Mapping Autumn Olive on Surface Coal Mines using Multitemporal Landsat Imagery

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Abstract: Invasive plant species threaten native plant communities and inhibit efforts to restore disturbed landscapes. Surface coal mines in the Appalachian Mountains are some of the most disturbed landscapes in North America. Moreover, there is not a comprehensive understanding of the land cover characteristics of post- mined lands in Appalachia. Better information on mined lands' vegetative cover and ecosystem recovery status is necessary for implementation of effective environmental management practices. The invasive autumn olive (*Elaeagnus umbellata*) is abundant on former coal surface mines, often outcompeting native trees due to its faster growth rate. The frequent revisit time and spatial and spectral resolution of Landsat satellites make Landsat imagery well suited for mapping and characterizing land cover and forest recovery on former coal surface mines. I performed a multitemporal classification using a random forest analysis to map autumn olive on former and current surface coal mines in southwest Virginia. Imagery from the Operational Land Imager on Landsat 8 were used as input data for the study. Calibration and validation data for use in model development were obtained using high-resolution aerial imagery. Results indicate that autumn olive cover is sufficiently dense to enable detection using Landsat imagery on approximately 12.6% of the current and former surface coal mines located in the study area that have been mined since the early 1980s. The classified map produced here had a user's and producer's accuracy of 85.3% and 78.6% respectively for the autumn olive coverage class. Overall accuracy in reference to an independent validation dataset was 96.8%. These results indicate that autumn olive growing on reclaimed coal mines in Virginia and elsewhere in the Appalachian coalfields can be mapped using Landsat imagery. Additionally, autumn olive occurrence is a significant landscape feature on former surface coal mines in the Virginia coalfields.

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