

## Nishan Bhattarai, Ph.D.

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### ACADEMIC/PROFESSIONAL PREPARATION

#### **United States Department of Agriculture-Agricultural Research Service (USDA-ARS)**

Hydrology and Remote Sensing Lab (HRSL), USDA-ARS, Beltsville, MD

Research Physical Scientist (Postdoctoral Research Associate), Dec 2020 - Current

#### **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**

Dept. 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**

### PUBLISHED PAPERS IN PEER-REVIEWED JOURNALS (under review/revision papers not listed)

1. Bai, Y., **Bhattarai, N.**, Mallick K., Zhang, S., & Zhang, J. 2022. Thermally derived evapotranspiration from the Surface Temperature Initiated Closure (STIC) model improves cropland GPP estimates under dry conditions. *Remote Sensing of Environment* (In Press).
2. **Bhattarai N.**, Guido D'Urso, W. P. Kustas, N. Bambach-Ortiz, Kyle R. Knipper, M. Anderson, F. Gao, M.M. Alsina, M. Aboutaleb, L. McKee, J. G. Alfieri, A. J. McElrone, J. H. Prueger, & Oscar R. Belfiore. 2022. Influence of modeling domain and meteorological forcing data on daily evapotranspiration estimates from a Shuttleworth-Wallace model using Sentinel-2 surface reflectance data. *Irrigation Science* (In Press).
3. Xu, G., Dong H., Xu. Z., & **Bhattarai, N.** 2022. China can reach carbon neutrality before 2050 by improving economic development quality. *Energy* 243: 12083.
4. Singh, K.K., **Bhattarai, N.**, & Vukomanovic, J., 2022. Landscape-scale hydrologic response of plant invasion relative to native vegetation in urban forests. *Science of the Total Environment*, 802:149903 [Link].
5. **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* 16:085003. [Link].
6. Jain M., Fishman, R., Mondal, P., Galford, G.L., **Bhattarai, N.**, Naeem, S., Lall, U., Singh, B., & DeFries, R.S. 2021. Groundwater depletion will reduce cropping intensity in India. *Science Advances* 7, eabd2849. [Link]. **Media:** CNN, AAAS, NPR, Earther.
7. Trebs, I, Mallick, K., **Bhattarai, N.**, Sulis, M., Cleverly J, Woodgate W, Silberstein, R., Najera, Hinko-Najera, N., Beringer J, Su Z., & Boulet G. 2021. The role of aerodynamic resistance in thermal remote sensing-based evapotranspiration models. *Remote Sensing of Environment* 264: 112602 [Link].
8. Bai, Y., Zhang, S., **Bhattarai, N.**, Mallick, K., Qi, L, Tang, L., Im, J., Guo, L., & Zhang, 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].
9. 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 Production*, 313: 127866 [Link].
10. 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].
11. 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–CO<sub>2</sub> nexus across metacoupled systems. *Nature Communications* 11, 5837. [Link]

12. 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]
13. 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].
14. **Bhattarai, N.**, Mallick, K., Stuart, J. <sup>†</sup>, 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]
15. 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
16. Kafley, H., Lamichane, B.R., Maharjan, R., Khadka, M., **Bhattarai, N.**, & Gompfer, M.E., 2019. Tiger and leopard co-occurrence: intraguild interactions in response to human and livestock disturbance, *Basic and Applied Ecology*. [Link]
17. **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]
18. Kafley, H., Lamichane, B.R., Maharjan, R., Thapaliya, B., **Bhattarai, N.**, Khadka, M., & Gompfer, M.E. 2019. Estimating Prey Abundance and Distribution from camera Trap data using bionomical mixture models. *European Journal of Wildlife Research* 65: 77. [Link]
19. 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]
20. **Bhattarai, N.**, Mallick, K., Brunzell, 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]
21. 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
22. **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]
23. 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]
24. **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]
25. 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 & Remote Sensing*, 128:192-203. [Link]
26. 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
27. **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]
28. **Bhattarai, N.**, Quackenbush, L.J., 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]
29. Shaw, Stephen B., Marrs, J.<sup>†</sup>, **Bhattarai, N.**, & Quackenbush, L.J. 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]
30. **Bhattarai, N.**, Dougherty, M., Marzen, L., & Kalin, 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]

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\* indicates shared first authorships; <sup>†</sup> undergraduate students mentored

## **OTHER PUBLICATIONS**

### **Peer-Reviewed**

1. Mallick, K., Hu, T., Yun, B., **Bhattarai, N.**, Trebs, I., Scherf, M., Boulet, G., Wang, T., Sanchez, C.R., Shortt, R., Baldochi, D., Thermal and shortwave infrared remote sensing of ecosystem processes: Opportunities, synergies, and challenges. IEEE InGARSS 2021 (Accepted).
2. **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, Editorial, and dissertation/thesis**

3. **Bhattarai, N.** and Wagle P. Recent advances in remote sensing of evapotranspiration. 2021, *Remote Sensing* 13(21):4260 (Editorial [link]).
4. **Bhattarai, N.** 2015. Single-source surface energy balance algorithms to estimate evapotranspiration from satellite-based remotely sensed data, PhD Dissertation, SUNY-ESF.
5. **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.
6. **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.
7. **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***

Research Associate, USDA-ARS, Beltsville, MD	Dec 2020-Current
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-May 2021 ), University of Michigan: Mentored three 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**

- Synergistic use of spectral information from Landsat and Sentinel-2 data for modeling near real-time crop water status across California vineyards, December 15, 2021, AGU Fall Meetings, New Orleans, LA
- 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, 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.

## **GRANTS, AWARDS, AND HONORS**

- Collaborator, NASA NNH21ZDA001N-LCLUC: Land Cover/ Land Use Change (~\$450K), 2022-2025
- Collaborator, NASA NNH19ZDA001N- LCLUC:Land Cover/ Land Use Change Grant (~440K)- 2021-2024
- Research Achievement Award, USDA-ARS (2021)
- Outstanding Reviewer: Journal of Hydrologic Engineering (2018)
- ERE Departmental Award for Academic Excellence (2014), SUNY-ESF
- RvD Idea Awards (Raymond Von Dran Fund) (2012), Syracuse University, \$2,000
- 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
- Research in Need travel grant (2012), GSA, SUNY-ESF, \$250
- ConForM/Danida fellowship for undergraduate research (2006), Tribhuvan University, Nepal, ~\$250
- BS Entrance Topper (Science stream) and Merit Scholarship, Tribhuvan University, Nepal (2006)

## **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 (reviewed > 100 papers):** *Remote Sensing of Environment\**, *Environmental Research Letters*, *JGR-Atmospheres*, *Water Resources Research*, *Journal of Hydrology*, *Agricultural & Forest Meteorology\**, *IEEE TGRS*, *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\**, *International JAG*, *Remote Sensing Letters*, *Land Use Policy*, *Computers & Geosciences*, *Environmental Processes*, *Hydrological Sciences Journal*, *Environmental Modelling & Software*, and *Agricultural Water Management*.

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\*Recognized as outstanding contributor in reviewing papers for the journal

**Proposal Reviewer:** NASA (Hydrology) proposal review Panel, External project advisor for International Initiative for Impact Evaluation (3ie)

**Professional Memberships:** American Geophysical Union, American Society for Photogrammetry & Remote Sensing (2010-17)

## **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.