



Self-directed: mapping
The rare plants of Bergen Swamp

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Background & task

Bergen Swamp is located in Genesee County in Western New York State. The area was formed by glacial activity over 10,700 years ago, leaving behind unique geological forms and hydrology that has resulted in the presence of many rare species of plants and animals. The area is a National Natural Landmark that is preserved by the Bergen Swamp Preservation Society in order to protect the rare and exotic species that exist within the swamp.

Focus

The focus of this project is on the rare species and habitats within the Bergen Swamp.



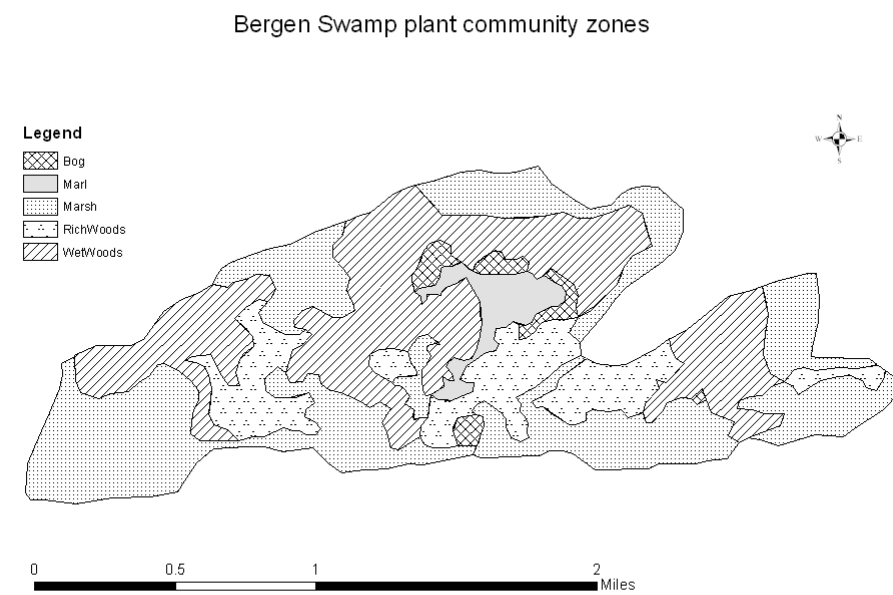
Task

To visualize environmental themes and/or scientific data and to make this information accessible across many interest levels from outdoor enthusiasts to botanists in the form of a map and field guide. And to work with geographic data in a way that maintains the integrity of the data while making it visually pleasing and accessible to its audience.

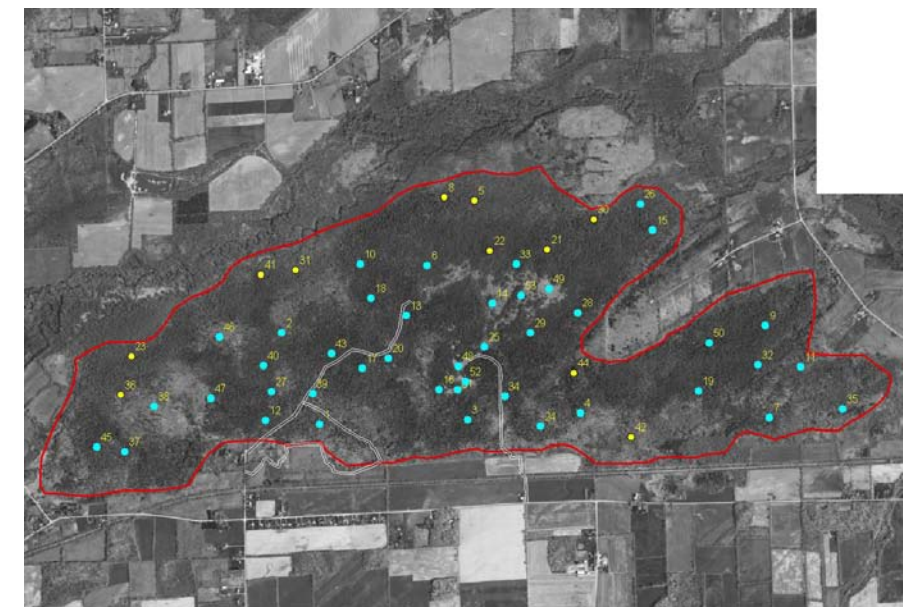
This map and guide attempts to capture and describe what the Bergen Swamp is all about. It is a collection of information that people can use to explore the area, learn about the rare plant species and habitats in which they're found, and to plan future visits based on flowering times.

About the data

The data was collected from a masters study of Bergen Swamp conducted by Aaron Hall — friend, fellow RIT grad, and PhD candidate at the University of Toronto, Canada. The collected data covers specific locations and the community zones where plant species were found, such as the bog, marl, marsh, rich woods, and wet woods.



Plant communities or habitat delineations within Bergen Swamp.



Sample locations where species were identified within the swamp (data correlates to information in an excel spreadsheet), swamp boundary, and aerial map.

Working with geographic tools

Geographic tools such as MapPublisher and Geographic Imager interface with Adobe software making it possible to have increased control over the visual characteristics of GIS data sets and labeling, while keeping the geographic information intact.

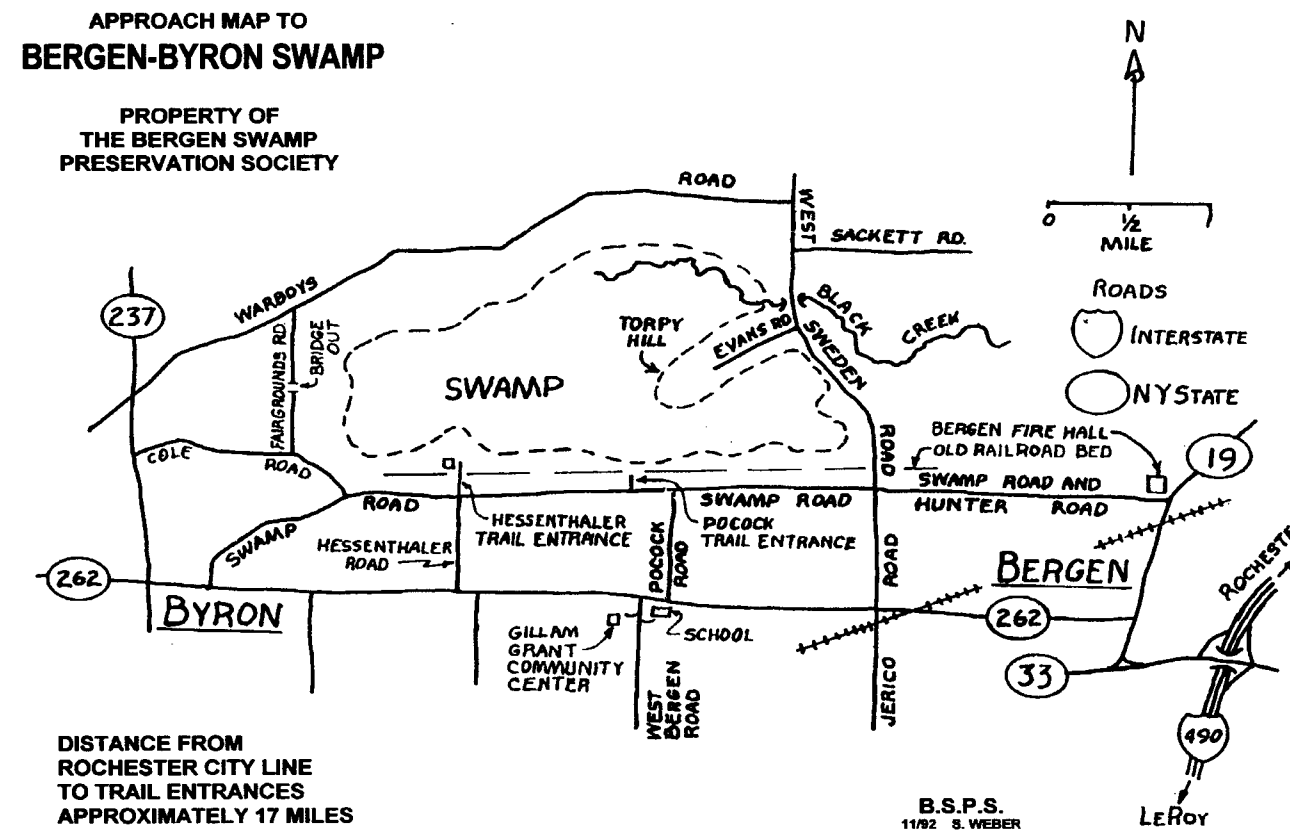


Using MapPublisher and Geographic Imager I was able to see any additional information that was associated with the data sets, such as feature names, x and y coordinates, line lengths, et cetera. I was able to use the tools to access this information to create and position labels for roads, contours, and water bodies; to display and style the line work; and to create selection filters to show the relevant information.

These tools also allowed me to bring data sets that were in different coordinate systems into the same system by running projections, to crop the data sets, and set the scale of my map. I was also able to create new data fields in the attribute tables by setting up queries and joins to focus on the data I needed and to combine data from different sources.

DISCOVERY

- 5 Analysis
- 6 Target audience & user needs



Analysis

These are two samples of trail maps commonly found in parks and nature areas like Bergen Swamp. These guides typically show the terrain, general areas, such as forest and fields, roads, public facilities, and points of access. They tend to focus on the trails and provide visitors with information about the trails, such as distance and duration. Rarely, do these maps focus on a specific theme or connect visitors with the areas by describing what is special about it.

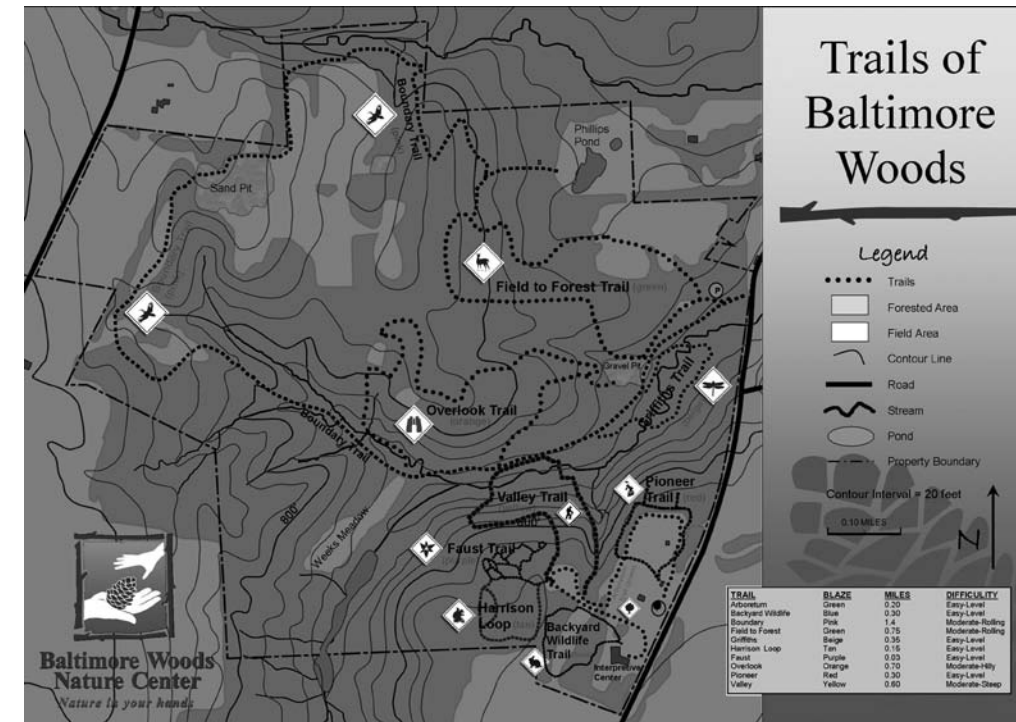
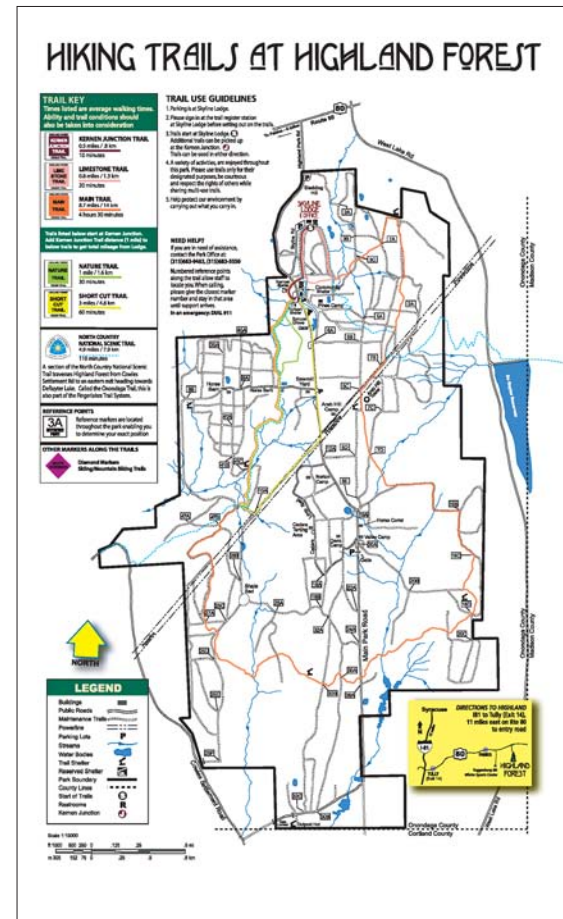
Problems

Highland Forest (Left)

- Trail markers don't connect to the trail names. Arbitrary letters and numbers?
- Quantity of information with minimal hierarchical distinctions
- Maintenance trails compete with the hiking trails, making it difficult to see which trails are available for public use.
- The trail key is separate from the map

Baltimore Woods Nature Center (Right)

- Lack of color makes it difficult to distinguish the different areas, and separate the trails from the other information on the map, such as contours, roads, and water.
- Contour labels are placed above the line instead of with (the convention).
- Labels and lines overlap, decreasing legibility.
- The map doesn't reveal any of the unique parts of Baltimore Woods, such as the different gardens, Pioneer Cabin, or the specific view points along the trails.



Target audience & user needs

Because the Bergen Swamp is often visited by Botanists and general visitors, I wanted to make sure that this was a piece that would appeal to both audiences. The challenge in targeting these two very different groups was in achieving a balance in terms of providing the right kind of information in a way that would make it accessible to both groups.

Botanist

Specialist knowledge of the plants as well as the physical environment and surrounding habitats.

possible uses

- to see existing rare species
- to locate related species

information needed

- scientific names
- flowering times
- habitat
- trails

General visitor

Someone who appreciates the natural environment, but might not have specific knowledge about the kinds of plants found within the swamp, or where specific species could be found.

possible uses

- to see existing rare species
- explore the area and to see what makes it special

information needed

- common names
- visual aid to help with identification
- flowering times
- points of access
- trails
- distances and time of travel

TRANSFORMING

- 8 Problem solving
- 9 Turning raw data into information
- 10 Integrating information from different sources
- 11 Presenting the rare species
- 12 Process work
- 13 Map explorations
- 14 Poster variations



Turning data into usable information was a challenging process on many levels. It involved a lot of planning and exploration, evaluating data, identifying and extracting usable information, integrating information from many sources, and thinking about what needed to be shown and how to show it. The greatest challenge was bringing all of the parts together in a way that was aesthetically pleasing and functional, capturing the unique environment and special qualities of the Bergen Swamp.

CHALLENGES

- working with data sets in different coordinate systems
- verifying/checking the positional accuracy of combined data sets
- identifying and locating the rare species
- identifying the rare species accessible to the public
- appealing to both a general and scientific audience
- creating a piece that is large enough to see, yet small enough to carry
- balancing the aesthetic and the functional
- creating a hierarchy
- capturing/showing a sense of place



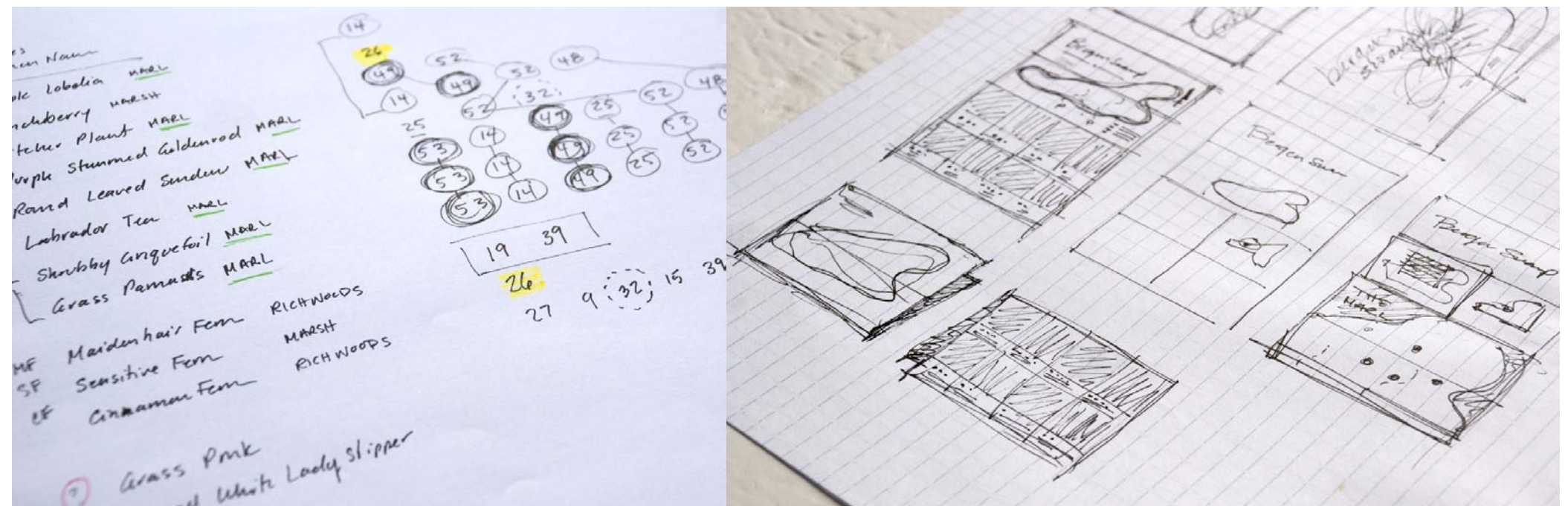
A sample of the data provided. Bergen Swamp is located in the upper right hand corner.

Turning raw data into information

Sketching and arranging information on paper was an important part of how I decided what information to use. Doing this allowed me to explore different ways of organizing and presenting the information, and helped me to visualize the final piece.

Identifying the information to be displayed:

- habitat areas
- terrain & hydrography
- roads
- points of access / parking areas
- trails
- rare species & locations
- flowering times
- conservation status



Above: **Making connections between different species**
Looking at which ones are found in similar areas and at the same locations. Part of my process of determining which locations to highlight along the trails.

Right: **Process sketches**
Contemplating how the piece would function as a 2-sided guide and poster and how the information would be displayed in relation to the folds.

Integrating information from different sources

Since my focus was on the rare species of the swamp, I decided to pull in additional information from other sources in order to add interest and meaning to the overall piece. I used a spreadsheet to collect and assemble all the information gathered from my research, such as the New York State conservation status for each plant as well as their flowering times, names, location, and habitat.



Above: Identifying the habitat where each rare species was found
 Right: New York State Rare Plant Statuses

New York State Rare Plant Statuses

- E Endangered Species** *listed species are those with:*
 - 5 or fewer extant sites, or
 - fewer than 1,000 individuals, or
 - restricted to fewer than 4 USGS 7 1/2 minute topographical maps, or
 - species listed as endangered by the U.S. Department of Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

- T Threatened** *listed species are those with:*
 - 6 to fewer than 20 extant sites, or
 - 1,000 to fewer than 3,000 individuals, or
 - restricted to not less than 4 or more than 7 USGS 7 1/2 minute topographical maps, or
 - listed as threatened by the U.S. Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

- R Rare** *listed species have:*
 - 20 to 35 extant sites, or
 - 3,000 to 5,000 individuals statewide.

- V Exploitably vulnerable** *listed species are likely to become:*
 - threatened in the near future throughout all or a significant portion of their range within the state if causal factors continue unchecked.

- U Unprotected**

Source: 2008 New York Natural Heritage Program NYS DEC

Presenting the rare species

I began thinking about how to display the data by grouping the rare species information by different criteria, such as the habitat where they are found, flowering time, and conservation status. These groupings were explored visually in my process work and provided the organizational structure for the information presented in the final piece.

HABITAT

Bog & Marl

- Grass of Parnassus
- Small White Lady's Slipper
- Houghton's Goldenrod
- Dragons Mouth Orchid
- Rose Pogonia
- Grass of Parnassus

Rich Woods

- Cinnamon Fern
- Maidenhair Fern
- Wood Lily
- Pink Lady's Slipper
- Painted Trillium

Wet Woods

- Cardinal Flower
- Yellow Lady's Slipper

FLOWERING TIME

Spring

- Painted Trillium

Summer

- Small White Lady's Slipper
- Yellow Lady's Slipper
- Pink Lady's Slipper
- Dragons Mouth
- Rose Pogonia
- Grass of Parnassus
- Cardinal Flower
- Wood Lily
- Houghton's Goldenrod

STATUS

Endangered

- Small White Lady's Slipper
- Houghton's Goldenrod
- Horizontal Juniper

Threatened

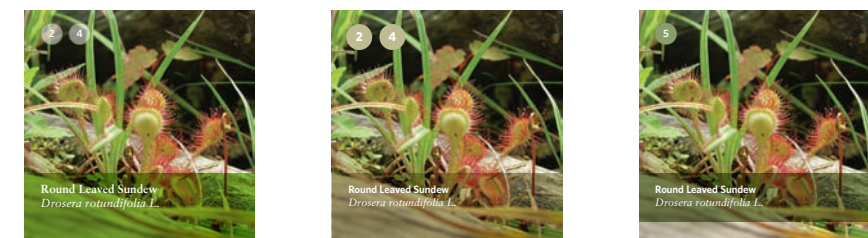
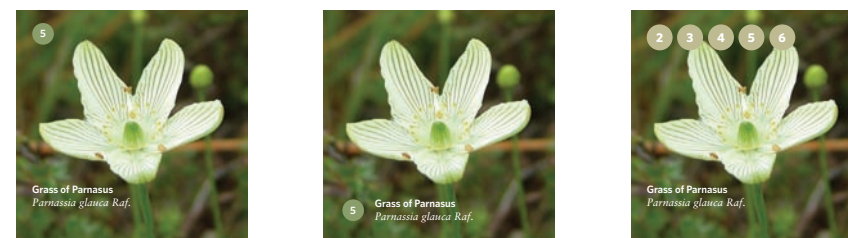
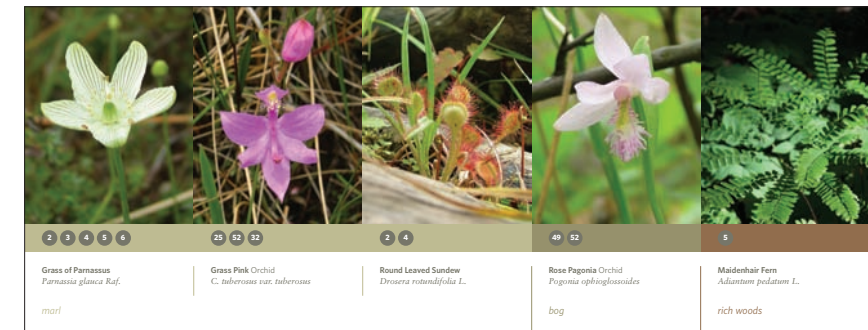
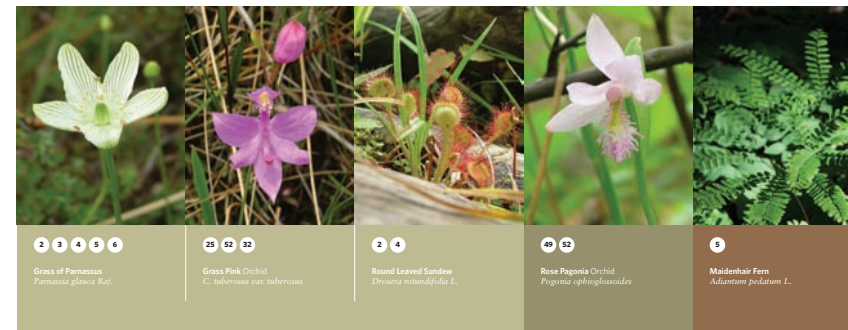
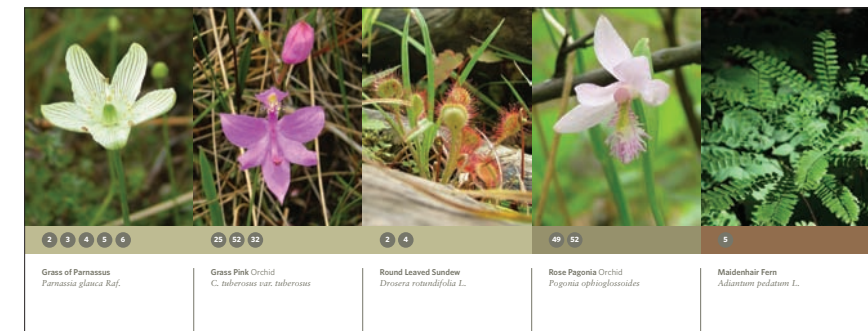
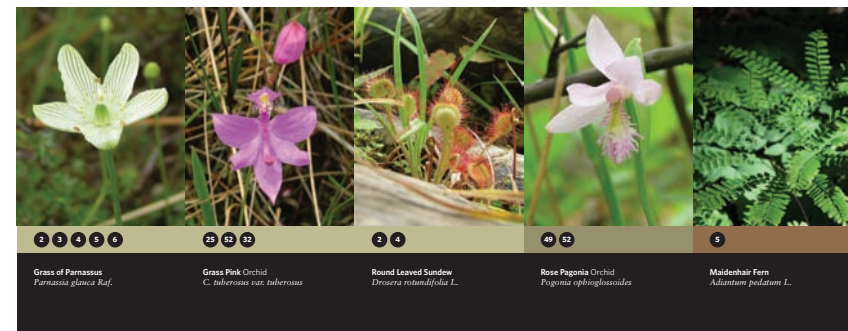
- Dragons Mouth Orchid

Exploitably Vulnerable

- Cinnamon Fern
- Maidenhair Fern
- Grass Pink
- Rose Pogonia
- Grass of Parnassus
- Cardinal Flower
- Yellow Lady's Slipper
- Wood Lily
- Pink Lady's Slipper
- Painted Trillium

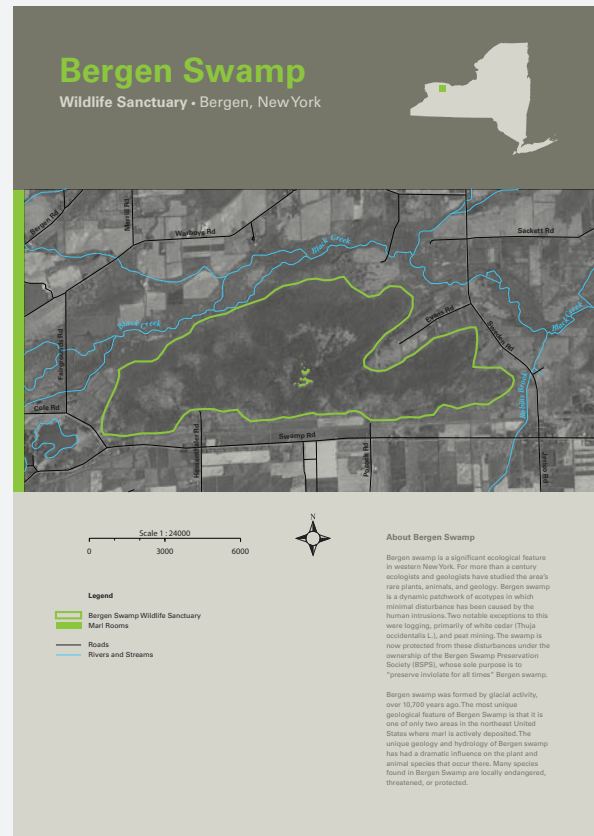
Process work

Exploring variations for displaying rare plant info, including: photos, habitat, location, common and scientific names.

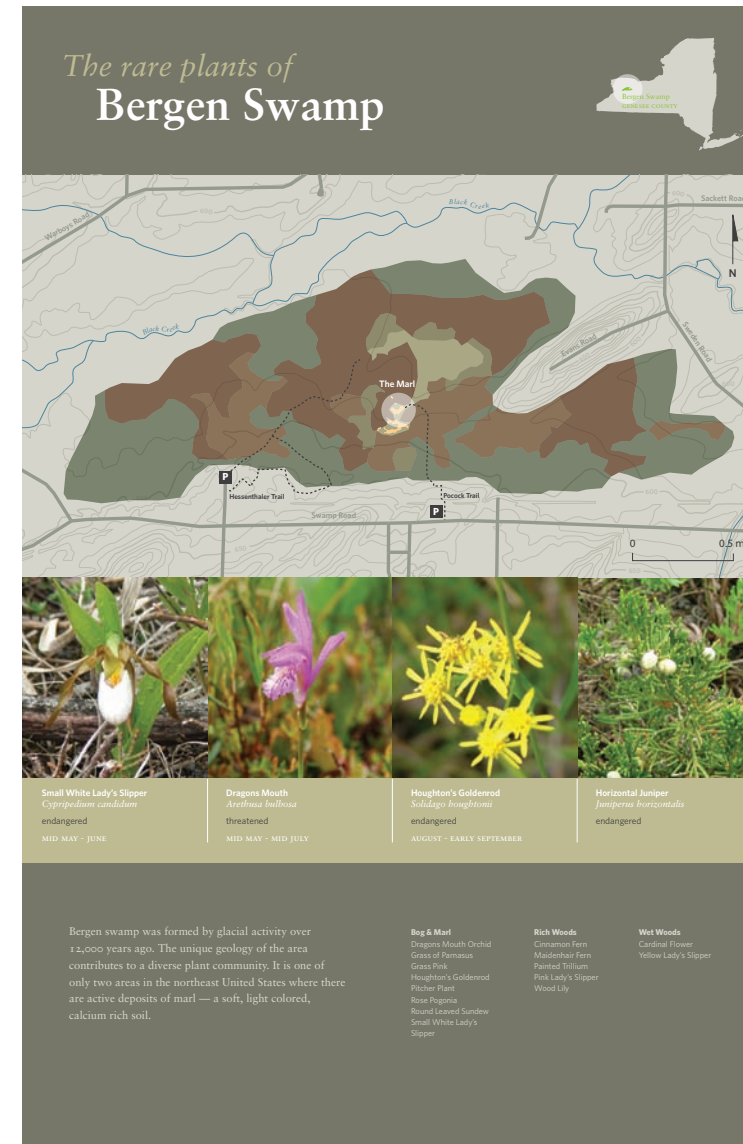


TRANSFORMING

Map explorations



The early explorations focused on pulling together the different data sources. The above sample used a combination of vector and raster geographic information.



The above iteration focused on rare species that are listed as endangered or threatened. Doing so, focused the map on the marl and limited possible connections with the rest of the swamp, making the Hassenenthaler trail seem meaningless.



Here, the focus is on the rare species. This method of presentation gives more interest to the swamp as a whole by drawing people to different areas along the public trails and to different habitats within the swamp.

TRANSFORMING

Poster variations

Early variations of posters for the reverse side of the map. These explore the use of color or black and white photographs to show the rare species. These early posters were extremely simple, focusing on the image and plant name.



TRANSFORMING

Poster variations

Later variations explored the addition of the map title as well as a fact about the plant and its existence within New York State.



MAKING

- 17 Map & poster
- 18 Format & structure
- 19 Color selection
- 20 Specifications



MAKING

Map & poster

In the final piece, priority was given to habitat in order to group species found in the same areas, since they can be accessed by the same trails. Within each habitat, species were then listed by flowering times (the earliest ones on the left, the later ones on the right), and then the New York State Conservation statuses are shown to call attention to the plants that are either endangered or threatened. These species are the rarest of the rare. (The unflagged species are considered rare or vulnerably exploitable.)

The rare plants of Bergen Swamp

Bergen swamp was formed by glacial activity over 10,700 years ago. The unique geology and hydrology of the area contribute to a rich and diverse plant community. Over 780 species have been identified within the swamp. The Bergen Swamp is a Natural History Landmark protected by the Bergen Swamp Preservation Society.

Marl
5 via the Pocock trail

 Small White Lady's Slipper <i>Cypripedium acaule</i> MID-MAY - JUNE endangered	 Dragons Mouth <i>Arctostaphylos</i> MID-MAY - MID-JUNE threatened	 Rear Pigonia <i>Polygonum oppositifolium</i> MAY - JUNE	 Grass of Parnassus <i>Parnassia glauca</i> JULY - AUGUST	 Grass Pink <i>Calopogon tuberosus</i> JULY - AUGUST	 Houghton's Goldenrod <i>Solidago houghtonii</i> AUGUST - EARLY SEPTEMBER endangered	 Horizontal Juniper <i>Juniperus horizontalis</i> endangered
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Rich Woods
1 3 4 via the Hesselthaler & Pocock trails

 Cinnamon Fern <i>Osmunda cinnamomea</i>	 Maidenhair Fern <i>Adiantum pedatum</i>	 Painted Trillium <i>Trillium undulatum</i> APRIL - JUNE	 Pink Lady's Slipper <i>Cypripedium acaule</i> MAY - JUNE	 Wood Lily <i>Lilium philadelphicum</i> JUNE - AUGUST
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Wet Woods
2 via the Hesselthaler trail

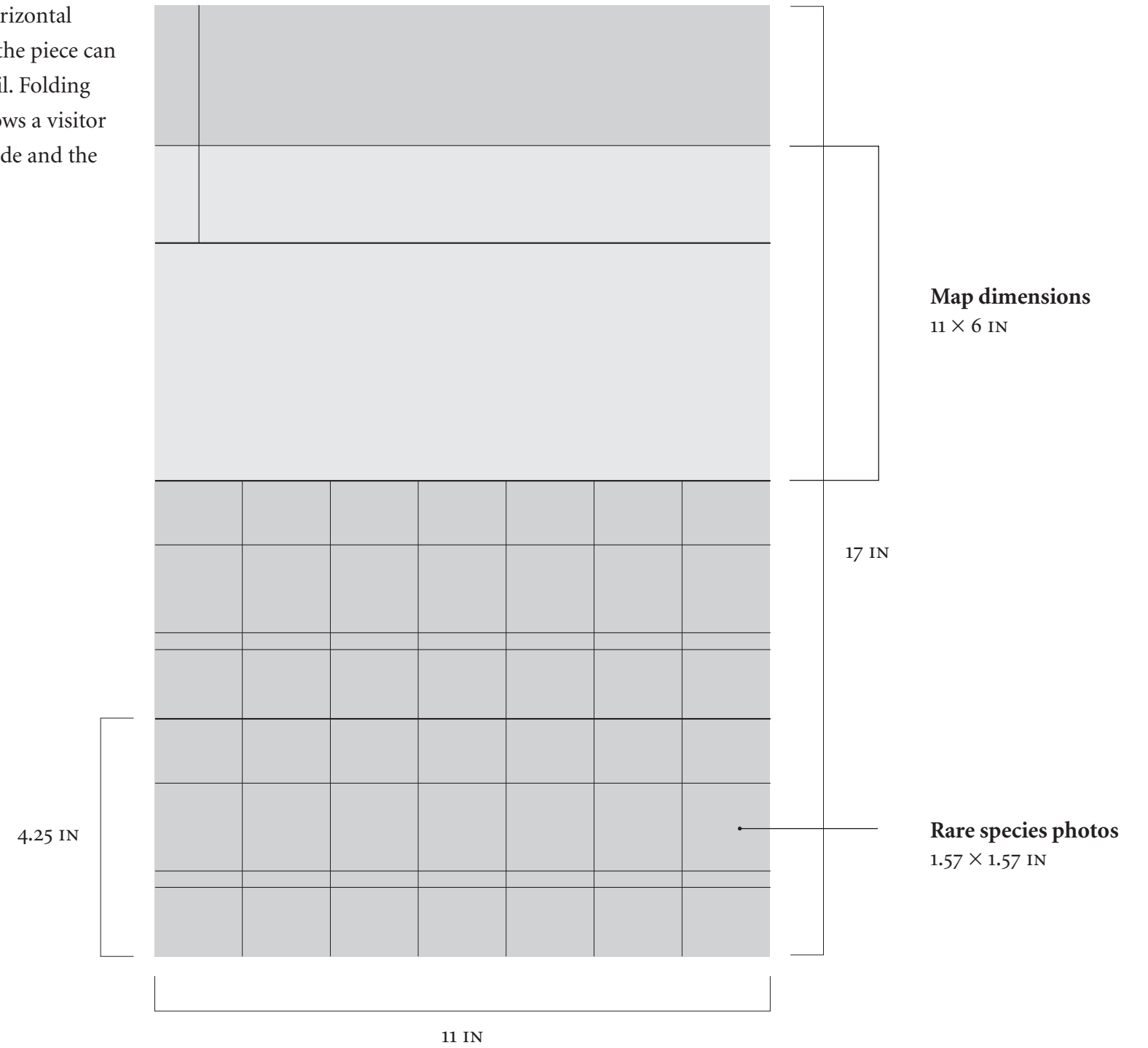
 Yellow Lady's Slipper <i>Cypripedium parviflorum</i> MID-MAY - JUNE	 Cardinal Flower <i>Lobelia cardinalis</i> JULY - OCTOBER
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Format & structure

Format 2-sided poster & map
Dimensions 11 × 17 inches

The page can be folded down into 4 horizontal sections, each 4.25 inches high, so that the piece can be easily held and carried along the trail. Folding the sheet in half (to 8.5 × 11 inches) allows a visitor to have the entire map visible on one side and the rare species on the other.



Color selection

The colors used to depict the habitat areas are based on my own knowledge of the wetlands and forests in New York State and on the opinions of others who have knowledge of the area. In an article published in the May 1988 issue of Conservationist Magazine titled *Bergen Swamp: A Living Museum*, the author describes a walk through the unique and diverse habitats. These descriptions (below) also informed my choice of color.



“The hard water from these springs is high in calcium carbonate picked up from the limestone. From it, in some areas of the swamp, calcium carbonate is precipitated as a soft light-colored mud called marl.”

“Few hardwoods are found here in the wetter soil. The woods become dark, fragrant and serene.”

MAKING

Specifications

A combination of Minion and Syntax was used for the typography on the poster.

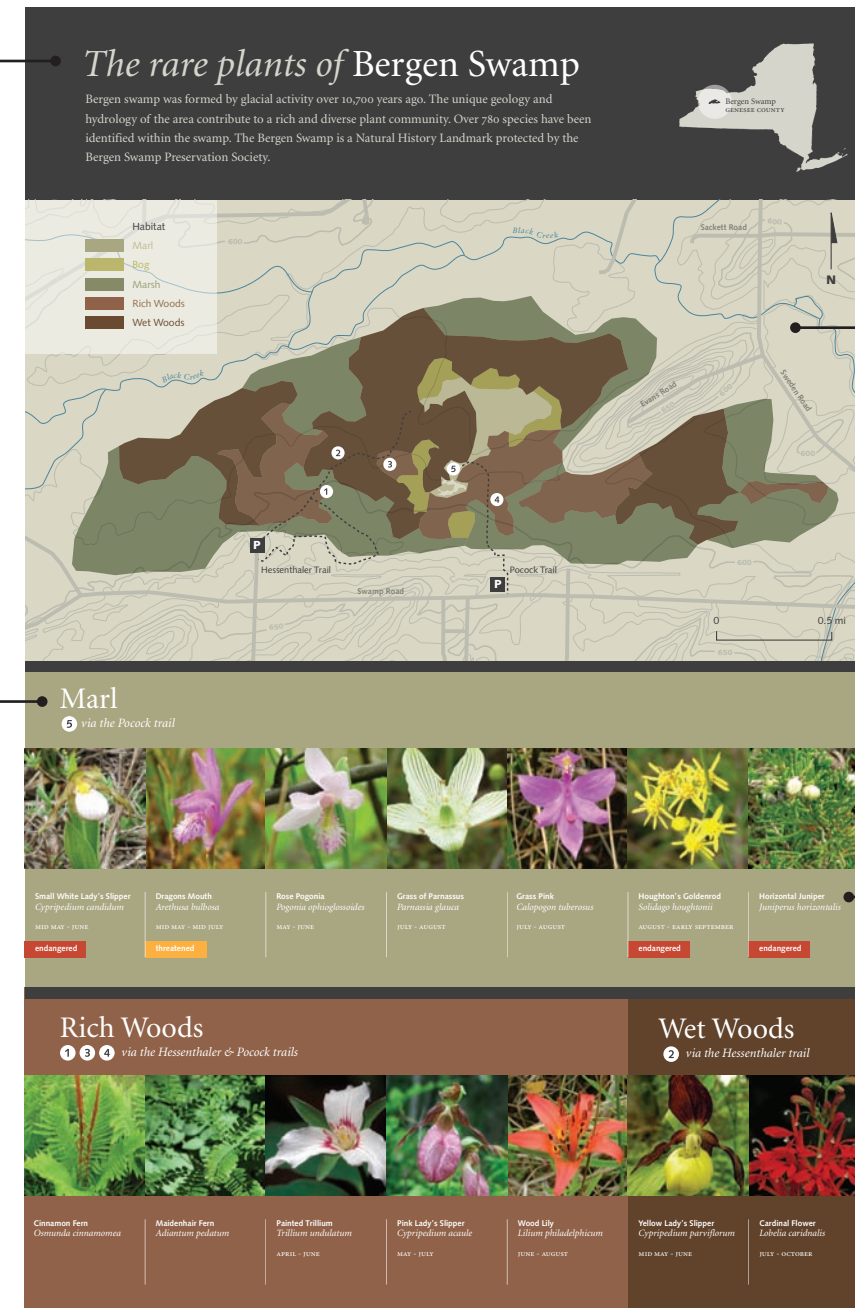
Syntax was used on the map so that it would have a clean, functional appearance and be easy to read. It was also used for the common names of the species to tie them to the locations on the map and to give the piece a modern aesthetic. Minion was used for the title, body text, and scientific names to capture the natural environment of the swamp.

Title
Minion italic & regular 36 pt

Intro text
Minion regular 12/18 pt

Habitat heading
Minion regular 28 pt

Trail
Minion italic 12 pt



Roads & Index contours
Syntax bold 8 pt

Trails
Syntax regular 9 pt

Legend
Syntax regular 10 pt

Common name
Syntax 8 pt

Scientific name
Minion italic 9 pt

Flowering time
Minion small caps 8 pt

Conservation status
Syntax 8 pt