

REDUCING N & P LOAD IN WATER BODIES

TREVOR DEERING



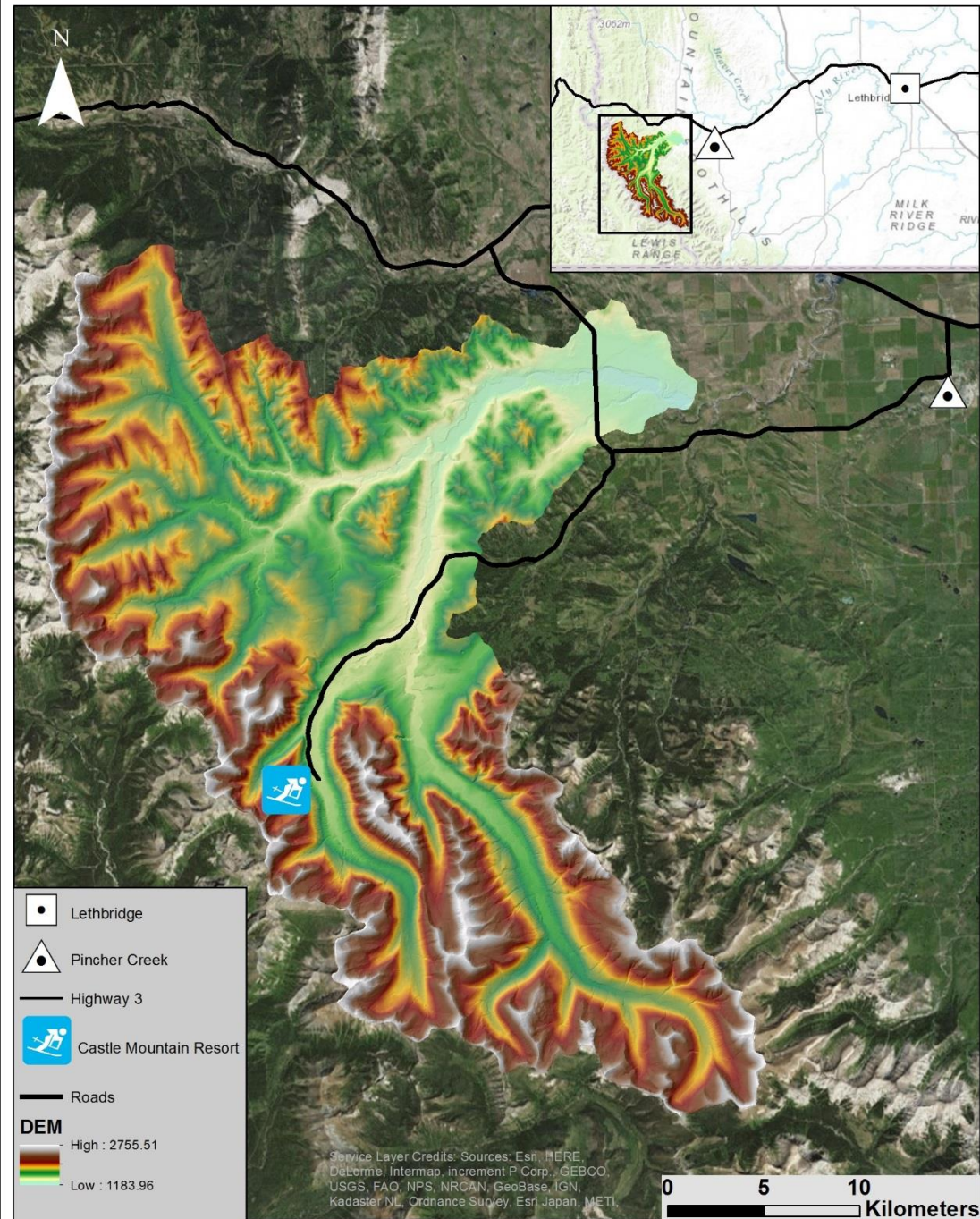
PROGRAMS

- DIPLOMA— LC
- BACHELORS — U OF L
- MASTERS — U OF L
- INTERESTS:
 - SOIL SCIENCE
 - PRECISION AGRICULTURE
 - CROP PRODUCTION
 - WEED SCIENCE



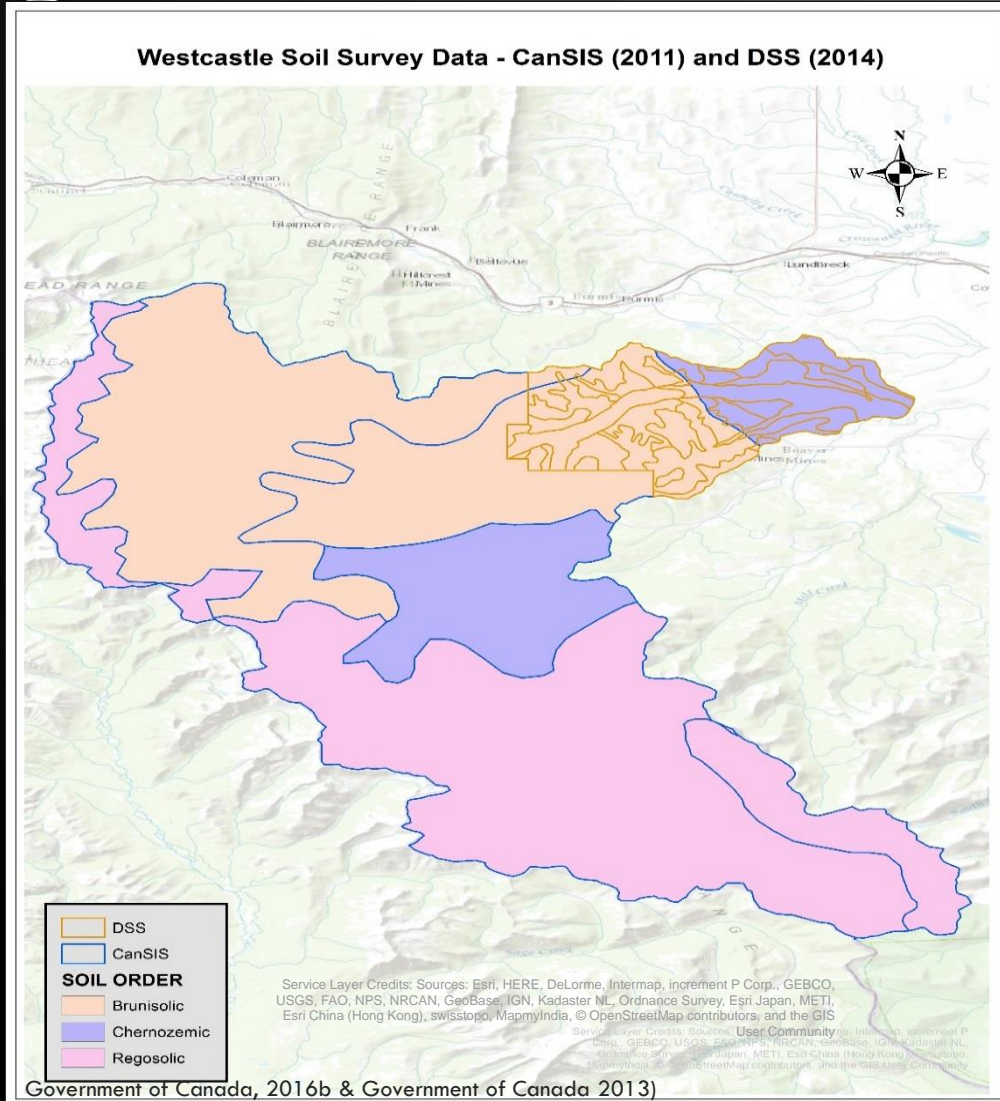
STUDY AREA

- COMPLEX MOUNTAINOUS TERRAIN
- PRISTINE CONDITION
- HIGHLY DIVERSE ORGANISMS
- CLOSE PROXIMITY TO U OF L
- HOT RESEARCH AREA



DESCRIPTION OF RESEARCH

- GENERALIZED SOIL SURVEY DATA



- THERE IS LITTLE KNOWN ABOUT THE SOIL IN SOUTHERN ALBERTA MOUNTAINOUS SOILS
- HYDROLOGICAL STUDIES AND CLIMATE CHANGE
- OTHER DISPOSITIONS
- SOIL PROPERTY MAPPING

GOALS

- TO CONFIDENTLY MAP SOIL PROPERTIES
 - GIVEN THE LARGE AREA, LIMITED # OF SAMPLES, AND COMPLEX LANDSCAPE
- TO PROVIDE MORE DETAILED SOIL INFORMATION FOR HYDROLOGICAL RESEARCH
 - WATER MANAGEMENT
- TO PROVIDE MORE DETAILED SOIL INFORMATION FOR OTHER PARTIES
 - PARKS CANADA
 - HISTORICAL RESOURCES ALBERTA

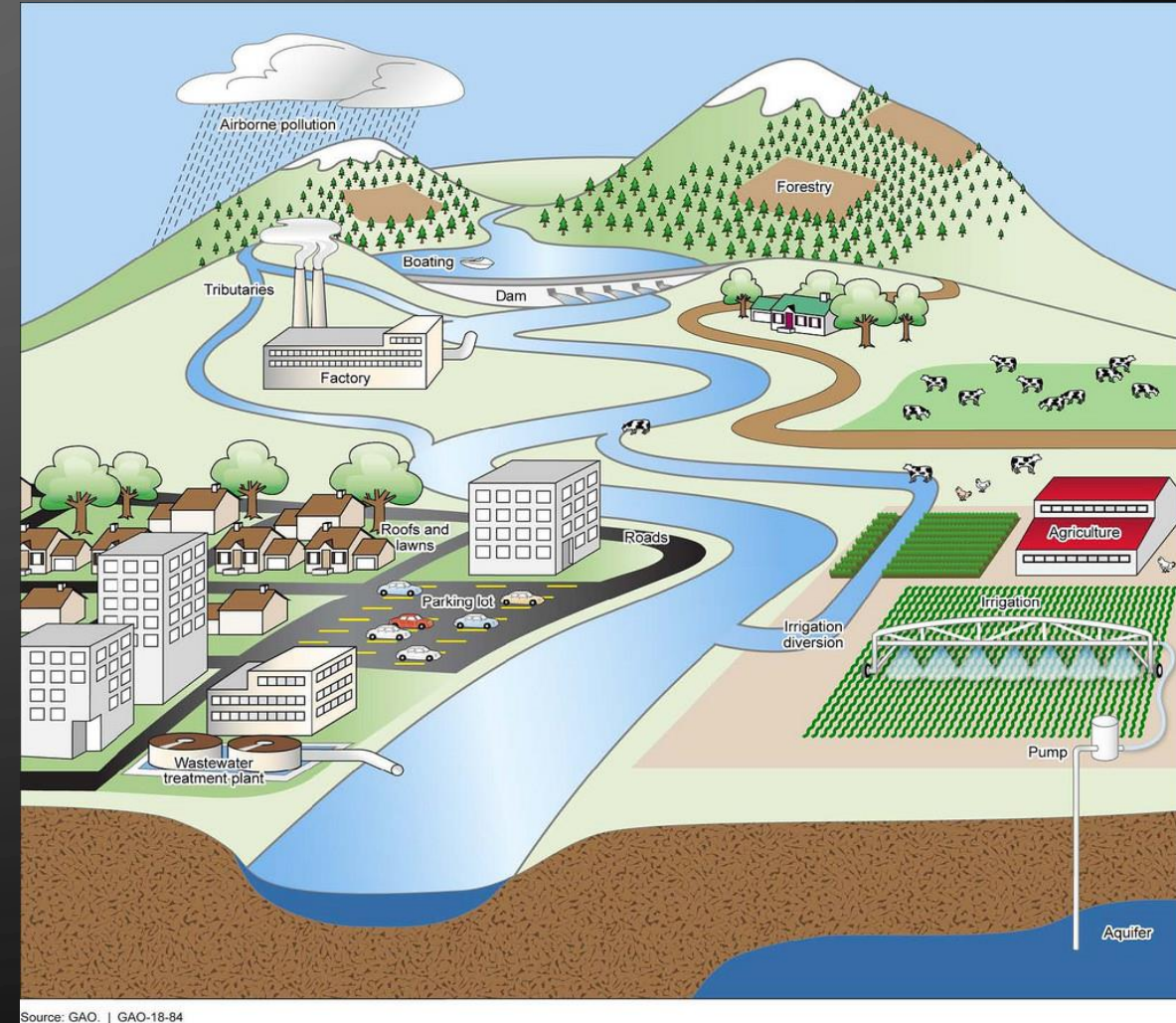


DIRTY WATER

- MANY SOURCES
- MANURE SPREADING
- CATTLE FEEDING AND MANURE BUILD UP
- INORGANIC FERTILIZER USE



(Betts, 1999)



Source: GAO. | GAO-18-84

(GAO, 2016)

TOOLS

- DECISION MAKING TOOLS
 - ALBERTA AGRICULTURE AND FORESTRY
- ENVIRONMENTAL FARM PLAN
- AFFIRM 2.0
- PHOSPHORUS TOOL
- WSADT
- SWAT
 - HYDROLOGICAL INFORMATION

Wintering Site Assessment and Design Tool

Summary Page – fill out one per site

Legal Land Location: _____

No. of Cattle: _____

☐ Pre-Calving ☐ Post Calving

No. of acres: _____

	Red – High Risk	Yellow – Moderate Risk	Green – Low Risk	Action or Mitigation
Site Characteristics				
Soil Zone				
Soil Type				
Snowmelt				
Runon				
Slope				
Position (Up/mid/low)				
Steepness				
Length				
Amount of bare ground				
Site history				
Feeding System				
Non-imported Feed				
Imported Feed				
High Input Feed				
Feeding Intensity				
Nutrient Deposition				
Frequency of Use				
Flooding				
Runoff				
Shelter/Bedding				
Water Source				
Well				
Spring				
Dugout				
Water Body				
Snow				
Groundwater/Water Table				
Post-Wintering Mgmt				

MANURE APPLICATION

- **PROXIMITY**
 - SET BACKS
- DISTANCE FROM STORAGE
 - COST
 - TIME

Variable	Spreading	Injecting
Neighbours	150 m	No Specification
Wells	10 m	10 m
Waterbodies	30, 60, 90 m	10 m
Incorporation	Within 48 hrs when on cultivated land	Done



MANURE FOR NUTRIENTS

- **CONTENT**

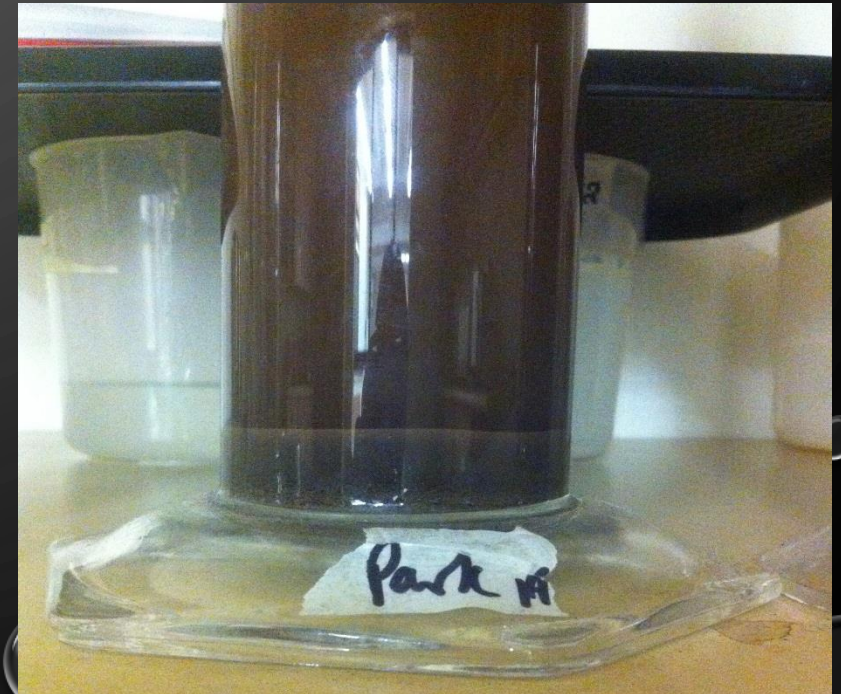
- N-P-MOISTURE
- CROP UPTAKE OF N VS P



(Tolentino J., et al., 2013)

- **SOIL**

- N & P
- TEXTURE



Sedimentation Cylinder

MANURE - TIMING

- **TIMING**

- **SPRING VS FALL**

SPREADING VS INJECTION



(Jessen, R., N.D.)



(Ehlers T., 2006)

WINTER FEEDING CATTLE

- PROXIMITY TO WATER
 - SPRING THAW
 - CHINOOKS
 - DRINKING INTENSITY
- DELIVERY METHOD
 - OCCUPATION TIME
 - WASTAGE

Table 2. Feed Wastage in Imported Feed Systems

Feed Delivered	System Used	Waste
Round bale hay	Ring feeders ¹	3 - 15%
	Processed onto snow ²	19.2%
	Unrolled onto snow ²	12.3%
	Bale processor into portable bunk ²	0%
	Bale grazing	15 - 20%
Round bale silage	Processed onto snow ²	23.2%
Pit silage*	Delivered onto snow ²	26.8%*
	Delivered into portable bunk ²	0%

(Alberta Agriculture and Rural development Environmental Stewardship Division, WSDAT, 2013)



(Karine, N.D.)

WINTER FEEDING CONT'D

- # OF CATTLE
- FEED STOCK AND NUTRIENT CONTENT
- SOIL TYPE
 - SOIL TESTING
- ROTATION



FACING THE PROBLEM - WORKFLOW

Refine

*Decision
Making*

Modeling

Analysis

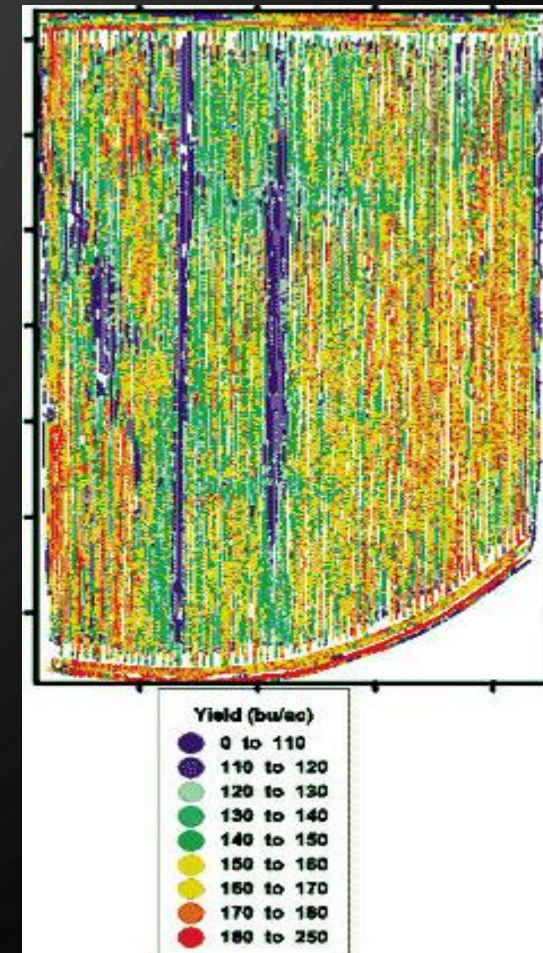
Data

Resources

Purpose

PURPOSES

- **REDUCING NUTRIENT LOSS**
- ROTATING CROPS
- NUTRIENT MANAGEMENT
- IRRIGATION MANAGEMENT



CASE - WEST CASTLE WATERSHED

- GRAZING OF CATTLE
 - SIGNIFICANT GRL RESOURCE
- WINTER FEEDING
- SPREADING MANURE
- RENER'S



RESOURCES

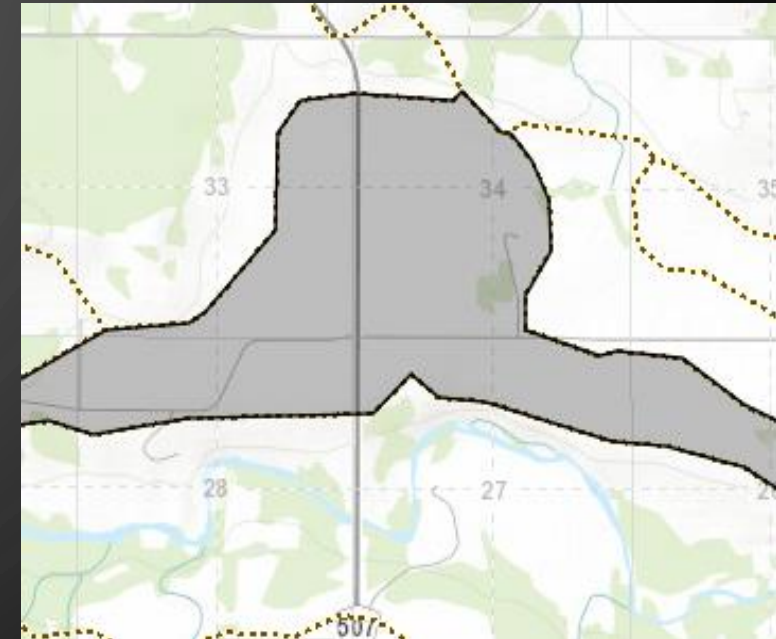
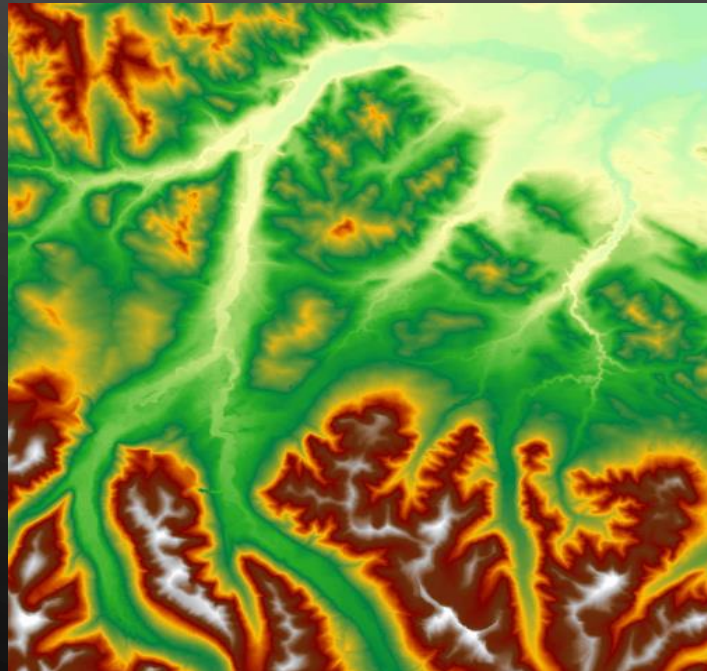
- VEGETATION
- SOIL
- MANURE
- CATTLE
- FEED SOURCE
 - BALES
 - FORAGE
 - OTHER
- WATER BODIES



- CROPS
- LAND BASE
- MONEY
- TIME
- LABOUR

DATA

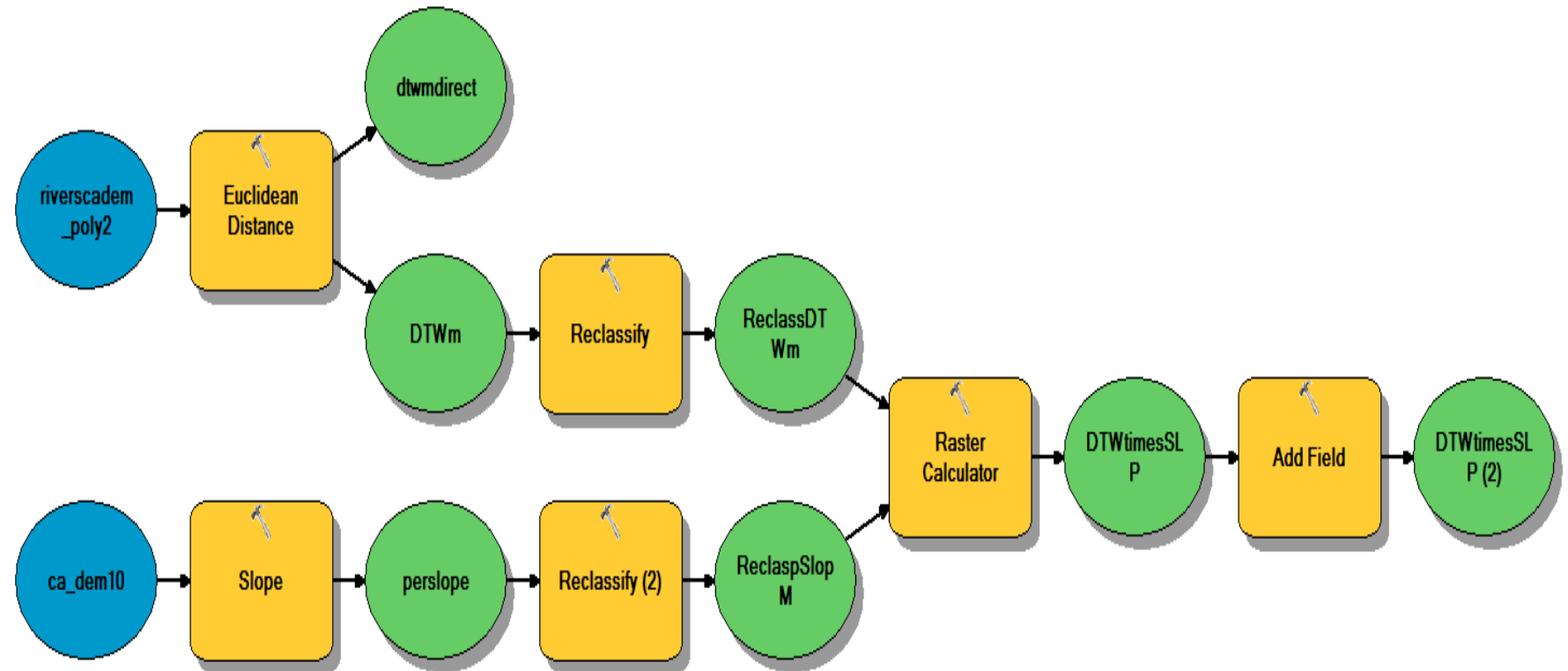
- SOIL
- NUTRIENTS
- DEM
 - LIDAR (LIGHT DETECTION AND RANGING)
 - SLOPE
 - DISTANCE TO WATER
- VEGETATION
- ACCOUNTING
- WEATHER



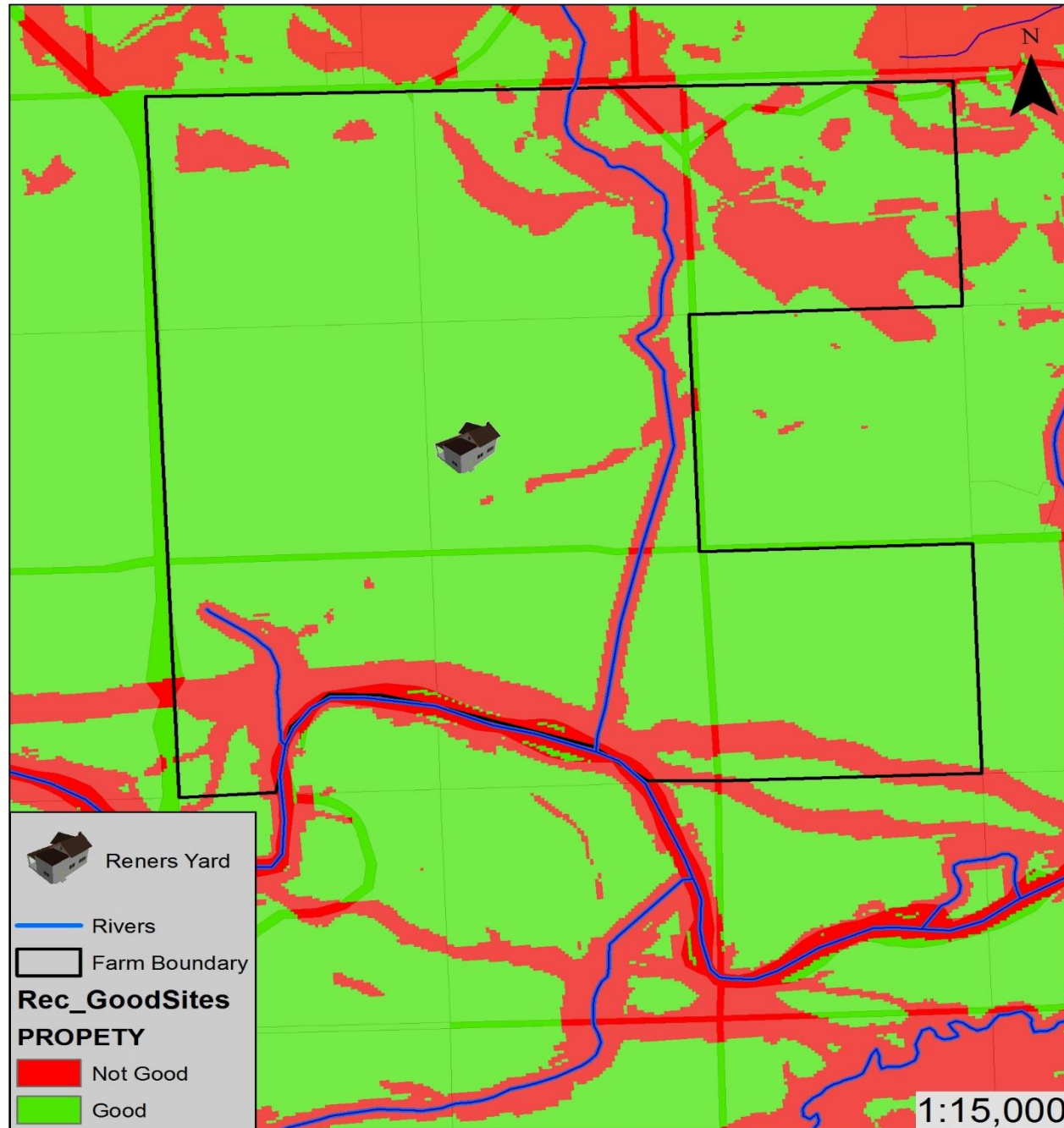
SOIL CODE	DRW
Soil Series	DRYWOOD
Drainage	W - Well
Parent Material Texture (1)	ME - Medium textured: loam, silt loam and very fine sandy loam
Soil Subgroup	O.BLC - Orthic Black Chernozem
Parent Material Code	L5 - Medium textured over gravel or gravelly coarse (includes cobbly and stony variations)

MODELING

- ARCGIS
 - MODEL
BUILDER
- SWAT
- EXCEL



Example Farm Near Beaver Mines



ANALYSIS

- WHERE ARE GOOD SITES TO SPREAD MANURE
- WHERE ARE GOOD SITES TO WINTER FEED

DECISION MAKING & REFINEMENT

- ACCESS
- FEASIBILITY
- DATABASE BUILDING
 - RECORD KEEPING



SUMMARY

- REDUCING NUTRIENT LOADING INTO WATER BODIES IS IMPORTANT
- BMP'S ARE AFFECTIVE
 - CAN BE ENHANCED WITH COMPUTERS
- MANAGEMENT CAN TAKE MANY FORMS AND INCLUDE MANY METHODS
 - MODELING AND MAPPING

QUESTIONS??

