# Development of Ecosystem Structure and Function on Reforested Surface-Mined Lands

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***Abstract:*** Surface mining in the central Appalachian coalfield disturbs landscapes. Post-mining reforestation efforts now achieve successful reestablishment and growth; however, it is unclear whether reforestation efforts also restore the native forest ecosystem functions. We quantified rates of return of key ecosystem functions and structural attributes of the post-mining forested ecosystem. A chronosequence of four reforested mine sites and an unmined reference stand were studied in southwestern Virginia. Total soil nitrogen (N) and component (mineral soil, forest floor, root, and aboveground biomass) ecosystem carbon (C) pools were quantified. Throughout the growing season, soil gas fluxes [i.e., carbon dioxide ($CO_2$), nitrous oxide ($N_2O$) and methane (CH4)], soil inorganic-N [nitrate ($NO_3^-$) and ammonium ($NH_4^+$)], and total and active microbial biomass were measured. Soil organic C (SOC) and total ecosystem C are returning to the mined landscape. Ecosystem C was correlated with N ($r= 0.80$; $p= 0.0003$) and with total and active microbial biomass ($r= 0.92$; $p=<.0001$ and $r= 0.86$; $p=<.0001$). Available soil inorganic-N and $CO_2$ and $N_2O$ fluxes showed no significant differences among study sites; however, the reforested mine soils showed a diminished capacity for $CH_4$ uptake. Although some ecosystem components and functions rapidly returned to the mined landscape, others did not. Our results indicate that reforestation on surface mined lands is largely successful at restoring many ecosystem functions, yet certain functions are decoupled from the redeveloping ecosystem structure. Improved understanding of relationships between ecosystem functions and structural measures in this context can aid development of ecosystem restoration science and mine reclamation practice.

***References:***

Avera B.N. 2015. Development of Ecosystem Structure and Function on Reforested Surface-Mined Lands. M.S. Thesis, Forest Resources and Environmental Conservation, Virginia Tech. (The above abstract is from that thesis).

Avera B.N., B.D.Strahm, J.A. Burger, C.E. Zipper. Development of ecosystem structure and function on reforested surface-mined lands. New Forests DOI 10.1007/s11056-015-9502-8

***Acknowledgments:*** The authors thank Powell River Project for funding this study.