



LIKELIHOOD METHODS IN ECOLOGY

Oct. 9th – 20th, 2006
Institute of Ecosystem Studies, Millbrook, NY

COURSE SCHEDULE

DAILY SCHEDULE (unless otherwise noted)

Mornings: Gifford House lecture room

Lecture: 8:30 – 10:00 am
Break: 10:00 – 10:30 am
Seminar/Discussion: 10:30 – 12:00 am

Lunch: Gifford House 12:00 – 1:00

Afternoons: Plant Science Building lobby

Lab Exercises: 1:30 – 3:00 pm
Break: 3:00 – 3:30 pm
Individual Projects 3:30 – 5:00 pm

SYLLABUS

DAY 0: MONDAY, OCTOBER 9TH [CC]

Optional 1-day tutorial as an introduction to R – in the Plant Science Building lobby

DAY 1: TUESDAY, OCTOBER 10TH

Lecture and Discussion: [CC]

[Introduction to likelihood and model comparison: A new framework for linking models, data and parameters.](#)

Seminar: [Neighborhood dynamics of forest ecosystems: a likelihood and model comparison approach.](#) [CC]

Recommended reading:

Johnson, J. B., and K. S. Omland. 2004. [Model selection in ecology and evolution.](#) Trends in Ecology & Evolution 19:101-108.

Hobbs, N. T., and R. Hilborn. 2006. [Alternatives to statistical hypothesis testing in ecology: A guide to self teaching.](#) Ecological Applications 16:5-19.

Stephens, P.A., S.W. Buskirk, G.D. Hayward and C. Martinez del Rio. 2005. [Information theory and hypothesis testing: a call for pluralism.](#) Journal of Applied Ecology 42:4-12.

Lab: [Regression using likelihood methods in R.](#) [CC]

DAY 2: WEDNESDAY, OCTOBER 11TH

Lecture: [Know your data: probability distributions and dataset properties.](#) [MU]

Seminar: [Jensen's inequality](#) [MU]

Recommended reading:

Hilborn and Mangel, Chapter 3

Ruel, J. J. and M. P. Ayres. 1999. [Jensen's inequality predicts effects of environmental variation.](#) Trends in Ecology & Evolution 14: 361-366.

Schmitt, R. J., S. J. Holbrook, and C. W. Osenberg. 1999. [Quantifying the effects of multiple processes on local abundance: a cohort approach for open populations.](#) Ecology Letters 2:294-303.

Lab: [Probability, probability density functions and dataset properties.](#) [MU]

DAY 3: THURSDAY, OCTOBER 12th

Lecture: [Know your data: likelihood functions](#) [MU]

Seminar: [Data requirements, limitations, and challenges - Inverse modeling of seed and seedling dispersal.](#) [CC]

Recommended reading:

Hilborn and Mangel, Chapter 7

Canham, C. D. and M. Uriarte. 2006. [Analysis of neighborhood dynamics of forest ecosystems using likelihood methods and modeling.](#) Ecological Applications 16:62-73

Lab: [Probability & likelihood.](#) [MU]

DAY 4: FRIDAY, OCTOBER 13th

Lecture: [Model formulation and choice of functional forms.](#) [CC]

Seminar: [Mechanism vs. phenomenology in choosing functional forms - Neighborhood analyses of tree competition.](#) [CC]

Recommended reading:

Canham, C. D., M. Papaik, M. Uriarte, W. McWilliams, J.C. Jenkins, and M. Twery. 2006.

[Neighborhood analyses of canopy tree competition along environmental gradients in New England forests.](#) Ecological Applications 16:540-554.

McGill, B. 2003. [Strong and weak tests of macroecological theory.](#) Oikos 102: 679-685.

Jackson, L. J., A. S. Trebitz, et al. 2000. [An introduction to the practice of ecological modeling.](#) Bioscience 50: 694-706.

Lab: [Choosing functional forms and programming functions in R.](#) [CC]

DAY 5: MONDAY, OCTOBER 16th

Lecture: [Parameter estimation and evaluation of support.](#) [CC]

Seminar: [How much variation should we be able to explain? – A spatially-explicit, landscape-scale analysis of the chemistry of Adirondack lakes.](#) [CC]

Recommended reading:

Hilborn and Mangel, Chapter 11

Canham, C. D., M. L. Pace, M. J. Papaik, A. G. B. Primack, K. M. Roy, R. J. Maranger, R. P. Curran, and D. M. Spada. 2004. [A spatially-explicit watershed-scale analysis of dissolved organic carbon in Adirondack lakes.](#) *Ecological Applications* 14:839-854.

Lab: [Parameter estimation using local and global optimization in R; Evaluating support.](#) [CC]

DAY 6: TUESDAY, OCTOBER 17th

Lecture: [Model evaluation.](#) [CC]

Lecture: [Model comparison, selection, and multimodel inference](#) [CC]

Recommended Reading:

Brook, B.W. and C.J.A. Bradshaw. 2006. [Strength of evidence for density dependence in abundance time series of 1198 species.](#) *Ecology* 87:1445-1451.

Pascual, M., P. Kareiva and R. Hilborn. 1997. [The influence of model structure on conclusions about the variability and harvesting of Serengeti wildebeest.](#) *Conservation Biology* 11: 966 -976

Lab: [Model evaluation and goodness of fit. Model comparison methods.](#) [CC]

DAY 7: WEDNESDAY, OCTOBER 18th

Lecture: [Statistics revisited: Traditional statistics and analysis of experiments from a likelihood framework](#) [MU]

Seminar: [Likelihood alternatives to traditional methods: Logistic Regression for Analysis of Windthrow](#) [CC]

Recommended Reading:

Pascual, M. and P. Kareiva. 1996. [Predicting the outcome of competition using experimental data: Maximum likelihood and Bayesian approaches.](#) *Ecology* 77: 337-349.

Strong, D. R., Whipple, A. V, Child, A. L., and Dennis, B. 1999. [Model selection for a subterranean trophic cascade: root-feeding caterpillars and entomopathogenic nematodes.](#) Ecology 80(8): 2750-2761

Lab: Free (Individual projects)

DAY 8: THURSDAY, OCTOBER 19th

Lecture: [An overview of Bayesian methods.](#) [MU]

Seminar: [Stochastic processes.](#) [MU]

Recommended Readings:

Hilborn and Mangel: Parts of chapters 3 & 7 that deal with stochastic processes

Clark, J. S. 2005. [Why environmental scientists are becoming Bayesians?](#) Ecology Letters 8: 2-14.

Dennis, B. 2004. [Statistics and the scientific method in ecology.](#) pp. 327-359 in M. L. Taper and S. R. Lele, (editors), The Nature of Scientific Evidence. University of Chicago Press

Lab: free (individual projects)

DAY 9: FRIDAY OCTOBER 28TH

Symposium (9:00 – 12:00, 1:30 – 3:00): Presentation of individual projects

Group Dinner (5:30 pm, PSB)