
WILDFLOWER RESTORATION PROJECT

Experimental Design and
Data Collection Guide

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INTRODUCTION

This citizen science wildflower restoration project requires you to set up a study site, gather and plant seeds, and monitor changes in the wildflower community over time. While the following instructions may seem daunting, note that setting up the study site is the most time-consuming portion of the project. Once your study plots are created, monitoring yearly changes is simple. Records of successful plantings provide concrete evidence that your effort has made a difference, leaving you with a powerful program and your participants with a great sense of accomplishment.

GETTING STARTED

Choosing a study site

Find an area that will become your study site. The owner must grant you permission to collect seeds and root stock from native wildflowers and plant them elsewhere on the property. The planting site should be secondary growth forest: comprised of younger trees and lacking wildflowers and other understory plants. You may be able to use Google Earth to find historical aerial photographs of your forested area to determine when and where farming has occurred. Try to find an area that is somewhat accessible but is unlikely to be disturbed by visitors. The size of this area will depend upon the amount of available secondary forest and the number of plots you decide to set up.

To keep data consistent, sites must be comprised of blocks and plots as they are described in the following section. The minimum sized study site is a 46×66 meter rectangle, but you are strongly encouraged to create a larger site containing additional blocks and plots. There is no upper limit to the size of your site, and you may expand it in stages, year after year, if you wish. Use the following section to aid you in planning your site layout.

Do not fence off your study area as this would exclude potential seed dispersers and change the natural conditions of the site.

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The following terms and measurements *must* be used to ensure that data collected by different organizations is consistent and usable.

Plot : an area where wildflower surveys and planting are done

- Each plot is a circle with a radius of 0.8 meters. Wildflower data will be gathered from these 2m² areas (FIGURE 1).
- Plots are set up in groups of four, and are numbered 1 through 4.
- In addition to a number, plots are also labeled with a letter. The letter refers to the block that the plot is in (Block A, B, C...etc.).

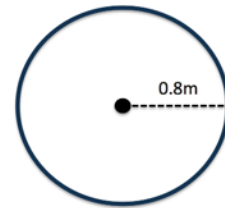


FIGURE 1. **Study plot**

Block : a group of four plots

- Each block is a group of four equally spaced plots. The center of a block is 2 meters away from each of the four plot centers (FIGURE 2).
- Blocks are identified by capital letters (Block A, Block B...etc.).
- Blocks are of three different types: control, experimental seed, and experimental root stock. All four plots within a single block must be of one type (i.e. in an experimental seed block, all four plots are sown with seeds).
- Block **centers** must be separated from one another by 20 meters.

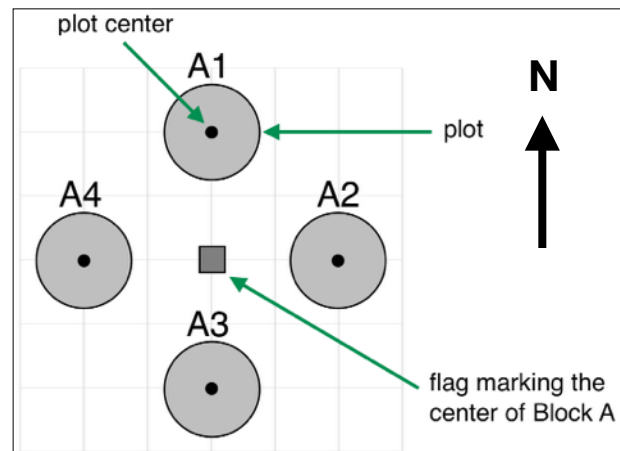


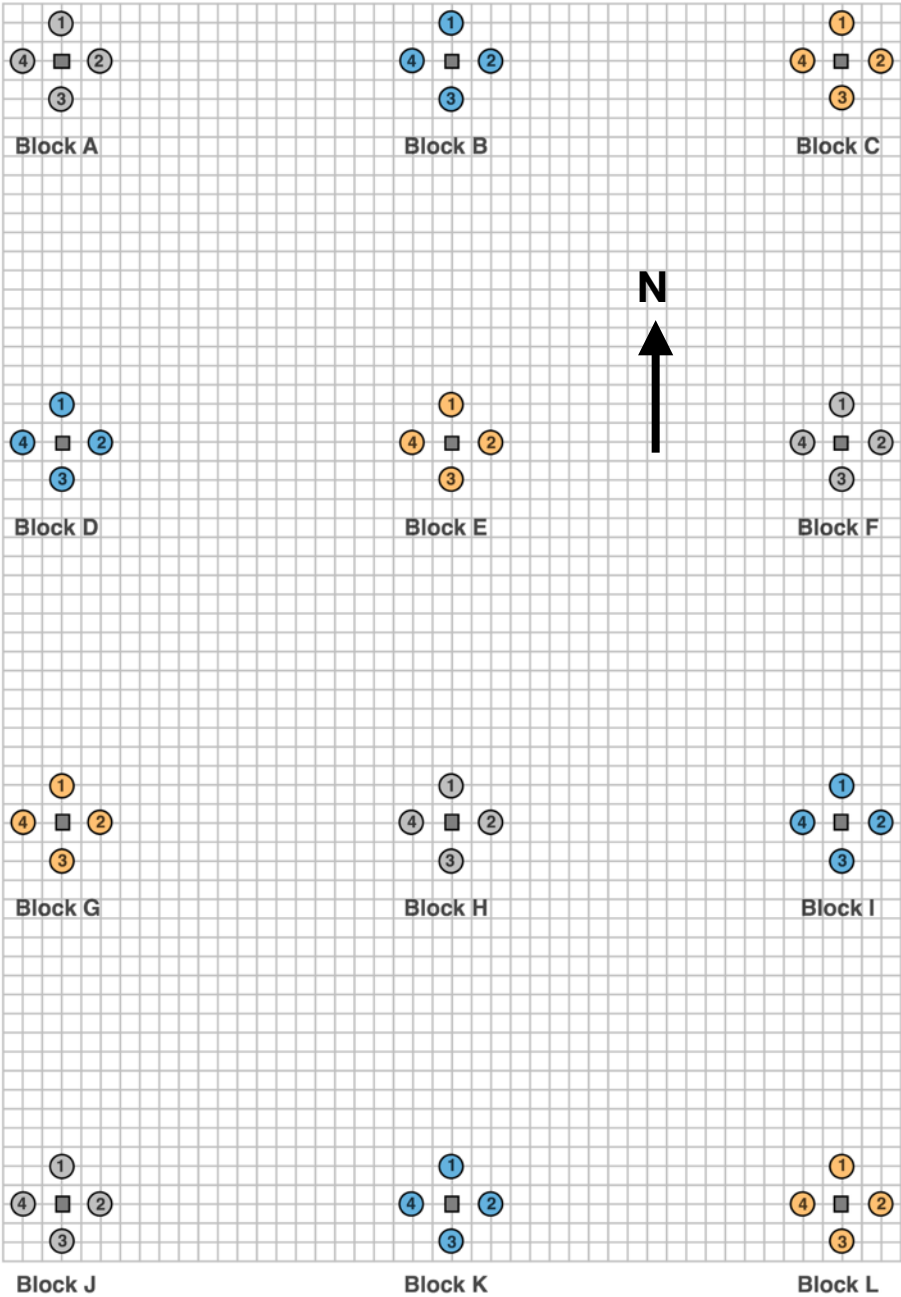
FIGURE 2. **Block A.** Each grid square equals a distance of 1 meter. Plots are numbered in a clockwise fashion with plot 1 always facing North.

Site : an area containing of all of the blocks

- The site is the entire area used in the study.
- The site must contain *at least* twelve blocks: four control blocks, four experimental seed blocks, and four experimental root stock blocks (FIGURE 3).
- There is no limit to the number of blocks you may have on one site, but you must have an equal number of blocks of each type (i.e. if you have 6 control blocks you must also have 6 experimental seed blocks and 6 experimental root stock blocks).

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Example Site Diagram



Key

- control plot
- experimental seed plot
- experimental root stock plot
- flag marking center of block

FIGURE 3. Study site containing twelve blocks. Each grid square represents a distance of 1 meter. Block centers are separated from one another by a distance of 20 meters.

Treatment types alternate so that they are spread out across the entire study site.

In this example three blocks run East to West and four blocks run North to South. Your layout may differ depending on the available area of secondary growth forest.

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SITE SETUP

Note: You must lead the Interpretive Wildflower Program prior to the site setup and data collection to familiarize your participants with the reasoning behind the restoration, and wildflower identification.

You are encouraged to enlist help from your participants in the site setup, as opposed to setting it up on your own prior to your program.

Ask participants to suggest types of measurements needed to monitor changes in the forest wildflowers.

- Number of wildflowers of each species per meter² before planting and each subsequent year
- The same data listed above from a “control” plot
- Number and type of seeds/roots planted in each plot
- Length of root stock planted

Note: Control plots, where no planting occurs, must be created. Explain that control plots are necessary to compare to the experimental plots; without them, we would not know if wildflowers increased due to artificial planting or natural dispersal.

Supplies & Materials

Site setup and data collection

- NYS Wildflower Identification Guides (one per person)
- Wildflower Survey Data sheets (one per block)
- a sheet of graph paper
- pencils
- clipboards
- permanent markers
- marking flags (one per block *and* one per plot)
- meter measuring tapes (at least 20m long)
- string
- scissors
- compass(es)

Explain the site layout and setup.

- Describe the terms plot, block, and site.
 - Use a piece of graph paper to draw your study site, including the future locations of the block centers and plot centers. It should look similar to Figure 3.
 - Make certain that participants understand that the flags will mark the *centers* of plots and blocks.
 - Describe the three treatment types: control (no planting), experimental seed (planted with seeds), and experimental root stock (planted with roots).
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Use a compass and meter tape to find and mark the block centers.

1. Find the Western edge of your site and, using a compass, extend the meter tape from North to South parallel to this edge. Leave a few extra meters between the meter tape and the edge of the site.
2. Place four flags 20 meters apart along the meter tape running North to South (at 0m, 20m, 40m, and 60m). These are your first four block centers.
3. Stand at the first of the block center flags and extend the meter tape directly East, using a compass.
4. Place three flags 20 meters apart along the meter tape running West to East (at 0m, 20m, and 40m).
5. Repeat steps 3 and 4 using each of the four initial block center flags as starting points.
6. You should now have twelve block centers marked with flags. (Remember this is the minimum, you may set up additional blocks.)
7. Label the twelve flags A through L with a permanent marker. It does not matter how you letter your blocks as long as you record it properly on your site diagram.

Use a compass and meter tape to find and mark the plot centers.

- Four flags marking plot centers should be placed around each block center: 2 meters North, 2 meters East, 2 meters South, and 2 meters West of the block center.
- Label the flags with a permanent marker. Plot 1 always faces North. Label the remaining flags in a clockwise fashion.

Complete your site diagram.

- Make note of the cardinal orientation of your diagram. Draw an arrow facing North.
 - You should have labeled each block center flag with a capital letter. Record these block labels on your site diagram.
 - Label the plots on your diagram 1 through 4.
 - Determine treatments for each block. Alternate the three treatment types so that each type is spread out across the site. The exact location of each treatment type does not matter, but they must be recorded on your site diagram.
 - *Do not lose this document.* Your site diagram will help you determine the locations of your blocks and plots in the event that your flags are taken. It also provides a record of the treatment types assigned to each block.
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WILDFLOWER SURVEY DATA COLLECTION

Survey a plot to illustrate the procedure.

1. Show the participants how to complete a survey data sheet. Fill in the block letter, date, and treatment type.
2. Tie a string to the flag marking the center of the plot and cut it so that it extends 0.8 meters away from the flag. This creates a 0.8 meter radius for your plot.
3. Identify and count each of the wildflowers within the plot by rotating the string 360° so that it covers the entire circular plot. Record the wildflowers you see as the string touches them. Note your starting point to avoid counting any plant twice.

Note: Explain how you identified each wildflower by referencing the NYS Wildflower Identification Guide and explain the difference between seedlings, juveniles, and adults so that they are recorded properly. Seedlings only have two leaves, juveniles have more than two leaves but have yet to ever flower, and adults flower and fruit seasonally.

Try to complete the wildflower survey in mid or late May, when most of the species will be flowering or fruiting. This will help you determine whether an individual plant is a juvenile or an adult. There is no way to tell the difference if you complete the survey before a species has entered its flowering season. Just do your best.

Help your participants survey the remaining plots.

1. Organize your participants into groups of at least two to decrease error.
 2. Give each group data sheets, a clipboard, a pencil, marking flags, string, and a NYS Wildflower Identification Guide.
 3. Divide the remaining blocks among the groups, indicating the block letters, treatment types, and their locations on the site diagram.
 4. Oversee the groups and help them identify plants and record data. Check to make sure that all data sheets and flags are labeled with the proper plot and block IDs.
 5. Collect the data sheets and enter the data into the Excel spreadsheet obtained from our website. Do not submit the Excel document to us until you have also entered your planting data later in the season.
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SEED AND ROOT COLLECTION AND PLANTING

Different species of wildflowers seed at different times throughout the summer, making one single seed collection and planting event impossible. Ideally, participants will be willing and able to collect and plant seeds and roots throughout the summer at their leisure.

Alternatively, you can collect seeds and roots, store them, and host a single planting event.

Note:

- Seeds and root stock should be gathered from other areas on the property.
- You are only expected to plant species that already occur on the property in sustainable populations, so you may be able to plant only a few species.
- You can only plant species listed on the data sheets and you can only plant on experimental plots. Other than that, what you plant and where you plant it is up to you.

Supplies & Materials

Seed and root collection and planting

- NYS Wildflower Identification Guides (one per person)
- Wildflower Planting Data sheets (one per experimental block)
- your site diagram
- pencils
- clipboards
- plastic collection bags
- trowels

Collecting and planting seeds

- Use the NYS Wildflower Identification Guide to determine the ideal times to harvest seeds from different species.
- Gather the fruits when they are ready and squish them open to reveal the seeds. Different fruits contain different numbers of seeds. Make sure that your participants are counting and planting *seeds*, not whole fruits.
- Only plant seeds on plots located in experimental seed blocks. To sow seeds, simply scrape the earth with a trowel and cover the seeds with a thin layer of soil.
- Sow a bunch of seeds in each quadrant of a plot (Figure 4). You may plant up to four different species of wildflowers in each plot, one species per quadrant. A single bunch of seeds planted in one quadrant should contain at least 20 seeds.
- Be sure to fill out the planting data sheet completely, including the date of planting, number of seeds sown, and quadrant(s) for each species planted.

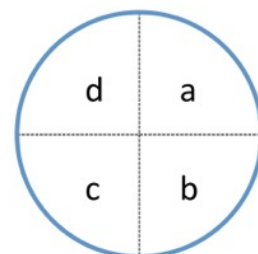


FIGURE 4. Plot divided into four quadrants

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Collecting and planting root stock

- A transplant is best done after the leaves and stems lose their color and shrivel up. At this time, the plant is done storing energy for the season anyway.
- Use a trowel to dig up the entire root, including the thin root filaments. Take note of the root's depth in the ground so you can replant it at a similar depth.
- Before planting root stock, you must measure them and record their sizes on the planting data sheet. **Do not measure the small root filaments. Measure the width of spherical or bulb shaped roots. Measure the length of rhizomes.** Rhizomes grow horizontally, from which filamentous roots grow downward.
- Only plant roots on plots located in experimental root stock blocks.
- Try to plant them at their original depths. Note: The stem typically turns white where it enters the soil.
- Plant a few roots in each quadrant of a plot. You may plant up to four different species of wildflowers in each plot, one species per quadrant. The roots planted in a single quadrant should all be similar in size.
- On the planting data sheet, record the date, number of roots, size of roots, and quadrant(s) for each species planted.

Submit your data on our website.

- Download the Excel spreadsheet from our website.
- Enter all your data from the year, including wildflower survey data and planting data.
- Return to our website to submit your completed Excel spreadsheet.

MONITORING

- In subsequent years, you will not have to set up new plots but you are welcome to do so. Your participants will record the same types of data for each existing plot.
 - Bring past data and results with you to subsequent programs to show how the project has affected your site.
 - Wildflowers may take several years to flower, but you can identify seedlings and juveniles by their leaves.
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