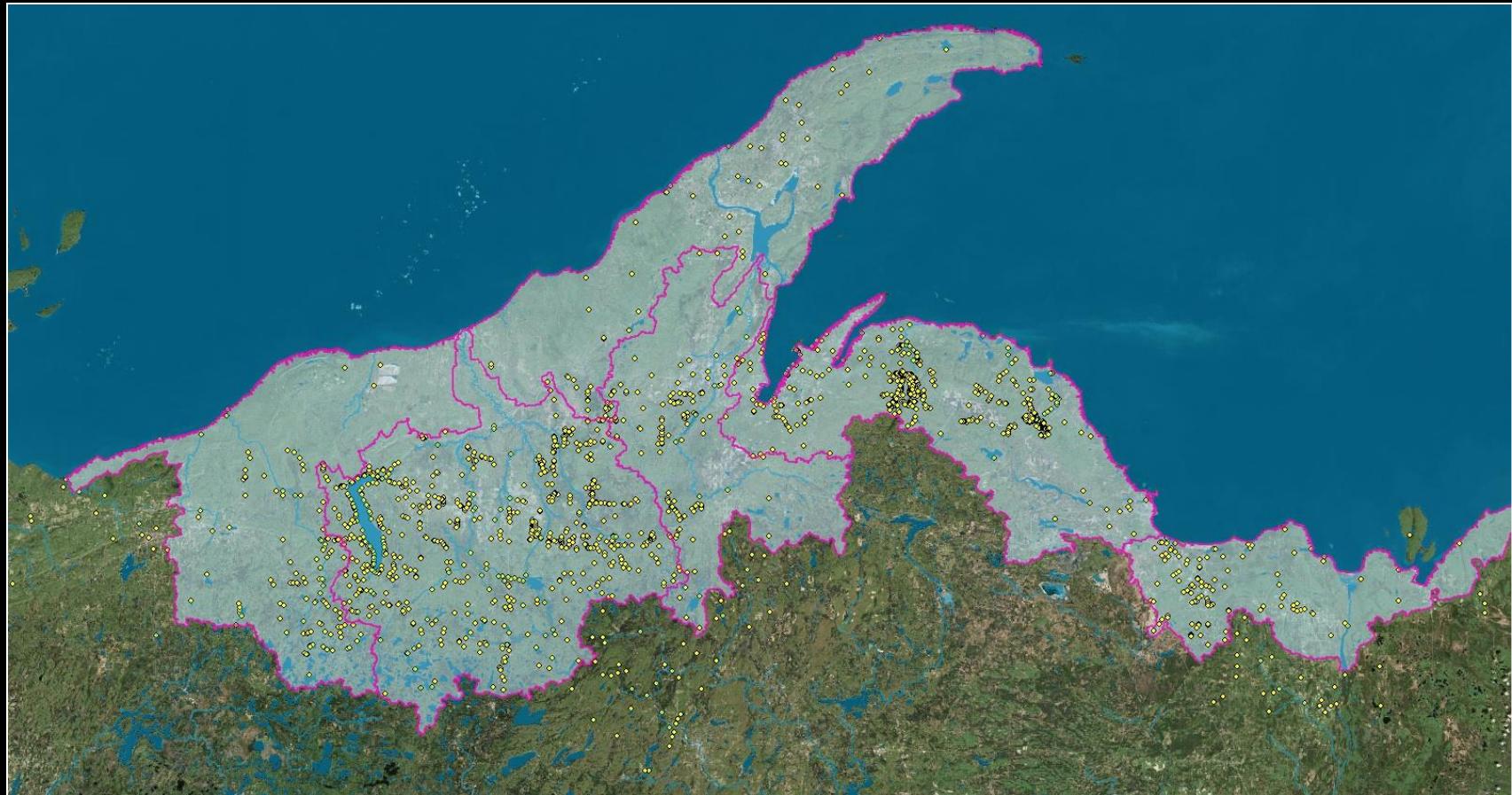


LCC Project Update: Geodatabases & Spatial Models

Tools for Watershed Restoration



Erin Johnston & Luís Veríssimo - KBIC

PRESERVATION OUTLINE



**Introduction – LCC Project
Project Area
Partner Contributions
Guidelines for Standardized Protocol
Overview of Geodatabases
Overview of Spatial Models
Next Steps**

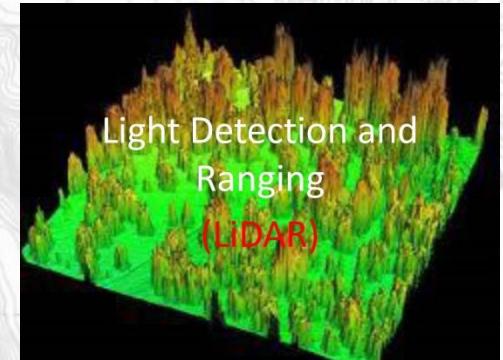


INTRODUCTION

USFWS
Landscape Conservation Cooperative
July 1, 2014 – September 30, 2016
COLLABORATIVE RESTORATION OF
AQUATIC RESOURCES IN THE
SOUTH CENTRAL
LAKE SUPERIOR BASIN

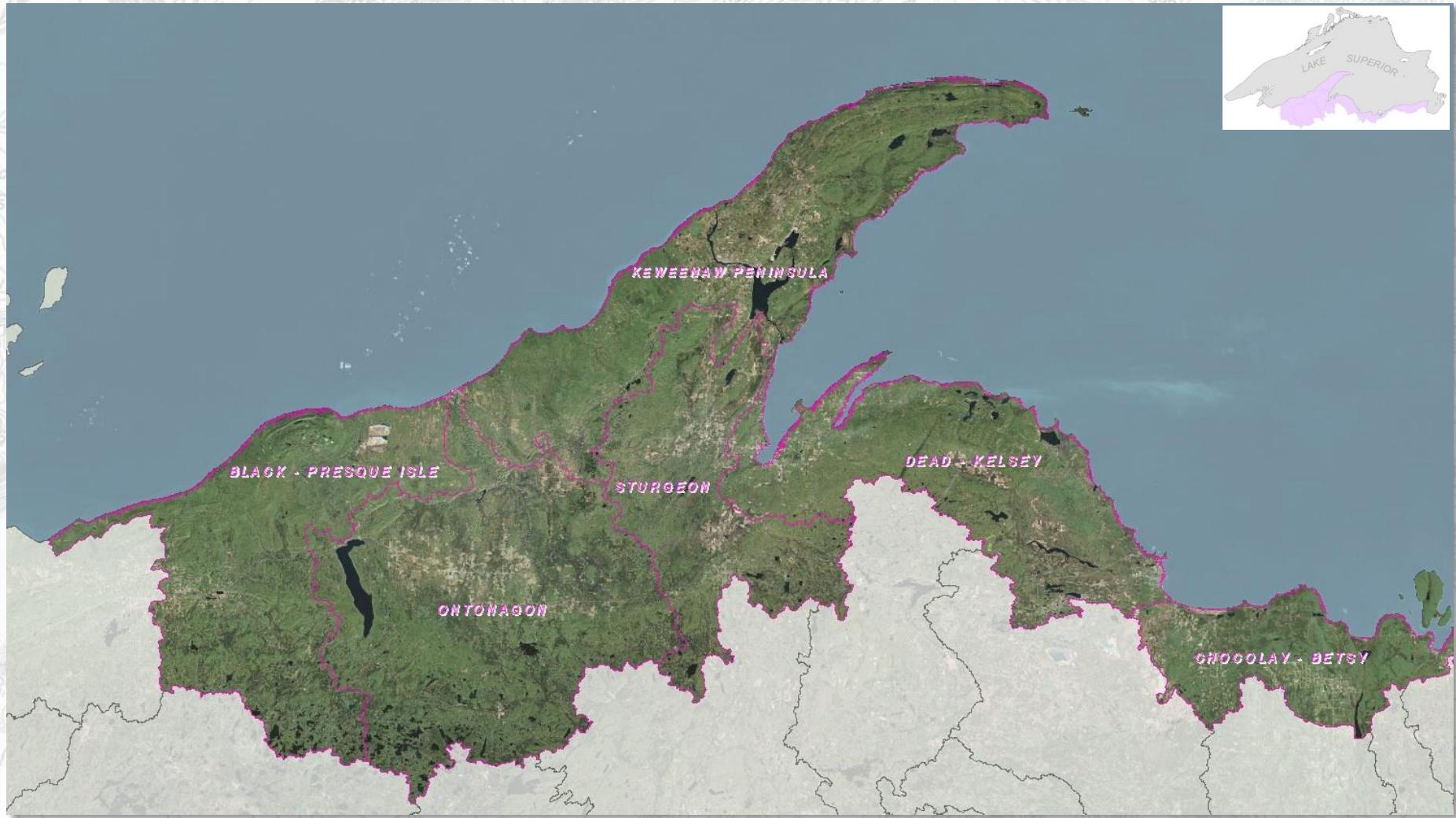
Great Lakes Road Stream
Crossing Inventory
Instructions

4/1/2011



PROJECT AREA

SOUTH CENTRAL LAKE SUPERIOR BASIN



Partner Contributions

Partner Data POINT DATA Excel or GIS

Stream Crossing Data Sheet

General Information

Site ID: _____
Stream Name: _____ Road Name: _____

Name of Observer(s): _____ Date: _____

GPS Waypoint: _____ GPS Lat/Long: _____

County: _____ Township: _____ Range: _____ Sec: _____

Adjacent Landowner Information: _____ Additional Comments: _____

Crossing Information

Crossing Type: Culvert(s) no.: _____ Bridge Ford Dam Other: _____

Structure Shape: Round Square/Rectangle Open Bottom Square/Rectangle Pipe Arch Open Bottom Arch Ellipse

Inlet Type: Projecting Mitered Headwall Apron Wingwall 10-30° or 30-70° Trash Rack Other

Outlet Type: At Stream Grade Cascade over Riprap Freefall into Pool Freefall onto Riprap Outlet Apron Other

Structure Material: Metal Concrete Plastic Wood

Multiple Culverts/Spans

Number the culverts/spans left to right, facing downstream.
Include #s in site sketch on back page

Culvert/ Span #	Width (ft)	Length (ft)	Height (ft)	Material

Structure Length (ft):¹ _____ Structure Width (ft):¹ _____ Structure Height (ft):¹ _____

Structure Water Depth (ft):¹ _____ inlet _____ outlet _____ Perch Height (ft):¹ _____ or NA

Embedded Depth of Structure (ft):¹ _____ inlet _____ outlet _____

Structure Water Velocity (ft/sec):¹ _____ inlet _____ outlet _____

Structure Water Velocity Measured: At Surface OR _____ ft Below Surface Measured With: Meter or Float Test

Stream Information

Stream Flow: Non <> Bankfull < Bankfull = Bankfull > Bankfull

Scour Pool (if present) Length: _____ Width: _____ Depth: _____ Upstream Pond (if present) Length: _____ Width: _____

Riffle Information (measured in a riffle outside of zone of influence of crossing)

Water Depth (ft): _____ Bankfull Width (ft): _____ Wetted Width (ft): _____ Water Velocity (ft/sec): _____

Dominant Substrate: Cobble Gravel Sand Organics Clay Bedrock Silt Measured With: Meter or Float Test

Road Information

Type: Federal State County Town Tribal Private Other: _____

Road Surface: Paved Gravel Sand Native Surface Condition: Good Fair Poor

Road Width at Culvert (ft): _____ Location of Low Point: At Stream Other Runoff Path: Roadway Ditch

Embankment: Upstream Fill Depth (ft): _____ Slope: Vertical 1:1.5 1:2 >1:2

Downstream Fill Depth (ft): _____ Slope: Vertical 1:1.5 1:2 >1:2

Left Approach: Length (ft): _____ Slope: 0% 1-5% 6-10% >10% Ditch Vegetation: None Partial Heavy

Right Approach: Length (ft): _____ Slope: 0% 1-5% 6-10% >10% Ditch Vegetation: None Partial Heavy

¹ - Fill out for primary culvert (culvert #1). If multiple culverts are used, number each and use embedded table.

Form Date: February 28, 2011

Great Lakes Road Stream Crossing Inventory Instructions

4/1/2011



- Standardized Protocol - **Great Lakes Road Stream Crossing Inventory**

Prioritize by variable factors
Plan larger projects
Query and compare

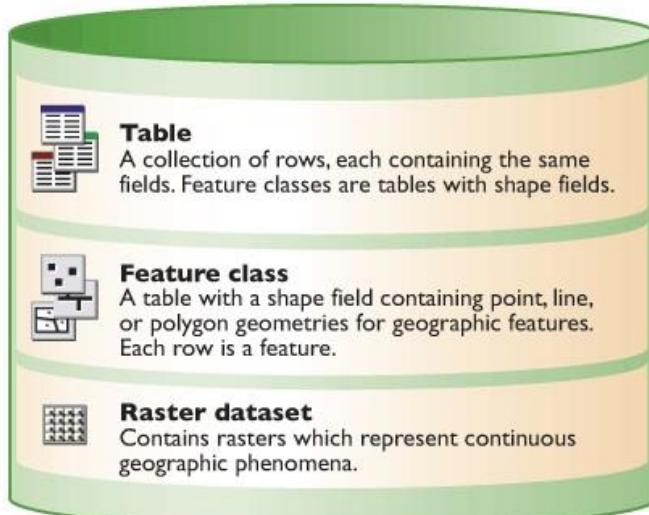
GUIDELINES **Agency/Organization**

Coordinates Format (Decimal Degrees - not ' or " = text)
Complete as many data fields as possible
Additional tables can be created/added
Need to define minimum useful data
Confirm /correct GPS locations on map

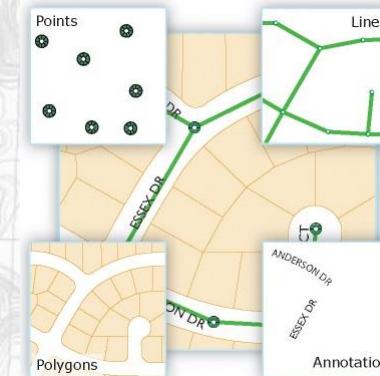
GEODATABASES

STREAM CROSSINGS

A geodatabase is a collection of geographic datasets of various types



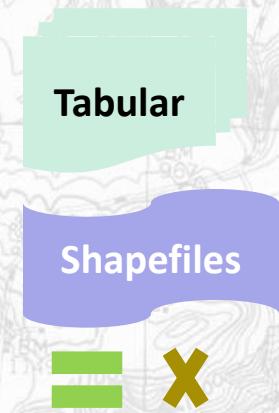
Shape	ID	PIN	Area	Addr	Code
1	334-1626-001	7,342	341 Cherry Ct.	SFR	
2	334-1626-002	8,020	343 Cherry Ct.	UND	
3	334-1626-003	10,031	345 Cherry Ct.	SFR	
4	334-1626-004	9,254	347 Cherry Ct.	SFR	
5	334-1626-005	8,856	348 Cherry Ct.	UND	
6	334-1626-006	9,975	346 Cherry Ct.	SFR	
7	334-1626-007	8,230	344 Cherry Ct.	SFR	
8	334-1626-008	8,645	342 Cherry Ct.	SFR	



Geodatabase Type
ArcGIS File Geodatabase

File Geodatabase: Stream Crossing Guideline Format Datasets

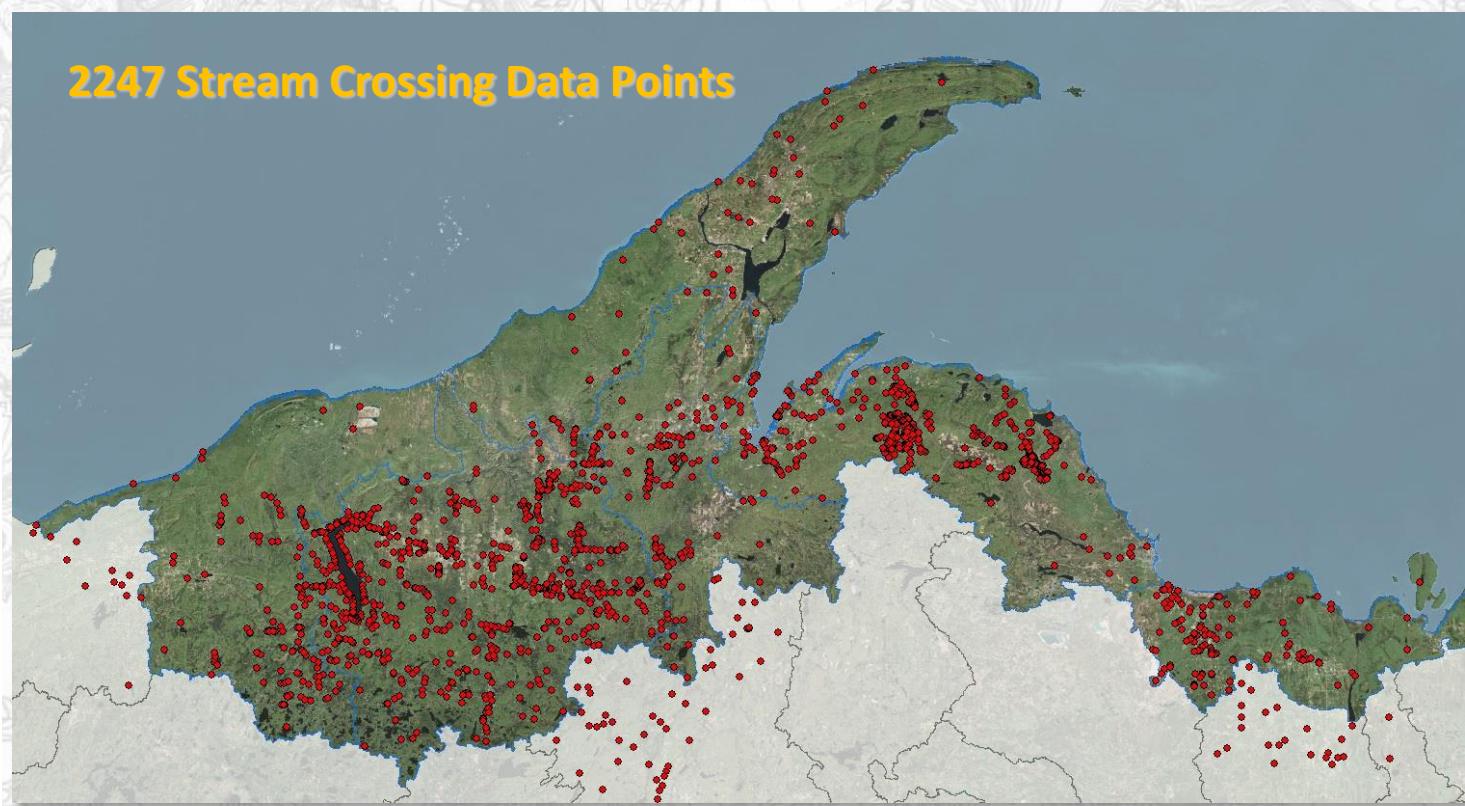
Data Provided by Partners



Stream Crossing Data Sheet

(Stream Information) Site ID:

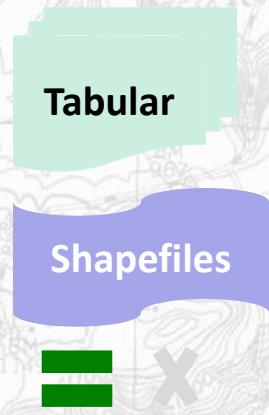
Stream Name:	Road Name:						
Name of Observer:	Date:						
GPS Waypoint:	(GPS Lat/Lng):						
Comments:							
Additional Landowner Information:							
Crossing Type:	Bridge, Pier, Dam, Other:						
Structure Type:	Round, Square/Rough, Open Bottom, Box Girder, Pier Arch, Open Bottom Arch, Elbow						
Inlet Type:	Projecting, Mitered, Wedged, Aner, Wingwall, 30° or 30°, Train Rail, Other						
Outlet Type:	At Stream Grade, Cascade or Ripped, Paved or Poured, Paved or Riprap, Outlet Aggravated, Other						
Structure Material:	Metal, Concrete, Plastic, Wood						
Substrate in Structure:	None, Sand, Gravel, Rock, Mulch						
General Condition:	New, Same, Fair, Poor						
Plugged:	% Inlet, Outlet, In Pipe						
Crossed:	% Inlet, Outlet, In Pipe						
Rusted Through:	% Inlet, Outlet, Corroded						
Structure Length (ft):	Structure Width (ft):	Structure Height (ft):					
Structure Water Depth (ft):	Inlet	outlet	Perch Height (ft):	NA			
Embedded Depth of Structure (ft):	Inlet	outlet					
Structure Water Velocity (ft/sec):	Inlet	outlet					
Structure Water Velocity Measured:	At Surface	Or	ft Below Surface	Measured With:	None	or	Foot Test
Stream Flow:	1 ft/sft	2 ft/sft	3 ft/sft	4 ft/sft	5 ft/sft	6 ft/sft	7 ft/sft
Score Pool (if present):	Length:	Width:	Depth:	Upstream Pool (if present):	Length:	Width:	
Riffle Information:	(measured in a riffle outside of zone of influence of crossing)						
Water Depth (ft):	Bankfull Width (ft):	Water Velocity (ft/sec):					
Domestic Substrate:	Gravel, Sand, Organic, Clay, Bedrock, Sh.	Measured With:	None	or	Foot Test		
Road Information:							
Type:							
Road Surface:	Paved, Gravel, Sand, Organic, Clay, Bedrock, Sh.						
Road Width at Culvert (ft):	Location of Low Point:	An Instream	Other	Rearfill Path:	Roadway	Bank	
Embankment:	Upstream	Fill Depth (ft):	Slope:	Vertical	3:1.5	1:2	



Stream Crossing Data Collection Guideline

File Geodatabase: Stream Crossing Guideline Format Datasets

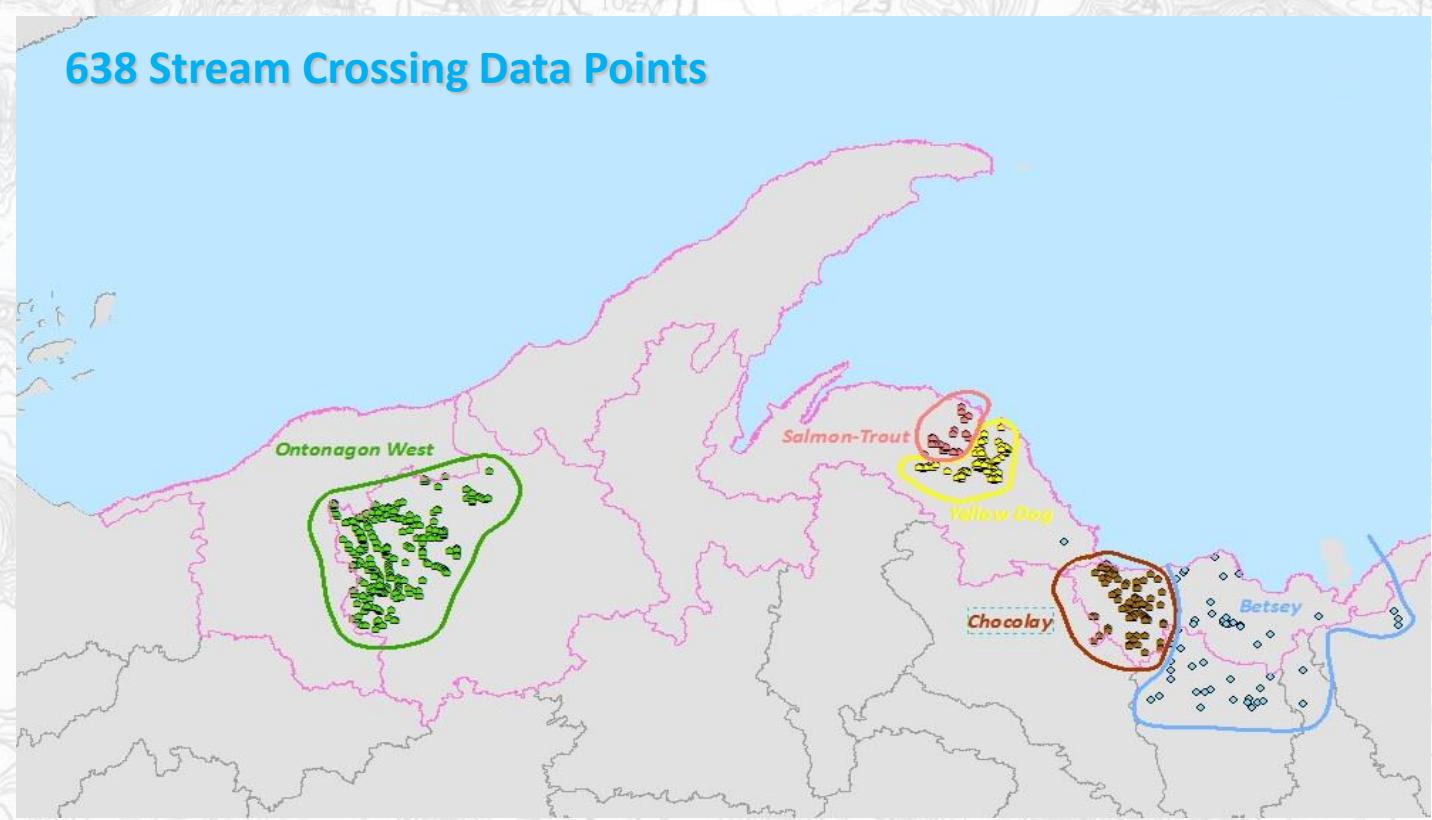
Data Provided by Partners



Stream Crossing Data Sheet

(Stream Information) Site ID: _____

Name of Observer:	_____	Road Name:	_____					
GPS Worksite:	_____	GPS Lat/Lng:	_____					
Date:	_____							
County:	_____	Range:	_____					
Adjusted Latitude Information:	_____	Sec:	_____					
Crossing Information								
Crossing Type:	Covering	Bridge	Road	Bank	Other			
Structure Shape:	Round	Square/Rectangular	Open Box/Ram	Open Arch	Open Box Arch	Other		
Inlet Type:	Projecting	Mitered	Reduced	Auger	Wingwall	20° or 30°	Train Rail	Other
Outlet Type:	At Stream Grade	Concave	Convex	Projecting	Reduced	Auger	Other	
Structure Material:	Metal	Concrete	Plastic	Wood				
Substrate in Structure:	None	Sand	Gravel	Rock	Material			
General Conditions:	None	Some	Fair	Poor				
Plugged:	Yes	No	Inside	Outside	In Pipe			
Crossed:	Yes	No	Inside	Outside				
Routed Through:	Yes	No	Structural Member	Smooth	Corrugated			
Structure Length (ft):	_____	Structure Width (ft):	_____	Structure Height (ft):	_____			
Structure Water Depth (ft):	_____	inlet	outlet	Perch Height (ft):	_____	NA		
Embedded Depth of Structure (ft):	_____	inlet	outlet					
Structure Water Velocity (ft/sec):	_____	inlet	outlet					
Structure Water Velocity Measured:	At Surface	Or	Fl Below Surface	Measured With:	None	or	Foot Test	
Stream Flow:	1 = Bankfull	2 = Bankfull + 1 ft	3 = Bankfull + 2 ft	4 = Bankfull + 3 ft	5 = Bankfull + 4 ft	6 = Bankfull + 5 ft	7 = Bankfull + 6 ft	
Score Pool (present):	Length:	Width:	Depth:	Upstream Pool (present):	Length:	Width:		
Riffle Information:	(measured in a riffle outside of zone of influence of crossing)							
Water Depth (ft):	Bankfull Width (ft):	Wetted Width (ft):	Water Velocity (ft/sec):					
Domestic Substrate:	Gravel	Sand	Organic	Clay	Bedrock	Stk	Measured With: None or Foot Test	
Ridge Information:								
Type:	Road Surface	Rail	State	Town	Street	Trail	House	
Road Surface:	Asphalt	Concrete	Gravel	Soil	Native Surface	Wood	Other	
Road Width at Culvert (ft):	Upstream	Fill Depth (ft):	Slope:	Vertical	1:1.5	1:2	1:2.5	
Embankment:								



Stream Crossing Data Collection Guideline

GEODATABASES

STREAM CROSSINGS

File Geodatabase: Stream Crossing Guideline Format Datasets

Stream Crossing Data Sheet

General Information

Stream Name: _____ Road Name: _____ Site ID: _____

Name of Observer(s): _____ Date: _____

GPS Waypoint: _____ GPS Lat/Long: _____

County: _____ Township: _____ Range: _____ Sec: _____

Adjacent Landowner Information: _____ Additional Comments: _____

Crossing Information

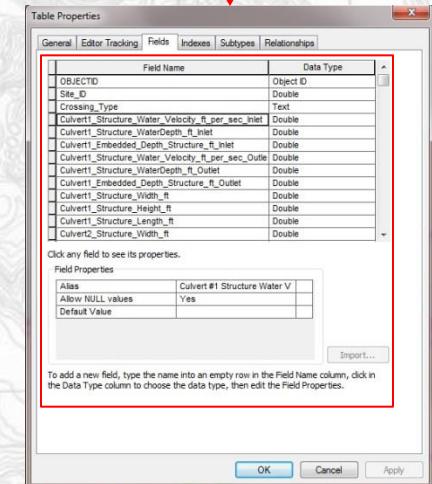
Crossing Type:	Bridge	Ford	Dam	Other					
Structure Shape:	Round	Square/Rectangle	Open Bottom Square/Rectangle	Pipe Arch	Open Bottom Arch	Ellipse			
Inlet Type:	Projecting	Mitered	Headwall	Apron	Wingwall 10-30° or 30-70°	Trash Rack	Other		
Outlet Type:	At Stream Grade	Cascade over riprap	Freefall into pool	Freefall onto riprap	Outlet Apron	Other			
Structure Material:	Metal	Concrete	Plastic	Wood					
Substrate in Structure:	None	Sand	Gravel	Rock	Mixture				
Number the culverts/spans left to right, facing downstream. Include it in site sketch on back page.									
Culvert/ Span #	Width (ft)	Length (ft)	Height (ft)	Material					
Plugged:	%	Inlet	Outlet	In Pipe					
Crushed:	%	Inlet	Outlet	In Pipe					
Rusted Through?	Yes	No	Structure Interior:	Smooth	Corrugated				
Structure Length (ft): ¹		Structure Width (ft): ¹		Structure Height (ft): ¹					
Structure Water Depth (ft): ¹	inlet	outlet		Perch Height (ft): ¹		or	NA		
Embedded Depth of Structure (ft): ¹	inlet	outlet							
Structure Water Velocity (ft/sec): ¹	inlet	outlet							
Structure Water Velocity Measured:	At Surface	OR	At Below Surface	Measured With:	Meter	or	Flow Test		

Table

FWSSWP_Chocolay_Crossing_Information

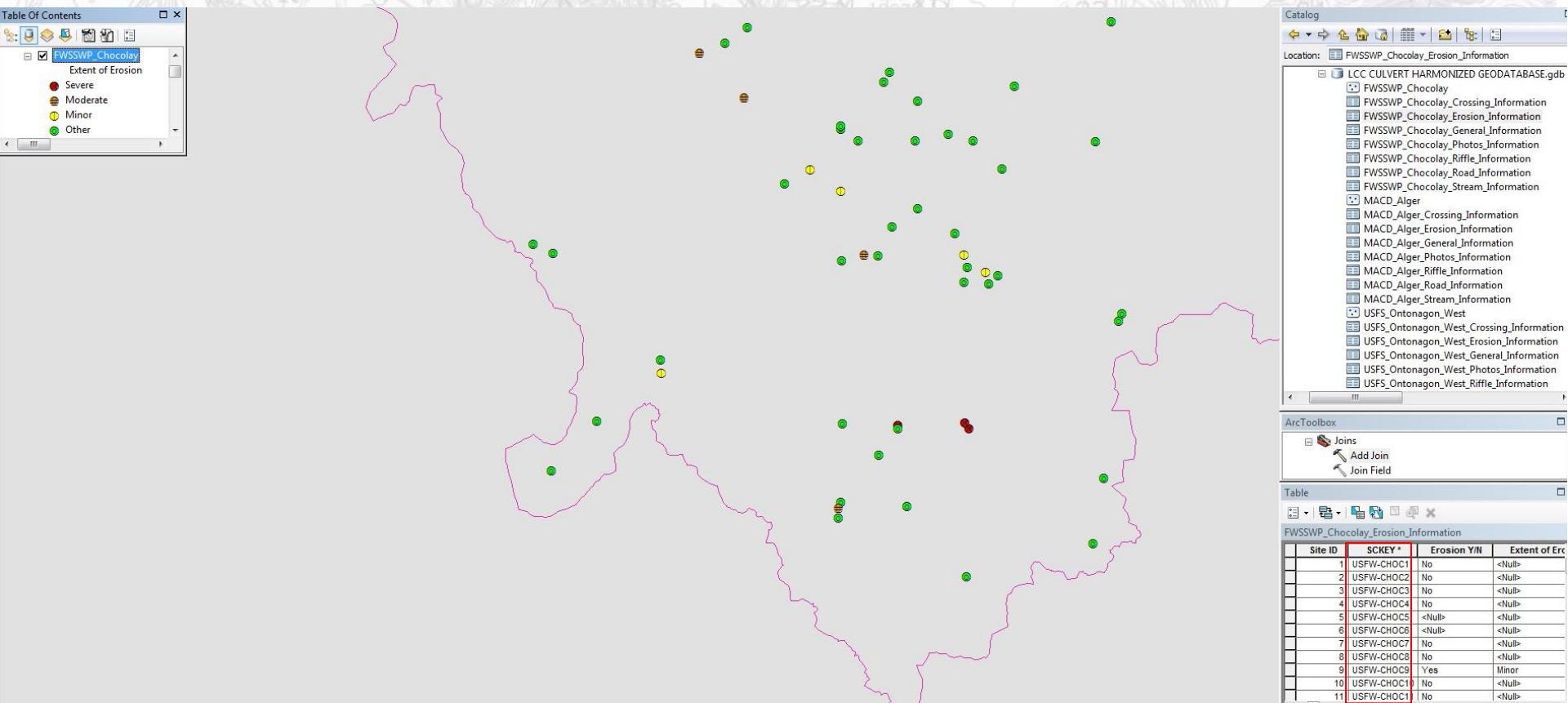
OBJECTID	Site ID	Crossing Type	Structure Shape	Inlet Type	Outlet Type	Structure Material	Substrate in Structure	General Condition	Plugged (%)	Crushed (%)	Culvert #1 Structure Water Velocity (ft/sec)	Inlet	Culvert #1 Structure Water Velocity (ft/sec)	Inlet
1	1	Bridge	<Null>	<Null>	<Null>	Concrete	Mixture	good	<Null>	<Null>	0.39			
2	2	Culvert	Square/Rectangle	<Null>	<Null>	Concrete	Sand	good	<Null>	<Null>	1.58			
3	3	Bridge	NA	NA	NA	Concrete	Sand	good	<Null>	<Null>	1			
4	4	Culvert	Round	<Null>	<Null>	Al stream grade	Metal	poor	<Null>	5	2			
5	5	Culvert	<Null>	<Null>	<Null>	Al stream grade	Metal	fair	<Null>	30	1.19			
6	6	Bridge	<Null>	<Null>	<Null>	Concrete	Gravel	new	<Null>	<Null>	0.47			
7	7	Culvert	Round	Projecting	Al stream grade	Concrete	Sand	fair	<Null>	2 <Null>				
8	8	Culvert	Open Bottom Square/Rectangle	Projecting	Al stream grade	Concrete	Sand	fair	<Null>	<Null>	1			
9	9	Culvert	Ellipse	Mitered	Al stream grade	Metal	Sand	new	<Null>	<Null>	1.53			
10	10	Culvert	Square/Rectangle	Projecting	Al stream grade	Concrete	Sand	new	<Null>	<Null>	1			
11	11	Barrier-Unknown	<Null>	<Null>	Freefall into pool	Concrete	Sand	fair	<Null>	<Null>	0.8			
12	12	Bridge	Open Bottom Square/Rectangle	Other	Al stream grade	Concrete	Mixture	fair	<Null>	<Null>	0.6			
13	13	Culvert	Open Bottom Square/Rectangle	Projecting	Cascade over riprap	Concrete	Gravel	good	0	0	0.49			
14	14	Culvert	Round	Projecting	Cascade over riprap	Concrete	Sand	good	<Null>	<Null>	1			

- LCC CULVERT HARMONIZED GEODATABASE.gdb
 - FWSSWP_Chocolay
 - FWSSWP_Chocolay_Crossing_Information
 - FWSSWP_Chocolay_Erosion_Information
 - FWSSWP_Chocolay_General_Information
 - FWSSWP_Chocolay_Photos_Information
 - FWSSWP_Chocolay_Riffle_Information
 - FWSSWP_Chocolay_Road_Information
 - FWSSWP_Chocolay_Stream_Information
 - MACD_Alger
 - MACD_Alger_Crossing_Information
 - MACD_Alger_Erosion_Information
 - MACD_Alger_General_Information
 - MACD_Alger_Photos_Information
 - MACD_Alger_Riffle_Information
 - MACD_Alger_Road_Information
 - MACD_Alger_Stream_Information
 - USFS_Ontonagon_West
 - USFS_Ontonagon_West_Crossing_Information
 - USFS_Ontonagon_West_Erosion_Information
 - USFS_Ontonagon_West_General_Information
 - USFS_Ontonagon_West_Photos_Information
 - USFS_Ontonagon_West_Riffle_Information
 - USFS_Ontonagon_West_Road_Information
 - USFS_Ontonagon_West_Stream_Information
 - YDWP_YellowDog
 - YDWP_YellowDog_Crossing_Information
 - YDWP_YellowDog_Erosion_Information
 - YDWP_YellowDog_General_Information



File Geodatabase: Stream Crossing Guideline Format Datasets

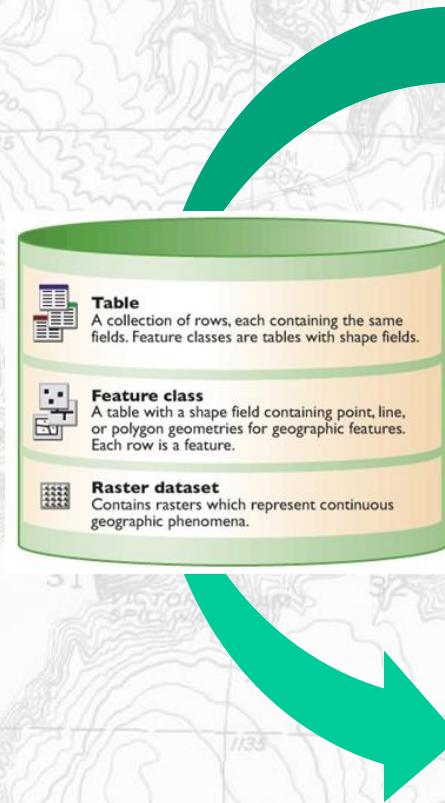
Adding attributes to feature class based on a “Key” Join-Field



INTEGRATION OF FURTHER GEOSPATIAL DATA

7 INDEPENDENT FILEGEODATABASES TO SUBSTANTIATE GEOSPATIAL SUPPORT

USGS; USDA Forest Service; USDA Natural Resources Conservation Service; TNC; UMD; LCC



- + LCC CULVERT HARMONIZED GEODATABASE.gdb
- + LCC CULVERT NON STANDARD DATASETS.gdb
- + LCC_SLSB_GEODATABASE_PROJECT2016_LANDCOVER_MODELS.gdb
- + LCC_SLSB_GEODATABASE_PROJECT2016_LIDAR_FOREST_METRICS_MODELS.gdb
- + LCC_SLSB_GEODATABASE_PROJECT2016_LIDAR_TOPOGRAPHIC_METRICS_MODELS.gdb
- + LCC_SLSB_GEODATABASE_PROJECT2016_ORTHOIMAGERY_NAIP.gdb
- + LCC_SLSB_GEODATABASE_PROJECT2016_REFERENCE.gdb
- + LCC_SLSB_GEODATABASE_PROJECT2016_TOPOGRAPHIC_MAPS.gdb
- + LCC_SLSB_GEODATABASE_PROJECT2016_USGS_ELEVATION_MODELS.gdb
- + LCC CULVERT HARMONIZED GEODATABASE.gdb
 - + FWSSWP_Chocolay
 - FWSSWP_Chocolay_Crossing_Information
 - FWSSWP_Chocolay_Erosion_Information
 - FWSSWP_Chocolay_General_Information
 - FWSSWP_Chocolay_Photos_Information
 - FWSSWP_Chocolay_Riffle_Information
 - FWSSWP_Chocolay_Road_Information
 - FWSSWP_Chocolay_Stream_Information
 - + MACD_Alger
 - MACD_Alger_Crossing_Information
 - MACD_Alger_Erosion_Information
 - MACD_Alger_General_Information
 - MACD_Alger_Photos_Information
 - MACD_Alger_Riffle_Information
 - MACD_Alger_Road_Information
 - MACD_Alger_Stream_Information
- + SWP_SalmonTroutRiver
 - + SWP_SalmonTroutRiver_Crossing_Information
 - SWP_SalmonTroutRiver_Erosion_Information
 - SWP_SalmonTroutRiver_General_Information
 - SWP_SalmonTroutRiver_Photos_Information
 - SWP_SalmonTroutRiver_Riffle_Information
 - SWP_SalmonTroutRiver_Road_Information
 - SWP_SalmonTroutRiver_Stream_Information
- + USFS_Ontonagon_West
 - + USFS_Ontonagon_West_Crossing_Information
 - USFS_Ontonagon_West_Erosion_Information
 - USFS_Ontonagon_West_General_Information
 - USFS_Ontonagon_West_Photos_Information
 - USFS_Ontonagon_West_Riffle_Information
 - USFS_Ontonagon_West_Road_Information
 - USFS_Ontonagon_West_Stream_Information
- + YDWP_YellowDog
 - + YDWP_YellowDog_Crossing_Information
 - YDWP_YellowDog_Erosion_Information
 - YDWP_YellowDog_General_Information
 - YDWP_YellowDog_Photos_Information
 - YDWP_YellowDog_Riffle_Information
 - YDWP_YellowDog_Road_Information
 - YDWP_YellowDog_Stream_Information

GEODATABASES

SUPPORT GEODATABASES

INTEGRATION OF FURTHER GEOSPATIAL DATA

7 INDEPENDENT FILEGEODATABASES TO SUBSTANTIATE GEOSPATIAL SUPPORT

- LCC_SCLSB_GEODATABASE_PROJECT2016_REFERENCE.gdb
- □ BASE_REFERENCE_REGION
 - North_America_Carto_Streets_ESRI
 - North_America_Cities_ESRI
 - North_America_City_Limits_ESRI
 - North_America_Detailed_Streets_ESRI
 - North_America_Drainage_DCW
 - North_America_Highways_ESRI
 - North_America_Inland_Waterbodies_DCW
 - North_America_Institutions_ESRI
 - North_America_Interstate_Highways_ESRI
 - North_America_Landmarks_ESRI
 - North_America_Major_Lakes_ESRI
 - North_America_Major_Roads_ESRI
 - North_America_Parks_ESRI
 - North_America_Railroads_ESRI
 - North_America_Rivers_ESRI
 - North_America_States_Provinces_Border_Lines_ESRI
 - North_America_States_Provinces_ESRI
 - North_America_Water_Bodies_ESRI
- □ BIOTA
 - Currente_Invasive_Plant_Infestation_USFS
 - Ecological_Subregions_Kuchler1975_Landcover_Subsections_USFS
 - Ecological_Subregions_Kuchler1975_Potential_Natural_Vegetation_Subsections_USFS
 - Ecological_Subregions_Kuchler1975_Potential_Natural_Vegetation_USFS
 - Ecological_Subregions_Kuchler1975_Sections_USFS
 - Ecological_Subregions_Kuchler1975_Soils_Subsections_USFS
 - Ecological_Subregions_Kuchler1975_Subsections_USFS
 - Great_Lakes_Fish_Spawning_Locations_GLC
- □ BOUNDARIES_MANAGEMENT
 - Admnistrative_Forest_Boundaries_USFS
 - Forest_Service_Administrative_Regions_USFS
 - Forest_Service_Developed_Sites_Subject_Regulations_USFS
 - National_Forest_Original_Proclaimed_Areas_USFS
 - National_Forest_System_Land_Units_USFS
 - National_Wild_and_Scenic_Rivers_Legal_Status_USFS
 - National_Wild_and_Scenic_Rivers_USFS
 - National_Wilderness_Areas_Legal_Status_USFS
 - National_Wilderness_Areas_USFS
 - Ranger_District_Boundaries_USFS
 - Special_Interest_Management_Areas_USFS
 - Survey_Boundaries_Maintained_by_USFS
 - Survey_Parcels_Described_by_Metes_and_Bonds_USFS

- □ CADASTRAL
 - Public_Land_Survey_System_MICHIGAN_QuarterQuarter_Sections_MDNR
 - Public_Land_Survey_System_Sections_BLM
 - Public_Land_Survey_System_Townships_BLM
 - Public_Land_Survey_System_WISCONSIN_QuarterQuarter_Sections_WDNR
- □ CENSUS
 - TIGER2010_Census_111th_Congressional_Districts_USCB
 - TIGER2010_Census_Block_USCB
 - TIGER2010_Census_Blocks_Groups_USDA
 - TIGER2010_Census_County_Subdivision_USCB
 - TIGER2010_Census_County_USCB
 - TIGER2010_Census_Place_USCB
 - TIGER2010_Census_State_Legislative_Districts_LowerChamber_USCB
 - TIGER2010_Census_State_Legislative_Districts_UpperChamber_USCB
 - TIGER2010_Census_Tract_USCB
 - TIGER2010_Census_Tribal_Tract_USCB
 - TIGER2010_Urban_Areas_USDA
- □ EASEMENTS_AND_OWNERSHIP
 - Conservation_Easement_Areas_NRCS
 - Conservation_Easement_Points_NRCS
 - Surface_Ownership_Parcels_Detailed_USFS
 - The_Nature_Conservancy_Lands_TNC
 - The_Nature_Conservancy_Transferred_Lands_TNC
- □ ELEVATION
 - NED10m_20FeetContours_USGS
 - NED30m_20FeetContours_USGS
- □ ENVIRONMENT
 - Aerial_Fire_Retardant_Avoidance_Terrestrial_Areas_USFS
 - Aerial_Fire_Retardant_Hydrographic_Avoidance_Aquatic_Areas_USFS
 - Hazardous_Fuel_Treatment_Reduction_Areas_USFS
 - Roadless_Areas_circa2001_USFS
 - Timber_Harvests_Areas_USFS
- □ GEOGRAPHIC_NAMES
 - Geographic_Names_NonPopulated_Places_GNIS
 - Geographic_Names_Populated_Places_GNIS
- □ GEOLOGY
 - Bedrock_Geology_1987version_USGS
 - Bedrock_Geology_1999version_USGS
 - Bedrock_Geology_2007version_USGS
 - Faults_1999version_USGS
 - MAPI1970_Geological_Contacts_2012version_USGS
 - MAPI1970_Geological_Point_Features_2012version_USGS
 - MAPI1970_Stack_Geological_Units_2012version_USGS
 - MAPI1970_Surficial_Materials_2012version_USGS
 - Mineral_Resources_1999version_USGS
- □ GOVERNMENT_UNITS
 - American_Indian_Lands_TIGER2010
 - Congressional_Districts_TIGER2010
 - Counties_NRCS
 - Federal_State_Tribal_Ownership_USGS
 - National_Park_Service_USGS
 - States_NRCS
- □ HYDROGRAPHY
 - National_Hydrographic_Dataset_24K_Areas_NRCS
 - National_Hydrographic_Dataset_24K_Point_Experimental_NRCS
 - National_Hydrographic_Dataset_24K_Point_NRCS
 - National_Hydrographic_Dataset_24K_Streams_NRCS
 - National_Hydrographic_Dataset_24K_WaterBody_NRCS
- □ HYDROLOGIC_UNITS
 - Watershed_Boundary_10_Digit_NRCS
 - Watershed_Boundary_12_Digit_NRCS
 - Watershed_Boundary_6_Digit_NRCS
 - Watershed_Boundary_8_Digit_NRCS
 - Watershed_Condition_12_Digit_USFS
- □ INFRASTRUCTURE
 - Crude_Oil_Pipelines_USEIA
 - HGL_Pipelines_USEIA
 - Natural_Gas_Interstate_Pipelines_USEIA
 - Power_Lines_OSM
 - Power_Plants_USEIA
- □ SOILS
 - SOILS_BLACK_PRESQUE_ISLE_DRAINAGE_REGION
 - SOILS_DEAD_KELSEY_DRAINAGE_REGION
 - SOILS_KEWENAW_DRAINAGE_REGION
 - SOILS_ONTONAGON_DRAINAGE_REGION
 - SOILS_STURGEON_DRAINAGE_REGION
- □ TRANSPORTATION
 - National_Forest_Motor_Vehicle_Use_Roads_USFS
 - National_Forest_Motor_Vehicle_Use_Trails_USFS
 - National_Forest_Roads_USFS
 - Primary_and_Secondary_Roads_100K_TIGER2010
 - Railways_OSM
 - Railways_TIGER2010
 - Roads_OSM
 - Street_100K_TIGER2010

GEODATABASES

SUPPORT GEODATABASES

INTEGRATION OF FURTHER GEOSPATIAL DATA

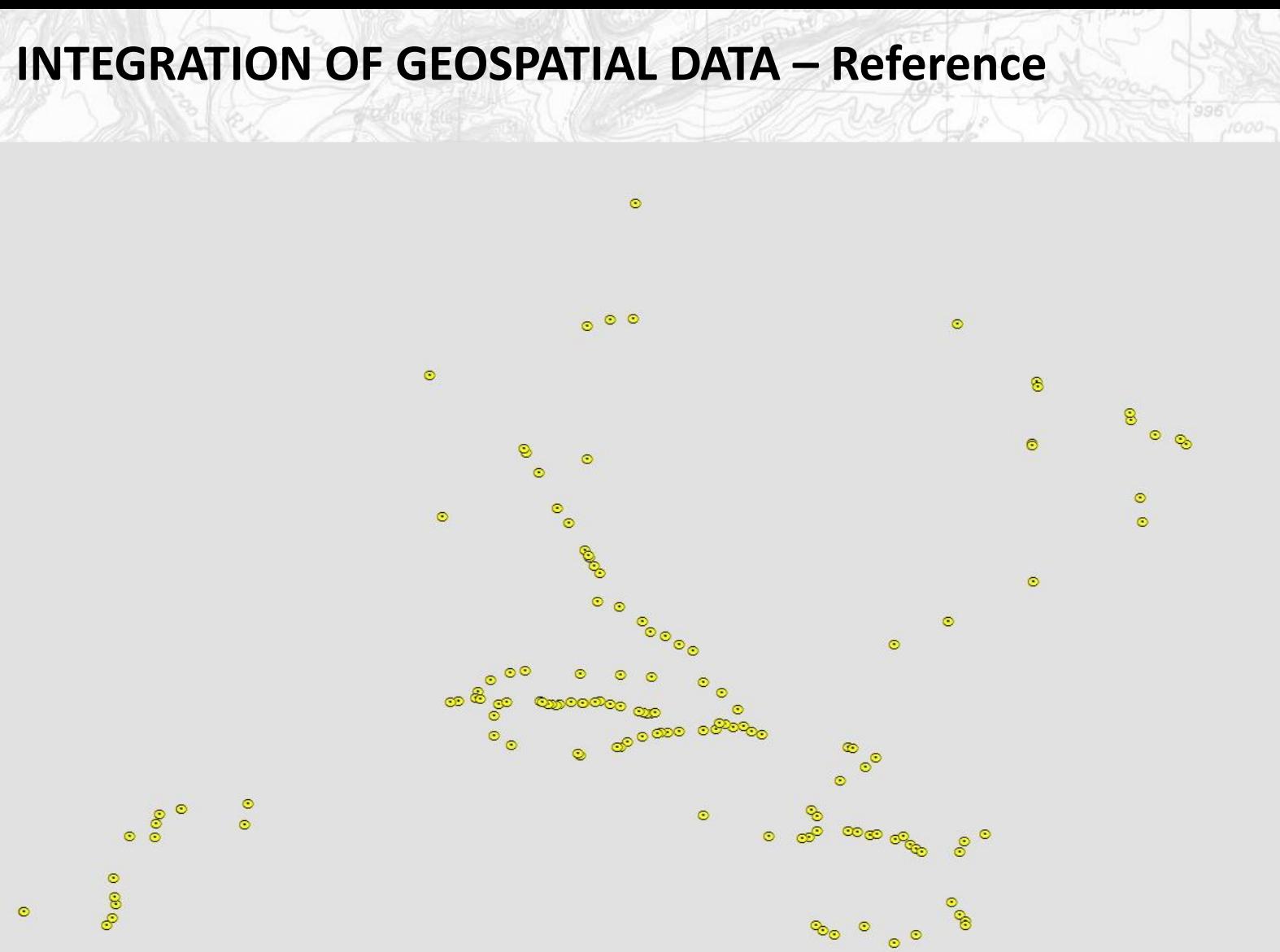
7 INDEPENDENT FILEGEODATABASES TO SUBSTANTIATE GEOSPATIAL SUPPORT

- LCC_SCLSB_GEODATABASE_PROJECT2016_LANDCOVER_MODELS.gdb
 - + LCC_SCLSB_CCAP_ForestFragmentation_Model_1985_NOAA
 - + LCC_SCLSB_CCAP_ForestFragmentation_Model_1996_NOAA
 - + LCC_SCLSB_CCAP_ForestFragmentation_Model_2001_NOAA
 - + LCC_SCLSB_CCAP_ForestFragmentation_Model_2006_NOAA
 - + LCC_SCLSB_CCAP_ForestFragmentation_Model_2010_NOAA
 - + LCC_SCLSB_CCAP_Landcover_Dataset_1975_NOAA
 - + LCC_SCLSB_CCAP_Landcover_Dataset_1985_NOAA
 - + LCC_SCLSB_CCAP_Landcover_Dataset_1996_NOAA
 - + LCC_SCLSB_CCAP_Landcover_Dataset_2001_NOAA
 - + LCC_SCLSB_CCAP_Landcover_Dataset_2006_NOAA
 - + LCC_SCLSB_CCAP_Landcover_Dataset_2010_NOAA
 - + LCC_SCLSB_CCAP_Wetland_Potential_Dataset_NOAA
 - + LCC_SCLSB_LANDFIRE_Disturbance_1999_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2000_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2001_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2002_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2003_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2004_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2005_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2006_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2007_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2008_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2009_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2010_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2011_TNC
 - + LCC_SCLSB_LANDFIRE_Disturbance_2012_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Mean_Return_Interval_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Percent_Low_Severity_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Percent_Mixed_Severity_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Percent_Replacement_Severity_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Regime_Groups_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Succession_Classes_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Vegetation_Condition_Class_TNC
 - + LCC_SCLSB_LANDFIRE_Fire_Vegetation_Departure_TNC

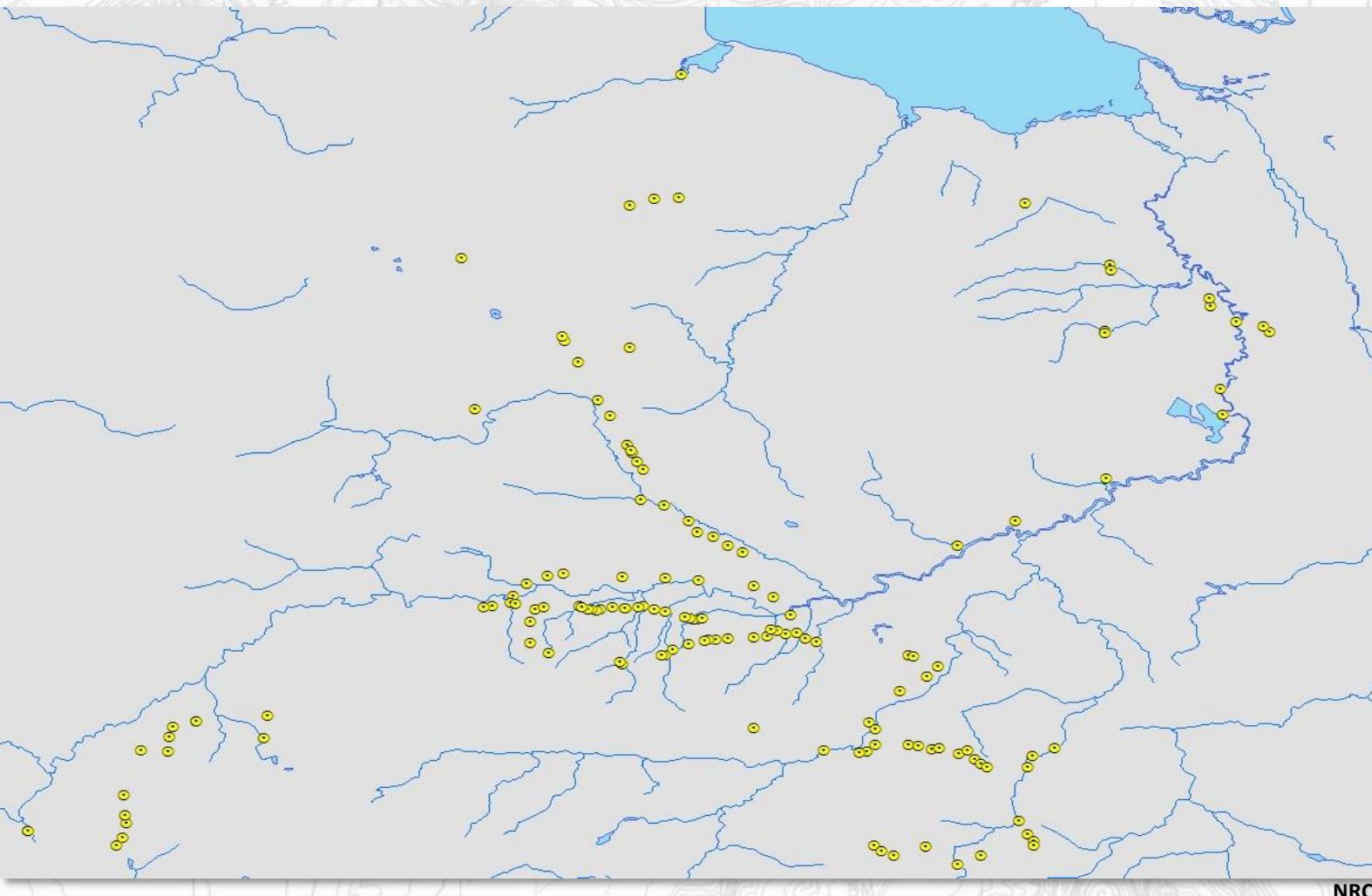
- + LCC_SCLSB_LANDFIRE_Fuel_Disturbance_2008_TNC
 - + LCC_SCLSB_LANDFIRE_Fuel_Disturbance_2010_TNC
 - + LCC_SCLSB_LANDFIRE_Fuel_Disturbance_2012_TNC
 - + LCC_SCLSB_LANDFIRE_Fuel_Forest_Canopy_Base_Height_TNC
 - + LCC_SCLSB_LANDFIRE_Fuel_Forest_Canopy_Bulk_Density_TNC
 - + LCC_SCLSB_LANDFIRE_Fuel_Forest_Canopy_Cover_TNC
 - + LCC_SCLSB_LANDFIRE_Fuel_Forest_Canopy_Height_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Biophysical_Settings_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Disturbance_2008_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Disturbance_2010_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Disturbance_2012_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Environmental_site_Potential_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Existing_Vegetation_Cover_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Existing_Vegetation_Height_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Existing_Vegetation_Type_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Transition_Magnitude_2010_TNC
 - + LCC_SCLSB_LANDFIRE_Vegetation_Transition_Magnitude_2012_TNC
 - + LCC_SCLSB_MRLC_National_Landcover_Dataset_2011_USGS
- LCC_SCLSB_GEODATABASE_PROJECT2016_ORTHOIMAGERY_NAIP.gdb
 - + NAIP_2014_BARAGA_CO_MI
 - + NAIP_2014_GOGEBIC_CO_MI
 - + NAIP_2014_HOUGHTON_CO_MI
 - + NAIP_2014_KEEWENAW_CO_MI
 - + NAIP_2014_MARQUETTE_CO_MI
 - + NAIP_2014_ONTONAGON_CO_MI
 - + NAIP_2015_IRON_CO_WI
 - + NAIP_2015_VILLAS_CO_WI

- + LCC_CULVERT_HARMONIZED_GEODATABASE.gdb
- + LCC_CULVERT_NON_STANDARD_DATASETS.gdb
- + LCC_SCLSB_GEODATABASE_PROJECT2016_LIDAR_FOREST_METRICS_MODELS.gdb
- + LCC_SCLSB_GEODATABASE_PROJECT2016_LIDAR_TOPOGRAPHIC_METRICS_MODELS.gdb
- + LCC_SCLSB_GEODATABASE_PROJECT2016_REFERENCING.gdb
- + LCC_SCLSB_GEODATABASE_PROJECT2016_TOPOGRAPHIC_MAPS.gdb
- + LCC_SCLSB_GEODATABASE_PROJECT2016_USGS_ELEVATION_MODELS.gdb
- LCC_SCLSB_GEODATABASE_PROJECT2016_TOPOGRAPHIC_MAPS.gdb
 - + LCC_24K_TOPO_MOSAIC_BARAGA_CO
 - + LCC_24K_TOPO_MOSAIC_GOGEBIC_CO
 - + LCC_24K_TOPO_MOSAIC_HOUGHTON_CO
 - + LCC_24K_TOPO_MOSAIC_KEEWENAW_CO
 - + LCC_24K_TOPO_MOSAIC_MARQUETTE_CO
 - + LCC_24K_TOPO_MOSAIC_ONTONAGON_CO
 - + LCC_SCLSB_100K_TOPO_MOSAIC
 - + LCC_SCLSB_250K_TOPO_MOSAIC
- LCC_SCLSB_GEODATABASE_PROJECT2016_USGS_ELEVATION_MODELS.gdb
 - + LCC_SCLSB_NED10m_Aspect_Model
 - + LCC_SCLSB_NED10m_Digital_Elevation_Model_USGS
 - + LCC_SCLSB_NED10m_Hillshade_Model
 - + LCC_SCLSB_NED10m_Slope_Degrees_Model
 - + LCC_SCLSB_NED30m_Aspect_Model
 - + LCC_SCLSB_NED30m_Digital_Elevation_Model_USGS
 - + LCC_SCLSB_NED30m_Hillshade_Model
 - + LCC_SCLSB_NED30m_Slope_Degrees_Model
- LCC_SCLSB_GEODATABASE_PROJECT2016_LIDAR_TOPOGRAPHIC_METRICS_MODELS.gdb
 - + IRONWOOD2011_ASPECT_1mPixel
 - + IRONWOOD2011_Digital_Surface_Elevation_1mPixel
 - + IRONWOOD2011_Digital_Surface_Height_1mPixel
 - + IRONWOOD2011_Digital_Terrain_Model_1mPixel
 - + IRONWOOD2011_DSM_Hillshade_1mPixel
 - + IRONWOOD2011_DTM_Hillshade_1mPixel
 - + IRONWOOD2011_Slope_Degrees_1mPixel
 - + IRONWOOD2011_Slope_Percent_1mPixel
- LCC_SCLSB_GEODATABASE_PROJECT2016_LIDAR_FOREST_METRICS_MODELS.gdb
 - + IRONWOOD2011_DM_CanopyCover_20mPixel
 - + IRONWOOD2011_DM_CanopyDensity_20mPixel
 - + IRONWOOD2011_HM_05thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_10thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_25thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_50thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_75thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_90thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_95thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_99thPercentile_of_Heights_20mPixel
 - + IRONWOOD2011_HM_Maximum_of_Heights_20mPixel
 - + IRONWOOD2011_HM_Mean_of_Heights_20mPixel
 - + IRONWOOD2011_HM_Standard_Deviation_of_Heights_20mPixel

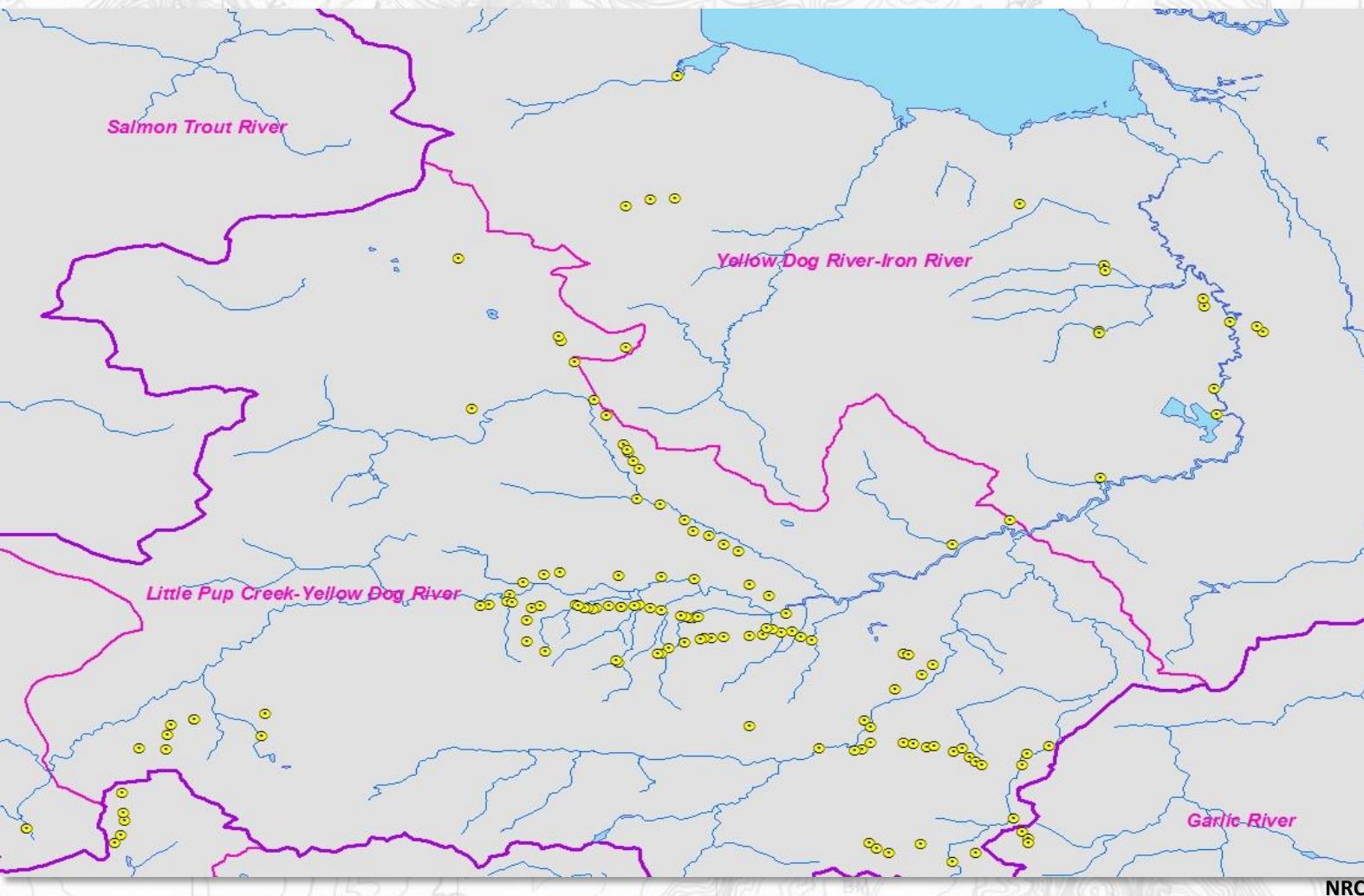
INTEGRATION OF GEOSPATIAL DATA – Reference



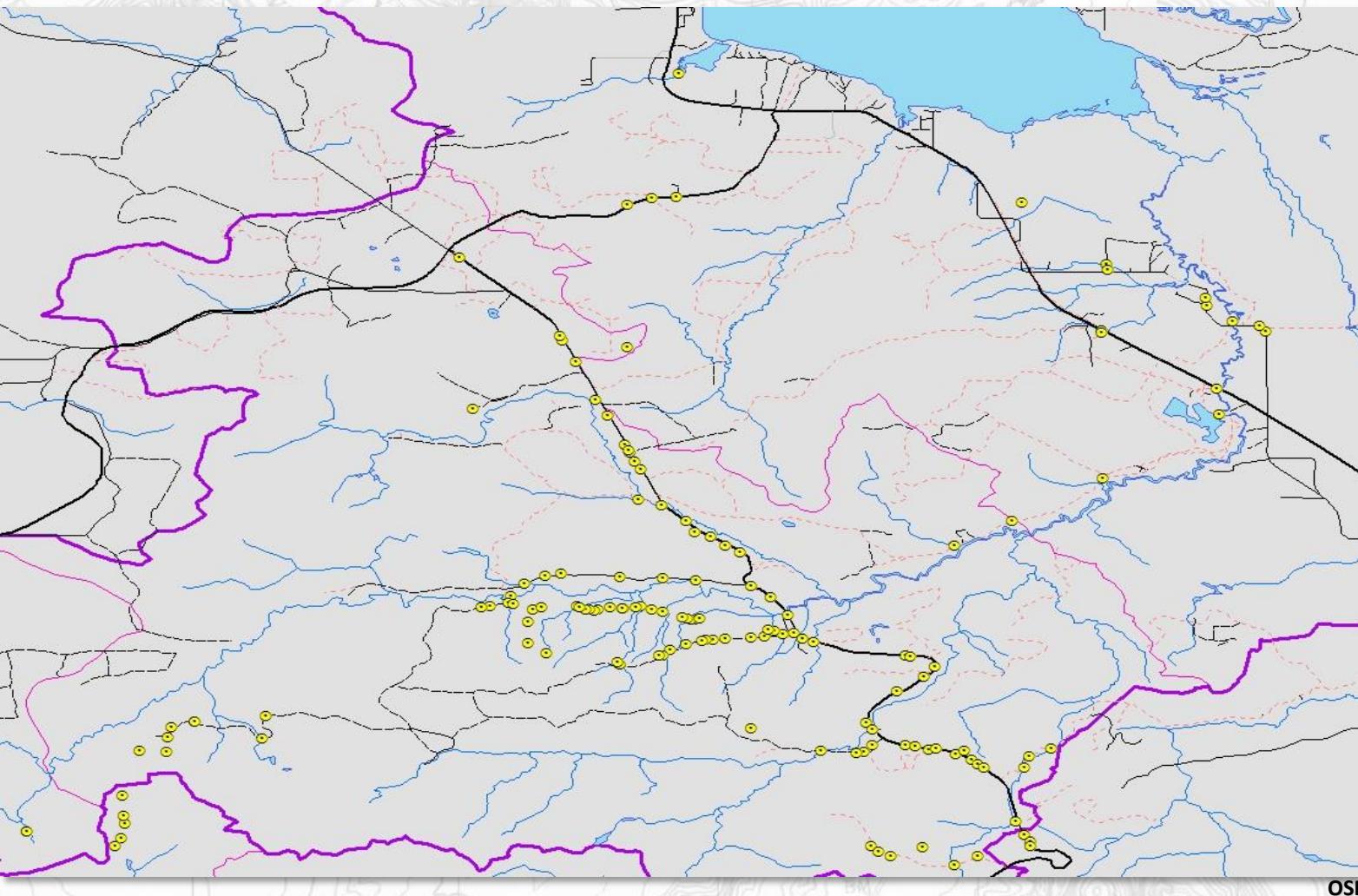
INTEGRATION OF GEOSPATIAL DATA – Reference



INTEGRATION OF GEOSPATIAL DATA – Reference

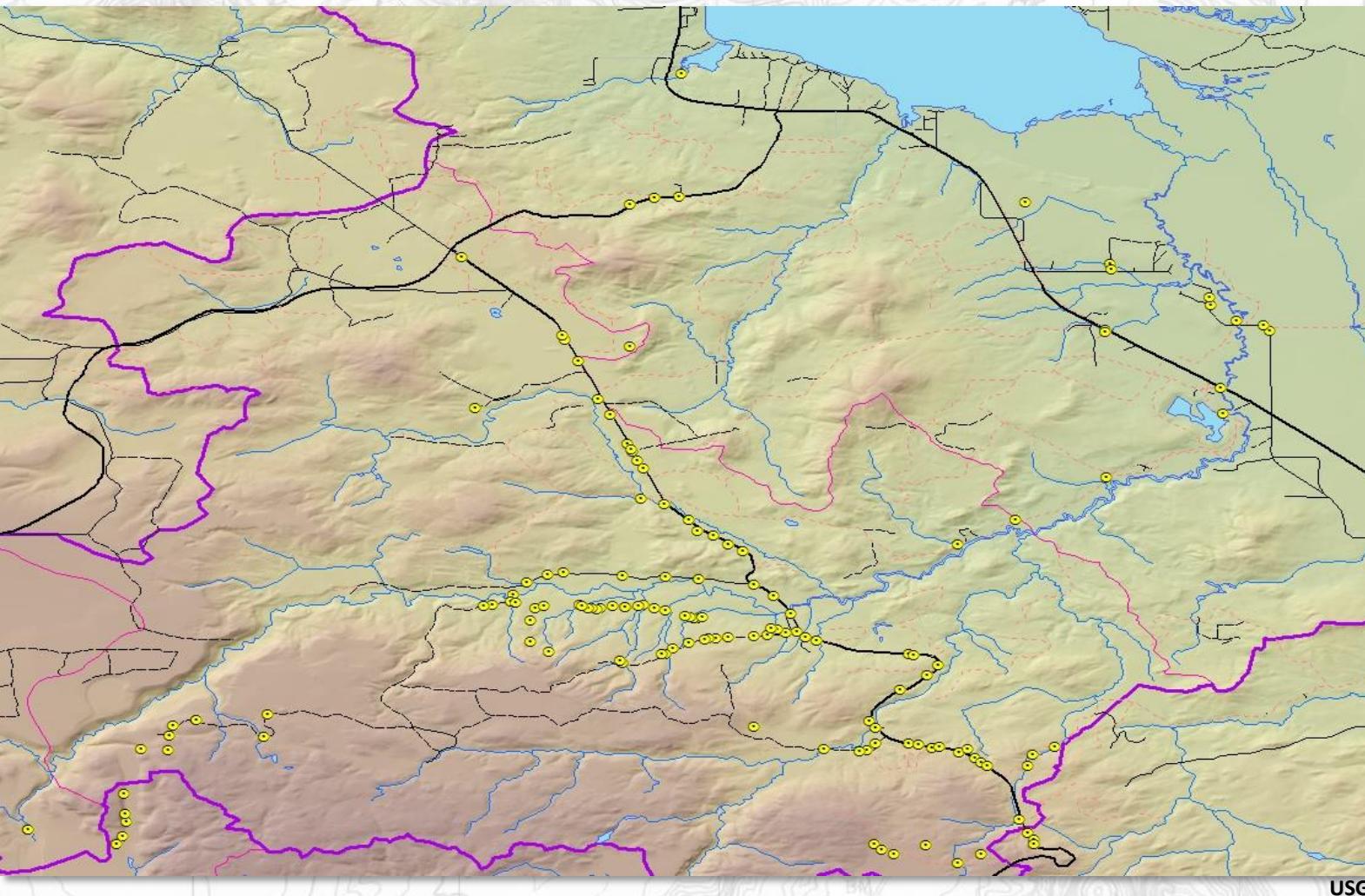


INTEGRATION OF GEOSPATIAL DATA – Reference



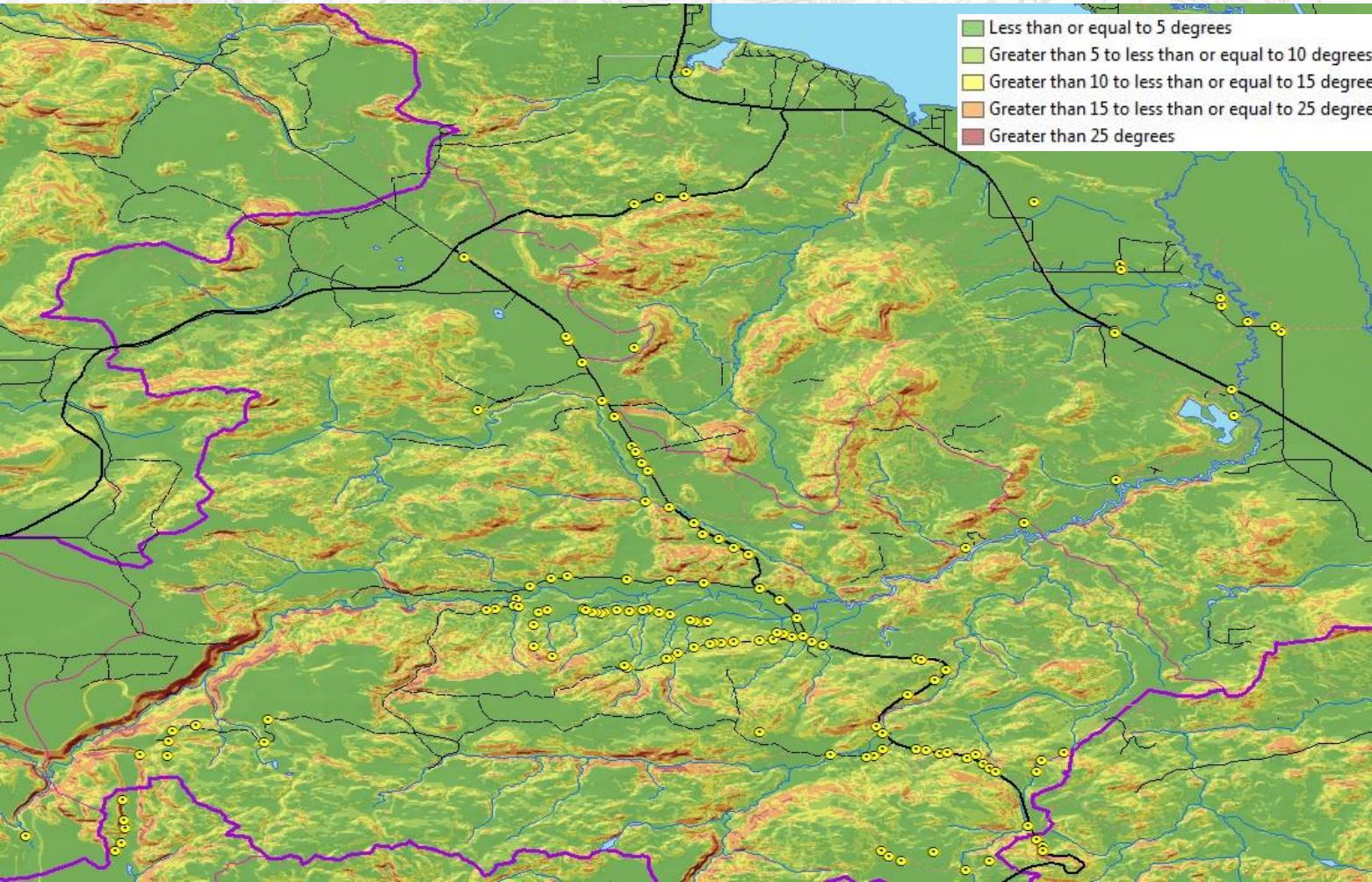
Crossings Feature Class
Drainage
Watersheds
Roads

INTEGRATION OF GEOSPATIAL DATA – Reference



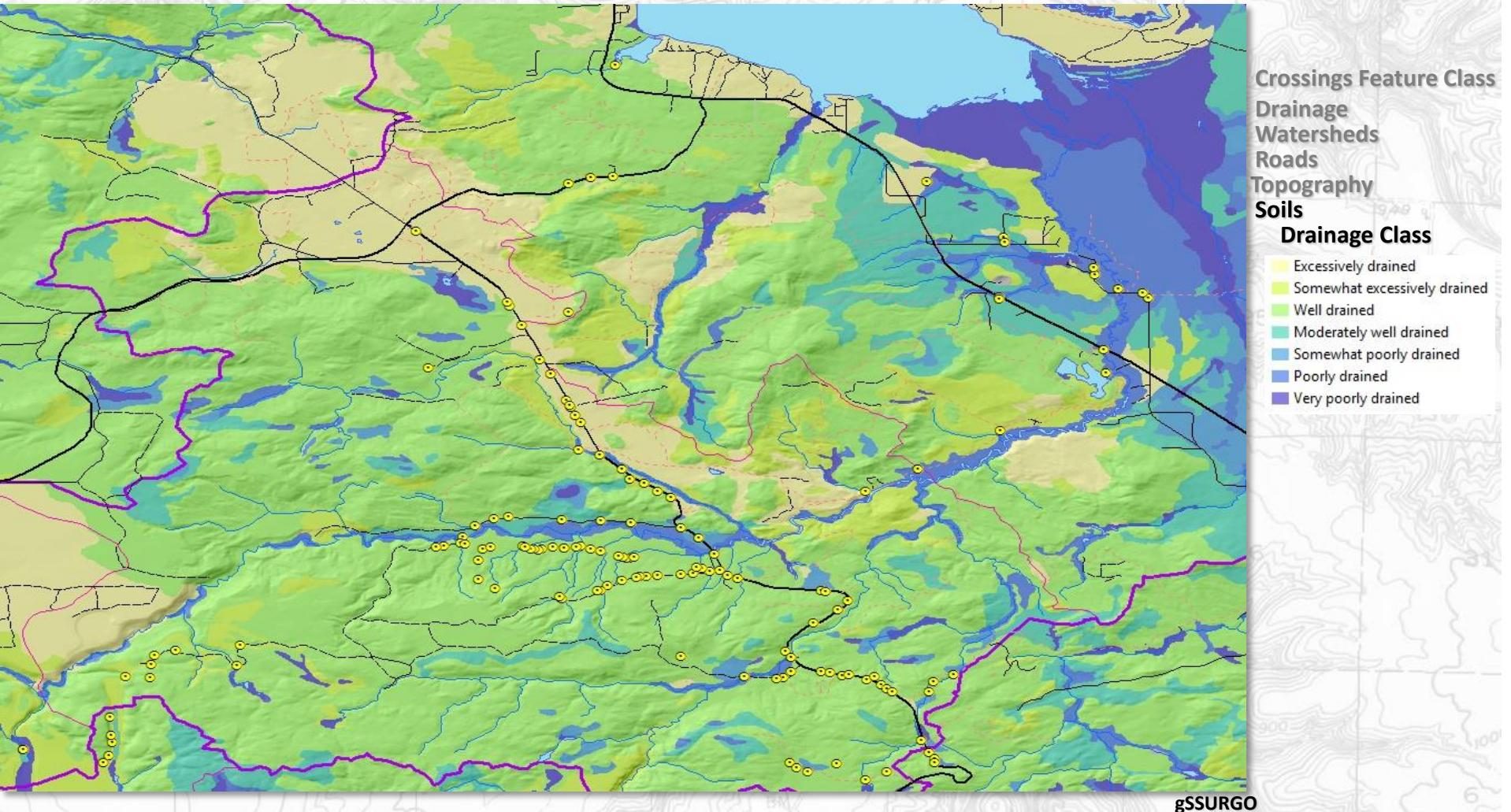
USGS

INTEGRATION OF GEOSPATIAL DATA – Reference

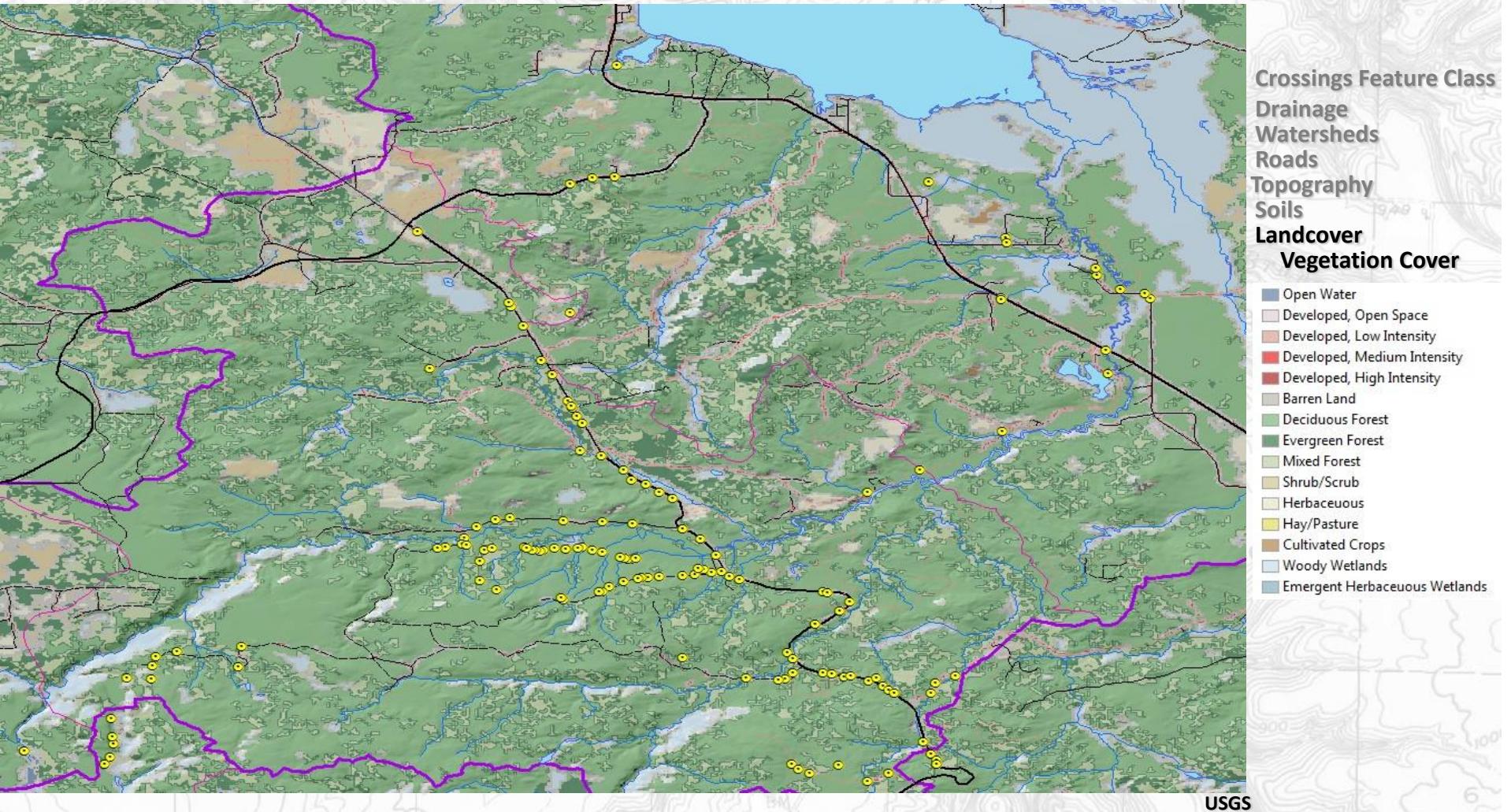


Crossings Feature Class
Drainage
Watersheds
Roads
Topography
Slope

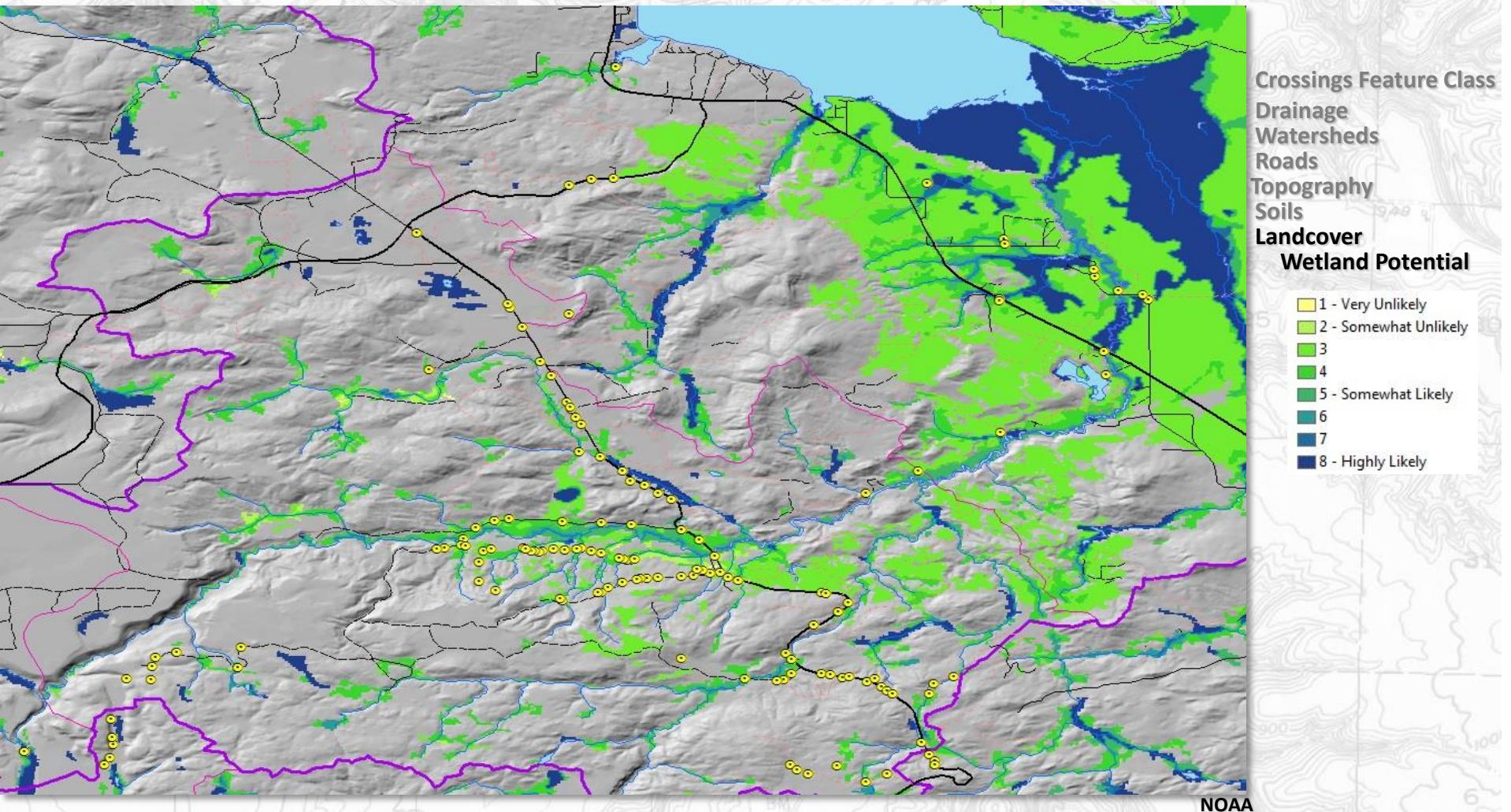
INTEGRATION OF GEOSPATIAL DATA – Reference



INTEGRATION OF GEOSPATIAL DATA – Reference



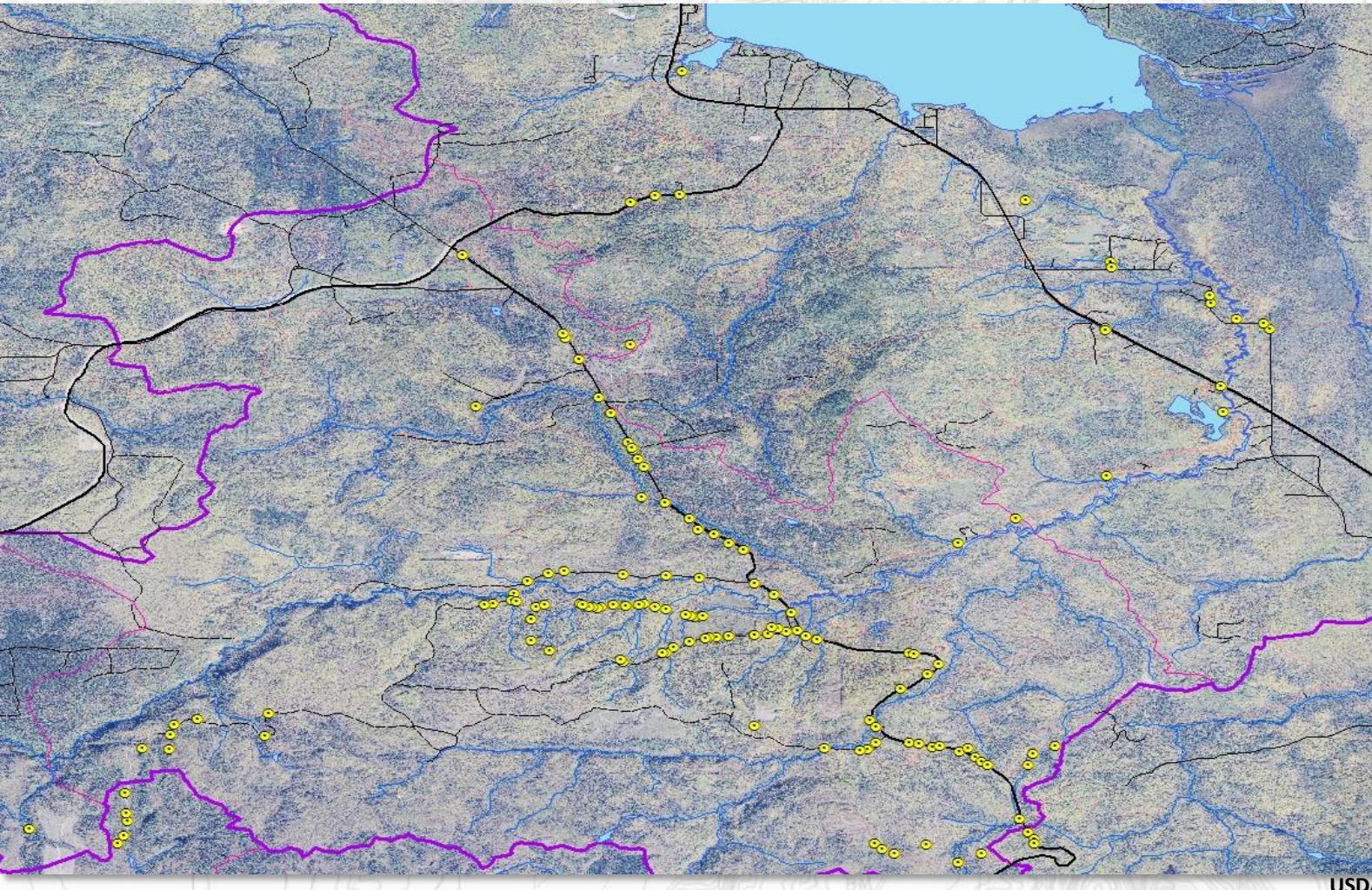
INTEGRATION OF GEOSPATIAL DATA – Reference



INTEGRATION OF GEOSPATIAL DATA – Reference

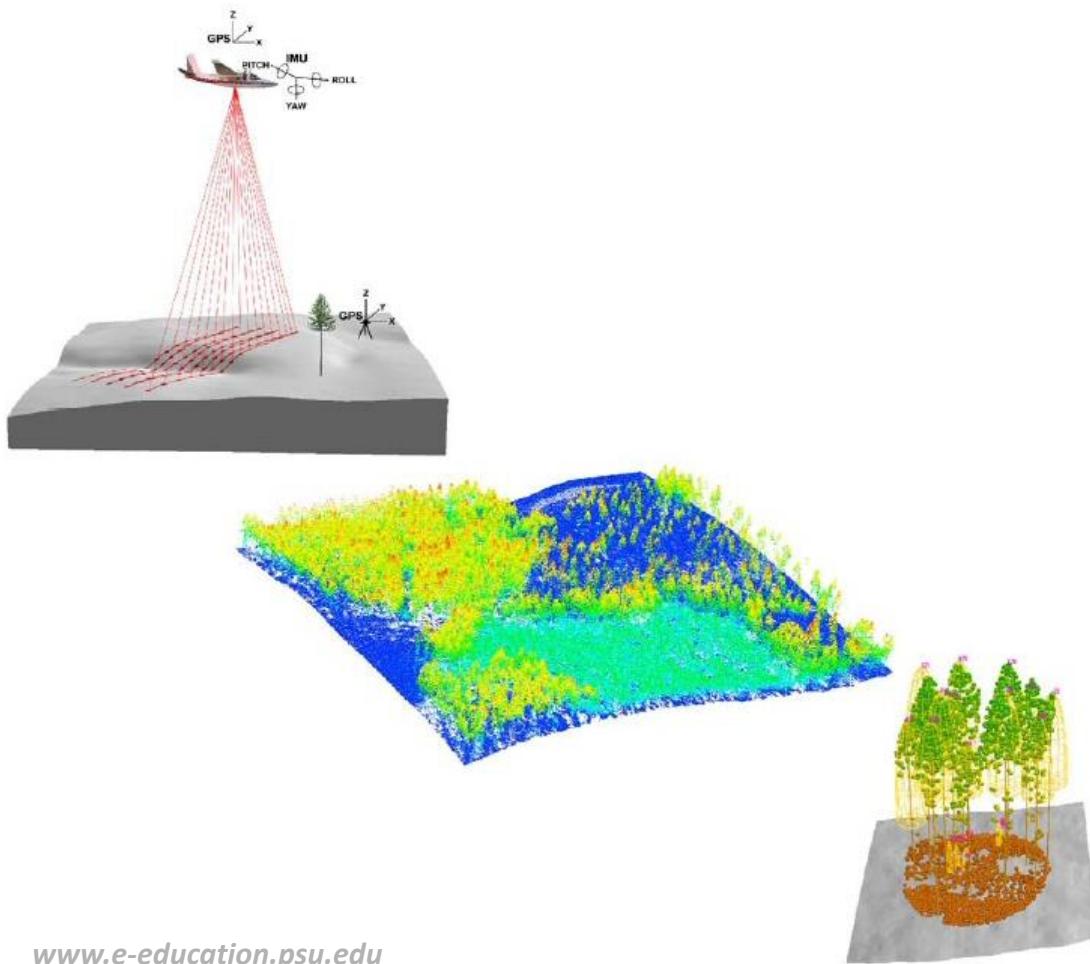


INTEGRATION OF GEOSPATIAL DATA – Reference

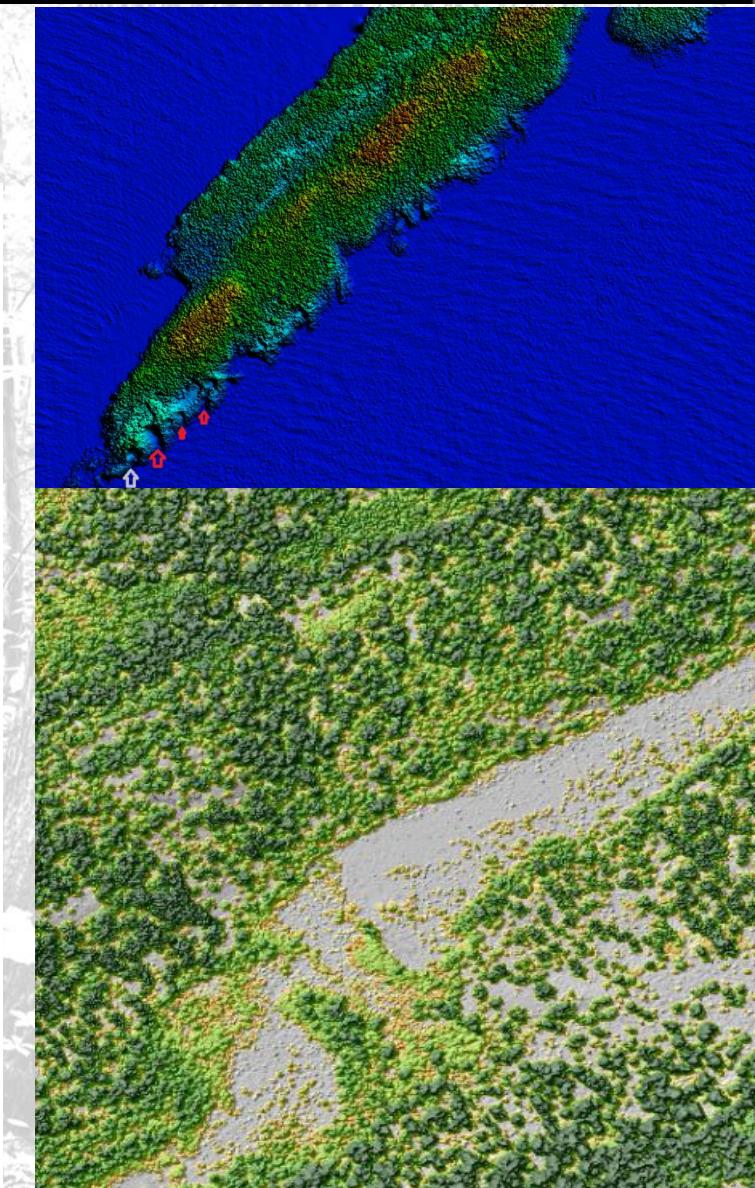


Crossings Feature Class
Drainage
Watersheds
Roads
Orography
Soils
Landcover
Cartographic Datasets
Orthoimagery

LiDAR – Light Detection and Ranging ALS – Airborne Laser Scanning

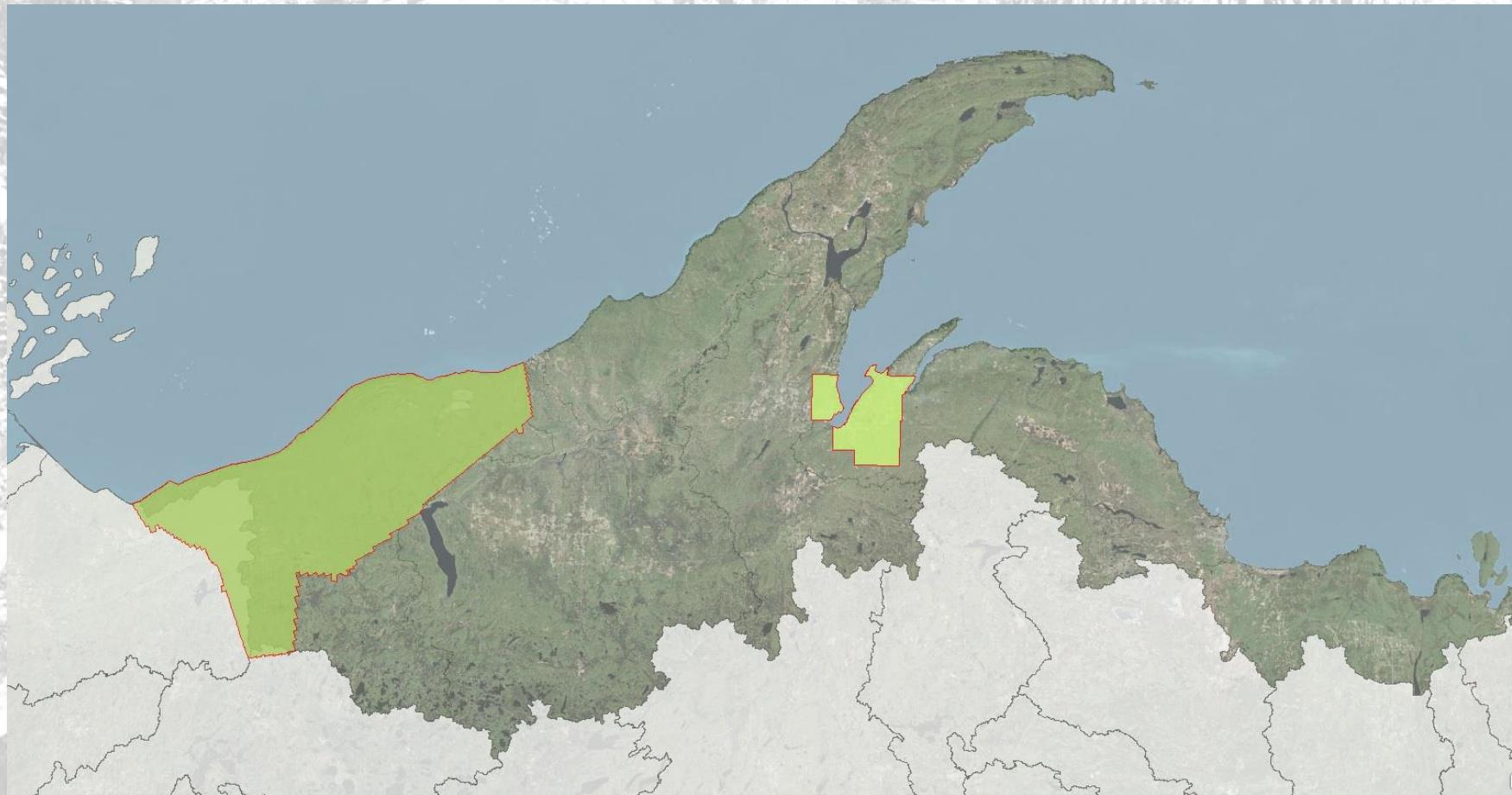


www.e-education.psu.edu



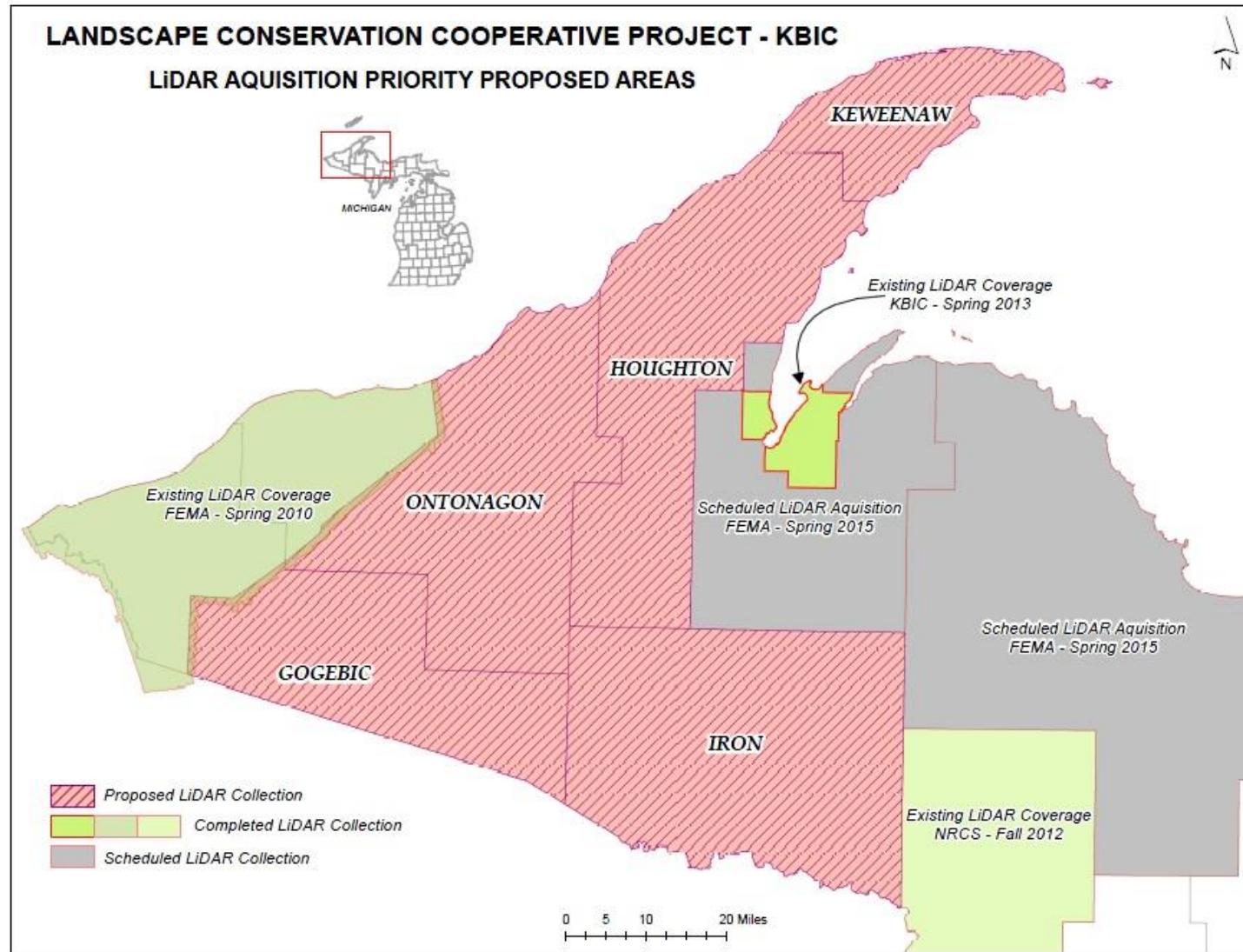
LIDAR COVERAGE

LiDAR - Existing Coverages in the South Central Lake Superior Basin



LIDAR COVERAGE

LiDAR - Upcoming Data-Blocks in the South Central Lake Superior Basin



DATA & PROCESSING

LiDAR data

FEMA IRW

Optech ALTM (Airborne Laser Terrain Mapping) LiDAR system

Data Aquisition: Spring 2011

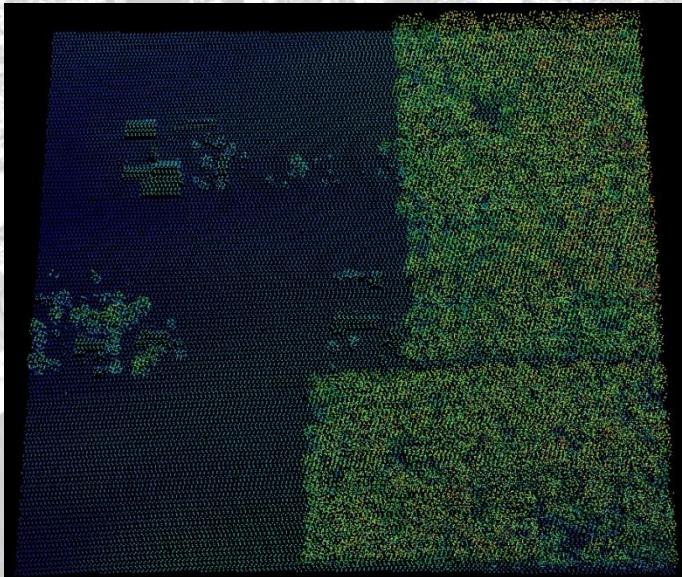
Entity : FEMA

Return Density: 1.2 pulses per sq m

Total Returns Processed: 6,480,848,587

Data Format: Classified LAS formatted point cloud data

Data Original Purpose: collect LiDAR point cloud datasets to provide an appropriate Digital Elevation Model (DEM) for topographic mapping needs



LiDAR data

KBIC

Optech ALTM (Airborne Laser Terrain Mapping) LiDAR system

Data Aquisition: Spring 2013

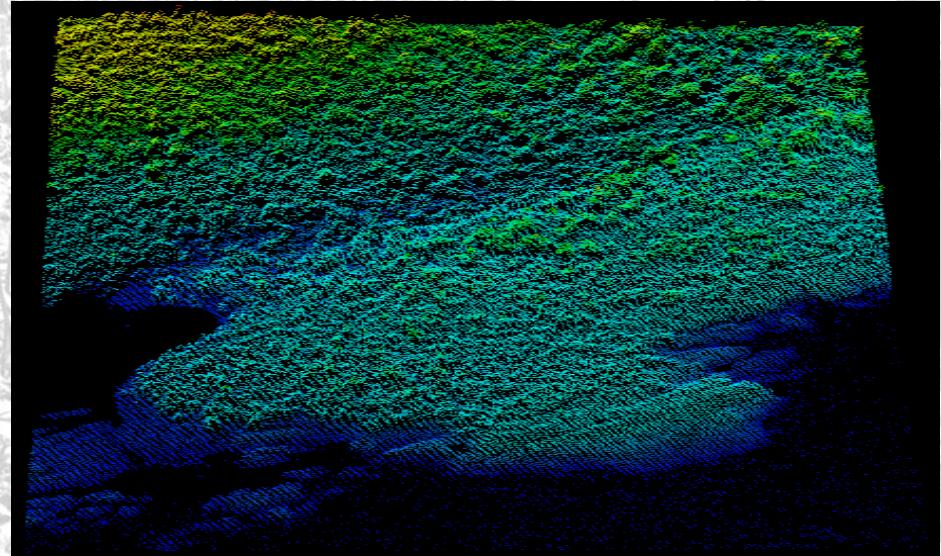
Entity : KBIC

Return Density: >7 pulses per sq m

Total Returns Processed: 4,657,388,804

Data Format: Classified LAS formatted point cloud data

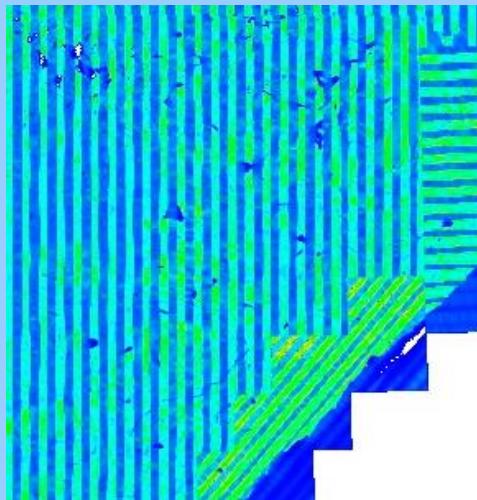
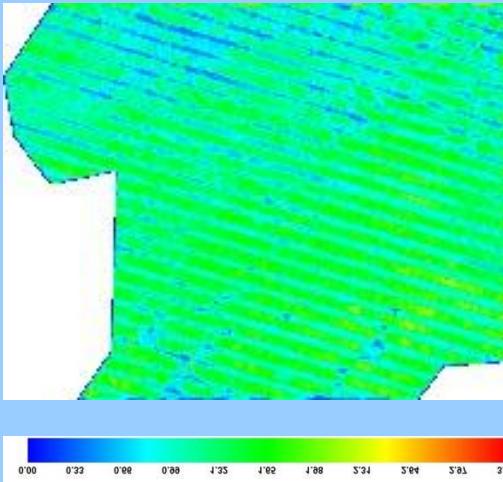
Data Original Purpose: collect LiDAR point cloud datasets to provide an appropriate Digital Elevation Model (DEM) archeologic and forest assessment needs.



DATA & PROCESSING

LiDAR data

QA/QC



LiDAR Data Coverage Report

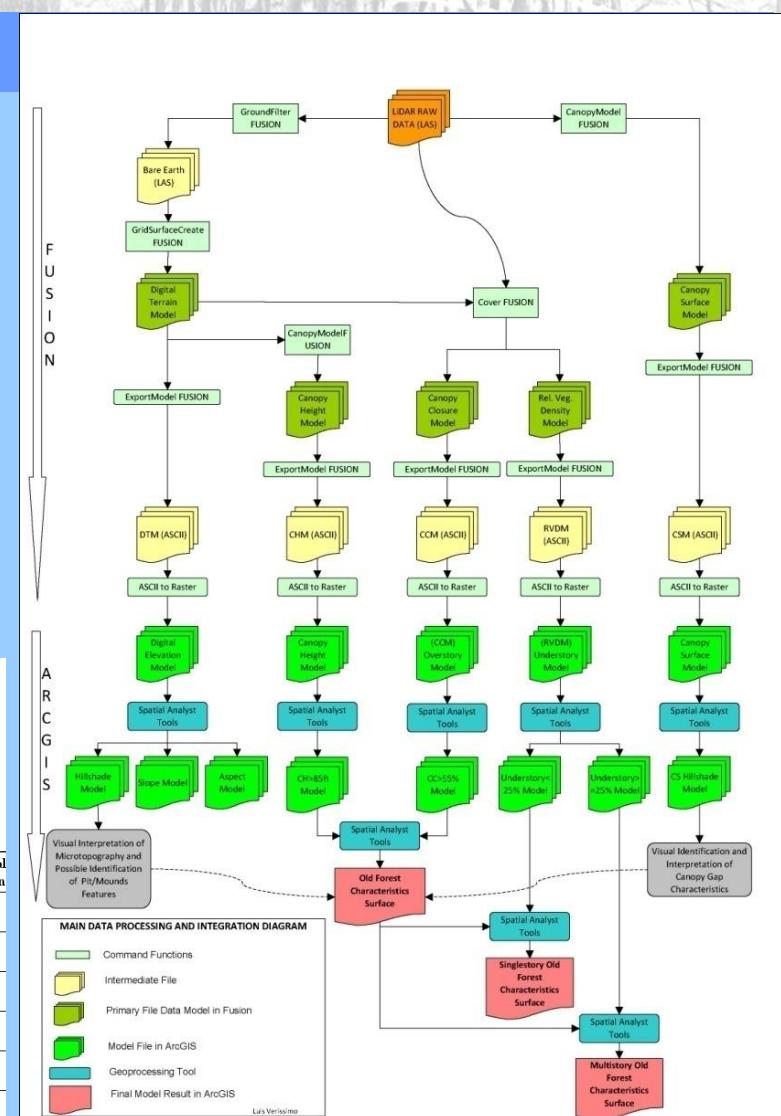
Catalog version 2.00 (FUSION version 3.30) (Built on Feb 22 2013 12:00:29)

Report created on Sat Jul 06 14:32:41 2013

Command line: Catalog\rawcounts\index\coverage\intensity.56.25,0.255\firstdensity.10000,4.20\density.10000,4.20\filelist.txt N\NSG\Cooper_Creek\Products\QAQC\QAQC.csv

File Summary

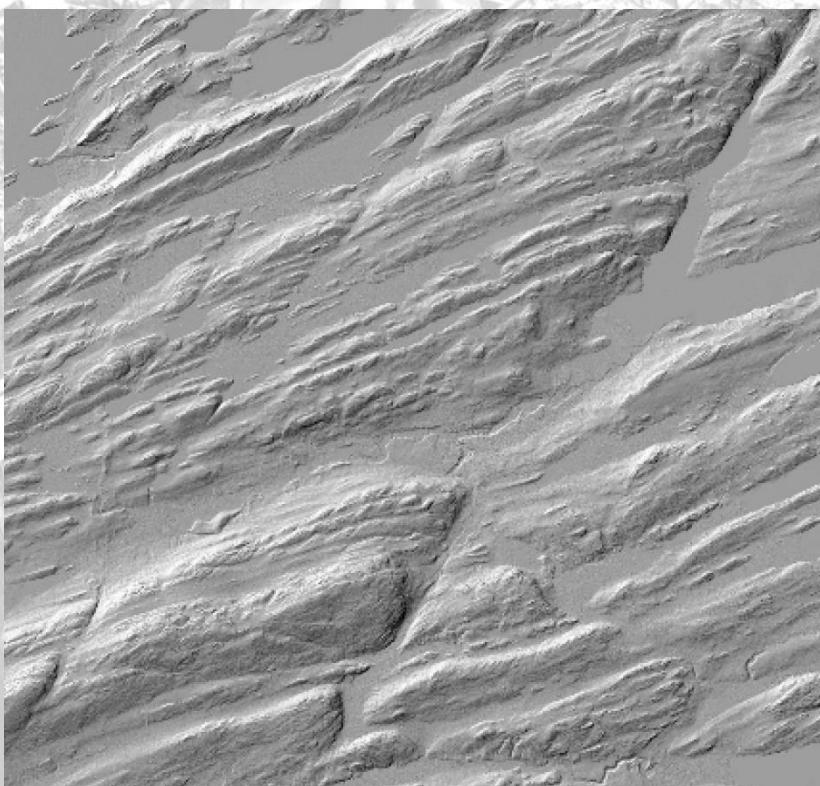
Filename	Minimum X	Minimum Y	Minimum Elevation	Maximum X	Maximum Y	Maximum Elevation	Total Returns	Nominal Den
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000030.las	220500.00	3846000.00	656.77	221999.99	3847499.99	2709.33	5,125,221	
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000077.las	216000.00	3858000.00	581.77	217499.99	3859499.99	2677.27	3,509,276	
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000088.las	228000.00	3853500.00	745.66	229499.99	3854999.99	1282.28	5,329,541	
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000099.las	231000.00	3855000.00	556.79	232499.99	3856499.99	2559.04	4,115,365	
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000111.las	225000.00	3844500.00	833.79	226499.99	3845999.99	2709.49	4,754,423	
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000149.las	226500.00	3855000.00	602.41	227999.99	3856499.99	2479.57	4,749,913	
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000157.las	226500.00	3844500.00	692.93	227999.99	3845999.99	2736.50	5,494,601	
N\NSG\Cooper_Creek\CooperCreek_las_files\ARRA-GA_LakeLanier_2010_000160.las	216000.00	3846000.00	630.60	217499.99	3847499.99	2685.87	4,948,267	



DATA & PROCESSING

LiDAR Derived Metrics - Topographic Model Variables

Metric Description	Model Code
Elevation (m)	TELEV
Slope (%)	TSLP
Aspect	TASP
PlanCurvature	TPLC

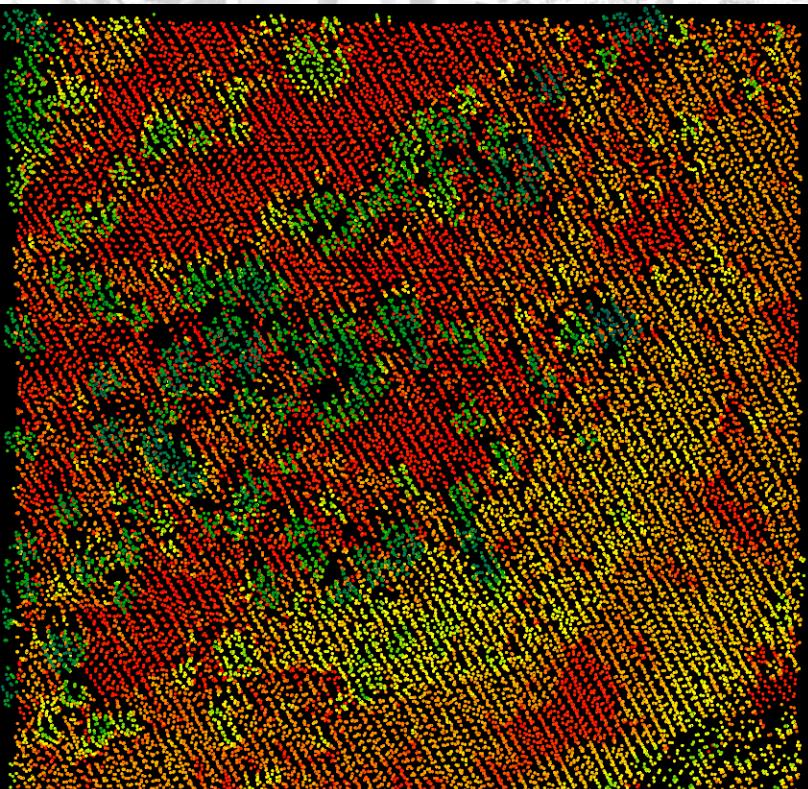


Metric Description	Model Code
Average Absolute Deviation of Heights for Cell	HAAD
Variance of Heights for Cell	HVAR
Standard Deviation of Heights for Cell	HSTDEV
Skewness of Heights for Cell	HSKEW
Heights 99 th Percentile for Cell	H99PCTIL
Heights 95 th Percentile for Cell	H95PCTIL
Heights 90 th Percentile for Cell	H90PCTIL
Heights 80 th Percentile for Cell	H80PCTIL
Heights 75 th Percentile for Cell	H75PCTIL
Heights 70 th Percentile for Cell	H70PCTIL
Heights 60 th Percentile for Cell	H60PCTIL
Heights 50 th Percentile for Cell = Median	H50PCTIL
Heights 40 th Percentile for Cell	H40PCTIL
Heights 30 th Percentile for Cell	H30PCTIL
Heights 25 th Percentile for Cell	H25PCTIL
Heights 20 th Percentile for Cell	H20PCTIL
Heights 10 th Percentile for Cell	H10PCTIL
Heights 5 th Percentile for Cell	H05PCTIL
Heights 1 st Percentile for Cell	H01PCTIL
Modal Height for Cell	HMODE
Minimum Height for Cell	HMIN
Mean Height for Cell	HMEAN
Maximum Height for Cell	HMAX
Kurtosis of Heights for Cell	HKURT
Interquartile 75 th minus 25 th Percentiles for Cell	HIQ
Canopy cover (All returns above 3m/total returns*100)	CANOPY
Percentage of Vegetation Returns > 1.5m and <=2.5m	STRATUM1
Percentage of Vegetation Returns > 2.5m and <=5m	STRATUM2
Percentage of Vegetation Returns > 5m and <=10m	STRATUM3
Percentage of Vegetation Returns > 10m and <=20m	STRATUM4
Percentage of Vegetation Returns > 20m	STRATUM5

DATA & PROCESSING

LiDAR Derived Metrics - Vegetation Height Model Variables

Metric Description	Model Code
Elevation (m)	<i>TELEV</i>
Slope (%)	<i>TSLP</i>
Aspect	<i>TASP</i>
PlanCurvature	<i>TPLC</i>

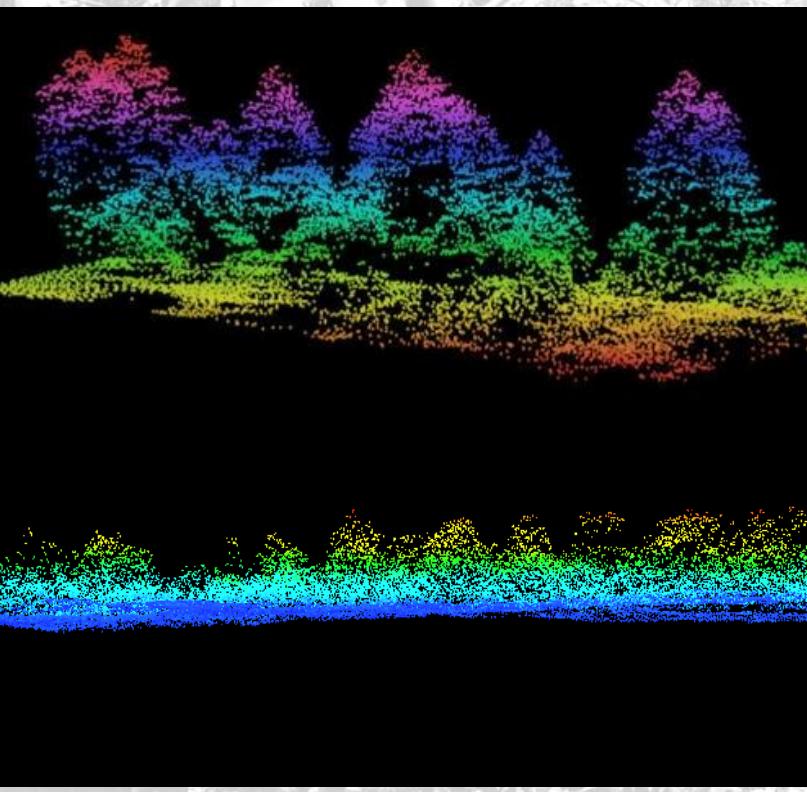


Metric Description	Model Code
Average Absolute Deviation of Heights for Cell	<i>HAAD</i>
Variance of Heights for Cell	<i>HVAR</i>
Standard Deviation of Heights for Cell	<i>HSTDEV</i>
Skewness of Heights for Cell	<i>HSKEW</i>
Heights 99 th Percentile for Cell	<i>H99PCTIL</i>
Heights 95 th Percentile for Cell	<i>H95PCTIL</i>
Heights 90 th Percentile for Cell	<i>H90PCTIL</i>
Heights 80 th Percentile for Cell	<i>H80PCTIL</i>
Heights 75 th Percentile for Cell	<i>H75PCTIL</i>
Heights 70 th Percentile for Cell	<i>H70PCTIL</i>
Heights 60 th Percentile for Cell	<i>H60PCTIL</i>
Heights 50 th Percentile for Cell = Median	<i>H50PCTIL</i>
Heights 40 th Percentile for Cell	<i>H40PCTIL</i>
Heights 30 th Percentile for Cell	<i>H30PCTIL</i>
Heights 25 th Percentile for Cell	<i>H25PCTIL</i>
Heights 20 th Percentile for Cell	<i>H20PCTIL</i>
Heights 10 th Percentile for Cell	<i>H10PCTIL</i>
Heights 5 th Percentile for Cell	<i>H05PCTIL</i>
Heights 1 st Percentile for Cell	<i>H01PCTIL</i>
Modal Height for Cell	<i>HMODE</i>
Minimum Height for Cell	<i>HMIN</i>
Mean Height for Cell	<i>HMEAN</i>
Maximum Height for Cell	<i>HMAX</i>
Kurtosis of Heights for Cell	<i>HKURT</i>
Interquartile 75 th minus 25 th Percentiles for Cell	<i>HIQ</i>

Canopy cover (All returns above 3m/total returns*100) Percentage of Vegetation Returns > 1.5m and <=2.5m Percentage of Vegetation Returns > 2.5m and <=5m Percentage of Vegetation Returns > 5m and <=10m Percentage of Vegetation Returns > 10m and <=20m Percentage of Vegetation Returns > 20m	<i>CANOPY</i> <i>STRATUM1</i> <i>STRATUM2</i> <i>STRATUM3</i> <i>STRATUM4</i> <i>STRATUM5</i>
--	--

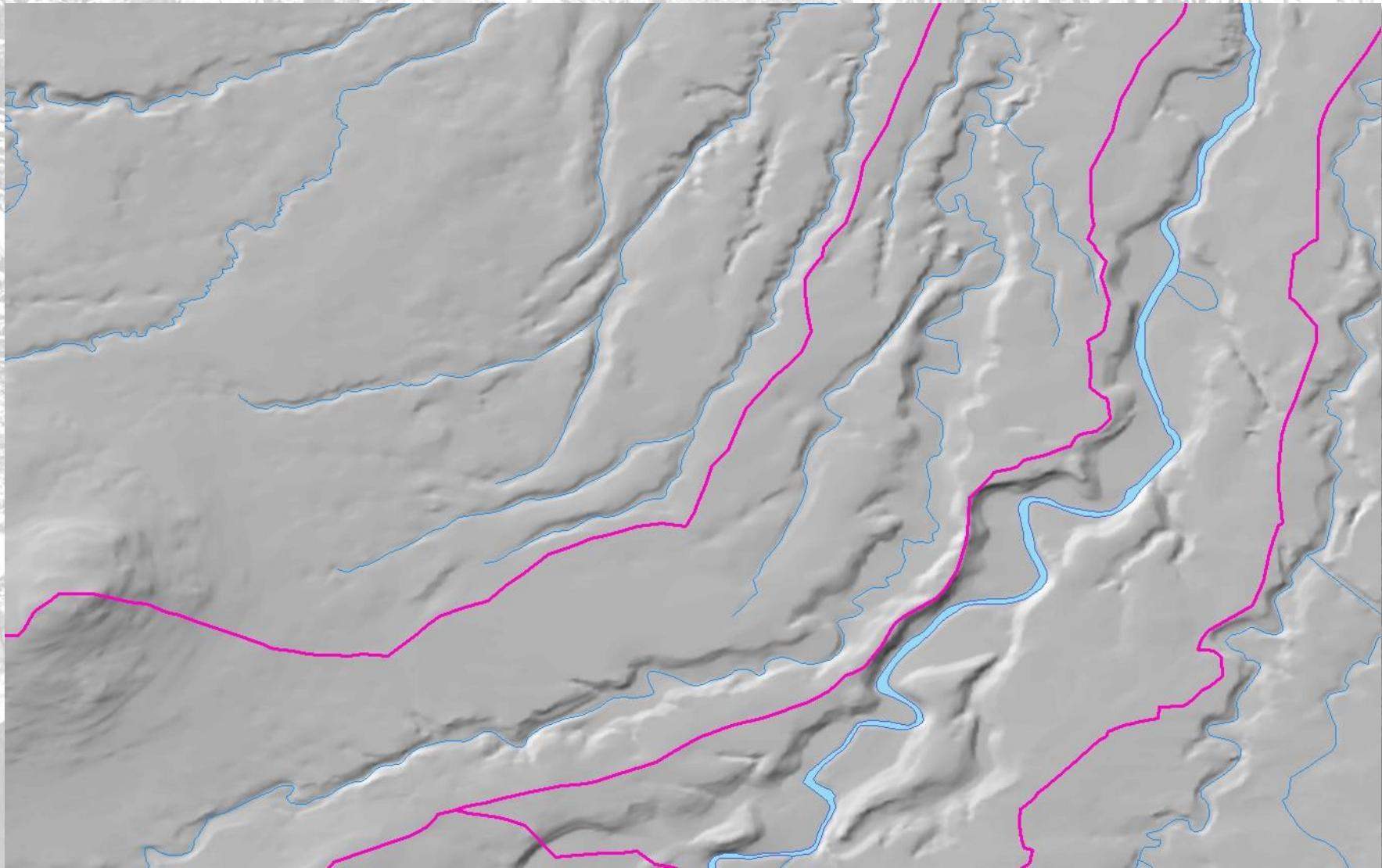
DATA & PROCESSING

LiDAR Derived Metrics - Vegetation Density Model Variables

Metric Description	Model Code	Metric Description	Model Code
Elevation (m)	<i>TELEV</i>	Average Absolute Deviation of Heights for Cell	<i>HAAD</i>
Slope (%)	<i>TSLP</i>	Variance of Heights for Cell	<i>HVAR</i>
Aspect	<i>TASP</i>	Standard Deviation of Heights for Cell	<i>HSTDEV</i>
PlanCurvature	<i>TPLC</i>	Skewness of Heights for Cell	<i>HSKEW</i>
			
		Heights 99 th Percentile for Cell	<i>H99PCTIL</i>
		Heights 95 th Percentile for Cell	<i>H95PCTIL</i>
		Heights 90 th Percentile for Cell	<i>H90PCTIL</i>
		Heights 80 th Percentile for Cell	<i>H80PCTIL</i>
		Heights 75 th Percentile for Cell	<i>H75PCTIL</i>
		Heights 70 th Percentile for Cell	<i>H70PCTIL</i>
		Heights 60 th Percentile for Cell	<i>H60PCTIL</i>
		Heights 50 th Percentile for Cell = Median	<i>H50PCTIL</i>
		Heights 40 th Percentile for Cell	<i>H40PCTIL</i>
		Heights 30 th Percentile for Cell	<i>H30PCTIL</i>
		Heights 25 th Percentile for Cell	<i>H25PCTIL</i>
		Heights 20 th Percentile for Cell	<i>H20PCTIL</i>
		Heights 10 th Percentile for Cell	<i>H10PCTIL</i>
		Heights 5 th Percentile for Cell	<i>H05PCTIL</i>
		Heights 1 st Percentile for Cell	<i>H01PCTIL</i>
		Modal Height for Cell	<i>HMODE</i>
		Minimum Height for Cell	<i>HMIN</i>
		Mean Height for Cell	<i>HMEAN</i>
		Maximum Height for Cell	<i>HMAX</i>
		Kurtosis of Heights for Cell	<i>HKURT</i>
		Interquartile 75 th minus 25 th Percentiles for Cell	<i>HIQ</i>
Canopy cover (All returns above 3m/total returns*100) Percentage of Vegetation Returns > 1.5m and <=2.5m Percentage of Vegetation Returns > 2.5m and <=5m Percentage of Vegetation Returns > 5m and <=10m Percentage of Vegetation Returns > 10m and <=20m Percentage of Vegetation Returns > 20m			
			<i>CANOPY</i>
			<i>STRATUM1</i>
			<i>STRATUM2</i>
			<i>STRATUM3</i>
			<i>STRATUM4</i>
			<i>STRATUM5</i>

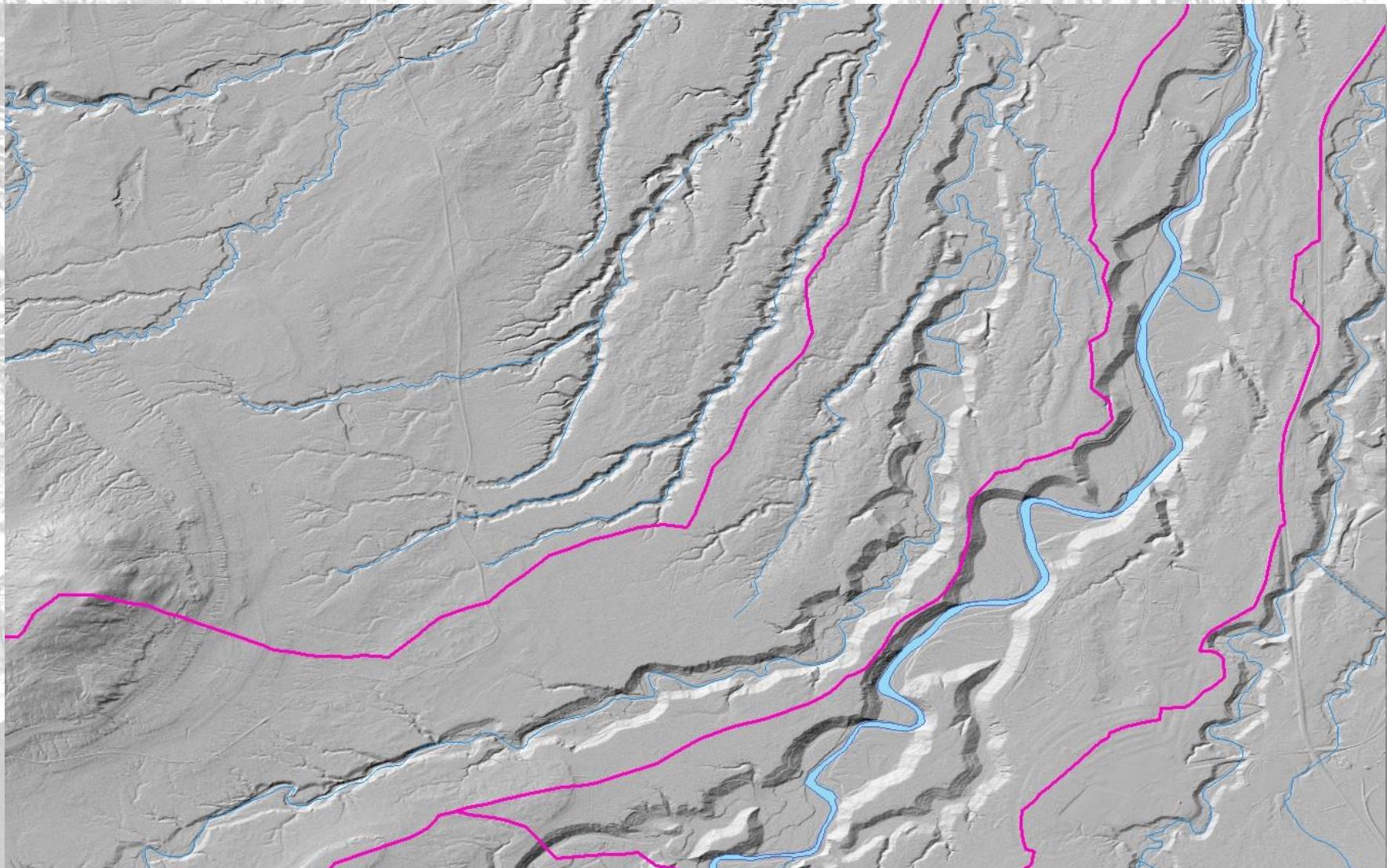
MODELS - Topographic

Digital Terrain Model: NED 10m (hillshade)



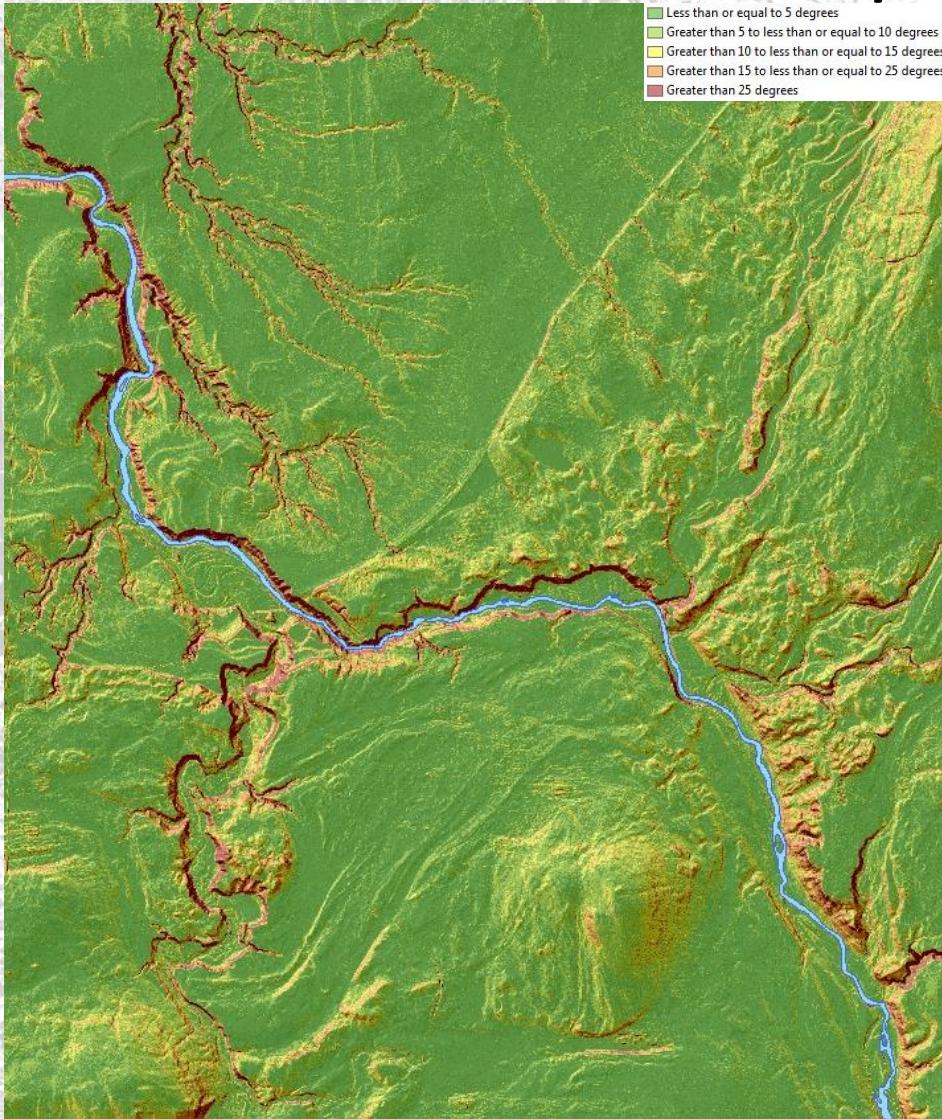
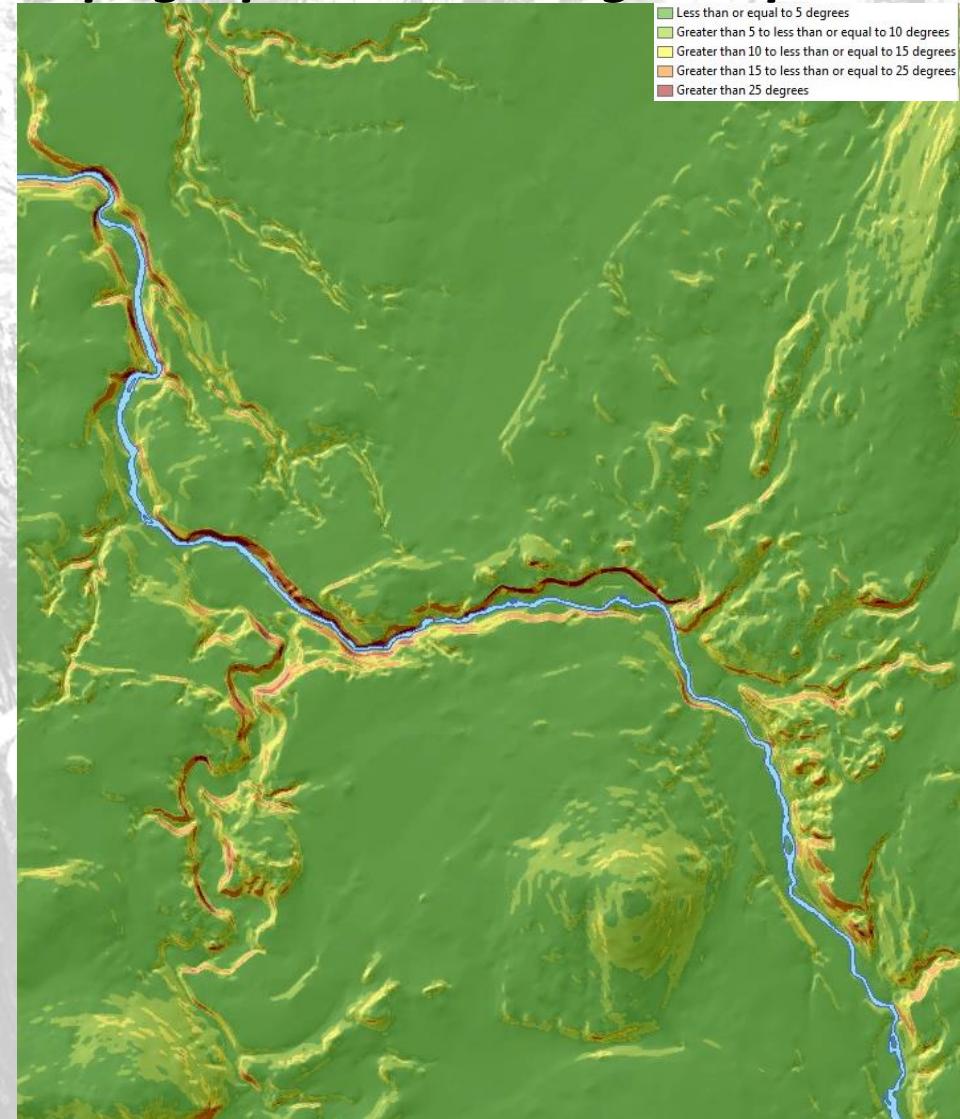
MODELS - Topographic

Digital Terrain Model: LiDAR 1m (hillshade)



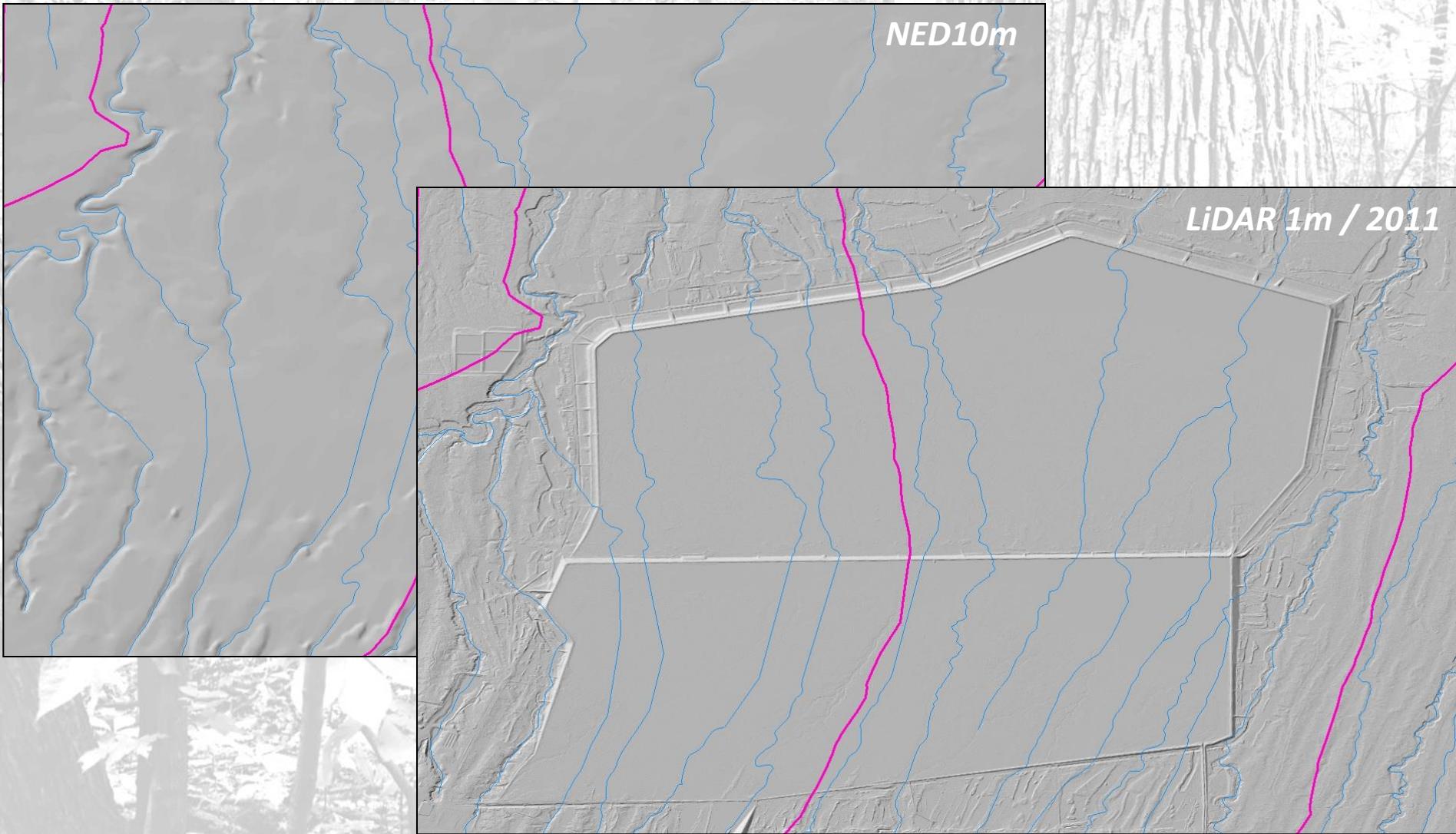
MODELS - Topographic

Topographic Modelling Comparison: NED10m vs LiDAR DTM 1m - Slope



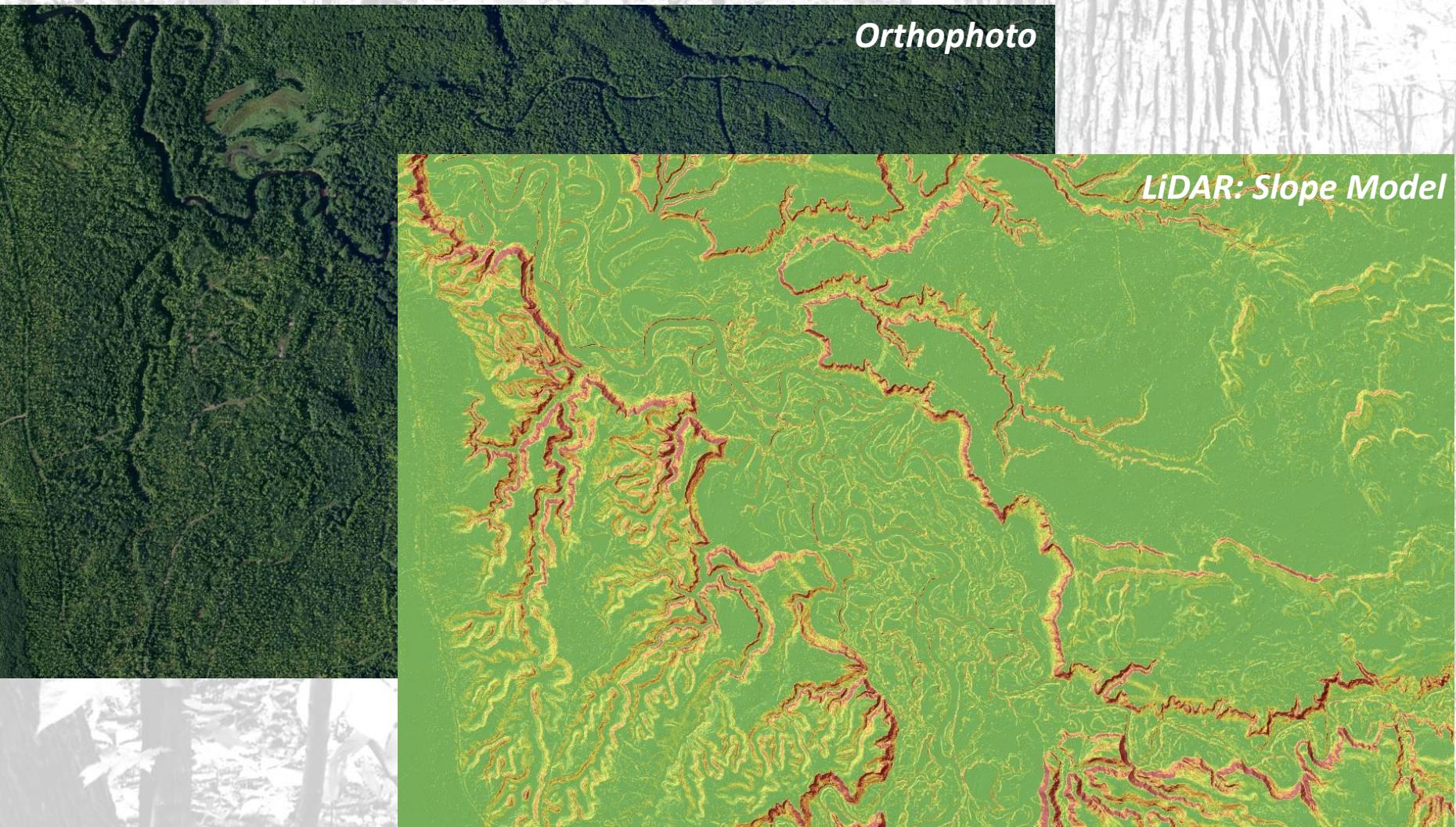
MODELS - Topographic

Digital Terrain Model: Landscape Change



MODELS - Topographic

LiDAR: Morphology Models

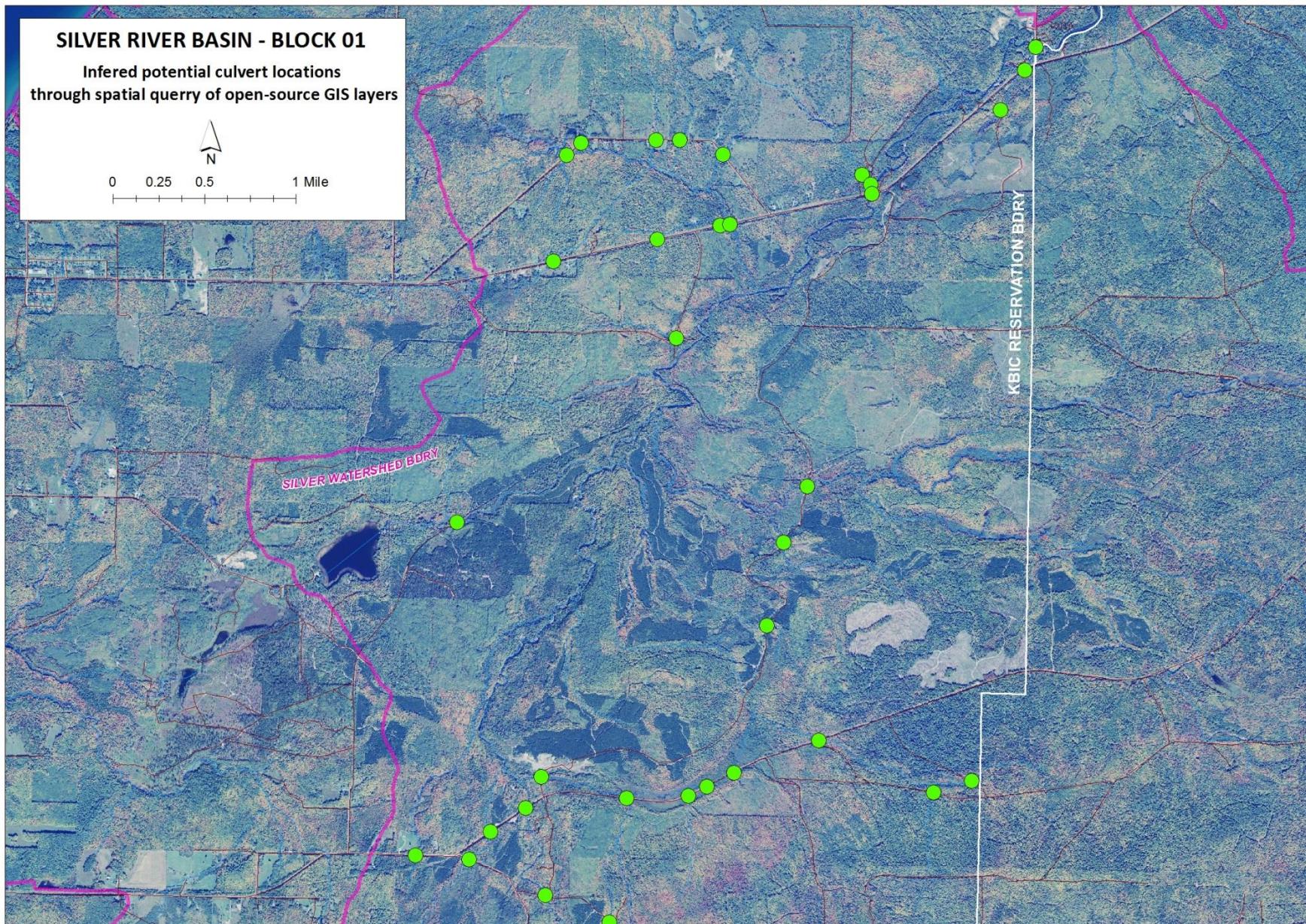


MODELS - Topographic

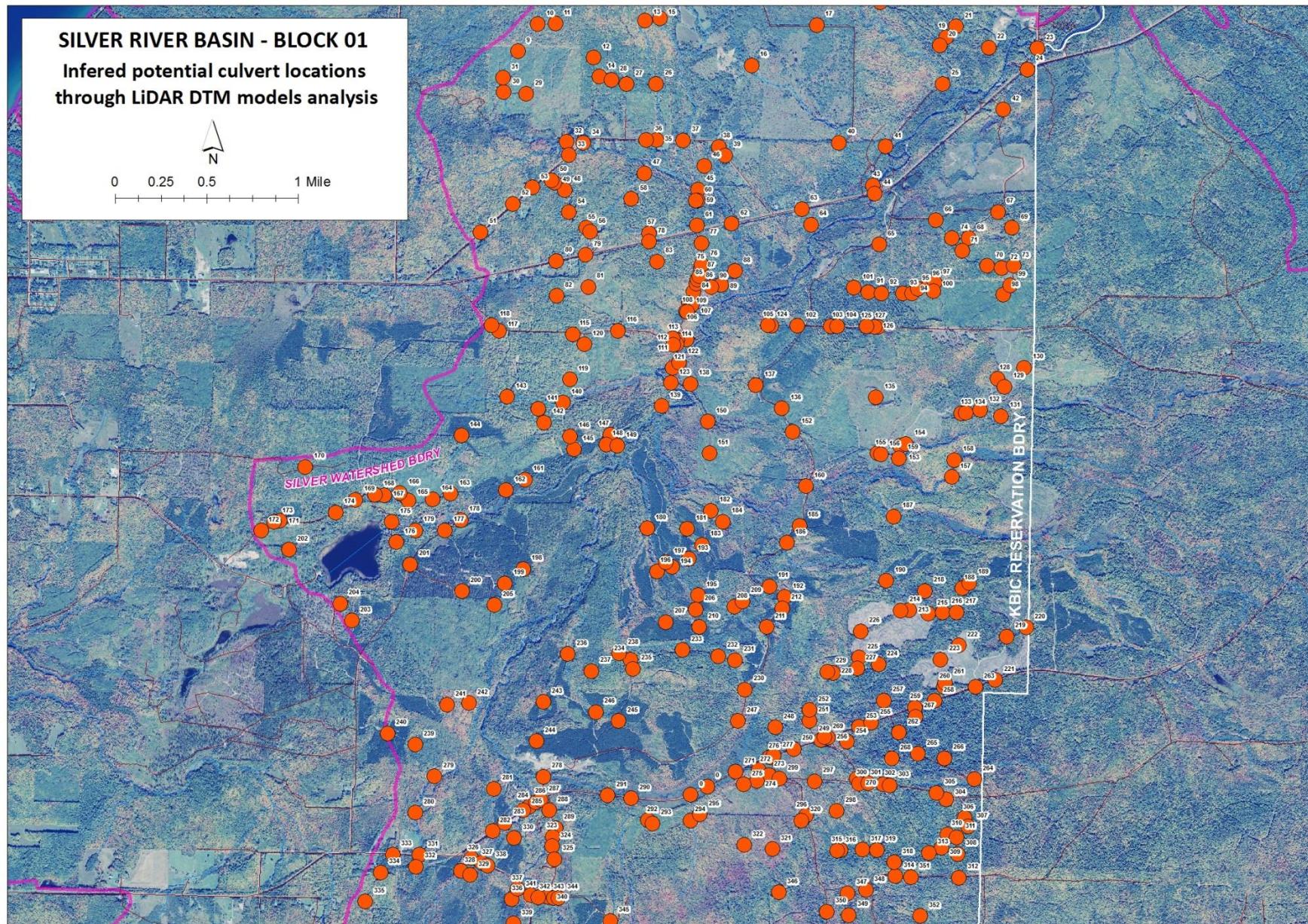
LiDAR: DTM & Culvert Locations



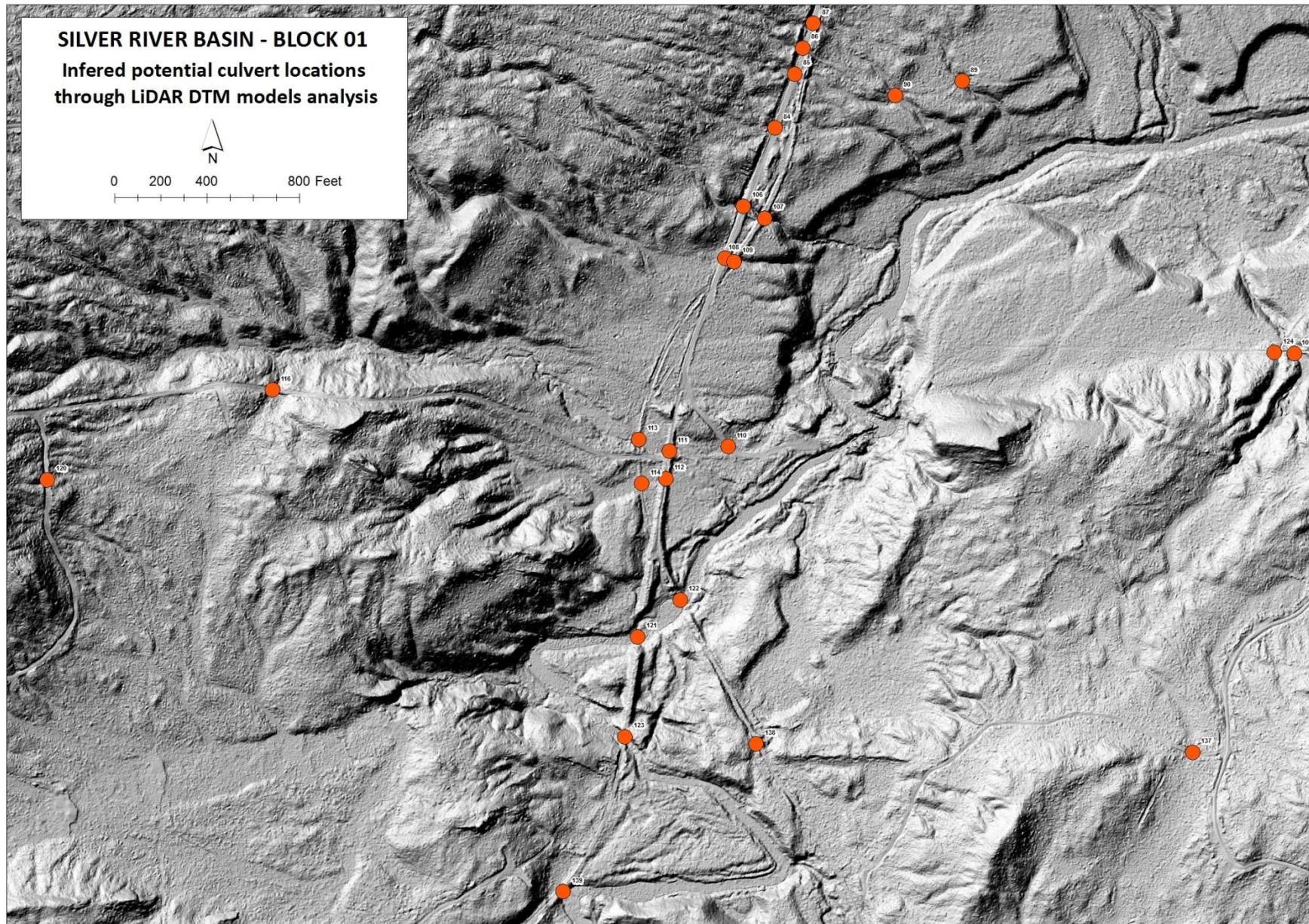
LiDAR AS TOOL



LiDAR AS TOOL



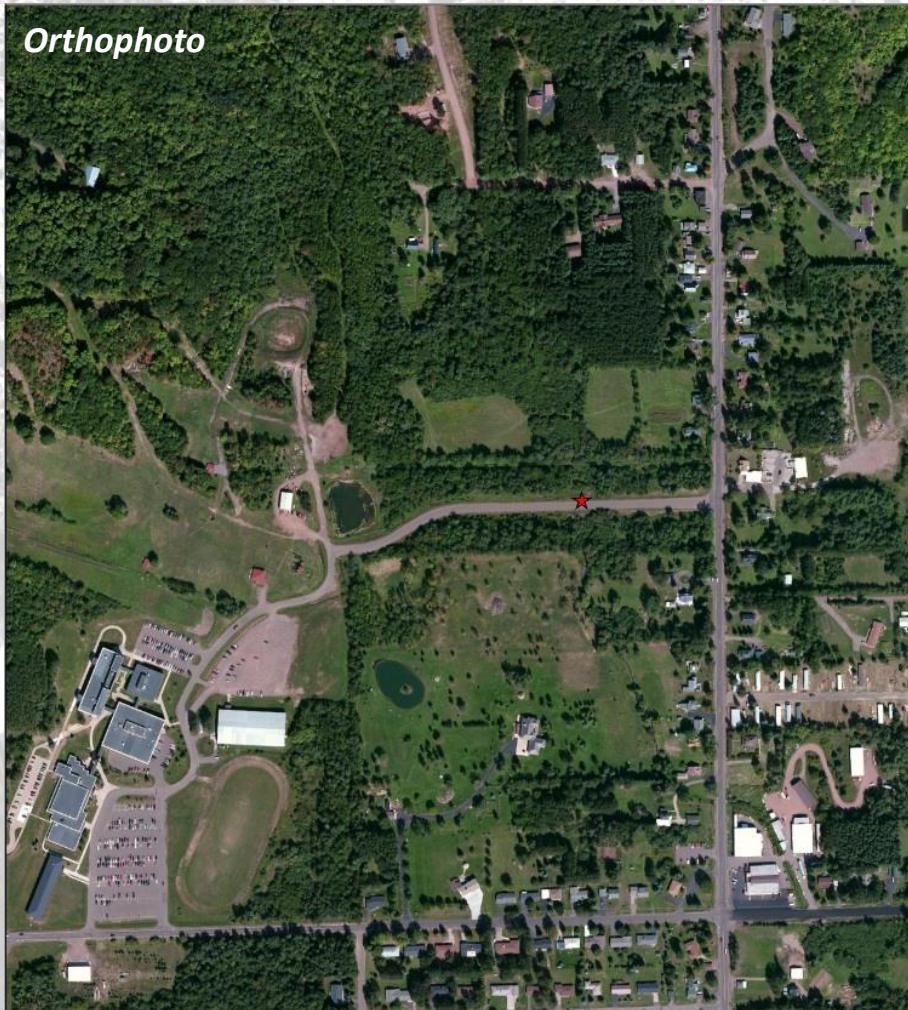
LiDAR AS TOOL



MODELS - Cover

LiDAR: Digital Surface Model – Cover Height

Orthophoto



LiDAR – DSM 1m



MODELS - Forest Strct

LiDAR Forest Metrics

LAKE SUPERIOR



LiDAR DTM-Hillshade (1m)

MODELS - Forest Strct

LiDAR Forest Metrics – Canopy Surface Height

LAKE SUPERIOR



MODELS - Forest Strct

LiDAR Forest Metrics – Canopy Surface Height

LAKE SUPERIOR



LiDAR DSMH 1m

MODELS - Forest Strct

LiDAR Forest Metrics – Mean of Heights

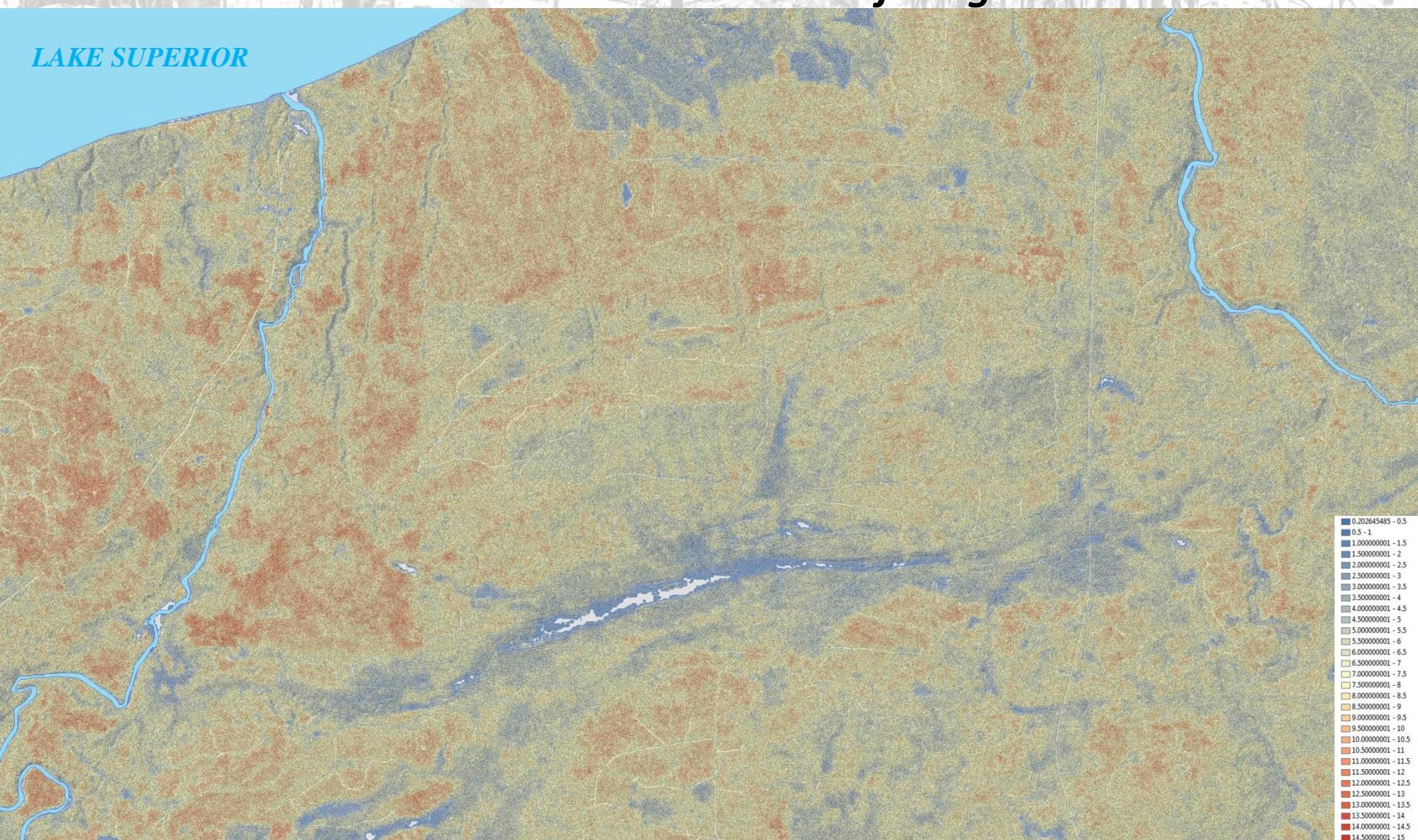
LAKE SUPERIOR



MODELS - Forest Strct

LiDAR Forest Metrics – Standard Deviation of Heights

LAKE SUPERIOR



MODELS - Forest Strct

LiDAR Forest Metrics – Canopy Cover



MODELS - Forest Strct

LiDAR Forest Metrics – Canopy Density



Within Timeline

*Trial sharing with four partners**

Webinar: Working with the Geodatabase

Webinar: LiDAR models (August)

Sharing database with UW Madison (Sept)

Thank You to All

U.S. Forest Service*

Superior Watershed Partnership*

U.S. Fish and Wildlife Service

Michigan DNR

Yellow Dog Watershed Preserve*

Baraga County Road Commission

Huron River Restoration, Inc.

KBIC

Michigan Assoc. Conservation Districts*

Michigan Tech University

Natural Resource Conservation Service

AIG Consultants

Stantec

Natural Resource Conservation Service

MDOT