MAGGIE R. DAVIS

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I am a natural resource data scientist with 11 years of experience applicable to the R&D, monitoring, and adaptive management of forested and agricultural lands. I'm passionate about leveraging data to further the integrity and impact of forest-based industries in the circular economy. I focus on research that will:

> • increase opportunities for bio-based products with standardized tools and monitoring procedures to ensure sustainable management practices are transparent to stakeholders;
>
> • improve the economic viability of sustainable natural resource industries through data, standards, and certification of nature-based solutions.

PROFESSIONAL POSITIONS:

Oak Ridge National Laboratory, TN, USA   **2011-present (Full time):**

R&D Scientist (GS13 comp.), Mobility and Energy Transitions Analysis Group, Bioenergy Resources & Engineering Systems, Data Science & Integration   **Feb 2023 – present**
Researching interdisciplinary decarbonization strategies using decision-science; leading R&D research on biomass availability for low-carbon strategies to meet US energy needs

- Lead: modeling and tool development to inform deployment of bioenergy crops for specific regions with known nature-based solutions (NbS) markets that can enable cost competitiveness, *and* benefit marginalized communities. Task will collaborate with industry establishing NbS markets.
- Lead: forest-based biomass, DOE's next "Billion Ton" report
- Contributor: Biomass in a Circular Economy, International Standards Organization
- Management: Atmospheric Radiation Measurement metadata team
- Leadership: Climate Change Science Institute, decarbonization in the Southeast through NbS

R&D Scientist (GS13 comp.), Data Science & Integration: Atmospheric Radiation Measurement (ARM), Bioenergy Resources & Engineering Systems   **2021 –2023**
Leading data management at ARM, a DOE National User Facility, and leading R&D research on biomass availability for low-carbon strategies to meet US energy needs [3 Publications, 1 dataset to date]

- Lead author for forest-based biomass, DOE's next "Billion Ton" report (in development): modeling synthesis facilitates understanding of private industry interests and biomass market impact
- Drafting Team WG3, TC323- Circular Economy: International Standards Organization: strengthens connections with private industry interested in measuring circularity and trade of products and services
- Coordinated data contributions from international field researchers for ARM's Data Center (ADC); incorporating standardized data management concepts (e.g., DublinCore) and pushing towards cutting edge technologies such as machine learning and graph database structures to support FAIR principles
- Modernized biomass resource assessment POLYSYS partial equilibrium model for high performance computing and moved manual analysis of data to automated Python workbooks, improving efficiency
- Managing a team of 3 responsible for all metadata for ARM data: >2 PB spanning 30 years: Applied knowledge of statistics, mathematics, data modeling and high performance data architectures, and advanced computing to integrate and prepare data
- Chairing Bioenergy, Climate Change & Carbon (E3 WG), Society of American Foresters| Washington, DC: increases cross-organization and interdisciplinary collaborations on forest carbon and bioenergy topics
- Chairing the Women in Science and Engineering (WiSE) ERG for 650 women and allies

R&D Associate Scientist (GS12 comp.), ARM & Bioenergy Resources & Engineering Systems   **2016 – 2021**
Modernized ARM metadata management, led resource modeling and modernization of models on HPC, standards development and bioenergy sustainability assessments [10 Publications, 8 datasets]

- Lead modeling for ecosystem service valuation impact on feedstock markets: facilitates better data on the impact of valorizing water quality ES
- Billion Ton 2016: Volume 1 Lead author and lead energy crop and agricultural residues modeler (POLYSYS); Volume 2 author for Land Management (Ch 3) evaluating the impacts of biomass production
- Developed a trade module in POLYSYS, and improved data on impacts of bioenergy on commodity prices
- Developed International standards: ASTM E3066, 2017: Standard Practice for Evaluating Relative Sustainability Involving Energy or Chemicals from Biomass
- Modernized the main portal to ARM data, data discovery, including data epochs and recommendations
- Implemented automation and auditing for ARM metadata management, securing ADC expanded scope
- Sustainability website creator: Primary content developer, manager of UX design and implementation
- Lead for Data Management Planning for entire BioEnergy Technologies Office (BETO) portfolio
- Research Theme lead, Bioenergy, Climate Change & Carbon (E3) Working Group, Society of American Foresters| Washington, DC, US, 2020-2021. Chair the special session, Data for bioproduct assessments in November of 2021
- Lead author on Regulation of Genetically Modified Trees, Utilization of Woody Biomass for Energy, Committee on Forest Policy, Society of American Foresters
- Global Bioenergy Partnership participant:
- Award (Distinguished Achievement): Science Serving Society, Awarded May 2017
- Award (Service): Atmospheric Radiation Measurement (ARM): Awarded June 2021, Awarded June 2020

R&D Assistant Scientist (GS 11 comp.), Resource modeling, International trade of bioproducts 2014-2016
Supported 2 projects for assessments of sustainability and lead modeler on dedicated energy crops for BT16
- Demonstrated leadership and technical breadth as part of a small team leading modeling, visualizations, and stakeholder engagement to prepare content for the Billion Ton report, 2016.
- Secretariat (Working Group on Indirect Effects, ISO13065- Sustainability of Bioenergy): International Standards Organization | Geneva, CH; 2012-01-01 to 2015-09-30: Addressed key barriers, e.g., related to sustainability assessment methods, food security, land-use change (LUC), reference case and carbon measurement; Led final report, annotated bibliography, and 20 international webinars
- Contributed expertise in sustainability indicators to working group, ISO (The International Organization for Standardization). 2015. *13065:2015 - Sustainability criteria for bioenergy*. Paris, France: ISO.
- Lead investigator for report, "Bioenergy trade and Domestic Biomass Resource Implications"
- Contributing investigator for report, "Brief Perspectives on Expanding Advanced Energy Sources in Brazil: Part 1: Biofuels and Bioenergy" 2015. Office of intelligence and counterintelligence.
- Contributor to Brazil Bio-Energy, Science and Technology Conference - Communications, awareness, joint presentations on sustainability, food security, carbon accounting

Postmasters Research Associate (GS10 comp.)   2011–2014
Supported 2 projects for sustainability assessments of biomass for bioenergy, collaborating with Brazilian researchers on land use change assessments, bioenergy sustainability [3 Publications]
- Led 30 international webinars as Secretariat (Working Group on Indirect Effects, ISO13065- Sustainability of Bioenergy): International Standards Organization | Geneva, CH;
- US delegate to ISO13065: Working Group on Indicators of bioenergy sustainability
- International collaborations with Brazil researchers resulted in report: Comparison of Regions and Modeling of Land in the GTAP-DEPS and BLUM. Oladosu, G., M.M.R. Moreira, K. Kline, M. Davis, W. Kmura, 2014.

Research Specialist III (GS9 comp.): Institute for a Secure & Sustainable Environment,   2006-2010
The University of Tennessee, Knoxville TN, USA
Throughout my master's education, I supported 2 projects to develop science teacher training programs [1 Pub]

- Created ORNL STEM teacher training workshops, led reports to funders and tours at ORNL
- Environmental education program created for Tennessee Valley Authority and delivered to Alcoa school

EDUCATION:
- **Data Science/Informatics** **(ongoing)**
  - Python, Tableau, SQL, Remote Sensing
  - Continuing Forestry Education (CFE) SAF: Enhancing the precision of broad-scale forest growing stock and stock change estimates with small area estimation (2021); Data Science for Forestry (2018)
  - University of Tennessee Agricultural Economics, 2018: International and regional trade of bioproducts
  - Disciplined Agile Scrum Master training, Project Management Institute
- **M.S., Forestry Wildlife and Fisheries Sciences, University of Tennessee, TN, USA** **2011**
  - International research: Brazilian Eucalyptus, Minas Gerais Brazil (Jan-Nov, 2010)
- **B.A., Economics and Geography, University of Tennessee, TN, USA** **2007**

LANGUAGES:
Portuguese (Level 3 ILR), Spanish (Level 2 ILR)

RESEARCH SKILLS:
- Bioenergy with carbon capture and storage (BECCS) & Short Rotation Woody Crops (SRWCs)
- Biomass standards & certification development
- Natural resource economics, carbon valuation, soil organic carbon (SOC) sequestration
- Data science, data archival standards & visualization,
- Python, Fortran, High Performance Computing (Linux), Git, SQL, Tableau, Power BI
- GIS/remote sensing,
- POLYSYS, SRTS

REFEREED PUBLICATIONS:
[https://tinyurl.com/yyfco6eg]:

1. T. Hossain, D.S. Jones, D. Hartley, M. Griffel, Y. Lin, P. Burli, D. Thompson, M Langholtz, M. Davis, C. Brandt. (2021). Locating nth-plants for biomass conversion and preprocessing nationwide: biorefineries and depots. Applied Energy. https://doi.org/10.1016/j.apenergy.2021.116946
2. Esther Parish, Virginia Dale, Maggie Davis, Rebecca Efroymson, Michael Hilliard, Henriette Jager, Keith Kline, Fei Xie. 2020. An Indicator-based Approach to Sustainable Management of Natural Resources. Chapter 14 of Data Science Applied to Sustainability Analysis. ISBN: 9780128179765. Published: 1st May 2021
3. Guntapally, K. K. Dumas, G. Prakash, R. Devarakonda, W. Darnell, M. Davis, R. Cederwall, 2021. Enabling modern data discovery for atmospheric measurements. Earth Science Informatics. https://doi.org/10.1007/s12145-021-00635-0
4. Davis M., D. Kainer, G. Tuskan, M. Langholtz, C. Hellwinckel, M. Shedden, L. Eaton, 2020. Modeled economic potential for Eucalyptus spp. production for jet fuel additives in the United States, Journal Biomass and Bioenergy, 143. https://doi.org/10.1016/j.biombioe.2020.105807
5. M. Langholtz, B. H. Davison, H. I. Jager, L. Eaton, L. M. Baskaran, M. Davis, Craig C. Brandt, 2020. Increased nitrogen use efficiency in crop production can provide economic and environmental benefits, Science of The Total Environment, 2020, 143602, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.143602.
6. Langholtz M., I. Busch, A. Kasturi, M. Hilliard, J. McFarlane, C. Tsouris, S. Mukherjee, O. Omitaomu, S. Kotikot, M. Ree Allen, C. DeRolph, M.R. Davis, E.S. Parish, 2020. The economic accessibility of CO_2 sequestration through bioenergy with carbon capture and sequestration (BECCS) in the US. Land 2020, 9(9), 299; https://doi.org/10.3390/land9090299.
7. Langholtz, M., Eaton, L., Davis, M., ...Brandt, C., Hilliard, M. (2019), Cost and profit impacts of modifying stover harvest operations to improve feedstock quality. Biofuels, Bioproducts and biorefining, 2019, 13(4), pp. 1098-1105
8. Langholtz, M., Eaton, L., Davis, M., ... Volk, T., Richard, T. (2019). Economic comparative advantage of willow biomass in the Northeast USA. Biofuels, Bioproducts and Biorefining, 2019, 13(1), pp. 74-85

9. Davis, M.R.; Alves, B.J.R.; Karlen, D.L.; Kline, K.L.; Galdos, M.; Abulebdeh, D. Review of Soil Organic Carbon Measurement Protocols: A US and Brazil Comparison and Recommendation. Sustainability 2018, 10, 53.

10. Eaton L., M. Langholtz M. Davis, 2018. The impact of alternative land and yield assumptions in herbaceous biomass supply modeling: one-size-fits-all resource assessment? Journal of Biofuels, Bioproducts and Biorefining, 2018. Volume13, Issue1. P. 120-128. https://doi.org/10.1002/bbb.1946

11. Kline, K.L., M.R. Davis, J. Dunn, L. Eaton, R.A. Efroymson, 2017. Land, crops, and landmanagement: Understanding potential direct and indirect "land-use change" (LUC) under BT16 simulations. 2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy, Volume 2: Environmental Sustainability Effects of Select Scenarios from Volume 1. doi: 10.2172/1338837

12. Brandt C., M. Langholtz, M. Davis, Bryce Stokes, Chad Hellwinckel, Keith Kline, and Laurence Eaton, 2017. Chapter 2 – BT16 Feedstock Assessment Methods and Focal Scenarios U.S. Department of Energy. Appearing in Volume 2: Environmental Sustainability Effects of Select Scenarios from Volume 1 (2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy). doi 10.2172/1338837

13. Davis, M.R., L.M. Eaton, M.H. Langholtz, A. Turhollow, C. Brandt, and M.H. Hillard, 2016. Agricultural residues and biomass crops at the farmgate. U.S. Department of Energy. 2016. 2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy, Volume 1: Economic Availability of Feedstocks. doi: 10.2172/1271651.

14. Dale V.H., Efroymson R.A., Kline K.L., Langholtz M.H., Leiby P.N., Oladosu G.A., Davis M.R., Downing M.E., Hilliard M.R., 2013. Indicators for assessing socioeconomic sustainability of bioenergy systems: A short list of practical measures. Ecological Indicators 26: 87-102. http://dx.doi.org/10.1016/j.ecolind.2012.10.014

15. Oladosu G, Kline K, Leiby P, Uria-Martinez R, Davis M, Downing M and Eaton L. 2012. Global economic effects of US biofuel policy and the potential contribution from advanced biofuels. Future Science – Biofuels 3(6):703-723.

16. Peine, J., B. Jacobs, K. Franzreb, M. Stevens, 2011. Ecosystem Management - The Law and Politics of Sustainability, Berkshire Encyclopedia of Sustainability

17. Slayton, J.D., M.R. Stevens (Davis), H.D. Grissino-Mayer, and C.H. Faulkner, 2009. The Historical Dendroarchaeology of Two Log Structures At the Marble Springs Historic Site, Knox County, Tennessee, U.S.A Tree-Ring Research 65(1):23-36. 2009. doi: http://dx.doi.org/10.3959/2007-5.1

DATASETS

1. Davis, Maggie R. 2021. Integrated land management scenarios: regional demand of bioethanol for select counties (single refinery) and crops. https://doi.org/10.11578/1797943. Select visualizations available.

2. Davis, Maggie R., 2020. RegionalDemand-CornStover_INL_BT16BC1030-40-50 (data available 6/19/20) doi 10.11578/1633888

3. Davis, Maggie R., 2020. stovertillage2019-bc1040-060 (data available 6/9/20) doi 10.11578/1632327

4. Langholtz, Matthew; Busch, Ingrid; Kasturi, Abishek; Hilliard, Mike R.; McFarlane, Joanna; Tsouris, Costas; Mukherjee, Srijib; Omitaomu, Olufemi A.; Kotikot, Susan M.; Allen-Dumas, Melissa R.; DeRolph, Christopher R.; Davis, Maggie R; Paris, Esther S. Data and interactive visualization for "The economic accessibility of CO2 sequestration through bioenergy with carbon capture and sequestration (BECCS) in the US" submitted to the journal "Land", 2020 (data available 8/6/20) doi 10.11578/1647453

5. Davis, M. 2018. Dataset: NewBio_SwgMxgWillowOnly: Price Scenarios at $54 and $119 simulated for Switchgrass, Miscanthus and Willow production from 2017 to 2040. Feedstock Production, Supporting Data available on the BioKDF 01/01/2018. DOI 10.11578/1468424

6. Davis, MR. CH Hellwinkel, L. Eaton, MH Langholtz, A. Turhollow, C Brandt, A Myers, 2016. Agricultural Baseline (BL0) scenario of the 2016 Billion-Ton Report (data available 7/13/16) doi 10.11578/1337884

7. Davis, MR. CH Hellwinkel, L. Eaton, MH Langholtz, A. Turhollow, C Brandt, A Myers, 2016. Base-Case 1% Yield Increase (BC1), All Energy Crops scenario of the 2016 Billion Ton Report (data available 7/13/16) doi 10.11578/1340497

8. Davis, MR. CH Hellwinkel, L. Eaton, MH Langholtz, A. Turhollow, C Brandt, A Myers, 2016. 2% Yield Increase (HH2), All Energy Crops scenario of the 2016 Billion Ton Report (data available 7/13/16) doi 10.11578/1340541
9. Davis, MR. CH Hellwinkel, L. Eaton, MH Langholtz, A. Turhollow, C Brandt, A Myers, 2016. 3% Yield Increase (HH3), All Energy Crops scenario of the 2016 Billion Ton Report (data available 7/13/16) doi 10.11578/1340543
10. Davis, MR. CH Hellwinkel, L. Eaton, MH Langholtz, A. Turhollow, C Brandt, A Myers, 2016. 4% Yield Increase (HH4), All Energy Crops scenario of the 2016 Billion Ton Report (data available 7/13/16) doi 10.11578/1340546

SELECTED INVITED SYMPOSIA, PRESENTATIONS AND SEMINARS:
1. Invited speaker, V Workshop on Data Science of Escola Politécnica da Universidade de São Paulo - Challenges in Brazilian context to promote atmospheric data management, 2020
2. Davis, M., Langholtz, M., Kainer, D. The potential for eucalyptus spp. production in the U.S, sustainability considerations. AIChE Bioenergy Sustainability Conference 2019, pp. 13-14
3. Davis, M. 2016. Chapter 4 of the Billion Ton assessment as presented by the chapter's lead authors in Breakout Session 1-A: Assessing America's Biomass Potential (2016 Billion-Ton Report). Bioenergy 2016: Mobilizing the Bioeconomy through Innovation. Washington, D.C., July 2016.
4. Davis, M. 2014. Indirect effects of bioenergy: International standards and science. RCN Conference on Pan American Biofuels and Bioenergy Sustainability 2014, pp. 264-276