Lesson Title: In the Zone!

Grade: 4-6

Duration of Lesson: 2 - 50 minute classes

Brief: Students will investigate planting zones in Montana and will determine which plants are best suited for the area.

Materials:
Access to computer lab
Road map of Montana
Blank map of Montana
Colored Pencils
Edible landscape design (worksheet A) one copy for each student
Planting list (worksheet B) one copy for each student
Access to the following web sites:
http://urbanext.illinois.edu/treeselector/search.cfm

Key Terms: USDA, zone, climate, microclimate, producer, hardiness zone, annuals, perennials, fruits, berries, four season interest, frost free days, growing season, and edible landscape.

<table>
<thead>
<tr>
<th>Standards/Objectives</th>
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<tbody>
<tr>
<td><strong>Montana State Standards:</strong></td>
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<tr>
<td><strong>Science: Content Standard 1</strong> - Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate results and reasonable conclusions of scientific investigations. Benchmarks 1.1,1.2,1.3; <strong>Science Content Standard 3</strong> - Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.</td>
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Benchmark 3.1

**Communication Arts: Benchmark 2.8** Students will recall and explain a series of events or the sequence of information.

**Math: Content Standard 1** – Number sense and operation. Benchmark 1.5

**Arts: Content Standard 1** - Students create, perform/exhibit, and respond in the Arts. Benchmarks 1.1, 1.3, 1.4 **Content Standard 2** - Students apply and describe the concepts, structures, and processes in the Arts. Benchmarks 2.1, 2.2, 2.3 **Content Standard 6** - Students make connections among the Arts, other subject areas, life, and work. Benchmark 6.4

### Understanding(s)/Big Ideas:
Students will understand that the hardiness zone they are investigating in Montana will determine which plants are best suited for the area. Students will understand that USDA hardiness zones help farmers, gardeners, and landscapers to choose the best plants for their area.

### Essential Question(s):
What is a USDA hardiness zone? Why does a zone map help producers of agriculture products?

### Students will know:
Students will know that the USDA hardiness zone map is a guideline for choosing the best plant varieties for the planting area. Students will know that each state and county can be divided into many zones. Students will know that inside each zone microclimates can be identified.

### Students will be able to:
use research skills to find the appropriate internet sites to locate the zone for their area. Students will be able to divide geographical areas into USDA hardiness zones. Differentiate between planting zones.

### Performance/Observations

#### Performance Task(s):
Students will use interactive internet pages to determine what USDA plant hardiness zone their assigned town is in, and what types of food producing plants can be grown there.

#### Other Evidence
Students will explain and identify microclimates. Students will use the key terms in observation and discussion of hardiness zones.

### Learning/Inquiry Activities

#### Introduction/Prep

![USDA Plant Hardiness Zone Map](image)
A hardiness zone map supplies information based upon planting guidelines for perennials, trees, shrubs, and biennials. At stores and nurseries tags are attached to each plant with hardiness zone information. (See Appendix 1) By knowing your area’s growing zone you can choose any of these plant types and be sure that they can survive typical winters in your area. Sometimes unusual climate variations can occur which damage or kill plants, yet the hardiness zone is the safest way to find plants for your area. When asked “Can I plant a banana tree in Montana” the answer is, “yes, you can plant a banana tree anywhere you want, but check the zone map to make sure it will survive more than one season!” Knowing your zone saves time and money!

Hardiness zones, also called planting zones, divide the United States, Mexico and Canada into 11 areas. Each of the gardening zones is based on a 10 degree Fahrenheit difference in the average annual minimum temperature. Planting Zones 1 and 2a, the coldest, represent Canada. The continental United States falls within zones 2 through 10. Hawaii and Mexico are represented by zone 11. States as large as Montana can have several different zones. Most of Montana is in zones 3 and 4, with a few small areas in zones 2 and 5. Take a look at the chart below. You’ll see the lowest average temperature in Zone 2 is -50 to -40 degrees Fahrenheit, while the lowest average temperature in zone 10 is +30 to +40 degrees Fahrenheit. Plants are considered hardy up to the zone number of your area, for example if you are planting in zone 5a you could use plants hardy from zone 1 to zone 5

<table>
<thead>
<tr>
<th>Zone</th>
<th>Fahrenheit</th>
<th>Celsius</th>
<th>Example Cities</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Below -50</td>
<td>Below -45.6</td>
<td>Fairbanks, Alaska; Northwest Territories (Canada)</td>
</tr>
<tr>
<td>2a</td>
<td>-50 to -45</td>
<td>-42.8 to -45.5</td>
<td>Prudhoe Bay, Alaska; Flin Fon, Manitoba (Canada)</td>
</tr>
<tr>
<td>2b</td>
<td>-45 to -40</td>
<td>-40.0 to -42.7</td>
<td>Unalakleet, Alaska; Pinecreek Minnesota</td>
</tr>
<tr>
<td>3a</td>
<td>-40 to -35</td>
<td>-37.3 to -39.9</td>
<td>International Falls, Minnesota; St. Michael, Alaska</td>
</tr>
<tr>
<td>3b</td>
<td>-35 to -30</td>
<td>-34.5 to -37.2</td>
<td>Tomahawk, Wisconsin; Sidney, Montana</td>
</tr>
<tr>
<td>4a</td>
<td>-30 to -25</td>
<td>-31.7 to -34.4</td>
<td>St. Paul, Minnesota; Lewistown, Montana</td>
</tr>
<tr>
<td>4b</td>
<td>-25 to -20</td>
<td>-28.9 to -31.6</td>
<td>Northwood, Iowa; Nebraska</td>
</tr>
<tr>
<td>5a</td>
<td>-20 to -15</td>
<td>-26.2 to -28.8</td>
<td>Des Moines, Iowa; Illinois</td>
</tr>
<tr>
<td>5b</td>
<td>-15 to -10</td>
<td>-23.4 to -26.1</td>
<td>Columbia, Missouri; Mansfield, Pennsylvania</td>
</tr>
<tr>
<td>6a</td>
<td>-10 to -5</td>
<td>-20.6 to -23.3</td>
<td>St. Louis, Missouri; Lebanon, Pennsylvania</td>
</tr>
<tr>
<td>6b</td>
<td>-5 to 0</td>
<td>-17.8 to -20.5</td>
<td>McMinnville, Tennessee; Branson, Missouri</td>
</tr>
<tr>
<td>7a</td>
<td>0 to 5</td>
<td>-15.0 to -17.7</td>
<td>Oklahoma City, Oklahoma; South Boston, Virginia</td>
</tr>
<tr>
<td>7b</td>
<td>5 to 10</td>
<td>-12.3 to -14.9</td>
<td>Little Rock, Arkansas; Griffin, Georgia</td>
</tr>
<tr>
<td>8a</td>
<td>10 to 15</td>
<td>-9.5 to -12.2</td>
<td>Tifton, Georgia; Dallas, Texas</td>
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<tr>
<td>8b</td>
<td>15 to 20</td>
<td>-6.7 to -9.4</td>
<td>Austin, Texas; Gainesville, Florida</td>
</tr>
<tr>
<td>9a</td>
<td>20 to 25</td>
<td>-3.9 to -6.6</td>
<td>Houston, Texas; St. Augustine, Florida</td>
</tr>
<tr>
<td>9b</td>
<td>25 to 30</td>
<td>-1.2 to -3.8</td>
<td>Brownsville, Texas; Fort Pierce, Florida</td>
</tr>
<tr>
<td>10a</td>
<td>30 to 35</td>
<td>1.6 to -1.1</td>
<td>Naples, Florida; Victorville, California</td>
</tr>
<tr>
<td>10b</td>
<td>35 to 40</td>
<td>4.4 to 1.7</td>
<td>Miami, Florida; Coral Gables, Florida</td>
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<tr>
<td>11</td>
<td>Above 40</td>
<td>Above 4.5</td>
<td>Honolulu, Hawaii; Mazatlan, Mexico</td>
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**Note:** Hardiness zone information is not the same as growing season information. The growing season refers to the average number of frost free days and the dates of first and last freeze in your area. This information is helpful for determining a planting date and picking varieties when planting annuals (flowers or crops that grow for one season). The last freeze date in the spring is used as a guideline to know then you can transplant or plant most annual vegetables and flowers outside. Jack Frost can visit at any time and freeze tender annuals, these dates are based upon yearly averages and are not guaranteed dates! For a listing of growing season information for Montana visit: [http://gardenguide.montana.edu/pdf/Climatological%20Data.pdf](http://gardenguide.montana.edu/pdf/Climatological%20Data.pdf)

For a listing of statistics on first and last frost dates per cities in Montana visit: [http://www.northwestgardening.com/resources/climate/data/MT.pdf](http://www.northwestgardening.com/resources/climate/data/MT.pdf)

Other factors that can determine which trees, shrubs, biennials, and perennials best suit your area are humidity, wind, soil, drainage, and precipitation. Each area may also have a microclimate. A microclimate is the climate of a small area that is different from the area around it. It may be warmer or colder, wetter or drier, or more or less prone to frosts.

Microclimates may be quite small. They can be as simple as a protected courtyard next to a building which is warmer than an exposed open area nearby. A microclimate may also be extensive - a band extending several miles inland from a large body of water that moderates temperatures such as the shores of Flathead Lake which allow producers to have sweet cherry orchards. In windy areas a microclimate might exist alongside a tall fence which blocks the wind. For more on microclimates visit: [http://www.gardening.cornell.edu/weather/microcli.html](http://www.gardening.cornell.edu/weather/microcli.html)

Information on microclimates supplied in part by Cornell University

**Learning Activities**

Introduce and explain to students hardiness zones and the key terms for the lesson from the introduction above. Inform students that they will be choosing which fruit trees and berry plants to plant in their ideal edible landscape. They will be using the internet for research and information to complete the assignment. Let them know that they will each be assigned a city in Montana in which they will design their dream edible landscape. They must pick plants from the list that will survive in their city based upon the United States Department of Agriculture (USDA) hardiness zone map.

1. Assign students one of the following Montana towns. Do not tell students which hardiness zone their town is in, they will be researching that as part of the assignment. Ask students to find their town on a Montana road map or by using the internet. They will have to know what region of Montana their town is in so they can find the town again on the hardiness zone map.
2. After students have found their town on a road map and can locate it again by knowing the area of Montana the town is in, ask them to find the hardiness zone for their town. For this exercise they will need to have the terrain layer chosen at the link below to complete this assignment: [http://www.plantmaps.com/interactive-montana-usda-plant-zone-hardiness-map.php](http://www.plantmaps.com/interactive-montana-usda-plant-zone-hardiness-map.php) Ask students to write down any major landmarks by their towns such as lakes, mountain ranges, rivers, etc. and save the information for later.

3. Check student answers for hardiness zones against the list above. Since many sources for hardiness vary slightly, it is ok for students to be one zone higher or lower.

4. Pass out copies of the edible landscape design (worksheet A) and planting worksheet B to each student.

5. Students will begin researching plants and trees which bear edible fruits and berries. Some of the landscape is already labeled with crops. These crops will grow in all of the hardiness zones in Montana. Students can find the information on trees and berry plants and their hardiness zones at the following website:

   Trees: [http://urbanext.illinois.edu/treeselector/search.cfm](http://urbanext.illinois.edu/treeselector/search.cfm)
   To use this site, simply type in the type of fruit tree you want to plant and check your hardiness zone or any of the zones lower than your zone. Once students have chosen a tree click on the tree species and learn more about the size, growing needs, diseases, season colors, etc.


6. Ask students to fill out worksheet B as they are doing their research. After the
worksheets have been filled out ask students to fill in the numbers 1-9 on their edible landscape (worksheet A) with the names of their trees and berry plants. They can also name their edible landscape and add structures, tunnels, or other drawings to their landscape, inform students to keep their work very neat as it will be the basis for their grade on this project.

7. Ask students to give a verbal report to the class about their town and what zone it was in. Prompt them to explain what difficulties they had in finding plants and trees for their landscape. Ask students who had hardiness zone 2 if they found it extremely difficult to find varieties of fruit. Ask students to consider Native Americans and what types of indigenous bushes and trees they might have gotten fruit from. Some examples of berries indigenous to Montana are: service berries (aka sarvas berries), chokecherries, huckleberries, wild strawberries, and thimbleberries (aka salmonberries).

8. Show students Appendix 1 and discuss which of their towns these perennials would be best suited for. These tags are available on most nursery plants and trees, and the zones are also listed in tree and plant catalogs. Once you are “in the zone” you will have the knowledge needed to understand how to choose plants and trees for your area. If this type of information interests your student(s), they might enjoy a career as a plant scientist, horticulturist, botanist, or landscape designer.
Planting Worksheet B

Name ______________________________ My edible landscape is in ________________________________ which is in hardiness zone □ (assigned town) □ (#)

Major geographical landmarks near my town __________________________________________________________

Type of fruit bearing plant I chose and why. (Include full name of plant variety and hardiness zone)
1. __________________________________________________________
2. __________________________________________________________
3. __________________________________________________________
4. __________________________________________________________
5. __________________________________________________________
6. __________________________________________________________

Type of fruit bearing tree I chose and why. (Include full name of tree variety and hardiness zone)
7. __________________________________________________________
8. __________________________________________________________
9. __________________________________________________________

What can you point out about the landmark near your town and did it determine any changes to the hardiness zone you were assigned? __________________________________________________________

Provide a name for your special edible garden: __________________________________________________________
Key:
#’s 1-6 berry bushes
#’s 7-9 apple trees
Add any structures, tunnels, or equipment you want!
Sample of tags off of perennial flowers, ask students to compare the zones on these tags to their areas and see if they are a good choice as a perennial for their area?