



Integral Consulting Inc.  
411 1st Avenue S.  
Suite 550  
Seattle, WA 98104

telephone: 206.230.9600  
facsimile: 206.230.9601  
rpastorok@integral-corp.com



**Robert A. Pastorok, Ph.D.**  
**Senior Science Advisor**

**PROFESSIONAL PROFILE**

Dr. Robert Pastorok is an ecologist specializing in ecological risk assessment and evaluation of natural resources. He has more than 30 years of experience developing and applying quantitative empirical techniques and ecological models to evaluate and solve environmental issues. Dr Pastorok has managed or served as technical lead on projects to address siting of industrial, municipal, and commercial facilities, cleanup of chemically contaminated urban-industrial habitats, restoration and conservation of habitat, and management of aquatic and terrestrial ecosystems. Dr. Pastorok has led major multidisciplinary investigations in Puget Sound (Washington), the Willamette River (Oregon), the Hudson River (New York), and the Clark Fork River (Montana). He has managed projects to develop risk management decision frameworks, ecotoxicological methods, risk assessment models, and chemical standards for soil, surface water, sediments, and wetlands. He was instrumental in the development of technical approaches in the USEPA framework for ecological risk assessment, the Washington State Model Toxics Control Act program, the Puget Sound Estuary Program, and the USEPA training program for use of population modeling in ecological risk assessment.

Dr. Pastorok was the lead author and editor of the seminal book titled *Ecological Modeling in Risk Assessment: Chemical Effects on Populations, Ecosystems, and Landscapes* (2002, CRC Press). He contributed substantially to two SETAC Pellston workshops and the resulting books (*Uncertainty Analysis in Ecological Risk Assessment* and *Population-Level Ecological Risk Assessment*). Dr. Pastorok is internationally known for his expertise in ecological modeling and risk assessment and has been an invited technical reviewer for prominent journals, industries, and environmental management agencies.

**CREDENTIALS AND PROFESSIONAL HONORS**

Ph.D., Zoology, University of Washington, Seattle, Washington, 1978

B.S., Biology, University of Notre Dame (honors), Notre Dame, Indiana, 1971

Senior Editor, Ecological Risk Assessment for the international journal *Human and Ecological Risk Assessment* (Senior 2000–present; Associate 1997–2000)

Associate Editor, *Ecosystems and Communities for the Scientific World* (2001–present)

Technical Leader, *Roskilde University Research Consortium on Population Modeling in Ecological Risk Assessment* (2009–present)

## PROFESSIONAL AFFILIATIONS

Society of Environmental Toxicology and Chemistry  
Ecological Society of America

## RELEVANT EXPERIENCE

### *Technical Management and Analysis for Ecological Studies*

*Portland Harbor Superfund Site RI/FS, Oregon*—Senior technical reviewer for the ecological risk assessment, co-author of the assessment decision framework, and co-author of Executive Summary of the remedial investigation report for the Portland Harbor Superfund Site on the Lower Willamette River.

*Upper Columbia River RI/FS Ecological Risk Assessment, Washington* — Technical expert for development of study design and decision framework for ecological risk studies for the Upper Columbia River remedial investigation; presenter and co-leader of wildlife group at technical workshop with client, consultants, and regulatory agencies.

*Exxon Valdez Oil Spill Re-Assessment, Alaska* —Evaluated population modeling for harlequin duck and sea otter to assess natural resource recovery status after the *Exxon Valdez* oil spill in Prince William Sound.

*Chronic Toxicity Testing of Effluent, Alaska*—Technical reviewer for evaluation of methods, species, laboratories, and other considerations for conducting chronic toxicity testing of effluent from the Ward Cove Landfill under the pulp mill's NPDES permit.

*Improvements in Applications of Models in Ecological Risk Assessment, USA*—Managed the compilation and evaluation of ecological models for population-, ecosystem-, and landscape-level endpoints for use in ecological risk assessment; lead author of report.

*Hudson River Ecological Structure and Function, New York*—Analyzed ecological structure and function relationships for freshwater systems to guide the selection of indicators for monitoring the success of habitat restoration projects.

*Hudson River Ecological Risk Assessment, New York*—Managed ecological risk studies of the Hudson River, New York. The project involved investigating the role of aquatic vegetation communities and associated food web structure in the transfer of PCBs to fish, birds, and mammals, and the status of key species.

*Clark Fork River Superfund Site RI/FS Ecological Risk Assessment, Montana*—Managed a field investigation of bioaccumulation and effects of mining-related metals in riparian vegetation, small mammals, and wildlife in the Upper Clark Fork River basin.

*Everglades Wading Birds Ecological Risk Assessment, Florida*—Developed a study plan and technical reviews for comparative ecological risk assessment for phosphorus enrichment and mercury effects on wading birds in the Everglades agricultural areas.

*Model Toxic Control Act Methods Development, Washington*—Managed the development of ecological risk assessment approaches for numerical cleanup criteria for soil, surface water, and wetlands at hazardous waste sites.

*Sediment Management Standards Methods Development, Washington*—Developed an approach to analysis of sediment toxicity test data and statistical power to support development of sediment standards.

*Puget Sound Estuary Program Support*—Deputy program manager for technical support activities for the Puget Sound Estuary Program, which included monitoring programs, sediment toxicity surveys, risk assessments, and action plans. Also developed holistic management framework and technical approaches for urban bay action programs.

*McCormick & Baxter RI/FS Ecological Risk Assessment, Oregon*—Managed an ecological risk assessment of a creosote-contaminated site on the lower Willamette River.

*Variability of Chronic Toxicity Testing for Effluent, U.S.*—Managed an interlaboratory and intralaboratory variability study of four chronic toxicity-testing protocols to evaluate effects of pulp mill effluents on marine species.

*National Zinc Site RI/FS Ecological Risk Assessment, Oklahoma*—Managed an ecological risk assessment of a zinc smelter site in Oklahoma involving ecological surveys, tissue analyses, and toxicity testing in aquatic and terrestrial habitats.

*U.S. Army Corps of Engineers Environmental Program Support, Northwestern U.S.*—Managed a series of environmental studies, including wetlands and eelgrass inventories, sediment bioassays of dredged material, and development of chronic toxicity tests.

*Bangor Submarine Base RI/FS Ecological Risk Assessment, Washington*—Managed an ecological risk assessment for the Bangor Submarine Base in Washington State. Evaluated food web models for metals and explosives-related organic compounds. Reviewed RI/FS work plans and evaluated sensitive habitats.

*Dioxin Risks from Pulp Mill, Washington*—Managed a review of ecological and human health risks associated with dioxin congeners in sediments near a pulp mill site on Commencement Bay.

*Harbor Island Superfund RI/FS Field Sampling, Washington*—Managed the sampling program for estuarine sediment chemistry and mussel bioassay studies.

*Ecological Risk Assessment Work Plan, Washington*—Developed an RI/FS work plan for estuarine sediment investigations and ecological risk assessment for a Harbor Island Superfund site.

*Coastal Marsh Ecological Risk Assessment, Georgia*—Provided technical oversight for an ecological risk assessment of a *Spartina* marsh with elevated concentrations of PCBs, mercury, dioxins/furans, and other chemicals.

*Ecological Risk Assessment for a Vanadium Metallurgical Site, Ohio*—Technically reviewed an ecological risk assessment of a vanadium metallurgical site.

*Sediment Toxicity Performance Standards for Reference Areas, Washington*—Managed field surveys of sediment chemistry and sediment bioassays using amphipods, bivalve larvae, echinoderm larvae, polychaete worms, and Microtox® to support development of reference area performance standards for Puget Sound.

*Reference Area Performance Standards, Washington*—Developed a framework for defining reference area performance standards in Puget Sound.

*Interlaboratory Comparison of Sediment Toxicity Bioassays, Washington*—Managed a multi-laboratory comparison of sediment toxicity tests involving 7 tests and 13 endpoints.

*Guidance for Aquatic Habitat Restoration, U.S.*—Facilitated a work group to develop the planning process for U.S. Army Corps of Engineers environmental restoration projects.

*U.S. Army Corps of Engineers Comparative Risk Analysis, U.S.*—Coordinated a national workshop and developed a modeling framework for comparative risk analysis of dredged material disposal options.

*Environmental Monitoring Design for Dredged Material Disposal, Washington*—Managed the development of a comprehensive environmental monitoring program for confined aquatic disposal of contaminated dredged material in Port Gardner.

*Environmental Monitoring Design for Fresh Waters, Washington*—Developed a long-term monitoring program for point and nonpoint sources, including surface fresh waters.

*Ecological Risk Assessment Modeling, U.S.*—Reviewed ecological risk assessment models for potential application to data quality objectives planning.

*Wetland Ecological Risk Assessment, Ohio*—Developed an RI/FS study design for ecological assessment of a lead-contaminated wetland.

*Work Plans for Ecological Risk Assessment, Western U.S.*—Developed RI/FS work plans for ecological assessments at hazardous waste sites contaminated with pesticides, creosote, and dioxins.

*Commencement Bay Superfund Field Sampling Design, Washington*—Evaluated 78 available data sets and designed field investigations of sediment contamination, water quality, bioaccumulation, and biological effects at the Commencement Bay Superfund site.

*Impacts of Sewage Discharges in Coastal Waters, U.S.*—Evaluated sewage discharge impacts on marine and estuarine biota and designed monitoring programs for more than 20 sites under the Clean Water Act Section 301(h) applications.

*Guidance for Habitat Restoration after Oil Spills, Worldwide*—Evaluated potential ecological impacts and recovery in marine habitats affected by oil spills and cleanup operations.

*Impacts of Oil Platform Drilling Muds, Alaska*—Evaluated potential effects of drilling mud discharges on plankton of the Beaufort, Chukchi, and Bering seas; Cook Inlet; and northeast Gulf of Alaska.

*Aeration/Circulation for Lake Restoration, U.S.*—Reviewed literature and evaluated aeration/circulation techniques for lake restoration.

*Impacts of Aeration/Circulation in Reservoirs, U.S.*—Evaluated physical, chemical, and biological effects of aeration/circulation techniques in reservoirs.

*Urban Lake Habitat Restoration, California*—Developed aeration systems and reviewed lake restoration plans for three urban lakes in Los Angeles.

*Long-Term Monitoring of Biological Communities in Lakes, Washington*—Performed a 3-year field and laboratory evaluation of population dynamics and community interactions of zooplankton and fish in two Washington lakes.

*Effects of Salinity on Zooplankton, Washington*—Performed a laboratory study of the effects of salinity on freshwater zooplankton.

*Structure and Dynamics of Freshwater Communities, Washington*—Participated in a long-term research project on productivity and population dynamics in Lake Washington, Soap Lake, Lenore Lake, and Hall Lake.

### ***Natural Resource Damage Assessment***

*Natural Resource Damage Assessments at Various Sites, USA*—Evaluated natural resources and NRDA issues for the Hudson River in New York, Saginaw River in Michigan, and other sites.

*Technical Seminar, Minnesota*—Key presenter at NRDA technical seminar for attorneys and regulatory agency staff hosted by Barr Engineering. Topic presented was *Scientific Issues in Natural Resource Damage Assessment*.

*Exxon Valdez Oil Spill Re-Assessment, Alaska*—Key technical expert for population assessments for the State of Alaska assessment of lingering oil and resource injuries from the *Exxon Valdez* oil spill, 15 years after the spill. Summarized natural resource status and recovery issues in Prince William Sound, including analyzing ecosystem connectivity (food webs) and developing a decision framework to evaluate status of natural resources and causes of non-recovery.

*Habitat Restoration after Oil Spills, U.S.*—Evaluated the relative benefits and costs of habitat cleanup and restoration techniques following oil spills in coastal environments.

*Ongoing Research*—Defining metrics that are instrumental for NRDA injury assessment and habitat restoration performance evaluation based on analysis of relationships between ecological structure and function. Key role in an international research consortium

developing guidance on population modeling for risk assessment, injury determination, and species recovery analysis.

### ***Ecological Risk Assessment Guidance Development and Teaching***

*Population Modeling Course, USA*—Developed and served as principal instructor for USEPA course in *Population Modeling in Ecological Risk Assessment*.

*Ecological Risk Assessment Framework, Montana*—Developed an ecological risk assessment framework for a major Superfund site involving mining waste in the Clark Fork River basin, Montana.

*Ecological Risk Assessment Framework, U.S.*—Developed a seminal framework for ecological risk analysis used in natural resource damage assessments at Superfund sites.

*Bioaccumulation Monitoring Guidance, U.S.*—Technical supervisor to develop national guidance manuals on estimating the bioaccumulation potential of toxic pollutants, selecting target species, and selecting sampling strategies for bioaccumulation monitoring.

*Workshop on Ecological Modeling for Risk Assessment, U.S.*—Workshop leader, American Chemistry Council *Workshop on Evaluation of Ecological Models for Use in Chemical Risk Assessment*.

*Habitat Selection Functions Course, U.S.*—Co-Instructor, short course at Annual Meeting of Society of Environmental Toxicology and Chemistry, *Use of Habitat Selection Functions in Ecological Risk Assessment*.

*Ecological Risk Assessment Course, U.S.*—Primary developer, short course for American Industrial Hygiene Council, *Ecological Risk Assessment*.

*Ecological Risk Assessment Course, Korea*—Instructor, short course for KOPEC Engineers, in *Ecological Risk Assessment*.

*Ecological Risk Assessment Course, USA*—Instructor, short course for PTI Environmental Services, *Ecological Risk Assessment*.

*Workshop on Aquatic Habitat Restoration, USA*—Workshop leader, for U.S. Army Corps of Engineers workshop, *Guidance for Restoration of Aquatic Habitats*.

*Ecological Risk Assessment Course, Worldwide*—Co-instructor, short course for General Motors, *Ecological Risk Assessment*.

*Ecological Risk Assessment Course, U.S.*—Co-Instructor, short courses for E3 on *Ecological Risk Assessment* at several locations throughout the U.S.

*Ecological Risk Assessment Course, USA*—Workshop leader, U.S. Army Corps of Engineers workshop, *Models for Comparative Risk Analysis of Dredged Material Disposal Options*.

*Ecological Sciences Courses, Washington*—Taught undergraduate and graduate-level courses in models in population biology, general ecology, invertebrate zoology, animal biology,

and other topics at University of Puget Sound, University of Washington, and Western Washington University.

***Management and Technical Analysis for Human Health Risk Studies***

*Portland Harbor Superfund Site RI/FS, Oregon*—Senior technical reviewer for the human health risk assessment and co-author of executive summary of the remedial investigation report for the Portland Harbor Superfund Site on the Lower Willamette River, Portland.

*Sediment Management Standards Methods Development, Washington*—Developed alternative approaches and recommendations for sediment quality criteria based on human health risk assessment, including evaluation of exposure pathways and fish pathology indicators.

*Human Health Risk Assessment for Sea Cucumbers, Washington*—Managed a field survey and health risk assessment for bioaccumulation of toxic chemicals in sea cucumbers in Puget Sound.

*Commencement Bay Superfund Site RI/FS, Washington*—Developed a responsiveness summary for human health risk assessment in record of decision for Commencement Bay Superfund site.

*Human Health Risk Assessment for Dredged Material Disposal, Washington*—Developed a human health risk assessment for estuarine and ocean disposal of dredged material contaminated by dioxins in Grays Harbor, Washington.

*Human Health Risk Assessment for Puget Sound Fish and Shellfish, Washington*—Reviewed information on bioaccumulation and potential human health effects of toxic chemicals in fish and shellfish in Puget Sound.

*Human Health Risks in Santa Monica Bay, California*—Managed a comprehensive synthesis of data on transport, fate, bioaccumulation, and human health risks of chemicals and pathogens in Santa Monica Bay.

*Guidance on Human Health Risk Assessment for Fish and Shellfish Consumption*—Developed regional and national technical guidance manuals on human health risk assessment for ingestion of chemically contaminated fish and shellfish.

*Human Health Risks of 2,4-D, Washington*—Managed a human health risk analysis for freshwater application of the herbicide 2,4-D.

**PUBLICATIONS**

Forbes, V., P. Calow, V. Grimm, T. Hayashi, T. Jager, A. Palmqvist, R. Pastorok, D. Salvito, R. Sibly, J. Spromberg, J. Stark, and R. Stillman. In press. Integrating population modeling into ecological risk assessment. SETAC Globe, Learned Discourse. *Soc. Environ. Toxicol. Chem.*

Wentsel, R., N. Beyer, V. Forbes, S. Maund, and R. Pastorok. 2008. A framework for population-level ecological risk assessment. pp. 211–238. In: *Population-level ecological risk*

assessment. L.W. Barnthouse, W.R. Munns, Jr., and M.T. Sorensen (eds). CRC Press, Boca Raton, FL.

Pastorok, R.A., D. Preziosi, and D. Rudnick. 2008. Ecotoxicological models of populations, ecosystems, and landscapes. pp. 1165–1186. In: *Encyclopedia of ecology, Volume 2*. S.E. Jorgenson and B.D. Fath (eds). 5 vols. Oxford: Elsevier Publishers. Amsterdam, Netherlands.

Preziosi, D.V., and R.A. Pastorok. 2008. Ecological food web analysis for chemical risk assessment. *Sci. Total Environ.* 406(3):491–502.

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Pastorok, R.A. 2003. Introduction: Improving chemical risk assessments through ecological modeling. *Hum. Ecol. Risk Assess.* 9:885–888.

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Pastorok, R.A., S.M. Bartell, S. Ferson, and L.R. Ginzburg. 2002. *Ecological modeling in risk assessment: Chemical effects on populations, ecosystems, and landscapes*. CRC Press, Lewis Publishers, Boca Raton, FL. 302 pp.

Reible, D.D., R.H. Jensen, S.J. Bentley, M.B. Dannel, J.V. DePinto, J.A. Dyer, K.J. Farley, M.H. Garcia, D. Glaser, J.M. Hamrick, W.J. Lick, R.A. Pastorok, R.F. Schwer, and C.K. Ziegler. 2002. The role of modeling in managing contaminated sediments. pp. 63–110 (Chapter 2). In: C.C. Chien, M.A. Medina, Jr., G.F. Pinder, D.R. Reible, B.E. Sleep, and C. Zheng. *Environmental modeling and management: Theory, practice, and future directions*. Prepared by the Environmental Modeling Panel under the auspices of DuPont Company. Today Media, Inc., Wilmington, DE.

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- Pastorok, R.A., R.D. Nielsen, and M.K. Butcher. 1996. Future directions in modeling wildlife exposure to toxic chemicals. *Hum. Ecol. Risk Assess.* 2(3):570–579.
- Pastorok, R.A., M.K. Butcher, and R.D. Nielsen. 1996. Modeling wildlife exposure to toxic chemicals: Trends and recent advances. *Hum. Ecol. Risk Assess.* 2(3):444–480.
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- Pastorok, R.A. 1996. Lakes and reservoirs. In: Planning and evaluating restoration of aquatic habitats. D. Yozzo, J. Titre, and J. Sexton (eds). IWR Report 96-EL-4. U.S. Army Corps of Engineers. pp. 5F-1–5F-46.
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- Pastorok, R.A., A.J. La Tier, M.K. Butcher, and T.C. Ginn. 1995. Mining-related trace elements in riparian food webs of the Upper Clark Fork River Basin. In: Proc. Twelfth Annual National Meeting of the Amer. Soc. for Surface Mining and Reclamation, Gillette, WY. pp. 31-51.
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Barrick, R.C., R.A. Pastorok, H.R. Beller, and T.C. Ginn. 1988. Use of sediment quality values to assess sediment contamination and potential remedial actions in Puget Sound. In: Proc. First Annual Meeting on Puget Sound Research, Puget Sound Water Quality Authority, Seattle, WA. pp. 667–675.

USEPA. 1987. Bioaccumulation monitoring guidance: 5. Strategies for sample replication and compositing. U.S. Environmental Protection Agency, Office of Marine and Estuarine Protection, Washington, DC. (co-author)

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**INVITED PRESENTATIONS (SELECTED)/PANELS/PEER REVIEWS**

2009—Invited paper: *Role of Population Modeling in Pesticide Risk Assessment*. Presented at the Society of Environmental Toxicology and Chemistry (SETAC) Europe 19th Annual Meeting, May 31–June 4, 2009, Göteborg, Sweden.

2009—Invited participant and rapporteur for discussion group: Roskilde University (Denmark) research consortium workshop on integrating population modeling into ecological risk assessment (co-author of subsequent publications).

2008—Invited paper: *Developments in Population-Level Ecological Risk Assessment in the USA*. Presented to Research Center for Chemical Risk Management, Research Institute of Science for Safety and Sustainability, National Institute of Advanced Industrial Science and Technology, Tukuba City, Japan.

2008—Invited paper: *Assessing Inversely Related Risks from Different Stressors*. Presented to Presented to Research Center for Chemical Risk Management, Research Institute of Science for Safety and Sustainability, National Institute of Advanced Industrial Science and Technology, Tukuba City, Japan.

2008—Co-leader: USEPA's international group of experts to evaluate status of population modeling and guidance needs for programs under USEPA Risk Assessment Forum policy initiatives on population-level ecological risk assessment (co-author of report chapter).

2007—Workshop participant: *Ecological Models in Support of Regulatory Risk Assessments of Pesticides: Developing a Strategy for the Future (LEMTOX)*. Society of Environmental Toxicology and Chemistry (SETAC) Workshop, 9-12 September 2007, Leipzig, Germany.

2006—Invited paper: *Ecological Food Web Analysis for Risk Assessment*. Presented at the Society of Environmental Toxicology and Chemistry (SETAC) North America Annual Meeting, 5-9 November, 2006, Montreal, Quebec.

2006—Invited paper: *Ecological Food Web Analysis for Toxic Chemical Risk Assessments*. Presented at the Society of Environmental Toxicology and Chemistry (SETAC) Europe 16th Annual Meeting, 7-11 May 2006, The Hague, Netherlands (co-author of publication).

2004—Review panel member: U.S. Army Corps of Engineers panel of experts in ecological risk assessment to review a comparative risk assessment of dredged material disposal options in Moss Landing Harbor and Monterey Bay, California (author of review).

2003—Workshop participant: SETAC Pellston Workshop on population-level ecological risk assessment (co-author of book chapter).

2003—Review panel member: USEPA panel of experts in ecological modeling to review the AQUATOX model (Release 2) and supporting documentation (author of review).

2001—Invited poster: *Ecological Modeling in Chemical Risk Assessment*. Poster presented at *European Workshop on Probabilistic Risk Assessment of Plant Protection Products*, Amsterdam, The Netherlands.

2001—Invited paper: *The Role of Ecological Modeling in Assessing Natural Recovery of Sediments*. Presentation at Meeting of the Remedial Technology Development Forum, Seattle, WA, January.

2001—Invited paper: *Ecological Modeling in Assessing Natural Recovery of Sediments*. Presentation at meeting of the U.S. Environmental Protection Agency Technical Support Program Workshop, San Diego, CA.

2000—Invited paper: *Use of Ecological Models to Assess Sediment Contamination*. Presentation at *Modeling and Management of Emerging Environmental Issues Workshop 2000*, sponsored by DuPont, Malvern, PA.

1998–2000—Workgroup member: USEPA experts work group on wildlife exposure modeling to support development of ecological soil screening values.

1998—Review panel member: American Society of Mechanical Engineers, including co-writing the consensus report for ecological screening/preliminary risk assessment (co-author of report).

1993—Workshop participant: USEPA experts' workshop for the review of ecological data and models for dioxins and development of ecological risk assessment approaches for aquatic life and associated wildlife.

1991–1992—Regional expert: Workshop on case studies to support the development of USEPA national guidelines for ecological risk assessment (co-author of case study on Commencement Bay Superfund Site ecological risk assessment).

1978–present—Peer reviewer for the journals *Human and Ecological Risk Assessment*, *Environmental Toxicology and Chemistry*, *Integrated Environmental Assessment and Management*, *Limnology and Oceanography*, and others.