Nishan Bhattarai, Ph.D.

Research Associate, Hydrology and Remote Sensing Lab, USDA-ARS,
Beltsville, MD, Email: nbhattar@umich.edu/nishan.bhattarai@usda.gov/Website

ACADEMIC BACKGROUND

University of Michigan, **Ann Arbor, MI**
School for Environment and Sustainability
Research Fellow, Sep 2016 -Dec 2020

Tufts University, Medford, MA
Center for International Environment and Resource Policy at The Fletcher School of Law & Diplomacy
Postdoctoral Research Fellow, 2015-2016

SUNY College of Environmental Science & Forestry (SUNY-ESF), Syracuse, NY
Department of Environmental Resources Engineering
Ph.D. Environmental Resources Engineering (Geospatial Information Science & Eng.), 2015

Auburn University, Auburn, AL
Department of Biosystems Engineering and School of Forestry and Wildlife Sciences
M.S. Forestry, 2010

Tribhuvan University, Nepal
B.S. Forestry, 2006

PEER-REVIEWED PUBLICATIONS (Published only)

1. **Bhattarai, N.***, Pollack, A.*, Lobell, D., Fishman, R., Singh, B., Dar, A., & Jain, M. 2021. The impact of groundwater depletion on agricultural production in India. *Environmental Research Letters* (Accepted).
2. Jain M., Fishman, R., Mondal, P., Galford, G.L., **Bhattarai**, **N.**, Naeem, S., Lall, U., Singh, B., & DeFries, R.S. 2021. The Impact of Groundwater Depletion on Cropping Intensity in India. *Science Advances* 7: eabd2849 [Link]. Media: CNN, AAAS, NPR, Earther.
3. Yun, B., Sha, Z., **Bhattarai, N.**, Mallick, K., Qi, L, Tang, L., Im, J., Guo, L., & Jiahua, Z. 2021. On the use of machine learning algorithms to improve cropland evapotranspiration across a wide environmental gradient. *Agricultural and Forest Meteorology*, 288-289: 208308 [Link].
4. Javed, T., Zhang, J., **Bhattarai, N.**, Zhang, S., Rashid, S., Yun, B., Ahmad, S., Henchiri, M., Kamran, M. 2021. Drought characterization across agricultural regions of China using standardized precipitation and vegetation water supply indices. *Journal of Cleaner Producti*on, 313: 127866 [Link].
5. Rao, P., Zhou, W., **Bhattarai, N.**, Srivastava A., Singh, B., Poonia, S., Lobell, D., and Jain, M. 2021. Using Sentinel-1, Sentinel-2, and Planet Imagery to Map Crop Type of Smallholder Farms. *Remote Sensing*, 13: 870 [Link].
6. Xu, Z., Chen, X., Liu, J., Zhang, Y., Chau, S., **Bhattarai, N.**, Wang, Y., Li, Y., Li, Y., & Connor, T. 2020. Impacts of irrigated agriculture on food–energy–water–CO2 nexus across metacoupled systems. *Nature Communications* 11**,** 5837. [Link]
7. Niraula, R., Saleh, A., **Bhattarai, N.**, Bajgain, R., Kannan, N., Osie, E., Gowda, P., Neel, J., Xiao, X., & Basara, J. 2020. Understanding the effects of pasture type and stocking rate on the hydrology of Southern Great Plains. *Science of the Total Environment*, 708: 134873. [Link]
8. Khand, K., **Bhattarai, N.**, Taghvaeian, S., Wagle, P., Gowda, P., & Alderman, P. 2020. Modeling evapotranspiration of winter wheat using contextual and pixel-based surface energy balance models. *Transactions of ASABE* [Link].
9. Cohn, A., **Bhattarai, N.**, Campolo, J., Crompton, O., Dralle, D., Duncan, J., & Thompson, S., 2019. Forest loss in Brazil increases maximum temperatures within 50km. *Environmental Research Letters*, 14: 084047. [Link]
   Media: phys.org**,** Scientific American**,** Newsroom
10. **Bhattarai, N.,** Mallick, K., Stuart, J.**, Vishwakarma, B.D., Niraula, R., Sen, S., & Jain, M. 2019. An automated multi-model evapotranspiration mapping framework using remotely sensed and reanalysis data. *Remote Sensing of Environment*, 229: 69-92. [Link]
11. Kafley, H., Lamichane, B.R., Maharjan, R., Khadka, M., **Bhattarai, N**., & Gompper, M.E., 2019. Tiger and leopard co-occurrence: intraguild interactions in response to human and livestock disturbance, *Basic and Applied Ecology*.[Link]
12. **Bhattarai, N.** & Liu, T. 2019. LandMOD ET Mapper: a new Matlab-based graphical user interface (GUI) for automated implementation of SEBAL and METRIC models in thermal imagery. *Environmental Modelling and Software*, 118: 76-82. [Link]

13. Kafley, H., Lamichane, B.R., Maharjan, R., Thapaliya, B., **Bhattarai, N.**, Khadka, M., & Gompper, M.E. 2019. Estimating Prey Abundance and Distribution from camera Trap data using bionomical mixture models. *European Journal of Wildlife Research* 65: 77. [Link]
14. Mallick, K., Wandera, L., **Bhattarai, N.**, Hostache, R., Chormanski J., & Kleniewska, M. 2018. A critical evaluation on the role of aerodynamic and canopy-surface conductance parameterization in SEB and SVAT models for simulating evapotranspiration: a case study in the Upper Biebrza National Park wetland. *Water,* 10 (12): 1753. [Link]
15. **Bhattarai, N.**, Mallick, K., Brunsell, N. A., Sun, G., & Jain, M. 2018. Regional evapotranspiration from an image-based implementation of the Surface Temperature Initiated Closure (STIC1.2) model and its validation across an aridity gradient in the conterminous United States, *Hydrology and Earth System Sciences*, 22: 2311-2341. [Link]
16. Niraula, R., Meixner, T., Dominguez, F., **Bhattarai, N.**, Rodell, M., Ajami, H., Gochis, D., & Castro, C. 2017. How might recharge change under projected climate change in the western US? *Geophysical Research Letters*, 44: 10407-10418.[Link] **Media:** UA News**,** Science Daily**,** phys.org**,** AAAS and Eurekalert**,** technology.org, futurity.org
17. **Bhattarai, N.**, Wagle, P., Gowda, P., & Kakani, V. 2017. Utility of remote sensing-based surface energy balance models to track water stress in rain-fed switchgrass under dry and wet conditions. *ISPRS Journal of Photogrammetry and Remote Sensing*, 133:128-141. [Link]
18. Richards, P., Cohn, A., Arima, E., VanWey, L., & **Bhattarai, N.** 2017. Enforcement evasion highlights need for independent satellite monitoring for forest governance. *Conservation Letters*, 10:497-498. [Link]
19. **Bhattarai, N.**, Quackenbush, L.J., Im, Jungho, & Shaw, S.B., 2017. A new optimized algorithm for automating endmember pixel selection in the SEBAL and METRIC models. *Remote Sensing of Environment*,196:178-192. [Link]
20. Wagle, P., **Bhattarai, N.***, Gowda, P., & Kakani, V. 2017. Performance of five surface energy balance models for estimating daily evapotranspiration in high biomass sorghum*. ISPRS Journal of Photogrammetry and Remote Sensing,* 128:192-203. [Link]
21. Richards, P. Arima, E., VanWey, L, Cohn, A., & **Bhattarai, N.** 2017. Are Brazil's Deforesters Avoiding Detection? *Conservation Letters*, 10:470-476. [Link] **Media:** Nature Climate Change; Mongabay, phys.org, eurekalert, Brown University, Nature World News,Technology.org
22. **Bhattarai, N.**, Shaw, S. B., Quackenbush, L. J., Im, J., & Niraula, R. 2016. Evaluating five remote sensing-based single-source surface energy balance models for estimating daily evapotranspiration rates in a humid subtropical climate. *International Journal of Applied Earth Observation and Geoinformation,* 49:75-86 [Link]
23. **Bhattarai, N.**, Quackenbush, LJ., Dougherty, M., & Marzen, L. 2015. A simple Landsat–MODIS fusion approach for monitoring seasonal evapotranspiration at 30 m spatial resolution. *International Journal of Remote Sensing* 36:115-143. [Link]
24. Shaw, Stephen B., Marrs, J.**, **Bhattarai, N.**, & Quackenbush, LJ. 2014. Longitudinal Study of the Impacts of Land Cover Change on Hydrologic Response in Four Mesoscale Watersheds in New York State, USA. *Journal of Hydrology,* 519:12-22. [Link]
25. **Bhattarai, N.,** Dougherty, M., Marzen, L., & Kailn, L. 2012.Validation of evaporation estimates from a modified surface energy balance algorithm for land model in the south-eastern US. *Remote sensing letters,* 3:511-519. [Link]

***** *indicates shared first authorships; ***undergraduate students mentored*

OTHER PUBLICATIONS

Peer-Reviewed

1. **Bhattarai, N.**, Mallick, K., and Jain, M. Sensitivity of four contextual remote sensing based surface energy balance models to spatial domain, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-3/W6, 3-7, https://doi.org/10.5194/isprs-archives-XLII-3-W6-3-2019, 2019.

Non-referred Conference papers and dissertation/thesis

2. **Bhattarai, N.** 2015. Single-source surface energy balance algorithms to estimate evapotranspiration from satellite-based remotely sensed data, PhD Dissertation, SUNY-ESF.
3. **Bhattarai, N.,** Quackenbush L.J., Jungho, Im, and Shaw, S. B Automation of Endmember Pixel Selection in SEBAL/METRIC Model. AGU Fall Meetings Abstracts, December 14-18, 2015, San Francisco, CA.

4. **Bhattarai, N.,** Quackenbush L.J., & Shaw, S. B. 2014. Comparison of four single-source surface energy balance-based models for estimating remotely sensed daily ET. Abstracts from the ASABE 2014 International Symposium on ET. April 7-11, 2014, Raleigh, NC.
5. **Bhattarai, N.** & Quackenbush, L.J. 2013. A data fusion approach for monitoring remotely sensed seasonal ET. AGU Fall Meetings Abstracts, December 9-13, 2013, San Francisco, CA.
6. **Bhattarai, N.,** Quackenbush, L.J., Calandra, L., Im, J., & Teale, S. 2012. An automated object-based approach to detect Sirex-infestation in pines. Proceedings of American Society for Photogrammetry and Remote Sensing (ASPRS) 2012 Annual conference, March 19-23, Sacramento, CA.
7. **Bhattarai, N.,** Quackenbush, L.J., Calandra, L., Im, J., & Teale, S. 2011. Spectral analysis of Scotch pine infested by Sirex Noctillo. Proceedings of ASPRS 2011 Annual conference, May 1-5, 2011, Milwaukee, WI.
8. **Bhattarai, N.** 2010. Use of Remotely Sensed Data to Quantify Plant Water Use from Irrigated Lands in Wolf Bay Watershed Area, MS Thesis, Auburn University.

PROFESSIONAL PREPARATIONS

Research experience

Postdoctoral Research Fellow, University of Michigan Ann Arbor	Sep 2016-Dec 2020
Research Affiliate, Tufts University, Medford, MA	Sep 2016- Aug 2017
Postdoctoral Research Fellow, Tufts University, Medford, MA	Aug 2015- Sep 2016
Research Project Assistant, Research Foundation for the SUNY, Syracuse, NY	Sep – Dec 2014
Research Aide, Research Foundation for the SUNY, Syracuse, NY	May – Aug 2012
Research Project Assistant, Research Foundation for the SUNY, Syracuse, NY	Aug 2010 – Aug 2011
Research Assistant, Biosystems Engineering, Auburn University, AL	Aug 2008 – Aug 2010

Teaching experience

Teaching Assistant, SUNY-ESF (Aug 2011-May 2014): Courses: GIS for engineers (fall 2011, 2012, and 2013 graduate courses; conducted all GIS labs); Statics and Dynamics (Spring 2012 undergrad course); Mechanics of Materials (spring 2012, undergrad course); Introduction to Engineering Design (springs of 2012, 2013, and 2014, undergrad course)

Teaching Assistant, Auburn University (Aug-Dec 2009): Course: Introduction to renewable resources

Mentorship experience

STEM Mentor (Jan 2015 – May 2015), Research Foundation for the SUNY: Taught three science classes/week at two elementary schools during Jan-May 2015.

UROP (Undergraduate opportunity research program) Mentor (June 2017-), University of Michigan: Mentored two undergraduates on research projects (climate change, programming in R, Matlab, Google Earth Engine, ArcGIS, and remote sensing).

Undergraduate Mentor (summers of 2012 and 2015), SUNY-ESF: Mentored three Undergraduates at SUNY-ESF (ArcGIS, Python, SapFlux Instrumentation, and Weather station data collection)

Other field/research experience

Research/Field Tech, University of Illinois, Urbana-Champaign, IL	Jun – Aug 2014
Conservation Science Intern, World Wildlife Fund for Nature, Washington, DC	Jun – Aug 2013
International Corps Member, EarthCorps, Seattle, WA	Jun – Dec 2007

SELECTED TALKS

- Remote Sensing for Sustainable Agriculture: From Evapotranspiration Modeling to Understanding Crop-Climate-Human Interactions, June 10, 2020, Lawrence Berkeley National Lab, Berkeley, CA. (Invited)
- Remote sensing approach to estimate crop water use and stress across agricultural lands in India. Jan 24, 2020, Western Michigan University, Kalamazoo, MI (Invited).
- Warming Temperatures Lead to Increased Groundwater Depletion in India, Dec 11, 2019, AGU Fall Meetings, San Francisco, CA.

- Biophysical and Socioeconomic Complexities of Global Environmental Change. Oct 8, 2019, College of William and Mary, Williamsburg, VA. (Invited)
- Understanding the impacts of groundwater depletion and climate shocks on irrigation decisions in India. AGU Fall Meetings Abstracts, December 10-14, 2018, Washington, DC.
- An automated multi-model based evapotranspiration estimation framework for understanding crop-climate interactions in India, AGU Fall Meetings, December 11, 2017, New Orleans, LA.
- Understanding the climate-included variations in the seasonal water demands of irrigated crops in Northern India. AGU Fall Meetings, December 11-16, 2016, San Francisco, CA.
- Introduction of automated calibration approaches to the surface energy balance-based ET algorithms, ASPRS annual Conference, March 23-27, 2014, Louisville, KY.
- Comparison of four single-source surface energy balance-based models for estimating remotely sensed daily ET. ASABE 2014 International Symposium on ET. April 7-11, 2014, Raleigh, NC.
- Application of remote sensing and surface energy balance algorithms in estimating ET in the southeastern US. 24th ASPRS 2013 annual conference, March 24-28, 2013, Baltimore, MD.
- Using remote sensing and geospatial techniques in hydrological applications. NYGeoCon. NYGIS Association, November 12-13, 2013, Saratoga Springs, NY.
- Calibration of the InVEST water yield model- An automated approach, World Wildlife Fund-US, August 9, 2013, DC.
- A coupled multi-sensor fusion & surface energy balance algorithm approach to derive spatially-distributed seasonal ET.22nd GIS/SIG Annual Spatial/Digital Mapping Conference, April 16, 2013, Pittsford, NY.
- An automated object-based approach to detect Sirex-infestation in pines. 23rdASPRS 2012 annual conference, March 19-23, 2012, Sacramento, CA.

AWARDS, HONORS, AND GRANTS

- USDA ARS
- Collaborator, NASA NNH19ZDA001N-LCLUC Grant (~400K)- 2021-2024
- Outstanding Reviewer: *Journal of Hydrologic Engineering* (2018)
- Outstanding Contribution in Reviewing: *Agricultural & Forest Meteorology* (2018) and *ISPRS Journal of Photogrammetry & Remote Sensing* (2018)*; Remote Sensing of Environment* (2017) and *Science of the Total Environment* (2017)
- ERE Departmental Award for Academic Excellence (2014), SUNY-ESF, $1,000
- AGU Student travel award (2013), American Geophysical Union (AGU), $500
- CNY Graduate Student of the year (2013), ASPRS, $500
- Ta Liang Memorial Award (2013), ASPRS, $2,000
- ESF travel grant (2012-2013), ESF, $500, $250
- RvD Idea Awards (Raymond Von Dran Fund) (2012), Syracuse University, $2,000
- Research in Need travel grant (2012), GSA, SUNY-ESF, $250
- BS Entrance Topper (Science stream), Merit Scholarship, and ConForM/Danida fellowship for undergraduate research (~$250), 2006, Tribhuvan University, Nepal

PROFESSIONAL SERVICES

Editorial: Editorial Board Member, *GIScience & Remote Sensing* (Publisher: Taylor & Francis)
Guest Editor, *Remote Sensing* (MDPI), Special Issue on Remote Sensing of Evapotranspiration II

Peer Reviewer: *Remote Sensing of Environment, Environmental Research Letters, JGR-Atmospheres, Journal of Hydrology, Agricultural & Forest Meteorology, IEEE Transactions on Geosciences and Remote Sensing, Nature Scientific Reports, International Journal of Remote Sensing, ISPRS Journal of Photogrammetry & Remote Sensing, Hydrological Processes, Remote Sensing , IEEE-JSTARS, Stochastic Environmental Research & Risk Assessment, GIScience & Remote Sensing, PLoS ONE , Hydrology, Water, Transaction of ASABE, Science of the Total Environment, Applied Water Science, Sustainability, Sensors, International Journal of Applied Earth Observation and Geo-information, Remote Sensing Letters, Land Use Policy, Computers & Geosciences, Environmental Processes, Hydrological Sciences Journal, Environmental Modelling and Software and Agricultural Water Management.*

Proposal/Project Reviewer: NASA review Panel, External project Advisor for International Initiate for Impact Evaluation (3ie)

Professional Memberships: American Geophysical Union (AGU); American Society for Photogrammetry and Remote Sensing (ASPRS, 2010-); European Geophysical Union (EGU, 2018);

SKILLS

Fluent in multiple programming platforms including R, Matlab (Github Page); Advanced skills in Python, use of High-Performance Computing (HPCs)/Clusters, Google Earth Engine, Stata; GIS/Remote Sensing software, such as ArcGIS, QGIS, ENVI, ERDAS Imagine; Basic knowledge of C/C++ and Visual Basic; Knowledge of several software, such as AutoCAD, HEC-HMS, SAS, SigmaPlot, SSH, Unix shell scripts, Git, and SQL Server.