

KAI C. RAINS, KRAINS@USF.EDU

WATER INSTITUTE, SCHOOL OF GEOSCIENCES, UNIVERSITY OF SOUTH FLORIDA

EDUCATION

PhD Ecology	University of California, Davis
M.S. Botany	University of Washington, Seattle
B.S. Biochemistry/Biophysics	Oregon State University, Corvallis

PROFESSIONAL EXPERIENCE

Research Associate Professor	School of Geosciences, USF, 2015-Present
Senior Wetland Scientist/Botanist	Three Parameters Plus, Fairbanks, AK 2005-2014
Instructor/Academic Advisor	Environmental Science & Policy Dept, USF, 2003-2005
Plant Ecologist	Foster Wheeler Environmental Corp, Bellevue WA, 1997
Associate Ecologist	L.C. Lee & Associates, Seattle, WA 1996
Ecologist (seasonal)	U.S. Forest Service, Washington State 1995, 1994, 1993

PEER REVIEWED PUBLICATIONS

Rains, M., K. Schmidt, S. Landry, W. Kleindl, **K.C. Rains** In Review. Reorganizing the waterscape: asymmetric loss of wetlands and gain of artificial water features in a mixed-use watershed. *Wetlands*

Rains, K.C., C. Bledsoe, T.E.C. Kraus, N. Wurzbarger In Review. Ericoid mycorrhizal shrub outcompetes ectomycorrhizal tree for nitrogen in tannin-rich litter. *Ecosphere*

Stepchinski L.M., M.C. Rains, L.C. Lee, R.A. Ris, W.L. Nutter, **K.C. Rains**, S.R. Stewart (2023) Hydrologic Connectivity and Flow Generation from California Vernal Pool, Swale, and Headwater Stream Complexes to Downstream Waters *Wetlands*

Gerlach M.E., **K.C. Rains**, E.J. Guerrón-Orejuela W.J. Kleindl, J. Downs, S.M. Landry, M.C. Rains, (2022) Using remote sensing and machine learning to locate groundwater discharge to salmon-bearing streams. *Remote Sensing*. 14(1):63. <https://doi.org/10.3390/rs14010063>

Creed I.F., C.L. Lane, L. Alexander, N.B. Basu, A. Calhoun, M.J. Cohen, C. Craft, E. D'Amico, E. DeKeyser, L. Fowler, H.E. Golden, J.W. Jawitz, P. Kalla, L.K. Kirkman, M. Lang, S.G. Leibowitz, D.B. Lewis, J. Marton, D.L. McLaughlin, H. Raanan-Kiperwas, M.C. Rains, **K.C. Rains**, L. Smith, (2017) Enhancing protections for vulnerable waters. *Nature Geoscience* DOI: 10.1038/NGEO3041

Callahan, M.K., D.K. Whigham, M.C. Rains, **K.C. Rains**, R.S. King C.M. Walker, J.R. Maurer, S.J. Baird (2017) Nitrogen subsidies from hillslope alder stands to streamside wetlands and headwater streams, Kenai Peninsula, Alaska. *Journal of the American Water Resources Association* 53:478-492. doi:10.1111/1752-1688.12508

Rains M.C., M.J. Cohen, H.E. Golden, **K.C. Rains** (2017) Connecting the dots: hydrologic connectivity between wetlands and other wetlands and waterbodies. *Water Resources IMPACT* 19:9-10 <http://www.awra.org/impact/Mar17IMPACTSample.pdf>

Rains, M.C., S. Landry, **K.C. Rains**, V.Seidel, and T.L.Crisman (2013) Using net wetland loss, current wetland condition, and planned future watershed condition for wetland conservation planning and prioritization, Tampa Bay Watershed, Florida. *Wetlands* 33:949-963. DOI:10.1007/s13157-013-0455-4

Rains, K.C. and C.S. Bledsoe (2007) Rapid uptake of ^{15}N -ammonium and glycine- ^{13}C , ^{15}N by arbuscular and ericoid mycorrhizal plants native to a Northern California coastal pygmy forest. *Soil Biology and Biochemistry* 39:1078-1086. 10.1016/j.soilbio.2006.11.019

Rains, K.C. (2004) Ericoid mycorrhizas in organic soils: Distribution of ericoid mycorrhizas among epiphytes in a Costa Rican cloud forest and uptake of organic nitrogen by ericoid, ecto-, and arbuscular mycorrhizal pygmy forest plants. Ph.D. Dissertation, *University of California, Davis, California*.

Rains, K.C., N.M. Nadkarni, and C.S. Bledsoe (2003) Epiphytic and terrestrial mycorrhizas in a lower montane Costa Rican cloud forest. *Mycorrhiza* 13:257-264. DOI: 10.1007/s00572-003-0224-y

RESEARCH FUNDING

Utilizing Beavers to mitigate Climate Drying Peatland Wildlife Conservation Society Climate Adaptation Fund
PI K.C. Rains; co-PI M.C. Rains. \$122,000 2023-2025

Wetlands and Water Quality: A Multimetric Tool for Restoration Prioritization in the Indian River Lagoon Watershed, FL. US Environmental Protection Agency, Wetland Program Development Grant. PI K.C. Rains; co-PIs M.C. Rains, S. Landry. \$249,000 November 2021-Jan 2024

Groundwater Vulnerability in Coupled Human-Natural Systems. Source of Funding: National Oceanographic and Atmospheric Administration Investigators: PI M.C. Rains; co-PIs K.C. Rains. \$119,000 August 2020-July 2022

Ranking Inundation Potential of Wetlands in the Northern Tampa Bay Area, FL. Source of Funding: Tampa Bay Water Investigators: PI K.C. Rains; co-PIs T.M. Lee, G. Fouad. \$176,875 September 2019-June 2021

Wetland Vulnerability and Resiliency Study, St Lucie County, FL, Phase III: Historic Mapping and Wetland Change Analysis. Source of Funding: St. Lucie County Investigators: PI K.C. Rains; co-PIs M.C. Rains, S. Landry. \$29,000 August 2020-September 2020

Rapid Assessment of Shallow Groundwater Recharge-Discharge in Salmon-Bearing Watersheds, Kenai Lowlands, Alaska Source of Funding: National Estuarine Research Reserve System Science Collaborative Investigators: PI M.C. Rains; co-PI K.C. Rains. \$159,000 November 2017-October 2019

Detailed Analysis of the Florida Fish and Wildlife Conservation Commission Saltwater Angler Licensing System. Source of Funding: NOAA/Florida Fish and Wildlife Conservation Commission Investigators: PI S. Landry, co-PI K.C. Rains. \$96,748 January 2016-July 2016.

Development of a System for Measuring Current and Historic Conditions of a Mangrove Wetland. Sources of Funding: Paso Pacifico and the World Bank Investigators: PI M.C. Rains; co-PI K.C. Rains. \$9,000. August 2015-December 2015

Wetland Inventory and Evaluation Study of St Lucie County, FL. Source of Funding: St. Lucie County, Florida
Investigators: PI M.C. Rains; co-PIs K.C. Rains, T. Crisman. \$85,000 April 2010-November 2013

TEACHING

University of South Florida, Tampa, FL, 2003-2006, 2015-current

Environmental Science & Policy Senior Seminar EVR 4921

Environmental Science & Policy Internship EVR 4940

Hydrogeology Field Methods GLY4948L

Mangrove Ecosystem Field Research Techniques GLY4930/6739

Plant Taxonomy of Florida, EVR 4930/6930

Soil Genesis and Classification GEO 4265

Wetland Environments EVR 4027

Professional Workshops Instructed, Three Parameters Plus, Alaska, 2006-2014

Field Assessment of Wetland Function

Field Methods: Methods for Conducting Surveys of Rare or Non-Native Plants

Field Methods: Vegetation Sampling and Habitat Analysis

Techniques for Collecting and Preserving Herbarium Specimens

Wetland Delineation: Regulatory Techniques for Determination of Hydrophytic Vegetation

Development of Online Modules for Professional Development, Three Parameters Plus, Alaska, 2012-2014

Field Methods: Design and Implementation of Targeted Plant Surveys (Non-Native or Rare Plants)

Field Methods: Plant Material Collection Techniques for DNA Analysis

Field Methods: Vegetation Sampling and Habitat Analysis

Methods for Collecting and Preserving Plants as Voucher Specimens

Reporting and Validation Procedures for Incidental Observations of Rare or Non-Native Plants

Wetland Delineation: Regulatory Techniques for Determination of Hydrophytic Vegetation

PRESENTATIONS

Rains, M., K. Rains, S. Fransbergen, G. Fouad (2022) *Expansion-contraction: Spatial and temporal variability in connectivity in a stream-wetland flow network.* AGU American Geophysical Union, Chicago, IL

Brigino T., K. Rains, M. Rains, A. Intveld, S. Bentz, C. Walker (2022) *No water, no fish: The crucial role of groundwater in supporting streamflow in non-glacial, salmon-bearing streams in south-central Alaska.* AGU American Geophysical Union, Chicago, IL

Intveld, A., T. Brigino, E. Guerrón Orejuela, K. Rains, M. Rains, C. Walker (2022) *Understanding hydrochemical data through a geological context in the Anchor River Watershed, Kenai Peninsula Lowlands, Alaska.* AGU American Geophysical Union, Chicago, IL

Guerrón-Orejuela, E., K. Rains, M. Rains, S. Landry, W. Kleindl, S. Church (2022) *Groundwater risk and resilience in social-hydrological systems* Joint Aquatic Sciences Meeting, Grand Rapids, MI.

- Rains, K., M. Gerlach, E. Guerrón-Orejuela, W. Kleindl, J. Downs, S. Landry, C. Walker, S. Bentz, M. Rains (2022) *Using remote sensing and machine learning to locate groundwater discharge to salmon-bearing streams* Joint Aquatic Sciences Meeting, Grand Rapids, MI.
- Stepchinski, L, M. Rains, L. Lee, R. Lis, W. Nutter, K. Rains, S. Stewart (2022) *Vernal pools, swales, and headwater streams are integrated tributaries to navigable waters* Joint Aquatic Sciences Meeting, Grand Rapids, MI.
- Rains, M. S. Bentz, T. Brigino, M. Gerlach, E. Guerrón-Orejuela, W. Kleindl, K. Rains, C. Walker (2022) *Groundwater flows support the integrity of riparian wetlands and salmon-bearing streams, Alaska* Joint Aquatic Sciences Meeting, Grand Rapids, MI.
- Rains, K., M. Rains, S. Lawlor, Landry, S (2022) *Forensic mapping of the stunning transformation of Florida's coastal watersheds over 150+ years* UF Water institute Symposium, Gainesville, FL.
- Rains, K. and M. Rains, (2022) *Fewer wetlands, more ditches: How knowledge of land use change can inform water-quality restoration in the Indian River Lagoon*. Presentations delivered to the Indian River Lagoon National Estuary Program Management STEM Advisory Committee and to the IRL Council Management Board, Grant-Valkaria, FL.
- Van Alphen, R., M. Rodgers, R. Malservisi, T. Dixon, K. Rains (2021) *Coastal land use classification using multispectral and RGB imagery from an unoccupied aerial vehicle (UAV)* American Geophysical Union New Orleans, LA.
- Stepchinski, L., M. Rains, L. C. Lee, R. Lis, W. Nutter, K.C. Rains, S. Stewart. (2021) *Headwater wetlands or headwater streams? Hydrologic connectivity and flow generation from California vernal depressions to downstream waters* American Geophysical Union New Orleans, LA.
- Lawlor, S. K.C. Rains, M Rains, S Landry, C. Flannagan (2021) *Quantifying changes in wetland distribution and drainage patterns (1850s-2004) to inform conservation and restoration in an agricultural landscape, St. Lucie County, FL*. Society of Wetland Scientists, Spokane, WA.
- Fransbergen, S., K.C. Rains, G. Fouad, M Rains (2021) *Field validation of the National Hydrography Dataset and a Regional Hydrography Dataset in Tampa Bay, FL, USA* Society of Wetland Scientist, Spokane, WA.
- Fouad, G, T. Lee, K.C. Rains (2021) *Estimating intermittent streamflow rates between geographically isolated wetlands and rivers using watershed terrain and historical runoff* Society of Wetland Scientists, Spokane, WA.
- Rains, K.C., N. Wurzburger, C. S. Bledsoe (2017) *Acquisition of N by plants from 15N-labelled root and leaf litter* Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America. Tampa, FL.
- Rains, K.C., M.C. Rains, S. Landry, V., Seidel, T. Crisman (2014) *Using net wetland loss, current wetland condition, and planned future watershed condition for wetland conservation planning and prioritization, Tampa Bay watershed, Florida*. Joint Aquatic Sciences Meeting (JASM): Society for Freshwater Science (SFS), Phycological Society of America (PSA), Association for the Sciences of Limnology and Oceanography (ASLO), Society of Wetland Scientists (SWS). Portland, OR.

Rains, K.C. (2013) *Analysis of the response of wetland functional assessment indices to landscape-level perturbations* 3PPI Wetland Restoration Meetings; Fairbanks, Alaska.

Rains, K.C., M.C. Rains, S.M. Landry, V. Seidel and T.L. Crisman (2013) *Net wetland loss (1950s-2007) and current wetland condition (2007), Tampa bay watershed, Florida* Joint Conference of the Society of Wetland Scientists South Atlantic Chapter (SWS SAC), Florida Association of Environmental Soil Scientists (FAESS), and Southwest Chapter of the Florida Association of Environmental Professionals (SWFAEP). Tampa, FL.

Rains, K.C. (2012) *Vegetation structure and composition across 125,000 acres of the Bristol Bay Watershed* Government Agency Briefings and Webinar: Pebble Partnership Baseline Environmental Team Agency Meeting; Anchorage, Alaska.

PUBLICATIONS: TECHNICAL REPORTS

Rains K.C., K. Bornhorst (2016) *A detailed analysis of the Florida Saltwater Angler Registry*. Water Institute, School of Geosciences, University of South Florida, Tampa, FL. Prepared for: Florida Fish and Wildlife Conservation Commission <http://waterinstitute.usf.edu/publications>

Rains KC, M.C Rains (2015) *Mangrove and Mangrove-Fringe Wetlands in Ostional, Nicaragua: Current Conditions and Pathways Forward*. University of South Florida, School of Geosciences, Tampa, FL

Three Parameters Plus (2014) *Vegetation Field Methods, Summary Statistics, Descriptions of Habitat Types, Digital Mapping, and Landscape Distribution*, Total Project Size: 332,000 acres, Southwest Alaska in "Preliminary jurisdictional wetland determination for the Donlin Gold Project" Prepared for Barrick Gold Corp. Role: Lead Author

Three Parameters Plus (2014) *Vegetation: Field Methods, Summary Statistics, Descriptions of Habitat Types, and Landscape Distribution*, Total Project Size: 12,697 acres, Interior Alaska in "Preliminary jurisdictional wetland determination for the Pogo Project", Prepared for Sumitomo Metal Mining, LLC, Role: Lead Author

Three Parameters Plus (2014) *Vegetation Field Methods, Summary Statistics, Descriptions of Habitat Types, and Landscape Distribution*, Total Project Size: 8,500 acres, Interior Alaska in "Preliminary jurisdictional wetland determination for the Tanana Project", Prepared for Sumitomo Metal Mining, LLC, Role: Lead Author

Three Parameters Plus (2014) *Disposal and control of invasive plant species*. Prepared for the Alaska Dept. of Transportation and Public Facilities, Southeastern Region. Role: Lead Author
www.dot.state.ak.us/stwddes/desenviron/assets/pdf/resources/se_invasive_final.pdf

Three Parameters Plus (2014, 2013, and 2012) *Botanical resource studies: Annex Creek/ Salmon Creek Hydroelectric Project (FERC Project No. 2307)*. Annual reports prepared for: Alaska Electric Light and Power, Juneau, Alaska. Role: Lead Author

Three Parameters Plus (2013) *Vegetation Field Methods, Summary Statistics, Descriptions of Habitat Types, Digital Mapping, and Landscape Distribution*, Total Project Size: 103,747 acres, North Slope, Alaska in "Preliminary jurisdictional wetland determination for the Foothills West Transportation Access Project",

Prepared for the Alaska Department of Transportation and Public Facilities, Northern Region, Role: Lead Author

Three Parameters Plus (2013) *Vegetation Field Methods, Summary Statistics, Descriptions of Habitat Types, Digital Mapping, and Landscape Distribution*, Total Project Size: 62,587 acres in “Preliminary jurisdictional wetland determination for the Livengood Gold Project”, Interior Alaska. Prepared for International Tower Hill, Role: Lead Author

Rains, K.C. (2013) *Non-native plant species survey, Umiat airstrip and associated road system, North Slope, Alaska*. Prepared for the Alaska Department of Transportation and Public Facilities, Northern Region.

Three Parameters Plus (2012) *Vegetation (Bristol Bay Drainages), Field Methods, Summary Statistics, Descriptions of Habitat Types, Digital Mapping, and Landscape Distribution*, Total Project Size: 250,000 acres, Southcentral Alaska Chapter 13 and related appendices in “The Environmental Baseline Document” Prepared for Pebble Partnership. <http://pebbleresearch.com/> Role: Co-Author

Rains, K.C. and T. Van Diest (2012) *Guide to common plants in northern Alaska: referencing Inupiaq and English names*. Prepared for native communities in Northern Alaska and funded by the Alaska Department of Transportation and Public Facilities, Northern Region.

Rains, M.C., K.C. Rains, W.J. Kleindl, S. Landry, T.L. Crisman, A. Brown, and L. van Maurik (2011) *Wetland inventory, functional classification, and regulatory code evaluation, St. Lucie County, Florida (440,320 acres)* Prepared for St. Lucie County, Fort Pierce, Florida.

Three Parameters Plus (2009) *Off-site functional assessment of wetlands in Interior Alaska*. Prepared for Donlin Creek LLC (Barrick Gold Corporation). Role: Co-Author

Rains, K.C. (2009) *Field guide to plants of the Donlin Gold Project*. (Western Alaska, 229 target species and potential look-alike species) Prepared for Barrick Gold Corp.

Rains, K.C. (2009) *Field guide to the plants of the Foothills West Transportation Access Project, North Slope*. (Northern Alaska, 148 target species and potential look-alike species) Prepared for the Alaska Department of Transportation and Public Facilities, Northern Region.

Rains, K.C. and L. Lewis (2008) *Field Guide to Plants of the Pebble Project*. (Southwestern Alaska, 270 target species and potential look-alike species) Prepared for Pebble Partnership, Anchorage, AK.

Rains, K.C. (2008) *Indices of Ecosystem Functions in Lacustrine Fringe Wetlands* In “Draft functional assessment guidebook to wetlands of Southcentral Alaska”. Prepared for Pebble Limited Partnership, Anchorage, AK.

MEMBERSHIPS AND CERTIFICATIONS

Memberships:

American Geophysical Union
Ecological Society of America
Society of Wetland Scientists
Soil Science Society of America
Florida Association of Environmental Soil Scientists
Florida Native Plant Society

Certifications

Professional Wetland Scientist No. 1958; Society of Wetland Scientists
Wilderness First Aid Instructed by NOLS Wilderness Medicine