**CURRICULUM VITA**

**CHRIS RINGO**

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1. **EDUCATION AND EMPLOYMENT INFORMATION**
	1. **Education**

Certificate in Ornamental Horticulture, Edmonds Community College, Edmonds, WA 2009

Master of Science in Mathematics (Numerical Analysis), Syracuse University, Syracuse, NY 1984

Bachelor of the Arts in Mathematics, State University of New York, Potsdam, NY 1980

* 1. **Professional Experience**

**Faculty Research Assistant/ Senior Faculty Research Assistant, Department of Crop and Soil Science** (November 2012 to Present)

Oregon State University, Corvallis, OR 97331

This position provides technical GIS, programming, and data management expertise and support to the Oregon State University (OSU) Global Hemp Information Center; the OSU Department of Crop and Soil Science; the Pacific Northwest Region Ecology Program of the USDA Forest Service; and the Fire, Fuel, Smoke Science Program of the USDA Forest Service Rocky Mountain Research Station.

For this first year of the Global Hemp Innovation Center I have served as data manager for the center, helping to coordinate data collection and management for field trials at participating Oregon State University Research and Extension Centers and land-grant universities across the US. These duties have included designing database structures for housing data from field trials; designing field forms for data collection; designing, printing, and delivering bar-coded tags for field trials; designing and delivering a data collection application for portable devices (smart phones, tablets) for reading bar-coded plant tags in the field, recording required data elements, and uploading to a cloud-based database; and helping coordinate collection of plant samples from field trials for lab analysis, and resulting statistical analysis of lab data.

I am also a part of a team of scientists from Oregon State University, Portland State University, and the USDA Forest Service (USFS) that is working on helping inform the USFS’s National Investment Strategy for reducing wildfire risk to communities throughout the US. This work has included the development of the Fireshed Registry Online Application (described here: <https://www.iawfonline.org/wp-content/uploads/2020/12/BP2-Fireshed-Registry.pdf>), which is helping the USFS focus on implementing wildfire mitigation strategies (forest restoration activities such as canopy thinning, prescribed burns, etc.) in areas having the highest wildfire risk to communities. The online application is currently only accessible inside the Forest Service network, but we are currently working on migrating it to be publicly available via ESRI’s ArcGIS Online architecture. This work resulted in USDA Forest Service Chief’s and Under Secretary’s awards for our team in November 2020.

Other major projects, in collaboration with the USDA Forest Service Pacific Northwest Region’s Ecology and Soils programs, have included developing a spatial soils database for all National Forests in the Pacific Northwest; researching and developing techniques for modeling drought-prone forest soils at regional scales to provide inputs to federal forest planning and management activities; and assisting in the development of a regional spatial layer of Landtype Associations based on geomorphology, soils, and potential vegetation. Additional projects, for which I secured external funding, have included helping develop a regional forest structure restoration needs analysis and helping develop a regional forest planning database for the US Forest Service.

Additional duties of the position have included GIS mapping and analysis support to the Crop and Soil Science Forage Program, including GIS-based modeling of suitability zones for clover and alfalfa; technical mentoring and supervision of undergraduate and graduate students working on Pedology projects; and researching and recommending computer and networking equipment for the research group.

**Faculty Research Assistant, College of Earth, Oceans, and Atmospheric Sciences** (February 2012 – November 2012)

Oregon State University, Corvallis, OR 97331

Following the 2010 Deepwater-Horizon oil spill in the Gulf of Mexico, the Federal Oil Spill Commission reported that our understanding of the impact of oil spills on the environment and humans was inadequate. The goal of this work was to research and assemble available spatial datasets to support the assessment of deepwater and ultra-deepwater regions in the Gulf of Mexico in the event of future oil spills. My role in the project was to assist in the assembly of a library of spatial datasets (particularly species occurrence and associated habitat data), and to research and model habitat requirements for various marine species such as sea turtles and shrimp. Results were published in a US Department of Energy Technical Report (Graham et al., 2012).

**GIS Programmer/Analyst**, **contractor to US Forest Service**, (October 2009 – November 2012)

Tetra Tech CES, Bothell, WA 98011

Lead GIS Analyst for Region 6 (Pacific Northwest) Climate Change Vulnerability Assessment and member of Assessment Core Team; also assisted Region 1 (Northern Region). Assembled a spatial data library of climate and hydrologic projections for western US; provided all GIS analyses and programming support; produced climate change map galleries for use by USFS staff in vulnerability assessments and for public; over 7,000 maps and datasets published to web (Digital Datasets, Ringo et al., 2011). Also provided all GIS programming and analysis for project for Northwest regional landscape analysis of ecological departure from historic range of variability. Published data and maps on web (Digital Datasets, DeMeo and Ringo, 2010). Project analyses were published in a book chapter and conference proceedings (DeMeo et al., 2012; DeMeo and Ringo 2010).

**GIS Programmer/Analyst, Mount Baker-Snoqualmie National Forest** (October 2004 - September 2009)

USDA Forest Service, Everett, WA, 98201

Lead GIS programmer/analyst for the Potential Vegetation Model and Mapping Project, responsible for assembling and maintaining spatial data library for WA and OR; geospatial programming of models and tools for principal investigators; researching scientific literature in support of model development and refinement; and cartography. Published USFS General Technical Report with project PIs (Henderson et al., 2011); published project data, maps, and draft map atlases to web (Digital Datasets, Henderson et al., 2010). Received USFS Certificate of Merit for role in project.

**GIS Manager, Technical Services Manager, GIS Analyst** (April 1992 - March 2004)

Washington Department of Fish and Wildlife, Olympia, WA 98501

Supervised up to five GIS analysts, cartographers, application developers and technical support staff in a wide range of GIS and application development projects. Provided end-user support for over 100 staff in areas of hardware and software support, including support for ArcInfo, ArcView, Powerbuilder applications, and Microsoft Office. Researched, recommended and purchased GIS software and hardware, including ArcInfo, ArcView and assorted software, plotters, digitizers, PC’s and UNIX workstations. Helped design, implement, and administer agency-wide GIS data libraries of priority fish and wildlife habitats and species layers, including threatened and endangered species. Helped develop QA/QC procedures to ensure integrity of agency-critical layers.

GIS Task Force chairperson and lead GIS analyst for multi-year, multi-agency project in Lewis River watershed in SW Washington. Responsible for gathering and compiling GIS data for over twenty priority habitats and species and designing and testing GIS models for predicting habitat change over time. Co-authored project report and agency watershed management plan.

**GIS Technician, Water Quality Division** (June 1990 - March 1992)

New Hampshire Department of Environmental Services, Concord, NH 03301

Aided in design and construction of statewide groundwater hazards inventory, including field locating of sites, compilation and automation of spatial and tabular data, cleaning and error checking. Developed a menu interface to design and produce town maps of threats to groundwater quality. Designed and produced digital maps for a wide variety of purposes, from report-size to poster maps for legislative sessions.

**Research Scientist, Institute for the Study of Earth, Oceans, and Space** (May 1985 – Nov 1989)

University of New Hampshire, Durham, NH 03824

Wrote new and modify existing mathematical models in FORTRAN depicting the oceans' circulation and role in the global carbon cycle; methods used were not "classical", and so procedures had to be somewhat eclectic and creative. Wrote technical reports and research summaries for funding agencies, and research articles for the scientific literature. Research results published in mathematical modeling journal (Copeland et al., 1993; Copeland et al., 1991) and book chapter (Moore et al., 1989).

**Graduate Teaching Assistant, Department of Mathematics** (August 1982 - December 1984)

Syracuse University, Syracuse, New York 13244

Taught freshman courses in probability and statistics and calculus, and graded homework assignments and exams in APL computer programming classes. Held office hours for consultation with students in a variety of math courses; included instruction on the use of a computer terminal and the basics of interaction with mainframe.

1. **TEACHING, ADVISING, AND OTHER ASSIGNMENTS**
	1. **Teaching and Advising**

N/A

* 1. **Other Assignments**

**Global Hemp Innovation Center:** The Global Hemp Innovation Center's stated mission is to “advance Oregon’s leadership in crop production and post-harvest industries related to industrial hemp”. I serve as the data manager for the Center. In the first year of the Center, my principal contributions have been:

* **Process data from industrial hemp field trials** (July 2019 to present). Process all data collected in the field trials conducted at the Imperial Valley Conservation Research Center, including conducting statistical analyses of harvest data and chemical analyses of lab samples.
* **Design and implement data management strategies** (January 2020 to present). For 2020 nationwide field trials conducted at 17 research sites across the US, my duties have included designing database structures for collecting and housing plant growth and final harvest data; designing and implementing a data collection system to tag plants in research plots with barcoded tags, and writing a smartphone/tablet application for scanning barcodes and entering/uploading required data elements to a cloud-based server; and helping coordinate sample collection and subsequent management of chemical analysis data from lab analyses.
* **Create data management plan** (March 2021 to April 2021). Created data management plan for 5-year, $10 million NIFA-SAS proposal entitled, “*Sustainably Incorporating Hemp Biobased Economy into Western U.S. Regional Rural and Tribal Lands*”. Proposal involves faculty from several OSU colleges, Tribal entities, federal agencies, and private companies.

**Fire, Fuel, Smoke Science (FFS) Program of the USDA Forest Service Rocky Mountain Research Station:** The main functions of the FFS program are to conduct research and develop management tools and applications designed to improve understanding of wildland fire and increase the safety and effectiveness of fire, fuel, and smoke management. My principal involvement in this research has been in providing GIS data management, analysis, and python programming expertise to our research team. Some primary results of our work to date have been:

* **The Fireshed Registry Dashboard and Database** (October 2019 to present). The Fireshed Registry is a geospatial dashboard and decision tool built in ArcGIS online. It provides an interactive system to view a wide array of information about firesheds and monitor progress towards risk reduction from management investments. The Fireshed Registry is the geospatial data warehouse for the Forest Service Scenario Planning Platform. The system integrates available data into a series of panels that address specific question related to risk to developed areas. My contributions to this project include identifying, processing, and linking geospatial data of interest to the platform; co-creation of the nested geospatial containers that provide the organizing structures for the application (firesheds and project areas – see Digital Datasets, Evers et al. 2020c); designing and programming the initial versions of the dashboard (Digital Datasets, Ager et al. 2020a); and providing figures, cartography, and manuscript edits for the publication describing the application (Ager et al. 2021). This application is currently available only to users with Forest Service ArcGIS Online accounts, but we are in the process of making it available to the general public.
* **The USFS Fireshed Investment Portal** (May 2020 – September 2020). This was an outgrowth of the Fireshed Registry Dashboard application, and was developed in response to the US Forest Service FY2021 National Investment Strategy for Reducing Wildfire Risk to prioritize investments in wildfire risk reduction to address community wildfire transmission. We identified the top ten firesheds in each Forest Service Region, and in each state, which contribute the highest level of wildfire exposure to communities and have available NFS lands for active management (e.g., fuel treatments such as prescribed burning, canopy reduction, etc.). This application was created for use by Forest Service personnel only, but is briefly described in Ager et al. 2021. For this project I designed and programmed the application interface and programmed portions of the prioritization analyses.
* **Community Wildfire Exposure Studies** (2017 to present). Leading up to the development of the Fireshed Registry outlined above, our team’s research has involved various aspects of transboundary wildfire risk modeling and management. This has included; examining tradeoffs between potentially conflicting forest management objectives and wildfire risk management; spatial modeling of wildfire spread from public lands into the wildland-urban interface (WUI); and studying the geography of wildfire transmission from National Forest lands in the western US into communities (i.e., the WUI). My role on the team is primarily in the areas of spatial data management, spatial analyses, and python programming. (Day et al. 2021; Ager et al. 2021; Ager et al. 2019a; Ager et al. 2019b; Ager et al. 2019c; Digital Datasets, Evers et al. 2020c)

**Department of Crop and Soil Science Pedology Program:** The main goals of the Landscape Pedology research program focus on the exploration of the role of soils in the Earth system using an interdisciplinary approach; gaining understanding of the spatial distribution of soils across the landscape; and bringing this broad-scale view into practical use by helping make the use and management of Pacific Northwest agriculture and natural resources sustainable into the future. The main emphasis of my role in the program centers on the research and production of robust spatial datasets that are used by public agencies to inform regional-scale ecological assessments, and resulting land management activities. Being an interdisciplinary program, these research activities extend out from soil science and into other disciplines such as forestry, ecology, agriculture, and public lands management. For the past several years, a significant portion of my research has branched out to include modeling community exposure to wildfire, and associated mitigation strategies. My principal contributions in these capacities are listed below.

* **Development of regional soil drought potential map and datasets** (June 2013 to 2019)

This study was an outgrowth of the SRI database project (detailed below), for which we obtained additional funding, in which we were asked to create a regional spatial dataset of “soil drought characteristics”. We developed a novel approach to the problem using readily-available spatial datasets depicting available water supply, soil depth, and evapotranspiration to model the likelihood that soils experience prolonged summer drying. To calibrate the model we examined soil profile descriptions, lab data, and soil moisture curves for 25 SNOTEL stations throughout the Pacific Northwest and estimated the average annual number of days that soil moisture drops to levels at or below permanent wilting point, the theoretical lower limit of plant-available water. Using this approach we found statistically significant relationships between the independent variables and broad classes of soil moisture levels representing the highest and lowest levels of plant-available moisture. For this project I contributed all geospatial data development, analysis, and programming; assisted in the development of the model design and the calibration methodology; and much of the manuscript writing and preparation. This work was funded by, and developed in collaboration with, the Forest Service Regional Soils Program. (Ringo et al., 2018; Digital Datasets, Ringo et al., 2016)

* **Development of regional forest ecological departure and restoration needs datasets** (October 2012 to 2018)

This is a series of related projects that I began before coming to my current position. Since coming to the Crop and Soils Department I have been able to continue and expand upon this line of research, while bringing in continued funding to support it. The work centers on the idea that forestlands in the Pacific Northwest have become departed from historic conditions due to management activities such as over-harvesting and fire suppression, resulting in unnatural stand conditions and periods of unusually large and severe wildfires. In this series of projects we are attempting to quantify the amount and spatial distribution of ecological departure, as well as the amount and types of stand treatments that would be required to bring Northwest forests into more sustainable conditions.

The first project provided an initial assessment of forest restoration need on National Forests in the Pacific Northwest region, funded by the Forest Service Regional Ecology Program. The results were used in helping to shape the Forest Service’s “Eastside Restoration Strategy” in Oregon and to help illustrate the urgent need for the thinning of forests in the Northwest to help mitigate wildlife risk and restore resiliency to these fire-adapted ecosystems. These analyses and mapped results were used in the Forest Service’s promotional materials for their Eastside Restoration Strategy, published online ([RestorationHandout.pdf](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5423599.pdf), [RestorationMap.pdf](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5423601.pdf)). I provided all geospatial programming, analysis, and cartographic support to this phase of the project.

The next phase was a collaborative effort between the Nature Conservancy and the Forest Service. It was undertaken to improve upon the methodology used in the first study, and to provide not only improved measures of structural forest departure, but also quantifying the amount and type of forest restoration needed throughout Washington and Oregon. It focused on fire-prone forests of eastern Washington and Eastern and Southwest Oregon. My main contributions were writing python code to calculate ecological departure and restoration need based on a set of management prescriptions, and writing/editing portions of the methods section of the publication. The results were published in Haugo et al., 2015.

The next phase of the analysis, in which we used updated input data, refined methodology, and an expanded study area encompassing all forested lands in Oregon and Washington, was completed in 2018. For this phase of the project my role was performing all spatial analyses, data summaries, maps, figures, and tables for publication, and assistance in writing and editing the manuscript (published in DeMeo et al., 2018).

* **USFS Soil Resource Inventory (SRI) Database Project** (November 2012 to 2017)

This was one of the two main projects that I was initially hired to work on, which involves the compilation of legacy soils data from twenty National Forest volumes in Oregon and Washington. In assembling these datasets, I supervised 6-8 graduate and undergraduate students in tabular data entry and polygon digitizing. We developed a regional spatial geodatabase with over 120,000 polygons, together with tabular attribute data on soil texture, depth, coarse fragments, soil color, pH, and more. We also produced a regional dataset of Available Water Holding Capacity, which was then used in a regional analysis of soil drought potential (Ringo et al., 2016). In addition, we produced twenty individual National Forest geodatabases with information on bedrock characteristics, landtype characteristics, and management interpretations on engineering characteristics, erosion and hydrology, recreation, timber management, and more, totaling over 200 separate tables. The databases we developed were subsequently published online (Digital Datasets, Noller et al., 2016a).

This project also led to the development of a set of regional soils layers for USFS climate change vulnerability assessments, in which I produced several high-resolution regional spatial soils layers at 3 depths for input into climate change models being developed at the Forest Service’s Pacific Northwest Research Station in Corvallis, OR. Model outputs are being used in the Forest Service’s regional climate change vulnerability assessments in Oregon and Washington.

* **Regional Landtype Associations database** (November 2012 to 2016)

This is the other major project for which I was hired, which involved the development of a regional spatial database of Landtype Associations (LTAs) in collaboration with the US Forest Service, based on geomorphology, soils, and potential vegetation. LTAs are a mid-level assessment unit intended to assist natural resource managers with a characterization of both the inherent capacity of the landscape to provide for a variety of ecological services and an assessment of the sensitivity and resiliency of that landscape to recover from various natural and human impacts. My main role was to develop python code to systematically subdivide Landform polygons, which are based primarily on geomorphology, by potential natural vegetation (PNV) types, to produce the final Landtype Associations (LTA) polygon dataset. This was done to ensure that the process of delineating landtypes was fully rule-based, documented and repeatable. I also performed digital terrain analyses to provide analytical bases for the delineation and naming of various landform features; and wrote FGDC-compliant metadata documenting the steps used, performed polygon and attribute editing, and final QA/QC. (Digital Datasets, Noller et al., 2016b)

* **Development of regional database and map atlas for restoration management capability** (August 2014 to November 2015)

This is another project for which I secured outside funding, which involved the development of a region-wide spatial database of forest plan allocations. The project was undertaken because despite the importance of forest plan designations for assessing ecological restoration capacity, standardized spatial data at regional scales do not exist, making comprehensive regional and national assessments of restoration potentials and priorities difficult. We built the database to depict active management restrictions on national forests (e.g., prescribed fire) to aid in regional analyses of landscape restoration and prioritization and wildfire risk management. The results were published in a Forest Service General Technical Report (Ringo et al., 2015), and the resulting dataset has been used in a recently published study on wildfire risk mitigation, as well as in our own current study of ecological departure (Haugo et al., 2016). As lead author of the study, I converted tabular data from Excel to database format, wrote python code for all data summaries and analyses; created tables and map atlases for publication; and wrote and edited sections of the publication. The work was a collaborative effort between myself, a Faculty Research Assistant in the OSU Forestry Sciences Lab, the Forest Service’s Regional Economist in Portland, OR, and a Forest Service Operations Research Analyst in Pendleton, OR. (published in Ringo et al., 2015)

Other duties of my position include training, supervision, and technical support. These are outlined below.

* **Supervision of student workers**

I supervised 6-8 graduate and undergraduate students in the compilation of legacy soils data from twenty national forest volumes in Oregon and Washington; trained/mentored students in the use of geographic information systems software for digitization of soil polygon boundaries and creation of metadata; helped recruit and train student workers (Megan Atkinson, Sonia Davis, Corey Owen, Diana Vega) to work on our Soil Resource Inventory project.

* **Provide training in digital mapping techniques**

I have assisted graduate students with their thesis research, providing programming support to Yulin Sun and Vance Almquist. I assisted in Geo 468/568 labs as guest lecturer and lab assistant, and one-on-one student support in digitizing techniques and general geographic information science (GIS) concepts (8-10 students working on SRI spatial data compilation project).

* **Research Equipment**

I researched, recommended, and purchased network-attached storage for the Pedology research program and the Global Hemp Innovation Center.

* **Network Testing**

Serve as technical liaison between Crop and Soils Department and Center for Genome Research and Biocomputing (CGRB) in transitioning of network file space to CGRB network. Tested network speeds as network upgrades were performed to assess CSS access to the CGRB network. Assist Pedology graduate students with access to new file space.

1. **SCOLARSHIP AND CREATIVE ACTIVITY**
	* + 1. **Publications**
				1. **Refereed Publications**

Ager, A., Day, M., **Ringo, C.**, Evers, C., Alcasena, F. J., Houtman, R., Scanlon, M., and Ellersick, T. (2021). Development and application of the Fireshed Registry. *RMRS-GTR-425.* Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 47 p. <https://doi.org/10.2737/RMRS-GTR-425>

*Role:* I contributed spatial data compilation and management, geospatial analyses, python programming, figure production, and manuscript edits.

Day, M., Houtman, R., Belavenutti, P. **Ringo, C.**, Ager, A., and Bassett, S. (2021). An assessment of forest and woodland restoration priorities to address wildfire risk in New Mexico. *RMRS-GTR-423.* Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 70 p. <https://doi.org/10.2737/RMRS-GTR-423>

 *Role:* I contributed spatial data compilation and management, geospatial analyses, python programming, cartographic production, and manuscript edits.

Ager, A., Houtman, R., Day, M., **Ringo, C.**, and Palaiologou, P. (2019a) Tradeoffs between US national forest harvest targets and fuel management to reduce wildfire transmission to the wildland urban interface. *Forest Ecology and Management* 434 (2019) 99-109. <https://doi.org/10.1016/j.foreco.2018.12.003>

 *Role:* I contributed spatial data compilation and management, geospatial analyses, python programming, cartography, and manuscript edits.

Ager, A., Palaiologou, P., Evers, C., Day, M., **Ringo, C.**, and Short, K. (2019b). Wildfire exposure to the wildland urban interface in the western US. *Applied Geography* 111 (2019) 102059. <https://doi.org/10.1016/j.apgeog.2019.102059>

 *Role:* I contributed spatial data compilation and management, geospatial analyses, python programming, and manuscript edits.

Ager, A., Day, M., Palaiologou, P., Houtman, R., **Ringo, C.**, and Evers, C. (2019c). Cross-boundary wildfire and community exposure: A framework and application in the western U.S. *Gen. Tech. Rep. RMRS-GTR-392*. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 36 p. <https://doi.org/10.2737/RMRS-GTR-392>

*Role:* I contributed spatial data compilation and management, geospatial analyses, python programming, cartography, and manuscript edits.

**Ringo, C**., Bennett, K, Noller, J., Jiang, D., and Moore, D. (2018). Modeling droughty soils at regional scales in Pacific Northwest forests, USA. *Forest Ecology and Management* 424 (2018), 121-135. <https://doi.org/10.1016/j.foreco.2018.04.019>

*Role:**I contributed all geospatial analyses and python programming; assisted in the development of the model calibration methodology; assembled and processed all data for calibration dataset; wrote/edited manuscript sections on methods, discussion, conclusions*.

DeMeo, T., Haugo, R., **Ringo, C**., K., Kertis, J., Acker, S., Simpson, M., and Stern, M. (2018). Expanding our understanding of forest structural restoration needs in the Pacific Northwest. *Northwest Science* 92(1):18-35. <https://doi.org/10.3955/046.092.0104>

*Role: I assembled the final datasets; performed all spatial analyses and data summaries; created all maps and tables for publication; wrote/edited sections on analysis methods and data inputs.*

**Ringo, C.**; Ager, A.; Day, M.; Crim, S. (2015). A spatial database for restoration management capability on national forests in the Pacific Northwest USA. *Gen. Tech. Rep. PNW-GTR-919*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 71 p. <https://doi.org/10.2737/PNW-GTR-919>

*Role: I classified data into land management classes; wrote python code to produce and analyze the associated spatial database; produced atlas of maps and summary tables for publication; wrote/edited portions of the methods section of the technical report for publication*

Haugo, R., Zanger, C., DeMeo, T., **Ringo, C**., Shlisky, A., Blankenship, K., Simpson, M., Mellen-McLean, K., Kertis, J., Stern, M. (2015). A new approach to evaluate forest structure restoration needs across Oregon and Washington, USA. *Forest Ecology and Management* 2015;335:37-50. <https://doi.org/10.1016/j.foreco.2014.09.014>

 *Role: Wrote python code to calculate ecological departure from historic range of variability; wrote python code to calculate restoration need based ecological departure and a set of management prescriptions; wrote portions of the methods section of manuscript.*

Henderson, J., Lesher, R., Peter D., **Ringo**, **C.** (2011). A landscape model for predicting potential natural vegetation of the Olympic Peninsula USA using boundary equations and newly developed environmental variables. *Gen. Tech. Rep. PNW-GTR-841*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 38 p. <https://doi.org/10.2737/PNW-GTR-841>

 *Role: Provided geospatial programming of models and tools for principal investigators in development of vegetation model; assembled spatial data layers needed as model inputs; wrote section of manuscript dealing with cold air drainage sub-model.*

Copeland, A., **Ringo, C.**, Moore, III, B., Segall, R. (1993). Mathematical Modelling for Singular Value Decomposition Problems for Oceans. *Applied Mathematical Modelling*, Vol. 17, No. 10, 536-546. [https://doi.org/10.1016/0307-904X(93)90083-S](https://doi.org/10.1016/0307-904X%2893%2990083-S)

 *Role: Performed all computer programming and data analyses; wrote/edited initial drafts of article.*

Copeland, A., Segall, R., **Ringo, C.**, and Moore, III., B., (1991). Mathematical Modelling for Inverse Problems for Oceans. *Applied Mathematical Modelling*, Vol. 15, No. 11/12, 586-595. [https://doi.org/10.1016/S0307-904X(09)81004-4](https://doi.org/10.1016/S0307-904X%2809%2981004-4)

 *Role: Performed all computer programming and data analyses; wrote/edited initial drafts of article.*

* + - * 1. **Research and Technical Reports (non-refereed)**

**Ringo, C.** (2020). Region 6 droughty soils validation report*.* *Report to the USDA Forest Service Pacific Northwest Ecology Program.* 5 pp.

*Role: Sole responsibility for the planning, design, data management, and analysis involved in validating droughty soils model; also summarization of findings, cartographic production, figure rendering, and writing final project report.*

Day, M., Houtman, R., Belavenutti, P., **Ringo, C.**, and Ager, A. (2020). Shared Stewardship in New Mexico. *A report compiled by the Forest Service Rocky Mountain Research Station Scenario Planning Team for the National Fire Decision Support Center.* 76 pp.

 Role: *Provided data management, geospatial analyses, programming, cartography, and manuscript edits.*

Day, M., Ager, A., Palaiologou, P., and **Ringo, C.** (2019). Cross-Boundary Wildfire Transmission in Oregon – A quantitative transmission analysis. *Report to the Oregon Department of Forestry and the National Fire Decision Support center.* 37 pp.

Role: *Provided data management, geospatial analyses, programming, and manuscript edits.*

Houtman, R., **Ringo, C.**, Evers, C., Day, M., and Ager, A. (2019). Idaho Shared Stewardship: Assessment of priorities and potential outcomes. *Prepared by the Forest Service Rocky Mountain Research Station and Oregon State University for the Idaho Department of Lands and USDA Forest Region 4 Shared Stewardship Initiative staff.* 61 pp.

 *Role: Provided data management, geospatial analyses, programming, cartography, and manuscript edits.*

Lesher, R., Henderson, J., **Ringo, C**. (2013). “Known Occurrence and Potential Habitat Model for Big Huckleberry (*Vaccinium membranceum*) on the Mt. Baker-Snoqualmie National Forest”. *Report to the Tulalip Tribes*; 47 pp.

 *Role: GIS programming and mapping support; creation of maps for report.*

DeMeo, T., Swanson, F., Smith, E., Buttrick, S., Kertis, J., Rice, J., **Ringo**, **C.,** Waltz, A., Zanger, C., Friesen, C., Cissel, J. (2012). Applying historical fire-regime concepts to forest management in the western United States: three case studies. In J. Wiens, G. Hayward, H. Safford, and C. Giffen (Eds.), *Historical Environmental Variation in Conservation and Natural Resource Management* (pp. 194-204). John Wiley & Sons.

 *Role: All geospatial analyses pertaining to the Oregon Restoration Planning portion of the article.*

Graham, J., Rose, K., Bauer, J., Disenhof, C., Jenkins, C., Nelson, J., **Ringo, C**., Sim, L., VanAckeren, K. (2012). Integration of Spatial Data to Support Risk and Impact Assessments for Deep and Ultra-deepwater Hydrocarbon Activities in the Gulf of Mexico. *NETL-TRS-4-2012; EPAct Technical Report Series*; U.S. Department of Energy, National Energy Technology Laboratory: Morgantown, WV; 36 p.

 *Role: Created spatial reference system for project; performed literature searches; created spatial dataset of estuarine habitats; assembled spatial data library of important marine species in the Gulf of Mexico; wrote portions of manuscript on spatial reference error analysis and estuarine habitats.*

DeMeo, T. and **Ringo**, **C.** (2010). A Comparison of Fire Regime Condition Class Assessments at Multiple Scales in the Pacific Northwest. *Proceedings of 3rd Fire Behavior and Fuels Conference, October 25-29, 2010, Spokane, Washington, USA*. International Association of Wildland Fire, Birmingham, Alabama, USA. 10p.

 *Role: Performed all geospatial analyses and data summaries.*

Lesher, R, Henderson, J., **Ringo, C.** (2008). Potential Habitat Model for Salal (*Gaultheria shallon*) for the Olympic National Forest. Unpublished report on file at the Mt. Baker-Snoqualmie National Forest, Everett, Washington.

 *Role: GIS support to the PIs, including spatial overlays, data summarization, and geospatial programming; produced maps for final report.*

* + - * 1. **Book Chapters**

Day, M., and **Ringo, C.,** Ager, A. (2021). Assessment of Wildfire Exposure to Public Water Supply Areas in Oregon. Pages 8-1 – 8-17 *in* J. Souder, ed. Trees to Tap: How forest practices affect Oregon’s municipal water. Oregon State University Extension Communications.

 *Role: Provided python programming for summarization of wildfire impacts to public water supply areas (PWS); digital cartographic atlas of wildfire impacts to individual PWS; all maps, tables, and graphs for manuscript; and manuscript edits.*

**Ringo, C.**, Bennett, K., and Cartwright, J. (2020). Soil drought probability for Pacific Northwest forests. Pages 189-195 *in* J. Cartwright, ed. A guidebook to spatial datasets for conservation planning under climate change in the Pacific Northwest. U.S. Geological Survey. <https://doi.org/10.5066/P92L1H7O>

 *Role: Provided summaries of our original research and proofreading/edits of manuscript.*

DeMeo, T.E., Swanson, F.J., Smith, E.B., Buttrick, S.C., Kertis, J., Rice, J., **Ringo, C.D.**, Waltz, A., Zanger, C., Friesen, C.A., and Cissel, J. H. 2012. Applying historical fire regime concepts to forest management in the western U.S. Pages 194-204 *in* J. A. Wiens, G.D. Hayward, H.D. Safford, and C. Giffen, eds. Historical environmental variation in conservation and natural resource management. Oxford, UK: Wiley-Blackwell, 337 pp. [10.1002/9781118329726.ch13](https://doi.org/10.1002/9781118329726.ch13)

 *Role: I performed all geospatial analyses for case studies 1 and 2.*

Moore, III, B., Bolin, B., Bjorkstrom, A., Holmen, K., **Ringo, C.** (1989).Ocean Carbon Models and Inverse Methods. In D.L.T. Anderson and J. Willebrand (Eds.), *Oceanic Circulation Models: Combining Data and Dynamics* (pp. 409-449)*.* Kluwer Academic Publishers. <https://doi.org/10.1007/978-94-009-1013-3>

 *Role: FORTRAN programming of portions of the ocean circulation model, writing/editing of sections on inverse methods.*

* + - * 1. **Published Digital Datasets and Online Applications**

Bunzel, K., A. A. Ager, M. A. Day, **C. Ringo**, and C. Evers (2022). Smoothed raster of wildfire transmission to buildings in the continental United States. Forest Service Research Data Archive. <https://doi.org/10.2737/RDS-2022-0015>

*Role: Provided data management, spatial analyses, and python programming, and created all FGDC-compliant metadata for final datasets.*

Ager, A., Day, M., **Ringo, C.**, Evers, C., Alcasena, F. J., Houtman, R., Scanlon, M., and Ellersick, T. (2020a) Fireshed Registry Dashboard online application. [https://usfs.maps.arcgis.com/apps/opsdashboard/index.html#/81d5f0aaa4c349fc83452c7f8ff0bf97](https://usfs.maps.arcgis.com/apps/opsdashboard/index.html%23/81d5f0aaa4c349fc83452c7f8ff0bf97) (Currently it requires Forest Service ArcGIS Online account for access. The application is described [here](https://www.iawfonline.org/wp-content/uploads/2020/12/BP2-Fireshed-Registry.pdf), and public access is pending).

 *Role: My contributions to this project include identifying, processing, and linking geospatial data of interest to the platform; co-creation of the nested geospatial containers that provide the organizing structures for the application (firesheds and project areas – see Digital Datasets, Evers et al. 2020c); and designing and programming the initial versions of the dashboard.*

Ager, A., Day, M., **Ringo, C.**, Evers, C., Alcasena, F. J., Houtman, R., and Scanlon, M. (2020b) Fireshed Investment Portal online application. <https://usfs.maps.arcgis.com/apps/opsdashboard/index.html#/caa9434664c04681b71d75ba7afa521f> (requires Forest Service ArcGIS Online account for access).

 *Role: I designed and programmed the application interface and programmed portions of the prioritization analyses.*

Evers, C.; **Ringo, C.**; Ager, A.A.; Day, M.A.; Alcasena Urdíroz, F. J.; Bunzel, K. (2020c). The Fireshed Registry: Fireshed and project area boundaries for the continental United States [Database]. USDA Forest Service Research Data Archive. <https://doi.org/10.2737/RDS-2020-0054>.

 *Role: Provided data management, spatial analyses, and python programming, and created all FGDC-compliant metadata for final datasets.*

Noller, J., **Ringo, C.**, Bennett, K. (2016). USDA Forest Service Pacific Northwest Soil Resource Inventory SpatialDatabase. <http://ecoshare.info/soils/soil-resource-inventory>

 *Role: I supervised student workers in tabular data entry and polygon digitizing; performed QA/QC on data and made final edits; performed all data modeling and database management; performed all python programming required by project; wrote all metadata and published final data to web; wrote project documentation.*

Noller, J., Bennett, K., **Ringo, C.**, Hobson, J., Hash, S. (2016). Pacific Northwest Landtype Association Mapping – A New View of the Region. <http://ecoshare.info/projects/landtype-associations/>

 *Role: My main role was to develop python code to systematically subdivide hand-delineated Landform Association polygons, based on primary and secondary potential natural vegetation (PNV) zones from best-available raster-based PNV data, to produce the final Landtype Associations (LTA) polygon dataset. This was done to ensure that the process of delineating LTAs was consistent, fully documented, and repeatable. I also wrote FGDC-compliant metadata documenting the steps used, and performed polygon and attribute editing and final data QA/QC.*

**Ringo, C.**, Bennett, K., Noller, J. (2016). Modeled Soil Drought Probability for Forested Lands in the Pacific Northwest (2016). <http://ecoshare.info/soils/droughty-soils-model>

*Role: I researched, developed, and prepared all input data for model; assisted in the development of the model design and calibration methodologies; assembled and analyzed all data for calibration dataset; performed all geospatial analysis, cartography, and programming; and wrote project documentation and metadata.*

**Ringo, C.**, Ager, A., Day, M., Crim, S.(2015).A Spatial Database for Restoration Management Capability on National Forest Lands in the Pacific Northwest. <http://www.treesearch.fs.fed.us/pubs/50120>

*Role: I classified Excel spreadsheets of Land Resource Management Plan data for 21 National Forests into land management classes; wrote python code to produce and analyze the associated spatial database; created tables and all cartographic products in publication.*

Haugo, R., Zanger, C., DeMeo, T., **Ringo, C**., Shlisky, A., Blankenship, K., Simpson, M., Mellen-McLean, K., Kertis, J., Stern, M. (2014). TNC/USFS Restoration Needs Analysis and Database for Oregon and Washington. <http://ecoshare.info/products/r6-analysis>

 *Role:* *I wrote python code to calculate ecological departure from historic range of variability; and wrote python code to calculate restoration need based ecological departure and a set of management prescriptions.*

**Ringo, C.**, Whitman, M., DeMeo, T., Bennett, K., Lovetang, S. (2011). Maps and Spatial Data for the Forest Service’s Region 1 & 6 Climate Change Resource Center website. [http://www.ecoshare.info/maps-and-data](http://climatechange.ecoshare.info/maps-and-data)

 *Role: I wrote python scripts to convert outputs (over 7000 datasets) from regional climate models to geospatial format and prepare for transfer to website; wrote metadata for all layers and wrote python scripts to apply to spatial datasets; supervised one other cartographer and we developed over 120 map atlases of selected climate variables, representing over 3000 maps.*

DeMeo, T. and **Ringo, C.** (2010). Fire Regime Condition Class Spatial Database for Pacific Northwest National Forests. <http://ecoshare.info/category/fire-regime-condition-class/>

 *Role: I used standard methodologies and tools to create these spatial datasets, wrote documentation of the procedures used, and prepared layers for web download.*

Henderson, J., Lesher, R., Peter, D., **Ringo, C.** (2010). Modeled Potential Vegetation Zones of Washington and Oregon. <http://ecoshare.info/category/gis-data-vegzones/>

 *Role: I provided geospatial programming support to this modeling project, programming many of the tools used in the modeling process; prepared spatial layers for download; produced all maps for web site; wrote metadata for all spatial layers.*

* + - * 1. **Abstracts**

Scanlon, M. and **Ringo, C**. (2021). Considerations for Nested Dashboards. E*SRI Developers Summit*, April 6-8 2021, Virtual.

Hannaway D.B., Brewer L.J., Ates S, Anderson N.P., Wang G., Filley S., Daly C., Halbleib M.D., **Ringo C.,** Monk S., Moot D.J., Yang X., Chapman D.F. and Sohn P. (2018). Match clover: optimal selection of clover species. *Proceedings of the 27th General Meeting of the European Grassland Federation,* June 17-21 2018, Cork, Ireland.

Lesher, R., Henderson, J., and **Ringo, C**. (2018). Ecology and Distribution of Salal on the Olympic National Forest: Using a Potential Habitat Model and Map to Address Sustainability Issues. *Northwest Scientific Association Annual Meeting*, March 29, 2018, Olympia Washington.

Noller, J., Bennett, K., **Ringo, C.** (2016)*.* LandType Associations of the Pacific NW - a New Regional View to Support Management Actions. *Society for Ecological Restoration Regional Conference*, April 4–8 2016, Portland, Oregon.

**Ringo,** **C.**, Noller, J., Bennett, K. (2016). An Approach to Modeling Soil Moisture Drought Potential at Regional Scales in the Pacific Northwest. *Northwest Scientific Association Annual Meeting*. March 23–26 2016, Bend Oregon.

Lesher, R., Henderson, J., **Ringo, C.** (2016). The Mystery of the 700 year-old Trees*. Northwest Scientific Association Annual Meeting*. March 23–26 2016, Bend Oregon.

Noller, J., **Ringo, C.**, Bennett, K. (2016). Available Soil Resource Information on Forest Lands in the Pacific Northwest Region - Retrieval of Legacy Forest Service Soil Resource Inventory Data. *Northwest Scientific Association Annual Meeting*. March 23–26 2016, Bend Oregon.

Haugo, R., Zanger, C., DeMeo, T., **Ringo, C.**, Shlisky , A., Blankenship, K., Simpson, M., Mellen-McLean, K., Stern, M., Kertis, J. (2015). A new approach to evaluate forest structure restoration needs across Oregon and Washington, USA. *Fire Ecology and Management Congress*, November 16–20 2015, San Antonio, Texas.

**PROFESSIONAL MEETINGS**

1. **Invited Presentations**

Day, M. and **Ringo, C.** (2021). Assessment of Wildfire Exposure to Public Water Supply Areas. *Trees to Tap: Forest Management and Drinking Water Virtual Conference.* March 11-12 2021. Virtual. (Co-presenter)

**Ringo, C**., Noller, J., Bennett, K. (2016). Development of a Geospatial Climate-Soil Drought Index Model. *Soil Science Society of America Annual Conference (Special Session: Advances in Physiographic Modeling of Soil Water Storage and Plant Availability)*, November 6-9, 2016, Phoenix Arizona.

**Ringo, C**., Noller, J., Bennett, K. (2016). Development of a droughty soil-site index for resource modeling. *Intermountain Forestry Cooperative Annual Meeting*, March 29, 2016, Moscow, ID. (Presenter)

1. **Contributed Presentations and Posters**

Scanlon, M. and **Ringo, C.** (2021). Considerations for Nested Dashboards. Presentation at the *2021 ESRI Developer Summit*, April 6–8, 2021. Virtual. (Co-presenter)

Ager, A., Day, M., Houtman, R, Evers, C., and **Ringo, C.** (2019). Scenario Planning for Shared Stewardship: A Tool to Identify Opportunities for Collaborative Landscape Management. Presentation at the *Landscape Ecology and NEPA Planning Meeting*, November 5, 2019, LaSells Stewart Center, Oregon State University, Corvallis, OR.

**Ringo, C.**, Ager, A., Palaiologou, P., and Evers, C. (2018). Exploring Community Wildfire Risk with Story Maps. Poster presented at the *2018* *ESRI User Conference*, July 9-13, 2018, San Diego, CA. (Presenter)

Lesher, R., Henderson, J., and **Ringo, C**. (2018). *Ecology and Distribution of Salal on the Olympic National Forest: Using a Potential Habitat Model and Map to Address Sustainability Issues.* Presented at the *Native Food Plants of the Northwest: Ecology, Culture and Management in a Changing World, Special Session of the Northwest Scientific Association Annual Meeting*, March 29, 2018, Olympia Washington.

Hannaway, D. B, Brewer, L. J. , Ates, S. , Anderson, N. P. , Wang, G. , Filley, S. J. , Daly, C. , Halbleib, M. D. , **Ringo, C. D.** , Monk, S. F. , Moot, D. J. , Mills, A. , Zang, X. , Chapman, D. F. , Sohn, P. "Match clover: A web-based tool to match clovers to climates, soils, and intended uses," Presented at the *27th General Meeting of the European Grassland Federation Conference*, June 17-21 2018, Cork, Ireland.

**Ringo, C**., Noller, J., Bennett, K. (2016). A Regional Soil Drought Potential Model for Forested Lands in the Pacific Northwest. Poster presented at the *2016 International ESRI User Conference*, June 27 – July 1, 2016, San Diego, CA. (Presenter)

**Ringo, C**., Noller, J., Bennett, K. (2016). An Approach to Modeling Soil Moisture Drought Potential at Regional Scales in the Pacific Northwest. Presented at the *2016* *Northwest Scientific Association Annual Meeting*, March 23-26, 2016. (Presenter)

Noller, J., **Ringo, C**., Bennett, K. (2016). Available Soil Resource Information on Forest Lands in the Pacific Northwest Region - Retrieval of Legacy Forest Service Soil Resource Inventory Data. Poster presented at the *2016* *Northwest Scientific Association Annual Meeting*, March 23-26, 2016. (Presenter)

**Ringo, C**., Noller, J., Bennett, K. (2013). Toward a Regional Droughty Soils Map: Rescuing Legacy Forest Service Soil Resource Inventory Data. Poster presented at the *4th Pacific Northwest Climate Change Conference*, September 5-6, 2013. (Presenter)

Bennett, K. and **Ringo, C.** (2013). A Soil Drought Vulnerability Index. Presentation to the *USDA Forest Service Region 6 Annual Watershed and Fisheries Program Managers Meeting*, Corvallis, OR, November 20, 2013.

**Ringo, C.** and Bennett, K. (2013). Toward a Regional Droughty Soils Map. Presentation to the *Forest Service Region 6 Joint Ecology and Silviculture Meeting*, Springfield, OR, November 6, 2013. (Co-presenter)

Lesher, R. and **Ringo, C**. (2011). Building a Potential Habitat Model for Big Huckleberry (*Vaccinium membranaceum*). Presented at the *Sustaining Our Culture: Management and Access to Traditional Plants on Public Lands Conference*, Tulalip, WA, October 2011. (Co-presenter)

**Grants and contracts**

The following grants and contract amendments are those which I secured from sources other than our primary contract with the USFS Pacific Northwest Soils Program (Jay Noller, PI).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Years** | **Agency** | **Title** | **Personnel** | **Amount** |
| 2013-2014 | USFS R6 Ecology Program | R6 Restoration (DeMeo extension to R6 Soils contract1) | Co-investigator | $25,000 |
| 2014-2015 | USFS R6 Ecology Program | R6 Restoration (DeMeo extension to R6 Soils contract) | Co-investigator | $25,000 |
| 2014-2015 | USFS R6 WWETAC2 | Spatial Analyses of Restoration Priorities on the National Forests of the Pacific NW | Lead Principal Investigator | $27,000 |
| 2015-2016 | USFS R6 Ecology Program and WWETAC2 | R6 Restoration (Ager/DeMeo extensions to R6 Soils contract) | Co-investigator | $50,000 |
| 2017-2020 | USFS R6 Ecology Program | Landscape Assessment (DeMeo contract modifications) | Principal Investigator | $78,000 |
| 2019 -2020 | USFS PNW Research Station | Exotic species invasion dynamics in eastern Oregon and the Blue MT Ecoregion (Krawchuk/Kerns) | Co-investigator | $10,000 |
| 2017-2021 | Rocky Mt Research Station (USFS, R1) | Managing Community Wildfire Risk in the Western US (Ager) | Co-investigator | $250,000 |

1R6 Soils contract – Noller contract with the USFS Pacific Northwest Soils Program, 2012-2017

2 WWETAC – Western Wildlands Environmental Threat Assessment Center, USFS Region 6, Prineville, OR.

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1. **SERVICE**

**Departmental GIS Support for Student and Faculty Research Activities**

* Created a series of soil maps for CSS Professor Maria Dragila to aid in field locating of potential study sites in eastern Oregon.
* Researched and acquired current satellite imagery, orthorectified, and produced a series of high-resolution field maps for land use study site in Acconia, Italy for cooperating professor Albert Ammerman of Colgate University.
* Produced a series of maps for Emeritus Professor William Stephen depicting the relationship between bumble bee populations and acres of red clover planted in the Willamette Valley.
* Produced maps of interpolated potato psyllid data in northeast Oregon as a demonstration to Extension research faculty of the utility of serving maps of pest insects through the web.
* Provided soils data from the Soil Resource Inventory database we developed to forest soils graduate students Trent Segar, James Johnston, Brooke Cassell for use in their thesis research.
* In order to help illustrate possible wildfire smoke effects on hemp for the Global Hemp Innovation Center, I gathered and interpolated data from 1,000+ air quality sites across Oregon, Idaho, and northern California, and created a video of air quality index (SQI) and registered industrial hemp locations in Oregon during the wildfires of September 2020, available [here](https://agsci.oregonstate.edu/hemp/comprehensive-research/wildfire-smoke-effects-hemp-stewardship-committee).

**Classroom Assistance**

* Served as guest lecturer and lab/classroom assistant in CSS 468/568
* Served as guest lecturer in GEO 580

**Committee participation**

* Served as search committee member for Central Analytical Lab manager, 2018 (Internal search)
* Served as search committee member for Central Analytical Lab manager, 2016 (Posting Number P00427UF)
* Served on ROOTS IT Customer Advisory Team, 2014-2015
1. **AWARDS**
* **USDA Forest Service Chief’s Award**, November 18, 2020. *Firesheds Registry: Foundational for Community Fire Protection*. Award given for our Firesheds Registry Online Application, created by our team to help the Forest Service target areas of high wildfire risk to communities for treatments (e.g., canopy thinning, prescribed fire, etc.)