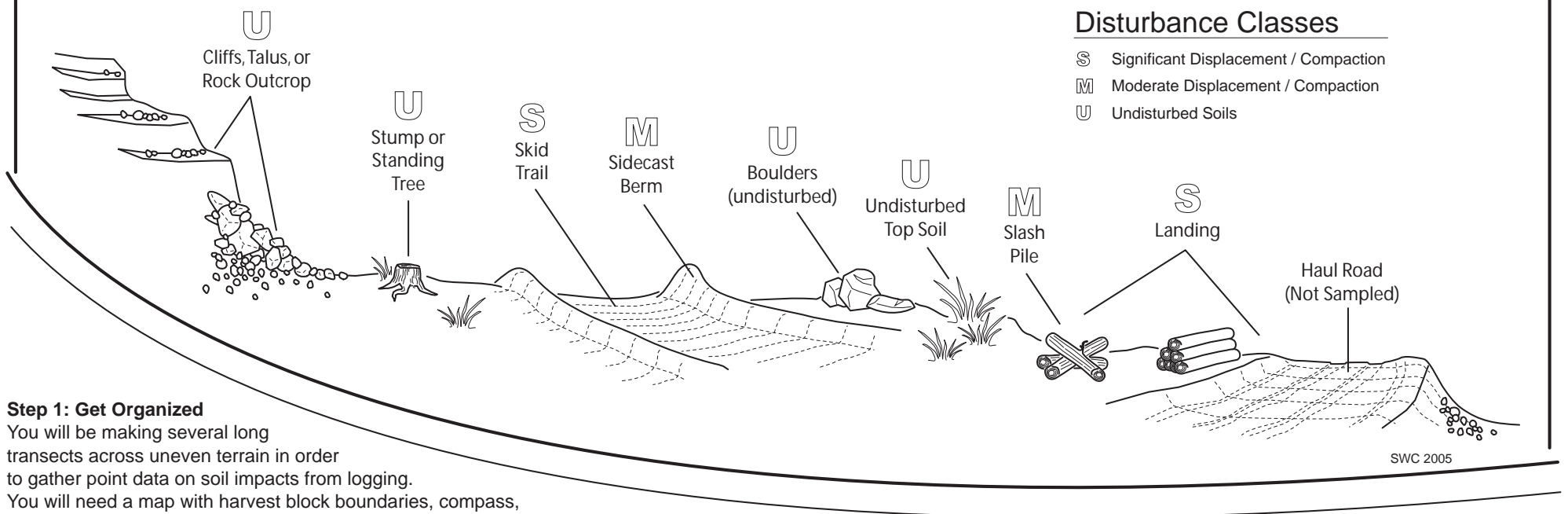


# Soil Impact Survey: A Field Method for Monitoring & Documenting Timber Harvest Impacts to Forest Soils of the Inland Northwest

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## Step 1: Get Organized

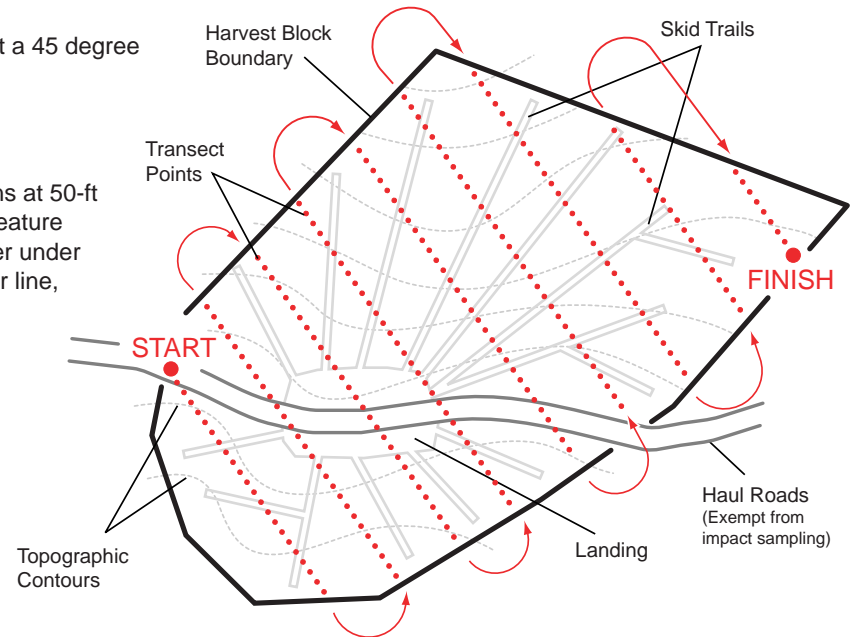
You will be making several long transects across uneven terrain in order to gather point data on soil impacts from logging. You will need a map with harvest block boundaries, compass, field sheets, and pencils for the transect work. Note on your field sheet the block number/name, date, and the transect bearing. Transects need to be oriented across the block on a compass bearing determined onsite or from a map. A good rule of thumb is to choose a bearing that takes you at about a 45 degree angle to the generalized fall line.

## Step 2: Collect the Field Data

With the bearing on your compass and field book in hand start your first transect. Each should be spaced approximately 50-75 feet apart and extend from boundary to boundary. Record disturbance class observations at 50-ft intervals (5-6 paces) along the transect line using "S", "M", or "U" notations corresponding to the landscape feature you encounter at each point. Think about each observation as being about a 2-ft diameter circle with its center under your boots (see Disturbance Class diagram). Move quickly and don't overthink the observation; just sight your line, walk 5 or 6 paces, look what your feet are standing on, and note an S, M, or U on the sheet. Stick to your bearing. Slash piles need to be fully accounted for, but physically sidestepped for efficiency. Make sure to resume your bearing line once on the other side. When you come to the edge of the block, take 50-75 paces along the boundary line and re-enter the block on the 180 degree reverse of your compass bearing. Repeat transects across the block and make sure to record about 300 observations. Haul road prisms, ditches, and haul road sidecast materials should be recorded with an "R", but do not factor into calculations.

## Step 3: Consolidate Data and Calculate Results

Total up your observations for each disturbance class and work through the basic calculations shown on the next page. An example is provided. The idea is to test your forest practices code "hypothesis" that states something about substantial soil impact, or sometimes called "detrimental impact". Usually this portion of the rules can be distilled or otherwise rendered into an areal percentage per block. The default value is 20%. That is, no more than 20% of the soils in a given harvest block can be left in a significantly or detrimentally impacted state following harvest of that block. Calculate X, the chi square statistical test, using formula provided. If it is larger than 3.84, then there is more soil impact than what is "expected", or more than what is permitted. If it is less, then impacts to soils are below what is expected, or less than the impact limitation.



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Unit	Definition	Equation	Example Block #1
n	= Total # of all points	S + M + U (exclude Haul Roads)	n = 289
S	= # of S points	From field sheet	S = 89
M	= # of M points	From field sheet	M = 93
U	= # of U points	From field sheet	U = 107
%S	= %S of n	S / n	%S = 31%
%M	= %M of n	M / n	%M = 32%
%U	= %U of n	U / n	%U = 37%
S-obs	= # of impact points	S	S-obs = 89
S-exp	= 0.20 x n	Hypothesis: 20% of each harvest block is expected to receive significant soil disturbance due to harvest	S-exp = 57.800
NS-obs	= # of non-impact points	M + U	NS-obs = 200
NS-exp	= Non-impact % expected	0.80 x n	NS-exp = 231.200
P-value	= 0.05	Level of significance (fixed value)	P-value = 0.05
X	=	Chi square test equation; Solve for X	chi (x) = 21.051
df	= 1	Degrees of freedom (fixed value)	df = 1
a)	= 3.84	Critical value (fixed value)	a = 3.84
Ho	= If X is greater than 3.84, then reject null hypothesis		Ho (x > a) = Rejected

Example Calculation --

$$\frac{(S_{obs} - S_{exp})^2}{S_{exp}} + \frac{(NS_{obs} - NS_{exp})^2}{NS_{exp}}$$

$$\frac{(89 - 57.800)^2}{57.800} + \frac{(200 - 231.200)^2}{231.200}$$

$$\frac{(31.2)^2}{57.800} + \frac{(-31.2)^2}{231.200}$$

$$\frac{973.44}{57.800} + \frac{973.44}{231.200}$$

$$16.841 + 4.210$$

21.051

this is greater than 3.84, so Reject Null Hypothesis

\*\* This method measures areal percentage of individual harvest blocks (excluding the area occupied by haul roads) which receive substantial topsoil displacement and surface compaction (significant loss of soil function). Transects should be performed immediately following harvest of the block. The method is conservative because the impact/non-impact threshold is set high. Impacts considered significant are limited to only those which occur inside the traveled track portion of skid trails (not sidecast berms) and log landings. These two areas routinely receive multiple passes by the tracks, tires, and blades of heavy equipment in the usual course of yarding, arranging, and loading harvested logs from the block. Haul roads are exempted from the calculations because they are considered part of the road transportation system, rather the yarding system. Environmental impacts resulting from the transportation network are more appropriately assessed through other methods (road maintenance inventories, road density calculations, erosion studies, etc.).

\*\* If your own forest practices code specifies or infers a different "acceptable impact percentage" (based on % area per harvest block), then substitute that value into S-exp (expected significant impact hypothesis). Change S-exp and NS-exp coefficients accordingly and re-run the calculations. For example, if 40% was the acceptable impact percentage, then S-exp equation becomes