

RACHEL A. KATZ, PH.D.

U.S. Fish and Wildlife Service
National Wildlife Refuge System
Inventory and Monitoring Initiative
Division of Natural Resources and Conservation Planning
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INTERESTS

Principles of conservation biology and ecology
Capture-mark-recapture and state-based modeling
Dynamic occupancy (presence/absence) modeling
Spatial habitat analysis and remote sensing
Ecological forecasting and scenario planning
Facilitation, elicitation, and group dynamics

Inventory and monitoring planning and design
Survey protocol development and implementation
Decision analysis (structured decision-making)
Risk, uncertainty, and sensitivity analysis
Bayesian statistics and adaptive management
Project management, planning and design

EDUCATION

Ph.D. in Ecology - University of Georgia (UGA), 2014

Thesis: *Evaluating the relations between fish population dynamics, streamflow, and geomorphic characteristics at multiple spatial scales.*

Supervisors: Drs. M. Freeman, J. Peterson, C. Pringle, B. Freeman & J. Wares

M.S. in Ecology - University of Georgia, 2009

Thesis: *Abundance and survival of common benthic biota in a river affected by water diversion during an historic drought.*

Supervisors: Drs. M. Freeman, A. Covich & T. Rassmussen

B.A. Biology - University of North Carolina at Chapel Hill, 2005

EXPERIENCE

Biometrician (and Decision Analyst), July 2016–Present. U.S. Fish and Wildlife Service, National Wildlife Refuge System, Division of Natural Resources and Conservation Planning, Inventory and Monitoring Initiative, Hadley, MA.
Supervisor: T. Wilson

- Support development and review of habitat management and inventory & monitoring plans, species' 5-year reviews and species status assessments.
- Assist protocol development, review, and implementation at refuge, regional, and national scales (including federally and state listed species, such as the Atlantic Coast Breeding Piping Plover).
- Develop and train staff in efficient data management (spatial and tabular), visualizations, analyses, tool reporting tools, including R (primary coding language) and ESRI (GIS/python).
- Provide statistical guidance (question, design, model, and interpretation) of diverse population and habitat-based monitoring and research projects to inform management.
- Facilitate identifying critical information gaps (qualitative and quantitative, expert elicitation) to aid in accumulating scientific knowledge for current and future decision-making (including current and future condition analysis for species status assessments).
- Communicate complex ecological issues, principles of conservation biology (3R's), and scientific information (including uncertainty, risk, and climate change) to wide range of audiences, including briefings for range of decision-makers.
- Utilize decision analysis frameworks and tools to develop objectives, management alternatives, hypotheses, and evaluate trade-offs to support structured, transparent, and defensible decision-making.

Postdoctoral Researcher, 2014–2016. University of Massachusetts-Amherst, Department of Environmental Conservation; U.S. Geological Survey, Massachusetts Cooperative Fish and Wildlife Research Unit; U.S. Geological Survey Patuxent Wildlife Research Center and Northeast Amphibian Research and Monitoring Initiative; Turners Falls, MA. PIs: E.H. Campbell-Grant, A.H. Roy, B.H. Letcher, and M.C. Runge.

- Led six structured decision-making workshops with up to 20 federal and state natural resource management agencies and scientific experts to identify and evaluate alternative strategies for landscape collaborative conservation of headwater streams within the northeastern US.
- Developed statistical and decision models to estimate effects of alternative actions on occurrence, abundance and distribution of fish and salamanders.
- Evaluated model predictions to provide insights into critical ecological uncertainties and the role of climate uncertainty in management decisions.
- Conveyed technical information, including the role of monitoring data, research, and wildlife estimation to a wide range of audiences, including managers and quantitative ecologists.
- Conducted expert elicitation to collect information on ecological hypothesis and parameters when data were lacking.

Graduate Research Assistant, 2009–2014. U.S. Geological Survey, Georgia Cooperative Fish & Wildlife Research Unit, Warnell School of Forestry and Natural Resources, UGA, Athens, GA. PI: M.C. Freeman.

- Designed and implemented three research projects focused on wildlife (stream fish) estimating and prediction in stream ecosystems.
- Applied novel quantitative Bayesian methods (MCMC) to estimate demographic parameters (presence and abundance) and processes (survival and growth rate) for robust inference of the role of hierarchical environmental predictors on biotic outcomes.
- Lead multiple field crews (undergraduates and technicians) in field data collection (species and habitat), as well as laboratory skills for developing molecular markers (msat loci) and genetic analysis.
- Provided statistical consulting and developed analyses for graduate students and faculty involving Bayesian methods (prior information and model specification), especially for capture-mark-recapture and occupancy model for a range of freshwater species (fish, turtles, shrimps) and ecosystem processes (nutrient dynamics, biomass, and production).

Butler Research Fellow, 2007–2009. River Basin Center, Odum School of Ecology, UGA, Athens, GA. PI: M.C. Freeman.

- Developed and carried out projects to evaluate effects of streamflow and flow management on stream fishes, benthic macroinvertebrates and aquatic macrophytes.
- Utilized a Bayesian model framework to estimate the occurrence, abundance, biomass and production of various aquatic biota.
- Developed streamflow management-focused capture-mark-recapture models to evaluate the effects of flow management on population dynamics of a stream fish.

Research Technician, 2006–2007. River Basin Center and Odum School of Ecology, UGA, Athens, GA. PI: B.J. Freeman.

- Collected and analyzed field data to assess occurrence and distribution of several state and federally listed stream fish species in GA.
- Contributed to state governmental reports that provided guidance to federal and state agencies regarding field sampling protocols and species status and trends.

Raptor Rehabilitation Research Internship, 2005–2006. Carolina Raptor Center, Charlotte, NC.

- Responsible for the daily feeding and care of over 40 raptors.
- Assisted veterinarians in examination and treatment of injured or ill individuals.
- Data preparation and synthesis of Red-tailed Hawk data to evaluate sexual dimorphic characteristics.

Marine Research Technician, 2003-2005. University of North Carolina at Chapel Hill, Chapel Hill, NC. PIs: K. Lohman, J. Bruno, J. McAlister.

- Designed and conducted field-based experiments on the effects of altered magnetic fields on sea turtle (hatchlings and juveniles) swimming orientation.
- Prepared and measured sea urchins using visualization software for experiments testing food-availability impacts on growth and development.

PUBLICATIONS

USFWS Inventory and Monitoring Protocols

Bush N., **R. Katz**, L. Eaton, K. Vagos, L. Mowbray, and K. Sturm. *In Review*. Regional Protocol Framework for the Inventory Invasive Plants. Version 0.9. US Fish and Wildlife Service North-Atlantic Appalachian Regional Office, Hadley, MA. <https://ecos.fws.gov/ServCat/Reference/Profile/116190>

King E., **R. Katz**, K.E. Iaquinto, K. Suir, M.J. Baldwin, A. Hecht. 2019. Regional Protocol Framework for the Inventory and Monitoring of Piping Plover Atlantic Coast Breeding Populations. Version 1.0. US Fish and Wildlife Service Northeast Regional Office, Hadley, MA. <https://ecos.fws.gov/ServCat/Reference/Profile/110791>

Journal Articles

Bush N., and **R.A. Katz**. *In prep*. The Utility of Remote Sensing Data and Machine Learning for Monitoring Salt Marsh Management Objectives on North Atlantic-Appalachian Region National Wildlife Refuges. *To be submitted to Wetlands or Remote Sensing*.

Bernard R.F., J.D. Reichard, J.T.H. Coleman, J.C. Blackwood, M.L. Verant, J.L. Segers, J.M. Lorch, J.P. White, M.S. Moore, A.L. Russell, **R.A. Katz**, D.L. Lindner, R.S. Toomey, G.G. Turner, W.F. Frick, M.J. Vonhof, C.K.R. Willis, E.H. Campbell Grant. 2020. Identifying research needs to inform white-nose syndrome management decisions. *Conservation Science and Practice* 2020; e2020. <https://doi.org/10.1111/csp2.220>

Sterrett, S.C., **R.A. Katz**, A.B. Brand, W.R. Fields, A.E. Dietrich, D.J. Hocking, T.M. Foreman, A.N.M. Wiewel, E.H.C. Grant. 2019. Proactive management of amphibians: challenges and opportunities. *Biological Conservation* 236: 404-410. <https://doi.org/10.1016/j.biocon.2019.05.057>

Smalling K.L., C.A. Eagles-Smith, **R.A. Katz**, E.H. Campbell-Grant. 2019. Managing the trifecta of disease, climate, and contaminants: Searching for robust choices under multiple sources of uncertainty. *Biological Conservation* 236: 153-161. <https://doi.org/10.1016/j.biocon.2019.05.026>

Ingram T., S. Sammons, A. Kaeser, **R. Katz**, S Sterrett. 2019. Spatial Ecology of Shoal Bass *Micropterus cataractae* in Ichawaynochaway Creek, Georgia *in* Managing Centrarchid Fisheries in Rivers and Streams. American Fisheries Society, Bethesda, Maryland. M.J. Siepker & J. W. Quinn, editors. Pg.193-211.

Sterrett S.C., **R.A. Katz**, W.R. Fields, E. Campbell Grant. 2019. The contribution of road-based citizen science efforts to the conservation of pond-breeding amphibians. *Journal of Applied Ecology* 56(4): 988-995. <https://doi.org/10.1111/1365-2664.13330>

Campbell-Grant E.H., E. Muths, **R.A. Katz**, S. Canessa, M.J. Adams, J.R. Ballard, L. Berger, C.J. Briggs, J. Coleman, M.J. Gray, M.C. Harris, R.N. Harris, B. Hossack, K.P. Huyvaert, J. Kolby, K. Lips, R.E. Lovich, H.I. McCallum, J.R. Mendelson III, P. Nanjappa, D.H. Olson, J.G. Powers, K.L.D. Richgels, R.E. Russell, B.R. Schmidt, A. Spitzen-van der Sluijs, M.K. Watry, D.C. Woodhams, C.L. White. 2017. Developing a proactive response to the introduction of a fungal pathogen, *Batrachochytrium salamandrivorans* to US salamander populations. *Frontiers in Ecology and the Environment* 15(4): 214-221. <https://doi.org/10.1002/fee.1481>

Russell R.E., **R.A. Katz**, K.L.D. Richgels, D.P. Walsh, and E.H. Campbell-Grant. 2017. A framework for modeling emerging disease to inform management. *Emerging Infectious Diseases* 23(1): 1-6. <https://dx.doi.org/10.3201/eid2301.161452>

Katz R.A. and M.C. Freeman. 2015. Evidence of population resistance to extreme low flows in a fluvial-dependent fish species. *Canadian Journal of Fisheries and Aquatic Sciences* 72 (11): 1776-1787. <https://doi.org/10.1139/cjfas-2015-0173>

Sterrett S.C., A.J. Kaeser, **R.A. Katz**, L.L. Smith, J.C. Brock and J.C. Maerz. 2015. Spatial ecology of female Barbour's map turtles (*Graptemyes barbouri*) in Ichawaynotchaway Creek, Georgia. *Copeia* 103(2): 263-271. <https://doi.org/10.1643/CH-13-162>

Sterrett S.C., A.B. Brand, W.R. Fields, **R.A. Katz** and E.H. Campbell-Grant. 2015. *Plethodon cinereus* (Eastern Red-backed Salamander): Movement (Natural History Note). *Herpetological review* 46(1): 71

Sterrett S.C., J.C. Maerz and **R.A. Katz**. 2015. What can turtles teach us about the theory of ecological stoichiometry? *Freshwater Biology* 60: 443-455. <https://doi.org/10.1111/fwb.12516>

Other Publications and Reports

Katz R., N. Raymon-Metcalf, R. Niver, and L. Erb. *In prep.* Current Condition Resiliency Assessment for the Northern Population of the Bog Turtle 5-Year Review and Species Status Assessment. *U.S. Fish and Wildlife Service Report*, 40 pg.

Casey J., **R. Katz**, and M. Mills. *In prep.* Freshwater Impoundment Assessment for Moosehorn National Wildlife Refuge, Appendix X: Moosehorn NWR Habitat Management Plan. *U.S. Fish and Wildlife Service Report*, 22 pg.

Roy A. H., E. Bjerre, J. Cummings, K. Kalasz, J. Carminngani, P. Hazelton, M. Kern, D. Perkins, L. Saucier, A. Skorupa, **R. Katz**, and C. Coghlan. *In prep.* Brook Floater Restoration: Identifying Locations to Reintroduce or Augment Populations. *U.S. Fish and Wildlife Service Report*, X pg.

Morelli T. L., J. Hoffman, K. O'Donnell, K. Fitzgerald, B. McCann, S. Jackson, C. Balantic, K. Bentsen, J. Blatt, T. Dexter, A. Kautza, B. O'Connor, R. Quinones, R. Richards, E. Rodgers, R. Zimmerer, **R. Katz**, and C. Coghlan. 2020. Preliminary Development of Water-Withdrawal Mitigation Framework for Coldwater Resources Conservation. *U.S. Fish and Wildlife Service Report*, 25 pg. <https://ecos.fws.gov/ServCat/Reference/Profile/127533>

Pau N., C. Buelow, S. Adamowicz, B. Benvenuti, M. Hartley, R. Hopping, P. Huckery, P. Phippen, A. Vitz, G. Wilson, C. Frost, K. Alger, E. Rivenbark, **R. Katz**, and C. Coghlan. 2020. Great Marsh and Salt Marsh Sparrow Restoration. *U.S. Fish and Wildlife Service Report*, 16 pg. <https://ecos.fws.gov/ServCat/Reference/Profile/124774>

Katz R., and S. Sterrett. 2019. How a decision-analysis tool helped one scientist couple make some tough career choices. *Nature Careers* 5 July 2019. <https://doi.org/10.1038/d41586-019-02106-5>

Katz R., *A. Brand, N. Bush, C. Davis, L. Eaton, J. Fleming, S. Flint, E. Grant, J. Horan, E. King, S. Koch, K. Lantz, R. Longenecker, B. Mosher, A. Rizzo, D. Washington, T. Wilson, D. Zimmerman (*listed alphabetically). 2019. Challenges and Opportunities for Vernal Pool Management in Northeast National Wildlife Refuges. *U.S. Fish and Wildlife Service Report*, 39 pg. <https://ecos.fws.gov/ServCat/Reference/Profile/110606>

Taylor, J. T. Wilson, **R. Katz**, R. Longenecker, E. King. 2018. NWRS Northeast Region Biological Assessment and Workforce Planning Decision Support Tool. *U.S. Fish and Wildlife Service Executive Summary Report*, 10 pg. <https://ecos.fws.gov/ServCat/Reference/Profile/108353>

Stantial M., **R. Katz**, J. Cohen, *K. Amaral, J. Denoncour, A. Hecht, K. Hojnacki, K. Hunt, K. O'Brien, N. Pau, J. Regosin, C. Spiegel, L. Tudor, D. Tyre (*listed alphabetically). 2018. Structured Decision Making for Predator Removal to Benefit Piping Plovers and Other Beach Nesting Birds Least Terns. In Guidance and Best Practices for Coordinated Predation Management to Benefit Temperate Breeding Shorebirds in the Atlantic Flyway. *U.S. Fish and Wildlife Service Report*, 32 pg. <https://ecos.fws.gov/ServCat/Reference/Profile/110898>

Tsipoura N., **R. Katz**, D. Mizrahi, M. Allen, and T. Schotland. 2018. Coastal Impoundment Vulnerability and

Resilience Project: Ecological Values Assessment (Waterbirds) Report, Assessing Coastal Impoundment Vulnerability and Resilience in the Northeast, Appendix 9. *Hurricane Sandy Coastal Resiliency, National Fish and Wildlife Foundation Report.*

- Adams T., J. Bourne, J. Devers, **R. Katz**, B. Knudson, R. Longenecker, and S. Spencer (listed alphabetically). 2018. Patuxent Research Refuge road-stream crossing prioritization. *U.S. Fish and Wildlife Report*, 26 pg. <https://ecos.fws.gov/ServCat/Reference/Profile/95276>
- Althouse M., **R. Katz**, R. Longnecker, V. Muller, and T. Roster (listed alphabetically). 2017. Freshwater impoundment removal decision analysis, Erie NWR Comprehensive Conservation Plan Appendix H. *U.S. Fish and Wildlife Report*, 15 pg. <https://ecos.fws.gov/ServCat/Reference/Profile/84812>
- Crawford B.A., **R.A. Katz**, and S.K. McKay. 2016. Engaging stakeholders in natural resource decision-making. *EMRRP Technical Notes Collection*. ERDC/TN EMRRP-SR-83. U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. <https://cdm16021.contentdm.oclc.org/digital/collection/p266001coll1/id/4489>
- Harris, M.C., J.M. Pearce, D.J. Prosser, C.L. White, A.K. Miles, J.M. Sleeman, C.J. Brand, J.P. Cronin, S. De La Cruz, C.L. Densmore, T.W. Doyle, R.J. Dusek, J.P. Fleskes, P.L. Flint, G.F. Guala, J.S. Hall, L.E. Hubbard, R.J. Hunt, H.S. Ip, **R.A. Katz**, K.W. Laurent, M.P. Miller, M.D. Munn, A.M. Ramey, K.D. Richards, R.E. Russell, J.P. Stokdyk, J.Y. Takekawa, and D.P. Walsh. 2016. U.S. Geological Survey science strategy for highly pathogenic avian influenza in wildlife and the environment (2016–2020): *U.S. Geological Survey Open-File Report 2016–1121*, 38 p. <https://doi.org/10.3133/ofr20161121>
- Campbell-Grant E.H., E. Muths, **R.A. Katz**, M.J. Adams, S. Canessa, J.R. Ballard, L. Berger, C.J. Briggs, J. Coleman, M.J. Gray, M.C. Harris, R.N. Harris, B. Hossack, K.P. Huyvaert, J.E. Kolby, K.R. Lips, R.E. Lovich, H.I. McCallum, J.R. Mendelson III, P. Nanjappa, D.H. Olson, J.G. Powers, K.L.D. Richgels, R.E. Russell, B.R. Schmidt, A. Spitzen-van der Sluijs, M.K. Watry, D.C. Woodhams, and C.L. White. 2015. Salamander chytrid fungus (*Batrachochytrium salamandrivorans*) in the United States: Developing research, monitoring and management strategies. *U.S. Geological Survey Open-File Report 2015–1233*, 16 p. <https://doi.org/10.3133/ofr20151233>
- Staudinger M., L. Hilberg, M. Janowiak, C. Caldwell, A. D’Amato, E. Grant, R. Horton, **R. Katz**, C. Neill, K. Nislow, K. Potter, E. Rowland, C. Swanston, F. Thompson, K. Winiarski. 2015. Scale-Appropriate Adaptation Strategies and Actions in the Northeast and Midwest United States. In (Ed. Staudinger, Morelli, and Bryan), *Integrating Climate Change into Northeast and Midwest State Wildlife Action Plans* (pp.154-195). DOI Northeast Climate Science Center Report, Amherst, Massachusetts. <https://pubs.er.usgs.gov/publication/70179620>
- Katz R.A.**, E. Grant, M. Runge, B. Connery, M. Crockett, E. Herland, S. Johnson, D. Kirk, J. Wofford, R. Bennett, K. Nislow, M. Norris, D. Hocking, B. Letcher, and A. Roy. 2014. Making decisions in complex landscapes: Headwater stream management across multiple federal agencies. *U.S. Geological Survey and Fish and Wildlife, National Conservation Training Center, Structured Decision Making Workshop Report.* <https://training.fws.gov/courses/ALC/ALC3159/reports/index.html>
- Katz R.A.** and S.K. McKay. 2011. Evaluating effects of pump-storage water withdrawals using an individual-based metapopulation model of a benthic fish species. *Proceedings of the 2011 Georgia Water Resources Conference.*
- Sterling J.L, B. Rashleigh, B.L. Nuse, **R.A. Katz**, A. Trice and A.D. Rosemond. 2009. Using streamflow as a predictor of biotic health in the Upper Oconee Watershed. *Proceedings of the 2009 Georgia Water Resources Conference.*
- Freeman B.J., M.M. Hagler, S.J. Wenger, G.B. Anderson and **R.A. Katz**. 2007. Identification and Mapping of Critical Habitats in the Conasauga River Corridor of Georgia and Tennessee. *Georgia Department of Natural Resources 2006 Annual Report.*

Freeman B.J., M.M. Hagler, S.J. Wenger and **R.A. Katz**. 2007. Identification and Mapping of Critical Habitats in the Etowah River System With an Emphasis on the Distribution of Sensitive Species of Fishes. *Georgia Department of Natural Resources 2006 Annual Report*.

Freeman B.J., M.M. Hagler, and **R.A. Katz**. 2007. Results of Reservoir Monitoring Project for the Fall of 2006, Condition 26 and Condition 24. *Georgia Department of Natural Resources 2006 Annual Report*.

FACILITATION

National Wildlife Refuge Inventory and Monitoring Planning (USFWS). 60 participants within 5 teams. Leads: J. Casey, **R. Katz**, M. Knutson, A. Rizzo, L. Talbert, and T. Wilson. National Wildlife Refuge System, Inventory and Monitoring Initiative, Hadley MA. *USFWS*. January 2020 (1 day) and February 2020 (2 days).

Northeast Structured Decision-Making Workshop (NCTC). 50 participants within 3 teams. Lead Coach: **R. Katz**. Massachusetts Division of Fisheries and Wildlife, Westborough MA. *USFWS*. February 2020.

Biological Objectives & Inventory and Monitoring Planning, National Wildlife Refuge System. 16 participants. Leads: **R. Katz** and J. Holler. Organizers: P. Heglund, J. Newman, and R. Mollnow. National Resource Program Center, Fort Collins CO. *USFWS*. February 2019.

Regional Vernal Pool Management Structured Decision-Making Workshop. 15 participants (3 NWRs). Leads: **R. Katz** and E. Grant. Northeast USFWS Regional Office, Hadley MA. *USFWS & USGS*. February 2019.

Biological Assessment for NWRS Workforce Planning. 40+ participants. Leads: **R. Katz**, J. Taylor, T. Wilson, B. Longenecker, and E. King. Northeast USFWS Regional Office, Hadley MA. *USFWS*. August 2017 – April 2018.

Regional Conservation of Gopher Frog Structured Decision-Making Workshop (to inform Species Status Assessment) (NCTC). 10 participants. Leads: **R. Katz**, T. Jones-Farrand, B. Crawford, C. Moore, and J. Maerz. Austin Cary Forest Campus, FL. *U.S. Geological Survey, Alabama Cooperative Research Unit Funding: \$1.7K*. July 2018.

Predator Removal for Shorebirds SDM Workshop. 21 participants. Leads: D. Tyre, A. Hecht, and **R. Katz**. Parker River National Wildlife Refuge, MA. *USFWS*. October 2017.

Future of Waterfowl Workshop II, North American Waterfowl Management Plan. 180 participants. Leads: J.D. Case and F. Johnson (**R.A. Katz**, facilitator). USFWS National Conservation Training Center, WV. *USFWS*. September 2017.

White-nose Syndrome Science Synthesis Workshop. 15 participants. Leads: J. Coleman, J. Reichard, E.H. Grant, R. Bernard, and **R.A. Katz**. Cranbrook Institute, MI. *USFWS Funding: \$1.8K*. May 2017.

Landscape Conservation for Headwater Stream Ecosystems using Structured Decision Making (SDM). Led and organized five SDM workshops for landscape collaborative conservation of headwater stream with diverse stakeholders from federal, state, and local natural resource agencies in the northeastern US. 30 participants. Leads: **R.A. Katz**, E.H. Campbell-Grant, and M.C. Runge. *USGS & NECSC Funding: \$110K*. February 2014 – July 2016.

Salamander Chytrid Fungus (Bsal) United States Response Team SDM Workshop. 35 participants. Leads: E.H. Campbell Grant, M. Adams, E. Muths, **R. Katz**, and S. Canessa. USGS Powell Center for Analysis and Synthesis, CO. *USGS Funding: \$18K*. June 2015 – July 2016.

White-nose Syndrome Treatment and Management Strategy Workshop. 50 participants. Leads: J. Coleman, J. Reichard, P. Field, and **R. Katz**. Grand Rapids, MI. *USFWS Funding: \$1.5K*. July 2015.

Decision Analysis Tools Course (Training). Leads: M. Runge and C. Fonnesebeck (**R. Katz**, participant). USFWS National Conservation Training Center, WV. *USFWS & USGS Funding: \$1.8K*. March 2015.

Negotiation Skills for Conservation Professionals Course (Training): Building a Foundation. Leads: N. Burkardt and B. Lamb (**R. Katz**, participant). USFWS National Conservation Training Center, WV. *USFWS & USGS Funding: \$1K*. September 2014.

Rio Grande Silvery Minnow SDM Workshop. 11 participants. Leads: J. Cochrane and **R. Katz**. USFWS National Conservation Training Center, WV. *USFWS & USGS Funding: \$1.8K*. February 2012.

Climate Change Uncertainty and Shenandoah Salamander SDM Workshop. 7 participants. Leads: D. Smith and J. Gannon (**R. Katz**, observer). USFWS National Conservation Training Center, WV. *USFWS & USGS Funding: \$1.8K*. February 2011.

TEACHING

Courses

Introduction to Structured Decision-Making. *In progress.* 4.5-day virtual/online USFWS course, NCTC. Co-Instructor. Summer 2021.

Introduction to Tidy Data and R Workflows. 1-day training, NWRs/USFWS, Northeast Regional Office, Hadley, MA (16 participants). February 2020.

Building a Strong Refuge System Biological Program. 4.5-day USFWS course, NCTC, Sevilleta NWR, NM. (18 participants). Co-Instructor with P. Heglund, R. Mallow, M. Cobb, and J. Laufenberg. April 2019.

Introduction to Structured Decision-Making. 4.5-day USGS/FWS course at the National Conservation Training Center, Shepardstown, WV. (30 participants). Teaching Assistant and Co-Instructor with L. Brandt, G. Breese, M. Eaton, B. Irwin, C. Morris, and L. Ortiz. August 2015.

Ichthyology. Led and assisted laboratory sections and fish sampling methods, Odum School of Ecology, UGA, Athens, GA. (26 students). Co-Teaching Assistant with A. Gehman. Lead Instructors: B. Freeman and M. Freeman. August-December 2012.

Bayesian Modeling in Ecology. Led discussion and developed a working group focused on using Bayesian methods to analyze complex data sets from graduate students and faculty across a diversity of fields, Odum School of Ecology, UGA, Athens, GA. (15 participants). Lead Instructor. September-November 2011.

Guest Lecturer

Aquatic Ecology. Lab: *Applying Flow-ecology Linkages to Conservation Decision Making and Identifying Research Needs*, Department of Environmental Conservation, UMass-Amherst, MA. (30 students) Co-Instructor with K. Kennedy. Lead instructor: A. Roy. November 2016 and 2018.

Career and Curriculum Planning. Lecture: *Improving Conservation and Career Choices*. Department of Environmental Conservation, UMass-Amherst, MA. (40 students) Lead instructor: L. Fletcher. March 2018.

Conservation Biology. Lecture: *Using Structured Decision Making to Solve Conservation Problems in the USFWS National Wildlife Refuge System*. Department of Environmental Conservation, UMass-Amherst, MA. (25 students) Lead instructor: P. Warren. March 2017.

Environmental Decision-Making/Human Dimensions of Conservation. Lecture: *Application of Structured Decision-Making to Environmental Conservation*. Department of Environmental Conservation, UMass-Amherst, MA. (80 students) Lead instructor: E. Markowitz. November 2015.

Aquatic Ecology. Lab: *Sampling Methods for Stream Fishes*, Department of Environmental Conservation, UMass-Amherst, MA. (24 students) Lead instructor: A. Roy. September 2014.

International Conservation. Lecture (2-day): *Introduction to Structured Decision-Making in Conservation*, Warnell School of Forestry, UGA, Athens, GA. (40 students). Co-Instructor with B. Crawford. Lead instructor: J. Hickey. October 2012.

Fishes of Georgia. Lecture: *Demography of Freshwater Fishes in Georgia Piedmont Streams*. Warnell School of Forestry, UGA, Athens, GA. (15 students) Lead instructor: B. Albanese. May 2014.

Environmental Science. Lecture: *Stream Ecology and Streamflow Management*. Gainesville State College-Oconee Campus, Athens, GA. (20 students) Lead instructor: K. Edmonds. April 2012.

PRESENTATIONS

Invited Seminars and Presentations

Katz R.A., E. King and P. Denmon. *Regional Protocol Framework: Opportunity for American Oystercatcher?* American Oystercatcher Working Group Meeting. Osyster, VA. **Invited Presentation.** November 2019.

Katz R.A. *Balancing risk and reward in NWRS coastal impoundment management decisions.* Symposium: Structured decision making: a vehicle for navigating the crossroads of cultures in wildlife management. The Wildlife Society. Albuquerque, NM. **Invited Presentation.** September 2017.

Katz R.A. *Start from the beginning: decision-focused projects for co-producing science.* Northeast Climate Science Center Regional Science Meeting. Amherst, MA. **Invited Panelist.** May 2017.

Katz R.A., E.H. Campbell-Grant and K.L. Smalling. *Evaluating strategies for disease and environmental contaminant management using structured decision-making.* North Atlantic Chapter of the Society of Environmental Toxicology & Chemistry. Amherst, MA. **Invited Presentation.** June 2016.

Katz R.A. and P. Damkot. *Managing in the face of climate uncertainty: An introduction to decision trees.* USGS Northeast Climate Science Center, Fellows Seminar Discussion. Amherst, MA. **Invited Presentation.** March 2016.

Katz R.A. *Conservation in the face of uncertainty using decision analytics.* College of the Holy Cross, Biology Department Seminar. Worcester, MA. **Invited Seminar.** March 2016.

Katz R.A. *Linking science and management: Challenges and opportunities for the conservation of stream fishes.* University of Connecticut, Natural Resources and the Environment Department Seminar, Storrs, CT. **Invited Seminar.** October 2015.

Katz R.A., E.H. Campbell-Grant, M.C. Runge, B.H. Letcher and A.H. Roy. *Making decisions in complex landscapes: headwater stream management across multiple agencies using structured decision-making.* USGS Northeast Climate Science Center. Amherst, MA. **Invited Seminar.** November 2014.

Contributed Presentations (only listed as presenter)

Katz R.A., E.H. Campbell-Grant, M.C. Runge. *Decision Analytics in Ecology: Introduction and Application to Research and Conservation.* Ecological Society of America Annual Meeting. Fort Lauderdale, FL. August 2016.

Katz R.A. and A.H. Roy. *Using decision analysis to identify research needs that inform conservation and management.* USGS Massachusetts Cooperative Fish and Wildlife Research Unit Research Symposium. MA Division of Fisheries and Wildlife. Westborough, MA. May 2016.

Katz R.A., E.H. Campbell-Grant, M.C. Runge, D.J. Hocking, B.H. Letcher and A.H. Roy. *Not all scientific uncertainties are created equal for landscape scale headwater stream management.* Society for Freshwater Science. Milwaukee, WI. May 2015.

- Katz R.A.** and A.H. Roy. *Challenges facing conservation decision making in complex landscapes for headwater streams*. USGS Massachusetts Cooperative Fish and Wildlife Research Unit Research Symposium. MA Division of Fisheries and Wildlife. Westborough, MA. May 2015.
- Katz R.A.**, E.H. Campbell-Grant, A.H. Roy, D.J. Hocking, B.H. Letcher and M.C. Runge. *Evaluating collaborative landscape conservation for headwater stream ecosystems in two northeastern US watersheds*. Northeast Association of Fish and Wildlife Conference. Newport, RI. April 2015.
- Katz R.A.** and M.C. Freeman. *Survival and temporary movement of turquoise darters (*Etheostoma inscriptum*) during extremely low flows*. American Fisheries Society – Southeastern Division. Nashville, TN. February 2013.
- Katz R.A.**, S.K. McKay and M.C. Freeman. *Evaluating effects of pump-storage water withdrawals using an individual-based metapopulation model of a benthic fish species*. Proceedings of the 2011 Georgia Water Resources Conference. Athens, GA. April 2011.
- Katz R.A.**, J. Pahl and M.C. Freeman. *Effect of low-flows, caused by drought and water withdrawals, on net-spinning caddisfly larvae*. Joint Meeting of the American Society of Limnology and Oceanography and the North American Benthological Society. Sante Fe, NM. June 2010.
- Katz R.A.** and M.C. Freeman. *Estimating survival and abundance of *Etheostoma inscriptum* during extremely low flows in a sixth-order river bedrock shoal*. American Fisheries Society – Southeastern Division, *Student Presentation Finalist*. Asheville, NC. February 2010.

FUNDING AND AWARDS

MA Division of Fisheries and Wildlife, Hazelton et al. – Decision Analyst and Statistical Consultant for Brook Floater Range-wide Conservation and Restoration Initiative, State Wildlife Action Grant, 2016–2019.	\$ 500 000
USGS, Northeast Climate Science Center – Postdoctoral Researcher, Decision Analyst and Ecologist for Landscape Conservation, 2014–2016	\$ 110 000
USGS – Bsal Decision Analyst and Quantitative Ecologist, 2015–2016	\$ 18 000
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Odum School of Ecology UGA Small Grant Award, 2011	\$ 1 500
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Odum School of Ecology, UGA, Graduate Symposium Research Award, 2009	\$ 200

PROFESSIONAL SERVICE

Affiliations: The Wildlife Society, Society for Conservation Biology, Ecological Society of America

Journal Reviewer: Conservation Biology, Journal of Environmental Management, Animal Conservation, Fisheries, Journal of American Water Resources, Journal of Coastal Research, USGS Open File Reports

USFWS Membership: Structured Decision Making Community of Practice, Decision Analysis for Natural Resources Certificate Program (Mentor/Instructor), Pride (LGBTQ+) Employee Resource Group, Stats Community of Practice, Sustainability Community of Practice