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SoL: NC Bio.3.1.3, Bio.3.3.1, and Bio.3.3.2

Activity Outline- "How do Pine Trees Wear Their Genes?" **(Total: 57-72 minutes)**

I. Introduction **(2 minutes)**
- A) PINEMAP, who I am, and what we are going to do in school. **(2 minutes)**
  - i) Student at the University of North Carolina Wilmington.
  - ii) Worked at Texas A&M University over the summer.
  - iii) What is PINEMAP and what is their aim?

II. Basics of genetics and applications to pine forests during climate change **(20 minutes)**
- A) How physical traits are determined by genetics. **(10 minutes)**
  - i) Structure of DNA and how it encodes for proteins.
  - ii) How proteins translate into physical features (called phenotypes).
  - iii) How everything has its own unique set of DNA.
    - -Can identify different organisms by looking at DNA.
  - iii) How a change in DNA can alter a physical feature.
    - -Mutations (caused by natural or artificial sources).
  - iv) Environment also plays a big role in physical traits.
    - -Climate, temperature, wind, rain, etc.
- B) Transgenic organisms are engineered to benefit society. **(10 minutes)**
  - i) What does transgenic mean?
    - -Containing a gene/genes transferred from another species.
  - ii) Difference between transgenic plants and GMO plants?
    - -GMO: a plant that has undergone genetic changes through breeding.
    - -Transgenic: a plant that has had a gene or genes artificially inserted into its genome.
  - iii) Pine trees are being engineered to better thrive in GCL.
    - -GCL: Global Climate Change.
  - iv) Features looking to be enhanced and how.
    - -Examples: resistance to drought, respiration, and photosynthesis, better nitrogen use, disease resistance, insect resistance, overall faster growth, and wood quality.
  - v) What part of a physical pine trees does this correlate to?
    - -Examples: base diameter, total tree height, and needle area.

III. Activity: **(30-45 minutes)**

A) Measuring phenotypes trees (in small groups). **(20-30 minutes)**

i) Outside measure the trunk of a tree 4.5 feet off the ground.

-Called DBH: Diameter at Breast Height.

~Most consistent area across different terrains and tree types or heights.

-Use measuring tape or a caliper.

ii) Collect some needle samples (can bring in own if raining).

-Estimate needle area using a ruler (assume needle is a cylinder).

B) Compare results of all groups. **(10-15 minutes)**

i) Which of the trees best adapted to Global Climate Change?

-Greatest diameter and leaf area.

IV. Conclusion: Where are we at now? **(5 minutes)**

A) Has the "perfect" tree been found yet?

i) No, genetic research work is still ongoing.

ii) Loblolly pines used for? Lumber and pulp.

iii) Loblolly pines not used for? Fruit production.

B) What can you do?

i) Live an environmentally friendly life.

ii) Stay up to date on genetic research.

-Ex: http://journals.cambridge.org/action/displayJournal?jid=GRH

-Look for genetics references in mass media.

C) Questions?