ANSWER KEY

Changing Forests (1 of 3)

TREES IN TRANSITION

1. The introduction states that the only constant is change. If forests always change, what's the problem?

   Forest species are able to tolerate small seasonal fluctuations in temperature and precipitation in addition to small changes caused by disturbances such as storms and wildfire. In many areas today, typical temperature and precipitation patterns are changing beyond typical ranges. Many forest species may not have the ability to adjust to these rapid and large climate changes.

2. How might tree populations respond to changes in the climate?

   Tree populations may adapt onsite to changing conditions, shift ranges to new locations with more suitable conditions, or simply die out.

3. What is the ForeCASTS project? How are ForeCASTS maps useful?

   The ForeCASTS project allows researchers to predict future suitable habitat ranges for tree species both in the United States and around the world. Researchers are able to do this by using projections of future climate and fine scale ecoregions, or by observing areas that share similar characteristics such as soil and topography. These maps can help target tree species for monitoring by determining the areas in which climate change pressures are likely to be the most intense.

4. Why is it important to conserve genetic variation?

   Conserving genetic variation is important because such diversity makes it possible for species to adapt to change. This ability to change reduces the species' susceptibility to stressors such as insects, pathogens, and climate change.

FOREST ECOSYSTEM STRESS IN REAL TIME

1. What is RAFES and what is it intended to do?

   The RAFES (Remote Assessment of Forest Ecosystem Stress) network provides real time data on climate impacts in at-risk ecosystems. It is designed to give forest managers the time they need to respond to forest stress.

2. What is the problem with current ecosystem assessment, and why is the new approach more effective?

   Current ecosystem assessments often use too large a spatial scale, fail to directly measure climate impacts on tree stress, and don't allow time for managers to respond. RAFES uses a finer scale, monitors tree stress in real time, is cost effective, and can be deployed either across the landscape or simply in high-risk areas.

3. What important forest stressor is being researched for this project? Why is this stressor important?

   Water availability is the stressor being researched for this project. Water availability plays an important role in regulating forest stress and stream flow.

4. How do you think drought increases forests' susceptibility to pests, disease, and wildfire?

   Student responses will vary and may include drought reduces the ability for pine trees to defend themselves against bark beetles because they are less able to secrete sticky gum into wounds or drought reduces soil moisture and makes the understory more flammable.

Changing Forests (2 of 3)

MORE FUEL FOR FIRE?

1. What is the KBDI? What does a high KBDI mean?

   The KBDI, or Keetch-Byram Drought Index, estimates landscape fire potential. A high KBDI value indicates increased flammability of organic matter on the forest floor, which could lead to wildfires that are more intense and spread faster.

2. In which geographic area is the increase in the length of fire season expected to be the greatest?

   The increase in the length of fire season is expected to be the greatest in the Appalachian Mountain region, where the fire season is expected to increase from four to seven months by the end of this century.

3. Describe the changes in fuel loads predictions. Which areas will have a decline? Which areas will have an increase?

   In the Southeast, reduced precipitation will cause an overall decline in fuel load because of reduced forest growth. However, due to differences in climate, there is a lot of variability in predicted fuel loads in different areas. For example, decreases in precipitation in Tennessee and Kentucky may reduce fuel loads, while increases in precipitation and decreases in daily mean temperature in coastal Virginia and the Carolinas may cause an increase in fuel loads.

4. What is a management option to reduce wildfire risk?

   Managers can use prescribed fire to reduce the amount of vegetation in the forest understory, which lowers the risk of wildfires by reducing the amount of hazardous fuels.

CRAFTING FUTURE FORESTS

1. What is the Forest Service National Roadmap for Responding to Climate Change?

   The Forest Service National Roadmap for Responding to Climate Change is a framework that supports restoring forests to healthy, functioning conditions.

2. Why is there a strong interest in restoring longleaf pine forests in the Southeast?

   Longleaf pine forests are more resilient to insect attacks and hurricane winds than the loblolly forests that have replaced them in many areas in the Southeast.

3. What challenges do forest restoration specialists face?

   Population growth has increased in the Southeast, and more people are building homes near forests. Longleaf pine forests require frequent prescribed burning, which generates smoke that residents in nearby areas may not be willing to tolerate. Restoration efforts that mimic the natural forest processes rely on regular prescribed burns to reduce unwanted trees that overtake long-leaf pine areas.

Changing Forests (3 of 3)

CRAFTING FUTURE FORESTS (CONTINUED)

4. What is CRAFT? How does CRAFT help managers and stakeholders make decisions for the future?

   CRAFT, or Comparative Risk Assessment Framework and Tools, is a new resource that scientists have developed to help natural resource managers and stakeholders make decisions about land management and find common ground. CRAFT guides users through a step-by-step process that includes examining the values placed on forests and how these values are likely to be affected by the interactions of management decisions and future uncertainties. Users can then address uncertainties in a systematic and quantitative way for a direct examination of risk. CRAFT also allows users to synthesize findings throughout the process so that tradeoffs between competing values, broader effects, and stakeholder needs can be revealed and incorporated.

CLIMATE CHANGE INVASIONS

1. How will invasive plants likely be affected by climate change?

   Studies have shown that climate change creates niches and opportunities that promote the invasion of non-native species.

2. What types of tools are EFETAC researchers using to assess how climate change will affect the distribution of plant species?

   EFETAC researchers use a variety of modeling and simulation tools to make comparisons between habitats and geographical distributions of native and non-native invasive plant species, which help to predict how climate change will affect the distribution of plant species. Additionally, researchers use Geographic Information System (GIS) remote sensing tools to visually map out results that are easy to understand.

3. What is required to understand how invasive species affect native habitats and species?

   To understand how invasive species affect native habitats and species, an understanding of plant biology and ecology is required. In particular, this includes an understanding of how species interact with each other and the environment. Biologists must look at how the life history and genetic traits of invasive plants affect the plant's ability to invade under current and projected future climate conditions.

4. What is the goal of the EFETAC research?

   The goal of EFETAC research is to preserve native biodiversity and to manage invasive species.