

Soil Disturbance Study Executive Summary

History: The 2016 Soil Disturbance Study was the result of state and county forest certification audits in 2004/2005. During the auditory review, SFI and FSC auditors found that the Department did not have written guidelines regarding what level of soil disturbance that would be considered “acceptable” during forest management activities. Both the state and county agencies were tasked with developing “written and preferably quantitative guidelines for defining the limits of acceptable rutting on roads and trails”. To comply, DNR and County Forestry staff mutually sought to obtain guidance which balanced both science and practicality. The guidelines for excessive rutting were developed in 2006 and are shown in Table 1 below.

Infrastructure	Soil disturbance is excessive if:
Roads, Landings, Skid Trails and General Harvest Area	A gully or rut is 6 inches deep or more and is resulting in channelized flow to a wetland, stream or lake
Roads, Landings and Primary Skid Trails	In an RMZ or wetland, a gully or rut is 6 inches deep or more and is 100 feet long or more. In an upland area (outside of RMZ), a gully or rut is 10 inches deep or more and is 66 feet long or more.
Secondary Skid Trails and General Harvest Area	A gully or rut is 6 inches deep or more and is 100 feet long or more.

Table 1. Excessive rutting guidelines on state and county lands are divided into Infrastructure type.

The Soil Disturbance Study (SDS) was developed to monitor the success of the policy. This study was first performed in 2006 on state lands only; in 2011 and 2016 it was conducted for both state and county lands.

Methodology and Definitions: Transects were used to collect data and were based off timber sale acreage. Four data collection points were taken on each transect, each 300 feet long. There was a total of 225 transects completed, which included 900 data collection points that spanned those transects over 2,288 acres under state ownership and 1,795 acres under county ownership. Several variables were measured over transects including: infrastructure type, soil compaction, soil texture, ruts and gullies.

There are five infrastructure types: **General harvest areas (GHAs)**, **Secondary skid trails (SSTs)**, **Primary skid trails (PSTs)**, **Forest Roads**, and **Landings**. Infrastructure type was recorded for each transect data point. In addition, all PSTs, forest roads, and landings were measured separately so areas could be calculated. Soil compaction was measured with a soil compaction tester (penetrometer) that could measure soil resistance, in pounds per square inch (psi). Soil compaction readings were grouped into four readings according to their psi: 0-100, 100-200, 200-300, and 300+. Using the soil core, soil texture was determined into two layers below ground surface, from 0-4 inch layer and 4-8 inch layer. The soil samples were classified as either sand, clay, silt, or as organic matter.

A **rut** is an elongated depression caused by the dragging of logs, or from the movement of wheeled or tracked harvesting machinery and equipment. A measurable rut was one which, at some point, becomes greater than six inches in depth and is greater than five feet from depression start to depression end. The only ruts measured

were those found on infrastructure types such as; roads, landings, primary skid trails (PST), and on all transects. A **gully** is an erosion channel that cuts into the soil, forming a concentration of preferential water flow. Gullies were measured if they meet the same quantitative values and infrastructure types as ruts.

Results: 60 sites were monitored with 27 of the sites located on land under the stewardship of Wisconsin County Forests and 33 sites were located on state land and under the stewardship of the Department of Natural Resources.

The 900 data points collected on the transects were broken down into the following infrastructure types: 650 readings in GHAs, 221 readings on SSTs, 22 readings on PSTs, five readings on roads, and only two readings on landings. As was expected, soil compaction was correlated to infrastructure type. GHAs had the least amount of soil compaction where all but three percent fell into the lowest two compaction categories. SSTs had the second least amount of soil compaction followed by PSTs and both landings and roads contained the most amount of compaction.

The study identified 282 sand samples, 50 silt samples, 47 clay samples, and three organic matter samples. Soil types, like infrastructure categories, were correlated to soil compaction levels, but to a lesser degree. 28% of sand samples were in the lowest compaction category (0-100 psi) followed by silt (46%) and clay (64%), while organic matter had 100% of its samples in the lowest compaction category.

Recorded ruts and gullies were the lowest since the study started in 2006. Less than one-half of county sites (13 of 27 sites) and less than one-third of state sites (10 of 33 sites) contained ruts or gullies that were either recorded or observed. Ruts and gullies were most commonly found on PSTs for both state and county sites (7 and 19 respectively). However, just as in 2011, no soil disturbance, met the definition of “excessive” adopted by the state and county. The total length of ruts/gullies was 649 feet for state land and 1668 feet for county land. While these numbers may sound large this only equals 0.49% of total infrastructure length (PSTs, roads and landings) that contained ruts/gullies for state lands and 1.49% for county lands.

Seasonal restriction was also examined as it is one avenue a forester may use to lessen soil disturbance. State lands had 64.5% of sites seasonally restricted compared to county lands which had 59.1% of sites seasonally restricted. However, nearly 86% of the ruts on state lands occurred on sales with seasonal restrictions, which was close to the county level of 81.8%. The data shows the majority of rutting still happens under seasonal restrictions (frozen or dry soil) for both county and state lands. This would mean that selecting more sales to become seasonally restricted would potentially not see any significant decrease in the presence of ruts found on either state or county land.

Besides seasonally restricting sites, some timber sale contracts had additional “no-rutting” language added for emphasis or as a reminder. Only 14.3% of ruts that occurred on state land and 18.2% of ruts that occurred on county land when this additional language was listed in timber sale contracts.

Overall, the findings of this study were positive – soil disturbance of all types are on the decrease in Wisconsin. This study successfully quantifies the decrease in soil disturbances from 2006 to 2016, which met its intended goal of tracking soil disturbance after the establishing guidelines.