Question 3: Scientific Investigation — 4 points

Buffelgrass, an invasive grass species in southwestern desert ecosystems, is threatening the saguaro cactus, a keystone species in these ecosystems. Buffelgrass is drought-tolerant and can survive wildfires. However, the dry buffelgrass also acts as fuel for wildfires, causing the fires to be more severe. Older saguaro cacti can survive wildfires; however, many of the young cacti cannot.

Scientists conducted an experiment to determine whether they could control the abundance of the buffelgrass population. The scientists identified several native grass species that, when grown with buffelgrass, might reduce the abundance of buffelgrass. They grew buffelgrass in the presence of several different native grass species in greenhouses, in either nondrought (watered every 3 days) or drought (watered every 9 days) conditions. After twelve weeks, they measured the height and dry weight of the buffelgrass in each treatment group.

A — **Describe** the effect that removing a keystone species will have on an ecosystem. **1 point**

Examples of acceptable responses may include the following:

- (Removal of a keystone species) reduces biodiversity/diversity/resilience (of the ecosystem).
- (Removal of a keystone species) will cause the ecosystem to collapse.

B — **Identify** a control group the scientists should include in their experiment. **1 point**

Examples of acceptable responses may include the following:

- (A treatment group with) only buffelgrass planted
- (A treatment group with) no native grass species

C — **State** the null hypothesis of the experiment in which buffelgrass is grown in the presence of native grass species. **1 point**

Examples of acceptable responses may include the following:

- There will be no difference in/effect on the abundance/dry weight/height/size of buffelgrass (when grown alone as compared with) when grown with native plants.
- There will be no difference in/effect on the abundance/dry weight/height/size of buffelgrass grown in drought and nondrought conditions.

D — Scientists have found that the population growth rates of native grasses are much slower than the population growth rate of buffelgrass following a wildfire. The scientists claim that wildfires will therefore increase the abundance of buffelgrass plants in the ecosystem. Based on the information given, **justify** the scientists' claim. **1 point**

Examples of acceptable responses may include the following:

- (With fewer native plant species after a wildfire) buffelgrass will have less competition/no competition (for resources).
- (With fewer native plant species after a wildfire) buffelgrass will have more resources (for growth, development, and reproduction).

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Question 3

As part of a new suburban development, a sports complex consisting of athletic fields and buildings is constructed in a formerly wooded area.

(a) **Predict** ONE ecological consequence on the local plant community that is likely to result during the site preparation and construction of the sports complex. **Justify** your prediction. (**2 points maximum**; LO 4.16, 2.21, 4.21)

Predicted consequences on plant community **(1 point)**	Justification of prediction **(1 point)**
Plant death / Loss of plant biomass	• Removing trees/shrubs • Pollution from construction equipment • Fewer individuals for reproduction • Altered habitat, e.g. change in amount of sunlight, obstruction by buildings, isolation of populations
Reduced number of plant species / Loss of biodiversity	• Removal of trees/shrubs • Reduced habitat • Pollution from construction kills local species
Decreased genetic diversity	Reduction in population size / bottleneck
Habitat loss	• Removal of trees/shrubs • Soil loss due to lack of ground cover
Increased success of sun-tolerant plants	Removal of shading trees
Introduction / Immigration of new plant species	Creation of new habitat and landscaped environments

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Question 3 (continued)

(b) To maintain the playing fields, large quantities of water and chemicals are applied regularly to the grass-covered areas. **Predict** ONE effect on the local animal community that might result from regular use and maintenance of the playing fields. **Justify** your prediction. (**2 points maximum**; LO 4.16, 2.21, 4.21)

Predicted consequence on animal community **(1 point)**	Justification of prediction **(1 point)**
Harm / Death to animals	• Exposure to toxic chemicals • Toxic chemicals accumulate through the food chain Persist in the environment • Contaminated groundwater
Emigration Displacement	• Loss of habitat and/or food • Loss of access • Exposure to toxic chemicals
Loss of native animal biodiversity	• Loss of plants on which the animals depend • Loss of habitat
Mutations	Chemicals effect on DNA
Improved conditions for animals	Increased food sources
Immigration of new animal species	Formation of new habitat
Less potable/drinking water for animals	• Increased salinity in water reservoir • Removal of water from reservoir / wells • Contamination of water with chemicals