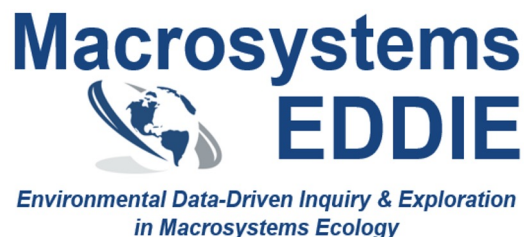


Macrosystems EDDIE: Getting Started + Troubleshooting Tips

Moore, T. N., Lofton, M.E., Carey, C.C., Thomas, R. Q. 12 December 2023.
Macrosystems EDDIE: Understanding Uncertainty in Ecological Forecasts.
Macrosystems EDDIE Module 6, Version 2.

<http://module6.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/module6/>
 - 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

Teaching materials associated with this module can be found at <http://module6.macrosystemseddie.org>.

Module 6: Understanding Uncertainty in Ecological Forecasts

[Overview](#)[Presentation](#)[Introduction](#)[Activity A](#)[Activity B](#)[Activity C](#)[Bookmark my progress](#)[Help](#)

At any time, use this button to obtain a link that saves your progress.



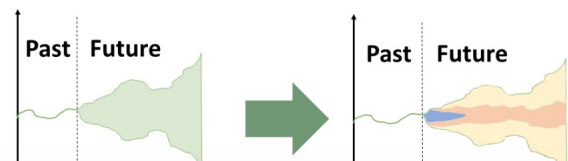
Understanding Uncertainty in Ecological Forecasts

Summary

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. Forecast uncertainty is derived from multiple sources, including an ecological model's structure parameters, model input (driver) data, and uncertainty in the current, or initial, conditions in an ecosystem. Knowing the uncertainty associated with a forecast enables forecast users to evaluate the forecast and make more informed decisions. There are a number of approaches that forecasters can use to reduce uncertainty, including improving the structure of a model, collecting additional data, and improving the accuracy of environmental sensors and forecasts of model input (driver) variables.

This module will guide you through an exploration of the sources of uncertainty within an ecological forecast, how uncertainty can be quantified, and steps which can be taken to reduce the uncertainty in a forecast you

Understanding Uncertainty in Ecological Forecasts



Navigating the Shiny App

Teaching materials associated with this module can be found at <http://module6.macrosystemseddie.org>.

Module 6: Understanding Uncertainty in Ecological Forecasts

Overview

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Bookmark my progress

Help

At any time, use this button to obtain a link that saves your progress.



Presentation

The presentation accompanying this module covers the introduction to forecast uncertainty, sources of forecast uncertainty and the importance and relevance of quantifying uncertainty within ecological forecasts.

What is ecological forecast uncertainty?

- Forecast uncertainty is the range of possible alternate future conditions predicted by a model. We generate multiple different predictions of the future because the future is inherently unknown.

Key Slides

Click the arrows to navigate through the slides

1/17

Macrosystems EDDIE:
Understanding Uncertainty in
Ecological Forecasts

Select a tab by clicking on it

Navigate slides

Advance slides by clicking on the arrows

Presentation

The presentation accompanying this module covers the introduction to forecast uncertainty, sources of forecast uncertainty and the importance and relevance of quantifying uncertainty within ecological forecasts.

What is ecological forecast uncertainty?

- Forecast uncertainty is the range of possible alternate future conditions predicted by a model. We generate multiple different predictions of the future because the future is inherently unknown.

Where does ecological forecast uncertainty come from?

- Uncertainty comes from natural variability in the environment and imperfect representation of an ecological system in a model. When generating a forecast, uncertainty can come from the **structure** of the model used, the **initial conditions** of the model, the **parameters** of the model, and the **data** used to drive the model, among other sources.

Why is uncertainty important to quantify for an ecological forecast?

- Knowing the uncertainty in a forecast allows forecast users to make informed decisions based on the range of forecasted outcomes and prepare accordingly.

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

Key Slides

Click the arrows to navigate through the slides

1/17

Macrosystems EDDIE: Understanding Uncertainty in Ecological Forecasts

Moore, T. N., Lofton, M.E., Carey, C.C., Thomas, R. Q. 31 July 2023.
Macrosystems EDDIE: Introduction to Ecological Forecasting.
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Macrosystems EDDIE
Environmental Data Driven Inquiry & Exploration
in Macrosystems Ecology

NSF

neon
Operated by Battelle

SERC
The Science Education
Resource Center
Carleton College

Interact with app

Objective 1 - Select a Site

Select a NEON site from the table, then click on the 'View latest photo' 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 it on the map.

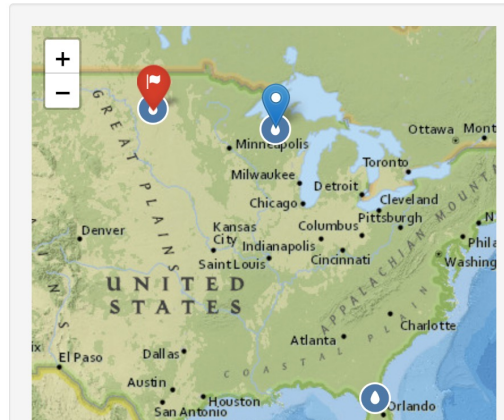
	siteID	location
3	BARC	Barco Lake Site
4	PRPO	Prairie Pothole Site
5	LIRO	Little Rock Lake Site

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

View latest photo



Map of NEON sites



Phenocam



Select data table rows and click buttons

Interact with plots

Nice work! You've fit four models!

Question

Q18. Assess the model fits.

a. Click 'Download plot' to download the timeseries of all model predictions and water temperature observations and copy-paste it into your report.

b. Which model do you think will produce the best forecasts of water temperature? Why?



Hover cursor over points or click and drag to zoom in

Hover cursor over plot to bring up options

Saving plots

Nice work! You've fit four models!

Question

Q18. Assess the model fits.

a. Click 'Download plot' to download the timeseries of all model predictions and water temperature observations and copy-paste it into your report.

b. Which model do you think will produce the best forecasts of water temperature? Why?



Download plot



Download plots to copy-paste into your final report

Downloading the Report

1. Navigate to the “Introduction” tab
2. Click on the “Download Final Report Template” button to download a Word document into which you can type your answers.

Student Handout

Within the Introduction and Activities A, B and C tabs there are questions for students to complete as part of this module. These can be completed by writing your answers into the final report template, which can be downloaded as a Word document (.docx) below.



Download Final Report Template



Answer questions

Type your answers into the final report template

Objective 8: Driver Uncertainty

Explore how driver uncertainty affects the different models when forecasting water temperature.

34. Assess the contribution of driver uncertainty across models.
- Click 'Download plot' to download the plot of forecasts with driver uncertainty and copy-paste it into your report.

Please copy-paste your Q-34a-plot.png image here.

Figure 12. Water temperature forecasts with driver uncertainty for your selected NEON lake.

- Why do only two of the models exhibit driver uncertainty in their water temperature forecasts?

Answer:

35. You have learned that driver uncertainty arises because we cannot perfectly know what the future values of our model inputs will be. Knowing this, describe one way that you think driver uncertainty in our water temperature forecasts could be reduced.

Answer:

Saving & Resuming Progress

Saving Progress

1. Scroll to top of the page.
2. Click on the “Bookmark my progress” button. A pop-up window with a *very long link* will appear.
3. Copy-paste the link and store it at the top of your final report.

Teaching materials associated with this module can be found at <http://module6.macrosystemseddie.org>.

Module 6: Understanding Uncertainty in Ecological Forecasts

[Overview](#)[Presentation](#)

Bookmark my progress

At any time, use this button to obtain a link that saves your progress.

eddie
environmental data-driven inquiry & exploration

Activity A - Build Models and Generate Forecasts

Build different models to simulate water temperature for your chosen NEON site.

Bookmarked application link

```
https://macrosystemseddie.shinyapps.io/module6_dev/?
_inputs_&plot_airt_swt=0&plot_airt_swt2=0&plot_persist=0&plot_airt_swt3=0&plot_airt
_swt4=0&add_lm=0&add_lm1=0&plot_mlr=0&view_at_fc=0&fc1_Pers=0&fc1_Wtemp=
0&fc1_Atemp=0&fc1_Both=0&gen_proc_dist=0&fc2_Pers=0&fc2_Wtemp=0&fc2_Atem
p=0&fc2_Both=0&fit_model_year_1=0&fit_model_year_2=0&param_Pers=0&fc3_Pers=
0&param_Wtemp=0&fc3_Wtemp=0&param_Atemp=0&fc3_Atemp=0&param_Both=0&
fc3_Both=0&gen_ic=0&fc4_Pers=0&fc4_Wtemp=0&fc4_Atemp=0&fc4_Both=0&load_n
oaa_at=0&fc5_Pers=0&fc5_Wtemp=0&fc5_Atemp=0&fc5_Both=0&run_tot_fcA=0&qua
nt_ucA=0&run_tot_fcB=0&quant_ucB=0&dec_scen1=null&dec_scen2=null&values_&
sel_row=null&sel_mods=null
```

This link stores the current state of this application. Press ⌘-C to copy.

Dismiss

Resuming progress

1. Open your browser.
2. Copy-paste the link into your browser.
3. As you navigate through the tabs in the module, your progress will reappear.

We recommend that you save your progress often!

- Because the Shiny app can time out after inactivity (15 minutes) or disconnect if an internet connection is interrupted, we don't want you to lose your work.
- Save your progress as you go, as well as every time you close your computer or close the Shiny app in your internet browser.
- After you save the link somewhere safe, you should be able to resume your progress where you left off!