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# Nicholas W. Gard, Ph.D.
**Managing Scientist**

## Professional Profile

Dr. Nicholas Gard is a Managing Scientist in Exponent's EcoSciences practice and is based in Bellevue, Washington. He has more than 20 years of experience in ecology, environmental toxicology, and wildlife biology. He has managed or conducted natural resource damage assessments (NRDA), ecological risk assessments (ERA), site reconnaissance visits, environmental impact assessments, and habitat evaluations in a variety of terrestrial, wetland, and estuarine ecosystems both in the United States and internationally. Dr. Gard has evaluated environmental effects for a number of industrial activities, including manufacturing facilities, mines, smelters, pulp and paper mills, refineries, pipelines, and agro-chemical operations. He has considerable experience evaluating ecotoxicological effects of PCBs, dioxins, heavy metals, including mercury and lead, and pesticides. Dr. Gard is experienced in quantifying risks and damages to ecological systems from a wide range of chemical and environmental stressors, and in identifying suitable mitigation approaches or ecological restoration opportunities to compensate for those impacts.

Dr. Gard has used many field and laboratory ecological and toxicological techniques as part of the site assessments and ecological investigations he has performed, often relying on multi-disciplinary approaches to address complex issues. He has experience in the use of population modeling techniques to assess risks to aquatic and terrestrial wildlife, including threatened and endangered species. Additionally, he has used innovative methods in delineating baseline conditions, quantifying reductions in ecological services and scaling compensatory restoration alternatives. He has designed sampling and analysis protocols, site-specific toxicity evaluations, wildlife surveys, and monitoring programs for many of the projects on which he has worked. He also has experience designing and conducting field and laboratory studies in accordance with rigorous GLP and QA/QC procedures.

## Academic Credentials and Professional Honors

Ph.D., Environmental Toxicology, Clemson University, 1995
M.Sc., Wildlife Ecology, McGill University, 1989
B.Sc., Wildlife Biology, University of Guelph (honors), 1983

## Licenses and Registrations

Hazardous Waste Operations and Emergency Response 40-hour training program; Hazardous Waste Operations and Emergency Response 8-hour management and supervisor training

**Publications**

Booth PN, Salatas JH, Kaetzel RS, Gard NW, Yost LJ, O'Boyle RA, Mackay CE. Risk assessment as a decision-making tool for treatment of emissions at a new aluminum smelter in Iceland: 1. Background and introduction. J Hum Ecol Risk Assess 2009; 15:423–441.

Salatas JH, Booth PN, Gard NW, O'Boyle RA, Mackay CE. Risk assessment as a decision-making tool for treatment of emissions at a new aluminum smelter in Iceland: 3. Ecological assessment. J Hum Ecol Risk Assess 2009; 15:469–502.

Ludwig DF, Iannuzzi TJ, Kannan K, Giesy JP, Safe SH, Schmeising LM, Gard NW, Moore ML, Connor T. An innovative injury quantification approach for organisms exposed to AhR-active compounds. Organohalogen Compounds 1999; 44:471–478.

Rose KA, Brewer LW, Barnthouse LW, Fox GA, Gard NW, Mendonca M, Munkittrick KR, Vitt LJ. Ecological responses of oviparous vertebrates to contaminant effects on reproduction and development. pp. 225–281. In: Reproductive and Developmental Effects of Contaminants in Oviparous Vertebrates. Giulio RT and Tillitt DE (eds), SETAC Press, Pensacola, FL, 1999.

Yost LJ, Maloy J, Gard N, Moore M, Shields W, Jacobs L. Dioxins: Threat versus reality. A case study at a sulfite pulp mill. Proceedings, Technical Association of the Pulp and Paper Industry (TAPPI) International Environmental Conference and Exhibit, Nashville, TN, April 18–21, 1999.

Gard NW. Induction of immunotoxicity and mixed-function oxygenase activity as biomarkers of exposure to environmental contaminants in the deer mouse (*Peromyscus maniculatus*). Dissertation, Clemson University, Clemson, SC, 1995.

Gard NW, Hooper MJ. An assessment of potential hazards of pesticides and environmental contaminants. pp. 294–310. In: Ecology and Management of Neotropical Migratory Birds. T. Martin and D. Finch (eds), Oxford University Press, 1995.

Dickerson RL, Hooper MJ, Gard NW, Cobb GP, Kendall RJ. Toxicological foundations of ecological risk assessment: biomarker development and interpretation based on laboratory and wildlife species. Environ Health Perspect 1994: 102(12):65–69.

Gard NW, Hooper MJ. Age-dependent changes in plasma and brain cholinesterase activities of eastern bluebirds and European starlings. J Wildl Dis 1993; 29:1–7.

Gard NW, Hooper MJ, Bennett RS. Effects of pesticides and contaminants on neotropical migrants. pp. 310–314. In: Status and Management of Neotropical Migratory Birds. Finch DM and Stangel PW (eds), U.S. Department of Agriculture, Forest Service, Gen. Tech. Rep. Rm. 229, 1993.

Gard NW, Bird DM. Nestling growth and fledgling success in manipulated American kestrel broods. Can J Zool 1992; 70:2421–2425.

Gard NW, Bird DM. L'utilisation des rapaces en lutte biologique. pp. 585–595. In: La lutte biologique. Vincent C and Coderre D (eds), G. Morin, Boucherville, Quebec, Canada, 1991.

Gard NW, Bird DM. Breeding behavior of American kestrels raising manipulated broods in years of varying prey abundance. Wilson Bull 1990; 102:605–614.

Gard NW, Bird DM, Densmore R, Hamel M. Responses of breeding American kestrels to live and mounted great horned owls. J Raptor Res 1989; 23:99–102.

**Presentations**

Goldsmith B, Gard NW. Best practice principles for natural resource restoration under the EU Environmental Liability Directive. Presented at the 19th Annual SETAC Europe meeting, Göteborg, Sweden, May 31–June 4, 2009,

Gard NW, Bigham GN. Assessment of natural resource damages at the New Almaden Mercury Mining District, California. Presented at the 27th Annual Society of Environmental Toxicology and Chemistry Meeting, Montréal, QC, November 5–9, 2006.

Booth P, Gard N, Bodishbaugh D. Tools for streamlining ecological risk assessments at RCRA Corrective Action facilities. Presented at the 26th Annual Society of Environmental Toxicology and Chemistry Meeting, Baltimore, MD, November 13–17, 2005.

Gard NW, Maier EA, Shock SS. Assessment of risk to wildlife from fugitive dust releases along a mine transportation corridor in Alaska. Presented at the 26th Annual Society of Environmental Toxicology and Chemistry Meeting, Baltimore, MD, November 13–17, 2005.

Maier EA, Reeder DR, Edwards MR, Gard NW, Shock SS. Assessment of plant communities exposed to fugitive dust along a mine transportation corridor In Alaska. Presented at the 26th Annual Society of Environmental Toxicology and Chemistry Meeting, Baltimore, MD, November 13-17, 2005.

Gard NW, Mackay CE. Forensic analysis of the pelican die-off on Lake Apopka: Evidence for the contribution of organochlorine pesticides. Presented at the 24th Annual Society of Environmental Toxicology and Chemistry Meeting, Austin, TX, November 9–13, 2003.

Gard NW, Mackay CE. Forensic analysis of the pelican die-off on Lake Apopka: Probabilistic analysis of potential exposure to organochlorine pesticides. Presented at the 24th Annual Society of Environmental Toxicology and Chemistry Meeting, Austin, TX, November 9–13, 2003.

Mackay CE, DeMott RP, Habig C, Gard NW, Pastorok RA. Integrating temporal changes in receptor sensitivity in the development of TMDLs for non-persistent chemicals. Presented at the 24th Annual Society of Environmental Toxicology and Chemistry Meeting, Austin, TX, November 9–13, 2003.

Iannuzzi TJ, Gard NW, Ludwig DF, Truchon SP. Natural resource injury assessment for polychlorinated biphenyls (PCBs) in the Lower Fox River System: Part I: Water, sediments and fish. Presented at the 21st Annual Society of Environmental Toxicology and Chemistry Meeting, Nashville, TN, November 12–16, 2000.

Gard NW, Iannuzzi TJ, Ludwig DF, Schmeising LM, Truchon SP. Natural resource injury assessment for polychlorinated biphenyls (PCBs) in the Lower Fox River System: Part II: Fish-eating birds and mammals. Presented at the 21st Annual Society of Environmental Toxicology and Chemistry Meeting, Nashville, TN, November 12–16, 2000.

Gard NW, Schmeising LM, Wallin JM, Ludwig DF, Iannuzzi TJ. Ecological risk assessment of PCBs in the Lower Fox River and Green Bay, Wisconsin. Presented at the 20th Annual Society of Environmental Toxicology and Chemistry Meeting, Philadelphia, PA, November 15–18, 1999.

Mackay CE, Butcher M, Gard N, Moore P, Bigham G. Integration of life history analysis in evaluating the population impacts of methylmercury exposure on the great blue heron. Presented at the 20th Annual Society of Environmental Toxicology and Chemistry Meeting, Philadelphia, PA, November 15–18, 1999.

Gard NW, Smith JS Jr., Moore ML, Schoof RA, Bigham GN. Is mercury an environmental endocrine disrupter? Presented at the 18th Annual Society of Environmental Toxicology and Chemistry Meeting, San Francisco, CA, November 16–20, 1997.

**Project Experience**

*Natural Resource Damage Assessment*

Performing a co-operative natural resource damage assessment for the St. Lawrence River at Massena, New York, in support of settlement negotiations on behalf of Alcoa and General Motors. The assessment involves determining PCB-related injuries to sediment, fish, and wildlife to quantify compensable damages and to identify habitat-based restoration alternatives that can offset damages. A major aspect of the project involves collaborative interaction with state and federal natural resource trustees to discuss and resolve technical issues pertinent to establishing mutually acceptable injury estimates.

Managing a natural resource damage assessment for a site in New York. The project entails evaluating potential PCB-related injuries to sediment, fish, and wildlife, developing field studies in support of the evaluation, and reviewing studies being conducted by federal and state natural resource trustees.

Conducting a natural resource damage assessment for Dow Chemical for the Tittabawassee River in Michigan in support of settlement negotiations. The assessment involves quantifying service losses to ecological resources from exposure to polychlorinated dibenzo-*p*-dioxins and

polychlorinated dibenzofurans (PCDD/Fs) in river sediment and floodplain soils and identifying potential restoration projects to offset those losses.

Reviewed the forthcoming European Union Environmental Liability Directive (ELD) on behalf of a confidential client. The review involved development of multiple case studies to illustrate the expected effects of the ELD in actual practice and accompanying issues for industries.

Conducted an evaluation of restoration projects to determine if they satisfy natural resource damage liabilities for an industry on the Hylebos Waterway in Washington. Evaluation includes assessment of candidate restoration sites, development of a conceptual restoration design, and calculation of resource service enhancements to verify that restoration will fully compensate for alleged liabilities.

Performed an evaluation of ecological service losses as part of a natural resource damage assessment for PCB-related injuries at Lake Hartwell, South Carolina, on behalf of Schlumberger.

Performed a natural resource damage assessment for the Fox River and Lower Green Bay, Wisconsin, ecosystem in support of settlement negotiations. The assessment involved modeling PCB-related injuries to fish and wildlife, quantifying compensable damages, evaluating potential habitat-based restoration alternatives, and providing critical comments on the trustees' injury assessment.

Managed a technical review of a natural resource damage assessment for the Guadalupe River watershed in Santa Clara County, California, evaluating service losses to salmonids, fish-eating birds, and endangered California clapper rails from mercury released by historical mining operations at the New Almaden mine. Work was performed on behalf of the Santa Clara Valley Water District in support of settlement negotiations.

Identified natural resource damages and prepared claims submitted to the United Nations Compensation Committee on behalf of the Hashemite Kingdom of Jordan for degradation to marine, wetland, and desert ecosystems in the Kingdom arising from the 1991 Gulf War.

Reviewed the ecotoxicological significance of concentrations of DDT and metabolites in surface water drainages adjacent to the Montrose Chemical Corporation facility in Los Angeles, California.

*Ecological Risk Assessment*

Managing ecological risk assessments for a RCRA voluntary corrective action at three sites in Indiana on behalf of General Motors. Sites include the Rolls-Royce Corporation site in Indianapolis, the Allison Transmission Facility in Speedway, and the former Delco plant in Kokomo. The assessments involve determining risk from metals, PAHs, PCBs, and chlorinated solvents present in ecological habitats resulting from manufacturing processes and/or releases by application of ecological risk assessment tools developed to streamline the risk assessment process.

Conducting an ecological risk assessment for lead in offsite areas of a site in Circleville, Ohio for General Electric. Assessment includes design and review of sediment bioassays for lead toxicity and food web modeling to evaluate risks to wildlife.

Directing an evaluation of ecological risks of elevated levels of cadmium, lead, and zinc in tundra ecosystems resulting from fugitive dust releases at the Teck Cominco Alaska Inc., Red Dog Mine in northwestern Alaska.

Performing a critical review of lead usage in sporting arms ammunition and its effect on wildlife for a confidential client.

Performed project for Alcoa evaluating ecological risks associated with air emissions of sulfur dioxide, hydrogen fluoride, PAHs, and particulate material from a proposed aluminum smelter in Reyðarfjörður, Fjarðabyggð, Iceland. The primary objective of this predictive risk assessment was to determine whether there would be consequential differences in the level of risk posed by air emissions from the smelter operation with and without seawater scrubbers. The ecological risk assessment incorporated spatially and temporally explicit exposure modeling in a probabilistic framework to evaluate risks to plants, birds, and mammals. The risk assessments concluded that the smelter would not pose consequential risk to ecological receptors under either scenario; however, exposure to all constituents would be considerably higher for a smelter with seawater scrubbers.

Conducted a baseline ecological risk assessment for Operable Unit 3 of the Horseshoe Road and Atlantic Resources Corporation Superfund sites in Sayreville, New Jersey. Assessment is evaluating risk to invertebrates, fish, and wildlife in the marsh and intertidal portions of the Raritan River that are adjacent to the sites from exposure to PCBs, metals, PAHs, and pesticides.

Conducted an ecological scoping assessment of chemicals from historical mining operations at a site in Grass Valley, California. The chemicals of potential concern were arsenic, lead and mercury in soils. The scoping assessment identified habitats on the site that support plants and wildlife and delineated potentially complete exposure pathways of the chemicals of concern to receptors in these habitats.

Performed a screening-level ecological risk assessment for The City of Sitka, Alaska for a former municipal solid waste incinerator. Operation of the facility and past waste handling practices had been linked to the detection of metals and PCDD/Fs at concentrations greater than the Alaska Department of Environmental Conservation (DEC) residential cleanup levels within onsite and offsite soils and an adjacent wetland area. The assessment evaluated whether adverse impacts to the environment could occur now or under reasonably likely future use, as a result of direct or indirect exposure to site-related chemicals.

Evaluated sediment contamination and ecological risks of metals (e.g., copper, zinc, and butyltins) and organic substances (PAHs and PCBs) at two major shipyards in San Diego Bay.

Site-specific studies included sediment triad assessment and sampling of resident biota for bioaccumulation and histopathology analyses.

Managed an ecological risk assessment on behalf of Beazer East, Inc. for a former Koppers Company wood treatment facility located near Newport, Delaware. The work involved assessing effects of PAHs and metals on wetland and terrestrial flora and fauna, developing site-specific ecotoxicity thresholds for sediment and soil, and evaluating residual risk associated with different remedial alternatives. Also managed an evaluation of issues relevant to potential natural resource damage claims for the site and an identification of potential restoration alternatives.

Managed an ecological risk assessment of copper concentrations in water, sediment, and soils at an abandoned copper mine in Spenceville, California, as part of site closure activities to ensure that the planned remedy will be protective of the environment.

Managed site habitat characterizations and developing ecological risk assessment strategies for several General Motors facilities in Michigan, Ohio, and Indiana as part of RCRA facility investigations.

Performed ecological risk assessments to investigate risks of PCBs to wildlife, particularly fish-eating birds and mammals, in habitats surrounding natural gas pipeline compressor facilities in Kentucky, Mississippi, Tennessee, and Texas on behalf of El Paso Energy.

Performed preliminary ecological risk evaluations at International Paper mill facilities in Savannah and Valdosta, Georgia.

Performed an ecological risk assessment of sediments and soils at a former manufactured gas plant in Athens, Georgia, for Georgia Power Company and Atlanta Gas Light Company. The specific objective was to use FETAX toxicity testing to derive threshold toxicity levels for PAHs and metals to compare with levels measured in sediment and soil.

Performed ecological risk assessments of U.S. Air Force former radio relay station sites near Iliamna and Elim, Alaska.

Served as deputy project manager for an ecological risk assessment and RI/FS study for AlliedSignal Inc. of a coastal Spartina marsh in Brunswick, Georgia, where concentrations of PCBs, mercury, and other chemicals were elevated. Key issues involved developing study designs to investigate water column and sediment toxicity; bioaccumulation of PCBs and mercury by important prey species; conducting food web exposure model analysis of risk to aquatic and terrestrial species, including several threatened and endangered species; and developing a strategy for the critique of an ecological risk assessment prepared for the site by EPA. Participated in agency negotiations regarding implementation of the ecological risk assessment.

Performed an ecological risk assessment for the Ketchikan Pulp Company pulp mill site in Ketchikan, Alaska, which had elevated sediment concentrations of metals, dioxins and furans,

and PAHs. Evaluated risks to marine mammals and sea birds from bioaccumulation of chemicals through the food web.

Reviewed an ecological risk assessment for a pulp mill site in southeastern Alaska prepared on behalf of an industrial client by another environmental consulting company. Provided client with recommended modifications to strengthen the technical content of the assessment.

Conducted an ecological risk assessment problem formulation for a river system in West Virginia where elevated concentrations of VOCs are present in groundwater. Characterized the ecosystem, identified chemical stressors, developed a conceptual site model, and evaluated the risk to fish and aquatic invertebrates.

Served as field project manager for an ecological risk assessment of several Superfund sites in South Carolina. Assessed potential effects of PCBs on terrestrial wildlife resulting from bioaccumulation through the food web.

Served as an assistant project supervisor for the ecological risk assessment of the Rocky Mountain Arsenal Superfund facility in Colorado. Assessed exposure to and potential effects of dieldrin and arsenic for feral small rodent populations.

Participated in an ecological risk assessment of a U.S. Navy installation in Washington. Analyzed data collected by other researchers to assess potential effects of PAHs on population abundance and reproductive success of small rodents and raptors.

*Environmental Assessment*

Performed an environmental impact assessment of a facility upgrade at the Jebel Dhanna Tank Farm, United Arab Emirates, on behalf of the Abu Dhabi Company for Onshore Oil Operations.

Managed an ecotoxicological investigation of large-scale avian mortality at restored wetland habitats on the north shore of Lake Apopka, Florida, for the St. Johns River Water Management District in support of defense against an ongoing criminal investigation by the U.S. Fish and Wildlife Service. The specific objective was to determine whether organochlorine pesticides or some other environmental factor was the causal agent of the mortalities.

Evaluated the potential effects of a drill-mud spill on coral reef and seagrass communities offshore of St. Croix, U.S. Virgin Islands, for AT&T, and also participated in developing a long-term monitoring plan for the site.

Evaluated relationships between eutrophication, mercury bioaccumulation and ecological risk to wildlife species in the South Florida Water Conservation Areas and the Everglades.

*Technical Reviews*

Provided technical expertise as part of an expert team conducting a review of the scientific literature and critique of an ecological risk assessment report from the Environment Agency of

the United Kingdom on a fluorochemical, (perfluorooctanesulphonate) on behalf of a major chemical manufacturer. Reviewed original scientific literature and documentation used by government contractor to support regulatory conclusions regarding development of risk characterization criteria for multiple environmental compartments based on EUSES modeling.

Directed a technical evaluation of biomarkers of endocrine-disrupting effects of chemical exposure in non-mammalian wildlife for the American Chemistry Council (formerly Chemical Manufacturers Association). Proposed recommendations for use of biomarkers in screening batteries and in ecological risk assessments of endocrine disruptors.

Prepared comments on draft ecological risk assessment guidance proposed by the Ohio Environmental Protection Agency for incorporation in the Ohio Voluntary Action Plan rules for property-specific risk assessment procedures.

Compiled literature information on concentrations of organochlorine compounds in bird species in North America and Europe as part of a project to evaluate and summarize temporal and geographic trends in residue levels in wildlife species.

Conducted a review on the status of endangered peregrine falcons in Quebec for the Quebec Ministry of Natural Resources.

Conducted a review for the Canadian Ministry of Transportation on the attractiveness to birds of agricultural operations at, or near, airports.

*Miscellaneous*

Characterized and optimized biochemical evaluations of contaminant exposure and effects in deer mice (*Peromyscus maniculatus*) by developing derivative applications of immunological, enzymatic, and endocrinological techniques reported by other researchers.

Performed field and laboratory studies with several passerine bird species to characterize age- and species-dependent differences in plasma and brain cholinesterase activities and sensitivity to agricultural organophosphate pesticides.

Provided statistical support for a food aversion study examining responses of quail to organophosphate pesticide-impregnated granules.

Established and supervised the maintenance of field nest box colonies for bluebirds and starlings in South Carolina for use in toxicological research projects.

Assisted in the maintenance of a captive research colony of 300–400 American kestrels, a breeding colony of 20 peregrine falcons, and a wild field colony of kestrels. Duties involved bird handling; behavioral observations; nest monitoring and censusing; and trapping, measuring, and banding of wild birds.

Assisted in a field research project that investigated the effects of pesticides used for sea-lamprey control on invertebrate species diversity and population abundance in northern Ontario streams.

Designed and performed laboratory experiments to study effects of suspended sediment loads on filtration rates of aquatic molluscs.

**Professional Affiliations**

- American Institute of Biological Sciences
- Society for Conservation Biology
- Society of Environmental Toxicology and Chemistry