

## Nishan Bhattarai, Ph.D.

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### ACADEMIC BACKGROUND

#### **University of Michigan, Ann Arbor, MI**

School for Environment and Sustainability

Postdoctoral Research Fellow, Sep 2016 -Dec 2020/Advisor: Dr. Meha Jain

#### **Tufts University, Medford, MA**

Center for International Environment and Resource Policy at The Fletcher School of Law & Diplomacy

Postdoctoral Research Fellow, 2015-2016/Advisor: Dr. Avery Cohn

#### **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/Advisor: Dr. Lindi J.

Quackenbush

#### **Auburn University, Auburn, AL**

Department of Biosystems Engineering and School of Forestry and Wildlife Sciences

M.S. Forestry, 2010/Advisors: Dr. Mark Dougherty and Dr. Latif Kalin

#### **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 Production*, 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.**, & Gompfer, 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, 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]
24. Shaw, Stephen B., Marrs, J.\*\*, **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]
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]

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\* 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. 24<sup>th</sup> 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. 23rd ASPRS 2012 annual conference, March 19-23, 2012, Sacramento, CA.

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

- USDA ARS
- Collaborator, NASA NNN19ZDA001N-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 Initiative 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.