

IMPACTS OF PATH SURFACES ON SURROUNDING VEGETATION

Walking down the Longs Peak Trail in Rocky Mountain National Park (Colorado) near the appropriately named Granite Pass, I looked at the path and thought, “This is not granite. Could it be volcanic tuff or are these flat pieces of cement?” Having scrambled over 1.4-billion-year-old Silver Plume Granite for most of the day, the path’s surface seemed peculiar. However, short of a Feng Shui discomfort in the 10th mile of the day with another five miles ahead, I dismissed the thought—until now. Reading Godefroid and Koedam (2004) made me recall this experience. I suspect I am neither alone in my thought nor is Rocky Mountain National Park the only park to have exotic surfaces. For instance, this study in central Belgium investigates an acidic beech forest that hosts a dense network of roads and paths with varying surface materials. Constructing paths with foreign materials is common on a global scale, and the lessons learned from this study could be applied broadly.

The investigators set up 50 sampling sites—10-meter (33') belt transects divided into 10 rectangular quadrants (10 m x 1 m [33' x 39"]). All the sites had the same soil type, topography, overstory species, and traffic intensity; hence, the variable was path surface. Investigators considered five types of surfaces: asphalt, cobblestone, dolomite, non-surfaced (native soil), and sand. Though the forest has concrete paths, these did not meet the prerequisite for selection. Additionally, in order to include a broad range of soil compaction values, investigators selected stands of trees of many different ages, as soil compaction and stand age have a positive correlation. The construction phase of paths accounts for compaction of both sides of the path, the disappearance of the most vulnerable species, and the development of plants adapted to this kind of disturbance (Godefroid and Koedam 2004).

Analysis of the 500 plots shows that path surfaces influence surrounding plant composition up to 10 meters (33')

Path surfaces influence surrounding plant composition up to 10 meters from the path.

from the path: plant traits and soil compaction were driving factors in the first 3 to 4 meters (10' to 13'); soil reaction and soil nitrogen affected the remaining distance.

Additionally, the pattern of vegetation shows plant preferences for particular surfaces. The study documents the following results: Spreading woodfern (*Dryopteris dilatata*) shows a strong bias for stands associated with non-surfaced paths. Small balsam (*Impatiens parviflora*),

yellow archangel (*Lamium galeobdolon*), and stinging nettle (*Urtica dioica*) are more frequent in the vicinity of cobblestone. The presence of field forget-me-nots (*Myosotis arvensis*), common plantain (*Plantago major*), and gypsywort (*Lycopus europaeus*) seems to be correlated to asphalt paths. Near the sand sample quadrant the close positioning of common gypsywort (*Veronica officinalis*) and pill sedge (*Carex pilulifera*) indicates that these species have a strong preference for this surface.

The surface with the most forest species was cobblestone. Moreover, it had the highest number of stress-tolerant (forest) species, but also the highest number of competitive and stress-tolerant ruderals—vegetation that commonly grows in disturbed areas. Bare soil paths had the most disturbance species but also the most competitor (forest) species. Dolomite was responsible for the disappearance of nitrogen-demanding species. It also had the most short-term species (seed bank persistence between one and five years) and abundant ruderals. Sand had the most long-term species (seed bank persistence greater than five years). Asphalt had abundant ruderals and the highest number of transient species (seed bank persistence less than one year).

In order to conserve ecological processes and minimize the spread of plants that threatens optimal development of forest vegetation, the authors recommend that efforts be made “to limit the use of the most detrimental surfacing materials,” in this case asphalt and dolomite.

Generally speaking, however, the presence of a path increases the number of ruderal species, disturbance indicator species, nitrogen-demanding species, and species that indicate chemically basic conditions. Hence, creating paths promotes a so-called “edge effect” where internal edges in the forest make its functional interior area smaller than its actual area. According to a previous study by the same authors, Godefroid and Koedam (2003), this effect “will likely enhance the spread of opportunistic species and might be a threat for conserving woodland flora.”

References Cited

- Godefroid, S., and N. Koedam. 2003. Distribution pattern of the flora in a peri-urban forest: An effect of the city-forest ecotone. *Landscape and Urban Planning* 65:169–185.
- Godefroid, S., and N. Koedam. 2004. The impact of forest paths upon adjacent vegetation: Effects of the path surfacing material on the species composition and soil compaction. *Biological Conservation* 119:405–419.

—Katie KellerLynn 

