CANOPY COMPASS

Example Farm

327.8 acres

Sauk County, WI

43.21335, -89.96995

June 10, 2024

Generated by CanopyCompass.com

Table of Contents

About this Report 3

Current Context 4
- Existing Land Cover 5
- Hydrology 6
- Irrigation 7
- Tile Drainage 8
- Regional Topography 9
- Local Topography 10
- Crop History 11
- Row Crop Productivity . . . 12

Environmental Concerns 13
- Soil Erosion 14
- Water Runoff & Flooding . . 15
- Species Richness 16
- Protected Areas 17

Crop Suitability 18
- Included Crops 19
- FAQ - Crop Suitability 20
- Apple 22
- Black Currant 24
- Black Locust 26
- Chestnut 28
- Sugar Maple 30

Soil & Climate 32
- FAQ - Soil & Climate 33
- Soil Texture 34
- Soil Formation & Loss 35
- Depth Constraints 36
- Water Retention 37
- Soil Chemistry 38
- Soil pH 39
- Soil Fertility 40
- Tree Planting Considerations 41
- Climate Statistics 42

FAQ - General 43

About Canopy 44

What's Next? 45

About this Report

What is a Compass Report?

The Canopy Compass website and this Compass Report support data-driven decisions for your land. Regenerative agriculture, especially permanent crops and agroforestry, has great potential to enhance the economic and environmental outcomes of agriculture.

Many crops and practices are available, but it is difficult to know which are best suited for specific contexts. The comprehensive data provided in this report can help remove the guesswork, improve outcomes, and avoid pitfalls.

Who is this report for?

- **Farmers** considering adding regenerative practices to their portfolio
- **Landowners** exploring regenerative options for their land
- **Investors** scouting fields for investments in regenerative agriculture
- **Lenders** evaluating the risk of a particular crop in a field
- **Consultants** and **Land Managers** gathering information for their clients

Can I update my report?

Yes! As new crops and other data are added to the Canopy Compass website, you can update your report to include this new information for **free**.

Can I talk to an expert?

Yes! Click the 'Ask an Expert' button below. We'll set you up with a **free** intake call and then connect you with one of our regional experts to help you interpret this report, evaluate options, validate soil data, and source plants.

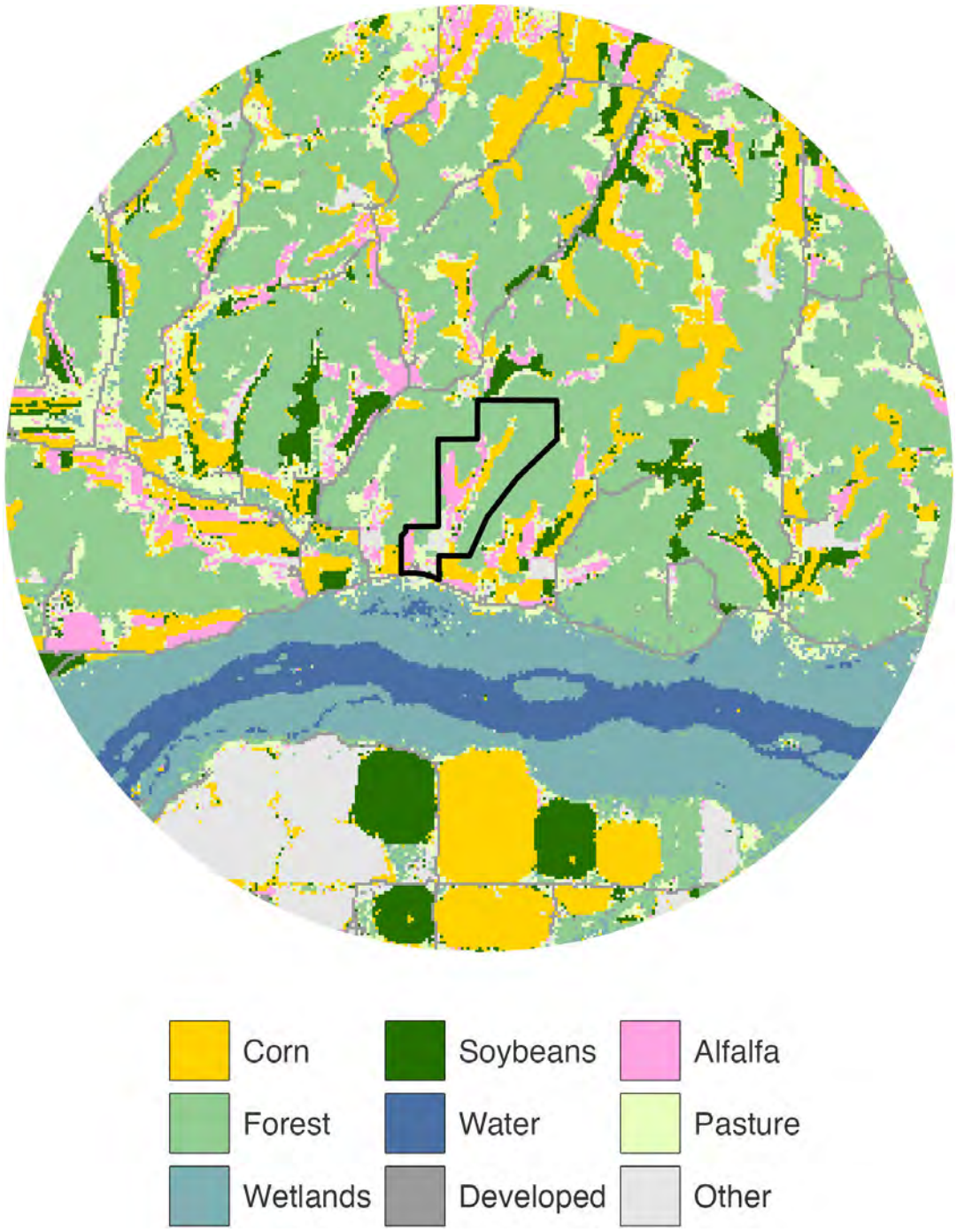
Disclaimer

The analysis in this report is not a recommendation by Canopy. The analysis is provided without representation or warranty of any kind. The accuracy of the analysis varies by location. Validation with real soil samples is recommended.

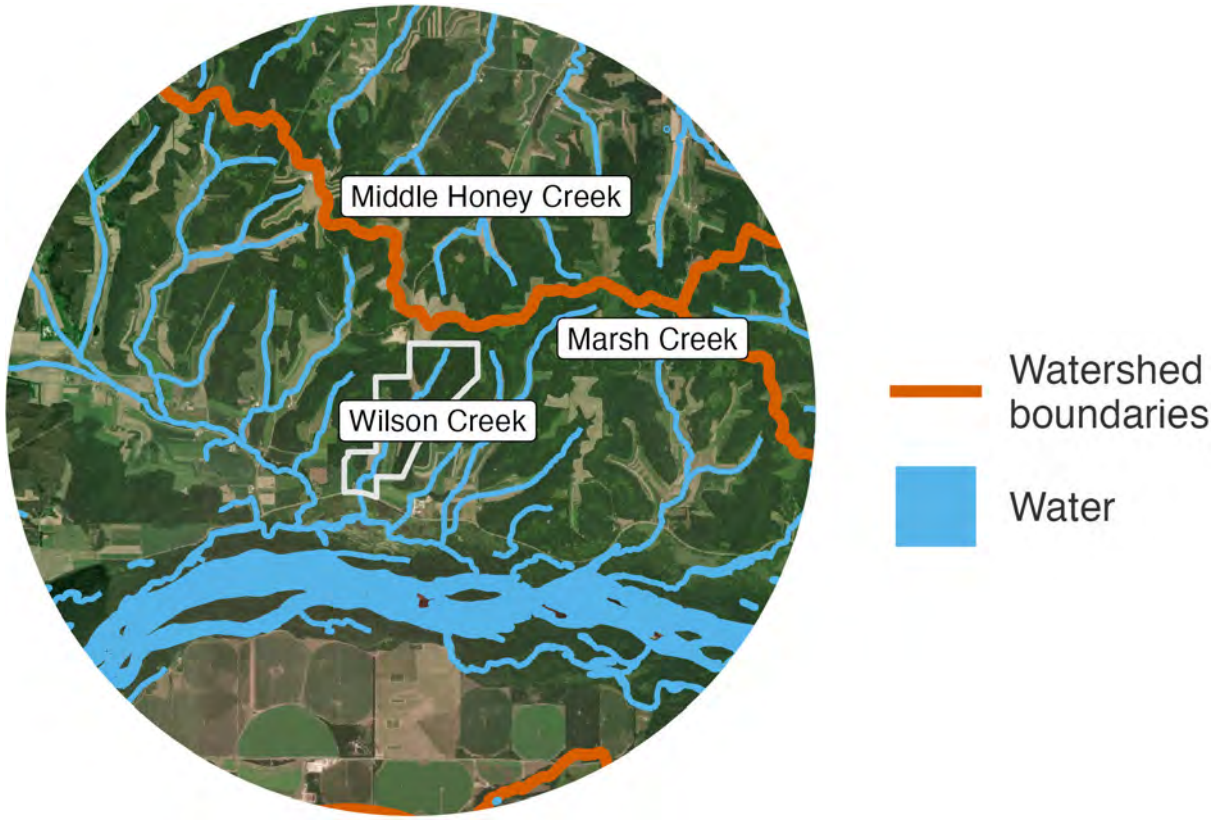
Current Context

Where are you starting from? What is in and surrounding this field now?

Existing Land Cover



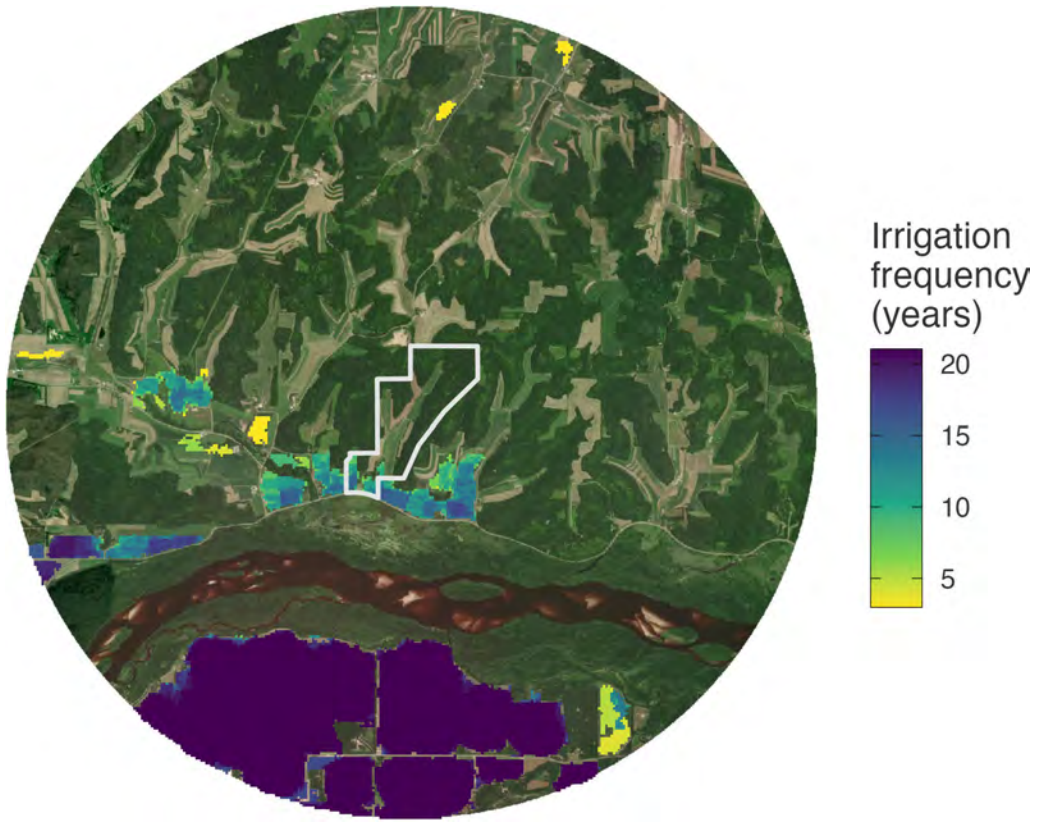
Hydrology



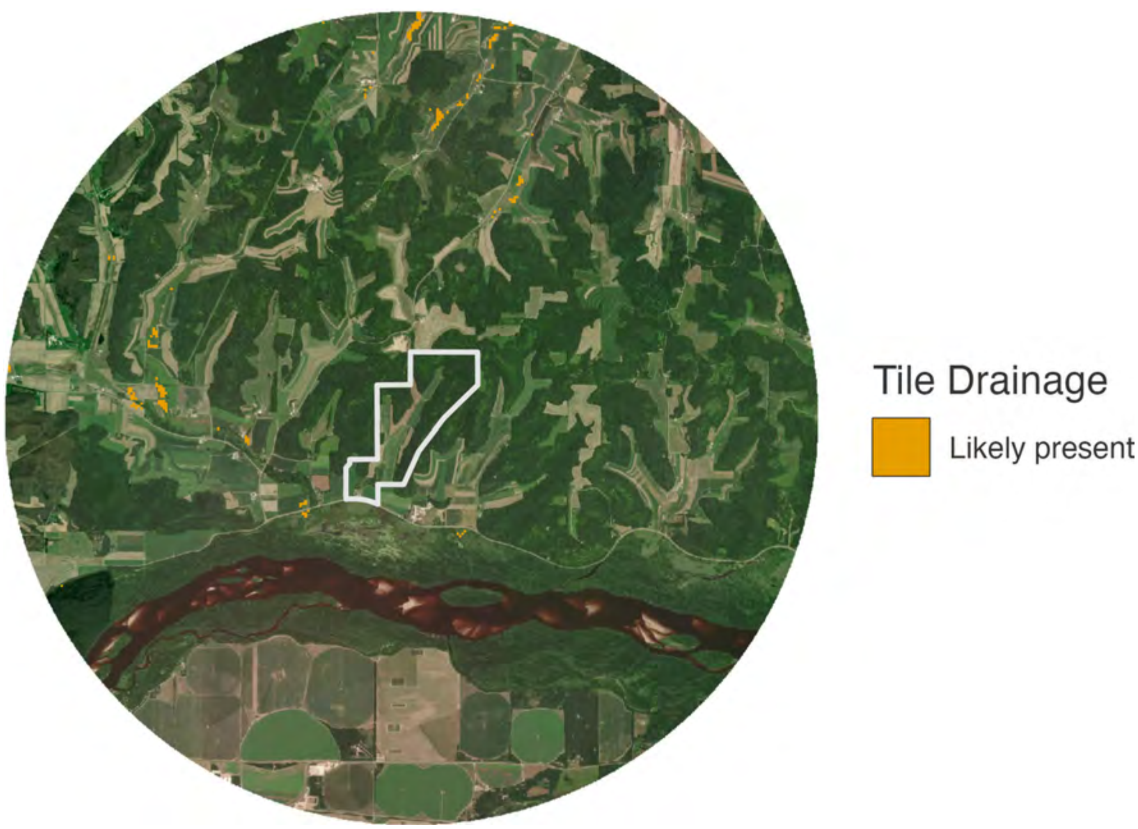
Category	Name	Hydrologic Unit Code
Subwatershed	Wilson Creek	070700051202
Watershed	City of Spring Green	0707000512
Subbasin	Lower Wisconsin	07070005
Basin	Wisconsin	070700
Subregion	Wisconsin	0707
Region	Upper Mississippi	07

Irrigation

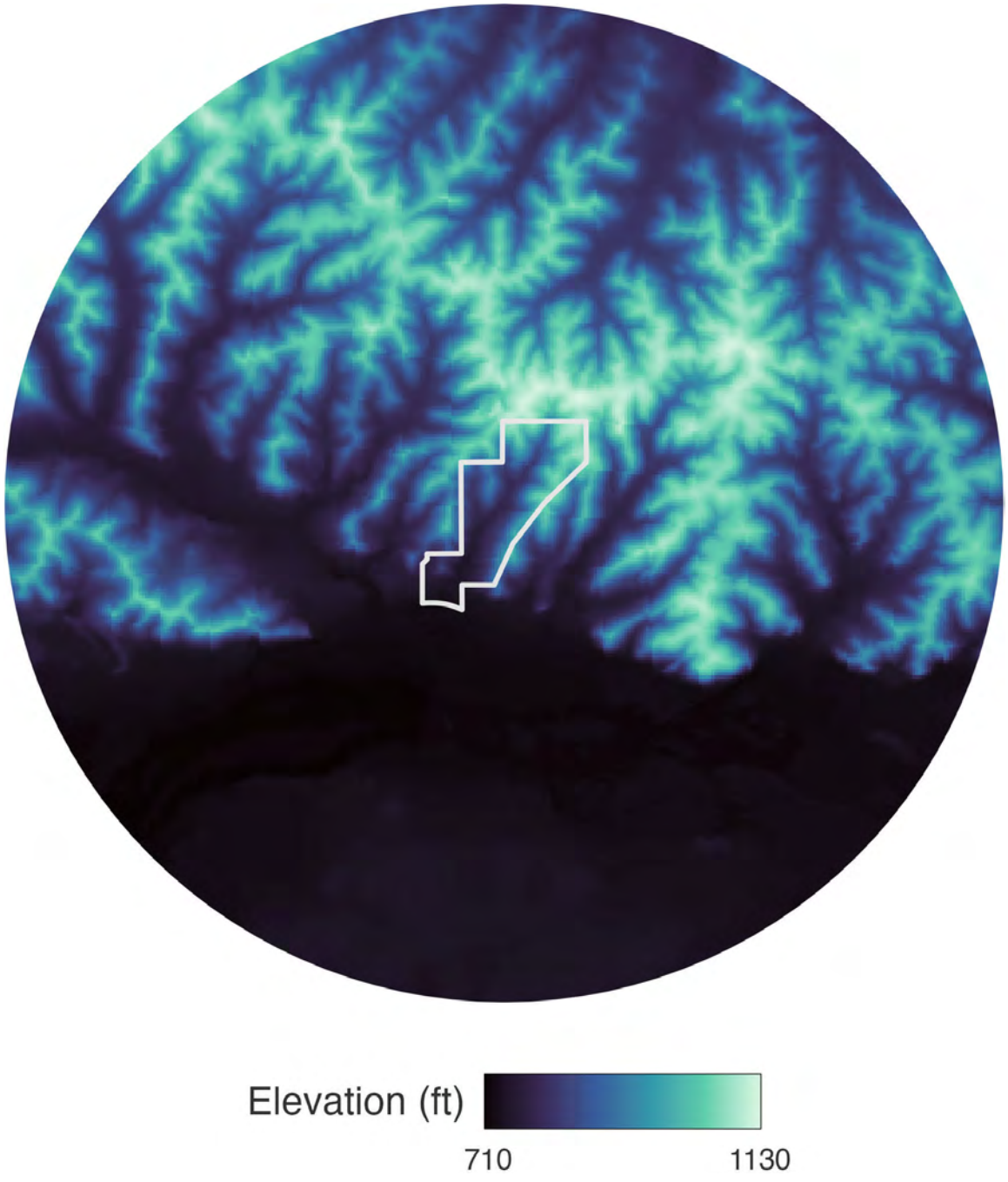
[redacted]



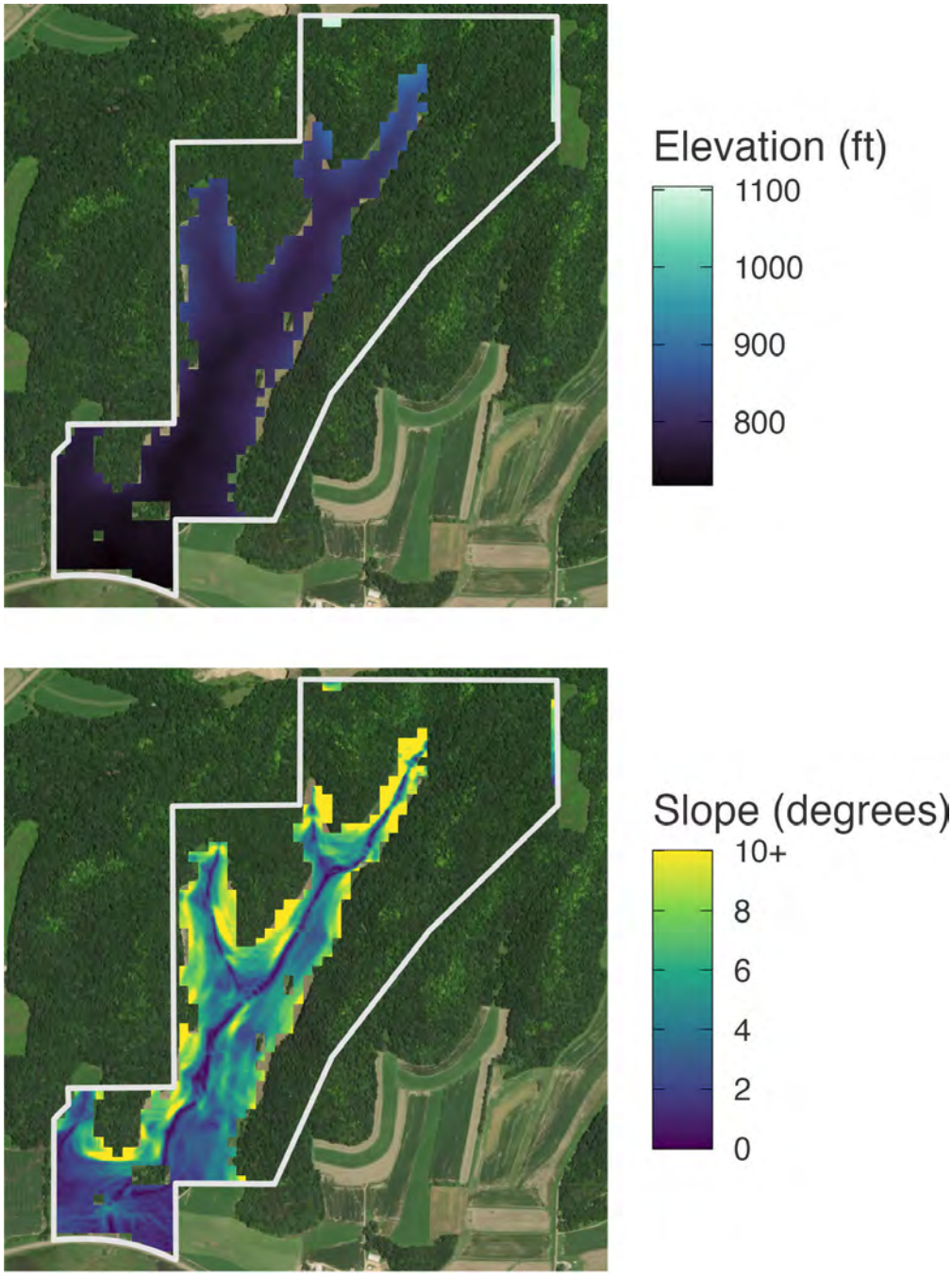
Tile Drainage



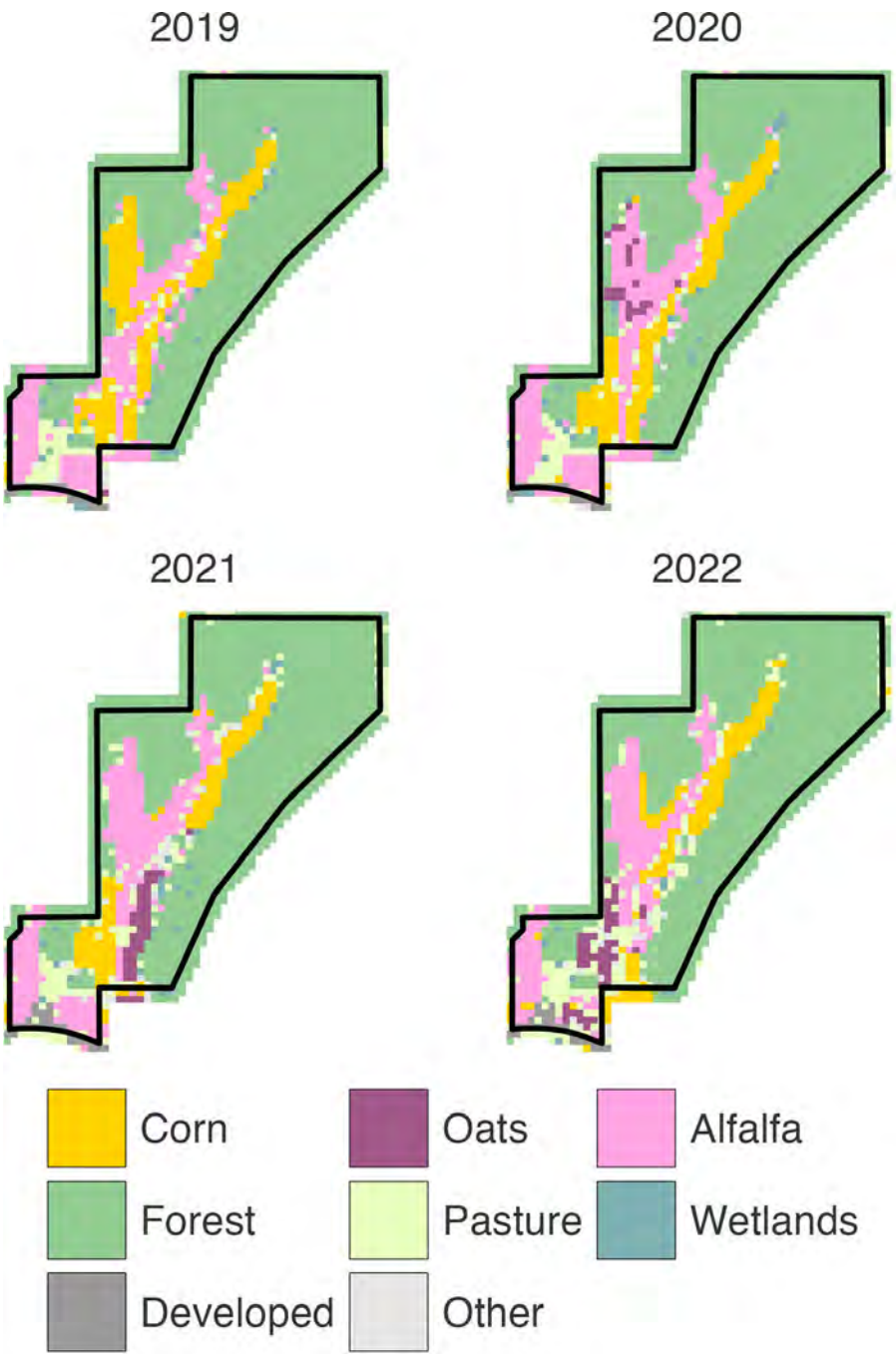
Regional Topography



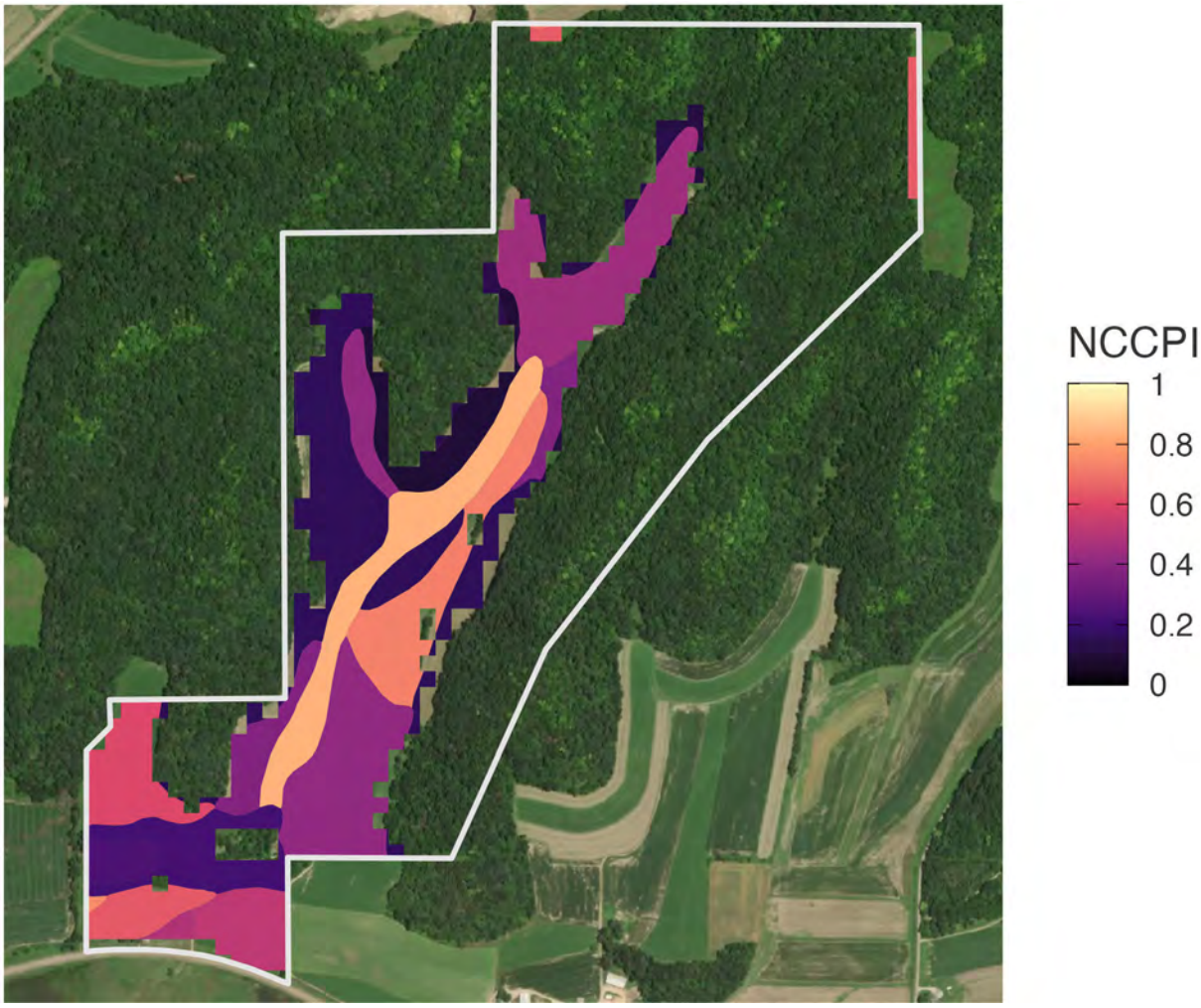
Local Topography



Crop History



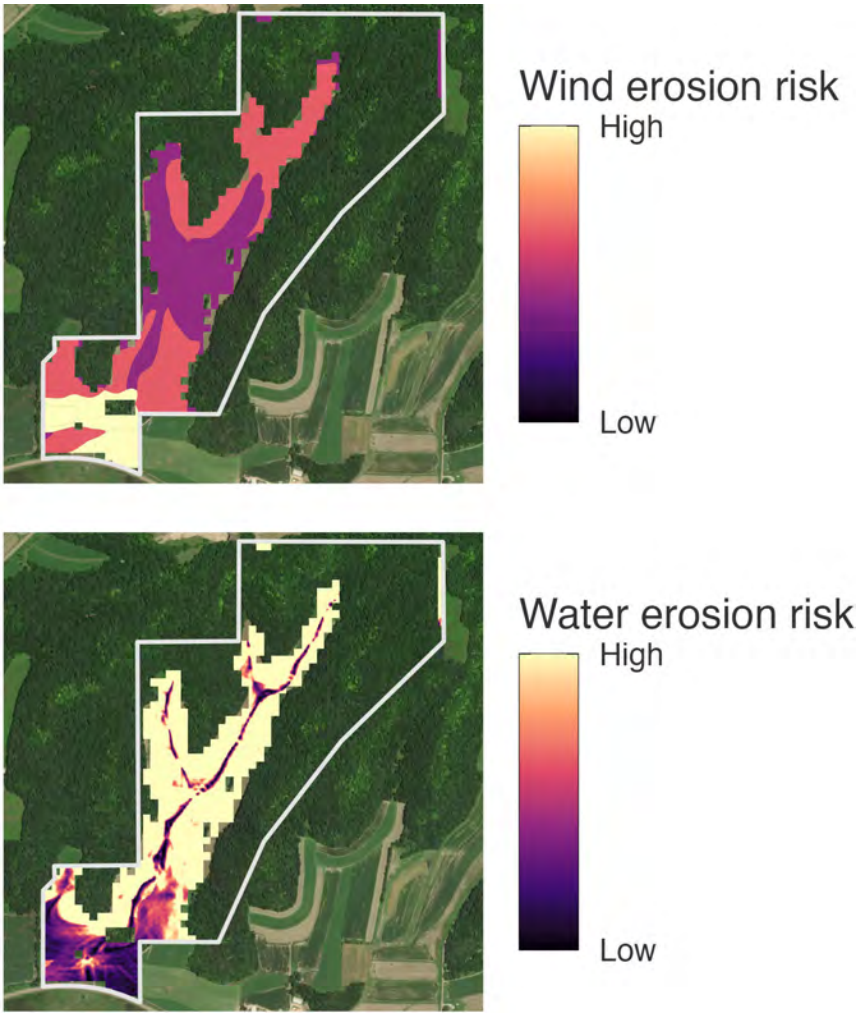
Row Crop Productivity



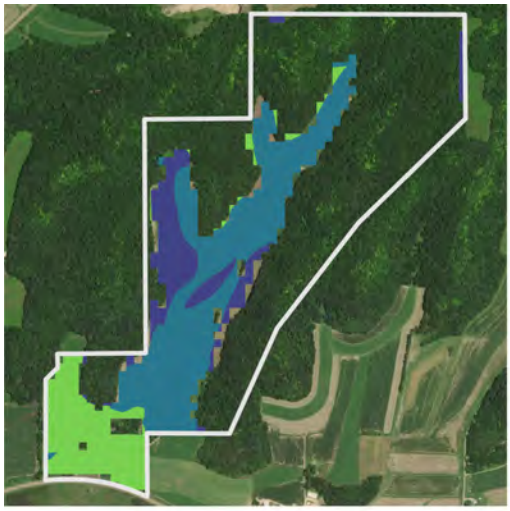
Environmental Concerns

What are the primary concerns in the field or region? What concerns could you work to address?

Soil Erosion

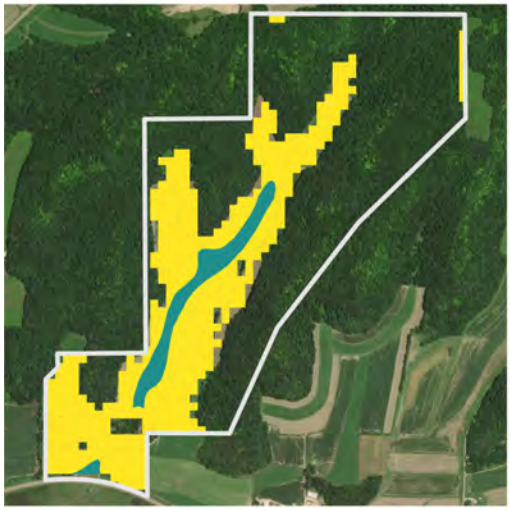


Water Runoff & Flooding



Water runoff potential

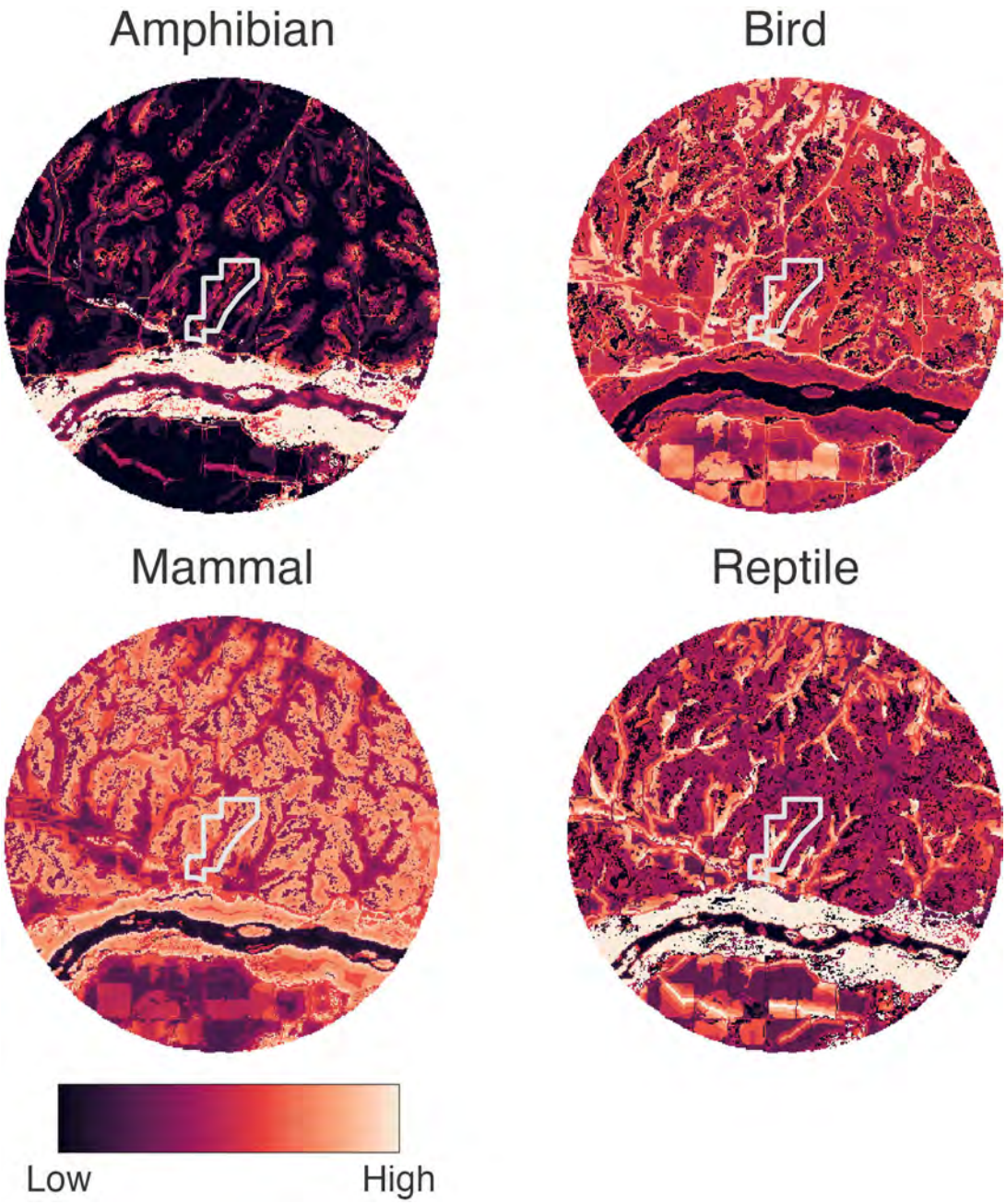
- Very High
- High
- Moderate
- Moderate if drained
- Low
- Low if drained



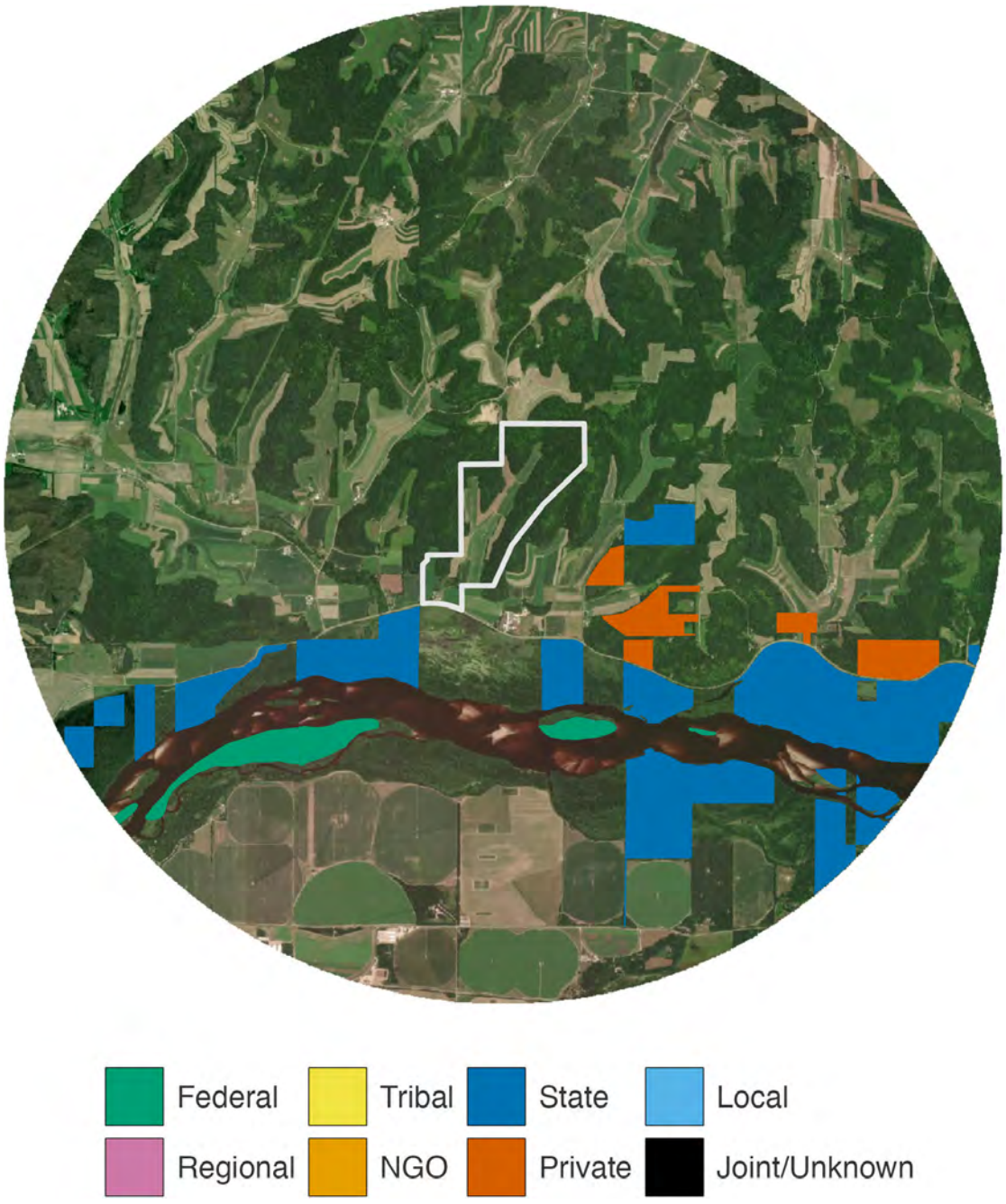
Flood frequency

- Very Frequent
- Frequent
- Common
- Occasional
- Rare
- Very rare
- None

Species Richness



Protected Areas



Crop Suitability

This section evaluates the field against the preferences of specific crops. Evaluating crop suitability is especially critical for permanent crops due to their deep roots and long lifespan. Crops can vary substantially in their soil and climate preferences. For example, some crops cannot tolerate cold winters while others require a long winter period in order to produce fruit. Some crops prefer deep, well-drained soil while others like having 'wet feet' with roots accessing the water table. Some crops require a specific soil texture and pH range, while others are more adaptable. Collectively, these preferences are called crop suitability criteria.

Included Crops

These are the crops you selected to include in this report. You can recreate this report with different or additional species, including any new species added to the Canopy Compass website, for **free** at any time.

Tree fruits

- ☑ Apple
- ☐ Cherry
- ☐ Mulberry
- ☐ Pawpaw
- ☐ Peach
- ☐ Pear
- ☐ Persimmon
- ☐ Plum
- ☐ Quince

Small fruits

- ☐ Aronia
- ☑ Black currant
- ☐ Blueberry
- ☐ Elderberry
- ☐ Hardy kiwi
- ☐ Honeyberry
- ☐ Serviceberry

Timber & fodder

- ☑ Black locust
- ☐ Black walnut
- ☐ Eastern white pine
- ☐ Honeylocust
- ☐ Norway spruce
- ☐ Poplar
- ☐ Swamp white oak
- ☐ White oak
- ☐ Willow

Nuts

- ☑ Chestnut
- ☐ Heartnut
- ☐ Hybrid hazelnut
- ☐ Pecan

Other

- ☑ Sugar maple

FAQ - Crop Suitability

How are the crop suitability maps generated?

The crop suitability maps on the Canopy Compass website and in this section are based on the Savanna Institute's peer-reviewed crop suitability algorithm (Shea & Wolz, *in review*). In this methodology, data on a crop's soil and climate preferences are first gathered from scientific literature, extension publications, and expert insights. Then, these preferences are used, in conjunction with soil and climate data, to predict how suitable a field is for a given crop.

Your field is divided into zones of common soil and climate traits. For each soil/climate variable, each zone is classified as ideal, suitable, or unsuitable. If any single variable is **unsuitable** in a zone, that zone is deemed unsuitable as a whole, regardless of the suitability of other variables. If no variables are unsuitable, the relative proportion of **ideal** vs. **suitable** variables in a zone generates a 'suitability index', which is displayed on the main maps in this section.

What about different varieties, cultivars or genetics?

The crop suitability algorithm is meant to be *inclusive of all varieties, cultivars, and genetics within a given crop*. In other words, the analysis asks: 'Can *at least one* variety of this crop grow here?' This is the first step in evaluating crop suitability. If this analysis deems an area suitable, the varieties that work best for your field must then be identified. Ask our experts for help with that!

How should the suitability index (from suitable to ideal) be interpreted?

The suitability index mapped for each species indicates the relative proportion of factors that are either 'suitable' or 'ideal' for that crop. The suitability index should *not* be interpreted as directly proportional to growth rate or yield.

Will the suitability analysis change over time?

Yes! Many alternative crops are just now developing robust data on soil and climate preferences. We are constantly working to improve our suitability algorithm as new research is published and more data becomes available. As crops are added or updated on the Canopy Compass website, you can update this Compass Report to include this new information for **free**.

What factors are considered or not considered?

The factors considered in the suitability analysis vary across crops. The specific factors considered for each crop are shown on the pages titled "Criteria Breakdown". Factors can include:

CLIMATE

- **Minimum winter temperature** - Cold hardiness often limits crops at the northern end of their range.
- **Maximum summer temperature** - Heat tolerance often limits crops at the southern end of their range.
- **Precipitation** - On existing agricultural land, precipitation criteria are ignored - we assume that installation of irrigation is feasible if necessary. On non-agricultural land, precipitation criteria are enforced.
- **Chilling hours** - Some crops need enough winter chill time to trigger flower or fruit production.
- **Growing degre days** - This is a metric of growing season length. Some crops need longer growing seasons to fully ripen their crop.

SOIL

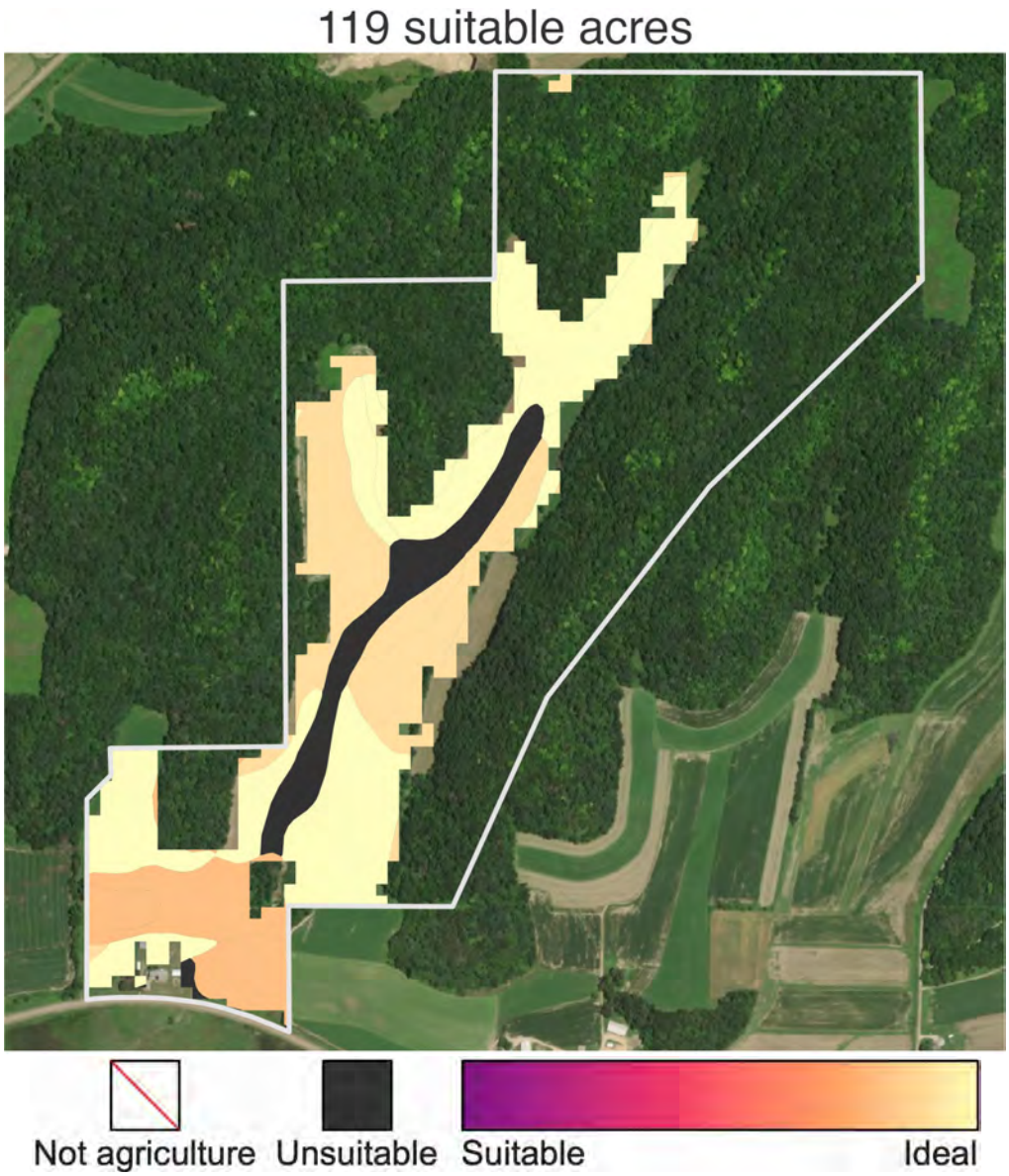
- **Soil depth** - Too shallow of bedrock or restrictive layer can restrict roots.
- **Water table depth** - Plant roots generally cannot survive for long if submerged in the water table, but some crops prefer having intermittent access to the water table.
- **Soil texture** - The soil's sand, silt, and clay composition.
- **Soil drainage** - Some crops are more tolerant of soggy soils than others.
- **Flood frequency** - Some crops are more tolerant of flooding than others.
- **Soil pH** - Nutrient availability is strongly influenced by soil pH - how acidic or alkaline the soil is.

NOT INCLUDED

- **Microclimate effects** - You can't beat on-the-ground observations for this!
- **Future climate change** - Analyses utilize present-day climate data.
- **Slope** - This can be important for some types of mechanical harvesters.
- **Management-related variables** - e.g., if a certain soil texture is necessary for a specific management practice, rather than just for crop growth.

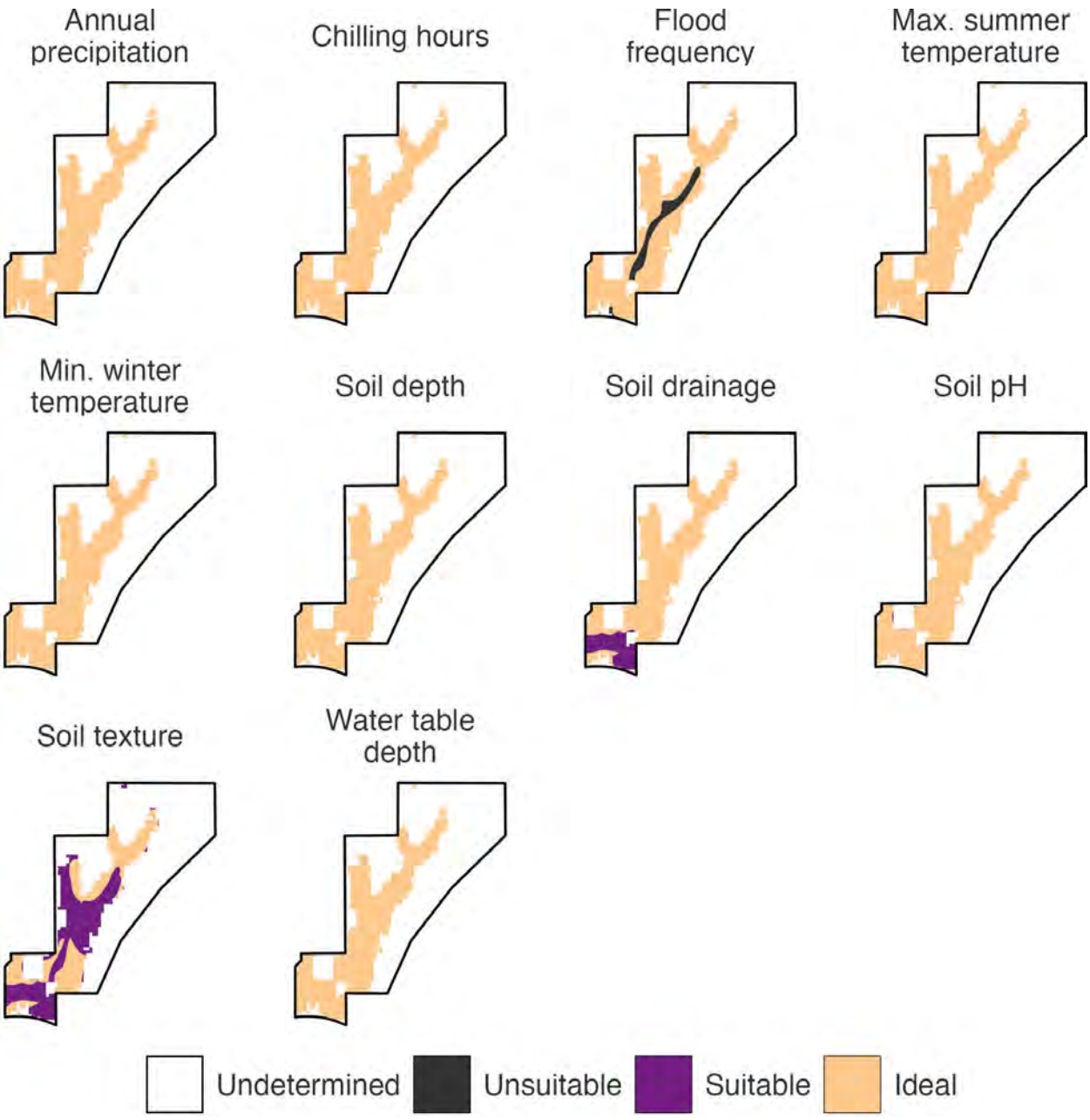
Apple

[redacted]



Apple - Criteria Breakdown

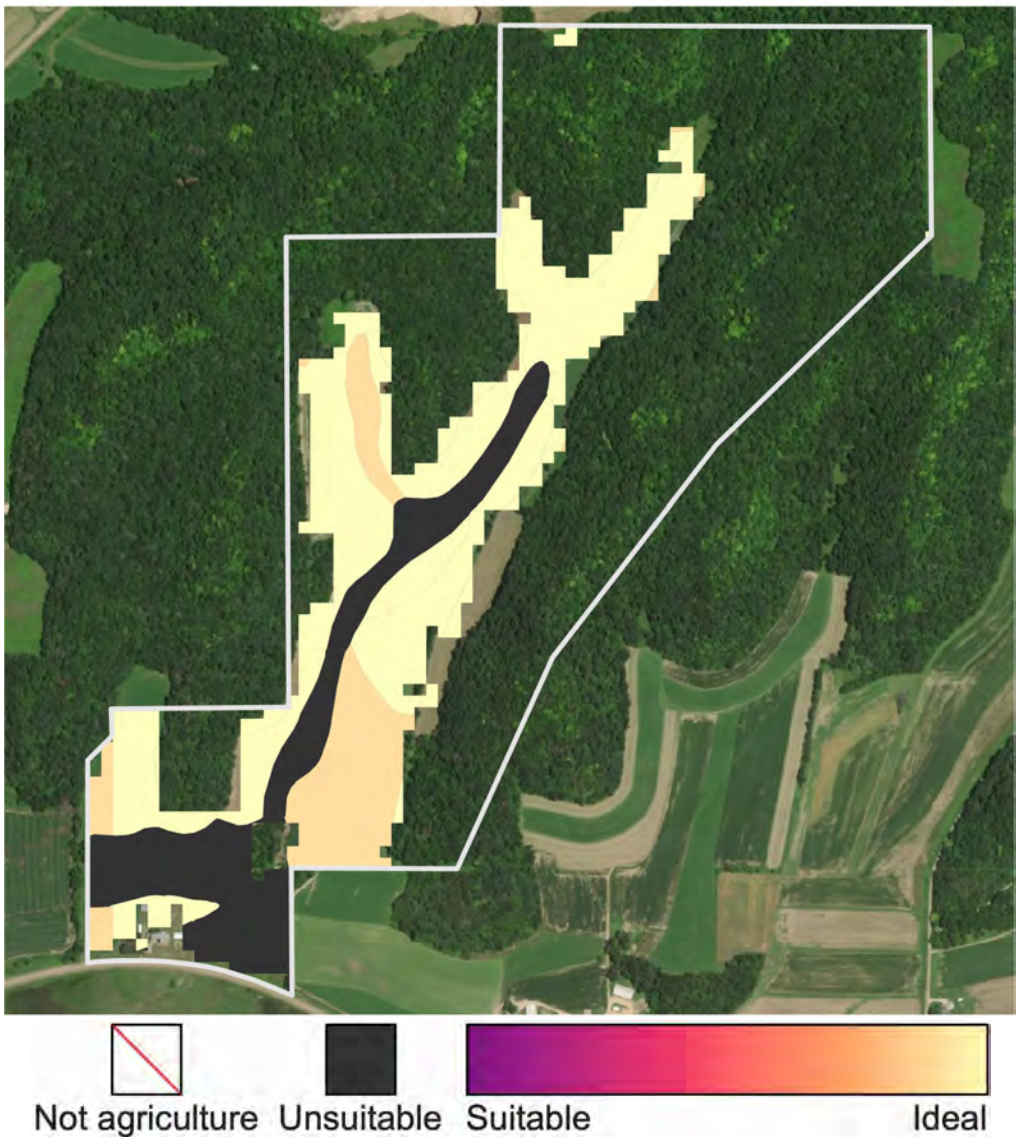
Why does the map on the previous page identify specific areas of the field as suitable, ideal, or unsuitable? Each crop has its own preferences! The maps below provide a breakdown of how the soil and climate variables in our suitability analysis were evaluated against the preferences of this specific crop.



Black Currant

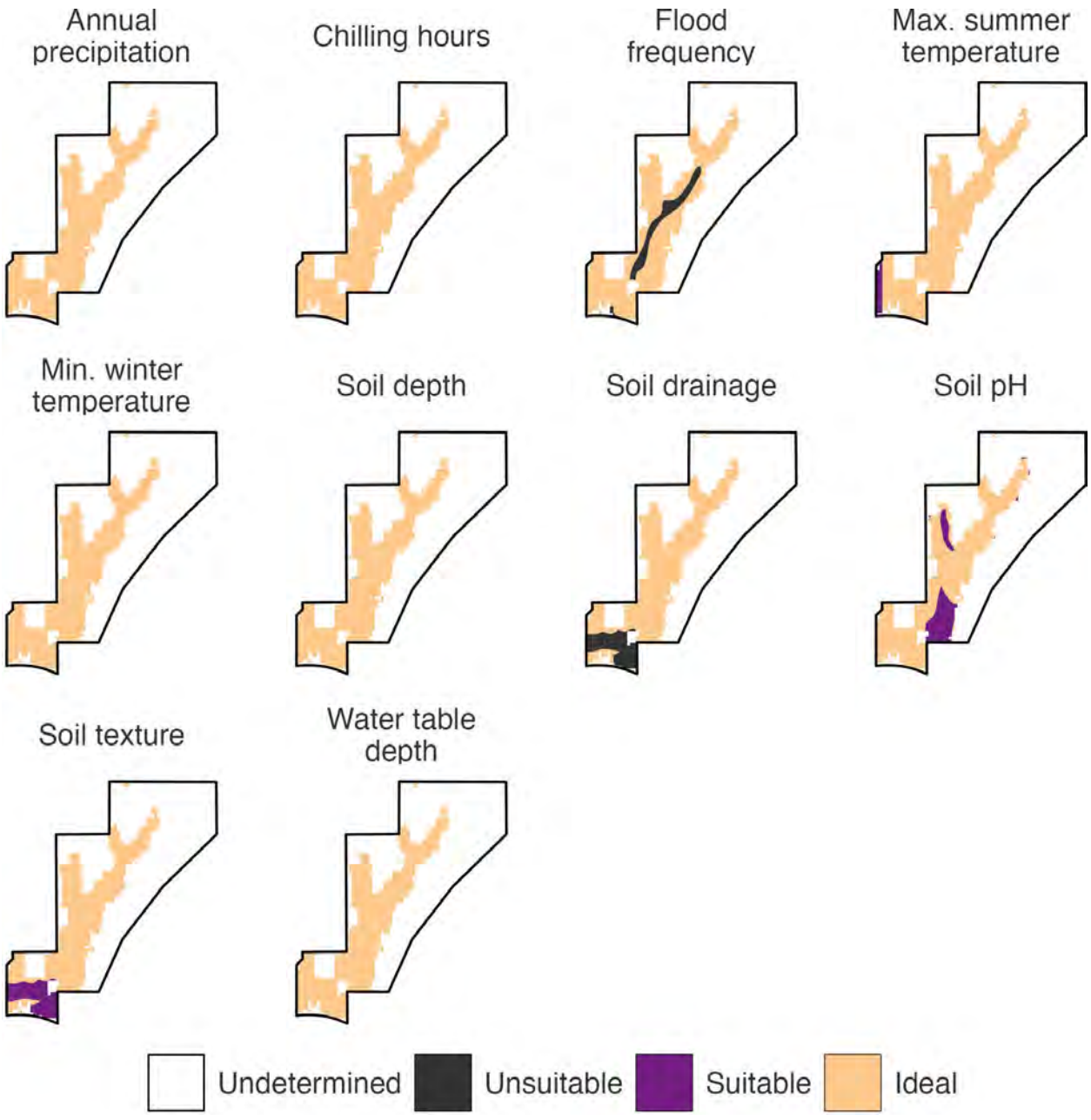
[illegible]

87 suitable acres

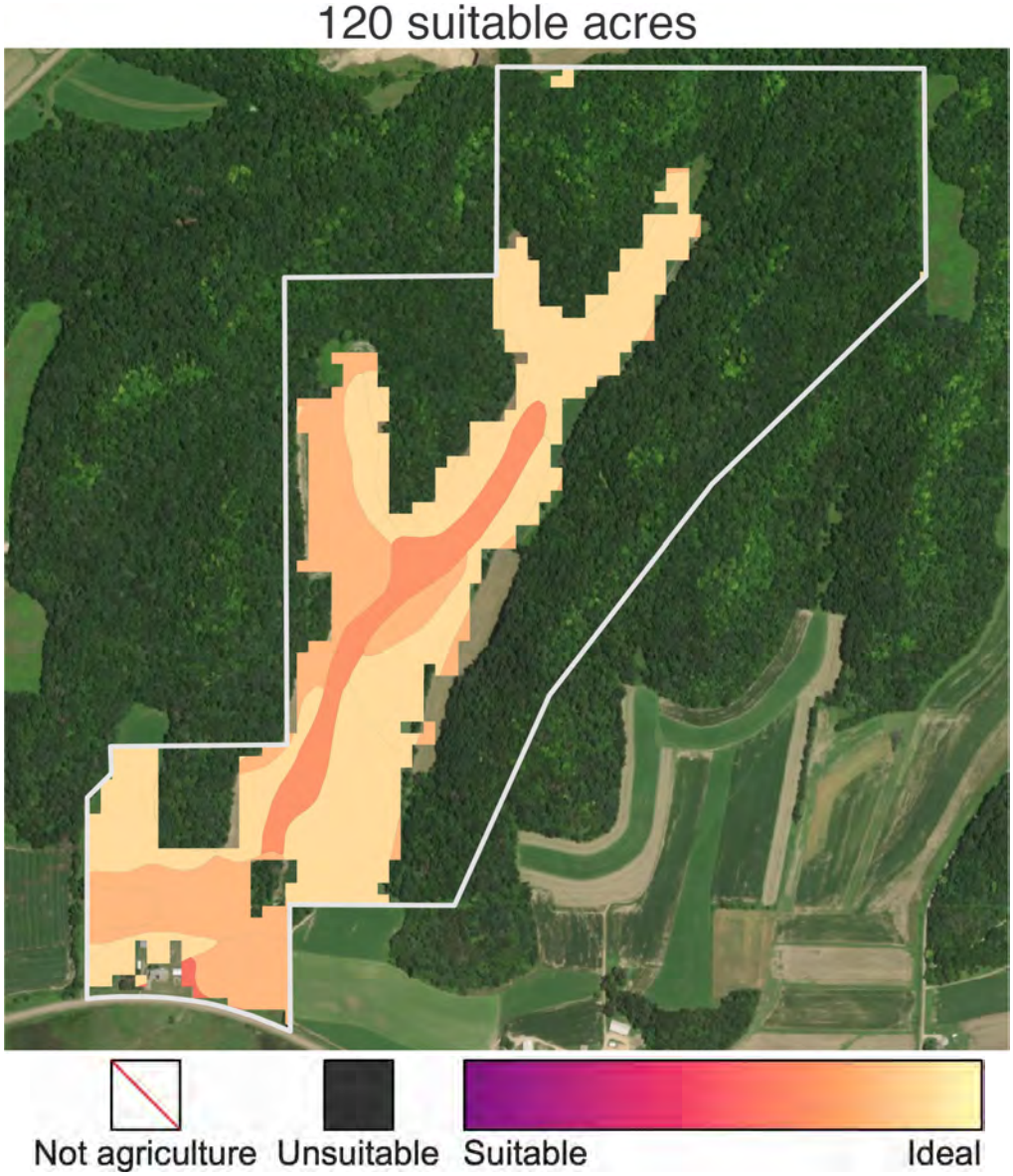


Black Currant - Criteria Breakdown

Why does the map on the previous page identify specific areas of the field as suitable, ideal, or unsuitable? Each crop has its own preferences! The maps below provide a breakdown of how the soil and climate variables in our suitability analysis were evaluated against the preferences of this specific crop.

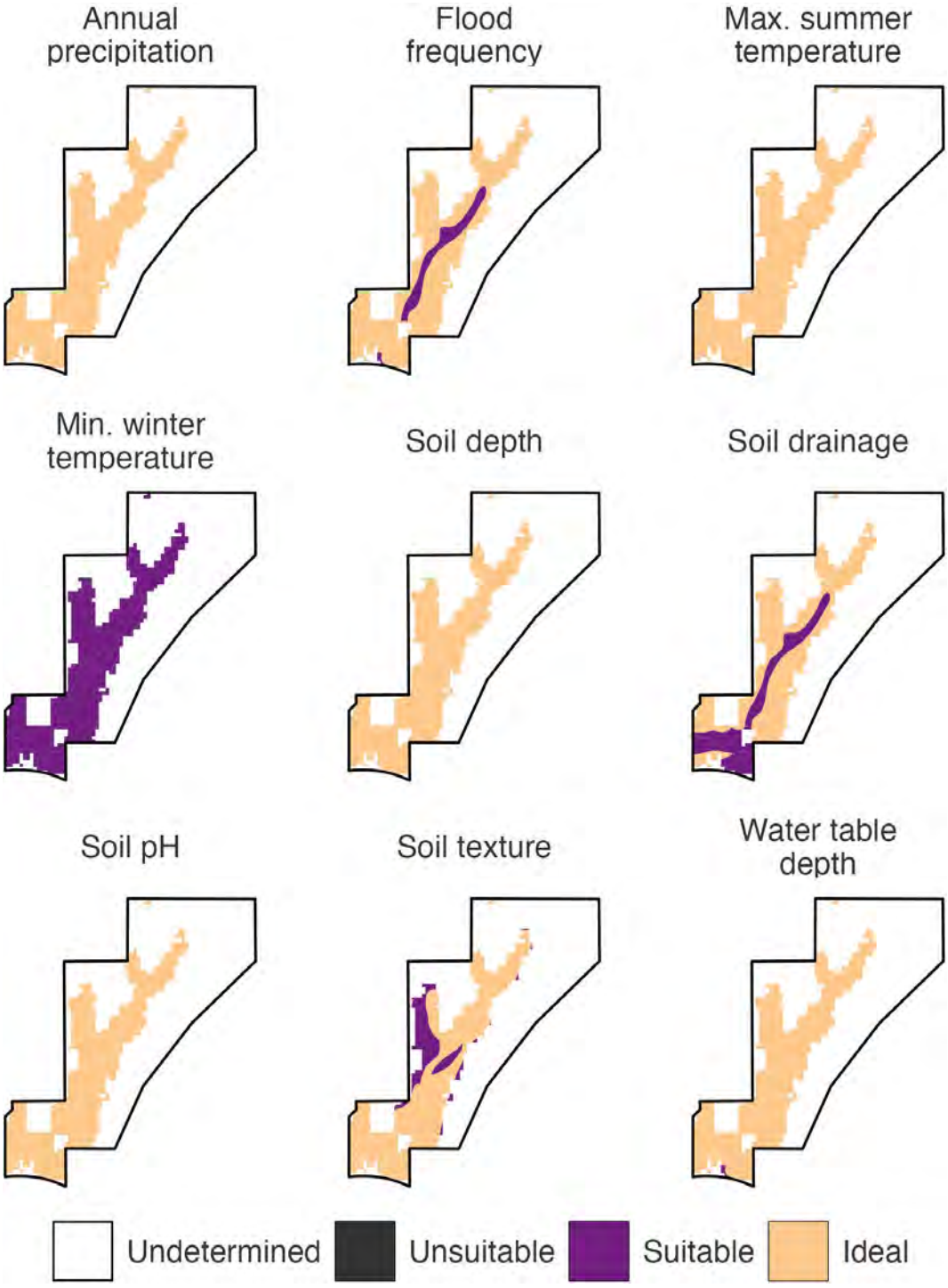


Black Locust



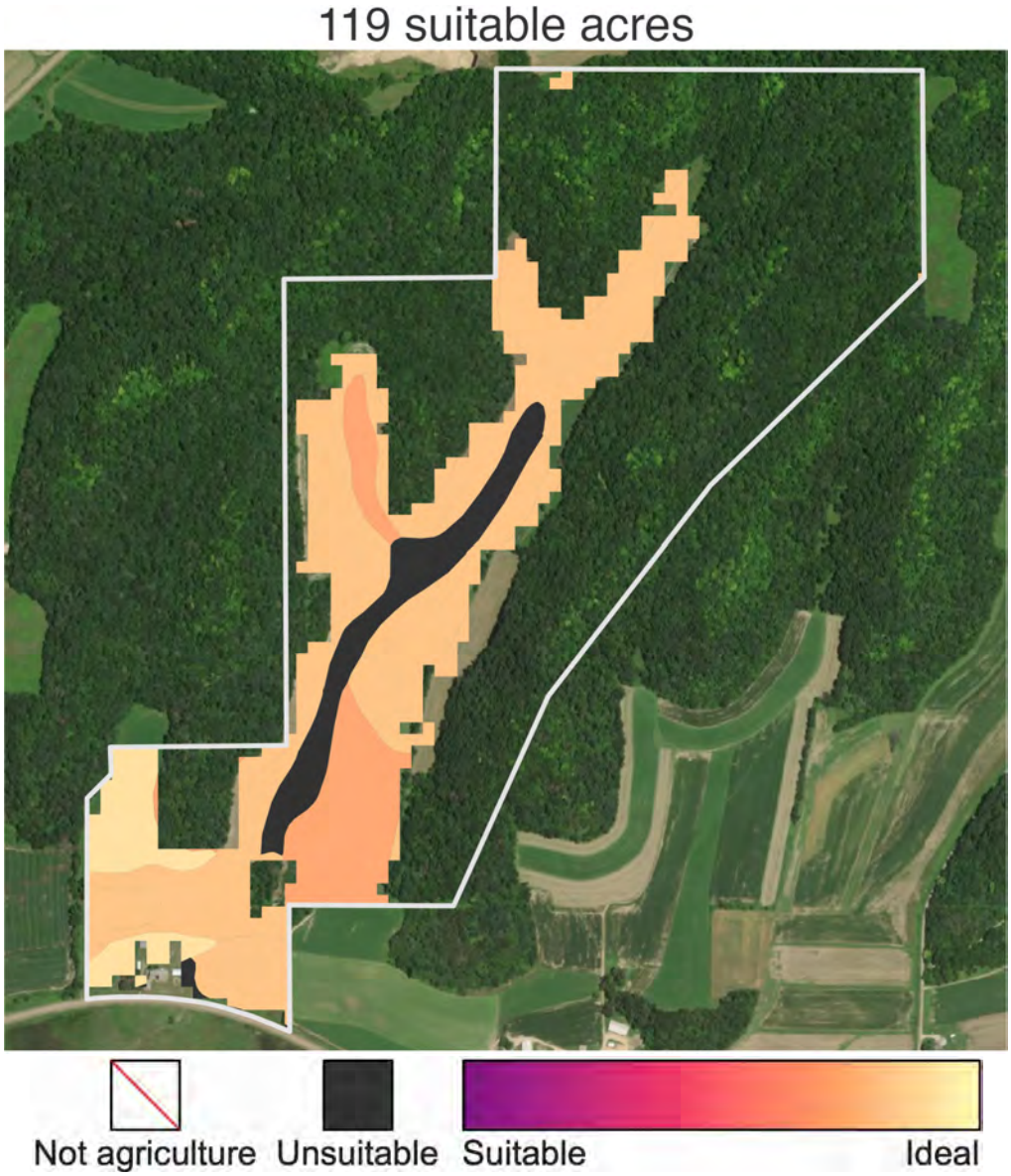
Black Locust - Criteria Breakdown

Why does the map on the previous page identify specific areas of the field as suitable, ideal, or unsuitable? Each crop has its own preferences! The maps below provide a breakdown of how the soil and climate variables in our suitability analysis were evaluated against the preferences of this specific crop.



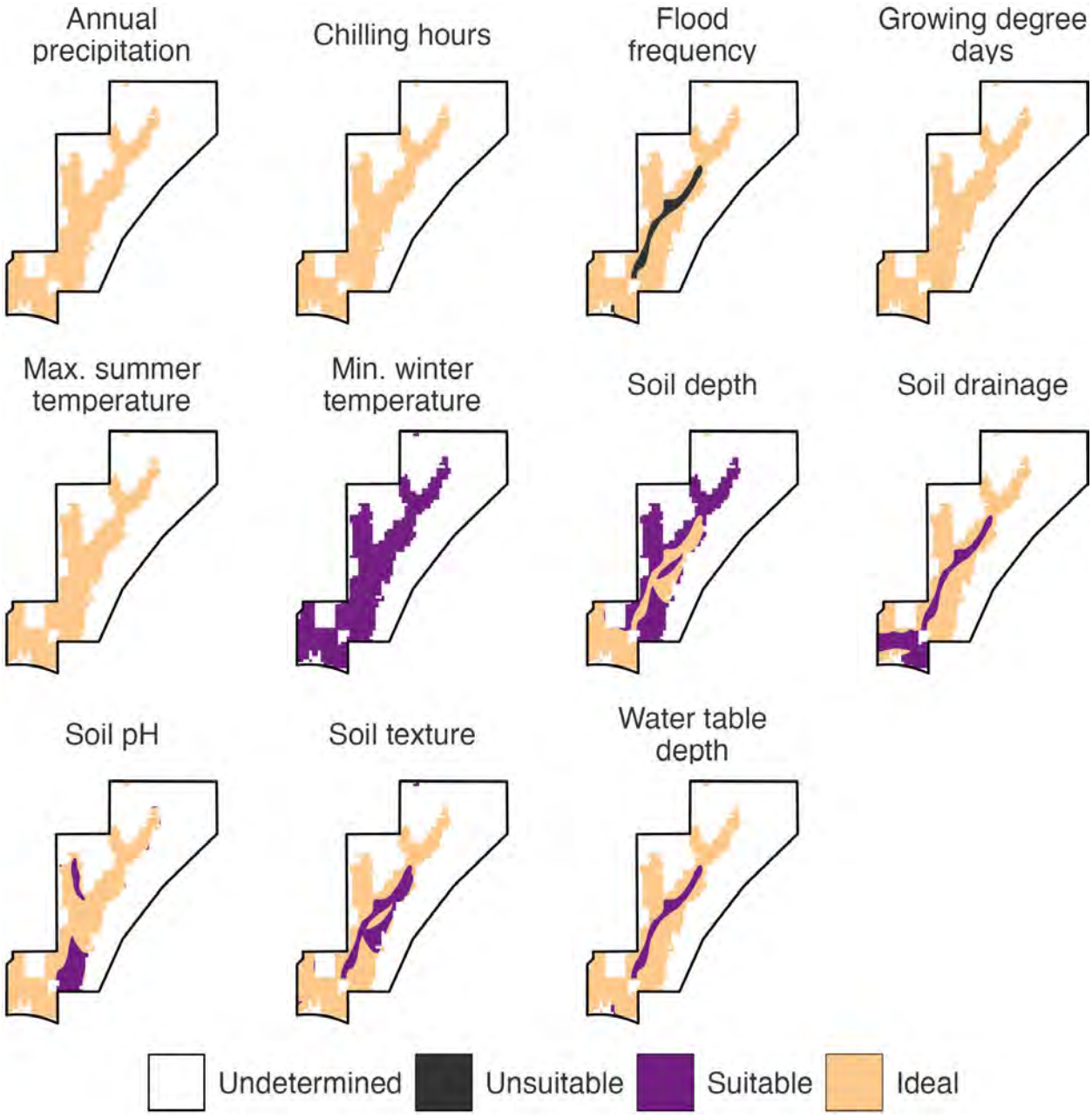
Chestnut

[redacted]

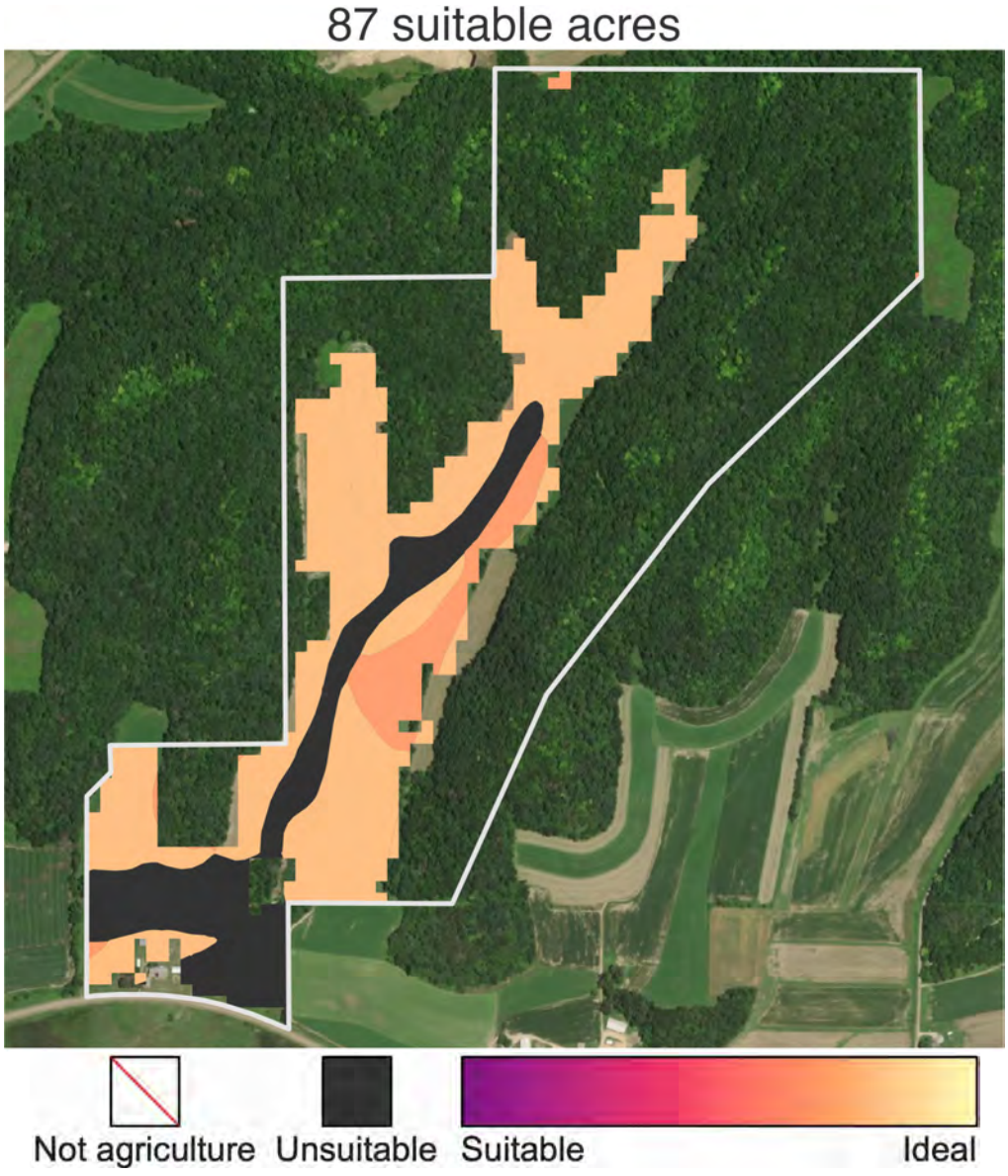


Chestnut - Criteria Breakdown

Why does the map on the previous page identify specific areas of the field as suitable, ideal, or unsuitable? Each crop has its own preferences! The maps below provide a breakdown of how the soil and climate variables in our suitability analysis were evaluated against the preferences of this specific crop.

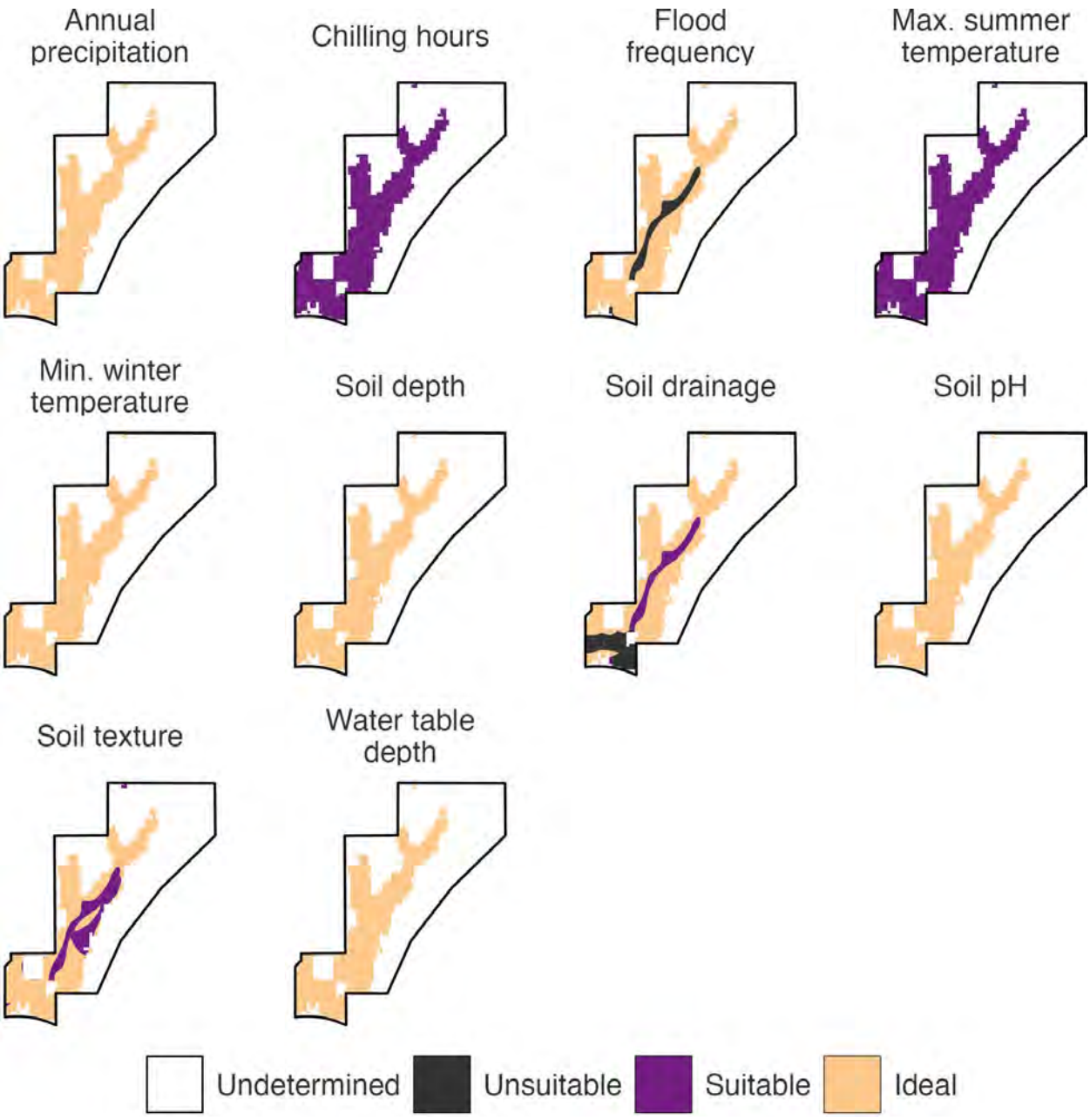


Sugar Maple



Sugar Maple - Criteria Breakdown

Why does the map on the previous page identify specific areas of the field as suitable, ideal, or unsuitable? Each crop has its own preferences! The maps below provide a breakdown of how the soil and climate variables in our suitability analysis were evaluated against the preferences of this specific crop.



Soil & Climate

This section provides a snapshot of a wide range of soil and climate data for the field. There are no ‘right’ or ‘wrong’ answers in this section. This data is intended to inform decision making around the topics in this report and beyond. Unmapped areas have no data or are non-agricultural land.

FAQ - Soil & Climate

Is the soil data trustworthy? Did someone take soil samples in *this* field?

The USDA SSURGO soil database contains information collected by the National Cooperative Soil Survey over *more than a century*. The data was gathered by USDA scientists who walked over the land, observed the soil, and took many deep cores for laboratory analysis.

While they may not have taken soil cores in *your* field, they did take soil cores in the same soil types in a similar landscape context nearby.

Soils vary across the landscape in a repeatable pattern influenced by steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many other characteristics. Using these patterns, in conjunction with the soil cores that were taken, soil scientists can predict soil types and characteristics across the broader landscape. Accurately drawing the soil maps was greatly aided by aerial imagery, initially by planes, and now satellites.

Should I take my own soil samples?

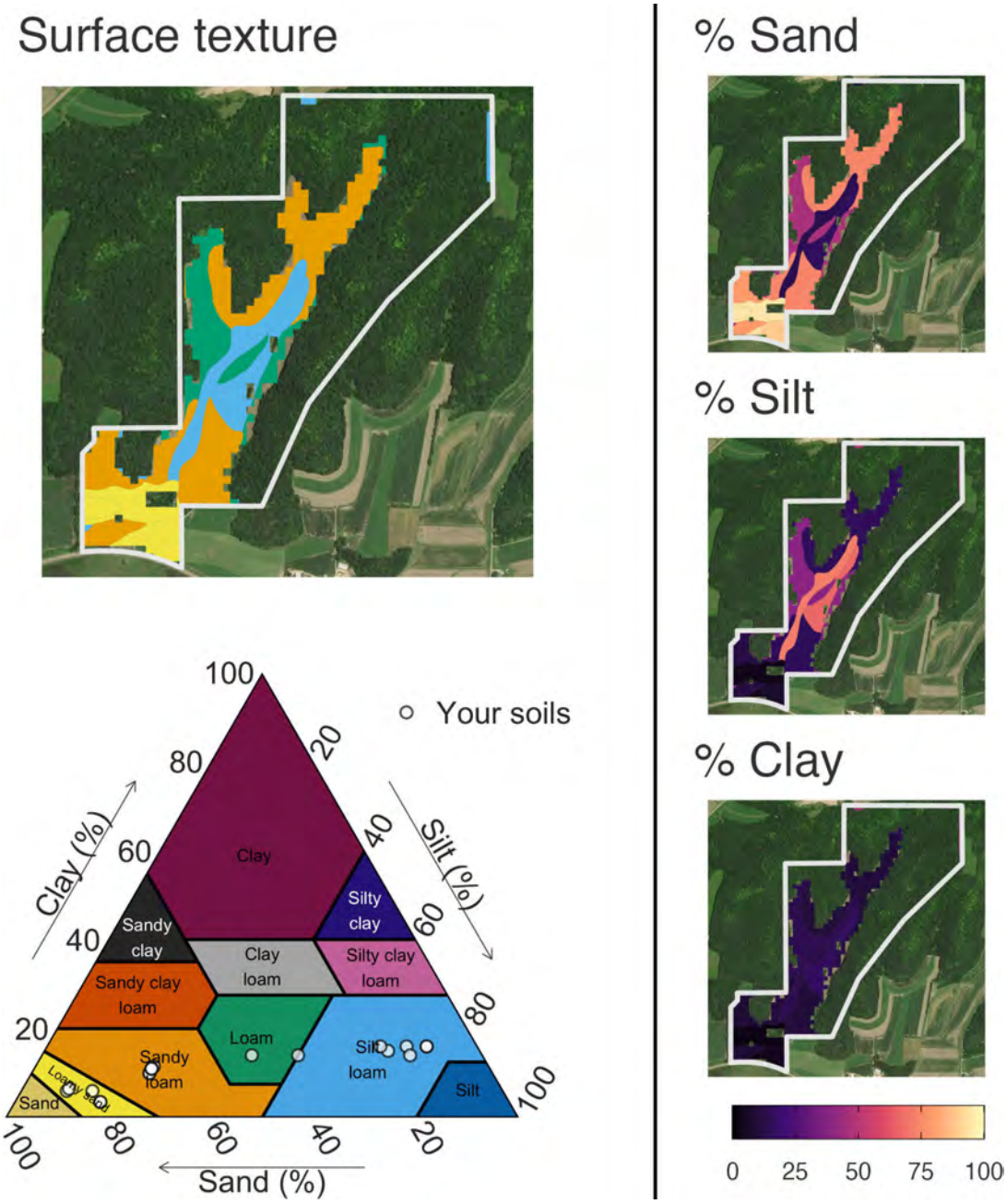
This soil database is evidence-based and robust. Nevertheless, errors and variability do exist. In addition, while many soil traits are stable over time, others can vary with time and under agricultural management (e.g. organic matter, pH).

It is highly recommended to validate this analysis with real soil samples collected from your field, especially prior to making an investment in permanent crops.

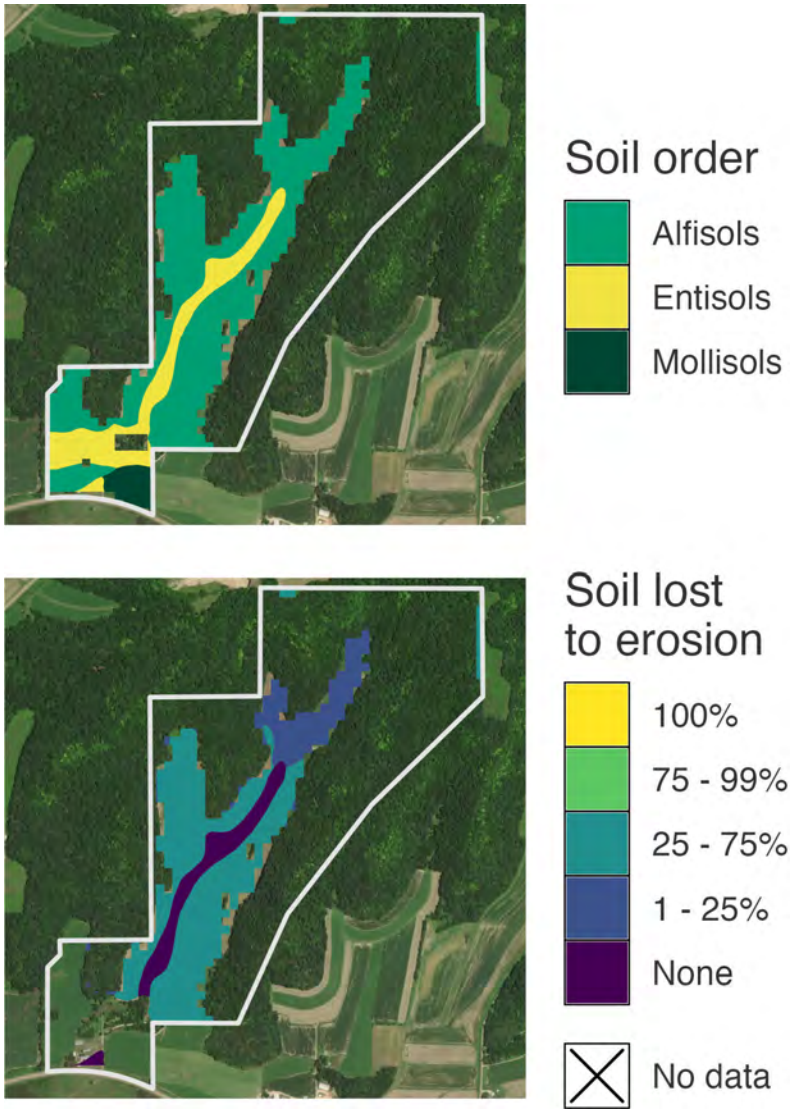
To get in touch with one of our regional experts for help interpreting and validating the soil data in this report, see the instructions on the 'What's Next?' page at the back of this report.

Soil Texture

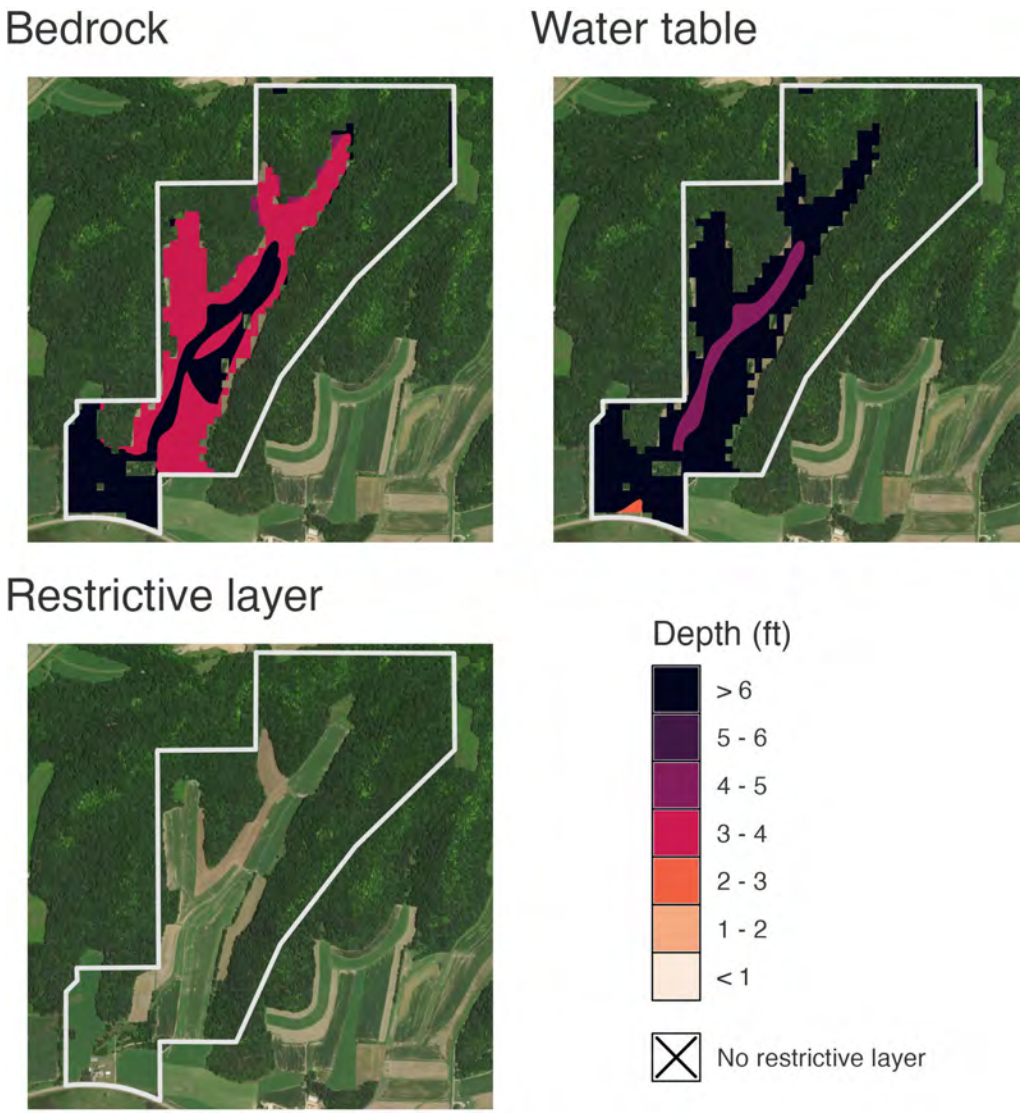
[redacted]



Soil Formation & Loss

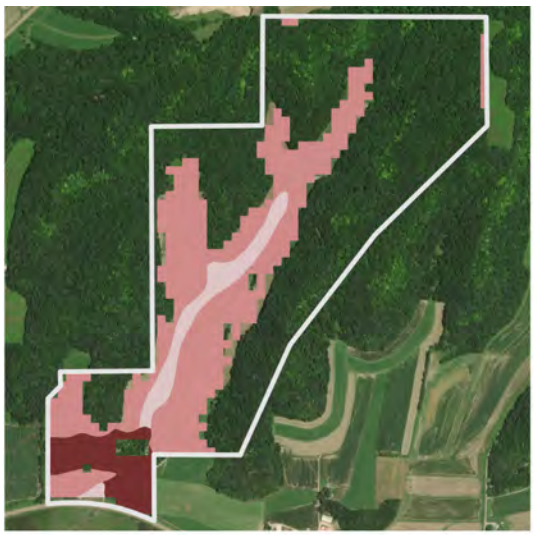


Depth Constraints



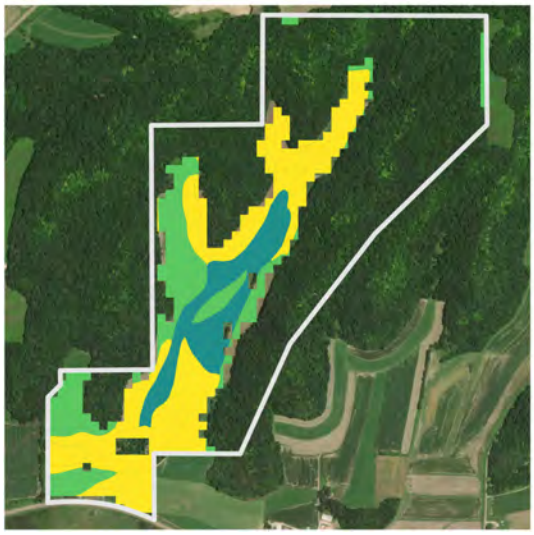
Water Retention

[blurred]



Drainage class

- Excessive
- Somewhat excessive
- Well
- Moderately well
- Somewhat poor
- Poor
- Very poor

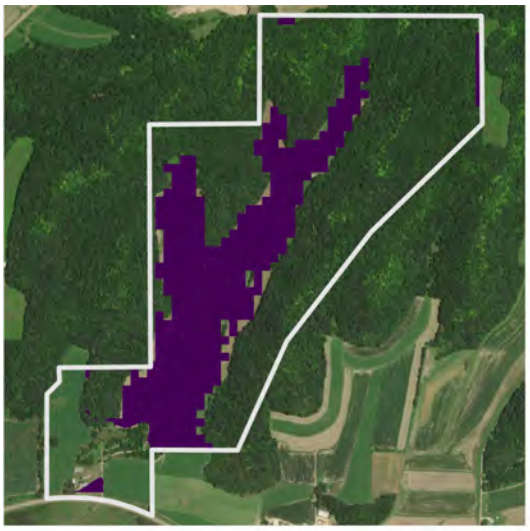


Available water storage (in)

- > 24
- 18 - 24
- 12 - 18
- 6 - 12
- < 6

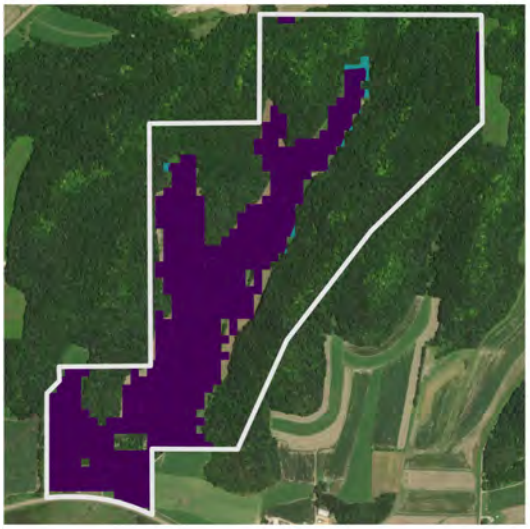
Soil Chemistry

[blurred]



EC (dS/m)

- Strongly saline
- Moderately saline
- Slightly saline
- Very slightly saline
- Nonsaline (1 - 2)
- Nonsaline (0.25 - 1)
- Nonsaline (< 0.25)



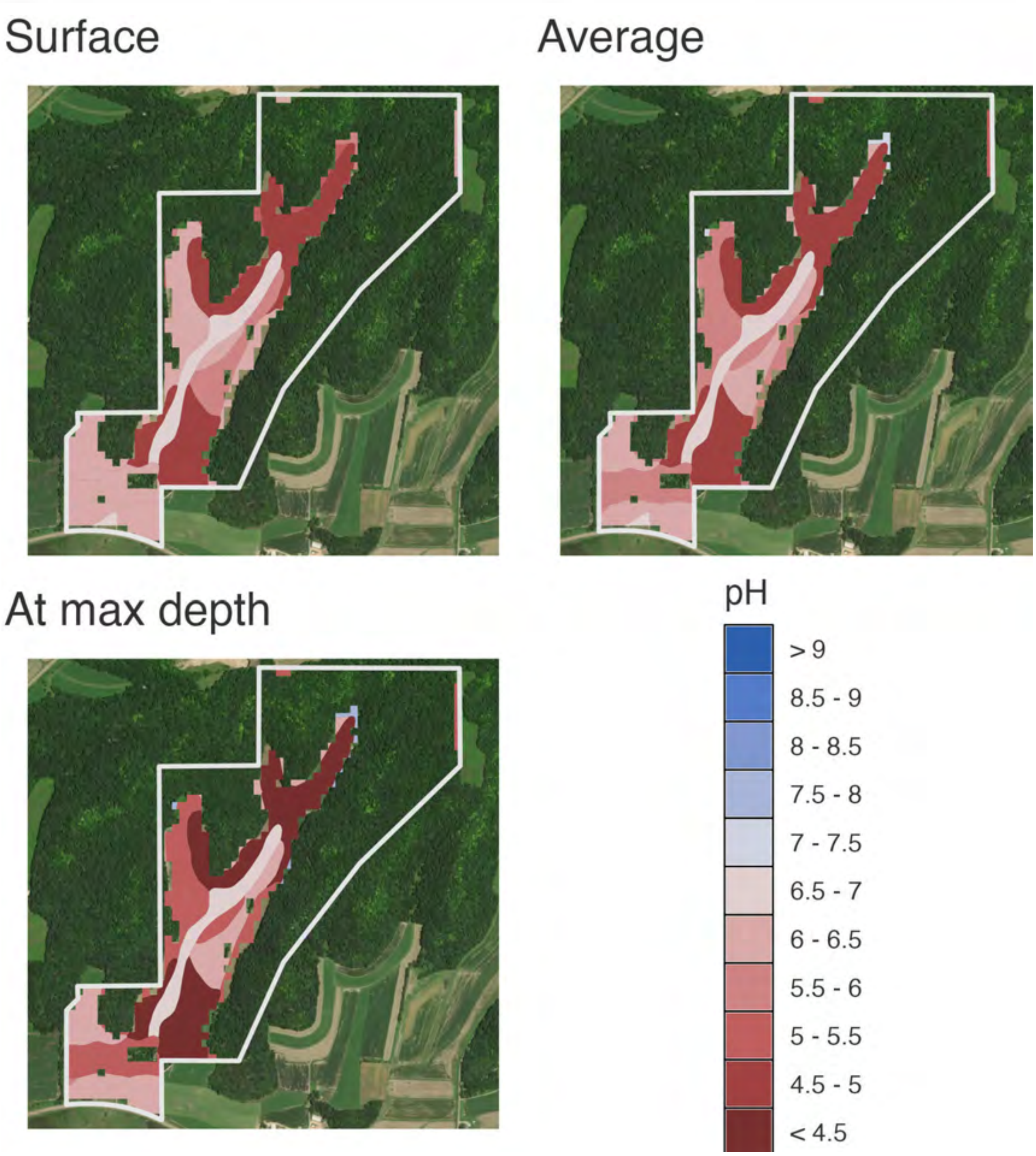
Carbonates (kg/m^3)

- > 300
- 225 - 300
- 150 - 225
- 75 - 150
- 25 - 75
- 5 - 25
- < 5

Soil pH

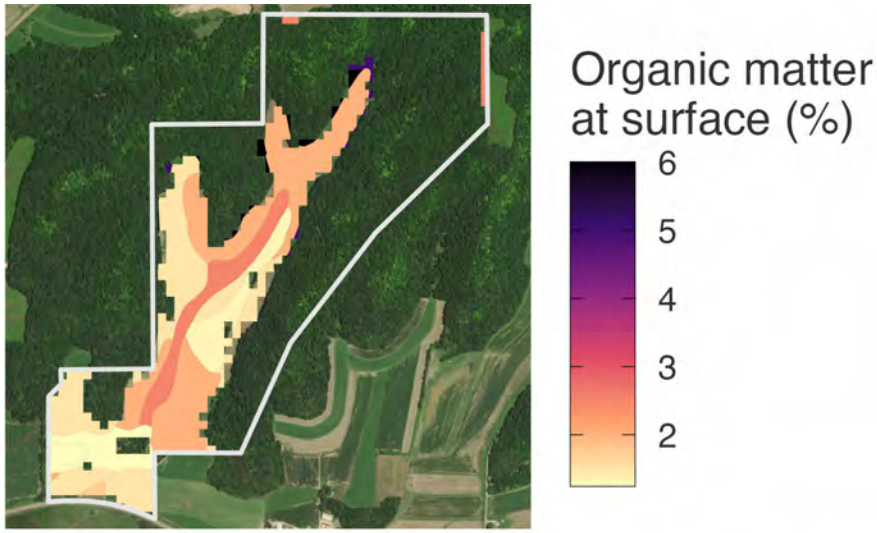
[illegible]

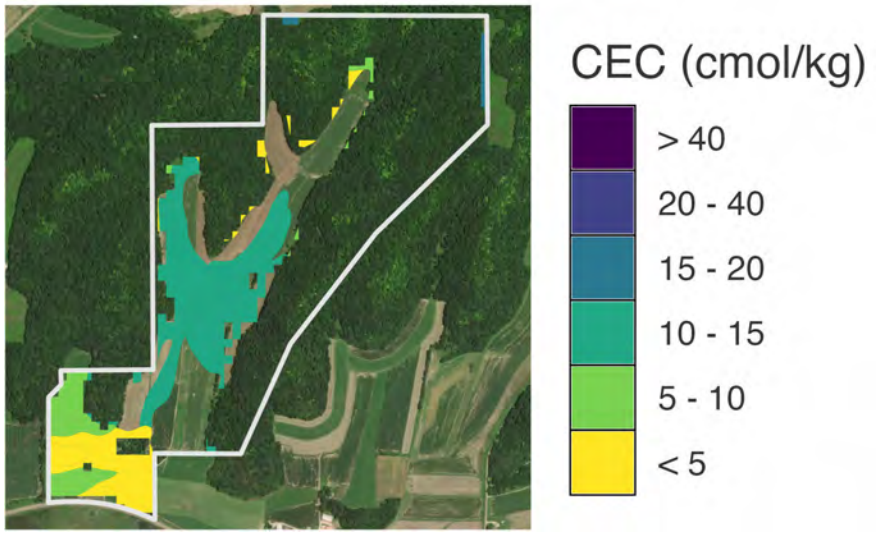
[illegible]



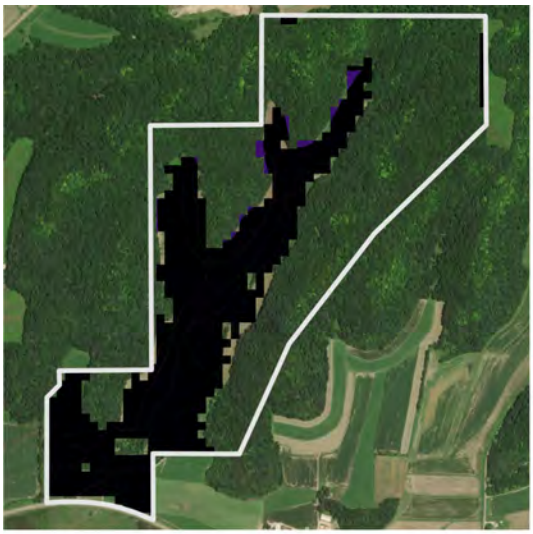
Soil Fertility

[illegible]



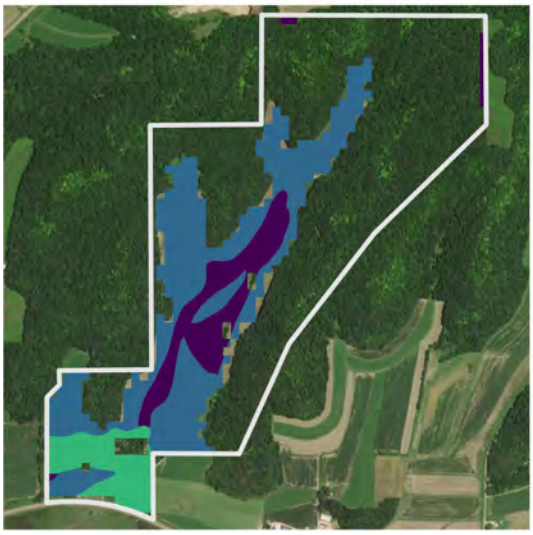


Tree Planting Considerations



Rock fragments in top 1 foot (%)

- > 9
- 8 - 9
- 7 - 8
- 6 - 7
- 5 - 6
- < 5



Frost heave potential

- High
- Moderate
- Low
- None

Climate Statistics

Below are high-level climate statistics for the field based on the last 30 years.

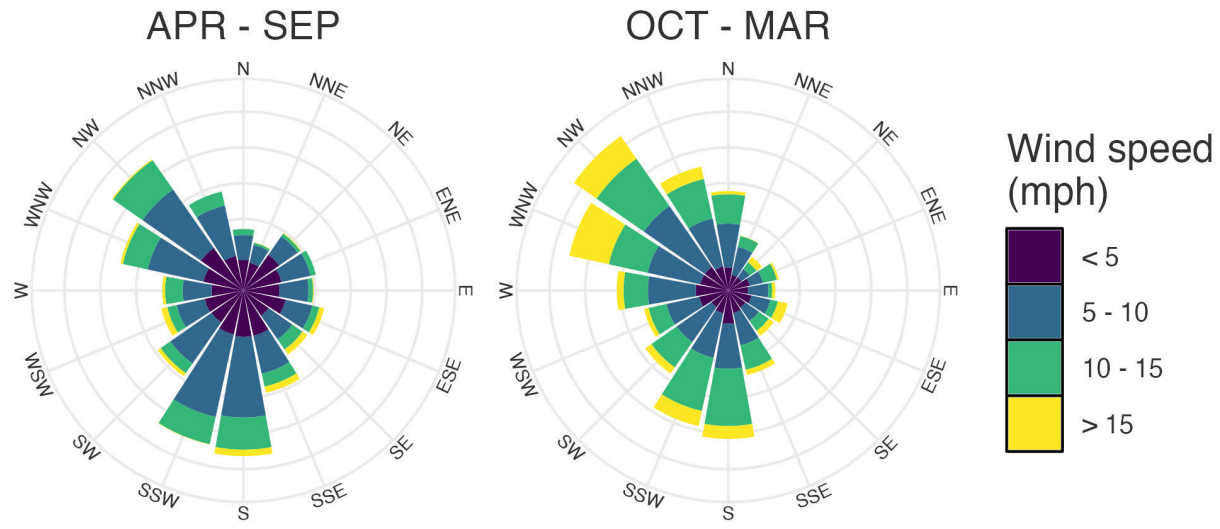
Average minimum winter temperature: -18 ˚F

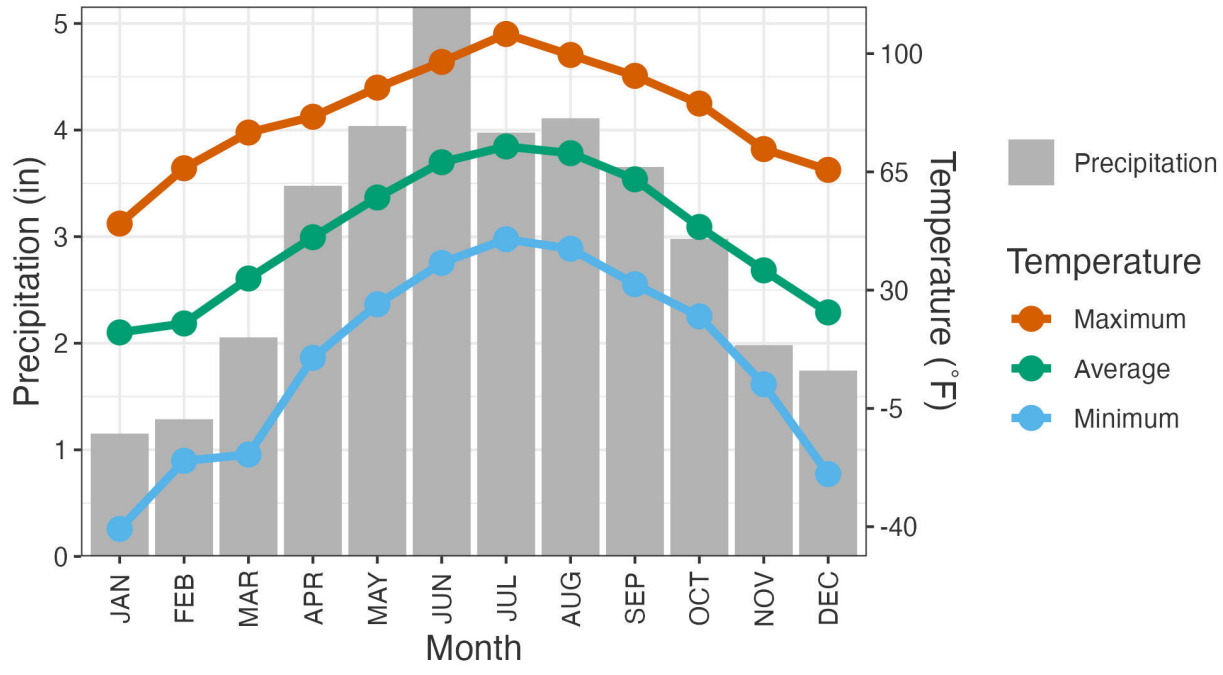
USDA plant hardiness zone: 5a

Average winter chill time: 1,785 hours

Average growing degree days (GDD): 2,553 ˚F-days

Average annual precipitation: 37 in





FAQ - General

Where does the data in this report come from?

- Land cover & crop history: USDA Cropland Data Layer (CDL)
- Hydrology: USGS National Hydrography Dataset (NHD)
- Topography: USGS 3D Elevation Program (3DEP)
- Row Crop Productivity: USDA NCCPI v3.0
- Species Richness: USGS Gap Analysis Project (GAP)
- Protected Areas: USGS Proteted Areas Database (PAD-US)
- Crop Suitability: Savanna Institute
- Agroforestry Opportunities: Savanna Institute
- Soils: USDA National Soil Survey Geographic Database (gNATSGO)
- Climate: PRISM Climate Group; NASA POWER; IL State Climatologist
- Irrigation Frequency: Xie and Lark 2021
- Tile Drainage: Valayamkunnath et al. 2020

How do I utilize the included supplementary data files?

This report comes with two supplementary data files, which are available in your account on CanopyCompass.com.

The included KML file contains basic spatial data shown in this report, such as the outline of your field and crop suitablity zones. This file can be opened on your computer using Google Earth Pro, which can be downloaded HERE.

The included ZIP file holds an array of advanced data files (e.g. TIF, GPKG) that contain comprehensive spatial data shown in this report. These files are most often provided to technical consultants for use in GIS software.

Where can I purchase plants for the crops evaluated in this report?

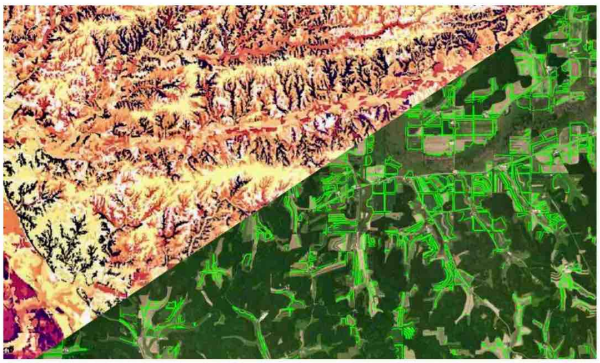
Canopy's in-house nursery is a great place to start. We produce the highest quality genetics across a range of permanent crops. Our bare-root trees and shrubs can be shipped across the US. If we don't grow a particular crop, we will connect you with a trusted partner that does!

About Canopy

Canopy **plants and manages** tree crops, timber plantings, conservation practices, and integrated agroforestry systems. In addition to our home offices in the Midwest, we are connected to regional experts across the US.

We help farmers and landowners via:

- **Our expert team** of agronomists, scientists, and business specialists
- **Thoughtful design** using state-of-the-art spatial analysis and mapping
- **Top tree genetics** across a range of species, from our in-house nursery
- **Precision tree establishment** enabling trees to survive and thrive
- **A mobile equipment fleet**, custom-engineered for precision management
- **Opportunity and impact mapping** at any scale across the US



What's Next?

Have you identified promising new crops or practices for your land? Are you ready to dig deeper? Do you have more questions? No problem! Click the 'Ask an Expert' button below.

We'll set you up with a **free** intake call and then connect you with one of our regional experts to help you interpret this report, evaluate options, validate soil data, and source plants.We may even be able to help you design, establish, and manage your project.

Do you have other fields that you would like to analyze? Go back to Canopy Compass to draw new fields and generate additional reports.

~~Click here to:~~
~~Ask an Expert~~

This report was created using Canopy Compass version 0.5.0-0.4.1-0.4.8.

Give your farm
a second story.