

Kevin Gross

Web CV
(for a complete CV please email)

Last updated November 29, 2011

Biomathematics Graduate Program
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EDUCATION

Ph.D., Zoology and Statistics. University of Wisconsin-Madison, Madison WI. Advisors: Prof. Anthony R. Ives and Erik V. Nordheim. Research Area: Statistical ecology and population dynamics. May 2003.

M.S., Statistics. University of Wisconsin-Madison, Madison WI. May 2000.

B.S., Biology. Duke University, Durham, NC. May 1996.

POSITIONS HELD

Associate Professor (with tenure). North Carolina State University, Department of Statistics, Raleigh NC. Core faculty member of Biomathematics Graduate Program. Fall 2009 – present. Associated faculty appointments: Department of Biology 2004 – present. Fisheries, Wildlife, and Conservation Biology program 2010 – present.

Assistant Professor. North Carolina State University, Department of Statistics, Raleigh NC. 2003 – 2009.

PUBLICATIONS

In print, or accepted for publication:

- Gross, K.** and J. A. Rosenheim. 2011. Quantifying secondary pest outbreaks in cotton and their monetary cost with causal inference statistics. *Ecological Applications* 21: 2770-2780.
- Gross, K.** 2008. Positive interactions among competitors can produce species-rich communities. *Ecology Letters* 11: 929-936.
- Gross, K.** 2008. Fusing spatial resource heterogeneity with a competition-colonization trade-off in model communities. *Theoretical Ecology* 1: 65-75.
- Gross, K.**, and B. J. Cardinale. 2007. Does species richness drive community productivity or vice versa? Reconciling historical and contemporary paradigms in competitive communities. *American Naturalist*, 170: 207-220.
- Gross, K.**, E. J. Kalendra, B. R. Hudgens, and N. M. Haddad. 2007. Robustness and uncertainty in estimates of butterfly abundance from transect counts. *Population Ecology*, 49: 191-200.
- Gross, K.**, W. F. Morris, M. S. Wolosin, and D. F. Doak. 2006. Modeling vital rates improves estimation of population projection matrices. *Population Ecology*, 48: 79-89.
- Gross, K.**, and B. J. Cardinale. 2005. The functional consequences of random versus ordered species extinctions. *Ecology Letters*, 8: 409-418.
- Gross, K.**, A. R. Ives, and E. V. Nordheim. 2005. Estimating fluctuating vital rates from time-series data: a case study of aphid biocontrol. *Ecology*, 86:740-752.
- Gross, K.**, B. A. Craig, and W. D. Hutchison. 2002. Bayesian estimation of a demographic matrix model from stage-frequency data. *Ecology* 83: 3285-3298.
- Gross, K.** 2002. Efficient data collection for estimating growth rates of structured populations. *Ecology* 83:1762-1767.
- Gross, K.** and A. R. Ives. 1999. Inferring host-parasitoid stability from patterns of parasitism among patches. *American Naturalist* 154:489-496.

- Gross, K.**, J. R. Lockwood III, C. C. Frost, and W. F. Morris. 1998. Modeling controlled burning and trampling reduction for conservation of *Hudsonia montana*. *Conservation Biology* 12:1291-1301.
- Rosenheim, J.A., S. Parsa, A. A. Forbes, W. A. Krimmel, Y. H. Law, M. Segoli, M. Segoli, F. J. Sivakoff, T. Zaviezo, and **K. Gross**. 2011. Ecoinformatics for integrated pest management: expanding the applied insect ecologist's tool-kit. *Journal of Economic Entomology*, 104: 331-342. doi 10.1603/EC10380.
- Haddad, N.M., G.M. Crutsinger, **K. Gross**, J. Haarstad, and D. Tilman. 2011. Plant diversity and the stability of foodwebs. *Ecology Letters* 14:42-46.
- Allen, S.D., Y. Fathi, **K. Gross**, and M. Mace. 2010. An optimal and near-optimal strategy to selecting individuals for transfer in captive breeding programs. *Biological Conservation*, 143: 2858-2863.
- Weiser, M.D., N. J. Sanders, and 23 others. 2010. Canopy and litter and assemblages share similar climate-species density relationships. *Biology Letters*. doi 10.1098/rsbl.2010.0151.
- Midway, S., D.D. Aday, T.J. Kwak, and **K. Gross**. 2010. Cover preference of the Carolina madtom (*Noturus furiosus*), an imperiled, endemic southeastern stream fish. *Journal of Freshwater Ecology* 25: 151-154.
- Haddad, N.M., G.M. Crutsinger, **K. Gross**, J. Haarstad, J. M.H. Knops, and D. Tilman. 2009. Plant species loss decreases arthropod diversity and shifts trophic structure. *Ecology Letters* 12: 1029-1039.
- Cardinale, B.J., H. Hillebrand, W. S. Harpole, **K. Gross**, and R. Ptacnik. 2009. Separating the influence of resource 'availability' from resource 'imbalance' on productivity-diversity relationships. *Ecology Letters* 12: 475-487.
- Cardinale, B. J., D. Bennett, C. Nelson, and **K. Gross**. 2009. Does diversity drive productivity or vice versa? A test of the multivariate productivity-diversity hypothesis in streams. *Ecology* 90:1227-1241.
- Harvey, C. J., **K. Gross**, V. H. Simon, and J. Hastie. 2008. How trophic and fishery interactions with Pacific hake might affect the rebuilding times of overfished rockfish. *Marine Ecology Progress Series*, 365: 165-176.
- Haddad, N. M., B. R. Hudgens, C. D. Damiani, **K. Gross**, and D. Kuefler. 2008. Optimal monitoring for rare butterfly populations. *Conservation Biology* 22: 929-940.
- Abbott, K.C., W. F. Morris, and **K. Gross**. 2008. Simultaneous effects of food limitation and inducible resistance on herbivore population dynamics. *Theoretical Population Biology* 73:63-78.
- Kilpatrick, A.M., D. LaPointe, C.T. Atkinson, B.L. Woodworth, J.K. Lease, M.E. Reiter, and **K. Gross**. 2006. Effects of chronic avian malaria (*Plasmodium relictum*) infection on the reproductive success of Hawaii Amakihi (*Hemignathus virens*). *Auk*, 123: 764-774.
- Doak, D.F., **K. Gross**, and W.F. Morris. 2005. Understanding and predicting the effects of sparse data on demographic analyses. *Ecology*, 86: 1154-1163.
- Nol, P., T. E. Rocke, **K. Gross**, and T. M. Yuill. 2004. Prevalence of active *Clostridium botulinum* type C in the gastrointestinal tracts of tilapia (*Oreochromis mossambicus*) in the Salton Sea. *Journal of Wildlife Diseases* 40:414-419.
- Cardinale, B. J., A. R. Ives, C. T. Harvey, and **K. Gross**. 2003. Biodiversity and biocontrol: emergent impacts of a multi-enemy assemblage on pest suppression and crop yield in an agroecosystem. *Ecology Letters*, 6: 857-865.
- Dodson, S. I., A. Z. Grishanin, **K. Gross**, and G. A. Wyngaard. 2003. Morphological analysis of cryptic species in the *Acanthocyclop syemalis* species complex. *Hydrobiologia*, 500:131-143.
- Rooney, T. P., and **K. Gross**. 2003. A demographic study of deer browsing impacts on *Trillium grandiflorum*. *Plant Ecology* 168: 267-277.
- Ives, A. R., **K. Gross**, and V. A. A. Jansen. 2000. Periodic mortality events in predator-prey systems. *Ecology* 81: 3330-3340.
- Ives, A. R., J. L. Klug, and **K. Gross**. 2000. Stability and species richness in complex communities. *Ecology Letters* 3:399-411.
- Olson, A., A. R. Ives, and **K. Gross**. 2000. Spatially aggregated parasitism on pea aphids, *Acyrtosiphon pisum*, caused by random foraging behavior of the parasitoid *Aphidius ervi*. *Oikos* 91:66-76.
- Underwood, N., W. Morris, **K. Gross**, and J. R. Lockwood III. 2000. Induced resistance to Mexican bean beetles in soybean: variation among genotypes and lack of correlation with constitutive resistance. *Oecologia*, 122:83-89.
- Ives, A. R., **K. Gross**, and J. L. Klug. 1999. Stability and variability in competitive communities. *Science* 286:542-544.

PUBLICATIONS BY STUDENTS IN MY LAB WITHOUT MY CO-AUTHORSHIP

- Canner, J.E., and M. Spence. 2011. A new technique using metal tags to track small seeds over short distances. *Ecological Research* 26: 233-236. DOI 10.1007/s11284-010-0761-8
- Fiske, I.J., and R.B. Chandler. 2011. unmarked: An R package for fitting hierarchical models of wildlife occurrence and abundance. *Journal of Statistical Software* vol. 43 issue 10. <http://www.jstatsoft.org/v43/i10>.

GRANTS AWARDED

- Collaborative: MSPA-CSE: Analysis and detection of transient dynamics in ecological systems. NSF collaborative proposal with A. Hastings and T. Ives. Funded 10/1/04-9/31/08.
- Bioinformatics for IPM: Using Consultant-Generated Data to Solve Difficult Problems in Applied Insect Ecology. Subcontract on USDA-ARS proposal led by J. Rosenheim. Funded 2/15/07-2/14/11.
- Collaborative research: Does productivity drive diversity or vice versa? Empirical and theoretical investigations of the multivariate productivity-diversity hypothesis in streams. NSF collaborative proposal with B. Cardinale. Funded 3/15/09-3/14/13.
- Collaborative research: The community ecology of viral pathogens - Causes and consequences of coinfection in hosts and vectors. NSF collaborative proposal with C. Mitchell and 4 others. Funded 7/1/10 - 6/30/15.

PRESENTATIONS*Departmental seminars and colloquia*

- Mechanisms of species diversity in competitive communities. UNC-Wilmington Biology seminar, September 2009.
- Mechanisms of species diversity in competitive communities. NOAA Fisheries Center for Coastal Fisheries and Habitat Research seminar, April 2009.
- Mechanisms of species diversity in competitive communities. Appalachian State University Mathematics seminar, October 2008.
- Resource competition in a patchy world: Using model communities to understand the causes and consequences of species diversity. University of North Carolina – Chapel Hill Curriculum in Ecology seminar, November 2007.
- Resource competition in a patchy world: Using model communities to understand the causes and consequences of species diversity. NCSU Plant Biology seminar, October 2007.
- Resource competition in a patchy world: Using model communities to understand the causes and consequences of species diversity. East Carolina University Ecology seminar, October 2007.
- Does species diversity drive ecosystem productivity or vice versa? Towards a unification of historical and contemporary paradigms. NCSU Biomathematics seminar, January 2007.
- Exploring the connections between community productivity and diversity using metacommunity models. Virginia Tech Ecology and Evolutionary Biology seminar. November 2006.
- Two problems in statistical ecology. University of Chicago Center for Integrating Statistical and Environmental Science seminar, October 2005.
- Estimating butterfly abundances from count data. NCSU Statistics faculty sampler, Raleigh, NC, August 2005.
- Does extinction order matter? Modeling the functional consequences of random vs. ordered extinction. Duke University Program in Ecology seminar, April 2005.
- Does extinction order matter? Modeling the functional consequences of random vs. ordered extinction. NCSU Biomathematics seminar, February 2005.
- On the scope of inference for biodiversity – ecosystem function experiments. NCSU Statistics faculty sampler, Raleigh, NC, January 2004.
- Do parasitoids control pea aphids in alfalfa? Estimating interspecific effects from ecological time series. NCSU Zoology seminar, Raleigh, NC, January 2004.

Conference presentations: oral

- Quantifying secondary pest outbreaks in cotton and their monetary cost with causal inference statistics. ESA, Austin, TX August 2011.
- Does productivity drive diversity or vice versa? Reconciling old and new viewpoints in model communities. ESA, San Jose, CA August 2007.
- Estimating rare butterfly abundance by combining multiple data types with simple population models. ENAR meetings, Atlanta, GA, March 2007 (invited).
- Estimating butterfly abundances from count data. ESA, Memphis, TN, August 2006.
- Estimating butterfly abundances from count data. Statistics, Combinatorics, Mathematics and Applications meeting, Auburn, AL, December 2005 (invited).
- Modeling vital rates improves estimation of population projection matrices. ESA, Montreal, QC, August 2005.
- Two problems in statistical ecology. JSM New Researcher's Conference, Minneapolis, MN, August 2005.
- Estimating abundances from count data for species with discrete generations. WNAR / IBS, Fairbanks, AK, June 2005.
- Bootstrap for broader inference in biodiversity – ecosystem function experiments. Joint Statistical Meetings, Toronto, ON, August 2004.
- On the scope of inference for biodiversity – ecosystem function experiments. ESA, Portland, OR, August 2004.
- Do parasitoids control pea aphids in alfalfa? A state-space approach to analyzing monitoring data. Entomological Society of America, Fort Lauderdale, FL, November 2002.
- Modeling population dynamics with a mechanistic description of process error. ESA, Tucson, AZ, August 2002 (invited).
- Bayesian analysis of a demographic matrix model using multiple survey data. ENAR / IBS, Charlotte, NC, March 2001.
- Process models for long-term data: Two examples. LTER All-Scientists Meeting, Snowbird, UT, August 2000 (invited).
- Inferring host-parasitoid stability from patterns of parasitism. ESA, Spokane, WA, August 1999.
- Optimal sample allocation for demographic matrix models. Ninth Lukacs Symposium, Bowling Green, OH, April 1999.

Conference presentations: posters

- Bootstrap for broader inference in biodiversity – ecosystem function experiments. Fifth Winemiller Symposium, Columbia, MO, October 2004.
- A Bayesian approach to demographic matrix modeling. ESA, Snowbird, UT, August 2000.
- A Bayesian approach to demographic matrix modeling. ENAR / IBS, Chicago, IL, March 2000.

COURSES TAUGHT

- Probability and Statistics for the Physical Sciences (Statistics 380), NCSU, Fall 2003 - 2008.
- Biomathematics II (Biomath 772), NCSU, Spring 2004 - 2011.
- Experimental Statistics for Biological Sciences II, with lab (Statistics 512), NCSU, Fall 2006 - 2011, Spring 2011.
- Biomathematics seminar (Biomath 801), Spring, Fall 2009.
- Modeling of Biological Systems, with lab (Biomath 567), NCSU, Fall 2009.

STUDENTS ADVISED

Graduate students:

Completed:

Shanae Allen. MS co-major in Biomathematics with Operations Research (Y. Fathi, co-advisor) completed December 2008. Thesis title: "An integer programming approach to selecting

individuals for transfer in pedigreed populations."
Judith Canner. Ph.D. in Biomathematics and Zoology completed Fall 2010. Co-advised with Rob Dunn. Dissertation title: "The population ecology of ant-dispersed plants in space and time."
Matthew Hamilton. MS in Biomathematics completed August 2007. Thesis title: "Local dispersal and coexistence in a metacommunity model with trophic structure."
Rebecca Lyzinski, MS in Biomathematics completed May 2011. Thesis title: "Spatial Dynamics of Infection by Multiple Pathogens: A Case Study with Yellow Dwarf Viruses"
Yabo Wu. Masters of Biomathematics (MBMA) completed May 2006. Project title: "Using first-order autoregressive models to approximate nonlinear birth-death processes"

In progress:

Ian Fiske. Ph.D. student in Statistics. Fall 2006 – present. Dissertation topic: Hidden Markov models for amphibian monitoring data.

Service on 50 additional graduate student committees (34 complete, 16 in progress).

Undergraduate students:

Eric Kalendra, undergraduate in Statistics, 2004 – 05. Project: Statistical methods for estimating abundance of rare butterflies. Awarded Best Poster for this work at NCSU's 2005 Undergraduate Research Symposium.

EDITORIAL SERVICE

Editorial board member, *Ecology Letters*, January 2007 – present.

Editorial board member, *Theoretical Ecology*, March 2011 – present.

Refereed papers for: *American Naturalist*, *Annals of Applied Statistics*, *Bayesian Analysis*, *Biocontrol*, *Biometrics*, *Biostatistics*, *Biotropica*, *Bulletin of Mathematical Biology*, *Computational Statistics and Data Analysis*, *Conservation Biology*, *EcoHealth*, *Ecological Applications*, *Ecology*, *Ecology Letters*, *Ecoscience*, *Frontiers in Ecology and the Environment*, *Integrative and Comparative Biology*, *Journal of Agricultural, Biological, and Environmental Statistics*; *Journal of Animal Ecology*, *Journal of Mathematical Biology*, *Journal of Theoretical Biology*, *Mathematical Biosciences*, *Oecologia*, *Oikos*, *PNAS*, *Proceedings of the Royal Society Series B*, *Theoretical Ecology*, *Theoretical Population Biology*.

OTHER SERVICE

Author and maintainer of the R package mvnmle (multivariate normal maximum likelihood estimation).
<http://cran.r-project.org/>

Co-organized oral session entitled: "What is the right size model? Views on model complexity and parsimony from different statistical paradigms." ESA, San Jose, CA, August 2007.

Executive committee, Theoretical Ecology Section of the Ecological Society of America, August 2009-11 (one-year term as vice chair followed by one-year term as chair).

NSF panel service.

PROFESSIONAL ASSOCIATIONS

Member, Ecological Society of America (also member of Theoretical Ecology and Statistical Ecology sections). 2003 – present.