

# ROLAND A. KNAPP

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## RESEARCH INTERESTS

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- Resistance and resilience of aquatic ecosystems to anthropogenic stressors, in particular, emerging infectious diseases and nonnative species.
- Impacts of nonnative species on the structure and function of aquatic ecosystems.
- Developing effective strategies to recover endangered amphibians.

## EDUCATION

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University of California - Santa Barbara: <i>Ph.D. in Biology</i>	1992
University of California - Santa Barbara: <i>B.A. in Aquatic Biology</i>	1986

## ACADEMIC APPOINTMENTS

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Earth Research Institute, UC Santa Barbara: <i>Research Biologist</i>	2017-present
Marine Science Institute, UCSB: <i>Research Biologist</i>	2009-2017
Marine Science Institute, UCSB: <i>Associate Research Biologist</i>	2004-2009
Marine Science Institute, UCSB: <i>Assistant Research Biologist</i>	1993-2004
Marine Science Institute, UCSB: <i>Postdoctoral Researcher</i>	1992-1993
Dept. of Biological Sciences, UCSB: <i>Lecturer</i>	1991

## HONORS & AWARDS

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UCSB Dissertation Fellowship	1991
UCSB General Affiliates Fellowship	1989
Phi Beta Kappa, UCSB	1986

## PROFESSIONAL ORGANIZATIONS

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Ecological Society of America

## PROFESSIONAL ACTIVITIES

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### Reviewer:

- *Journals*: American Naturalist, Amphibia-Reptilia, Animal Behaviour, Animal Conservation, Behavioral Ecology, Biological Conservation, Bulletin of Marine Science, Canadian Journal of Fisheries and Aquatic Sciences, Conservation Biology, Copeia, Diseases of Aquatic Organisms, Diversity and Distributions, Ecography, EcoHealth, Ecological Applications, Ecological Monographs, Ecology, Ecology and Evolution, Ecology Letters, Ecosphere, Ecosystems, Environmental Biology of Fishes, Freshwater Biology, Herpetological Conservation and Biology, Herpetologica, Herpetological Conservation and Biology, Herpetological Review, Journal of

Animal Ecology, Journal of Applied Ecology, Journal of Fish Biology, Journal of Herpetology, Journal of Zoology, Limnology and Oceanography, North American Journal of Fisheries Management, New Zealand Journal of Marine and Freshwater Research, Oecologia, PeerJ, PLOS One, Science, Science of the Total Environment, Scientific Report, Transactions of the American Fisheries Society.

- *National Science Foundation*: Grant proposals to the Division of Environmental Biology and Division of Integrative Organismal Systems.
- *Other agencies*: Grant proposals to the Alberta Conservation Association Grants in Biodiversity, Austrian Academy of Sciences – Earth Systems Sciences.
- *U.S. Fish and Wildlife Service*: Species status assessments for taxa being considered for listing under the U.S. Endangered Species Act, recovery plans for listed species.

#### **Scientific Advisor:**

- *Technical Advisory Committee & Technical Team*: Assisted the U.S. Fish and Wildlife Service, U.S. Forest Service, California Department of Fish and Wildlife, and National Park Service in developing a conservation assessment and developing and updating a conservation strategy for the mountain yellow-legged frog (1999-present).

#### **Consultant:**

- *Chevron Guadalupe Restoration Project - Garcia and Associates*: Analyzed long-term trends in California red-legged frog populations at the Guadalupe Dunes project site (with Maxwell Joseph; 2018-2019).
- *California Department of Fish and Wildlife*: Developed a species distribution model for mountain yellow-legged frogs using Maxent, for inclusion in a status review of this taxon (2010-2011).

### **TEACHING EXPERIENCE**

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**Lecturer:** Taught two months of UCSB undergraduate course, *Ethology and Behavioral Ecology* (1991).

**Guest Lecturer:** Provided 1-2 hour lectures in undergraduate and high school courses:

- UCSB *Ecology and Management of California's Wildlands*: 2005, 2006, 2008, 2010, 2011
- UCSB *Introduction to Environmental Studies*: 2014, 2016, 2023
- University of Redlands *Environmental Chemistry Field Experience*: 2013
- Bay School of San Francisco *Water in the West*: 2019, 2022, 2023

### **GRADUATE STUDENT COMMITTEES**

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- I have served on Ph.D. and Master's committees of graduate students from UCSB (1), UC Davis (3), UC Riverside (1), and CSU San Francisco (2).

## EXTRAMURAL GRANTS (selected)

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- 2021-2026. National Science Foundation. \$12,499,323. *BII: Uncovering mechanisms of amphibian resilience to global change from molecules to landscapes* (lead PI C. Richards-Zawaki, co-PIs C. Briggs, J. Voyles).
- 2019-2022. California Dept. of Fish and Wildlife. \$159,666. *Using frog translocations and reintroductions to recover frogs in the Rocky Basin Lakes, Inyo National Forest* (lead PI R. Knapp, co-PI T. Smith).
- 2018-2022. National Park Service. \$96,602. *Restoring genetic diversity of endangered mountain yellow-legged frogs* (lead PI R. Knapp, co-PI T. Smith).
- 2018-2019. Yosemite Conservancy. \$105,772. *Restoring rare frogs in Yosemite National Park* (lead PI R. Knapp).
- 2017-2019. National Park Service. \$70,500. *Critical restoration efforts needed to recover endangered mountain yellow-legged frogs in Sequoia and Kings Canyon National Park* (lead PI R. Knapp).
- 2016-2021. National Science Foundation. \$225,747. *Collaborative Research: Long-term dynamics of amphibian populations following disease-driven declines* (lead PI C. Briggs, co-PIs R. Knapp, E. Rosenblum).
- 2016-2019. California Department of Fish and Wildlife. \$195,000. *Three important conservation actions to recover *Rana sierrae* in the northern Sierra Nevada* (lead PI R. Knapp).
- 2016-2019. U.S. Geological Survey. \$142,733. *Understanding and ameliorating predation on reintroduced mountain yellow-legged frogs by terrestrial gartersnakes in the Sierra Nevada* (lead PI R. Knapp, co-PI Brian Halstead).
- 2015-2018. U.S. Fish and Wildlife Service. \$140,000. *Treatment and prevention by *Bd* in two species of mountain yellow-legged frogs* (lead PI R. Knapp, co-PI D. Boiano).
- 2015-2018. National Science Foundation. \$600,000. *Collaborative Research: Linking causes of variation in the amphibian skin microbiome with consequences for disease risk* (lead PI: A. Jani, co-PI C. Briggs).
- 2015-2018. National Park Service. \$290,745. *Restoring rare frogs in Yosemite National Park* (lead PI R. Knapp).
- 2014-2016. State Water Resources Control Board. \$295,200. *Microbial source tracking at bacteria-impaired waters of the Lahontan region* (lead PI R. Knapp, co-PI C. Nelson).
- 2012-2015. State Water Resources Control Board. \$230,000. *Microbial indicators of water quality in the Lahontan Region of California* (lead PI C. Nelson, co-PI R. Knapp).
- 2013-2015. U.S. Geological Survey. \$210,000. *Factors influencing reintroduction success of the endangered mountain yellow-legged frog* (PI M. Brooks, co-PI R. Knapp).
- 2013-2014. National Park Service. \$50,000. *Sierra Nevada yellow-legged frog genetic analysis for Yosemite National Park* (lead PI R. Knapp, co-PI E. Rosenblum).

- 2012-2015. USDA Forest Service-Pacific Southwest Research Station. \$275,003. *Effectiveness of reintroductions and probiotic treatment as tools to restore the endangered Sierra Nevada yellow-legged frog (Rana sierrae) to the Lake Tahoe Basin.* (lead PI R. Knapp, co-PI: V. Vredenburg).
- 2012-2014. National Science Foundation. \$181,776. *Collaborative research: Testing intervention strategies to change the outcome of disease-caused mass mortality events in a declining amphibian* (lead PI R. Knapp, co-PI).
- 2012-2013. National Park Service. \$116,146. *Preventing the extirpation of mountain yellow-legged frog populations in Sequoia and Kings Canyon National Parks* (lead PI R. Knapp).
- 2007-2012. National Science Foundation. \$2,500,000. *Collaborative Research: After the crash: factors allowing host persistence following outbreaks of a highly virulent disease.* (lead PI C. Briggs, co-PIs R. Knapp, E. Rosenblum, V. Vredenburg).
- 2007-2008. Yosemite Fund. \$50,000. *Hidden biodiversity in Yosemite's lakes and ponds* (lead PI R. Knapp).
- 2005-2007. Environmental Protection Agency. \$251,583. Evaluation of reference site classification schemes, probability-based survey designs, biological indicators, biotic tolerance values, and the comparability of different sampling methods for western lakes and ponds (lead PI C. Hawkins, co-PIs R. Knapp, M. Vinson)
- 2005-2008. National Park Service. \$135,941. *A proposal to reintroduce Rana muscosa to fishless lakes in Yosemite National Park* (lead PI R. Knapp).
- 2004-2006. Wildspaces Foundation. \$50,000. *Impacts of nonnative trout on alpine-nesting birds in the Sierra Nevada* (lead PI R. Knapp).
- 2004-2005. National Park Service. \$100,000. *Amphibian resurvey of select lakes in Sequoia-Kings Canyon National Park* (lead PI R. Knapp).
- 2002-2007. National Institutes of Health. \$2,484,295. *Amphibian disease dynamics in a fragmented landscape* (lead PI: C. Briggs, co-PIs C. Moritz, R. Knapp).
- 2002-2005. Environmental Protection Agency. \$214,848. *Airborne agricultural contaminants, disease, and amphibian declines: using landscape-scale patterns to evaluate the severity of an emerging environmental problem* (lead PI C. Davidson, co-PI R. Knapp).
- 2000-2005. National Science Foundation. \$350,000. *Collaborative Research: Recovery of ecosystem structure and function following exotic species eradication* (lead PI R. Knapp, co-PI O. Sarnelle).
- 2000-2003. Yosemite Fund. \$376,250. *Faunal surveys of Yosemite National Park's lentic habitats and their use in understanding impacts of nonnative fish and designing aquatic restoration measures* (lead PI R. Knapp).
- 2000-2002. Wildspaces Foundation. \$55,000. *Restoration of alpine lakes in the Sierra Nevada following removal of nonnative trout* (lead PI R. Knapp).
- 1999-2002. Environmental Protection Agency and National Park Service. \$208,316. *Analysis of natural and anthropogenic factors in controlling the distribution of amphibians in the alpine Sierra Nevada* (lead PI R. Knapp).

- 1996-2000. National Science Foundation. \$300,000. *Effects of exotic species eradication on the recovery of ecosystem structure and function* (lead PI R. Knapp, co-PI O. Sarnelle).
- 1995-1996. U.S. Environmental Protection Agency. \$80,231. *Evaluation of rangeland stream condition and recovery using physical and biological assessments of non-point source pollution* (lead PI R. Knapp, co-PI D. Herbst).
- 1995-1999. U.S. Dept. of Agriculture. \$637,334. The distribution of non-native trout in the Sierra Nevada and their impacts on aquatic ecosystems (lead PI R. Knapp, co-PI R. Jellison).
- 1992-1994. U.S. Dept. of Agriculture. \$55,000. *Golden trout ecology and the influence of livestock grazing on streams in the Golden Trout Wilderness* (lead PI R. Knapp).

## PUBLICATIONS (peer-reviewed - [Google Scholar profile](#))

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1. Byrne, A. Q., A. P. Rothstein, L. L. Smith, H. Kania, R. A. Knapp, D. M. Boiano, C. J. Briggs, A. R. Backlin, R. N. Fisher, and E. B. Rosenblum. 2023. [Revisiting conservation units for the endangered mountain yellow-legged frog species complex \(\*Rana muscosa\*, \*Rana sierrae\*\) using multiple genomic methods](#). Conservation Genetics.
2. Knapp, R. A., M. B. Joseph, T. C. Smith, E. E. Hegeman, V. T. Vredenburg, J. E. Erdman Jr, D. M. Boiano, A. J. Jani, and C. J. Briggs. 2022. [Effectiveness of antifungal treatments during chytridiomycosis epizootics in populations of an endangered frog](#). PeerJ 10:e12712.
3. Smith, T. C., R. A. Knapp, J. Imperato, K. Miller, and D. Rose. 2022. *Rana sierrae* (Sierra Nevada Yellow-legged Frog). *Behavior and Diet*. Herpetological Review 53:478–479.
4. Wilber, M. Q., R. A. Knapp, T. C. Smith, and C. J. Briggs. 2022. [Host density has limited effects on pathogen invasion, disease-induced declines and within-host infection dynamics across a landscape of disease](#). Journal of Animal Ecology 91:2451–2464.
5. Ellison, S., R. Knapp, and V. Vredenburg. 2021. [Longitudinal patterns in the skin microbiome of wild, individually marked frogs from the Sierra Nevada, California](#). ISME Communications 1:45.
6. Jani, A. J., J. Bushell, C. G. Arisdakessian, M. Belcaid, D. M. Boiano, C. Brown, and R. A. Knapp. 2021. [The amphibian microbiome exhibits poor resilience following pathogen-induced disturbance](#). The ISME Journal 15:1628–1640.
7. Joseph, M. B., and R. A. Knapp. 2021. [Using visual encounter data to improve capture–recapture abundance estimates](#). Ecosphere 12:e03370.
8. Rothstein, A. P., A. Q. Byrne, R. A. Knapp, C. J. Briggs, J. Voyles, C. L. Richards-Zawacki, and E. B. Rosenblum. 2021. [Divergent regional evolutionary histories of a devastating global amphibian pathogen](#). Proceedings of the Royal Society B: Biological Sciences 288:20210782.
9. Tiberti, R., T. Buchaca, D. Boiano, R. A. Knapp, Q. Pou Rovira, G. Tavecchia, M. Ventura, and S. Tenan. 2021. [Alien fish eradication from high mountain lakes by multiple removal methods: Estimating residual abundance and eradication probability in open populations](#). Journal of Applied Ecology 58:1055–1068.
10. Rothstein, A. P., R. A. Knapp, G. S. Bradburd, D. M. Boiano, C. J. Briggs, and E. B. Rosenblum. 2020. [Stepping into the past to conserve the future: Archived skin swabs from extant and extirpated populations inform genetic management of an endangered amphibian](#). Molecular Ecology 29:2598–2611.
11. Byrne, A. Q., V. T. Vredenburg, A. Martel, F. Pasmans, R. C. Bell, D. C. Blackburn, M. C.

- Bletz, J. Bosch, C. J. Briggs, R. M. Brown, A. Catenazzi, M. Familiar López, R. Figueroa-Valenzuela, S. L. Ghose, J. R. Jaeger, A. J. Jani, M. Jirku, R. A. Knapp, A. Muñoz, D. M. Portik, C. L. Richards-Zawacki, H. Rockney, S. M. Rovito, T. Stark, H. Sulaeman, N. T. Tao, J. Voyles, A. W. Waddle, Z. Yuan, and E. B. Rosenblum. 2019. [Cryptic diversity of a widespread global pathogen reveals expanded threats to amphibian conservation](#). *Proceedings of the National Academy of Sciences* 116:20382–20387.
12. Ellison, S., R. A. Knapp, W. Sparagon, A. Swei, and V. T. Vredenburg. 2019. [Reduced skin bacterial diversity correlates with increased pathogen infection intensity in an endangered amphibian host](#). *Molecular Ecology* 28:127–140.
  13. Joseph, M. B., and R. A. Knapp. 2018. [Disease and climate effects on individuals drive post-reintroduction population dynamics of an endangered amphibian](#). *Ecosphere* 9:e02499.
  14. Jani, A. J., R. A. Knapp, and C. J. Briggs. 2017. [Epidemic and endemic pathogen dynamics correspond to distinct host population microbiomes at a landscape scale](#). *Proceedings of the Royal Society B: Biological Sciences* 284:20170944.
  15. Poorten, T. J., R. A. Knapp, and E. B. Rosenblum. 2017. [Population genetic structure of the endangered Sierra Nevada yellow-legged frog \(\*Rana sierrae\*\) in Yosemite National Park based on multi-locus nuclear data from swab samples](#). *Conservation Genetics* 18:731–744.
  16. Smith, T. C., A. M. Picco, and R. Knapp. 2017. [Ranaviruses infect mountain yellow-legged frogs \(\*Rana sierrae\*\) threatened by \*Batrachochytrium dendrobatidis\*](#). *Herpetological Conservation and Biology* 12:149–159.
  17. Wilber, M. Q., R. A. Knapp, M. Toothman, and C. J. Briggs. 2017. [Resistance, tolerance and environmental transmission dynamics determine host extinction risk in a load-dependent amphibian disease](#). *Ecology Letters* 20:1169–1181.
  18. Knapp, R. A., G. M. Fellers, P. M. Kleeman, D. A. W. Miller, V. T. Vredenburg, E. B. Rosenblum, and C. J. Briggs. 2016. [Large-scale recovery of an endangered amphibian despite ongoing exposure to multiple stressors](#). *Proceedings of the National Academy of Sciences USA* 113:11889–11894.
  19. Piovita-Scott, J., S. Sadro, R. A. Knapp, J. Sickman, K. L. Pope, and S. Chandra. 2016. [Variation in reciprocal subsidies between lakes and land: Perspectives from the mountains of California](#). *Canadian Journal of Fisheries and Aquatic Sciences* 73:1691–1701.
  20. Smith, T. C., R. A. Knapp, and C. J. Briggs. 2016. [Declines and extinctions of mountain yellow-legged frogs have small effects on benthic macroinvertebrate communities](#). *Ecosphere* 7:e01327.
  21. Matchett, J. R., P. B. Stark, S. M. Ostojia, R. A. Knapp, H. C. McKenny, M. L. Brooks, W. T. Langford, L. N. Joppa, and E. L. Berlow. 2015. [Detecting the influence of rare stressors on rare species in Yosemite National Park using a novel stratified permutation test](#). *Scientific Reports* 5:10702.
  22. Zhou, H., T. Hanson, and R. Knapp. 2015. [Marginal Bayesian nonparametric model for time to disease arrival of threatened amphibian populations](#). *Biometrics* 71:1101–1110.
  23. Berlow, E. L., R. A. Knapp, S. M. Ostojia, R. J. Williams, H. McKenny, J. R. Matchett, Q. Guo, G. M. Fellers, P. Kleeman, M. L. Brooks, and L. Joppa. 2013. [A network extension of species occupancy models in a patchy environment applied to the Yosemite toad \(\*Anaxyrus canorus\*\)](#). *PLoS ONE* 8:e72200.
  24. Bradford, D. F., K. A. Stanley, N. G. Tallent, D. W. Sparling, M. S. Nash, R. A. Knapp, L. L. McConnell, and S. L. Massey Simonich. 2013. [Temporal and spatial variation of atmospherically deposited organic contaminants at high elevation in Yosemite National Park, California, USA](#). *Environmental Toxicology and Chemistry* 32:517–525.

25. Deiner, K., R. A. Knapp, D. M. Boiano, and B. May. 2013. [Increased accuracy of species lists developed for alpine lakes using morphology and cytochrome oxidase I for identification of specimens](#). *Molecular Ecology Resources* 13:820–831.
26. Garwood, J. M., R. A. Knapp, K. L. Pope, R. L. Grasso, M. L. Magnuson, and J. R. Maurer. 2013. [Use of historically fishless high-mountain lakes and streams by nearctic river otters \(\*Lontra canadensis\*\)](#). *Northwestern Naturalist* 94:51–66.
27. Miner, B. E., R. A. Knapp, J. K. Colbourne, and M. E. Pfrender. 2013. [Evolutionary history of alpine and subalpine \*Daphnia\* in western North America](#). *Freshwater Biology* 58:1512–1522.
28. Bradford, D. F., R. A. Knapp, D. W. Sparling, M. S. Nash, K. A. Stanley, N. G. Tallent-Halsell, L. L. McConnell, and S. M. Simonich. 2011. [Pesticide distributions and population declines of California, USA, alpine frogs, \*Rana muscosa\* and \*Rana sierrae\*](#). *Environmental Toxicology and Chemistry* 30:682–691.
29. Knapp, R. A., C. J. Briggs, T. C. Smith, and J. R. Maurer. 2011. [Nowhere to hide: Impact of a temperature-sensitive amphibian pathogen along an elevation gradient in the temperate zone](#). *Ecosphere* 2:art93.
30. Briggs, C. J., R. A. Knapp, and V. T. Vredenburg. 2010. [Enzootic and epizootic dynamics of the chytrid fungal pathogen of amphibians](#). *Proceedings of the National Academy of Sciences, USA* 107:9695–9700.
31. Epanchin, P. N., R. A. Knapp, and S. P. Lawler. 2010. [Nonnative trout impact an alpine-nesting bird by altering aquatic-insect subsidies](#). *Ecology* 91:2406–2415.
32. Latta, L. C., D. L. Fisk, R. A. Knapp, and M. E. Pfrender. 2010. [Genetic resilience of \*Daphnia\* populations following experimental removal of introduced fish](#). *Conservation Genetics* 11:1737–1745.
33. Vredenburg, V. T., R. A. Knapp, T. S. Tunstall, and C. J. Briggs. 2010. [Dynamics of an emerging disease drive large-scale amphibian population extinctions](#). *Proceedings of the National Academy of Sciences, USA* 107:9689–9694.
34. Knapp, R. A., and O. Sarnelle. 2008. [Recovery after local extinction: Factors affecting re-establishment of alpine lake zooplankton](#). *Ecological Applications* 18:1850–1859.
35. Kramer, A. M., O. Sarnelle, and R. A. Knapp. 2008. [Allee effect limits colonization success of sexually reproducing zooplankton](#). *Ecology* 89:2760–2769.
36. Davidson, C., and R. A. Knapp. 2007. [Multiple stressors and amphibian declines: Dual impacts of pesticides and fish on yellow-legged frogs](#). *Ecological Applications* 17:587–597.
37. Fisk, D. L., L. C. Latta, R. A. Knapp, and M. E. Pfrender. 2007. [Rapid evolution in response to introduced predators I: Rates and patterns of morphological and life-history trait divergence](#). *BMC Evolutionary Biology* 7:22.
38. Knapp, R. A., D. M. Boiano, and V. T. Vredenburg. 2007. [Removal of nonnative fish results in population expansion of a declining amphibian \(mountain yellow-legged frog, \*Rana muscosa\*\)](#). *Biological Conservation* 135:11–20.
39. Latta, L. C., J. W. Bakelar, R. A. Knapp, and M. E. Pfrender. 2007. [Rapid evolution in response to introduced predators II: The contribution of adaptive plasticity](#). *BMC Evolutionary Biology* 7:21.
40. Morgan, J. A. T., V. T. Vredenburg, L. J. Rachowicz, R. A. Knapp, M. J. Stice, T. Tunstall, R. E. Bingham, J. M. Parker, J. E. Longcore, C. Moritz, C. J. Briggs, and J. W. Taylor. 2007. [Population genetics of the frog-killing fungus \*Batrachochytrium dendrobatidis\*](#). *Proceedings of the National Academy of Sciences, USA* 104:13845–13850.
41. Vredenburg, V. T., R. Bingham, R. Knapp, J. A. T. Morgan, C. Moritz, and D. Wake. 2007. [Concordant molecular and phenotypic data delineate new taxonomy and conservation priorities](#)



- for the endangered mountain yellow-legged frog. *Journal of Zoology* 271:361–374.
42. Knapp, R. A., and J. A. T. Morgan. 2006. Tadpole mouthpart depigmentation as an accurate indicator of chytridiomycosis, an emerging disease of amphibians. *Copeia* 2006:188–197.
  43. Rachowicz, L. J., R. A. Knapp, J. A. T. Morgan, M. J. Stice, V. T. Vredenburg, J. M. Parker, and C. J. Briggs. 2006. Emerging infectious disease as a proximate cause of amphibian mass mortality. *Ecology* 87:1671–1683.
  44. Adams, M. J., B. R. Hossack, R. A. Knapp, P. S. Corn, S. A. Diamond, P. C. Trenham, and D. B. Fagre. 2005. Distribution patterns of lentic-breeding amphibians in relation to ultraviolet radiation exposure in western North America. *Ecosystems* 8:488–500.
  45. Briggs, C. J., V. T. Vredenburg, R. A. Knapp, and L. J. Rachowicz. 2005. Investigating the population-level effects of chytridiomycosis: An emerging infectious disease of amphibians. *Ecology* 86:3149–3159.
  46. Brooks, P. D., C. M. O'Reilly, S. A. Diamond, D. H. Campbell, R. Knapp, D. Bradford, P. S. Corn, B. Hossack, and K. Tonnessen. 2005. Spatial and temporal variability in the amount and source of dissolved organic carbon: Implications for ultraviolet exposure in amphibian habitats. *Ecosystems* 8:478–487.
  47. Brose, U., L. Cushing, E. L. Berlow, T. Jonsson, C. Banasek-Richter, L.-F. Bersier, J. L. Blanchard, T. Brey, S. R. Carpenter, M.-F. C. Blandenier, J. E. Cohen, H. A. Dawah, T. Dell, F. Edwards, S. Harper-Smith, U. Jacob, R. A. Knapp, M. E. Ledger, J. Memmott, K. Mintenbeck, J. K. Pinnegar, B. C. Rall, T. Rayner, L. Ruess, W. Ulrich, P. Warren, R. J. Williams, G. Woodward, P. Yodzis, and N. D. Martinez. 2005. Body sizes of consumers and their resources. *Ecology* 86:2545.
  48. Diamond, S. A., P. C. Trenham, M. J. Adams, B. R. Hossack, R. A. Knapp, S. L. Stark, D. Bradford, P. S. Corn, K. Czarnowski, P. D. Brooks, D. Fagre, B. Breen, N. E. Detenbeck, and K. Tonnessen. 2005. Estimated ultraviolet radiation doses in wetlands in six national parks. *Ecosystems* 8:462–477.
  49. Harper-Smith, S., E. L. Berlow, R. A. Knapp, R. J. Williams, and N. D. Martinez. 2005. Communicating ecology through food webs: Visualizing and quantifying the effects of stocking alpine lakes with trout. Pages 407–423 in P. C. de Ruiter, V. Wolters, and J. C. Moore, editors. *Dynamic food webs - multispecies assemblages, ecosystem development and environmental change*. Academic Press, Burlington, Massachusetts.
  50. Knapp, R. A. 2005. Effects of nonnative fish and habitat characteristics on lentic herpetofauna in Yosemite National Park, USA. *Biological Conservation* 121:265–279.
  51. Knapp, R. A., C. P. Hawkins, J. Ladau, and J. G. McClory. 2005. Fauna of Yosemite National Park lakes has low resistance but high resilience to fish introductions. *Ecological Applications* 15:835–847.
  52. Sarnelle, O., and R. A. Knapp. 2005. Nutrient recycling by fish versus zooplankton grazing as drivers of the trophic cascade in alpine lakes. *Limnology and Oceanography* 50:2032–2042.
  53. Armstrong, T. W., and R. A. Knapp. 2004. Response by trout populations in alpine lakes to an experimental halt to stocking. *Canadian Journal of Fisheries and Aquatic Sciences* 61:2025–2037.
  54. Sarnelle, O., and R. A. Knapp. 2004. Zooplankton recovery after fish removal: Limitations of the egg bank. *Limnology and Oceanography* 49:1382–1392.
  55. Knapp, R. A., K. R. Matthews, H. K. Preisler, and R. Jellison. 2003. Developing probabilistic models to predict amphibian site occupancy in a patchy landscape. *Ecological Applications* 13:1069–1082.
  56. Matthews, K. R., R. A. Knapp, and K. L. Pope. 2002. Garter snake distributions in high-



- elevation aquatic ecosystems: Is there a link with declining amphibian populations and nonnative trout introductions? *Journal of Herpetology* 36:16–22.
57. Knapp, R. A., P. S. Corn, and D. E. Schindler. 2001a. The introduction of nonnative fish into wilderness lakes: Good intentions, conflicting mandates, and unintended consequences. *Ecosystems* 4:275–278.
  58. Knapp, R. A., J. A. Garton, and O. Sarnelle. 2001b. The use of egg shells to infer the historical presence of copepods in alpine lakes. *Journal of Paleolimnology* 25:539–543.
  59. Knapp, R. A., K. R. Matthews, and O. Sarnelle. 2001c. Resistance and resilience of alpine lake fauna to fish introductions. *Ecological Monographs* 71:401–421.
  60. Matthews, K. R., K. L. Pope, H. K. Preisler, and R. A. Knapp. 2001. Effects of nonnative trout on Pacific treefrogs (*Hyla regilla*) in the Sierra Nevada. *Copeia* 101:1130–1137.
  61. Schindler, D. E., R. A. Knapp, and P. R. Leavitt. 2001. Alteration of nutrient cycles and algal production resulting from fish introductions into mountain lakes. *Ecosystems* 4:308–321.
  62. Knapp, R. A., and K. R. Matthews. 2000. Non-native fish introductions and the decline of the mountain yellow-legged frog from within protected areas. *Conservation Biology* 14:428–438.
  63. Knapp, R. A., and H. K. Preisler. 1999. Is it possible to predict habitat use by spawning salmonids? A test using California golden trout (*Oncorhynchus mykiss aguabonita*). *Canadian Journal of Fisheries and Aquatic Sciences* 56:1576–1584.
  64. Matthews, K. R., and R. A. Knapp. 1999. A study of high mountain lake fish stocking effects on the U.S. Sierra Nevada wilderness. *International Journal of Wilderness* 5:24–26.
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## INVITED SEMINARS AND SYMPOSIA (selected)

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- 2019. *Natural recovery of endangered frogs in the presence of Bd as a guide for active conservation measures*. Symposium: Mitigating single pathogen and co-infections that threaten amphibian biodiversity. Zoological Society of London, London, UK.
- 2019. *Recovering endangered amphibians in the presence of a recently-emerged disease*. Dept. of Ecology and Evolutionary Biology, University of Colorado, Boulder.
- 2017. *Local and watershed-scale effects of fish eradication from lakes in California's Sierra Nevada*. International Meeting on the Conservation of High Mountain Lakes. Gran Paradiso National Park, Italy.
- 2017. *Recovering the endangered mountain yellow-legged frog in the Sierra Nevada*. Public seminar series, Tahoe Environmental Research Center, Incline Village, Nevada.
- 2013. *Causes of amphibian population extinction versus persistence following disease-caused mass mortality events*. Dept. of Ecology, Behavior, and Evolution, University of California, San Diego.
- 2012. *Causes of amphibian population extinction versus persistence following disease-caused mass mortality events*. Dept. of Ecology, Evolution, and Conservation Biology, University of Nevada, Reno.
- 2012. *Reversing the decline of mountain yellow-legged frogs: current knowledge and future research*. Yosemite Forum, Yosemite National Park, California.
- 2011. *Chytridiomycosis: Impacts to amphibian populations and conservation implications*. Symposium: Fungal diseases. The Wildlife Society - Western Section, Riverside, California.
- 2011. *Fungal diseases in amphibians*. Symposium: Amphibian diseases. Partners in Amphibian and Reptile Conservation - Northwest Chapter, Gig Harbor, Washington.
- 2011. *Challenges for species recovery in an age of multiple stressors: the mountain yellow-legged frog example*. Webinar: Perspectives on extinction. U.S. Fish and Wildlife Service National Conservation Training Center, Shepherdstown, West Virginia.
- 2011. *Impacts of nonnative trout on mountain ecosystems: thinking outside of the lake*. Dept. of Watershed Sciences, Utah State University, Logan, Utah.
- 2011. *Causes of amphibian population extinction versus persistence following disease-related mass mortality events*. Dept. of Watershed Sciences, Utah State University, Logan, Utah.
- 2010. *Fish stocking impacts to Sierra Nevada ecosystems: promise and peril of policy-relevant science*. Dept. of Ecology, Evolution, and Marine Biology, University of California, Santa Barbara.

- 2010. *Causes of amphibian population extinction versus persistence following disease-related mass mortality events*. Scripps Institute of Oceanography, University of California, San Diego.
- 2010. *Changing the outcome of Bd epizootics using field anti-fungal treatments: does it work?* International meeting on Bd mitigation, University of Zurich, Switzerland.
- 2010. *Impacts of nonnative fish on mountain ecosystems: thinking outside of the lake*. Webinar: Mountain lakes management and research. U.S. Fish and Wildlife Service National Conservation Training Center, Shepherdstown, West Virginia.
- 2010. *Fish stocking impacts to Sierra Nevada ecosystems: promise and peril of policy-relevant science*. Keynote address, Graduate Student Symposium, Graduate Group in Ecology, University of California, Davis.
- 2007. *Recovery of mountain lake ecosystems following the removal of nonnative fish*. Dept. of Ecology and Evolutionary Biology, University of California, Santa Cruz.
- 2006. *Restoration of lake ecosystems – does Humpty Dumpty reassemble spontaneously or does reassembly require tape and glue?* Graduate Group in Ecology, University of California, Davis.
- 2006. *Restoration of lake ecosystems – does Humpty Dumpty reassemble spontaneously or does reassembly require tape and glue?* Dept. of Ecology and Environmental Sciences, University of Maine, Orono.
- 2006. *Restoration of lake ecosystems – does Humpty Dumpty reassemble spontaneously or does reassembly require tape and glue?* Natural Reserve System Advisory Committee, University of California Office of the President, Oakland.
- 2005. *Turning back the clock: restoring lake ecosystems by eradicating introduced fish*. Symposium: New Currents in Conserving Freshwater Systems. American Museum of Natural History – Center for Biodiversity and Conservation, New York, New York.
- 2005. *Sierra Nevada lakes: A natural history tour of an unknown underwater world*. Parsons Memorial Lodge Summer Seminar Series, Yosemite National Park, California.
- 2005. *Recovery of mountain lake ecosystems following the removal of nonnative trout*. California Academy of Sciences, San Francisco, California.
- 2004. *Does species-level conservation help or hinder ecosystem restoration efforts?: An unfinished story of declining amphibians, conflicting mandates, and unforeseen consequences*. Plenary presentation, Bay Area Conservation Biology Symposium, University of California, Davis.
- 2004. *Resistance and resilience of lake-dwelling fauna to fish introductions: a predictive modeling approach*. Symposium: Resistance, Resilience, and Multiple Stable States: Defining Endpoints and Recovery Pathways for Damaged Ecosystems. Ecological Society of America annual meeting, Portland, Oregon.
- 2003. *Perturbation and recovery of aquatic fauna in mountain lakes following fish introduction and disappearance*. Dept. of Natural Resource Ecology and Management, Oklahoma State University, Stillwater.

- 2002. *Nonnative species introductions and the reversibility of amphibian declines in the Sierra Nevada*. Dept. of Biology, Fresno State University, California.
- 2002 *Nonnative species introductions and the reversibility of amphibian declines in the Sierra Nevada*. Dept. of Biology, Utah State University, Logan.
- 2002. *Nonnative species introductions and the reversibility of amphibian declines in the Sierra Nevada*. Sierra Nevada Science Symposium, Kings Beach, North Lake Tahoe.
- 2001. *Nonnative species introductions and the reversibility of amphibian declines in the Sierra Nevada*. Dept. of Ecology, Evolution, and Conservation Biology, University of Nevada, Reno.
- 2000. *Resistance and resilience of alpine lake fauna to fish introductions*. Dept. of Ecology and Evolution, University of Chicago, Chicago, Illinois.
- 1999. *Removal of introduced trout from Sierra Nevada lakes to restore amphibian habitat*. Symposium: Ecosystem Restoration – a Practitioners Workshop. The Wildlife Society, Oregon Chapter, Portland, Oregon.
- 1999. *Design and implementation of aquatic reserves to restore amphibian populations impacted by introduced fishes*. Ecosystem Conservation Workshop: Managing for Conservation. U.S. Fish and Wildlife Service, National Conservation Training Center.
- 1999. *Resistance and resilience of amphibian populations in the Sierra Nevada to fish introductions: are declines reversible?* Dept. of Ecology, Evolution, and Marine Biology, University of California, Santa Barbara.
- 1998. *Developing a watershed-based reserve system for native aquatic species in the Sierra Nevada, California*. Symposium: Effects of Fisheries Management on the Amphibians and Other Biota of Wilderness Lakes, Flathead Lake Biological Station, Polson, Montana.
- 1996. *Introduced trout and the decline of the mountain yellow-legged frog in the Sierra Nevada, California*. Dept. of Wildlife, Fish, and Conservation Biology, University of California, Davis.
- 1993. *Female mate choice in the bicolor damselfish, Stegastes partitus*. University of Sydney, Australia.
- 1993. *Female mate choice in the bicolor damselfish, Stegastes partitus*. Dept. of Integrative Biology, University of California, Berkeley.