## Question 3: Analyze an Environmental Problem and Propose a Solution
## Doing Calculations — 10 points

**(a)** **Describe** a characteristic of a specialist species that would make the specialist species more likely to be negatively affected by habitat fragmentation than a generalist species. **1 point**

Accept one of the following:

- Specialists have narrow ecological niches compared to broad niches of generalist species, which are reduced even further by habitat fragmentation.
- Specialists with specialized adaptations are unable to adapt quickly, making them more vulnerable to habitat fragmentation than generalists that adapt quickly.
- Specialists tend to have small populations with less genetic variation than generalist species with larger populations and more genetic variation, making specialists more vulnerable to habitat fragmentation.

**(b)** **Identify** the symbiotic relationship between the wood thrush and the cowbird. **1 point**

Accept one of the following:

- Parasitism
- Brood Parasitism
- The cowbird uses the wood thrush (as the surrogate parent) to raise their hatchling, which negatively affects the wood thrush and benefits the cowbird.

**(c)** **Describe** one ecological advantage of leaving areas of undeveloped forest in the development plan as compared to clear-cutting the property. **1 point**

Accept one of the following:

- Since the habitat isn't being clear-cut, it does preserve some biodiversity by allowing some of the species to survive in the fragmented areas of the forest.
- Habitat fragmentation can benefit some generalist species or species which thrive in edge habitat, leading to population increases for those species.
- If planned with buffer zones around targeted conservation areas, edge disturbances for specialist species can be reduced.
- The remaining forest/trees will reduce soil erosion.
- The remaining forest will help with climate/cooling resulting from transpiration/shade from trees.





**(d)** **Propose** a solution that will minimize the effect of development on the resident population of wood thrush while still meeting the municipality's need for a housing development. **1 point**

Accept one of the following:

- Leave areas for wildlife corridors/crossings to prevent isolating populations.
- Include conservation easements in the plan that will preserve species and also provide tax breaks for the residents.
- Create buffer zones near the development to separate it from wildlife habitat.
- Create a mitigation plan that preserves land elsewhere of similar quality.
- Cluster housing or vertical development to limit the development footprint.
- Incorporate common green spaces that promote wood thrush populations.

**(e)** A male wood thrush needs a minimum of 800 $m^2$ of territory for reproduction. The municipal development committee has set a biodiversity preservation target of 275 male wood thrush territories. **Calculate** the area that must be set aside to support the goal of 275 male thrush territories. **Show** your work. **1 point**

One point for the correct setup to calculate the area:

- $275 \text{ territories} \times \frac{800\,m^2}{1 \text{ territory}}$

One point for the correct calculation of the area: **1 point**

- 220,000 $m^2$

**Total for part (e)** **2 points**

**(f)** A real estate developer wants to build houses on the property. The plan will support 1,000 lots with a lot size of 1,100 $m^2$. The developer has proposed setting aside land equal to 10% of the size of each lot it sells. **Calculate** the maximum number of male wood thrush territories that could be created under this proposal. **Show** your work. **1 point**

One point for the correct setup to calculate the number of male wood thrush territories:

- $1{,}000 \text{ lots} \times \frac{1{,}100\,m^2}{1 \text{ lot}} \times 0.10 \div 800\ m^2 \text{ per territory}$

One point for the correct calculation of the number of male wood thrush territories, accept one of the following: **1 point**

- 137.5 male wood thrush territories
- 137 male wood thrush territories
- 138 male wood thrush territories

**Total for part (f)** **2 points**

**(g)** **Calculate** the percentage of each of the 1,000 lots that would need to be set aside in order to support the goal of 275 male wood thrush territories. **Show** your work. **1 point**

One point for the correct setup to calculate the percentage of each lot to be set aside:

- $\frac{220{,}000\,\text{m}^2}{1{,}100{,}000\,\text{m}^2} \times 100$
- $275\ \text{territories} \times \frac{110{,}000\,\text{m}^2}{137.5\ \text{territories}} \div 1{,}100{,}000\,\text{m}^2 \times 100$
- $\frac{275\ \text{territories} \times 10\%}{137.5\ \text{territories}} \times 100$

One point for the correct calculation of the percentage of each lot to be set aside: **1 point**

- 20% of each lot

**Total for part (g)** **2 points**

**Total for question 3** **10 points**