

# **FORESTRY STATION**

*Users will notice that the essential topics listed are general, comprehensive, and broad in contrast to the references that focus on specifics. When examining materials on the reference list, focus on key ideas. For example, try to understand the big picture significance of the various laws in Maine, to help you decide which facts are important.*

## **ESSENTIAL TOPICS**

- 1. Understand and Use Forestry Terms**
  - a) Glossary
  
- 2. Identify Major Trees of Economic Importance in Maine**
  - a) Know the economically important trees of Maine
  - b) Key out and identify the major trees of Maine
  - c) Common forest shrubs and ground covers
  - d) Timber types
  
- 3. Economics of Forest Resources**
  - a) Recreation
  - b) Forest Products
  - c) Aesthetics
  - d) Forest Management
  
- 4. Understanding Interactions with Forest Resources**
  - a) Living (human and wildlife)
  - b) Nonliving (water, weather, soils, topography)
  
- 5. Protection of Forest Resources**
  - a) Wildfire
  - b) Insects
  - c) Diseases
  - d) Impact of Human activity
  
- 6. Identify Hand Tools, Equipment, and Their Uses in the Forest Industry**
  - a) Forestry measurement and scaling equipment such as clinometers, 10 factor prisms, cruz-alls, global positioning satellites, and others.
  - b) Forest harvesting equipment
  - c) Planting equipment
  - d) Safety equipment
  
- 7. Recognize and Understand Approved Silvicultural Practices**
  - a) Harvesting techniques (methods)
  - b) Thinning/pruning schedules
  - c) Regeneration methods
  - d) Timber stand improvement

- 8. Recognize the Economic Impacts and Agencies Responsible For Forestry In Maine**
  - a) Size of forestry industry
  - b) Types of forestry industry
  - c) Agencies responsible for Maine forests (Federal, State and Local)
  
- 9. Ability To Take A Forest Inventory**
  - a) Reading maps (land description)
  - b) Interpreting aerial photographs
  - c) Cruising standing timber
    1. Diameter
    2. Height
    3. Volume
    4. Species
  
- 10. Urban Concerns**
  - a) Street trees
  - b) City Parks
  - c) Greenways
  
- 11. Recycling - Fiber**
  
- 12. Current Maine Forestry Issues**
  - a) Sustainability
  - b) Proposed State Legislation
  - c) Ecosystem Management
  - d) Biodiversity

**Suggested ways of preparing for the Forestry section of the Maine Envirothon:**

1. Find a variety of wooded areas around the school and identify the trees. Try to get a variety of conifers, deciduous, young forests, mature forests, and upland and wetland areas. Try to figure out why each tree species grows where it does and what kind of forest trees are growing in the understory or unmowed fields.
  
2. Find a clear area close to a forest. Drive a stake in the ground in the clear area. Practice using a compass, taking readings from the stake to different trees, and then from the trees back to the stake. Practice converting from bearings to azimuths and back. Learn what the magnetic declination is for your area and practice converting from magnetic compass readings to true compass readings.
  
3. Choose a small wooded area and inventory the trees: Map the boundaries using map and compass skills (use both azimuth and bearing methods), measure the boundaries by pacing, set up 1 or 2 tenth acre plots and measure all the trees using a Biltmore stick, and estimate the volume of sawlogs, pulp, boltwood, and firewood using various volume tables. Also note suitable wildlife habitat.

4. Develop simple forest management recommendations for your forest taking into considerations how to: get a reasonable return for harvesting (where suitable), protect or enhance wildlife habitat, maintain good tree growth and regeneration. You may want to develop different plans given different landowner goals. Compare the advantages, disadvantages and sustainability, and economic return for the various plans. Review current regulations to make sure your plans comply.
5. Develop an erosion and sedimentation plan for a potential or pre-existing woods road.
6. Develop a library of current issue articles and discuss current issues taking into consideration ecological, economic and social factors.
7. Discuss the uses of trees around town or your school and ways to enhance trees in your area (i.e. tree planting, wind breaks, sound barriers).

### **REFERENCE MATERIALS LIST FOR FORESTRY**

**Contact Persons:**     **Merle Ring, District Forester**  
**Maine State Forest Service**  
**131 Bethel Road**  
**West Paris, Maine 04289**  
**(207) 674-3787**  
**Email: Merle.Ring@state.me.us**

**Geneva Duncan-Frost, Consulting Forester**  
**P.O. Box 316**  
**Perry, Maine 04667**  
**(207) 853-4192**  
**Email: afrost@hughes.net**

#### **PART I     Essential Reference Materials for the 2009 Envirothon**

1. *Forest Trees of Maine.* Single copies available free from your Maine Forest Service, District Forester, or the Department of Conservation, Maine Forest Service, Attention Jennifer Wright, #22 State House Station, Augusta, Maine 04330; 1-800-367-0223.
2. *Using the Compass,* CD provided Maine Forest Service. To request, contact Merle Ring, MFS, 131 Bethel Road, West Paris ME 04289; 1.207.674.3787.
3. *Yankee Woodlot Series:*

#7077	<i>Where Is It? #2</i>	- \$ .50
#7075	<i>What's On It? #3</i>	- \$ .50
7079	<i>Working With It</i>	- \$ .50
#7060	<i>Harvesting It #7</i>	- \$ .50
#7007	<i>Basic Mapping</i>	- \$2.50
#27	<i>Measuring Trees</i>	<i>Free</i>

- #7070      *Raindrops Keep Falling: How Woodlands Affect  
Our Water Supply-Free*
- #7103      *Units of Measure and Conversion Factors  
for Forest Products -Free*

This information is available from your county University of Maine Cooperative Extension Office or UMCE, State Publications Office, 5741 Libby Hall, Orono, ME 04469-5741; 1-800-287-0274.

4.    *Landowner's Guide To Forest Stewardship Practices:*  
#2    *Forest Management Planning*  
#8    *Harvesting Wisely*  
#9    *Wildlife Management*  
#11   *Forest Soils*  
Available from the Maine Forest Service (see #1 above).
5.    *Soil Survey*, Natural Resources Conservation Service. This information is available at your local Soil & Water Conservation District Office.
6.    Boy Scout and Girl Scout Handbooks.
7.    *Best Management Practices Field Handbook*. Free from: Department of Conservation, Maine Forest Service, 1-800-367-0223 or 287-2791.
8.    *Sustainable Forestry Initiative*. Available from most paper companies.
9.    *Field Guide To Laws Pertaining To Timber Harvesting In Organized Areas of Maine*. Available free from: The Maine Department of Environmental Protection, #17 State House Station, Augusta, ME 04333; 1-800-452-1942.
10.   *The Current Survey, Forestry Report* developed by the US Forest Service. Available from: The Maine Forest Service-see #'s 1 above.
11.   *Conservation Trees For Your Farm, Family and Future*. Single copies available free from: The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410; (402) 474-5655.
12.   *Benefits of Urban Trees*. Available from: USDA Forest Service, Southern Region, 1720 Peachtree Rd., NW Atlanta, GA 30367-9102.
13.   Intent to Harvest Form
14.   New Forest Practices Act
15.   Biltmore Stick
16.   *About GPS* (Included in this packet - scroll to bottom; also on the Internet: <http://www.garmin.com/AboutGPS/>)

**PART II      Additional References**

16. *Natural Resource Highlights: The Forest of Maine Yesterday, Today, Tomorrow* Feb. 1987.
17. *Forestry Fact Sheets: (Maine Forest Service)*  
#1 *Weeding Young Forests*  
#4 *Boundary Information*  
#5 *The Profit in Pruning*
18. *4-H Forestry Unit B (Forests)*, Cooperative Extension  
Note: *Units A (Trees)* and *Unit C (Careers)* are also useful.
19. *Forests and Forestry*, 1982, David A. Anderson and I.I. Holland. The Interstate Printers Publishing Inc., Danville, Ill.
20. *Elementary Forestry*, 1981, Edited by Karl Wenger for the Society of American Foresters, 5400 Grosvenor Lane, Bethesda, MD.
21. *Lumber from Local Woodlots*, NRAES-27  
Northeast Regional Agricultural Engineering Service, Cornell University,  
152 Riley-Robb Hall, Ithaca, New York 14853
22. *Wildlife Habitat Evaluation Handbook* (4-H, CES Covers all US) Cooperative Extension, Colorado State University, Fort Collins, Colorado 80523;  
(303) 491-1101 Fee unknown
23. *Mandatory Shoreland Zoning Act and Revisions, State of Maine Guidelines for Municipal Shoreland Zoning Ordinances* - Department of Environmental Protection, State House Station # 17, Augusta, ME 04333-0017
24. Forest Laws of Maine - Summary
22. Landowner's Guide To Forest Stewardship Practices
23. Report On Stumpage Prices
24. The Economic Importance of Maine's Forest
25. Forest Regeneration & Clearcutting Standards Summary, Forest Information Center, SHS #22, Augusta, ME 04333, 1-800-367-0223.

The following are brief publications by the International Society of Arboriculture.

Contact: ISA, P.O. Box GG, Savoy, ILL 61874: *Tree Selection, New Tree Planting, Avoiding Tree & Utility Conflicts, Insects and Disease Problems, Trees and Turf, Mature Tree Care, Plant Health Care*

University of Maine Cooperative Extension has a Publication List available from your County Extension Office. CES Forestry and Wildlife is at Room 107, 5755 Nutting Hall, Orono, ME 04469-5755; 1-800-287-0274

Suggested publications:

7000 *A Forester's Guide To Managing Wildlife Habitats In Maine*

7015 *Conifers of Maine*

7069 *Practical Economics of Woodlot Management*

7070 *Raindrops Keep Falling: How Woodlands Affect Our Water Supply*

7103 *Units of Measure and Conversion Factors for Forestry Products*

*Journal of Forestry* (Journals are a good source of information on current forestry issues.

Check your local library which may be able to obtain copies through interlibrary loan).

*American Foresters Journal*

Forestry Videos (Check for loaners from Maine Forest Service or Maine Forest Products Council).

The MBPN QUEST forestry show, produced in the fall of 1995, broadcast in January 1996.

ITV Earthminders Environmental Education Series. (Order copies of tapes from the Maine State Library. Two specific forestry shows to request are: *Wood Is Good*, and *Forestry: Cycles and Choices*.)

Forestry equipment supply catalogs have good photos and explanations of how field tools are used. Order from: Ben Meadows, 3589 Broad St., Atlanta, Georgia 30341 (1-800-241-6401)  
Forestry Suppliers, Inc., P.O. Box 8397, Jackson, MS 39284 (1-800-647-5368)

Project Learning Tree has some useful reference materials. Environmental concerns and forestry related topics are found in the high school module. To obtain a copy, educators must attend a workshop. For information, go to [www.mainetreefoundation.org](http://www.mainetreefoundation.org) or contact Pat Maloney, PLT Coordinator, 626-7990; [meplt@gwi.net](mailto:meplt@gwi.net)

The following three reference items pertain to urban forestry:

*The Planting and Care of Shade Trees.* Maine Forest Service Urban Forestry Publication.

*Trees and Shrubs For Your Community.* Electric Council of New England, 54 Middlesex Turnpike, Bedford, MA 01730

*Street Tree Fact Sheets.* Price is \$20.00. ISBN 1-883956-00-5. Order from: Publications Office, 112 Agricultural Administration Building, University Park, PA 16802.

*Planting Trees in Designed and Built Landscapes*

[http://www.na.fs.fed.us/spfo/pubs/uf/plant\\_trees/planting\\_trees.htm](http://www.na.fs.fed.us/spfo/pubs/uf/plant_trees/planting_trees.htm)

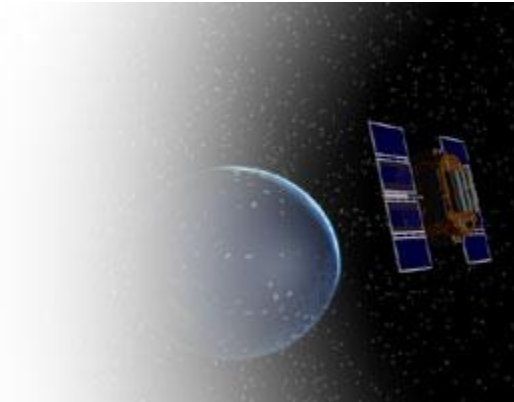
*Benefits of Trees in an Urban Area;* <http://www.coloradotrees.org/benefits.htm>

All of the following are available from the MFS Insect and Disease Lab, 50 Hospital St., Augusta, ME 04330; 287-2431:

*Field Book of Destructive Forest Insects*

*Integrated Crop Management Schedule for the Production of Christmas Trees*

*Major Hardwood Defoliators of the Eastern United States*



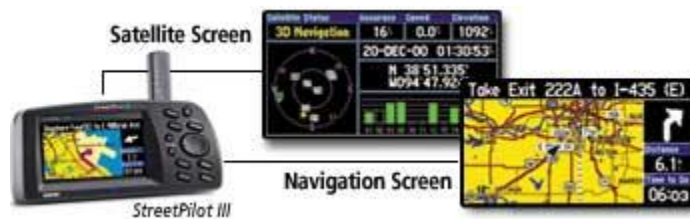
### GARMIN: WHAT IS GPS?

INFORMATION ON THE INTERNET AT:  
<http://www.garmin.com/AboutGPS/>

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

#### How it works

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

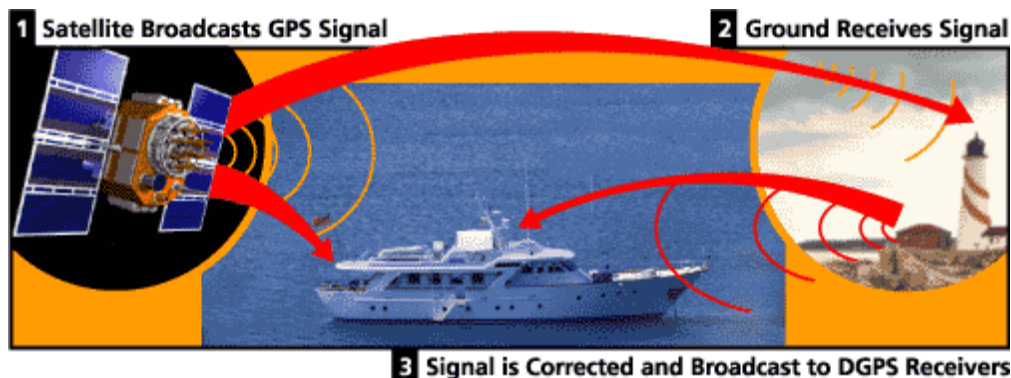


A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more.

#### How accurate is GPS?

Today's GPS receivers are extremely accurate, thanks to their parallel multi-channel design. Garmin's 12 parallel channel receivers are quick to lock onto satellites when first turned on and they maintain strong locks, even in dense foliage or urban settings with tall buildings. Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. Garmin® GPS receivers are accurate to within 15 meters on average.

Newer Garmin GPS receivers with [WAAS](#) (Wide Area Augmentation System) capability can improve accuracy to less than three meters on average. No additional equipment or fees are required to take advantage of WAAS. Users can also get better accuracy with Differential GPS (DGPS), which corrects GPS signals to within an average of three to five meters. The U.S. Coast Guard operates the most common DGPS correction service. This system consists of a network of towers that receive GPS signals and transmit a corrected signal by beacon transmitters. In order to get the corrected signal, users must have a differential beacon receiver and beacon antenna in addition to their GPS.



## The GPS satellite system

The 24 satellites that make up the GPS space segment are orbiting the earth about 12,000 miles above us. They are constantly moving, making two complete orbits in less than 24 hours. These satellites are travelling at speeds of roughly 7,000 miles an hour.

GPS satellites are powered by solar energy. They have backup batteries onboard to keep them running in the event of a solar eclipse, when there's no solar power. Small rocket boosters on each satellite keep them flying in the correct path.

Here are some other interesting facts about the GPS satellites (also called NAVSTAR, the official U.S. Department of Defense name for GPS):

- The first GPS satellite was launched in 1978.
- A full constellation of 24 satellites was achieved in 1994.
- Each satellite is built to last about 10 years. Replacements are constantly being built and launched into orbit.
- A GPS satellite weighs approximately 2,000 pounds and is about 17 feet across with the solar panels extended.
- Transmitter power is only 50 watts or less.



## What's the signal?

GPS satellites transmit two low power radio signals, designated L1 and L2. Civilian GPS uses the L1 frequency of 1575.42 MHz in the UHF band. The signals travel by line of sight, meaning they will pass through clouds, glass and plastic but will not go through most solid objects such as buildings and mountains.

A GPS signal contains three different bits of information — a pseudorandom code, ephemeris data and almanac data. The pseudorandom code is simply an I.D. code that identifies which satellite is transmitting information. You can view this number on your Garmin GPS unit's satellite page, as it identifies which satellites it's receiving.

Ephemeris data, which is constantly transmitted by each satellite, contains important information about the status of the satellite (healthy or unhealthy), current date and time. This part of the signal is essential for determining a position.

The almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits almanac data showing the orbital information for that satellite and for every other satellite in the system.

## Sources of GPS signal errors

Factors that can degrade the GPS signal and thus affect accuracy include the following:

- **Ionosphere and troposphere delays** — The satellite signal slows as it passes through the atmosphere. The GPS system uses a built-in model that calculates an average amount of delay to partially correct for this type of error.
- **Signal multipath** — This occurs when the GPS signal is reflected off objects such as tall buildings or large rock surfaces before it reaches the receiver. This increases the travel time of the signal, thereby causing errors.

- **Receiver clock errors** — A receiver's built-in clock is not as accurate as the atomic clocks onboard the GPS satellites. Therefore, it may have very slight timing errors.
- **Orbital errors** — Also known as ephemeris errors, these are inaccuracies of the satellite's reported location.
- **Number of satellites visible** — The more satellites a GPS receiver can "see," the better the accuracy. Buildings, terrain, electronic interference, or sometimes even dense foliage can block signal reception, causing position errors or possibly no position reading at all. GPS units typically will not work indoors, underwater or underground.
- **Satellite geometry/shading** — This refers to the relative position of the satellites at any given time. Ideal satellite geometry exists when the satellites are located at wide angles relative to each other. Poor geometry results when the satellites are located in a line or in a tight grouping.
- **Intentional degradation of the satellite signal** — Selective Availability (SA) is an intentional degradation of the signal once imposed by the U.S. Department of Defense. SA was intended to prevent military adversaries from using the highly accurate GPS signals. The government turned off SA in May 2000, which significantly improved the accuracy of civilian GPS receivers.

