

The Helmville Weed Project

An Integrated Cross Curricular Unit
Aligned With Montana State Standards



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Subject Area: Science/Art

Lesson Title: "What Weeds Are We?"

Overview: This lesson will teach the students how to use an identification key to accurately identify the ten most noxious weeds in Montana. The students will use pictures and descriptions of the plants to correctly identify them. Students will also be able to sketch a picture of each noxious weed found in their journals with accuracy using colored pencils.

Connection to Standards: Science: Standards 1, 4
Art: Standards 1, 3

Time: Two to three class periods.

Materials/Equipment Required:

- Weed identification handbooks, range and field guides.
- Outside area where a variety of weeds can be found.
- Journal
- Colored pencils

Objectives:

1. The students will correctly identify ten of the twelve noxious weeds found in the area.
2. The students will learn how to use the range and field guides to accurately identify the plants.
3. The students will be able to accurately portray through drawing in their journals species of weeds that they have identified.

Suggested Procedure:

Opening: Introduce to the students the range and field guides. Explain to them using examples how to use them to identify plants using both the descriptions and the pictures. Remind them that the colors may not be accurate for all plants. It also may be necessary to define some of the descriptive terms found in the guides. For example: leaflets, pods, palmate etc...

Development: Allow the students to wander about as individuals or in groups depending on the number of guides that you have. Let them draw conclusions and be able to defend those conclusions using the terms in the guide and the characteristics of the plants. If they are struggling with their accuracy the teacher could guide the group through a couple identifications at the beginning of the class.

Closing: Ask students open ended questions to assess what they have learned. Reinforce how the field and range guides are helpful to a variety of occupations in identifying desirable and undesirable plant species. Discuss the benefits of having such knowledge and resources. Give students time to write and draw in their journals.

Student Assessment:

- Collect samples and have students identify the samples.
- Check students' journals for drawings and accuracy.

Extensions:

- Using a digital camera, have groups of students develop their own field guides using their own terminology and observations.

Additional Resources:

- MSU Extension Service Bozeman, MT
- Bureau of Land Management
- Missoula/Powell County Conservation Districts

Subject Area: Science/Art/Math/Workplace Competencies

Lesson Title: "Flattening the Foliage!"

Overview: This lesson will teach the students how to build and use a plant press. The students will collect plant samples and press them. They will then correctly identify the plant, location it was collected, and date. They will build a plant library with plants found in their area.

Connection to Standards: Science: Standards 1, 4
Art: Standards 1, 3
Math: Standards 4, 5
Workplace Competencies: Standard 1

Time: Two to three class periods.

Materials/Equipment Required:

For Each Plant Press:

- Four pieces of wood 18"x1½"x 3/8"
- Sixteen pieces of wood 12"x1"x1/4".
- Two ratcheting tie down straps 6' in length.
- 32 ½" screws.
- Sheets of Cardboard 12"x18"
- Newspaper
- Screwdriver, wood glue, and a framing square
- Hand saw, tape measure

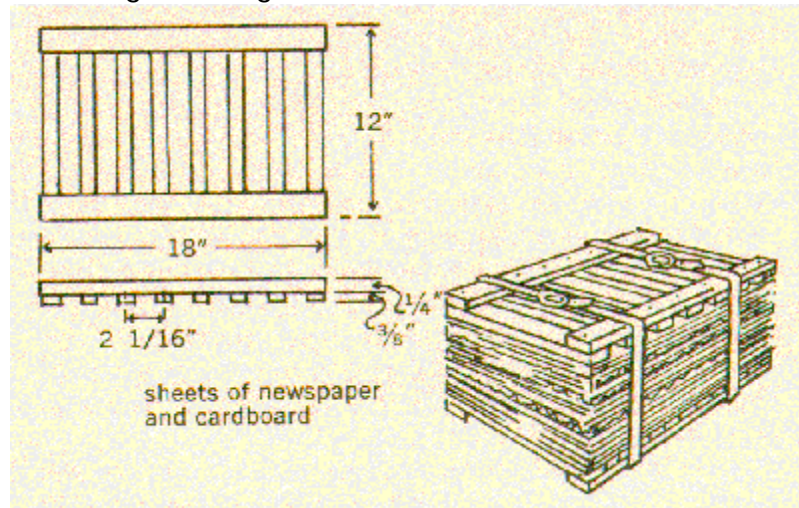
Objectives:

1. The students will be able to accurately follow a set of directions.
2. The students will be able to accurately read a tape measure.
3. The students will be able to use a framing square to ensure 90 degree angles.
4. The students will use a variety of hand tools safely and for a specific purpose.

Suggested Procedure:

Opening: Introduce the students to preserved plants that have been pressed. Discuss with them the benefit of having a preserved plant specimen. Show the students how a plant press works. Demonstrate the step by step process that they will follow to build a plant press.

Development: Allow the students to work in groups to build their plant presses. The number of students in each group will depend on how many plant presses you are going to build. Have the students gather their material, and if possible, cut their pieces to length. It might be beneficial to have the pieces already cut to the correct width and thickness. In some cases it also might be beneficial to have all pieces pre-cut. Assemble two frames by following the diagram below:



Closing: Collect samples of different plants to put into the plant press. Remember to not only collect a sample, but document where and when the sample was collected. Also, if collecting noxious weed samples, discuss the importance of not spreading the seeds. Take precautions that the seeds are not spread during this process.

Student Assessment:

- Check to see if directions were followed and plant press will be functional.
- Check to see if hand tools are being used safely and for the correct purpose.

Extensions:

- Using the tape measure and a hand saw, have students measure and cut to length their own pieces for their plant press.

Additional Resources:

- www.uen.org/utahlink/pond/buildpress.htm
Another variation of a simple plant press

Subject Area: Science/Math

Lesson Title: "Making Molehills out of Maps!"

Overview: This lesson will teach the students how to use and read a map. Students will be exposed to the idea of different map projections, such as a globe vs. a topographical map. By recognizing different features of a topographical map, the students will be able to accurately give distance, identify latitude and longitude, and accurately identify the cardinal directions.

Connection to Standards: Science: Standard 2
Math: Standards 1, 2, 5

Time: One to two class periods.

Materials/Equipment Required:

- Globe
- Helmville or Browns Lake Quadrangle 7.5 Minute Topographical Maps
- Worksheet 1 and 2
- Ruler and string

Objectives:

1. The students will begin to understand that the earth can be represented in different projections.
2. The students will be able to correctly identify symbols on a topographical map.
3. The students will be able to identify the cardinal directions of a map.
4. The students will be able to explain a 7.5 minute series map and what that means in terms of longitude and latitude.
5. The students will be able to explain the difference between true north, geographic north and magnetic north.

Suggested Procedure:

Opening: Introduce the students to a topographical map and the

symbols that they will find on the map. Discuss with them latitude and longitude and show them where these are labeled on the map. Discuss with them that a map is always oriented with the top of the map being north. Talk to them about the cardinal directions in relation to map orientation.

Development: Use the topographical maps to identify some locations that the students are familiar with. You may want to use a map of your location. Talk about distance and how to calculate distance using the scale at the bottom of the map. Do some example problems with the class. It may also be beneficial to do one of the worksheets in class, and have the students do the second worksheet independently.

Closing: Have the students complete the worksheet(s) independently or in small groups.

Student Assessment:

- Check accuracy on the worksheet questions.
- Discuss the concepts covered by the worksheet.

Extensions:

- Use a variety of maps of the same area and discuss benefits of each.

Additional Resources:

- Missoula Blueprint: A great resource for maps of our area.
- Bruce Bourne: Seeley Lake Science Teacher: The worksheets included are adapted from his map unit.

Name _____

Topographic Maps
Helmville Quadrangle

1. The scale of this map is _____.
2. The contour interval is _____.
3. The elevation difference between index contours is _____.
4. This map covers a latitude of _____ to _____.
5. This map covers a longitude of _____ to _____.
6. What series is this topographic map? _____ How does this compare to the difference in the two latitudes in question #4?
7. How does the series compare to the difference in longitudes listed in question #5?
8. If you were using a compass to navigate by, how many degrees off of true north (geographic north) will the compass be, and which direction?
9. If you were navigating at night by using the north star, Polaris, how far off would the star's position be from geographic north, and in which direction?
10. What do the following represent on the map?
 - a. Blue areas
 - b. Green areas
 - c. White areas
11. What is the name of the map that is adjacent to this one on the West side?
12. How many feet long is the largest body of water on the South Fork of Cottonwood Creek?
13. What is the elevation of the following points?
 - a. City of Helmville
 - b. Roselle Mine
 - c. Gravel Pit
 - d. Spring along Wet Cottonwood Creek
14. Where is the highest point on the map? What is its elevation?

Name _____

Topographic Maps
Browns Lake Quadrangle

15. The scale of this map is _____.
16. The contour interval is _____.
17. The elevation difference between index contours is _____.
18. This map covers a latitude of _____ to _____.
19. This map covers a longitude of _____ to _____.
20. What series is this topographic map? _____ How does this compare to the difference in the two latitudes in question #4?
21. How does the series compare to the difference in longitudes listed in question #5?
22. If you were using a compass to navigate by, how many degrees off of true north (geographic north) will the compass be, and which direction?
23. If you were navigating at night by using the north star, Polaris, how far off would the star's position be from geographic north, and in which direction?
24. What do the following represent on the map?
 - a. Blue areas
 - b. Green areas
 - c. White areas
25. What is the name of the map that is adjacent to this one on the West side?
26. How many feet long is the body of water called Long Lake?
27. What is the elevation of the following points?
 - a. Campground on Browns Lake
 - b. Blackfoot River Ranch
 - c. Gravel Pit on Highway 200
 - d. Raymond Bridge
28. Where is the highest point on the map? What is its elevation?

Name _____

Topographic Maps
Helmville Quadrangle

Township/Range/Distance

On this map, you can see boxes separated by red dashed lines. These boxes are numbered from 1 to 36. Each box is called a section and it is about one mile square. Each group of 36 sections, collectively called a township, is located by a township number (like **T 12 N**) that changes as you go north or south, and by a range number (like **R 11 W**) that change as you go east or west. Each group of 36 sections can be located by knowing its township and range number. On your map. You can see the township numbers in the right and left margins at the beginning and end of each group of sections, and you can find the range numbers at the top and bottom margins where the next group of sections begins or ends.

A location within a section, is described by where it is such as “the southwest corner of section 10”. You can even locate a smaller area by identifying which quarter within that quarter section. There are 640 acres in a section, 160 acres in a quarter section, and 40 acres in a quarter of a quarter section. Therefore you should be able to identify a location on this map down to a 40 acre area by describing it like this: “The NE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 24, T 13 N, R 11 W”. This is the location of the Gravel Pit on Highway 141.

1. What natural feature is located in the SE $\frac{1}{4}$ of Section 18, T 12 N, R 10 W?
2. Give the township/range location of Helmville.
3. Give the township/range location of the bodies of water on the South Fork of Cottonwood Creek.

Distance

4. How far is it in mile (to the nearest tenth of a mile) if you walked from Helmville School to Highway 141 following the Canal Road?
5. How wide is Nevada Creek, including the marshy area, at its widest point in Section 31, T13 N, R 10 W?
6. If you were at the Nevada Creek Ranch, and wanted to follow Hall Creek to the top of Hoodoo Mountain, how far would you have to hike? (in feet)
 - a. How many feet in elevation would you gain?
 - b. What direction would you need to walk in? (HINT: not up!)
7. In what general direction does Cottonwood Creek flow?

Subject Area: Science/Math/Library Media/Technology/Social Studies

Lesson Title: "Gee, What is GIS?"

Overview: This lesson will introduce the students to GIS which stands for Geographic Information Systems. Discuss how this information is being used with technology in many different fields. It also may be beneficial to go to the website: <http://www.lewisandclarkeducationcenter.com/> and show the students the animation. This was created using GIS information.

Connection to Standards: Science: Standard 1, 5
Math: Standard 1
Library Media: Standard 1
Technology: Standard 1
Social Studies: Standard 3

Time: Two to three class periods.

Materials/Equipment Required:

- Computer, projector, and internet access
- Arcview program and data disc
- Worksheet 1

Objectives:

1. The students will begin to understand that the earth can be represented in different projections.
2. The students will be able to use technology to manipulate information.
3. The students will be able to apply geographic knowledge and skills.
4. The students will be able to complete the worksheet.

Suggested Procedure:

Opening: Show the animation found at the above website. This should spark an interest in how it was created. Tell the students that it was developed using GIS. Explain to the students what GIS is and how it can be useful in our

everyday lives. Discuss some fields of study that are currently using GIS in their businesses.

Development: Demonstrate how to find the Arcview program on the computer. The worksheet is very much step by step and encourage the students to follow the directions precisely. One other problem that arises with the Arcview program is where things are saved. You may wish to create a student folder on the desktop so they can save all of their files to that folder. This way it is all in one place and can be accessed or discarded with ease.

Closing: View the projects that the students have produced. Discuss applications of the GIS information and how your students may develop a problem that they can solve using GIS.

Student Assessment:

- Check accuracy on the Arcview project.
- Discuss the concepts covered by the worksheet and actions used in the Arcview program.

Extensions:

- Again, to reinforce, show the map in different projections using the School Tools extension.
- Have students develop a problem in their community in which they could use GIS to help solve.

Additional Resources:

- EOS Center University of Montana: This is a great resource, and will even come to your school with computers to introduce GIS to you and your students.

Name _____

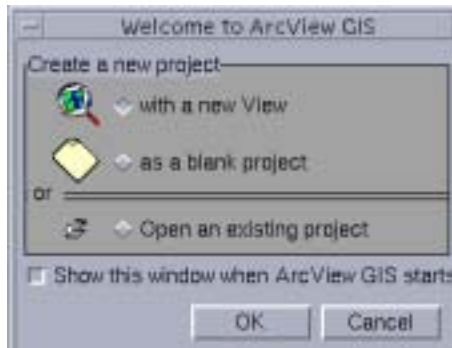
GIS Worksheet One An Introduction

Directions:

This is your first task using GIS and Arcview. Follow the directions precisely so that you will not become confused.

Your Task:

1. **Open** Arcview



2. **Select** “as a blank project”, click OK.

3. **Select** “New” 


4. Make sure your window is **maximized**.


5. **Select** “Add Theme” button. 

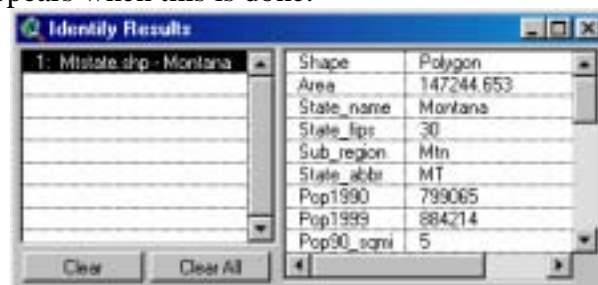
6. **Navigate** to C: drive and open the **esri** folder. This folder contains all of the information that you will be using for this assignment. Remember how to get to this folder.



7. Open **esridata**, and open the **usa** folder. Add the “**states.shp**” theme to your view.

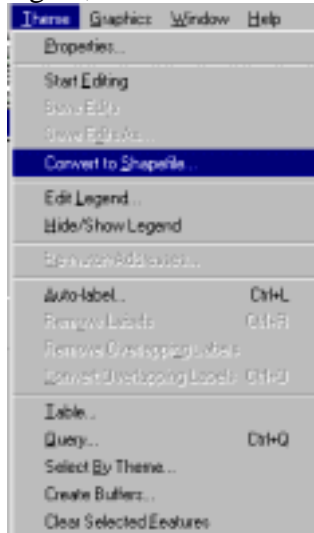
8. Turn on the “**states.shp**” theme.  You should now be able to see the states, including Hawaii and Alaska.

9. Since we only want to look at Montana, choose the **zoom in** button  and **draw** a box around Montana. Release the mouse button, and the map will refresh itself. You should be able to see all of Montana. It is a yellow color.

10. Select the **Identify** tool,  and click on the state of Montana. Notice that other information appears when this is done.

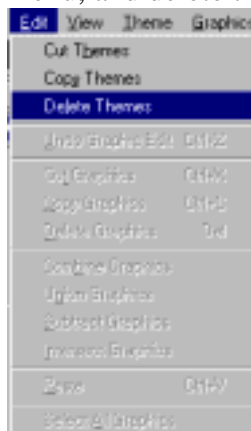


11. Again, make sure the states theme is active, and go to the **query** builder  in the theme menu. Since we want to select only the state of Montana, we need to create a query for just the state. In the query builder, double click on the **state name** option, then the **equal** button,  then the name “**Montana**”. This will select only the state of Montana. Select new set, and close the query builder. Again, under the theme menu, choose **convert to shapefile**.



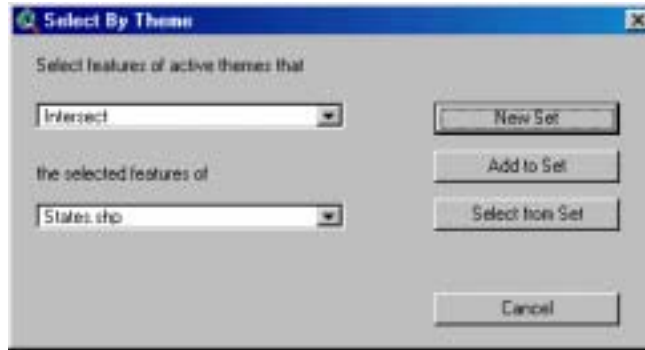
This will convert the selected object to a new theme in your view. Save this as “**mtstate.shp**”. When it asks to add to current view, choose yes.


12. **Unselect** the states theme, and select the “**mtstate**” theme. Notice, now only the state of Montana appears. Delete the “**states.shp**” theme from the view by selecting edit from the menu, and delete theme.

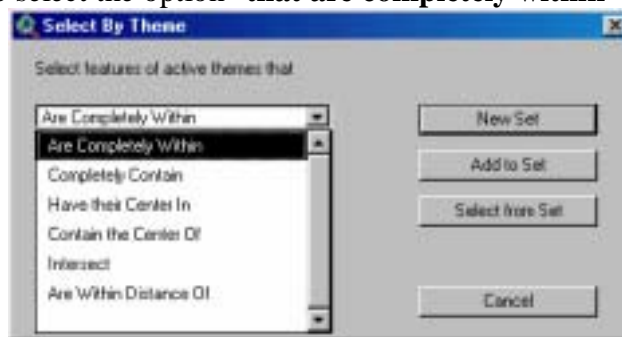



Answer **yes** to the next box that pops up. Notice now that you only have the one theme in view 1.

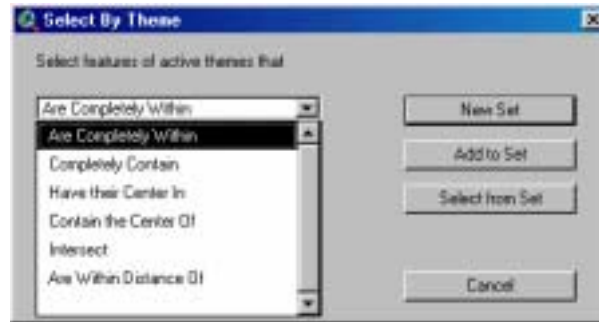
13. We will use the same method to apply only the county boundaries of Montana, the rivers, and the cities. However, these themes are not broken down into states, so we will have to use the **select by theme** option in our theme menu.



14. Click on the **add theme** button.  In the **eris** folder, in the **usa** folder, select the shapefile named **“cities.shp”**. Make the new theme active, and check the box. Notice that many more cities appear than just the cities in Montana. We only want the cities of Montana to show, so again we are going to have to use the **select by theme** option in our **theme** menu to select only the cities of Montana. Make sure the **cities.shp** shapefile is active, and go to the theme menu and select **“select by theme”**. A box will pop up that says **“Select themes of active features that..”** and gives you choices. Since we only want the cities in the state of Montana, we want to select the option **“that are completely within”**



- in the first box, and select **“mtstate.shp”** in the second box. Go to the theme menu and **create a new shapefile**, select **yes**, and name the shapefile **“mtcities.shp”**. It will also ask to add the new theme to the view, select **yes**. When you return to the view you will see that the new theme has been added. Unselect the **“cities.shp”** file, delete it and select the **“mtcities.shp”** file. Notice, now only the cities in Montana appear in the view.
15. Again, we want to add a new theme to our view. Select the add theme button,  and choose the **“counties.shp”** file from the **esri**, **usa** folder. Again, select the theme in the view, and turn on the theme by checking the box next to the label. Notice that the county lines show up for all states. Again we will have to go to the **theme** menu and use the **select by theme option**. Again you will see a box pop up that says **“select themes of active features that...”** Choose the option **“that are completely within”** in the first box, and again select the **“mtstate.shp”** in the second box.



- This will choose only those county lines that are in Montana.
16. Also save this as a new shapefile, and add the theme to the current view. Again, save this theme as **“mtcounties.shp”**. Turn the theme on by checking the box next to it, and turn the **“counties.shp”** theme off and delete it from the current view.
 17. Now, go to the legend editor and make the background color of Montana transparent. Then you will have to select a color for the outline of the **“mtcounties.shp”** theme so that only the outlines of the counties will show up. This will allow the other themes to be viewed at the same time.
 18. Now we will do the same for the rivers of Montana. Be careful while in the select by theme menu to choose intersect, since not all of the rivers are in the state of Montana. Save the theme as **“mtrivers.shp”**. When finished with this step, save your work as **“proj1.apr”**.

Subject Area: Science/Math/Library Media/Technology/Health Enhancement/Social Studies

Lesson Title: "Are We Lost Yet?"

Overview: In this lesson the students will learn how to read a compass. They will also learn how to navigate using a compass and a map.

Connection to Standards: Science: Standard 1, 2
Math: Standard 1
Library Media: Standard 1
Technology: Standard 1
Health Enhancement: Standard 3
Social Studies: Standard 3

Time: Two to three class periods.

Materials/Equipment Required:

- Maps
- Compasses
- Worksheet 1&2

Objectives:

1. The students will be able to accurately calculate the directions on a compass housing.
2. The students will be able to navigate accurately using a compass and a familiar area. (the playground)
3. The students will be able to apply this knowledge to navigate in an unknown area provided a map and compass.

Suggested Procedure:

Opening: Go over the information provided in the two worksheets. Allow the students time to play with the compasses. This will allow them to feel confident when using a compass.

Development: Practice using the compass by developing point A to point B questions using your map. You can further this by

setting up a scavenger hunt in your playground by creating a map and putting points on the map in which the students must navigate to in a certain order.

Closing: Make sure all students know the parts of the compass and how to accurately navigate using both the compass and the map.

Student Assessment:

- Check accuracy with navigation.
- Discuss the concepts covered by the worksheet and parts of the compass.

Extensions:

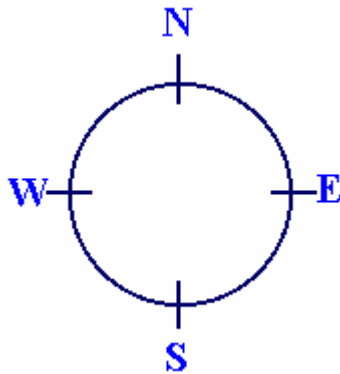
- Find a local orienteering course and have the students participate.
- Have students develop an orienteering course on a map of your area and create a local course.

Additional Resources:

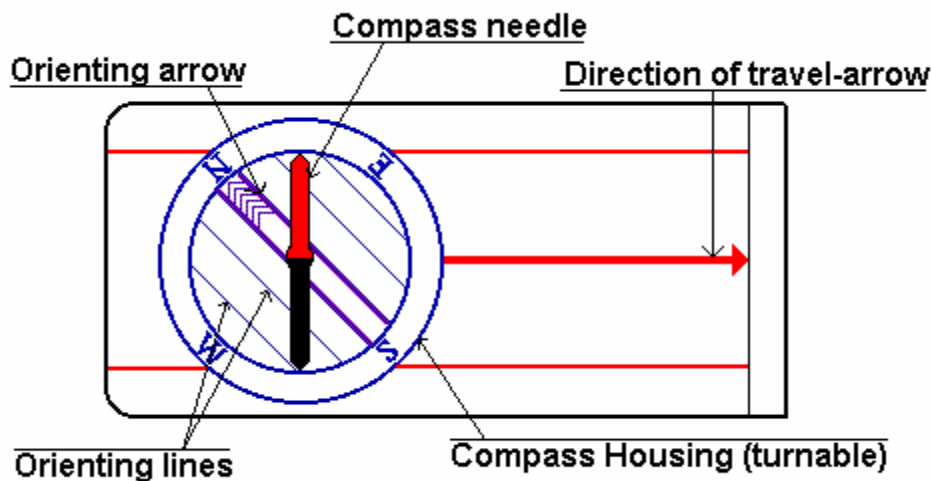
- www.orienteering.org/ This is a good site with lots of links that will give more information about the sport of orienteering.

Using a Map and Compass Lesson One

The first thing we will learn is our cardinal directions: North, South, East, and West. Look at the figure below to see how these directions are aligned. Remember where they are located according to North.



There are many different types of compasses but we will work with a compass that has a flat base which has a scale on it. This scale is useful when measuring distance on a map. Look at the diagram below and study it:

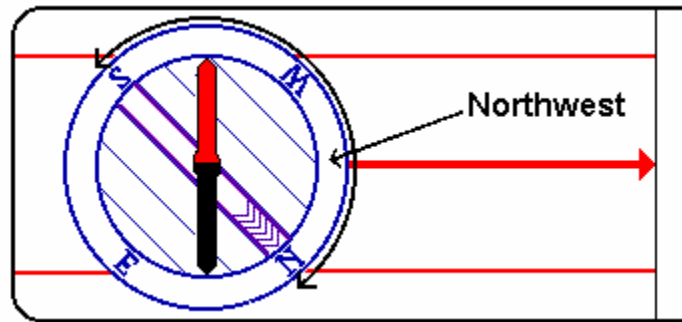


The red and black arrow is called the compass needle. Sometimes this arrow is not red and black. It can also be red and white. However, the basic concept is that the red part of the arrow will always point to the earth's magnetic north pole.

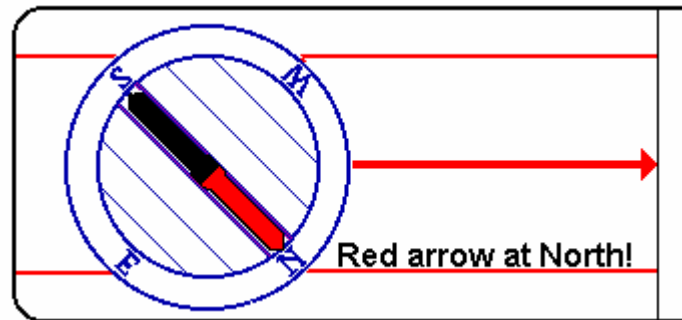
The compass housing is the turnable dial with the numbers and directions. The numbers range from 0 to 360, the same amount of degrees that a circle has. You may want to remember the measurements for each of the cardinal directions. The numbers may also be called an azimuth or sometimes a bearing.

The large red arrow on the base of the compass is the direction of travel arrow. Let's say we wanted to travel North West. First, find the appropriate place on the compass housing. Some will have a NW, and some will not. However if we apply our math knowledge we can calculate that measurement. We know North is zero, so South would

be half of 360, or 180 degrees. We also now know that each cardinal direction is 90 degrees apart, so West is 270 degrees. Now, by observation we can see that NW is halfway between West and North, or 45 degrees. So NW must measure 315 degrees.



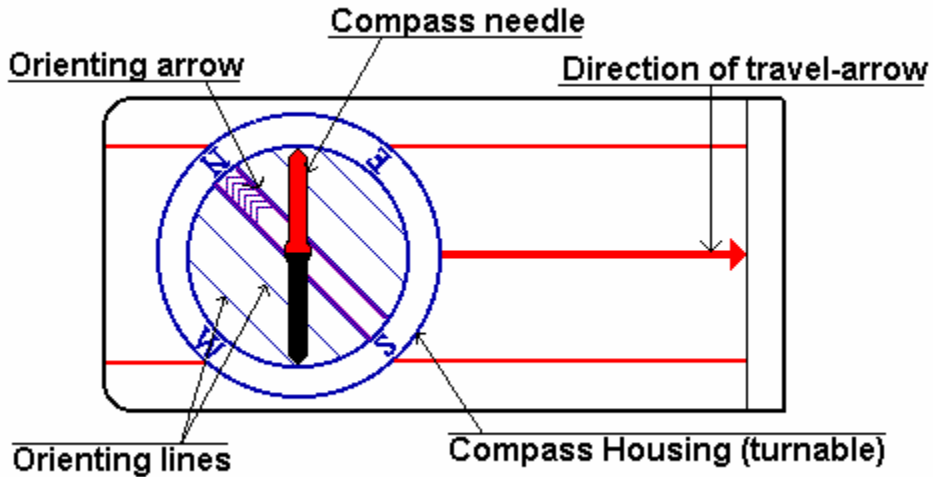
Now, hold your compass flat and turn your compass housing so that NW or 315 degrees lines up with the direction of travel arrow as in the above picture. Before we can begin navigating, we must line up the compass needle with the orienting arrows. To do this, hold your compass flat, with the direction of travel arrow pointing away from you. Then turn your body until the compass needle aligns with the orienting arrows. Be sure that the red end of the needle is pointing at the N on the compass housing. See the picture below.



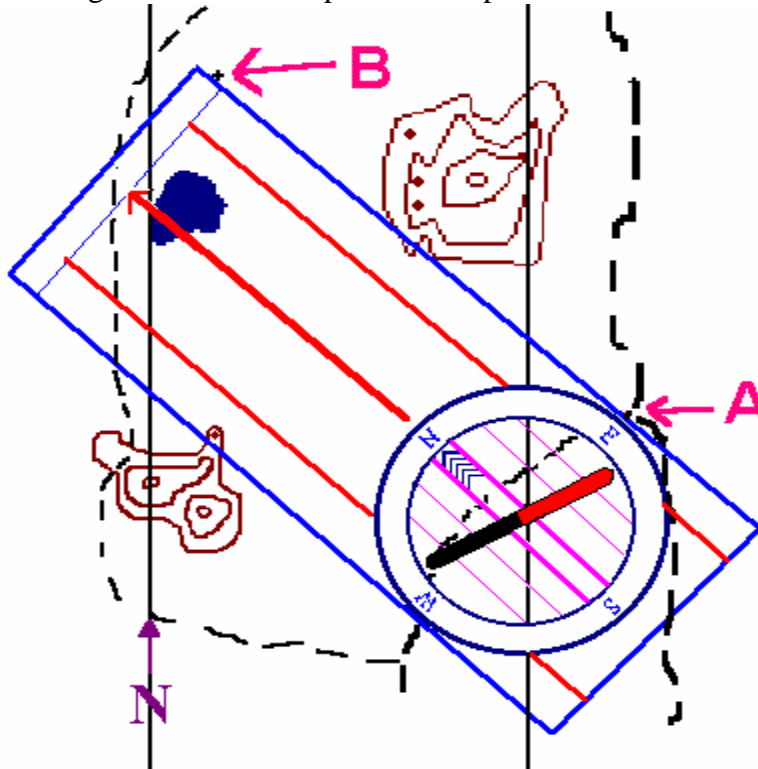
Two things to remember. One, make sure you have the red part of the compass needle pointing North. If it is pointing South you will go in the opposite direction. Two, sometimes your compass is interfered with by objects that contain iron. Make sure you do not have any objects close to your compass that contain iron. Belt buckles and table tops are always culprits. Now slowly move your compass up to eye level and sight down your direction of travel arrow. Make sure to keep your compass as flat as possible. Pick an object in the distance and go to it. You have just traveled North West. This is the very basics of using a compass.

Using a Map and Compass Lesson Two

Remember what our compass looks like and the parts of the compass.



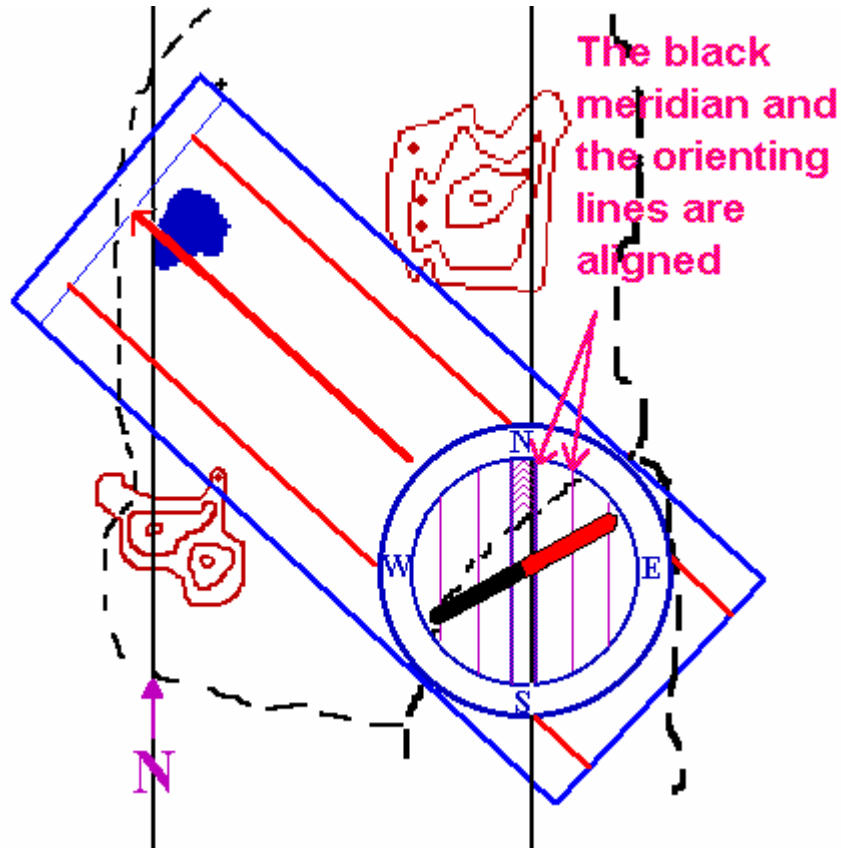
Now we will learn how to use our compass with our map. Basically, a compass is used to travel from point A to point B in a straight line. However, sometimes it is not possible to travel in a straight line due to obstacles. Your knowledge of map reading must also be used when determining a route between point A and point B.



Look at the image at the bottom of the previous page. Lets say we are standing at point A and want to travel to point B. Notice we line the edge of our compass up with the two

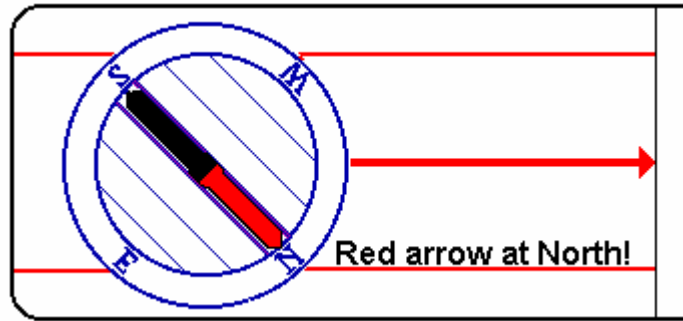
points. If your compass is not large enough, then you will need to use a straight edge of some sort. Be careful to use the long edge of the compass. Do Not Use The Short Edge. Next, draw a line from point A to point B on the map. Now also make sure that the direction of travel arrow points in the direction you are going to walk. In other words, it points away from your current location.

Now lets look at our map. There should be some black vertical lines on the map. These are called the orienting lines. Do not move the compass yet, but turn the compass housing until the compass housing lines are lined up with the orienting lines on the map. See the picture below.

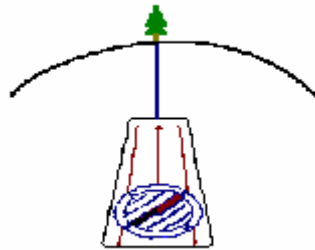


When doing this, there are a couple of common mistakes. First, make sure your direction of travel arrow is pointing towards the point where you wish to go. Second, make sure you know which direction North is on the map. Most of the time, North will be oriented to the top of the map. In other words, as you look at a map, the top of the page will be North. Make sure the orienting arrow is pointing North on your map. Third, make sure the compass has not moved when you turned the compass housing. If it has, realign it. This could send you off course.

When you are sure the compass and the housing are correct, you can read your azimuth from the point where the compass housing lines up with the direction of travel arrow. Do not turn the compass housing.



Now, hold your compass flat and turn your body while the compass needle turns inside of the compass housing. Make sure the needle lines up with the lines in the compass housing and that the red part of the compass needle is pointing North. Now slowly move your compass up to eye level and sight down your direction of travel arrow. Make sure to keep your compass as flat as possible. Pick an object in the distance and go to it. You may have to do this several times depending on the terrain and distance you are traveling.



Two things to remember. One, make sure you have the red part of the compass needle pointing North. If it is pointing South you will go in the opposite direction. Two, sometimes your compass is interfered with by objects that contain iron. Make sure you do not have any objects close to your compass that contain iron. Belt buckles and table tops are always culprits. Now let's practice!

Subject Area: Science/Math/Workplace Competencies

Lesson Title: "Weeds be There!"

Overview: In this lesson the students will learn how to develop a plot that will be used over a period of time to study the affects of various types of weed control methods. They will also be working with a group to accomplish the task of identifying a plot. They will measure and stake out plots used for this project.

Connection to Standards: Science: Standard 1
Math: Standards 1, 4, 5
Workplace Competencies: Standards 1, 2

Time: Two to three class periods.

Materials/Equipment Required:

- Tape Measures
- Wooden Stakes
- Flags, flagging tape, string
- Hammer, safety glasses

Objectives:

1. The students will be able to choose an area that contains noxious weeds.
2. The students will be able to measure a specific distance from one point to another using a tape measure.
3. The students will be able to make a 90 degree angle using their prior knowledge of Pythagoreans Theorem and perfect squares.

Suggested Procedure:

Opening: Review the math concepts: measurement, Pythagoreans Theorem, and perfect squares. Discuss what type of an area would be an appropriate plot. For example: size, location, vegetation.

Development: Assist students with picking a plot site and staking it out. You might want them to approve it with you before they pound in the stakes. Make sure whoever is using the hammer wears eye protection. Then make sure each stake is flagged with marking tape so they will be easy to see and find again at another time. Make sure stakes are visible to avoid hazards with people and equipment.

Closing: Reinforce the concepts of perfect squares when pounding the stakes. Use measurement to accomplish this.

Student Assessment:

- Check accuracy of plots.
- Have students show their math problems using drawing and diagrams in their journals.
- How well did the students work with their teams?

Extensions:

- Have students calculate perimeter, and area using their measurements.

Additional Resources:

- "The Private Life of Plants: Living Together": Discovery Channel documentary.

Subject Area: Science/Math/Workplace Competencies/Technology

Lesson Title: "Numerous Knapweeds!"

Overview: In this lesson the students will learn how to conduct a transect Study. They will make a transect across their plot that they previously created, and do a sampling of the plant species that are in their plot area. They will then collect the data and transfer that data into a spreadsheet. To help with the spreadsheet, they will perform a spreadsheet activity before they enter their own data.

Connection to Standards: Science: Standard 1
Math: Standard 2
Workplace Competencies: Standards 1, 2
Technology: Standards 1, 2

Time: Two to three class periods.

Materials/Equipment Required:

- Tape Measures
- Wooden Stakes
- Flags, flagging tape, string
- Hammer, safety glasses
- 50cmx20cm transect
- Computer with Excel

Objectives:

1. The students will be able to create a transect line.
2. The students will be able to measure an amount of ground cover given a specific range.
3. The students will be able to accurately collect data.
4. The students will be able to enter their data into a spreadsheet application.

Suggested Procedure:

Opening: Discuss with the students what a transect line is and why it is important. Discuss with them the method of using a transect on a line. Have the students use a tape measure to

make a transect, and count plants within the transect on the same side of the transect line in 50cm increments. Create for them a scale to use instead of counting each specific plant species. For example:

1	0-5%
2	5-25%
3	25-50%
4	50-75%
5	75-95%
6	95-100%

So the data would look like this for a specific transect:

Cover: Knapweed-Class1, Grass-Class 2, Bare ground-Class 4, and Litter- Class 2.

Development: Assist students with making their estimations on cover classes. The classes that we used are Knapweed, grass, forbs, bare ground, and litter. Make sure the students understand each of these classes before beginning. Also observe to make sure that the transect lines are in the correct place and marked. It is important to mark them so that the same area can be studied and a determination can be made whether or not the control method implemented has done any good. Collect the data in a basic chart.

Closing: Input the data collected into an Excel spreadsheet. This will be beneficial in the future when you are trying to make a prediction of which control method works the best. Remember to include a date and location with all data.

Student Assessment:

- Check data collection.
- Excel spreadsheets.
- How well did the students work with their teams?

Extensions:

- Use skittles to develop competency in Excel. (see worksheet)

Additional Resources:

A Rainbow of Colors

1. Student Objectives

- Students will demonstrate the ability to input data into an Excel spreadsheet.
- Students will learn how to set up basic formulas using the Excel software components.

2. Materials

- Bags of Skittles candy.
- Computers with Microsoft Excel with printer.

3. Purpose

- Create a spreadsheet of information using Excel.
- Use formulas within the software program to multiply, add, and average a set of data.
- Learn the importance of simple data collection.

4. Procedure

1. Open your package of Skittles. Separate your pieces into individual colors.
2. Count the number of each color.
3. Open Microsoft Excel.
4. Click the mouse in B1 and title your data set.
5. Highlight your title, and change the size to 16, and BOLD To do this, select format from the menu, and from the drop down selections choose cell. Click on the font tab, and change the size, and select BOLD from the menu.
6. Press the enter key to move the information that you have just typed into the cell B1.
7. In cells B2-F2 type the colors of your Skittles. Change the font size to 12. To do this, select format from the menu, and from the drop down selections choose cell. Click on the font tab, and change the size.
8. In cells A3-A5 will be the name of your group members. Change the font size to 12. To do this, select format from the menu, and from the drop down selections choose cell. Click on the font tab, and change the size.
9. Cell B8-F8 will be the total number of each color.
10. Cell B9-F9 will be the average of each sample. Be sure to round each number to the tenths place. To do this, select format from the menu, and from the drop down selections choose cell. Click on the number tab, and from the list on the left highlight number. Adjust the number of decimal places to one. Click OK.
11. After you have entered your group members and Skittle colors, you will have to enter your gathered data.
12. Repeat for the number of members in your group.
13. Once the data is entered, create formulas to average the number of each color from each sample. To do this, click on the = button on the left of the entry bar. Then, to the left of the entry bar, choose average from the list of

formulas. A box will pop up and you can either manually enter the range or click on the spreadsheet icon and click and drag a dotted line around the boxes that you wish to average. Then push enter. Another box will appear. Check to see if the number is reasonable. If it is press OK, otherwise go back and adjust the range of cells.

14. In cell H2 type “ Total Pieces”. This will be the total number of Skittles each person has.
15. The cells H3-H6 again will have sum formulas.
16. In cell H7 type in “Group Total”. Cell H8 will need a sum formula for the totals. Resize column H by placing the mouse on the H and I line. When the icon changes, left click and hold as you drag the column line to the right.
17. In cell I7 type “Group Average”. Again resize the column. Cell I8 will need an average formula, averaging the total pieces from each person. Again, format the cell to round to the tenths place.
18. In cell A10 type the word “Percent”. In cells B10-F10 insert formulas for percent of total number. Remember, a percent is a part divided by a whole. Format these numbers by choosing format cell, numbers tab and selecting the percent from the list on the left.
19. Click on cell A10 and hold as you drag your mouse to cell F10. A10 through F10 should now be highlighted. Select the chart wizard from the menu, and click on pie chart. Follow the directions in the pop up boxes. Once this is done, create a pie chart, titled _____’s Skittles, where the blank is replaced by your group name, and the pie chart shows the average of each color as a percent of the total package. Change the colors of your pie chart to represent the colors of your Skittles. To do this, double click in each color square in the legend, and changing the color to the corresponding Skittle color. Display the percent, and remove the legend.
20. Now make a line graph of the number of pieces of each color for each group member. Click on cell A2 and drag to cell F6. This should highlight the group data. Again select chart wizard from the menu, and choose line graph. Numbers should be on the y-axis, and names of group members on the x-axis. The lines should represent each individual color. Again, make the color of the lines correspond to the color of the Skittles.
21. Make sure the data and the pie chart can be viewed on the same page. A sample is attached, and your final product should resemble this printout. When you have completed this, save your spreadsheet in my documents, call it Skittlespreadsheet<yourname>, and print one copy to turn in.

5. Evaluation and Assessment:

- Compare data with others. Compare charts and graphs to sample.
- Give students the opportunity to make corrections to their work.
- Formal assessment could be done with a controlled set of data.

Subject Area: Science/Math/Library Media/Technology/Social Studies

Lesson Title: "I See What GIS is!"

Overview: This lesson will further the students understanding and use of GIS systems and Arcview. They will manipulate local data to create a map that is recognizable to them of their area.

Connection to Standards: Science: Standard 1, 5
Math: Standard 1
Library Media: Standard 1
Technology: Standard 1
Social Studies: Standard 3

Time: Two to three class periods.

Materials/Equipment Required:

- Computer, projector, and internet access
- Arcview program and data disc
- Worksheet 2

Objectives:

1. The students will begin to understand that the earth can be represented in different projections.
2. The students will be able to use technology to manipulate information.
3. The students will be able to apply geographic knowledge and skills.
4. The students will be able to complete the worksheet.

Suggested Procedure:

Opening: Discuss with the students the importance of data. Show them different GIS projects such as the pocha.apr found on the disk. This is a project that shows a property line dispute between two neighbors. By using GIS and GPS show the students how data was collected and then projected onto the orthophoto that shows where the property line is now, and where the legal boundary is.

Development: Again, guide the students through a short review of the program Arcview. They will again have to follow the directions on the worksheet pretty precisely so they do not get lost. Again, be careful where the information is saved. Use the folder on the desktop for this project as well.

Closing: View the projects that the students have produced. Discuss applications of the GIS information and how your students may develop a problem that they can solve using GIS.

Student Assessment:

- Check accuracy on the Arcview project.
- Discuss the concepts covered by the worksheet and actions used in the Arcview program.

Extensions:

- To spark interest, an orthophoto can be downloaded to show the school and the surrounding area.
- Overlay some data onto the photo.
- Have students develop a problem in their community in which they could use GIS to help solve.

Additional Resources:

- EOS Center University of Montana: This is a great resource, and will even come to your school with computers to introduce GIS to you and your students.
- <http://nris.state.mt.us/gis/default.htm> This is a great site for downloading all kinds of local data to use in Arcview.

Name _____

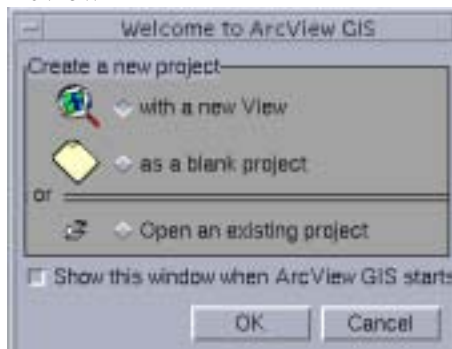
GIS Worksheet Two Using Our Information

Directions:

This is your second task using GIS. We have learned how to add themes and create new themes using a larger set of information. Now we are going to learn how to add multiple themes, create our own theme, add attributes to a table, and learn how to print out a project. Let's get started.

Your Task:

19. Open Arcview



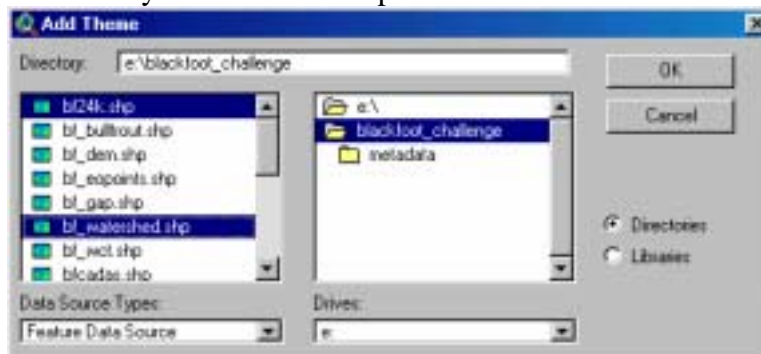
20. Select “as a blank project”, click OK.

21. Select “New” 


22. Make sure your window is **maximized**.

23. Select “Add Theme” button. 

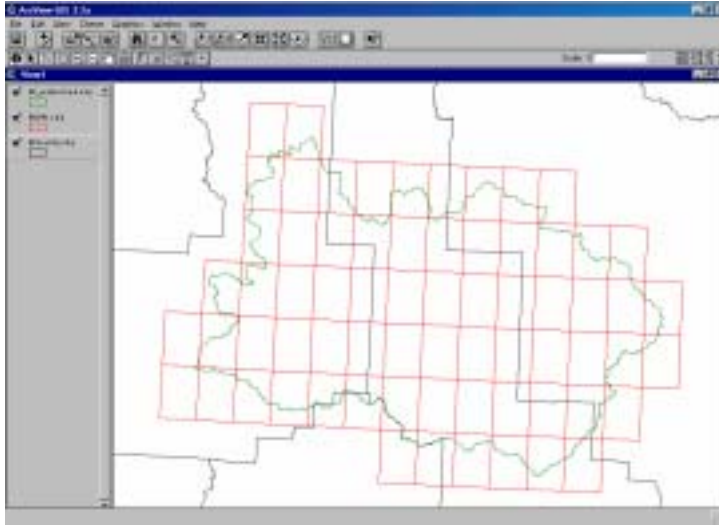
24. **Insert the Blackfoot Challenge Data CD.** Navigate to the CD drive and select the “**bf24k.shp**” theme and both the “**bf_watershed.shp**” theme, and the “**bf_counties.shp**” theme. To do a multiple themes at the same time, select the first theme, hold down the shift button and select the second and third themes. This should allow you to select multiple themes at the same time.



25. Go to the legend editor and change the foreground color of all three themes to the transparent color. Then change the outline color of the watershed theme to green, and the outline of the 24k theme to red. Turn the outline of the counties to black.


Make sure you apply  your changes before you leave the legend editor.

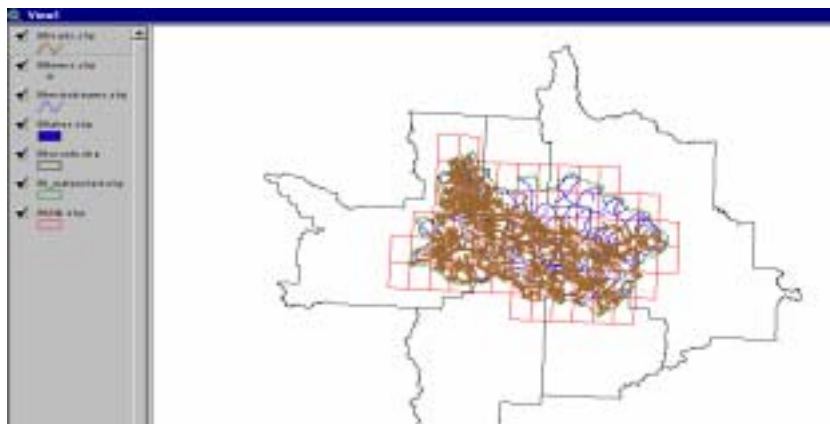
26. Check all three themes on in view 1 so that they appear on the screen.




27. Select the **Add themes** tool,  and select the following themes:

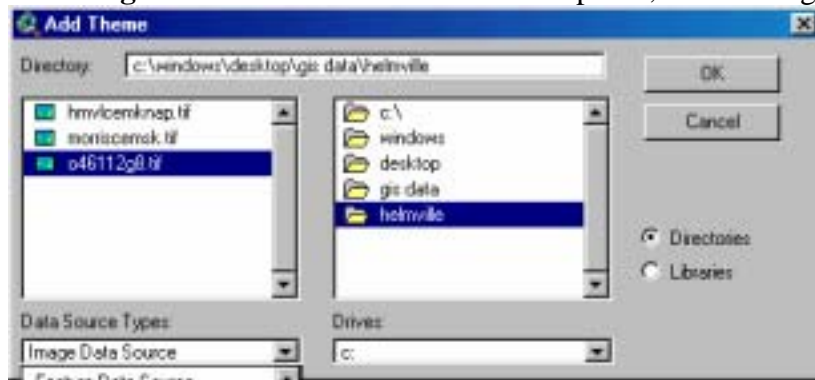
- a. **bftowns.shp**
- b. **bfroads.shp**
- c. **bfmrisstreams.shp**
- d. **bflakes.shp**

Again, adding multiple themes can be done at the same time by holding down the shift key while selecting the themes. When these themes are added, it may be wise to change the color and the appearance of some of these themes. Change the water to a blue color, the roads to a brown color, and the towns to a green color. Remember, to do this you must double click to get into your legend editor and manipulate the colors. Again, make sure you  your changes before leaving the editor menu. You should now have a view that looks something like this:

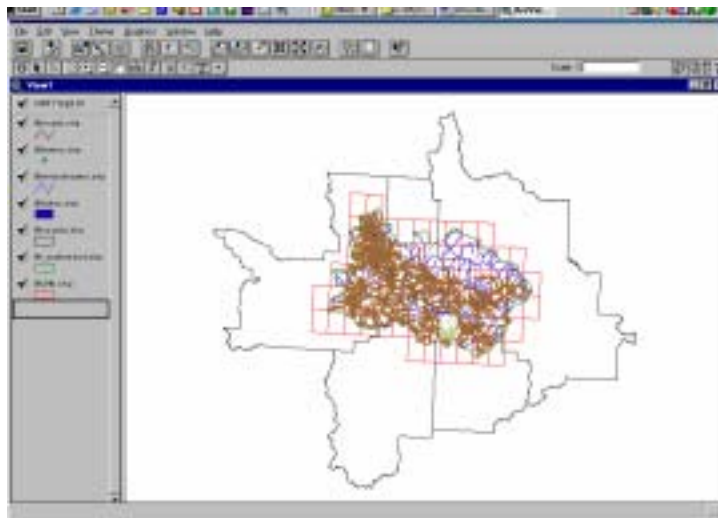



e. Now we only have on more theme to add. Again, click on the **add theme** button . From our desktop, there is an **image data source** file that contains a topographic map of one section of our current map. We want to make sure that under the add theme menu, we select image data source before we navigate to the location. The file that we want to add is the

“o46112g8.tif”. Notice that this is not a shapefile, but an image file.



28. Check the box so that it will be added to our current view. Notice that it covers other information. Click on the theme and drag it to the bottom of the theme list.

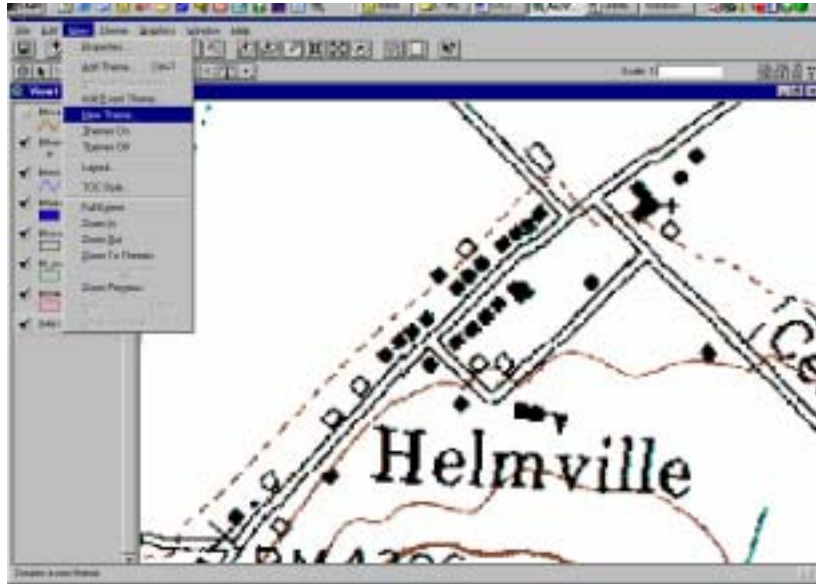


29. Now let's **zoom in**  to the section with the topographical map in it. Zoom in enough that you can easily make out the town of Helmville, and see the school building. The school building has a flag on top of a black box. It will look

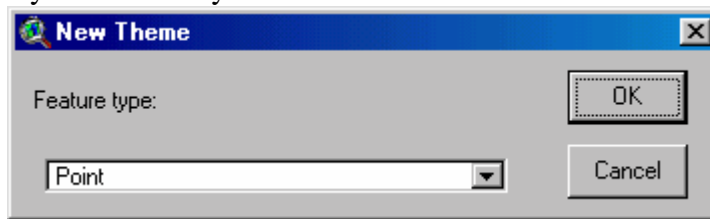


similar to this. Remember, that this is a zoomed in image, so you will have to look for something that is similar.

30. We know what this building is, so let's create a new shapefile for just the Helmville School. To do this we must select the view menu, and select new theme.





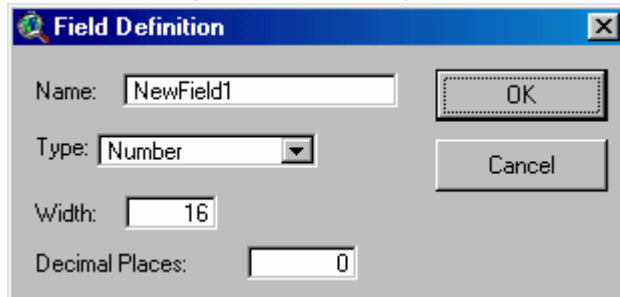
Once the new theme has been selected, a box will pop up asking what type of feature you want to add. Select point from the drop down box if it is not already selected for you. Then click on the OK button.




31. Then navigate to your folder on the desktop, and label the new theme **“helmvilleschool.shp”**. It will add the theme to the current list of themes, but notice the gray box has a dashed outline around it. This means that this theme is open for editing and can be changed.



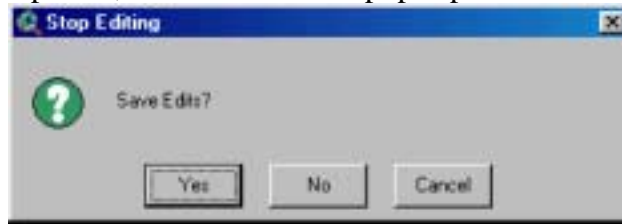
32. Now we want to choose the **draw point** button.  Click on the building with the flag on it. Notice a yellow point appears on top of the building. You have just created a point theme to identify the Helmville School. Now open the theme table . In the edit menu, select add field, and new box will pop up.




In the Name portion, let's label it a “building”, and in the type field, let's label it a string. We can leave the width at 16 characters. Click OK. When the OK button is pushed, it immediately takes you to the attributes table of the

“helmvilleschool.shp” theme. We want to now click on the **edit tool**  and then click in the yellow box under the new field “building”. When you click in the box

it turns white. Type in “Helmville School” in the field. Then in the table menu, select stop edits, and when the box pops up to save edits, click on the yes button.




33. Now select the identify tool  and click on the dot that represents the theme that was just added. Remember to make sure the theme is selected by having the gray box around that theme. When the attributes table comes up, notice that we have added the building and the building name to the table. When you have completed these steps, save your project in your folder as “**proj2.apr**”.


34. Let’s learn how to use the layout to print our project. Close the view screen, and it should take you back to the main project screen. Click on the **layout button**



Layouts

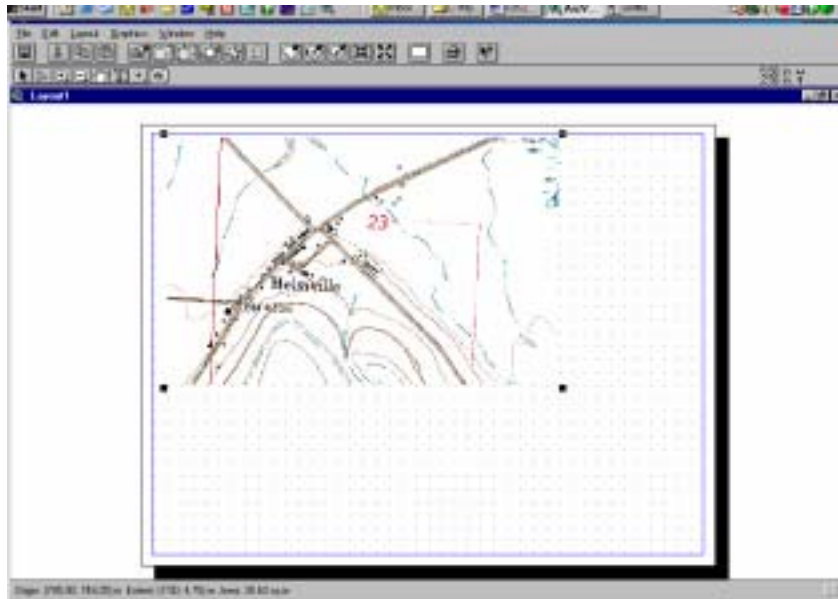
New


and select . This will bring you to a layout template where you can design how your printout looks.

35. Click on the **view frame button**  and drag a box left from the upper left hand corner across the page 33 dots, and down the page 20 dots. A box will appear asking what you want to put into your frame.




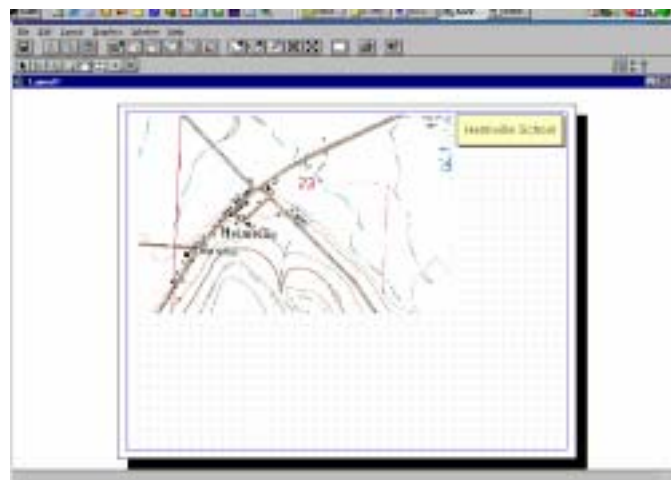
In the first box, select View1, then select the OK button. When you do this, the current view in view 1 will appear in the frame that you have just created. Hopefully, it will look something like this.




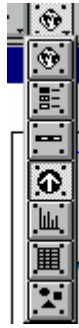
36. If your view does not look like this, then close your layout screen, go back to view 1 and adjust your view using your pan and zoom tools. Then return to the layout screen, and notice the view has already been adjusted.
37. Now lets add a title to our map. Select the **text tool**  and hold down on the left mouse button when you click on it. Notice that a drop down menu appears.



Select the option with the white square box around the T. A small circle with a dot will appear. This selects the location of your text box. Move the dot over to the right of your view 1 and click one time. A box will pop up. In the text area type “Helmville School”, and select the centered option. Then click OK. The text is entered and centered in a box. This box looks a little small, however, so select the **pointer tool**  and click on the text box. Notice it gives us four dark squares, one in each corner of the text box. Click on one of these squares and drag the corner to make our text box larger. We have now created a title for our printout.




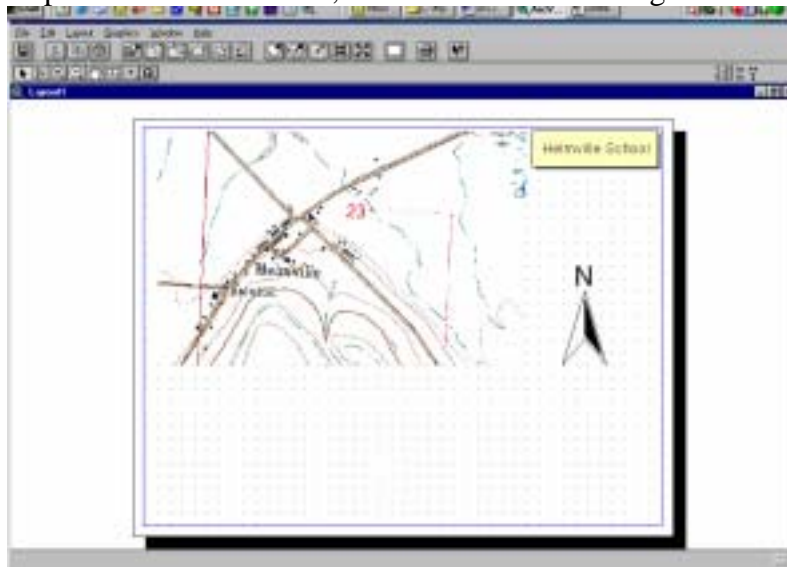
38. Now let's add a compass rose to our printout. In arcview, this is easily done with buttons, and the items can easily be moved around the print layout screen. Click on the **view frame button**  and hold down. A drop down menu will once



again appear. From this menu, choose the box that has an arrow pointing up inside of a dark circle. This is the **north arrow button**. This will give you a small cross, with which you will drag a box on your layout into which the north arrow of your choice will fill. When you drag the box and release the mouse button, a menu will appear with many choices for what your north arrow will look

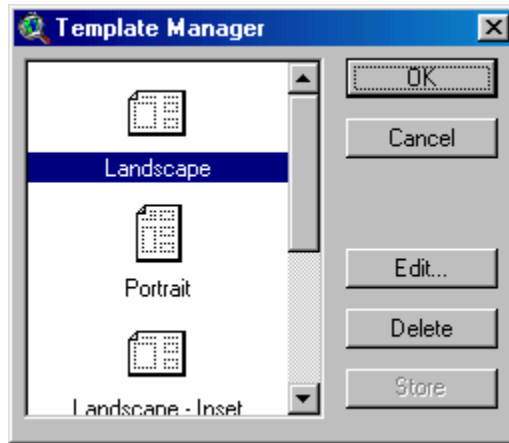


like. For this exercise, let's all choose the north arrow that looks like . Now let's place it below our title, so it will look something like:



39. Now we can print our project. Before printing however, go to the layout screen and manipulate how the printout will look by selecting on the pointer tool, and clicking on the items in the layout screen and dragging and dropping them in different positions within the layout screen.

40. Now that you know how to setup a layout, there are already some layout templates that can be used and manipulated as well. In the view menu, choose the layout option.



Many templates will be available to choose from. Select one, and view the layout of view1. Notice how it adds all of the items that we manually added to our layout, plus adds a few other options. Click on the “view1” title, and change it to Helmville School. Then save your project, and print out your final layout.

In this lesson, you have learned how to add multiple themes, manipulate themes using the legend editor, create your own themes, add attributes to a theme table, manipulate the print layout, and use print layout templates to design how your project is printed.

Subject Area: Science/Math/Library Media/Technology/Social Studies

Lesson Title: "Wandering Wonders!"

Overview: This lesson will further the students understanding and use of GIS systems and GPS. They collect digital spatial data of their own environment. They will also learn the basic functions of the GPS unit.

Connection to Standards: Science: Standard 1
Math: Standard 1
Library Media: Standard 1
Technology: Standard 1, 2
Social Studies: Standard 3

Time: Instruction time on this lesson would be one class period. However, depending on the number of GPS units, this could take a couple of weeks for all students to collect their data.

Materials/Equipment Required:

- GPS units. (Garmin Vista)
- Worksheet: Garmin 1

Objectives:

1. The students will begin to understand how to use a GPS unit.
2. The students will be able to use technology to manipulate information.
3. The students will be able to collect real life data from a familiar environment.
4. The students will be able to complete the worksheet.

Suggested Procedure:

Opening: Discuss with the students the importance of data. Again, show them different GIS projects such as the pocha.apr found on the disk. This is a project that shows a property line dispute between two neighbors. By using GIS and GPS show the students how data was collected and then projected onto the orthophoto that shows

where the property line is now, and where the legal boundary is. Communicate to the students the importance of being as accurate as possible when collecting data.

Development: You may wish to guide the students through a sample collection series. Take the students outside, split them into groups depending on the number of GPS units you have, and have them collect points. Also walk the perimeter of the school yard. Show them how the real life data is changed into digital spatial information by the GPS unit.

Closing: Check the GPS unit when it is returned. Make sure there is a point and a track with the students name on the label.

Student Assessment:

- Check for collected data on the GPS unit.
- Discuss the concepts covered by the worksheet.

Extensions:

- To spark interest, an orthophoto can be downloaded to show the school and the surrounding area.
- Overlay some data onto the photo.
- Have students develop a problem in their community in which they could use GIS to help solve.

Additional Resources:

- EOS Center University of Montana: This is a great resource, and will even come to your school with computers to introduce GIS to you and your students.
- <http://nris.state.mt.us/gis/default.htm> This is a great site for downloading all kinds of local data to use in Arcview.

Name _____

GIS Worksheet Three

Collecting Data

Directions:

This is your first task using Garmin GPS units. Follow the directions precisely so that you will not become confused.

Your Task: Collect one waypoint, and one polygon.



41. **Turn on** the Garmin vista GPS unit.
42. **Wait** for the GPS unit to locate at least four satellites. You will know when the GPS unit is ready because at the top of the screen it will say **“ready to navigate”**.
43. Using the **Page** button on the top right of the unit, scroll through the various pages until you reach the **Main Menu** page.
44. Go to the setup menu by guiding the selected box with the click stick found on the face of the GPS unit. When **Setup** is highlighted, push straight down on the click stick to select.
45. Again, scroll using the click stick to system, and select by pushing straight down on the click stick. In this menu we want to make sure that the option **WAAS** is **disabled**.
46. Again, using the click stick, scroll up until the **“X”** at the top of the screen is highlighted, and push down on the click stick. This should take you back to the **Setup Menu**.
47. In the **Setup Menu** select the option **Units** using the click stick. We will now set the **Position Format to hddd’mm’s.s”**. We also need to set **Map Datum to NAD83**. Once this is done, again close this menu by clicking on the **“X”** in the top right corner of the screen.
48. Close the **Setup Menu** by again clicking on the **“X”** in the top right corner. To close any screen, remember the **“X”** in the top right corner or use the **Page** button on the top right side of the unit.
49. You should now be at the **Main Menu** page. Select **Tracks, and make sure the Track Log is ON**. Close the screen. Using the **Page** button, scroll through the pages until you get to the map page.
50. At the **Map** page, go to the options menu, which is the page icon to the left of the **“X”** at the top of the page. Again select this by pushing straight down on the click stick. Scroll to the selection that has a line between two dots and make sure

- that the **Saved tracks feature is set to AUTO and the Track Log feature is set to AUTO**. We are now ready to collect our data.
51. Go to the entryway of your house. If you have a covered porch or lots of trees, you may have to be careful not to get too close or you may lose your satellite coverage. If this happens, scroll to the **Satellite** page and again wait for your GPS unit to locate four satellites.
 52. From any screen you can collect a waypoint. Simply push the click stick straight down and hold for about three seconds. A **Mark Waypoint** screen should appear.
 53. In this screen, navigate to the dot on the flag. When the dot is highlighted, push down on the click stick, and change the icon to a small house under the heading **Residence**. Once this is done, again push down on the click stick to select, and it should take you back once again to the **Mark Waypoint** page.
 54. Using the click stick, **highlight the number** corresponding to the new waypoint. Push down on the click stick. This will bring up a keyboard screen. Label the point with your first initial and your last name. Now our house is labeled with a custom name. Make sure you select the **OK button** before leaving this screen. Now scroll down to the bottom of the Mark Waypoint screen and select OK again. If this is not done, your new waypoint will not be stored.
 55. Now we are going to walk the perimeter of our yard. Remember, perimeter is the distance around an object. Go to one corner of your yard or any other place that will be a good start and stop location for the perimeter of your yard. Begin walking around the perimeter of your yard. Make sure you are on the **Map** screen and check to see if there is a line forming behind the current location marker which is the pointer. If there isn't a line forming, go to the **Main Menu** page and make sure the auto tracking function is turned on under the heading **Tracks**. Continue to walk around the perimeter checking the **Map** page as you go. When finished, navigate to the **Main Menu** screen and under the **Tracks** option, select **Save Track**. A screen will pop up asking how long ago you want to save the track back from. Just **select today's date**. It will then take you to the **Map** screen. You will see the **Track Back** screen in the bottom of the map screen. We will not use this function at this time. Now, using the click stick, pull down until the date of the track is highlighted. Again, push down on the click stick to name the track. Use your first initial and your last name again for this polygon. Make sure you select the **OK button** to save your new information.
 56. You have now just collected digital spatial data that we can use in Arcview and project onto a map. We will use this data in lesson Twelve.

Subject Area: Science/Math/Library Media/Technology/Social Studies
Speaking and Listening

Lesson Title: "Projecting Problems!"

Overview: This lesson will help students to develop a powerpoint presentation about the control methods used on weeds in their area. The students will do research on their types of control, and develop a presentation using Microsoft Powerpoint.

Connection to Standards: Science: Standard 1, 3
Math: Standard 1
Library Media: Standard 1
Technology: Standard 1, 2, 3, 5
Social Studies: Standard 3
Speaking and Listening: Standard 1, 2, 3, 4

Time: Two to five class periods.

Materials/Equipment Required:

- Computers with Microsoft Powerpoint
- Computer Projector (optional)

Objectives:

1. The students will create a powerpoint presentation.
2. The students will research types of control methods used on weeds in their area.
3. The students will present, using powerpoint, the benefits and adversities of a type of control.
4. The students will be able to complete the requirements of the research, and the presentation.

Suggested Procedure:

Opening: Show the students the Basics of Powerpoint presentation included in the Lesson Ten folder. This presentation shows the power of the program and has many examples of how to use the program to enhance their presentation. This presentation was taken from the Bethel College website, and is written by Robert Kistler.

Development: Show the students how to begin a powerpoint presentation using the projector. A sample presentation is started, and is in the Lesson Ten folder. Notice, however, the title Types of Control is left blank. This is a great opening for the students to develop their presentations from that point.

Closing: Make sure to give the students the expectations of the assignment. Whether that is a set number of slides, a time on the presentation, or whatever, let the students know the expectations before the assignment is given.

Student Assessment:

- View presentation and watch for expectations.
- Did the students do adequate research on the type of control?

Extensions:

- Discuss cost of each type of control method.
- Implement different types of control method to your plots.

Additional Resources:

- Robert Kistler, Bethel College.

Subject Area: Science/Math/Library Media/Technology/Social Studies
Speaking and Listening

Lesson Title: "Does Our Data Do It?"

Overview: This lesson will allow students the opportunity to create a map of their home and project the data that was collected in lesson nine.

Connection to Standards: Science: Standard 1, 3
Math: Standard 1
Library Media: Standard 1
Technology: Standard 1, 2, 3, 5
Social Studies: Standard 3
Speaking and Listening: Standard 1, 2, 3, 4

Time: Two to three class periods.

Materials/Equipment Required:

- Computers with Arcview
- DNR Garmin Extension
- GPS units with interface cables
- Internet access

Objectives:

1. The students will create a map using Arcview.
2. The students will use their data that they collected.
3. The students will begin to understand how to manipulate that data.
4. The students will print out a map of their home.

Suggested Procedure:

Opening: Make sure all of your computers have the DNR Garmin extension, and desktop program. You will have to hook up the GPS cable to your computer while your GPS is off. You may want to demonstrate this to your class before you set them off to do it on their own. Again, stress the importance of following the worksheet as closely as possible.

Development: Show students how they can correct their data if it is not exactly how they want it. Clean up some of the “tails” that were made from collecting the data. Use some of the features of Arcview to enhance their maps.

Closing: Have students print out their maps in color. Many of them will be exploring different options of the software on their own.

Student Assessment:

- Personal data downloaded to Arcview from GPS.
- An accurate color map of their home is generated.

Extensions:

- Discuss implementing this technology into a real life problem in your community. (traffic crossings, bus routes, fire hydrants, etc...)
- Create maps for different purposes.

Additional Resources:

- EOS Center University of Montana: This is a great resource, and will even come to your school with computers to introduce GIS to you and your students.
- <http://nris.state.mt.us/gis/default.htm> This is a great site for downloading all kinds of local data to use in Arcview.

Name _____

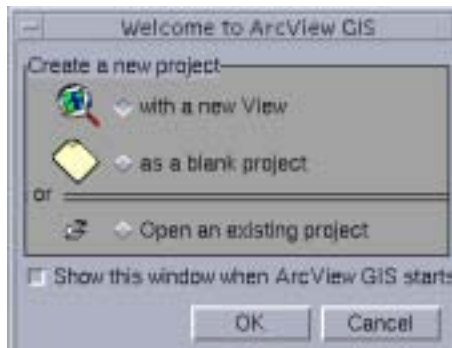
GIS Worksheet Four Using Our Collected Information

Directions:

This is your fourth task using GIS. We have learned how to add themes and create new themes using a larger set of information. We have learned how to add multiple themes, create our own themes, add attributes to a table, and how to print a project. Now we are going to learn how to add data from our GPS units and create themes. We will also learn how to download information from the **NRIS** website. Let's get started.

Your Task:

57. Open Arcview



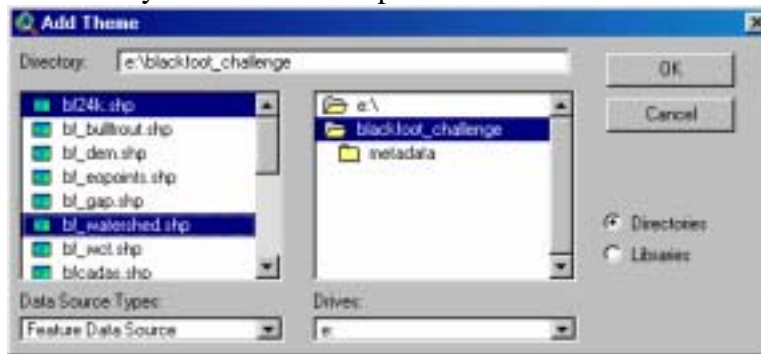
58. Select “as a blank project”, click OK.

59. Select “New” 


60. Make sure your window is **maximized**.

61. Select “Add Theme” button. 

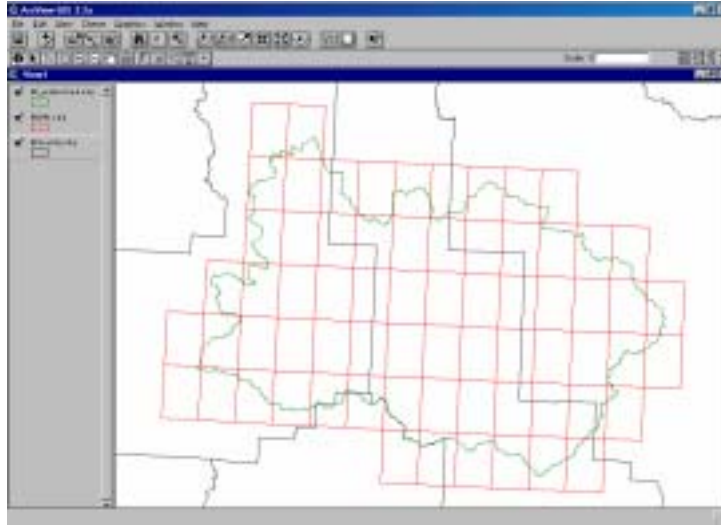
62. **Insert the Blackfoot Challenge Data CD.** Navigate to the CD drive and select the “**bf24k.shp**” theme and both the “**bf_watershed.shp**” theme, and the “**bf_counties.shp**” theme. To do a multiple themes at the same time, select the first theme, hold down the shift button and select the second and third themes. This should allow you to select multiple themes at the same time.



63. Go to the legend editor and change the foreground color of all three themes to the transparent color. Then change the outline color of the watershed theme to green, and the outline of the 24k theme to red. Turn the outline of the counties to black.


Make sure you apply  your changes before you leave the legend editor.

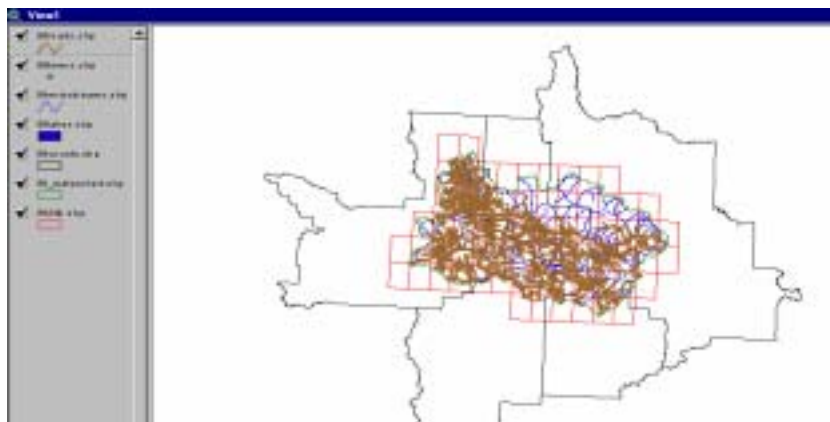
64. Check all three themes on in view 1 so that they appear on the screen.



65. Select the **Add themes** tool,  and select the following themes:

- a. **bftowns.shp**
- b. **bfroads.shp**
- c. **bfmrisstreams.shp**
- d. **bfakes.shp**

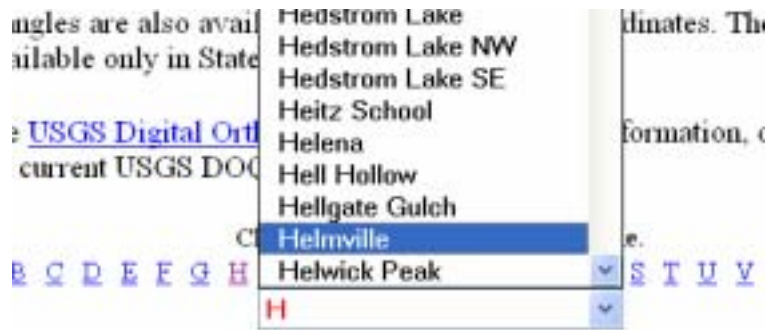
Again, adding multiple themes can be done at the same time by holding down the shift key while selecting the themes. When these themes are added, it may be wise to change the color and the appearance of some of these themes. Change the water to a blue color, the roads to a brown color, and the towns to a green color. Remember, to do this you must double click to get into your legend editor and manipulate the colors. Again, make sure you  your changes before leaving the editor menu. You should now have a view that looks something like this:



66. Now we need to navigate to the nris website for data of Montana. The website is <http://nris.state.mt.us/gis/default.htm>. We want to find the orthographic photo for our area. Remember to check the map at the top of the page to help with this.

- [USGS Orthophotos \(DOO's\)](#)

Select this link on the opening nris page.



On the next page, select the letter “H”, and in the drop down box, pull down until you see the selection for Helmville. This will be the Helmville quadrangle photo. Download times differ depending on the connection speed. You may wish to download this file and save it to a specific location for your students.

Compressed image in [MrSID](#) format.
Image size is approximately 8 megabytes.



Quad Name	Image File	World File
Helmville	Image (.sid)	World File (.sdw)


When downloading, be sure to download the MrSID format which is usually designated with a “filename”.sid. Arcview will recognize this format when the Mr. Sid extension is turned on. Remember to save it to a location that will easily be located.

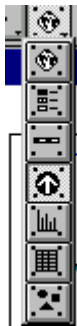
67. Now, in Arcview, make sure the extension for Mr. Sid is turned on. (Refer to worksheet two if you can't remember) Then add the image to the current view.
68. Select the DOQ as the active theme, and zoom to the selected theme. Now drag the image to the bottom of the theme list so the other themes will be projected on top of the image.
(Image)
69. Now in Arcview, open a new view with just the photo of Helmville and the data on top of the photo. To do this minimize the current window, and select “New View”. This will open a new view with the same data in it. Go back to View 1 and zoom to full extent. This will then give an overview of all of the themes that are being projected. View 2 will remain the zoomed in view of just the photo and the overlapping themes.
(Image)
70. We are now ready to download information from our GPS units. To do this you will have to have the DNR Garmin extension downloaded and installed on your computer, and the extension turned on in Arcview. At the top of the View 2 screen, the toolbar should have a DNRGarmin option. Before selecting this option make sure your GPS is hooked to your computer via the cable, and the GPS unit is on. If the GPS unit is not on, you will not be able to download any information from the unit. Select “open Garmin GPS” option in the drop down menu. This will take you to a screen outside of Arcview. Again make sure you save your files in a place that you will be able to navigate to. Save the files from the GPS to your computer.

71. Now, select the add theme option, and turn the themes on. Notice you have now successfully uploaded information from your GPS to the Arcview program and projected that data onto existing data. Now you can label each of the themes accordingly: name and house, name and yard. Again, you can go into the legend editor and change colors, and thicknesses of the lines. We are now ready to print our project.
72. Close the view screen, and it should take you back to the main project screen.




Click on the **layout button**  and select . This will bring you to a layout template where you can design how your printout looks.


73. In the Menu at the top of the screen, choose the “Layout” option. In the drop down menu that follows, scroll down to “use template”. Scroll down and select one of the options from the menu.
74. Now we need to have both views in our layout. To do this you must click on the **view frame button**  and hold down. A drop down menu will once again



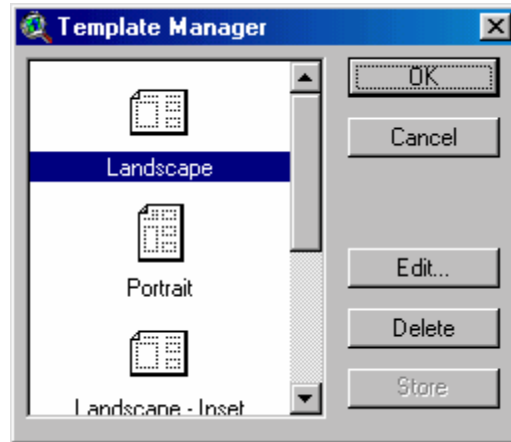
appear. From this menu, choose the box that has the picture of the globe on it. This will give you a small cross, with which you will drag a box on your layout into which the north arrow of your choice will fill. When you drag the box and release the mouse button, a menu will appear so you can choose which view will be in the box that you have just created. You can then resize your box, add more views, and a legend that corresponds to each view by using the drop down menu from above.

75. Now lets add a title to our map. Select the **text tool**  and hold down on the left mouse button when you click on it. Notice that a drop down menu appears.



Select the option with the white square box around the T. A small circle with a dot will appear. This selects the location of your text box. Move the dot over to the right of your view 1 and click one time. A box will pop up. In the text area type “My Yard”, and select the centered option. Then click OK. The text is entered and centered in a box. This box looks a little small, however, so select the **pointer tool**  and click on the text box. Notice it gives us four dark squares, one in each corner of the text box. Click on one of these squares and drag the corner to make our text box larger. We have now created a title for our printout.

76. Now we can print our project. Before printing however, go to the layout screen and manipulate how the printout will look by selecting on the pointer tool, and clicking on the items in the layout screen and dragging and dropping them in different positions within the layout screen.
77. Now that you know how to setup a layout, there are already some layout templates that can be used and manipulated as well. In the view menu, choose the layout option.



Many templates will be available to choose from. Select one, and view the layout of view1. Notice how it adds all of the items that we manually added to our layout, plus adds a few other options. Save your project, and print out your final layout.