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| <b>CHAPTER 3</b>  | <b>Challenge Analysis: Swift Fox Survey</b> | <b>BLM 3.3.8</b> |
| <b>ASSESSMENT</b> |   |                  |
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Analyze and interpret the following data and material, and prepare a written response to the questions that follow. You may wish to consult Appendix E: Tips for Writing Diploma Exam Written Response Questions to help you plan your response.

Biologists in all fields perform research studies to learn more about their topic of interest. They often collect large amounts of data that then need to be analyzed and interpreted in order to gain new knowledge. Analysis is about making a mathematical, chemical, or methodical examination of the parts to determine the nature, proportion, function, or interrelationship of the whole. Interpretation involves telling the meaning of something. To help establish meaning, data can be organized into a new form, usually a data table and/or graph.

*Use the following information to answer the questions that follow.*

### **Reintroduction of Swift Foxes**

The swift fox (*Vulpes velox*) is a rare, house-cat-sized carnivore that can race across native prairie at speeds of up to 60 km/hr. Although swift foxes were once so abundant in Canada that 117 025 were trapped between 1853 and 1877, this species was extirpated from Canada and northern Montana by the late 1930s. Since 1983, a reintroduction program has been underway to restore this species to Canada, and the most recent releases were made in Grasslands National Park, Saskatchewan in 1997.

A Canadian swift fox census during the winter of 1996-1997 revealed that the reintroduced population was located within two regions: 1) approximately 192 foxes were estimated to span the Alberta/Saskatchewan border south of the Cypress Hills; and 2) approximately 89 foxes were thought to exist along the United States border in and around Grasslands National Park, Saskatchewan. Concurrent with the Canadian swift fox reintroduction program, mounting evidence suggested that Canadian fox releases had also established a small swift fox population in north-central Montana.

When researchers carried out the 2000–2001 swift fox (*Vulpes velox*) census, they were trying to estimate changes in the distribution and abundance of swift foxes within Canada since the 1996–1997 census and to estimate the distribution and abundance of swift foxes in adjacent areas of Montana. The study area included 65 townships in the Alberta/Saskatchewan border region and 43 townships in and around Grasslands National Park in south-central Saskatchewan. Similarly a census area of 30 townships was selected in Montana.

The study area has low human population density and is used primarily for cattle ranching. The area is in the brown soil zone and is characterized by an abundance of mid-length and short grasses, numerous herbs, and few bush species. Live swift fox trapping was conducted at night from November 4, 2000 until February 15, 2001 in Alberta, Saskatchewan, and Montana. Researchers set up live traps at one-kilometre intervals along a five-kilometre, continuous section of trail closest to the centre of each respective township. Each township was then surveyed, using six traps for three nights, for a total of 18 trap nights per township. Foxes were uniquely marked with tattoo dye so that recaptured individuals could be identified. Trapping success was compared in these regions by comparing the number of trap nights per new capture.

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The significant results of the 2000-2001 census are:

1. In total, 149 swift foxes were live-trapped: 97 in the Alberta/Saskatchewan border area population, 14 in the Grasslands National Park region, and 38 in adjacent Montana areas. By comparison, 32 swift foxes were caught during catch-and-release efforts during the Canadian 1996-1997 swift fox census. In 2000-2001, 98.6% of captured foxes were unmarked, which means that they were wild-born in the Canadian/Montana population. This is a greater proportion of wild-born foxes than that recorded in 1996-1997, when 81.3% were unmarked.
2. The known distribution of swift foxes in Canada and Montana has substantially increased through the results of this census. In the Alberta/Saskatchewan border area, swift foxes were found in 18 townships in 1996-1997; during the 2000-2001 census they were found in 38 townships. In the Grasslands National Park region, swift foxes were found in 7 townships during the previous census, whereas they have now been located in 13 townships. In Montana, where a previous census of this kind had not been conducted, swift foxes were found in 25 townships in the 2000-2001 census.

Source: [http://www.srd.gov.ab.ca/fw/speciesatrisk/pdf/SAR\\_24.pdf](http://www.srd.gov.ab.ca/fw/speciesatrisk/pdf/SAR_24.pdf)

Table 1: Comparative survey effort, capture success, and proportion of foxes that were recaptured at least once in the Alberta/Saskatchewan border subpopulation, the Grasslands National Park subpopulation, and Montana in 1996-1997 and 2000-2001.

| Area                           | Number of Townships Surveyed | # of Foxes Caught | % of Foxes Recaptured | # of Trap nights/New Capture |
|--------------------------------|------------------------------|-------------------|-----------------------|------------------------------|
| Alberta/Saskatchewan 1996-1997 | 39                           | 24                | 33                    | 29.5                         |
| Grasslands 1996-1997           | 19                           | 8                 | 25                    | 41.3                         |
| Montana 1996-1997              | No census                    |                   |                       |                              |
| <b>Total 1996-1997</b>         | <b>58</b>                    | <b>32</b>         | <b>31</b>             | <b>32.4</b>                  |

|                                |            |            |           |             |
|--------------------------------|------------|------------|-----------|-------------|
| Alberta/Saskatchewan 2000-2001 | 55         | 97         | 33        | 10.0        |
| Grasslands 2001-2002           | 30         | 14         | 29        | 38.6        |
| Montana 2001-2002              | 66         | 38         | 32        | 31.3        |
| <b>Total 2000-2001</b>         | <b>151</b> | <b>149</b> | <b>31</b> | <b>18.1</b> |

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Table 2. Survey effort, captures, estimated densities, and estimated population sizes for the Alberta/Saskatchewan border, Grasslands, Montana, and total survey area in 2000–2001

| Region       | Region Townships | Region Area (km <sup>2</sup> ) | Townships Surveyed | Total Area Sampled (km <sup>2</sup> ) | Foxes Caught in Sample | Estimated Fox Density (foxes per 100km <sup>2</sup> ) | Estimated Population Size |
|--------------|------------------|--------------------------------|--------------------|---------------------------------------|------------------------|---|---------------------------|
| Border       | 65               | 5990.4                         | 53                 | 3690.5                                | 95                     | 9.3   | 560.1                     |
| Grasslands   | 43               | 3962.9                         | 30                 | 2013.0                                | 14                     | 2.4   | 96.4                      |
| Montana      | 80               | 7372.8                         | 66                 | 4428.6                                | 38                     | 3.0   | 221.4                     |
| <b>Total</b> | 188              | 17326.1                        | 149                | 10132.1                               | 147                    | 5.1   | 877.9                     |

1. a) **Graphically** illustrate the change in the number of trap nights/new capture at each location from the 1996–1997 survey to the 2000–2001 survey. **(4 marks)**
- b) In all regions in both years of the study, the number of foxes recaptured is relatively low, 25–35%. **Explain** what this indicates about the swift fox population. **(2 marks)**

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- c) **Explain**, in terms of natality and mortality, the change in the swift fox population in the Alberta/Saskatchewan area from 1996 to 2001. **Identify** one abiotic and two biotic characteristics of this ecosystem that could have contributed to this change. **(4 marks)**

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- d) **Hypothesize** why the Grasslands National Park subpopulation had a smaller increase than the border subpopulation. **(2 marks)**

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- e) **Describe** how the researchers determined the population size estimate in each area. **(1 mark)**

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- f) **Why** were the townships selected in this region? Why didn't they survey all townships in each region? **(2 marks)**

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- g) **Describe** further research that could be undertaken to help with removing the swift fox from Canada's endangered species list? **Describe** a technology that could be incorporated into this research. **(2 marks)**

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