Linking Anthropogenic Influence To Landscape Disturbance Patterns

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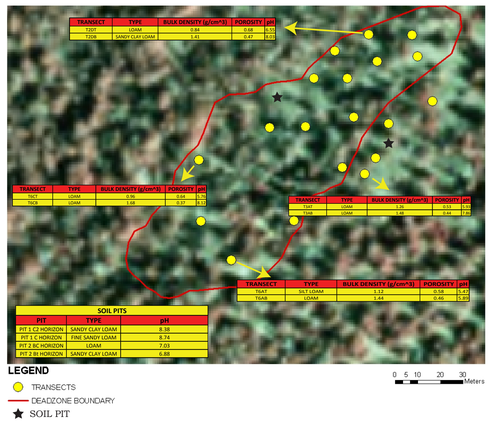
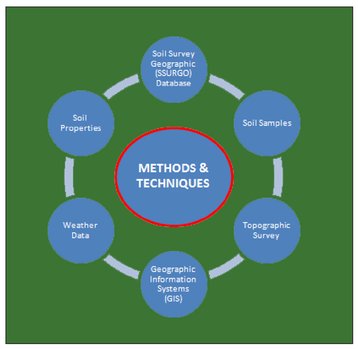
ABSTRACT

This work concentrates on anthropogenic landscape disturbance by investigating the relationship between a small logging trail easement established in 1986 and a subsequent concentrated area of frequent tree fall occurrences thereafter; this areas is now referred to by the landowners as the 'dead zone'. Results from this study permitted the identification of tree felling as a result of two factors: wind and soil. The techniques employed in the quantitative modeling provide a better understanding of significant geological/geographical features from a physical and anthropogenic perspective. Of equal importance, the results from this study established a systematic and quantitative tool kit to identify tree fell behavior that can be used in a wide variety of other important terrestrial environments.

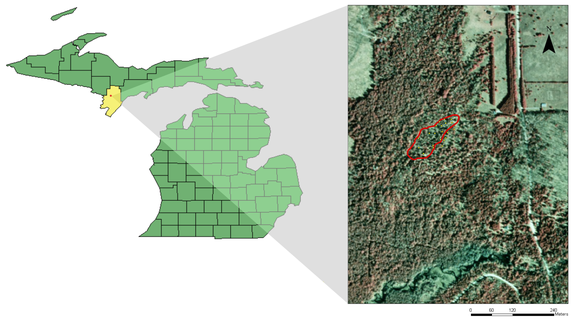
PIT 2	DEPTH (in)	HORIZON	Bnd	MATRIX COLOR MOIST	ROCK KND% RND SZ	STRUCTURE GRADE SZ TYPE	CONSISTENCE MST
	0-3	O	C/S				
	3-14	A	C/S	10 YR, 4/1	0	GR,2,FINE-MEDIUM	VFR
	14-19	E	G/S	7.5 YR, 7/2	0	PLATY,2,FINE-MEDIUM	VFR
	19-33	B/E	G/W	7.5 YR, 4/6	0	GR,2,FINE-MEDIUM	FR
	33-45	BT1	G/S	10 YR, 4/4	0	SUBANGULAR-BLOCKY,2, FINE-MEDIUM	FR
	45-70	BT2	G/S	10 YR 3/4	5%, MED COURSE GRAIN	SUBANGULAR-BLOCKY,1/2, FINE-MEDIUM	FR
	70-89	2 BT/C1	G/I	10 YR, 4/6	30%, COURSE GRAVEL/COBEL	SUBANGULAR-BLOCKY,1/2,MEDIUM-FINE	FR
	≥ 89	2 BT/C2	NA	10 YR, 4/4	60%, LARGE COARSE GRAVEL, SOME COBEL	SUBANGULAR-BLOCKY,1/2,MEDIUM-FINE	FR
PIT 1	**DEPTH (in)**	**HORIZON**	**Bnd**	**MATRIX COLOR MOIST**	**ROCK KND% RND SZ**	**STRUCTURE GRADE SZ TYPE**	**CONSISTENCE MST**
	0-4	O	AS				
	4-16	A	GS	5 YR,3/1	0	GR,2,FINE-MEDIUM	FR
	16-21	AB	GW	7.5 YR,4/2	0	GR,2,FINE-MEDIUM	FR
	21-26	BW1	GW	7.5 YR,5/3	0	GR,2,FINE-MEDIUM	FI
	26-31	BW2	GW	7.5 YR,5/8	0	GR,2,VERY FINE-FINE	VFR
	31-40	BW3	GW	7.5 YR,4/6	2%,SCATTERED,FEW ROUNDED	GR,1,VERY FINE-FINE	VFR
	40-53	2 BC	GW	7.5 YR,4/6	15%,SCATTERED,FEW SUBROUNDED	GR,1,VERY FINE-FINE	FI
	53-63	C1	G/S	7.5 YR,6/5	50%,SCATTERED,FEW SUBROUNDED	GR,1,VERY FINE-FINE	FI
	≥63	C2	G/S	7.5 YR,5/4	25%,SCATTERED,MANY SUB	GR,1,VERY FINE	VFR

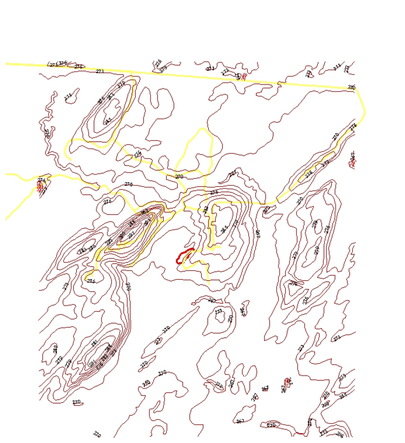


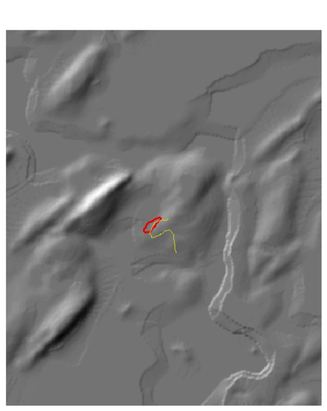
METHODS AND TECHNIQUES



STUDY SITE: MENOMINEE COUNTY, MICHIGAN





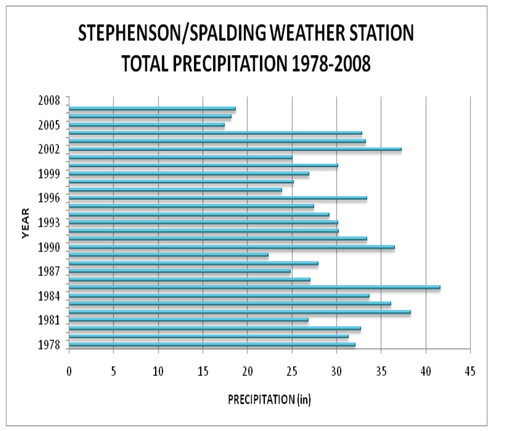


A Digital Elevation Model (DEM) representing the extensive drumlin fields found near the study site. Soils within the drumlins are a sandy loam glacial till and are part of the Onaway-Solona soil series

SOIL PIT 2 (Outside 'Dead zone' Boundary)

SOIL PIT 1 (Inside 'Dead zone' Boundary)

SOIL PIT 1 SHORTLY AFTER EXCAVATION REPRESENTING A HIGH WATER TABLE DURING THE MONTH OF MAY



TREE SAMPLE USING POINT QUARTER METHOD					
HIGHGROUND		DEADZONE		LOWGROUND (CEDAR SWAMP)	
Genus	Relative Density %	Genus	Relative Density %	Genus	Relative Density %
Populus	35	Picea	25	Abies	22.5
Prunus	7.5	Prunus	12.5	Populus	7.5
Picea	17.5	Abies	56.25	Thuja	55
Abies	40	Betula	6.25	Betula	10
Total	100	Total	100	Fraxinus	5
				Total	100

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CONCLUSION

While there is much work remaining with this study, progress was made. After a preliminary round of fieldwork at the site in May 2008, it was clear the road easement played a large role in the mortality issue in regards to windfall. The trees in question were subject to tree throw as a result of exposure to wind speeds that are capable of uprooting the tree. This means the trees must somehow be exposed downwind from an area that previously had enough friction to slow down the wind, such trees on a ridge jutting above the landscape surface or, as another example, when there are trees exposed to heavy winds after an area upwind lost its tree cover. The subsequent result of high winds amounted to high rates of mortality over the course of more than twenty years in an area described by the landowners as the 'dead zone', an area muddled with uprooted trees and remnants of a once thriving spruce (Picea) and poplar (Populus) community.

The susceptibility of a tree to falling depends mainly on its exposure to high wind speeds and soil's ability to hold the roots of that particular tree in place. Sometimes, when the soil is deep and bond well with the roots, trees will simply snap in half like a match stick. However, more commainly, the tree roots will fail to hold and the entire root mass is upended with the tree, referred to in the literature as tree-throw. It was with idea in mind that led to soil sampling along several transects, both within and outside of the delineated boundary of the dead zone. It is our belief, contrary to our hypothesis, that the soils were not the issue based on both physical and chemical properties. This consensus was approached with two ideas in mind: 1) Soil tests proved there was not a root restrictive layer that impeded downward movement of tree roots and 2) The root system of the black spruce is shallow, with most in the upper 8" of organic soil.

With these thoughts in mind, it is of great interest to revisit the site and begin collecting data that was unattainable due to funding restrictions and time. Future studies will result in the following: 1) Wind data; 2) Tree ring samples; 3) Build upon GIS data.

Through activities such as mining, logging, and agriculture, humans are increasingly changing the face of the landscape. Although anthropogenic impacts have received a considerable amount of attention in the research community, the actions of small-scale anthropogenic landscape disturbance are often overlooked. Consequently, to the best of our knowledge, no component of research to date has linked tree-throw to small-scale anthropogenic disturbances such as the effects of creating a logging road easement.