Chapter-wide learning goals:

1. Summarize the evidence supporting the importance of ecological mechanisms in driving biogeographical patterns.
2. Evaluate the evidence in support of the major hypotheses attempting to explain latitudinal patterns in species richness.
3. Describe patterns of species diversity by latitude.
4. Summarize the evidence supporting the importance of historical mechanisms in driving biogeographical patterns.

Section 1: Species Richness and the Extinction Crisis

1. Describe how global species richness has changed over Earth's history and why scientists believe we are undergoing a sixth mass extinction.
2. Describe examples of how ecologists attempt to estimate global species richness.
3. Persuade a lay audience that biodiversity should be protected.
4. Describe some of the key threats to global biodiversity posed by humans.
5. Provide examples of how biogeographic principles can inform conservation strategies.
6. Determine which hypothesis for variation in alpha species richness (i.e., gamma diversity drives alpha diversity versus local interactions drive alpha diversity) is better supported using data on local and regional diversity.
7. Estimate alpha diversity in a site using a species accumulation curve.
8. Describe the information that is communicated by a species accumulation curve.
9. Construct a species-accumulation curve, making sure to account for sampling error.
10. Evaluate the evidence supporting the hypothesis that beta diversity of new World birds is driven by variation in altitude, making sure to explain the importance of scale.

Section 2: Ecological Biogeography

1. Explain how dispersal, extinction, and evolution interact to determine local species richness.
2. Provide examples supporting the relationship between species richness and area described by the equation: $S = cA^z$.
3. Predict equilibrium species richness and turnover rates on islands of different sizes and located at different distances from a mainland species pool using MacArthur and Wilson's theory of island biogeography.
4. Provide examples of studies supporting the qualitative predictions of MacArthur and Wilson's theory of island biogeography.
5. Compare and contrast the conclusions researchers can draw from natural experiments to those from more manipulative field or laboratory experiments.
6. Summarize the limits ecologists have recognized in MacArthur and Wilson's theory of island biogeography since it was first proposed.
7. Suggest a hypothesis that could explain why species area-curves based on island fauna are steeper than curves based on mainland data.
8. Use island biogeographic theory to provide insight into suggested approaches to some conservation issue.
9. Provide examples of how MacArthur and Wilson's theory of island biogeography have influenced conservation biology.
10. Provide examples of the three primary barriers to dispersal (i.e., corridors, filters, sweepstakes routes).
11. Provide examples of how a species' attributes influence the mechanisms (i.e., jump dispersal, diffusion, secular migration) it has available to overcome its barriers to dispersal.

Section 3: Historical Biogeography

1. Describe four hypotheses that have been offered to explain the latitudinal gradient in species richness and the sorts of data that could be used to evaluate them.
2. Draw a graph illustrating how species richness tends to vary with temperature.
3. Test the correlation between a dependent and independent variable using regression analysis.
4. Contrast the different mechanisms of speciation (i.e., sympatric speciation and allopatric speciation via dispersal and vicariance events), including the sorts of data that can be used to help discriminate between them.
5. Explain how plate tectonics has affected species distributions.
6. Describe in broad terms how earth's land masses have moved around over the past billion years.
7. Provide examples of how humans have accelerated the dispersal of many species, including the consequences of these examples.
8. Propose a set of data that could be used to distinguish between different hypotheses for the radiation of some clade of species.
9. Argue for or against different allopatric speciation hypotheses for a clade using phylogenetic, geographic, and plate tectonics data.
10. Provide examples of how dispersal and vicariance events have interacted to determine the current distribution of some clade.
11. Provide examples of how disruptive and sexual selection can lead to sympatric speciation.
12. Predict the most likely evolutionary relationships between closely related species occupying a changing geography.
13. Evaluate the hypothesis that conservation biology can be advanced by identifying and protecting biodiversity hotspots.

Section 4: Global Patterns in Physical Conditions

1. Describe how seasonal and spatial climatic variation interact to determine the location of Earth's major biomes.
2. Show how the tilt of Earth's axis and its rotation around the Sun interact to drive the changing of the seasons.
3. Sketch how the curvature of the Earth and the differential heating of its surface produces its major circulation cells and the associated precipitation patterns.
4. Explain the Coriolis effect.
5. Describe Earth's major biomes.
6. Show how the biome concept can inform conservation efforts.