James Powell

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Academic Experience

- Interim Department Head, Department of Mathematics and Statistics, Utah State University, August, 2019-2021.
- Program Director, Mathematical Biology, National Science Foundation, Alexandria, Virginia, 2017-2019.
- Assistant Department Head for Graduate Studies, Utah State University, 2016-2017.
- Sabbatical Visiting Professor, Colorado College, Block 8, 2014, 2015
- Adjunct Professor, Department of Biology (joint appointment), Utah State University, 2008-present.
- Associate, Utah State University Ecology Center, 2008-present.
- Director of Graduate Studies, Department of Mathematics and Statistics, Utah State University, 2006-2009.
- Professor, Department of Mathematics and Statistics, Utah State University, 2003-present.
- Research Sabbatical, University of Glasgow and University of Alberta, 2007.
- Associate Professor, Department of Mathematics and Statistics, Utah State University, 1997-2003.
- Research Sabbatical, Laboratory of Theoretical Production Ecology, Wageningen Agricultural University, Wageningen, the Netherlands, 1999.
- Assistant Professor, Department of Mathematics and Statistics, Utah State University, 1991-1997.
- Postdoctoral Fellow, Arizona Center for Mathematical Sciences, University of Arizona, 1990-1991. Supervisor: Jerome V. Moloney.
- Ph.D. in Applied Mathematics, 1990, University of Arizona. Advisor: Alan C. Newell.
- Graduate Research Assistant/Teaching Assistant, University of Arizona, 1985-1990.
- B.S. in Mathematics, 1985, with Honors and Highest Distinction, Colorado State University. Honors Advisor: Murray Nabors.
- Student Researcher, Department of Atmospheric Sciences, Colorado State University, 1983-1985. Supervisor: William R. Cotton.

Honors and Awards

- Lee Segel Prize for Best Paper, Society for Mathematical Biology (with B.R. Kohler, R.J. Swank and J.W. Haefner), 2010.
- USU College of Science 'Researcher of the Year,' 2008.
- USU Math Department 'Researcher of the Year,' 2004.
- Best Visionary Science Publication, 2002 (with Jesse Logan). Rocky Mountain Research Station, USDA Forest Service.
- USU Alumni Association 'Professor of the Year,' 2001.
- USU College of Science 'Teacher of the Year,' 2001.
- Selected for USU Mortar Board's 'Top Prof' Award, 1994.

Research Interests/Specializations

- Mathematical Fields: Applied Mathematics, Nonlinear Evolution PDE, Asymptotic Analysis, Dynamical Systems, Model Fitting and Competition
- Areas of Application:
  - Ecology – dispersal and demographics of organisms, formation of spatial patterns
  - Entomology – developmental phenology and dynamic aspects of adaptations to the environment
  - Modeling – population dynamics, energetics of organisms, industrial chemical reactions, market pricing of derivatives, evolution of quantitative traits....

Work in Progress

1. Mathematical and simulation approaches to understanding how climate and habitat affect phenology, dispersal and outbreak behavior of Mountain Pine Beetle in North America (with B.J. Bentz, USDA Forest Service RMRS, Logan Forestry Sciences Lab).
2. Using homogenization to understand the affects of landscape heterogeneity on spread of Chronic Wasting Disease (with Dr. Dan Walsh, USGS Unit Leader, University of Montana Coop Unit, and Dr. Wendy Turner, USGS Asst. Unit Leader, University of Wisconsin Coop Unit).
3. The *Idiot's Guide to Applied Math in Biology* (IGAMBi). A book introducing mathematical and computational techniques in the context of biology applications, aimed at advanced undergraduates.

CV Contents

Publications

Below ♡ indicates publications resulting from undergraduate research and ♠ indicates publications with graduate co-authors. International collaborations are indicated with ♢.

Refereed Journals:

1. ♠ Gouda, M., J. Powell, W.J. McClure, D. Walsh and D. Storm. 2024. Characterization of the Long-distance Dispersal Kernel of White-Tailed Deer and Evaluating its Impact on Chronic Wasting Disease spread in Wisconsin. Accepted (November) Bulletin of Mathematical Biology.

2. ♠ McClure, W.J. and J. Powell. 2024. Effects of Transmission Pathways, Immunological Thresholds, and Long-Distance Dispersal on Infectious Spread: Chronic Wasting Disease Case Study. Accepted (November) Theoretical Ecology.

3. ♠ Wangen, C., J. Powell and B. Bentz. 2024. A mountain pine beetle (Coleoptera: Curculionidae) adult development rate model confirms evolved geographic differences, Journal of Insect Science, Volume 24(4), https://doi.org/10.1093/jisesa/ieae074

4. ♢ González-Olalla, J.M., Powell, J.A. and Brahney, J., 2023. Dust storms increase the tolerance of phytoplankton to thermal and pH changes. Global Change Biology, 30(1), p.e17055. https://doi.org/10.1111/gcb.17055

5. ♠ Wangen, C., J. Powell and B. Bentz. 2022. Oviposition Model for a Southern Population of Mountain Pine Beetle. Bulletin of Mathematical Biology, 84 (11). https://link.springer.com/article/10.1007/s
022-01089-1

6. Neupane, RC, JA Powell and TC Edwards. 2022. Connecting regional-scale tree distribution models with seed dispersal kernels using homogenization. Applied Mathematics and Computation, 412: 126591. https://doi.org/10.1016/j.amc.2021.126591.

7. Robbins, ZJ, C Xu, BH Aukema, PC Buotte, R Citra-Tarak, CJ Fettig, ML Goulden, DW Goodsman, AD Hall, CD Koven, LM Kueppers, GD Madakumbura, LA Mortenson, JA Powell and RM Scheller. 2021. Warming Increased Bark Beetle-Induced Tree Mortality by 30% During an Extreme Drought. Global Change Biology, (available online). http://doi.org/10.1111/gcb.15927

8. ♢ Rojano, F, L Ibarra-Juarez, J Powell, R. Salazar, AL Noriega. 2021. Modeling the impact of temperature on the population abundance of the ambrosia beetle *Xyleborus affinis* (Curculionidae: Scolytinae) under rearing conditions. J. Thermal Biology 101: 103001. https://doi.org/10.1016/j.jtherbio.2021.103001.

9. ♠ McGahan, I, J. Powell and E. Spencer. 2021. 28 Models Later: Model competition and the zombie apocalypse. Bulletin of Mathematical Biology 83:22. https://doi.org/10.1007/s11538-020-00845-5

10. ♠ Hooten, MB. X Lu, MJ Garlick and JA Powell. 2020. Animal movement models with mechanistic selection functions. Spatial Statistics (37) 100406. https://doi.org/10.1016/j.spasta.2019.100406

11. Lu, X, PJ Williams, MB Hooten, JA Powell, JN Womble and MR Bower. 2020. Nonlinear reaction-diffusion process models improve inference for population dynamics. Environmetrics (31) p.e2604. https://doi.org/10.1002/env.2604

12. Vollmer, AH, NN Youssef, JA Powell and DJ McMahon. Progressive ultrastructural changes in the casein matrix during the ripening of inadequately acidified feta cheese. 2019. Journal of Dairy Sciences 102:7734-46. https://doi.org/10.3168/jds.2019-16395

13. ♠ McManis, A., Powell, J., & Bentz, B. Modeling mountain pine beetle (*Dendroctonus ponderosae*) oviposition. 2019. Entomologia Experimentalis et Applicata pp. 457-466.(doi: 10.1111/eea.12783).

14. ♠ McManis, A., Powell, J., & Bentz, B. 2018. Developmental parameters of a southern mountain pine beetle (Coleoptera: Curculionidae) population reveal potential source of latitudinal differences in generation time. The Canadian Entomologist 151: 1-15. (doi: 10.4039/tce.2018.51)

15. Powell, J.A., M.J. Garlick, B.J. Bentz and N.A. Friedenberg. 2018. Differential Dispersal and the Allee Effect Create Power-Law Behavior: Distribution of Spot Infestations During Mountain Pine Beetle Outbreaks. Journal of Animal Ecology 87: 73-86. (https://doi.org/10.1111/1365-2656.12700)

16. Vollmer, A., Youssef, N., Powell, J., Qi, X., & McMahon, D. 2017. Understanding pH-Induced Softening of Feta Cheese During Storage at the Ultrastructural Level - A Structure-Function Case Study. Microscopy and Microanalysis, 23(S1), 1128-1129. (doi:10.1017/S1431927617006304)

17. ♠ Dupuy, M., Powell, J. and Ramirez, R. 2017. Developing a degree-day model to predict billbug (Coleoptera: Curculionidae) seasonal activity in Utah and Idaho turfgrass. Journal of Economic Entomology (DOI: 10.1093/jee/tox210).

18. Hefley, T.J., Hooten, M.B., Russell, R.E., Walsh, D.P., Powell, J.A. 2017. When mechanism matters: forecasting the spread of disease using ecological diffusion. Ecology Letters 20: 640-650. (doi.org/10.1111/ele.12763)

19. ♠♡ Duncan, J.P., J.A. Powell, R.N. Rozum and K.M. Kettenring. 2017. Multi-scale methods predict invasion speeds in variable landscapes. Case study: *Phragmites australis*. Theoretical Ecology 2017: 1-17 (doi: 10.1007/s12080-017-0329-0).

20. ♠ Duncan, J.P. and J.A. Powell. 2017. Analytic approximation of invasion wave amplitude predicts severity of insect outbreaks. SIAM J. Applied Math 77: 294-314. (doi: 10.1137/15M1042085)

21. ♠ Lewis, M. and J. Powell. 2016. Yeast for Mathematicians – A Ferment of Discovery and Model Competition to Describe Data. Bulletin of Mathematical Biology 79: 356-82.

22. ♠ Lewis, M. and J. Powell. 2016. Modeling zombie outbreaks: A problem-based approach to improving mathematics one brain at a time. PRIMUS 26(7): 705-726.

23. ♠ Bentz, B.J., J. Duncan and J.A. Powell. 2016. Vulnerability assessment of mountain pine beetle population growth in a changing climate: A case study in the US Northern Rocky Mountains. Forestry 89: 271-283; doi: 10.1093/forestry/cpv054.

24. ♠ ♢ Guiver, C.C. Edholm, Y. Jin, M. Mueller, J. Powell, R. Rebarber, B. Tenhumberg, and S. Townley. 2016. Simple adaptive control for positive linear systems with applications to pest management. SIAM J. Applied Math 76: 238-275.

25. ♠ Neupane, R.C. and J.A. Powell. 2015. Invasion Speeds with Active Dispersers in Highly Variable Landscapes: Multiple Scales, Homogenization, and the Migration of Trees. Journal of Theoretical Biology 387:111-119. https://doi.org/10.1016/j.jtbi.2015.09.029

26. ♠ Neupane, R.C. and J.A. Powell. 2015. Mathematical model of active seed dispersal by frugivorous birds and migration potential of pinyon and juniper in Utah. Applied Mathematics 6: 1506-23.

27. ♡ ♠ Duncan, J.P., J.A. Powell, L.F. Gordillo and J. Eason. 2015. A model for mountain pine beetle outbreaks in an age structured forest: Approximating severity and outbreak-recovery cycle period. Bull. Mathematical Biology 77: 1256-1284.

28. ♡ Kay, S. and J.A. Powell. 2015. Canid social structure and density dependence improve predator-prey models of *Canis latrans* and *Lepus californicus* in Curlew Valley, UT. Open Journal of Ecology, Special Issue on Modelling in Ecological Systems, Vol. 5, 120-135.

29. ♠ Addison, A., J.A. Powell, B.J. Bentz and DL Six. 2015. Integrating models to investigate critical phenological overlaps in complex ecological interactions: The mountain pine beetle-fungus symbiosis. J. Theoretical Biology 368:55-66.

30. ♠ Dooley, E.M., D.L. Six and J.A. Powell. 2015. A comparison of mountain pine beetle (Coleoptera: Curculionidae, Scolytinae) productivity and survival in lodgepole and whitebark pine after a region-wide cold weather event. Forest Science 61: 235-246.

31. ♠ Sims, C., D. Aadland, J. Powell, B. Crabb and D. Finnoff. 2014. Complementarity in the provision of ecosystem services reduces the cost of mitigating climate-amplified natural disturbance events. PNAS 111(47), 16718-16723.

32. Bentz, B.J. and J.A. Powell. 2014. Mountain pine beetle seasonal timing and constraints to bivoltinism: A comment on Mitton and Ferrenberg (2012). Am. Nat. 184: 787-796.

33. Engelhardt, K. A. M., M. E. Ritchie, and J. A. Powell. Body size and the included niche: Patterns of resource use by Tundra and Trumpeter swans. The Scientific World Journal, Volume 2014, Article ID 643694, 12 pgs.

34. Powell, J.A. and B.J. Bentz. 2014. Phenology and Density-Dependent Dispersal Predict Patterns of Mountain Pine Beetle (*Dendroctonus ponderosae*) Impact. Ecological Modelling 273: 173-185.

35. ♠ Addison, A., J.A. Powell, D.L. Six, M. Moore and B.J. Bentz. 2013. The role of temperature variability in stabilizing the mountain pine beetle-fungus mutualism. J. Theoretical Biology 336: 40-50.

36. ♠ Hooten, M.B., M.J. Garlick and J.A. Powell. 2013. Computationally Efficient Statistical Differential Equation Modeling Using Homogenization. J. Agricultural, Biological and Environmental Statistics 18: 405-428.

37. ♠♢ Strohm, S., R.C. Tyson and J.A. Powell. 2013. Pattern formation in a model for mountain pine beetle dispersal: Linking model predictions to data. Bull. Math Bio. 75:1778-1797.

38. Sims, C., D. Aadland. D. Finnoff, J. Powell. 2013. How ecosystem service provision can increase forest mortality from insect outbreaks. Land Economics, February 2013, 89:154-176.

39. ♠ Garlick, M.J., J.A. Powell, M.B. Hooten and L.R. MacFarlane. 2012. Homogenization, sex, and differential motility predict spread of chronic wasting disease in mule deer in southern Utah. J. Math. Bio., 1-31.

40. ♠ Powell, J.A., B. Kohler, J.W. Haefner and J. Bodily. 2012. Carrying BioMath Education in a Leaky Bucket. Bulletin of Mathematical Biology 74: 2232–2264.

41. Modisett, M.C. and J.A. Powell. 2012. Black-Scholes Option Pricing Model Modified to Admit a Miniscule Drift can Reproduce the Volatility Smile. Applied Mathematics 6: 597–605. DOI: 10.4236/am.2012.36093

42. ♠ Crabb, B.A., Powell, J.A. and Bentz, B.J. 2012. Development and assessment of 30-m pine density maps for landscape-level modeling of mountain pine beetle dynamics. Res. Pap. RMRS-RP-93WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 43 p.

43. ♠ Hsu, J, J. Powell and P. Adler. 2012. Sensitivity of primary production to precipitation. Global Change Biology 18:2246–2255.

44. ♢ Régnière, J., J. Powell, B. Bentz and V. Nealis. 2012. Effects of Temperature on Development, Survival and Reproduction of insects: Experimental Design, Data Analysis and Modeling. Journal of Insect Physiology 58:634–647.

45. ♢ Hansen, E.M., B.J. Bentz, J.A. Powell, D.R. Gray and J.C. Vandygriff. 2011. Prepupal diapause and instar IV developmental rates of the spruce beetle, Dendroctonus rufipennis (Coleoptera: Curculionidae, Scolytinae). J. Insect Physiology 57: 1347–1357.

46. ♠ Garlick, M.J., J.A. Powell, M.B. Hooten and L. Macfarlane. 2011. Homogenization of large scale movement models in ecology. Bulletin of Mathematical Biology 73:2088–2108.

47. ♢ Cobbold, C.A. and J.A. Powell. 2011. A Quantitative Genetics Approach to Model the Evolution of Insect Development. Bulletin of Mathematical Biology 73: 1052-81.

48. ♠ Yurk, B.P. and J.A. Powell. 2010. Modeling the Effects of Developmental Variation on Insect Phenology. Bulletin of Mathematical Biology 72: 1334-1360.

49. ♠ Garlick, M.J. and J. Powell. 2010. Mathematically Modelling Polymerase Chain Reaction: An Asymptotic Approximation with Potential for Optimization. Mathematical Biosciences and Engineering 7: 365–386.

50. ♠ Kohler, B.R., R. Swank, J.W. Haefner and J.A. Powell. 2010. Leading Students to Investigate Diffusion as a Model of Brine Shrimp Movement. Bulletin of Mathematical Biology 72: 230-257. (**Winner of the Lee Segel Prize**)

51. Powell, J.A. and B.J. Bentz. 2009. Connecting Phenological Predictions with Population Growth Rates for an Outbreak Insect. Landscape Ecology 24: 657-672.

52. ♠ Yurk, B.P. and J.A. Powell. 2009. Modeling the Evolution of Insect Phenology. Bulletin of Mathematical Biology 71: 952-979.

53. ♠ ♢ Lof, M., R. Etienne, J. Powell, M. de Gee, L. Hemerik. 2008. The effect of chemical information on the spatial distribution of fruit flies I: Model results. Bulletin of Mathematical Biology 70: 1827-49.

54. ♠ Heavilin, J. and J. Powell. 2008. A novel method for fitting spatio-temporal models to data, with applications to the dynamics of Mountain Pine Beetle. Nat. Res. Modeling 21: 489 - 524.

55. Friedenberg, N.A., J.A. Powell and M.P. Ayres. 2007. Synchrony's double edge: Transient dynamics and the Allee effect in stage structured populations. Ecology Letters 10: 1-10.

56. ♠ Kathuroju, N., M.A. White, J. Symanzik, M.D. Schwartz, J.A. Powell, R.R. Nemani. 2007. On the use of the Advanced Very High Resolution Radiometer for development of prognostic land surface phenology models. Ecological Modelling 201: 144-156.

57. Hicke, J.A., J.A. Logan, J. Powell and D.S. Ojima. 2006. Changing temperatures influence suitability for mountain pine beetle outbreaks in the western US. Journal of Geophysical Research-Biogeosciences 111, G02019.

58. ♠ ♢ P. Skelsey, W.A.H. Rossing, G.J.T. Kessel, J. Powell, and W. van der Werf. 2005. Influence of Host Diversity on Development of Epidemics: An Evaluation and Elaboration of Mixture Theory. *Phytopathology* 95:328-338.

59. ♢ J.A. Powell, I. Slapničar and W. van der Werf. 2005. Epidemic Spread of a Lesion-Forming Plant Pathogen – Analysis of a Mechanistic Model with Infinite Age Structure. *Journal of Linear Algebra and Applications* 398: 117-140.

60. J.A. Powell and J.A. Logan. 2005. Insect Seasonality – Circle Map Analysis of Temperature-Driven Life Cycles. *Theoretical Population Biology*, 67: 161-179.

61. Logan, J.A. and J.A. Powell. 2004. Ecological consequences of climate change altered forest insect disturbance regimes. Proceedings of the Pacific AAAS meeting, California Acad. Sci., Fred Wagner (Ed.), Summer, 2004.

62. ♠ ♢ Kessel, G.J.T., J. Köhl, J.A. Powell, R. Rabbinge and W. van der Werf. 2004. Modelling spatial characteristics in the biocontrol of fungi at the leaf scale: Competitive substrate colonization by *Botrytis cinerea* and the saprophytic antagonist *Ulocladium atrum*. *Phytopathology* 95: 439-48.

63. ♡ E. Gilbert, J.A. Powell and J.A. Logan. 2004. Comparison of three models predicting developmental milestones given environmental and individual variation. *Bulletin of Mathematical Biology* 66: 1821-1850.

64. ♢ J.A. Powell and N.E. Zimmermann. 2004. Multi-Scale Analysis of Seed Dispersal Contributes to the Resolution of Reid's Paradox. *Ecology*: 85(2) 490-506.

65. J.A. Logan and J.A. Powell. 2003. Modeling mountain pine beetle phenological response to temperature. Pp. 220-222 in Shore, T. (ed), Proc. of a Mountain Pine Beetle Symposium: Challenges and Solutions, October 30-31, 2003, Kelowna, BC. Rep. NOR-X-381.

66. Cutler, R., L. Brown, J. Powell, B. Bentz and A. Cutler. 2003. Identifying 'Redtops': Classification of Satellite Imagery for Tracking Mountain Pine Beetle Progression through a Pine Forest. Proceedings of 35th Symposium on the Interface, Mar. 12–15, Salt Lake City, UT.

67. ♢ J.A. Logan, J. Régnière and J.A. Powell. 2003. Assessing the Impacts of Global Climate Change on Forest Pests. *Frontiers in Ecology*, 1(3): 130-137. (This paper was selected as a **Centennial Special Notable Paper** for *Frontiers* in 2015)

68. ♢ M. de Jong, G. Bourdôt, J. Powell and J. Goudriaan. 2002. A model of the escape of *Sclerotinia sclerotiorum* ascospores from pasture. *Ecological Modeling* **150**: 83–105.

69. ♠ ♢ R. Etienne, B. Wertheim, L. Hemerik, P. Schneider and J. Powell. 2002. The interaction between dispersal, the Allee effect and scramble competition affects population dynamics. *Ecological Modelling* 148: 153–168.

70. J.A. Logan and J.A. Powell. Ghost Forests, Global Warming and the Mountain Pine Beetle. *American Entomologist* 47: 160–173, Fall 2001. (**Winner of the RMRS Best Visionary Science Publication**)

71. ♠ J.L. Jenkins, J.A. Powell, J.A. Logan and B.J. Bentz. 2001. Low seasonal temperatures promote life cycle synchronization. *Bulletin of Math Biology* 63: 573–595.

72. ♢ W. van der Werf, E.W. Evans and J. Powell. 2001. Measuring and modelling dispersal of *Coccinella septempunctata* in alfalfa fields. *European Journal of Entomology* 97: 487–493.

73. ♠ J. Powell, J. Jenkins, J. Logan and B. Bentz. 2000. Seasonal Temperature Alone Can Synchronize Life Cycles. *Bulletin Math. Biology* 62: 977–998.

74. ♠ K.A.M. Engelhardt, V.L. Roy, J.A. Powell, and J.A. Kadlec. 2000. Evaluation of translocation criteria: a case study with trumpeter swans (*Cygnus buccinator*). *Biological Conservation* 94: 173-181.

75. ♡ Z. Biesinger, J. Powell, B. Bentz and J. Logan. 2000. Direct and Indirect Parametrization of a Localized Model for the Mountain Pine Beetle – Lodgepole Pine System. *Ecological Modelling* 129: 273–296.

76. ♠ ♢ R. Etienne, B. Wertheim, L. Hemerik, P. Schneider and J. Powell. 2000. Dispersal may enable persistence of fruit flies suffering from the Allee effect and scramble competition. *Proceedings of the Dutch Entomological Society* (11): 121–128.

77. ♢ W. van der Werf, E.W. Evans and J. Powell. 2000. Dispersal of *Coccinella septempunctata* in Utah alfalfa. *Proceedings of the Dutch Entomological Society* (11): 135–144.

78. ♠ J. Powell and K.A.M. Engelhardt. 2000. Optimal trajectories for the short-distance foraging flights of swans. *J. Theor. Biology* 204: 415-430.

79. ♡ J. Powell, B. Kennedy, P. White, B. Bentz, J. Logan and D. Roberts. 2000. Mathematical elements of attack risk analysis for mountain pine beetles. *J. Theor. Biol.* (204): 601–620.

80. Logan, J.A., P. White, B.J. Bentz, and J.A. Powell. 1999. Ecological Insights Gained From Model Analysis of Mountain Pine Beetle Outbreaks. Pp 163-76 In: Cook, J. E., and B. P. Oswald (compilers) Proceedings, 1st N.A. For. Ecol. Workshop. Raleigh, NC, June, 1997.

81. ♡ J. Powell, J. Tams, B. Bentz and J. Logan. 1998. Theoretical Analysis of 'Switching' in a Localized Model for Mountain Pine Beetle Mass Attack. *J. Theor. Biology* 194: 49–63.

82. ♠ J. Powell, J. Cangelosi, AM. Harris. 1998. Games to teach mathematical modelling. *SIAM Review*, volume 40, no. 1, pp. 87–95.

83. J. Logan, P. White, B. Bentz and J. Powell. 1998. Model analysis of the temporal evolution of spatial patterns in mountain pine beetle outbreaks, *Theor. Pop. Biology* 53: 236–255.

84. ♠ J. Powell, T. McMillen and P. White. 1998. Connecting a Chemotactic Model for Mass Attack to a Rapid Integro-Difference Emulation Strategy. *SIAM J. Appl. Math* vol. 59, no. 2, pp 547-572.

85. ♠ K.A. Mott, F. Denne and J. Powell. 1997. Interactions among stomata in response to perturbations in humidity. *Plant, Cell and Environment* 20: 1098-1107.

86. P. White and J. Powell. Spatial invasion of pine beetles into lodgepole forests: a numerical approach. 1998. *SIAM J. Sci. Comp.*, vol. 20, no. 1, pp 164-184.

87. P. White and J. Powell. 1998. Phase transition from environmental to dynamic determinism in mountain pine beetle attack. *Bull. Math. Biol.* 59:609–643.

88. ♡ J. Powell and J. Rose. 1997. Local consequences of a global model for mountain pine beetle mass attack. *Dynamics and Stability of Systems* 12:1, 3–24.

89. J. Powell. 1997. Conditional stability of front solutions. *J. Math. Biol* 35: 729–47.

90. B.J. Bentz, J.A. Powell and J.A. Logan. Spatial and temporal attack dynamics of the mountain pine beetle (*Dendroctonus ponderosae*) in lodgepole pine," *USDA/FS Research Note* INT-RP-494, November 1996.

91. B.J. Bentz, J.A. Logan and J.A. Powell. 1996. Spatial and Temporal Attack Dynamics of the Mountain Pine Beetle: Implications for Management. IN *Integrating Cultural Tactics into the Management of Bark Beetle and Reforestation Pests*; Editors: J. C Gregoire, A.M. Liebhold, F.M Stephen, K.R. Day, and S.M. Salom; USDA Forest Service GTR-NE-236, pp: 153-162.

92. J. Powell, J.A. Logan and B.J. Bentz. 1996. Local projections for a global model of mountain pine beetle attacks. *J. Theor. Biol.* 179, 243–260.

93. J. Powell, E.M. Wright, J.V. Moloney. 1994. Reflection of localized beams from a nonlinear absorbing interface. *SIAM J. Appl. Math*, Vol. 54, 774–788.

94. J. Powell, J.V. Moloney, A.C. Newell and R.A. Albanese. Beam collapse as an explanation for anomalous ocular damage. *JOSA B*, Vol 10, 1230–1241, July, 1993.

95. J. Powell and P.K. Jakobsen. 1992. Localized states in fluid convection and multi-photon lasers. *Physica D* 64, 132–52, 1993.

96. J. Powell and M. Tabor. Non-generic connections corresponding to front solutions. *J. Phys. A* 25, 3773–3796.

97. J. Powell, A.C. Newell and C.K.R.T. Jones. 1991. Competition between generic and non-generic fronts in envelope equations. *Phys. Rev. A* 44, 3636–3652.

98. C.K.R.T. Jones, T.M. Kapitula and J. Powell. 1990. Nearly real fronts in a Ginzburg-Landau equation,' *Proc. Roy. Soc. Edinburgh* 116A, 193–206.

99. C. Tremback, J. Powell, W. Cotton, R. Pielke. 1987. The forward-in-time upstream advection scheme: extension to higher orders. *Monthly Weather Rev.* 115, 540–555.

Publications (continued)

Submitted to Refereed Journals:

1. ♠ McClure, W.J. and J. Powell. 2024. Homogenization reveals large-scale dynamics in the spread of chronic wasting disease. Submitted to Bulletin of Mathematical Biology (December).

In Preparation:

1. Hansen, E.M., J.A. Powell, et al. Pinyon ips phenology (*Ips confusus*)(Coleoptera: Curculionidae, Scolytinae). In preparation for Ecological Modelling, 2024.

Book Chapters:

1. ♠ Loehman, R.A., Bentz, B.J., DeNitto, G.A., Keane, R.E., Manning, M.E., Duncan, J.P., Egan, J.M., Jackson, M.B., Kegley, S., Lockman, I.B., Pearson, D.E., Powell, J.A., Shelly, S, Steed, B.E. and Zambino, P.J., 2018. Effects of Climate Change on Ecological Disturbance in the Northern Rockies. Pp. 115-141 IN: Climate Change and Rocky Mountain Ecosystems, J.E. Halofsky and D.L. Peterson (eds.). Springer, Cham. (DOI 10.1007/978-3-319-56928-4_7)

2. ♢ Régnière, J., B.J. Bentz, J.A. Powell and R. St-Amant. 2015. Individual-based modelling: mountain pine beetle seasonal biology in response to climate. Pp. 135-64 IN: Modeling Forest Landscape Disturbances, Perera, AH, BR Sturtevant and LJ Buse (eds.). Springer.

3. ♢ Régnière, J. and J. Powell. 2013. Animal life cycle models (Poikilotherms). IN: Phenology: An Integrative Environmental Science, Mark Schwarz (ed). Kluwer Academic, 564 pgs.

4. Logan, J. A. and J. A. Powell. 2009. Ecological consequences of climate change altered forest insect disturbance regimes. Pp. 98-109 *in* F. H. Wagner (ed.), Climate change in western North America: Evidence and environmental effects. Univ. of Utah Press, Salt Lake City, UT.

5. ♠ Heavilin, J., J.A. Powell and J.A. Logan. 2007. Development and parametrization of a model for bark beetle disturbance in lodgepole forest. pages 527-553 IN: K. Miyanishi and E. Johnson (eds), Plant Disturbance Ecology, Academic Press, NY.

Ph.D Thesis:

- J. Powell. *Nonlinear Fronts near a First-Order Phase Transition,* Ph.D. Thesis, University of Arizona, May, 1990.

Non-refereed Publications and Posters:

1. ♢ González-Olalla, J.M., Powell, J.A. and Brahney, J. 2024. La doble cara de las tormentas de polvo. The Conversation (Espana). https://theconversation.com/la-doble-cara-de-las-tormentas-de-polvo-224983

2. ♠ McGahan, I and J. Powell. 2017. *28 Models Later: Best Practices for Modeling the Zombie Apocalypse with Real Data.* SIAM Conference on Dynamical Systems, Snowbird, UT. **Winner of the Red Sock Award** for best poster by a student or postdoc.

3. ♠ ♡ Nydegger, R, J Duncan and J Powell. 2015. *Rooted in Hell: Predicting Invasion Rates of* Phragmites australis. Society for Mathematical Biology Annual Meeting, Atlanta.

4. ♠ ♢ Strohm, S, R Tyson and J Powell. 2012. *Pattern Formation in a Model for Mountain Pine Beetle Dispersal.* Society for Mathematical Biology Meeting, University of Tennessee, Knoxville, July 2012.

5. ♡ Kay, S and J. Powell. 2012. *Modeling Predator-Prey Interactions and Canid Sociability in Curlew, Valley UT.* Presented at Posters on the Hill (UT), February, 2012 and at NIMBioS Undergraduate Research Conference, University of Tennessee, Knoxville, October 2011.

6. ♠ Crabb, B., J. Powell and B. Bentz. 2011. *Development of high-resolution pine density maps for landscape-level modeling of mountain pine beetle.* North American Forest Insect Work Conference, May 2011, Portland OR.

7. ♡ Chea, D., K. McCullogh, J. Powell and R.C. Sims. 2011. *Daphnia Impact on Logan Wastewater Lagoons.* Poster presented at Institute of Biological Engineering Conference in Atlanta, George. **Special Recognition Award** from the Korean Society of Biotechnology and Bioengineering (KSBB).

8. ♡ Chea, D., K. McCullogh, J. Powell and R.C. Sims. 2010. *Daphnia-Algae Modeling of the Logan Wastewater Lagoons.* Poster presented at Biological Engineering Regional Conference, Logan, UT.

9. ♠ Hooten, M.B., M.J. Garlick, and J.A. Powell. 2009. Change of support in inverse implementations of statistical differential equation models. 2009 Proceedings of the American Statistical Association. Alexandria, VA: American Statistical Association: pp. 1847-1857.

10. ♠ Garlick, M.J., J.A. Powell and M. Hooten. 2009. *Homogenization of Large Scale Movement Models with Application to Spread of Wasting Disease in Ungulate Populations.* Poster presented at Society for Math Biology Meeting, Vancouver.

11. ♠ Garlick, M.J. and J.A. Powell. 2007. *Modelling Polymerase Chain Reaction and Implications for Optimization.* Poster presented at Joint Society for Math Biology/American Mathematical Society Meeting.

12. ♠ Bush, B., A. Criddle and K. Huang. 2006. *Characterizing Output of PCR.* Poster presented at USU Industrial Biosciences Workshop.

13. ♢ Carroll, A.L., J. Régnière, J.A. Logan, S.W. Taylor, B.J. Bentz and J.A. Powell. 2006. Impacts of Climate Change on Range Expansion by the Mountain Pine Beetle. Mountain Pine Beetle Initiative Working Paper 2006-14, Natural Resources Canada, Canadian Forest Service Pacific Forestry Center, Victoria B.C.

14. ♠ Yurk, B.P. and J.A. Powell. 2005. *Partial differential equations and phenology modelling.* Poster presented at the 2005 Joint European Society of Mathematical and Theoretical Biology/Society for Math Biology meeting in Dresden, Germany.

15. ♠ Heavilin, J. and J. Powell. 2005. *Modelling Mountain Pine Beetle Outbreaks at Landscape Scales.* Poster presented at the 2005 Joint European Society of Mathematical and Theoretical Biology/Society for Math Biology meeting in Dresden, Germany. **First Prize Winner** from over 300 presented posters.

16. ♡ Leek, J.T. and J.A. Powell. *Mathematical and Computational Methodology for Predicting the Emergence of Insect Pests*, poster presented at the 2003 Annual Meeting of the Society of Mathematical Biology, Dundee, Scotland.

17. ♡ Leek, J.T. and J.A. Powell. *Mathematical and Computational Methodology for Predicting the Emergence of Insect Pests*, poster presented at the 2003 Council for Undergraduate Research Meeting, Washington, D.C.

18. ♠ Bentz, B.J., J.A. Powell, J.A. Logan and E. Gilbert. *Field Validation of Mountain Pine Beetle Phenology Models*, poster presented at 2002 Entomological Society of America Meeting, Ft. Lauderdale, Florida.

19. ♠ Heavilin, J., J.A. Powell, J.A. Logan and B.J. Bentz. *The Red-Top Model*, poster presented at 2002 Society of Math Biology Meeting, Knoxville, Tennessee.

20. ♠ Gilbert, E., J.A. Powell, J.A. Logan and B.J. Bentz. *Modelling Phenology with Variability*, poster presented at 2002 Society of Math Biology Meeting, Knoxville, Tennessee.

21. ♠ Tangermann, H, J. Powell and T. Messmer. 2002. *Swan Flight Dynamics and Vulnerability.* Poster presented at National Wildlife Management Society Meetings.

22. Sullivan, K.A. and J.A. Powell. *The Energetics of Bird Migration: An Applied Project in Optimization.*, invited poster session - Educating about Behavior, presented at Animal Behavior Society Meeting Oregon State University, July 14-18, 2001

23. Powell, J.A. 2001. *Spatio-Temporal Models in Ecology: An Introduction to Integrodifference Equations.* Course notes and lab exercises for courses taught at Wageningen University, the Netherlands.

24. Black, K., J.A. Powell, J.A. Logan and B.J. Bentz. Epidemic Waves in a Discrete Time Model of Bark Beetle Infestation, poster presented at the 2001 Society of Math Biology Meeting, Hilo, Hawaii.

25. Logan, J.A., B.J. Bentz, and J.A. Powell. 2001. Ghost forests, global warming, and the mountain pine beetle. In Volney, W.J.A., J.R. Spence and E.M Lefebvre (eds), Boreal Odyssey: Proceedings of the North American Forest Insect Work Conference, Edmonton, Alberta, Canada, pp. 27-28.

26. ♡ Bentz, B.J., J.A. Logan, J.A. Powell, and E. Hanks. 2001. Modeling the impacts of temperature on the population dynamics of the mountain pine beetle. In Volney, W.J.A., J.R. Spence and E.M Lefebvre (eds), Boreal Odyssey: Proceedings of the North American Forest Insect Work Conference, Edmonton, Alberta, Canada, pp. 101.

27. Bentz, B.J., J.A. Logan, and J.A. Powell. 2001 Mountain pine beetle population distribution: influences of an adaptive seasonality. . In Volney, W.J.A., J.R. Spence and E.M Lefebvre (eds), Boreal Odyssey: Proceedings of the North American Forest Insect Work Conference, Edmonton, Alberta, Canada, pp. 151.

28. J. Logan, P. White, B. Bentz and J. Powell. Model analysis of spatial patterns in mountain pine beetle outbreaks. Proceedings, First Biennial American Forest Ecology Workshop (abstract of presented paper), 1997.

29. B.J. Bentz, J.A. Logan and J.A. Powell. Spatial and temporal attack dynamics of the mountain pine beetle: Implications for Management, proceedings of the joint meeting of IUFRO Working Parties on Population Dynamics of Forest Insects, Vallombrosa, Italy, September 1996.

30. B.J. Bentz, J.A. Powell and J.A. Logan. Self-focusing and Self-dissipation: Strategies for Mountain Pine Beetle Survival. Proceedings: North American Forest Insect Work Conference (abstract), Texas Forest Service Publication 160, April 1996.

31. P. White and J. Powell. *Computational Labs in Mathematica for Vector Calculus*, 1996.

32. J.V. Koebbe and J. Powell. *Mathematica in Context: Applied Problem Solving with the Aid of a Computer*. Pre-published text for use in Math 462-63, Computer Aided Mathematics for Teachers, Scientists and Engineers.

33. J. Powell. *Beam Collapse in the Human Eye.* Research report under AFOSR grant number 910074, October, 1990.

34. J. Powell. *Beam Collapse in the Human Eye: Numerical Model.* Research report under AFOSR grant number 910074, April, 1991.

35. J. Powell and A. Bernoff. Saddle-node bifurcation of slowly-varying, nonlinear travelling waves, technical report written for research under AFOSR grant number 900021, May, 1989.

Invited Talks and Presentations:

1. *Homogenization across Scales Reveals Relative Strengths of Environmental and Direct Transmission of Chronic Wasting Disease in Deer.* Invited talk, Society for Mathematical Biology Annual Meeting, Columbus, OH, July, 2023.

2. *Invasion Speeds in Highly Variable Landscapes: Multiple Scales, Homogenization and the Migration of Trees.* Invited talk, European Conference on Mathematical and Theoretical Biology/Society for Mathematical Biology Annual Meeting, Nottingham, July 2016; Integrodifference Equations in Mathematical Biology: Thirty Years and Counting, Banff International Research Station, September, 2016; Society for Mathematical Biology Annual Meeting, Montreal, 2019.

3. *Data Collection as a Modeling Challenge in the Classroom: Laboratory Experiences in Mathematical Biology.* Invited talk, Society for Mathematical Biology Annual Meeting, Atlanta, GA, June 2015.

4. *One spot, two spot, red spot grew spots: How differential dispersal, phenology and the Allee effect predict pattern formation in mountain pine beetle impact.* Invited talk, Society for Mathematical Biology Annual Meeting, Atlanta, GA, June 2015.

5. *Research/Teaching Statements for Job Applications.* Invited talk, SIAM Student Chapter, USU. November 15, 2013.

6. *Modeling Pest Dynamics in the Limit as Trees become Broccoli: Lessons from the Mountain Pine Beetle.* Invited talk, National Institute for Mathematical and Biological Synthesis (NIMBioS) Investigative Workshop on "The evolution of pest resistance to crop protection strategies: What we know, the models we have, and the models we need." University of Tennessee, Knoxville, November 2013.

7. *How mechanistic models with landscape resistance, direct temperature effects on life-cycle timing, and the Allee effect explain bark beetle outbreaks.* Invited talk, Ecological Society of America Meeting, Minneapolis, MN August 2013.

8. *Slow Down, Bring your Friends, and Eat a Tree: How Phenology and Differential Dispersal Predict Landscape Patterns of Mountain Pine Beetle Impact.* Invited talk, Western Forest Insect Work Conference, Couer d'Alene, ID, March 4-7, 2013.

9. *Informative and Inspiring Mathematical Writing (with Students).* A workshop given at MAA Sectional Meeting, BYUI Rexburg, March 29, 2013

10. *Instantaneous NSF.* University of Alabama, Birmingham Nutrition and Obesity Research Center, September 2012.

11. *Math and the Life-Impaired: How Disease Theory Predicts the Zombie Apocalypse.* USU College of Science 'Science Unwrapped' February, 2012. (**Highest attendance in the five-year history of Science Unwrapped.**) Plenary talk, MAA Sectional Meeting, BYUI Rexburg, March 29, 2013. Fearless Friday Talk, Colorado College, May, 2014. Invited lecture, Sitka Science Center, Sitka AK, January 2015.

12. *Emerging at the Right Time, Stopping at the Right Place, and Scaling Up the Right Way: Phenology and Differential Motility Describe Patterns of Bark Beetle Outbreak.* UBC Okanagan, September, 2011; University of Colorado, November, 2011; Colorado State University, October 2012; University of Montana, October 2012.

13. *The Timing of Insect Development and Trajectory of Bark Beetle Outbreaks.* SIAM Conference on Dynamical Systems, Snowbird, UT May 2011; UBC Okanagan, September, 2011; Colorado College, November, 2011.

14. *Being on Time: Tree-Level Phenology, Landscape Outbreaks and Evolutionary Dynamics for Mountain Pine Beetle.* Keynote Speaker, Tria Project Scientific Workshop, Edmonton, Alberta November, 2009.

15. *Connecting Tree-level Phenology and Landscape-level Mountain Pine Beetle Outbreak Dynamics*. Invited speaker, Society of Math Biology Minisymposium on Modelling Forest Insects, Vancouver, July 2009, University of Gröningen Department of Evolution and Ecology, May 2009, Mathematical Biology Seminar, University of Utah, October, 2009, Departments of Wildlife Science and Applied Economics, USU, Spring 2010, Department of PHysics, USU, Spring 2011.

16. *Mountain Pine Beetle, Ecology, Modelling and Risk Analysis*. With J. Régnierè and B.J.B Bentz. Laurentian Forestry Centre, Canadian Forest Service, Quebec, Quebec. October 2008.

17. *Ghost Forests, Global Warming and the Mountain Pine Beetle*. Loyola Marymount University, February 2008.

18. *Mathematical Modelling and Mountain Pine Beetles 1994-2007: A Case Study*. 2007. Invited Plenary talk at the Fredericton 'Spread' workshop, Fredericton, New Brunswick.

19. ♠ Yurk, B.P. and J. Powell. 2007. *Evolution of Phenology*. Presented by Brian Yurk at Joint SMB/AMS Meeting.

20. *Connecting Tree-level Phenology and Landscape-level Mountain Pine Beetle Outbreak Dynamics: Where did All the Green Trees Go?*. North American Forest Insect Work Conference, 2006; University of Alberta, 2006; University of Dundee, 2007, Heriot-Watt University, 2007, University of Glasgow, 2007; 65th Birthday Conference for Jim Cushing, University of AZ, 2007.

21. *Invasion of Mountain Pine Beetle due to Climate Change*, Invasion Models in Ecology and Biology, Banff International Research Station/MSRI, November, 2004.

22. *Modelling Development with Variability in Phenotype and Environment*, Workshop on Transport Models in Industry, Traffic, and Biology, ASU, February, 2003; Society for Math Biology Annual meeting, Dundee, Scotland, August, 2003; Wageningen University, September, 2004; Arizona State University, February, 2005; Western Forest Insect Workshop, Victoria, BC, March 2005; Dartmouth College, May, 2005.

23. *The Mathematical Basis for Modelling Insect Seasonality*, Joint Meetings of the Entomological Societies of America and Canada, Montreal, December, 2000; Natural Resource Ecology Lab (CSU), January, 2001; University of Alberta, February, 2002.

24. ♡ Leek, J.T. and J. Powell. 2003. *Numerical approaches to solving PDE modelling Mountain Pine Beetle Phenology*. Presented by Jeff Leek at the regional AMS meeting in Salt Lake City.

25. *Quantitative Environmental Biology Workshop*, NSF-sponsored, invitation-only workshop to help determine future directions for quantitative environmental biology. San Diego Supercomputer Institute, September, 2000.

26. *Teaching Mathematics in the Biology Classroom: BioMathLab at Utah State University*. Annual meeting of the Society of Mathematical Biology, Salt Lake City, Utah, August, 2000.

27. *Spatio-Temporal Models in Ecology: An Introduction to Integro-Difference Equations*. Two-week post-graduate workshop taught at Wageningen University, the Netherlands, February, 1999; to be repeated Spring, 2001.

28. *Mathematical Elements of Spatial Risk Analysis in the MPB/Forest System*, International Workshop on Spatially Heterogenous Problems in Ecology and Epidemiology, Fifth International Conference in Mathematical Population Dynamics, Zakopane, Poland, June 1998. (Also presented in: Theoretical Production Ecology Workgroup and Sub-department of Entomology, Wageningen Agricultural University, 1999; Gödöllö Agricultural University, Gödöllö, Hungary, May 1999).

29. *Dynamics of Mass Attack: Local Projections of Global Models*, presented at the Interdisciplinary Nonlinear Dynamics Seminar, USU, Nov. 1995. Also invited to National Forest Insect Work Conference, April, 1996, and Gordon Research Conference, June 1996.

30. *Mathematical Issues in Ultra-Short Propagation*, presented at Physics Colloquium, USU, Nov. 1995.

31. *Mathematical Models of Mass Attack in Mountain Pine Beetles* at: the Nonlinear Analysis Conference, University of Utah, Salt Lake City, Utah, April 1994; the Department of Chemistry, USU, May 1994; Mathematical Biology Seminar, University of Utah, Salt Lake City, Utah, May 1994; Department of Mathematics, Colorado State University, September, 1994; Department of Biology, USU, November, 1994; Weber State University, February 1995; Mathematical Models in Population Dyanamics Conference, USU, August 1995.

32. *Reflection of Localized Beams from a Nonlinear Absorbing Interface*, at the Applied Math Colloquium, University of Utah, Salt Lake City, Utah. March, 1993. Presented also at the Applied Math Colloquium, University of Arizona, Tucson, Arizona, April, 1993, and at Idaho State University, November, 1993.

33. *Localized States in Fluid Convection and Multi-Photon Lasers*, at the SIAM meeting on Dynamical Systems, Snowbird, UT, October, 1992; Physics Colloquium, Utah State University, May 1992.

34. *Pulse Dynamics at Interfaces between Nonlinear Materials*, presented at the Applied Math Colloquium, University of Colorado, Boulder CO. September 1992.

35. *Accuracy-Optimized Approaches to Self-Steepening in Self-Focussing, Ultra-Short Laser Pulses*, at the meeting Computational Optics and its links to Computational Fluid Dynamics. Arizona Center for Mathematical Sciences, Tucson, AZ. March, 1992.

36. *Pulse Dynamics at Interfaces between Nonlinear Materials*, presented at the Physics Colloquium, Utah State University, May 1992.

37. *First Year Project Report on Beam Collapse as an Ocular Damage Mechanism*, presented to contract monitors and staff at the Directed Energy Division, Radiation Analysis Branch, School of Aerospace Medicine, Brooks AFB, San Antonio, Texas. June 1991.

38. *Nongenericity and Stability in Front Solutions*, presented at the Applied Math Colloquium, University of Colorado, Boulder CO. October 1990.

Proposals Funded

1. *Integrating host behavior and environmental transmission of chronic wasting disease using homogenization of spatially-explicit models.* USDA/NIFA 2022-27 (subaward from University of Wisconsin $250,000, JP was co-PI on original $2.5 million proposal)

2. *Mathematical models and homogenization of deer dispersal, environmental hazard, and direct/indirect transmission to predict spread of chronic wasting disease.* US-DOI/USGS, 2021-2025. ($60,000, JP is PI).

3. *Northern States Mathematical Biology Workshop: Stochastic Spatial Dynamics in Biology.* NSF DMS/MathBio, 2021-22. ($15,000, JP is co-PI).

4. *Unifying mathematical and statistical approaches for modeling animal movement and resource selection.* NSF DMS/BIO, 2016-2020. ($190,000, JP is USU PI; collaborative grant with Colorado State University, Mevin Hooten PI, and South Dakota School of Mines and Technology, Martha Garlick PI.)

5. *Predicting mountain pine beetle phenology and forest susceptibility in the southwester United States.* USDA Forest Service, 2015-2020. ($24,024, JP is PI).

6. *Bridging Math and Science - Authentic Laboratory Experiences in Mathematical Biology.* NSF-TUES Type I, 2013-15. ($100,000, JP is USU PI; collaborative grant with Colorado College, Andrea Bruder PI.)

7. *Landscape-Scale Enhanced Mountain Pine Beetle Model.* USDA Forest Service, 2009-015. ($60,000, JP is subcontractor as part of $80,000 WWETAC grant to Barbara Bentz, USDA Forest Service RMRS.)

8. *Phenological coupling and decoupling in mutualism: Temperature effects on a bark beetle host and two fungal symbionts.* NSF DEB 2009-13. ($113,000 subcontract, Diana Six, University of Montana is PI.)

9. *Constructing an Intermediate-Complexity Biological Modeling Framework for Nutrient Cycling in Lakes Based on Physical Structure.* USU Water Initiative, May 2008. ($11,000, JP is PI.)

10. *Evolutionary Models for Phenology.* Linked travel proposals to the Royal Society of London, Edinburgh and London Math Societies, 2007. ($12,000, Christina Cobbold, University of Glasgow, was PI.)

11. *Validating a Southern Pine Beetle Phenology Model and Testing Hypotheses of Spot Initiation and Success.* USDA Forest Service Southern Research Station, 2006-07 ($20,000, JP is PI).

12. MATLAB *Implementation of an Improved Southern Pine Beetle Phenology Model and Hypotheses of Spot Initiation and Success.* USDA Forest Service Rocky Mountain Research Station, 2006-07 ($11,000, JP is PI).

13. *PCR Thermal Protocol Optimization.* Idaho Tech, Inc, 2005-06,($12,000, J.P. was PI, proposal supports a graduate student).

14. *Bark Beetle Phenology Modelling with Full Variability in Temperatures and Among Individuals.* USDA Forest Service Southern Research Station, 2005-06, ($20,000, J.P. was PI).

15. *Mathematical Determination of Climate Change Impacts on Range of Mountain Pine Beetle.* Canadian Forest Service, 2003-2006, ($52,000, J.P. was PI).

16. *Advance-US: Applying a Business Model to a University.* NSF-SBE, 2003-2008, ($\sim$ $3,000,000, JP was co-PI in a team of four: Ronda Callister (PI, Management and Human Resources), Kim Sullivan (co-PI, Biology), Christine Hult (co-PI, English)).

17. *The Role of Mathematics and Computation in Systems and Integrative Biology.* NSF-BIO, 2003-2004. ($\sim$ $35,000 workshop proposal, JP was PI).

18. *Homogenization and Simulation Applied to Optimize Heating Designs.* Contract with Idaho Technologies, Inc. 2003-2005. ($\sim \$17,000$, J.P. was PI).

19. *Integration of Mountain Pine Beetle Models across Spatial and Temporal Landscapes.* USDA-FS RMRS Research Station 2001-2003. ($\sim \$16,000$, J.P. was PI).

20. *Homogenization Applied to Integrate Across Spatial and Temporal Scales in Forest/Insect Ecology* (NSF, 2000-03, $\sim$ \$340,000, J.P. was PI; co-PIs: B. Bentz (USDA-FS), D.R. Cutler (Stats), J. Logan (USDA-FS)). REU and RET supplements support two undergraduates and a local teacher.

21. *Predicting Emergent Dyanamics of ANT Systems*, DARPA, 2000-03 ($\sim \$460,000$, J.P. was PI; co-PIs: T. Moon (Engineering), D. Watson (Computer Science)).

22. *Flight Dynamics of Trumpeter Swans*, US Fish and Wildlife Service, 2000-2005 ($\sim \$10,000$, J.P. was PI).

23. *Optimal Flight Dynamics as a Limiting Factor to Trumpeter Swan Migration*, Utah Mineral Lease Replacement Fund, 2000-01 ($\sim \$40,000$, J.P. was PI; co-PI: V. Roy (USFWS)).

24. *International Collaboration on Modelling Biocontrol of Fungal Pathogens*, NSF, 1998-2000 ($\sim \$11,000$, J.P. was PI).

25. *BioMathLab: Modelling Biological Processes in the Laboratory*, FIPSE, 1997-2000 ($\sim \$318,000$, J. Haefner (Biology) was PI; J.P. was co-PI with J. Koebbe (Math), J. Cangelosi (Math), A. Lindahl (Biology)).

26. *Acquisition of a High-Performance Computer for Mathematical Sciences Applications*, NSF/MRI 1997-99 ($\sim \$150,000$, J.P. was co-PI, then acting PI; H. Walker was initial PI; co-PIs: A. Cutler (Stats), K. Hestir (Math), E. Stone (Math)).

27. *Developing an Integro-Difference Approach to MPB Dispersal*, USDA/FS, 1996-97 ($\sim \$17,000$). Proposal funded postdoctoral associate and development of integro-difference emulation strategy for the MPB dispersal model.

28. NSF REU Supplement to *Nonlinear self-focussing...* grant, 1996-97, ($\sim \$10,000$). Proposal funded research for two undergraduates.

29. *Predicting Bark Beetle Dispersal in Western Forests*, Utah Mineral Lease Proposal, 1996-97 ($\sim \$45,000$). Funded data collection, parametrization and validation of MPB dispersal model. (J.P. was PI; co-PIs: B. Bentz (USDA-FS), J. Logan (USDA-FS), D. Roberts (Forestry))

30. *Spatial Invasion of Pine Beetles into Lodgepole Forests, Year 2*, USDA/FS Proposal, 1995-96 ($\sim \$32,000$). Proposal continued postdoctoral funding and development of 'local' projections for global models. (J.P. was PI; co-PIs: B. Bentz (USDA-FS), J. Logan (USDA-FS))

31. *Nonlinear Self-Focussing as a Mechanism for Generating Spatial Complexity in Ecosystems*, NSF, 1995-97 ($\sim \$50,000$). (J.P. was PI; co-PIs: B. Bentz (USDA-FS), J. Logan (USDA-FS), D. Roberts (Forestry))

32. *Southwest Regional Institute for Mathematical Sciences (SWRIMS)* NSF, (W.Y. Velez was P.I, USU a collaborative institution with the University of Arizona), 1995-97 ($\sim \$70,000$). Proposal funded integration of research and education at levels from high school to university.

33. *Spatial Invasion of Pine Beetles into Lodgepole Forests*, USDA/FS, 1994-95 ($\sim \$35,000$). Proposal funded a postdoctoral associate and development of spatial dispersal model for MPB.

34. *Study of Optical Shock Formation in Self-Focussing, Ultra-Short Pulses*, University Faculty Research Grant 1991-92 ($\sim \$10,000$).

35. Proposal to the SCREMS program, NSF, for an improved graphical computing environment in the math department. (J.Powell was co-PI, proposal written with J. Koebbe, K. Hestir, H. Walker.)

36. *Safety Standard Development for Ultra-Short Laser Pulses*, AFOSR, 1990-91. (J.V. Moloney was PI)

Other Information

Journal Review

Agricultural and Forest Entomology, European Journal of Applied Math, SIAM Journal of Applied Math, Physica D, Mathematical Reviews, Physical Review A, Diversity and Distributions, Ecology, Ecological Monographs, Ecological Applications, Environmental Entomology, Journal of Applied Entomology, Forest Ecology, Journal of Mathematical Biology, Journal of Theoretical Biology, Bulletin of Mathematical Biology, Philosophical Transactions of the Royal Society of London

Current Students

1. W. Jacob McClure (PhD – Interdisciplinary Math)

Past PhD Students (Major Advisor)

1. Audrey Addison (PhD –Interdisciplinary Math)
2. Jacob Duncan (PhD – Math)
3. Marti Garlick (PhD – Interdisciplinary Math)
4. Justin Heavilin (Ph.D.–Interdisciplinary Math)
5. Matt Lewis (PhD – Interdisciplinary Math)
6. Ian MacGahan (PhD – Math)
7. Ram Neupane (PhD – Math)
8. Brian Yurk (Ph.D.–Interdisciplinary Math)

Past MS Students (Major Advisor)

1. Daniel Balls (MS – Math)
2. Zy Biesinger (MS–Biology)
3. Bradley Bush (MS–Industrial Math)
4. Alicia Caldwell (MS – Math)
5. Alia Criddle/Maw (MS–Industrial Math)
6. Estella Gilbert (MS–Industrial Math)
7. Menna Gouda (MS – Math)
8. AnnMarie Harris (MS–Math)
9. Kun Huang (MS–Industrial Math)
10. Jan Jenkins (MS–Math)
11. Matt Lewis (MS – Math)
12. Anne McManis (MS – Biology)
13. Tyler McMillen (MS–Math)
14. Sarah Reehl (MS – Industrial Math)

15. Chris Retford (MS–Industrial Math)
16. Michael Rigley (MS – Math)
17. Audrey Smith (MS – Math)
18. Heidi Tangermann (MS –Fisheries and Wildlife)
19. Catherine Wangen (MS – Statistics)

Undergraduate: Arjun Ayyangar (with MJ Garlick, Math, SDSMT), Zy Biesinger (Biology), Dawance Chea (Biological Engineering), Shaina Columbe (with MJ Garlick, Math, SDSMT), Mac Cutler (Applied Math), Joe Eason (Math/Physics), Estella Gilbert (Math), Ephraim Hanks (Math), Sujit John (Math/CS), Shannon Kay (Undergrad, Wildlife), Bruce Kennedy (Math), Michael Larkin (Math/Education), Jeff Leek (Math), Rachel Nydegger (Physics), Andrew Pound (Math/Physics), Chris Retford (Math), Jason Rose (Math/Physics), Ben Seamons (Biochemistry and Mathematics), Lizzie Spencer (Math), David Stowell (Computational Math), Jessica Tams (Math/Physics), Ethan Williams (Math)

Conferences/Workshops Organized:

1. **Laboratory Experiences for Mathematical Biology Students**. A mini-symposium offered at the Society for Mathematical Biology Annual Meeting, 2015, in Atlanta. Co-organized with Brynja Kohler, USU and Andrea Bruder, Colorado College.
2. **Model Fitting Across the Mathematics Curriculum**. Co-organized with David Brown, Colorado College, and offered on April 17, 2015 at the MAA sectional meeting at Colorado College, Colorado Springs, Colorado.
3. **The Role of Mathematics and Computation in Systems and Integrative Biology**. NSF-funded workshop to suggest the future course of integrative biological research involving mathematics, statistics and computer science. Held on the USU campus, March 2003.
4. **Spatio-Temporal Models in Ecology: An Introduction to Integro-Difference Equations**. Post-graduate course sponsored by the Graduate School, Wageningen Agricultural University, Wageningen, the Netherlands, February, 1999. Repeated in Spring, 2001, Spring, 2009.
5. **Spatial Dynamics in Ecology: Redefining the Paradigm**. Mini-symposium proposed for the SIAM General Meeting, June 1997.
6. **SWRIMS Biology/Applied Math Instruction Model Workshop** for high school and college instructors, sponsored by NSF through SWRIMS, November, 1995.
7. **Mathematical Models of Population Dynamics**, sponsored by NSF through SWRIMS, August, 1995.
8. **Singularities in Physical Systems,** USU mini-conference, June, 1992.

Programs and Courses

- Redesigned Applied Math/Numerical Analysis/Mathematical Biology Graduate Curriculum (with M. Cortez, L. Gordillo, J. Koebbe, B. Kohler, N. Nguyen and ZQ Wang), 2015.
- Organized the Quantitative Ecology Block for the USU Ecology Center (with T. Edwards), Wildland Resources, 2012.
- Industrial/Interdisciplinary Projects in Applied Mathematics capstone course for the Industrial Mathematics Program at USU. Course involves applied problem solving and presentation in group/studio format. 2006-2008.

- As graduate director redesigned the Interdisciplinary Ph.D in Math, a doctoral program integrating graduate course work outside of mathematics, aimed at encouraging and supporting cross-disciplinary research in math, 2006-2009.
- Developed and taught Math 4910-LD, Introduction to Linear Algebra and Differential Equations, for USU's UMEP Distance Education program, taught to in-service Utah Math Teachers over USU's satellite network, 2005-2007.
- Developed and taught an international course in "Spatial Modelling in Ecology: an Introduction to Integrodifference Equations" for the Graduate School of Wageningen University, the Netherlands, 1999, 2004, 2009.
- Developed and co-taught Applied Math in Biology with J. Haefner (Biology, USU), a team-taught capstone course for the BioMath Minor, 1998.
- Designed the BioMath Minor (with J. Koebbe and J. Haefner), an interdisciplinary minor program for students in Mathematics, Statistics, Biology, and Biological and Irrigation Engineering, 1994-6.
- Constructed the Industrial Master's Program (with J. Koebbe and E. Stone), a professional masters program geared to generate students trained to apply mathematics in private-sector environments, 1995.
- Developed and taught the Honors Calculus sequence at USU, 1994-95.

Departmental, College and University Service

- Search Committee Member, Numerical Analysis, Computational Math and Data Science 2024-25.
- Search Committee Chair, Applied Probability and Mathematical Biology, 2020-21.
- Applied/MathBio Coordinator, 2021-present.
- Interim Department Head, 2019-21.
- Asst. Department Head for Graduate Studies (Department), 2016-17.
- Search Committee Chair, Mathematical Biology (Department), 2011-12, 2013-14 and 2016-17.
- Search Committee Chair, Mathematics Education (Department), 2012-13.
- College of Science Research Advisory Committee (College), 2006-2012.
- Graduate Committee (Department), 1999-2000, 2002-2005, 2011-2013 (Chairman 2006-2009).
- Honors Advisory Council (University), 1999-2002.
- Departmental Honors Coordinator (Department), 1996-1998, 1999-2009.
- Co-Chairperson (with Emily Stone and David Peak), Interdisciplinary Nonlinear Dynamics Seminar (INDy), 2000-2002.
- Industrial Master's Committee (Department), 1996-present.
- Undergraduate Advising (Department) 1993-97.
- Computer Committee (Department), 1993-96, 97-98 (Chairman, 1993-94).
- Colloquium Committee (Department) 1992-95 (Chairman, 1992-93).
- Math Dept. Search Committee (Department), 1992-93.
- Summer Lecture Series Committee (College), 1991-92.
- Graduation Ceremonies Committee (University), 1992-95 (Chairman 1994-95).