

## Activity 1 – Phenotype to Environment

With this activity, you will investigate traits a plant has evolved to survive and persist in its native environment and make predictions for how a changing environment might affect the plant's survival. Make a three-slide PowerPoint with your answers to the questions below.

### Materials:

- Computer
- Activity Cards

**Directions:** Your teacher will assign you a plant. Research your plant and include the following in your group's PowerPoint:

- Find a picture!
- What is the plants 'common name'? Does it have more than one?
- Is this plant used by Native American communities? How?
- Is it an herb, bush, tree?
- How does it reproduce?
- What is its distribution and habitat preferences?

Finally, the last slide of your PowerPoint should include your hypothesis to this question: In a rapidly changing environment what type of stresses might this plant experience? Include your response to this question in your PowerPoint.

## Teachers Answers to Activity 1

- **Acer negundo**
  - Common names: box elder, boxelder maple, ash-leaved maple, maple ash
  - Uses: sap is used as sweetener or as beverage, leaves are used to relieve dry mouth, etc.
  - Tree, sexual reproduction (by seed)
  - Native to North America but it is an invasive species in Europe, China and Australia
  - This species grows well in disturbed areas and is well adapted to different climates, in face of climate change, it will probably do well. Apparently, it is susceptible to drought so it might suffer from drought stress in dry areas.
- **Amelanchier alnifolia**
  - Common names: saskatoon, Pacific serviceberry, western serviceberry, alder-leaf shadbush, dwarf shadbush, chuckley pear, western juneberry
  - Uses: stems used for arrows, leaves boiled for tea, fruits eaten fresh or dried, etc.
  - Shrub, sexual reproduction (by seed)
  - Native to North America, from Alaska to western and north-central US, also in western Canada.
  - Grows from sea level up to 8,500 ft in California and up to 11,200 ft in the Rocky Mountains. It is common in the understory of forests.
  - Since it grows in temperate regions, it might get affected if temperature raises. Since it grows in forest understory, cutting down the forests might also impact it.
- **Artemisia cana**
  - Common names: silver sagebrush, sticky sagebrush, silver wormwood, hoary sagebrush, dwarf sagebrush
  - Uses: leaves and stems are burned as insect repellent
  - Shrub, sexual reproduction (produces fruits)
  - Native to central and western North America, distributed in the US and Canada.
  - It is tolerant to flooding but the seedlings are sensitive to drought so in case of severe drought, the new plants will not probably germinate.

- **Betula papyrifera**
  - Common names: Paper birch, white birch, canoe birch
  - Uses: bark is used for making torches and also as a container for collecting sap
  - Tree, sexual reproduction (by seed)
  - Native to northern North America, distributed along north US and Canada
  - It is susceptible to high temperatures and humidity so it will be affected by a rise in temperature and abundant rain or floodings.
  
- **Cucurbita foetidissima**
  - Common names: buffalo gourd, coyote gourd, fetid gourd, fetid wild pumpkin, Missouri gourd, stinking gourd
  - Uses: root used to treat all sorts of body ailments, fruit is used as soap, infusion made with the seeds is used to kill intestinal worms
  - Herb or vine, sexual (by seed) reproduction and asexual reproduction by nodal roots
  - Distributed in central and southern US and north of Mexico.
  - This species needs warm temperatures, growing in arid or semi-arid areas with little water. This plant might be susceptible to flooding and a decrease in temperature.
  
- **Dalea purpurea:**
  - Common names: purple prairie clover
  - Uses: roots are chewed because of their sweetness, infusion of the leaves to treat diarrhea, poultice of crushed leaves used for curing wounds, etc
  - Perennial herb, sexual reproduction (by seed)
  - Native to central North America, distributed in central Canada and southeast and southwest US, abundant in the great plains.
  - It is adapted to areas with periodical fires since it likes open areas, grows in well-drained areas so it might be subject to stress if periodic flooding occur. Also, lack of pollinators might impact its propagation
  
- **Echinacea angustifolia:**
  - Common names: echinacea, purple coneflower, blackroot
  - Uses: the root is used for wounds, swelling, snake bites, seed heads chewed to relieve toothache and other ailments
  - Perennial herb, sexual reproduction (by seeds), also it is possible to propagate using root or stem cuttings
  - Native to North America, grows in central US and Canada, abundant in the Great Plains
  - Grows in dry prairies so it might be sensitive to floodings

- **Fragaria vesca:**
  - Common names: wild strawberry
  - Uses: fruits eaten fresh or dry
  - Perennial herb reproduces mostly asexually by lateral shoots though it can also be propagated by seed
  - Distributed throughout the Northern Hemisphere
  - It tolerates well wet or dry conditions, but it is sensitive to extreme drought or flooding. It can also survive mild fires
- **Fraxinus pennsylvanica:**
  - Common names: green ash, red ash
  - Uses: wood used for bows, tipi pins and pegs, firewood, etc
  - Tree, sexual reproduction (by seed) - Native to central and eastern North America but has become naturalized in Europe
  - This tree grows fast and is well adapted to urban areas, so it might do well in disturbed environments. It is highly sensitive to beetle infestation so if climate change favors beetle reproduction, this might significantly impact green ash populations
- **Galium aparine:**
  - Common names: cleavers, bedstraw, goosegrass, catchweed, etc
  - Uses: roasted seeds are used as a coffee substitution, plant used for skin irritations
  - Annual herb, sexual reproduction (by seed), the fruits are hairy and attach to the hair of animals
  - It is considered to be native to North America by some, but it is widespread across the world.
  - Though this plant would probably be successfully adapted to changing environments, it generally prefers moist soils which could make it sensitive to extreme drought
- **Juglans nigra:**
  - Common names: black walnut –
  - Uses: walnuts are edible, bark is used for black dye, leaves are used for skin ailments, etc
  - Tree, sexual reproduction (by seed) 6
  - Native to eastern North America, it has been introduced in Europe and is also cultivated in Hawaii
  - This species prefers open habitats so if climate changes favoring herb coverage the young trees might suffer from lack of exposure to the sun. Likewise, this species is highly susceptible to beetle infestation so if beetle population increases, it can severely affect black walnuts population

- **Lepidum densiflorum:**
  - Common names: common pepperweed, prairie peppergrass
  - Uses: tea made with the plant is used for the kidneys, leaves are consumed in salads, seeds are used as condiment, etc
  - Annual herb, sexual reproduction (by seed)
  - Widespread across North America, common in Canada and the US
  - It grows throughout a variety of environments, it can be invasive. It is probable that in a changing climate, this plant will be able to successfully adapt
  
- **Maianthemum racemosum:**
  - Common names: star-flowered, false Solomon's seal
  - Uses: berries have a laxative effect, root is used for wounds
  - Perennial herb, asexual reproduction by lateral roots (rhizomes) and sexual reproduction (by seeds)
  - Native to North America it grows in the US, Canada and Mexico
  - This plant prefers shaded areas with deep, moist soils. In a climate change scenario, this plant might be stressed by drought and by deforestation
  
- **Nelumbo lutea:**
  - Common names: yellow lotus, American lotus, water chinquapin, etc
  - Uses: seeds and tubers are eaten (cooked), leaves can also be eaten, it is considered to have some sort of mystical powers
  - Aquatic herb
  - Native to North America, it grows in the US and some countries in central America and the Caribbean
  - This plant is adapted to lakes and swamps and grows in flooded areas. The species would probably not survive long periods of drought
  
- **Prunus virginiana:**
  - Common names: chokecherry, bitter-berry, Virginia bird berry
  - Uses: blood tonic, astringent, sedative, tonic and appetite stimulant, treatment of fevers, coughs and colds
  - Shrub or small tree, sexual reproduction (by seed)
  - Native to North America, distributed across most US and Canada, including northern Mexico.
  - It is susceptible to pests so if the weather changes in a way that is favorable for insects, it will affect the plants. Also, the wood is weak, so branches might break if snow or ice increase.