Seasonal Changes in Your Biology Study Site(s)

Purpose

To investigate seasonal changes by collecting data on spring bud-break and fall leaf senescence

Overview

In the Fall and Spring, students conduct measurements of seasonal changes in the green canopy and/or grasslands. In the spring, they measure bud-break, and in the Fall they measure leaf senescence. They do these measurements every week, for six weeks in the Fall and six weeks in the Spring. Students then investigate the rate of change based on the data they collected.

Time

Two class periods to introduce the activity and explore the data

Also, a small group of students needs to collect the data, one period per week, for a six weeks in the Fall and six weeks in the Spring.

Level

Intermediate or Advanced

Key Concepts

In the Spring, there is a period of bud-break, in which leaf buds appear and grow.

In the Fall, there is a period of senescence, in which actively growing plant material dies.

Skills

Measuring tree canopy

Analyzing data for Spring and Fall changes over time

Materials and Tools

Tubular Densiometer

See Land Cover/Biology Protocol *Identification of Dominant and Co-Dominant Species.*

Prerequisites

Students should know how to use the tubular densiometer. See Land Cover/Biology Protocol *Identification of Dominant and Co-Dominant Species.*

Background

This learning activity focuses on the changing lengths of growing seasons for different parts of the Earth. In order to determine the length of growing season for your area, researchers, and you and your students, can monitor the development of a green canopy and/or grasslands from spring "bud-break" to autumnal senescence (the death of actively growing plant material.) Satellite data and images can be used to track the "green wave" in the spring, as it moves from south to north in the northern hemisphere, and the "brown wave" in the fall, as it moves from north to south. In the southern hemisphere the "green wave" moves in the reverse direction, from north to south and the "brown wave" moves from south to north.

One of the disadvantages of using satellite data is that the spatial resolution may be poor. This means that many ground features such as individual trees or stands of trees will not be seen directly. Thus researchers working with satellite imagery need more detailed information about what is happening in the vegetated land cover types that are contributing to the data monitored by the satellites. Two very critical times of the year are the "spring" leaf-out and the "fall" senescence, for they define the length of the growing season for a particular place on the Earth's surface. Your studies in this activity will add to your understanding of these critical times in your area in a very significant way.

Depending on your location, your climate or vegetation types may not lend themselves to the observation of the seasonal events described here.

What To Do and How To Do It

If your GLOBE Biology Study Site contains deciduous trees:

Bud-break:

1. Using the 30 m x 30 m Biology Study Site, select a day in early spring just as leaves are beginning to emerge to conduct an assessment of percent canopy closure, using the tubular densiometer method. See Land Cover/Biology Protocol *Identification of Dominant and Co-Dominant Species*.
2. Once per week, for the next five weeks, (for a total of six weeks) conduct the same canopy closure assessment, using the same method.
3. Record your data, and save it for study of the year-to-year changes in bud-break.

Senescence:

1. Using the same 30 m X 30 m Biology Study Site, select a day when the first signs of autumnal color change in foliage are seen. Conduct an assessment of percent canopy closure (see Land Cover/ Biology Protocol I*dentification of Dominant and Co-Dominant Species*), with the following change in method.
2. Measure canopy closure, using the tubular densiometer, but instead of recording just (+'s) and (-'s), record "g" if you see green leaves, "b" if you see brown or colored leaves, and (-) if you see no foliage. This is the same method you used for brown and green ground cover.
3. Calculate the percentages of green and brown canopy in the same manner as you calculated ground cover.
4. Once per week, for the next five weeks, repeat this observation.
5. Record your data and save it for year-to-year studies of changes in senescence.

Grassland areas: Just as the timing of bud-break and senescence are important indicators in forests, the timing of changes in grassland vegetation is also an important indicator. In grassland, the timing of the beginning and end of active growth, the occurrence of flowering and fruiting, and senescence are significant, observable changes that describe the growing season, that can be measured by you and your students.

If your GLOBE Biology Study Site contains grasses:

Bud-break:

1. Using the 30 m X 30 m Biology Study Site (in this case, one in which grass is dominant or co-dominant), select a day in early spring just as the grasses are beginning to turn green.
2. Measure the percentages of brown and green ground cover in the same manner described in the ground cover protocol.
3. Once per week, for the next five weeks, repeat this ground cover survey.

Senescence:

1. Repeat the ground cover measurements above when grasses begin to turn brown. The timing of the browning may or may not coincide with the fall period in your area; if, for example, a lack of rain makes the grass turn brown. You will need to observe your grasslands area to decide when to begin this measurement.

Going Farther – An Extension

A significant event in grasslands is the formation of flowering heads and fruiting heads. Since it may be difficult for you and your students to determine the difference between grass flowers and fruits, simply note the time of year when the grass changes from growing leaves (grass blades) to growing a central stalk, which elongates, eventually becoming topped by the flowering/ fruiting head. Note the timing of this event, within one week, and record this it in your data archive.

Changes from year-to-year in the timing and lengths of the events measured in this exercise will give you and your students a way of relating

changes in your other GLOBE measurements (temperature, precipitation, etc.) to their effects on your local environment.

To help you and your students evaluate these seasonal changes, see the suggestions in the *Seasons Investigation* later in the GLOBE Teacher's Guide.