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Signs of the Seasons: A New England Phenology Program Field Guide

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SIGNS OF THE SEASONS:

A NEW ENGLAND PHENOLOGY PROGRAM

FIELD GUIDE

Signs of the Season's Field Guide is adapted from *Nature's Notebook*, USA National Phenology Network.

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**Phenophase definitions of selected Signs of the Seasons Species will be handed out at SOS trainings and can be found on the SOS website at http://umaine.edu/signs-of-the-seasons/indicator-species/.

Note: This field guide includes a glossary in Appendix C. Words included in the glossary are underlined when they first appear in the text.

Revision date: ***January 2014***

Signs of the Seasons: A New England Phenology Program

Signs of the Seasons (***SOS***) is an environmental monitoring and education program for Maine citizens of all ages. Participants contribute to scientists' understanding of the local effects of climate change by observing and recording phenology, the seasonal changes of common plants and animals, in their own backyards and communities. The University of Maine Cooperative Extension and Maine Sea Grant developed the program in 2010, and co-coordinate the program's volunteer services, research collaborations, and public outreach. In 2012, University of New Hampshire Cooperative Extension and New Hampshire Sea Grant joined the effort, and have extended the program to volunteers and research partners in New Hampshire. We are a Partner Program of the USA National Phenology Network, and we work closely with many other research and outreach partners, including the National Park Service, U.S. Fish and Wildlife Service, Maine Audubon, Schoodic Education and Research Center, Coastal Maine Botanical Gardens, and faculty at the University of Maine, Maine Maritime Academy, and the University of New Hampshire.

What is phenology?

Phenology is the study of recurring seasonal life stages (phenophases) of plants and animals including bird, fish, mammal and butterfly migrations and reproduction; insect emergence and metamorphosis; and plant leafing, blooming, fruiting, and foliage changes.

Why is phenology important?

Many organisms, including humans, depend on the timing of seasonal changes. For example, songbirds migrating north in springtime need to time their arrivals so that they coincide with the availability of food, mates, and appropriate habitat. Farmers, fishermen, and gardeners rely on the predictability of plant and animal phenology to support their livelihoods, and in turn, our diets, as we all eat the food they grow and catch.

How does monitoring phenology help us understand climate change?

Climate scientists have found that changes in the timing of plant and animal phenology is ***one of the most sensitive indicators of the local effects of global climate change***.

- Through matching historical observations with more recent ones, climate scientists have found that changes in phenology are linked to changes in our Earth's climate.

Example: Comparing current records with those collected by Henry David Thoreau in the 1850s, scientists find that plants such as highbush blueberry are flowering as many as three weeks earlier in response to warming in Concord, MA, over the past 160 years.

- Plant and animal species are responding to climate change in a variety of ways — the timing of some species' life cycles have changed dramatically, while others have remained fairly constant. Monitoring helps us identify which species are capable of adapting to our changing climate, and which ones may be in trouble.
- Information collected through programs like ***Signs of the Seasons*** will help scientists, as well as farmers, gardeners, fishermen, resource managers, and others, understand how the species they rely on are changing, predict changes they might face in the future, and help all of us prepare for our changing climate.
  Currently, we don't have enough data about how plant and animal species in New England are changing, but your participation in this project will help fill that gap.

Quick-Start Guide

This training and field guide will take you through the necessary steps to begin making observations, including entering your observation data online into our partner, USA-NPN *Nature's Notebook*. The SOS Field Guide provides detailed information on each step, as well as providing additional resources to help you observe and learn about plant and animal life cycles.

- **Select a site** to make phenology observations.

A site is the area within which you will look for your selected animal species and the plants you choose to observe in a location that is accessible.

- **Select plant and/or animal species** to observe.

Choose plants and/or animals from the ***Signs of the Seasons* species list** in this field guide.

Tips for observing plants and animals:

Plants: Observe the same individual plants each time you visit your site. For example, you should observe the same red maple in your back yard all through the year.

Animals: Look for all of your selected animal species each time you visit your site. For example, if you select American robin and Monarch butterfly, record whether or not you see or hear those species at your site each time you visit.

- **Register** with NPN-USA's *Nature's Notebook* online.

Create your own account with Nature's Notebook at http://www.usanpn.org/user/register. *All you need is a valid email address.*

- **Register your site** with *Nature's Notebook* online.

After you create an online account, use the online mapping tool to register and describe your site(s) in Nature's Notebook.

- **Register your plants and/or animals** with *Nature's Notebook* online.

- Register your individual **Signs of the Seasons** plants and/or animals.
- Review the species profiles and phenophase descriptions for your selected plants and animals.

- **Record your observations.**

Using datasheets that you download and print from Nature's Notebook, record for each of your species:

- Yes (y) – if you saw a phenophase occurring (e.g., open flowers or animal mating)
- No (n) – if you saw that a phenophase **is not** occurring
- Uncertain (?) – if you were not certain whether a phenophase was occurring, or if you did not check for that phenophase
- *Do not circle anything if you did not check for the phenophase!*

- **Enter your data in *Nature's Notebook* online.**

As you collect data during the season, log on to your Nature's Notebook account and enter the observations you recorded on your datasheets.

Key Resources

- Signs of the Seasons – www.umaine.edu/signs-of-the-seasons. Check back often for updates and news about phenology in Maine.
- Nature's Notebook "How to Observe" – https://www.usanpn.org/nn/become-observer
- Frequently Asked Questions –SOS Guide Appendix B; or www.usanpn.org/participate/faq
- Training Videos and online handbook - http://umaine.edu/signs-of-the-seasons/resources-for-observers/
- Species profiles and phenophase definitions – http://umaine.edu/signs-of-the-seasons/indicator-species/

About this Field Guide

This field guide is a reference for participants in ***Signs of the Seasons***. You will use the information in the SOS guide, along with materials on Nature's Notebook website, to learn how to conduct and record your observations in the field and online. You may find it helpful to take this guide with you when you go out into the field, especially the first few times.

- As part of ***Signs of the Seasons***, you are encouraged to observe both plants and animals. Some material in this guide pertains to only plants, only animals, or both plants and animals.

Headings for ***plant observations only*** are preceded by a **leaf icon**.
Headings for ***animal observations only*** are preceded by a **bird icon**.

- Headings for **either plant or animal observations** are **standard black text**.
- This guide includes a glossary. Words included in the glossary are underlined when they first appear in the text.

Note: *This guide is adapted from the US National Phenology Network, Nature's Notebook How to Observe handbook. All mentions of Nature's Notebook in this guide refer to materials found on the USA-NPN website (www.usanpn.org/participate).*

Step-by-Step Guide for How to Observe

Safety First!

1. Use good judgment before going out into the field--be prepared.
2. When in doubt, do not ever risk personal safety for making observations.
3. Working in pairs is recommended for safety, efficiency and quality of data—this is particularly true for coastal species in the rocky intertidal (Rockweed) where it could be slippery. At the least, take your cell phone and let someone know where you are.
4. Make sure you have available items for protecting against sun exposure, insect stings, and poison ivy; and wear proper footwear with good tread.

1. Select a site

The first step in getting started on observing phenology is to select a site or sites.

A site is the area within which you will look for your selected animal species and/or encompasses any plants you select to observe.

When selecting sites, such as your yard or a nearby natural area, consider these guidelines:

A. Convenience: This is number one! You will be visiting your site(s) regularly and often to collect phenology data, so it should be convenient and easily accessible.

Example: You may want to choose sites that you already visit frequently such as your yard, a neighbor's woods or field, or a nearby natural area where you regularly hike on the weekend. ***The best data are data that actually get collected – make it easy on yourself!***

B. Representative location: As much as is practical, the selected site(s) should be representative of the environmental conditions for your area.

What is a representative location?

We welcome all observations, even if your site is unusual for your area, but we encourage people to select sites that are *representative of the local environment,* when possible.

- Select a site in a relatively flat or gently sloping area.
- Avoid areas subject to drifting snow or funneled or channeled winds.
- Ideally, the site should be neither excessively dry nor wet for your area.
- In forested areas, the site should be generally similar to the surrounding forest, reflecting the overall canopy composition and forest stature.
- If you are observing wild plants, avoid locations where plants are watered or fertilized.
- If your site is unusual for your area, record the unusual characteristics in the comments section on your datasheet, and later enter this information in Nature's Notebook online.

C. Uniform habitat: The conditions of your selected site(s) should be relatively uniform across the site.

- If you choose to observe in two adjacent but distinct habitats, please document them as separate sites.
- For example, a wetland adjacent to or surrounded by a drier grassland or forest should be documented as a separate site from the grassland or forest. (Fig. 1)

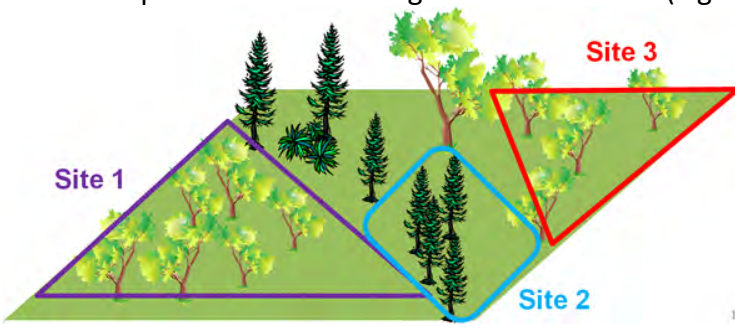


Fig. 1. In this example, the area has been divided into three sites: Site 1 is deciduous forest, Site 2 is conifer forest, and Site 3 is deciduous forest.

D. Appropriate size: A site should be ***no larger than 15 acres*** (200 x 240 yards), a square with sides the length of 2 ½ football fields. A site can certainly be smaller than this, and larger areas can be divided into multiple sites. (Fig. 2)

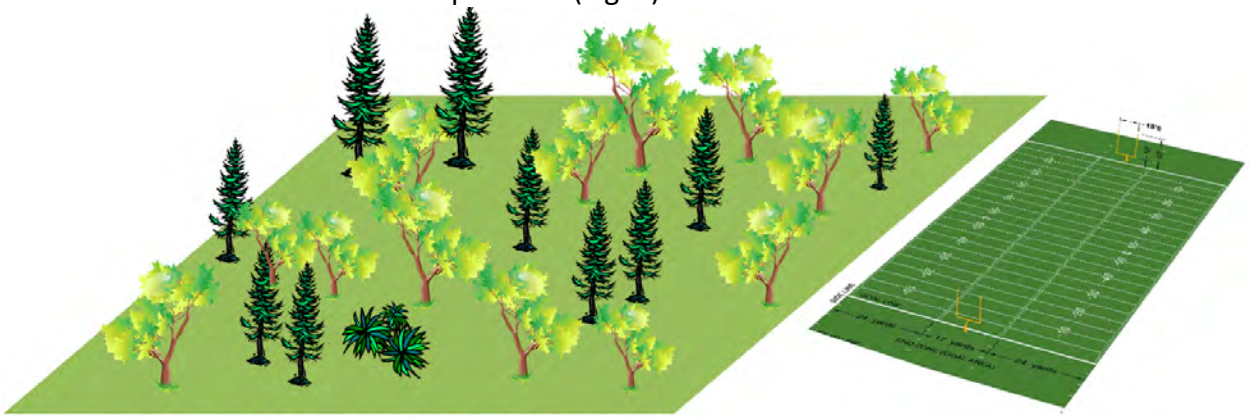


Fig. 2. In this example, the site is slightly larger than the length of one football field, so it is well within the recommended 15-acre size limit.

How do I choose an appropriate size for my site?

The best size for your site depends on the scale of your landscape and the distance over which you can easily see or walk.

If you are observing animals only, or plants and animals: Because you will be reporting observations of animals you see or hear in your site, your site can include the area that you can see and hear well while standing still in your observation spot.

- If you are observing in an open grassland or near a body of water, your site might be the maximum recommended size (15 acres), because you may be able to identify animals that are far away. (Fig. 3)
- In contrast, if your site is in a dense forest, it might be relatively small, as you may not be able to identify species at great distances. (Fig. 4)

Fig. 3. Open grassland

Fig. 4. Dense forest

Note: Even though you can identify animals over a large area, *an area should be divided into different sites if it includes habitats that are obviously different*.

Example: If you are making observations at a pond in a meadow, the pond and the meadow should be registered as separate sites. Report your animal observations for the site at which you saw or heard them, either the pond or the meadow.

If you are observing only plants*:* For plants, the size of your site does not matter much as long as the conditions are pretty similar throughout your site.

- If you are **observing just one plant**, your site may simply be the small area immediately around that plant, say within 3 feet of the plant. (Fig. 5)
- If you are **observing several plants** near one another, you can consider them all to be at one site, as long as the site conditions are pretty similar and the site is ***no larger than 15 acres***.

Fig. 5. Sample site for individual plant.

E. Proper permission is essential!

It is essential that you get permission to use a location as your site while participating in the Signs of the Seasons Program. Before marking the site, marking plants, reporting the site location, or making regular visits to the site:

1. If you do not own the property where the site is located, and it is on **private property, *you must get permission*** from the landowner.
2. If the site is on **public land: *You must get permission*** from the appropriate federal or state agency, municipality or land trust that has responsibility for the property.

2. Select plant and animal species to observe

A. Choose one or more species from the Signs of the Seasons list of indicator plant and *animal species. These s**pecies have been selected because they are familiar species (easy to identify), common in Maine and elsewhere, and because they are important for people and many natural processes*.**

Note: *Several species on the SOS list are USA-NPN calibration species that have been selected to help scientists "calibrate" – or get the big picture – of phenology across the United States.*

Signs of the Season Indicator Species (calibration species marked with C)

- Red maple, *Acer rubrum* C
- Sugar maple, *Acer saccharum*
- Common lilac, *Syringa vulgaris* C
- Forsythia, *Forsythia spp.* C
- Beach rose, *Rosa rugosa*
- Common dandelion, *Taraxacum officinale* C
- Common milkweed, *Asclepias syriaca*
- Wild strawberry, *Fragaria virginiana* C
- Rockweed, *Ascophyllum nodosum (Includes a separate protocol, guide, equipment and training - http://umaine.edu/signs-of-the-seasons/coastal-observers/)*
- Monarch butterfly, *Danaus plexippus*
- American robin, *Turdus migratorius*
- Ruby-throated hummingbird, *Archilochus colubris*
- Common loon, *Gavia immer*
- White Pine, *Pinus strobus*
- Common reed, *Phragmites australis*
- American toad, *Bufo americanus*
- Wood frog, *Rana sylvatica*
- Spring peeper, *Pseudacris crucifer*

B. How do I identify my plants and animals? Correct plant and animal identification is important when reporting your observations. *Make sure that you have correctly identified the plant and animal species at your site before reporting your observations online. (See Appendix B, FAQs 7)*

- We know it can be tricky to identify a plant early in the season, or an animal that may be immature or that you can only hear.
- There are field guides and online resources that can assist (see below).
- You may be able to get help from a local gardening, birding, native plant or naturalist group, cooperative extension office, or nature center.

Note: *If you can't identify a plant or animal by sight, email a digital photo of the unknown species to esp@maine.edu in ME and Alyson.Eberhardt@unh.edu in NH to assist in identification.*

Field Guide Books:

Wildflowers
Newcomb's Wildflower Guide
Wildflowers, Northeastern and North Central North America (Peterson Field Guide)
Audubon Field Guide to North American Wildflowers: Eastern Region
Plants of Acadia National Park (UMainePress)

Trees
Trees: A Guide to Familiar American Trees (Golden Guide)
Audubon Field Guide to North American Trees: Eastern Region
Field Guide to Eastern Trees (Peterson Field Guide)
Winter Keys to Woody Plants of Maine (UMaine Press)

Birds
Audubon Field Guide to North American Birds: Eastern Region
Peterson Field Guide to birds of Eastern and Central North America

Butterflies
Peterson First Guide to Butterflies and Moths
Butterflies and Moths (Golden Guide)
Butterflies through Binoculars: The East
Caterpillars in the Field and Garden: Field Guide to Butterfly Caterpillars of North America

Online field guides

- Discover Life's ID nature guides (www.discoverlife.org)
- eNature (www.enature.com/home)
- Arbor Day Foundation (for trees, www.arborday.org/trees/whattree)

Other online resources for plants

- USDA PLANTS (www.plants.usda.gov)
- Lady Bird Johnson Wildflower Center (www.wildflower.org/explore)
- Go Botany: New England Wildflower Society (https://**gobotany**.newenglandwild.org/)

Other online resources for birds

All About Birds (www.allaboutbirds.org)
Links for SOS bird species below, including songs and calls:

- www.allaboutbirds.org/guide/American_Robin/id
- www.allaboutbirds.org/guide/Common_Loon/id
- www.allaboutbirds.org/guide/Ruby-throated_Hummingbird/id
- Journey North-- http://www.learner.org/jnorth/tm/robin/Vocalizations.html

3. Select individual plants

**If you are observing only animals at your site, you will not need to refer to this section.*

A. At your site(s):

- Select one or more individuals of each of your selected plant species to observe.
- Choose plants that appear to be healthy, undamaged, and free of pests and disease.
- If you decide to observe several individuals of the same species, select individual plants that are growing in a similar environment, but are not direct neighbors.

B. How many individual plants of the same species should I observe?

We recommend observing between **one and three individuals** of the same plant species at a site.

- Observing multiple individuals helps to give scientists an idea of the variation in phenology among individuals at your site.
- If you decide to observe multiple individuals of the same species, select plants growing in a similar environment (e.g., similar amounts of sun or shade), but which are not direct neighbors. Selected plants should not be closer than two or three times the width of one of the plants.

  Example: You might select three lilacs growing in your yard, each growing in full sun and spaced three plant widths apart from each other. If the lilacs are growing as a hedge, this would mean every third lilac plant could be selected.
- Consider the time it will take to make the observations. If you are observing the same species at multiple sites and have limited time, you may want to observe multiple individuals of each species at one site, and only observe one of each species at the other sites.

Fig. 6. Three red maples selected for monitoring in an observer's back yard.

C. Are there other things I should consider when selecting my plant(s)?

Yes. Although we welcome <u>all</u> observations, we encourage observers to:

- When possible, avoid selecting plants that are closer than 20 feet to a road or building.
- Please refer to the phenophase definitions in Appendix D of this handbook or read the "Special Considerations for Observing" section of the species profile on Nature's Notebook to find out if there are other considerations for your plant species.

  Example: Red maple has separate male and female flowers. If you know which flowers you are observing, make a note in the comments section of that individual plant's field datasheet. Later, you will add this information to your Nature's Notebook online **Add or Edit Plants** form.

4. Mark your site and individual plants

Regardless of whether you are observing only plants, only animals, or both, you will make your observations repeatedly at the same site(s) over time. You will want to best mark your site(s) so that you can find it each time you make observations.

A. How can I best mark my site?

There are many options, but the ***most important thing is that you mark your site so that you can find it again in the future***.

- For large sites, it is probably easiest to mark the four corners with a stake or rebar tied with colorful flagging, scrap cloth, or something similar (Fig. 7).

Note: On public lands, or other places where it is not possible to mark your site, you may use natural or man-made landmarks, like the edge of a yard, big rocks, a bend in a trail, a road, or something similar to define the boundaries.

- You will need to replace your markers periodically as they weather and become unreadable.

Fig. 7. Marking a site corner

B. How can I best mark the plant(s) that I am observing?

There are many options, but the ***most important thing is to come up with a reliable way to find your individual plants each time you visit your site***.

- **Trees and shrubs** - Attach labeled flagging tape or small aluminum tags (which you can buy at a hardware store or forestry supply company) to the trunk or a branch on each plant.
- **Herbaceous perennials** (forbs) - Place labeled aluminum plant markers, tent stakes, popsicle sticks, or skewers in the ground next to each plant, or loosely tie labeled flagging tape around the base of the plant (Fig. 8).

Fig. 8. Using aluminum plant tags and wooden stakes to mark plants

- Use a black indelible marker to write your labels
- However you mark your individual plants, **make sure you do not change the growing conditions of the plant**.

  Example: Avoid placing a broad stake next to a small plant that would shade it or cause root damage.
- Replace your markers periodically as they weather and become unreadable.

5. How to Observe

A. Materials needed to make observations

To make your plant and/or animal phenology observations, you will need the following:

- **Phenophase definitions and instructions on how to recognize them:**
  - Phenophase definitions and species fact sheets are available at http://umaine.edu/signs-of-the-seasons/indicator-species/
  - They are also printed on each plant/animal phenophase datasheet in brief, and
  - You will be given copies of the phenophase definitions and data sheets at the SOS training you attend, for each plant and animal species you select to observe.

  Note: *Be sure to check **Tips for Observing** for each species.*
- **Datasheets, clipboard, pencil, ruler**
  - Download and print single datasheets from individual species *profile pages**, or***
  - ***Create a personalized datasheet packet*** from your Observation Deck.
- **Binoculars** (optional, but very helpful for observing animals as well as phenophases in tall canopy of trees)
- **Marking equipment for first trip:** Flagging, black indelible markers, stakes, plastic tags, aluminum tags or markers, popsicle sticks
- **Safety/Comfort Items:** sun protection, insect repellent, Benadryl, proper footwear, etc.

B. Observation Methods: Because animals move around and plants do not, there is a difference in the methods we ask you to use.

For plants: Observe each marked, individual plant every time you visit your site.
Example: Observe the same marked red maple in your back yard all through the year.

For animals: As an SOS participant, you will be observing birds and Monarch butterflies, both adults and larvae (caterpillars). Look or listen for all your species by *making a single pass (walking) through your site* along the same line (transect) each time you visit.

- Define a transect line at your site.
  A transect is a fixed path at your site that you will walk along to listen and look for animal species on your list. It may be an already existing path or trail, or you may use a compass to locate a transect line along a given bearing.

  Note: *Whether you use an existing path or define a new one, make sure that you can locate the beginning and end of your transect so that you can walk the same path on each visit.*

- Walk slowly along your transect while looking and listening for animals.
- If needed, move towards an animal that you see or hear to identify it.

  Note: *If you are observing Monarch butterflies, your transect should pass by common milkweed, the typical food plant of monarch caterpillars. As you walk along, turn over leaves on common milkweed to look for caterpillar activity.*

- Plan to spend the same amount of time looking and listening for animals, **three minutes on each visit to your site**, which is the standard observation time used for SOS.

How often should I make my observations?

As often as is convenient for you!

- **Once a week** or, if possible, even as often as every two or three days is ideal, particularly during the spring and fall when plant and animal phenology is changing quickly. However, if you are only able to make observations twice per month or monthly—that is also good data!
- ***Most importantly, record all the observations you make.*** Your observations, no matter how often you make them, provide valuable data!

At what time of day should I make my observations?

- Make observations **at a time of day that is convenient** for you.
- **Try to make your observations consistently around the same time**, because some animal species tend to be more active at certain times of day and plant activity can vary over the course of the day.

  Example: *If one of your sites is your backyard, you may decide to observe on Tuesday and Thursday after work and again on Saturday afternoon. If another site is a nearby natural area that you visit on weekends, you may make observations there on your regular Sunday morning hike.*

6. Record your observations in the Field

Now that you have all your supplies and understand the observation methods, you are ready to fill in your datasheets. In this section we will take a look at all the datasheets. In **Appendix A**, pg. 32, you will find a **complete example** of making plant and animal observations and completing the field datasheets.

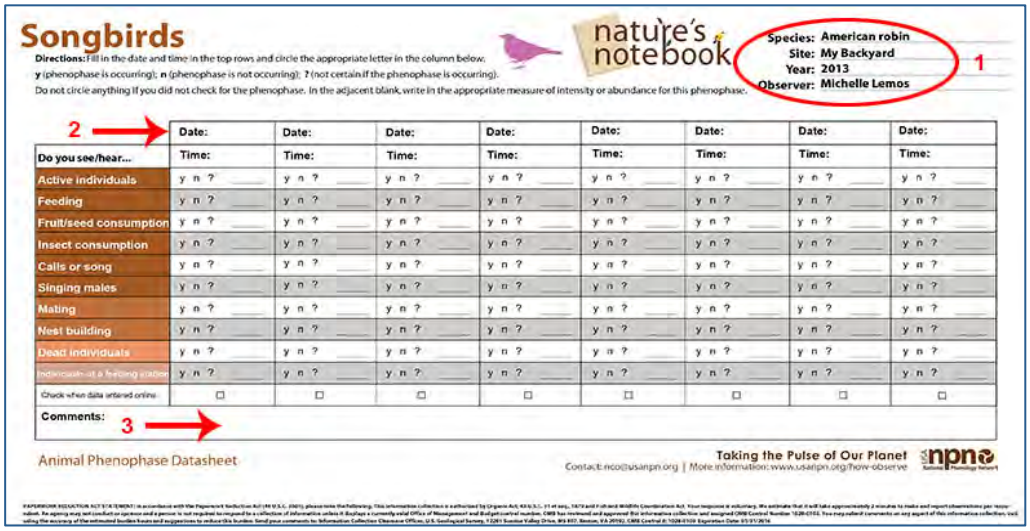
A. Types of Datasheets

Each time you make your plant and animal phenology observations, there are 2 types of datasheets you are asked to complete:

- **Plant or Animal Phenophase Datasheet** for each species on your list
- **Cover Sheet**

B. Filling in Plant and Animal Phenophase Datasheets

The individual plant and animal Phenophase Datasheets are for tracking your phenophase observations for each animal species or each individual plant species.



Songbirds

nature's notebook

Directions: Fill in the date and time in the top rows and circle the appropriate letter in the column below.
y (phenophase is occurring); **n** (phenophase is not occurring); **?** (not certain if the phenophase is occurring).
Do not circle anything if you did not check for the phenophase. In the adjacent blank, write in the appropriate measure of intensity or abundance for this phenophase.

Species: American robin
Site: My Backyard
Year: 2013
Observer: Michelle Lemos

1

2

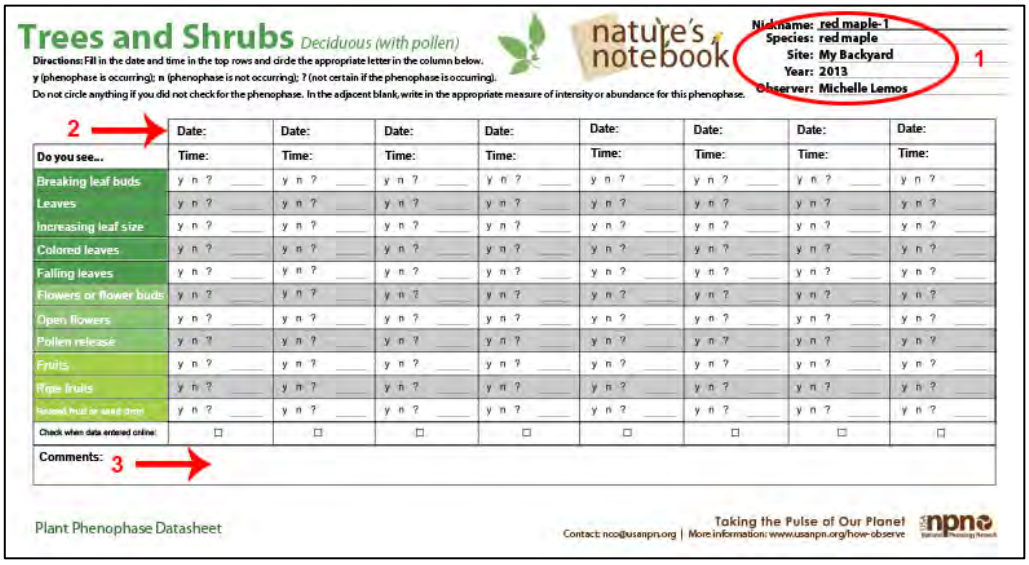
Do you see/hear...	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:
Active individuals	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Feeding	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Fruit/seed consumption	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Insect consumption	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Calls or song	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Singing males	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Mating	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Nest building	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Dead individuals	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Individuals at a feeding station	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Check when data entered online	☐	☐	☐	☐	☐	☐	☐	☐

Comments: 3

Animal Phenophase Datasheet

Taking the Pulse of Our Planet

Contact: nco@usanpn.org | More information: www.usanpn.org/how-observe



Trees and Shrubs *Deciduous (with pollen)*

nature's notebook

Directions: Fill in the date and time in the top rows and circle the appropriate letter in the column below.
y (phenophase is occurring); n (phenophase is not occurring); ? (not certain if the phenophase is occurring).
Do not circle anything if you did not check for the phenophase. In the adjacent blank, write in the appropriate measure of intensity or abundance for this phenophase.

Nickname: red maple-1
Species: red maple
Site: My Backyard
Year: 2013
Observer: Michelle Lemos

1

2

Do you see...	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:	Date: / Time:
Breaking leaf buds	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Leaves	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Increasing leaf size	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Colored leaves	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Falling leaves	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Flowers or flower buds	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Open flowers	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Pollen release	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Fruits	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Ripe fruits	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Recent fruit or seed drop	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Check when data entered online:	☐	☐	☐	☐	☐	☐	☐	☐

Comments: 3

Plant Phenophase Datasheet

Taking the Pulse of Our Planet
Contact: nco@usanpn.org | More information: www.usanpn.org/how-observe

Fig 22. Example of Trees and Shrubs datasheet and (above) Animal Phenophase datasheet

For each day that you make observations and for each species on your list you will:

- Fill in the block in the upper right hand corner with Species, Plant/Animal Nickname, Site, Year and Observer (Fig. 22, **1**)
- Record the date that you made the observations (Fig 22, **2**)
- For each phenophase *(Do you see/hear?),* record one of the following choices:
  - **Yes (y)** – if you saw that the phenophase ***is*** occurring
  - **No (n)** – if you saw that the phenophase ***is not*** occurring
  - **Uncertain (?)** – if you were not certain whether the phenophase was occurring
  - ***Do not circle anything if you did not check for the phenophase!***

  For plants: ***It is very important to record this information, even if nothing has changed on your plant since your last visit!*** Knowing when a plant is ***not*** in a given phenophase is just as important as knowing when it is in that phenophase.

  For animals: *It is very important to record this information, even if you did not see a particular animal species!* Knowing when an animal is ***not*** present, or when an animal is ***not*** in a given phenophase is just as important as knowing when it is.

- Record comments such as time of day, weather conditions or any special circumstances *(e.g., "field was mowed; milkweed gone")* (Fig. 22, **3**).

Note: ***Phenophase descriptions are not the same for all species*** *– not for all deciduous trees, and not for all birds. Be sure to review your phenophase definitions handed out at the training or in SOS website, http://umaine.edu/signs-of-the-seasons/indicator-species/) for each species; and check that you are using the correct datasheet!*

C. Filling in the Cover Sheet

The purpose of the **Cover Sheet** is to report information to describe each day you visit the site. For each day that you make observations you will fill in a Cover Sheet (Fig. 23.)

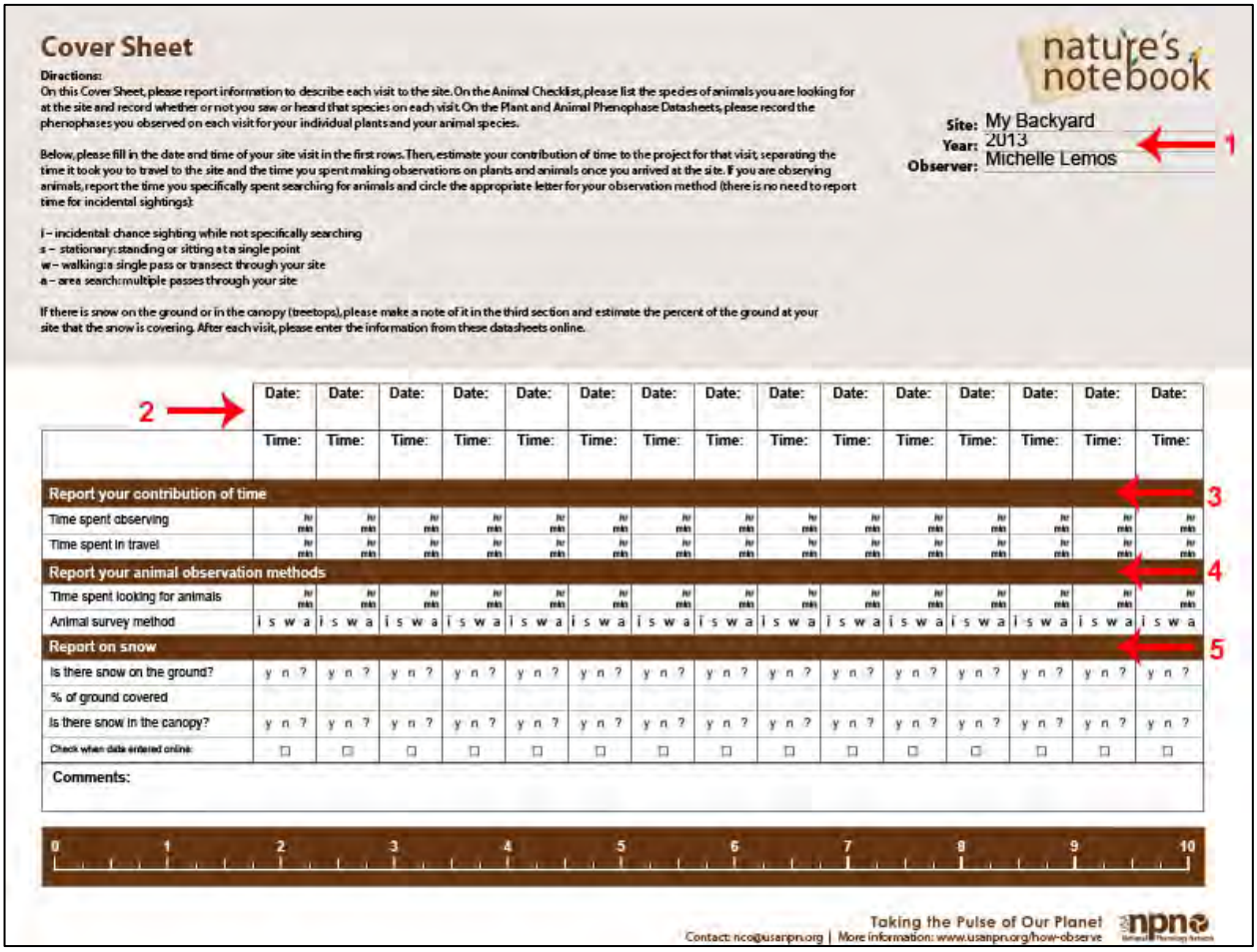


Fig. 23. Cover Sheet

- If you created a complete set of datasheets, your Cover Sheet is pre-printed with your site name, year, and your name at the top of the page (Fig. 23, **1**).
- Record the date (Fig. 23, **2**).
- Report your contribution of time (enter number and circle unit: minutes or hours) (Fig. 23, **3**) for:
    - Time spent observing, including getting organized
    - Time spent traveling
- Report your animal observation methods (Fig. 23, **4**)
    - Time spent looking for animals (enter the number 3 and circle unit: minutes Animal survey method (enter "**w**" for **w**alking along your transect)
- Report on snow on ground and canopy (Fig. 23, **5**)

Note: Capturing volunteer time will assist the *Signs of the Seasons Program* in seeking funds.

7. Register with Nature's Notebook Online

Once you have selected your site and plants and/or animals, you are ready to log on to Nature's Notebook where you will go through the following steps:

- Create an account
- Register your site or sites
- Register your plants
- Register your animals
- Create datasheets

A. Create your account on Nature's Notebook

- Go to USA-NPN at https://www.usanpn.org/nn/become-observer and click on "Become an Observer Now" (Fig. 9).
- Or, click on the Nature's Notebook link on the top of **any page** on the USA-NPN website www.usanpn.org (Fig. 10).

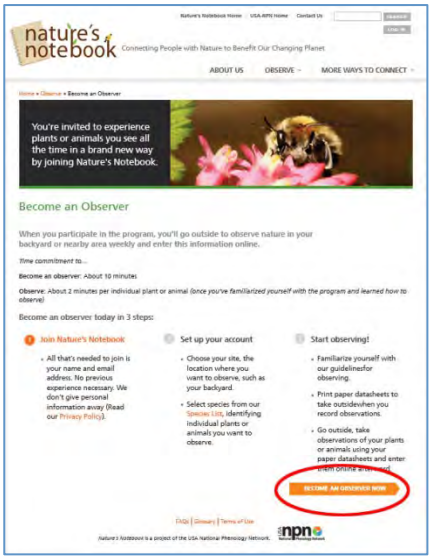


Fig. 9 USA-NPN https://www.usanpn.org/nn/become-observer

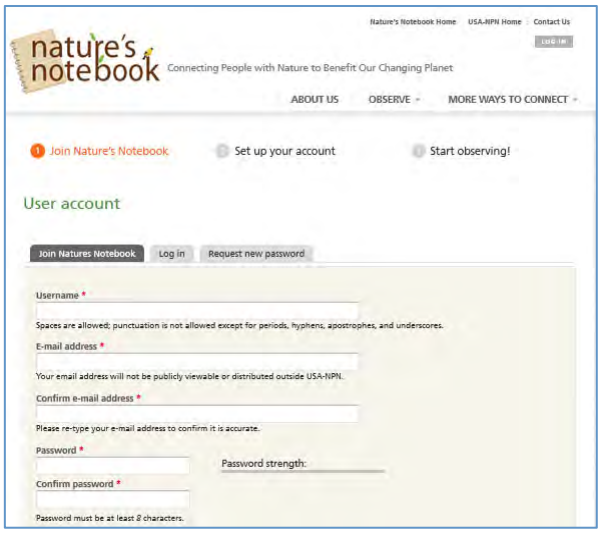


Fig. 11. Join Natures Notebook form at User Account page

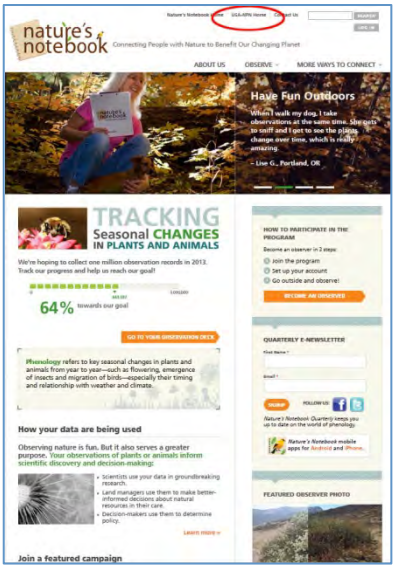


Fig. 10 USA-NPN home page www.usanpn.org

- Fill out the "Join Natures Notebook" form – all you need is a valid email address (Fig. 11)

- **Be sure to choose Signs of the Seasons as your partner organization and the state where you are making observations, and click "Add" (Fig. 12)**

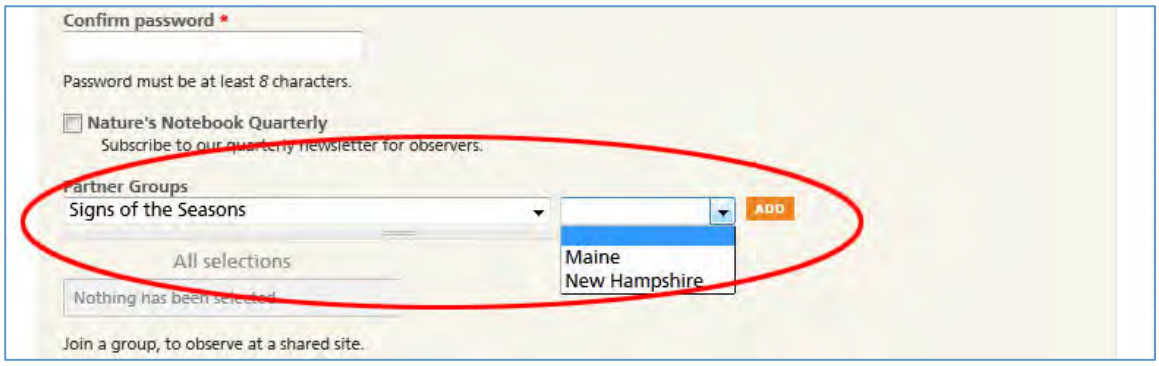


Fig 12. Choose Signs of the Seasons as Partner organization on Create New Account form.

- Once you complete and submit the online form, you can go directly to your own Observation Deck from your user account page (Fig. 13) or follow the instructions that will automatically be sent to your email address.

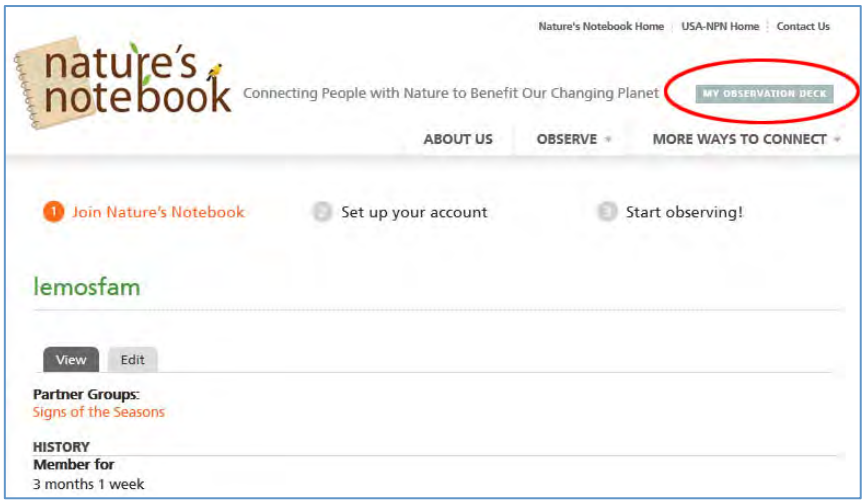


Fig. 13. Your User Account page with links

B. Register a Site on your home page

From your Nature's Notebook Observation Deck (Fig. 14), you can add a site, add or edit plants and animals, create datasheets, and enter your observations online.

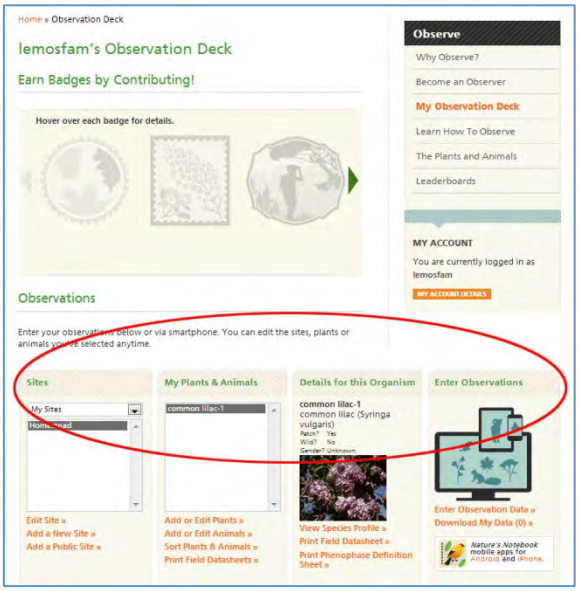


Fig. 14. Getting started at your Nature's Notebook Home page.

- Click **"Add a New Site"** on the menu at the bottom left of your home page (Fig. 14) to open the Add a New Site form (Fig. 15).

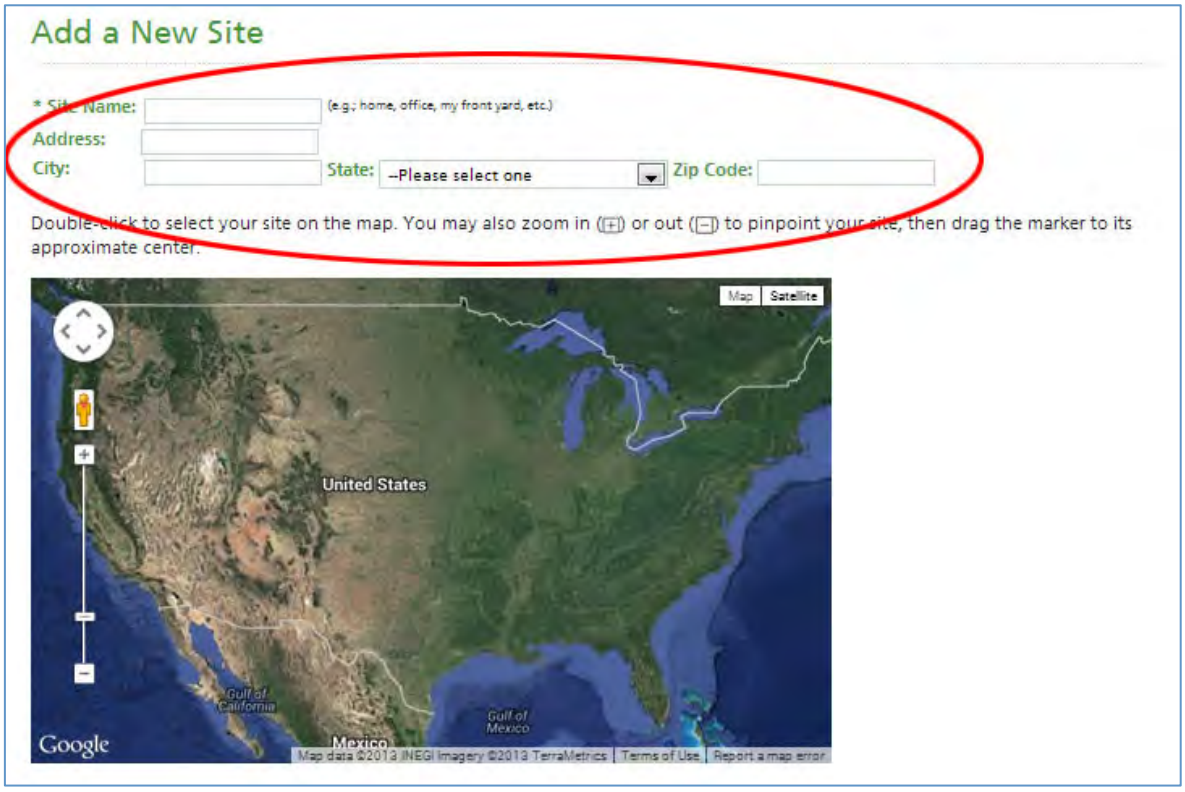


Fig 15. Add a New Site Google Earth form

- Here, you can locate your site by
  - Entering an address, which will be automatically geo-located on the map (Fig. 15),
  - Finding and selecting your site on the interactive map, or

- Typing the latitude and longitude into the boxes below the map interface.
- There are Optional Additional Information questions to further describe your site.
- If you have any trouble working with this Google Earth form, email or call your ME or NH SOS contact. *(esp@maine.edu in ME and Alyson.Eberhardt@unh.edu in NH)*

- **Once you have successfully registered a site, you can add plants and animals to that site.**

C. Add Plants to your site

- Click "Add or Edit Plants" from the menu at the bottom of your Nature's Notebook Home page (Fig. 14) to open the form (Fig. 16).

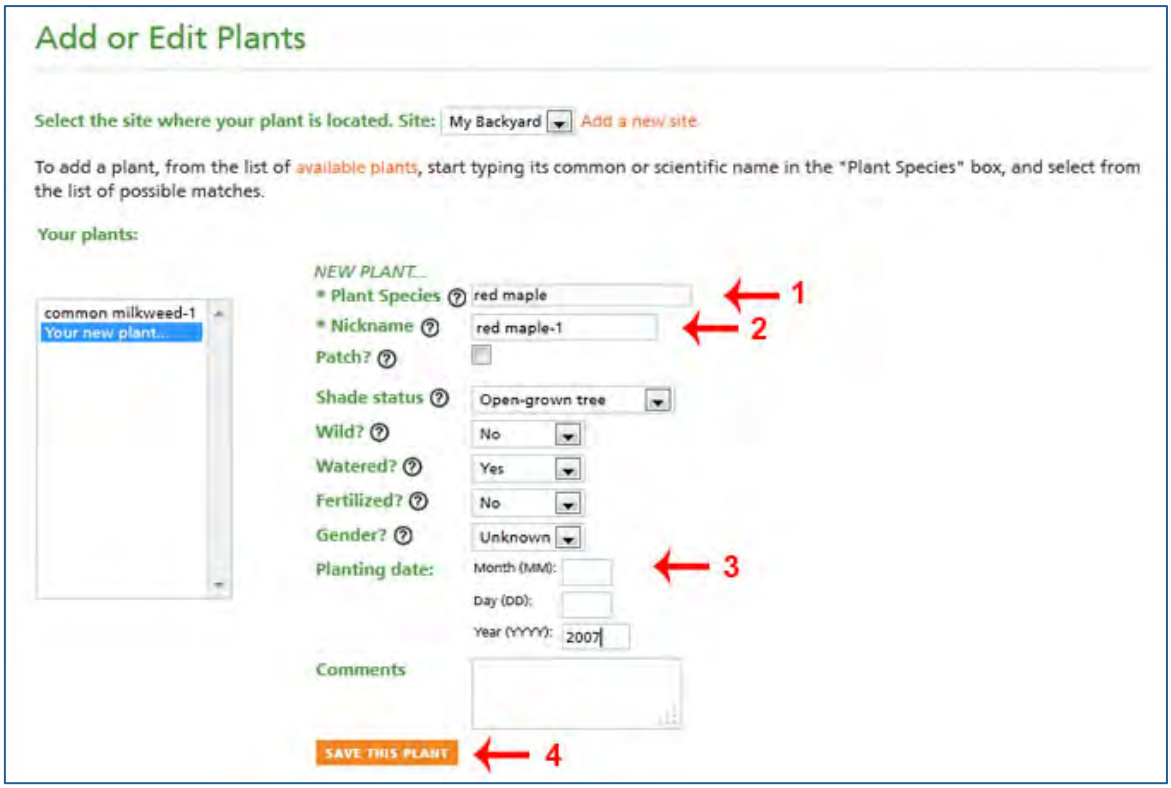


Fig. 16. "Add or Edit Plants" form

- Make sure that the site to which you would like to register the plants is selected in the "Site Drop Down Box" at the top of the **Add or Edit Plants** form (Fig. 16, **1**).
- Begin typing a plant species name from the *Signs of the Season Indicator Species List* in the "Plant species" box (Fig. 16, **2**). A pop-up window will appear with suggested plant names. (E.g., the first maple tree you select can be labeled Maple-1, the second maple tree you select to observe can be labeled Maple-2, etc.).
- Click on your selected species from the list that appears in the pop-up window.
- Fill in answers to the remaining questions and add comments, e.g., about site conditions for this plant (Fig. 16, **3**).
- Click on the "Save this plant" button before adding other plants (Fig. 16, **4**).

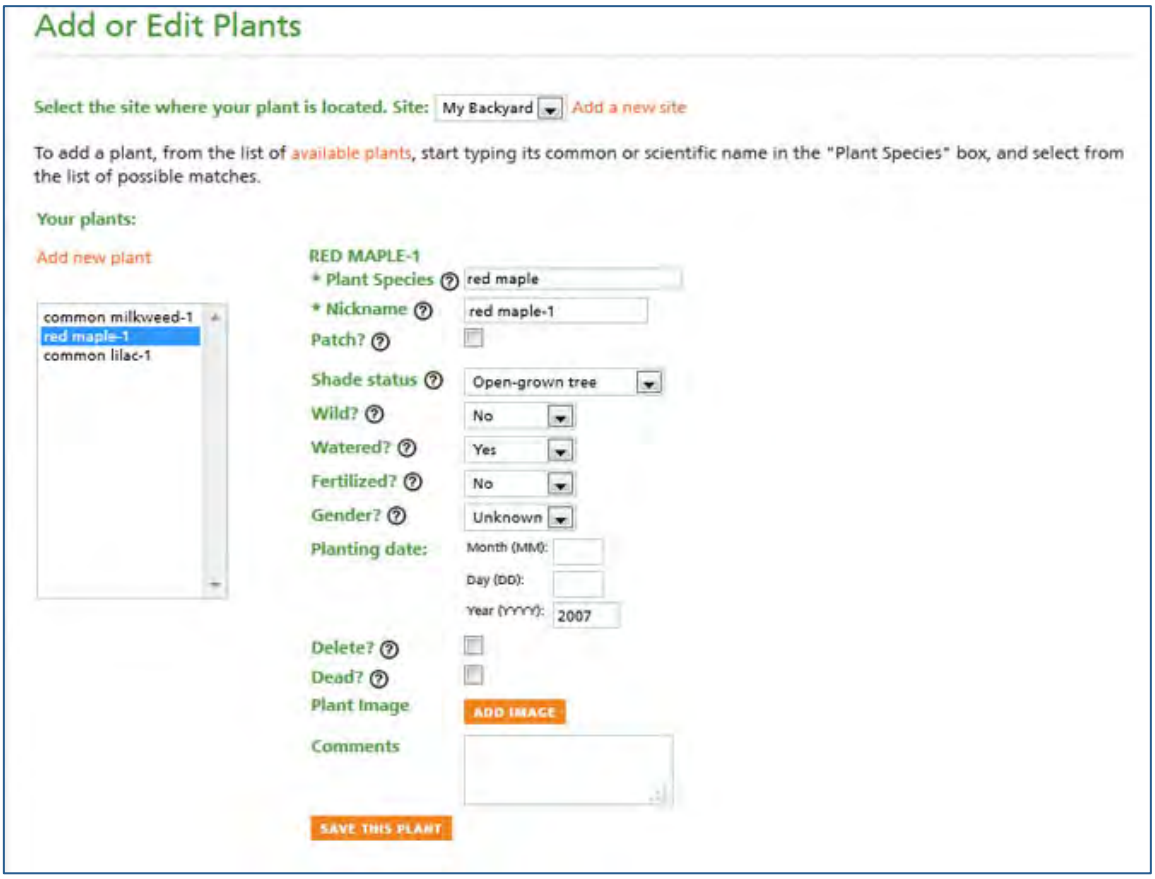


Fig. 17. "red maple-1"and common lilac-1 were successfully registered to "My Backyard."

- Once you have successfully registered a plant to your site, it should appear in Your Plants list. (Fig. 17)
- To add more plants, click on **"Add New Plant"** and repeat the previous steps.

D. Add Animals to Your Site(s)

To add animals to your site, you must create an "Animal Checklist"

- Click **"Add or Edit Animal"** on the bottom of your Observation Deck (Fig. 14) to open the Animal Checklist page (Fig. 18)

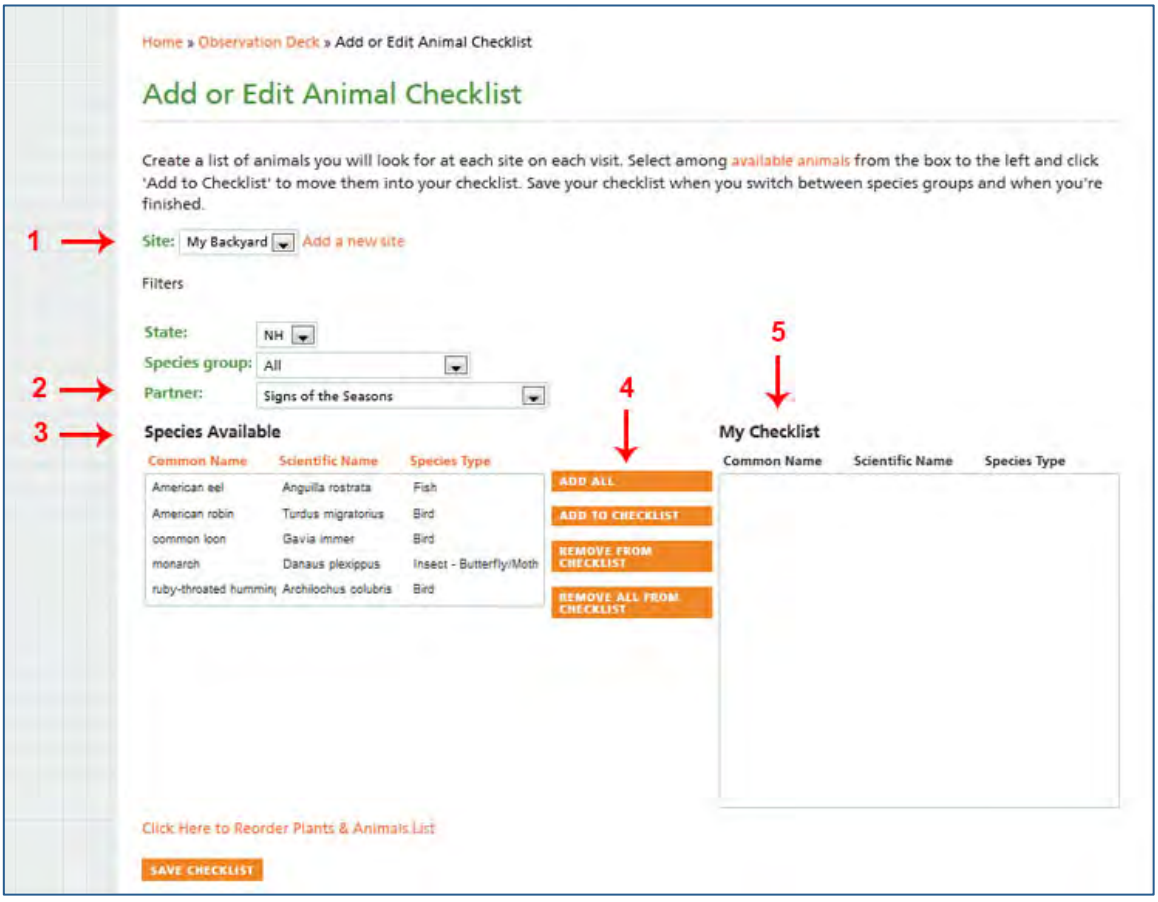


Fig. 18. Adding animals to "My Checklist" for a site called "My Backyard"

- Make sure your site is selected in box at the top of the new window (Fig. 18, **1**).
- Select ***Signs of the Seasons*** in the "Partner" drop down menu (Fig. 18, **2**) to show all SOS animal species in "Species Available" window (Fig. 18, **3**).
- Click "Add All" (Fig. 18, **4**) to move species into "My Checklist" (Fig. 18, **5**) on the right.

  Note: *We recommend adding all of the animals on the SOS list, even if you do not typically see the all of the animals at your site.* ***Negative data*** *(not seeing animals) is just as important to us as animal sightings (See Appendix B, pg. 41, FAQs 5).* To add additional species, you can filter the animals in this list using the "Species group" drop-down menu. *Be sure to save your checklist before you switch between species groups.*

- Once you are finished adding animals, click the "Save checklist" button (6). Your checklist should now appear on your Nature's Notebook Observation Deck. In the example below (Fig. 19), All Signs of Seasons animals have been added to the checklist for the site called "My Backyard." They will appear in the **My Plants and Animals** box with red maple-1 and common lilac-1, which you previously added.

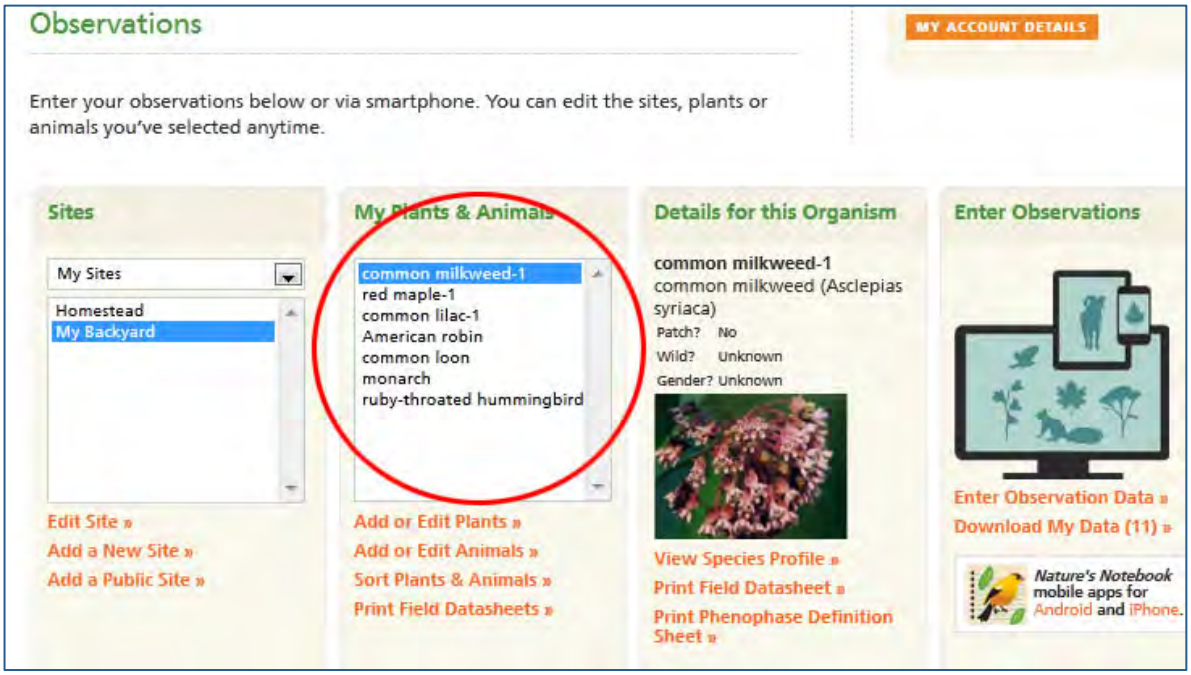


Fig. 19. SOS animal species were successfully added for a site named "My Backyard."

E. View Species Profiles/Create and Print Datasheets

Once you have registered your site and added plants and animals, *click on "My Observation Deck" link in the list at the top right of the page to:*

- Go to the plant or animal profile for any species on your list.
- Enter observations for a selected plant or animal.
- Enter observations for all your plants and animals.

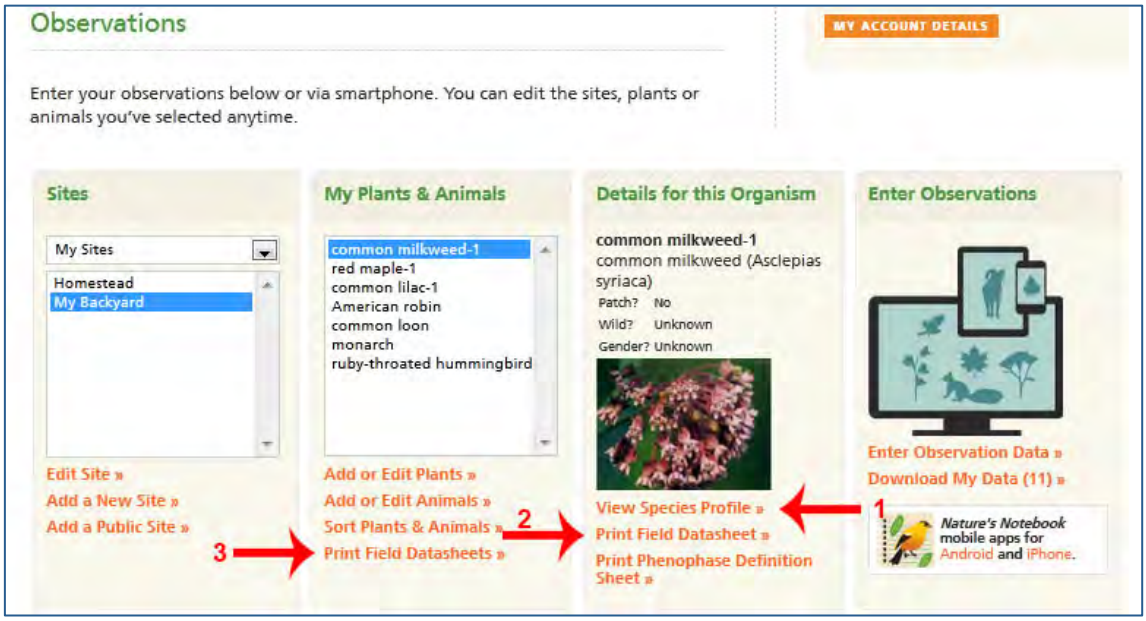


Fig 20. Nature's Notebook Home with site, plants and animals registered.

To create and print a single datasheet for one species:

1. Select a site and a plant or animal on your Observation Deck (Fig. 20).
2. Click on **"Print Field Datasheet"** (Fig. 20, **2**) under the **"Details for this Organism"** window.

3. You can open and print one or more copies of the data sheet for that plant or animal or save a copy to a folder on your computer.

To create and print datasheets:

On your Observation Deck, click on "Print Field Datasheets" button under "My Plants & Animals" (Fig. 20, **3**), a pop-up window will appear (Fig. 21).

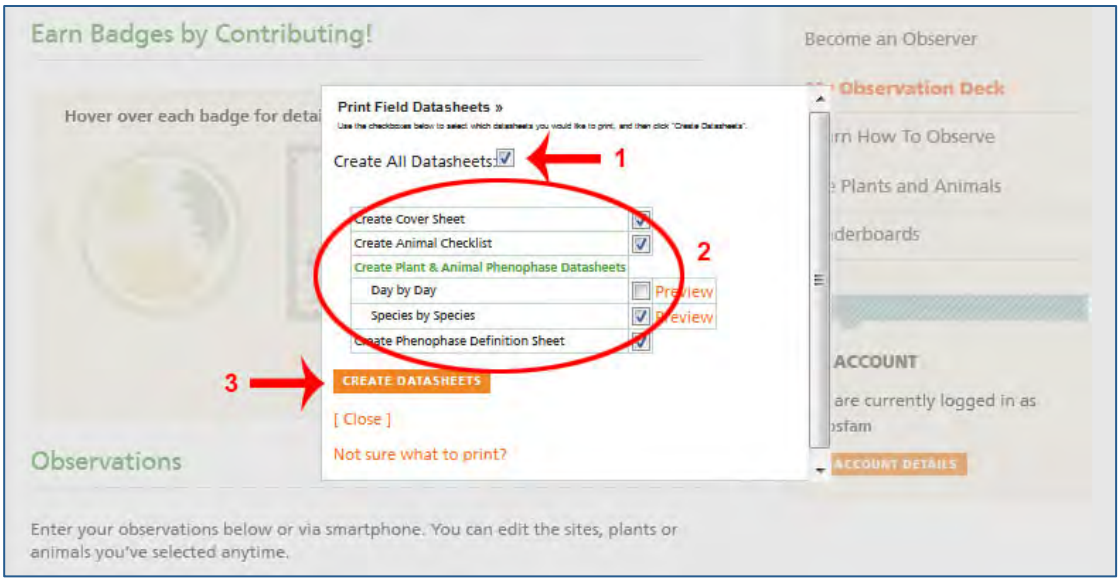


Fig. 21. Create Datasheets pop-up window.

- Use the checkboxes to select the datasheets you would like to print:
  - Create All Datasheets (a cover sheet, an animal checklist and a phenophase datasheet for every plant and animal you registered) (Fig. 21, **1**).
    We recommend you get started by selecting "Create All Datasheets"
  - Create a Coversheet only (Fig. 21, **2**).
  - Create all Plant and Animal Phenophase Datasheets only. (Fig. 21, **2**)
    - Click "Create Datasheets" button (Fig. 21, **3**) to
      - Open and print datasheets now or
      - Save datasheets to a folder on your computer to print when you need them.

Note: *In addition to a form for recording your observations, datasheets provide very brief phenophase definitions for your species. These definitions which are more complete with photos of each phase are available on the SOS website, http://umaine.edu/signs-of-the-seasons/indicator-species/, and at the SOS trainings.*

F. Enter your Observations Online/Log in

1. Go to www.usanpn.org/natures_notebook and click on "Log In" at the top of the page (Fig. 30)

Note*: You may find it handy to save your Nature's Notebook Home in your Favorites or Bookmarks on your computer*

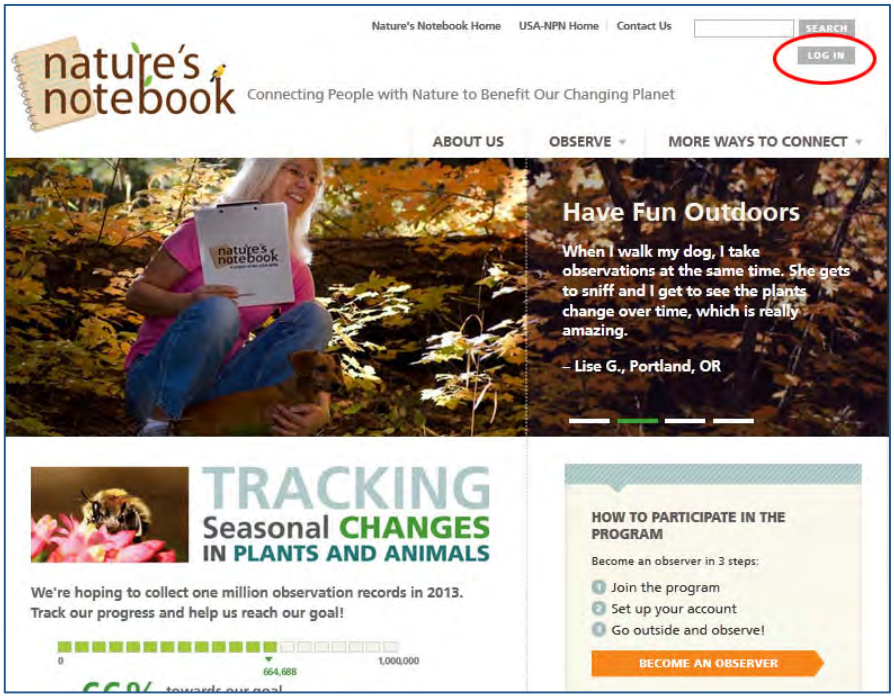


Fig. 30 NPN Home Page

2. On your home page, click on **"My Observation Deck"** and scroll down to **"Enter Observations"** at the bottom of the page. Click **"Enter Observation Data."**

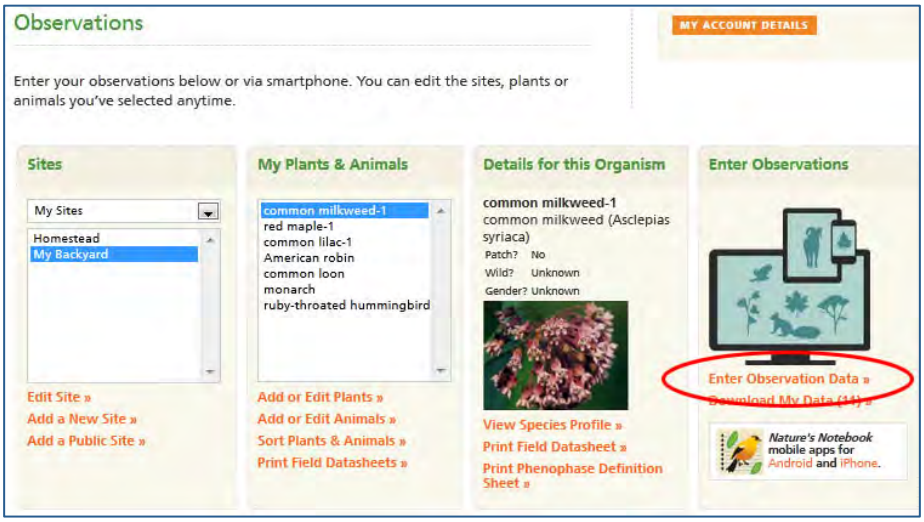


Fig. 31. Nature's Notebook Home Page

You should now see the **Enter Observations Form** (Fig. 32, below).

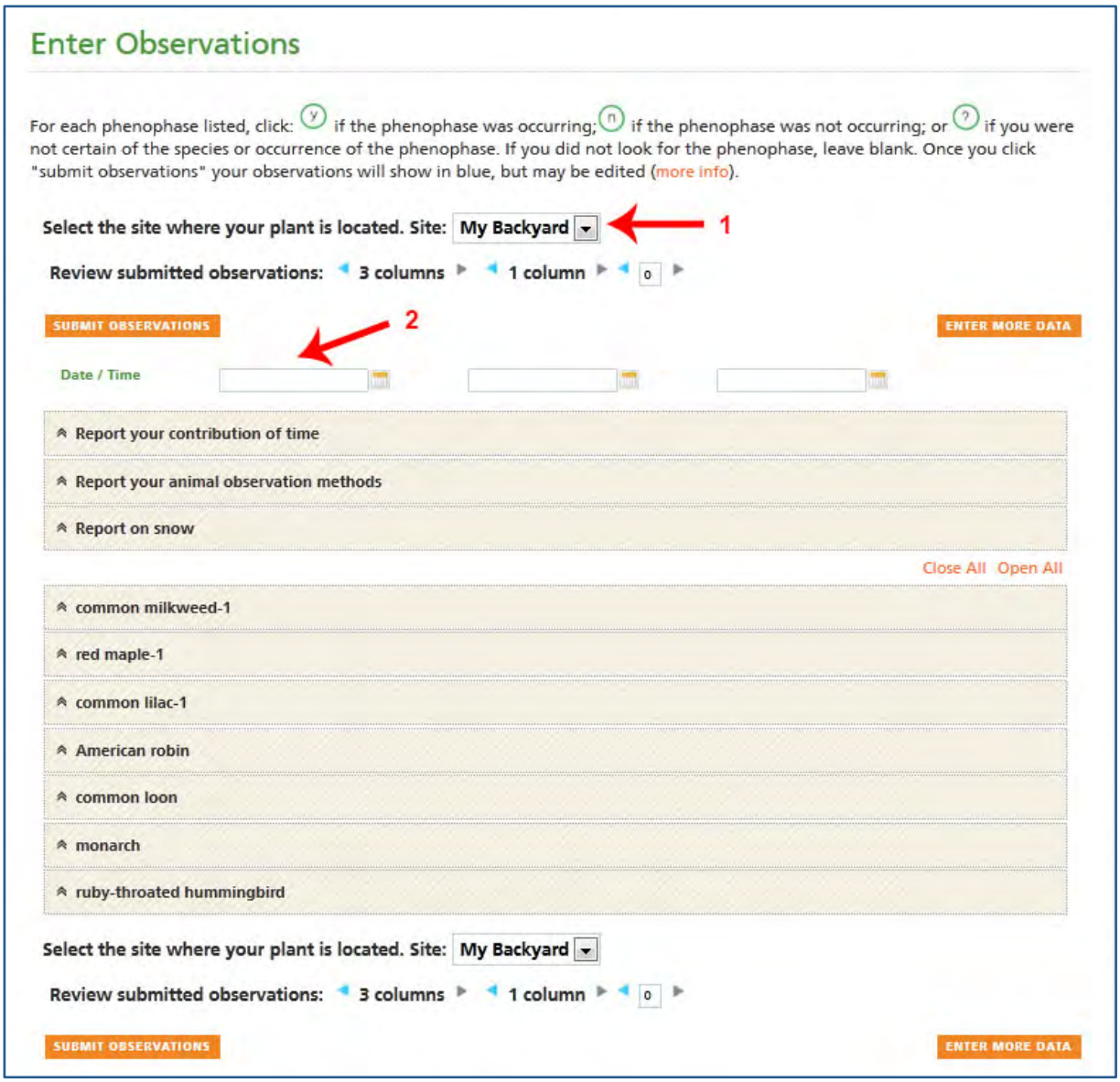


Fig. 32. Observation Data Entry Form

Before you enter observations:

- Select the correct site from the drop-down menu at the top of the form (Fig. 32, **1**)
- Using the calendar function, select the date for which you want to enter observations then click on “Apply”(Fig 32, **2**).
- Each of the categories of information that you need to enter (contribution of time, animal observation methods and snow conditions at your site) can be accessed by clicking on the black arrows on the left of the page to expand the menu.

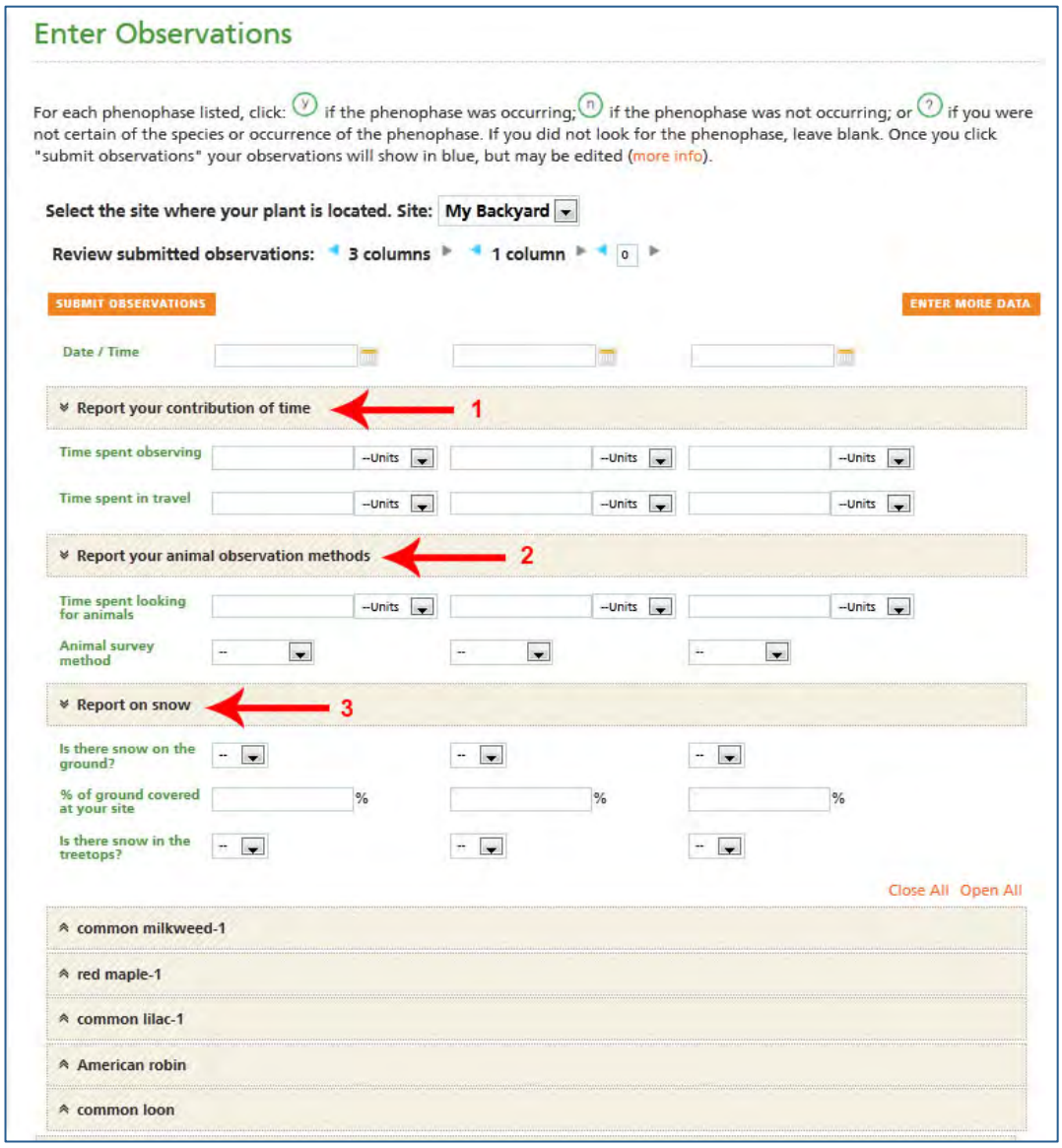


Fig. 33. Enter Observation form (detail)

- To enter your time, click on Report Your Contribution of Time to open the menu for "time spent observing" and "time spent in travel " (Fig. 33, **1**)
- Enter a number in box next to Time Spent Observing and then select the appropriate unit of measure from the drop-down menu to the right.
  Example: If you spent a total of 15 minutes observing (both plants and animals), enter "15" and select "minutes" from the drop-down menu.
- Repeat the above step for Time Spent in Travel (Fig. 33, **2**).
- Next click on "Report Your Animal Observation Methods."
- For time "spent looking for animals", enter **3** and select **minutes for your unit** of measure from the drop-down menu, as you did above for time reports.
- Now, enter your "animal survey method" by clicking on **"Walking"** in the drop-down menu.
- Finally, click on Report on Snow and enter the information regarding snow cover. (Fig. 33, **3**).

H. Enter Plant and Animal Observations

You have already chosen the site and entered the date, so now you are ready to enter your plant and animal observations (Fig. 34, below).

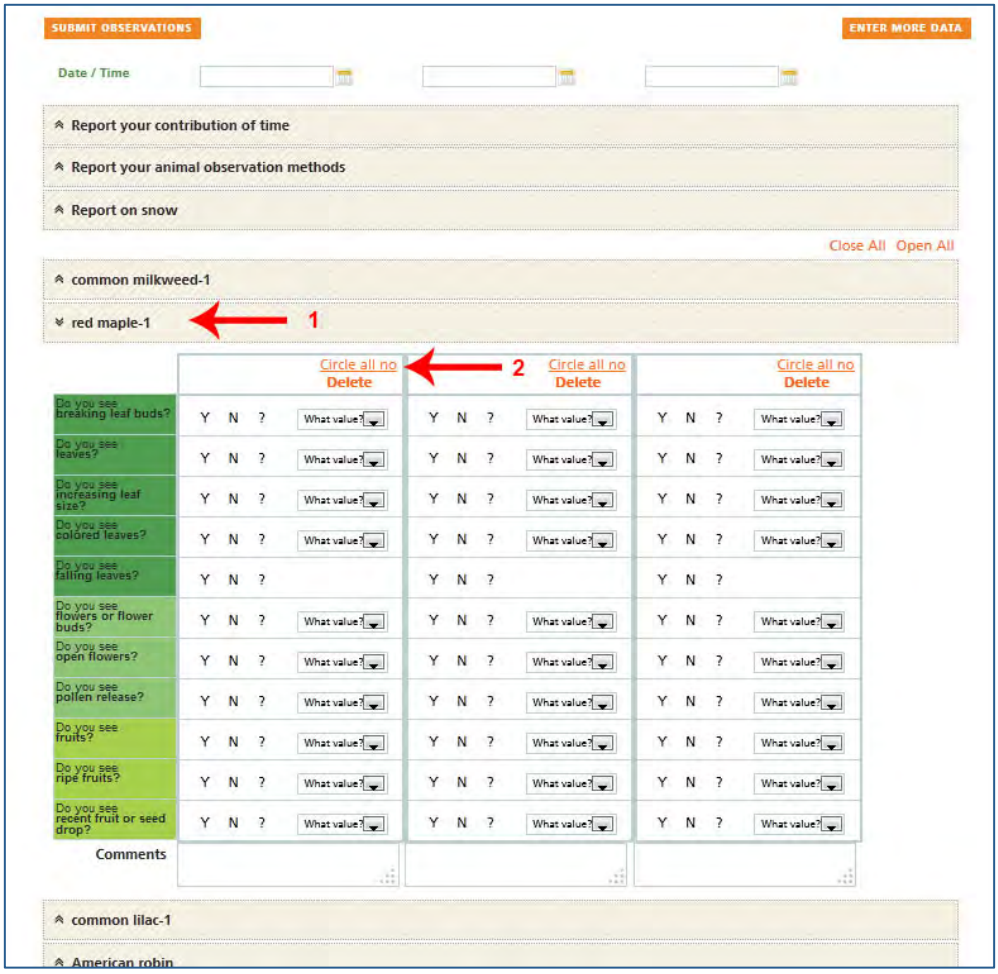


Fig. 34. Enter Observations Form.

The plant and animal species that you have registered to this site will appear in expandable menus on the left side of the form (Fig.34, **1**).

- Click on one of the species names to access the data entry interface for that species
- Each column represents one day's worth of observations.
- Using the phenophase datasheets that you filled out in the field, enter your observations
- Click "y" for any phenophase that you observed
- Click "n" for any phenophase that you did not observe

Note: *If you are reporting animal observations and you did not see or hear a particular animal species, click* ***"Circle all no"*** *at the top of the column to automatically enter "n" for all phenophases for this animal on this date* (Fig. 34, **2**).

- Click "?" if you are not sure whether you observed a particular phenophase.

Note: *Do not click anything if you did not look for a particular phenophase.*

- Repeat these steps for all the plants and animals on your species list.

I. Submit observations

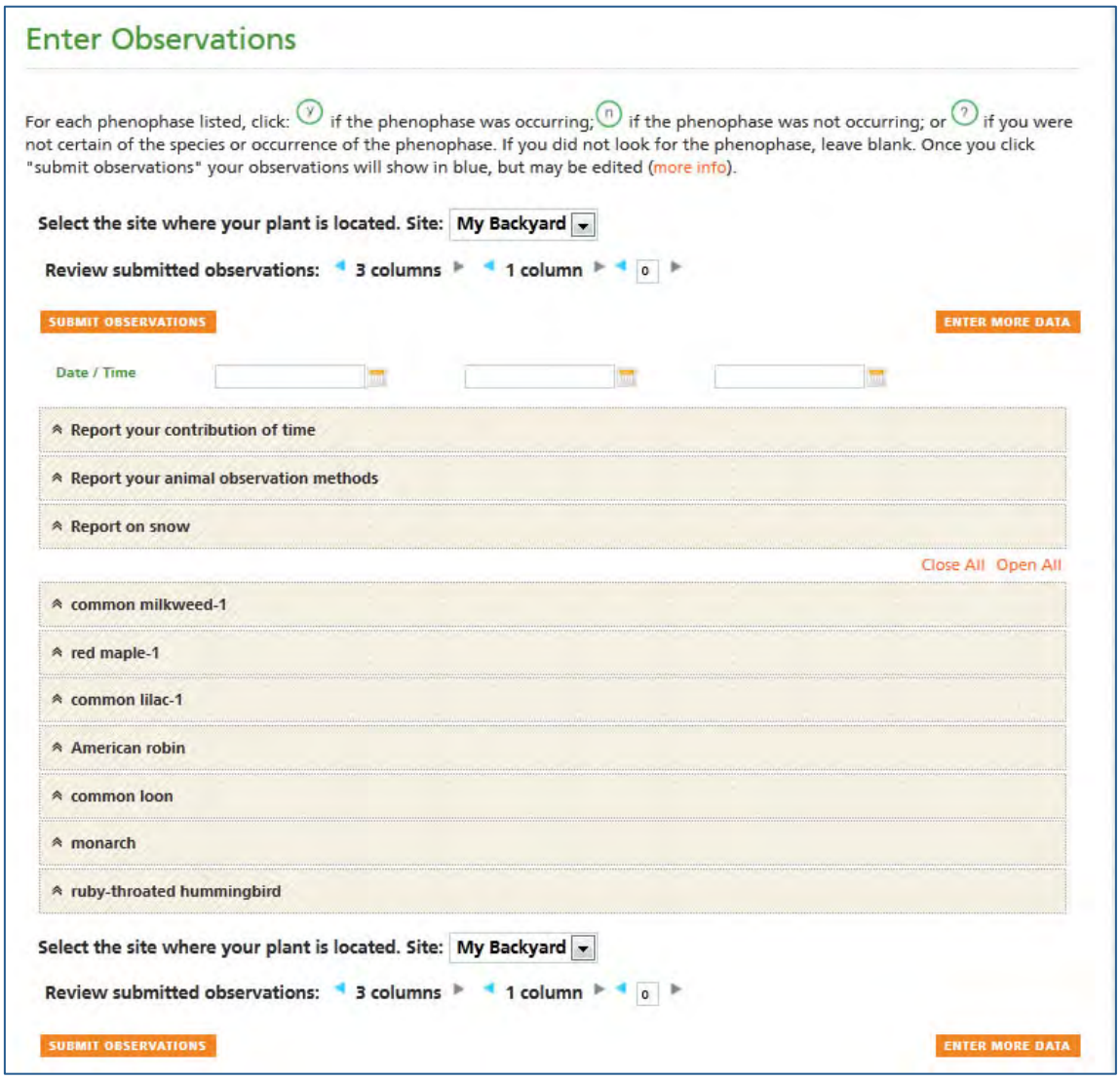


Fig. 35. Submit button and "Observations successfully saved" message on Observation Data Entry Form

Now that you have entered all your observations, **be sure that you save them!**

1. To save your observations, click the **orange "Submit observations"** button in the lower left corner of the screen. You will see a message that your observations were successfully saved.
2. From here, you can enter further observations, or use the menu bar at the top of the page to navigate to other functions within Nature's Notebook.

How do I change observation data once I have entered it?

If you wish to correct your observation data for a particular date, navigate to that day's column using the arrows at the bottom of your Nature's Notebook Enter Observations form.

- Phenophases: Change the "Yes", "No" and "?" to the correct ones for that day.
- Date: it is not possible to change the date once you have mistakenly put in a wrong date when you have recorded observations.

To solve this problem: *If you have correct data entered for the wrong date, please change all the responses in the column with the wrong date to "***?***", and add a new column with the correct date and responses*. You can add a comment describing the correction to help us keep track of your change.

Congratulations, you are finished!

Much of the value of phenology data is in making observations from the same sites and plants over many years, so *please come back next year!*

APPENDICES

Phenophase Definitions—These will be given out at trainings or can be accessed on the SOS website at http://umaine.edu/signs-of-the-seasons/indicator-species/

Appendix A. A Complete Example for Making and Recording Plant and Animal Observations

This section provides **an example** of how to make plant or animal phenology observations and how to complete the Phenophase Datasheets and Cover Sheet. The Animal Checklist is optional. In this example, you are observing at one site: My backyard.

While at site, ***My Backyard***, you are observing the following:

- One red maple (red maple-1)
- Three common milkweed plants (milkweed-1, milkweed-2 and milkweed-3)
- Monarch butterflies
- American robins

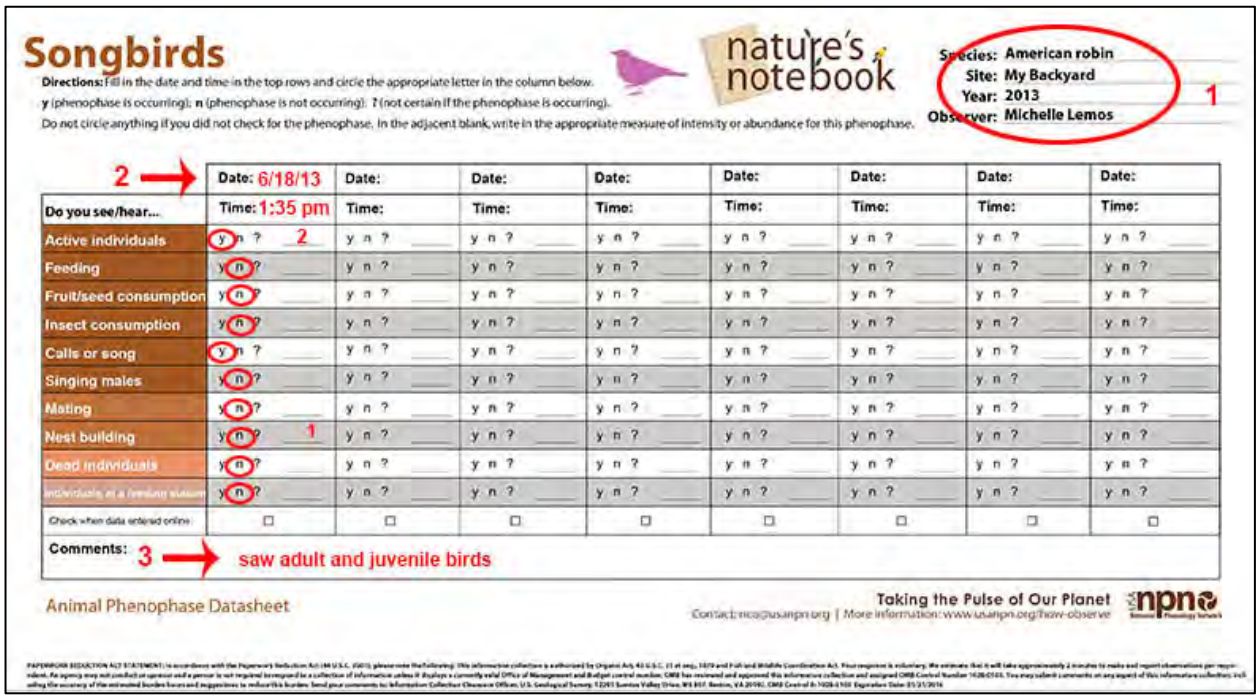
Making Observations in *My Backyard*

A. Taking animal observations in My Backyard

1. Imagine that it is early summer.
2. You travel to your site *(perhaps by walking out your back door)* and decide to observe your animal species before checking your plants.
3. Go to the beginning point of your transect.
4. Look and listen for three minutes while you slowly walk along your transect from beginning to end*. Don't forget to look for caterpillars on the underside of leaves when you walk by common milkweed plants!*

   Note: *The common milkweeds on which you are observing monarch caterpillars do not have to be the same milkweed plants that you are monitoring for plant phenology, although they can. It is most important that the milkweeds you observe for caterpillars are near your transect.*
5. Observation:
   - You see two robins fly through the site
   - You hear one robin singing.
   - You don't see any monarchs.
   - You also didn't see any caterpillars on common milkweed plants.

Filling in the Phenophase Datasheet for American robin



Songbirds

Directions: Fill in the date and time in the top rows and circle the appropriate letter in the column below.
y (phenophase is occurring); **n** (phenophase is not occurring); **?** (not certain if the phenophase is occurring).
Do not circle anything if you did not check for the phenophase. In the adjacent blank, write in the appropriate measure of intensity or abundance for this phenophase.

nature's notebook

Species: American robin
Site: My Backyard
Year: 2013
Observer: Michelle Lemos
1

Do you see/hear...	Date: 6/18/13 Time: 1:35 pm	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:
Active individuals	y n ? 2	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Feeding	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Fruit/seed consumption	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Insect consumption	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Calls or song	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Singing males	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Mating	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Nest building	y n ? 1	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Dead individuals	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
[illegible]	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Check when data entered online	☐	☐	☐	☐	☐	☐	☐	☐

Comments: 3 saw adult and juvenile birds

Animal Phenophase Datasheet

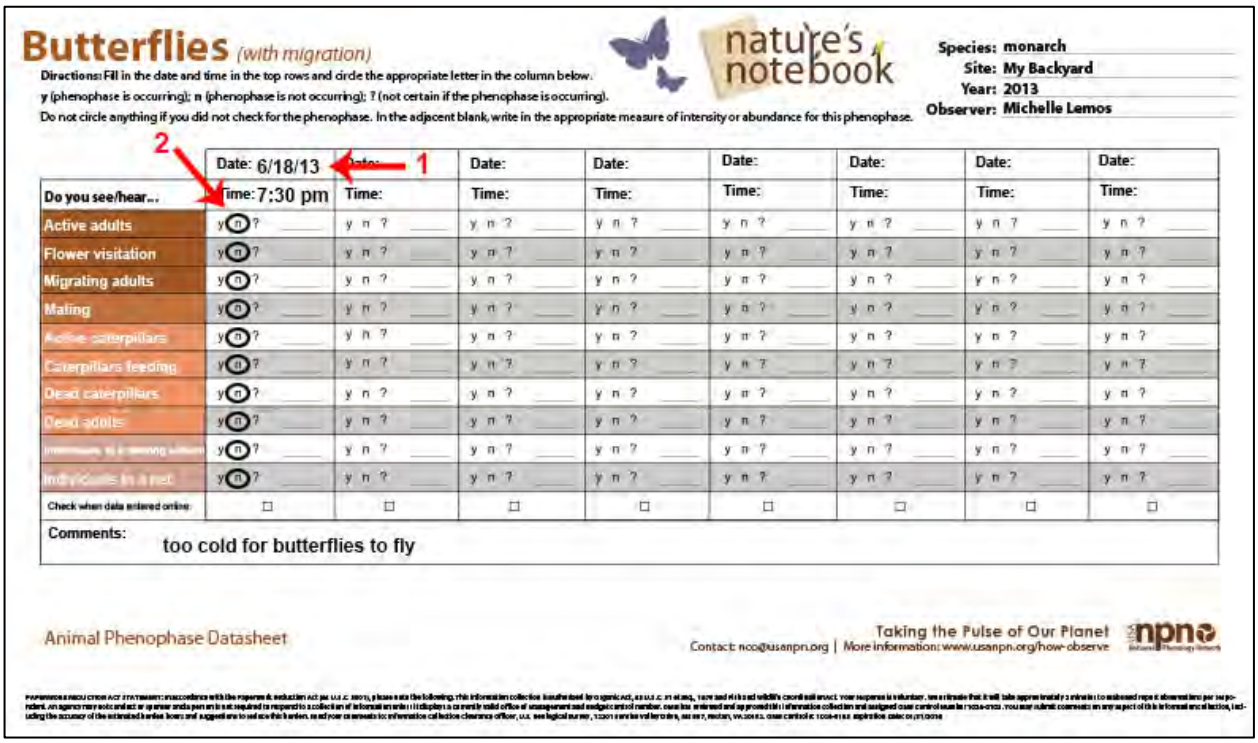
Taking the Pulse of Our Planet
Contact: nco@usanpn.org | More information: www.usanpn.org/how-observe

npn

Fig. 25. Phenophase Datasheet for American robin

6. On your American robin Phenophase Datasheet (Fig. 25):
   - Fill in the information block in the upper right corner with: Species, Plant nickname, Site, Year and Observer (your name) (Fig. 25, **1**)
   - Enter date of observations (Fig. 25, **2**) and fill in your observations for today (Do you see/hear…?)
   - You saw two robins flying, so circle "y" for 'active individuals' and indicate the abundance as '2'.
   - You heard one robin singing, so circle "y" for 'calls or song' and indicate the abundance as '1'.
   - You weren't certain whether it was a male or a female robin singing, so circle "?" for 'singing males'.
   - Circle "n" for the rest of the phenophases, as you did not observe robins that were:
     - Feeding
     - Eating fruit or seeds
     - Eating insects
     - Mating
     - Building a nest
     - Dead
     - At a feeder
   - Add any comments (e.g., saw adult and juvenile birds) (Fig. 25, **3**)

Filling in the Monkey Phenophase Datasheet (Fig. 26)



Butterflies *(with migration)*

Directions: Fill in the date and time in the top rows and circle the appropriate letter in the column below.
y (phenophase is occurring); n (phenophase is not occurring); ? (not certain if the phenophase is occurring).
Do not circle anything if you did not check for the phenophase. In the adjacent blank, write in the appropriate measure of intensity or abundance for this phenophase.

nature's notebook

Species: monarch
Site: My Backyard
Year: 2013
Observer: Michelle Lemos

Do you see/hear...	Date: 6/18/13 Time: 7:30 pm	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:
Active adults	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Flower visitation	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Migrating adults	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Mating	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Active caterpillars	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Caterpillars feeding	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Dead caterpillars	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Dead adults	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
[illegible]	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
[illegible]	y (n) ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Check when data entered online	☐	☐	☐	☐	☐	☐	☐	☐

Comments: too cold for butterflies to fly

Animal Phenophase Datasheet

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Fig. 26. Monarch phenophase datasheet (detail)

7. On the Monarch Phenophase Datasheet (Fig. 26):
    - Fill in the information block in the upper right corner with Species, Site, Year and Observer (your name), just as you did for the American robin datasheet (not shown, see Fig. 24)
    - Enter the date (Fig. 26, **1**) and fill in your observations for that day.
    - You did not see any monarchs or caterpillars; so circle "n" for all phenophases (Fig. 26, **2**).

Note: *Remember - do not circle anything if you did not check for a phenophase.*

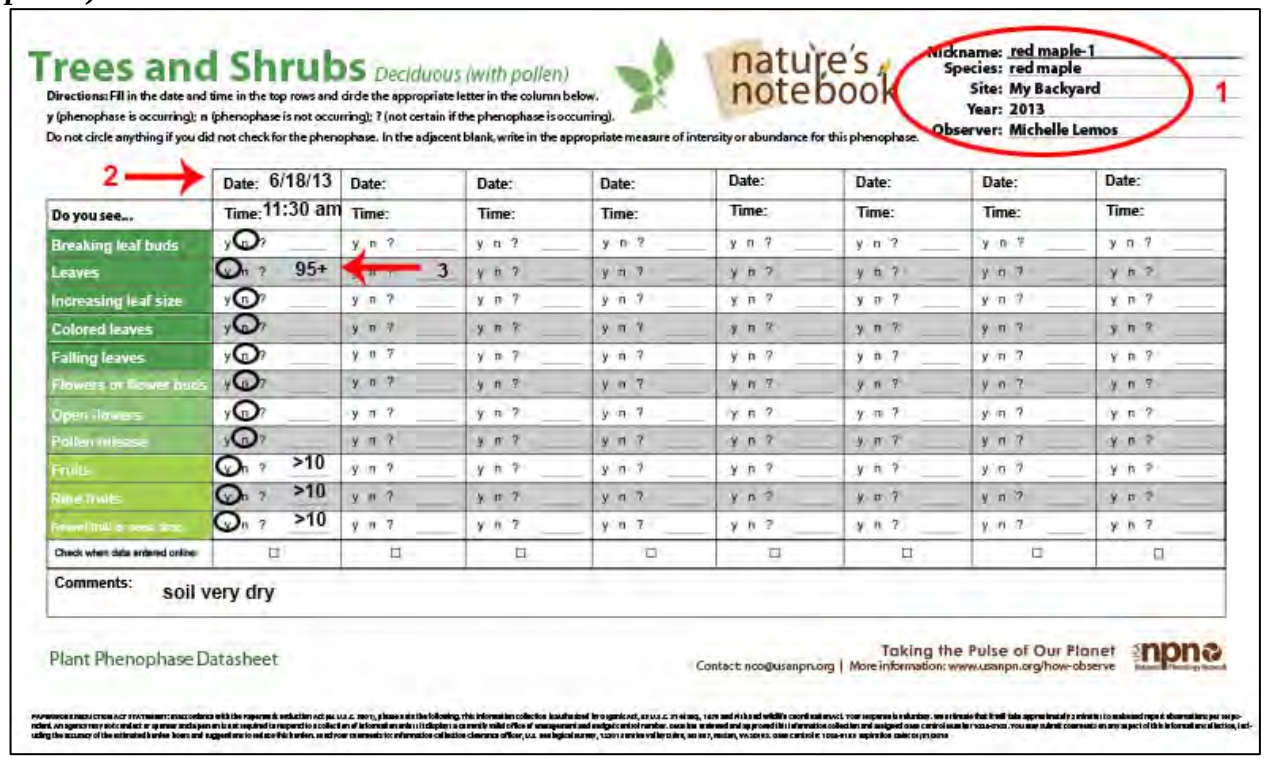
- Add comments (e.g., too cold for butterflies to fly)

Now you are ready to make your plant observations.

B. Taking Plant Observations in My Backyard

1. You walk to red maple-1 and look carefully to compare what you see to the phenophases you are asked to observe for red maple.
2. Looking up you see that the tree is full of green leaves and you can see the petioles (leaf stalks) that attach the leaves to the branch.
3. You also see samaras (winged fruits) on the tree and on the ground.

Filling in the Maple Side Yard Phenophase Datasheet (Trees and Shrubs /Deciduous with pollen)



Trees and Shrubs *Deciduous (with pollen)*

nature's notebook

Directions: Fill in the date and time in the top rows and circle the appropriate letter in the column below.
y (phenophase is occurring); n (phenophase is not occurring); ? (not certain if the phenophase is occurring).
Do not circle anything if you did not check for the phenophase. In the adjacent blank, write in the appropriate measure of intensity or abundance for this phenophase.

Nickname: red maple-1
Species: red maple
Site: My Backyard
Year: 2013
Observer: Michelle Lemos

1

2

Do you see...	Date: 6/18/13 Time: 11:30 am	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:
Breaking leaf buds	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Leaves	y n ? 95+	y n ? 3	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Increasing leaf size	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Colored leaves	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Falling leaves	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Flowers or flower buds	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Open flowers	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Pollen release	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Fruits	y n ? >10	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Ripe fruits	y n ? >10	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Fresh fruit or seed drop	y n ? >10	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Check when data entered online	☐	☐	☐	☐	☐	☐	☐	☐

Comments: soil very dry

Plant Phenophase Datasheet

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Fig. 27. Red Maple Phenophase Datasheet

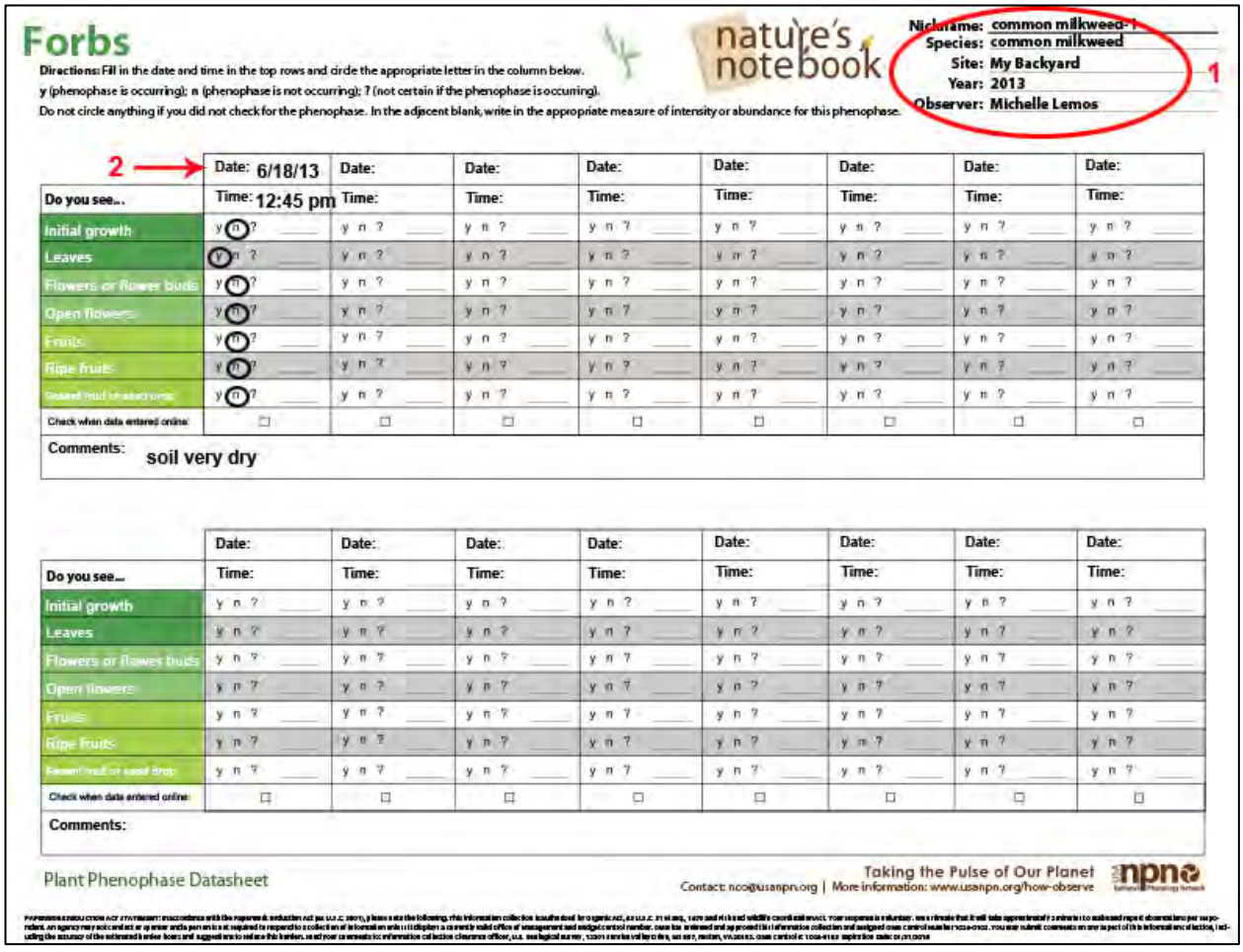
4. On your Maple Side Yard Phenophase Datasheet
   a) Fill in the information block in the upper right corner with: Species, Plant nickname, Site, Year and Observer (your name) (Fig. 27, **1**)
   b) Enter date of observations (Fig. 27, **2**) and fill in your observations for today (Do you see/…?)
   c) Next you circle "y" for leaves and must estimate that the <u>canopy</u> is about as full with leaves as it could be, so you enter 95+ for abundance (Fig. 27, **3**).
   d) Circle "y" for fruits and since you saw a lot of fruits, enter >10 for abundance.
   e) The fruits that you can see appear large and mature, so circle "y" for ripe fruits and again >10 for abundance.
   f) Since you saw fruits on the ground, and there were none on your last visit to the site, circle "y" for recent fruit drop and estimate >10 for abundance.
   g) Enter "n" for the rest of the phenophases since you did not see:
      - Breaking leaf buds
      - Increasing leaf size (You observed that most of the leaves have reached full size.)
      - Colored leaves
      - Falling leaves
      - Flowers
      - Open flowers
      - Pollen release
      - Write in any comments related to your observations.

You are finished entering data for the red maple, so walk over to your milkweed plants. Last time you were out you noticed initial growth (new shoots emerging from the ground) in

your milkweed patch and marked three plants to monitor.

5. You look at each plant carefully and observe that you can now see the bases of the leaves on all of your milkweed plants.

Filling in the milkweed phenophase datasheets (Forbs)



Forbs

Directions: Fill in the date and time in the top rows and circle the appropriate letter in the column below.
y (phenophase is occurring); n (phenophase is not occurring); ? (not certain if the phenophase is occurring).
Do not circle anything if you did not check for the phenophase. In the adjacent blank, write in the appropriate measure of intensity or abundance for this phenophase.

nature's notebook

Nickname: common milkweed-1
Species: common milkweed
Site: My Backyard
Year: 2013
Observer: Michelle Lemos

1

2

Do you see...	Date: 6/18/13 Time: 12:45 pm	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:
Initial growth	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Leaves	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Flowers or flower buds	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Open flowers	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Fruits	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Ripe fruits	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Recent fruit or seed drop	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Check when data entered online	☐	☐	☐	☐	☐	☐	☐	☐
Comments: soil very dry								

Do you see...	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:
Initial growth	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Leaves	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Flowers or flower buds	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Open flowers	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Fruits	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Ripe fruits	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Recent fruit or seed drop	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?	y n ?
Check when data entered online	☐	☐	☐	☐	☐	☐	☐	☐
Comments:								

Plant Phenophase Datasheet

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Fig 28 Common milkweed-1 phenophase datasheet

6. On your common milkweed-1 phenophase datasheet

a) Fill in the information block in the upper right corner with: Species, Plant nickname, Site, Year and Observer (your name) (Fig. 28, **1**)
b) Enter date of observations (Fig. 28, **2**) and fill in your observations for today (Do you see/…?)
c) Circle "y" for leaves, since you saw more than one unfolded leaf on milkweed-1.

Note: *The phenophase definitions do not ask that you estimate how many leaves are unfolded, so you leave the abundance line blank.*

d) Circle "n'" for all other phenophases since you did not see:

- Initial growth (once you see unfolded leaves on a shoot, initial growth is over)
- Flowers
- Open flowers

- Fruits
- Ripe fruits
- Recent fruit drop

7. Add comments (e.g., soil is very dry)

8. Since you saw unfolded leaves on all three milkweed plants, fill in datasheets for milkweed-2 and milkweed-3 exactly the same as for Milkweed-1.

C. Completing the Cover Sheet

Before leaving your site, you fill out your Cover Sheet (Fig. 29).

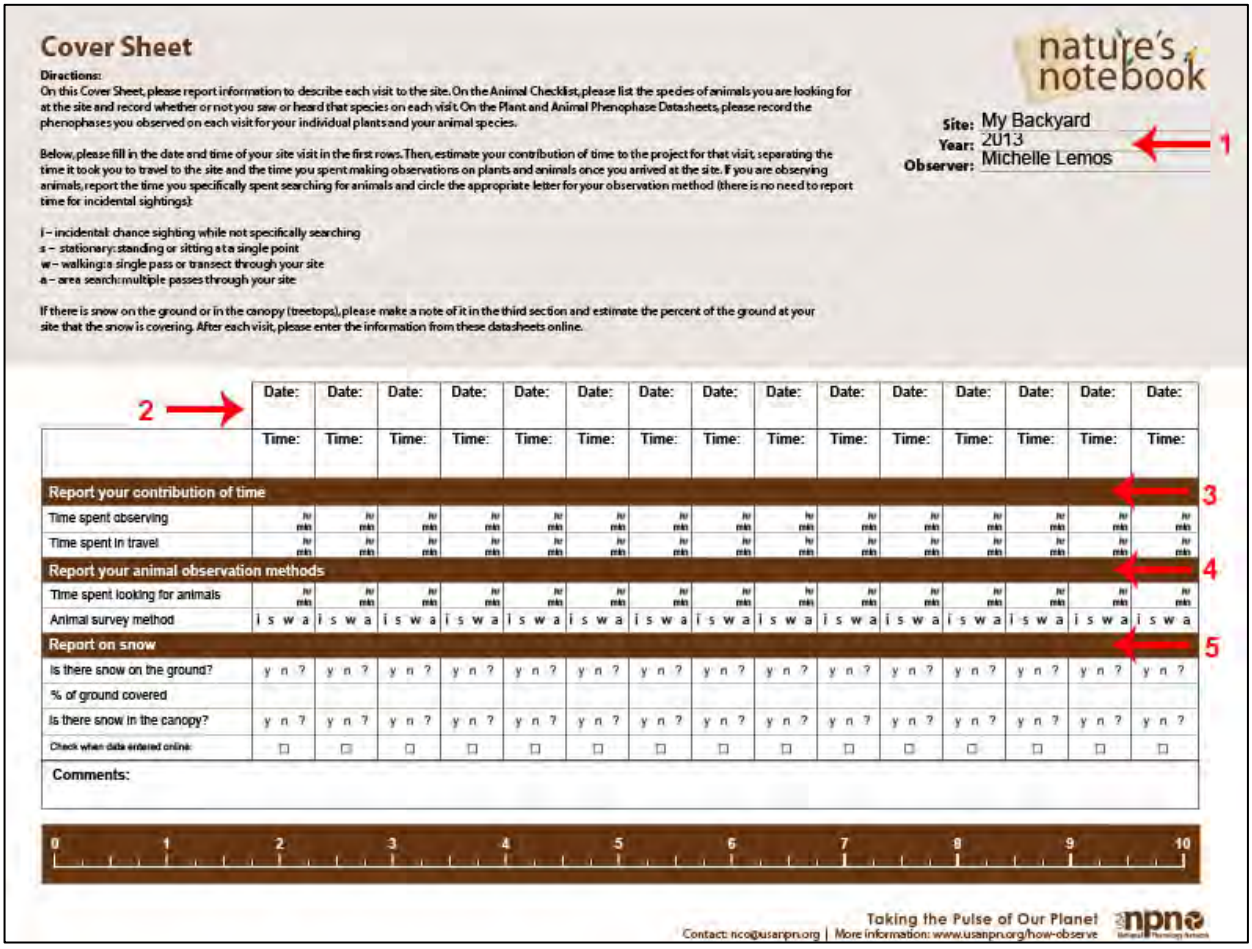

Fig. 29. Completed Cover Sheet

1. If you created a complete set of data sheets, your cover sheet will be pre-printed with your site, year and your name; if not, please add this information (Fig. 29, **1**).
2. Then, enter the date (Fig. 29, **2**).

3. Next, record the amount of time you spent today (Fig. 29, **3**).
    a. Record the amount of time you spent traveling to and from your site. In this example, as your site is your backyard, you spent one minute traveling to your site, and one minute traveling back to your house, for a total of two minutes in travel.
    b. Indicate the time you spent observing.

- *Recall, this is an indication of the total time you spent observing. If you were observing both plants and animals, this estimate would include the time you spent both looking and listening for your animals and also inspecting your plants.*
- In this example, you looked and listened for animals for 3 minutes. It took 11 minutes to check your red maple and milkweed plants ***and*** to fill out the datasheets. You spent 1 minute sharpening your pencil at the beginning and filling out the cover sheet at the end. This adds up to a **total of 15 minutes spent observing.**

Note: *This is important information, documenting volunteer effort, to assist the program in procuring funding.*

4. Now, report your animal observation methods (Fig. 29, **4**).
    a. Indicate the amount of time you spent looking for animals. Recall that in this example you made observations for 3 minutes.
    b. Indicate which method you used to search for the animals on your checklist. Since we are using the transect observation method, you circle "W" for 'walking' along your transect.

5. Finally, indicate whether there was snow at your site on this day. In this example, there was no snow on the ground, so you circled "N" for both questions regarding snow on the ground and in the tree canopy (Fig. 29, **5**).

Congratulations! You have finished filling in your datasheets for this *Example.*

Filling in the Animal Checklist (<u>this is optional</u>)—Use only if helpful to you

The **Animal Checklist** provides a quick summary of the animal species seen or heard at your site on each date. **It is not a required datasheet**, but if you find it helpful you may fill it in.

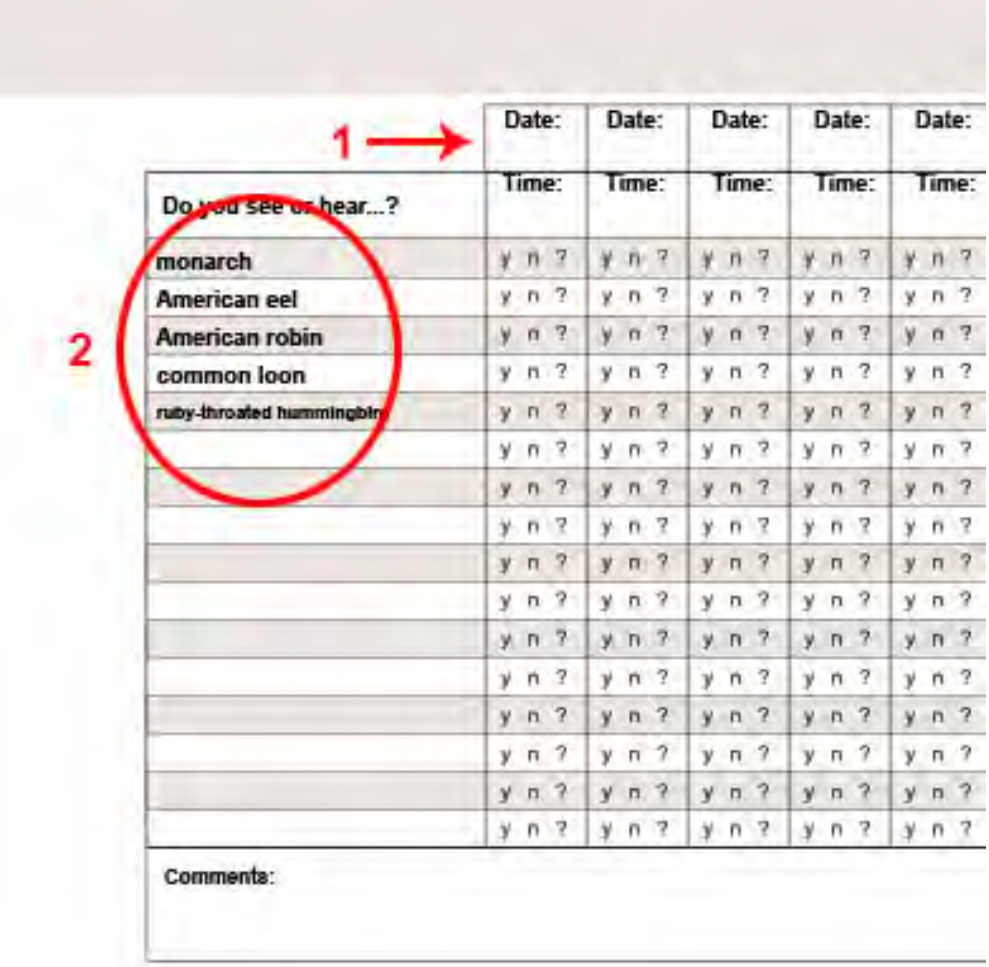

Fig. 24 Detail of animal checklist

If you choose to use the optional Animal Checklist, for each day that you make observations:

1. Fill in the site name, year and your name at the top of the page (not shown)
2. Record the date (Fig. 24, **1**)
3. List the species of animals you are looking for at the site if it is not already pre-filled with the species names (Fig. 24, **2**)
4. Record whether you saw or heard that species
    a. Circle "**y**" if you saw or heard that species
    b. Circle "**n**" if you did not see or hear that species.
        Note: For each species that you circle "n", you do not need to fill out a column in the Animal Phenophase Data sheet for that day. You can simply click "Circle all no" when entering your observations online for that date.
    c. Circle "**?**" if you were unsure whether you saw or heard that species.

Appendix B. Frequently Asked Questions

How to Observe

1. Why should I record my observations when nothing seems to be happening?

Having a full record of your observation dates allows scientists to more confidently estimate the date a phenophase began or ended.

Example: If you first report hearing wood frog calls April 6, and your last visit (when you did not hear them) was April 2, we know that the wood frogs started calling sometime within those four to five days. If you only report the April 6 visit and no previous visit, we only know that the frogs started to call sometime before April 6.

2. What if I missed a phenophase?

- If you miss the occurrence of a phenophase entirely, and you see evidence that the phenophase did occur, then make a note of this in the comments section of your Nature's Notebook **Enter Observation Data Entry** form.
  Example: If your plant flowered while you were away on vacation, and you see dried flowers on the ground below the plant, feel free to note this in the comments section of your data entry form. You can note similar occurrences with animals, for example, if you see chicks in a bird nest, but never saw the eggs.
- If you are watching for a phenophase and it does not seem to be starting when you expect it would, ***continue to watch for it and record that it is not occurring.*** This could mean the phenophase is occurring later or not at all in a given year, and could be very valuable information.

3. Why is it valuable to know that a phenophase did not occur at all in a given year?

Many phenophases do not occur in every year—birds may not breed in a certain area, trees may not flower or fruit, turtles may not lay eggs.

Note: Information about when and where these phenophases did and did not occur is very important to scientists studying these species and the interactions between species and how it relates to the changing climate.

4. Why should I continue looking for a phenophase even after it has passed?

- Once a phenophase has ended you should ***continue to look for signs of it and record whether or not it occurs again***. Sometimes phenophases will occur a second or third (or more) time in a season, whether because of rain, pests, or climate change.
- Many phenophases may occur two or more times in a year. Many birds lay a second clutch of eggs in the summer after the first clutch has fledged. If a frost or pest kills many of the leaves on a tree, it will often have a second flush of new leaves.
- Also, ***climate change is altering the timing and frequency of life cycle events, which is extremely important to capture!***

  Example*:* As temperatures warm and growing seasons get longer, many species are reproducing more frequently—some birds are having more broods, some plants flower earlier or more often, and insects like butterflies and dragonflies may go through more generations in a single year, or less due to scarcity of food and water.

Animals

5. What if I never see some of the animals I am observing?

- *On most days you will probably not see or hear most of the animals you are observing.* You may not see or hear some species all year. Even though it can be frustrating to look for animals that are not there very often, information about when and where a species is and is not is very important to scientists.

  Note: *Please continue to record that you DO NOT see phenophases for these animal species on each day you observe*.
- In some ways the information about when and where a species is not present is *more* important than information about where it is, because those observations (called negative data) are more rare.

6. Can I still report seeing 'Active individuals/adults' or 'Individuals/adults on land/water' if I also report seeing another more specific phenophase?

Yes. You should report "Yes" for ALL the phenophases you see occurring on a given date. For animals, if you see a specific activity, like nest building, you are also seeing one or more active individuals, and should be reporting "Yes" to both of those phenophases for that species.

Plants

7. Can I start observing a plant if I am unsure which species it is?

- **Yes.** Keep track of observations on a field datasheet and use phenophase definitions for the species you think it is, or for a similar tree, shrub or herbaceous perennial.

  Note: Please do not enter your observations online until you have identified the species with reasonable confidence.
- Once you have identified the plant, please check that the phenophases for that species are consistent with what you had been recording. If they are consistent, enter the data online. If they are not consistent, please do not enter your old observations. Instead start fresh now that you have identified your plant.

8. Can I still report 'Breaking leaf buds' (trees and shrubs) or 'Initial growth' (forbs and grasses) once I see 'leaves' or 'Young leaves' on the plant?

Yes. You should judge each leaf bud or shoot separately.

- As long as some buds or shoots on the plant are still breaking or initiating growth and have not yet produced an unfolded leaf, you are seeing 'Breaking leaf buds' or 'Initial growth'.
- For plants that have more than one bud or shoot, in most cases you will still be seeing 'Breaking leaf buds' or 'Initial growth' in some buds or shoots for many days after you first begin seeing 'Leaves' or 'Young leaves' from other buds or shoots.
- It is also possible to see multiple episodes of leaf bud break or initial growth within a season. This might occur after a period of frost, severe drought, or after a plant is defoliated by insects.
- However, once ALL the active leaf buds or shoots on the plant have at least one unfolded leaf, you should be reporting that you no longer see 'Breaking leaf buds' or 'Initial growth'.

9. How can I judge the proportion of full leaf size while leaves are still increasing in size? This is a little difficult the first year you try it, but gets easier with practice.

- If you are in doubt, you can use a ruler to measure full size (length and/or width) of a typical leaf during summer of the first year, and then use that measure to better judge the proportion of full leaf size during the period of leaf growth in subsequent years.
- We are asking observers to note when leaves are less than 25%, 25-49%, 50-74%, 75-94%, and 95% or more of full leaf size in order to create an estimate of the time it takes for leaves to grow to full size.
  Note: Including this measure allows scientists to keep track of the length of the "green-up" period, which is an important aspect of a plant's response to climate change.

10. When should I report I no longer see 'Leaves'?

You should continue to report seeing 'Leaves' as long as fresh green or colored leaves/needles remain on the plant.

- *Do not include dried, dead leaves* that remain on the plant, such as occur with some species throughout the winter.
- In some cases, *green leaves* will remain on the plant in a frozen condition for part or all of the winter. If more than about 5% of the leaves have remained on the plant in this condition, you should continue to report seeing 'Leaves' until they fall off or appear wilted.

11. How can I tell if mature fruit have dropped from my plant since my last visit?

Evidence of 'Recent fruit drop' may include mature fruits on the ground below the plant that were not there on your last visit or fruits missing from the plant which were present on your last visit.

Note: Do not include obviously immature fruits that have dropped before ripening, as might happen in a heavy rain or wind.

12. *What if the plant I am observing dies?*

If an individual dies or is obviously declining in health (when others of the same species around it are still healthy), you should:

- **Select a new individual to observe**.
- Be sure to note the death in the comments section of your Nature's Notebook **Add or Edit Plants** form and add the replacement as a new plant with a different nickname.

Appendix C. Glossary

calibration species - A set of 20 plants selected to help "calibrate" phenological measurements across the USA. These native and introduced plants have broad distributions and are ecologically or economically significant. Observations on calibration species will be integrated to get "the big picture" regarding plant response to environmental change. Widespread observation of calibration species helps integrate collective plant data with climate change measurements nationwide.

canopy - A layer of vegetation elevated above the ground. It can refer to the layer of vegetation that comprises the top layer of a forest or the layer of leaves surrounding an individual tree or shrub

canopy composition – The tree species that comprise a forest canopy

caterpillar – Larval form of butterflies and moths

cotyledon – seed leaf; embryonic leaf; the first leaf or one of the first pair of leaves to develop in a seed plant. Cotyledons, when they emerge with seedling shoot, do not look the same as the plant's "true leaves," which develop after germination.

deciduous - Falling off, as leaves from a tree; not evergreen; not persistent

forb – Herbaceous (non-woody) flowering plants that are not grasses, sedges or rushes.

forest stature – The stage of growth of a forest or woodland; e.g., old growth (primary) and second or third growth (regrowth after disturbance/cutting)

habitat - The type of environment in which an organism usually resides (e.g., "marine habitat" or "woodland habitat"); an organism's "address"

inflorescence - A group or cluster of individual flowers arranged on a stem that is composed of a main branch or an arrangement of branches. Milkweed flowers are arranged in an inflorescence.

larva - The newly hatched, earliest stage of any of various animals that undergo metamorphosis, differing markedly in form and appearance from the adult. Caterpillars are the larval form or larvae (pl) of butterflies and moths.

negative data – The record of not seeing an animal of study or observing that a phenophase is not occurring. Negative data is just as important as sightings of animals observing phenophase occurrence.

petiole – leaf stem; The petiole attaches a leaf or arrangement of leaflets to the main stem or branch of a plant

phenology - The recurring plant and animal life cycle stages or the study of these recurring plant and animal life cycle stages, especially their timing and relationships with weather and climate

phenophase - An observable stage or phase in the annual life cycle of a plant or animal that can be defined by a start and end point. A phenophase generally has a duration of a few days or weeks.

Examples include the period over which newly emerging leaves are visible or the period over which open flowers are present on a plant.

pistil – The female reproductive part of a flower made up of the ovary, style (stalk) and stigma (sticky tip that receives pollen).

pollen - A mass of microspores in a seed plant, usually appearing as a fine dust. Pollen grains are transported (typically by wind, water, insects or animals) from a stamen to a pistil, where fertilization occurs.

seaweeds - although they have many plant-like features, are not true vascular plants; they are algae, part of the Kingdom Protista, which means that they are neither plants nor animals. Seaweeds are not grouped with the true plants because they lack roots, stems, leaves, enclosed reproductive structures like flowers and cones and a specialized vascular system (a conducting system for fluids and nutrients). They are able to take up fluids, nutrients, and gases directly from the water, in which they come in contact and do not need an internal conducting system. Like true plants, seaweeds are photosynthetic, converting energy from sunlight into materials needed for growth. Seaweeds have the green pigment chlorophyll within their cells, which absorbs the sunlight they need for photosynthesis.

stamen – The male reproductive part of a flower made up of a filament (stalk) and anthers (contain pollen).

transect - A fixed path in a given area along which one observes and records occurrences of plants or animals of study.