

## Unit Overview

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This one-week unit serves as an in-class preparation for the coming field data collection. It covers the basics of climate and climate change, and an overview of the data that students will be collecting, and the methods, as well as how those data will be used.

The lessons are as follows:

**1. Climate:**

Signal vs. Noise; Evaporation;

**2. Ecology and Climate:**

Signal vs. Noise: What's really going on?; How do plants and animals experience climate?; Manomet Bird Data

**3. Climate Change:**

Temperature Change; Storm surges and sea level rise

**4. Biological Responses to Climate Change:**

Signal vs. Noise; Changes in New England; Regional Climates; Biomes

**5. Research and Bioindicators:**

Signal vs. Noise; What's causing the change? Biomes and bioindicators

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### Key ideas for the unit

#### **Signal vs. noise.**

A key element of the Climate Lab is the collection of data for the tracking of long-term trends. The point of this kind of data collection can be hard to understand if one doesn't have a good idea of what it takes to look at trends that are only detectible over the course of many years.

So in each lesson, we address the concept of signal vs noise, to help keep students thinking about how the "answers" to climate change questions emerge over time. At the start of each lesson of this unit, there will be a short activity focused on figuring out the "signal" in a data set. The purpose of these activities is less to impart knowledge, and more to help students gain an understanding of the idea of separating the actual signal (e.g. ,Waldo, in a "Where's Waldo?" puzzle) from a dataset that could be misleading (like all of the hats, shirts, or glasses in a "Where's Waldo?" puzzle).

#### **Data analysis.**

The signal vs noise activities should also help instill a habit of looking for that signal when presented with data. The lessons in them will be reinforced in the main body of

each activity as you look at real datasets and graphs. When we get to data from Manomet about bird responses to climate change, the students will see a signal emerging from data related to the data they are collecting. They will be able to see basic methods for identifying signals in a data set, and this can lay the groundwork for basic descriptive statistics work.

**Additional considerations:**

When you're out in the field, what other organisms might you want to look for?

The transect is a sample, and for the purposes of the core data collection, it is the only thing of interest — and it will be the standard observation site for the years of the study. On the other hand, other data from the field site might be of interest for other questions. For example, what other plants are present that are NOT on the transect? What birds are seen? What nests? What signs of other organisms (tracks or trails, burrows, scratch marks, hair, scat, leaf-damage, cocoons)? What evidence of human activity is visible?

Depending on your students, you may wish to encourage them to be looking for things like this while they're in the field, and thinking about how the rich, diverse ecosystem around them ties into the work they're doing, and the content of this lesson.

**A note on the final lesson of the unit:**

The activity “Biomes and Bioindicators” draws on information and lessons from throughout the week. Note has been made of this in several locations throughout the five lesson plans, but keep it in mind, and look for opportunities to let your students know that one concept or another will be revisited down the line, and they should keep thinking about it.