

# A. Michael Macrander, Ph.D.

## Associate of Integral



### Education and Credentials

Ph.D., Biology  
(Ecology/Physiology), University  
of Alabama, Tuscaloosa,  
Alabama, 1983

B.A., Biology, Tarkio College,  
Tarkio, Missouri, 1975

### Continuing Education and Training

Hazardous Waste Operations and  
Emergency Response 24-Hour  
Certification (1991; refreshers  
current through 2007)

First Aid and CPR certified (2015)

### Professional Affiliations

Member of the National Academy  
of Board for the Gulf Research  
Program (current)—Defining the  
research needs for long-term  
sustainable development and  
restoration of the Gulf of Mexico.

National Petroleum Council  
Evaluation of Research Needs for  
Prudent Development of Energy  
Resources in the Arctic (2014–  
2015)—Ecological and Human  
System subject matter lead,  
editor, and contributing author.

National Academy of Sciences  
Committee Member (2012–  
2013)—Advising on emerging  
research needs in the Arctic.

National Academy of Sciences  
Committee on Characterization of  
Wetlands (1992–1994)—Advising  
Congress, EPA, and Department  
of Interior on methods for the  
identification and delineation of  
wetlands.

### Professional Profile

Dr. Michael Macrander is an environmental scientist with more than 35 years of experience as an ecologist investigating environmental interactions and the restoration of natural systems affected by human and industrial activities. He has worked extensively with the identification of and issues relating to sensitive ecological resources, including Arctic offshore environments, threatened and endangered species, marine mammals, wetlands, riparian zones, and coastal ecosystems. He has designed and implemented wildlife and ecological investigations and restorations in a diversity of settings and situations and specializes in developing science-based strategies that help to resolve complex environmental issues, achieve permitting requirements, and address stakeholder concerns.

Dr. Macrander recently joined Integral's Ecology Group after working 25+ years as an environmental ecologist for the Royal Dutch Shell Group (1991–2017) during which he worked on a variety of projects in all aspects of the petrochemical and energy industry. In addition to his most recent role as global lead and spokesperson for Arctic science, he worked on many of the company's most complex and high profile environmental issues of the last three decades. He has worked extensively in the areas of ecological risk assessment, natural resource damage assessment, ecological restoration, spill response, and site and impact assessment. He has also been an industry leader in the development and use of emerging assessment technologies in marine acoustics, the use of drones in aerial reconnaissance, and the use of computer-assisted pattern recognition to provide high quality data cost-effectively and with lower human exposure potential.

Having served on multiple National Academy of Sciences and other national advisory panels, he is a recognized leader in the field of environmental ecology and brings broad experience in working under the provisions of NEPA, CERCLA, the Clean Water Act, Oil Pollution Act, Endangered Species Act, and Marine Mammal Protection Act. He has worked successfully to resolve environmental issues with state and federal regulators in all regions of the United States and the international community.



## Relevant Experience

### Natural Resource Damage Assessment

*Shell NRDA, Numerous Sites, Nationwide*—Served as the lead advisor on NRDA to the Shell Group for 25 years participating in industry/regulator joint efforts to develop robust protocols and collaborative approaches. Managed a number of significant NRDA cases under both the Oil Pollution Act and CERCLA rules, including the Rocky Mountain Arsenal chemical contamination site, Whatcom Creek gasoline fire, Delaware City acid release, and New Jersey groundwater contamination cases. Recognized as a leader in the development of cooperative assessments and settlements.

*Whatcom Creek Pipeline Explosion, Bellingham, Washington*—Managed the relationship with resource trustee agencies following an explosion and fire in Bellingham, Washington. Led the assessment of resource injuries including impacts to a salmon stream and forested park as well as recreational use of the impacted area. Developed an emergency restoration plan within 10 days of the incident that addressed the majority of resource injuries and greatly reduced long-term impacts.

*Bayou Trepagnier Sediment Contamination, Louisiana*—Managed the evaluation of risks and resource injuries associated with sediments in a Louisiana swamp impacted by refinery effluents (primarily lead and hydrocarbon) and utilized hydrologic and sediment restoration as a mechanism for both site remediation and resource restoration.

*Delaware River Refinery Explosion and Acid Release, Delaware*—Led the assessment of a fish kill and habitat impacts associated with an explosion and release of sulfuric acid to the Delaware River. Identified the use of riparian conservation easement and forest restoration as a means of addressing water quality and long term habitat management.

*Groundwater Impacts, New Jersey*—Negotiated the settlement of potential injuries to groundwater associated with underground storage tanks at more than 300 service stations in the state of New Jersey by identifying high priority conservation acquisition areas that could be purchased and set aside in the process of negotiation.

### Arctic Ecology

*Shell Arctic Science Program*—Lead responsible for fostering the development, planning, and implementation of a diverse portfolio of scientific investigations and monitoring in the Arctic. This portfolio included both onshore and offshore study programs and was directed at understanding broad baseline environmental/ecological conditions, monitoring and assessing interactions between industry activities and the environment, and assessing impacts of an overall changing Arctic. The investigative program included physical sciences such as oceanography, ice dynamics, and weather, as well as biological sciences of all trophic levels and ecological interactions. This program has been a significant source of research on Arctic science and has contributed to the development of extensive ocean instrumentation networks including acoustic arrays, metocean buoy arrays, ice tracking, and high-frequency radar. In many of these efforts, industry funding was



leveraged in a collaborative manner with other private and public funding sources to expand investigative scope and research infrastructure.

*Marine Mammal Monitoring and Mitigation Program, Worldwide*—Designed and implemented a widely recognized world-class program to protect marine mammal resources, to protect their subsistence harvest by local native populations, and to investigate the potential for impacts to populations of protected marine mammal populations within the context of oil and gas activities including seismic data acquisition and drilling activities. The program utilized professional and native observers, innovative use of acoustics investigations, and aerial surveillance using both manned and unmanned aircraft. The program pioneered innovations in computer-assisted acoustic identification of marine mammal vocalizations and computer-assisted image analysis of aerial photography.

*Chukchi Sea Environmental Studies Program, Arctic Ocean*—Worked with industry collaborators to establish and implement a broad-based studies program that produced extensive insights into the Chukchi Sea Arctic ecosystem and resolved perceptions that the system is an unknown biosphere. The studies program included expert investigation of physical oceanography, metocean/ice dynamics, phytoplankton, marine mammals, marine birds, benthos, and fisheries. Over the 7 years of operation, the program funding exceeded \$75 million. To date, the program has generated more than 30 publications in the peer-reviewed literature and numerous master's and doctoral theses.

*Representation of the Shell Alaska Science Program, Alaska*—As chief scientist of the Shell Alaska Science program, served as spokesperson for the science that Shell conducted and funded and to represent the broader scientific knowledge of multiple areas of investigation and concern, including trends in sea ice and ice forces in the Arctic, marine mammal populations, Arctic ecology, and effects of industry operations (i.e., noise, effluents and emissions). Worked extensively with a broad spectrum of stakeholders, including local native populations, members of various governments, and news media.

## **Biodiversity and Sensitive Resource Issues**

*Threatened, Endangered, and Rare Species, Nationwide*—Extensive experience in the identification, monitoring, and protection of biodiversity and sensitive resources with a focus on rare, threatened, and endangered species. Served as director of the Alabama Natural Heritage Program from 1983 to 1986. Led industry/regulatory team in the development of protocols for the identification of “unusually sensitive areas” under the Pipeline Safety Act. Worked extensively with regulators and stakeholders to identify strategies that protect sensitive resources while accommodating development.

*Identification of Unusually Sensitive Areas, Nationwide*—Led an industry/government work group that established the definition of “unusually sensitive areas” as called for by the Pipeline Safety Act. This definition blazed new trails in the identification of biodiversity hot zones as defined from existing data sets and has become a standard applied by conservation organizations. Once established, the definition required broad application of safety measures within specific identified areas.



## **Wetlands, Coastal Zone, and Riparian Evaluations and Restorations**

*National Academy of Sciences Committee, Characterization of Wetlands, United States*—As one of the early practitioners in wetland identification and advice to industry in the 1980s, served on the National Academy of Sciences Committee on Characterization of Wetlands, which resolved the debate on wetland identification and delineation. Utilized a broad suite of tools, including hydrodynamic modeling, habitat equivalence, and habitat suitability to evaluate wetland and coastal habitat quality and resilience. Represented industry in numerous advisory panels on wetland and coastal issues and the evaluation of the intersection between coastal systems and historical industry practices.

*Mars Pipeline Negotiation and Restoration Project, Gulf of Mexico*—Served as technical advisor during negotiations between landowners and Shell Pipeline to resolve litigation associated with perceived impacts of pipeline construction within an eroding coastal area. Developed an innovative restoration program that stands as a successful and achievable coastal wetland restoration and protection effort.

*Bayou Trepagnier/LaBranche Wetland System Evaluation and Restoration, Louisiana*—Directed a team of scientists to evaluate functional integrity and hydrodynamics of a coastal wetland complex in Louisiana and to develop a restoration plan as a part of a combined risk evaluation and natural resource damage assessment of a contaminated bayou.

## **Ecological Risk Assessment and Site Assessment**

*Wildlife Assessment of Rocky Mountain Arsenal, Colorado*—Participated in a multiparty evaluation of ecological risk associated with a large chemical munitions/agrichemical Superfund site near Denver, Colorado. Was directly responsible for wildlife studies that were conducted to gain an understanding of the ecological significance of the site and to calibrate efforts to model ecological risk. The contributions of the wildlife studies substantially influenced the extent of remediation and outcome of the site, which is now a National Wildlife Refuge.

*Ecological and Human Health Risk Assessment of Delaware City Refinery Acid Release, Delaware*—Following a 2001 explosion, fire, and release of more than 400,000 gallons of spent sulfuric acid, led a team of scientists and agency oversight in the evaluation of surface, subsurface, and hydrologic contamination and risk. The resulting remedy focused on neutralization of surficial soil pH coupled with longer term *in situ* remediation and groundwater sequestration.

## **Spill and Environmental Hazard Response—Key Responder**

*Belpre Chemical Plant Release of Styrene and Ethylene Dibromide, Ohio River*—Developed and implemented a downstream rolling assessment of water contamination that operated from the release in southeastern Ohio to the confluence with the Mississippi River. The monitoring and associated remediation program provided protection to major and minor population centers along the length of the Ohio River.



*Bunker Fuel Release from a Liquefied Natural Gas Carrier, Norfolk, Virginia*—Served as environmental unit lead in the crisis command center in Houston. Responsible for mass balance and mobilization of response resources.

*Gasoline Tank Fire, Sewaren, New Jersey*—Managed the environmental response to a fire that resulted from a lightning strike to a gasoline storage tanks. Developed water quality monitoring and development of permitting for the use of fire retardants in coastal waters.

*Pipeline Leak, New Mexico*—Managed the evaluation and remediation of soils and evaluation of groundwater following a crude oil release from a damaged pipeline. Worked with key stakeholders, including representatives of a local Native American Pueblo that owned the land.

*Olympic Pipeline Release, Bellingham, Washington*—Participated in the evaluation and development of a remedial/natural resource restoration program in the aftermath of a large release and fire associated with a compromised gasoline pipeline in Bellingham, Washington. Worked within the environmental unit to establish trust and working relationships with regulators and key stakeholders to rapidly respond and address environmental hazards and reduce overall impacts and restoration costs.

*Spent Sulfuric Acid Explosion, Fire, and Release, Delaware City, Delaware*—Led the environmental response and evaluation of a 400,000-gallon release. Served as key interface with EPA and completed the remediation within 6 months.

*Shell Alaska Kulluk Drilling Rig Grounding, Alaska*—Led the environmental response, including modeling of ocean conditions and trajectory of drift prior to and during the grounding and recovery of the drill rig Kulluk on Kodiak Island.

## **Publications**

Blackwell, S.B., C.S. Nations, T.L. McDonald, A.M. Thode, D. Mathias, K.H. Kim, C.R. Greene, Jr., A.M. Macrander. 2015. Effects of airgun sounds on bowhead whale calling rates: Evidence for two behavioral thresholds. *PLOSOne* 10(6):e0125720.

Blackwell, S.B., C.S. Nations, T.L. McDonald, C.R. Greene Jr., A.M. Thode, M. Guerra, and A.M. Macrander. 2013. Effects of airgun sounds on bowhead whale calling rates in the Alaskan Beaufort Sea. *Marine Mammal Science* 29(4):E342–E365.

Koski, W.R., T.A. Thomas, D.W. Funk, and A.M. Macrander. 2013. Marine mammal sightings by analysts of digital imagery vs. aerial surveyors: a preliminary comparison. *Journal of Unmanned Vehicles* 01(01):25–40.

Thode, A.M., K.H. Kim, S.B. Blackwell, C.R. Greene, Jr., C.S. Nations, T.L. McDonald, and A.M. Macrander. 2012. Automated detection and localization of bowhead whale sounds in the presence of seismic airgun surveys. *J. Acoust. Soc. Am.* 131(5):3726-3747.



Guerra, M., A.M. Thode, S.B. Blackwell, and A.M. Macrander. 2011. Quantifying seismic survey reverberation off the Alaskan North Slope. *J. Acoust. Soc. Am.* 130(5):3046-3058.

Koski, W.R., T. Alan, D. Ireland, G. Buck, P.R. Smith, A.M. Macrander, M.A. Halick, C. Rushing, D.J. Sliwa, and T.L. McDonald. 2009. Evaluation of an unmanned airborne system for monitoring marine mammals. *Aquatic Mammals* 35(3):347-357.

## **Presentations/Posters**

Whitehead, K., D. Nielsen, B. Sackmann, M. Macrander, G. Revelas, and D. Preziosi. 2020. Determination of sediment impacts due to exploratory oil operations using likelihood based statistics. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Macrander, A.M., D.S. Ireland, S.B. Blackwell, and M.E. Austin. 2019. Observations on bowhead whale (*Balaena mysticetus*) movements and behavior in relation to oil and gas exploration activities. Poster presentation at Fifth International Conference on the Effects of Noise on Aquatic Life. Den Haag, The Netherlands. July 7–12.

