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Engineering & Scientific Consulting

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Professional Profile

Dr. James is a soil scientist specializing in forest management and biogeochemistry. His work explores the environmental impacts of anthropogenic activities such as forest harvesting, prescribed fire, mining, and oil spills. His expertise is analyzing complex ecological and chemical datasets at scales ranging from the whole globe to soil pores using multivariate statistics and machine learning techniques. His research experience includes:

- Sampling soil and groundwater as part of a remedial investigation on a site potentially contaminated with petroleum, heavy metals, and dioxins/furans.
- Tracking the fate and composition of organic matter in fifteen major rivers across the US.
- Investigating the composition of groundwater impacted by petroleum and the biodegradation products from the natural attenuation of oil in soils and sediments using GCxGC mass spectroscopy and Orbitrap liquid chromatography-mass spectroscopy.
- Studying the fate and remediation of inorganics and heavy metals such as lead, barium, arsenic, zinc, and cadmium in environments ranging from tropical to arctic in the context of risk assessment and risk management.
- Synthesizing the scientific literature through meta-analysis and systematic reviews, particularly focusing on the effects of land use change, natural resource management, and climate on forest and agricultural soils around the globe.

Dr. James has consulted for both government and industry clients, focusing on remediating heavy metals contamination from mines and smelters to prevent ecological and human health effects. He has also worked with industrial forest resource companies, non-profits, and the US Forest Service to provide research that facilitates context-specific decision-making.

Dr. James has expertise in evaluating organic matter structure, composition, and fate in both terrestrial soils and freshwater ecosystems. He has used chromatography and spectroscopy of soil and dissolved organic matter in both natural and oil spill contexts across spatial scales ranging from soil pores to whole continents. He examines multi-dimensional organic matter datasets using multivariate and machine learning statistical tools including ordinations, hierarchical clustering, PERMANOVA, and partial least squares regression to identify how shifts in organic matter composition relate to climate, remotely sensed indices of vegetation growth (NDVI & EVI), land use, and anthropogenic activities. He has also used these techniques to evaluate the natural attenuation, transformation, and degradation of dissolved hydrocarbons that affect environmental fate and transport.

Academic Credentials & Professional Honors

Ph.D., Environmental and Forest Sciences, University of Washington, 2018

M.S., Environmental and Forest Sciences, University of Washington, 2014

B.S., Oberlin College, 2012

Licenses and Certifications

HAZWOPER 40-hour training

Certified Associate Professional Soil Scientist (APSS)

First Aid and CPR/AED

Professional Affiliations

Vice President, Northwest Forest Soils Council

Member, American Geophysical Union

Member, Soil Science Society of America

Member, Society of American Foresters

Member, Society for Ecological Restoration

Member, Geological Society of America

Publications

James, J.N., C.D. Gross, P. Dwivedi, T. Myers, F. Santos, R. Bernardi, M.F. Faria, I.A. Guerrini, R.B. Harrison, and D.E. Butman. 2019. Land use change alters the radiocarbon age and composition of soil and water-soluble organic matter in the Brazilian Cerrado. *Geoderma* 345:38-50.

Rocha J.H., R.B. Harrison, M. Menegale, J.L. Gonçalves, M. Rodrigues, P. Pavinato, E. Foltran, and J.N. James. 2019. Impacts of timber harvesting intensity and P fertilizer application on soil P fractions. *For. Ecol. and Manag.* 437:295-303.

F.C. Oliveira, M.F. Faria, E.I. Bertoncini, M.I. Sato, E.M. Hachich, I.A. Guerrini, J.R. Passos, J.N. James, R.B. Harrison, T.G. Feitoza, J.J. Chiaradia, C.H. Abreu-Junior, and L.P. Moraes. 2019. Persistence of fecal contamination indicators and pathogens in Class B biosolids applied to sugarcane fields. *J. Environ. Qual.* 48(2):526-530.

James J.N., N. Kates, C.D. Kuhn, C.E. Littlefield, C.W. Miller, J.D. Bakker, D.E. Butman, and R.D. Haugo. The effects of forest restoration on ecosystem carbon in western North America: a systematic review. 2018 *For. Ecol. and Manag.* 2018; 429:625-641

Gross C.D., J.N. James, E. Turnblom, and R.B. Harrison. 2018 Thinning treatments reduce deep soil carbon and nitrogen stocks in a coastal Pacific Northwest forest. *Forests* 9(238).

Dietzen C., E. Marques, J.N. James, R. Bernardi, S. Holub, and R.B. Harrison. 2017. Response of deep soil carbon pools to forest management in a highly productive Andisol. *Soil Sci. Soc. Amer. J.* 81:970-

978.

James J.N., R.B. Harrison. 2016. The effect of harvest on forest soil carbon: A meta-analysis. *Forests* 7(308).

Menegale M., J. Rocha, R.B. Harrison, J.L. Gonçalves, R. Almeida, M. Picollo, A. Hubner, J.N. James, and S. Michelson-Correa. 2016. Effect of timber harvest intensities and fertilizer application on stocks of soil C, N, P, and S. *Forests* 7(319).

Faria M.F., I.A. Guerrini, F.C. Oliveira, M. Sato, E. Hachich, J. Passos, L. Goulart, T. Silva, J. Gava, J. Furches, J.N. James, and R.B. Harrison. 2016. Persistence of *Ascaris* spp. ova in tropical soil cultivated with *Eucalyptus* and fertilized with municipal biosolids. *J. Environ. Qual.* 46(3):522-527.

James J.N., K. Littke, T. Bonassi, and R.B. Harrison. 2016. Exchangeable cations in deep forest soils: separating climate and chemical controls on spatial and vertical distribution and cycling. *Geoderma* 279:109-121.

James J.N., C. Dietzen, J. Furches, and R.B. Harrison. 2015 Lessons in buried horizons and pedogenesis from deep forest soils. *Soil Hor.* 56(6).

James J.N., E. Knight, V. Gamba, and R.B. Harrison. 2015. Deep soil: Quantification, modeling, and significance of subsurface nitrogen. *For. Ecol. and Manag.* 336:194-202.

James J.N., W. Devine, T. Terry, and R.B. Harrison. 2014. Deep soil: Accurately quantifying and modeling carbon in subsurface layers. *Soil Sci. Soc. Amer. J.* 78:S1-S10.

Oral Presentations

James J.N., K. Littke, R.B. Harrison. Interaction between carbon and nutrient cycles in deep soils of the Pacific Northwest. Geological Society of America Annual Meeting, Seattle, WA, 2017.

James J.N., C. Gross, P. Dwivedi, R.B. Harrison, D.E. Butman. Coupling solid- and liquid-phase soil organic matter analyses to understand the consequences of forest conversion and management on Brazilian Oxisols. Soil Science Society of America Annual Meeting, Tampa, FL, 2017.

James J.N., and R.B. Harrison. The effect of harvest on forest soil carbon. Stand Management Cooperative Spring Meeting, Vancouver, WA, 2017.

James J.N., and R.B. Harrison R. The effect of harvest on forest soil carbon: A global meta-analysis. UN FAO Global Soil Organic Carbon Symposium, Rome, Italy, 2017.

James J.N.. How soil reveals the hidden history of the Earth. Town Hall Seattle, Seattle, WA, 2016.

James J.N., C. Dietzen, C. Gross, and R.B. Harrison. The impact of buried horizons and deep soil pedogenesis on soil carbon content and vertical distribution. American Geophysical Union Annual Meeting, San Francisco, CA, 2015.

James J.N., C. Dietzen, K. Littke, C. Gross, and R.B. Harrison. Lessons on buried soils and pedogenesis from deep forest soils. Soil Science Society of America Meeting, Minneapolis, MN, 2015.

James J.N., C. Dietzen, K. Littke, and R.B. Harrison. Profiles and chemistry of deep forest soils in the Pacific Northwest. Northwest Forest Soils Council Meeting, Hood River, OR, 2015.

James J.N., K. Littke, and R.B. Harrison. The relationship between exchangeable base cations, soil carbon and soil nitrogen in deep forest soils of the Pacific Northwest. Soil Science Society of America

Annual Meeting, Long Beach, CA, 2014.

James J.N., W. Devine, T. Terry, and R.B. Harrison. The quantity and storage mechanisms of carbon in deep soil horizons of the Pacific Northwest. International Union of Forest Research Organizations (IUFRO) World Congress, Salt Lake City, UT, 2014.

James J.N., K. Littke, and R.B. Harrison. Interactions of carbon, nitrogen, and base cation cycles in deep forest soils. Stand Management Cooperative Spring Meeting, Vancouver, WA, 2014.

James J.N., W. Devine, T. Terry, and R.B. Harrison. Deep soil: Sampling, modeling, and significance of carbon in subsurface layers. Northwest Scientific Association Annual Conference, Missoula, MT, 2014.

James J.N., K. Littke, and R.B. Harrison. Predicting Douglas-fir response to fertilizer using site-specific factors. University of Washington, Stand Management Cooperative Spring Meeting, Vancouver, WA, 2013.

James J.N., K. Littke, and R.B. Harrison. Understanding site-specific factors affecting the nutrient demands and response to fertilizer by Douglas-fir. National Science Foundation Center for Advanced Forest Systems Annual Meeting, St. Simons Island, GA, 2013.

Poster Presentations

James, J.N., C.D. Gross, P. Dwivedi, T. Myers, F. Santos, R. Bernardi, M.F. Faria, I.A. Guerrini, R.B. Harrison, and D.E. Butman. Forest management and land-use change alter the radiocarbon age, fluorescence characteristics, and lability of K₂SO₄ extractable organic matter. North American Forest Soil Conference, Quebec City, Canada, 2018.

James, J.N., C.D. Gross, P. Dwivedi, T. Myers, F. Santos, R. Bernardi, M.F. Faria, I.A. Guerrini, R.B. Harrison, and D.E. Butman. From solid to liquid: Assessing the release of organic matter into soil solution in response to land-use conversion on Brazilian Oxisols. European Geosciences Union General Assembly, Vienna, Austria, 2017.

James J.N., and R.B. Harrison. The effect of harvest on forest soil carbon: A global meta-analysis. Soil Science Society of America Annual Meeting, Tampa, FL, 2017.

James, J.N., C.D. Gross, P. Dwivedi, T. Myers, F. Santos, R. Bernardi, M.F. Faria, I.A. Guerrini, R.B. Harrison, and D.E. Butman. Assessing the effect of land use conversion to Eucalyptus forest on water extractable organic carbon dynamics in Brazilian Oxisols. Northwest Forest Soil Council Meeting, Hood River, OR, 2017.

James, J.N., C.D. Gross, P. Dwivedi, T. Myers, F. Santos, R. Bernardi, M.F. Faria, I.A. Guerrini, R.B. Harrison, and D.E. Butman. From solid to liquid: assessing the release of carbon from soil into solution in response to forest management. American Geophysical Union, San Francisco, CA, 2016.

James J.N., T. Bonassi, K. Littke, and R.B. Harrison. Climate and chemical controls on exchangeable cations in acidic forest soils. Soil Science Society of America Journal, Phoenix, AZ, 2016. Best Presentation Contest Winner.

James J.N., W. Devine, T. Terry, and R.B. Harrison. Deep soil: modeling and significance of soil carbon and nitrogen in subsurface layers. Soil Science Society of America Annual Conference, Tampa, FL, 2013.

James J.N., W. Devine, T. Terry, and R.B. Harrison. Deep soil: Modeling and significance of subsurface carbon and nitrogen. Northwest Advanced Renewables Alliance (NARA) Annual Meeting, Corvallis, OR, 2013.

James J.N., W. Devine, T. Terry, and R.B. Harrison. Deep soils: Accurately quantifying and modeling total carbon in subsurface layers. North American Forest Soils Conference, Whitefish, MT, 2013.

Project Experience

Sampled surface soils and logged soil borings as part of an extensive remedial investigation at a former Washington State Department of Transportation site. Soil and groundwater samples were analyzed for TPH, VOCs, SVOCs, heavy metals, and dioxins/furans due to a wide variety of activities at the site including burning waste, dumping of highway debris, and rinsing asphalt trucks out with diesel.

Performed a meta-analysis on the effects of additional biomass removal from forests to create biofuel on the soil carbon cycle. Gathered and synthesized data from the peer-reviewed literature and analyzed data with multi-level, random effects models to account for publication bias, spatial autocorrelation, and nested effects.

Evaluated the environmental persistence, bioaccumulation, and toxicity of industrial chemicals as part of public safety due diligence and product stewardship for a client. All publicly available data on selected chemicals were gathered from the European Chemicals Agency (ECHA), US EPA, and OECD and were evaluated for potential harm to the environment.

Modeled the environmental fate of a pesticide on Brazilian soils using the EPA Pesticide Water Calculator model which integrates a modified Universal Soil Erosion model, a groundwater model, and a water column model. The study provided an environmental risk assessment for the use of the pesticide in Brazil across 11 different crop species and 10 Brazilian states. Identified differences in potential ecological risk to algae due to differences in application techniques, including aerial application, tilling the pesticide into the soil, or adding a buffer zone near freshwater.

Analyzed and wrote a manuscript evaluating the changes in barium, cadmium, lead, and zinc concentrations in tussock tundra soils over 15 years. Found preferential exclusion of certain metals (particularly lead) from plant tissues, with stronger correlations between soil and non-vascular (lichen and moss) tissue concentrations and weaker correlations in annual grass and perennial tree tissues.

Performed historical reconstruction of waste rock placement and timing as part of Superfund litigation. Created cost analysis for site remediation including analysis of remedial alternatives and sensitivity analysis of the model.

Developed a machine learning tool to examine controls on dissolved organic carbon fluorescence in 15 US rivers sampled over two years. Identified relationships with radiocarbon age, dissolved nutrients and metals, and land use change gradients that help quantify the mobilization of terrestrial carbon into freshwater ecosystems.

Led a systematic review of the literature examining the impacts of prescribed fire and forest thinning on ecosystem carbon in western North America. Analyzed data using mixed effects models and published findings in *Forest Ecology and Management*.

Conducted soil descriptions and classification for a long-term study aimed at identifying organic and chemical amendments to reduce bioavailability of lead and arsenic. Identified potentially cost efficient and effective amendments to prevent loss of sensitive plant species in northeastern Washington.

Managed and authored a meta-analysis examining the impact of forest harvesting, including pretreatment strategies such as prescribed fire and litter removal, on soil carbon worldwide. Presented findings at the UN Food and Agriculture Organization in Rome as part of an international effort to establish international agreements and legislation to improve soil management, to ensure agricultural and forest productivity, and to sequester carbon.

Planned, organized, and led a study examining the effect of land use change from native Cerrado forest in Brazil to Eucalyptus plantations on both soil and dissolved organic matter biodegradability, radiocarbon age, and chemical characteristics. Utilized multivariate statistical techniques to combine highly complex chemical and biological datasets to identify relationships that control the release of organic carbon into soil solution following forest conversion.

Conducted field research on the impacts of land use change and application of municipal biosolids and chemical fertilizers in maintaining productivity and soil nutrition in forestry and agricultural applications. He has tracked the persistence of pathogenic microbiota and examined the effects on soil carbon and nutrients including nitrogen, phosphorus, sulfur, and exchangeable cations.

Analyzed a spatially and temporally complex dataset that examined the long-term persistence of pathogens following the application of biosolids in forests and sugarcane plantations. Evaluated the regulatory frameworks for biosolids policy. Published findings in Journal of Environmental Quality.

Managed a multi-year study to examine the ecological and environmental importance of deep soil (> 1 m) for the productivity, nutrition, and carbon dynamics of forests. Published findings in Geoderma, Forest Ecology and Management, and Soil Science Society of America Journal.

Peer Reviewer

Associate Editor

- Scientia Agricola

Peer Reviewer

- Nature
- Global Change Biology
- Journal of Geophysical Research - Biogeosciences
- Forest Ecology and Management
- Geoderma
- Applied Soil Ecology
- Soil Science Society of America Journal
- Forests