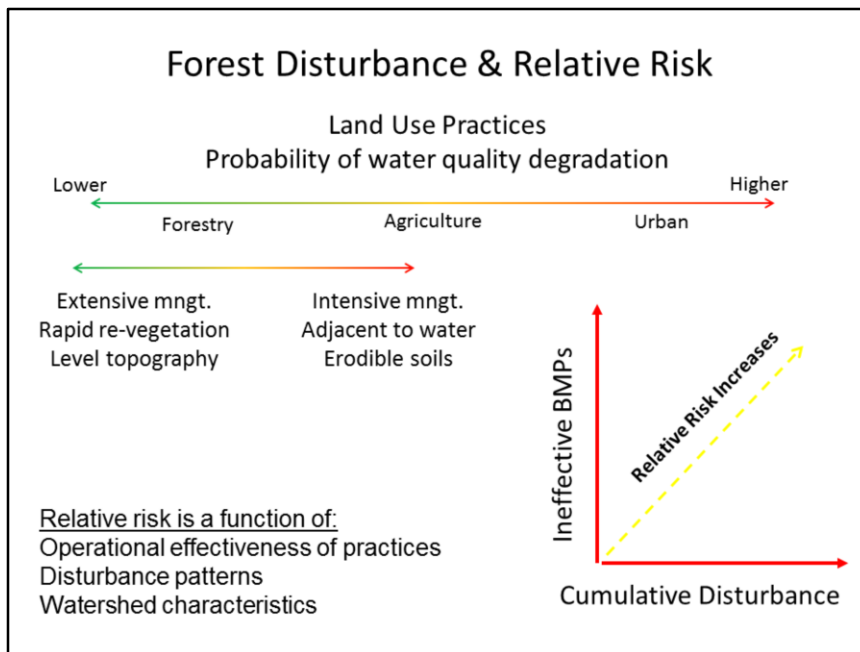


**Assessing Relative Risks for  
Water Quality Concerns  
in Forest Management**

Jennifer Corcoran, MN DNR  
Guideline Monitoring Program  
Cooperative Forest Management Unit



Emphasize relative nature of assessment. Not to quantify actual risk per se, more of a mechanism to target resources to watersheds which have the greatest potential risk among all of them.

## Risk Assessment Approach

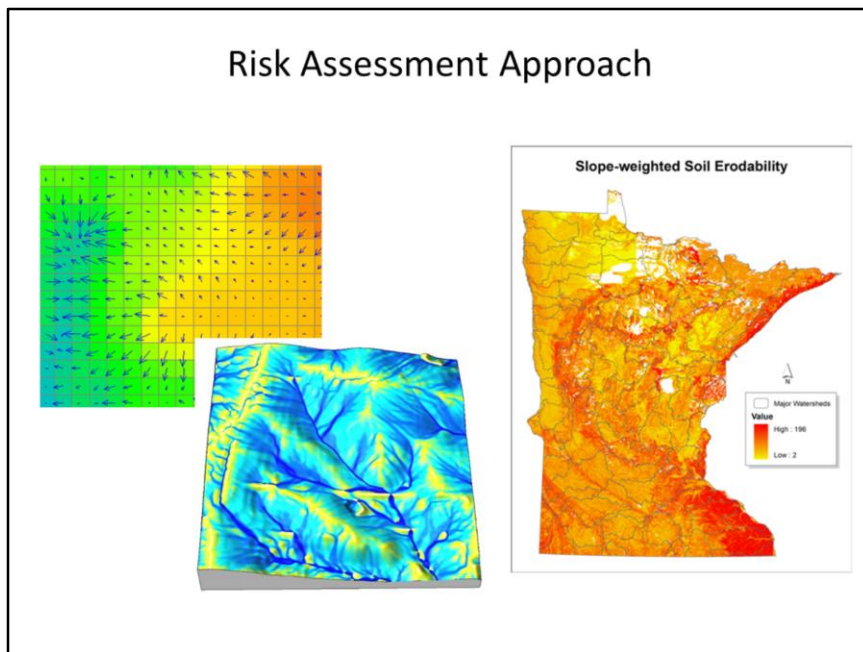
$$R = \sum A + C + N$$

R = Relative Risk to Water Quality

A = Human Activity (Harvest, Land Use Change, etc)

C = Physical Characteristics (Scale dependent - Site, Catchment, Watershed)

N = Acts of Nature (Fire, Blowdown, Flood, Invasives)



**THREE MAIN SOURCES OF DATA ARE UTILIZED: Topographic (slope, flow direction, and flow accumulation), Soils (K factor), and Waters/Wetlands (Streams, Lakes/Ponds, and Open Water Wetlands).**

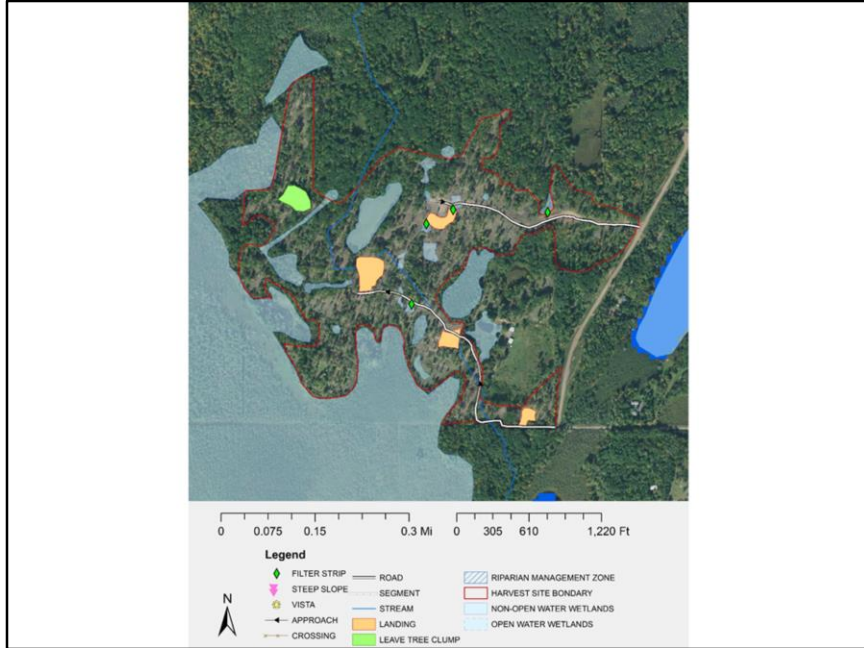
**3-4 main products are created: Distance to Water, Stream Power Index, Compound Topographic Index, and Slope-Weighted Soil Erosion Potential.**

“SPI is calculated as the product of the natural log of both slope and flow accumulation. High SPI values displayed in GIS represent areas on the landscape where high slopes and flow accumulations exist and thus areas where flows can concentrate with erosive potential”

“CTI is the quotient of both slope and flow accumulation. It can show areas on a landscape that pond and store water, and is therefore useful for locating potential wetland locations.”

“K factor is soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff... Soils high in clay have low K values because they are more resistant to detachment. Coarse textured soils, such as sandy soils, have low K values too, because of low runoff even though these soils are easily detached. Medium textured soils, such as the silt loam soils, have a moderate K values because they are moderately susceptible to detachment and they produce moderate runoff.

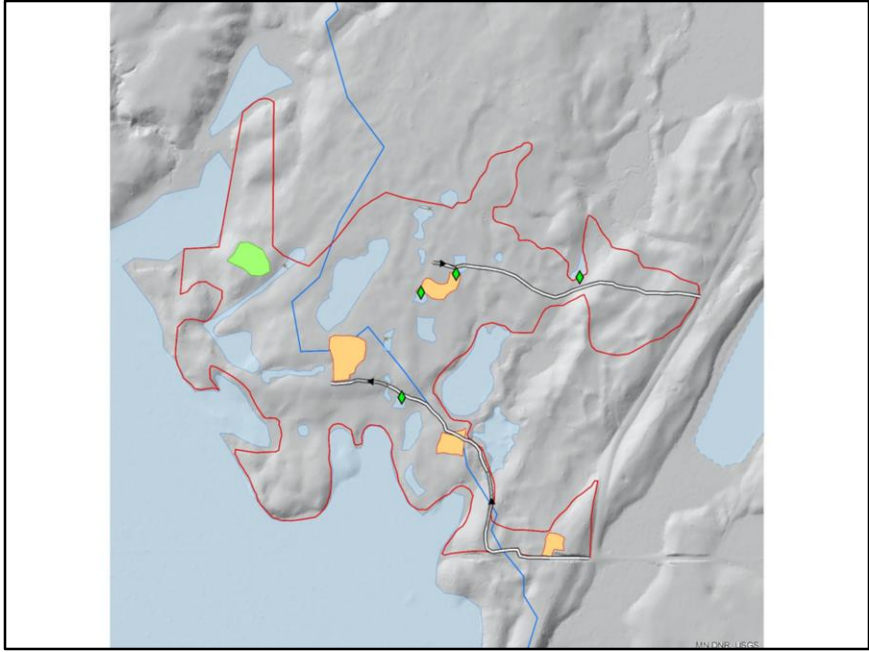
Soils having a high silt content are most erodible of all soils because they are easily detached and tend to crust and produce high rates of runoff.”



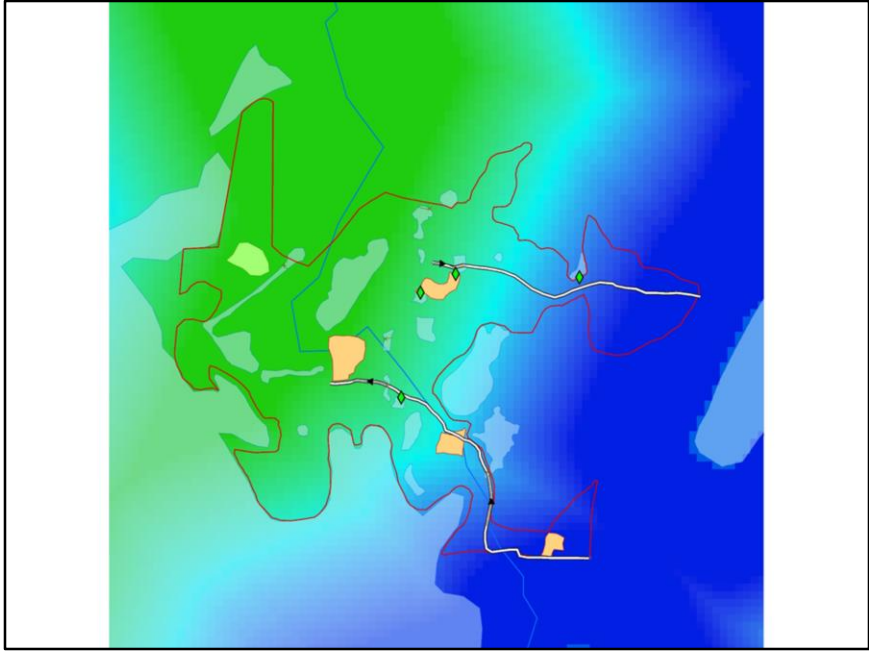
Site 12145, in the Kettle River Watershed, monitored in 2016. Had erosion issues on two of the three segments.



Site 12145, in the Kettle River Watershed, monitored in 2016. Had erosion issues on two of the three segments.



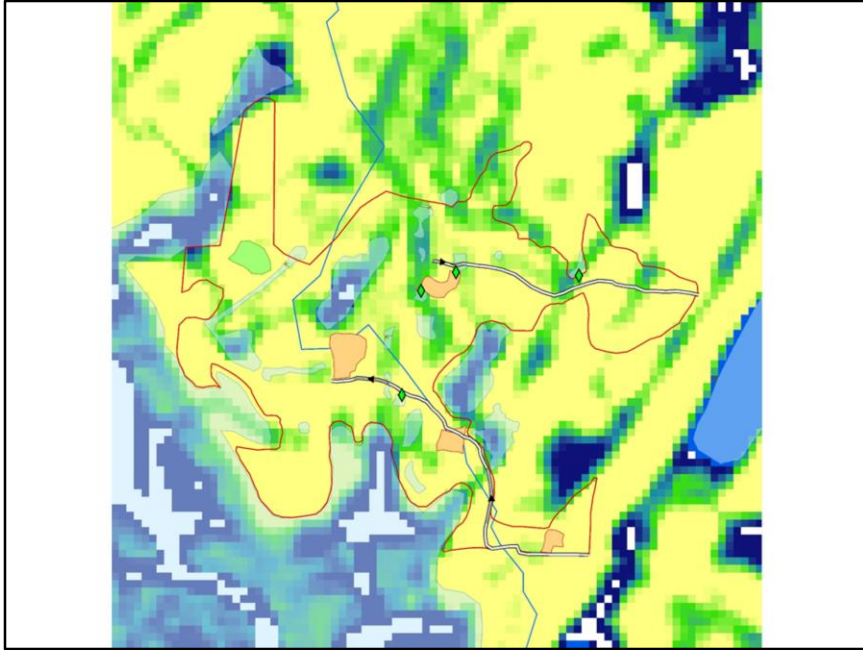
Hillshade – lidar derived



Distance to water – blue is closer than green



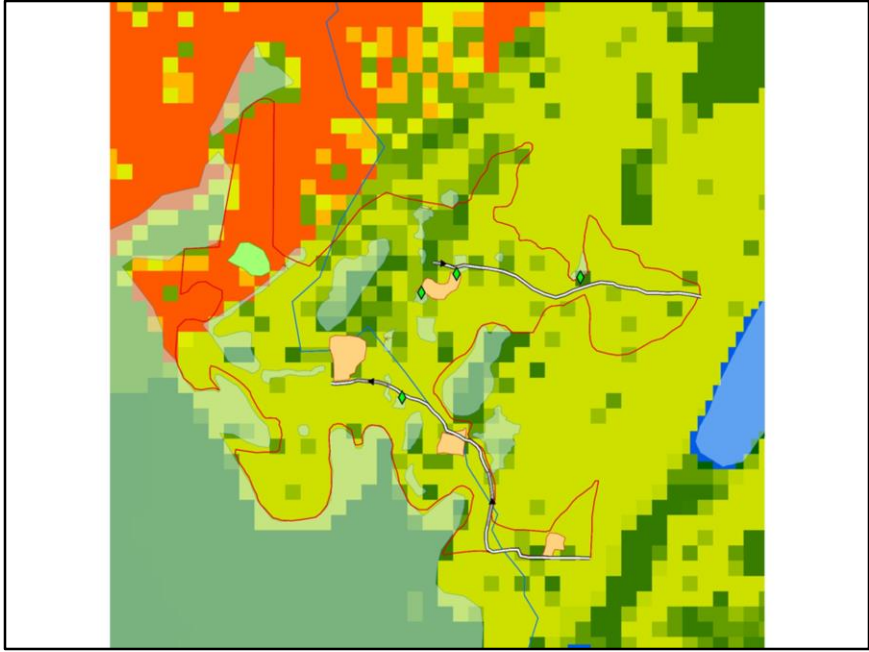
Stream Power Index – the lighter the color, the higher the “stream power”



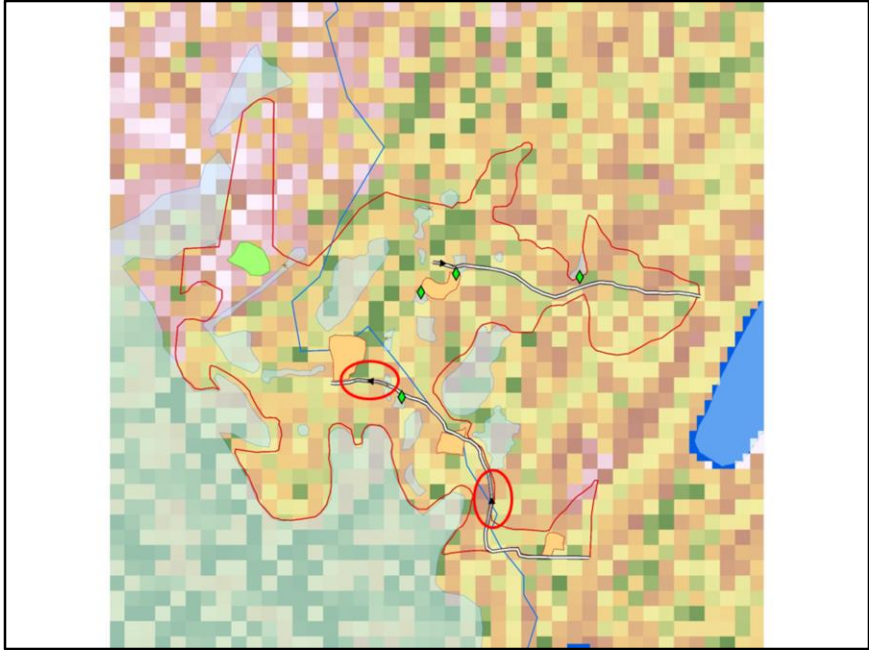
Compound Topographic Index, aka potential wetness – the bluer the color, the higher the potential for wetness (scale goes from green->blue/white)



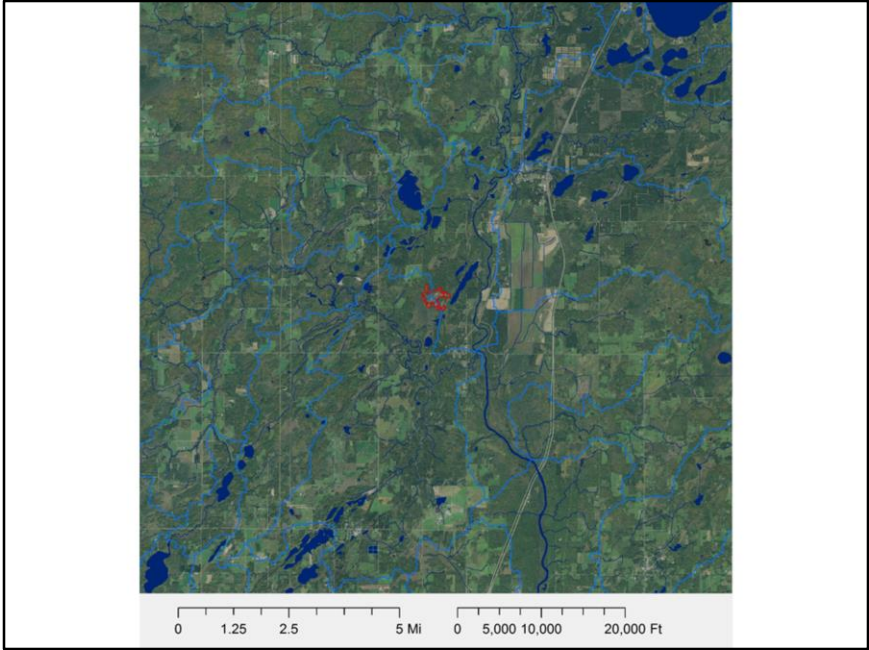
Relative Risk Model #1, incorporating only CTI, SPI, and Distance to Water. Estimated volume of eroded soils: 59 ft<sup>2</sup> and 71 ft<sup>2</sup>, expected to continue

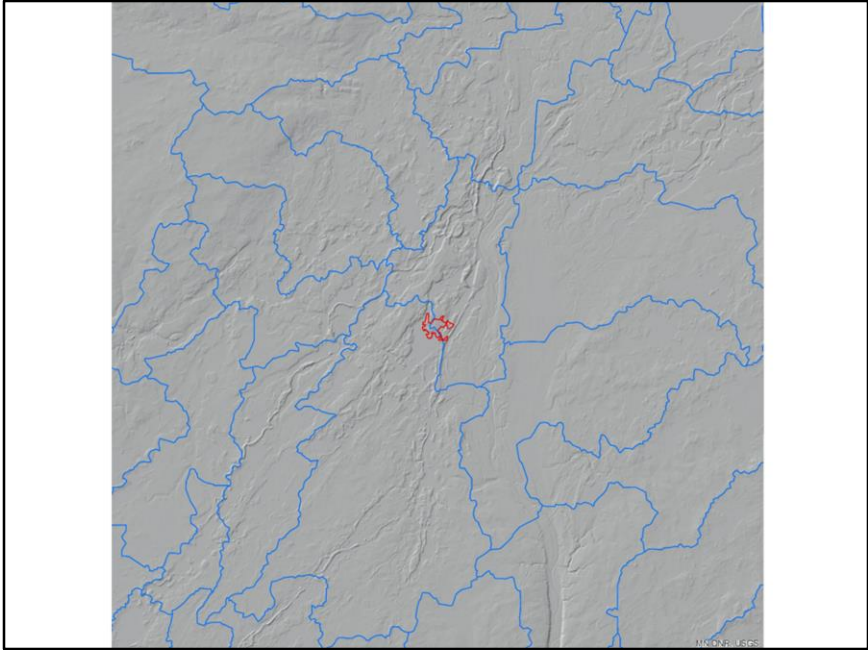


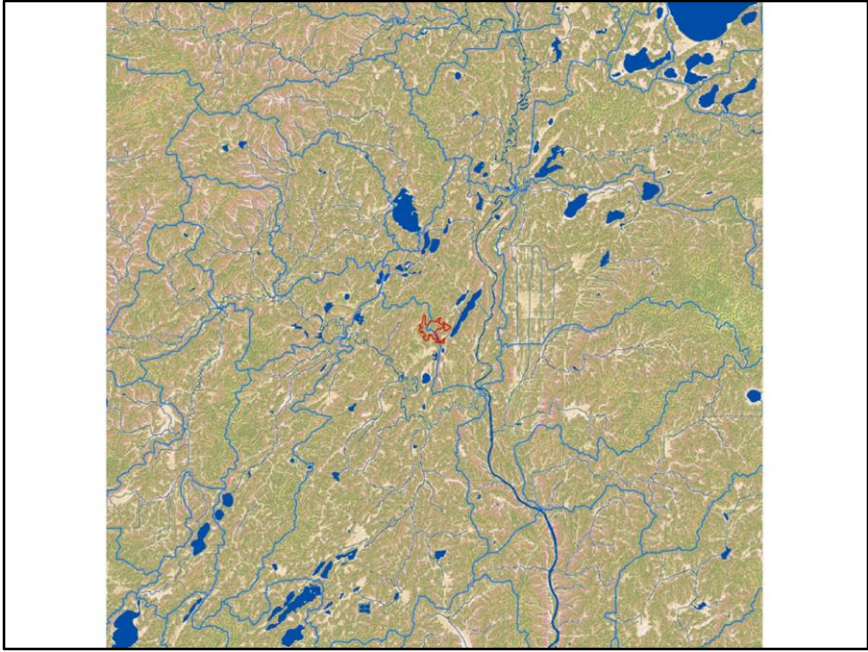
Slope weighted K factor -> Soil Erosion Potential

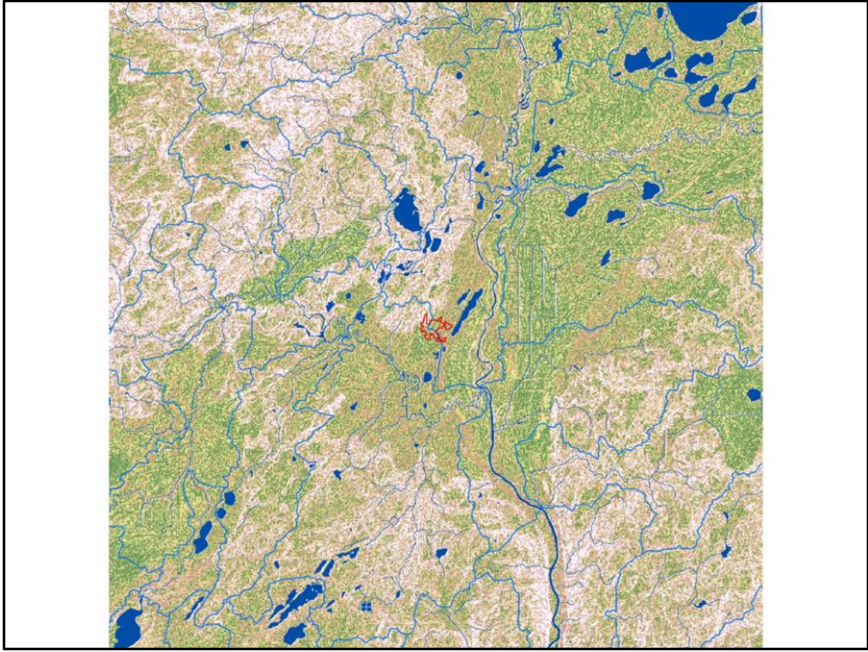


Relative Risk Model #2, incorporating soil erosion potential as well as CTI, SPI, and Distance to Water

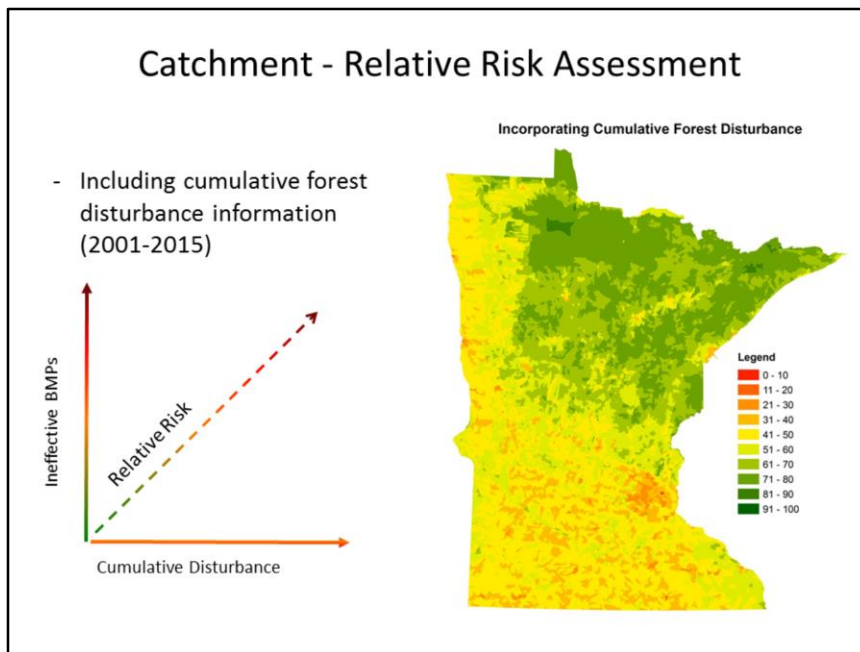








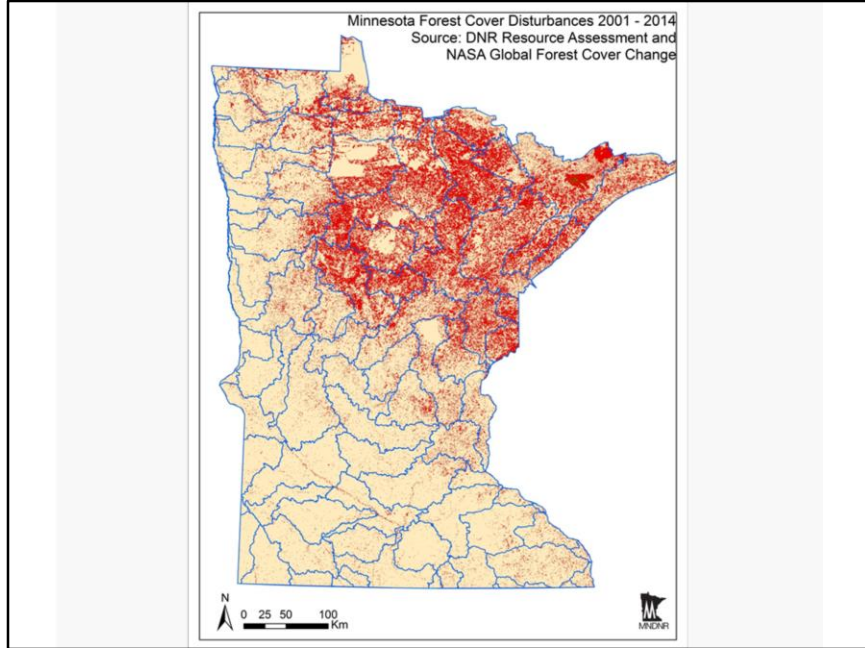
## Catchment - Relative Risk Assessment



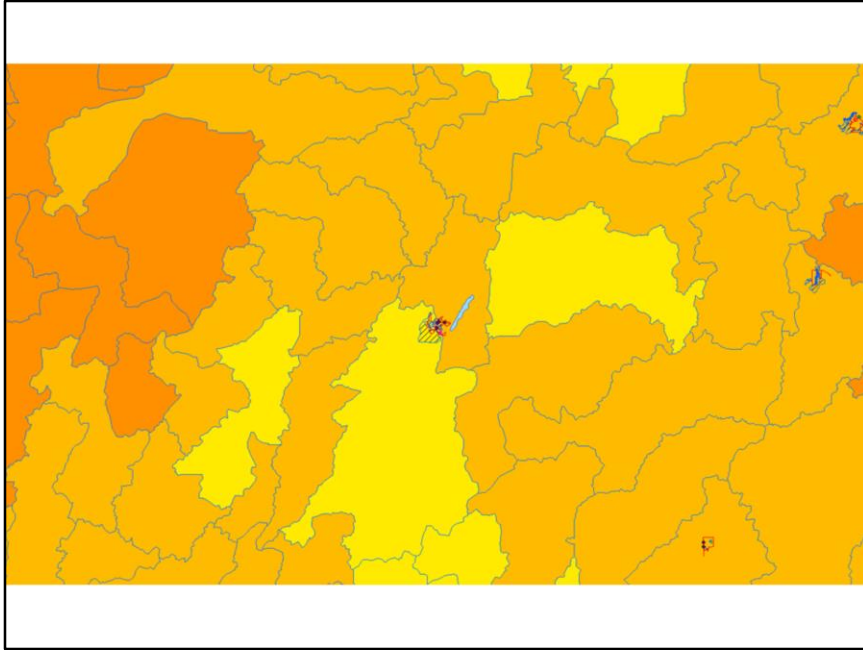
WHAF data layers include: Perennial Cover Remaining, Impervious Cover, Soil Erosion Potential, Aquatic Connectivity, Riparian Connectivity, Terrestrial Habitat Index, Point Source Index

Other layers included: road/stream crossing density, compound topographic index, and cumulative forest disturbance.

Emphasize relative nature of assessment. Not to quantify actual risk per se, more of a mechanism to target resources to watersheds which have the greatest potential risk among all of them.



What happened? What's the rest of the story here? What's the disturbance type, what impacts may have been made? Who else uses/needs/wants this data? DNR EWR, DNR FAW, WRAPS, TNC, UMN, SFEC, EPA, USFS...



Selected WHAF layers + CTI -> risk model – with cumulative disturbances

Thank you!



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