

## Thought Lab 3.3: Super Competitor: Knapweed Answer Key

### Answers to Procedure Question

Background biology of spotted knapweed (*Centaurea biebersteinii*)

- Introduction: European explorers and settlers brought with them cattle, goats, and other domestic animals, along with crops. Along with these came other foreign organisms (bacteria, influenza, rats, and other pests, including knapweed) carried in ballast water (water from Europe used to stabilize large ships) and shipping crate wood.
- Knapweed was introduced unintentionally into North America from Europe in the 1800s; there are 15 introduced *Centaurea* species established in Canada today. Alien species continue to be introduced into Canada today by agriculture, floral, horticulture, and other trade industries.
- Identification: Plants have a deep taproot, alternate leaves, up to 35 stems, and purple or pink flowers.
- Reproduction: seed; self-compatible; pollinated by flies and bees.
- How it is spread: seed dispersal (August–October) by wind, ruminants, squirrels, vehicles; seed yield increases with increasing soil moisture or disturbance and decreases dry conditions.
- Predators: insects; biologically controlled by *U. affinis* and *U. quadrifasciata* seed-head flies (although attacks result in increased seed production).
- Habitat: common on gravel streambeds (i.e., irrigation ditches), roadsides, pipelines, power lines, railways, and spread to adjacent fields by wind and vehicle distribution.
- Success: due to higher than usual replacement requirements of seed production; flexible germination and life cycle; great competitor; ability to regenerate; deep taproot sustains growth in dry conditions; discourages grazing by bitter anti-microbial substance (cnicin).

### Answers to Analysis Questions

1. a) Over the last century, the population of spotted knapweed has increased steadily. The species has an S-shaped invasion curve and will grow at an increasing rate until the carrying capacity is reached (8.4–10.7 million hectares in western Canada are threatened).
  - b) Students will extrapolate the data on the graph. In the year 2020, populations will likely cover 40 000 hectares of the province (a hectare is 10 000 m<sup>2</sup>) unless the spread is brought under control.
2. Some introduced species become so invasive because they are removed from their original habitat and natural parasites or predators no longer control populations.
3. Spotted knapweed is not a pest in its native habitat (Europe) because some native European insects, weevils, and moths are resistant to cnicin, the lethal substance produced by knapweed species, and these herbivorous organisms can control knapweed populations.
4. a) Spotted knapweed could continue to be spread through Alberta by seed dispersal by wind, seeds carried on vehicles, hay farming, ruminant and rodent dispersal, etc.
  - b) (i) As knapweed invades fields, the numbers of native grasses of rangelands are decreased, and in turn, there is less forage for cattle. (Also, herbicide costs and application increases, degrading soil quality and increasing seed production of knapweed).

<b>CHAPTER 3</b>	<b>Thought Lab 3.3: Super Competitor: Knapweed (cont'd)</b>	<b>BLM 3.3.6</b>
HANDOUT		

- (ii) In native habitats, plant species diversity decreases over time, as knapweed out-competes native species. As knapweed populations increase, soil erosion and stream sedimentation also increase. These factors result in a decline in herbivore populations in both terrestrial and aquatic habitats.