Key to Analysis Questions (**Biotic and Abiotic Factors in An Ecosystem Activity 1.4**)

(Assessment – DCI - MS LS2.A, CCC - Patterns, Cause & Effect) Analysis question 1 provides an opportunity to assess student understanding of patterns of interaction, particularly those related to biotic factors. Sample answers are shown.

Part 1 *Wolves and Moose on Isle Royale*

1. Describe the pattern the graph shows in the interaction between wolves and moose on Isle Royale, Michigan.

When the wolf population increased, the moose population decreased. When the wolf population decreased, the moose population increased.

a. What do you think might cause this pattern?

When the large wolf population ate moose, they caused the moose population to decline. When the wolf population decreased and there were few wolf predators, this allowed the moose population to increase.

b. What other biotic factors could affect the size of moose population?

A change in the availability of plant food, disease, or the presence of harmful parasites could cause changes in the moose population.

c. What abiotic factors could affect the size of the moose population?

Possible responses include availability of water, significant change in temperature, and/or a change in air quality.

2. Looking at Figure 1, what do you predict will happen to the size of the wolf and moose populations over the next 10 years? Explain your reasoning.

The wolf population will increase, following the slight trend is it currently showing. The moose population will remain low with the increase in predators.

Part 2 *Rainfall and Fawn Survival*

(Assessment – DCI - MS LS2.A, CCC - Patterns, Cause & Effect) Analysis question 1 provides an opportunity to assess student understanding of patterns of interaction, particularly those related to abiotic factors. Sample answers are shown.

1**. Describe the pattern in the relationship between Sonoran pronghorn antelope and rainfall.**

When rainfall increased, the number of surviving fawns increased. When there was little rainfall, the number of surviving fawns declined.

a. What do you think might cause this pattern?

The lack of water could cause the young fawns to die.

b. What other abiotic factors could affect the survival rate of fawns?

Possible responses include temperature, air quality,

c. What biotic factors could affect the survival rate of fawns?

Possible responses include predators, competition from other organisms, disease, and a lack of vegetation. All of these could cause the death of young fawns.

2. What do you predict would happen to the survival rate of fawns if rainfall levels stayed high? Explain your reasoning.

Many more fawns would survive with high levels of rainfall. In the years that rainfall increased, the number of surviving fawns increased significantly.

(Assessment – SEP - Constructing Explanations, CCC - Connections to Engineering, Technology, and Applications of Science) Analysis question 4 provides an opportunity to assess students' early ability to construct a basic explanation relating to human impact (direct and indirect, positive and negative) on the environment. A sample answer is shown.

Bonus-Pigeons are native to Europe, Asia, and northern Africa. They originally nested on cliffs and ledges. Their diet included seeds, grains, and some fruit and insects. Their predators included large birds, such as hawks, and mammals, such as raccoons and foxes. Pigeons are one of the few animals that are very successful in urban ecosystems with dense human populations.

Why are pigeons successful in urban ecosystems? Use what you know about biotic and abiotic factors in your answer.

Pigeons like to nest on cliffs and ledges. This is an interaction with an abiotic factor. Urban areas don't have cliffs, but they have roofs and window ledges. Pigeons eat seeds, grains, fruit, and insects, which are available in cities, so they can get the food they need. In the wild, pigeons are prey to organisms such as hawks, raccoons, and foxes. There are fewer of these predators in

urban ecosystems. So their biotic interactions (with foods and fewer predators) also allow them to succeed in urban ecosystems.