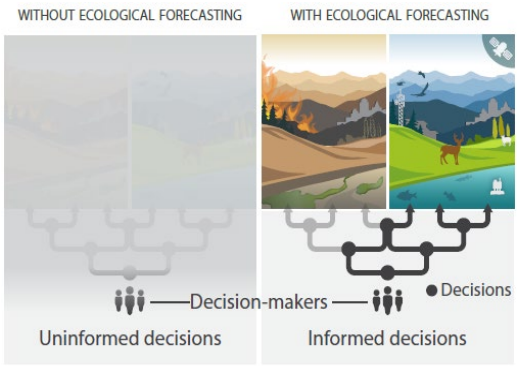
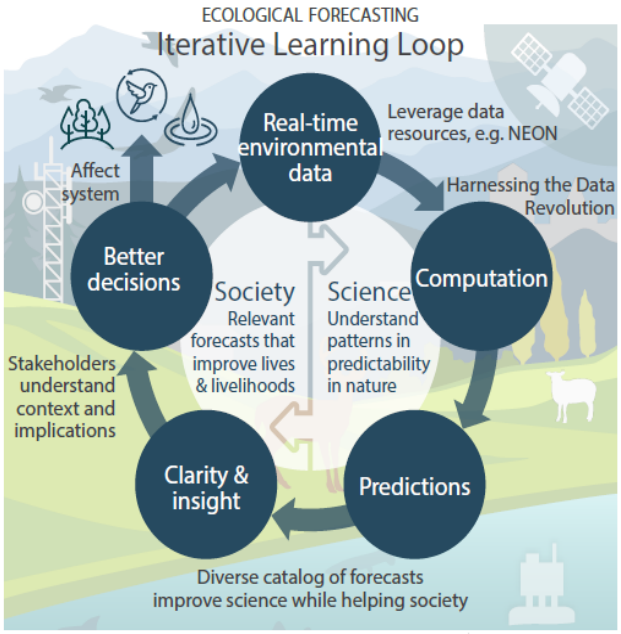
What is Ecological Forecasting?

Ecological forecasting uses mathematical models and data to **iteratively update our understanding of ecological systems through time and space**. This allows us to better "see" what the future may look like and can be **a critical tool for natural resource and environmental decision-makers**. Just like in a weather forecast, ecological forecasts identify both the likely outcomes given current data and probability statements about how likely each outcome is to occur.



What Does Ecological Forecasting Look Like?



The most effective ecological forecasts are informed by researchers, decision makers, and stakeholders working together. Examples of societal challenges that can be addressed with ecological forecasting include toxic algal blooms, wildfire, and forest growth given changing climate.

Several **key subject areas** are closely associated with ecological forecasting, so there are many ways for students to get involved. These include:

- Ecology
- Mathematical and statistical modeling
- Cyberinfrastructure and computation,
- The social science of decision making
- Working with stakeholders to implement forecasts

What Careers Are Available For Ecological Forecasters?

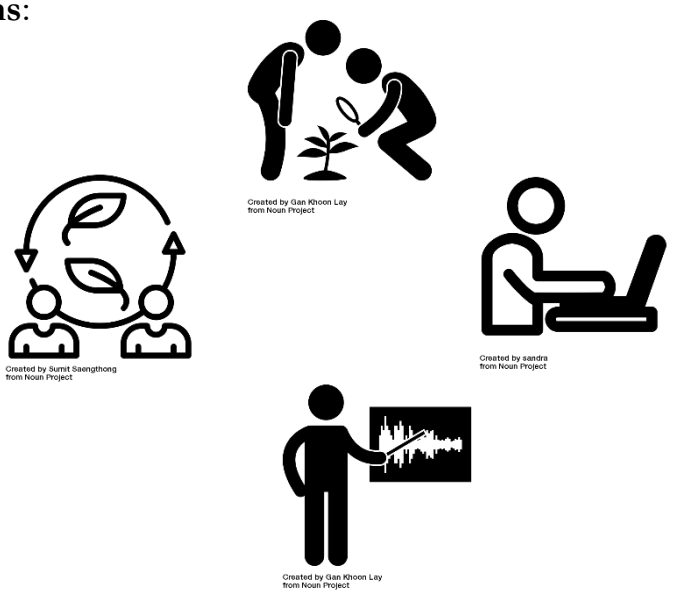
Ecological forecasting is relevant to **many career paths**:

- Ecological research
- Teaching ecology & environmental science
- Managing and protecting natural resources
- Public health

Jobs may be available in **sectors such as**:

- Academia
- Local, state, or federal government
- Non-profit organizations
- Private corporations

More information can be found on the following page or at: https://ecoforecast.org/education/.



Example Courses

Note: This list is not exhaustive nor are all courses necessary. This list is a starting point for students to learn more about the concepts, as well as statistical and computational tools used in ecological forecasting.

*** For students with limited time or options, we recommend a stats course that covers distributions, a coding course, a social science course that provides a broad understanding of mixed methods research approaches and social science research, and at least one disciplinary course.**

Mathematics and Statistics

- Mathematical Statistics w/ Intro to Families of Distributions
- Intro to Calculus
- Linear algebra
- Differential Equations
- Intro to Probability
- Intro to Bayesian Statistics
- Generalized Linear Models
- Machine Learning
- Time-series Analysis
- Spatial Statistics
- Computational Statistics (i.e., MCMC, CART, SVM, bootstrap, etc)
- Dynamic or Autoregressive Modeling

Data and Science Computing

- Intro to Coding (doesn't have to be a specific language but R is mostly used by ecological forecasters).
- Data Manipulation
- Intro to Data Analysis in R
- Intro to reproducible workflows

Social Science

- Human Dimensions in Natural Resources
- Environmental Justice
- Environmental Policy and/or Management
- Introduction to Decision Science Structured Environmental Decision-making and Decision Support
- Game Theory and Negotiations
- Ecological Economics

Disciplinary and Interdisciplinary Courses

- Ecology, Epidemiology, Physical Geography, Environmental Science, Global Climatology, etc.
- Ecological Methods, Modeling Biological Systems, Ecosystem Modeling
- Scientific Writing Courses – manuscript writing, grant writing, policy or public interest writing, public engagement
- Scientific Literature Reading & Evaluation Courses
- Team Science that incorporates Diversity, Equity, Inclusion, and Justice on the who, what and how that supports anti-racists science