



Smithsonian Environmental
Research Center

Orchids as Bioindicators

Take a look at the picture below.



Jim Fowler, Flickr: <https://www.flickr.com/photos/22032600@N04/5998017434>

This is a picture of flowering downy rattlesnake plantain (*Goodyera pubescens*). It is a terrestrial orchid found in North American forests, from dry to moist upland woods. As a part of the orchid growing project you will be exploring how combinations of fungi and fertilizer affect the growing success of orchids, one of which will be the rattlesnake plantain. So why is this flower so important? Orchids, much like this one, are considered to be good **bioindicators** of the health of an **ecosystem**.

Bioindicators can include natural biological processes, animals, plants, or communities of organisms that can be used to determine the quality of an environment and how it changes over time. These changes may be caused by people, climate, weather, organisms, invasive species, or other processes.

Not all species or communities can be good indicators of changes in an ecosystem. Some species grow easily and tolerate change very well. Bioindicators do not have a super high tolerance for change or disruption to

their environment. Because of this sensitivity these organisms can be monitored in real time as a measure of living responses to environmental changes and stresses going on in an environment. This is sometimes called **biomonitoring**.

Orchids can be good bioindicators because they have a low tolerance for changes in their environment. Look again at the picture above. What types of changes to the environment might affect this particular group of orchids?

Some of the things scientists might be looking for would be tree density around the orchids, shade or light availability, temperature in the area, rainfall, soil acidity (note the orchids are growing in acidic pine needles), tree size and species, disturbance by people, changes in soil cover, grazing by animals, disease, or even insect disturbance.

Another reason that orchids are good bioindicators is because they rely on **mycorrhizal fungus** for nutrients. They need specific types of fungus for the plants and seeds to grow. Without just the right conditions they won't thrive or survive. If the orchids disappear, die off, or fail to reproduce then it may mean that something is going on in the soil and fungus community of the forest.

YOU'RE THE SCIENTIST

You're now a scientist that has been tasked to help a team of Department of Natural Resources (DNR) and Smithsonian biologists collaborating together in Florida. The downy rattlesnake plantain is considered common in much of the Eastern US, but it is listed as endangered in Florida. You need to research its growing habits and preferences and then come up with a research plan for determining how you might use this orchid as a bioindicator of ecosystem quality and health.