

DR SUMIT SEN

Contact Address Department of Hydrology, Indian Institute of Technology Roorkee (IITR), Roorkee, Uttarakhand, India 247667
Contact Telephone (91) 1332-284754
Contact E-mail sumit.sen@hy.iitr.ac.in; sensumit2@gmail.com
Job Title Associate Professor in Hydrology

Professional and Education Qualifications

2001 BS Agricultural Engr., Allahabad Agricultural Institute DU, Allahabad, India
2004 MS Biological and Agricultural Engr., University of Arkansas, Fayetteville, AR, USA
2009 PhD Civil Engr., (*Runoff Generation in Pastures of the Appalachian Plateau Region of North Alabama*) Auburn University (AU), Auburn, AL, USA

Employment History

2018 to date Associate Professor, Dept., of Hydrology, IIT Roorkee.
2012 to 2018 Assistant Professor, Dept., of Hydrology, IIT Roorkee.
2016 to date Associated Faculty, Centre of Excellence in Disaster Mitigation and Management.
2011 to 2012 Fellow, Ashoka Trust for Research in Ecology and The Environment, India.
2009 to 2011 Post-doctoral Fellow, Biosystems Engineering Department, Auburn Univ.
2005 to 2009 Graduate Research Assistant, Biosystems Engineering Department, Auburn Uni.
2002 – 2004 Graduate Research Assistant, Biological & Agri. Engr., University of Arkansas.

Synergistic Research Activities

From last 8+ years, I have been involved in teaching graduate- and post-graduate courses, such as Watershed Behavior and Conservation Practices; Hydrological Data Collection and Analysis; Watershed Modeling and Simulation, and an undergraduate course, i.e., Engineering Hydrology. My research area focuses on experimental hydrology, watershed management, monitoring and modeling; rainfall-runoff modeling, specifically focusing in the Western and Eastern Himalayas. Our research group has been involved in instrumenting various Himalayan headwater watersheds to unravel the hydrological processes understanding (for eg., surface runoff generation mechanisms; sediment transport; bedload movement; ecohydrology) occurring under different landuse/landcover, geology, slopes & aspects. Another focused area of our group is to understand the hydrogeological processes of spring systems and developing best management practices for rejuvenating these Himalayan springs towards better water security for the mountainous communities. Furthermore, our group has been developing low-cost hydrological equipment, such as rainfall simulator, hydrometry sites for measuring various hydrological parameters.

Our group has been conducting the water resources assessment for various Ethiopian river basins using the watershed-scale hydrological model, especially Soil and Water Assessment Tool (SWAT). Specific research work has been towards developing proposals for the interbasin water transfer from surplus to deficit basin and developing water allocation proposals for the Central Rift Valley (Lake Ziway Basin) under the climate change and variability scenarios.

Doctoral Thesis Supervised

S. No.	Thesis Title	Status	Candidates Name	Supervisor/ Co-supervisor
1.	Modeling Moisture Flow in Root Zone: Estimation of Root Water Uptake and Soil Hydraulic Parameters	Awarded (2019)	Ickkshaanshu Sonkar	Co-supervisor Prof. K.S. Prasad Hari
2.	Hydrological Response of an Experimental Watershed of Lesser Himalaya	Awarded (2019)	Vikram Kumar	Sumit Sen
3.	Planning of Interbasin Transfer for Sustainable Water Management in Ethiopia	Awarded (2017)	Dereje Adeba Gerbi	Co-supervisor Prof. M. L. Kansal

Research Publications (reverse chronological order)

1. Nanda, A., **Sen, S***, Sharma, A. N., & Sudheer, K. P. Soil Temperature Dynamics at Hillslope Scale—Field Observation and Machine Learning-Based Approach. *Water*, 12(3), 713, **2020**.
2. Kumar, V., & **Sen, S***. Assessment of spring potential for sustainable agriculture: A case study in lesser Himalayas. *Applied Engineering in Agriculture*, 36(1), 11-24, **2020**.
3. Musie, M.; **Sen, S***; Chaubey, I. Hydrologic Responses to Climate Variability and Human Activities in Lake Ziway Basin, Ethiopia. *Water*, 12, 164, **2020**.
4. Musie, M., **Sen, S***, Srivastava, P. Comparison and Evaluation of Open Source Precipitation Datasets for Streamflow Simulation in Data Scarce Watersheds of Ethiopia. *Journal of Hydrology*, 579, 124168. **2019**. <https://doi.org/10.1016/j.jhydrol.2019.124168>.
5. Nanda, A., **Sen, S***, McNamara, J.P. How spatiotemporal variation of soil moisture can explain hydrological connectivity of infiltration-excess dominated hillslope: Observations from Lesser Himalayan Landscape, *Journal of Hydrology* 579, 124146, **2019**.
6. Sonkar, I., Kotnoor, H. P., **Sen, S**. Estimation of Root Water Uptake and Soil Hydraulic Parameters from Root Zone Soil Moisture and Deep Percolation. *Agricultural Water Management*, 222: 38-47. **2019**.
7. Bhattarai N., Mallick, K., Stuart, J., Vishwakarma, B. D., Niraula, R., **Sen, S.**, Jain, M. An automated multi-model evapotranspiration mapping framework using remotely sensed and reanalysis data. *Remote Sensing of Environment*, 229: 69-92. **2019**.
8. Nanda, A., **Sen, S***, Jirwan, V., Sharma, A., Kumar, V. Understanding Plot-Scale Hydrology of Lesser Himalayan Watershed- A Field Study and HYDRUS-2D Modeling Approach. *Hydrological Processes*, 32 (9): 1254-1266, **2018**.
9. Pati, A., **Sen, S***, Perumal, M. Modified Channel Routing Scheme for SWAT Model. *Journal of Hydrologic Engineering ASCE*, 23(6): 04018019, **2018**.
10. Shah, A.I., **Sen, S.**, Dar, M.U.D., Kumar, V. Land-Use/ Land-Cover Change Detection and Analysis in Aglar Watershed, Uttarakhand. *Current Journal of Applied Science and Technology*, 24(1): 1-11, **2017**.
11. Kumar, V., **Sen, S***. Evaluation of Spring Discharge Dynamics using Recession Curve Analysis: A Case Study in Data-Scarce Region, Lesser Himalayas, India. *Sustainable Water Resources Management*, DOI: 10.1007/s40899-017-0138-z, **2017**.
12. Noori, N., Kalin, L., **Sen S.**, Srivastava P., Lebleu, C. Identifying Areas Sensitive to Land Use/ Land Cover Change for Downstream Flooding in a Coastal Alabama Watershed. *Regional Environmental Change*, 16(6): 1833–1845, **2016**.
13. Adebaba, D., Kansal, M.L., **Sen, S**. Economic Evaluation of Proposed Alternatives of Inter-basin Water Transfer from BaroAkobo to Awash Basin in Ethiopia. *Sustainable Water Resources Management*, 2(3): 313-330, **2016**.
14. Madolli, M.J., **Sen, S***, Jain, M.K. Trends in Temperature and Precipitation for the Karnataka State, India. *Indian Association of Hydrologist, Hydrology Journal*, 37(1-4): 61-70, **2015**.
15. Adebaba, D., Kansal, M.L., **Sen, S**. Assessment of Water Scarcity and its Impacts on Sustainable Development in Awash Basin, Ethiopia. *Sustainable Water Resources Management*, 1(1): 71-87, **2015**.
16. Madolli, M.J., **Sen, S.**, Shinde, A. Effect of Climate Change on Rainfall Pattern and Socioeconomic Condition for Karnataka State. *Proceedings of International conference entitled "Green India: strategic knowledge for combating climate change-prospects and challenges."* 304-312, **2014**.
17. Lamba, J., Way, T.R., Srivastava, P., **Sen, S.**, Wood, C.W., Yoo, K.H. Nutrient Loss in Leachate and Surface Runoff from Surface-Broadcast and Subsurface-Banded Broiler Litter. *J. Environmental Quality*, 42: 1574-1582, **2013**.
18. Lamba, J., Way, T.R., Srivastava, P., **Sen, S.**, Wood, C.W., Yoo, K.H. Surface Transport of Nutrients from Surface-Broadcast and Subsurface-Banded Broiler litter. *Trans. of ASABE*. 55(3): 979-985, **2012**.

19. **Sen, S***, Srivastava, P., Vadas, P.A., Kalin, L. Watershed-level comparison of predictability and sensitivity of two phosphorus models. *J. Environmental Quality*, 41:1642-1652, **2012**.
20. **Sen, S***, Srivastava, P., Dane, J.H., Meng, H., Clement, P.T. Application of HIRO2 Hydrologic Model for Simulating Hortonian Overland Flow on a Pasture Hillslope in North Alabama. *J. Soil & Water Conservation*, 66(6): 411-422, **2011**.
21. **Sen, S***, Srivastava, P., Dane, J.H., Yoo, K.H., Shaw, J.N. Spatial-temporal variability and hydrologic connectivity of runoff generation areas in a North Alabama pasture - implications for phosphorus transport. *Hydrological Processes*, 24(3): 342-356, **2010**.
22. **Sen, S***, Srivastava, P., Yoo, K.H., Dane, J.H., Shaw, J.N., Kang, M.S. Runoff Generation Mechanisms in Pastures of the Sand Mountain Region of Alabama – A Field Investigation. *Hydrological Processes*, 22(21): 4222-4232, **2008**.
23. **Sen, S.**, Haggard, B.E., Chaubey, I., Brye, K.R., Costello, T.A., Matlock, M.D. Sediment Phosphorus Release at Beaver Reservoir, Northwest Arkansas, USA, 2002–2003: A Preliminary Investigation. *Water Air & Soil Pollution*, 179: 67–77, **2007**.

Outreach/Extension Timely Information Sheet

1. **S. Sen**, Way, T.R., Srivastava, P., Lamba, J., Stanford, M.K. Water Quality Benefits of Subsurface-Banded Poultry Litter. Biosystems Engineering Series, *Timely Information Sheet, Agriculture & Natural Resources, Alabama Cooperative Extension System*, **2010**.
2. **S. Sen**, Srivastava, P., Yoo, K.H., Stanford, M.K. Pasture Hillslope Hydrology of the Sand Mountain Region in North Alabama. *Biosystems Engineering Series, Timely Information Sheet, Agriculture & Natural Resources, Alabama Coop. Extension System*, **2010**.

Technical Reports

1. Worked as draft committee member on the NITI Aayog report focused on “Inventory and Revival of Springs in Himalayas for Water Security”, DST, New Delhi. **2018**.
2. Sen, S., Momblanch, A. Ecosystem Services Assessment and its Implementation in UK. Report of Researcher Exchange May15–June 2, **2017**.

Book Chapters

1. Kumar V., **Sen S.** Analysis of Spring Discharge in the Lesser Himalayas: A Case Study of Mathamali Spring, Aglar Watershed, Uttarakhand. In: Singh V., Yadav S., Yadava R. (eds) *Water Resources Management*. Water Science and Technology Library, vol 78. Springer, Singapore, **2018**.
2. Panda, S.S., Mason, E., **Sen, S.**, Kim, H.W., Amatya, D.M. Forest Hydrology Management Decision Support with Geospatial Technology. *Chapter in Forest Hydrology*. CAB International, Nosworthy Way, Wallingford OX10 8DE, United Kingdom, **2016**.

Research Publications Presented in Conferences

1. Kumar, V., **Sen, S.** Optimal crop planning under the constraint of area and water demand using multi-objective programming. Global Water Security for Agriculture and Natural Resources. Hyderabad, Oct., 3-6, **2018**.
2. Sen, D., **Sen, S.** Hydro-geology based Revival of Drying Springs through Community Participation: A case Study from the Indian Himalayan Region. *Asian Ministerial Conference on Disaster Risk Reduction 2018 (AMCDRR)*, Mongolia, July, 3-6, **2018**.
3. Nanda, A., **Sen, S.** Identifying Runoff Generation Mechanisms and Its Controlling Parameters in the Lesser Himalayan Hillslopes. *AGU Fall Meeting*, New Orleans, Louisiana, USA, Dec., 11-15, **2017**.
4. Shah, A., **Sen, S.** Landuse/Landcover change in Aglar watershed (Tehri-Garhwal district, Uttarakhand): Is it Manmade or natural. *11th Uttarakhand State Technology Congress*, Dehradun, March 2-4, **2017**.

5. Kumar, V., **Sen, S.** Morphometric Analysis of Lesser Himalaya: A Case Study of Aglar Watershed. *HYDRO International-2016*, Pune, Dec., 08-10, **2016**.
6. **Sen, S.**, Raghuwanshi, S. Subregional Relationship of IOD and ENSO with ISMR and EREs for the period 1951-2007. *Developing Hydro-climatic Services for Water Security*. IUKWC, IITM, Pune, 28 Nov – 1 Dec., **2016**.
7. Kumar, V., **Sen, S.** Analysis of Spring Discharge in the Lesser Himalaya: A Case Study of Mathamali Spring, Aglar Watershed, Uttarakhand. *International Conference on Water, Environment, Energy and Society, (ICWEES-2016)*, Jointly organized by Texas A & M University, Texas, USA and AISECT University, Bhopal, 15-18 March 15-18, **2016**.
8. Kumar V., **Sen, S.** Developing an Instrumented Watershed in the West Himalayas, India: Needs and Challenges for Hydrologic Sciences. *ASABE Annual International Meeting*, New Orleans, Louisiana, USA, July 26-29, **2015. (Invited Talk)**
9. Raghuwanshi, S., **Sen, S.** Subregional Relationship of IOD and ENSO with ISMR and EREs for the period 1951-2007. *ASABE Annual International Meeting*, New Orleans, Louisiana, USA, July 26-29, **2015**.
10. Jirwan, V. **Sen, S.** Characteristics of overland flow generation on two steep hillslopes in the Western Himalayas, India. *ASABE Annual International Meeting*, New Orleans, Louisiana, USA, July 26-29, **2015**.
11. **Sen, S.** Shinde, A. Hydrological modeling of critical source areas of soil erosion in the Gadarwara Watershed (India). *21st Century Watershed Technology Conference and Workshop*, Hamilton, New Zealand, Nov., 03-07, **2014**.
12. **S. Sen.** Hydrologic Ecosystem Services in Relation to the Himalayas. *Recent Engineering Trends on Energy Environment & Ecology, (RETEEE-14)*, Rajshree Institute of Management & Technology Bareilly, Sept., 27-28, **2014. (Invited Talk)**
13. **Sen, S.**, Kumar, V., Kumar, R. Static and Dynamic Response of Hydrologic Characteristics on Spring Discharge in the Tehri-Garhwal Region of Uttarakhand. *Conference on Farmers First for Conserving Soil and Water Resources in Northern Region (FFCSWR-2014)*, organized by Indian Association of Soil and Water Conservationists (IASWC) and Central Soil and Water Conservation (CSWCRTI, ICAR), Dehradun, March 22-24, **2014**.
14. Madolli, M.J., **Sen, S.**, Shinde, A. Effect of Climate Change on Rainfall Pattern and Socioeconomic Condition for Karnataka State. *Proceedings of International conference entitled "Green India: strategic knowledge for combating climate change-prospects and challenges."* 304-312, Dec., 05-07, **2013**.
15. **Sen, S.**, Srivastava, P., Lamba, J., Way, T. Modeling Phosphorus Transport in Soil and Water Using HYDRUS-1D Model. Paper # 1008607, *ASABE Annual International Meeting* Providence, Pittsburgh, PA, June 20–23, **2010**.
16. **Sen, S.**, Srivastava, P. Watershed level Benefits of Alabama PIndex: A Comparison of Predictability and Sensitivity of Two Phosphorus Models. *Annual Alabama Water Resources Conference*, Orange Beach, AL. Sept., 9-11, **2009**.
17. **Sen, S.**, Srivastava, P. Evaluating Effectiveness of Alabama P-Index in a Poultry Litter Applied Watershed Using SWAT and a State-of-the-Art Manure Phosphorus Model. Paper # 096188, *ASABE Annual International Meeting*, Reno, NV, June 21–24, **2009**.
18. Lamba, J., Way, T., Srivastava, P., Wood, W., **Sen, S.** Gupta, A. Subsurface Transport of Phosphorous from Surface- and Subsurface-Applied Poultry Litter. Paper# 096899, *ASABE Annual International Meeting*, Reno, NV, June 21–24, **2009**.
19. Lamba, J., Srivastava, P., Way, T., **Sen, S.**, Gupta, A., Wood, W. Surface Transport of Phosphorus from Surface- and Subsurface-applied Poultry Litter. Paper# 096893, *ASABE Annual International Meeting*, Reno, NV, June 21–24, **2009**.

Sponsored Research Projects

S. No.	Title	Sponsoring Agency	Amount (in Lakhs)	PI or Co-PI	Start Date	End Date	PI or Co-PI (if any)
1.	Pine and Oak ecosystem: Water, climate and plant biodiversity	National Mission on Himalayan Studies, MoEF&CC	250 (Co-PI ~ 61)	Co-PI	2019	2022	GB Pant Himalayan Instt., Almora
2.	Comparing the disparate impacts of Oak and Chir pine tree species on their local hydrological and hydroclimatic regimes in the west-central Himalayas	STARS, MHRD	97 (Co-PI ~ 20)	Co-PI	2020	2023	NISER, Bhubaneswar & ATREE, Banagalore)
3.	Hydro-geological Assessment and Socio-Economic Implications of Depleting Water Resources in Nainital	Ministry of Water Resources, Govn. of India	193 (Co-PI ~70)	Co-PI	2019	2022	CEDAR, Dehradun
4.	Water Security through Community Based Springshed Development in the IHR	National Mission on Himalayan Studies, MoEF&CC	199 (Co-PI ~24)	Co-PI	Jan., 2018	Dec., 2021	PSI, Dehradun
5.	Development of Field Demonstration Site for Revisiting Rainfall Measurement: An Undercatch Issue	Ministry of Water Resources, River Development and Ganga Rejuvenation, CWC, DRIP	40	PI	Nov., 2017	2020	
6.	Lead Time Inflow Estimation for Reservoir Operation during Monsoon	Ministry of Water Resources, River Development and Ganga Rejuvenation, CWC, DRIP	97	Co-PI	Nov., 2017	Nov., 2020	Dr. M. K. Jain (PI), Dr. M. Perumal (Co-PI)
7.	Citizens Science Approach for the revival of dying spring	Uttarakhand Government, Water for Welfare Initiative, IIT Roorkee	4	PI	Dec., 2017	Dec., 2018	
8.	Understanding Hydrogeological Processes and Their Impacts on Water Security in the Tehri-Garhwal Region of Uttarakhand	Seed Grant IIT Roorkee	9.5	PI	May, 2013	April 2017	
9.	Understanding Relationship between Infiltration Tradeoff Hypothesis and Surface Runoff Generation Mechanisms	SERB, DST	19.11	PI	July, 2014	Dec., 2017	