

Macrosystems EDDIE: Getting Started + Troubleshooting Tips

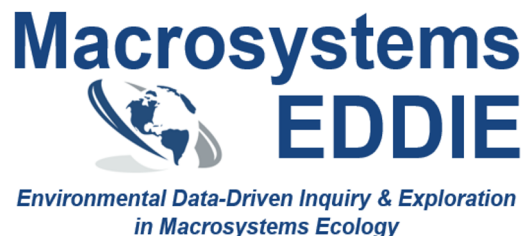
Moore, T. N., Carey, C.C., Thomas, R. Q. 23 January 2021.

Macrosystems EDDIE: Introduction to Ecological Forecasting.

Macrosystems EDDIE Module 5, Version 1.

<http://module5.macrosystemseddie.org>

Module development supported by NSF DEB-1926050; NSF DBI-1933016



R Shiny Applications



- Statistical environment



- Interactive web app built using R.
 - Allows users to interact with data
 - Conduct their own analysis

Check-in:

- Can you access the Shiny app or this module?
 - Copy and paste this link into your browser:
<https://macrosystemseddie.shinyapps.io/module5/>
 - If this is not working contact us at MacrosystemsEDDIE@gmail.com and we will help you resolve this issue.

Landing Page of the Shiny App

Module 5: Introduction to Ecological Forecasting

Module Overview
Introduction
Exploration
Activity A
Activity B
Activity C

Introduction to Ecological Forecasting

Summary

Ecological forecasting is a tool that can be used for understanding and predicting changes in populations, communities, and ecosystems. Ecological forecasting is an emerging approach which provides an estimate of the future state of an ecological system with uncertainty, allowing society to prepare for changes in important ecosystem services. Ecological forecasters develop and update forecasts using the iterative forecasting cycle, in which they make a hypothesis of how an ecological system works; embed their hypothesis in a model; and use the model to make a forecast of future conditions. When observations become available, they can assess the accuracy of their forecast, which indicates if their hypothesis is supported or needs to be updated before the next forecast is generated.

In this module, students will apply the iterative forecasting cycle to develop an ecological forecast for a National Ecological Observation Network (NEON) site. Students will use NEON data to build an ecological model that predicts primary productivity in an aquatic ecosystem. Using their calibrated model, they will learn about the different components of a forecast with uncertainty and compare productivity forecasts among NEON sites.

```

graph TD
    BuildModel[Build Model] --> QuantifyUncertainty[Quantify Uncertainty]
    QuantifyUncertainty --> GenerateForecast[Generate Forecast]
    GenerateForecast --> CommunicateForecast[Communicate Forecast]
    CommunicateForecast --> AssessForecast[Assess Forecast]
    AssessForecast --> UpdateModel[Update Model]
    UpdateModel --> CreateHypothesis[Create Hypothesis]
    CreateHypothesis --> BuildModel
  
```

Navigating the Shiny App

Module 5: Introduction to Ecological Forecasting Module Overview **Introduction** Exploration Activity A Activity B Activity C

eddie
environmental data-driven inquiry & exploration

Workflow for this module

1. After the instructor completes the PowerPoint presentation, students will launch the Shiny app. Students work in pairs to navigate through the upper tabs (e.g., "Introduction", "Exploration", "Activity A", "Activity B", and "Activity C") to complete each of the objectives embedded within each tab. Within each activity tab, there are individual objectives which must be completed before moving onto the next one (e.g., within Activity A, Objective 1 is "Select and view site").
2. There are questions in green text boxes embedded throughout the Shiny app which students can input answers into.
3. When all of the objectives are completed and questions are answered, navigate to the "Generate Report" section in the "Introduction" tab. This will then create a Microsoft Word document with all of the forecasts and answers embedded within, which can be downloaded and finalized before submitting to the instructor.
4. **Select a tab by clicking on it**

Introduction

- Background reading

Exploration

- Explore a current ecological forecast

Activity A – Get Data & Build Model

- Select a NEON site, explore the data collected and build a model.

Activity B – Forecast!

- Use the model to generate your own forecast

Activity C – Scale to another site

- Compare forecasts across different regions

Answer questions

Module 5: Introduction to Ecological × +

← → ↻ macrosystemseddie.shinyapps.io/module5/

Before you start...

Input your name and Student ID and this will be added to your final report.

Name:

ID number:

Questions

Note: The size of these text boxes can be adjusted by clicking and dragging the bottom right of the text box.

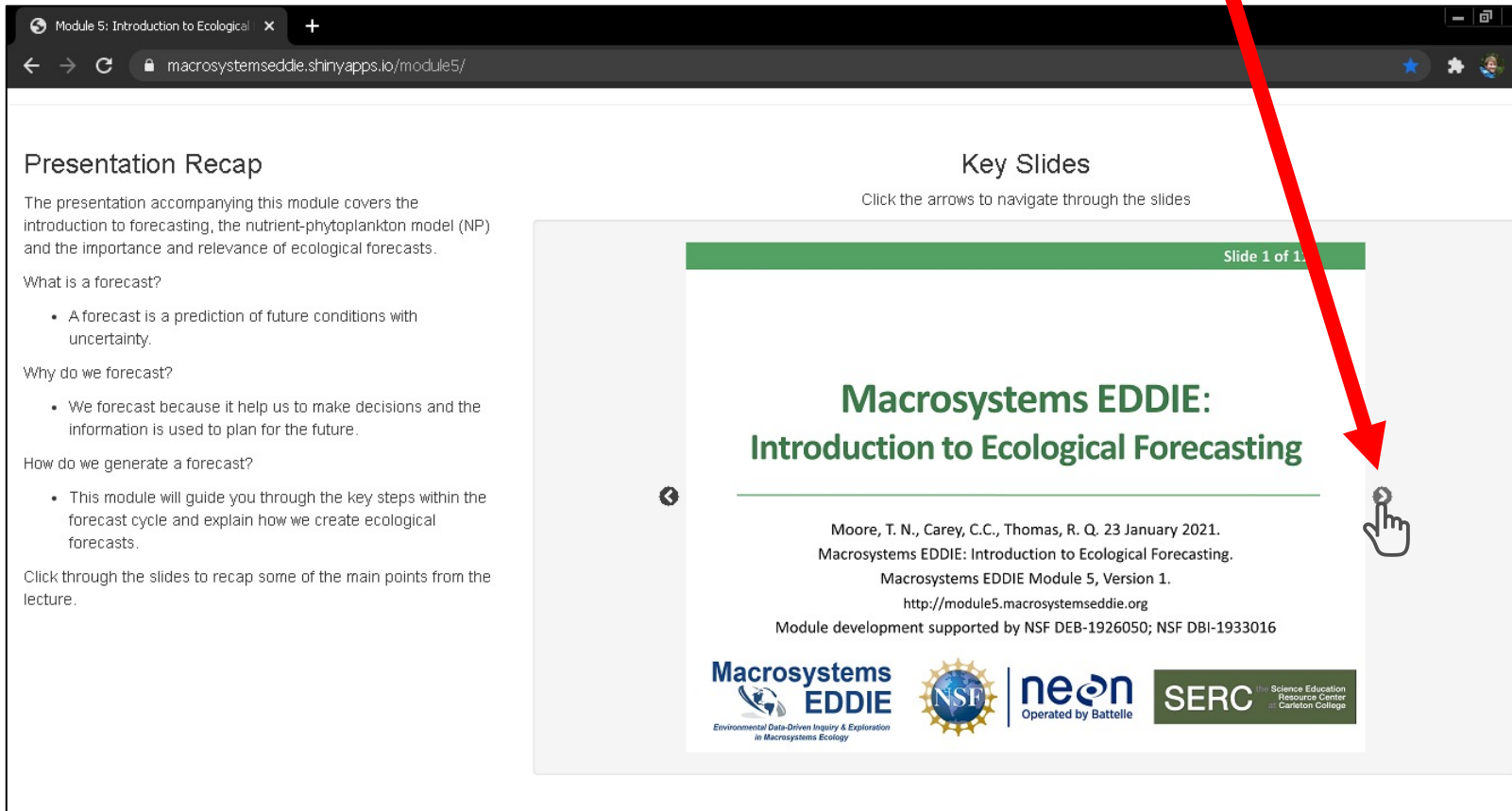
Q1. How have you used forecasts (ecological, political, sports, any kind!) before in your day-to-day life?

Q2. How can ecological forecasts improve both natural resource management and ecological understanding?

Type your answers into the text boxes

Navigate slides

Advance slides by clicking on the arrows



The screenshot shows a web browser window with the address bar displaying `macrosystemseddie.shinyapps.io/module5/`. The page is titled "Module 5: Introduction to Ecological Forecasting". On the left, there is a "Presentation Recap" section with the following text:

The presentation accompanying this module covers the introduction to forecasting, the nutrient-phytoplankton model (NP) and the importance and relevance of ecological forecasts.

What is a forecast?

- A forecast is a prediction of future conditions with uncertainty.

Why do we forecast?

- We forecast because it help us to make decisions and the information is used to plan for the future.

How do we generate a forecast?

- This module will guide you through the key steps within the forecast cycle and explain how we create ecological forecasts.

Click through the slides to recap some of the main points from the lecture.

On the right, there is a "Key Slides" section with the text "Click the arrows to navigate through the slides". Below this is a slide viewer showing "Slide 1 of 1". The slide content is:

Macroscopic EDDIE: Introduction to Ecological Forecasting

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At the bottom of the slide are logos for Macrosystems EDDIE, NSF, neon (Operated by Battelle), and SERC (Science Education Resource Center at Carleton College).

A red arrow points from the text "Advance slides by clicking on the arrows" to a hand icon pointing at a right arrow on the slide viewer, indicating how to navigate to the next slide.

Interact with app

Module 5: Introduction to Ecological | x +

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Objective 1 - Select a Site

Select a NEON site from the table, then click on the "View live feed" button to load the latest image from that site. Follow the link at the bottom of the 'About Site' section to find out more about the site.

Site Description


Select a site in the table to highlight on the map

Show **10** entries Search:


	siteID	location
1	CRAM	Crampton Lake Site
2	SUGG	Suggs Lake Site
3	BARC	Barco Lake Site
4	PRPO	Prairie Pothole Site
5	LIRO	Little Rock Lake Site
6	PRLA	Prairie Lake at Dakota Coteau Field School Site

Showing 1 to 6 of 6 entries Previous 1 Next

Click 'View live feed' to see the latest image from the webcam on site (this may take 10-30 seconds).




Map of NEON sites



Leaflet | Tiles © Esri — National Geographic, Esri, DeLorme, NAVTEQ, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, IPC

Phenocam

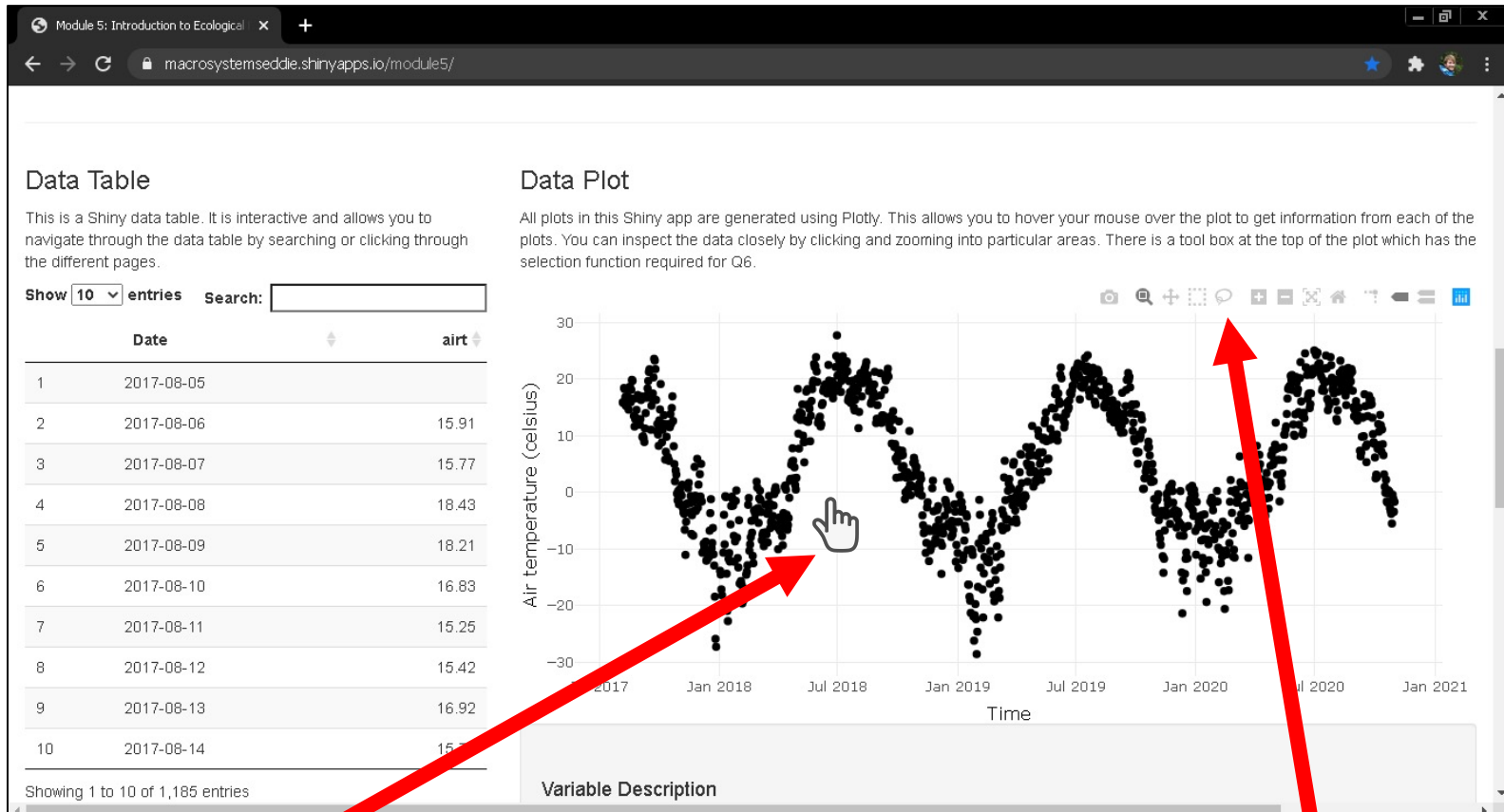
Hover your cursor above the image to enlarge.



A 'phenocam' is a digital camera capturing time-lapse images of foliage and lake sites. It can be used to generate

Select data table rows and click buttons

Interact with plots



Hover cursor over points or click and drag to zoom in

Hover cursor over plot to bring up options

Saving plots



Save plots for downloading with your final report

Saving & Resuming Progress

1. Navigate to the “Introduction” tab
2. Scroll down to “Save your progress” section
3. Click on the “Download user input” button. A ‘eddie’ file will download. Your computer might prompt you to open this in R. This will not work, it only works for uploading to the Shiny app
4. Store this file somewhere safe on your computer
5. When continuing, you will upload this file and it will populate your answers and saved parameters

Save your progress

If you run out of time to finish all the activities you can save your progress and return to it at a later date. Click the 'Download' button below and a file 'module5_answers_ID_number.rds' will download. Store this file in a safe place locally on your computer.

 Download user input

Resume your progress

To reload the app input you can upload the downloaded '.rds' file below and it will populate your answers into the Shiny app.

Upload data

 Browse...


No file selected


Downloading the Report

1. Navigate to the “Introduction” tab
2. Scroll down to “Save your progress” section
3. Click on the “Generate Report (.docx)” button.
4. Then the “Download Report” button will appear. Click this to download the report with answer and plots embedded within a Word document.

Generate Report

This will take the answers you have input into this app and generate a Microsoft Word document (.docx) document with your answers which you can download and make further edits before submitting. Return here when you have completed the module.

 Generate Report (.docx)

 Download Report

Questions still to be completed:

Activity A: Objective 5 - Q. 15 Save plot of model run

Activity B: Objective 9 - Q. 21

Activity B: Objective 10 - Q. 22

Activity B: Objective 11 - Q. 23 Save plot of new ecological forecast