Assessing Physiographic Controls on Snow Accumulation and Vegetation Cover in Traditional and Geomorphic Mineland Reclamation Using Airborne Lidar and High-Resolution Satellite Data[1]

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Abstract: Physiographic variables drive landscape differences in pedogenic and ecological development in both natural and reclaimed landscapes by affecting the basic energy balance of sites. Simple variables like slope and aspect, as well as more integrative metrics derived from elevation data such as solar insolation can provide insights into hydrologic and ecological function important for successional development and reclamation performance. This analysis quantifies physiographic characteristics of mineland reclamation sites in central Wyoming[3] using digital elevation models derived from airborne lidar, comparing landscapes reclaimed using traditional and geomorphic reclamation techniques and relatively undisturbed landscapes. We quantify landscape heterogeneity, as driven by reclamation technique, and evaluate the consequences of physiographic differences on snow accumulation and post-reclamation vegetation cover as derived from analyses of high-resolution satellite imagery. Supervised image classification and machine learning algorithms are used to derive snow and vegetation cover data. These are then statistically compared between reclamation treatments, undisturbed controls, and field measurements of vegetation cover and functional type. Results provide inferences on post-reclamation ecological trajectories. More than a decade after reclamation, we found clear differences in treatments that were influenced by differences in landscape physiography and heterogeneity.

Additional Key Words: mine reclamation, remote sensing, restoration ecology, disturbed lands

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3. Work reported here was conducted near 42° 47' 20.4" N, 107° 40' 6.0" W.