

4. The common wild oat is native to regions of Europe and Asia but is an invasive species in central California grasslands. In California, the common wild oat has almost completely replaced some species of native bunchgrass. Researchers found that aphids, a type of small insect that often carries plant viruses, have a much higher reproductive rate in grasslands that include the common wild oat than in grasslands composed of only native bunchgrass species. Additionally, the viruses carried by the aphids appear to affect only the native bunchgrasses and not the common wild oat. Native bunchgrasses infected by the virus have much higher death rates than do native bunchgrasses that are not infected.
- (a) **Describe** the change in the resilience of an ecosystem when there is a decrease in the number of species.
- (b) **Explain** how the addition of the common wild oat affects the number of native bunchgrass plants that can be supported by the California grasslands ecosystem.
- (c) Researchers suggest adding ladybugs, predators of aphids, to the California grasslands. **Predict** the effect of adding ladybugs on the abundance of the native bunchgrass population.
- (d) **Justify** your prediction in part (c).
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**Write your responses to this question only on the designated pages in the separate Free Response booklet.**

**If there are multiple parts to this question, write the part letter with your response.**

**Question 4: Conceptual Analysis****4 points**

The common wild oat is native to regions of Europe and Asia but is an invasive species in central California grasslands. In California, the common wild oat has almost completely replaced some species of native bunchgrass. Researchers found that aphids, a type of small insect that often carries plant viruses, have a much higher reproductive rate in grasslands that include the common wild oat than in grasslands composed of only native bunchgrass species. Additionally, the viruses carried by the aphids appear to affect only the native bunchgrasses and not the common wild oat. Native bunchgrasses infected by the virus have much higher death rates than do native bunchgrasses that are not infected.

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|------------|---|----------------|
| <b>(a)</b> | <b>Describe</b> the change in the resilience of an ecosystem when there is a decrease in the number of species.   | <b>1 point</b> |
|            | <ul style="list-style-type: none"> <li>• (The resilience of the ecosystem) will decrease.</li> </ul>  |                |
| <b>(b)</b> | <b>Explain</b> how the addition of the common wild oat affects the number of native bunchgrass plants that can be supported by the California grasslands ecosystem.<br>Accept one of the following:   | <b>1 point</b> |
|            | <ul style="list-style-type: none"> <li>• (The addition of the wild oat) limits the resources available (to the native plants), resulting in a decrease (in the population size).</li> <li>• (The addition of the wild oat) <u>enables the aphid population to increase/increases the exposure to viruses</u>, resulting in a decrease (in the population size of the native bunchgrass).</li> </ul> |                |
| <b>(c)</b> | Researchers suggest adding ladybugs, predators of aphids, to the California grasslands. <b>Predict</b> the effect of adding ladybugs on the abundance of the native bunchgrass population.  | <b>1 point</b> |
|            | <ul style="list-style-type: none"> <li>• (The native bunchgrass population) will increase (in abundance).</li> </ul>  |                |
| <b>(d)</b> | <b>Justify</b> your prediction in part (c).   | <b>1 point</b> |
|            | <ul style="list-style-type: none"> <li>• (Adding ladybugs) will decrease the number of aphids, which will cause a decrease in the <u>transmission of/infection by</u> plant viruses.</li> </ul>   |                |

**Total for question 4      4 points**