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MN Soil Disturbance Guidelines

Rutting: A Depressing Issue



Rutting Affects:



- Aesthetics
- Biology
- Habitat
- Hydrology
- Site productivity



- **Rutting occurs when soil strength is not sufficient to support the applied load from vehicle traffic**

Soil Factors Affecting Extent of Compaction and Rutting



- Soil texture
- Soil moisture content
- Soil structure
- Stone content
- Duff layer thickness
- Woody debris

Rutting: Uplands Compared to Wetlands

- Uplands
 - Compaction and rutting
 - Opportunities to restrict impacts to site infrastructure
 - Options to mitigate rutting impacts (e.g., ripping, grading)
- Wetlands
 - Compression (shallow and deep organics) and rutting
 - Prevention is the key
 - Few options for mitigation

Rutting Standards – State Guidelines

Rutting References in State Guidelines

Region (Number of States with State Guidelines)			
North (20)	South (13)	West (16)	Total (49)
Road & Skid Trail Construction & Maintenance			
12	5	11	28
Restricting Rutting in General harvest Area			
13	10	7	30

States that Provide a Measure for Rutting

Roads	Skid Trails	General Harvest Area
CA, MN, TX, NC	DE, MD, MN, WI	CA, MA, MN, NH, PA, RI, SC, TN, TX, WI

Measures for Upland Roads

State	Measure
California	> Normal expected following light rain
North Carolina	6" for > 50' in length
Texas	6" for > 50' in length

Measures for Wetland Roads

State	Measure
Minnesota	6" for > 300' in length

Measures for Upland Skid Trails

State	Measure
Delaware	6" for 50', 18" for 50', back blade
Maryland	6" for 50' for slopes $\geq 5\%$

Measures for Wetland Skid Trails

State	Measure
Minnesota	6" for > 300' in length, do not bisect small wetlands
Wisconsin	>6"

Measures for General Harvest Area of Uplands

State	Measure
California	> normal expected following light rain
Massachusetts	6" within 200' of vernal ponds; no rutting within 200' of streams
New Hampshire	6" within 200' of vernal ponds
Pennsylvania	6" within 200' of vernal ponds
Rhode Island	6" within 200' of vernal ponds
South Carolina	> 10" deep (excessive)
Tennessee	> 10" deep (for SMZs) (excessive)

Measures for General Harvest Area of Wetlands

State	Measure
Minnesota	> 6" repeated
Wisconsin	> 6"

Rutting Depth – Research Studies

- C.W. Martin. 1988. NJAF.
 - Deep rut: >12 in.
- J.A. Burger and Y. Xu. 2001. Report to US Dept of Energy.
 - Shallow rut: < 8 in.
 - Deep rut: > 8 in.
- T.W. Lister. 1999. M.S. thesis.
 - Shallow rut: \leq 8 in.
 - Deep rut: > 8 in.
- D.L. Kelting. 1999. Ph.D thesis
 - Shallow rut: < 8 in.
 - Deep rut: > 8 in.

What is "Excessive" Rutting?

Excessive Rutting



- Commonly prohibited in contracts
- Often prohibited in guidelines
- Rarely defined in either contracts or guidelines
- Two components
 - Depth of impact
 - Spatial extent of impact

States that Reference or Infer Excessive Rutting

Degree of rutting	States	# of states
Excessive	AR, DE (CZMA), FL, GA (fire), IL, IN, IO, KA, KY, LA, MN, MS, OH, OK, PA, SC, TN, TX, VA, WA, WI	21
Significant	GA, NC	2
Severe	MD, WY	2

Excessive Rutting Defined

States	Definitions
Kentucky	A point where ruts cannot be resurfaced with available equipment
Louisiana, Mississippi, South Carolina, Texas	The determination of excessive rutting is highly subjective and must be made by a licensed forester or other qualified professional experienced in local logging operations, soil types, and site conditions.
South Carolina	> 10" deep
Tennessee	On wet soils, > 10" deep in SMZs



Defining Rutting in Minnesota



Why Specify Rutting Standards

- Limited direction specified in current guidelines
- Logger / harvester request for consistent standard
- Certification requirements
- Need to restrict impact below maximum threshold

Rutting in Wetlands

“So what’s the problem? It’s
still a swamp!”

Example 1 - Decorative Tree Harvest



- Decorative trees in bags

Typical site conditions when harvesting decorative tops and Christmas trees



- Unfrozen peat (activity typically occurs between late September and early December).
- Lower evapotranspiration.
- Near saturated surface conditions.



Equipment for Decorative Tree Harvest



Rutting Impacts on Fragile Sites



“Acceptable” Impacts



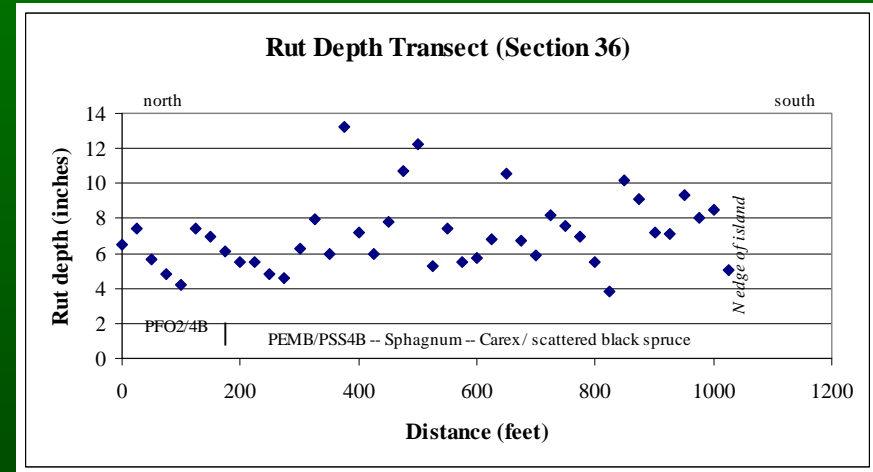
- Compression or cutting of hummocks

“Unacceptable” impacts



- Tearing or cutting of peat fiber mat and churning up of decomposing peat

Substantial Rutting Along Trail Segment



Crossing Lagg or Flowage Area



- Avoid crossing if at all possible
- Plan approaches for minimal impacts
- Use shortest route possible
- Approach at 90° to long dimension of lagg or flowage area
- Do not turn equipment while crossing

Crossing Lagg or Flowage Area



- Use lightweight equipment (e.g., tracked ATV)



Crossing Lagg or Flowage Area



- Use temporary crossing materials where appropriate (e.g., biodegradable mats, corduroy, pallets)
- Remove man-made materials at end of harvest
 - Safety and liability issue
 - Provides crossing opportunities for ATV traffic

Example 2 – Winter Spruce Harvest



- East Rat Root River Peatland – Littlefork Area

Rutting Aesthetics



winter of harvest



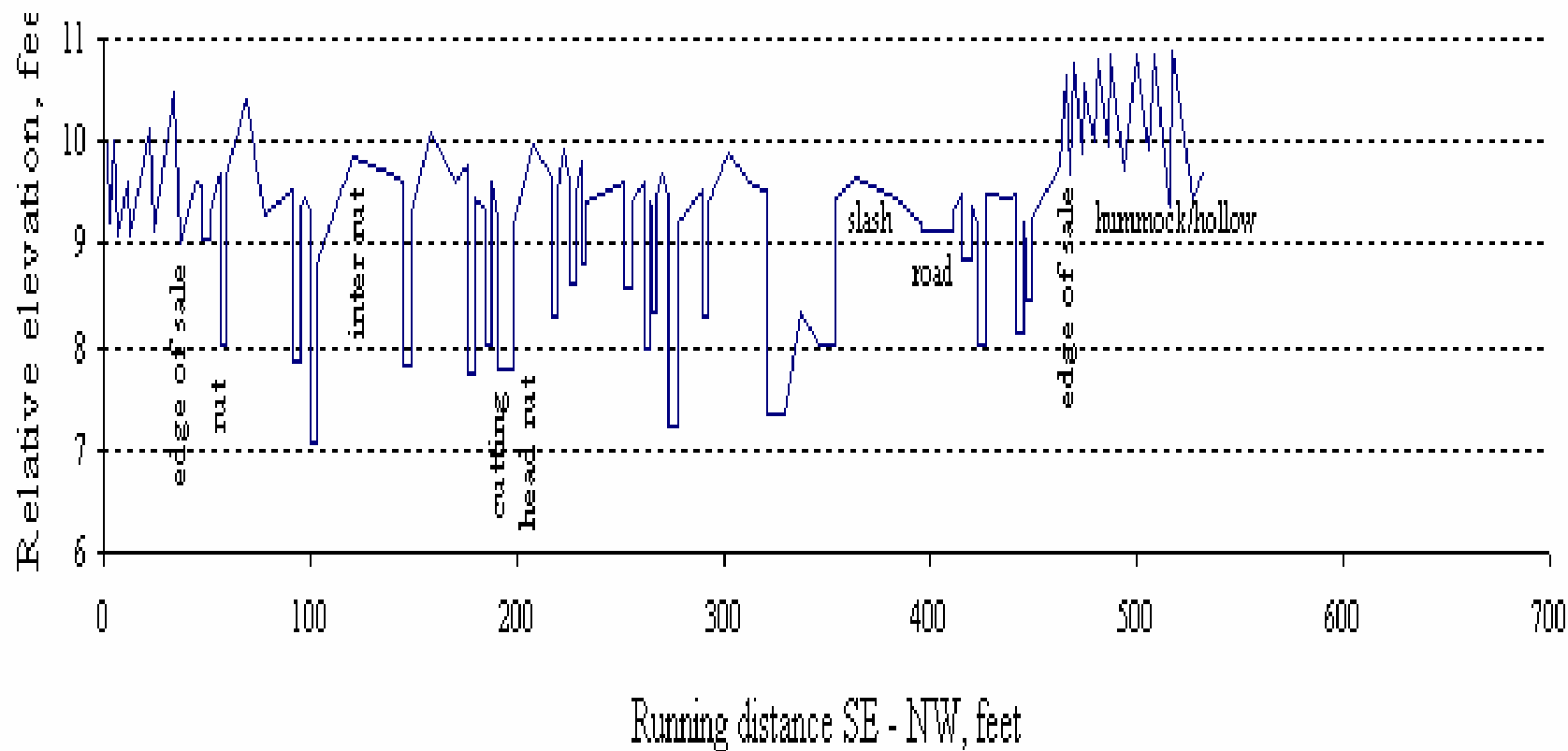
softened by following
fall after harvest

Hydrologic Impacts

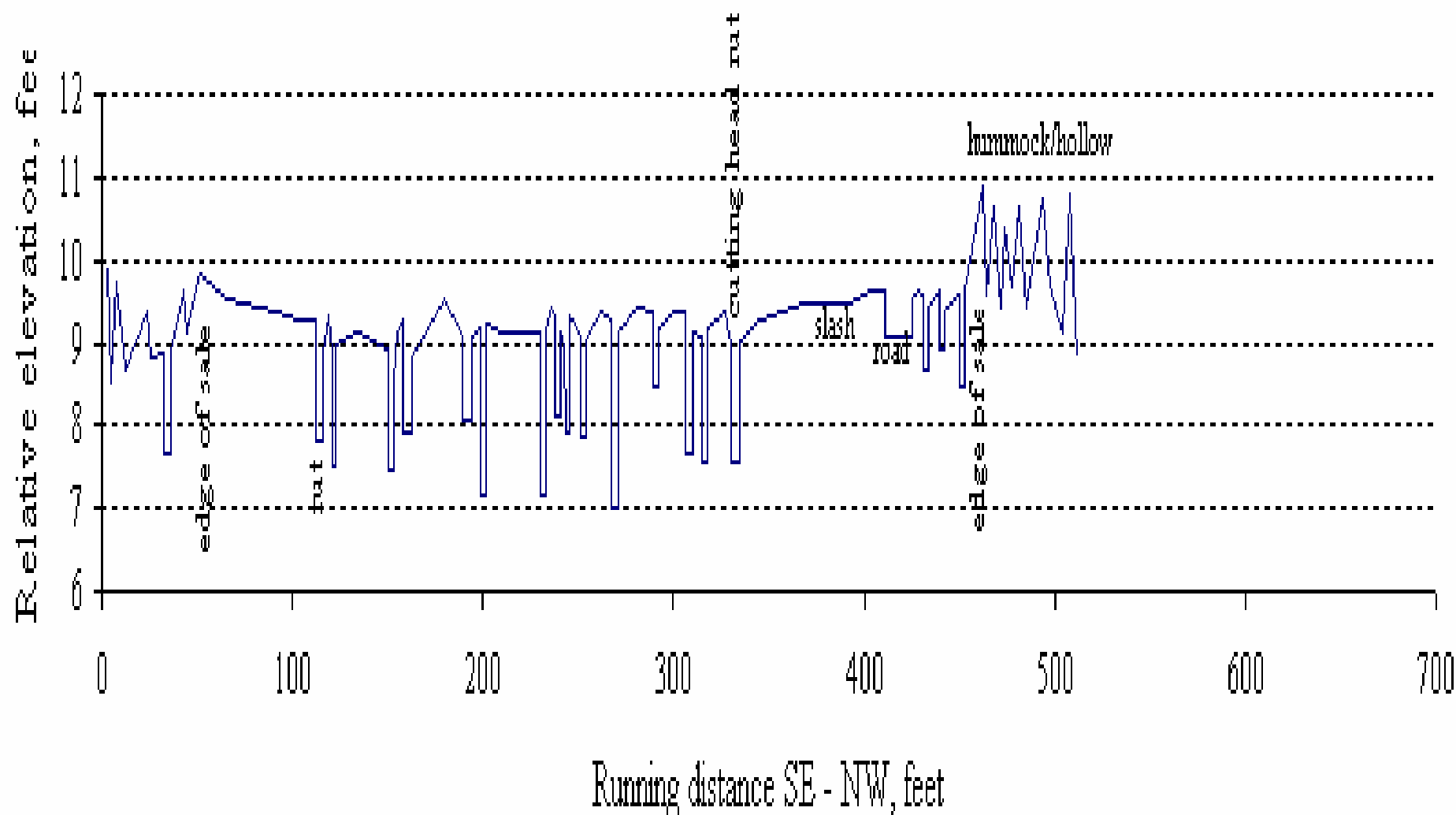


Change in the hydrologic flow of the peatland, change may be subtle and difficult to measure

Ray Peatland, Transect 1 -- squared ruts



Ray Peatland, Transect 2 -- squared ruts



Rutting data related to transects from timber harvests in the East Rat Root River Peatland

Transect number	Rutting depth (mean in inches)	Rutting depth (range in inches)	Ruts (number)	Rutting along transect (percent)
1	16	7-27	22	24.7
2	15	7-26	19	14.8
3	12	2-25	17	15.4
Walking			30*	23.0**

* Average of 34, 34, and 23 ruts for the three "walking transects

** Used average width of majority of ruts from Transects 1, 2, and 3 to calculate rut width

Site Productivity Impacts



- Severing of roots
- Diminished rooting environment

Site Productivity Impacts



- Cutting and mounding of sphagnum
- Serves as seedbed
 - Surface may eventually dry out and desiccate
 - Regeneration could be stunted or die

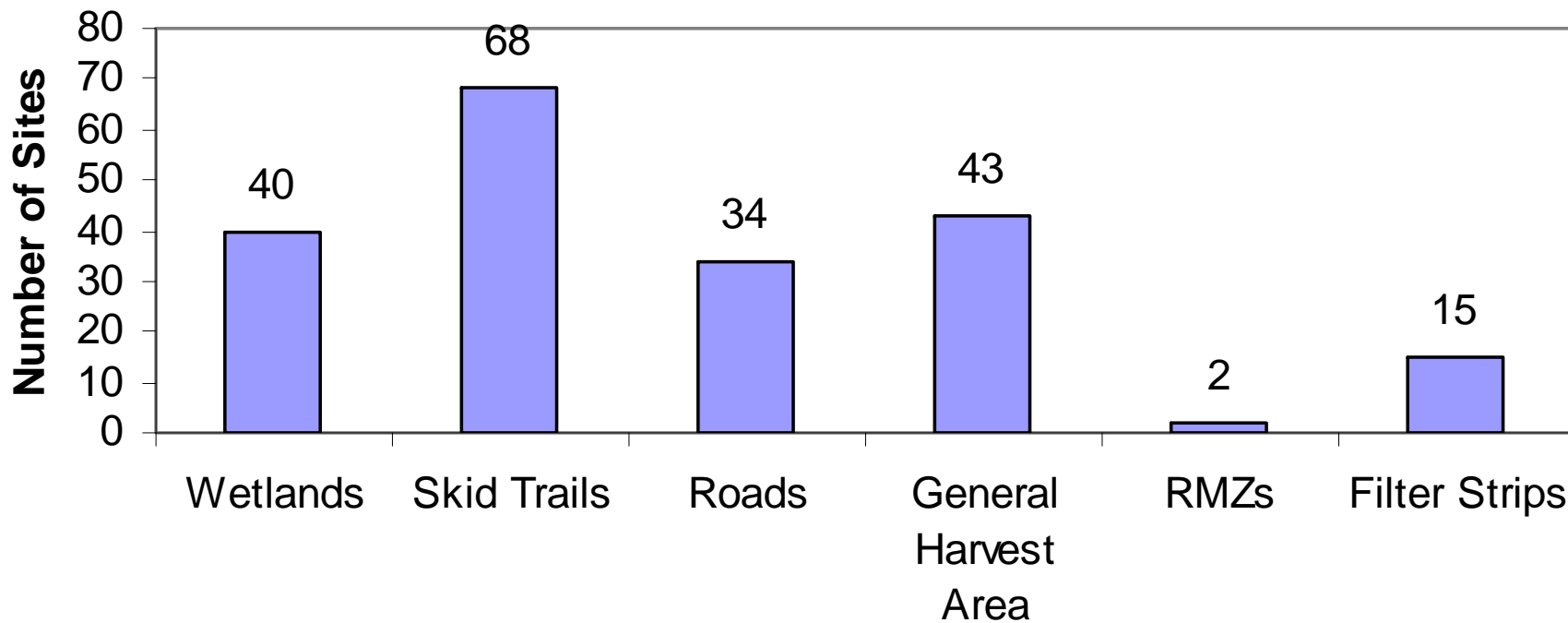
Site Productivity Impacts



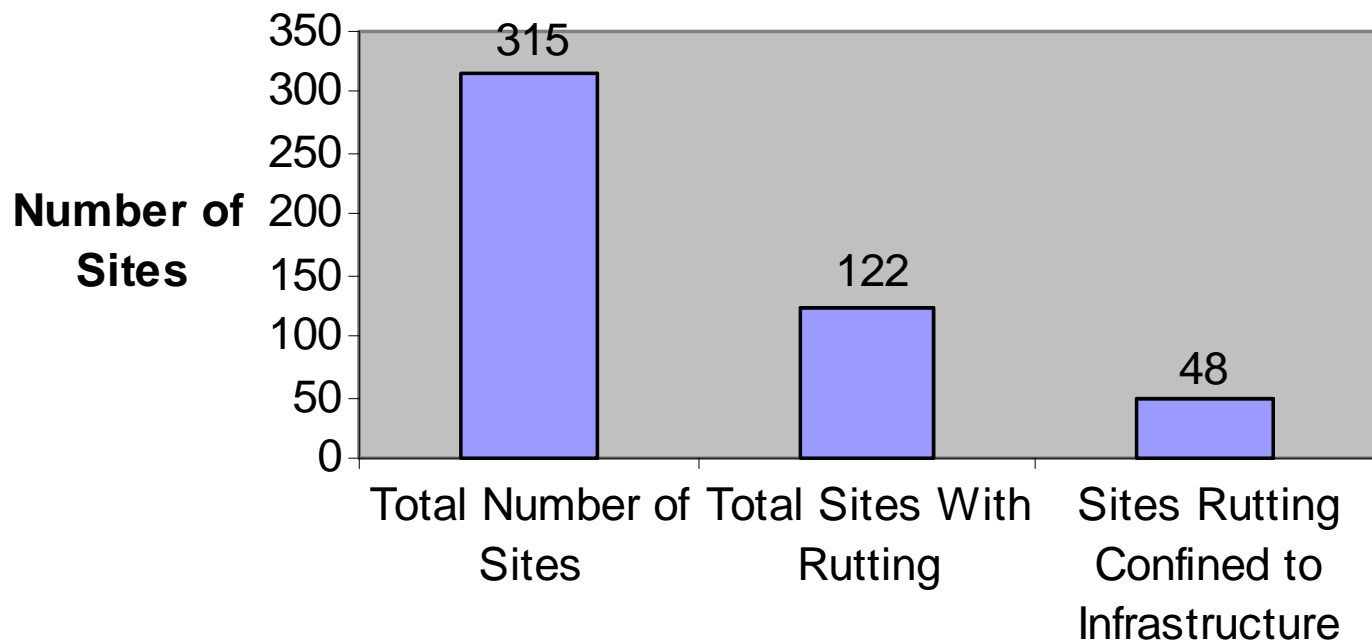
- Surface ponding of water
- Lower oxidation depth and change to more of a reducing environment (higher redox)
- Lower temperatures, moister site
- Change in species – sedges
- Potential reduced spatial rooting zone and, thus, eventual increase in windthrow

Minnesota Rutting Statistics

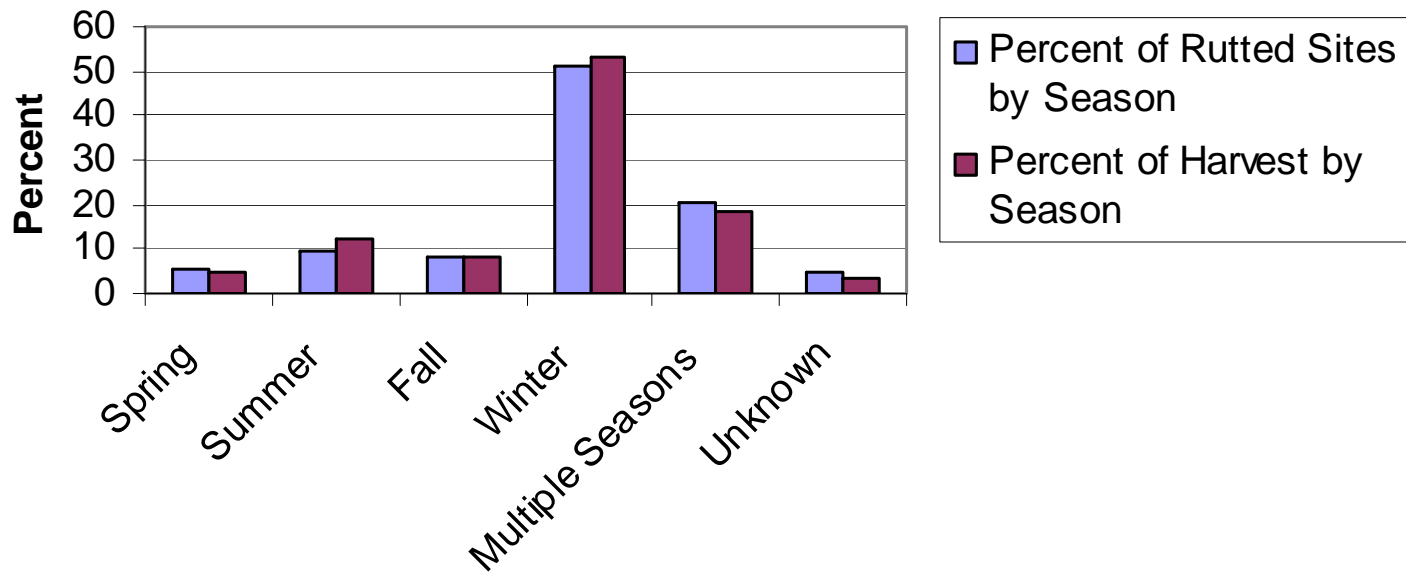
Site Features Where Rutting Was Observed (2000, 2001, 2002)



Sites Where Rutting Was Observed (2000, 2001, 2002)



Season of Harvest vs. Rutting (2000, 2001, 2002)



DNR Rutting Standards

Feature	Rut depth	Spatial extent
Wetland roads	$\geq 6''$	$\geq 300'$ contiguous or $> 50\%$ of wetland width, whichever is less
Skid trail (uplands)	$\geq 6''$	$\leq 10\%$ of total skid trail length and shall not exceed 50' for any 200' section
Skid trail (wetlands)	$\geq 6''$	$\geq 300'$ contiguous or $> 50\%$ of wetland width, whichever is less
Forwarder trail (decorative trees)	$> 6''$	Not to exceed cumulative total of 300' for each mile of trail

DNR Rutting Standards – General Harvest Area

Feature	Rut depth	Spatial extent
Uplands	$\geq 6''$	Not to exceed average of 200'/acre/site with max of 400' for any one acre.
Wetlands	$\geq 6''$	Not to exceed average of 200'/acre/site with max of 400' for any one acre. In addition, rutting shall not exceed 50% of width of wetland.

Rutting Caveat

Prior to reaching these levels of rutting, it is expected that logger/resource manager will apply the appropriate suite of guidelines to reduce rutting so that the maximum extent is not reached

Rutting Summary and Implications

- Science has not provided the information to establish definitive standards.
 - Rutting depths: arbitrary
 - Rutting lengths: arbitrary
 - Spatial extent of rutting: arbitrary
- Experience suggests a hesitancy to enforce standards.
- Rutting could affect the ability to become or remain certified.

Rutting Summary and Implications

- Develop and promote methodologies to evaluate the extent of rutting on forest management sites.
- Managers need to consider a future with the trend to warmer winters and the implications that suggests for timber harvests, particularly in peatlands.
- Develop white paper on implications for soil disturbance based on future warming trends.

Questions????

- How do we define a rut and rutting?
 - Individual tracks?
 - From outer edge of track to outer edge of track?
- To what extent should rutting be permissible?
 - Percentage of a site rutted (max average % / total site)?
 - Max rutting allowed for any one acre?
 - Percentage of timber sales rutted to a specific degree?
 - Percentage rutted for specific site resources?

Questions???? (con't)

- Can we certify forestland and not address rutting effectively?
 - Establish measurable standards.
 - Enforce standards.
 - Outcome based
 - Specify conditions, equipment, and psi limitations