Rooted in Resilience

Presqu'ile's Nursery & Tree Planting Program

Preserving our canopy, one seed at a time

1. How does the decline in natural recruitment at Presqu'ile relate to the concept of population dynamics?

2. Explain how the Emerald Ash Borer's impact on ash trees demonstrates density-independent vs. density-dependent limiting factors.

3. The nursery uses seeds collected from local trees. How does this practice support the principles of local adaptation and microevolution?

4. Describe how cold stratification reflects the evolutionary history of temperate-zone plant species.

5. How does the nursery program contribute to maintaining or increasing genetic diversity within the forest ecosystem?

6. Weevil infestation reduces the number of viable acorns. How does this selective pressure influence the gene pool of oak populations over time?

7. Deer overbrowsing is a major threat to saplings. Explain how this pressure can alter species composition and lead to directional or stabilizing selection.

8. Compare the survival probabilities of saplings grown in the nursery versus those germinating naturally. How does this relate to the concept of r- and K-selected strategies?

9. Explain how planting density affects intraspecific competition and carrying capacity in a regenerating forest.

10. Why is long-term monitoring essential for evaluating ecosystem resilience and succession in restored forest areas?

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Answer Key

1. A decline in natural recruitment means fewer young individuals are entering the population, causing a shift toward an aging population structure. This leads to decreased population growth and may push the forest toward a population crash if not corrected.

2. Density-dependent: The beetle targets ash trees specifically, so its impact increases where ash density is high. **Density-independent:** Once established, the beetle kills ash trees regardless of population size, acting like an external disturbance.

3. Local seeds contain alleles suited to the region's climate, soil, and seasonal patterns. Using them preserves adaptive traits and prevents maladaptation that could occur if seeds from other regions were introduced.

4. Cold stratification mimics winter conditions. Species that evolved in temperate climates developed this requirement to ensure germination occurs only in spring, increasing survival. It reflects natural selection acting on germination timing.

5. By collecting seeds from many parent trees across the park, the nursery preserves a wide genetic base. This increases resilience to disease, climate change, and future environmental pressures.

6. Weevils destroy weaker or poorly protected acorns. Only acorns with traits that deter infestation (thicker shells, chemical defenses, faster development) survive, shifting allele frequencies toward these advantageous traits.

7. Heavy browsing by deer can:

- Reduce species that are highly palatable (directional selection)
- Favour species with chemical defenses or rapid growth

Lead to long-term shifts in forest composition

- This is a strong selective pressure shaping which species survive.

8. Natural germination resembles **r-selection**: many seeds, low survival.

Nursery conditions resemble **K-selection**: fewer individuals but high parental (human) investment and higher survival.

The nursery increases the likelihood that each seed becomes a mature tree.

9. High density increases competition for light, nutrients, and water, reducing growth and survival. Proper spacing ensures the population remains below the carrying capacity of the site, promoting healthier long-term growth.

10. Monitoring tracks survival, growth, species composition, and responses to disturbances. It allows scientists to evaluate whether the restored forest is progressing through natural succession and becoming more resilient over time.