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| **Key Points / Questions** | **Reading Questions** |
| As you watch/read the assigned videos and readings, record any key terms, concepts, or ideas in the space below. Document any questions that arise as well. | 1. What is phenology? Provide examples for clarification.   Phenology refers to the study the timing of natural events. This can include the timing of migration events, the budding of plants, hatching of caterpillars, and hatching of chicks. Examples from the video include budburst events and the cherry blossoms in Washington, D.C. |
| 1. What is a phenological mismatch? Provide an example.   Phenological mismatches occur when the timing of two events that interact with one another changes. For example, insect hatches often coincide with the hatching of bird chicks. This provides a ready food source for the birds when they hatch. If insects hatch earlier, then the insects may not be available when the chicks emerge from their shells. Examples are provided in Robinson et al. (2009). |
| 1. Based upon Table 1 in Robinson et al. (2009), what are the ways in which climate change may affect migratory fishes?   Climate change may increase water temperatures, precipitation (and therefore, floods, droughts, etc.), loss of breeding habitat, loss of migration, changes in food availability, and a mismatch in timing. |
| 1. What questions are there regarding the timing of arrival and adaptation by migratory species to warming temperatures?   How variable changes will be, how much species can adjust or be flexible in their timing of migration to adapt, how changes will intersect with other life history events, the potential for mismatches to occur in different taxonomic groups. |
| 5. Predict how increased temperatures would affect migratory redhorses. Draw a figure that shows your prediction.  It would be predicted that redhorse migration would shift to earlier in the spring if the environmental cue for migration was water temperature.  An appropriate figure could include a histogram with redhorse abundance on the y-axis and date on the x-axis. Student could draw a “shift” in the dates of abundance over various climate scenarios. |
| **Summary/Reflections** | |

You were assigned the task of finding two scientific, peer-reviewed articles on phenological shifts in migratory fishes. Using the space below, summarize the two articles IN YOUR OWN WORDS and reflect upon the significance of the findings. Each summary should consist of at least 100 words. Include the title for each paper.

Title of first paper:

Summary of first paper:

Title of first paper:

Summary of first paper: