The ARNOLD ARBORETUM of HARVARD UNIVERSITY

Examining Tree Architecture

TO KNOW:

A tree's growth habit or **architecture** is influenced by three factors:

1. Genetic information: a plant's predisposed growth for height, diameter, stem form, crown form, angle of branch attachments, tolerance to insects and diseases, among others.

2. Site conditions: shady, sunny, crowded, open, slope, waterlogged, soil composition and depth, proximity of bedrock, etc.

3. Environmental influences: storm, lightning, fire, heavy snow, drought, insect infestation, disease, human interaction, etc.

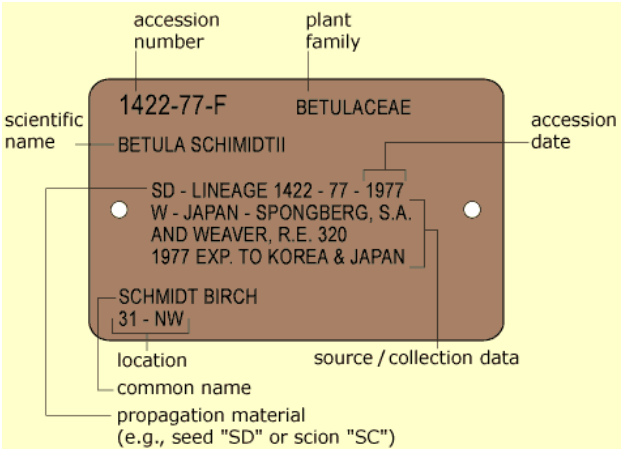
> **Genotype**: the entire set of genes in an organism
>
> **Phenotype**: the set of observable characteristics of an individual resulting from the interaction of its genotype with the environment

Sometimes a gene mutation happens that humans want to perpetuate, as is the case with most "weeping" varieties of trees. Somebody decided that the weeping habit was desirable and took cuttings to propagate the tree. That is the only way to get more weeping trees – the mutated gene does not become part of the genotype of the tree, and thus, does not pass the habit via seeds.

TO DO:

This exploration will focus on observing **phenotypes** of various trees in the Arnold Arboretum. Your job is to observe and record what you see that would help explain why each tree has its shape. When observing, walk all around the tree, look in every direction, examine the ground and step back to understand the tree's architecture. It is very helpful to make quick, 30 second sketches of each tree to help the eye focus on overall shape, branch angles and relationships to its surroundings. It may also be helpful to take photographs as a record of your observations. Field notes, including temperature, amount of sunlight, moisture level, ground elevation, etc. can be used as evidence for your explanations.

Learn to locate and read each tree's record label:



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Connections to MA STE standards:

- MA 8.MS-LS1-5 Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms.
- HS-LS3-4(MA) Use scientific information to illustrate that many traits of individuals, and the presence of specific alleles in a population, are due to the interactions of genetic factors and environmental factors.

Once back in the classroom, use your observations, photos, and field notes (evidence) and information learned from researching the various trees, to construct your argument.

This activity is best done in late fall through early spring, while the trees are bare of leaves.

Use the map as a reference to search for the following trees. Locate the record labels with accession number to make sure you found the right tree. Observe and describe the overall shape of each tree (1). Examine the site conditions (2). Look for any evidence of past or present environmental influences (3). "Read" each tree's architecture and explain what you see.

#1 Magnolia acuminata 15154*D

#2 Magnolia acuminata 49 2014*A

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Sketch and add field notes below.

#3 Metasequoia glyptostroboides 524-48*AA

#4 grove of Metasequoia glyptostroboides

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Sketch and add field notes below.

#5 Cercidiphyllum japonicum 882*A

#6 Cercidiphyllum japonicum ‘Morioka Weeping

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Sketch and add field notes below.

(observe tree's tilt and the roots)

#7 Acer mono 5358*A

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Sketch and add field notes below.

(observe the “knees”)

8Taxodium distichum ‘Pendens’ 806-52*A

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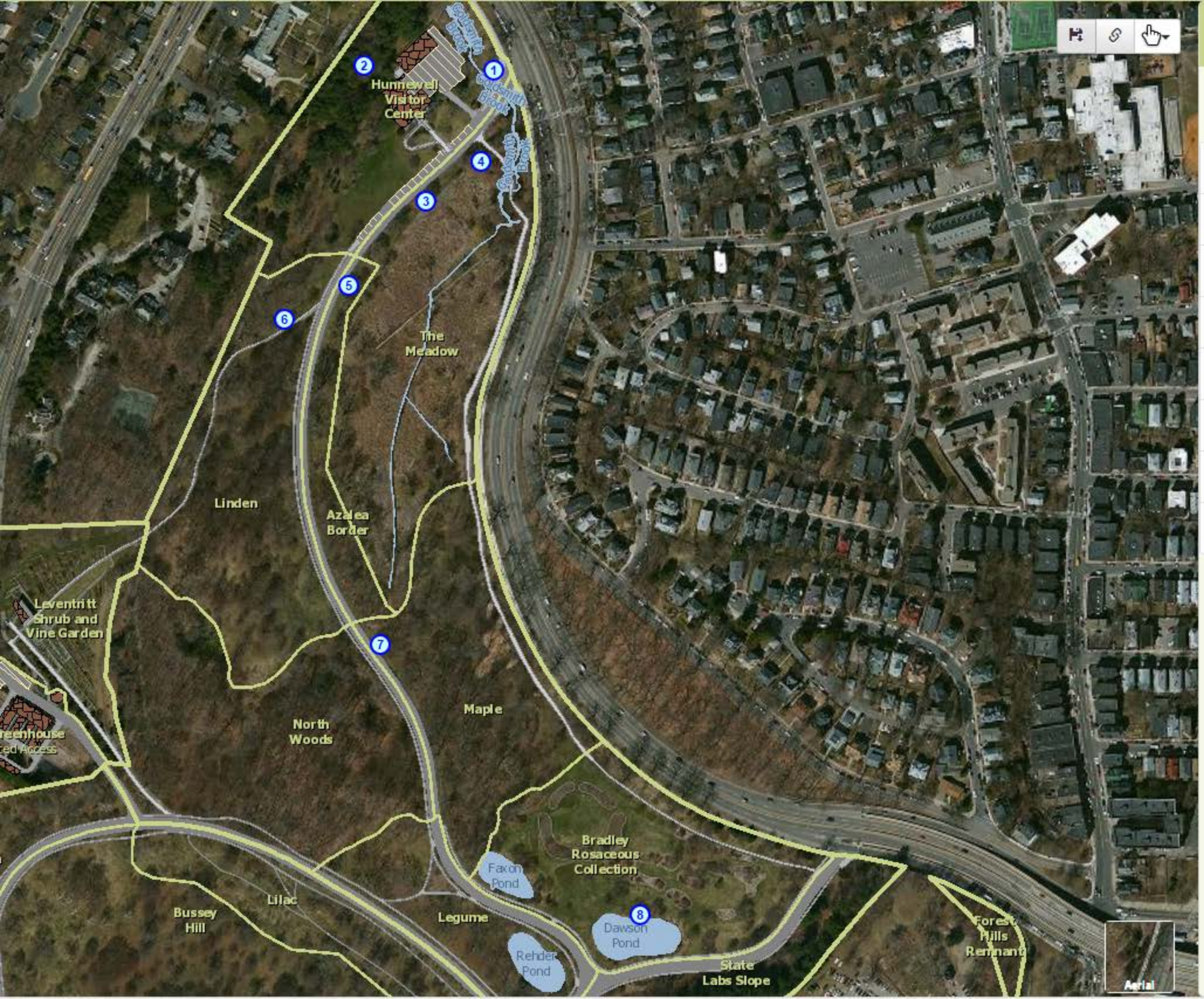
Sketch and add field notes below.



My Visit

1. **15154*D**
   Magnolia acuminata
2. **49-2014*A**
   Magnolia acuminata
3. **524-48*AA**
   Metasequoia glyptostroboides
4. **815-62*B**
   Metasequoia glyptostroboides
5. **882*A**
   Cercidiphyllum japonicum
6. **698-81*A**
   Cercidiphyllum japonicum 'Morioka Weeping'
7. **5358*A**
   Acer mono
8. **806-52*A**
   Taxodium distichum 'Pendens'