AARON E. MAXWELL, PhD, GISP

Assistant Professor of Geography
West Virginia University
Department of Geology and Geography
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Education

PhD Geology
West Virginia University (Morgantown, WV)
MS Geology
West Virginia University (Morgantown, WV)
BS Chemistry, BS Biology, **BS Environmental Science**, **Minor in Education**
Alderson-Broaddus College (Philippi, WV)

Professional Certifications

Geographic Information Systems Professional (**GISP**) certification from the GIS Certification Institute (GISCI)

Work Experience

Assistant Professor of Geography (August 2019 – Present)
West Virginia University (Morgantown, WV)

- Conduct remote sensing and geospatial modeling research
- Mentor graduate students
- Teach courses relating to geospatial science
- Create course content
- Pursued research funding
- Director of *West Virginia View* consortium
- Faculty Director of *West Virginia GIS Technical Center*

Teaching Assistant Professor of Geography (August 2016 – August 2019t)
West Virginia University (Morgantown, WV)

- Taught courses relating to geospatial science
- Advised undergraduates
- Created course content
- Pursued independent research

Adjunct Professor (Fall 2016)
Alderson Broaddus University (Philippi, WV)

Assistant Professor of Natural Science (August 2012 – May 2016)
Alderson Broaddus University (Philippi, WV)

- Taught undergraduate courses relating to GIS, geology, and physical science
- Mentored students for the completion of senior research projects
- Acted as academic advisor for undergraduate students
- Pursued research relating to remote sensing and GIS applications in environmental studies, resource management, and geomorphology
- Planned and conducted field trips, including a field experience in Yellowstone National Park and the Black Hills of South Dakota
- Acted as faculty leader for the 2015 Semester in Europe Program based in Salzburg, Austria
- Operated undergraduate research lab (*Alderson Broaddus Geospatial Laboratory* (*ABGSL*))

Adjunct Professor in Department of Geology and Geography (January 2016 – August 2016)
West Virginia University (Morgantown, WV)

- Maintain research involvement at WVU while working at Alderson Broaddus University

Visiting Scientist (Summer 2013/Summer 2014)
Natural Resource Analysis Center (NRAC) at West Virginia University (WVU) (Morgantown, WV)

Remote Sensing Analyst (June 2010 – August 2012)
Natural Resource Analysis Center (NRAC) at West Virginia University (WVU) (Morgantown, WV)

WVU Geology Teaching Assistant (August 2008 – June 2010)
West Virginia University Department of Geology and Geography (Morgantown, WV)

Teaching Experience

West Virginia University

Geography 149/150: Digital Earth and Digital Earth Lab
Geography 350/550: Introduction to GIScience (Traditional and Online)
Geography 455/655: Introduction to Remote Sensing/Remote Sensing Principles
Geography 456: Remote Sensing Applications
Geography 457/657: Open-Source Spatial Analytics
Geography 461/661: Web GIS
Geography 462: Digital Cartography
Geography 520: Methods in Open Science (Traditional and Online)

Alderson Broaddus University

Astronomy 190: Introduction to Astronomy
Biology 110: Introduction to Biology
Biology 380: Aquatic Entomology
Chemistry 303: Environmental and Toxicological Chemistry
Environmental Science 325: Sedimentation and Erosion
Environmental Science 335: Watershed Hydrology
Environmental Science 356: Introduction to GIS
Environmental Science 390: Field Ecology and Geology Experience in Yellowstone National Park
Environmental Science 465: Advanced GIS
Geology 190: Introduction to Geology
Geology 350: Hydrogeology
International Studies 390.01: The Physical Landscape of Europe
International Studies 390.02: Contemporary European Environmental Issues
Natural Science 185: General Science/Science and Society
Natural Science 190: Rocks, Stars, and Weather
Natural Science 210: Physical Geography (Online)
Natural Science 361: Research Methods I
Natural Science 462: Scientific Communication

First-Author Peer Reviewed Publications

*Indicates students

1. Maxwell, A.E., and C.M. Shobe, 2022. Land-surface parameters for spatial predictive mapping and modeling, *Earth-Science Reviews*, 226: 103944. https://doi.org/10.1016/j.earscirev.2022.103944.
2. Maxwell, A.E., M. Sharma, and K.A. Donaldson, 2021. Explainable boosting machines for slope failure spatial predictive modeling, *Remote Sensing*, 13(24): 4991. https://doi.org/10.3390/rs13244991.
3. Maxwell, A.E., T.A. Warner, and L.A. Guillen, 2021. Accuracy assessment in convolutional neural network-based deep learning remote sensing studies – Part 2: Recommendations and best practices, *Remote Sensing*, 13(13): 2591. https://doi.org/10.3390/rs13132591.
4. Maxwell, A.E., T.A. Warner, and L.A. Guillen, 2021. Accuracy assessment in convolutional neural network-based deep learning remote sensing studies – Part 1: Literature review, *Remote Sensing* 13(13): 2450. https://doi.org/10.3390/rs13132450.
5. Maxwell, A.E., M. Sharma, J.S. Kite, K.A. Donaldson, S.M. Maynard*, and C.M. Malay*, 2021. Assessing the generalization of machine learning-based slope failure prediction to new geographic extents, *ISPRS International Journal of Geo-Information*, 10(5): 293. https://doi.org/10.3390/ijgi10050293.
6. Maxwell, A.E., M.S. Bester*, L.A. Guillen*, C.A. Ramezan, D.J. Carpinello*, Y. Fan*, F.M. Hartley*, S.M. Maynard*, and J.L. Pyron*, 2020. Semantic segmentation deep learning

for extracting surface mine extents from historic topographic maps, *Remote Sensing*, 12(24): 4145. https://doi.org/10.3390/rs12244145.

7. Maxwell, A.E., and T.A. Warner, 2020. Thematic classification accuracy assessment with inherently uncertain boundaries: an argument for center-weighted accuracy assessment metrics, *Remote Sensing*, 12(12): 1905. https://doi.org/10.3390/rs12121905.
8. Maxwell, A.E., P. Pourmohammadi, and J. Poyner*, 2020. Mapping the topographic features of mining-related valley fills using mask R-CNN deep learning and digital elevation data, *Remote Sensing*, 12(3): 547. https://doi.org/10.3390/rs12030547.
9. Maxwell, A.E., M. Sharma, J.S. Kite, K.A. Donaldson, J.A. Thompson, M.L. Bell*, and S.M. Maynard*, 2020. Slope failure prediction using random forest machine learning and LiDAR in an eroded folded mountain belt, *Remote Sensing*, 12(3): 486. https://doi.org/10.3390/rs12030486.
10. Maxwell, A.E., M.P. Strager, T.A. Warner, C.A. Ramezan, A.N. Morgan*, and C.E. Pauley*, 2019. Large-area, high spatial resolution land cover mapping using random forests, GEOBIA, and NAIP orthophotography: findings and recommendations, *Remote Sensing*, 11(12): 1409. https://doi.org/10.3390/rs11121409.
11. Maxwell, A.E., and T.A. Warner, 2019. Is high spatial resolution DEM data necessary for mapping palustrine wetlands?, *International Journal of Remote Sensing*, 40(1): 118-137. https://doi.org/10.1080/01431161.2018.1506184.
12. Maxwell, A.E., T.A. Warner, and F. Fang*, 2018. Implementation of machine learning classification in remote sensing: an applied review, *International Journal of Remote Sensing*, 39(9): 2784-2817. https://doi.org/10.1080/ 01431161.2018. 1433343.
13. Maxwell, A.E., T.A. Warner, B.C. Vanderbilt, and C.A. Ramezan*, 2017. Land cover classification and feature extraction from National Agriculture Imagery Program (NAIP) orthoimagery: A Review, *Photogrammetric Engineering & Remote Sensing*, 83(11): 737-747. https://doi.org/10.14358/PERS.83.10.737.
14. Maxwell, A.E., T.A. Warner, and M.P. Strager, 2016. Predicting palustrine wetland probability using random forest machine learning and digital elevation data-derived terrain variables, *Photogrammetric Engineering & Remote Sensing*, 82(6): 437-447. https://doi.org/10.1016/S0099-1112(16)82038-8.
15. Maxwell, A.E., and T.A. Warner, 2015. Differentiating mine-reclaimed grasslands from spectrally similar land cover using terrain variables and object-based machine learning classification, *International Journal of Remote Sensing*, 36(17): 4384-4410. https://doi.org/10.1080/01431161.2015.1083632.
16. Maxwell, A.E., T.A. Warner, M.P. Strager, J.F. Conley, and A.L. Sharp*, 2015. Assessing machine learning algorithms and image- and LiDAR-derived variables for GEOBIA classification of mining and mine reclamation, *International Journal of Remote Sensing*, 36(4): 954-978. https://doi.org/10.1080/01431161. 2014.1001086.
17. Maxwell, A.E., M.P. Strager, T.A. Warner, N.P. Zégre, and C.B. Yuill, 2014. Comparison of NAIP orthophotography and RapidEye satellite imagery for mapping of mining and mine reclamation, *GIScience & Remote Sensing*, 51(3): 301-320. https://doi.org/10.1080/15481603.2014.912874.

18. Maxwell, A.E., T.A. Warner, M.P. Strager, and M. Pal, 2014. Combining RapidEye satellite imagery and LiDAR for mapping of mining and mine reclamation, *Photogrammetric Engineering & Remote Sensing*, 80(2): 179-189. https://doi.org/10.14358/PERS.80.2.179-189.
19. Maxwell, A.E., and M.P. Strager, 2013. Assessing landform alterations induced by mountaintop mining, *Natural Science*, 5(2A): 52A034. 10.4236/ns.2013.52A034.
20. Maxwell, A.E., M.P. Strager, C.B. Yuill, and J.T. Petty, 2012. Modeling critical forest habitat in the Southern Coal Fields of West Virginia, *International Journal of Ecology*, Volume 2012, Article ID 182683, 10 pages.

Peer Reviewed Publications from Lab Group
*Indicates students

1. Hartley, F.M.*, A.E. Maxwell, R.E. Landenberger, and Z.J. Bortolot, 2022. Forest type differentiation using GLAD phenology metrics, terrain variables, and machine learning, *Geographies*, (accepted).

Other Peer Reviewed Publications
*Indicates students

1. Warner, T.A. T.A. Miller, I.P. La Puma, L.A. Nolan, N.S. Skowronski, and A.E. Maxwell, 2022. Exploring golden eagle habitat preference using lidar-based canopy bulk density, *Remote Sensing Letters*, 13(6): 556-567. https://doi.org/10.1080/2150704X.2022.2055985.
2. Gallagher, M.R., A.E. Maxwell, L.A. Guillen, A. Everland, E.L. Loudermilk, and N.S. Skowronski, 2021. Estimation of plot-level burn severity using terrestrial laser scanning, *Remote Sensing*, 13(20): 4168. https://doi.org/10.3390/rs13204168.
3. Cribari, V.*, M.P. Strager, A.E. Maxwell, and C. Yuill, 2021. Landscape changes in the southern coalfields of West Virginia: Multi-level intensity analysis and surface mining transitions in the headwaters of the Coal River from 1976 to 2016, *Land*, 10(7): 748. https://doi.org/10.3390/land10070748.
4. Higgins, A.K.* and A.E. Maxwell, 2021. Universal design for learning in the geosciences for access and equity in our classrooms, *The Journal of Applied Instructional Design*, 10(1).
5. Ramezan, C.A., T.A. Warner, A.E. Maxwell, and B.S. Price, 2021. Effects of training set size on supervised machine-learning land-cover classification of large-area high-resolution remotely sensed data, *Remote Sensing*, 13(3): 368. https://doi.org/10.3390/rs13030368.
6. Fang, F.*, B.E. McNeil, T.A. Warner, A.E. Maxwell, G.A. Dahle, E. Eutsler, and J. Li, 2020. Discriminating tree species at different taxonomic levels using multi-temporal WorldView-3 imagery in Washington D.C., USA, *Remote Sensing of Environment*, 246: 111811. https://doi.org/10.1016/j.rse.2020.111811.
7. Ramezan, C.A.*, T.A. Warner, and A.E. Maxwell, 2019. Evaluation of sampling and cross-validation tuning strategies for regional-scale machine learning classification, *Remote Sensing*, 11(2): 185. https://doi.org/10.3390/ rs11020185.

8. Fang, F.*, McNeil, B.E., Warner, T.A., and A.E. Maxwell, 2018. Combining high spatial resolution multi-temporal satellite data with leaf-on LiDAR to enhance tree species discrimination at the crown-level, *International Journal of Remote Sensing*, 39(23): 9054-9072. https://doi.org/10.1080/01431161.2018.1504343.
9. Liebermann, H.*, J. Schuler, M.P. Strager, and A. Maxwell, 2018. A work flow and evaluation of using unmanned aerial systems for deriving forest stand characteristics in mixed hardwoods of West Virginia, *Geospatial Applications in Natural Resources*, 2(1): 23-53.
10. Strager, M.S., M. Thomas-Van Gundy, A.E. Maxwell, 2016. Predicting post-fire change in the Central Appalachians from remotely-sensed data, *Geospatial Applications in Natural Resources*, 1(2): 1-17.
11. Merriam, E.R.*, J.T. Petty, M.P. Strager, A.E. Maxwell, and P.F. Ziemkiewicz, 2015. Complex contaminant mixtures in multi-stressor Appalachian riverscapes, *Environmental Toxicology and Chemistry*, 34(11): 2603-2610.
12. Merriam, E.R.*, J.T. Petty, M.P. Strager, A.E. Maxwell, and P.F. Ziemkiewicz, 2015. Landscape-based cumulative effects models for predicting stream response to mountaintop mining in multi-stressor Appalachian watersheds, *Freshwater Science*, 34(3): 1006-1019.
13. Strager, M.P., J.M. Strager, J.S. Evans, J.K. Dunscomb, B.J. Kreps, and A.E. Maxwell, 2015. Combining a spatial model and demand forecasts to map future surface coal mining in Appalachia, *PLoS ONE*, 10(6): e0128813. 10.1371/journal.pone.0128813.
14. Zégre, N., A. Miller*, A. Maxwell, and S. Lamont, 2014. Multi-scale analysis of hydrology in a mountaintop mine-impacted watershed, *Journal of the American Water Resources Association*, doi: 10.1111/jawr.12184.
15. Merriam, E.R.*, J.T. Petty, M.P. Strager, A.E. Maxwell, and P.F. Ziemkiewicz, 2013. Scenario analysis predicts context-dependent stream response to landuse change in a heavily mined central Appalachian watershed, *Freshwater Science*, 32(4): 1246-1259.
16. Pal, M., A.E. Maxwell, and T.A. Warner, 2013. Kernel-based extreme learning machine for remote-sensing image classification, *Remote Sensing Letters*, 4(9): 853-862. https://doi.org/10.1080/2150704X.2013.805279.
17. Zégre, N., A. Maxwell, and S. Lamont, 2013. Characterizing streamflow response of a mountaintop-mined watershed to changing land use, *Applied Geography*, 39: 5-15.

Conference Oral Presentations/Paper in Proceedings

1. Maxwell, A.E. LiDAR Workshop. *WV GIS Conference*. May 26, 2022.
2. Maxwell, A.E. Introducing WVU's New Online MS in GIS and Spatial Analysis. *WV GIS Conference*. May 25, 2022.
3. Maxwell, A.E. Best practices for accuracy assessment of thematic products generated using CNN-based deep learning. *ASPRS 2022 Virtual Conference*. March 21-25, 2022.
4. Maxwell, A.E. Teaching coding to geospatial students. *ASPRS 2022 Virtual Conference*. March 21-25, 2022.
5. Maxwell, A.E. Transition to ArcGIS Pro Workshop. *WV GIS Conference*. June 29, 2021.

6. Maxwell, A.E., and F.M. Hartley. West Virginia View Free Educational Resources. *WV GIS Conference*. June 29, 2021.
7. Maxwell, A.E., Donaldson, K.A., and M. Sharma. Slope failure occurrence probabilistic model for West Virginia using machine learning and LiDAR. *WV GIS Conference*. June 29, 2021.
8. Maxwell, A.E., 2021. Machine learning and deep learning applied to digital terrain data: opportunities and challenges, *ASPRS 2021 Annual Conference*. March 29-April 2.
9. Maxwell, A.E., 2021. AmericaView and education: empowering remote sensing education, *ASPRS 2021 Annual Conference*. March 29-April 2.
10. Maxwell, A.E., 2019. West Virginia Statewide Land Cover Classification from NAIP Orthophotography: Findings and Recommendations, PECORA 21, 6 October – 11 October, Baltimore, Maryland.
11. Maxwell, A.E., 2018. Producing an ArcGIS Pro Lab Manual for Undergraduates: Lessons, Learned, ESRI 2018 Education Summit, 7 July – 10 July, San Diego California
12. Maxwell, A.E., 2018. Using the Free and Open-Source Software R as a GIS, 2018 WV GIS Conference, 11 June – 14 June, Charleston, West Virginia.
13. Maxwell, A.E., and T.A. Warner, 2017. NAIP Orthophotography for Land Cover Mapping Tasks: A Review with Recommendations, PECORA 20, 14 Nov. – 16 Nov., Sioux Falls, South Dakota.
14. Maxwell, A.E., 2016. Teaching, hands-on learning, and research: why make distinctions?, *2016 Appalachian College Association Annual Summit*, 29 Sept. – 1 Oct., Kingsport, Tennessee.
15. Maxwell, A.E., T.A. Warner, and M.P. Strager, 2016. Predicting palustrine wetland probability using random forest machine learning and digital elevation data-derived terrain variables, *2016 West Virginia GIS Conference*, 3-6 May, Morgantown, West Virginia.
16. Maxwell, A.E., 2016. Water scarcity: A discussion of California's water issues and what we can learn from them, *Dr. Unger Lecture Series (Alderson Broaddus University)*, 1 April, Philippi, WV.
17. PhD Dissertation: Remote Sensing for Monitoring the Mountaintop Mining Landscape: Applications for Land Cover Mapping at the Individual Mine Complex Scale (August 2012 – August 2015)
18. Maxwell, A.E., 2014. The Anthropocene: Is man writing the current chapter of geologic time?. *Dr. Unger Lecture Series (Alderson Broaddus University)*, 26 September, Philippi, WV. (As Presenter)
19. Maxwell, A., M. Strager, T. Warner, C. Yuill, and N. Zégre, 2014. Mapping of mining and mine reclamation: A comparison of NAIP orthophotography and RapidEye satellite imagery, *ASPRS 2014 Annual Conference*, 23-28 March, Louisville, KY.
20. Maxwell, A.E., 2013. Imagery as a scientific tool. *Dr. Unger Lecture Series (Alderson Broaddus University)*, 27 September, Philippi, WV.
21. Maxwell, A.E., 2014. Researchers develop an effective approach to forest cover analysis, *The Forestry Source*, 19(2): 13. (Reprint of previous trade publication)

22. Strager, M.P., A.E. Maxwell, J.T. Petty, and P. Ziemkiewicz, 2013. A value of information study examining the effectiveness of spatial datasets for modeling landscape to water quality relationships, *Symposium: Environmental Considerations in Energy Production*, 14-18 April, Charleston, WV.
23. Maxwell, A.E., 2012. Researchers develop an effective approach to forest cover analysis, *ESRI News for Forestry*, 2013(Spring): 6-7. (Trade Publication)
24. Maxwell, A.E., M. Strager, C. Yuill, E. Austin, and W. Kordek. Creation of a high resolution land cover and forest cover for West Virginia relative to 2011 NAIP orthophotography, *2012 West Virginia GIS Conference*, 8-11 May, Morgantown, West Virginia.
25. Maxwell, A.E., E. Austin*, M. Strager, C. Yuill, and A. Riley. Landform alterations induced by mountaintop mining: A case study in the Coal River Watershed, *2012 West Virginia GIS Conference*, 8-11 May, Morgantown, West Virginia.
26. Maxwell, A.E., A. Riley, and P. Kinder, 2012. Comparison of LiDAR-derived data and high resolution true color imagery for extraction urban forest cover, *18th Central Hardwood Forest Conference*, 26-28 March, Morgantown, West Virginia.
27. Maxwell, A.E., M.P. Strager, C. Yuill, J.T. Petty, E. Merriam*, and C. Mazzarella, 2011. Disturbance mapping and landscape modeling of mountaintop mining using ArcGIS, *Proceedings of the International ESRI User Conference Proceedings*, 11-15 July, San Diego, California (Environmental Systems Research Institute, Redlands, California), unpaginated CD-ROM.
28. Maxwell, A.E., and J.S. Kite., 2010. Analysis of LiDAR Point Data and Derived Elevation Models for Mapping and Characterizing Bouldery and Blocky
29. Landforms in the Forested Allegheny Mountains of West Virginia, *2010 GSA Denver Annual Meeting*, 31 October – 3 November, Denver, Colorado, GSA Abstracts Vol. 42, No. 5.
30. MS Thesis: Analysis of LiDAR Point Data and Derived Elevation Models for Mapping and Characterizing Bouldery Landforms (December 2008 – June 2010)

Conference Posters

1. "Forest Type Mapping in the Monongahela National Forest" presented at the *2016 West Virginia GIS Conference*.
2. "High Spatial Resolution Land Cover Classification in Preston County, WV Using GEOBIA, Machine Learning, NAIP Orthophotography, LiDAR, and Ancillary GIS Data" presented at the *2016 West Virginia GIS Conference*.
3. "Enhanced Wetland Detection using Feature Extraction, Topographic Derivatives, and Maxent Probabilistic Modeling" presented at the *Society for Ecological Restoration (SER) Mid-Atlantic Annual Conference 2011*.

Grants and Awards Received

Title	Funder	PI	Period	Amount
NSF Convergence Accelerator – Track D: Artificial Intelligence and Community Driven Wildland Fire Innovation via a WIFIRE Commons Infrastructure for Data and Model Sharing	NSF	Ilkay Altintas	Sept. 2021 to Sept. 2023	$228,652
CAREER: Mapping Anthropocene Geomorphology with Deep Learning, Big Data Spatial Analytics, and LiDAR	NSF/EPSCoR	Maxwell	Sept. 2021 to Sept. 2026	$636,785
Cooperative Agreement: Using 3D Terrestrial Laser Scanning Data and Machine Learning to Estimate Forest Fire Fuel Loads.	USDA Forest Service	Maxwell	Sept. 2020 to Sept. 2022	$64,000
StateView Program Development and Operations for the State of West Virginia	USGS/ AmericaView	Maxwell	Sept. 2018 to Sept. 2023	$117,500

Professional Skills

- Data analysis and spatial analytics using R and Python
- Spatial analysis using ArcGIS Desktop, ArcGIS Pro, QGIS, R, and Python
- Digital cartographic design using ArcGIS Desktop, ArcGIS Pro, Adobe Photoshop, and Adobe Illustrator
- Remote sensing analysis and image classification using Erdas Imagine, ArcGIS Desktop, ArcGIS Pro, and R
- Object-based image analysis using eCognition
- Spatial predictive modeling with machine learning and deep learning using Python, R, and PyTorch
- Client-side web map development using ArcGIS Online, HTML, CSS, Bootstrap, and JavaScript
- Processing and analysis of multispectral imagery and LiDAR data

Professional Affiliations

- American Society of Photogrammetry and Remote Sensing (ASPRS)
- West Virginia Association of Geospatial Professionals (WVAGP)