Urban EcoLab Science Curriculum
Module 11 – Bird Migration

Special Focus on Studying Migratory Behavior in Pine Siskins *Spinus pinus*

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Introduction/Purpose:

Module 11 introduces students to the topic of migration. Students will explore topics such as why some birds migrate while others do not; the differences between obligate (predictable) versus facultative (flexible) migrants; and the physical and environmental factors or cues that impact migration, including food availability, temperature, photoperiod, and hormone levels. This module is being funded by a National Science Foundation grant (IOS: 1456954/1756976), which aims to study the migratory behavior in Pine siskins *Spinus pinus*. Special focus on this bird species will be included in this module. The module concludes with students using their knowledge of migration to observe migratory birds in a laboratory setting. By the end of this module, students will better understand bird migration and the environmental cues that drive migratory behavior.

Module Outline:

- **Lesson 1 – Why Do Birds Migrate?**
  - Why some birds migrate while others do not
- **Lesson 2 – Migratory vs. Non-Migratory Birds**
  - Characteristics and adaptations
  - Diet / Food Variation / Digestive tract
  - Behaviors
- **Lesson 3 - Obligate vs. Facultative Migrants**
  - Characteristics and adaptations
  - Diet
  - Location / Timing
- **Lesson 4 - Cascading Factors Affecting Bird Migration**
  - Sun Position/Photoperiod
  - Climate/Weather/Length of Temperature
  - Temporal/Seasons
  - Food Resources/Nutrition Levels
  - Hormone Levels
- **Lesson 5 – Observing Seasonal Expression of Migratory Behavior in Pine Siskins**
  - Facultative migrants
  - Pine Siskin *Spinus pinus*
  - Ethograms
  - Scientific process
- **Lesson 6 – Obligate Migrants**
  - Discover and Explore the World of Seasonal Migrants
- **Migration Resources and Citizen Science**
- **Reference Materials**