New Tools in Soil Conservation and Sustainable Agriculture

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Sustainable Agriculture Section of PEIDAL

- **Soil Conservation**
- Residue Management
- Storage Management – fuel, pesticide, silage, manure
- Riparian/Buffer Zone Management - stream crossing, watering systems
- Improved irrigation efficiency
- On-farm water use efficiency
- Well water management
- Nutrient management
- Soil Health/Soil Quality
- Integrated pest management
- On-farm energy efficiency

Soil Erosion on Prince Edward Island

" *Soil degradation, primarily erosion, is the single most important resource problem facing the province*" (Coordinating Committee for Conservation, 1987)

"*Soil Erosion has been identified as the number one environmental problem on PEI*" (Stewardship & Sustainability, A Renewed Conservation strategy for Prince Edward Island, 1994)

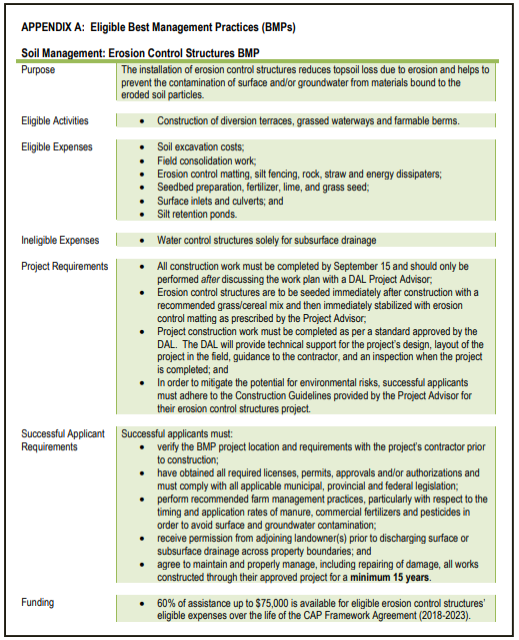
Soil Erosion Statistics

- The rate at which soil can rebuild it self is 3 tons per acre per year (RUSLE)
- At this rate, it would take 60+ years to build an inch of topsoil (other sources say 100 to 1000 years)
- A washout that is 1 foot wide X 1 foot deep X 100 feet long = 5 tons of topsoil lost
- A slope of 6% that is 180 feet long has the same erosion potential as a slope of 4% that is 790 feet long (RUSLE)

Soil Erosion Examples

Agriculture Stewardship Program – Erosion Control Structures BMP

- Farmers can receive 60% funding towards project costs for erosion control structures
- Program for 2020 funding opens up Tuesday, September 17th, 2019 at 8 am



APPENDIX A: Eligible Best Management Practices (BMPs)

Soil Management: Erosion Control Structures BMP

Purpose	The installation of erosion control structures reduces topsoil loss due to erosion and helps to prevent the contamination of surface and/or groundwater from materials bound to the eroded soil particles.
Eligible Activities	• Construction of diversion terraces, grassed waterways and farmable berms.
Eligible Expenses	• Soil excavation costs; • Field consolidation work; • Erosion control matting, silt fencing, rock, straw and energy dissipaters; • Seedbed preparation, fertilizer, lime, and grass seed; • Surface inlets and culverts; and • Silt retention ponds.
Ineligible Expenses	• Water control structures solely for subsurface drainage
Project Requirements	• All construction work must be completed by September 15 and should only be performed *after* discussing the work plan with a DAL Project Advisor; • Erosion control structures are to be seeded immediately after construction with a recommended grass/cereal mix and then immediately stabilized with erosion control matting as prescribed by the Project Advisor; • Project construction work must be completed as per a standard approved by the DAL. The DAL will provide technical support for the project's design, layout of the project in the field, guidance to the contractor, and an inspection when the project is completed; and • In order to mitigate the potential for environmental risks, successful applicants must adhere to the Construction Guidelines provided by the Project Advisor for their erosion control structures project.
Successful Applicant Requirements	Successful applicants must: • verify the BMP project location and requirements with the project's contractor prior to construction; • have obtained all required licenses, permits, approvals and/or authorizations and must comply with all applicable municipal, provincial and federal legislation; • perform recommended farm management practices, particularly with respect to the timing and application rates of manure, commercial fertilizers and pesticides in order to avoid surface and groundwater contamination; • receive permission from adjoining landowner(s) prior to discharging surface or subsurface drainage across property boundaries; and • agree to maintain and properly manage, including repairing of damage, all works constructed through their approved project for a **minimum 15 years**.
Funding	• 60% of assistance up to $75,000 is available for eligible erosion control structures' eligible expenses over the life of the CAP Framework Agreement (2018-2023).

Soil Erosion Examples

200’

200’

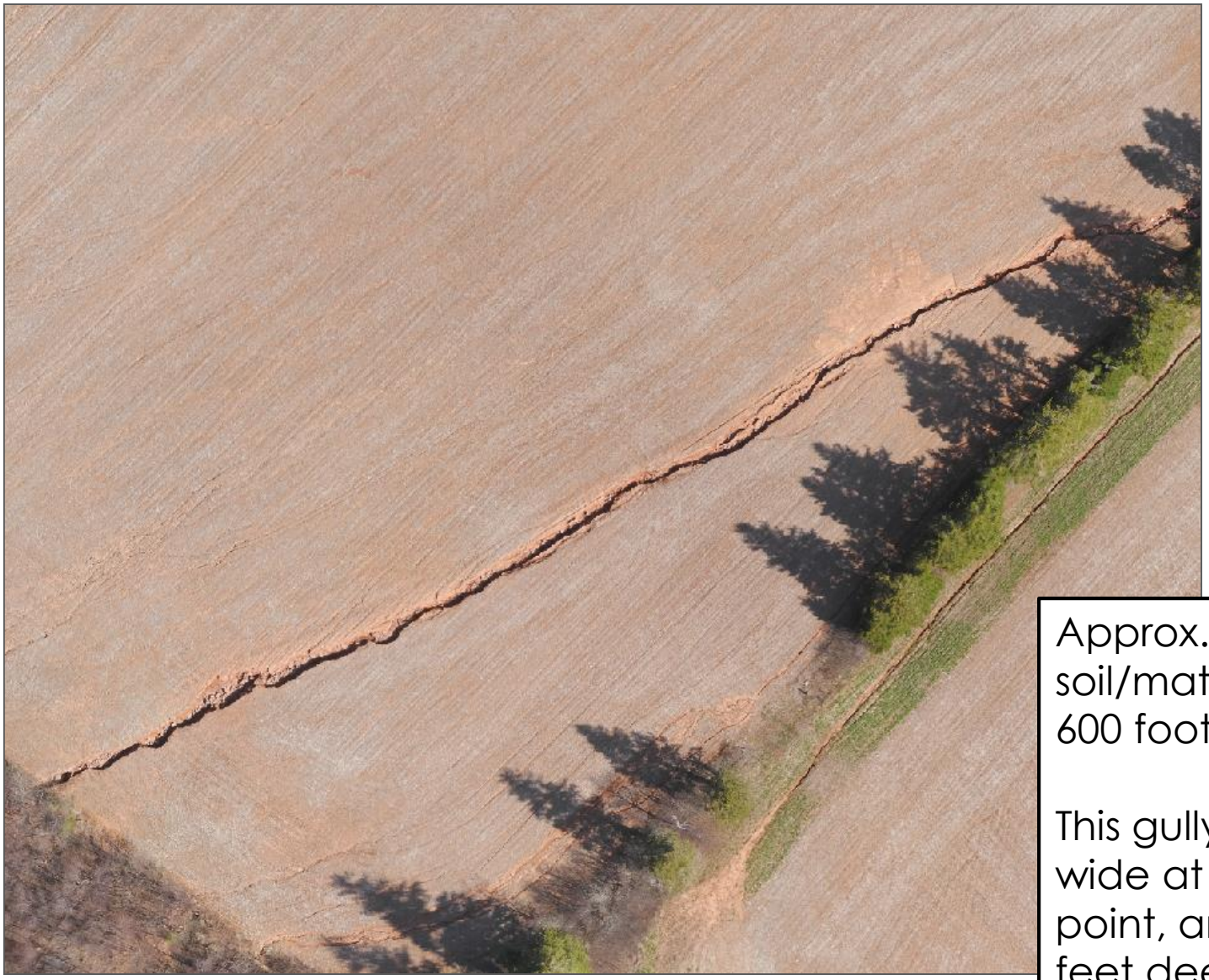
Approx. **50 tons** of topsoil lost on this 1 acre section of land with rill and gully erosion

If there were no erosion occurring on this section of land going forward, it would take nearly 20 years to get that 50 tons of topsoil back.

Soil Erosion Examples

400’

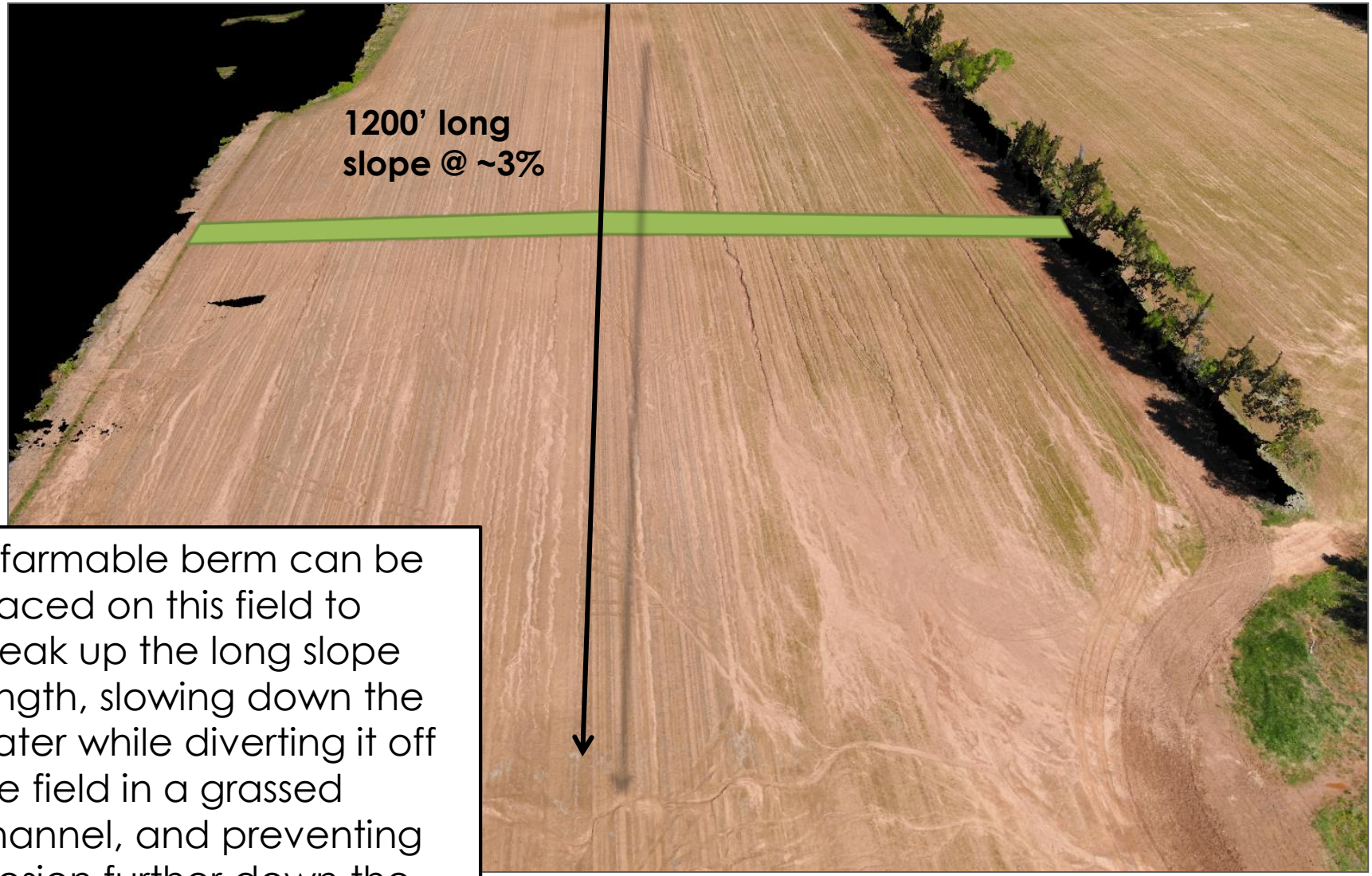
350’



Approx. **195 tons** of soil/material lost in this 600 foot long gully

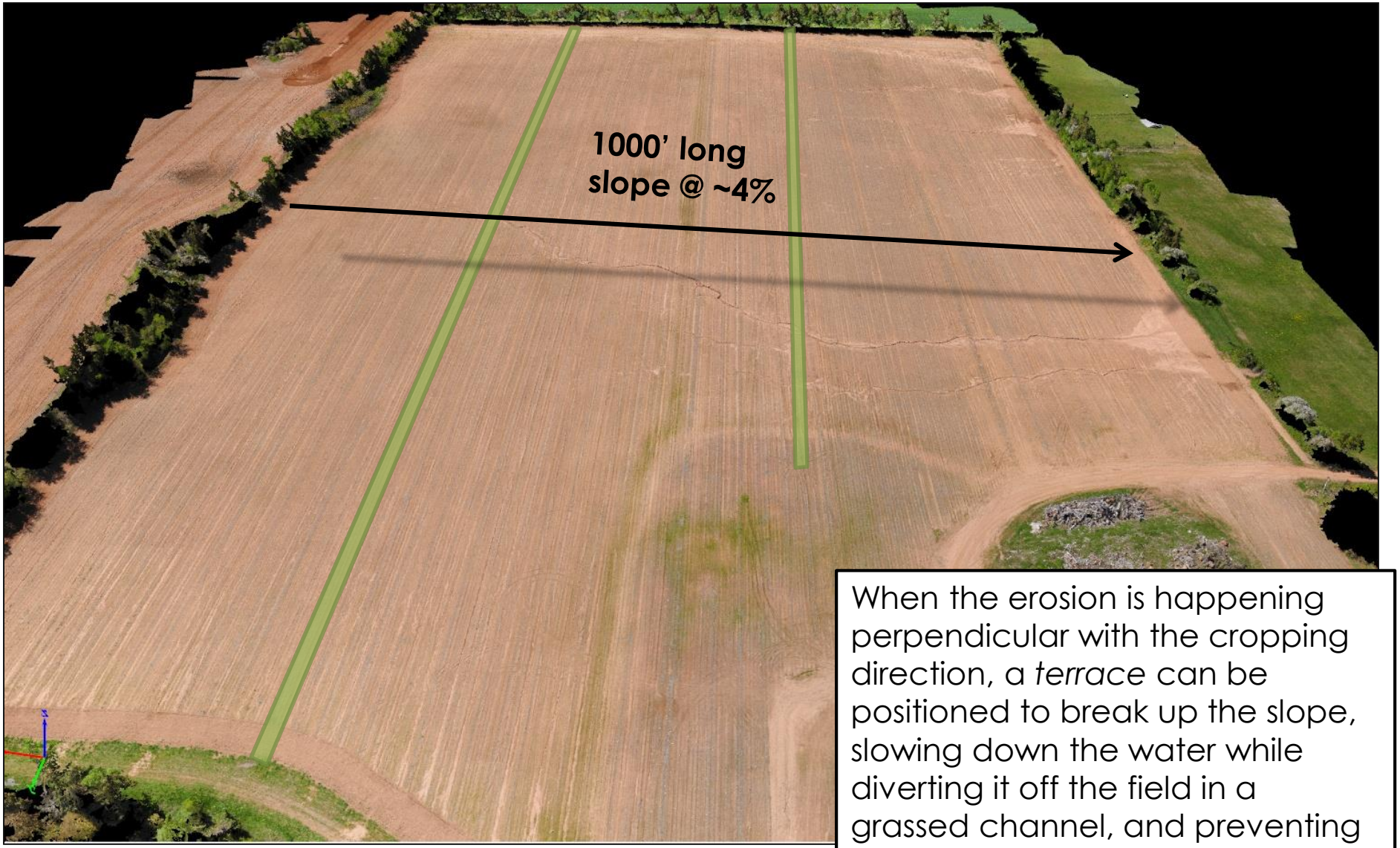
This gully is 11 feet wide at it’s widest point, and nearly 5 feet deep.

Soil Conservation Structures



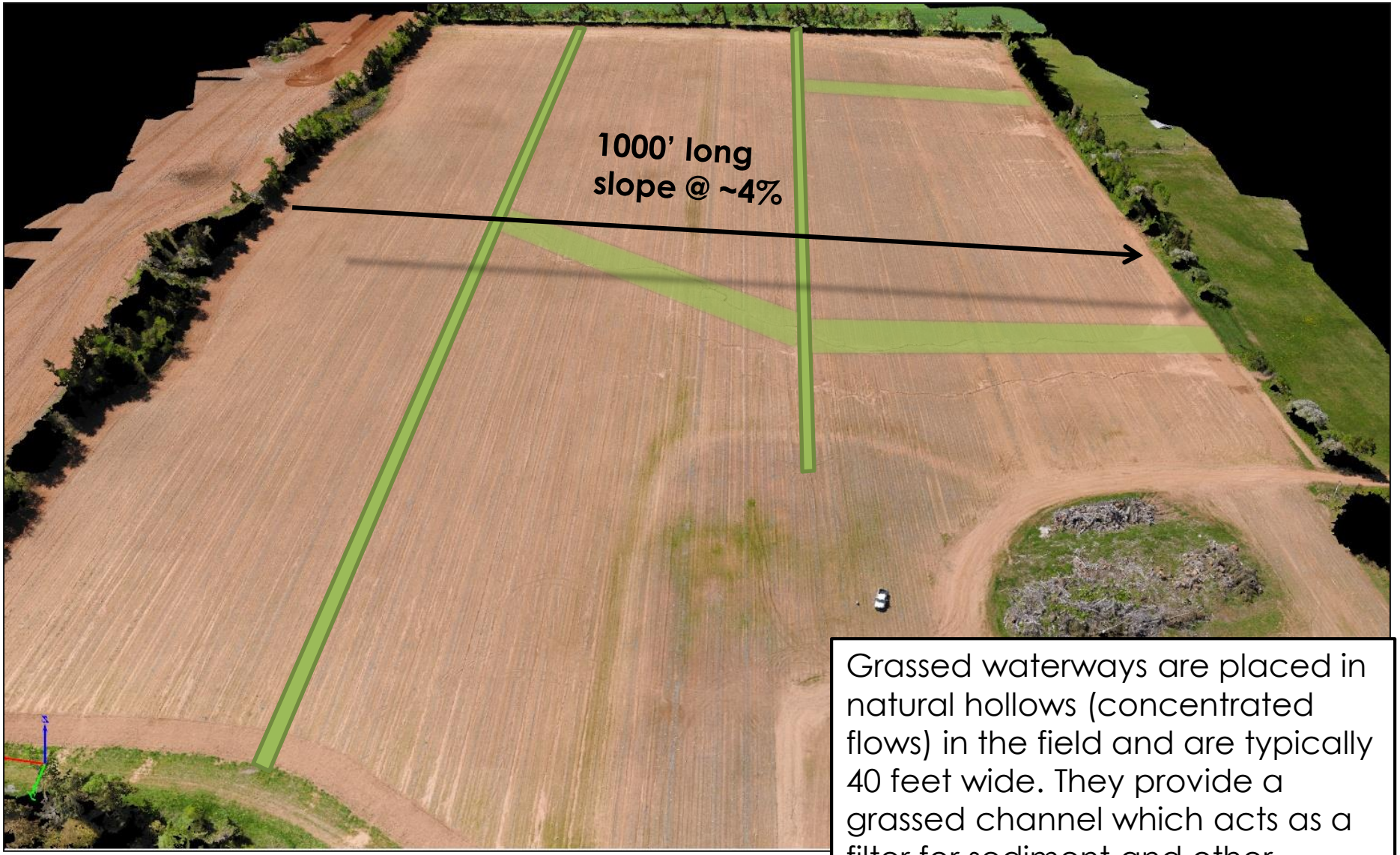
A farmable berm can be placed on this field to break up the long slope length, slowing down the water while diverting it off the field in a grassed channel, and preventing erosion further down the hill

Soil Conservation Structures



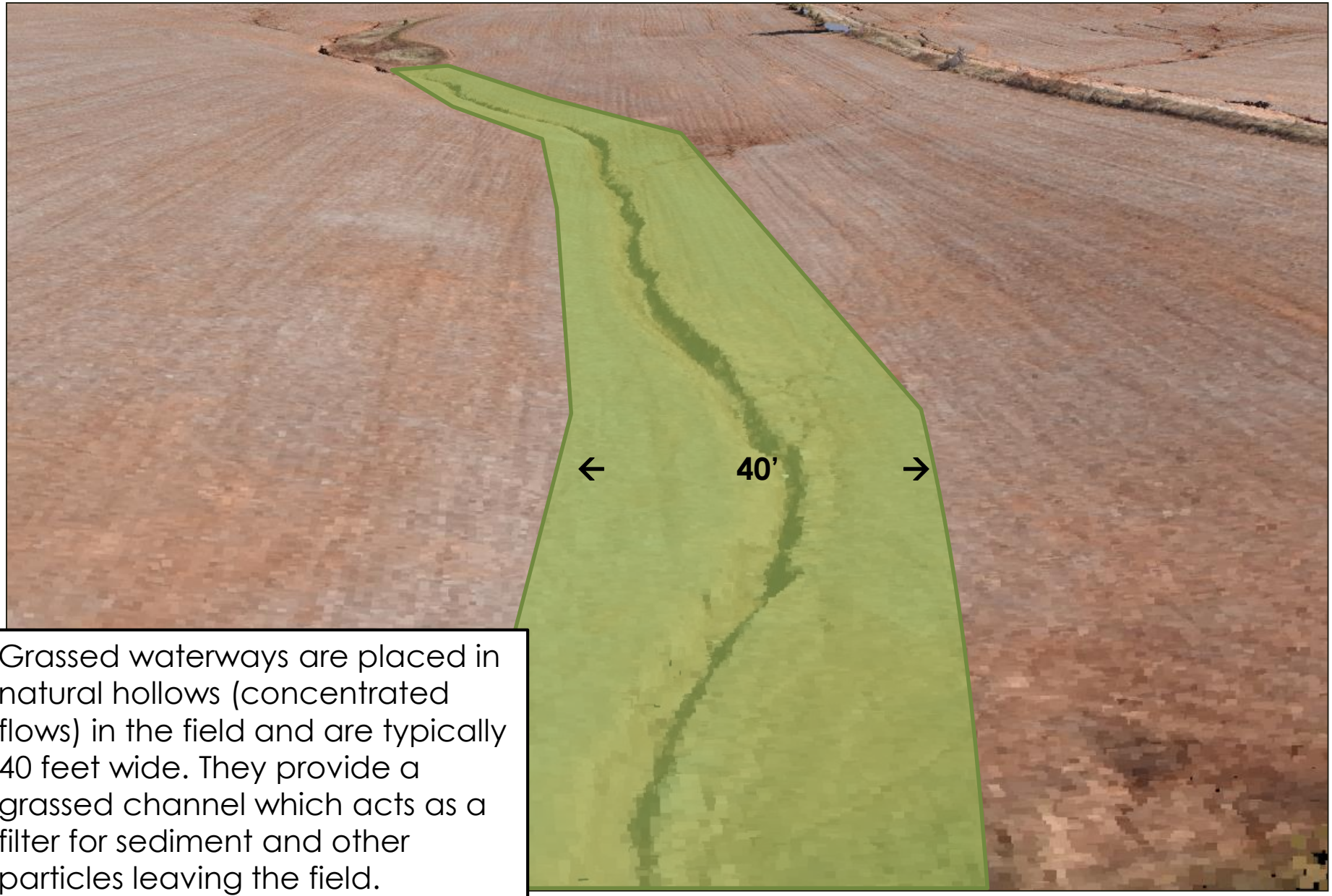
When the erosion is happening perpendicular with the cropping direction, a *terrace* can be positioned to break up the slope, slowing down the water while diverting it off the field in a grassed channel, and preventing erosion further down the hill

Soil Conservation Structures



Grassed waterways are placed in natural hollows (concentrated flows) in the field and are typically 40 feet wide. They provide a grassed channel which acts as a filter for sediment and other particles leaving the field.

Soil Conservation Structures



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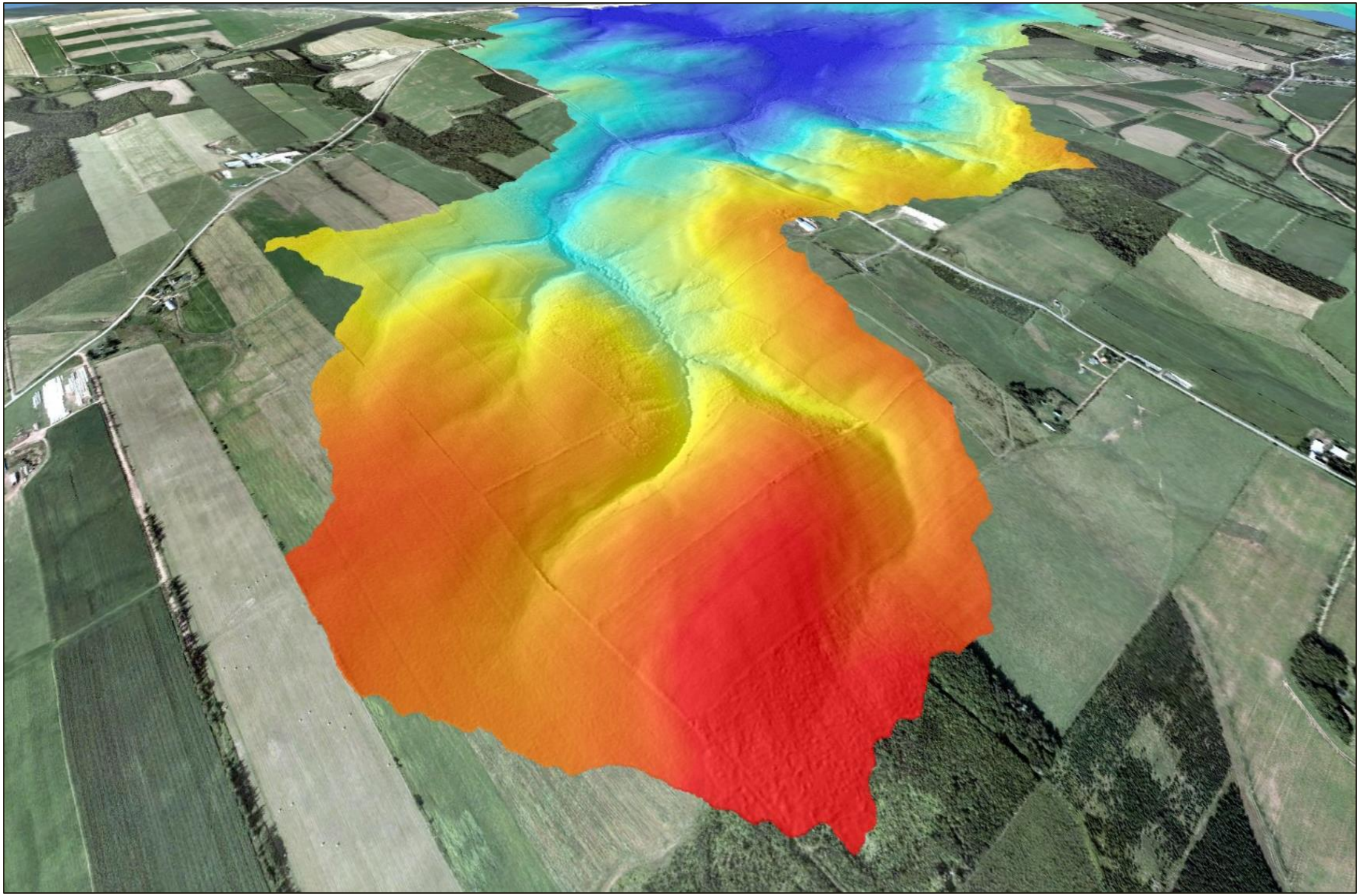
2008 LiDAR / Concentrated Flow



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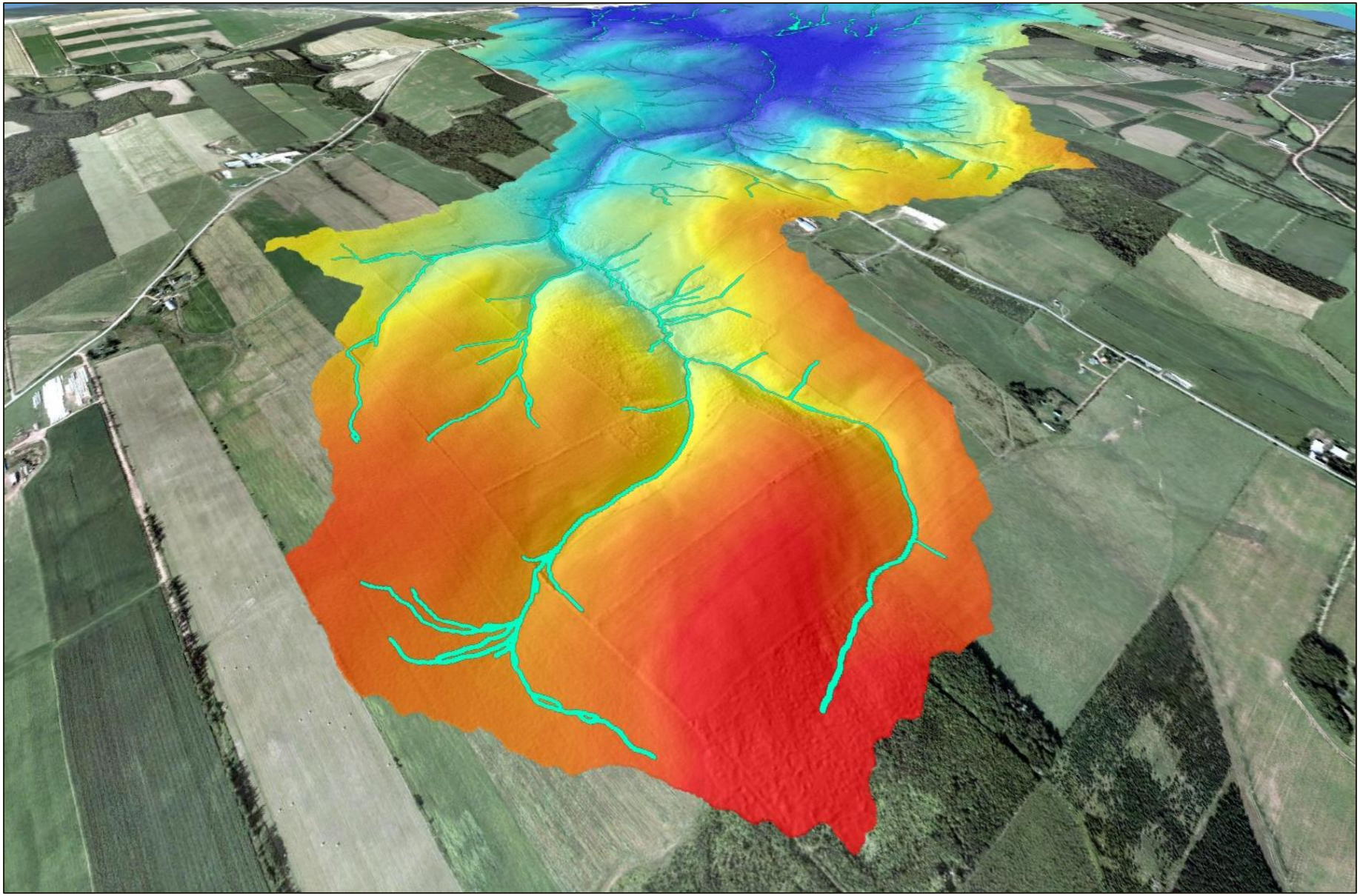
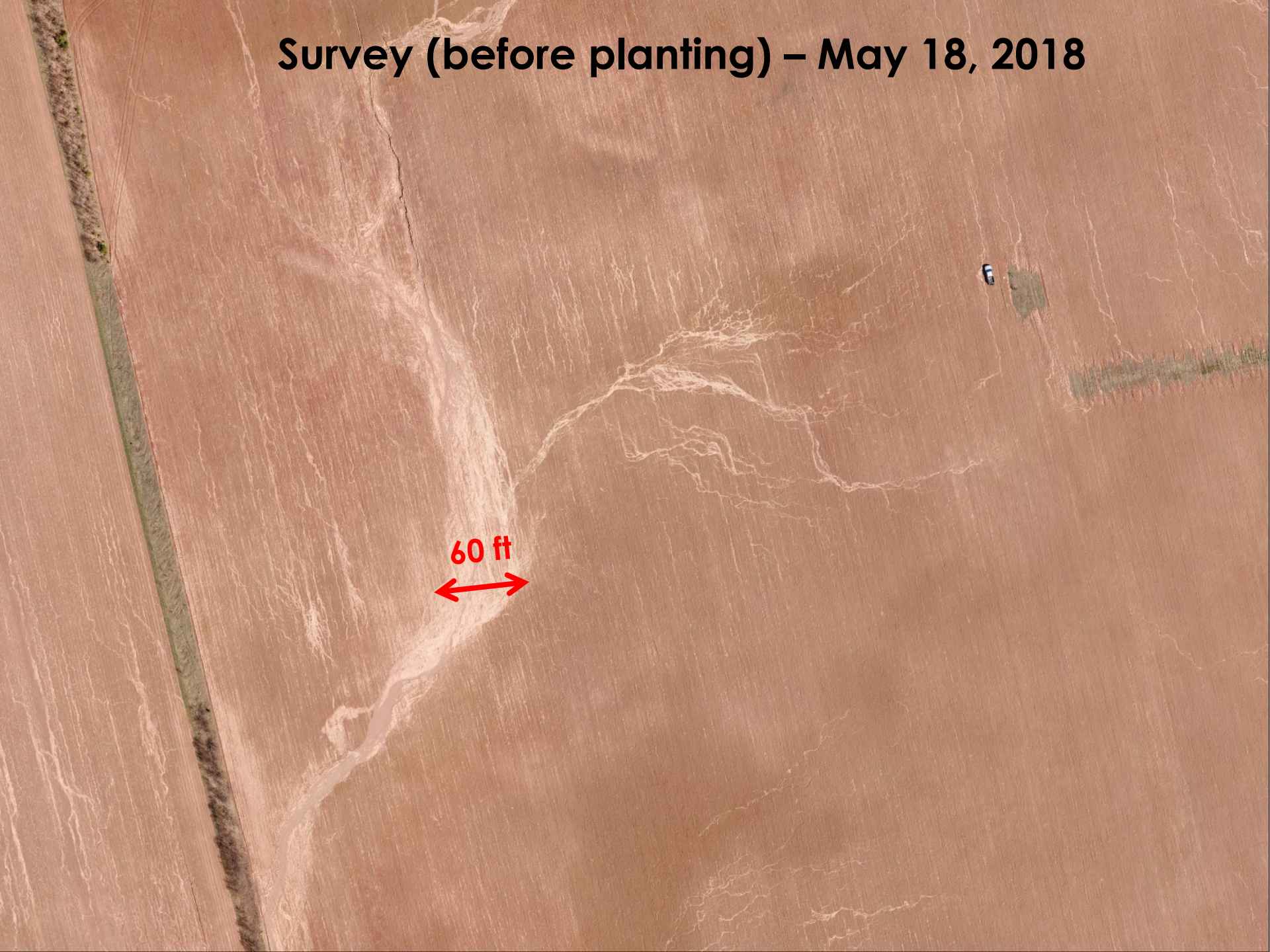


Concentrated Flow

Concentrated Flow

Exploring the Economic Impacts of Soil Erosion

Survey (before planting) – May 18, 2018



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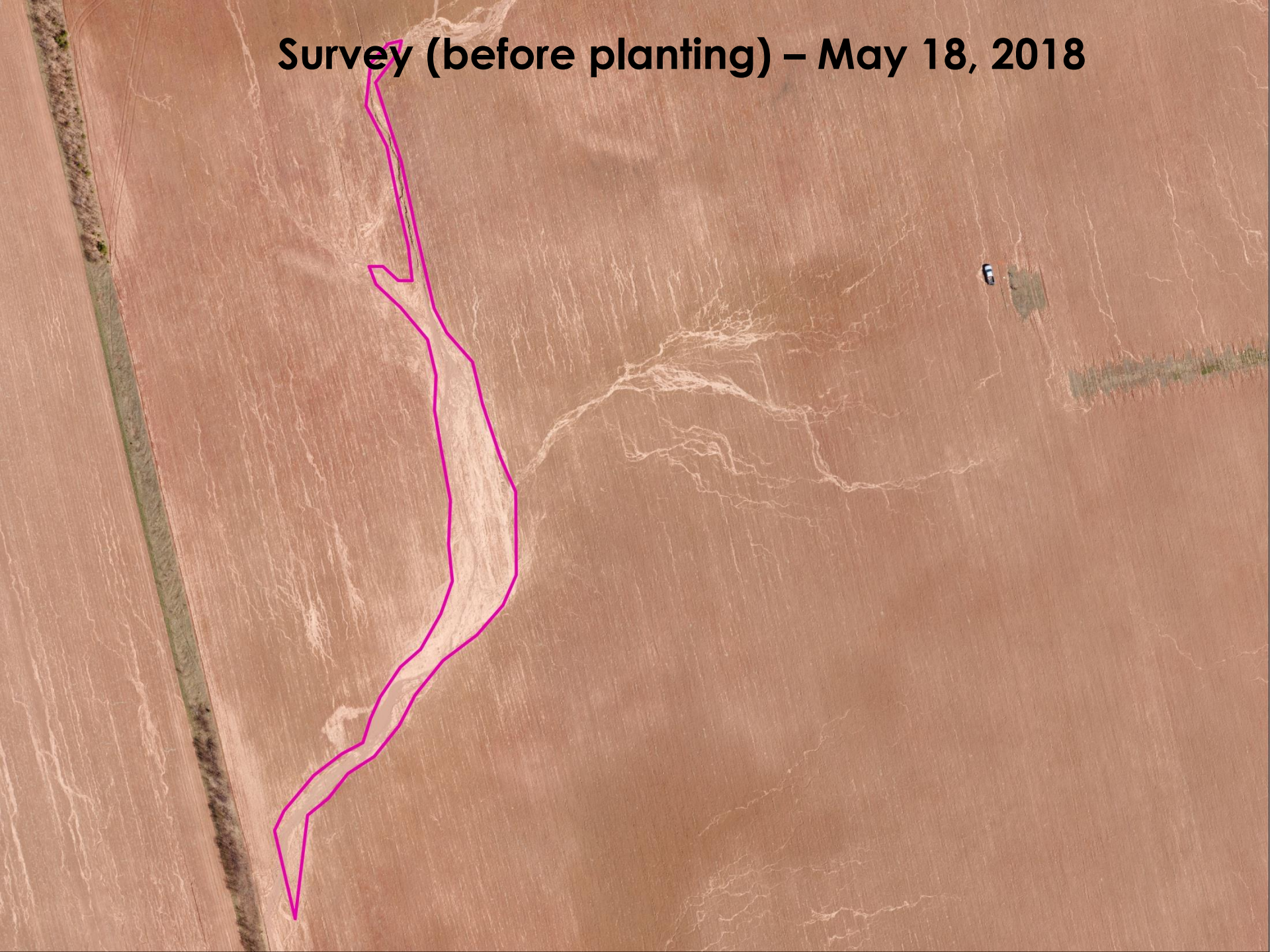
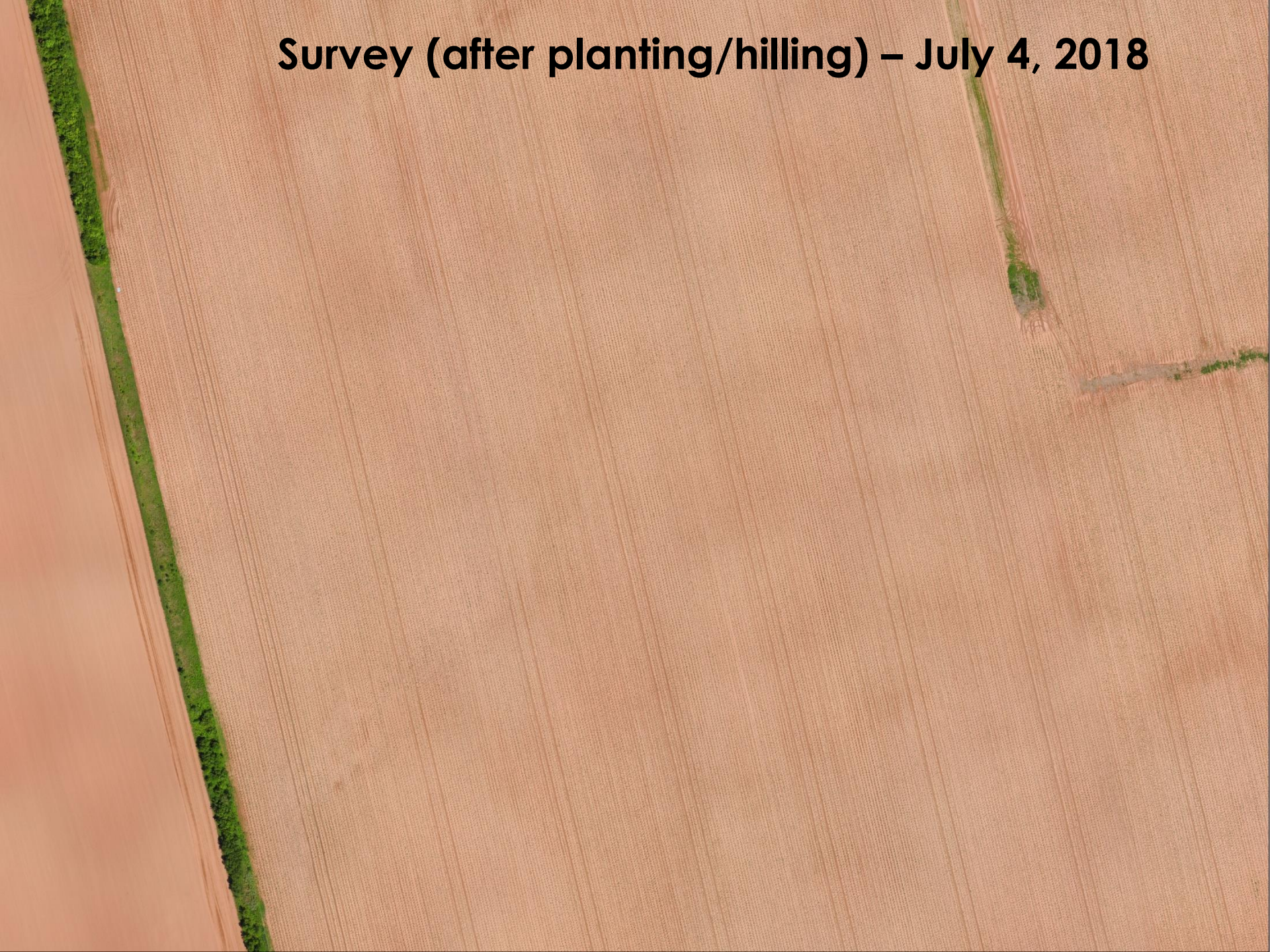
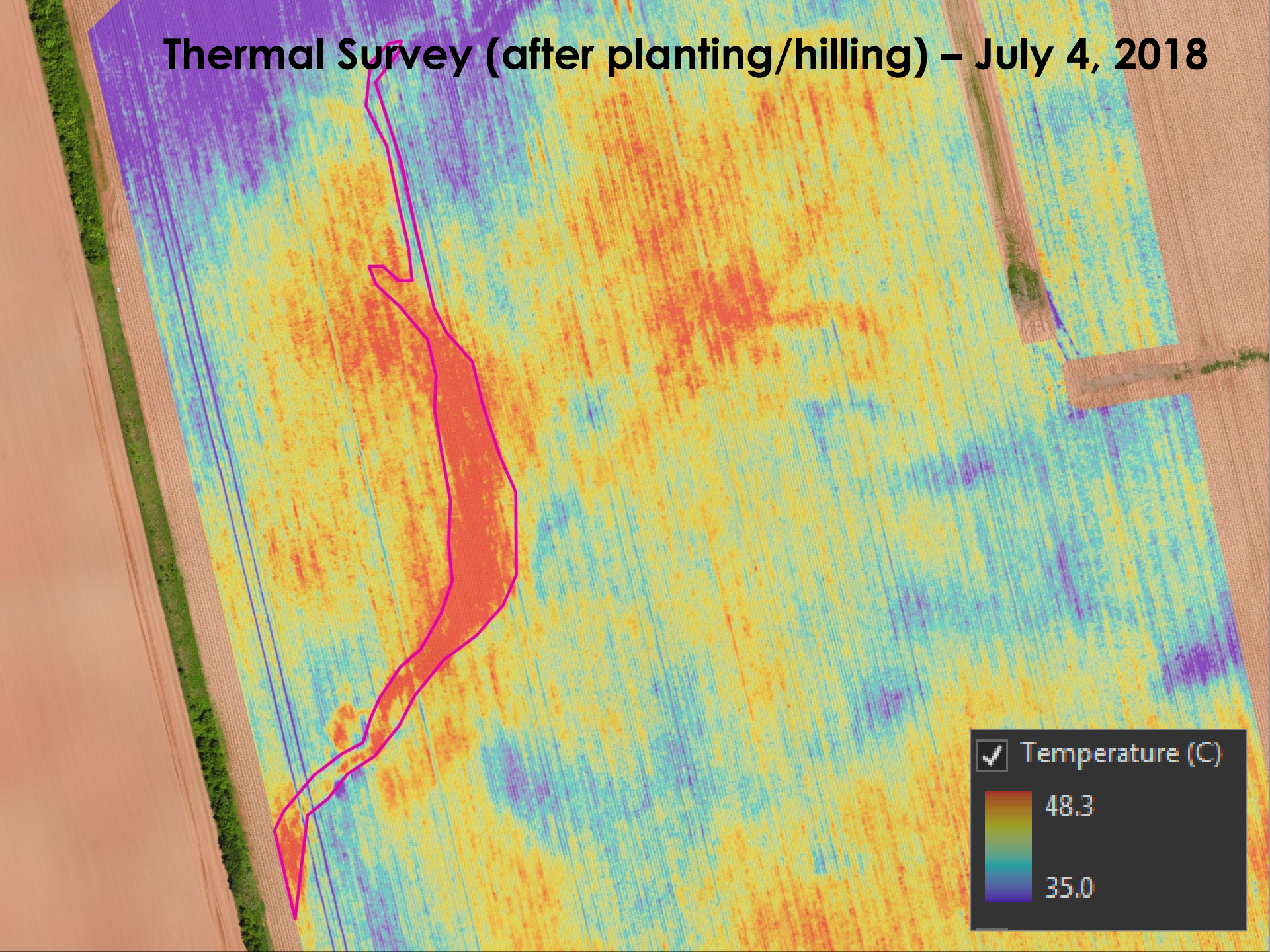


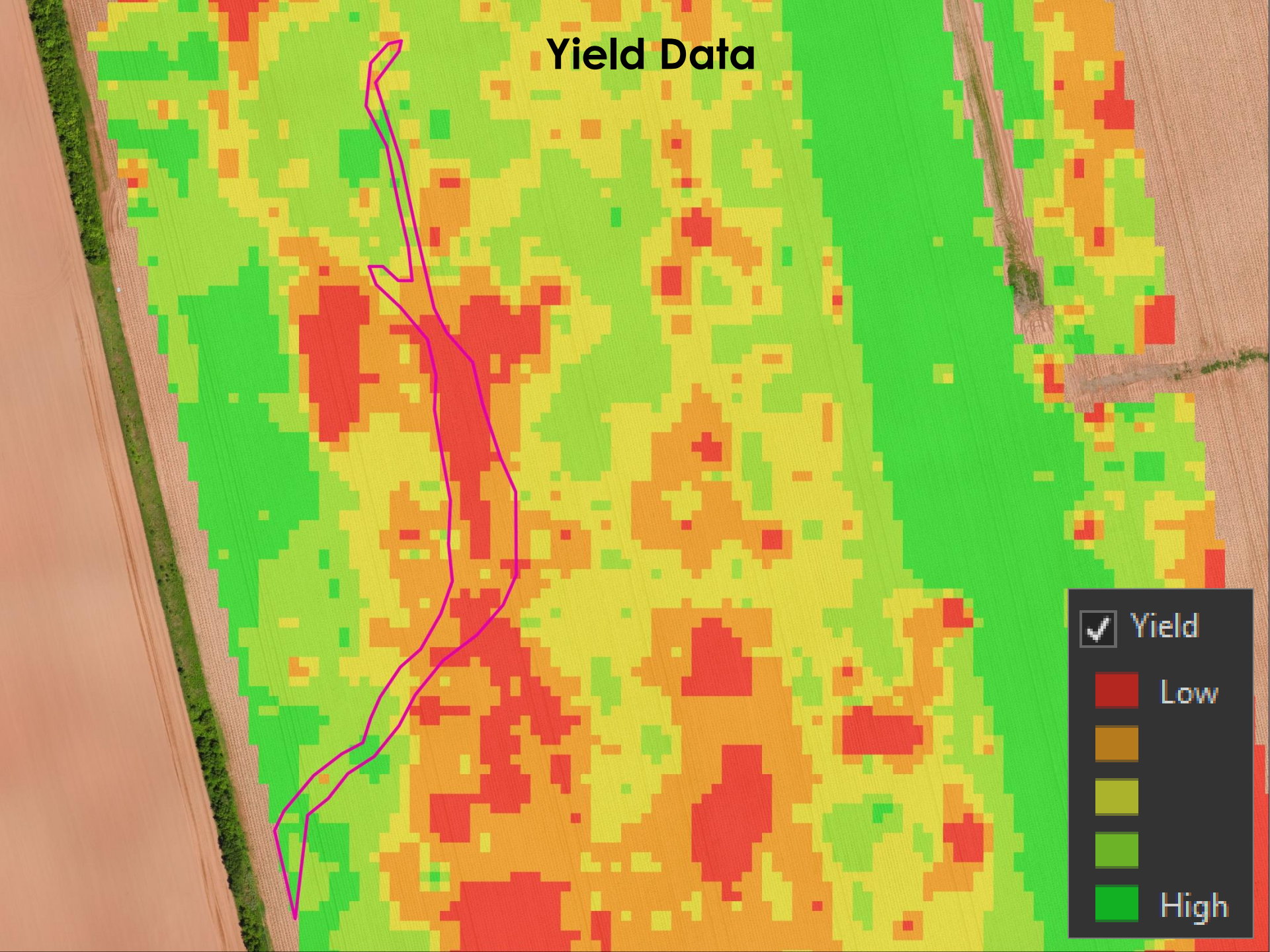
Survey (after planting/hilling) – July 4, 2018

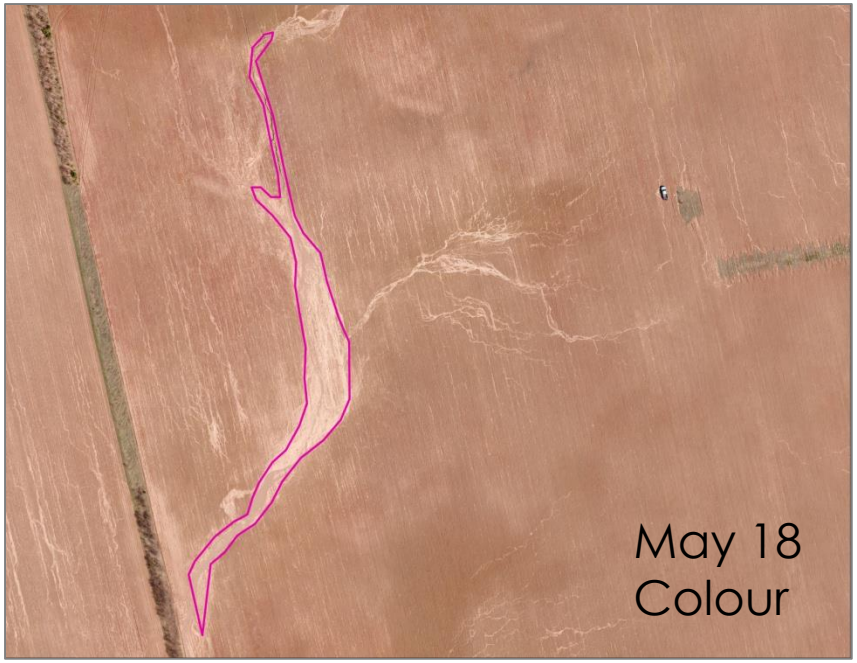


Survey (after planting/hilling) – July 4, 2018

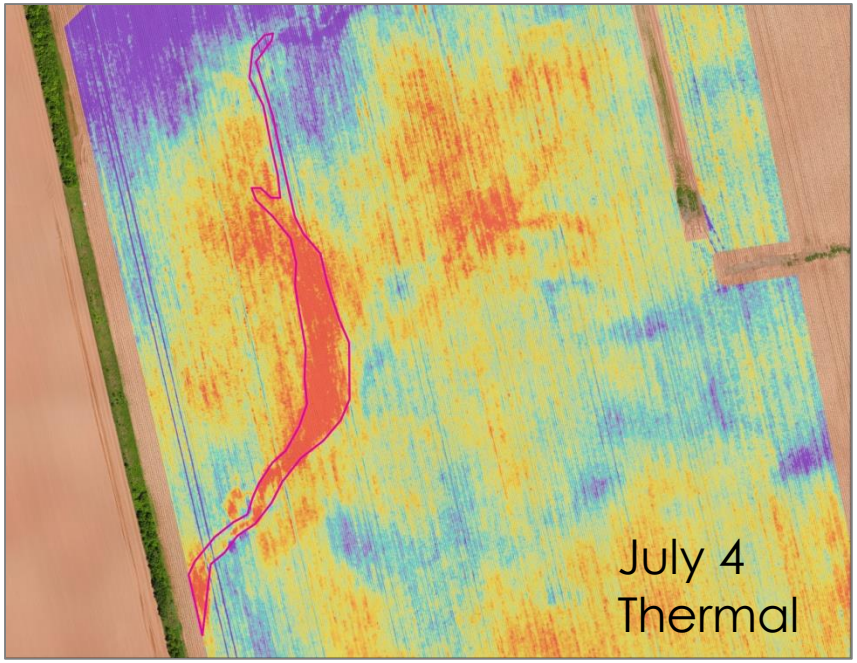
Thermal Survey (after planting/hilling) – July 4, 2018

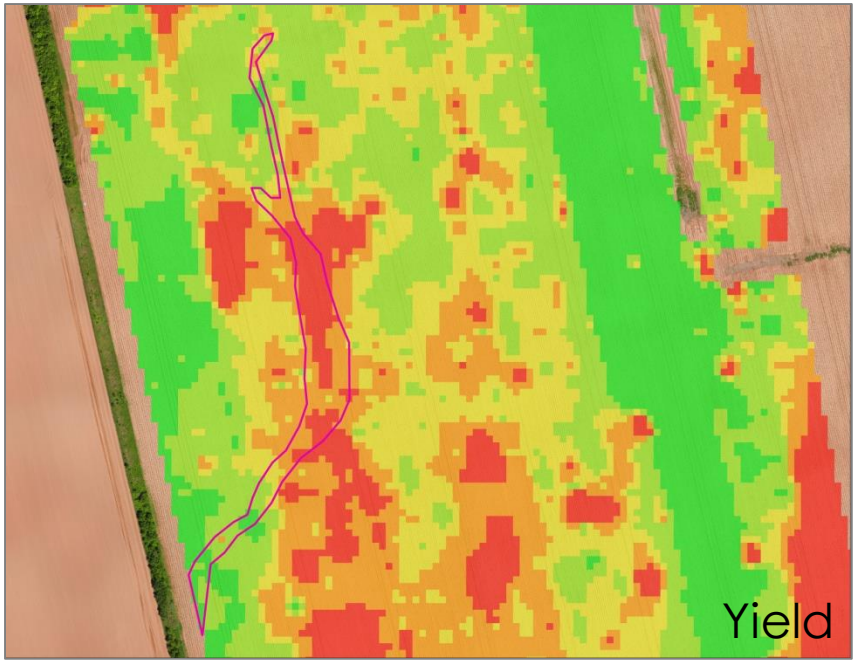



Yield Data
Yield
Low
High

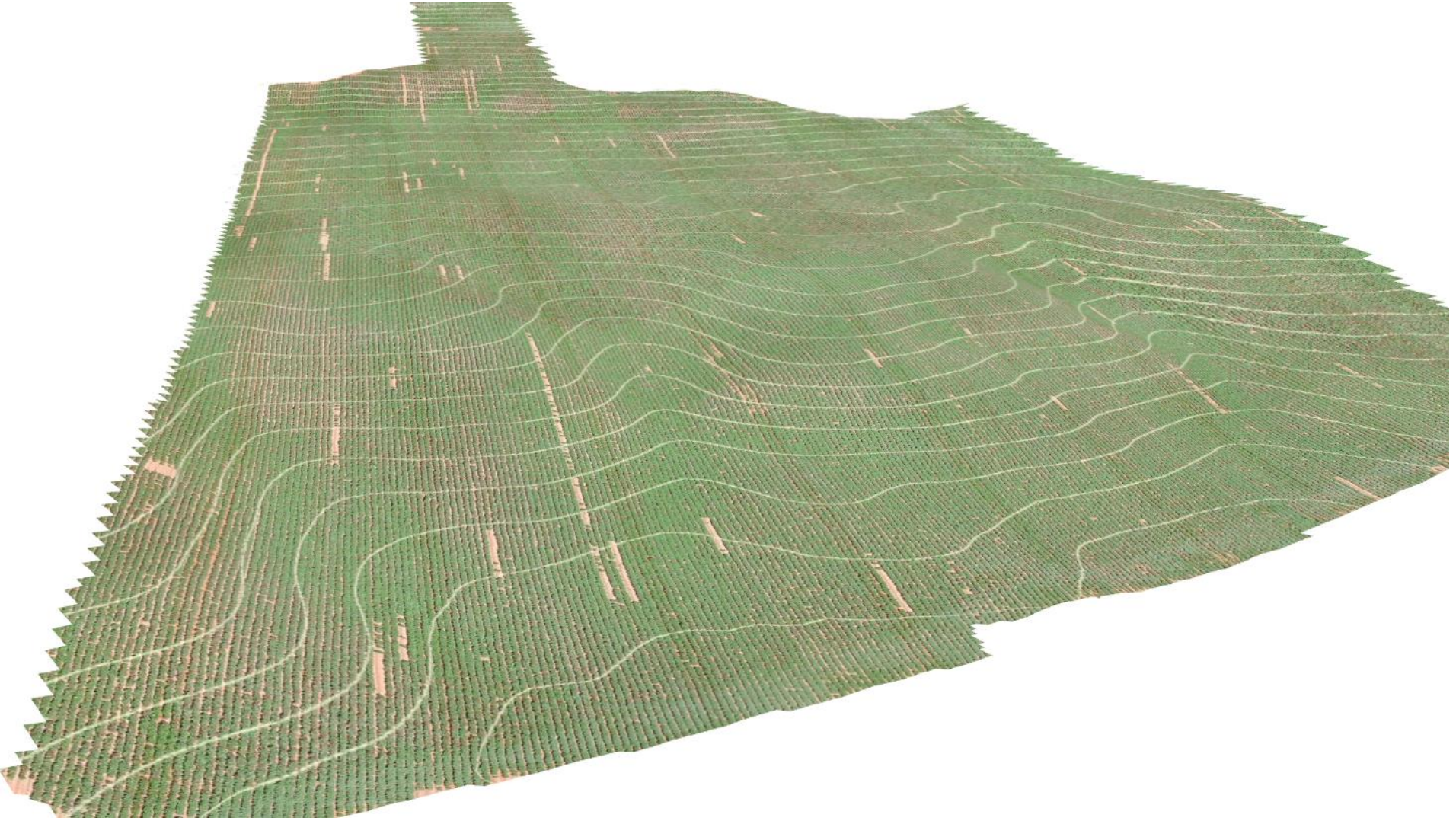

May 18
Colour


July 4
Colour

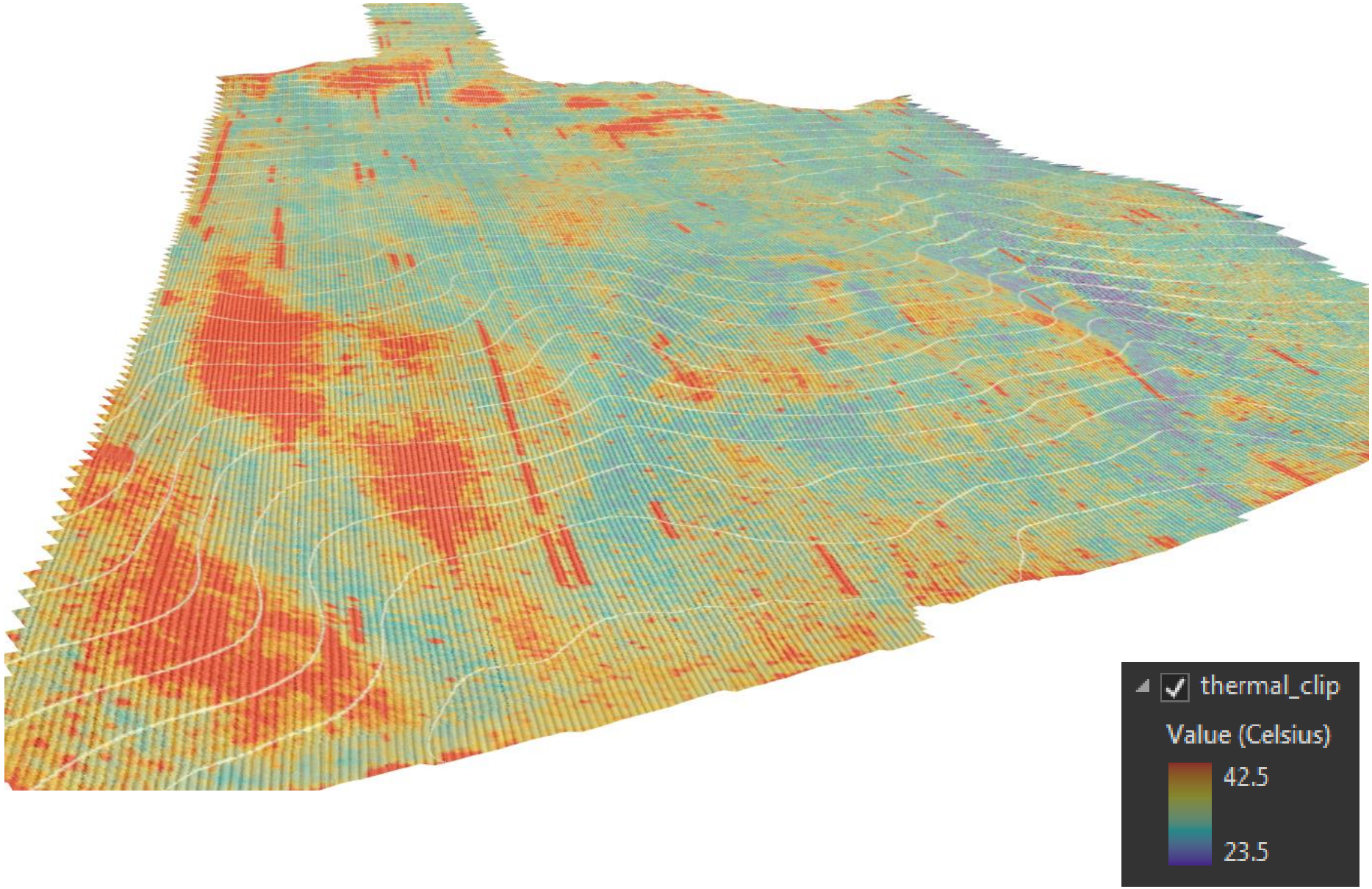

July 4
Thermal


Yield

Colour Mapping (3D)



Thermal Mapping



Topsoil Restoration as an option?

Manitoba Soil Scientist Dr. David Lobb says:

"decades of tilling have severely eroded the soil, removing topsoil from the knolls and slopes of hills.

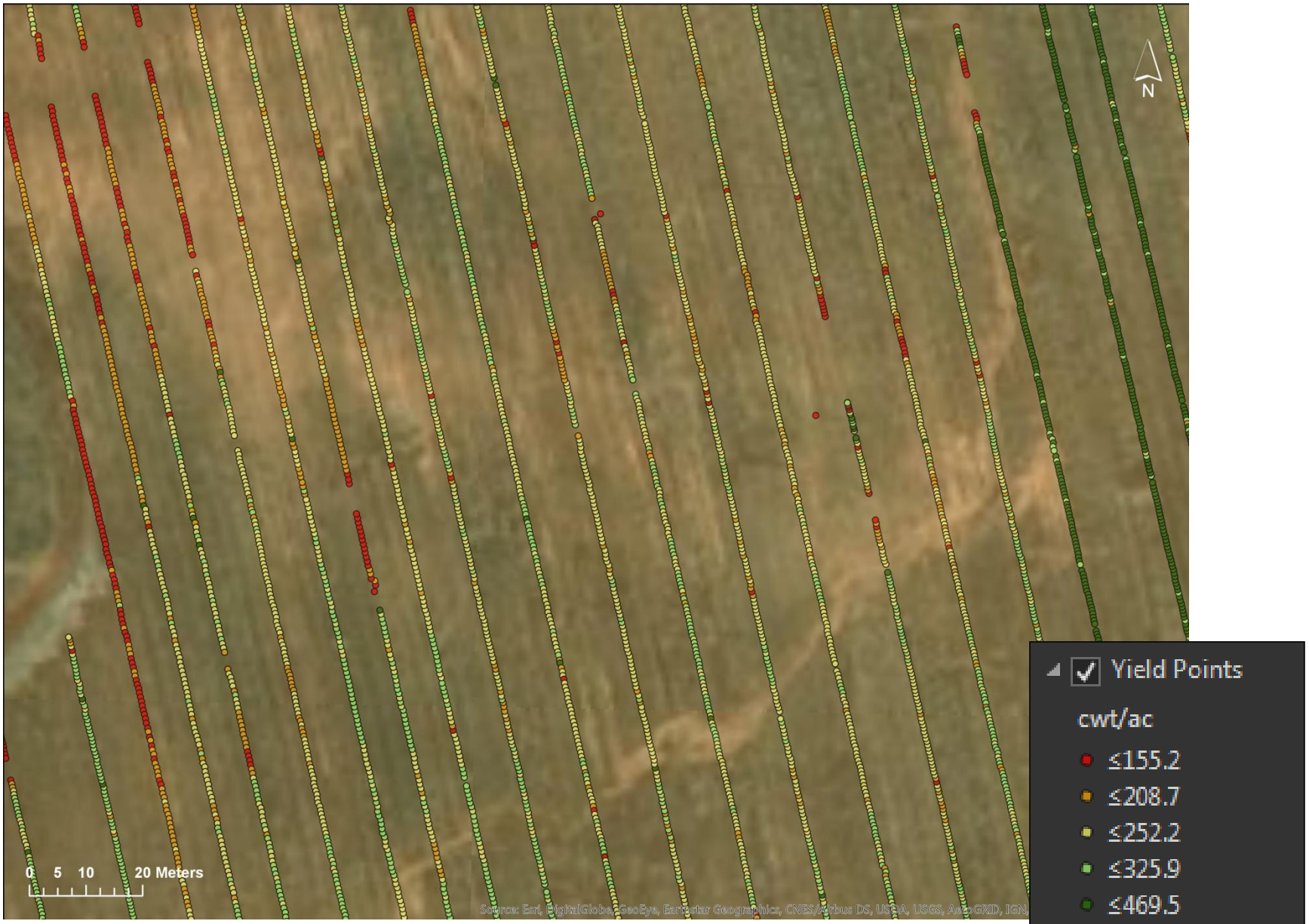
In some areas of Manitoba we find topsoils at the bottom of hills 50 to 100 centimetres thick. There's a lot of topsoil down there, which has been dragged down by tillage."

"Knoll renovation is the most profitable land improvement practice we have, more profitable than drainage and more profitable than irrigation."

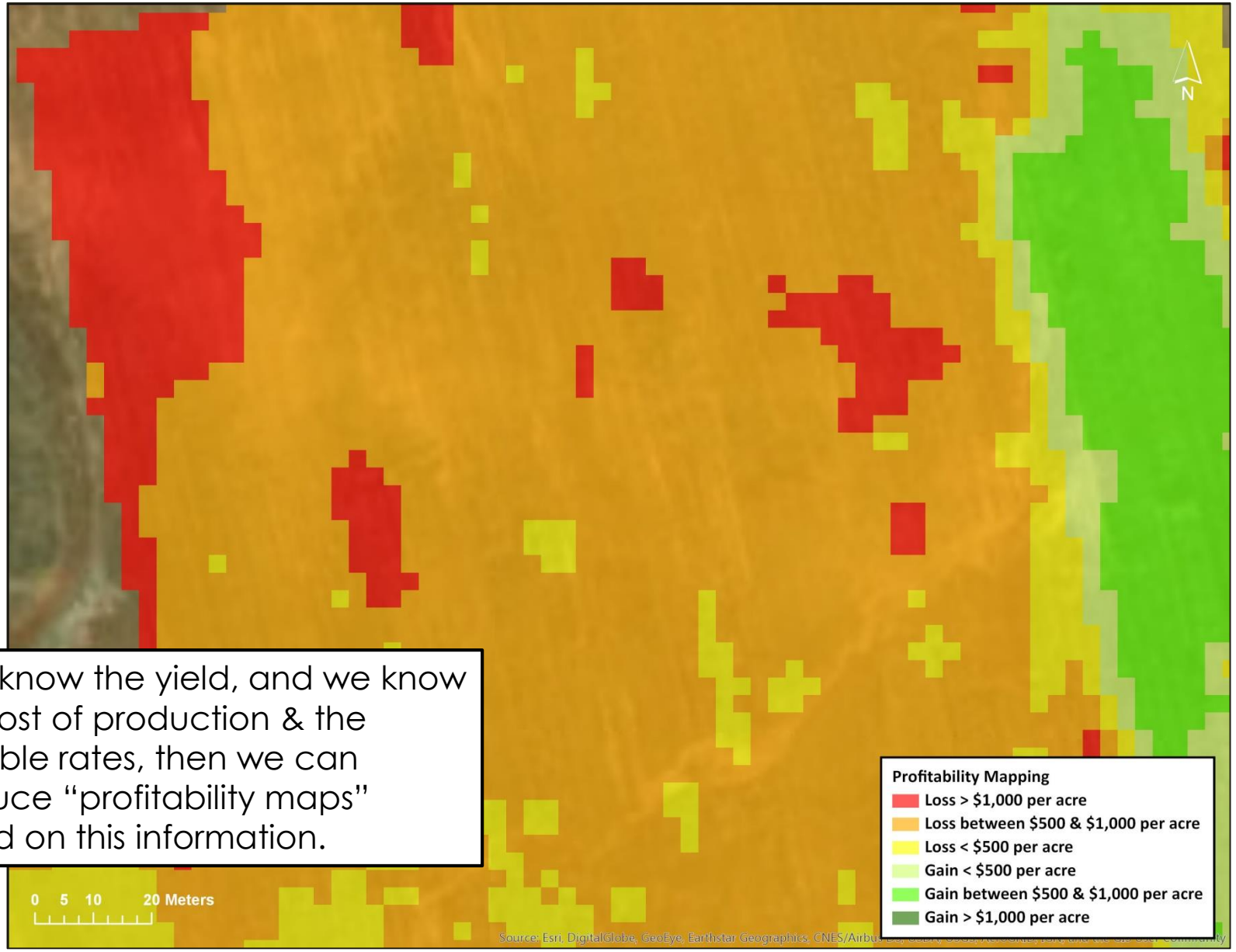
Lobb estimates that lost yield due to soil erosion is costing farmers about $3 billion per year

"We need to make soil health as important to all Canadians as air and water"

Yield Mapping



Profitability Mapping



If we know the yield, and we know the cost of production & the payable rates, then we can produce "profitability maps" based on this information.

Yield Mapping

- We need **Accurate** & **Quality** yield data
- With accurate yield data we can make informed management decisions
- With a large collection of good yield data, we can identify parts of fields that are not performing well and are not profitable. These areas could be targeted for improvement, or simply taken out of production altogether
- On the other hand, the areas of the field that consistently perform well may be able to handle more in terms of seed/nutrients and ultimately produce more in the end (*feed your athletes* way of thinking)

Precision Conservation

Three farms in Southern Ontario had ten years of yield data examined, and turned into profitability maps based on market data and input costs. Researchers found that 14% of the land was losing money on these farms.

Their goal is to turn this into a tool that producers themselves can use to identify non productive parts of their fields. This land could potentially be set aside and put into a program such as ALUS

ALUS Feature Statistics (as of 2019):

-352,000 ft of farmable berm (PEI to Moncton, NB)
- 1,430,000 ft of terrace (PEI to Houlton, ME)
-2,600,000 ft of grassed waterway (PEI to Montreal, QC)

Map of ALUS features – one point = 1 feature

Thank you

Questions?

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