Integral Projection Models: From field data collection to model construction and analysis

Instructors

William K. Petry, North Carolina State University

Amy M. Iler, Chicago Botanic Garden & Northwestern University

Paul J. CaraDonna, Chicago Botanic Garden & Northwestern University

Workshop Overview

Participants in this workshop will learn how to build, parameterize, and analyze Integral Projection Models (IPM) for studying population dynamics. This course will be taught at the Rocky Mountain Biological Laboratory in Gothic, Colorado, from **August 10–12, 2026,** with participants **arriving on August 9th and departing on August 13th**. The course will emphasize decision making across the entire workflow, from census design (outdoor field excursions to local demographic studies) through model construction and projection (indoor lectures and exercises).

The cost for participating is $565 for lodging and meals, in addition to travel to and from the RMBL. We have funding from the National Science Foundation to provide financial support to a limited number of participants based on financial need. To allow us to maximize participation, we ask that you make an effort to self-fund your participation through your PI's grants, your home institution's resources, or other funding sources (e.g., the American Society of Naturalist's regional conference and workshop travel grants, Sigma Xi, etc.).

Workshop description

Integral projection models (IPMs) enable the study of population dynamics in organisms with complex population structure and are widely used to answer ecological and evolutionary questions. Like matrix population models, IPMs break the life cycle down into intuitive, biologically meaningful rates of growth, survival, reproduction, and recruitment. Unlike matrix models, IPMs allow the state variable(s) that predict the demographic rates that compose the life cycle to be continuous (e.g., size, weight) or a combination of continuous and discrete variables (e.g., age, stage). The demographic vital rates that compose the life cycle are estimated using a series of regression analyses (*e.g.*, linear models, LMMs, GLMMs).

This workshop will guide participants through the process of demographic census design and the construction and analysis of IPMs. The RMBL field station will enable outdoor, field-based discussions of how to tailor IPMs to the life cycle of the study organism and strategies to overcome common data collection pitfalls. Indoors, these lessons will be used to guide model construction choices, culminating in the construction and analysis of an IPM in R using the package "ipmr". This course will provide an introduction to stage structured population modeling, instruction on how to build IPMs, and what you can do with IPMs once they are constructed

(*e.g.,* estimate population growth rate, calculate sensitivities and elasticities, and calculate stage-specific survival and reproduction).

If time permits, we will also cover advanced topics selected based on a pre-course survey of the participants. Potential advanced topics include: propagating uncertainty, density- and frequency-dependence, incorporating environmentally-driven vital rates, or multiple state variables.

Pre-requisites

This workshop is designed for graduate students, postdocs, or faculty who are planning a demographic field study with the intention of building IPMs or those who already have census data and want to construct an IPM. Participants are encouraged—but not required—to bring their own census data to use during the IPM construction exercises.

Applicants should be familiar with generalized linear (mixed) model regression and writing code in R. We will provide pre-workshop review material information on the basics of structured population models either before the course or at the beginning of the course.

Who is eligible to apply?

Applicants must either be accepted to or currently enrolled in graduate school or have a graduate degree (MS or PhD). Undergraduates will not be considered.

A maximum of 10–12 students will be admitted.

Workshop instructors will admit participants based on the applicants' qualifications and interest in using IPM models in their research.

Logistics

Workshop cost includes on-site housing, station fees at RMBL, and meals in the RMBL dining hall for 4 days (breakfast, lunch, and dinner).

Participants are responsible for booking and paying for their own travel. We anticipate that most participants will fly into Denver, then travel by intercity bus from Denver to Crested Butte. There is a closer airport in Gunnison, CO, but cancellations due to heat and thunderstorms are common. We welcome any questions you may have about travel or logistics (email ailer@chicagobotanic.org).

How to apply

To apply, prepare the following items in a **a single pdf file**, following this naming structure: "[family name] [given name]_RMBL IPM workshop application.pdf". **(1)** A max. two-page abbreviated CV, **(2)** a 1/2 page statement outlining how your research will benefit from this workshop or how it helps you achieve your career goals, and **(3)** [graduate students and postdocs only] a max. one-page letter of support from your academic advisor at your home institution. If you would like to be considered for financial support, please include **(4)** the statement: "I request financial support for this workshop" along with your projected expenses (registration + travel) and a brief description of current and/or pending sources of financial support for your participation. Finally, if you will already be at the RMBL for the workshop dates, please also indicate this at the end of the ½ page statement.

For full consideration, send this file via email to Amy Iler (ailer@chicagobotanic.org) no later than **April 8th, 2026**, using the subject line "Application for RMBL IPM course". If you are interested but think you need more time, please email Amy Iler. We aim to notify applicants of their workshop acceptance status by **April 22nd, 2026,** and if applicable, we will continue to review applications after this date until the course is full.