"Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts. There is something infinitely healing in the repeated refrains of nature—the assurance that dawn comes after every night, and spring after winter."

~ Rachel Carson
# Phenology Wheels

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Birthday Phenology Game: A-Getting-to-Know-You Game

Activity Overview
Students will gain awareness of local phenology and each other by playing a game connecting their birthdays with local phenology and seasonal phenomenon.

Objectives
Students will:
- Be more aware of local phenology and seasonal phenomena
- Understand the importance of phenology to our understanding of our place
- Learn something about each other
- Be curious to learn more about local phenology
- Be inspired to become more observant when outdoors

Subjects Covered
Science

Grades
3 through 8 (Can be modified for grades K-2 and 9-12)

Activity Time
20-30 minutes (This activity is best kept short to sustain interest. This might mean returning to the game several times, until everyone is included.)

Season
All (especially useful at the beginning of the school year, as a team-building activity.)

State Standards
Science:
- Ask questions, plan investigations, make observations, predictions (C.4.2)
- Use data to answer questions (C.4.5)
- Identify data and sources to answer questions (C.8.2)
- Use inferences and observations (C.8.4)
- Describe weather & seasonal changes (E.4.5)
- Explain earth's cycles using observation (E.8.8)

Source
Georgia Gómez-Ibáñez,
Cambridge Elementary School, WI

Background
Phenology is the observation and study of natural events and cycles in a place, timed in relation to seasonal and climate changes. Phenological knowledge grows from careful observations, made over many years. Modern climatologists recognize phenology as one important tool in the study of recent climate change, but phenological awareness is as old as the earliest humans. Our ancestors survived by observing carefully the world around them, relying on the resulting experience to know when to gather, hunt, plant and harvest.

Phenological awareness is also simply an enjoyable part of celebrating the seasons as they flow around the circle of the year, taking delight in both the ever-newness and reliability found in the natural world, from the anticipatory "Oh listen, I hear the chorus frog concert! Soon we'll be looking for the Rue Anemones!" to the comfortably dependable sequence of seasons. Sparked in childhood, this pleasure can greatly enhance one's enjoyment of life and one's sense of place.

This game is one way to spark an interest in what's going on outdoors. Even if some children are oblivious to the natural world, most children have strong feelings about their birthdays! Recalling what was happening outdoors at the time of their birthday will require a thoughtful memory-journey, and just perhaps they will connect the celebratory birthday feeling with an event in the natural world. (Note: students will need to be prompted to think of something happening outdoors in the natural world. Otherwise they will choose holidays, or activities, such as sledding, swimming, etc. Younger students (grades K-2) would need to play the game using seasons rather than months.)

Note: Local phenologies differ! The new student from another county or state may hold a different set of phenology facts in mind! This need not be a problem; it can spark a good discussion about why phenologies will vary from place to place. For example, latitude, altitude, and/or nearness to large temperature-moderating bodies of water can all affect local phenology.

Activity Description
The teacher should be the first player, so that the students understand how to play this game. For example the teacher says: "My birthday happens when the white flowers are blooming on the wild black raspberries; in what month is my birthday?" And the guessing begins.
Extensions

Extensions for grade 6-12 could include using Web sites to do research. For older students, access Web sites such as Project Budburst (http://www.budburst.org), Journey North (http://www.journaynorth.org), and Earth Alive! (http://www.naturenet.com/EarthAlive). A team building activity could include asking each student to find a phenology fact for a classmate’s birthday.

A whole classroom extension activity could be to put the birthdays (and phenology facts) on a wheel of the year. Personal size (11” x 17”) wheel of the year or classroom size (24” or 32”) wheels would be needed for this activity. Do some of the phenology facts intersect in interesting ways? Do some phenology facts depend on each other? What other phenology facts might the class want to learn, inspired by the birthday phenology facts? A wheel of the year needs an informative center. A good center for this wheel is an outdoor class photo, or something else agreed upon as a unifying theme.

Extensions for grades 4-12 could be for each student to choose a plant or animal whose life cycle intersects with the student’s birthday, and create a wheel of the year for that plant or animal. The center of that wheel would be the plant or animal, and its activities or cycles would be depicted around the year.

Extensions for grades 4-12 could be to create a classroom birthday-phenology book. Each student would contribute a page with a drawing to illustrate a poem or brief researched essay about the phenology fact connected with their birthday. This book would be organized by date. A good cover illustration might be a wheel of the year embellished with the birthdays and phenology facts.
Birthday Phenology Game: A-Getting-to-Know-You Game (cont.)

Additional Resources


Web Sites

- Forbes, A. “Wheels of Time and Place: A Set of Circular Journals and Instructions.”
  [www.partnersinplace.com](http://www.partnersinplace.com).
- The “Phenology Calendar” produced by The Friends of Pheasant Branch is especially helpful for those located in Southern Wisconsin, see [www.pheasantbranch.org](http://www.pheasantbranch.org).
Activity Overview
Students will deepen their sense of place by regular visits to a specific place, by writing or creating artwork about that place, and by assembling their work on a wheel of the year.

Objectives
Students will:
* Identify with a specific place by regular and frequent (at least seasonal) visits to that place
* Become familiar with that place in its changing seasons
* Increase knowledge of the phenology of that place
* Develop observation skills
* Use drawing, photography, and/or writing to deepen awareness of that place
* Understand what art, writing, and science have in common

Subjects
Science, Art, Language Arts

Grades
3 through 12

Activity
15-30 minutes each trip to place

Variable (some visits could be brief walks, some could/should include time for sitting, reflection, and artwork and/or writing)

Season
Any

Materials
Small writing/drawing notebooks, pencils, colored pencils, camera (digital if possible), and small and/or large wheels of the year*

State Standards
Science:
Ask questions, plan investigations, make observations, predictions (C.4.2)

Background
Gaining a deep sense of place is very rewarding, can be an enjoyable, lifelong activity, and is arguably essential to human well-being. It is part of our human inheritance: throughout history we have lived intimately with our place. Only very recently have so many people become disassociated with, and consequently unappreciative of and ignorant about the land (soils, waters, plants, and animals) where they live.

In the recent past children naturally formed a relationship with the land by exploring, playing, and working in it. Most children nowadays are not allowed such unsupervised roaming. This activity seeks to re-establish the natural feelings children once had for the land around their home and community.

What sort of “place” will be conducive to this endeavor?
First of all it must be within walking distance, so that visits can be as regular and frequent as possible. The best places will be somewhat “wild,” like a woods, a pond, or a prairie. A schoolyard with lovely trees will suffice, or perhaps a courtyard garden, or a butterfly garden. A less formal and groomed place will be better than “lawn,” but lawn under a tree would do. Ideally this place will be visited not only in every season, but in every sort of weather. Rainy day or snowy day walks will evoke deep responses.

Each visit need not include an art or writing response, but some visits should include time to sit, slow down, and quietly experience the place. Drawing and/or writing are useful devices to achieve focus and attention to details. Indeed, the observational skills so necessary for scientists are the same ones necessary for artists and writers.

Each student could have a personal wheel of the year (11” x 17” paper) on which to draw and/or write images or impressions of the place. A large classroom size wheel (24” x 24”) could be used to display student work, month by month or seasonally, creating a collective evocation of the place.

Ongoing discussions will help students relate to this place: What makes this place special? If the place has no boundary features, how are they defining the space for the place? Might they want to set some goals on frequency of visits, or special phenomena they hope to observe, or weather they hope to experience?
Activity Description

Activity 1- Creating Classroom Wheelscapes

Activity 1A: Photo/Phenology Wheelscapes

A photo taken from a single spot once a month creates a remarkable and evocative photographic record of a place. The scene should be chosen with care so that the photos can tell the story of the year without words. The series of photos can express this story if set up linearly, but the flow of seasonal change is evoked more powerfully if the photos are arranged around a large wheel of the year.

Every wheel has a center. For this activity, and the ones which follow, it will be important to decide upon an image for the center. What image will express something meaningful about this place? A photo of the students in their place? A single photo of the place (or a favorite spot within the place)? Four seasonal photos, cropped to fit together as a centering circle could emphasize the seasonal theme of this wheel. See figure 2.

If this large wheel has a permanent, prominent place on the classroom wall, it will provide an ongoing, growing body of knowledge about the class “place,” a tangible presence of that place, as well as a handy seasonal “color palette” for class artists and writers to reference.

Figure 3 focuses on phenology of place. It could have monthly photos arranged around the edge, but much of the space will be occupied by specific phenological observations (e.g. leaf fall, trees bare of leaves, buds swelling, leaves open) and seasonal/weather observations (last rain, first snow, etc.). For younger children the teacher will decide what to look for, but older students could help come up with a list.
Activity 1B: Reflective Wheelscapes

Ideally this large wheel of the year will have a permanent display place on a classroom wall. It will be blank as the year begins, but as the year progresses and the wheel fills up with student work, it will evoke the presence of that place daily.

These wheels, figures 4 and 5, are meant to be filled with student work (artwork, poems, short written observations) all focused on the place, grouped by month or by season. How do these student works evoke a sense of place? Do the combined works evoke a more complete essence of place? What aspects of the place did not show up in the student work? Why not?

It is important for the wheel to have a center, but for a community wheel it might work well to wait until the students are familiar with the place before they choose what the center image should be.

Activity 2: Personal Wheelscapes: personal impressions of a place

Personal wheels of the year help each student create a collection of personal reflections and observations about a specific place. The students fill their personal wheels with poems, short written observations, and/or drawings, monthly or seasonally. The place celebrated will usually be the same place that the whole class is visiting. Thus, sharing the personal wheels will enrich everyone’s understanding and appreciation of that place, and may well inspire improved observational skills as well as drawing and writing efforts.

Each student should choose what occupies the center of their own wheel. Possibilities include: a special moment or memory, a favorite spot, an interesting plant or animal, an activity. Younger students respond well to having a photo of themselves, in their own personal favorite spot, at the center of their wheel.
Extensions

- The large classroom wheelscape is targeted as a classroom activity. However, it could be an “advanced level” (grades 9 to 12) project for an interested student (or small team of students) in high school. In this case, the place chosen would not necessarily need to be near the school, because it might be a project worked on outside of school hours.

- A modification of the personal wheel for grades K through 2 could be the making of a 4 panel windsock, depicting 4 seasonal observations in the place. Younger children will easily see how their sequence of the seasons goes “round and round.”

- An extension of the personal wheel for older students (grades 9 through 12) would be to have the personal wheels celebrate a personal favorite place. (This would be an outside of school activity.) Sharing these wheel-journals could spark good discussions about what makes a favorite place special. Are these common themes? Or are the reasons as varied as the students? These places could be compared to the class place. Are the phenologies the same? Or are there micro climate factors at work? What might they be?
Fall 2008 “Firsts & Lasts” Phenology Chart

- First morning you can see your breath
- First day cold enough for a sweatshirt
- First day cold enough for a coat, hat, mittens
- First hard frost
- First snow
- Last real rain
- Day equal to night
- Sunrise later than 6:00 AM (CST) Oct 5
- Sunset earlier than 6:00 PM CST Sept 19
- Pond beginning to freeze (slushy ice)
- Pond frozen solid enough to walk on
- Notice not so much morning birdsong
- Last day see chipmunks
- Bees
- Butterflies
- Hummingbirds
- First day see migrators: Sandhill Cranes
- Canada Geese
- Warblers
- First day see Juncos back from Arctic
- First day see Robins gathering in great numbers in school woods
- First tree leaves turning color
- First day lots of leaves falling
- Hickory nuts begin falling
- Acorns begin falling
- Jack-in-the-Pulpit Berries turn red
- Trees mostly bare of leaves
- First Goldenrod blooming in prairie
- New England Asters blooming in prairie
- Last Cup Plant blooms in prairie
- Compass Plant blooms in prairie
- Prairie Dock blooms in prairie
- Goldenrod blooms in prairie
- New England Asters bloom in prairie
- Last Zizia Goldenrod blooms in woods
- Tobacco being harvested
- Corn being harvested
- Soybeans being harvested
Winter 2008-2009 Firsts & Lasts
(and in-betweens!)

First real snow Nov 24 (2"
Last real snow March 6

Slushy ice on pond (pond initially 1/4" RAIN Dec 27 made a pond 7" deep!
Ice firm enough to walk on slushy Dec 28, firm Dec 31
Ice beginning to melt
Ice gone from pond March 17

Shortest day of year (longest night)

Days of deep cold
Dec. 15, 16, 17, 21, 22, 25, 31, Jan 12, 13, 14, 15, 16, 24, 25, 26, 27, Feb 4, 5, 6
Feb 25

Days of thaw
Dec. 13 + 14, Jan 31, Feb 1, Feb 8, 9, 10, 11, 12, 13, 17, 26, 27

Days with winter rain
Dec. 14 (only) Dec 27 (5"
Feb 9 (made a big pond) Feb 10 (7"
Feb 26 (1"

Days of snow Nov 24 (2"), Dec 1 (2"), Dec 3 (4"), Dec 5 (2"
3) Dec 7 (1"), Dec 8-9 (6"), Dec 16 (4 1/2") Dec 18-19 (10") Dec 21 (3") Dec 27 (3"
Dec 30 (2"
1) Jan 7 (2") Jan 8 (2") Jan 9 (2") Jan 12 (3") Jan 14 (1"
1) Jan 16-19 (1"
Feb 13 (2"
Feb 18 (1") melted
Feb 21 (6"

1st time Cardinal sings spring song - Jan 22
Goldfinches begin turning yellow - March 7
Juncos depart for Arctic
Hear Horned Owls hoot -
Barred Owls hoot -
1st Sandhills - Feb 12!!

Tracks seen in snowy woods 1 deer only, rabbits, squirrels, raccoon, skunk Feb 17, possum, skunk Feb 27 (snow)

At after a windy night, 10,000s of Box Elder seeds were lying on the snow Jan 13 - after a few hours most had been eaten by squirrels (could see their tracks)
| Last snow | March 28, April 5 (met last) | 1st leaves | Blue Anemone | Flowers | Heart's Ease |
| First rain | March 7 | 1st leaves | April 20 | Flowers | May 1 |
| First thunderstorm | April 12, March 7 | 1st leaves | May 1 | Flowers | June 1 |
| Pond ice slushy | March 14 | 1st leaves | Ap 20 | Flowers | (nearly) |
| Pond ice-free | March 17 | 1st leaves | May 1 | Flowers | May 1 |
| Sweatshirt weather early April | ? | 1st leaves | ? | Flowers | ? |
| T-shirt weather | April 24 | 1st leaves | May 1 | Flowers | June 15 |
| 1st chipmunk | March 18 | 1st leaves | - | Flowers | May 14 |
| Bee, April 8 | butterfly | March 26 in woods | - | Flowers | - |
| First songs | Chorus Frog, Last songs | 1st leaves | - | Flowers | - |
| Spring peeper | May 1 | 1st leaves | - | Flowers | - |
| Tree Frog | May 1 | 1st leaves | - | Flowers | - |
| Green Frog | May 1 | 1st leaves | - | Flowers | - |
| Leopard Frog | May 1 | 1st leaves | - | Flowers | - |
| 1st April 30 | Toad | 1st leaves | - | Flowers | - |
| See first robin | March 7, Wood Thrush | 1st leaves | - | Flowers | - |
| Sandhill crane | March 14, May 11 | 1st leaves | - | Flowers | - |
| Wood duck | March 18 | 1st leaves | - | Flowers | - |
| Killdeer | March 22, Wrens April 28 | 1st leaves | - | Flowers | - |
| Bluebird | May 5 | 1st leaves | - | Flowers | - |
| Hummingbird | May 3 | 1st leaves | - | Flowers | - |
| Warblers | April 30 | 1st leaves | - | Flowers | - |
| Buckthorn | April | 1st leaves | - | Flowers | - |
| Goosberry | April | 1st leaves | - | Flowers | - |
| Boxelder | April 10 | 1st leaves | - | Flowers | - |
| Silver maple | May 1 | 1st leaves | - | Flowers | - |
| Elm | May 1 | 1st leaves | - | Flowers | - |
| Beech (seedlings) | April 1 | 1st leaves | - | Flowers | - |
| Black cherry | May 4 | 1st leaves | - | Flowers | - |
| Serviceberry | April | 1st leaves | - | Flowers | - |
| Pogoda Dogwood | April 1 | 1st leaves | - | Flowers | - |
| Wild plum | April 1 | 1st leaves | - | Flowers | - |
| Black Willow | April 30 | 1st leaves | - | Flowers | - |
| High bush Cranberry | April 30 | 1st leaves | - | Flowers | - |
| Blackberry | April 15 | 1st leaves | - | Flowers | - |
| Black Raspberry | April 15 | 1st leaves | - | Flowers | - |
| Oak | May 1 | 1st leaves | - | Flowers | - |
| Hickory | May 1 | 1st leaves | - | Flowers | - |
| Mystery Tree | May 1 | 1st leaves | - | Flowers | - |
Activity Overview

Students as biologists will investigate a woodland (or other outdoor place) and collect habitat-value data.

Objectives

Students will:

- View the woods or place as home to the creatures and plants who live there
- Find clues that indicate that basic needs (food, water, shelter, companionship) are being met
- Recognize the food value of trees, shrubs, brambles, mushrooms, fungi, and flowers (even if food is not in season at the time of the activity)
- Recognize many forms of shelter (dens, nests, brush piles, nest-boxes, etc.)
- Recognize signs of creature presence (tracks, scat, feathers or fur, pellets, cracked nuts, woodpecker grubbing holes, etc.)

Subjects Covered

Science

Grades

3 through 12

Activity Time

30-40 minutes for 1 acre (Depending on size and wildness of the habitat, and age of students. If habitat is the schoolyard, thoughtful data collection would probably require a similar amount of time.)

Season

Fall (when woodland flowers are dormant underground and the students can safely walk everywhere without causing damage).

Materials

Habitat Detectives worksheet, clipboard, pencil, field guides (trees, flowers, mushrooms, birds, mammals, insects, reptiles and amphibians), possibly a resource person

State Standards

Science:

Ask questions, plan investigations, make

Background

Learning to respect a place as home to the plants and animals who live there is an important step for students to make as they learn their role as stewards and community members of the natural world. This activity (and the 2 that follow) will help students appreciate the habitat needs of wildlife and how to support a wildlife community. Students may need to be prompted about what they should be looking for in their woodland. Brainstorming is usually the best way to accomplish this because everyone is actively engaged. First brainstorm the basic needs that are met in a human home: food, water, shelter, and companionship of family. Food sources and foods to look for in a woods include trees, shrubs, vines, brambles, flowers, sedges, mushrooms, fungi, leaves, seeds, nuts, nectar, insects, grubs, and prey creatures. Shelters include holes in the ground or logs, holes up in trees, nests in trees, and human-made shelters such as brush piles, and/or nest boxes. Signs of animal life could include tracks, scat, owl pellets, bits of fur, feathers, bones, gnawed bones, as well as actual sightings or vocalizations, insect holes in old logs, and woodpecker grubbing holes.

Many foods are seasonal. Students should look for food sources as well as actual food. (For example, maple trees provide seeds in May and June, bare fall brambles provided berries in July, etc.) One main feature of a healthy woods is its forest floor plants. Most woodland flowers will be dormant in Fall. How does this important plant group get counted? It can be done by doing a flower inventory in May with the students who will be doing the Habitat Detectives activity next fall. This works extremely well if it can be scheduled.

Something else to consider is the space needs for wildlife. Some tiny creatures might spend their lifetime within a 1-square-foot space. Birds and squirrels occupy vertical space as well as forest floor space. What about larger mammals like raccoons or deer? What kinds of wildlife could live within the actual space of the woodland (or schoolyard, etc.)?

This activity works more smoothly and accurately if the teacher knows the place well and can identify its trees, shrubs, and plants. If the species can be listed on the Habitat Detectives sheet before the activity begins, then the species can be simply tallied during the activity. Student familiarity with the place is also helpful. (Our grade 3 students have three years of experiences with the woods before they do this activity.)

This all implies a good working knowledge of wood’s lore on the teacher’s part. If this level of knowledge is not available, it’s time to find a resource person who can help with this activity. Local birders, gardeners, and sportsmen are often knowledgeable and willing to help.
Activity Description

Begin with all the prompting and brainstorming at the wood's edge, before actually entering the woods. This session sets the stage for careful exploration and accurate observations, crucial to the success of this activity.

The children can spread out, exploring slowly, calling observations out to the teacher, who has the worksheet on a clipboard and is busy tallying. Sometimes discoveries of special interest (a track, an owl pellet) demand a pause so everyone can see and discuss. Older students (grades 6-12) could work in teams, taking turns identifying and recording in assigned quadrants.

A large, rich habitat will require adequate time for accurate data collection and joyful exploration. This is not an activity that should be hurried. A schoolyard with some trees, shrubs, and perhaps a garden area may require less actual exploring/observing time, but may need extra time to reflect and evaluate the place for its habitat value.

This activity concludes with a reflection about what has been observed. What sorts of animal life could live in this habitat? (Don’t forget insects, earthworms, amphibians, and reptiles!) Does this habitat provide all their needs, or just some? Is this habitat more of a real home, or really a hotel with food service?

This activity can stand alone, or it can be part 1 of a 3 part series (Habitat Detectives, Habitat Assessors, and Habitat Enhancers). If a stand alone activity, the concluding reflection is especially important.

Source
Georgia Gómez-Ibáñez,
Cambridge Elementary School, WI
Activity Overview

Students learn to take raw data they collected in a habitat (see Habitat Detectives activity) and organize it into something useful and meaningful.

Objectives

Students will:
* Understand the process of turning raw data into meaningful information by summarizing, organizing, and analyzing it.
* Understand how to look at information quantitatively, spatially, and seasonally.
* Develop a meaningful seasonal representation of food availability using a wheel of the year.
* Understand the seasonal times of plenty and hunger in a habitat.
* Understand that helpful actions can result from accurate data collection and thoughtful analysis.

Subjects Covered

Science, Math

Grades

3 through 12

Activity Time

This indoor activity requires about 30 minutes for counting tallies and summarizing and organizing the information. Another 30 minutes is needed to put the information on a wheel of the year, reflect on the resulting insights, and analyze its meaning.

Season

Early Winter (following the Habitat Detectives activity in the Fall)

Materials

Pencils, colored pencils, paper, large wheel of the year* (including months)

State Standards

Science:
Use scientific vocabulary & themes (C.4.1)

Background

This activity depends on the preceding Habitat Detectives activity, which furnishes the raw data this activity will use.

The flow chart of the process of this activity:

1. Original raw data
2. Counting data
3. Summarizing data
4. Organizing data*
5. Adding info to data
6. Adding data to wheel

Habitat detectives tally sheet
Summary tree and plant list for each quadrat
Summary tree and plant list for whole woods
Reorganize list into food categories
Add dates when foods are available
Add food categories to wheel of year by times when they are available

* This is where the previous Spring’s flower inventory becomes useful, especially if bloom times have been recorded.

This activity uses data collected outdoors in a habitat like a woods (or a school-yard) and transforms it into meaningful information which can be used to plan a habitat improvement project (see Habitat Enhancers activity). It is not intended as a stand alone activity, but rather as part 2 of a 3 part series. If the habitat is large, this process will begin with multiple Habitat Detectives tally sheets, each one corresponding to an area of the woods. This activity is best accomplished in early Winter, so that the Habitat Enhancer activity can use late Winter/early Spring for planning the mid-to-late Spring outdoor project.

Activity Description

Step 1: Counting the Raw Data

Students begin the process of making meaningful information by counting the tallies on the Habitat Detectives worksheets. Large habitats may have many tally sheets; small habitats may have only one.

Step 2: Summarizing and Organizing the Raw Data

It is important at this point to discuss how best to organize the information. The data appears to be a simple list of trees, shrubs, plants, and shelters. It will be helpful if the list can be further organized by food categories. It could look like this:
Habitat Assessors: Summarizing, Organizing and Analyzing Data (cont.)

- Trees producing seeds: Maples - #, Elms - #, Hop hornbeam - #
- Trees producing nuts: Oaks - #, Hickories - #
- Trees & shrubs producing fruit: Black cherry - #, Highbush cranberry - #
  - Dogwood - #, Serviceberry - #
- Brambles producing berries: Black raspberries - #, Blackberries - #,
  - Gooseberry - #
- Mushrooms: - #
- Flowers (nectar): - #
- Sedges (seeds): - #
- Shelters: Dens in logs and ground - #, Dens in trees - #, Nests in trees - #,
  - Brush piles - #, Nest boxes - #
- Problems noticed: Buckthorn, Honeysuckle, Garlic Mustard

If the place being studied is large, it is useful to have a list like this for each main area, because the information is useful not only quantitatively but also spatially (for example, invasives may be present in only one specific area).

Now the numbers generated by counting tallies can be added to the list(s).

Once the numbers are added, it is time to collectively look at the information presented so far. Does it look like a lot of food and shelter? Is a diversity of food and shelter available? Are any food categories noticeably scarce? Are there spatially related abundancies/scarcities? Can you brainstorm why this might be? Where are the problem invasives?

The big picture at this point will give some idea about the quantity and location of food resources in the habitat.

Step 3. Re-organizing the Data

The next step is to move conceptually from food resources to actual foods, and add the dimension of time. Transform the list of food sources into a list of foods and dates they are available. For example, the list might look like this:

- Open water in pond: mid-March to September
- Tree Buds: February
- Leaves: mid-April to frost
- Seeds (trees & sedges): mid-May to frost (box elder seeds in February)
Step 4: Analyze the Data Seasonally using the Wheel of the Year

Now it is time to translate the information collected onto a wheel of the year.

A. Assign a meaningful color to each food category (the wheel will be easier to “read” if contiguous rings have contrasting colors).

B. Add enough rings to the wheel so that each food category has its own ring.

C. Label each ring with its food.

D. Create start/stop lines to help students who are coloring the food rings.

E. Students color in the rings.

F. Now it is the time for the Aha! moment. Hang the wheel up so everyone can see it in its entirety. The colored areas indicate food availability. The white areas indicate times of scarcity. The wheel allows students to see this clearly. This is a moment when students achieve a deeper understanding, suddenly and collectively. Each food has its season. The times of plenty and the times of hunger come and go as the seasons flow around the circle of the year. It is a powerful moment for students.

G. This circle too needs its center. Color-coded images of foods (that correspond with the rings) make a good center for this wheel of the year.

Source
Georgia Gómez-Ibáñez,
Cambridge Elementary School, WI

* Wheels available at
www.partnersinplace.com

<table>
<thead>
<tr>
<th>Food Category</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nectar</td>
<td>late April to frost</td>
</tr>
<tr>
<td>Berries &amp; Fruit</td>
<td>mid-June to December</td>
</tr>
<tr>
<td>Nuts</td>
<td>August through Winter</td>
</tr>
<tr>
<td>Mushrooms &amp; Fungi</td>
<td>year round</td>
</tr>
<tr>
<td>Active insects</td>
<td>late April to frost</td>
</tr>
<tr>
<td>Larval/dormant insects</td>
<td>year round</td>
</tr>
<tr>
<td>Prey creatures</td>
<td>year round</td>
</tr>
</tbody>
</table>
Activity Overview
Students use the wheel of the year and additional information to create a habitat improvement project. (This is a service learning activity.)

Objectives
- Students will:
  - Understand the seasonal nature of food abundance and scarcity in a habitat
  - Understand the spatial nature of food abundance and scarcity in a habitat
  - Identify potential problems in the habitat that could be addressed by students
  - Identify food scarcities that could be remedied by a student activity
  - Develop a habitat improvement project

Subjects Covered
Science

Grades
3 through 12

Activity Time
3-4 hour for planning (depending on habitat, grade level, number of projects, etc.)
Actual implementation time will vary.

Season
Winter for planning time
Winter through early Summer (depending on project) for action time

Materials
Information from Habitat Detectives and Habitat Assessors activities, field guides (trees, shrubs, flowers), native plant, tree, and shrub nursery catalogues

State Standards
Science:
- Ask questions, plan investigations, make observations, predictions (C.4.2)
- Select multiple information sources (C.4.3)
- Support conclusions with logic (C.4.7)

Background
An understanding of any habitat is fairly incomplete until it includes a seasonal and spatial understanding of food and shelter availability. This activity is based on the more complete understanding of habitat gained through processing information in the Habitat Assessors activity and then focusing attention on feasible student projects to improve the habitat.

What might these projects be? This will depend on the habitat itself, the students’ grade level, and the resources available.

A conventional schoolyard could be enhanced by:
- Planting native trees and/or shrubs producing nut, seeds, fruit, and/or shelter
- Planting a native species butterfly garden in a sunny spot
- Planting a native woodland garden in shady spot
- Creating a brush pile for shelter
- Installing bird feeders and/or birdhouses

A woodland habitat of any size could be enhanced by:
- Removal of invasive species
- Restoration of native flower species (if diversity is low)
- Extending the nectar season by planting native flower species that bloom earlier or later than the ones currently in the habitat
- Extending the berry/fruit season by planting native shrubs and/or brambles
- Planting good nut sources (hickory and white oak are especially edible)
- Creating brush piles for shelter
- Installing bird houses, especially for at-risk cavity-eaters
- Installing bat houses

Worthy achievable projects are numerous. Time will be a limiting factor, as will be the students’ age (and strength and abilities). Cost may not be a problem if you have a supportive PTO or PTA group eager to encourage service learning activities. Parents or community members can be found to help with carpentering activities. Gardeners can be counted on to help with planting activities.

Tips for successful activities
Students generally are more interested in helping animals or birds than plants, so it’s important to discuss why projects focused on plants actually help the animals
Identify data and sources to answer questions (C.8.2)
Use knowledge, models, and theories to explain results (C.8.5)
Evaluate questions, hypotheses, conclusions (C.8.9)
Identify further questions (C.8.11)
Identify issues, questions, research, design & conduct investigations (C.12.2)
Choose & evaluate data collection methods (C.12.4)
Use explanations & models to describe results (C.12.5)
Present a scientific solution to a problem (H.8.2)
Analyze resource management (H.12.1)
Investigate a resource management plan or proposal (H.12.5)
Environmental Education:
Make observations, ask questions, plan investigations (A.4.1)
Collect information, make predictions, offer explanations (A.4.2)
Develop answers, draw conclusions, revise understanding (A.4.3)
Collect information, conduct experiments, develop solutions (A.8.2)
Use techniques to organize information (A.8.3)
Identify questions to solve current problems (A.12.1)
Cite examples of adaptation to habitat (B.4.6)
Explain importance of biodiversity (B.8.3)
Explain & cite examples of how humans shape the environment (B.8.10)
Evaluate importance of biodiversity (B.12.7)
Identify environmental problems & issues (C.4.1)
Use environmental monitoring techniques (C.8.2)
Use questioning & analysis skills (C.8.3)

by increasing food and/or shelter. For example, increasing flower diversity increases the chance for nectar availability, which benefits hummingbirds, bees and butterflies.

In fact another successful approach to developing a project is for the class to choose an animal, bird, insect, etc., species of special interest to them. Is it a year-round resident? Is it a summer-migrant songbird, or a short-lived butterfly with specific larval forage-plant requirements? How do the food needs of this species match with the food availability wheel of the year? What might its shelter needs be? Approaching the habitat-enhancement by first choosing a creature to help will help students understand that habitat enhancement is the most effective way to help creatures.

It is important to remember to plant only native shrubs and trees; our native wildlife need native plants.

How can the class assess ample diversity in order to choose a planting project? In a 10 acre woods, 30 flower species would be considered quite good, while 5 species would be fairly poor. Other questions to ask: are there more than 2 kinds of nut trees? Seed trees? Fruit trees and shrubs? Berries? Do the foods come all at the same time? Planting different species can extend food seasons and nutritional sources, which can significantly help animal species.

It is extremely helpful to have a good set of tools. Most useful are work gloves, trowels, shovels, clippers, and loppers. A large collection of gallon milk jugs and several watering cans are also very useful. Large plastic tubs are handy when weeding out invasive species or weeds. Small-adult and child-size work gloves (leather palms and cotton backs) are not expensive. If funding is a problem, grants are frequently available for service learning activities.

Whenever tools are involved, it is best to have adequate supervision. A good rule is about 5 or 6 students per adult. Always explain safety rules, because most students don’t yet know them.

Before actually beginning any task, demonstrate how it’s done. For example see Earth Partnership for Schools activity, “Planting Native Plants” 7-16.

Additional Resources

Habitat Enhancers: Creating a Habitat Improvement Project (cont.)


Compare effects of activities on environment (C.12.1)
Identify ways to take positive action (D.4.3)
Develop a plan for improving or maintaining the local environment (D.8.6)
Develop a plan to maintain or improve local environment & implement plan (D.12.5)

**Source**
Georgia Gómez-Ibáñez,
Cambridge Elementary School, WI

Wheels available at
[www.partnersinplace.com](http://www.partnersinplace.com)
Thank you for piloting this phenology wheels unit with your students. We appreciate your feedback to help us develop high quality educational materials for educators. Your comments will remain confidential. Please answer the following questions:

1. What went well as you implemented the unit with your students?

2. What would you change and/or recommend as modifications?

3. Were the activity directions clear and simple to follow? If not, what would you recommend to make them more user-friendly?

4. Did the activities fit the suggested time frames? If not, what could be eliminated or shortened?
5. From your observations, how did the students react to the content?

6. What suggestions do you have to enhance this unit?

7. Would you use this unit again with your students? Why or why not?

8. Please check which activities you did with your students.
   
   ____ Birthday Phenology  ____ Habitat Detectives
   ____ Wheelscapes        ____ Habitat Assessors
   ____ Habitat Enhancers

Thank you for your time filling out this form! Your feedback is important and valuable for developing a curriculum worthwhile for teachers and meaningful for students.

E-mail your feedback to cherylbauer@wisc.edu, or send to:
Cheryl Bauer-Armstrong,
UW-Madison Arboretum,
1207 Seminole Highway, Madison, WI 53711

If you have any questions or additional comments, please feel free to call Cheryl at 608/262-5264
Earth Partnership for Schools
University of Wisconsin-Madison Arboretum
1207 Seminole Highway
Madison, WI 53711

Phone: 608/262-9925

Arboretum Web site: www.uwarboretum.org
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