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Research Statement

To advance societal sustainability and wellbeing, I study the intertemporal allocation, valuation, and management of natural assets and liabilities by bridging natural science, dynamical systems, and economics.

Education

Ph.D. in Fisheries and Wildlife; Ph.D. specialization in Resource and Environmental Economics, Michigan State University. 2007.
Masters of Science in Agricultural Economics, Michigan State University, 2005.
Bachelors of Science in Wildlife Ecology, University of Maine, 1999.

Positions Held

Associate Professor of Bioeconomics and Ecosystem Management, Yale School of Forestry & Environmental Studies. 7/18 - present.

Assistant Professor of Bioeconomics and Ecosystem Management, Yale School of Forestry & Environmental Studies. 7/12 – 6/18.

Assistant Professor of Ecological- and Bio-economics, Arizona State University, School of Life Sciences. 8/08-7/12.

Research Associate Quantitative Fisheries Center - Department of Fisheries and Wildlife, Michigan State University. 1/08 – 8/08.

Graduate Research Assistant Departments of Agricultural Economics & Department of Fisheries and Wildlife, Michigan State University. 8/03 – 12/07.

Seasonal Biologist New Jersey Division of Fish and Wildlife. 4/03 – 8/03.

Special Projects Officer WWF/ PAN Parks Foundation. 8/02 – 2/03.

United States Peace Corps Volunteer Slovensky Raj National Park, Slovakia. 8/00 – 7/02.

Awards and Honors

- Smart Prosperity Initiative Global Fellow, 2019-2020.
- Visiting Fellow at the Grantham Institute on Climate Change and the Environment, 2018-19.
- Award of Professional Excellence, University of Maine Wildlife Ecology Program alumni award, 2016.
- Arizona State University, Faculty Achievement Award in Defining Edge Research: Young Investigator 2011. One award given per year to untenured faculty.
- Arizona State University, Nominated for the Zebulon Pearce Distinguished Teaching Award 2011.
- Top paper presentation award 8th Annual Heartland Environmental & Resource Economics Workshop at Iowa State University, Ames, IA. 9/17-9/18, 2006.
- Outstanding Master's Thesis of 2005, Michigan State University Dept. of Agricultural Economics.

RESEARCH

Publications (79) (#led or co-led paper, *graduate student co-author, **graduate student co-author for which I was a principal advisor, ^{pd}post-doc co-author, ^{fes}Yale FES graduate student, ^uundergraduate co-author)

Google scholar link, <https://scholar.google.com/citations?user=PTFuF2cAAAAJ&hl=en&oi=ao>

Journal Articles (62)

62. Posner, S.M., **E.P. Fenichel**, D.J. McCauley, K. Biedenweg, R. Brumbaugh, C. Costello, F. Joyce, E. Goldman, H. Mannix. 2020. Boundary spanning among research and policy communities to address the emerging industrial revolution in the ocean. *Environmental Science and Policy*. 104: 73-81

61[#]. Addicott, E.T., ** **E.P. Fenichel**, and M. Kotchen. *In press*. Even the representative agent must die: using demographics to inform long-term social discount rates. *Journal of the Association of Environmental and Resource Economists*. Previously, NBER working paper 23591. <http://www.nber.org/papers/w23591>

60. Bradford, M.A., C. Carey, L. Atwood, D. Bossio, **E.P. Fenichel**, S. Gennet, J. Fargione, J.R.B. Fisher, E. Fuller, D.A. Kane*, J. Lehmann, E.E. Oldfield*, E.M. Ordway, J. Rudek, J. Sanderman, and S.A. Wood. 2019. Soil carbon science for policy and practice. *Nature Sustainability*. <https://doi.org/10.1038/s41893-019-0431-y>

59[#]. Carattini, S. E., **E.P. Fenichel**, A.D. Gordan*, and P. Gourley. *In press*. For want of a chair: Teaching price formation using a cap and trade game. *Journal of Economic Education*. Previously, Grantham Research Institute on Climate Change and the Environment Working Paper No. 318 <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2019/03/working-paper-318-Carattini-et-al.pdf>

58[#]. Berry, K,^{pd} **E.P. Fenichel**, B. Robinson. 2019. The Environmental Insurance Trap. *Journal of Environmental Economics and Management*. 98: 102251.

57[#]. Moberg, E.A.,^{pd} M.L. Pinsky, **E.P. Fenichel**. 2019. Capital investment for optimal exploitation of renewable resource stocks in the age of global change biology. *Ecological Economics*. 165: 106335.

56[#]. Addicott, E.T.** and **E.P. Fenichel**. 2019. Spatial aggregation and the value of natural capital. *Journal of Environmental Economics and Management*. 95: 118-132.

55[#]. Arlinghaus. R., J.K. Abbott, **E.P. Fenichel**, S.R. Carpenter, L.M. Hunt, J. Alos, T. Kleforth, S.J. Cooke, R. Hilborn, O. Jensen, M. Wilberg, J.R. Post, and M. Manfredo. 2019. Governing the recreational dimension of global fisheries. *Proceedings of the National Academy of Sciences* 116: 5209-5213.

Highlighted in Science 3/20/2019

<https://www.sciencemag.org/news/2019/03/qa-why-fishery-managers-need-overhaul-recreational-fishing-rules>

54[#]. Adamowicz, W., L. Calderon-Etter,^{fes*} A. Entem,** **E.P. Fenichel**, J. S. Hall, P. Lloyd-Smith,* F.L. Ogden, J.A Regina,* M. Rouhi Rad,^{pd} R.F. Stallard. 2019. Assessing Ecological Infrastructure Investments. *Proceedings of the National Academy of Sciences*. 116: 5254-5261.

- 53[#]. **Fenichel, E.P.**, W.L. Adamowicz, M. Ashton, and J.S. Hall. 2019. Incentives systems for forest-based ecosystem services when capital markets are missing. *Journal of the Association of Environmental and Resource Economists*. 6(2): 105-133.
52. Tekwa, E.W.^{pd}, **E.P. Fenichel**, S.A. Levin, and M.L. Pinsky. 2019. Global Fishing Patterns Reveal Path Dependence. *Proceedings of the National Academy of Sciences*. 116: 689-694.
- 51[#]. **Fenichel, E.P.** and Y. Hashida.^{pd} 2019. Sustainable economic programs and value of natural capital. *Oxford Review of Economic Policy*. 35: 120-137.
50. Shanafelt, D.^{*}, J. Colbert, **E.P. Fenichel**, M.E. Hochberg, A. Kinzig, M. Loreau, P.A. Marquet, and C. Perrings. 2018. Species dispersal and biodiversity in human-dominated metacommunities. *Journal of Theoretical Biology* 457: 199-210.
49. Berry, K^{pd}, J.E. Anderson,^{fes} J. Bayham, **E.P. Fenichel**. 2018. Linking time use data to explore health outcomes: Choosing to vaccinate against Influenza? *EcoHealth* 15: 290-301.
48. Fujitani, M.L.,^{**} **E.P. Fenichel**, J. Torre, and L.R. Gerber, 2018. Synthesizing ecological and human use information to understand and manage coastal change. *Oceans and Coastal Management* 162: 100-109.
- 47[#]. Horan, R.D., **E.P. Fenichel**, D. Finnoff, and C. Reeling. 2018. A portfolio-trade approach to livestock and wildlife management in the face of disease risk. *Environmental and Resource Economics* 70: 673-689.
- 46[#]. Berry, K.^{pd}, J. Bayham^{pd}, S. Meyer^{pd}, **E.P. Fenichel**. 2018. The allocation of time and risk of Lyme: a case of ecosystem service income and substitution effects. *Environmental and Resource Economics* 70: 631-650.
- 45[#]. Yun, S.D.^{pd}, B. Hutniczak, B.^{pd}, J.K. Abbott, and **E.P. Fenichel**. 2017. Ecosystem based management and the wealth of ecosystems. *Proceedings of the National Academy of Sciences*. 114: 6539-6544.
44. Huang, B.^{*}, J.K. Abbott, **E.P. Fenichel**, R. Muneeppeerakul, C. Perrings, L.R. Gerber. 2017. Thinking beyond the moratorium: Testing the Feasibility of a Hypothetical Whaling-Conservation Permit Market in Norway. *Conservation Biology* 31(4): 809-817
- 43[#]. **Fenichel, E.P.** and R.D. Horan. 2016. Tinbergen and Tipping points: Could some thresholds be policy-induced? *Journal of Economic Behavior & Organization* 132 Part B: 137-152.
42. Hunt, L.M., **E.P. Fenichel**, D.C. Fulton, R. Mendelsohn, J.W. Smith, T.D. Tunney, A.J. Lynch, C.P. Paukert, J. Whitney. 2016. Pathways for the climate change to impact inland fishers. *Fisheries* 41(7):362-373.
- 41[#]. **Fenichel, E.P.**, J.K. Abbott, J. Bayham^{pd}, W. Boon,^{FES} E.M.L. Haacker,^{*} and L. Pfeiffer. 2016. Measuring the value of groundwater and other forms of natural capital. *Proceedings of the National Academy of Sciences* 113: 2382-2387.

Press coverage

Washington Post, <https://www.washingtonpost.com/news/energy-environment/wp/2016/02/08/scientists-have-come-up-with-a-way-to-put-a-price-on-nature/>

- Newsweek**, <http://www.newsweek.com/dollar-value-water-air-natural-resources-424668>
- 40[#]. **Fenichel, E.P.**, S.A. Levin, B. McCay, K. St. Martin, J.K. Abbott, and M.L. Pinsky. 2016. Wealth reallocation and sustainability under climate change *Nature Climate Change* 6:237-244.
Press coverage
Christian Science Monitor, <http://www.csmonitor.com/Science/2016/0224/To-protect-natural-resources-put-a-price-tag-on-them-say-scientists>
The Weather Channel, <https://weather.com/science/environment/news/climate-change-fish-study>
Newsweek, <http://www.newsweek.com/climate-change-will-shift-natural-resources-creating-430910>
Wall Street Journal, <http://www.wsj.com/articles/changing-migration-patterns-upend-east-coast-fishing-industry-1462982278>
- 39[#]. Bayham, J.^{pd}, N. Kuminoff, Q. Gunn,^u and **E.P. Fenichel**. 2015. Measured voluntary avoidance behavior during the 2009 A/H1N1 epidemic *Proceedings of the Royal Society B* 282: 20150814.
- 38[#]. Stefanski, S.F.^{fes}, X. Shi,^{fes} J.S. Hall, A. Hernandez, and **E.P. Fenichel**. 2015. Forest and cattle tradeoffs in production for small scale producers in the Panama Canal Watershed. *Forest Policy and Economics* 56: 48-56.
37. Cease, A.J.^{pd}, J.J. Elser, **E.P. Fenichel**, J.C. Hadrich, J.F. Harrison, and B.E. Robinson. 2015. Living with locusts: connecting soil nitrogen, locust outbreaks, livelihoods, and livestock markets, *BioScience* 65: 551-558.
36. Horan, R.D., **E.P. Fenichel**, D. Finnoff, and C.A. Wolf. 2015. Arbitrage of Price and Quality Risks: An Integrated Model of Epidemiology and Trade, *Journal of Economic Dynamics and Control* 53: 192-207.
- 35[#]. Salau^{**}, K and **E.P. Fenichel**. 2015. Bioeconomics analysis supports the endangered species act, *Journal of Mathematical Biology* 71: 817-846.
- 34[#]. **Fenichel, E.P.** and J. Zhao. 2015. Sustainability and substitutability, *Bulletin of Mathematical Biology* 77: 348-367.
33. Springborn, M., G. Chowell, M. MacLaughlan,^{*} and **E.P. Fenichel**. 2015. Accounting for behavioral responses during a flu epidemic using home television viewing *BMC Infectious Diseases* 15: 21.
32. Perrings, C, C. Castillo-Chavez, G. Chowell, P. Daszak, **E.P. Fenichel**, D. Finnoff, R.D. Horan, A.M. Kilpatrick, A. Kinzig, N.V. Kuminoff, S. Levin, B. Morin, K.F. Smith, M. Springborn. 2014. Merging economics and epidemiology to improve the prediction and management of infectious disease, *EcoHealth* 11: 464-475.
31. Seppelt, R., A.M. Manceur, J. Liu, **E.P. Fenichel**, and S. Klotz. 2014. Synchronized peak rates of global resource use, *Ecology & Society* 19(4): 50.
Highlighted in Nature News section 1/15/2015,
<http://www.nature.com/nature/journal/v517/n7534/full/517246e.html>

- 30[#]. **Fenichel, E.P.** and J.K. Abbott. 2014. Natural capital: from metaphor to measurement. *Journal of the Association of Environmental and Resource Economists* 1: 1-27.
Inaugural issue, lead article.
- 29[#]. **Fenichel, E.P.**, T. Richards, and D. Shanafelt.** 2014. The control of invasive species on private property with neighbor-to-neighbor spillovers. *Environmental and Resource Economics* 59: 231-255.
28. Richards, T.J., D. Shanafelt,**, and **E.P. Fenichel**. 2014. Foreclosures and invasive insect spread: the case of Asian Citrus Psyllid. *American Journal of Agricultural Economics* 96: 615-630.
Lead article.
- 27[#]. **Fenichel, E.P.** and J.K. Abbott. 2014. Heterogeneity and the fragility of the first best: Putting the "micro" in bioeconomic models of recreational resources. *Resource and Energy Economics* 35: 351-369.
26. Morin, B.R.*^{pd}, **E.P. Fenichel**, and C. Castillo-Chavez. 2013. Epidemics with adaptive human behavior, *Natural Resource Modeling* 26: 505-525.
- 25[#]. Abbott, J.K. and **E.P. Fenichel**, 2013. Anticipating adaptation: An Empirical Economic Approach for Linking Policy and Stock Status to Recreational Angler Behavior, *Canadian Journal of Fisheries and Aquatic Sciences* 70: 1190-1208.
- 24[#]. **Fenichel, E.P.**, J.K. Abbott, and B. Huang.** 2013. Modelling angler behaviour as a part of the management system: Synthesizing a multi-disciplinary literature. *Fish and Fisheries* 14: 137-157.
- 23[#]. **Fenichel, E.P.** N.V. Kuminoff, and G. Chowell. 2013. Skip the trip: Air travelers' behavioral responses or "adaptive" panic to a flu epidemic. *PLoS One* 8(3): e58249.
- 22[#]. **Fenichel, E.P.**, R. Arlinghaus, and B. Gentner. 2013. Normative considerations for recreational fishery management: a bioeconomic framework for linking positive science and normative fisheries policy decisions. *Fisheries Management and Ecology* 20: 223-233.
- 21[#]. **Fenichel, E.P.** 2013. Economic considerations for social distancing and behavioral based policies during an epidemic *Journal of Health Economics* 32: 440-451.
- 20[#]. Fujitani, M.L.** , **E.P., Fenichel**, J. Torre, J., and L.R. Gerber. 2012. Implementation of a marine reserve has a rapid but short-term effect on recreational angling use. *Ecological Applications* 22(2): 597-605.
- 19[#]. Hughes, Z.D.** , **E.P. Fenichel**, L.R. Gerber, 2011. The potential impact of labor choices on the efficacy of marine conservation strategies. *PLoS ONE* 6(8): e23722.
18. Švajda, J. and **E.P. Fenichel**, 2011. Evaluation of integrated protected area management in Slovak national parks. *Polish Journal of Environmental Studies* 20; 1053-1060.
17. Horan, R.D., **E.P. Fenichel**, and R.T. Melstrom.* 2011. Wildlife Disease Bioeconomics. *International Review of Environmental and Resource Economics* 5: 23-61.

- 16[#]. Horan, R.D., **E.P. Fenichel**, K.L.S. Drury, and D.M. Lodge. 2011. Managing ecological thresholds in coupled environmental-human systems. *Proceedings of the National Academy of Sciences* 108: 7333-7338.
- 15[#]. **Fenichel, E.P.** C. Castillo-Chavez, M.G. Ceddia, G. Chowell, P.A. Gonzalez Parra,* G.J. Hickling, G. Holloway, R.D. Horan, B. Morin,* C.A. Perrings, M. Springborn, L. Velazquez, and C. Villalobos. 2011. Adaptive human behavior in epidemiological models. *Proceedings of the National Academy of Sciences* 108: 6306-6311.
- 14[#]. **Fenichel, E.P.**, R.D. Horan, and J.R. Bence. 2010. Indirect management of invasive species with bio-control: a bioeconomic model of salmon and alewife in Lake Michigan. *Resource and Energy Economics* 32: 500-518.
13. Horan, R.D., **E.F. Fenichel, C.A.** Wolf, and B.M. Gramig. 2010. Managing infectious animal disease systems. *Annual Review of Resource Economics* 2: 101-124.
- 12[#]. **Fenichel, E.P.**, R.D. Horan, and G.J. Hickling. 2010. Bioeconomic Management of Invasive Insect-Vectored Diseases. *Biological Invasions* 12: 2877-2893.
- 11[#]. **Fenichel, E.P.**, R.D. Horan, and G.J. Hickling. 2010. Management of Infectious Wildlife Diseases: Bridging Conventional and Bioeconomic Approaches. *Ecological Applications* 20: 903-314.
- 10[#]. **Fenichel, E.P.** and G.A.J. Hansen.* 2010. The opportunity cost of information: An economic framework for understanding the balance between assessment and control in sea lamprey management. *Canadian Journal of Fisheries and Aquatic Sciences* 67: 209-216.
- 9[#]. **Fenichel, E.P.**, J.I. Tsao, and M. Jones. 2009. Modeling fish health to inform research and management: *Renibacterium salmoninarum* dynamics in Lake Michigan. *Ecological Applications* 19: 747-760.
- 8[#]. **Fenichel, E.P.**, F. Lupi, J. Hoehn, and M. Kaplowitz. 2009. Split-sample Tests of "No Opinion" Responses in an Attribute Based Choice Model. *Land Economics* 85: 349-363.
7. Horan, R.D, C.A. Wolf, **E.P. Fenichel**, and K.H. Matthews Jr. 2008. Joint Management of Wildlife and Livestock Disease. *Environmental and Resource Economics* 41: 47-70.
- 6[#]. **Fenichel, E.P.**, Tsao, J.I., Jones, M., and Hickling, G. 2008. Real Options for Precautionary Fisheries Management. *Fish and Fisheries* 9: 121-137.
- 5[#]. **Fenichel, E.P.**, J.I. Tsao, M. Jones, and G. Hickling. 2008. Fish Pathogen Screening and its Influence on the Likelihood of Accidental Pathogen Introduction during Fish Translocations. *Journal of Aquatic Animal Health* 20: 19-28.
4. Horan, R.D. and **E.P. Fenichel**. 2007. Economics and Ecology of Managing Emerging Infectious Animal Diseases. *American Journal of Agricultural Economics* 89: 1232-1238.
- 3[#]. **Fenichel, E.P.** and Horan, R.D. 2007. Gender-Based Harvesting in Wildlife Disease Management. *American Journal of Agricultural Economics* 89: 904-920.
- 2[#]. **Fenichel, E.P.** and R.D. Horan. 2007. Jointly-Determined Ecological Thresholds and Economic Trade-Offs In Wildlife Disease Management. *Natural Resource Modeling* 20: 511-547.

1. Horan, R.D, C.A. Wolf, **E.P. Fenichel**, and K.H. Matthews Jr. 2005. Spatial Management of Wildlife Disease. *Review of Agricultural Economics* 27: 475-482.

Other Non-Reviewed Journal Publications (6)

- 6#. **Fenichel, E.P.**, M Kotchen, and E.T. Addicott**. 2017. Climate changes the debate: The impact of demographics on long-term discount rates. Vox CEPR's Policy Portal. <http://voxeu.org/article/impact-demographics-long-term-discount-rates>
- 5#. **Fenichel, E.P.**, J.K. Abbott, J. Bayham^{pd}, W. Boon,^{FES} E.M.L. Haacker,^{*} and L. Pfeiffer. 2017. How much money is stored under our feet? *Environmental Science Journal for Kids*. <http://www.sciencejournalforkids.org/articles/how-much-money-is-stored-under-our-feet>
4. Seppelt, R., A.M. Manceur, J. Liu, **E.P. Fenichel**, and S. Klotz. 2015. Synchrony of peak-rate years suggests challenges to sustainable development: A response to O'Sullivan (2015). *Ecology & Society* 20: 33.
- 3#. **Fenichel, E.P.** and D. Skelly. 2015. Why should data be free, don't you get what you pay for? *BioScience* 65: 541-542.
2. Tallis, H. et al. (including **E.P Fenichel**). 2014. Working together: a call for inclusive conservation. *Nature* 515: 27-28.
- 1#. **Fenichel, E. P.** 2013. Review of "Capitalizing on Nature: Ecosystems as Natural Assets" by Edward B. Barbier, book review. *Journal of Economic Literature* 51: 570-572.

Book Chapters (10)

- 10#. **Fenichel, E.P.** 2019. Valuing natural capital assets in the context of environmental accounting. Expert Meeting on the Ecosystem Valuation the Context of Natural Capital Accounting. Eds. Ekinci, B., E. Interwies, M. Matauschek, and A. Petersen. Bundesamt für Naturschutz (BfN), Federal Agency for Nature Conservation, Bonn, Germany. <https://www.bfn.de/fileadmin/BfN/service/Dokumente/skripten/Skript525.pdf>
- 9#. **Fenichel, E.P.** 2019. Natural Capital, Equity, and the Sustainable Development Challenge. in A Better Planet: 35 Big Ideas for a Sustainable Future. eds. D. Esty, Yale University Press, New Haven, CT.
8. Seppelt, R., A.M. Manceur, J. Liu, **E.P. Fenichel**, S. Klotz. 2019. Synchronized peak rate years of global resources use imply critical trade-offs in appropriation of natural resources and ecosystem services. eds. Schröter M., A. Bonn, S. Klotz, R. Seppelt, and C. Baessler. Atlas of Ecosystem Services. Springer, 301-307. https://link.springer.com/chapter/10.1007/978-3-319-96229-0_46
- 7#. **Fenichel, E.P.**, J.K. Abbott, and S.D. Yun^{pd}. 2018. The nature of natural capital and ecosystem income. The Handbook of Environmental Economics ed. Smith, V.K. Dasgupta, P. Pattanayak, S. Elsevier, 85-142. <https://www.sciencedirect.com/science/article/pii/S1574009918300020>
6. Bayham, J.^{pd} and **E. P. Fenichel**. 2016. Capturing household transmission compartmental models of infectious disease. Mathematical and Statistical Modeling for Emerging and Re-emerging Infectious Disease. Eds. Chowell, G. and Hyman, J.M., Springer, 329-340. https://link.springer.com/chapter/10.1007/978-3-319-40413-4_20

- 5[#]. **Fenichel, E.P.**, S. Gopalakrishnan, O. Bayasgaian.^{fes} 2015. Chapter 7 Bioeconomics: nature as capital. Handbook on the Economics of Natural Resources. Eds. R. Halvorsen, and D.F Layton. Edward Elgar Publishing. 165-205. <https://www.elgaronline.com/view/9780857937551.00014.xml>
- 4[#]. **Fenichel, E.P.** and X. Wang^{pd}. 2013. The mechanism and phenomenon of adaptive human behavior during an epidemic and the role of information. In d'Onofrio, A and P Manfredi (eds). Modeling the Interplay between Human Behavior and Spread of Infectious Diseases, Springer, 153-169. https://link.springer.com/chapter/10.1007/978-1-4614-5474-8_10
3. Wang, Q. *, **E.P. Fenichel**, and C.A. Perrings. 2012. Border inspection and trade diversion: risk reduction versus risk substitution. In Zilberman, O. Joachim, D. Roland-Host, D. Pfeiffer (eds). Health and Animal Agriculture in Developing Countries, Springer, 119-134. https://link.springer.com/content/pdf/10.1007/978-1-4419-7077-0_7.pdf
2. Horan, R.D., C.A. Wolf, and **E.P. Fenichel**. 2012. Dynamic Perspectives on the Control of Animal Disease: Merging Epidemiology and Economics. In Zilberman, O. Joachim, D. Roland-Host, D. Pfeiffer (eds). Health and Animal Agriculture in Developing Countries, Springer, 135-143. https://link.springer.com/chapter/10.1007/978-1-4419-7077-0_6
1. Perrings, C., **E. Fenichel**, and A. Kinzig. 2010. Globalization and the invasive alien species: trade, pests and pathogens. in C. Perrings, H. Mooney, and M. Williamson (eds). Bioinvasions and Globalization: Ecology, Economics, Management, and Policy, Oxford University Press, 42-55. <https://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199560158.001.0001/acprof-9780199560158-chapter-4>

Other products (1)

1. R package capn: Capital Asset Pricing for Nature, an R package for measuring the value of natural capital, with Seong Do Yun and Joshua K. Abbott. 2017. <https://cran.r-project.org/web/packages/capn/index.html>

Reports and unpublished manuscripts

Working and discussion papers not in the review process (5)

5. **Fenichel, E.P.** and C. Obst. 2019. Discussion paper 5.3: A framework for the valuation of ecosystem assets. Paper submitted to the Expert Meeting on Advancing the Measurement of Ecosystem Services for Ecosystem Accounting. https://seea.un.org/sites/seea.un.org/files/discussion_paper_5.3.pdf
4. Barton, D.N., Obst, C., Day, B., Caparrós, A., Dadvand, P., **Fenichel, E.**, Havinga, I., Hein, L., McPhearson, T., Randrup, T., Zulian, G. 2019. Discussion paper 10: Recreation services from ecosystems. Paper submitted to the Expert Meeting on Advancing the Measurement of Ecosystem Services for Ecosystem Accounting, New York, 22-24 January 2019 and subsequently revised. Version of 25 March 2019. Available at: https://seea.un.org/sites/seea.un.org/files/discussion_paper_10_-_recreation_services_final_0.pdf
3. Dvarskas A., **Fenichel E.**, Fulton B. 2019. Discussion paper 2: Biomass from Fisheries: Provisioning Services and Benefits. Paper submitted to the Expert Meeting on Advancing the Measurement of Ecosystem Services for Ecosystem Accounting, New York, 22-24 January 2019 and subsequently revised. Version of 15 March 2019. Available at: https://seea.un.org/sites/seea.un.org/files/discussion_paper_2_-_fisheries_biomass_final.pdf

2. Salau, K.R.^{**}, J.A. Baggio,^{pd} **E.P. Fenichel**, M.A. Janssen, and J.K. Abbott. 2015. Hierarchical measurement of networks, *arxiv.org*. <https://arxiv.org/abs/1509.07813>

1[#]. Abbott, J.K. and **E.P. Fenichel**. 2014. Following the golden rule: Negishi welfare weights without apology. *Working paper*.
<https://www.joshuakabbott.com/uploads/9/5/6/1/95618488/negishiweightpaper.pdf>

Manuscripts in the review process (7)

63. Lloyd-Smith, P^{*}, W. Adamowicz., A. Entem^{**}, **E.P. Fenichel**, and M. Rouhi Rad^{pd}. The Decade after Tomorrow: Estimation of Discount Rates from Realistic Temporal Decisions. *Journal of Economic Behavior and Organization*, revise and resubmit.

64[#]. Maher, S.M.L.^{**}, **E.P. Fenichel**, O.J. Schmitz, W.L. Adamowicz. The Economics of 'Conservation Debt': A Natural Capital Approach to Revealed Valuation of Ecological Dynamics. *Ecological Applications*, revised and resubmitted.

65. Holder, P.E, A.L. Jeanson, R.J. Lennox, J.W. Brownscombe, R. Arlinghaus, A.J. Danylchuk, S.D. Bower, K. Hyder, L. Hunt, **E.P. Fenichel**, P.A. Venturelli, E.B. Thorstad, M.S. Allen, W.M. Potts, S. Clark-Danylchuk, J.E. Claussen, J.M. Lyle, J. Tsuboi, R. Brummett, K.M.F. Freire, S.R. Tracey, C. Skov, S.J. Cooke. Preparing for a changing future in recreational fisheries: 100 research questions for global consideration emerging from a horizon scan. *In review*.

66[#]. Hashida, Y.^{pd} and **E.P. Fenichel**. Wait for it: Valuing natural capital when management is dominated by periods of inaction. *In prep*.

67[#]. Rouhi Rad, M.^{pd}, W.L. Adamowicz, A. Entem^{**}, **E.P. Fenichel**, and P. Lloyd-Smith. Complementarity (Not Substitution) between Natural and Produced Capital. *Revise and resubmit, Journal of the Association of Environmental and Resource Economists*.

68[#]. **Fenichel, E.P.**, B. Mulligan, I. Porras, Blue Paper 8: National Accounting for the Ocean & Ocean Economy. High Level Panel for a Sustainability Ocean Economy. *In internal review process*.

69. Pinsky, M., **E.P. Fenichel**, M. Fogarty, S. Levin, B McCay, K. St. Martin, R. Selden^{pd}, T. Young^{pd}. Fish and fisheries in hot water: what is happening and how do we adapt? *In review*.

Grants (14 as PI or Co-PI for a total of \$7.0+ million)

Fenichel, E.P. Smart Prosperity Global Fellow award **\$30,000** (CAD).

Fenichel, E.P. Valuing Natural Capital Project 2.0. Knobloch Family Foundation. (PI) **\$346,174** (2019-2021).

Fenichel E.P. National accounting of ocean natural assets: Measuring ocean recovery and productivity. UN High Level Panel for a Sustainable Ocean Economy. (PI) **\$50,000** (Feb 2019 – Dec 2019).

Fenichel, E.P. and K. C. Seto. The value of measuring and mapping montane urbanization. Resources for the Future, Molly K. Macauley Award for Research Innovation and Advanced Analytics for Policy. (PI) **\$100,000** (Sept 2018 – Feb 2020).

Phaneuf, D., L. Hunt, J. Abbott, and **E.P. Fenichel**. Enabling predictions of the economic

consequences of aquatic invasive species establishment to recreational fishers on the Ontario side of the Great Lakes. Great Lakes Fishery Commission. (Co-PI) **\$238,272** (July 2016 – Dec 2017).

Fenichel, E.P. Valuing Natural Capital Project. Knobloch Family Foundation. (PI) **\$360,000** (FY 2015-2017).

Pinsky, M.; **E.P. Fenichel**; S. Levine; B. McCay; K. St. Martin. Coastal SEES Collaborative Research: Adaptations of fish and fisheries to rapid climate velocities. NSF Coastal SEES. (Co-PI) **Yale portion \$150,514** (2014-2018).

Ogden, F.L. (natural scientist PI), **E.P. Fenichel (social science PI)**, J. Hall, B. Ewers, H. R. Barnard. WSC-Category 2 Collaborative Research: Planning and Land Management-Tropical Research in Ecosystem Services (PALM-TREES). NSF-Water, Climate, and Sustainability, **\$2,819,213 (Yale \$412,661)** (2014-2017) + Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) supplement at approximately **\$320,000** (money through UWYO and STRI partners).

Perrings, C.P. et al. (including **E.P. Fenichel**) Collaborative Proposal: Risks of Animal and Plant Infectious Diseases through Trade (RAPID Trade), NSF Ecology of Emerging Infectious Diseases, **\$1.45 million (Yale \$149,990)** (2014-2017).

Galvani, A. et al. (including **E.P. Fenichel**) Evaluating the social influences that impact vaccination decisions. National Institute of General Medical Sciences/NIH/DHHS, **\$1,550,019**, PI reallocated zero support to Fenichel post award, (2013-2017).

A.J. Cease, J.J. Elser, **E.P. Fenichel (Co-PI & lead social scientist)**, J. Hadrich, J. F. Harrison. NSF CNH: Linking Livestock Markets and Grazing Practices with the Nutritional Ecology of Grasses and Locusts Under Alternative Property Rights Regimes NSF Coupled Human-Natural Systems **\$955,001 (Yale \$174,351)** (2013-2017).

Fenichel, E.P. and M. Ashton with J. Hall. Investing in timber production through tropical reforestation and interactions with capital market access. F.K. Weyerhaeuser Memorial Fund, Faculty Research Grant. (PI) **\$54,435** (2013-2014).

Fenichel, E.P. and T.J. Richards. The Robustness of Current Approaches to Estimating Spread of Invasive Species to Individual Insect Behavior and Adaptive Human Behavior, ASU High Performance Computing Center, Saguaro award 200,000 CPU hours. (PI) **\$5,000**. (2012).

Fenichel, E.P. Human Adaptive Behavior and Invasive Insect Pests, ASU High Performance Computing Center, Saguaro award 110,000 CPU hours. (PI) **\$2,750**. (2012).

Perrings, C.P., **E.P. Fenichel**, C. Castillo-Chaves, G. Chowell, P. Daszak, M. Kilpartick, K. Smith, A. Kinzig, S. Levin, R. Horan, S. Springborn, and N. Kuminoff. "Modeling anthropogenic effects in the spread of infectious diseases," NSF/NIH. (Co-PI) **\$1.6 million** (2011-2015).

Richards, T.J. and **E.P. Fenichel**, "Asian Citrus Psyllid in California: an Economic Analysis of Efficient Management and Control Strategies," SCRI-USDA. (Co-PI) **\$312,471** (2010-2012).

Fenichel, E.P. and J.K. Abbott, "The Joint Modeling of Seasonal Recreational Demand, Entry-Exit Decisions, and Fish Stocks over Time with an Application to Great Lakes Sportsfishing," NOAA, Saltonstall-Kennedy. (PI) **\$190,806** (2009-2011).

Fenichel, E.P., C. Castillo-Chaves, P. Dazsak, R.D. Horan, and C. Perrings. "Working group for Synthesizing and Predicting Infectious Disease while accounting for Endogenous Risk, SPIDER," National Institute for Mathematical and Biological Synthesis. (PI) funding for 4 workshops and other support (2009-2010).

Tsao, J., **E. Fenichel**, M. Jones, and G. Hickling. "Real options analysis of Lake Ontario sterile sea lamprey transfers." Great Lakes Fishery Commission: sea lamprey research program. (PI) **\$66,418** (2008-09).

Collaborated with J.I. Tsao and G. Hickling on the following funded project:

- Great Lakes Fishery Commission, "A Framework for Evaluation of Great Lakes Disease Introduction Risks Associated with the Sterile Male Lamprey Release Program", **\$8,400**.

Collaborated with R.D. Horan and C.A. Wolf on the following funded projects:

- USDA-ERS, Program of Research on the Economics of Invasive Species Management (PREISM), cooperative agreement #58-7000-6-0084, "Bioeconomics of Managing Multi-Host Diseases", **\$117,000**.
- NRI-USDA-CSREES, Grant #2006-55204-17459, "Bioeconomics of Managing Pathogens in Multi-Host, Livestock-Wildlife Systems", **\$231,886**.

Michigan State University Dept. of Fisheries and Wildlife Graduate Student Organization travel grant 2006.

American Agricultural Economics Association travel grant 2006.

Saginaw Bay Walleye Club Fellowship 2006.

A variety of **\$5,000 - \$20,000** grants for small community based conservation projects, species conservation, and research projects (2000-2003).

Invited Presentations and Seminars

Valuing changes in natural capital and environmental wealth in three acts. **EcoHealth Alliance**, New York. 12/18/2019.

Making the empirical case for complementarities between natural and produced capital. **Duke Kunshan University, China**. 12/11/2019.

Making the empirical case for complementarities between natural and produced capital. Frontiers of Environmental and Resource Economics Workshop. **Shanghai University of Finance and Economics, Shanghai, China**. 12/10/2019.

Measuring changes in the value of natural resources and environmental wealth. Yangtze River Delta International Forum Regional Integration: Cooperation and Development. **Shanghai University of Finance and Economics, Shanghai, China**. 12/7/2019.

Measuring changes in the value of natural resources and environmental wealth. **Environment and Climate Change Canada**. 11/13/2019.

Measuring changes in the value of natural resources and environmental wealth. **Department of Fisheries and Oceans Canada & Statistics Canada**. 11/13/2019.

Valuing changes in natural capital to assess sustainability: what we've learned from and for fisheries. **State University of New York at Stony Brook**. 2/22/2019.

Water and Concrete: Complementarity between natural and produced capital. **Oregon State University**. 2/15/2019.

Natural capital valuation, sustainability, and the importance of ecological dynamics. **University College London**. 11/14/2018.

Valuing changes in natural capital to assess sustainability: what we've learned from and for fisheries. **UK DEFRA**. 11/9/2018.

Advances in natural capital asset pricing & its importance in sustainability assessment. **London School of Economics**. 11/7/2018.

It take two: The theory and evidence of the role of human choices in disease. **University of Glasgow**, 11/5/2018.

Ecosystem-based approaches to Natural Capital Provision: A Natural Capital Approach to Caribou Conservation. **Smart Prosperity Institute, University of Ottawa**, 10/29/30.

Measuring the value of natural capital & assessing sustainability. **Oxford University, Smith School**, 10/22/2018.

Developments in the measurement of natural capital to advance sustainability assessments. **Cambridge University**, 10/18/2018.

Valuing changes in natural capital to inform sustainability assessments and measuring natural capital with capn. **University of Exeter**, 9/3/2018.

Valuing natural capital in the context of ecosystem based management (Keynote). Expert meeting on ecosystem valuation in the context of natural capital accounting. **UN STAT & German Federal Agency for Nature Conservation**. Bonn, Germany 4/25/2018.

The mathematics of measuring sustainability – how to give coupled human systems modeling a policy punch. (Keynote) **The Fields Institute for Research in Mathematical Sciences**, Toronto Canada. 3/9/2018

Where the wild things are when schools close: the impact of time reallocation on the cost and benefit of school closures during an epidemic. **The Ohio State University, Mathematical BioSciences Institute**. 3/6/2018.

Sustainability, Economics, and Natural Capital. **National Academy of Sciences, Sackler Colloquium**, Irvin, CA. 1/17/2018.

Where the wild things are when schools close: the impact of time reallocation on the cost and benefit of school closures during an epidemic. **The Pennsylvania State University, Center for Infectious Disease Dynamics**. 1/11/2018.

Valuing natural capital and wealth of ecosystems, **East Carolina University**. 10/6/2017.

- Tipping points and Tinbergen: Could some thresholds be a policy artifact. MarSShift workshop, **Tilburg University, Netherlands**. 9/23/2017.
- Valuing natural capital and wealth of ecosystems. **Yale School of Forestry and Environmental Studies**. 9/13/2017.
- Congressional briefing, Ocean resources are capital assets. **US Congress, Senate Commerce Committee**. 6/12/2017.
- Ecosystem base management and wealth of ecosystems. **World Bank**. 4/13/2017.
- Human economic behavior and infectious disease. **Yale School of School of Public Health**, 12/12/2016.
- Groundwater as a capital asset. Keynote Panel, **Governor's Conference on the Future of Water in Kansas**, Manhattan, KS 11/14/2016.
- The Wealth of Ecosystems. **The Ohio State University**, Department of Agricultural, Environmental and Development Economics, 10/28, 2016.
- The Wealth of Ecosystems: Measuring Natural Capital Asset Prices, **Carey Institute of Ecosystem Studies** 10/13/2016.
- The Wealth of Ecosystems: Measuring Natural Capital Asset Prices, **University of Wyoming**, Department of Economics and Finance 9/29/2016.
- The Wealth of Ecosystems: Measuring Natural Capital Asset Prices, **Marine Ecosystem Service Partnership** webinar 9/8/2016.
- Measuring natural capital from Rhetoric to Reality, The True Cost of American Food, **Sustainable Food Trust**, San Francisco 4/16/2016.
- Valuing natural capital from Rhetoric to Reality, **NOAA** webinar 4/5/2016.
- Valuing natural capital from Rhetoric to Reality, The Natural Capital Symposium, 3/21/2016, **Stanford University**, Palo Alto, CA.
- Measuring shadow prices for natural capital. **Yale Environmental Economics Day**. Yale Dept. of Economics. 2/19/2016.
- Beyond the Metaphor: Advances in Natural Capital Measurement for Groundwater (and Fisheries & Ecosystems). **Yale Environmental Sustainability Summit** 2015. 11/6/2015, New Haven, CT.
- Beyond the metaphor: Advances in natural capital measurement for groundwater (and fisheries & ecosystems). **The World Bank**. 10/22/2015.
- Tipping points and Tinbergen: Could some thresholds be a policy artifact. Thresholds, Tipping Points & Random Events in Dynamics Economics Systems. Howard H. Baker Jr Center for Public Policy, **University of Tennessee**, July 27-28, 2005.
- Measured voluntary avoidance behavior during the 2009 A/H1N1 epidemic. **Cambridge University**, Clare College. Symposium on Contagion. 4/23 – 4/24/2015.

- Economic behavior, infectious disease dynamics, and targeting: theory and empirical application. RAPIDD workshop on targeted control of vector-borne pathogens. **Notre Dame**, 3/12-13/2015.
- Sustainability, Investing, and Corporate Social Responsibility Panel Event Panelist. **New York City Hedge Fund Round Table**, New York, New York, 10/21/2014.
- Slovenský raj ako prírodný kapitál (Slovak Paradise as Natural Capital), 50th Anniversary of **Slovensky Raj National Park** Conference (poster), Spisska Nova Ves, Slovakia 9/25/2014.
- Design incentives systems for forest-based ecosystem services when financial service markets are missing: Easting a Faustmann cake, **University of Southern Denmark**, 9/18/2014.
- Mechanistic models of angler behavior. **SESYNC** Recreational fishing as a Coupled-Human Natural System workshop June 18-20, 2014.
- The locust liability: the ecological economics of grasslands, Invited Symposium Speaker, **Lanzhou University**, China June 13, 2014.
- Natural capital from metaphor to measurement. Invited seminar, **Peking University**, China, June 5, 2014.
- Natural capital from metaphor to measurement. Invited symposium seminar, **Nanyang Technical University**, Singapore, May 27-28, 2014.
- Natural capital from metaphor to measurement. Invited seminar, **Arizona State University**, Department of Economics environmental economics seminar, 1/30/2014.
- Natural capital from metaphor to measurement. Invited seminar, TREE – Triangle Resource and Environmental Economics (joint among **Duke, North Carolina State, and University of North Carolina** Departments of Economics), 1/16/2014.
- Natural capital from metaphor to measurement. Invited seminar, **University of Connecticut**, Department of Economics, 11/1/2013.
- Natural capital from metaphor to measurement. Invited seminar, **Michigan State University** Department of Agricultural, Food, and Resource Economics, 1/31/2013.
- Anticipating adaptation: modeling the link between environmental policy and anthropogenic impact. Invited seminar **Yale School of Forestry & Environmental Studies**, 1/23/2013.
- A coupled human-natural systems approach to valuing natural capital. Invited Speaker at the fall meeting of the **American Geophysical Union**, 12/7/2012.
- Anticipating the unanticipated: modeling the link between environmental policy and anthropogenic impact. Invited seminar at the **Yale Institute for Biospheric Studies**, 10/19/2012.
- Linking economics, ecology, and institutions to provide a structural understanding of coupled human natural systems. Invited seminar at the **Yale School of Forestry and Environment Studies**, 2/9/2012.

- Managing ecological thresholds in coupled environmental-human systems. Math Biology Seminar, **William and Mary College**, 11/11/2011.
- Managing ecological thresholds in coupled environmental-human systems. Contributed Paper. 6th **World Recreational Fisheries Conference**, Berlin Germany, 8/1-8/4/2011.
- Risk and making natural resource related decisions. **Arizona Department of Environmental Quality**. Phoenix, AZ 7/21/2011.
- Managing ecological thresholds in coupled environmental-human systems. Tupper talk. **Smithsonian Tropical Research Institute**, Panama, 7/12/2011.
- Dynamic optimization as a model of human behavior, applications to epidemiology. **Casablanca Workshop on Mathematical Biology**, Casablanca, Morocco, 6/20-24/2011.
- Coupled Economic-Ecological Systems and Regime Shifts. Invited Speaker. Ecology and Environmental Biology Seminar. **South Dakota State University**, 4/5/2011.
- A bioeconomic model of recreational angling. Organizer and speaker, Workshop on modeling recreational angling behavior, **Arizona State University**, 2/17-2/18/2011.
- Managing ecological thresholds in coupled human environmental systems. Invited Speaker. Consortium for Biosocial Complex Systems, **Arizona State University**, 2/7/2011.
- A Consistent Framework for Integrating Non-Market Demand and Bioeconomic Models. Invited speaker. Departmental seminar, Department of Economics and Finance, **University of Wyoming**, 9/28/2010.
- Managing Ecological Threshold in Coupled Human-ecological Systems. Invited Speaker. Dynamic Discussions, Center for Social Dynamics and Complexity, **Arizona State University**, 4/8/2010.
- The Mathematics of Managing for Ecosystem Services. Invited speaker. Math Colloquium series. **Arizona State University**, 10/8/09.
- Economics of Emerging Infectious Diseases. Invited speaker. **NY Times Foundation workshop on environmental journalism**. Punta Cana, Dominican Republic 3/19/09.
- Bioeconomic Management of Invasive Insect-vectored Diseases. Invited seminar. **USDA, Arid-Land Agricultural Research Center**, Maricopa AZ, 2/2/09.
- Epidemiological models to guide fish health research and management: bacterial kidney disease in free-swimming fish in Lake Michigan. Invited speaker. **Great Lakes Fishery Commission Fish Health and Ecosystem Dysfunction Workshop**, Ann Arbor, MI, 11/5-11/6 2008.
- Fish population health and aquatic pathogens as a bioeconomic question. Invited speaker. **Great Lakes Fishery Commission Fish Health and Ecosystem Dysfunction Workshop**, Ann Arbor, MI, 11/5-11/6 2008.
- The bioeconomics of wildlife disease management. BESTnet, DIVERSITAS, AgTrans Workshop on Analyzing the Role of Agricultural Transformation and Invasive Species in Disease Emergence, **Arizona State University**, Tempe Arizona, 5/28-5/30, 2008.

Balancing the Benefits, Costs, and Risk of Sterile Male Sea Lamprey Transfers: The Need For A Systematic Approach. Invited presentation. Sea Lamprey Integration Committee, **Great Lakes Fishery Commission**. 4/24/2007.

The 'Real Options' Framework for Evaluating Benefits, Costs, and Risks associated with Fish Transfers. Invited presentation. Council of Lake Committees, **Great Lakes Fishery Commission**. 4/18/07.

Modeling in Fisheries and Wildlife: Applications in Ecology, Economics, and Disease Management. **Michigan State University** Fisheries and Wildlife Undergraduate Club. 2/22/07.

Fish Pathogen Screening and its Influence on the Likelihood of Accidental Pathogen Introduction during Fish Translocation. Great Lakes Fish Health Committee, **Great Lakes Fishery Commission**. 1/31/07.

Real Options for Risk Management in Fisheries and Wildlife. **Michigan State University** Fisheries and Wildlife Graduate Student Seminar Series, 11/17/06.

Balancing the benefits, costs, and risk of fish translocation programs: the case of the sterile male sea lamprey release. Invited presentation. **Saginaw Bay Walleye Club**. 5/22/06.

Conference and Workshop Presentations

Valueing Multiple Natural Capital Stocks Under Correlated Stochastic Dynamics. ASSA, San Diego, 1/5/2020.

Wait for it: Valuing natural capital when management is dominated by periods of inaction. BioEcon, Wageningen Netherlands, 9/12/2019.

Water and Concrete: Complementarity (Not Substitution) between Natural and Produced Capital, Association of Environmental and Resource Economists 2019 summer meeting, Incline Village, NV, 5/31/2019.

The value of measuring and mapping montane urbanization. American Geophysical Union, Washington D.C., 9/12/2018.

Valuing natural capital stocks with stochastic dynamics. BioEcon, King's College, Cambridge, UK, 9/13/2018.

Investing in Ecological Infrastructure. Thematic Session World Congress of Environmental and Resource Economics, Gothenburg, Sweden, 6/24-6/29/2018.

Spatial aggregation and the value of natural capital. BioECON, Tilburg, University, Netherlands, 9/21-9/22/2017.

The wealth of ecosystems. Resilience Conference. Stockholm, Sweden, 8/21-8/23/2017.

A shopper's guide to recreational fisheries human dimension's research, World Congress on Recreational Fisheries, Victoria, Canada, 7/17-7/20/2017.

Who is smarter Robert Arlinghaus or a Trout, World Congress on Recreational Fisheries, Victoria, Canada, 7/17-7/20/2017.

- The representative agent must die: Social utility discount rates and population distribution. BioECON, King's College, Cambridge, UK, 9/14-9/16/2016.
- The representative agent must die: Social utility discount rates and population distribution. European Association of Environmental and Resource Economists annual meeting, Zurich June 2016.
- Thoughts on accounting for natural capital and ecosystem services, The Natural Capital Symposium, Stanford University, Palo Alto, CA, 3/24/2016.
- A portfolio-trade approach to livestock and wildlife management in the face of disease risk. BioECON, King's College, Cambridge, UK, 9/13-9/15/2015.
- Where the wild things go: reallocation of time during school closures and other social distancing policies and effects on epidemiological dynamics. BioECON, King's College, Cambridge, UK, 9/13-9/15/2015.
- Beyond the metaphor: Natural capital as a foundation for integrating ecological and economic research, measuring sustainability, and accounting for what matters. Ecological Society of America, Baltimore, MD, 8/10/2015.
- Natural Capital: From Metaphor to Measurement. BioECON, King's College, Cambridge, UK, 9/22-9/23/2014.
- Eating a Faustmann cake: Designing incentive systems for forest-based ecosystem services when capital markets are missing. 5th World Congress of Environmental and Resource Economics, Istanbul, Turkey. 6/28-7/2/2014
- Natural Capital: From Metaphor to Measurement. Association of Environmental and Resource Economics 3rd Annual Meeting, Banff, Canada, 6/7 – 6/8/2013.
- The microeconomic origins of spatial externalities and a starting point for market-based control of invasive species. European Association of Environmental and Resource Economics Annual Meeting, Prague, Czech Republic, 6/28 – 6/30/2012.
- The microeconomic origins of spatial externalities and a starting point for market-based control of invasive species. Association of Environmental and Resource Economics 2nd Annual Meeting, Asheville, NC, 6/4 – 6/5/2012.
- Modeling angler behavior as a part of the management system: Synthesizing a multi-disciplinary literature. Contributed Paper. 2012 Joint Annual Meeting of the Arizona and New Mexico Wildlife Society and American Fisheries Society, Phoenix, AZ, 2/3-2/4/2012.
- Economic theory for regulating the human predator in a recreational fishery: integrating positive and normative frameworks. Contributed Paper. 6th World Recreational Fisheries Conference, Berlin Germany, 8/1-8/4/2011.
- Putting the "Micro" in bioeconomics: the case of recreational nonmarket goods. Contributed Paper. Association of Environmental and Resource Economics 1st Annual Meeting, Seattle, WA, 6/9 – 6/10/2011.

- Managing ecological thresholds in coupled environmental-human systems. SIAM Conference, Symposium on Recent Application of Dynamical Systems in Ecology, Snowbird, UT, 5/24/2011.
- A Consistent Framework for Integrating Non-Market Demand and Bioeconomic Models. Heartland Environmental Economics Workshop, Champaign, IL, 10/17-18, 2010.
- Epidemiological Models with Human Economic Behavior. Organized Session Paper. World Congress on Environmental and Resource Economics, Montreal, CA, 6/28 -7/2, 2010.
- Risks are not always what they seem, the case of sterile male sea lamprey transfers. Contributed paper. American Fisheries Society Annual Meeting, Nashville, TN, 9/1-9/4, 2009.
- Heterogeneity among user types and second-best management for non-market ecological services. Selected Paper. Agriculture and Applied Economics Association Annual Meeting, Milwaukee, WI, 7/26-7/29 2009.
- Heterogeneity among user types and second-best management for non-market ecological services. Selected Paper. European Association of Environmental and Resource Economics Annual Meeting, Amsterdam, NL, 6/24-6/27 2009.
- Risks are not always what they seem, the case of sterile male sea lamprey transfers. Invasive Species Symposium. International Association of Great Lakes Research, Toledo, OH, 5/22, 2009.
- Managing invasive wildlife pathogens on the margin: reconciling bioeconomic analysis and disease ecology. Entomological Society of America Meeting, Invited Program Symposium: Global Impact of Biological Invasions: Transformation in Pest Management Approaches, Reno, NV, 11/16-19/2008.
- Ecological-economic modeling of livestock-wildlife disease: where we are and where we can go. Invited panelist. Pathways to Success: Integrating Human Dimensions into Fish and Wildlife Management, Estes Park, CO, 9/28-10/2/2008.
- How many fish to screen – No easy answer. Fish disease ecology in the Great Lakes Symposium at the International Association of Great Lakes Research, Peterborough Ontario, 5/20-5/23, 2008.
- Non-native species and non-convexities: imperfect controls in invaded ecosystems. Workshop on Invasive Species Management, Michigan State University, East Lansing Michigan, 10/8-10/9, 2007.
- A Multiple-host Model of *Renibacterium salmoninarum* Dynamics in Lake Michigan: Implications for Disease Management and Assessment. Contributed Paper to the American Fisheries Society Annual Meeting, San Francisco, California, 9/2-9/6, 2007.
- Managing Risk Rather than Running from It: How does the precautionary approach fit? Performance of Alternative Harvest Policies Symposium at the American Fisheries Society Annual Meeting, San Francisco, California, 9/2-9/6, 2007.

Managing Infectious Wildlife Diseases Based on Marginal Analysis. Contributed paper to the Ecological Society of America's Annual Conference, San Jose, California, 8/6- 8/10, 2007.

Split-sample Tests of 'Don't Know' and 'Indifferent' Responses in Attribute Based Choice Models. Contributed paper to 8th Annual Heartland Environmental & Resource Economics Workshop, Iowa State University, Ames, IA, 9/17-9/18, 2006. – **Winner of top paper presentation award**

Balancing the benefits, costs, and risk of fish translocation programs: the case of the sterile male sea lamprey release. The Ecological, Social and Political Challenges of Managing Landlocked Sea Lamprey Populations in the Great Lakes-St. Lawrence Basin Symposium at the American Fisheries Society Annual Meeting, Lake Placid, New York, 9/10-9/14, 2006.

Split-sample Tests of 'Don't Know' and 'Indifferent' Responses in Attribute Based Choice Models. Selected paper to The Annual Conference of the American Agricultural Economics Association, Long Beach, California, 7/23-7/26, 2006.

Understanding Ecological and Economic Interactions in Wildlife Disease Management. Contributed paper to the Midwest Fish and Wildlife Conference, Grand Rapids, MI, 12/11-12/14, 2005.

Jointly-Determined Ecological Thresholds and Economic Trade-Offs in Wildlife Disease Management. Contributed paper to 7th Annual Heartland Environmental & Resource Economics Workshop at Iowa State University, Ames, IA. 9/18-9/19, 2005.

The Economics of Sex-based Wildlife Disease Management. Contributed paper to The Annual Conference of the Wildlife Society, Calgary, Canada, 9/18-9/22, 2004.

The Role of Sexual Dimorphism in the Economics of Wildlife Disease Management. Selected paper to The Annual Conference of the American Agricultural Economics Association, Denver, Colorado, 8/1-8/4, 2004.

TEACHING

Courses Taught

F&ES 762 (3cr) – Applied Math for Environmental Studies (Fall 2013, 2015-17)

F&ES 795 (3cr) – Nature as Capital (Spring 2013-14, 2016-18)

F&ES 794 1 (1cr) – Making Better Decisions Seminar, Yale University (Fall 2012)

F&ES 794 1 (1cr) – Confronting Models with Data, Yale University (Spring 2015)

F&ES 805 (1cr) – Environmental & Natural Resource Economics Seminar (AY14-15,16-18)

BIO 591 (1cr) – EcoServices lab mentoring, Arizona State University (Spring 2010-Spring 2012 every semester)

BIO 591 (1cr) – Math for Life and Sustainability Science, Arizona State University (Fall 2009)

BIO 591 (2cr) – Math for Life and Sustainability Science, Arizona State University (Fall 2010-2011)

BIO 411 (3cr) – Quantitative Conservation Biology, Arizona State University (Spring 2009-2012)

BIO/ECN/AMLSS/SOS 691 (3cr) – Mathematical Natural Resource Economics, taught with Perrings and Abbott (Fall 2010)

BIO 591/ HON 494 (1cr) – The Ecological Detective, Arizona State University (Spring 2011)

BIO 591/ HON 494 (1cr) – Theoretical Ecology (Spring 2012)
 BIO 189 (1cr) – Freshmen seminar, careers in natural resource management (Fall 2011)
 Various guest lectures Arizona State University and Michigan State University

Workshops and Short Courses

Two day workshop for Smart Prosperity Institute, Ottawa Canada. Valuing natural capital. 11/14-15/2019.
 Full day workshop for UNESCO-IHE, Delft, The Netherlands, on sustainability and natural capital and using the capN package 1/20/2017
 Four-part video series for Yale's online MBA course "Natural Capital: Managing Risks and Capturing Opportunities in Global Resource Systems," recorded 12/11/2013
 Modeling Adaptive Behavior and the Envelope Theorem, Arizona State University Summer MTBI program, 6/18/2012
 Bioeconomic – mathematical approaches to merging economics and biological systems, Arizona State University Summer MTBI program, 7/5/2011
 Bioeconomic – mathematical approaches to merging economics and biological systems, Arizona State University Summer Mini-workshop in applied mathematics, 6/27/2011
 Bioeconomic – mathematical approaches to merging economics and biological systems, Casablanca workshop on Mathematical Biology, Casablanca, Morocco 6/24/2011

Graduate Students

Completed

Zachary Hughes, M.S. Arizona State University, sustainability, 2009 – went to USGS.
 Marie Fujitani M.S. Arizona State University, biology, 2010 – went to PhD program at ASU.
 Marie Fujitani PhD. Arizona State University, environmental life science, May 2014 (NOAA Knauss Fellow 2013), - Post doc with Robert Arlinghaus, Leibniz-Institute of Freshwater Ecology and Inland Fisheries Management, Berlin, Germany.
 David Shanafelt M.S. Arizona State University, biology 2012 – went to PhD program at ASU.
 Kehinde "Kenny" Salau PhD, applied math in life and social science, 2013 – Alliance Postdoctoral Fellow at University of Arizona, now at J.P Morgan Chase.
 Ethan Addicott, MEd, Yale FES, 2017 – Yale FES PhD program.
 Samantha Maher, MEd, Yale FES, 2018 – EcoHealth Research Associate.

Current

Ethan Addicott, PhD, Yale FES
 Alicia Entem, PhD, Yale FES
 Austin Scheetz, Yale MEd
 Andie Creel, Yale MEd

Undergraduate Honor's Theses Advised

Andrea Sylvia, Arizona State University, 5/2012 – graduate fellow University of Maryland.
 Lucy Wang, Yale University, graduation 5/2015.

Committees

Completed

Shikha Gupta M.S. Arizona State University, biology (2010).
 Erica Warkus, undergraduate honor's thesis, Arizona State University (2012) – awarded Fulbright fellowship.
 Patrick Dockens M.S., Arizona State University, biology (2012).
 Bray Beltran M.S. Arizona State University, biology (2012).
 Darren Sversold M.S. biology, Arizona State University summer (2012).
 Quentin Gunn undergraduate honor's thesis, Arizona State University (2013).
 David Shanafelt Ph.D. Biology, Arizona State University (2016).

Outside reader for dissertations (Yale)

David Keiser (2014), Laura Bakkensen (2014), Nathan Chan (2014), Namrata Kala (2015), Jeff Chow (2016).

Post-docs Advised**Former**

Arianne Cease, Arizona State University (2012-2013), now an assistant professor at Arizona State.
 Jude Bayham, Yale (2013-2015), now an assistant professor Colorado State University (via Chico State).
 Kevin Berry, Yale (2015-2016), now an assistant professor University of Alaska.
 Augustina Odame, Yale (2015-2016).
 Seong Do Yun, Yale (2015-2017), now an assistant professor at Mississippi State University.
 Mani Rouhi Rad, Yale (2017-2018), now a research associate Colorado State University.
 Emily Moberg, Rutgers-Yale (2016-2018), now at World Wildlife Foundation.
 Yukiko Hashida, Yale (2017-2019), starting as an assistant professor at University of Georgia.

Current

Youpie Yan, Yale (starting fall 2019).

SERVICE**Service Internal to University**

FES admissions revision committee 2018-present (while on leave).
 Yale University wide ITS advisory committee 2017-2018.
 FES data science initiative lead 2017-present.
 FES academic affairs and master's program committee 2016-2018.
 FES strategic planning committees for diversity and curriculum 2016-2017.
 Yale University Wide Teaching and Learning Committee 2015-2016.
 Led multi-unit (FES led) \$3.0M NSF, NRT training proposal (not supported).
 Organizer of the Yale Environmental Economics Seminar AY 2013 – 2014, 2015-2018.
 Yale Forestry & Environmental Studies PhD admissions committee 2013 – 2014.
 Special project to develop efficient allocation of ASU's School of Life Sciences resources,
 developed software to efficiently allocate teaching effort and structure conversations about
 teaching responsibilities 2010-2012.

Organizer of the Environmental and Resource Economics Seminar series at ASU 2009-present.
Member of ad-hoc committee conservation biology and ecology undergraduate curriculum, 2009-2010.

Research and Training Initiatives Committee, School of Life Sciences, Arizona State University, 2009-present.

Panel member for Mentoring to Advance Post-docs and Students program (MAPS) on the job search. 2010.

Faculty advisor to the Central Arizona Chapter of the Society of Conservation Biology (student chapter) 2010-present.

Global Change Biology faculty search committee, Arizona State University, 2009-2010.

Service External to University and Outreach

UN High Level Panel for a Sustainable Ocean Economy Blue Paper co-lead and member of the expert committee, 2019 – present.

UNSTAT System of Environmental Economic Accounting (SEEA) technical expert, 2018 – present.

Review board for the 2018 Inclusive Wealth Report: Measuring Progress Towards Sustainability, eds. Managi, S. and P. Kumar. UNEP. Routledge Taylor & Francis Group.

Association of Environmental and Resource Economists Standing Program Committee, 2018 – 2020.

World Bank external advisor on valuing human capital.

Program review committee, BIOECON conference 2016 to present, Cambridge, UK.

Review panel for the World Bank WAVES (Wealth Accounting and Valuing Ecosystem Services) on paper series to advance the System of Experimental Environmental Accounts (SEEA).

International Advisory Board, 2017 World Recreational Fisheries Conference, Victoria, CA.

Editorial Council for the Journal of the Association of Environmental and Resource Economists, 2014 – current.

Member of the board of advisors for The National Institute of Mathematical and Biological Synthesis (NIMBioS) 9/2012 – 9/2015.

Member of the Scientific Review Committee for The National Socio-Environmental Synthesis Center (SESYNC) 4/2012 – 9/2015.

Organized symposium at the American Fisheries Society Meeting on connecting economic models of angler behavior with population biology models of fish, Seattle 9/2011.

Panelist for Advance Mathematical Biology at the Casablanca Workshop on Mathematical Biology, 6/20-24/2011, Casablanca, Morocco.

Participant in "Partnering for Conservation & Professional Development: Developing a more effective wildlife/fisheries college curriculum" meetings series with Arizona Game and Fish, University of Arizona, Northern Arizona University, Arizona State University PolyTech, Arizona State University, U.S. Forest Service – Tempe. 3/24/2011, 8/11/2011.

Organized workshop on modeling recreational fishing behavior at Arizona State University, 2/17-2/18/2011.

Session organizer at the 2010 World Congress on Environmental and Resource Economics; The economics of epidemics and infectious disease. 6/29/2010.

Invited participant to Sonoran pronghorn recovery taskforce meeting, Ajo, AZ, 06/10/2010.

- Technical participant in the National Institute for Mathematical and Biological Synthesis bovine tuberculosis and livestock movement workshops 7/6-7/8/2009.
- Organized and facilitated real options for sterile male sea lamprey transfers workshop with Lake Huron Managers, 4/17-4/18/2008.
- Technical participant at "Developing Science Strategies to Address VHS and Similar Emerging Diseases in the Great Lakes Basin." held by the Great Lakes Fishery Commission, International Joint Commission – Council of Great Lakes Research Managers, and Ontario Ministry of Natural Resources, Toronto, Canada 3/12-3/13/2008.
- Organizing committee for the "Workshop on Invasive Species Management" Michigan State University, East Lansing, Michigan, 10/8 – 10/9, 2007.
- Technical participant to the Great Lakes Fish Health Committee (2006-2007).
- Organized and facilitate two fish health modeling workshops
- Bacterial kidney disease modeling workshop I, East Lansing Michigan 2/6-2/7/2006
 - Bacterial kidney disease modeling workshop II, Traverse City Michigan 7/26/2006.

Journal referee.

Economics: *American Journal of Agricultural Economics, Climate Change Economics, Ecological Economics, Environment and Development Economics, Environment and Resource Economics, European Review of Agricultural Economics, Journal of the Association of Environmental and Resource Economists, Journal of Environmental Economics and Management, Journal of Health Economics, Journal of Public Economics, Land Economics, Marine Resource Economics, Resource and Energy Economics, Water Economics and Policy.*

Ecology, Epidemiology, Fisheries, Wildlife: *BioScience, Canadian Journal of Fisheries and Aquatic Sciences, Conservation Biology, Conservation Letters, Ecological Applications, Ecology Letters, Epidemics, Fish and Fisheries, Fisheries Management and Ecology, Fisheries Research, Journal of Wildlife Management, North American Journal of Fisheries Management, Oxford Bibliographies in Ecology.*

Biological Mathematics: *Journal of Mathematical Biology, Journal of Theoretical Biology.*

General Interest Science: *Nature Climate Change, Science, Science and Technology, PLoS One, Proceedings of the National Academy of Sciences, Science.*

Other: *Cahiers d'économie et Sociologie Rurales, International Journal of Engineering.*

Grant reviewer. NSF-Decision, Risk, Management Science Program, NOAA-Saltonstall-Kennedy Program, Great Lakes Fishery Commission – fishery research program, Montclair State University PSEG ISS grant program, Ohio Sea Grant

Funding agency panels. NSF/NOAA CAMEO Review Panel, 2/2010

Book proposal reviewer. Elsevier

Current Professional Affiliations Association of Environmental and Resource Economists

Foreign Language ability: *Fluent* Slovak *Passive* Czech, Polish, Croatian, Slovenian