

# **LAWRENCE W. BARNTHOUSE, Ph. D.**

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LWB Environmental Services, Inc.**

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## **Education**

Ph.D., Biology, University of Chicago, Chicago, Illinois, 1976

A.B., Biology, Kenyon College, Gambier, Ohio, 1968

## **Work History**

1976-1995: Research Staff Member, Environmental Sciences Division, Oak Ridge National Laboratory

1995-1998: Principal Scientist, McLaren-Hart, Inc.

1998: - President and Principal Scientist, LWB Environmental Services, Inc.

## **Experience Summary**

Dr. Barnthouse is the President and Principal Scientist of LWB Environmental Services, Inc. His consulting activities include 316(b) demonstrations for nuclear and non-nuclear power plants, Superfund ecological risk assessments, Natural Resource Damage Assessments, risk-based environmental restoration planning, and a variety of other projects involving close interactions with regulatory and resource management agencies. He formerly spent 19 years as a research staff member and Group Leader at Oak Ridge National Laboratory, where he was involved in dozens of environmental research and assessment projects involving development of new methods for predicting and measuring environmental risks of energy technologies. After leaving Oak Ridge National Laboratory in 1995, he spent two and a half years with McLaren-Hart, Inc. prior to establishing LWB Environmental Services.

Dr. Barnthouse has authored or co-authored more than 90 publications relating to ecological risk assessment. He is a Fellow of the American Association for the Advancement of Science, Hazard/Risk Assessment Editor of the journal *Environmental Toxicology and Chemistry*, and Founding Editorial Board Member of the new journal *Integrated Environmental Assessment and Management*. He frequently serves on committees of the National Academy of Sciences and on peer review panels for major federal agency projects.

### Current Activities

- **Technical expert on NRDA, Portland Harbor Superfund site.** Engaged to evaluate the contribution of the client's site to alleged natural resource injuries in the Willamette River, Oregon.
- **Technical expert on NRDA, Tar Creek Superfund site.** Engaged to evaluate natural resource injuries related to mining activities in northeastern Oklahoma.
- **Technical expert on ecological risk assessment and NRDA for General Electric Co. operations in New York and Massachusetts.** The project involves support of ongoing CERCLA risk assessment and Natural Resource Damage Assessment activities relating to historic discharges of PCBs to the Hudson and Housatonic Rivers.
- **Senior ecologist, restoration of the southeastern Tennessee Copper Basin.** The project involves development and implementation of an adaptive management-based watershed restoration plan for the North Potato Creek Watershed, Tennessee, which was seriously degraded by historic mining and smelting activities. This project was recently cited by the National Academy of Sciences as an example that should be followed at other large, complex sites.
- **Technical expert on effects of cooling water withdrawals on Hudson River fish populations.** Performing analysis of impacts of cooling water withdrawals on Hudson River fish populations and communities in support of ongoing permitting proceedings for the Indian Point Generating Station. Testified as an expert witness at permit hearings for the Danskammer Generating Station, November-December 2005.
- **Technical expert on impacts of power plants on Long Island Sound fish populations.** Engaged as expert witness by owners of two New England nuclear power plants to testify concerning impacts of their plants on winter flounder and American shad populations.
- **Technical expert on impacts of power plants on Cape Cod Bay fish populations.** Engaged by owners of a Massachusetts nuclear power plant to perform technical analyses and testify concerning impacts of their plant on winter flounder and other susceptible fish populations.

### Significant Previous Projects

#### LWB Environmental Services

- **Technical expert on fisheries impacts at the proposed Calypso LNG terminal.** Engaged by company preparing Environmental Impact Statement to provide oversight on the fisheries impact component of the EIS.

- **Technical expert on ecological risk assessment and NRDA for pulp mill in eastern North Carolina.** Provided confidential comments to facility owner concerning validity of ecological risk assessments performed by consultants to the owner and by the U.S. Environmental Protection Agency; advised the owner concerning the types and magnitudes of potential natural resource damage liabilities due to contamination of sediment by dioxins and mercury.
- **Technical advisor, remediation of contaminated sediment at Langley AFB, Virginia.** Provided advice to remediation team concerning (1) establishment of cleanup goals in lead-contaminated sediment, and (2) development of a post-remediation monitoring program involving measurement of lead concentrations in fish and mussels. Assisted team in obtaining EPA approval of cleanup goal.
- **Development of biologically-based methods for compliance with EPA's 316(b) Phase II Rule.** Funded by the Electric Power Research Institute (1) to develop and demonstrate methods for quantifying biological benefits of reducing entrainment and impingement losses at existing facilities, and (2) to review biological issues affecting the feasibility of using habitat restoration as a compliance approach.
- **Technical expert on entrainment impact assessment for Gulf of Mexico LNG terminals.** Provided advice to two major corporations concerning the validity of data and methods used to predict impacts of proposed offshore LNG terminals on Gulf of Mexico fishery resources, and on the design of baseline monitoring programs for these facilities.
- **Technical Team Leader, 316(b) assessment for the Salem Generating Station.** Responsible for developing methods for quantitative assessment of impacts of entrainment and impingement on estuarine fish species; directed the analysis of data relating to entrainment and impingement impacts to support the facility owner's 1999 and 2006 permit renewal applications.
- **Member, National Academy of Sciences Committee on Superfund Site Assessment and Remediation of the Coeur d'Alene River Basin.** This committee independently evaluated the U.S. Environmental Protection Agency's scientific and technical practices in Superfund site characterization, human and ecological risk assessment, remedial planning, and decisionmaking with regard to the Coeur d'Alene Basin Superfund site. The committee's report was released in July, 2005.
- **Expert witness, NPDES Permit action in western Pennsylvania.** Engaged by corporate client to evaluate claims that discharges from the client's steel mills have caused ecological degradation of the Allegheny and Kiskiminetas Rivers. Led technical team performing quantitative ecological risk assessment. Testified at trial, February, 2001. Prepared supplemental report following successful appeal of initial decision by client; case was settled out-of-court in November, 2004.

- **Expert witness, NPDES Permit action in Ohio.** Engaged by corporate client to evaluate allegations by federal and state agencies that discharges from the client's metal plating plant caused fish kills in the Ohio River. Charges against the client were withdrawn prior to trial.
- **Technical expert on 316(a) and 316(b) issues at the Diablo Canyon Power Plant.** Reviewed historical predictive and retrospective thermal effects assessment studies; provided expert review of draft 316(b) Demonstration. Represented client at regional water board hearing, March 2001.
- **Peer Review Coordinator, Columbia Basin PATH Project.** Organized and chaired an external review committee for a multi-stakeholder project that developed and tested models of the impacts of hydropower operations, harvesting, hatcheries, habitat quality, and oceanic conditions on endangered Snake River Basin salmonid populations. Organized an expert briefing on salmon issues for senior executives of the Bonneville Power Administration.

McLaren-Hart, Inc.

- **Senior Technical Advisor for an assessment of ecological risks of chlorinated solvents, heavy metals, mercury, and PCBs at a chemical manufacturing facility in southwest Louisiana.** Responsible for selection of risk assessment methodologies used by team of risk assessors evaluating on-site and off-site risks to fish, wildlife, and sediment-dwelling biota. Developed a strategy for negotiating major elements of the project work plan with EPA Region VI. Responsible for defining strategy for integrating results of ecological risk assessment into corrective measures planning and potential NRDA defense activities.

Environmental Sciences Division, Oak Ridge National Laboratory

- **Co-principal investigator, 5-year EPA/DOE research program on ecological risk assessment methods.** This was the first federally funded research project explicitly identified as an "ecological risk assessment" project. Methods for uncertainty analysis of ecological models developed for this project were the forerunners of Monte Carlo food-chain exposure models that are widely used today. Much of the ecological risk assessment terminology now used by EPA and other agencies (e.g., "assessment endpoints" and "measurement endpoints") originated with this project. The final publication from this research was named the best scientific paper published at Oak Ridge National Laboratory in 1990.
- **Project manager for a basic research program on biological mechanisms underlying density-dependent population growth in fish.** The project pioneered the development and application of "individual-based population models" that are now widely used in biological research and in management of endangered species.

- **Technical advisor and expert witness for EPA Region II in NPDES permit hearings related to impacts of fossil and nuclear power plants on fish populations in the Hudson River.** Assisted EPA lawyers in preparation of case, performed independent data evaluations and model-based analyses, testified in administrative law hearings. Represented EPA on a technical team that assisted EPA, the State of New York, and the Consolidated Edison Co. in the negotiation of a widely publicized settlement agreement. Became senior editor for an American Fisheries Society monograph presenting scientific results from 10 years of monitoring and research on the Hudson. Assessment methods developed for the “Hudson River Power Case” are now used by utility companies and regulatory agencies throughout the United States.
- **Group leader for ecological risk assessment team performing CERCLA baseline ecological risk assessments for U.S. Department of Energy facilities in Oak Ridge, Tennessee, Portsmouth, Ohio, and Paducah, Kentucky (EPA Regions IV and V).** Major assessments included a five-year investigation and baseline risk assessment for the Clinch River, Tennessee; reservation-wide assessments for the Portsmouth Gaseous Diffusion Plant and the Oak Ridge National Laboratory; and operational-unit-level assessments for numerous burial grounds and waste ponds.
- **Expert advisor on ecological risk assessment for the DOE Office of Air, Water, and Radiation.** Surveyed ecological risk assessment capabilities at all major DOE facilities, initiated development of standard ecological screening benchmarks for all DOE sites, reviewed EPA draft Ecological Risk Assessment Guidance for Superfund for DOE; developed training course on Natural Resource Damage Assessment for DOE site managers, led NRDA case study project at the Savannah River Site, prepared white paper on the application of the EPA Data Quality Objectives Process at DOE sites.

### **Professional Society Activities**

Member, Ecological Society of America, Society for Environmental Toxicology and Chemistry, Society for Risk Analysis

Hazard/Risk Assessment Editor, *Environmental Toxicology and Chemistry*, 1992 - 2010

Founding Editorial Board Member and Associate Editor, *Integrated Environmental Assessment and Management*, 2004-present

Chair, SETAC Global Internet Committee, 2007-present

Chair, SETAC/ESA Workshop on Sustainable Environmental Management, Pellston, Michigan, August 1993.

Chair, SETAC Workshop on Population-Level Ecological Risk Assessment, Roskilde, Denmark, August, 2003.

Short Course Instructor, Annual SETAC meeting

- Ecological Risk Assessment (1992, 1994)
- Product Life Cycle Assessment (1996, 1997)
- Applications of Population Biology in Ecological Risk Assessment (2008, 2010)

Chair, Applied Ecology Section, Ecological Society of America, 1995-1997

Ecological Risk Assessment Specialty Group Chair, Society for Risk Analysis, 1991-1993

Member, Advisory Panel, Society for Risk Analysis, 1996-1998

### **Other Professional Activities**

Member, Kalamazoo River Ecological Risk Studies Peer Review Panel, 2008-

Member, Atlantic States Marine Fisheries Commission Power Plant Panel, 2001-

Member, External Laboratory Review Panel, EPA Midwest Ecology Division, Duluth, MN, February, 2002.

Peer reviewer, EPA Drake Chemical Site Incinerator Risk Assessment, 1998.

Member, Ecological Committee on FIFRA Risk Assessment Methodologies (ECOFRAM), 1997-2000

Reviewer and issue paper author, EPA Risk Assessment Forum Ecological Risk Assessment Guidelines Program, 1991-present

- Member of Peer Review Panel for EPA Framework for Ecological Risk Assessment
- Author of issue paper on Conceptual Model Development
- Member of Peer Review Panel for EPA Ecological Risk Assessment Guidelines
- Member of Peer Review Panel for EPA Generic Endpoints for Ecological Risk Assessment

Chair, National Research Council Workshop on Ecological Risk Assessment, Warrenton, Virginia, February 1991.

Member, National Research Council Committee on Environmental Remediation at Naval Facilities, 1997-1998.

Member, National Research Council Committee to Review the DOI's Biomonitoring of Environmental Status and Trends Program, 1994

Member, National Research Council Committee on Risk Assessment Methodology (Chair, Ecological Risk Assessment Topic Group), 1989-1993

Member, National Research Council Board on Environmental Studies and Toxicology, 1989-1992

Member, National Research Council Committee on Pesticides and Ecological Risk Assessment, 1986-1987

**International Activities:**

Workshop on Population-Level Ecological Risk Assessment, 12<sup>th</sup> SETAC Europe Congress, Vienna, Austria, 2002

Ninth SETAC Europe Congress, Leipzig, Germany, 1999

XIIIth International Plant Protection Congress, The Hague, The Netherlands, 1995

Fifth SETAC Europe Congress, Copenhagen, Denmark, 1995

IPPC Special Workshop on Article 2 of the U.N. Framework Convention on Climate Change, Fortaleza, Brazil, 1994

SGOMSEC Workshop on Methods to Assess the Effects of Chemicals on Ecosystems, Montpellier, France, 1994

IAEA Validation of Assessment Models Project, Vienna, Austria, 1992

International Biospheric Model Validation Project, Vienna, Austria, 1992

Seventh International Congress of Pesticide Chemistry, Hamburg, Germany, 1990

Workshop on Ecological Risk Assessment for Chemicals, Schmallenburg, West Germany, 1987

NATO Conference on Safety Assurance for Environmental Introductions of Genetically-Engineered Organisms, Rome, 1987

### **Awards and Honors**

- Martin Marietta Energy Systems Technical Achievement Award, 1991
- Martin Marietta Energy Systems Author of the Year, 1991
- Martin Marietta Energy Systems Technical Achievement Award, 1994
- Fellow, American Association for the Advancement of Science, 1994

### **Publications**

#### **Books and Monographs**

**Barnthouse, L. W.,** W. R. Munns, and M. T. Sorensen (eds.). 2007. *Population-Level Ecological Risk Assessment*. Taylor & Francis, Boca Raton, Florida, U.S.A.

**Barnthouse, L. W.,** G. R. Biddinger, W. E. Cooper, J. A. Fava, J. H. Gillett, M. M. Holland, and T. F. Yosie (eds.) 1998. *Sustainable Environmental Management*. SETAC Press, Pensacola, Florida, U.S.A.

**Barnthouse, L. W.,** J. Fava, K. Humphres, R. Hunt, L. Laibson, S. Noeson, J. Owens, J. Todd, B. Vigon, K. Weitz, and J. Young. 1997. *Life-Cycle Impact Assessment: The State-of-the-Art*. SETAC Press, Pensacola, Florida, U.S.A.

**Barnthouse, L. W.,** R. J. Klauda, D. S. Vaughan, and R. L. Kendall (eds.) 1998. *Science, Law, and Hudson River Power Plants: a Case Study in Environmental Impact Assessment*. American Fisheries Society Monograph 4. American Fisheries Society, Bethesda, Maryland, U.S.A.

#### **Journal articles and book chapters**

**Barnthouse, L. W.,** D. Glaser, and L. DeSantis. 2009. Polychlorinated biphenyls and Hudson River whiter perch: Implications for population-level risk assessment and risk management. *Integrated Environmental Assessment and Management* 5:435-444.

**Barnthouse, L. W.** 2008. The strengths of the ecological risk assessment process: Linking science to decision making. *Integrated Environmental Assessment and Management* 4:299-305.

Gustavson, K. E., **L. W. Barnthouse,** C. L. Brierly, E. H. Clark, II, and C. H. Ward. 2007. Superfund and mining megasites. *Environmental Science and Technology* 41:2667-2672.

**Barnthouse, L. W.** 2007. Population modeling. Ch. 27 in G. W. Suter II (Ed.) *Ecological Risk Assessment*, 2<sup>nd</sup> Edition. Taylor & Francis, Boca Raton, Florida, USA.

**Barnthouse, L. W.** 2004. Quantifying population recovery rates for ecological risk assessment. *Environmental Toxicology and Chemistry* 23:500-508.



Suter, G. W. II, S. B. Norton, and **L. W. Barnthouse**. 2003. The evolution of frameworks for ecological risk assessment from the Red Book ancestor. *Human and Ecological Risk Assessment* **9**:1349-1360.

**Barnthouse, L. W.**, D. Glaser, and J. Young. 2003. Effects of historic PCB exposures on the reproductive success of the Hudson River striped bass population. *Environmental Science and Technology* **37**:223-228

**Barnthouse, L. W.**, D. G. Heimbuch, V. C. Anthony, R. W. Hilborn, and R. A. Myers. 2002. Indicators of AEI applied to the Delaware Estuary. *The Scientific World* **2** (S1): 169-190.

**Barnthouse, L. W.**, and R. G. Stahl, Jr. 2002. Quantifying natural resource injuries and ecological service reductions: challenges and opportunities. *Environmental Management* **30**:1-12.

Suter, G. W. II, and **L. W. Barnthouse**. 2001. Modeling toxic effects on populations: Experience from aquatic studies. In: Albers, P. H., G. Heinz, and H. M. Ohlendorf (eds.), *Environmental Contaminants and Terrestrial Vertebrates: Effects on Populations, Communities, and Ecosystems*, pp. 177-188. SETAC Special Publication Series, Society of Environmental Toxicology and Chemistry, Pensacola, FL, USA.

**Barnthouse, L. W.**, D. R. Marmorek, and C. N. Peters 2000. Assessment of multiple stresses at regional scales. IN: Ferenc, S. (ed.) *Multiple Stressors in Ecological Risk and Impact Assessment: Approaches to Risk Estimation*. SETAC Press, Pensacola, Florida

**Barnthouse, L. W.** 2000. Impacts of power-plant cooling systems on estuarine fish populations: The Hudson River after 25 years. *Environmental Science & Policy* **3**:S341-S348.

K. A. Rose, L. W. Brewer, **L. W. Barnthouse**, G. A. Fox, N. W. Gard, M. Mendonca, K. R. Munkittrick, and L. J. Vitt. 1999. Ecological responses of oviparous vertebrates to contaminant effects on reproduction and development. Ch. 4. IN: Di Giulio, R. T., and D. E. Tillitt (eds.). *Reproductive and Developmental Effects of Contaminants in Oviparous Vertebrates*. SETAC Press, Pensacola, Florida.

Suter, G. W. II., **L. W. Barnthouse**, R. A. Efroymsen, and H. Jager. 1999. Ecological risk assessment in a large river-reservoir: 2. Fish community. *Environmental Toxicology and Chemistry* **18**:589-598.

Jones, D. S., **L. W. Barnthouse**, G. W. Suter II, R. A. Efroymsen, J. M. Field, and J. J. Beauchamp. Ecological risk assessment in a large river-reservoir: 3. Benthic invertebrates. *Environmental Toxicology and Chemistry* **18**:599-609.

**Barnthouse, L. W.** 1998. Modeling ecological risks of pesticides: a review of available approaches. Pp. 769-798 in Chapter 24 in H. Schüürmann and B. Markert (eds.) *Ecotoxicology*. Spektrum Academic Publishers, Heidelberg.

Jaworska, J. S., K. A. Rose, and **L. W. Barnthouse**. 1997. General response patterns of fish populations to stress: an evaluation using an individual-based simulation model. *Journal of Aquatic Ecosystem Stress and Recovery* 6:15-31.

**Barnthouse, L. W.** 1995. A framework for ecological risk assessment. pp. 367-360 in R. A. Linthurst, P. Bourdeau, and R. G. Tardiff (eds.) *Methods to Assess the Effects of Chemicals in Ecosystems*. John Wiley & Sons, Chichester, England.

**Barnthouse, L.W.** 1994. Ecological Risk Assessment: the CRAM perspective. *Risk Analysis* 14:251-256.

**Barnthouse, L.W.** 1993. Population-level effects, pp. 247-274 in GW Suter I (ed). *Ecological Risk Assessment*. Lewis Publishers, Chelsea, Michigan.

Suter, G.W. II, and **L.W. Barnthouse**. 1993. Assessment Concepts, pp 21-48 in G.W. Suter (ed.) *Ecological Risk Assessment*. Lewis Publishers, Chelsea, Michigan.

**Barnthouse, L.W.** 1992. Models in ecological risk assessment: a 1990s perspective. *Environmental Toxicology and Chemistry*, 11:1751-1760.

**Barnthouse, L.W.** 1992. Case studies in ecological risk assessment. *Environmental Science and Technology* 26:230-231.

Jones, T.D., B.A. Owen, J.R. Trabalka, **L.W. Barnthouse**, C.E. Easterly, and P.J. Walsh. 1991. Chemical pollutants: a caricaturized logos for future planning. *Environmental Auditor* 2:71-88.

**Barnthouse, L.W.**, G.W. Suter II, S.M. Bartell, and C.T. Hunsaker. 1991. Prospective advances in ecological risk assessment for pesticides. pp. 445-454 in H. Frehse (ed.), *Pesticide Chemistry: Advances in International Research, Development, and Legislation*. VCH, Weinheim, Germany.

DeAngelis, D.L., **L.W. Barnthouse**, W. Van Winkle, and R.G. Otto. 1990. A critical appraisal of population approaches in assessing fish community health. *Journal of Great Lakes Research* 16(4):576-590.

Hunsaker, C.T., R.L. Graham, G.W. Suter II, R.V. O'Neill, **L.W. Barnthouse**, and R.H. Gardner. 1990. Assessing ecological risk on a regional scale. *Environmental Management* 14:324-332.

**Barnthouse, L.W.**, G.W. Suter II, and A.E. Rosen. 1990. Risks of toxic contaminants to exploited fish populations: influence of life history, data uncertainty, and exploitation intensity. *Environmental Toxicology and Chemistry* 9:297-312.

**Barnthouse, L.W.** 1990. Ecotechnology (book review). *Ecology* 71:411-412.

**Barnthouse, L.W.** 1989. Ecological simulation primer (book review). *Transactions of the American Fisheries Society* 118:103.

**Barnthouse, L.W.** G.W. Suter II, and A.E. Rosen, 1989. Inferring population-level significance from individual-level effects: an extrapolation from fisheries science to ecotoxicology, pp. 289-300 IN G.W. Suter II and M.A. Lewis (eds) *Aquatic toxicology and environmental fate: 11th volume*. ASTM STP 1007, American Society for Testing and Materials, Philadelphia, Pennsylvania.

**Barnthouse, L.W.** G.S. Saylor, and G.W. Suter II, 1988. A biological approach to assessing ecological risks of bioengineered organisms, pp. 89-98 IN J. Fiksel and V.T. Covello (eds), *Risk Analysis Approaches for Environmental Releases of Genetically Engineered Organisms*. NATA Advanced Science Institutes Series, Volume F. Springer-Verlag, Berlin.

**Barnthouse, L.W.** G.W. Suter II, and S.M. Bartell. 1988. Quantifying risks of toxic chemicals to aquatic populations and ecosystems. *Chemosphere* 17:1487-1492.

**Barnthouse, L.W.**, R.J. Klauda, and D.S. Vaughan. 1988. What we didn't learn about the Hudson River, why, and what it means for environmental assessment. *American Fisheries Society Monograph* 4:329-336.

Klauda, R.J., **L.W. Barnthouse**, and D.S. Vaughan. 1988. What we learned about the Hudson River: journey toward an elusive destination. *American Fisheries Society Monograph* 4:316-328.

**Barnthouse, L.W.**, J. Boreman, T.S. Englert, W.L. Kirk, and E.G. Horn. 1988. Hudson River settlement agreement: technical rationale and cost considerations. *American Fisheries Society Monograph* 4:267-273.

**Barnthouse, L.W.**, and W. Van Winkle. 1988. Analysis of impingement impacts on Hudson River fish populations. *American Fisheries Society Monograph* 4:182-190.

**Barnthouse, L.W.**, R.J. Klauda, and D.S. Vaughan. 1988. Introduction to the monograph. *American Fisheries Society Monograph* 4:1-8.

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**Barnthouse, L.W.** 1987. The Hudson River Ecosystem (book review). *Environmental Management* 11:421-422.

Suter, G.W. II, **L.W. Barnthouse**, and R.V. O'Neill. 1987. Treatment of risk in environmental impact assessment. *Environmental Management* 11:295-303.

**Barnthouse, L.W.**, G.W. Suter II, A.E. Rosen, J.J. Beauchamp. 1987. Estimating responses of fish populations to toxic contaminants. *Environmental Toxicology and Chemistry* 6:811-824.

Hildebrand, S.G., **L.W. Barnthouse**, and G.W. Suter II. 1987. The role of basic ecological knowledge in environmental assessment. pp. 51-70 IN: Draggen, S., J.J. Cohrsen, and R.E. Morrison (eds), *Preserving Ecological Systems*, Pareger, New York.

Smith, E.D., **L.W. Barnthouse**, G.W. Suter II, J.E. Breck, T.D. Jones, and D. Sanders. 1986. Improving the risk relevance of systems for assessing the relative hazard of contaminated sites. IN: Proceedings of the Third National Conference and Exhibition on Hazardous Wastes and Hazardous Materials, Atlanta Georgia, March 4-6, 1986.

**Barnthouse, L.W.**, and A.V. Palumbo. 1986. Assessing the transport of fate and bioengineered microorganisms in the environment. pp 109-128 IN: Covello, V.T., and J.R. Fiksell. *Biotechnology Risk Assessment: Issues and Methods for Environmental Introductions*, Pergamon, New York.

**Barnthouse, L.W.**, R.V. O'Neill, S.M. Bartell, and G.W. Suter II. 1986. Population and ecosystem theory in ecological risk assessment. pp. 82-96 IN: T.M. Poston and R. Purdy (eds), *Aquatic Toxicology and Environmental Fate: Ninth Volume*, ASTM STP 921, American Society for Testing and Materials, Philadelphia, Pennsylvania.

**Barnthouse, L.W.** 1986. Theory and practice of environmental impact assessment (book review). *Bioscience* 36:389-390.

Suter, G.W. II, **L.W. Barnthouse**, J.E. Breck, R.H. Gardner, and R.V. O'Neill. 1985. Extrapolating from the laboratory to the field: how uncertain are you? pp. 400-413 IN: *Aquatic Toxicology and Hazard Assessment, Seventh Symposium*. ASTM STP 854, American Society for Testing and Materials, Philadelphia, Pennsylvania.

**Barnthouse, L.W.** and G.W. Suter II. 1984. Risk assessment: ecology. *Mechanical Engineering* 106:36-39.

**Barnthouse, L.W.**, J.Boreman, S.W. Christensen, C.P. Goodyear, W. Van Winkle, and D.S. Vaughan. 1984. Population biology in the courtroom: the Hudson River controversy. *Bioscience* 34:14-19.

**Barnthouse, L.W.**, G.W. Suter II, and R.V. O'Neill. 1983. Quantifying uncertainties in ecological risk analysis. pp. 487-489 IN Proceedings, International Conference on Renewable Resources Inventories for Monitoring Changes and Trends, Corvallis, Oregon, August 15-19, 1983. School of Forestry, Oregon State University, Corvallis, Oregon.

**Barnthouse, L.W.**, W. Van Winkle, and D.S. Vaughan. 1983. The magnitude and biological significance or impingement of white perch at Hudson River power plants. *Environmental Management* 7:355-364.

O'Neill, R.V., R.H. Gardner, **L.W. Barnthouse**, G.W. Suter, S.G. Hildebrand, and C.W. Gehrs. 1982. Ecosystem risk analysis: a new methodology. *Environmental Toxicology and Chemistry* 1:167-177.

Christensen, S. W., W. Van Winkle, **L. W. Barnthouse**, and D. S. Vaughan. 1981. Science and the law: Conflict and confluence on the Hudson River. *Environmental Impact Assessment Review* 2:63-88.

Van Winkle, D. S. Vaughan, **L.W. Barnthouse**, and B. L. Kirk. 1981. Analysis of the minimum detectable reduction in year-class strength of the Hudson River white perch population. *Canadian Journal of Fisheries and Aquatic Sciences* 38:627-632.

**Barnthouse, L.W.** 1981. Mathematical models useful in chemical hazard assessment. pp. 155-168. IN: A.S. Hammons (ed) *Methods for Ecological Toxicology: A Critical Review of Laboratory Multispecies Tests*. Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan.

**Barnthouse, L.W.**, and W. Van Winkle. 1981. The impact of impingement on the Hudson River white perch population. pp. 199-205 IN: L.D. Jensen (ed), *Issues Associated with Impact Assessment: Proceedings of the Fifth National Workshop on Entrainment and Impingement*, San Francisco, California, May 5-7, 1980. Ecological Analysts, Inc., Sparks, Maryland.

Roop, R.D., F.S. Sanders, and **L.W. Barnthouse**. 1978. Coal conversion and aquatic environments: overview of impacts and strategies for monitoring. pp. 118-123. IN: D.G. Nichols, E.J. Rolinski, R.A. Servias, L. Theodore, and A.J. Buonicore (eds), *Energy and the Environment: Proceedings of the Fifth National Conference*. American Institute of Chemical Engineers, Dayton, Ohio.

Allan, J.D., **L.W. Barnthouse**, R.A. Prestbye, and D.R. Strong. 1973. On foliage arthropod communities of Puerto-Rican second growth vegetation. *Ecology* 54:628-632.

#### Technical Reports

**Barnthouse, L. W.** 2005. Parameter development for equivalent adult and production foregone models. EPRI Report 1008832. Electric Power Research Institute, Palo Alto, California.

**Barnthouse, L. W.** 2004. Extrapolating impingement and entrainment losses to equivalent adults and production foregone. EPRI Report 1008471. Electric Power Research Institute, Palo Alto, California.

**Barnthouse, L. W.**, and G. W. Suter II. 1996. Guide for developing data quality objectives for ecological risk assessment at DOE Oak Ridge Operations Facilities. ES/ER/TM-185/R1, Oak Ridge National Laboratory, Oak Ridge, Tennessee

**Barnthouse, L. W.**, J. J. Bascietto, S. A. Deppen, R. W. Dunford, D. E. Gray, and F. E. Sharples. 1995. Natural resource damage assessment implementation project: Savannah River Site. DOE/EH-0510, U.S. Department of Energy, Washington, D.C.

**Barnthouse, L. W.** 1995. Effects of ionizing radiation on terrestrial plants and animals: a workshop report. ORNL/TM-13141, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Floit, S.B., and **L.W. Barnthouse**. 1991. Demographic analyses of a San Joaquin kit fox population. ORNL/TM-11679, Oak Ridge National Laboratory, Oak Ridge Tennessee.

Hunsaker, C.T., R.L. Graham, G.W. Suter II, R.V. O'Neill, B.L. Jackson, and **L.W. Barnthouse**. 1989. Regional ecological risk assessment: theory and demonstration. ORNL/TM-11128, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

**Barnthouse, L.W.**, J.E. Breck, T.D. Jones, G.W. Suter II, C. Easterly, L.R. Glass, B.A. Owen, and A.P. Watson. 1988. Relative toxicity estimates and bioaccumulation factors for the Defense Priority Model. ORNL-6416. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

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