Tree identification and basic orienteering with GPS technology

Subject/target grade: *High school or college students in any course related to ecology, environmental science, or nature interpretation.*

Duration: *One 3-hour session, although lesson can be expanded into multiple sessions.*

Setting: *This lesson was designed for species common to the "mixed northern forests" of the Great Lakes region, but could easily be modified for use in any forested setting.*

Materials/equipment: *Hand-held GPS units (Garmin e-trex20 used in this example), tree identification books, background readings on traditional plant uses, forester's diameter tape, clinometer.*

Lesson overview: This lesson builds upon previous studies of northern Michigan tree species and traditional Ojibwa uses of them, while introducing students to simple functions in hand-held GPS technology. Students will work in small groups to learn basic field orienteering skills with the GPS units, leading them to pre-determined locations (waypoints) in the forest. Each waypoint will correspond to the location of a tree that students will identify based on a series of clues in their lesson handouts. Clues will relate to trees' physical characteristics and traditional Ojibwa uses. For an optional follow-up lesson, each student group could essentially re-create the activity – programming their own hiking route and waypoints – and swap their "quizzes" with the other student groups. While learning new technology, students engaged in this activity will also benefit from being active outdoors, making hands-on connections with nature, and being challenged to solve the "mysteries" presented to them at each site.

Learning outcomes: After completing this lesson, students will be able to:

- Use hand-held GPS units for basic field orienteering skills in the forest
- Load waypoints into GPS units for use in future activities
- Identify tree species based on physical characteristics and traditional Ojibwa uses

This lesson requires significant advanced preparation. Instructors wishing to create their own version of this lesson will be required to walk their study site beforehand, identifying features to be used in the lesson and pre-loading waypoints into each group's GPS unit. Quiz questions related to each waypoint will need to be created. Furthermore, each student group will need to be given different routes (containing different waypoints), so the preparation will essentially be repeated several times based on how many groups of students will be established.

ES110 Introduction to Environmental Science

Lab activity: Tree identification and basic orienteering with GPS technology

Group number:_____ **Names:**

_____

_____

_____

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Introduction: This activity will introduce you to basic functions of hand-held GPS technology as we explore the forests of the Sand Point Recreation Area. Think of this activity as a "scavenger hunt", where you'll be locating, identifying, and describing trees of Ojibwa cultural significance. This lesson builds on our previous discussions of tree characteristics and their traditional uses as well as our use of basic forester tools such as diameter tapes (to measure trunk size) and clinometers (to estimate tree height). You'll also need to recall basic terms and concepts used to describe features of trees.

Instructions:

- **Form a group.** You will be working in groups of 4 or 5, and each group will work together and will hand in **one** worksheet. Assemble your group now, and put all of your names in the box on the top of this sheet. Once groups are formed, I'll assign each group a group number.
- **Gather the equipment you'll need.** Each group will need the following supplies: A GPS unit (Garmin e-trex 20), a tree identification book (*Michigan Trees*, by Barnes & Wagner), a forester's diameter tape, a clinometer (Suunto model 1030), and your notes from our traditional tree use activity.
- **Participate in my mini-lesson on using the GPS unit.** Before heading out into the woods, you'll need to know how to use the functions of the GPS unit to accomplish your mission! Begin by powering the unit on, holding the button on the right side of the device. Wait for it to acquire a signal. The mini-toggle button on the face of the unit lets you scroll through menus on the screen and can be pressed straight down to enter selections from the main screen. I'll work with groups individually to make sure you're familiar with the menu and the basic functions we'll be using.

Notes: ***Each group's unit has been pre-loaded with a different route.*** In other words, groups will not be going to the same locations.

Waypoints are the locations the GPS will be leading you to. I programmed each GPS unit with a route containing five waypoints. Start by selecting **"Where to?"** on the main menu, then select **"Waypoints"**, then select **"Go"**. You'll repeat this step once you complete your mission at each waypoint along the route. I'll be available to help along the way.

- ***Let the adventure begin!*** Your challenges in this activity are to (1) use the GPS unit to locate each waypoint, and then (2) figure out what I sent you there to find. Once you're at each location, stop and look around you as you read the description I provided for each site. Somewhere in the immediate vicinity of each waypoint is a tree species for you to identify using the hints below. Consider this part of the activity the "mystery" that you need to solve. Using the hints, your tree ID book, and the forester tools, your job is simply to write the common name and the scientific name of the tree I directed you to. This might be more challenging as you think, since your waypoint may be located in a dense growth of forest. Which tree did I direct you to? Follow the hints and make your best guess at each site! Record your answers on the last page of this handout.

  Note that you all groups are given the same handout. For each waypoint, be sure to follow the instructions for your group only and write your answers in the appropriate places as you go through this activity.

Waypoint #1

Group 1: This deciduous tree typically grows in clumps in semi-open canopies. Although it can be used to make medicinal teas and for treating skin problems, its greatest traditional use is in the construction of canoes.

Common name: _____

Scientific name: _____

Group 2: Your tree at this location has a DBH of approximately 10 inches. It is a coniferous tree that grows in a wide range of environments across the region. Many Native cultures called it "the tree of peace". Ojibwa uses of this tree include the numerous benefits of the tree's sap, such as its antiseptic properties and its handiness as a waterproofing agent.

Common name: _____

Scientific name: _____

Group 3: This location features an abundance of these trees growing in the understory, with the tallest individual being about 30 feet in height. They are a coniferous species, with resin that can be used to treat coughs and skin sores. Its bark has also been used as a medicine.

Common name: _____

Scientific name: _____

Waypoint #2

Group 1: The largest of this deciduous species at this location has a DBH of approximately 9 inches and a height of approximately 60 feet. Its roots can be used as a sturdy cord. Its cones are longer a larger than those of its nearest relative.

Common name: _____

Scientific name: _____

Group 2: This species can thrive in almost any environment in northern Michigan. You'll find it at this location in a mixture with a very common relative. This species, however, features leaves with serrated edges, which should make it easy to distinguish from the others. Its bark can be boiled in water to make a tonic for treating sore eyes, diarrhea, and cramps.

Common name: _____

Scientific name: _____

Group 3: This location features a tree species that is particularly sacred to Ojibwa peoples. Its leaves can be used to make tea to treat headaches and colds. It can also be used in cough syrups and steam baths to treat rheumatism, arthritis, congestion, and gout. The beautiful, fragrant wood is very durable and rot-resistant, making it useful for lodges, canoes, and many other items.

Common name: _____

Scientific name: _____

Waypoint #3

Group 1: This deciduous understory tree has unique bark and very hard wood that is ideal for making tool handles, skis, posts, bows, and other items that require high durability. It rarely reaches a tall enough height to penetrate the canopy; rather it lives happily in the shade below its larger neighbors.

Common name: _____

Scientific name: _____

Group 2: This conifer species can thrive in almost any environment in northern Michigan except those that are either too wet or too dry. The largest one in this location has a DBH of approximately 6 inches and a height of approximately 45 feet. Its cones are larger and more oblong-shaped than its nearest relative.

Common name: _____

Scientific name: _____

Group 3: This particularly sacred tree species that has many uses to the Ojibwa (naming the most obvious use here would make this question too easy, however!) Instead, identify it based on the following hints. It is a large deciduous tree with leaves arranged oppositely on the twig. Leaf edges are smooth but feature prominent lobes. The height of the largest individual at this location exceeds 80 feet and the trunk has a DBH of about 15 inches.

Common name: _____

Scientific name: _____

Waypoint #4

Group 1: This location features a very sacred tree with leaves can be used to make tea to treat headaches and colds. It can also be used in cough syrups and steam baths to treat rheumatism, arthritis, congestion, and gout. The beautiful, fragrant wood is very durable and rot-resistant, making it useful for lodges, canoes, and many other items.

Common name: _____

Scientific name: _____

Group 2: This deciduous tree is often found mixed between the hemlocks, spruces, and maples of the typical “northern forest”. Its wood is very useful for a wide range of items. Its leaves have serrated edges and parallel venation. There is only one individual near this waypoint, with a DBH of approximately 8 inches.

Common name: _____

Scientific name: _____

Group 3: The conifer species at this location was much more common in our forests before the logging era of the late 1800s. Its regeneration is challenged by the overpopulation of deer that browse on its needles. It has surprisingly small cones for its size. The bark and needles of this tree have many medicinal uses. The large individual in the vicinity of this waypoint has a DBH of approximately 18 inches and a height of nearly 100 feet.

Common name: _____

Scientific name: _____

Waypoint #5

Group 1: This species can thrive in almost any environment in northern Michigan. You'll find it at this location in a mixture with a very common relative. This species, however, features leaves with serrated edges, which should make it easy to distinguish from the others. Its bark can be boiled in water to make a tonic for treating sore eyes, diarrhea, and cramps.

Common name: _____

Scientific name: _____

Group 2: This location features many of these trees growing in the understory, often in dense clusters. Its needles are aromatic and are oriented around the twig in a "flat" manner when the tree is growing in a shady environment. It has countless traditional uses for Ojibwa cultures, particularly with a resin that can be used to treat coughs and skin sores. Its bark has also been used as a medicine.

Common name: _____

Scientific name: _____

Group 3: This deciduous tree is often found mixed between the hemlocks, spruces, and maples of the typical "northern forest". Its wood is very useful for a wide range of items. Its leaves have serrated edges and parallel venation. There is only one individual near this waypoint, with a DBH of approximately 8 inches.

Common name: _____

Scientific name: _____

Congratulations, your tour of the woods is complete! Do you think you solved the mysteries at each waypoint? Return to our meeting location to find out!