

EGU24-44, updated on 25 Jan 2025

<https://doi.org/10.5194/egusphere-egu24-44>

EGU General Assembly 2024

© Author(s) 2025. This work is distributed under the Creative Commons Attribution 4.0 License.



Application of Dempster-Schafer theory for predicting ephemeral gullies with remote sensing data

Solmaz Fatholouloumi¹, Hiteshkumar B. Vasava¹, Prasad Daggupati², and Asim Biswas¹

¹School of Environmental Sciences, University of Guelph, Canada (sfatholo@uoguelph.ca), (hvasava@uoguelph.ca), (biswas@uoguelph.ca)

²School of Engineering, University of Guelph, Canada (pdaggupa@uoguelph.ca)

Mapping Ephemeral Gullies (EGs) is essential for enhancing the management and conservation of natural and agricultural resources. This study aimed to devise a novel approach utilizing the Dempster-Shafer (D-S) theory to achieve more accurate EGs mapping. To accomplish this, a high-resolution satellite image and ground data collected during a field visit to the Niagara region in Canada were utilized. Firstly, spectral features that effectively identify EGs were extracted from the satellite imagery. Subsequently, three machine learning classifiers including the artificial neural network (ANN), support vector machine (SVM), and random forest (RF) were employed to generate the EGs map. Finally, the D-S theory was applied to integrate the outcomes from these classifiers, aiming for a more precise EGs map. The results highlighted that the most significant variable importance was attributed to the Normalized Near-Infrared (NIR) (18%) and Soil line (15%). The average producer and user accuracies for the EGs and non-EGs classes across the three classifiers were 0.53 and 0.67, and 0.97 and 0.95, respectively. Incorporating the D-S theory enhanced these accuracy values by 0.15 and 0.19 for EGs and 0.02 and 0.02 for non-EGs. Furthermore, the overall accuracies for the EGs maps generated by the ANN, SVM, RF, and D-S theory models were 94%, 93%, 95%, and 97%, respectively. The results of this study showed that D-S theory is useful for improving the EGs mapping using remote sensing data.