Low LUC Requirements under CORSIA

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November 16, 2021

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- Under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), **certain land types**, **land management practices, and innovative agricultural practices can be considered to contribute to low risk for land area change.**
- As a result, these lands receive a **value of zero** for induced land use change (iLUC) in the life cycle analysis of a batch of fuels.
- CORSIA specifies two approaches for low land use change risk sustainable aviation fuel feedstock production:
    a) Yield Increase Approach
    b) Unused Land Approach
- CORSIA specifies under Unused Land Approach: "Eligible lands for the unused land approach could include, among others**, marginal lands,** underused lands, unused lands, degraded pasture lands, and **lands in need of remediation**."

Assess Potential Use of Reclaimed Coal Lands for “Low LUC Risk” SAF under CORSIA

- Developed geospatial tool that
  - documents the amount of reclaimed coal lands that can be used for “Low LUC Risk” biofuels.
  - documents the persistent yield lag realized by growers farming on reclaimed coal land.
  - allows efficient land parcel/owner identification for SAF feedstock sourcing.

Surface Mine Reclamation Overview & Objective of Project

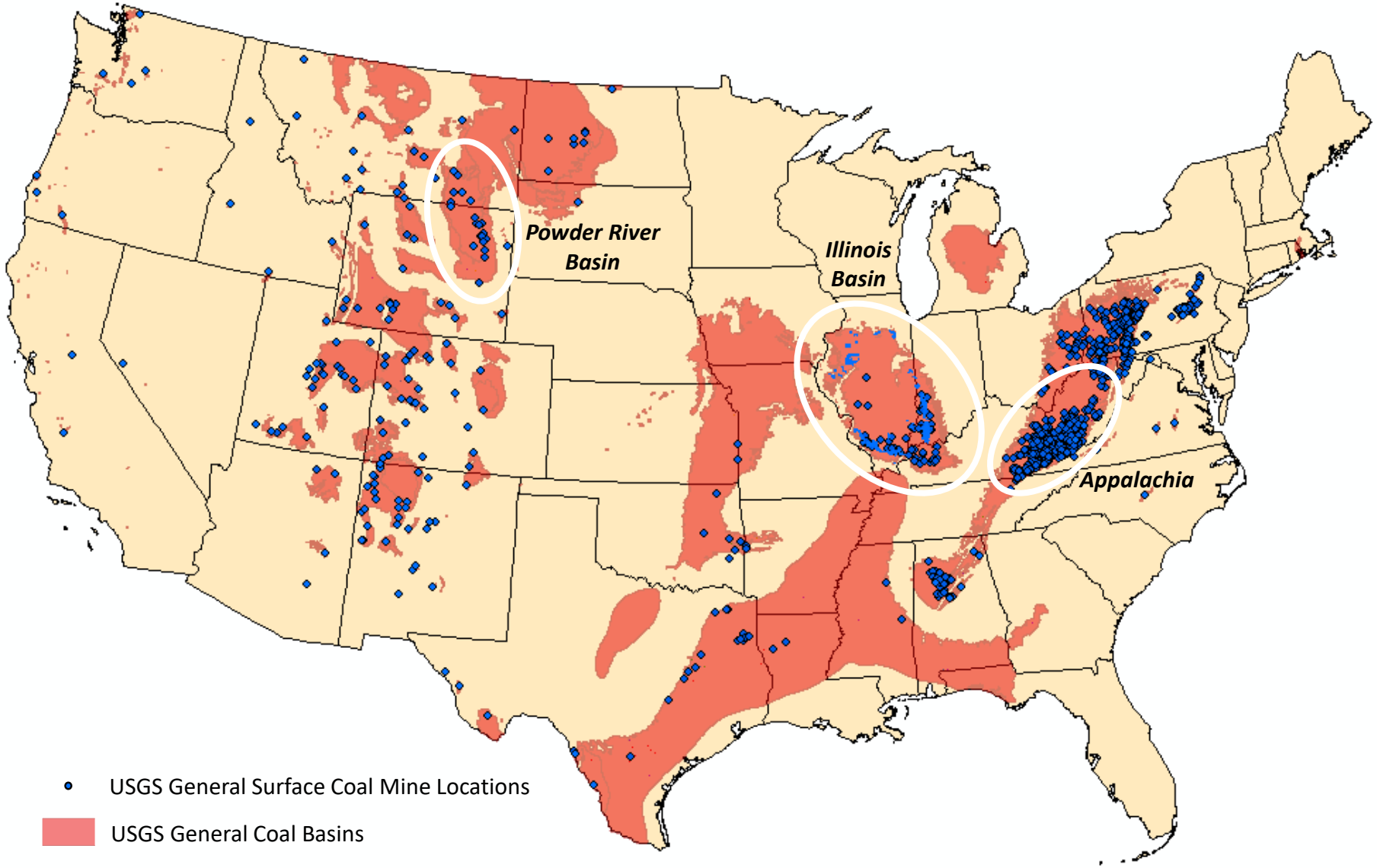
- Primarily occurs in Illinois Basin and Powder River Basin, midwestern and western U.S.
- At least 0.3m topsoil carefully removed and stockpiled, but major loss of structure and biotic health from disturbance.
- Subsurface layers excavated and replaced after mining in approximately same stratification.
- Three phases for full bond release:
  - Phase I - *Grading Release*
  - Phase II - *Vegetation Release*
  - Phase III - *Bond Release* (typically a 5-year window to complete)

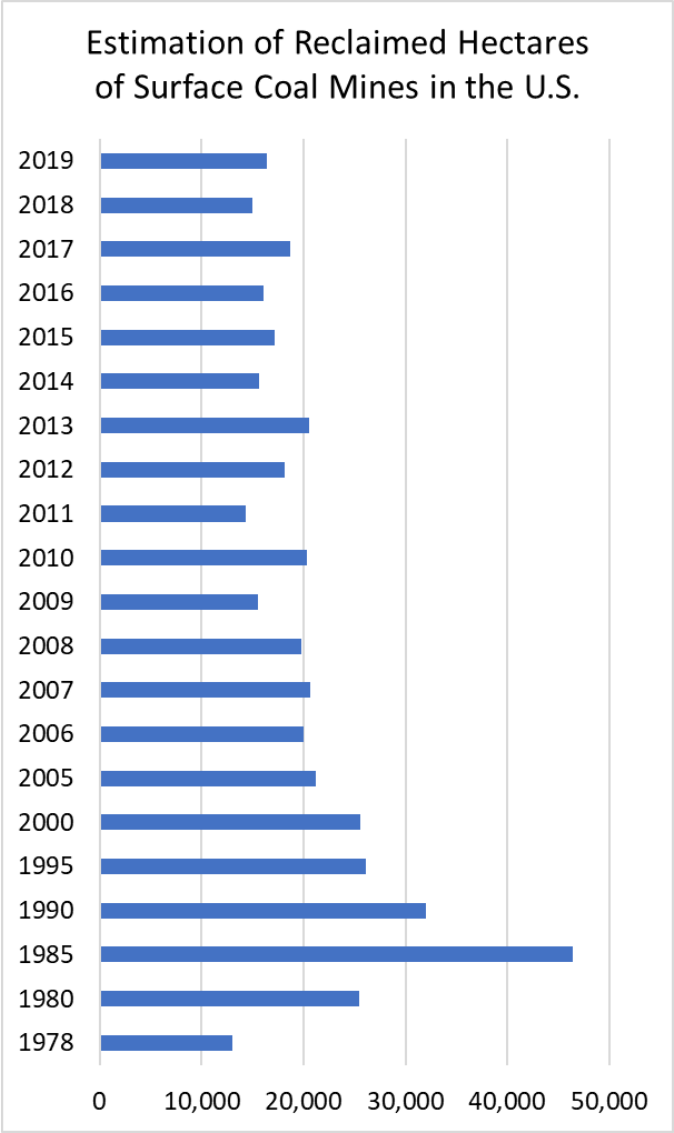
- Based on ISCC guidance this project mapped and characterized surface mine areas that were reclaimed back into agricultural production on or after January 1, 2016*. The analyses completed were:
  - A general assessment of surface mine reclamation (from 1978-2019) was conducted for the conterminous U.S.
  - Further reclamation analyses (i.e., mapping and field-level characterization) were conducted with remote sensing and GIS in the Illinois Coal Basin (from 2011-2019) due to the high agricultural productivity within this region.

Removing topsoil with scraper

Backfilling and grading subsoil

General Surface Coal Mining Locations and Basins in the U.S.

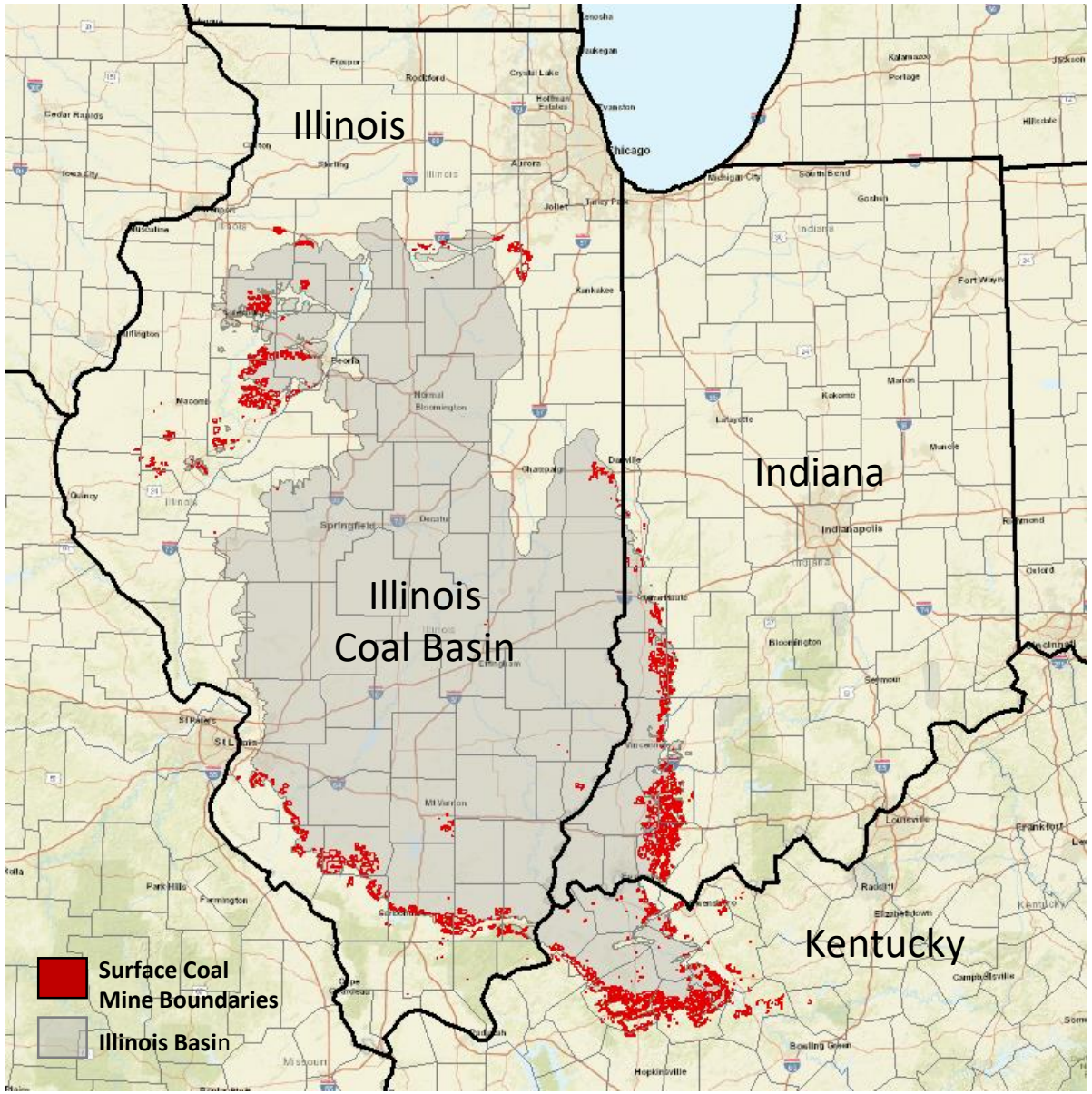




Sources: Garside 2020; OSMRE 2020; USEIA 2018; USGS 2013

1. Since 1978 there has been a total of just over 430,000 hectares of reclaimed coal mine lands in the U.S.
2. Since 2006 there has been an annual average of nearly 18,000 hectares of reclaimed coal mine lands in the U.S.

Results from Illinois Coal Basin Mapping Analysis

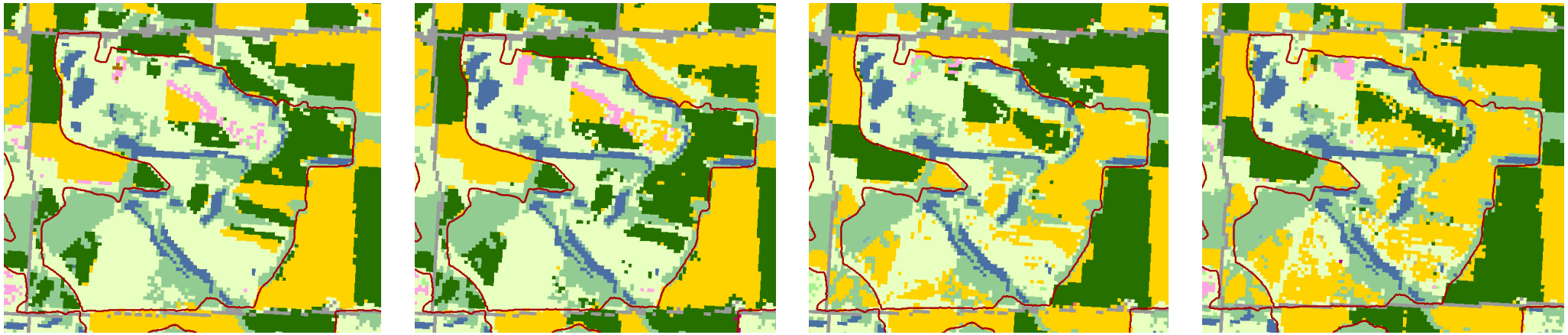


- Total area of surface mines in the Illinois Basin is approximately 250,000 hectares.
- The following is a list of hectares that met the criteria (on or after January 1, 2016) for this project's objective:
  - ***203,000 to 210,000*** ha of reclaimed surface mine lands that have never been in agricultural production between 2011-2019.
  - Between 28,000 to 32,000 ha were in agricultural production between 2011-2019.
  - ***4,000 to 9,000*** ha were not in agricultural production prior to 2016, but moved into agricultural production sometime after this date.
  - Between 1,000 to 7,000 ha were agricultural lands prior to 2016, but reverted to non-agricultural lands sometime after this date.

Example of Mapping Analysis Using Multitemporal CDL in the Southeastern Corner of Knox County, Illinois

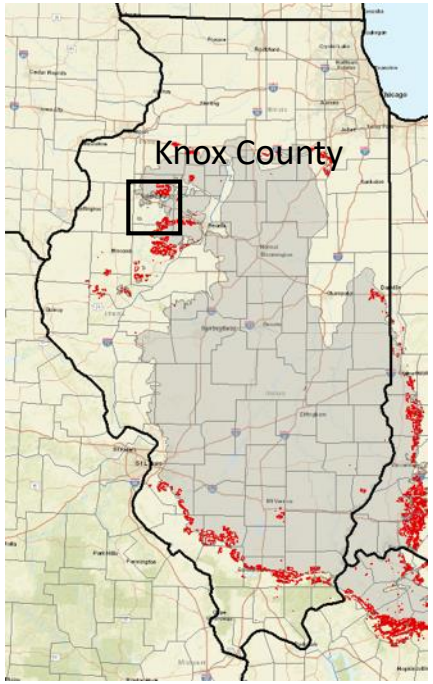
CDL Legend

- Corn
- Soybeans
- Alfalfa
- Developed
- Water
- Grass/Pasture
- Mixed Forest



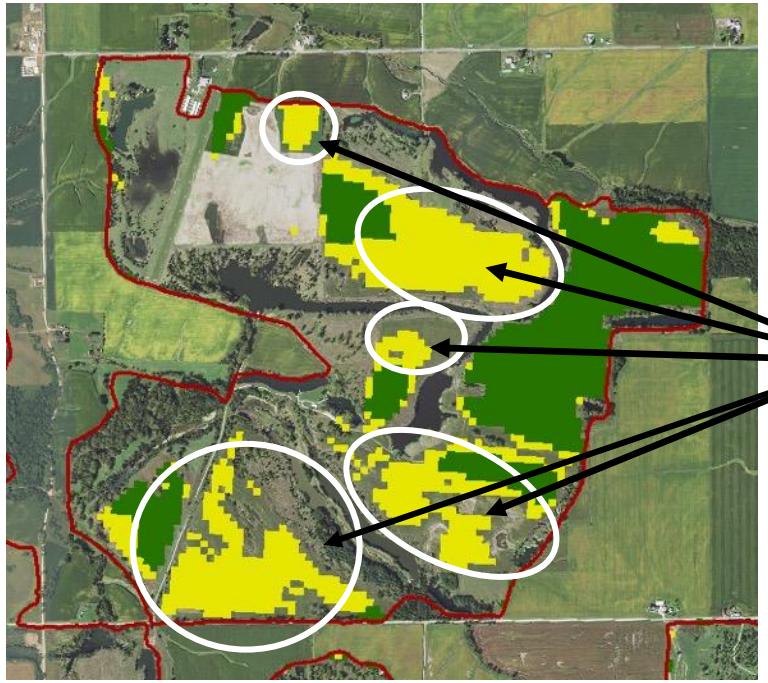
2014 2016 2017 2019

Temporal assessment of CDL resulted in the layer below (Note, all CDLs from 2011-2019 were used in analysis)



Agriculture after 2015

Agriculture from 2011-2019

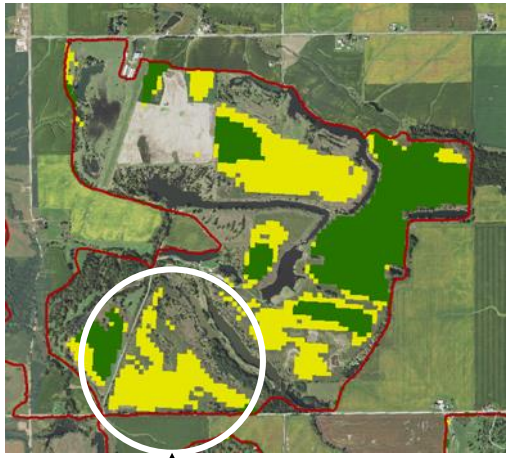


Identified change area for further characterization in yellow

Mine boundary AML Index 621 of the Springfield Coal Seam shown with red outline

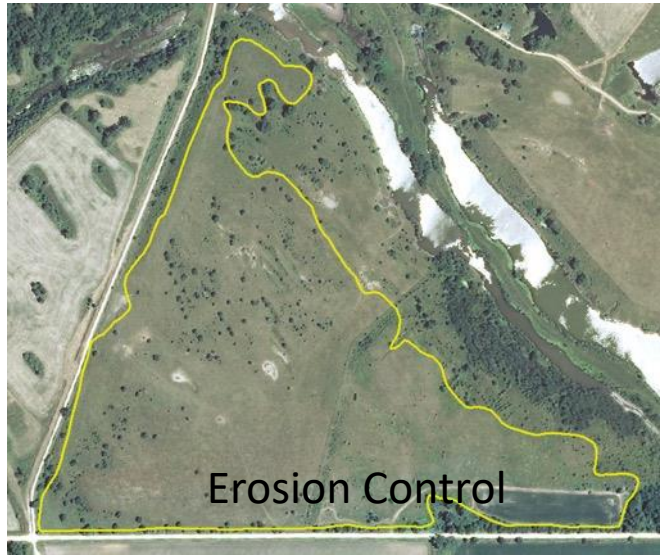
Visual Assessment of Example Field with High-Resolution Aerial Imagery from the National Aerial Imagery Program

CDL Change Assessment

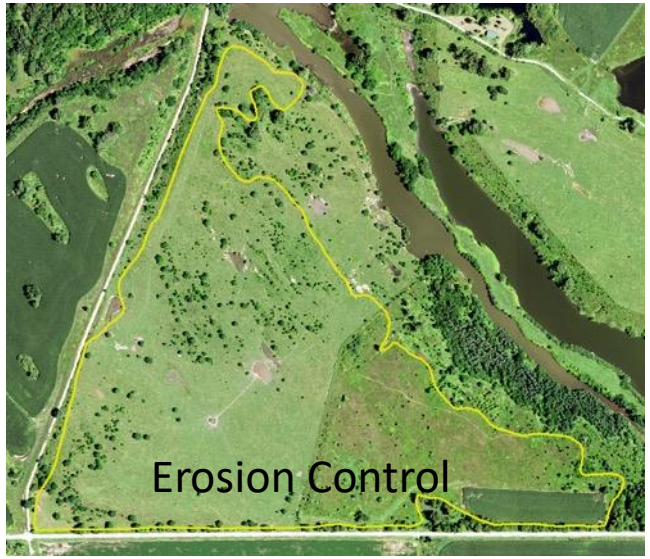


Field of Interest
approx. 37 ha

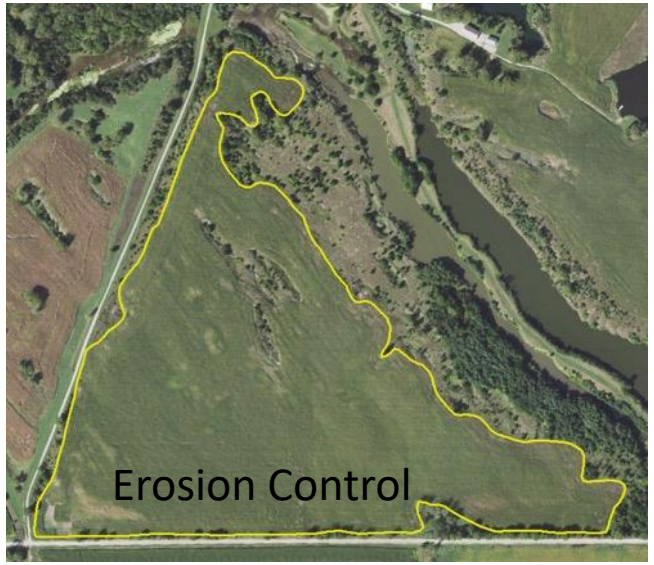
True Color



2012

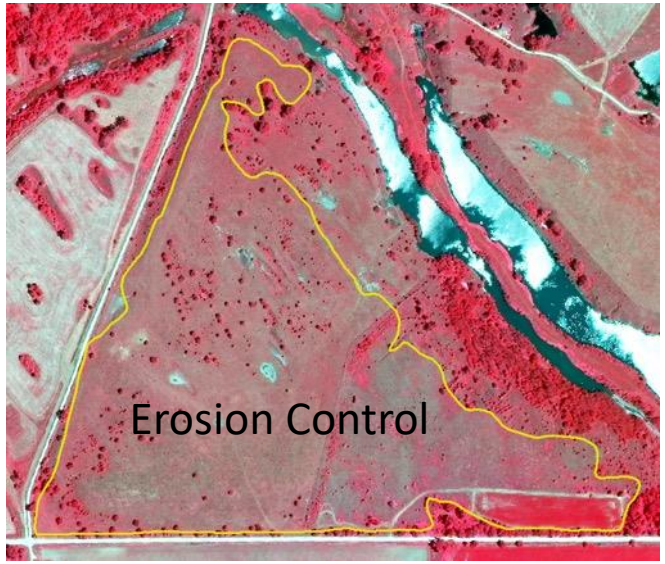


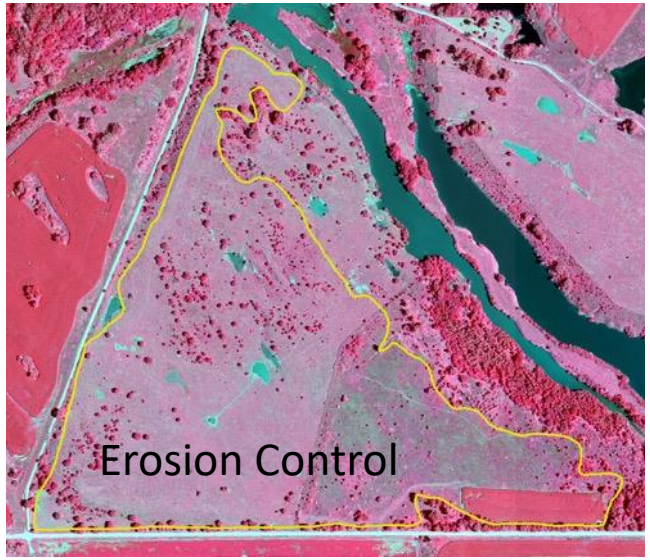
2015

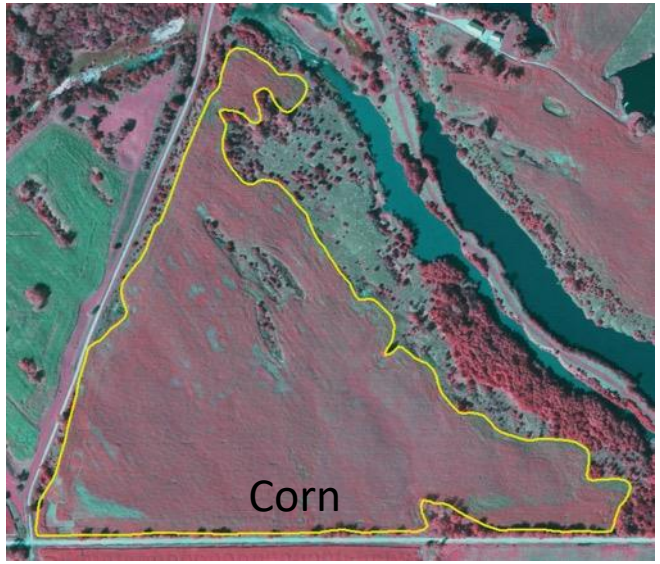


2019

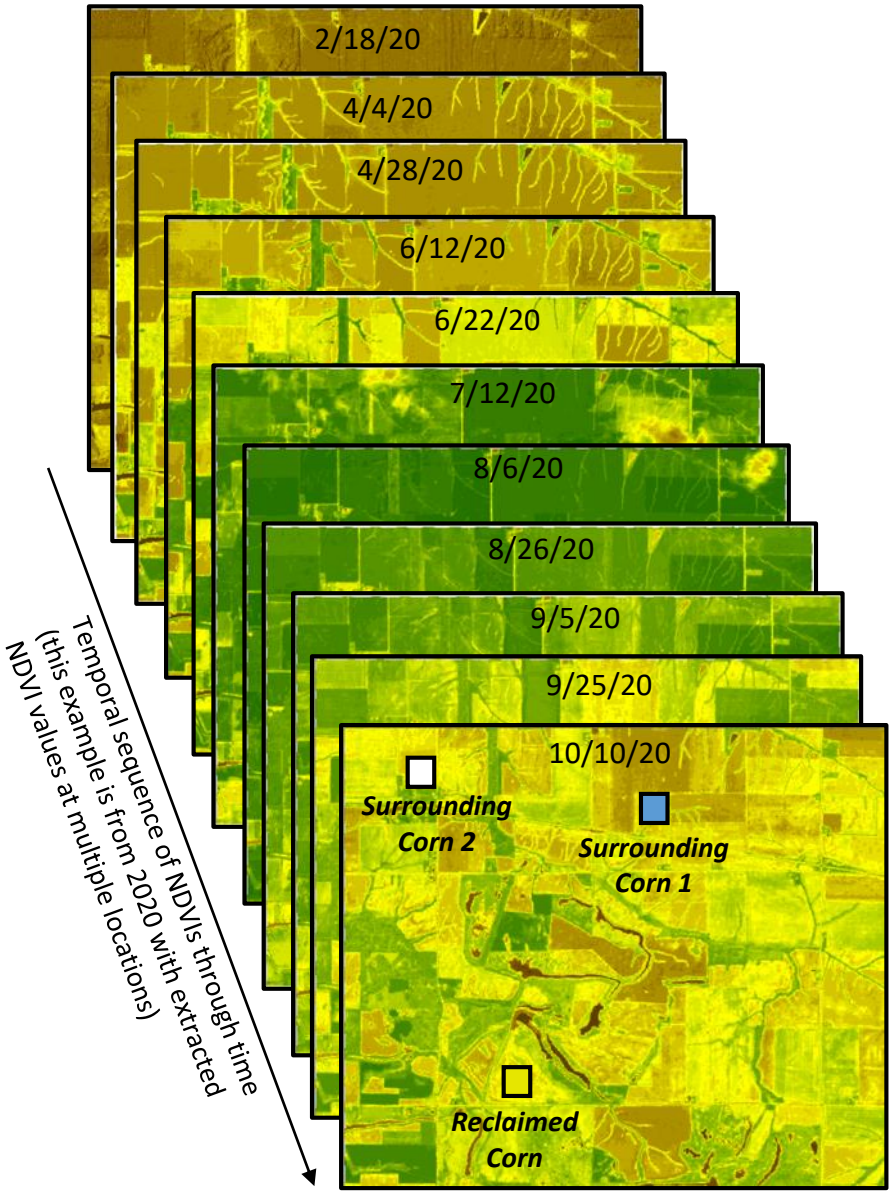
Color Infrared



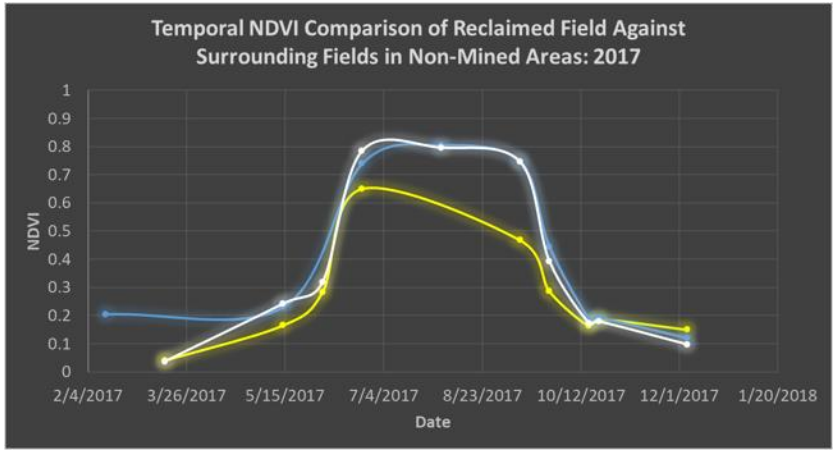


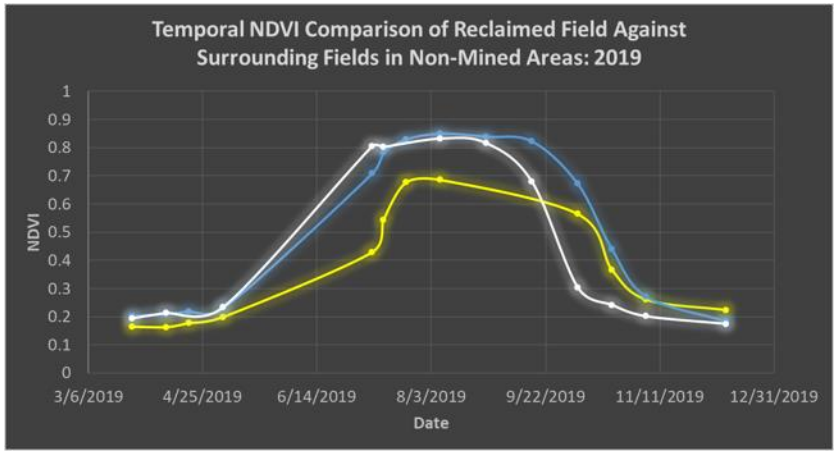


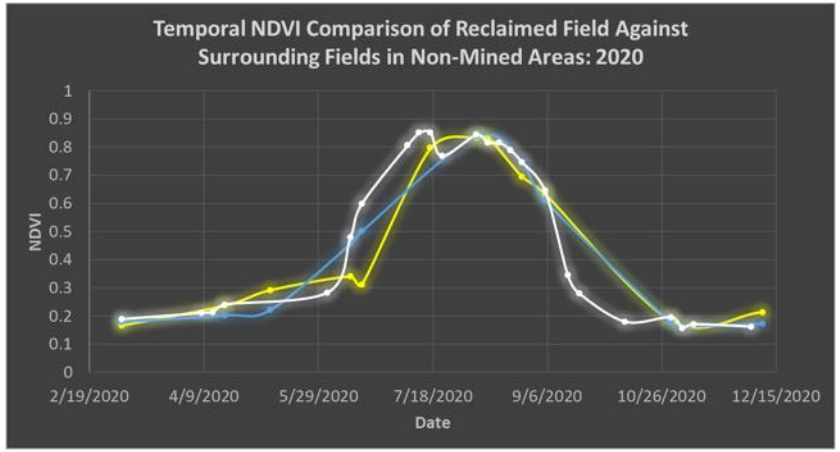
Field Characterization: Temporal Vegetation Index Assessment



The graphs to the right show a comparison of the temporal NDVI curves for corn over three different fields for 2017, 2019, and 2020. The yellow curve indicates the temporal vegetative health of the corn grown on the reclaimed land vs. the blue and white curves that depict corn grown on surrounding non-mined lands. In 2017 and 2019 there is a significant difference in the reclaimed corn and surrounding area corn. However, by 2020 this difference is negligible, indicating successful reestablishment of soil nutrients for agricultural production.





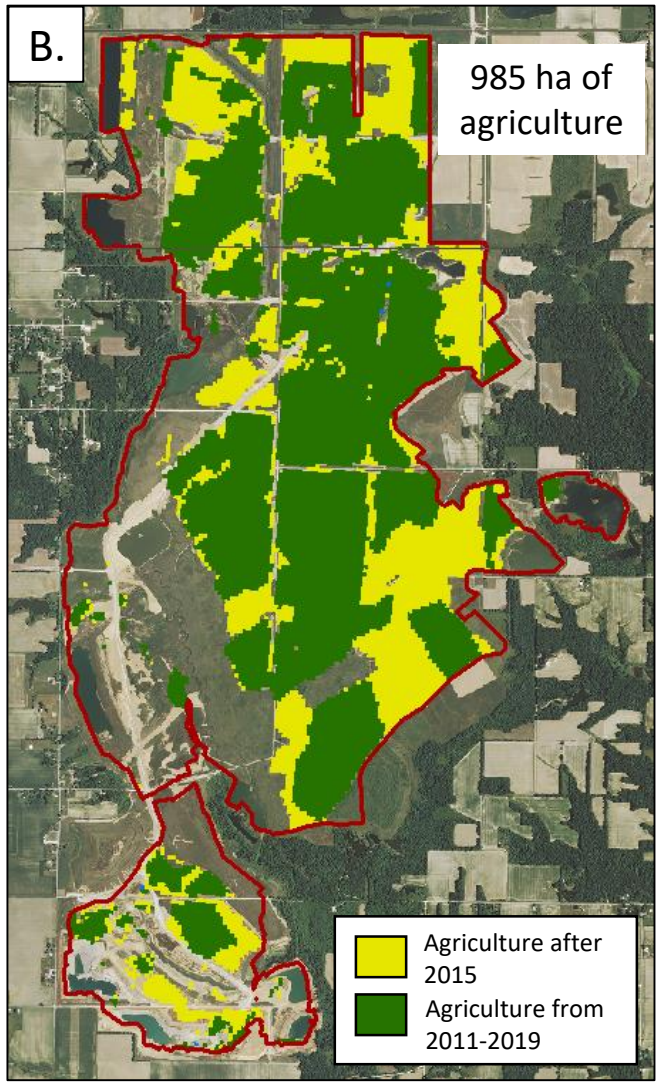


Reclaimed Corn
Surrounding Corn 1
Surrounding Corn 2

Results of Interview with Grower that Farms Reclaimed Mines in Vigo and Sullivan County, Indiana

Grower Interview with Denny Jarvis, Terre Haute, Indiana by Nathan Hall of SCS on 2/25/21

- Farms about 1175 hectares total, 800 ha reclaimed, and 160 ha marginal/low quality on reclaimed
- Even if reclaimed well, **still have at least a 20% reduction in yield vs non-reclaimed**
- About 0.3m of topsoil removed and stockpiled, then kept good subsoil and bad subsoil separated. Layers put back in order after mining
    - Although the mining process does not always result in an optimal reclamation, for example, edges of fields can have lower quality soils and certain mining techniques can require large amounts unconsolidated material to fill the surface mine area before topsoil is added
- **Stockpiling topsoil kills good biology, goes "stale," much less productive after distributed back onto surface** due to loss of structure and microbes
- Having additional market for crops such as CORSIA/REDII could encourage reclaimed lands currently in erosion control to be used for sustainable biofuel crop production, and **could also encourage more intensive soil building practices** (manure applications, more intensive cover cropping, no-till or reduced tillage, etc.)



Summary

- “Low LUC” provision under CORSIA can provide additional incentive to reclaim land for production agriculture such as land previously used for coal mining.
- Geospatial tools can support feedstock sourcing from reclaimed lands and document policy benefits