Effects of Clearing Linear Features through Forest Patches in WV and VA

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Background

In recent years, interest in natural gas in the United States has greatly increased with the development of the Marcellus Shale Play, a gas reservoir that underlies several eastern states (Schumman et. al, 2012). This discovery has led to an increase in transportation infrastructure including large pipeline construction projects. Total forest lost is often the only metric used to quantify the impacts of pipeline construction; however, the ecological impacts of such projects may be much greater. Other factors such as increased fragmentation affect core forest and create edges, and these changes have impacts on ecological processes (Racicot et. al, 2014).

Objectives

Our primary objective was to quantify the impacts of pipeline construction on extant forest patches intersected by the Mountain Valley Pipeline by measuring these forest patch characteristics:

- Core area before and after pipeline construction
- Forest edge before and after pipeline construction
- Patch fragmentation before and after pipeline construction

Results

Forest Area Difference

Construction of the MVP corridor resulted in the removal of 1,182.6 ha (0.03% of forest).

Patch Fragmentation

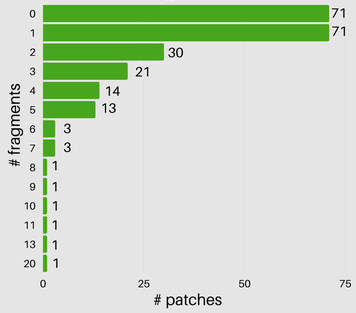
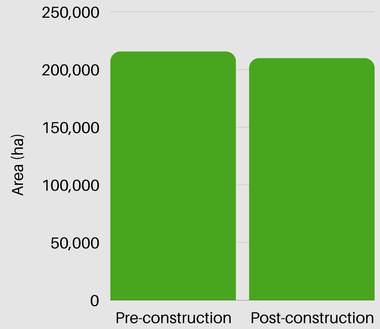


Figure 1: The graph above shows the patches that were fragmented by pipeline construction. There were 242 patches were affected by pipeline construction. Pipeline construction resulted in 667 patches. The average number of patches that resulted from the original patch was 2.9.

Photo of MVP by Heather Rousseau, The Roanoke Times

Core Forest

Figure 2: The total core forest area decreased by 5,781.3 ha (2.7%)



Edge Effects

Figure 3: Edge density increased from 0.0059 m/ha to 0.0062 m/ha (5.4%)

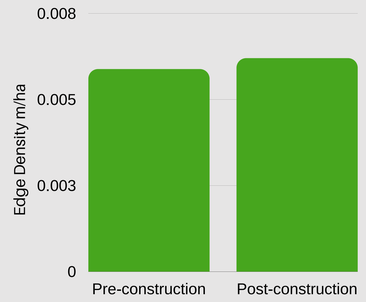


Figure 4: Average perimeter-area ratio increased from 0.049 to 0.2524

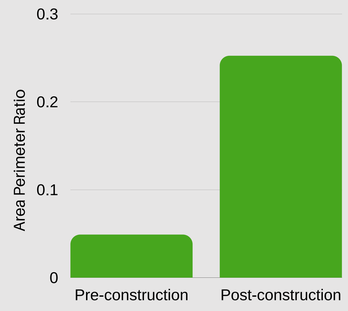


Image 1: pre- construction

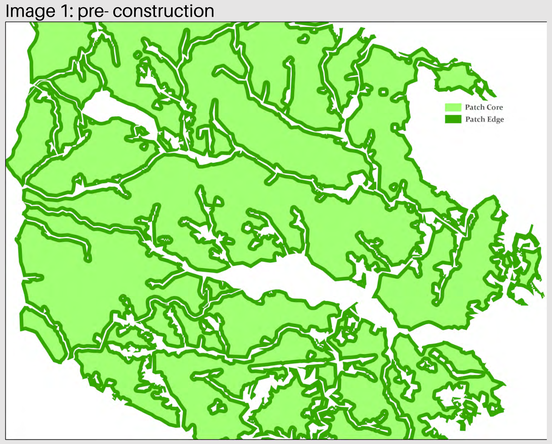
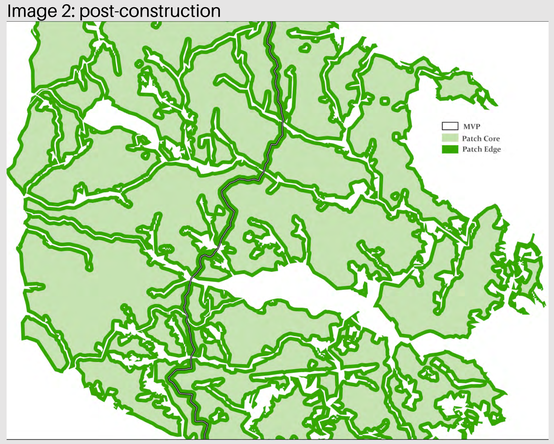


Image 2: post-construction



Images1 & 2: The images above represent a small portion of forest patches that intersect the pipeline. Image 1 shows the forest core and edge before construction. Image 2 shows how the pipeline creates smaller core patches and more edge.

Methods

1. We reclassified the 2016 NLCD so that the land that was identified as deciduous forest, evergreen forest, mixed forest, shrub/scrub, and woody wetlands could be combined to form a polygon layer that represented the forested areas in WV and VA.
2. We burned in the Mountain Valley Pipeline line segment into the new forest polygon layer to create a post-construction layer that determined where the forest has become fragmented from the pipeline.
3. We created core forest layers for pre- and post-construction by buffering the forest patch edge by -100m.
4. We calculated patch metrics in Microsoft Excel for the pre- and post-construction layers to determine the impacts of the pipeline.

Conclusions

- Only a small percentage of the forest area is lost, but an increase in edge and a decrease in core forest area are important, quantifiable impacts of pipeline construction.
- An increase in edge and decrease in core area can have drastic effects on ecological processes in the area (Porensky and Young, 2012, Ries et. al 2004).
- These larger quantifiable impacts should be considered in pipeline construction planning processes.

References & Acknowledgements

References:

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Ries, Leslie, et al. "Ecological Responses to Habitat Edges: Mechanisms, Models, and Variability Explained." Annual Review of Ecology, Evolution, and Systematics, vol. 35, no. 1, 2004, pp. 491–522.

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Acknowledgements:

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