Tree Mapping - Standard

Purpose

To prepare the Carbon Cycle Site for tree circumference measurements by identifying and mapping all trees greater than 15cm circumference.

Overview

Using skills they gained during *Carbon Cycle Site Set Up* and class field learning activities *(How to Measure Trees, Biomass Units, Allometry: Not a Llama Tree)* students will work in small groups and use scientific field methods to map and identify trees on the Carbon Cycle Site. **This can easily been done at the same time as Tree Circumference and Shrub/Sapling Sampling.*

Student Outcomes

Students will be able to:

- Work as a team to delegate and complete field tasks
- Use their knowledge of accuracy and precision to carry out scientific measurements (azimuth, distance, CBH) on all trees greater than 15cm circumference in the Carbon Cycle Site.
- Students will use tree identification keys and guides to ID trees

Questions

Unit (examples)

- How much carbon is being stored in the trees near my school?
- Is there more carbon in the global population or the vegetation of ____?
- How does carbon uptake in our schoolyard compare to carbon emissions from our school? (at least 2 years worth of data needed)

Science Concepts

Grades 9-12

Scientific Inquiry

- Design and conduct a scientific investigation
- Use appropriate tools and techniques to gather, analyze, and interpret data
- Use mathematics in all aspects of scientific inquiry

Science in Personal and Social Perspectives

- Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models

NGSS (Black-covered directly, gray-addressed, but not directly covered)

- *Disciplinary Core Ideas*
  - Gr.6-8: LS4.A
- *Science and Engineering Practices*
  - Planning and carrying out investigations
  - Using mathematics and computational thinking
- *Crosscutting Concepts:*
  - Patterns

Time/Frequency

70 minutes (travel time not included)

Only needs to be completed once for each site.

Level

Secondary (Middle & High School)

Materials and Tools

Materials and tool numbers are listed for each of 4 quadrant groups (North, South, East, West).

- Clipboard (1)
- Pencil (2)
- *Tree Data Sheet* (1)
- *Tree Mapping Student Field Guide (graphics, azimuth, distance, species, ID)*
- Compass (1-2)
- Flexible measuring tape (30-50m) (1)
- Tree identification guide/local species keys (2)
- *Tree Circumference Guide* (2)
- (optional) *Species Group List*

Prerequisites

- A Carbon Cycle Site should already be set up.
- *Learning activities (Biomass Units, How to Measure Trees, Allometry: Not a Llama Tree)*
- *Develop an Investigation Plan* (optional)
- Practice species identification. (See *GLOBE Landcover: Leaf Classification Learning Activity)*

Preparation

- Divide the class into 4 quadrant groups of ~6 students each. You may want to consider two groups if you have a small class (thus the field process will take longer than suggested)
- Review and make a copy of the *Tree Data Entry Sheet* for each quadrant
- Review, make 4 copies, and laminate the *Tree Mapping Student Field Guide* (students do not need to write on the protocol guides, so laminating them ensures saved time, money, and resources)
- If you are new to student field excursions read *Going Outside* (in the *Site Set-up Teacher Guide*)

What To Do and How To Do It

PREPARE TO GO OUTSIDE **Grouping:** Small Groups **Time:** 20 Minutes

- Review expected student behavior while in the field.
- Divide into Quadrant Teams.
- Students gather field materials and tools.
- Students review the *Tree Mapping Student Field Guide* and *Tree Data Sheet* and ask questions.
- Highlight a few areas of the *Tree Data Sheet:*
  - Tree # Column: While you may not plan to physically number the trees it is good to have an established numbering system so the trees can easily be referenced. The tree below has been numbered NE 1 for the first tree encountered in the Northeast Quadrant as you move around the site in a clockwise direction.
  - Tree #s _____: This is to be used after the first year to indicate to students the set of trees they are responsible for measuring *Tree Circumference* on.
  - Collection Year: This is important if you wish to track tree growth over time. *Fill in the collection year # to note how many years this sample site has been studied, and then record the collection date year. After the first year you will want to print the previous year's data sheet for students so everyone is sure the measurements of each tree* are comparable from year to year. If a tree has decreased by more than 1cm CBH, students should check if the tree has died. If it has died, put a "d" in the circumference column and record DEAD with the date in the "notes" section of the *Tree Data Sheet*.
- Review the Tree Data Collection Challenge – Team Scoring Rubric (found at the end of the *Tree Mapping Student Field Guide*) to make sure students know how they are being graded while in the field (optional and best completed in tandem with the *Tree Circumference protocol).*

Tree #s:						Collection Year #: 1	Collection Year #: 2
					Date:	2016	2017
Tree #	Azimuth (degrees)	Distance (m)	Notes	Species Scientific Name	Species Group	CBH (cm)	CBH (cm)
NE 1	2	5	Red Maple	Acer rubrum	Maple Oak	60	61.5

PERFORM MAPPING	**Grouping:** Small Groups	**Time:** 50 Minutes

Students should follow the procedures for each task in their Student Guide.
**Note: This can be done in conjunction with Tree Circumference, Shrub/Sapling and Herbaceous Field measurements.*

NOTES:

- If the Species ID team does not use the *Species Group List* in the field, this step will need to be done before or during data entry.
- You may choose to tag or number your trees to eliminate student confusion. If you follow this route be sure to check with school administrators about potential future use of the forested area, as tags can cause a problem if trees are harvested. Please be aware that tagging and painted numbers can call attention to the site, which may result in vandalism. (See *Tree Tagging* below for field instructions on how to safely tag trees.)
- In subsequent years, after the initial site set up you will need to occasionally map trees that have grown to 15 cm or greater. The mapping procedures should be followed for each "new" tree. This can be done when students go out to perform *Tree Circumference.*
- If you choose not to have students perform *Tree Mapping* after the initial year it is suggested that students view and discuss the sample site before performing *Tree Circumference.* Use the *Discussion Points for Site Visit* (in the *Site Set-up Teacher Guide*) as a guide.

Assessment

Tree Data Collection Challenge – Team Scoring Rubric

Quadrant Teams compete against each other to complete their field tasks. To win the challenge students will be graded on a number of factors. The rubric found at the end of the *Tree Mapping Student Field Guide.*

NOTES:

- Check the precision, accuracy, and completeness of collected data.
  - Either you or a student pair from another team can randomly select 2-4 trees and check all of its measurements.
- How quickly all tasks are completed may be different for quadrants if there are significantly more trees in one area of the site.

Resources

- Carbon Cycle eTraining: www.globe.gov/get-trained/protocol-etraining/etraining-modules/16867717/3099387

Tree Mapping - Student Field Guide

Quadrant Team _____

Names _____

_____

Task

Work as a team to map trees greater than 15cm circumference on your Carbon Cycle Site.

Materials

- ❑ Clipboard (1)
- ❑ Pencil (2)
- ❑ *Tree Data Entry Sheet* (1)
- ❑ *Tree Mapping - Student Field Guide (azimuth, species ID, distance)*
- ❑ Compass (1-2)
- ❑ Flexible measuring tape (30-50m) (1)
- ❑ Tree identification guide/local species keys (2)
- ❑ *Species Groups List* (2)

Procedure

1. Your quadrant team (North, East, South, West) is written at the top of the page. All of the following field procedures are to help you map your quadrant.

2. Read the attached field instruction guides and diagrams. Observe how many people should work on each task. Also view the *Tree Data Sheet.* Write down anything that is unclear and discuss it with your team and the teacher.

3. Select a team data recorder. This person should be able to write clearly and record data quickly and accurately. The data recorder will need the *Tree Data Entry Sheet*, a clipboard and one pencil.

4. Divide remaining team members between the Azimuth, Species ID, and Distance groups. The Azimuth group should help orient all other team members to the quadrant (following their initial field guide instructions).

5. When azimuth, species ID, and distance are complete, your team is ready to make tree circumference at breast height (CBH) measurements. (You may also be asked to perform CBH simultaneously with mapping.)

Field Guide Instructions - **Azimuth**

Azimuth Group - 2 people

Task

Find the azimuth from plot center to the center of all live trees greater than 15 cm circumference on your Carbon Cycle Site.

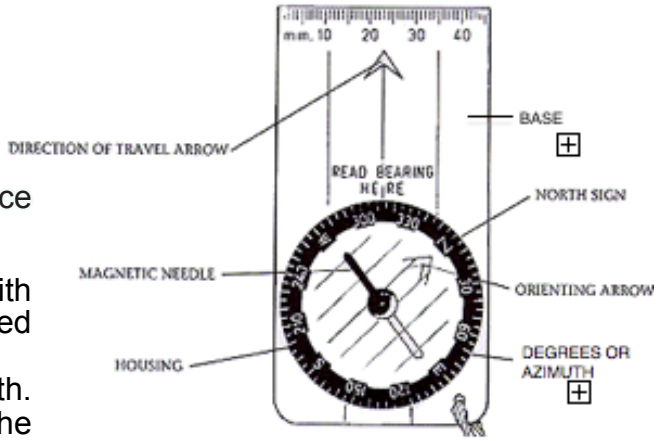
Materials

- ❑ Compass

Procedure

1. Stand at the center of the plot and face north.

   a) Hold the compass in front of you with the direction of travel arrow pointed away from you.
   b) Turn your compass housing to north.
   c) Turn your body until the red is in the shed.



2. Show your Quadrant Team where the cardinal directions are (N, E, S, W) and specifically where the boundaries of your quadrant are located.
3. To find the azimuth to the first tree in your quadrant, turn your compass housing to the direction indicated by your quadrant name, as you did for north. Then turn your body until you are facing that direction and red is in the shed.
4. Now turn your body clockwise until you are facing the first tree in your quadrant. (Keep in mind it may be far away {15-20m}.)
5. Turn your compass housing until red is in the shed.
6. Read the number that is lined up with the direction of travel arrow. This is the azimuth from the center of the plot to the tree you are looking at.
7. Have the second azimuth group member check the azimuth.
8. When you both agree, record the azimuth on the Tree Data Entry Sheet.
9. Repeat this process for each tree on the plot.

Field Guide Instructions - **Species ID**

Tree Species Group - 2-4 people

Task

Identify species (or general species group, e.g. pine, oak) for all live trees greater than 15 cm circumference on your Carbon Cycle Site.

Materials

- ❑ Clipboard
- ❑ Pencil
- ❑ *Tree Data Sheet*
- ❑ Flexible measuring tape (best if 150cm – 300cm)
- ❑ Tree identification guide/local species keys
- ❑ *Species Groups List* adapted from Jenkins et al. paper

Procedure

1. Start with the first tree in your quadrant and work around the plot clockwise, following the azimuth team.
2. Using a species ID key or guide, identify the genus and species (and optional: common name) of each tree.
3. Report species information to the team data recorder to be recorded on the Tree Data Entry Sheet.
4. Repeat this process for all trees in your quadrant.
5. After completing species ID, use the Species Groups List (or similar classification system) to assign all recorded species into species group categories. [This step can also be done during data entry into the computer.]

Field Guide Instructions - **Distance**

Distance Group - 2 people

Task

Measure the distance from plot center to the center of all live trees greater than 15 cm circumference on your Carbon Cycle Site.

Materials

- ❑ Flexible measuring tape (50m)

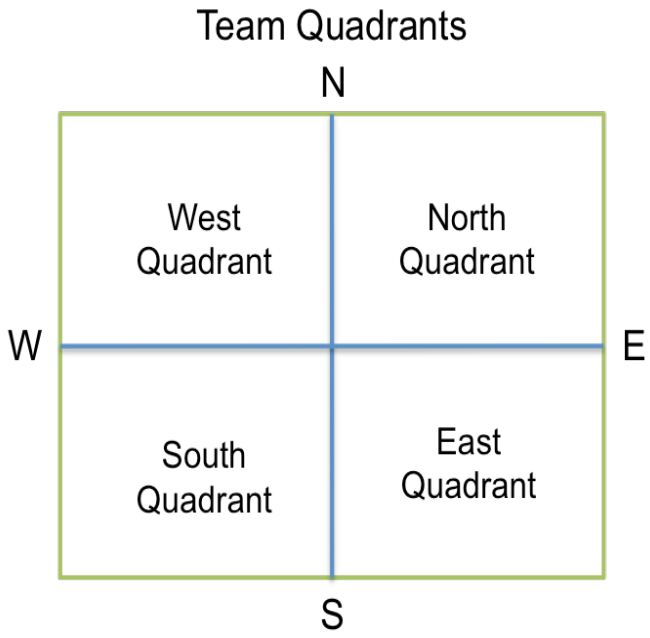
Procedure

1. Person one: Stand at plot center facing the direction of your quadrant name (N,E,S,W) and hold the crank handle of the measuring tape.
2. Person two: Pull the end of the tape out to the first tree clockwise from the direction you are facing.

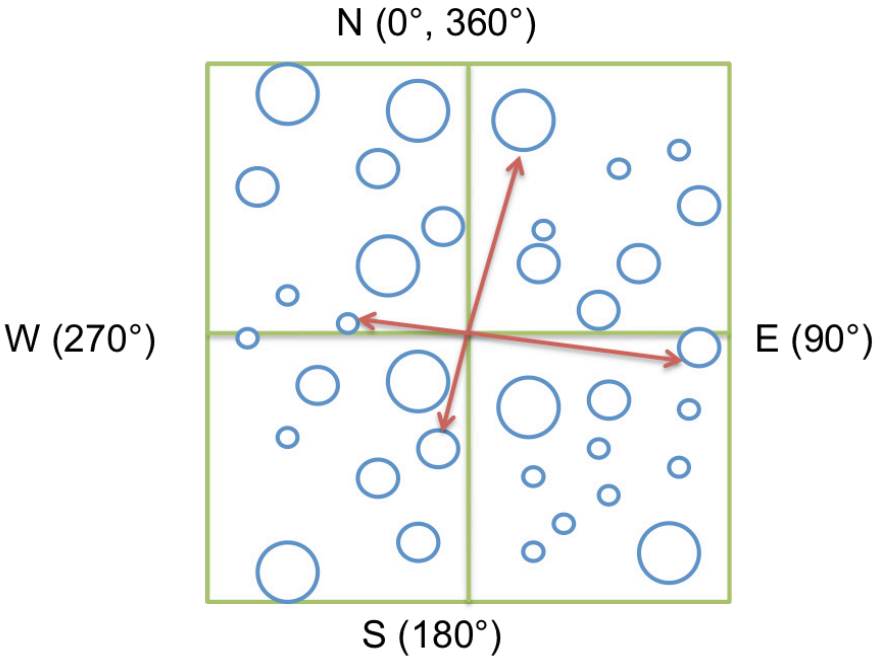
   a) Be careful to make as straight of a line as possible between the center and the tree.

   b) If there is an obstacle in the way measure the distance to that point and then walk to that point and measure from there to the desired tree, remember to add the measurements together to get total distance.
3. Record the distance in meters to the nearest tenth (e.g.13.2m) on the Tree Data Entry Sheet.
4. Have the data recorder repeat the distance back to you after they have recorded it to make sure it was recorded correctly.
5. Repeat the process until the distance to all trees is measured.

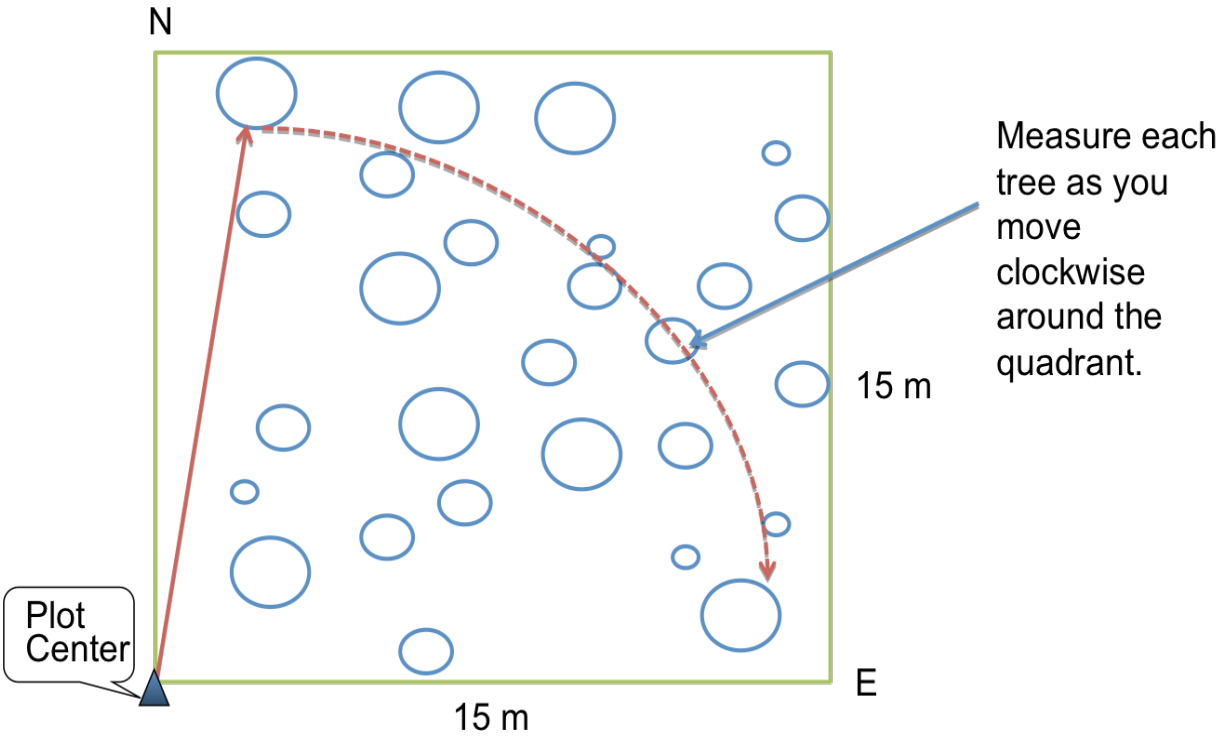
Tree Mapping Diagram 1



Sample: First Tree in Each Quadrant



Tree Mapping Diagram 2



Azimuth	Distance	Species	Notes	Circumference
15°	14m	Acer rebrum (Red maple)		50cm
85°	6.5m	Pinus strobus (White Pine)	Forked, Measured at 1.25m	27cm

Tree Data Collection Challenge – Team Scoring Rubric

Criteria	Developing (Needs improvement)	Proficient (Average)	Exemplary
Tool Use	Tools were used for purposes which they were not designed or were not used correctly	Demonstrated correct tool use after some teacher guidance	Demonstrated proficient use of tools without teacher assistance
Measurements – Precision and Accuracy	Did not follow resource directions for difficult to measure trees, correct units were used occasionally, data did not typically match measurements made during peer evaluation	Followed resource directions, used correct units on data sheet, data mostly matched measurements made during peer evaluation	Closely followed resource directions, double checked difficult to measure trees, used correct units on data sheet, data matched measurements made during peer evaluation
Tree Data Entry Sheet	Data sheet is incorrect, incomplete, or illegible	Data sheet is completed, legible, and notes are filled out where appropriate	Data sheet is completed, legible, and any notes are clear, concise (scientific in nature)
Participation	Some team members are involved in the data collection process.	All team members are involved in some part of the data collection process	Team delegates tasks so each member has an assigned role at all stages of the data collection process
Communication	Team members talk over one another, report data to recorder – but needs to be repeated often, do not seek answers to team questions from the teacher or each other	Team members listen when others are talking, report data to the recorder, ask the teacher questions when difficulties arise	Team members discuss procedures and tasks, report data loudly and clearly, ask each other questions when difficulties arise
Efficiency	Team was unable to work cooperatively to complete tasks, teacher assistance was required throughout the data collection process	Team worked cooperatively to complete tasks quickly and correctly with some teacher assistance on delegation of roles and problem solving	Team worked cooperatively to delegate and complete tasks quickly and correctly, problems were addressed and solved with little teacher assistance

Field Guide Instructions – Tagging (Optional)

Task

Tag all trees greater than 15 cm circumference on your Carbon Cycle Sample Site.

Materials

- ❑ Fishing line, scissors and tree tags

OR Nails, hammer, tree tags

OR Spray paint/tree crayons/paint sticks

- ❑ Flexible measuring tape (best if 150cm – 300cm)
- ❑ Pencil
- ❑ Compass

Procedure

1. Stand at plot center facing north, east, south or west (according to your assigned quadrant). Use a compass if you are unsure.
2. Turn your body clockwise until you are facing the tree closest to that direction, this will be the first 'tagged' tree.
3. Use the fishing line to tie a single tree tag around each tree. Be sure to tie it loosely enough to provide room for the tree to grow and not break the line.

   OR

4. Use a hammer and nail to attach a single tree tag near the **base** of each tree. Be sure to use long nails and not to pound them in too much leaving room for the tree to grow.

   OR

5. Paint a single number on each tree.
6. Work as a team to **continue tagging trees** by moving from the center toward the edges in a clockwise direction. This method will prevent you from missing any trees.

   a. NOTE: Do not tag any trees that are already dead.

7. Once tree tagging has begun, one person should move around the plot and mark each tag with a number using a pencil or nail.
   a. Number convention should be the name of the quadrant and the tree number, e.g. N1, E20, etc.
8. Repeat the tagging process on all trees greater than 15 cm circumference at breast height (1.35m). If you are unsure if a tree is 15 cm, use the measuring tape to confirm whether it should be tagged.

Species Group List

(Reproduced from Jenkins et al. 2003, Figure 1)

Species Group	Common name	Genus	Species
AspenAlder	Balsam poplar	Populus	balsamifera
AspenAlder	Bigtooth aspen	Populus	grandidentata
AspenAlder	Black cottonwood	Populus	trichocarpa
AspenAlder	Black willow	Salix	nigra
AspenAlder	Cottonwood (general)	Populus	spp.
AspenAlder	Diamond willow	Salix	eriocephala
AspenAlder	Eastern cottonwood	Populus	deltoides
AspenAlder	Fremont cottonwood	Populus	fremontii
AspenAlder	Narrowleaf cottonwood	Populus	angustifolia
AspenAlder	Peachleaf willow	Salix	amygdaloides
AspenAlder	Plains cottonwood	Populus	sargentii
AspenAlder	Quaking aspen	Populus	tremuloides
AspenAlder	Red alder	Alnus	rubra
AspenAlder	Silver poplar	Populus	alba
AspenAlder	Speckled alder	Alnus	rugosa
AspenAlder	Swamp cottonwood	Populus	heterophylla
AspenAlder	White alder	Alnus	rhombifolia
AspenAlder	Willow (general)	Salix	spp.
CedarLarch	Alaska-cedar	Chamaecyparis	nootkatensis
CedarLarch	Atlantic white-cedar	Chamaecyparis	thyoides
CedarLarch	Baldcypress	Taxodium	distichum
CedarLarch	Eastern redcedar	Juniperus	virginiana
CedarLarch	Giant sequoia	Sequoiadendron	giganteum
CedarLarch	Incense-cedar	Calocedrus	decurrens
CedarLarch	Larch (general)	Larix	spp.
CedarLarch	Pondcypress	Taxodium	distichum var. nutans
CedarLarch	Port-Orford-cedar	Chamaecyparis	lawsoniana
CedarLarch	Redwood	Sequoia	sempervirens
CedarLarch	Softwoods (general)	Softwood	spp.
CedarLarch	Southern redcedar	Juniperus	silicicola
CedarLarch	Subalpine larch	Larix	lyallii
CedarLarch	Tamarack (native)	Larix	laricina
CedarLarch	Western larch	Larix	occidentalis
CedarLarch	Western redcedar	Thuja	plicata
CedarLarch	White-cedar	Thuja	occidentalis
DougFir	Bigcone Douglas-fir	Pseudotsuga	macrocarpa
DougFir	Douglas-fir	Pseudotsuga	menziesii
FirHemlock	Balsam fir	Abies	balsamea

FirHemlock	Bristlecone fir	Abies	bracteata
FirHemlock	California nutmeg	Torreya	californica
FirHemlock	California red fir	Abies	magnifica
FirHemlock	Carolina hemlock	Tsuga	caroliniana
FirHemlock	Corkbark fir	Abies	lasiocarpa var. arizonica
FirHemlock	Eastern hemlock	Tsuga	canadensis
FirHemlock	Fir (general)	Abies	spp.
FirHemlock	Fraser fir	Abies	fraseri
FirHemlock	Grand fir	Abies	grandis
FirHemlock	Hemlock (general)	Tsuga	spp.
FirHemlock	Mountain hemlock	Tsuga	mertensiana
FirHemlock	Noble fir	Abies	procera
FirHemlock	Pacific silver fir	Abies	amabilis
FirHemlock	Pacific yew	Taxus	brevifolia
FirHemlock	Shasta red fir	Abies	magnifica var. shastensis
FirHemlock	Subalpine fir	Abies	lasiocarpa
FirHemlock	Western hemlock	Tsuga	heterophylla
FirHemlock	White fir	Abies	concolor
MapleOak	American beech	Fagus	grandifolia
MapleOak	Bear oak, scrub oak	Quercus	ilicifolia
MapleOak	Bitternut hickory	Carya	cordiformis
MapleOak	Black hickory	Carya	texana
MapleOak	Black maple	Acer	nigrum
MapleOak	Black oak	Quercus	velutina
MapleOak	Blackjack oak	Quercus	marilandica
MapleOak	Blue oak	Quercus	douglasii
MapleOak	Bluejack oak	Quercus	incana
MapleOak	Bur oak	Quercus	macrocarpa
MapleOak	California black oak	Quercus	kelloggii
MapleOak	California live oak	Quercus	agrifolia
MapleOak	California white oak	Quercus	lobata
MapleOak	Canyon live oak	Quercus	chrysolepis
MapleOak	Cherrybark oak, swamp red oak	Quercus	falcata var. pagodaefolia
MapleOak	Chestnut oak	Quercus	prinus
MapleOak	Chinkapin oak	Quercus	muehlenbergii
MapleOak	Delta post oak	Quercus	stellata var. mississippiensis
MapleOak	Durand oak	Quercus	durandii
MapleOak	Engelmann oak	Quercus	engelmannii
MapleOak	Hickory (general)	Carya	spp.
MapleOak	Interior live oak	Quercus	wislizeni
MapleOak	Laurel oak	Quercus	laurifolia

MapleOak	Live oak	Quercus	virginiana
MapleOak	Mockernut hickory	Carya	tomentosa
MapleOak	Northern pin oak	Quercus	ellipsoidalis
MapleOak	Northern red oak	Quercus	rubra
MapleOak	Nuttall oak	Quercus	nuttalii
MapleOak	Oregon white oak	Quercus	garryana
MapleOak	Overcup oak	Quercus	lyrata
MapleOak	Pecan	Carya	illinoinensis
MapleOak	Pignut hickory	Carya	glabra
MapleOak	Pin oak	Quercus	palustris
MapleOak	Post oak	Quercus	stellata
MapleOak	Scarlet oak	Quercus	coccinea
MapleOak	Scrub oak (general)	Quercus	spp.
MapleOak	Shagbark hickory	Carya	ovata
MapleOak	Shellbark hickory	Carya	laciniosa
MapleOak	Shingle oak	Quercus	imbricaria
MapleOak	Shumard oak	Quercus	shumardii
MapleOak	Southern red oak	Quercus	falcata var. falcata
MapleOak	Sugar maple	Acer	saccharum
MapleOak	Swamp chestnut oak	Quercus	michauxii
MapleOak	Swamp white oak	Quercus	bicolor
MapleOak	Turkey oak	Quercus	laevis
MapleOak	Water hickory	Carya	aquatica
MapleOak	Water oak	Quercus	nigra
MapleOak	White oak	Quercus	alba
MapleOak	Willow oak	Quercus	phellos
MixedHardwood	Ailanthus	Ailanthus	altissima
MixedHardwood	Allegheny chinkapin	Castanea	pumila
MixedHardwood	American basswood	Tilia	americana
MixedHardwood	American chestnut	Castanea	dentata
MixedHardwood	American elm	Ulmus	americana
MixedHardwood	American holly	Ilex	opaca
MixedHardwood	American hornbeam, ∂musclewood	Carpinus	caroliniana
MixedHardwood	American mountain-ash	Sorbus	americana
MixedHardwood	Apple (general)	Malus	spp.
MixedHardwood	Ash (general)	Fraxinus	spp.
MixedHardwood	Basswood (general)	Tilia	spp.
MixedHardwood	Bigleaf magnolia	Magnolia	macrophylla
MixedHardwood	Black ash	Fraxinus	nigra
MixedHardwood	Black cherry	Prunus	serotina

MixedHardwood	Black locust	Robinia	psuedoacacia
MixedHardwood	Black walnut	Juglans	nigra
MixedHardwood	Blackgum	Nyssa	sylvatica
MixedHardwood	Blue ash	Fraxinus	quadrangulata
MixedHardwood	Buckeye (except 331, 332)	Aesculus	spp.
MixedHardwood	Buckeye, horsechestnut	Aesculus	spp.
MixedHardwood	Butternut	Juglans	cinerea
MixedHardwood	California buckeye	Aesculus	californica
MixedHardwood	California sycamore	Platanus	racemosa
MixedHardwood	California-laurel	Umbellularia	californica
MixedHardwood	Canada plum	Prunus	nigra
MixedHardwood	Catalpa	Catalpa	spp.
MixedHardwood	Cedar elm	Ulmus	crassifolia
MixedHardwood	Cherry, plum spp.	Prunus	spp.
MixedHardwood	Chinaberry	Melia	azedarach
MixedHardwood	Chinese tallowtree	Sapium	sebiferum
MixedHardwood	Chinkapin	Castanopsis	spp.
MixedHardwood	Chittamwood, gum bumelia	Bumelia	lanuginosa
MixedHardwood	Chokecherry	Prunus	virginiana
MixedHardwood	Common persimmon	Diospyros	virginiana
MixedHardwood	Cucumbertree	Magnolia	acuminata
MixedHardwood	Eastern hophornbeam, ironwood	Ostrya	virginiana
MixedHardwood	Eastern redbud	Ceriss	canadensis
MixedHardwood	Elm (general)	Ulmus	spp.
MixedHardwood	Eucalyptus (general)	Eucalyptus	spp.
MixedHardwood	European mountain-ash	Sorbus	aucuparia
MixedHardwood	Flowering dogwood	Cornus	florida
MixedHardwood	Golden chinkapin	Castanopsis	chrysophylla
MixedHardwood	Green ash	Fraxinus	pennsylvanica
MixedHardwood	Hackberry	Celtis	occidentalis
MixedHardwood	Hackberry (general)	Celtis	spp.
MixedHardwood	Hardwoods (general)	Hardwood	spp.
MixedHardwood	Hawthorn	Crataegus	spp.
MixedHardwood	Honeylocust	Gleditsia	triacanthos
MixedHardwood	Kentucky coffeetree	Gymnocladus	dioicus
MixedHardwood	Loblolly-bay	Gordonia	lasianthus
MixedHardwood	Magnolia (general)	Magnolia	spp.
MixedHardwood	Mulberry (general)	Morus	spp.
MixedHardwood	Northern catalpa	Catalpa	speciosa
MixedHardwood	Ogeechee tupelo	Nyssa	ogeche
MixedHardwood	Ohio buckeye	Aesculus	glabra

MixedHardwood	Oregon ash	Fraxinus	latifolia
MixedHardwood	Osage-orange	Maclura	pomifera
MixedHardwood	Ozark chinkapin	Castanea	ozarkensis
MixedHardwood	Pacific dogwood	Cornus	nuttallii
MixedHardwood	Pacific madrone	Arbutus	menziesii
MixedHardwood	Paulownia, Empress tree	Paulownia	tomentosa
MixedHardwood	Pawpaw	Asimina	triloba
MixedHardwood	Pin cherry	Prunus	pensylvanica
MixedHardwood	Plums, cherries, except 762	Prunus	spp.
MixedHardwood	Pumpkin ash	Fraxinus	profunda
MixedHardwood	Red mulberry	Morus	rubra
MixedHardwood	Redbay	Persea	borbonia
MixedHardwood	Rock elm	Ulmus	thomasii
MixedHardwood	Sassafras	Sassafras	albidum
MixedHardwood	September elm	Ulmus	serotina
MixedHardwood	Serviceberry	Amelanchier	spp.
MixedHardwood	Siberian elm	Ulmus	pumila
MixedHardwood	Silverbell	Halesia	spp.
MixedHardwood	Slippery elm	Ulmus	rubra
MixedHardwood	Smoketree	Cotinus	obovatus
MixedHardwood	Sourwood	Oxydendrum	arboreum
MixedHardwood	Southern catalpa	Catalpa	bignonioides
MixedHardwood	Southern magnolia	Magnolia	grandiflora
MixedHardwood	Sparkleberry	Vaccinium	arboreum
MixedHardwood	Sugarberry	Celtis	laevigata
MixedHardwood	Swamp tupelo	Nyssa	sylvatica var. biflora
MixedHardwood	Sweetbay	Magnolia	virginiana
MixedHardwood	Sweetgum	Liquidambar	styraciflua
MixedHardwood	Sycamore	Platanus	occidentalis
MixedHardwood	Tanoak	Lithocarpus	densiflorus
MixedHardwood	Tung-oil tree	Ailanthus	fordii
MixedHardwood	Walnut	Juglans	spp.
MixedHardwood	Water tupelo	Nyssa	aquatica
MixedHardwood	Water-elm	Planera	aquatica
MixedHardwood	Waterlocust	Gleditsia	aquatica
MixedHardwood	White ash	Fraxinus	americana
MixedHardwood	White basswood	Tilia	heterophylla
MixedHardwood	White mulberry	Morus	alba
MixedHardwood	Wild plum	Prunus	americana
MixedHardwood	Winged elm	Ulmus	alata
MixedHardwood	Yellow buckeye	Aesculus	octandra

MixedHardwood	Yellow-poplar	Liriodendron	tulipifera
Pine	Apache pine	Pinus	engelmannii
Pine	Arizona pine	Pinus	arizonica
Pine	Austrian pine	Pinus	nigra
Pine	Bishop pine	Pinus	muricata
Pine	Border pinyon	Pinus	discolor
Pine	Bristlecone pine	Pinus	aristata
Pine	California foothill pine	Pinus	sabiniana
Pine	Chihuahuan pine	Pinus	leiophylla
Pine	Coulter pine	Pinus	coulteri
Pine	Eastern white pine	Pinus	strobus
Pine	Foxtail pine	Pinus	balfouriana
Pine	Jack pine	Pinus	banksiana
Pine	Jeffrey pine	Pinus	jeffreyi
Pine	Knobcone pine	Pinus	attenuata
Pine	Limber pine	Pinus	flexilis
Pine	Loblolly pine	Pinus	taeda
Pine	Lodgepole pine	Pinus	contorta
Pine	Longleaf pine	Pinus	palustris
Pine	Monterey pine	Pinus	radiata
Pine	Pinyon pine	Pinus	edulis
Pine	Pitch pine	Pinus	rigida
Pine	Pond pine	Pinus	serotina
Pine	Ponderosa pine	Pinus	ponderosa
Pine	Red pine	Pinus	resinosa
Pine	Sand pine	Pinus	clausa
Pine	Scotch pine	Pinus	sylvestris
Pine	Shortleaf pine	Pinus	echinata
Pine	Singleleaf pinyon	Pinus	monophylla
Pine	Slash pine	Pinus	elliottii
Pine	Southwestern white pine	Pinus	strobiformis
Pine	Spruce pine	Pinus	glabra
Pine	Sugar pine	Pinus	lambertiana
Pine	Table Mountain pine	Pinus	pungens
Pine	Virginia pine	Pinus	virginiana
Pine	Western white pine	Pinus	monticola
Pine	Whitebark pine	Pinus	albicaulis
SoftMapleBirch	Bigleaf maple	Acer	macrophyllum
SoftMapleBirch	Birch (general)	Betula	spp.
SoftMapleBirch	Boxelder	Betula	negundo
SoftMapleBirch	Florida maple	Acer	barbatum

SoftMapleBirch	Gray birch	Betula	populifolia
SoftMapleBirch	Mountain maple	Acer	spicatum
SoftMapleBirch	Paper birch	Betula	papyrifera
SoftMapleBirch	Red maple	Acer	rubrum
SoftMapleBirch	River birch	Betula	nigra
SoftMapleBirch	Silver maple	Acer	saccharinum
SoftMapleBirch	Striped maple	Acer	pensylvanicum
SoftMapleBirch	Sweet birch	Betula	lenta
SoftMapleBirch	Water birch	Betula	occidentalis
SoftMapleBirch	Western paper birch	Betula	papyrifera var. commutata
SoftMapleBirch	Yellow birch	Betula	alleghaniensis
Spruce	Black spruce	Picea	mariana
Spruce	Blue spruce	Picea	pungens
Spruce	Brewer spruce	Picea	breweriana
Spruce	Engelmann spruce	Picea	engelmannii
Spruce	Norway spruce	Picea	abies
Spruce	Red spruce	Picea	rubens
Spruce	Sitka spruce	Picea	sitchensis
Spruce	Spruce (general)	Picea	spp.
Spruce	White spruce	Picea	glauca
Woodland	Acacia (general)	Acacia	spp.
Woodland	Alligator juniper	Juniperus	deppeana
Woodland	Arizona cypress	Cupressus	arizonica
Woodland	Arizona white oak, Gray oak	Quercus	arizonica, grisea
Woodland	Bigtooth maple	Acer	grandidentatum
Woodland	Birchleaf mountain-mahogany	Cercocarpus	montanus var. glaber
Woodland	Bitter cherry	Prunus	emarginata
Woodland	California juniper	Juniperus	californica
Woodland	Common juniper	Juniperus	communis
Woodland	Curlleaf mountain-mahogany	Cercocarpus	ledifolius
Woodland	Cypress	Cupressus	spp.
Woodland	Deciduous oak spp.	Quercus	spp.
Woodland	Emory oak	Quercus	emoryi
Woodland	Evergreen oak spp.	Quercus	spp.
Woodland	Gambel oak	Quercus	gambelii
Woodland	Hairy mountain-mahogany	Cercocarpus	montanus var. pauciden
Woodland	Littleleaf mountain-mahogany	Cercocarpus	intricatus
Woodland	Mesquite	Prosopis	spp.
Woodland	Mexican blue oak	Quercus	oblongifolia
Woodland	New Mexico locust	Robinia	neomexicana
Woodland	Oneseed juniper	Juniperus	monosperma

Woodland	Pinchot juniper	Juniperus	pinchotti
Woodland	Redberry juniper	Juniperus	erythrocarpa
Woodland	Rocky Mountain juniper	Juniperus	scopulorum
Woodland	Rocky Mountain maple	Acer	glabrum
Woodland	Silverleaf oak	Quercus	hypoleucoides
Woodland	Tesota (Arizona ironwood)	Olneya	tesota
Woodland	True mountain-mahogany	Cercocarpus	montanus
Woodland	Utah juniper	Juniperus	osteosperma
Woodland	Western juniper	Juniperus	occidentalis