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Education

Ph.D. Forest Science, Biostatistics, Precision Agriculture. Warner College of Natural Resources, Colorado State University (CSU), Fort Collins Colorado USA, 2012. Dissertation: Using Cellular Automata to predict the spread and intensity of the Amber-Marked Birch leaf miner infestation in Alaska.
https://dspace.library.colostate.edu/handle/10217/71597

M.S. Natural Resources Engineering: Remote Sensing, Geographic Information Systems (GIS), and Statistical Analysis. Humboldt State University, Arcata, California USA 1995. Thesis: *Predicting vegetation type and fire hazard in the Smith River National Recreation area using a Geographic Information System*. Remote Sensing and Ecosystem Management, Proceedings of the Fifth Forest Service Remote Sensing Applications. P. 336.1997. (http://hdl.handle.net/2148/839).

B.S. Forest Ecology minor in Oceanography: Emphasizing in Botanical and Environmental Research. Humboldt State University, Arcata, California, USA 1988.

Work Experience

2005 – Current **Principal of ERIA Consultants, LLC. • Boulder Colorado.**

Current contracts include expert witness testimony, analysis, and ground metric computations as it pertains to Wildland Fire Burn Severity evaluation. I have created a workflow using custom computer applications written in python, and R. These programs will classify, quantify, and implement an accuracy assessment matrix for areas that have been exposed to wildfire. The input data into the workflow are multispectral imagery. The imagery data that has been vetted in the process is LandSat-5, LandSat-7, LandSat-8, WorldView-2, and WorldView-3.

Other clients have included Ocean Imaging, the US Forest Service Forest Health Enterprise Team (FHTET), The Nature Conservancy (TNC), NatureServe, and Department of Agriculture. Previous contracts involved mapping ocean littoral kelp beds in Marine Protected zones in Oregon and California using high-resolution multispectral four-band digital imagery collected from fixed wing aircraft. Development of fertilizer and irrigate regime for various row crops using satellite imagery field sampling, and spatial statistics. Previous projects involved creating and conducting spatially explicit and stochastic risk assessment modeling for the potential introduction of exotic forest pathogens and insects to the United States (FHTET) and Colorado Forest Assessment (TNC). Additional projects include "Wildland Tree Resources at Risk from *Agrilus coxalis*" and "A Spatial Model to

Determine the Economic Availability of Woody Biomass in Colorado." Expert witness analyses and testimony for natural resources damages due to wildfires. Also review the webpage for details on workshops taught and other projects completed (http://www.eriaconsultants.com)

2015 – Current **Climate Change Researcher at Colorado State University, Fort Collins, Colorado.**
Computing Global Greenhouse Gas emission contributions via organic matter decomposition (OMD) modeling. The inputs into the OMD model are Potential Evapotranspiration (PET), monthly temperature, monthly precipitation. The latter two are computed using the DayCent Model http://www.nrel.colostate.edu/projects/daycent/ . Results were computed for the entire globe on an annual basis from 1983 – 2011.

2010 – Current **Adjunct Instructor at Colorado State University, Fort Collins, Colorado**
Teaching courses to undergraduates and graduates students in GIS and Remote Sensing. Courses include: **Geographic Information Systems and Remote Sensing Seminar (**NR493**), Geographic Information System, Applied Natural Resource Management** (NR 422), **Natural Resource Sampling** (NR 421), **Forest Biometrics** (F321), **Remote Sensing** (NR323), **Spatial Statistical Modeling of Natural Resources** (NR512) and **Inventory and Monitoring of Natural Resources** (NR566).

2002 - 2005 **GIS Specialist/Ecologist • NatureServe • Boulder. Colorado**
Corporate charter is to conduct spatial analysis in order to preserve Biodiversity over the natural landscape. Responsible for the assessment and classification of wide ranging critical or sensitive terrestrial, freshwater, and marine habitats in the western United States, Canada, South America, and the Caribbean using the following: Geographic Information System (GIS), Remote Sensing (RS) techniques, and mathematical modeling algorithms. Responsible for coordinating vegetation classification, sample design, terrestrial and aquatic landscape evaluation. Developed a series of spatial models (i.e. flow accumulation, optimization selection criteria for reserve design using simulated Annealing, and Geodatabase development).

1998 to 2002 **Lead Environmental Engineer • California Department of Conservation • Abandoned Mine Lands Unit • Sacramento, California**
Tasked with designing, constructing, implementing, and maintaining a relational database and a GIS of abandoned mines for the State of California. Co-authoring a Strategic Plan for managing Mercury in the Sacramento River Watershed. Responsible for GPS location of mine sites, collecting field data, and conducting spatial analysis using ancillary data sets. Additional duties include locating and collecting data for "Point Source" and "Non-Point Source" occurrences of heavy metals in stream river sediments and wetlands.

1993 to 1998 **Data Scientist • California Department of Fish and Game • Natural Heritage Division • Sacramento, California**
Conducted spatial analysis on threaten and endanger plants and animals. Also responsible for the construction of field sampling design and implementation and

accuracy assessment of the wetlands and vernal pools spatial data in the Sacramento Valley, San Joaquin Valley, and San Francisco Bay Area.

Technical Computer

Python (ver 2.7.10)
numpy, scipy, and arcpy
Geospatial (ArcGIS ver 10.5, QGIS 2.4.0)
Image Processing (ERDAS 2016)
Statistics (R ver 3.2.0)
Univariate (regression), multivariate (MANOVA), nonparametric (CART), Random Forest, spatial (Kriging, IDW, GWR) and temporal (GLS)
Lunix (Ubuntu 16.02)
Database
MySQL, MS Access, SQL Server

Certifications

Geographic Information Systems Professional (**GISP**) (Certification #: 59559)
Certified Forester (**CF**) license number 4050 (Society of American Foresters)
Certified Mapping Scientist - Remote Sensing (CMS) license number RS196 (American Society for Photogrammetry and Remote Sensing (**ASPRS**)
Certified Senior Ecologist (CSE) (Ecological Society of America)

Affiliations

- American Society for Photogrammetry and Remote Sensing (**ASPRS**) Rocky Mountain Region (RMR). I serve as the as the 2014 and 2015 President of the ASPRS RMR and as the Vice-President for 2016.
- The Society for Conservation GIS (**SCGIS**)
- Ecological Society of America (**ESA**)
- International Association of Wildland Fire (**IAWF**)
- Professional Membership Forest Guild
- Society of American Foresters (**SAF**)

Publications

In Review

Tuffly, M.F. 2016. Creating a Burn Severity Map Using Classification and Regression Tree (CART)

Peered Reviewed

Lundquist , J. E., R. M. Reich, and M. Tuffly. 2012. Spatial dynamics of the invasive defoliator Amber-marked birch leaf miner (*Profesusa thomsoni*) across the Anchorage landscape. Journal of Economic Entomology 105: 1659 - 1667.

Downing , M.C., T. Jung, V. Thomas, M. Blaschke, M.F. Tuffly, R. Reich. 2010 Estiamting the Susceptilility to Phytopthora alni Globally Using Both Statistical Analysis and Expert Knowledge. In Advances in Threat Assessment and Their Application to Forest and Rangeland Management. General Technical Report. PNW-GTR-802. September 2010. https://www.fs.fed.us/pnw/pubs/gtr802/Vol2/pnw_gtr802vol2_downing.pdf

White Papers

1. Predicting vegetation type and fire hazard in the Smith River National Recreation area using a Geographic Information System. Remote Sensing and Ecosystem Management, Proceedings of the Fifth Forest Service Remote Sensing Applications. p 336.1997.(http://hdl.handle.net/2148/839).

2. Using a Geographic Information System, the Global Positioning System and a Relational Database for the Inventory of Abandoned Mines in California. July, 2000 Environmental Systems Research Institute (ESRI) Users Conference Proceedings.

3. California's Mining Legacy, Society of Ecological Restoration, Conference Paper. October 2000.

4. Impact from Historical Mining, Society for the Conservation of Geographic Information Systems, Conference Paper. July 2001.

5. Mercury in Stream Sediments in the Sierra Nevada, American Geophysical Union, Conference Poster. December 2001.

6. Managing Mercury in the Sacramento River Watershed, Delta Tributaries Mercury Council Strategic Planning Committee.

7. Upland and Wetland Ecological Systems in Colorado, Wyoming, South Dakota, Nebraska, and Kansas. Report and Map to the National Gap Analysis Program. Arlington, VA June 2003.

8. Biodiversity Values of Geographically Isolated Wetlands: An Analysis of 20 U.S. States, NatureServe, Arlington, VA. February 2005.

9. Generating Conservation Scenarios for Puerto Rico. July 2005 Environmental Systems Research Institute (ESRI) User Conference Proceedings.

10. Potential Introduction Establishment, and Susceptibility to Pine species in the Conterminous United States from Sirex Woodwasp - *Sirex noctilio* (2006) USFS Technical Paper http://www.fs.fed.us/foresthealth/technology/invasives_sirexnoctilio_riskmaps.shtml.

11. Potential Introduction, Establishment, and Susceptibility of Forest Tree species in the Conterminous United States from European spruce bark beetle - *Ips typographus* (2007) USFS Technical Paper : http://www.fs.fed.us/foresthealth/technology/invasives_ipstypographus_riskmaps.shtml

12. Introduction, Establishment, and Susceptibility of Alder species in the Conterminous United States from *Phytophthora alni*. (2008) USFS Technical Paper: http://www.fs.fed.us/foresthealth/technology/invasives_phytophthoraalni_riskmaps.shtml

13. URISA's GISCorps United Nations Institute for Training and Research Operational Satellite Applications Programme (UNOSAT). Myanmar (Burma) Project. 2008 http://www.giscorps.org/index.php?option=com_content&task=view&id=71&Itemid=63

14. Resources at Risk in the Conterminous United States from Goldspotted Oak Borer (*Agrilus coxalis* [Waterhouse]) (2011) USFS Technical Paper : http://www.fs.fed.us/foresthealth/technology/invasives_agriluscoxalis_riskmaps.shtml

15. Ph.D. Dissertation 2012. Using Cellular automata to predict the spread and intensity of the Amber-Marked Birch leaf miner infestation in Alaska. http://digitool.library.colostate.edu///exlibris/dtl/d3_1/apache_media/L2V4bGlicmlzL2R0bC9kM18xL2FwYWNoZV9tZWRpYS8xODY2MDg=.pdf