health, but these buffers are narrow and generally in poor condition. The ideal buffer between the meadow and the pond is densely vegetated and is at least 15' wide. Wider buffers are better, but 15' is the minimum amount needed to stabilize the bank and prevent erosion from occurring. When Land & Garden Preserve took ownership of the Little Long Pond natural lands in 2015 some of the pond's riparian areas along the West Meadow and southern meadows were experiencing serious erosion, mostly caused by dogs entering and exiting the pond. Since taking ownership, the Preserve has addressed erosion in the West Meadow and the Gate Meadow by hardening the eroded area with granite boulders and erecting cedar fence on both sides of Little Long Pond. These efforts have been largely effective at

keeping dogs off the banks and promoting new plant growth. We plan to regrow and widen the West Meadow riparian buffer where possible and continue to plant native trees in the Gate Meadow riparian buffer.

Goal: Manage foot traffic to minimize soil erosion

BOATHOUSE MEADOW

The Boathouse Meadow is steep and is crossed regularly by people visiting the Boathouse. The only path across the Boathouse Meadow for visitors is very steep and is subject to erosion. In 2021 the natural lands staff improved the erosion problem by placing steps along the path, but more steps are needed to reduce the grade further (scheduled for 2023). Some visitors and dogs choose to bypass steps and now a social trail is starting to form next to the intended path. It is difficult managing foot traffic through an open meadow, so we are forced to use physical obstacles to keep people and dogs in the intended pathway. Ideally, these obstacles are plants and stone features that visitors do not recognize as obstacles. Staff have begun allowing plants (mostly rose bushes and native wildflowers) to grow on either side of the preferred path (see page 63).

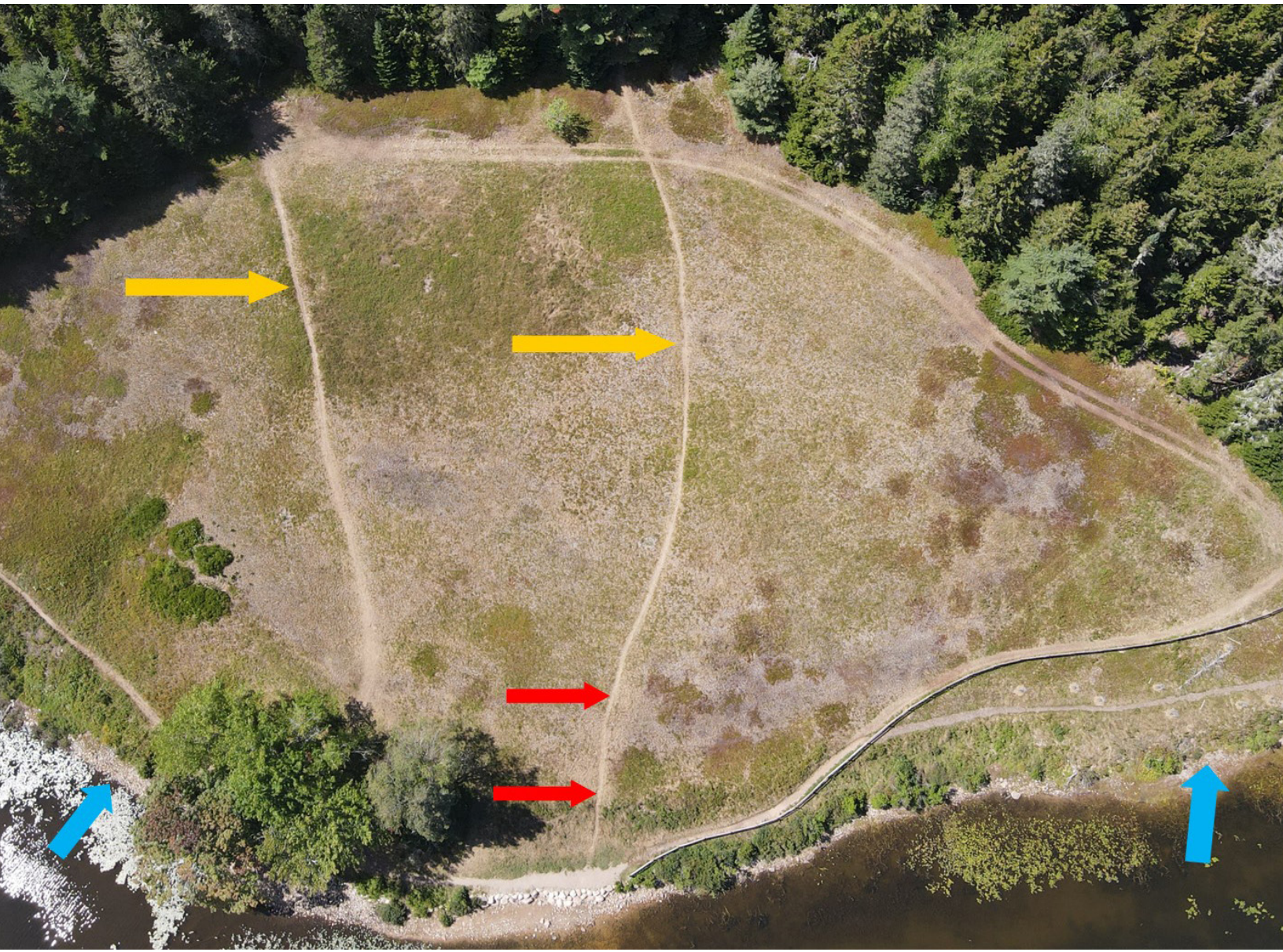
WEST MEADOW

The trails to the West Meadow's water access area descend a steep hill and are becoming eroded. Like curtailing erosion in the Boathouse Meadow, solutions that would successfully mitigate this trail erosion in the West Meadow may prove difficult to implement because they rely on the Preserve staff effectively directing visitor and dog traffic in an open landscape. The West Meadow currently has

BOATHOUSE MEADOW STEPS

Dashed lines code: Red=Areas next to the steps were not mowed in 2021 to allow plants to grow high.
Yellow=Staff planted a patch of trees, shrubs and perennials to prevent a social trail from developing at the top of the path.
White=Social trail developing by humans and dogs bypassing the steps. This is not currently causing a problem, but this is the first step toward erosion and should be corrected before it gets too bad. The goal is to keep visitors and dogs on the steps.

EROSION ON THE TRAIL IN THE WEST MEADOW



Management issues in the West Meadow. Yellow arrows: social trail, Red arrows: trail erosion, Blue arrows: bank erosion.

three social trails and at least four ways to enter and exit the meadow which makes directing human and dog traffic even more complicated. Staff are currently designing a comprehensive, West Meadow-wide solution that addresses human traffic and dog traffic flow, minimizes trail erosion, and protects the pond's banks.

Goal: Provide a greater diversity of habitats – shrubs

Shrubs and small trees can add wildlife habitat in the meadows by providing additional height, increased structural complexity and botanical diversity. For example, willow is one of the first plants to flower in the spring and its nectar supports the first wave of insects looking for nourishment. Another example is the dense patches of alder in the Bluestem Meadow that provide nesting habitat for the common yellowthroat and song sparrow. Staff will balance the need for shrub habitat with the desire to keep most of the meadows open and as 'meadow-like' as possible. We envision allowing shrubs to colonize in the following three areas:

- along the edge of the forest where the shrubs can help to blend the meadow vegetation (short) into the forest vegetation (tall). This 'edge' habitat is very good for wildlife.
- in select low/wet spots, and
- where the meadows meet Little Long Pond (see riparian goal above).

In the few years of suspended annual mowing, we are already starting to see native shrubs sprouting up around the meadow. We have observed bayberry, alder (*Alnus incana*, and *Alnus viridis*), wild raisin (*Viburnum nudum*), steeplebush (*Spiraea tomentosa*), rhodora (*Rhododendron canadense*), and choke berry (*Aronia spp.*).

Natural lands staff will make decisions about whether to allow colonizing shrubs to remain on a shrub-by-shrub/site-by-site basis.

Goal: Add color to the meadow where possible

Parts of the meadow in autumn are ablaze with reds, oranges, and yellows but at other times – such as winter and mid-summer – the meadow is more monochrome. The following examples are opportunities to make the meadow's colors more interesting while being consistent with our other goals.

WILLOW

The red and yellow twigs of willow add a nice touch of color to the winter meadow. There is a patch of willow growing in the Bluestem Meadow that was once kept low by annual mowing. Since annual mowing ceased in 2018 this willow patch has started to grow and is currently five feet tall. The patch can be pruned and managed for shape and size over time. See photos on previous pages 45 and 46.

RHODORA

The beautiful magenta flowers of rhodora are one of the first showy flowers of the spring and where rhodora grows in masses, the magenta makes a beautiful sea of color that can be seen from a distance. There is a patch of rhodora growing in a shrub thicket over peaty soil at the bottom of the Bluestem Meadow. Natural lands staff periodically remove and/or prune the competing shrubs (mostly alders) in the area to favor the rhodora. These early flowers not only provide nectar to hungry spring bees, but they provide inspiration to people coming out of winter.

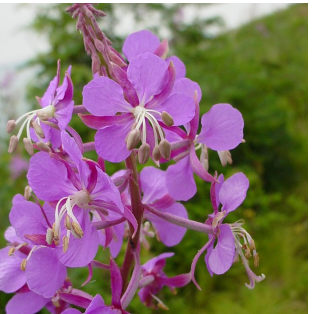
Rhodora blooming.

FIREWEED

Fireweed (*Chamerion angustifolium*) is native to MDI but is not present at Little Long Pond natural lands. It usually grows in dense patches, has a tall, narrow flower, and provides a very bright pink in mid-late summer when the meadow is without a lot of color. A few dozen quart-size fireweed plants were planted into experimental plot #16 in early summer 2020 but none of the plants successfully established despite being watered and cared for. Staff believe the reason the fireweed died is due to the heavy clay soil (fireweed favor coarse, well-drained soil) and competition from nearby plants (they are said to be weak competitors).

During the winters of 2020/2021 and 2021/2022 natural lands staff attempted unsuccessfully to establish fireweed from seed at two locations (shown on maps as 'Fireweed North' and 'Fireweed South') in the meadows. At both locations staff prepared a seedbed with fire and broadcast wild-collected seed (bulked with sand) in the early winter. Both years' attempts resulted in successful germination but poor subsequent growth. Another attempt was made in the West Meadow in the spring of 2023 where the soil is coarse and dry, and likely more appropriate. Rand and Redfield include the following notes for fireweed in their book: 'Common, especially in clearings and in burnt ground' (Rand & Redfield, 1894, p. 102).

Fireweed blooming.



ESTABLISHING FIREWEED





Clockwise starting in the top left: December 8, 2021, Fireweed North. Bonfire on small patch of meadow to prep a seedbed. December 12, 2021, Fireweed South. Post fire, the ground is charred, ash and charcoal remain. June 7, 2022, Fireweed North. Hundreds of small fireweed plants germinated. July 6, 2022, Fireweed South. Fireweed alive but remaining small. Sand is visible in the photograph. July 19, 2022, Fireweed South. Dozens of fireweed plans alive but now growing among faster growing native and exotic species. No fireweed bloomed in 2022.

Goal: Grow more white and grey birch trees

An old photo (date unknown) taken from the West Meadow looking east across Little Long Pond. There are many white birch trees visible along the carriage road. Many of these white birches have died since this photo was taken.

White birch (*Betula papyrifera*) and grey birch (*Betula populifolia*) are emblematic of New England and Maine but are fading from the landscape around Little Long Pond because they require abundant light to thrive. As the forest around Little Long Pond has matured, we have lost many of our birches. Birches are one of the first trees to colonize a meadow after mowing is suspended and many small (1-3 ft) birch trees can already be seen scattered around the meadow. The natural lands staff will monitor the meadow for birch saplings and select individuals that are good candidates for growing to maturity. Most new birch trees will be either along the carriage road or at the meadow/forest edge. From a horticultural perspective white birch is generally considered better looking (i.e., better form, whiter/more papery bark) than grey birch and will be given preferential treatment.

Goal: Maintain specimen trees

These huge trees are unique to this part of the natural lands and Preserve staff is currently growing approximately 10 of their replacements in our horticulture facilities. These trees will be planted along the carriage road once they are around six feet tall. Replacement trees will be from long-lived species that form broad crowns including sugar maple, black oak (*Quercus velutina*), black cherry (*Prunus serotina*), red oak, white oak (*Quercus alba*), and yellow birch. Seeds for these trees are generally from Maine or nearby states.

Goal: Maintain views

With their open state, the meadows provide an alternative to the forest and let visitors see long distances and orient themselves to the surrounding landscape. We will maintain these views across and within the meadows, which can be achieved by keeping vegetation next to the carriage roads low.

An example of a great view across the Gate Meadow.

Goal: Provide opportunities for blueberry picking

It is common to see people picking blueberries through the month of August and we view this as a great way for people to connect with nature. We will continue to promote the growth of blueberries and suppress the growth of other plants in the blueberry patches. The primary management activity will be to cut out shrubs or saplings that start growing in the blueberry patches. Sometimes this will be done on an individual plant basis and other times it will be easier and more effective to simply mow the patch.

Goal: Visitor/dog safety

EMERGENCY MEDICAL RESPONSE

As a basic requirement, all natural lands staff are trained in first aid and CPR and carry first aid kits. Additionally, two full-time employees are trained at higher levels of medical response and are members of the MDI Search and Rescue Team. Although dangers and risks are low in and around the meadows, emergency preparedness is important.

A coyote in the Northern Meadow.

COYOTE

In 2020, a family of coyotes was consistently observed in and around the northern meadows in July and August. The coyotes were observed hunting for rodents and eating blueberries in the meadows, as well as crossing and using the carriage road during the day. While coyotes are

much smaller than wolves, and they are accustomed to preying on small animals (mostly rodents), it is possible that they would harm and/or kill a small dog that was in the wrong place at the wrong time. During this period of high coyote reports we posted educational signs around the natural lands that encouraged people to keep their dogs leashed in specific areas. The summers of 2021 and 2022 brought far fewer sightings of coyotes in the meadow and virtually no reports of coyotes using the carriage roads.

Goal: No net loss of meadow acreage

It is important that the meadows do not shrink significantly in size as a result of any of the management described in this section. Generally, a habitat's benefit to wildlife is directly proportional to its size; if the meadow were to shrink in any appreciable amount, habitat value may be diminished. Some of the goals and management activities in this section call for the growing of trees and shrubs that would result in a slight decrease in meadow acreage, but this decrease will likely be too small to negatively impact the meadow habitat. To prevent the forest from encroaching on the meadow, staff periodically remove small softwood trees growing on the meadow's perimeter.

Goal: Create Meadow-wide landscape plan

Meadow-wide planning will help to coordinate and harmonize all of the management goals described above. Additionally, a comprehensive landscape plan produced by a professional landscape architect or landscape designer might provide insight on elements of the meadow that we have not yet considered. We

anticipate that much of the meadows will remain as they currently are (with possible minor modifications), with exceptions being areas like the Beaver Meadow, where we may make a larger effort to diversify the plant community. Designing meadow communities and developing seed mixes is something best left to professionals that specialize in northeastern meadows.

VIII. *Conclusions*

The meadows at the Little Long Pond natural lands are an important element of the living landscape that The Preserve is entrusted to steward. They represent special places to our visitors and are venues where the Preserve's mission can be achieved. Equally as important are the meadows' contribution to the landscape's ecological integrity and the plants and animals that require them for survival.

The Meadows' ecological health is generally good but there are a few areas where improvements can and should be made. Specifically: the riparian zones should be widened and revegetated as much as possible to avoid bank erosion; erosion from visitor use should be addressed on key trails; and invasive plants need to be kept in check.

Maintaining the meadow's status quo is a large part of current and future management but by adjusting our mowing regimes and introducing some historically present plant species, the Preserve has the opportunity to make improvements to the meadows' biodiversity. Additional help from professionals specializing in meadows will likely be useful.

IX. *References*

Eliot, S. A., & Rivers, J. R. (2017). *Little Long Pond, A Field Guide to Four Seasons*. Bar Harbor: Published by the authors.

Foster, D. R. (1999, June 26). Forests The Way They Used To Be. *New York Times*, p. A13.

Foster, D. R., & Motzkin, G. (2003). Interpreting and conserving the open lands habitats of coastal New England: insights from landscape history. *Forest Ecology and Management*, 127-150.

Foster, D. R., Motzkin, G., & Slater, B. (1998). Land-Use History as Long-Term Broad-Scale Disturbance: Regional Forest Dynamics in Central New England. *Ecosystems*, 96-119.

MacKenzie, C. M., Mittelhauser, G., Miller-Rushing, A. J., & Primack, R. B. (2019). Floristic Change in New England and New York: Regional Patterns of Plant Species Loss and Decline. *Rhodora*, 1-36.

Oswald, W. W., Foster, D. R., Shuman, B. N., Chilton, E. S., Doucette, D. L., & Daranleau, D. L. (2020). Conservation implications of limited Native American impacts in pre-contact New England. *Nature Sustainability*, 241-246.

Rand, E. L., & Redfield, J. H. (1894). *Flora of Mount Desert Island, Maine*. Cambridge: University Press.

Written by:

Tate Bushell, Natural Lands Director, Land & Garden Preserve

Photo Credits:

Allison Bourke: cover, pages 20, 27, 29, 46, 51, 64

Tate Bushell: pages 8, 19, 25, 27, 32, 37, 39, 43, 45, 48, 49, 52, 56, 60, 63, 66, 67, 68, 70

Dave Ouellette: page 71

unknown photographers: pages 7 and 69

X. *2022 Plant List of the Meadows*

Abies balsamea
Acer pensylvanicum
Acer rubrum
Acer saccharum var. saccharum
Achillea millefolium ssp. lanulosa
Achillea ptarmica
Ageratina altissima var. altissima
Agrostis capillaris
Agrostis gigantea
Agrostis perennans
Agrostis scabra
Agrostis stolonifera
Alchemilla monticola
Alnus incana ssp. rugosa
Alopecurus pratensis
Amaranthus hybridus ssp. hybridus
Ambrosia artemisiifolia
Amelanchier intermedia
Anaphalis margaritacea
Antennaria neglecta
Anthemis cotula
Anthoxanthum odoratum
Apocynum androsaemifolium
Aralia nudicaulis
Arctium minus
Arctostaphylos uva-ursi
Arisaema triphyllum var. triphyllum
Aronia floribunda
Aronia melanocarpa
Arrhenatherum elatius ssp. elatius
Artemisia vulgaris var. vulgaris
Asclepias syriaca
Asclepias tuberosa ssp. tuberosa
Athyrium angustum
Barbarea vulgaris
Berberis thunbergii
Betula alleghaniensis
Betula cordifolia
Betula papyrifera
Betula populifolia
Bidens frondosa
Brachyelytrum aristosum
Brassica nigra
Bromus inermis ssp. inermis
Calamagrostis canadensis var. canadensis
Calystegia sepium ssp. americana
Capsella bursa-pastoris
Carex atlantica var. capillacea
Carex brunnescens var. sphaerostachya
Carex canescens ssp. disjuncta
Carex conoidea
Carex crinita var. crinita
Carex debilis var. rudgei
Carex echinata var. echinata
Carex flava
Carex gynandra
Carex intumescens
Carex lacustris
Carex lasiocarpa ssp. americana
Carex leptalea ssp. leptalea
Carex lurida
Carex merritt-fernaldii
Carex nigra
Carex pallescens
Carex projecta
Carex scoparia
Carex stipata var. stipata
Carex stricta
Carex vesicaria
Carex vulpinoidea
Celastrus orbiculatus
Cerastium fontanum ssp. vulgare
Chamaepericlymenum canadense
Chelone glabra
Chenopodium album
Cirsium altissimum
Cirsium arvense
Cirsium vulgare
Clematis virginiana
Comptonia peregrina
Crataegus crus-galli
Cuscuta gronovii var. gronovii
Dactylis glomerata
Danthonia compressa

Danthonia spicata
Daucus carota
Dennstaedtia punctilobula
Deschampsia [=Avenella] flexuosa
Dichanthelium boreale
Dichanthelium implicatum
Diervilla lonicera
Digitalis purpurea var. purpurea
Digitaria sanguinalis
Doellingeria umbellata var. umbellata
Drosera intermedia
Dryopteris campyloptera
Dryopteris carthusiana
Dryopteris cristata
Dryopteris intermedia
Dulichium arundinaceum var. arundinaceum
Eleocharis acicularis
Eleocharis obtusa var. obtusa [VERIFY ID]
Elymus repens
Elymus virginicus var. halophilus
Epifagus virginiana
Epigaea repens
Epilobium ciliatum var. glandulosum
Epilobium coloratum
Epilobium palustre
Equisetum sylvaticum
Erechtites hieraciifolius var. hieraciifolius
Erigeron canadensis
Erigeron strigosus var. strigosus
Eriophorum angustifolium ssp. angustifolium
Eriophorum virginicum
Erysimum cheiranthoides
Eupatorium perfoliatum
Euphrasia nemorosa
Euphrasia stricta
Eurybia macrophylla
Eurybia radula
Euthamia graminifolia
Eutrochium maculatum var. maculatum
Fagus grandifolia
Fallopia convolvulus
Festuca filiformis
Festuca rubra ssp. rubra
Festuca trachyphylla
Fragaria virginiana ssp. virginiana
Frangula alnus
Fraxinus americana
Fraxinus pennsylvanica
Galeopsis bifida
Galium mollugo
Galium palustre
Gaultheria procumbens
Gaylussacia baccata
Geum aleppicum ssp. strictum
Glyceria canadensis
Glyceria striata
Gnaphalium uliginosum
Helianthus sp.
Hemerocallis fulva
Hieracium kalmii
Hieracium murorum
Hieracium sabaudum
Holcus lanatus
Houstonia caerulea
Hypericum canadense
Hypericum mutilum ssp. mutilum
Hypericum perforatum ssp. perforatum
Hypericum punctatum
Ilex mucronata
Ilex verticillata
Impatiens capensis
Iris (=Limniris) versicolor
Juncus brevicaudatus
Juncus bufonius
Juncus canadensis
Juncus effusus ssp. solutus
Juncus filiformis
Juncus tenuis
Juniperus communis var. depressa
Kalmia angustifolia ssp. angustifolia
Larix laricina
Lathyrus japonicus var. maritimus
Lechea intermedia var. juniperina
Leucanthemum vulgare
Linaria vulgaris
Linnaea borealis ssp. longiflora
Lobelia inflata
Lobelia siphilitica var. siphilitica
Lolium multiflorum
Lolium perenne

Lonicera villosa
Lotus corniculatus
Lupinus polyphyllus var. polyphyllus
Luzula multiflora ssp. multiflora
Lycopus uniflorus
Lycopus virginicus
Lysimachia borealis
Lysimachia quadrifolia
Lysimachia terrestris
Maianthemum canadense
Malus domestica
Malus sargentii
Malva moschata
Matricaria discoidea
Moehringia lateriflora
Monarda fistulosa ssp. fistulosa var. fistulosa
Morella caroliniensis
Myrica gale
Nabalus altissimus
Nabalus trifoliolatus
Nuttallanthus canadensis
Oclemena ×blakei
Oclemena acuminata
Oclemena nemoralis
Oenothera parviflora
Oenothera perennis [SMALL SUNDROPS]
Onoclea sensibilis
Osmunda claytoniana
Osmundastrum cinnamomeum
Oxalis stricta
Parathelypteris noveboracensis
Parthenocissus quinquefolia
Persicaria hydropiper
Persicaria maculosa
Persicaria sagittata
Phalaris arundinacea
Phegopteris connectilis
Phleum pratense
Picea glauca
Picea rubens
Pilosella (Hieracium pilosella) officinarum
Pilosella (hieracium) aurantiaca
Pilosella (hieracium) caespitosa
Pinus resinosa
Pinus strobus
Plantago lanceolata
Plantago major
Poa annua
Poa compressa
Poa palustris
Poa pratensis ssp. pratensis
Pogonia ophioglossoides
Polygonum aviculare ssp. aviculare
Pontederia cordata
Populus tremuloides
Potentilla argentea
Potentilla recta
Potentilla simplex
Prunella vulgaris ssp. lanceolata
Prunus virginiana var. virginiana
Pteridium aquilinum ssp. latiusculum
Pycnanthemum incanum
Pycnanthemum tenuifolium
Pyrola americana
Pyrola elliptica
Quercus muehlenbergii
Quercus rubra
Ranunculus acris
Ranunculus repens
Raphanus raphanistrum ssp. raphanistrum
Reynoutria (FALLOPIA) japonica var. japonica
Rhinanthus minor ssp. minor
Rhododendron canadense
Rosa canina
Rosa carolina ssp. carolina
Rosa nitida
Rosa rugosa
Rosa setigera
Rosa spinosissima
Rosa virginiana ssp. virginiana
Rubus allegheniensis
Rubus canadensis
Rubus hispidus
Rubus idaeus ssp. strigosus
Rubus pubescens
Rubus setosus
Rudbeckia hirta var. pulcherrima
Rumex acetosella ssp. pyrenaicus
Rumex britannica
Rumex crispus ssp. crispus

Rumex longifolius
Salix bebbiana
Salix discolor
Salix humilis
Salix petiolaris
Schizachyrium scoparium var. scoparium
Scirpus atrocinctus
Scirpus atrovirens
Scirpus cyperinus
Scirpus hattorianus
Scirpus microcarpus
Scirpus pedicellatus
Scorzoneroides autumnalis ssp. autumnalis
Scutellaria galericulata
Securigera varia
Senecio sylvaticus
Setaria pumila ssp. pumila
Sibbaldia (Potentilla) tridentata
Silene latifolia ssp. alba
Solanum dulcamara var. villosissimum
Solidago bicolor
Solidago caesia var. caesia
Solidago canadensis var. canadensis
Solidago juncea
Solidago nemoralis ssp. nemoralis
Solidago puberula var. puberula
Solidago rugosa ssp. rugosa
Solidago uliginosa
Sonchus asper
Sonchus oleraceus
Sorbus americana
Sorbus decora
Spiraea alba var. latifolia
Spiraea tomentosa
Stellaria graminea
Symphyotrichum cordifolium
Symphyotrichum lateriflorum
Symphyotrichum novae-angliae
Symphyotrichum novi-belgii var. novi-belgii
Symphyotrichum puniceum var. puniceum
Syringa vulgaris
Tanacetum parthenium
Tanacetum vulgare
Taraxacum officinale
Thalictrum pubescens
Thelypteris palustris var. pubescens
Thuja occidentalis
Trifolium arvense
Trifolium aureum
Trifolium campestre
Trifolium pratense
Trifolium repens
Typha latifolia
Uvularia sessilifolia
Vaccinium angustifolium
Vaccinium macrocarpon
Vaccinium myrtilloides
Vaccinium pallidum
Vaccinium vitis-idaea ssp. minus
Valeriana officinalis
Verbascum thapsus
Verbena hastata var. hastata
Veronica arvensis
Veronica officinalis
Veronica peregrina ssp. peregrina
Viburnum dentatum var. lucidum
Viburnum lentago
Viburnum nudum var. cassinoides
Vicia cracca ssp. cracca
Vicia tetrasperma
Viola cucullata
Viola pallens
Viola sororia

the preserve

Tate Bushell
Natural Lands Director
tbushell@gardenpreserve.org

PO Box 208, Seal Harbor, ME 04675
207-276-3727 | *info@gardenpreserve.org*

GARDENPRESERVE.ORG

Abby Aldrich Rockefeller Garden | Asticou Azalea Garden | Thuya Garden | Little Long Pond & Hunters Cliff Natural Lands