

# Macrosystems EDDIE: Getting Started + Troubleshooting Tips

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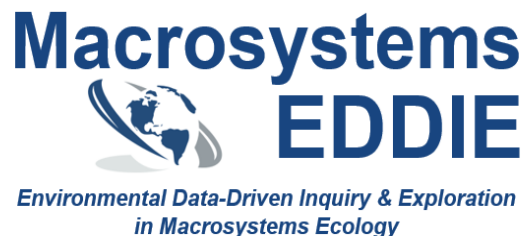
Moore, T. N., Carey, C.C., Thomas, R. Q. 23 January 2021.

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](mailto:MacrosystemsEDDIE@gmail.com) and we will help you resolve this issue.

# Landing Page of the Shiny App

The screenshot shows a web browser window with the URL `macrosystemseddie.shinyapps.io/module5/`. The page has a navigation bar with tabs: "Module 5: Introduction to Ecological Forecasting" (selected), "Module Overview", "Introduction", "Exploration", "Activity A", "Activity B", and "Activity C". Below the navigation bar is a green banner with the "eddie" logo and the text "environmental data-driven inquiry & exploration". The main heading is "Introduction to Ecological Forecasting". Under the heading is a "Summary" section. The summary text describes ecological forecasting as a tool for understanding and predicting changes in populations, communities, and ecosystems, and mentions the iterative forecasting cycle. Below the text is a diagram titled "The Forecast Cycle" showing a circular flow of six steps: "Quantify Uncertainty", "Generate Forecast", "Communicate Forecast", "Assess Forecast", "Update Model", and "Build Model". The cycle is represented by a large blue arrow pointing clockwise.

Module 5: Introduction to Ecological Forecasting

Module Overview Introduction Exploration Activity A Activity B Activity C

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## 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; A[Quantify Uncertainty] --> B[Generate Forecast]; B --> C[Communicate Forecast]; C --> D[Assess Forecast]; D --> E[Update Model]; E --> F[Build Model]; F --> A;
```

The diagram illustrates "The Forecast Cycle" as a continuous loop of six steps, each represented by an icon and text: "Quantify Uncertainty" (line graph with error bars), "Generate Forecast" (line graph with dashed forecast line), "Communicate Forecast" (group of people), "Assess Forecast" (grid table), "Update Model" (line graph with updated data), and "Build Model" (line graph with hypothesis). The steps are connected by a large blue circular arrow pointing clockwise, with the text "The Forecast Cycle" in the center.

# Navigating the Shiny App

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

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### 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/](https://macrosystemseddie.shinyapps.io/module5/)

**Before you start...**

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

**Name:**

Tadhg Moore

**ID number:**

123456

**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?**

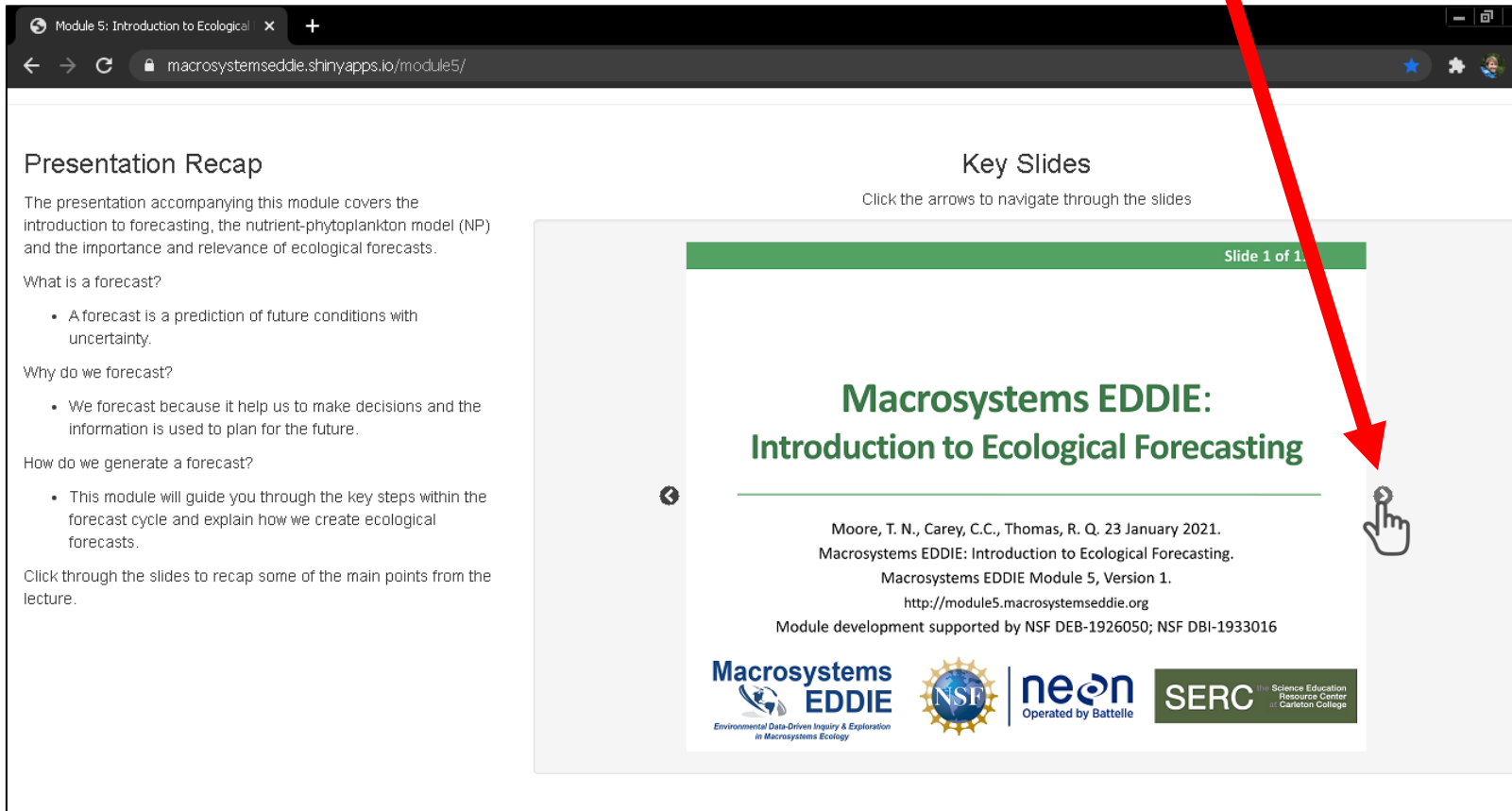
I use weather forecasts to plan my weekends.

**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 titled "Slide 1 of 1" with the main heading "Macro systems EDDIE: Introduction to Ecological Forecasting". The slide content includes:

Moore, T. N., Carey, C.C., Thomas, R. Q. 23 January 2021.  
Macrosystems 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 right-pointing arrow icon on the right side of the slide.

# Interact with app

Module 5: Introduction to Ecological | x +

← → ↻ 🔒 macrosystemseddle.shinyapps.io/module5/

## 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  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  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

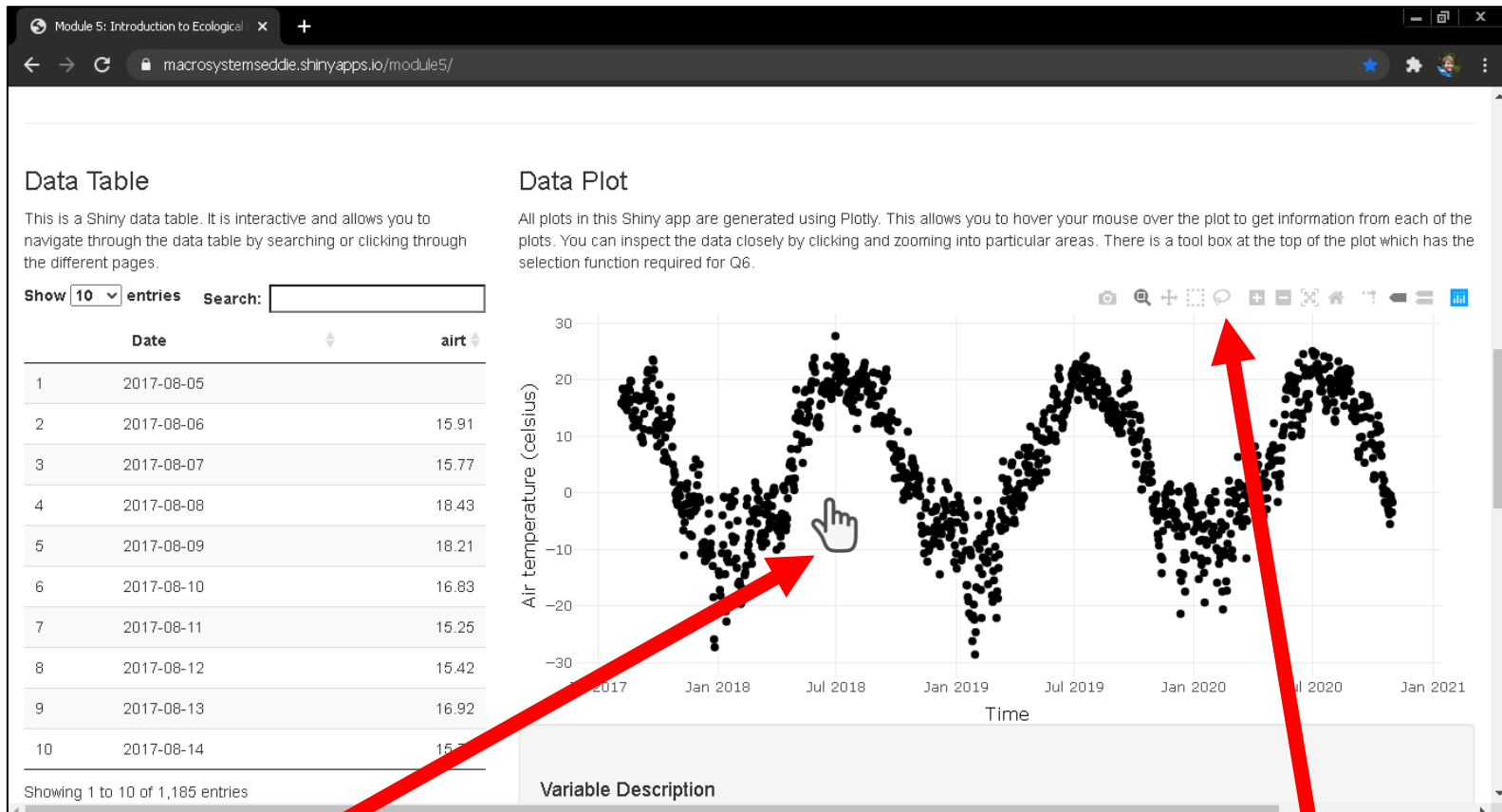
Hover your cursor above the image to enlarge.



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

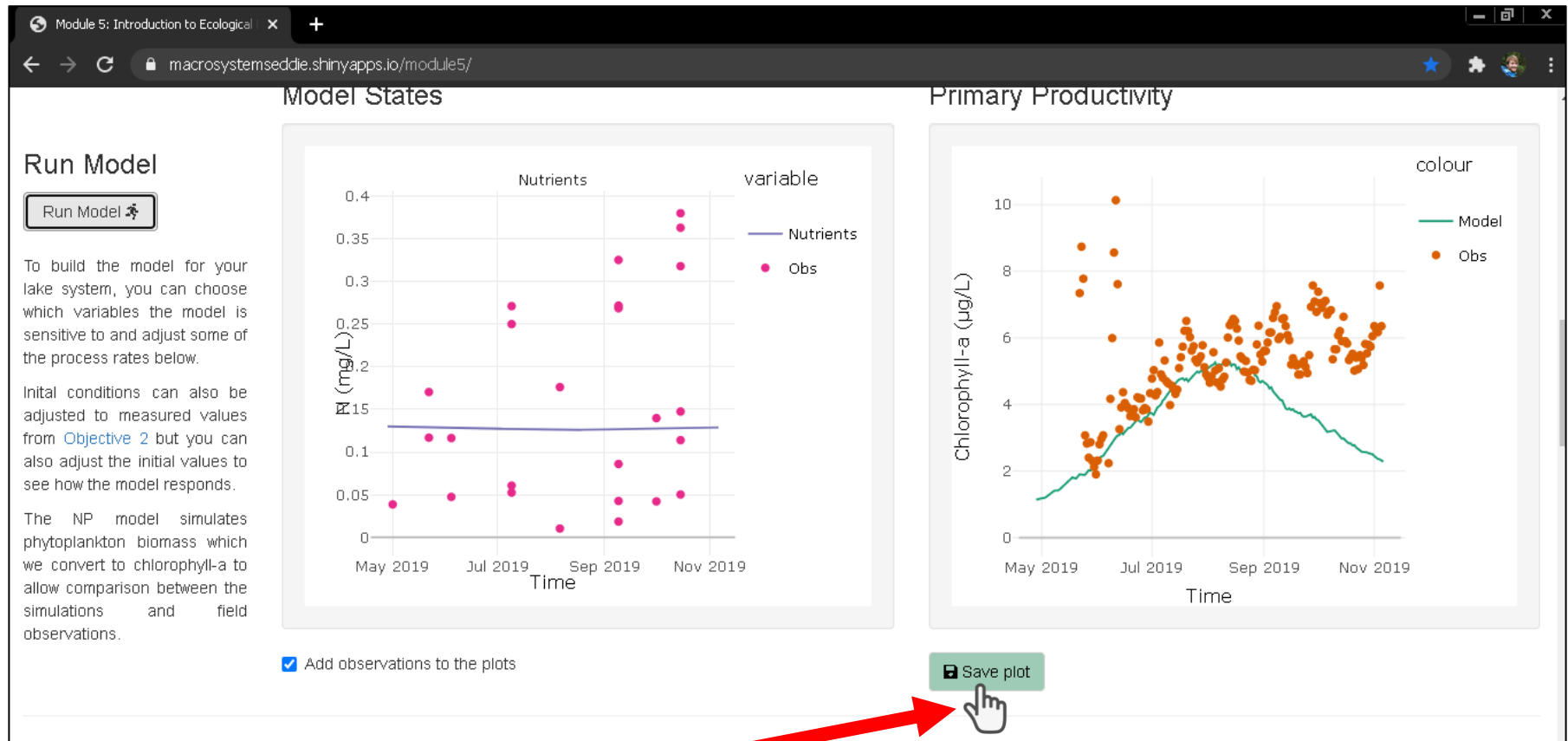


Hover cursor over points or click and drag to zoom in

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