IDENTIFYING WOODY VEGETATION ON COAL SURFACE MINES USING PHENOLOGICAL INDICATORS WITH MULTITEMPORAL LANDSAT IMAGERY

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ABSTRACT:

Surface mining for coal has disturbed large land areas in the Appalachian Mountains. Better information on mined lands' ecosystem recovery status is necessary for effective environmental management in mining-impacted regions. Because record quality varies between state mining agencies and much mining occurred prior to widespread use of geospatial technologies, accurate maps of mining extents, durations, and land cover effects are not available. Landsat data, however, are uniquely suited to mapping and characterizing land cover and forest recovery on former coal surface mines. Past mine reclamation techniques have often failed to restore pre-mining forest vegetation, but natural processes may enable native forest trees to re-establish on mined areas with time. However, the invasive species autumn olive (Elaeagnus umbellate) is proliferating widely on former coal surface mines, often inhibiting re-establishment of native forest trees. Autumn olive outcompetes native vegetation because it fixes atmospheric nitrogen and benefits from a longer growing season than native deciduous trees. This longer growing season, along with Landsat 8's high signal to noise ratio, has enabled species-level classification of autumn olive using multitemporal Landsat 8 data at accuracy levels previously only obtainable using higher spatial or spectral resolution sensors. We are assessing the utility of Landsat imagery, in combination with products from several vetted algorithms, for determining the area and date of forest clearing, length of mining operations, the presence of autumn-olive dominated plant communities, and woody vegetation recovery status on Appalachian mined areas. Our goal is to develop mined-land cover assessment methods that can be applied broadly across Appalachian mountain regions where coal surface mining occurs.

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