
Edward S. Rutherford Phone (734)-741-2118
 NOAA Great Lakes Environmental Research Lab FAX (734)-741-2205
 4840 S. State Rd Internet: Ed.Rutherford@noaa.gov
 Ann Arbor, MI. 48108-9719

Education

Ph.D., Marine Environmental Estuarine Sciences	University of Maryland	1992
M.S., Marine Science	University of Miami	1982
B.S., Biology	Tufts University	1976

Experience

Research Fishery Biologist, NOAA Great Lakes Environmental Research Laboratory (October 2008 – present); Interim Director University of Michigan Cooperative Institute for Limnology and Ecosystems Research (June 2007 – September 2008); Associate Research Scientist, University of Michigan, Ann Arbor, MI. (2003-2008); Assistant Research Scientist, University of Michigan (1994-2003); Postdoctoral Fellow, Oak Ridge Associated Universities, at Cornell University, Ithaca, NY. (1992-1994); Graduate Fellow, Electric Power Research Institute, University of Maryland, Solomons, MD. (1991-1992); Graduate Research Assistant, University of Maryland, Solomons, MD. (1987-1991); Fisheries Technician, Everglades National Park, Homestead, FL. (1979-1987).

Professional and Scientific Organizations

Member American Fisheries Society, International Association for Great Lakes Research

Publications (89 total)

- Zhang, H., **E. S. Rutherford**, D. M. Mason, X. Zhu, and T. B. Johnson. 2022. An ecosystem level assessment of hypoxia impacts on the food web and fisheries of Lake Erie. *A.E.H.M.*
- Apriesnig, J. L., T. W. Warziniack, D. C. Finnoff, H. Zhang, K. D. Lee, D. M. Mason, and **E. S. Rutherford**. 2022. The consequences of misrepresenting feedbacks in coupled human and environmental models. *Ecological Economics* 195. <http://doi.org/10.1016/j.ecolecon.2022.107355>
- Brockmann, S. H. Zhang, D. M. Mason, and **E. S. Rutherford**. 2022. Space and Species Interactions in Welfare Estimates for Invasive Species Policy. *Front. Ecol. Evol.* 9:703935. doi: 10.3389/fevo.2021.703935.
- Rowe, M. D., S. E. Prendergast, K. M. Alofs, D. B. Bunnell, **E. S. Rutherford**, and E. J. Anderson. 2022. Predicting larval alewife transport in Lake Michigan using hydrodynamic and Lagrangian particle dispersion models. *Limnology and Oceanography* pp. 1-17.
- Stadig, M., T. O. Höök, S. C. Guffey, **E. S. Rutherford**, and P. D. Collingsworth. 2022. Spatio-temporal trends in the density and condition of a secondary consumer,

- Bythotrephes, in southern Lake Michigan. *J. Great Lakes Research* 48(4):1121-1127.
- Rutherford, E.S.**, H. Zhang, Y-C Kao, D. M. Mason, A. Shakoor, K. Bouma-Gregson, J. T. Breck, D. M. Lodge, W. L. Chadderton. 2021. Potential effects of bigheaded carps on four Great Lakes food webs. *North American Journal of Fisheries Management*. <https://doi.org/10.1002/nafm.10527>
- Robinson, K., P. J. Alsip, D. A. R. Drake, Y.-C. Kao, M. A. Koops, D. M. Mason, **E. S. Rutherford**, and H. Zhang. 2021. Reviewing uncertainty in bioenergetics and food web models to project invasion consequences: four major Chinese carps in the Great Lakes. *J. Great Lakes Res.* 47:83-95.
- Bunnell, D. B., S. A. Ludsin, R. L. Knight, L. G. Rudstam, C. E. Williamson, T. O. Hook, P. D. Collingsworth, B. M. Lesht, R. P. Barbiero, A. E. Scofield, **E. S. Rutherford**, L. Gaynor, H. A. Vanderploeg, M. A. Koops. 2021. Consequences of changing water clarity on the fish and fisheries of the Laurentian Great Lakes. *Can. J. Fish. Aquat. Sci.*
- Newcomb, T. J., P. W. Simonin, F. A. Martinez, W. L. Chadderton, J. M. Bossenbroek, B. Cudmore, M. H. Hoff, R. P. Keller, B. D. Ridenhour, J. D. Rothlisberger, **E. S. Rutherford**, S. Van Egeren, D. M. Lodge. 2021. A best practices case study for scientific collaboration between researchers and managers. *Fisheries* 46 (3):131-138.
- Alsip, P. J., H. Zhang, M. D. Rowe, E. S. Rutherford, D. M. Mason, C. M. Riseng, and Z. Su. 2020. Modeling the interactive effects of nutrient loads, meteorology, and invasive mussels on suitable habitat for Bighead and Silver Carp in Lake Michigan. *Biological Invasions* <https://doi.org/10.1007/s10530-020-02296-4>
- Ivan, L. N., D. M. Mason, H. Zhang, **E. S. Rutherford**, T. Hunter, S. Sable, A. T. Adamack, and K. A. Rose. 2020. Potential establishment and ecological effects of bigheaded carp in a productive embayment of the Laurentian Great Lakes. *Biological Invasions* <https://doi.org/10.1007/s10530-020-02263-z> .
- Breck, J. E., Simon, C. P., **E. S. Rutherford**, B. Low, P. J. Lamberson and M. W. Rogers. 2020. The geometry of reaction norms yields insights on classical fitness functions for Great Lakes salmon. *PLoS One* 15: <https://doi.org/10.1371/journal.pone.0228990>.
- Zhang, H., **E. S. Rutherford**, D. M. Mason, M. E. Wittmann, D. M. Lodge, X. Zhu, and T. B. Johnson, A. Tucker. 2019. Potential impacts of three invasive species on the Lake Erie food web. *Biological Invasions* 21: 1697–1719.
- Smith, J.P., E.K. Lower, F.A. Martinez, C.M. Riseng, L.A. Mason, **E.S. Rutherford**, M. Nielson, P. Fuller, K.E. Wehrly, and R.A. Sturtevant. 2019. Interactive mapping of nonindigenous species in the Laurentian Great Lakes. *Management of Biological Invasions* 10:192-199.
- Eppehimer, D. E., D. B. Bunnell, P. M. Armenio, D. M. Warner, L. A. Eaton, D. J. Wells, and **E. S. Rutherford**. 2019. Densities, diets, and growth rates of larval Alewife

- and Bloater in a changing Lake Michigan ecosystem. *Transactions of the American Fisheries Society* 148(Supplement 3): 755-770.
- Alsip, P., H. Zhang, M. D. Rowe, D. M. Mason, **E. S. Rutherford**, C. M. Riseng, Z. Su. **2019**. A three dimensional analysis of bigheaded carp habitat suitability in Lake Michigan. *Freshwater Biology* <https://doi.org/10.1111/fwb.13382>.
- Sturtevant, R. A., D. M. Mason, **E. S. Rutherford**, A. Elgin, E. Lower, and F. Martinez. **2019**. Recent History of Nonindigenous Species in the Laurentian Great Lakes; An Update to Mills et al. 1993 (25 Years Later). *J. Great Lakes Research* 45: 1011-1035.
- Niu, Q., M. M. Xia, S. A. Ludsin, P. Chu, D. M. Mason, and **E. S. Rutherford**. 2018. High-turbidity events in Western Lake Erie during ice-free cycles: Contributions of river-loaded vs. resuspended sediments. *Limnology and Oceanography*
- Riseng, C. M., K. E. Wehrly, L. Wang, **E. S. Rutherford**, J. E. McKenna Jr., L. B. Johnson, L. A. Mason, C. Castiglione, T. P. Hollenhorst, B. L. Sparks-Jackson, S. P. Sowa **2018**. Ecosystem classification and mapping of the Laurentian Great Lakes. *Canadian Journal of Fisheries and Aquatic Sciences* <https://doi.org/10.1139/cjfas-2017-0242>.
- Davidson, A. D., A. J. Fusaro, R. A. Sturtevant, **E. S. Rutherford**, and D. R. Kashian. **2017**. Development of a risk assessment framework to predict invasive species establishment for multiple taxonomic groups and vectors of introduction. *Management of Biological Invasions* 8:25-36.
- Beletsky, D., R. Beletsky, **E. S. Rutherford**, J. Sieracki, J. Bossenbroek, L. Chadderton, and M. E. Wittmann. **2017**. Spread of aquatic invasive species by lake currents. *J. Great Lakes Res.* 43:14-32.
- Wittmann, M. E., G. Annis, A. M. Kramer, L. A. Mason, C. M. Riseng, **E. S. Rutherford**, W. L. Chadderton, D. Beletsky, J. M. Drake, and D. M. Lodge. **2017**. Refining species distribution model outputs using landscape scale habitat data: Forecasting Grass Carp and Hydrilla establishment in the Great Lakes Region. *J. Great Lakes Research* 43:298–307.
- Kramer, A. M., G. Annis, M. E. Wittmann, W. L. Chadderton, **E. S. Rutherford**, D. M. Lodge, L. A. Mason, D. Beletsky, C. M. Riseng, and J. M. Drake. **2017**. Suitability of Laurentian Great Lakes for invasive species based on global species distribution models and local habitat. *Ecosphere* 8(7):e01883.10.1002/ecs2.1883.
- Kao, Y-C., S. Adlerstein, and **E. S. Rutherford**. **2016**. Assessment of top-down and bottom up controls on the collapse of alewives in Lake Huron. *Ecosystems* 19(5):803-831.
- Mason, L. A., C. M. Riseng, A. D. Gronewold, **E. S. Rutherford**, J. Wang, A. Clites, S. D.P. Smith, P. B. McIntyre. **2016**. Fine-scale spatial variation in ice cover and surface temperature trends across the surface of the Laurentian Great Lakes. *Climatic Change* 138:71-83.

- Simpson, N., A., Honsey, **E. S. Rutherford**, and T. O. Höök. **2016**. Spatial shifts in salmonine harvest, catch rate and effort by charter boat anglers in Lake Michigan, 1992-2012. *J. Great Lakes Res.* 42(5):1109-1117
- Lodge, D.M., **E. S. Rutherford**, D. M. Mason, D. Beletsky, H. Zhang, and Others: **2016**. Risk Analysis and Bioeconomics of Invasive Species to Inform Policy and Management. *Annual Reviews in Environment and Resources* 41:453–88
- Lauber, T. B., R. C. Stedman, N. A. Connelly, L. G. Rudstam, R. C. Ready, G. L. Poe, D. B. Bunnell, Tomas O. Höök, M. A. Koops, S. A. Ludsin, and **E. S. Rutherford**. **2016**. Using Scenarios to Assess Possible Future Impacts of Invasive Species in the Laurentian Great Lakes. *North American Journal of Fisheries Management*.
- Feiner, Z. S., Wang, H-Y, Hook, T. O., **Rutherford, E. S.**, Vandergoot, C., Rudstam, L. G., Zorn, T. G., Fielder, D. **2016**. Thermal environment and maternal effects shape egg size in a freshwater fish. *Ecosphere* 7(5):e01304. 10.1002/ecs2.1304
- Rutherford, E. S.**, J. Allison, C. R. Ruetz III, J. Elliott, J. Nohner, M. DuFour, R. O’Neal, D. J. Jude, and S. R. Hensler. **2016**. Density and Survival of Walleye Eggs and Larvae in the Muskegon River, Michigan. *Transactions of the American Fisheries Society* 145:563-577.
- Krueger, D. M., **E. S. Rutherford**, and D. M. Mason. **2016**. Foraging ecology of walleye and brown trout in a Great Lakes tributary. *J. of Great Lakes Res.* 42: 108–115.
- Zhang, H., **E. S. Rutherford**, D. M. Mason, J. T. Breck, M. E. Wittmann, R. M. Cooke, D. M. Lodge, J. D. Rothlisberger, X. Zhu, and T. B. Johnson. **2016**. Forecasting Impacts of Silver and Bighead Carp on the Lake Erie Food Web. *Transactions of the American Fisheries Society* 145: 136-162
- Allan, J. D., S. D.P. Smith, P. B. McIntyre, C. A. Joseph, C. E. Dickinson, A. L. Marino, R. G. Biel, J. C. Olson, P. J. Doran, **E. S. Rutherford**, J. E. Adkins, A. O. Adeyemo. **2015**. Using Cultural Ecosystem Services to Inform Restoration Priorities in the Laurentian Great Lakes. *Frontiers in Ecology and the Environment* 13:418-424.
- David, S. R., J. S. Diana, **E. S. Rutherford**, and M. J. Wiley. **2015**. Countergradient variation in growth of the spotted gar *Lepisosteus oculatus* from core and peripheral populations. *Transactions of the American Fisheries Society* 144:837-850.
- Jiang, L., M. Xia, S. A. Ludsin, **E. S. Rutherford**, D. M. Mason, J. M. Jarrin, and K. L. Pangle. **2015**. Biophysical modeling assessment of the drivers for plankton dynamics in western Lake Erie. *Ecological Modeling* 308:18-33.
- Niu, Q., M. Xia, **E.S. Rutherford**, D. M. Mason, D. J. Schwab, and E. J. Anderson. **2015**. Investigation of Inter-basin and Inter-annual Lake Erie Dynamics Using an Unstructured-grid Model. *Journal of Geophysical Research:Oceans* 120:2212-2232.
- Smith, S. D. P., P. B. McIntyre, B. S. Halpern, R. M. Cooke, A. L. Marino, G. L. Boyer, A. Buchsbaum, G.A. Burton Jr., L. M. Campbell, J. J.H. Ciborowski, P. J. Doran, D.

- M. Infante, L. B. Johnson, J. G. Read, J. B. Rose, **E. S. Rutherford**, A. D. Steinman, and J. D. Allan. **2015**. Rating impacts in a multi-stressor world: a quantitative assessment of 50 stressors affecting the Great Lakes. *Ecological Applications* 25:717–728.
- Wang, L., C. M. Riseng, L. A. Mason, K. E. Wehrly, **E. S. Rutherford**, J. E. McKenna, Jr., C. Castiglione, L. B. Johnson, D. Infante, S. E. Sowa, M. Robertson, J. Schaeffer, M. Khoury, J. Gaiot, T. Hollenhorst, C. Brooks, and M. Coscarelli. **2015**. A Hierarchical Spatial Classification and Database for Management, Research, and Policy Making: the Great Lakes Aquatic Habitat Framework *Journal of Great Lakes Research*. *Journal of Great Lakes Research* 41: 584–596.
- Cooke, R. E., M. E. Wittmann, H. Zhang, **E. S. Rutherford**, D. M. Lodge, D. M. Mason, J. Rothlisberger. 2014. Out-of-Sample Validation for Structured Expert Judgment of Asian Carp Establishment in Lake Erie. *Integrated Environmental Assessment and Management* 10(4):522-528.
- Kao, Y-C., S. Adlerstein-Gonzalez, and **E. S. Rutherford**. **2014**. The relative impacts of nutrient loads and invasive species on a Great Lakes food web: An Ecopath with Ecosim analysis. *J. Great Lakes Res.* 40 (Suppl. 1): 35-52.
- Scavia, D., J. D. Allan, K. K. Arend, S. Bartell, D. Beletsky, N. S. Bosch, S. B. Brandt, R. D. Briland, I. Daloğlu, J. V. DePinto, D. M. Dolan, M. A. Evans, T. M. Farmer, D. Goto, H. Han, T. O. Höök, R. Knight, S. A. Ludsin, D. M. Mason, A. M. Michalak, R. P. Richards, J. J. Roberts, D. K. Rucinski, **E. S. Rutherford**, D. J. Schwab, T. M. Sesterhenn, H. Zhang, and Y. Zhou. **2014**. Addressing and readdressing the re-eutrophication of Lake Erie: Central basin hypoxia. *J. Great Lakes Research* 40:226-246.
- Wittmann, M. E., R. M. Cooke., J. Rothlisberger, **E. S. Rutherford**, H. Zhang, D. M. Mason, D. M. Lodge. **2014**. Use of structured expert judgment to forecast invasions by bighead and silver carp in Lake Erie. *Conservation Biology* 29:187-197.
- Allan, J.D., P.B. McIntyre, S.D.P. Smith, B.S. Halpern, G.L. Boyer, A. Buchsbaum, G.A. Burton Jr., L.M. Campbell, W.L. Chadderton, J.J.H. Ciborowski, P.J. Doran, T. Eder, D.M. Infante, L.B. Johnson, C.A. Joseph, A.L. Marino, A. Prusevich, J. Read, J.B. Rose, **E.S. Rutherford**, S.P. Sowa, and A.D. Steinman. **2013**. Joint analysis of stressors and ecosystems services to enhance restoration effectiveness. *PNAS* 110(1):372-377.
- Krueger, D. M., **E. S. Rutherford**, and D. M. Mason. **2013**. Modeling the Influence of Parr Predation by Walleye and Brown Trout on the Long-Term Population Dynamics of Chinook Salmon in Lake Michigan: A Stage Matrix Approach. *Transactions of the American Fisheries Society* 142:1101-1113.

- Madenjian, C. P., **E. S. Rutherford**, C. A. Stow, E. F. Roseman, and J. X. He. **2013**. Trophic Change, Not Collapse. [dx.doi.org/10.1021/es404089y](https://doi.org/10.1021/es404089y)/Environ. Sci. Technol.
- Marko, K. M., **E. S. Rutherford**, B. J. Eadie, T. H. Johengen, and M. B. Lansing. **2013**. Delivery of nutrients and seston from the Muskegon River watershed to nearshore Lake Michigan. *Journal of Great Lakes Research* 39(4):672–681.
- Zorn, T. G., P. W. Seelbach, and **E. S. Rutherford**. **2012**. A regional-scale habitat suitability model to assess the effects of flow reduction on fish assemblages in Michigan streams. *Journal of American Water Resources Association*. *Journal of the American Water Resources Association (JAWRA)* 1-25. DOI: 10.1111/j.1752-1688.2012.00656.x
- Ivan, L.N., **E.S. Rutherford**, and T.H. Johengen. **2011**. Impacts of adfluvial fish on the ecology of two Great Lakes tributaries. *Transactions of the American Fisheries Society*. 140:6, 1670-1682
- Krueger, D.M., **E.S. Rutherford**, and D. M. Mason. **2011**. Influence of predation mortality on survival of Chinook salmon parr in a Lake Michigan tributary. *Transactions of the American Fisheries Society* 140: 147-163.
- Madenjian, C.P., **E.S. Rutherford**, M. A. Blouin, B. J. Sederberg and J. R. Elliott. **2011**. Spawning habitat unsuitability: an impediment to cisco rehabilitation in Lake Michigan? *North American Journal of Fisheries Management* 31:905-913.
- Ivan, L.N., **E.S. Rutherford**, C. Riseng, and J.A. Tyler. **2010**. Density, production and survival of walleye (*Sander vitreus*) eggs in the Muskegon River, Michigan. *Journal of Great Lakes Research* (36): 328-337.
- Wiley, M.J., D.W. Hyndman, B.C. Pijanowski, A.D Kendall, C. Riseng, **E.S. Rutherford**, S.T. Cheng, M.L. Carlson, J.A. Tyler, R.J. Stevenson, P.J. Steen, P.L. Richards, P.W. Seelbach, J.M Koches, and R.R. Rediske. **2010**. A multi-modeling approach to evaluating climate and land use change impacts in a Great Lakes River basin. *Hydrobiologia* 657:243-262.
- Adlerstein, S.A., **E.S. Rutherford**, R.M. Claramunt, D.F. Clapp and J.A. Clevenger. **2008**. Seasonal movements of Chinook salmon in Lake Michigan based on tag recoveries from recreational fisheries and catch rates in gill net assessments *Transactions of the American Fisheries Society* 138 (3):137-150.
- Dufour, E., T.O. Höök, W.P. Patterson, and **E.S. Rutherford**. **2008**. High-resolution isotope analysis of age-0 alewife *Alosa pseudoharengus* otoliths: assessment of temporal resolution and reconstruction of habitat occupancy and thermal history. *Journal of Fish Biology* 73:2434-2451.
- Höök, T.O., **E.S. Rutherford**, T.E. Croley, D.M. Mason and C.P. Madenjian. **2008**. Annual variation in habitat-specific recruitment success: implications from an individual-based model of Lake Michigan alewife. *Canadian Journal of Fisheries and Aquatic Sciences* 65:1402-1412.
- Adlerstein, S.A., **E.S. Rutherford**, J.A. Clevenger, J.E. Johnson, D.F. Clapp, and A.P.

- Woldt. **2007**. Lake Trout Movements in US Waters of Lake Huron Interpreted from Coded Wire Tag Recoveries in Recreational Fisheries. *Journal of Great Lakes Research* 33:186-201.
- Adlerstein, S.A., **E.S. Rutherford**, D. Clapp, J.A. Clevenger and J.E. Johnson. **2007**. Estimating seasonal movements of Chinook salmon in Lake Huron from efficiency analysis of coded wire tag recoveries from recreational fisheries. *North American Journal of Fisheries Management* 27(3):792-803.
- Beletsky, D., D.M. Mason, D.J. Schwab, **E.S. Rutherford**, J. Janssen, D.F. Clapp, and J. Dettmers. **2007**. Biophysical model of larval yellow perch advection and settlement in Lake Michigan. *J. Great Lakes Res.* 33 (4):842-866.
- Godby, N.A., Jr., **E.S. Rutherford**, and D.M. Mason. **2007**. Diet, consumption, growth, survival, and production of juvenile steelhead in a Lake Michigan tributary. *North American Journal of Fisheries Management* Vol. 27:578-592.
- Höök, T.O., **E.S. Rutherford**, G.S. Carter, and D.M. Mason. **2007**. Hatch dates, growth, survival and over-winter mortality of age-0 alewives in Lake Michigan: Implications for habitat-specific recruitment success. *Transactions of the American Fisheries Society* 136:1298-1312.
- Ruetz, C.R., III, D.G. Uzarski, D.M. Krueger, and **E.S. Rutherford**. **2007**. Sampling a littoral fish assemblage: comparing small-mesh fyke netting and boat electrofishing. *North American Journal of Fisheries Management*. 27:825-831.
- Tyler, J.A., and **E.S. Rutherford**. **2007**. River Restoration Effects on Steelhead Populations in the Manistee River, Michigan: Analysis using an Individual-Based Model. *Transactions of the American Fisheries Society* 163(6):1654-1673.
- Wang, H-Y, **E.S. Rutherford**, H.A. Cook, D.W. Einhouse, R.C. Haas, T.B. Johnson, R. Kenyon, B. Locke, M.W. Turner. **2007**. Movement of Walleye in Lakes Erie and St. Clair Inferred from Tag Return and Fisheries Data. *Transactions of the American Fisheries Society* Vol. 136:539-551.
- Kotchen, M.J., M.R. Moore, F. Lupi and **E.S. Rutherford**. **2006**. Environmental Constraints on Hydropower: An Ex-Post Benefit-Cost Analysis of Dam Relicensing in Michigan. *J. Land Economics* 82(3):384-403.
- Höök, T.O., M.J. McCormick, **E.S. Rutherford**, D.M. Mason and G.S. Carter. **2006**. Short-term water mass movements in Lake Michigan: implications for larval fish transport. *Journal of Great Lakes Research* 32:728-737.
- Plattner, S., D.M. Mason, G.A. Leshkevich, D.J. Schwab and **E.S. Rutherford**. **2006**. Classifying and forecasting coastal upwellings in Lake Michigan using satellite derived temperature images and buoy data. *J. Great Lakes Research* 32:63-76.
- Creque, S.M., **E.S. Rutherford** and T.G. Zorn. **2005**. Use of GIS-derived landscape-scale habitat features to explain spatial patterns of fish density in Michigan Rivers. *North American Journal of Fisheries Management*. 25(4):1411-1425.
- Dufour, E., W.P. Patterson, T.O. Höök, and **E.S. Rutherford**. **2005**. Early life history of Lake Michigan alewives (*Alosa pseudoharengus*) inferred from intra-otolith

- stable isotope ratios. *Canadian Journal of Fisheries and Aquatic Sciences* 62(10):2362-2370.
- Madenjian, C.P., T.O. Höök, **E.S. Rutherford**, D.M. Mason, T. Croley, II, E.S. Szalai, and J.R. Bence. **2005**. Recruitment Variability of Alewives in Lake Michigan. *Transactions of the American Fisheries Society* 134(1):218-230.
- Bartron, M.L., D.R. Swank, **E.S. Rutherford**, and K.T. Scribner. **2004**. Methodological bias in estimates of strain composition and straying rates of hatchery-produced steelhead in Lake Michigan tributaries. *North American Journal of Fisheries Management* 24:1288-1299.
- Höök, T. O., **E.S. Rutherford**, S.J. Brines, D.J. Schwab, and M.J. McCormick. **2004**. Relationships between surface water temperature and steelhead distributions in Lake Michigan. *North American Journal of Fisheries Management* 24:211-221.
- Horne, B.D., **E.S. Rutherford**, and K.W. Wehrly. **2004**. Simulating effects of hydro-dam alteration on thermal regime and wild steelhead recruitment in the Manistee River, Michigan. *River Research and Applications* 20:185-203.
- Rutherford, E.S.**, K.A. Rose, and J.H. Cowan, Jr. **2003**. Evaluation of the Shepherd and Cushing (1980) model of density-dependent survival: a case study using striped bass (*Morone saxatilis*) larvae in the Potomac River, Maryland, USA. *ICES Journal of Marine Science* 60:1275-1287.
- Höök, T.O., **E.S. Rutherford**, S.J. Brines, D.M. Mason, D.J. Schwab, and M.J. McCormick, G.W. Fleischer, T.J. DeSorcie, T.J., and W.G. Sprules, W.G. **2003**. Spatially explicit measures of production of young alewives in Lake Michigan: Linkage between essential fish habitat and recruitment. *Estuaries* 26(1):21-29.
- Höök, T.O., **E.S. Rutherford**, S.J. Brines, C.A. Geddes, D.M. Mason, D.J. Schwab, and G.W. Fleischer. **2003**. Landscape scale measures of steelhead (*Oncorhynchus mykiss*) bioenergetic growth rate potential in Lake Michigan and comparison with catch rates. *Journal of Great Lakes Research*. 30:545-556.
- Madenjian, C. P., G.L. Fahnenstiel, T.H. Johengen, T.F. Nalepa, H.A. Vanderploeg, G.W. Fleischer, P.J. Schneeberger, D.M. Benjamin, E.B. Smith, J.R. Bence, E.S. **Rutherford**, D.M. Lavis, D.M. Robertson, D.J. Jude, and M.P. Ebener. **2002**. Dynamics of the Lake Michigan food web, 1970-2000. *Canadian Journal of Fisheries and Aquatic Sciences* 59:736-753.
- Rose, K.A., **Rutherford, E.S.**, Forney, J.L., Mills, E.L., and SinghDermott, D. **1999**. Individual-based model of yellow perch and walleye populations in Oneida Lake, New York. *Ecological Monographs* 69:127-154.
- Rutherford, E.S.**, K.A. Rose, J.L. Forney, E.L. Mills, C.M. Mayer and L.G. Rudstam. **1999**. Individual-based model simulations of a zebra mussel (*Dreissena polymorpha*) induced energy shunt on walleye (*Stizostedion vitreum*) and yellow perch (*Perca flavescens*) populations in Oneida Lake, NY. *Canadian Journal of Fisheries and Aquatic Sciences* 56:2168-2160.

- Rutherford, E.S.**, E.D. Houde, and R.M. Nyman. **1997**. Relationship of larval-stage growth and mortality to recruitment of striped bass, Morone saxatilis, in Chesapeake Bay. *Estuaries* 20:174-198.
- Rutherford, E.S.**, and Houde, E.D. **1995**. The influence of temperature on cohort-specific growth, survival and recruitment of larval striped bass, Morone saxatilis, in Chesapeake Bay. *Fishery Bulletin, U.S.* 93:315-332.
- Cowan, J.H., Jr., Rose, K.A., **Rutherford, E.S.**, and Houde, E.D. **1993**. Individual-based model of young-of-the-year striped bass population dynamics. II. Factors affecting recruitment in the Potomac River, Maryland. *Transactions of the American Fisheries Society* 122:439-458.
- Houde, E.D., and **Rutherford, E.S.** **1993**. Recent trends in estuarine fisheries: Predictions of fish production and yield. *Estuaries*. 16(2):161-176.
- Rutherford, E. S.**, Tilmant, J.T., Thue, E.B., and Schmidt, T.W. **1989**. Fishery harvest and population dynamics of spotted seatrout, Cynoscion nebulosus, in Florida Bay and adjacent waters. *Bulletin of Marine Science* 44:108-125.
- Rutherford, E. S.**, Tilmant, J.T., Thue, E.B., and Schmidt, T.W. **1989**. Fishery harvest and population dynamics of gray snapper, Lutjanus griseus, in Florida Bay and adjacent waters. *Bulletin of Marine Science* 44:139-154.
- Rutherford, E. S.**, Schmidt, T.W., and Tilmant, J.T. **1989**. Early life history of spotted seatrout, Cynoscion nebulosus, and gray snapper, Lutjanus griseus, in Florida Bay, Everglades National Park, Florida. *Bulletin of Marine Science* 44:49-64.
- Tilmant, J.T., **Rutherford, E.S.**, and Thue, E.B. **1989**. Fishery harvest and population dynamics of the common snook (*Centropomus undecimalis*) from Florida Bay and adjacent waters. Abstract In: Symposium on Florida Bay, a subtropical lagoon. *Bulletin of Marine Science* 44:52:53
- Tilmant, J. T., **E. S. Rutherford**, and E. B. Thue. **1989**. Fishery harvest and population dynamics of red drum (*Sciaenops ocellatus*) from Florida Bay and adjacent waters. *Bull. Mar. Sci.* 44:126-138.
- Scott, J. P., Dewey, R.R., Hansen, L.J., Owen, R.E., and **Rutherford, E.S.** **1989**. How many mullet are there in Florida Bay? *Bulletin of Marine Science* 44:89-107.
- Iversen, E.S., **Rutherford, E.S.**, Bannerot, S.P., and Jory, D.E. **1987**. Biological data on Berry Islands, (Bahamas) queen conchs, *Strombus gigas*, with mariculture and fisheries management implications. *Fishery Bulletin* 85:299-310

Refereed Book Chapters (6), Conference Proceedings (3), Reports (12):

- Bunnell, D. B., H. J. Carrick, C. P. Madenjian, **E. S. Rutherford**, R. P. Barbiero, E. Hinchey-Malloy, S. A. Pothoven, C. M. Riseng, R. M. Claramunt, H. A. Bootsma, A. K. Elgin, M. D. Rowe, S. M. Thomas, B. A. Turschak, S. Czesny, K. L. Pangle, and D. M. Warner. 2018. Are changes in lower trophic levels limiting prey fish biomass and production in Lake Michigan? Great Lakes Fishery Commission Miscellaneous Publication 18-01.

- Rutherford, E. S.,** R. Sturtevant, N. Mandrak, A. Thompson, A. Kramer, M. Wittmann, P. Kocovsky, H. Embke, C. Mayer, S. Qian, T. Brenden, C. Krueger, C. Harris, and C. Vandergoot. **2016.** Grass Carp Habitat Suitability, Establishment and Movement in the Detroit – St. Clair River Corridor. Pages 74-76, In: Francoeur, S., J. Ciborowski, J. Gannon, D. Kashian, and K. Kahl, eds. State of the Strait: Coordinating Conservation in the St. Clair-Detroit River System. Great Lakes Institute for Environmental Research, Occasional Publication No. 9, University of Windsor, Ontario, Canada. ISSN 17715-3980.
- Rutherford, E. S.,** and K. A. Rose. **2016.** Individual-Based Model Analysis of Walleye and Yellow Perch Population Dynamics in Response to Changing Ecosystem Conditions. Pages 427-452 *in* L.G. Rudstam, E.L. Mills, J.R. Jackson and D.J. Stewart, editors. Oneida Lake: Long Term Dynamics of a Managed Ecosystem and its Fishery. American Fisheries Society, Bethesda, MD.
- Moll, R. A., C. S. Sellinger, **E. S. Rutherford,** J. L. Johnson, M. R. Fainter, and J. E. Gannon. **2013.** The Great Lakes Ecosystems. Chapter 1, *In* W.W. Taylor and P. Ferrari (eds.), Great Lakes Fisheries Policy and Management. Michigan State University Press.
- Wehrly, K. E., L. Wang, D. M. Infante, C. A. Geddes, A. Cooper, L. Stanfield, and **E. S. Rutherford.** **2013.** Landscape Change and its Influences on Aquatic Habitat and Fisheries in the Great Lakes Basin. Chapter XX *In* W.W. Taylor and P. Ferrari (eds.), Great Lakes Fisheries Policy and Management. Michigan State University Press.
- Rutherford, E. S.,** L. A. Mason, and J. T. Breck. 2012. Development of a GIS for Inventory, Classification, and Management of Non-Game Wildlife in Great Lakes Waters. Michigan State Wildlife Program Final Project Rept No. T-10-T-2, Study No. 237000. 57 pp.
- Zorn, T. G., P. W. Seelbach, **E. S. Rutherford,** T. C. Wills, S.-T. Cheng, and M. J. Wiley. **2008.** A regional-scale habitat suitability model to assess the effects of flow reduction on fish assemblages in Michigan streams. Michigan Department of Natural Resources, Fisheries Research Report 2089, Ann Arbor.
- Rutherford, E.S.** **2008.** Lake Michigan’s tributary and nearshore fishery habitats. *In* The state of Lake Michigan in 2005. *Edited by* D.F. Clapp and W. Horns. Great Lakes Fish. Comm. Spec. Pub. 08-02. pp. 7-18.
- Rutherford, E.S.,** E.R. Marshall, D. J. Clapp, W. Horns, T. Gorenflo, and T. Trudeau. **2007.** Lake Michigan Environmental Objectives. Final Project Report to the Great Lakes Fishery Commission.
- Rutherford, E. S.,** and C. A. Geddes. **2007.** Ecological Classification of Nearshore and Open-Water Fish Habitats in the Great Lakes. Final Report, Michigan State Wildlife Grant program, Michigan Dept Natural Resources Fish. Res. Grant # 237000. 12 pp.
- Rutherford, E.S.,** C.A. Geddes, and M. Kimura. **2006.** Final Report: “Lake Erie Aquatic Habitat Geographic Information System” to US Fish and Wildlife Service and Michigan Dept. Natural Resources. 15 pp.

- Beletsky, D., D.J. Schwab, D.M.Mason, **E.S. Rutherford**, M.J. McCormick, H. Vanderploeg, and J. Janssen. **2003**. Modeling the transport of larval yellow perch in Lake Michigan. Proceedings of Estuarine and Coastal Management Conference.
- Rutherford, E.S. 2002**. The unique contributions of early life history stages to fisheries management. Ch. 9, In L. Fuiman and R.G. Werner (eds.), The Unique Contributions of Early Life Stages to Fisheries Science. Blackwell Science, London.
- Woldt, A.P., and **E.S. Rutherford. 2002**. Production of young steelhead in two central Lake Michigan tributaries. Michigan Department of Natural Resources, Fisheries Research Report 2060. Ann Arbor.
- Rose, K. A., J. A. Tyler, D. Singh Dermott, and **E. S. Rutherford. 1996**. Multispecies modeling of fish populations. pp. 194-222. In: B.A. Megrey and E. Moksness [eds.], Computers in Fisheries Research. Chapman and Hall, London.
- Rask, M., van Densen, W., Lehtonen, H., and **Rutherford, E.S.** (editors). **1995**. Percis II. The second international percid fish symposium, Vaasa Finland, 21-25 August, 1995. Annales Zoologici Fennici Vol. 33 (3-4).
- Rutherford, E.S. 1997**. Evaluation of natural reproduction, stocking rates, and fishing regulations for steelhead Oncorhynchus mykiss, chinook salmon O. tshawytscha, and coho salmon (O. keta) in Lake Michigan. Final Report Project No. F-35-R-22, study 650, to Federal Aid for Sport Fish Restoration. 29 pp.
- Houde, E.D., **E.S. Rutherford**, and S.D. Leach. **1996**. Interactions among environmental factors and recruitment potential in striped bass. Reference No.[UMCEES]CBL 96-107, Contract No. CB94-011-002 to Maryland Department of Natural Resources, Chesapeake Bay Research and Monitoring Division. 214 pp.
- Rutherford, E. S., T. W. Schmidt, and J. T. Tilmant. 1986**, The Early Life History of Spotted Seatrout, Red Drum, Gray Snapper, and Snook in Everglades National Park, Florida. South Florida Research Center Rept 86/07. 99 pp.
- Rutherford, E. S., E. B. Thue, and D. G. Buker. 1983**. Population Structure, Food Habits, and Spawning Activity of Gray Snapper, *Lutjanus griseus*, in Everglades National Park. South Florida Research Center Rept. 83/02. 41 pp.
- Rutherford, E. S., E. B. Thue, and D. G. Buker. 1982**. Population Characteristics, Food Habits and Spawning Activity of Spotted Seatrout, *Cynoscion nebulosus*, in Everglades National Park, Florida. South Florida Research Center Rept. T-668. 48 pp.
- Thue, E. B., **E. S. Rutherford**, and D. G. Baker. **1982**. Age, growth and mortality of the Common Snook, *Centropomus undecimilais* (Bloch), in Everglades National Park, Florida. South Florida Research Center Rept. T683. 32 pp.

Service

- UM-SNRE Promotion and Tenure Committee Review for D. Beletsky, T. Johengen, C. Riseng, H. Zhang
- Associate Editor, Journal of Great Lakes Research (2012-2016); Reviewer for several aquatic ecology and fisheries journals

Teaching

Guest Lecturer, Great Lakes Science and Management (NRE 538) Winter 2014-2017

Seminar on Marine Protected Areas (NRE 639 066) Winter 2009.

Fisheries Conservation and Management (NRE 639_066) Winter 2008.

Fish Ecology (NRE/ENVIRON 409) Winter 2000-04.

Fisheries Science (NRE 460) Fall 1995, 1997, 1999, 2001, 2003.

River Restoration Seminar (co-taught with Michael Moore NRE 609) Winter 2001.

Past and Current Graduate Student Advisees (total=41)

Current Graduate Student Advisees (3): Ali Shakoor and Katrina Lewandowski (Wayne State University), Les Warren (Purdue University)

Past Graduate Students Advisees (39): Peter Alsip, Nicholas Boucher, Brian Brenton, Su-Ting Cheng, Sara Creque, Solomon David, Michelle DePhilip, Christine Diana, Matthew Diana, Angela Giuliano, Neal Godby, David Halsing, Tomas Höök, Darryl Hondorp, Brad Horne, Dana Infante, Lori Ivan, Yu-Chun Kao, Damon Krueger, Brian McCrae, Katharine Marko, Thomas Neeson, Sara Prendergast, James Roberts, Hideaki Sano, Larissa Sano, Bryan Sederberg, David Swank, Hui-Yu Wang, Aaron Woldt, Yifan Zhang, Sarah Zorn (University of Michigan School of Natural Resources and Environment/SEAS); Meredith Bartron (Michigan State University); Susan Doka (McMasters University); Brian Lantry (Cornell University); Long Jiang and Qianru Niu (University of Maryland Eastern Shore); Cory Krabbenhoft (Wayne State University), Whitney Conard (Univ. Notre Dame)

Mentor for Univ. Michigan CILER/CIGLR Summer Fellows: Aimee Hoover (2010), Keith Hayes-Gregson (2011), Dana Burnette (2012), David Wells (2013), Drew Eppheimer (2015), Zoe Psarouthakis and Tiffany Chin (2016), Angelika Kurthen (2017), Haoran Liu (2018), Andrew Oppliger (2019), Kaitlyn Rivers (2020), Tait Algayer and Heather Truong (2023).

Mentor for Hollings Fellows: Gina Scott and Seth Hatfield (2020)

Supervisor for UM-SNRE/SEAS Research Associates: Jason Breck, Lacey Mason, Christine Geddes Joseph, Minako Kimura-Edgar, Emily Marshall, Christine Folz, Shannon Brines, David Wells, Madeline Tomczak.

Research Grants:

Current:

1. *Assessing the Value of Nutrient Load Policies on Lake Erie's Ecosystem and Regional Economy.* Brockmann, S., D. Finnoff, H. Zhang, D. M. Mason, **E. S. Rutherford**. Request \$200,000 from Great Lakes Fishery Commission. Jan. 1 2023 – Dec. 31, 2024. Funded.
2. *Modeling Potential Invasive Carp Recruitment, Population Growth and Food Web Effects in Great Lakes Tributaries.* **Rutherford, E. S.** (PI), D. M. Mason, B. D. Brenton, H. Zhang. Requested \$110,800 from US EPA GLRI. Status: Funded. Will start in November 2023.
3. *MOM6 development for Great Lakes ecosystem and fishery response to climate change.* **Rutherford, E. S.** (PI), Jia Wang, Doran Mason, Dan Titze, Charles Stock and Robert Hallberg (NOAA GFDL). Request \$232,162 in external support for FY23 from NOAA NMFS Climate, Ecosystem and Fisheries Initiative. Funded.
4. *Understanding and forecasting potential recruitment of Lake Michigan fishes by modeling growth and survival of larval stages with coupled climate, biophysical, and bioenergetics models.* Bunnell, D. B. (PI), T. O. Höök, M. D. Rowe, P. Xue, **E. S. Rutherford**, and P. Collingsworth. \$398,723 from the Northeast Climate Adaptation Science Center (Midwest Region), June 2020 - Dec. 2022.
5. *Quantifying the importance of multiple nursery habitats to alewife population recruitment and population resilience.* Höök, T. (PI), D. Bunnell, P. Collingsworth, S. Pothoven, D. Warner, S. Pothoven, **E. S. Rutherford**, D. Warner and C. Williamson. \$299,454 from the Great Lakes Fishery Trust, August 2019 - July 2022.
6. *Implications of phosphorus reduction for sustainable Great Lakes Fisheries.* Koops, M. (PI), M. Hossain, R. Randall, **E.S. Rutherford**, H. Zhang, G. Arhonditsis, D. Mason, K. Wehrly, L. Rudstam, R. Jackson, C. Chu, D. de Kerckhove, W. Fetzer, T. Hartman. \$205,488, Jan 2018 – Dec. 2020.
7. *Empowering local communities with Online Action Planning Tools: Tipping Points and Indicators for Improving Water Quality Across the Great Lakes.* **E. Rutherford** (P.I.), B. Miller, B. Pijanowski, and D. Hyndman (co-PIs). \$179,116 from US EPA, Great Lakes Restoration Initiative. May 2020-April 2021.

Past:

8. *Food web modeling to support risk assessment of Asian carp in the Great Lakes.* (D. Mason (PI), E. Rutherford (co-PI). \$110,800. US EPA, Great Lakes Restoration Initiative. (June 2021 – Sept 2021).
9. *Empowering local communities with Online Action Planning Tools: Tipping Points and Indicators for Improving Water Quality Across the Great Lakes.* **E. Rutherford** (P.I.), B. Miller, B. Pijanowski, and D. Hyndman (co-PIs). \$407,568 from US EPA, Great Lakes Restoration Initiative. Jan 2019- Dec. 2019.
10. *Food web modeling to support risk assessment of Asian carp in the Great Lakes.* (D. Mason (PI), E. Rutherford and H. Zhang (co-PIs). \$105,000. US EPA, Great Lakes Restoration Initiative. May 2018 – April 2019.

11. *GLANSIS: Science Management and Support*. F. Martinez (PI), **E. Rutherford**, R. Sturtevant (co-PIs). \$249,999. US EPA, Great Lakes Restoration Initiative. 2017-2018.
12. *The Great Lakes Aquatic Habitat Framework*. Great Lakes Fisheries Trust \$527,229. (co-PI), Catherine Riseng (PI);, **E.S. Rutherford**, Kevin Wehrly and L. Wang (co-PIs). 2014-2016.
13. *Forecasting spread and bioeconomic impacts of aquatic invasive species from multiple pathways to improve management and policy in the Great Lakes*. \$2,474,560 from NOAA CSCOR. David Lodge (PI, Univ. Notre Dame); **E.S. Rutherford** (co-PI), and several others. Oct. 1 2010-Sept 30, 2015.
14. *Assessing risk of Asian carp invasion and impacts on Great Lakes food webs and fisheries*. US EPA, Great Lakes Research Initiative, \$700,000. **E.S. Rutherford** (PI), D. M. Mason, H. Zhang, A. Adamack co-PIs. Oct. 1 2011-Sept. 30 2012.
15. *Identify land use indicators and tipping points that threaten Great Lakes ecosystems*. US EPA, Great Lakes Research Initiative, \$1,204,275. D.M. Mason (P.I.), **E.S. Rutherford**, D. M. Mason, M.J. Wiley, R.J. Stevenson, B. Pijanowski, D. Hyndman, J. Rose, S. Adlerstein-Gonzalez, and J.A. Tyler (co-PIs). 2010-2012.
5. *ECOFOR 2006: Assessing the causes, consequences and remedies for hypoxia in Lake Erie*. NOAA CSCOR, \$2,200,000. **E.S. Rutherford** (co-PI), Donald Scavia (PI, UM) and several others.
6. *Development of a GIS for inventory, classification and management of non-game wildlife in Great Lakes waters*. Michigan DNR, \$390,000, Oct 1 2007- Sept 30, 2010. **E.S. Rutherford** (P.I.)
7. *Development of a GIS-based decision support tool for evaluating windfarm sitings in Great Lakes aquatic habitats*. U. S. Dept. of Energy. \$100,000. 2010-2012. **E. S. Rutherford** (co-PI); L. Wang (PI); J. T. Breck co-PI.
8. *Impacts of multiple stressors on Lake Huron Fish Communities, 1970-2004: an integrative analysis*. **E.S. Rutherford** (co-PI), with P.I. Sara Adlerstein, R. Haas, D. Fielder, L. Mohr, J. Johnson, and S. Riley. Great Lakes Fisheries Commission.
9. *Quantitative tools to predict sea lamprey production based on habitat: prioritizing dam removal and control decisions - Development of a sea lamprey habitat model*. **E.S. Rutherford** (co-P.I.), with E. Silverman (P.I.), M.J. Wiley and S.A. Adlerstein. Great Lakes Fisheries Commission.
10. *Classification and Analysis of Great Lakes Fisheries Habitats*. \$537,240, 2003-2008. MDNR Fisheries Division. **E.S. Rutherford** (P.I.)

11. Reproductive and Recruitment Success of Walleye in the Muskegon River. \$82,732 from Michigan Dept Natural Resources. C. Ruetz, Grand Valley State University (PI), **E. S. Rutherford** (co-PI), University of Michigan. Jan 2009-Dec. 2010.
12. Poor quality of spawning habitat: a serious impediment to Cisco rehabilitation in the Great Lakes? \$74,601 from Great Lakes Restoration Act. **E.S. Rutherford** (PI), C. Madenjian (USGS Great Lakes Science Center, co-PI). June 2008 – Aug 2010.
13. *Development of GIS – based decision support system for evaluation of lake-bed alterations.* \$50,000 from Michigan Dept. Environmental Quality. E.S. Rutherford (P.I.) with C.A. Geddes. Jan 2010 – Mar 2011.
14. *Development of a GIS for Great Lakes Aquatic Habitats.* \$271,000. 2004-2007. From USFWS and Great Lakes Fisheries Commission. **E.S. Rutherford (P.I.)**, with 4 others.
15. *Impacts of multiple stressors on the Saginaw Bay fish community.* Michigan Sea Grant, **E.S. Rutherford (co-P.I.)**, with P.I. Sara Adlerstein and five others.
16. *Evaluation of Ecoregion Classifications and Development of Reference Conditions for Great Lake Fisheries Habitats.* \$63,000. 2004-2005. MDNR Fisheries Division. **E.S. Rutherford (P.I.)**.
17. *Fish Recruitment at the Interface of the Great Lakes and their Watersheds: (An Addendum to enhance current projects of the Muskegon River Initiative).* 2003-2007. \$900,000 from Great Lakes Fisheries Trust, 2003-2007. **E.S. Rutherford (co-P.I.)**, with MJ Wiley (PI, UM) and several others.
18. *Development of Environmental Objectives for Lake Michigan.* \$60,000 from Great Lakes Fishery Commission. **E.S. Rutherford (P.I.)**
19. *Watershed – Great Lakes Interactions: Defining the Ecological Footprint of the Muskegon River Watershed in Nearshore Lake Michigan.* \$100,000 from University of Michigan Office of Vice President for Research, 11/1/02 – 10/31/03. **E.S. Rutherford** (P.I.), M. Wiley, T. Johengen, D. Jude, S. Adlerstein, J. Diana, B. Eadie, D. Mason.
20. *Impacts of nutrient reduction and exotic species invasion on fish community composition and growth in Saginaw Bay, Lake Huron.* \$134,000 from Michigan Sea Grant. 3/1/03 – 2/28/05. **E.S. Rutherford** (Co-P.I.), with S. Adlerstein (PI, UM), T. Nalepa (NOAA), R. Haas and M. Thomas (MDNR)..
21. *Development of GIS-based analysis of tagging and cpue data for walleye and yellow perch in Lake Erie.* \$76,000 from Great Lakes Fishery Commission. 9/1/01 – 7/1/03. **E.S. Rutherford (PI)**.

22. *Review of Procedures for estimating wild production of chinook salmon through Marking Experiments.* \$16,669 from Great Lakes Fishery Commission. 9/01/01 – 8/30/02. **E.S. Rutherford** (PI), and J.R. Bence (MSU).
23. *Modeling the influence of lake circulation patterns, upwelling events and turbulence on fish recruitment variability in Lake Michigan.* \$350,419 from Great Lakes Fisheries Trust. 9/1/01 – 8/31/04. **E.S. Rutherford** (Co-P.I.), with D. Beletsky (P.I.), D. Schwab, H. Vanderploeg and D.Mason (NOAA), , and J. Janssen (Univ. Wisconsin).
24. *Development of GIS for Great Lakes Fisheries Analysis.* \$300,000 from Michigan Department of Natural Resources. 10/1/01-9/30/04. **E.S. Rutherford** (PI).
25. *Dynamics of Alewife Recruitment Variability in Lake Michigan.* \$358,456 from Great Lakes Fisheries Trust. 9/01/00 – 8/31/03. **E.S. Rutherford** (PI), Co-P.I.'s D. Mason (NOAA), C. Madenjian (USGS), and W. Patterson (Syracuse University).
26. *Salmonid Spawning Stock Abundance, Recruitment, and Exploitation in the Muskegon River, Michigan.* \$306,000 from Great Lakes Fisheries Trust. 9/1/99 – 8/30/02. **E.S. Rutherford** (Co-P.I.), with D. Mason (PI, NOAA).
27. *Impacts of Watershed Fragmentation and Restoration on Fish Habitat, Migration and Production in Great Lakes Tributaries.* \$206,181 from the Great Lakes Protection Fund. 9/1/99 – 8/31/02. **E.S. Rutherford** (PI), Co-P.I.'s J. Tyler (Worcester Polytechnic University), P. Seelbach (Michigan DNR), J. Diana (UM-SNRE) and K. Wehrly (Michigan DNR)
28. *Development of a Geographical Information System for Great Lakes Fisheries.* \$280,000 from Michigan Department of Natural Resources. 4/1/98 – 9/30/01. **E.S. Rutherford** (PI).
29. *Ecological and Economic Consequences of hydropower-related watershed restoration on salmonid production in Great Lakes Tributaries.* \$139,655 from Michigan Sea Grant, 3/1/99 – 2/28/01. **E.S. Rutherford** (PI) Co-P.I.'s M. Moore (UM-SNRE), K. Wehrly (EPA), F. Lupi and J. Hoehn (Michigan State University).
30. *Ecological and Economic Impacts of Watershed Restoration on Salmonid Productivity in Lake Michigan Tributaries.* \$106,455, funded by Michigan Sea Grant. 3/1/97 – 2/28/99. **E.S. Rutherford** (Co-P.I.), with M. Moore (PI, UM-SNRE), J. Hoehn and F. Lupi (Michigan State University).
31. *Abundance, Production and Harvest of Potamodromous Salmonids in the Manistee, Muskegon and Au Sable Rivers.* \$537,000 from Michigan Department of Natural Resources. 10/1/95 - 9/30/99. **E.S. Rutherford** (PI), E.S. Co-P.I. S. Thorrold (Old Dominion University).

32. *Bioenergetics model of ruffe trophic energetics in the Great Lakes*. \$107,800 from National Sea Grant. 10/1/95 – 9/30/98. E.S. **Rutherford** (Co-P.I.), C. Richards (PI University of Minnesota, and 8 others at Univ. Notre Dame and Univ. Cincinnati).
33. *Individual-based bioenergetics model of walleye and yellow perch in Oneida Lake, New York*. Reward \$19,996 from Martin Marietta Corp. (Department of Energy). 2/1/95 – 12/31/95. **E.S. Rutherford** (PI).
34. *Evaluation of natural reproduction, stocking rates, and fishing regulations for steelhead, chinook salmon, and coho salmon in Lake Michigan*. \$66,930 from Michigan Department of Natural Resources (MDNR). 10/1/95 – 9/30/97. **E.S. Rutherford** (P.I.).
35. *Interactions Among Environmental Factors and Recruitment Potential in Striped Bass*. \$8,504 (subcontract) from Maryland Department of Natural Resources (3/30/95 – 4/30/96). E. D. Houde (PI, University of Maryland), **E.S. Rutherford** (Co-P.I.).