

# TIPS FOR SELECTING A DECISION SUPPORT TOOL

---

Haleigh Summers, Ph.D.

Agricultural Geospatial Data Scientist



Leadership for Midwestern Watersheds

Mason City, Iowa • November 9<sup>th</sup>, 2023



## Agricultural Geospatial Data Scientist

- Water quality modeling
- Outcomes estimation:
  - Nutrients and sediment
  - Economics
- Data management
- GIS – spatial analysis & maps

# Outline

- What are decision support tools?
- How to choose the right tool for your project
- Overview of commonly used tools
- Common input data (and how to find it)

# Decision Support Tools



- Software-based tools that aid in conservation decision-making
- For conservation planners:
  - Identify opportunities for BMPs in the landscape
  - Estimate load reductions from BMP implementation
  - Evaluate financial cost of potential BMPs



# How to Choose a Tool:

## 1. Region/state availability

### Regional

- Agricultural Conservation Planning Framework (ACPF)\*
- Prioritize, Target, and Measure Application (PTMApp)\*
- Soil Nutrient Application Planner (SnapPlus)

### National

- Pollutant Load Estimation Tool (PLET)
- Spreadsheet Tool for Estimating Pollutant Loads (STEPL)
- Nutrient Tracking Tool (NTT)
- COMET-Farm/COMET-Planner

\*can be used nationally but requires more validation

# How to Choose a Tool:

1. Region/state availability
2. Model type

## Planning vs. Estimation

```
graph TD; A[Planning vs. Estimation] --> B[BMP focused]; A --> C[Outcomes focused];
```

BMP focused  
Use NRCS standards

Outcomes focused

## Spatially Explicit vs. Implicit

```
graph TD; D[Spatially Explicit vs. Implicit] --> E[Precise spatial location]; D --> F[General spatial location];
```

Precise spatial location  
Considers hydrology

General spatial location  
Considers soil type, not hydrology

# How to Choose a Tool:

1. Region/state availability
2. Model type
3. Outcomes measured

Economics

Water Storage

Phosphorus

Nitrogen

Carbon

Dissolved P

Sediment

Adsorbed P

Bacteria

# How to Choose a Tool:

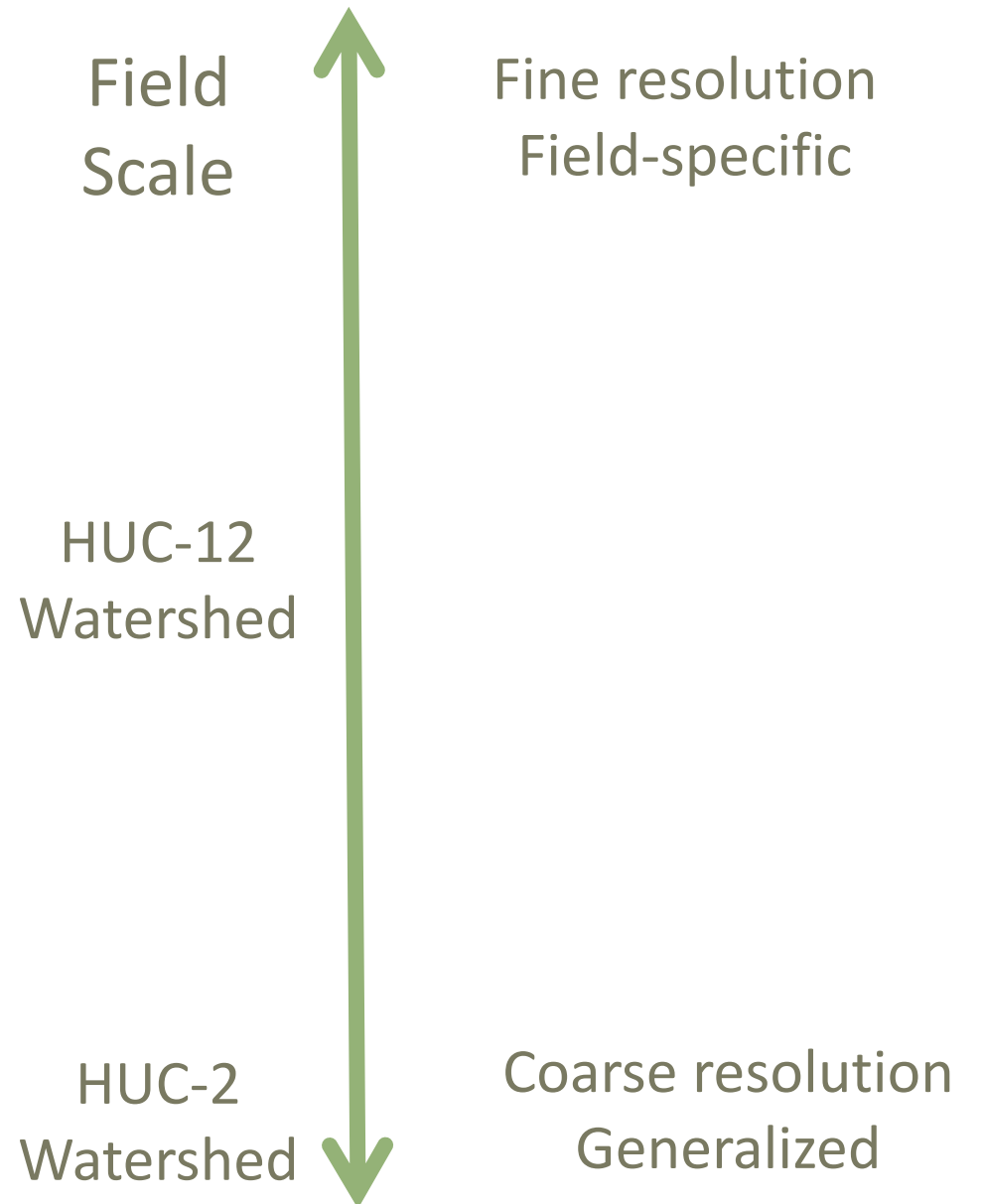
1. Region/state availability
2. Model type
3. Outcomes measured
4. Analysis scale





# How to Choose a Tool:

1. Region/state availability
2. Model type
3. Outcomes measured
4. Analysis scale
5. Input data required



# How to Choose a Tool:

1. Region/state availability
2. Model type
3. Outcomes measured
4. Analysis scale
5. Input data required
6. Platform

Q-GIS

ArcGIS Pro

ArcGIS Desktop

Excel

Online

Desktop Application

# How to Choose a Tool:

1. Region/state availability
2. Model type
3. Outcomes measured
4. Analysis scale
5. Input data required
6. Platform
7. Effort required

## Time

- Hours to weeks

## Difficulty

- Student to GIS expert

# OVERVIEW OF COMMONLY USED TOOLS

---

# Pollutant Load Estimation Tool (PLET)

(replaced STEPL)

<b>Region</b>	National
<b>Model Type</b>	Load Estimation; Spatially Implicit
<b>Platform</b>	Online
<b>Scale</b>	Field to Watershed (HUC-12)
<b>Effort</b>	Low-Medium
<b>Input Data</b>	Land use, soil properties, animal counts, manure application timeline, nutrient concentrations in soil and water, default data available
<b>BMPs Available</b>	83 total in cropland, pastureland, feedlots, urban, and forest
<b>Outcomes</b>	Nitrogen, Phosphorus, Sediment, Biochemical Oxygen Demand (BOD)

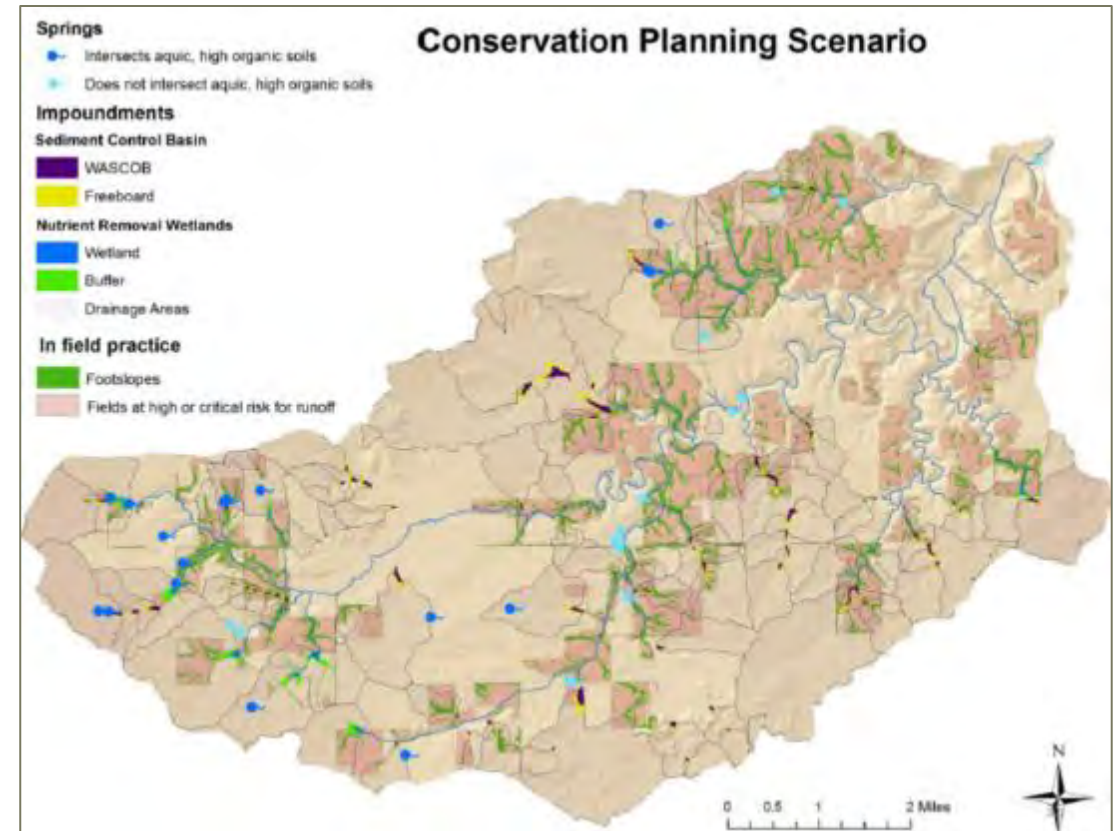
### 2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	2339037.88	360613.50	9012742.98	53758.72
Cropland	1301670.39	182062.00	2789451.75	23301.94
Pastureland	936442.28	76757.32	3017130.35	6576.76
Forest	54612.30	26795.55	134310.74	1387.50
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	2702.60	1058.52	11035.63	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	1291078.24	57926.79	0.00	0.00
<b>TOTAL</b>	<b>5925543.69</b>	<b>705213.68</b>	<b>14964671.45</b>	<b>85024.92</b>

# Agricultural Conservation Planning Framework (ACPF) + Financial and Nutrient Reduction Tool (FiNRT)



<b>Region</b>	Illinois, Iowa, Minnesota, and Wisconsin; parts of Indiana, Kansas, Missouri, Nebraska, and South Dakota
<b>Model Type</b>	Planning; Spatially Explicit
<b>Platform</b>	ArcGIS Pro
<b>Scale</b>	HUC-12 watershed
<b>Effort</b>	High (can hire consultant)
<b>Input Data</b>	DEM, watershed data available on website
<b>BMPs Available</b>	9 structural/edge-of-field BMPs + 2 in-field practices with FiNRT
<b>Outcomes</b>	Opportunities for BMP locations, nitrate reduction and economics with FiNRT



# Nutrient Tracking Tool (NTT)

<b>Region</b>	National
<b>Model Type</b>	Load Estimation; Spatially <i>Explicit</i>
<b>Platform</b>	Online
<b>Scale</b>	Field
<b>Effort</b>	Low-Medium
<b>Input Data</b>	Crop, tillage, fertilizer*, management dates*, equipment*
<b>BMPs Available</b>	Cover crops, tillage, 12 structural practices
<b>Outcomes</b>	Hydrology, Nitrogen, Phosphorus, Sediment, Carbon, Yield

\* Optional input

Description	Losses (±)
<b>Hydrology (in)</b> <input checked="" type="checkbox"/>	
Surface Runoff (in)	1.87 (1)
Subsurface Flow (in)	11.28 (3.4)
Tile Drain Flow (in)	0 (0)
Irrigation Applied (in)	0 (0)
Deep Percolation (in)	7.23 (2.2)
Precipitation (in)	39.92
<b>N Losses (lbs)</b> <input checked="" type="checkbox"/>	<b>4.82 (3.6)</b>
Organic N (lbs)	0.66 (0.2)
Runoff N (lbs)	1.97 (3.3)
Subsurface N (lbs)	2.19 (0.1)
Tile-Drain soluble N (lbs)	0 (0)
N <sub>2</sub> O (lbs)	0 (0)
<b>Deep Percolation N (lbs)</b>	<b>9.41 (2.6)</b>

# COMMON INPUT DATA

---

(and how to find it)



# Web Soil Survey

- Soil data download
- Use shapefiles for increased precision

The screenshot displays the USDA Web Soil Survey interface. At the top, there is a navigation bar with links for 'Contact Us', 'Subscribe', 'Archived Soil Surveys', 'Soil Survey Status', 'Glossary', 'Preferences', 'Link', 'Logout', and 'Help'. Below this is a secondary navigation bar with buttons for 'Area of Interest (AOI)', 'Soil Map', 'Soil Data Explorer', 'Download Soils Data', and 'Shopping Cart (Free)'. The main content area is divided into a left sidebar and a central map. The sidebar contains sections for 'Search', 'Area of Interest', 'Export AOI', and 'Quick Navigation'. The 'Area of Interest' section is highlighted with a red box and includes options to 'Open All', 'Close All', 'Import AOI', and 'Create AOI from Shapefile'. Under 'Create AOI from Shapefile', there are four rows of file upload options: '.shp file', '.shx file', '-prj file', and '.dbf file (optional)'. Each row has a 'Choose File' button and a filename 'ChelseaCreek.[extension]'. A 'Set AOI' button is located at the bottom of this section. The central map, titled 'Area of Interest Interactive Map', shows a satellite view of a rural area with a green hatched polygon representing the selected Area of Interest. The map includes a toolbar with various navigation and tool icons, a 'View Extent' dropdown set to 'Contiguous U.S.', and a 'Scale' dropdown set to '(not to scale)'. The map also shows labels for 'Hancock' and 'Cerro Gordo'.

# State GIS Databases

- Digital elevation models
- Likely higher resolution than national data

The screenshot displays the Iowa Geospatial Data website interface. At the top, there is a dark blue header with the logo and the text "Iowa Geospatial Data". Below the header, navigation links for "Home", "Data Collections and Projects", and "Guidelines and Standards" are visible. A search bar is located below the navigation, with a "Search" button on the right. The main content area shows search results for "Downloadable or External Data (81)". A filter sidebar on the left includes a "Location" search box and a "Filters" section. The search results are displayed in a grid format, showing three data items:

- 2007-10 Two Foot Contours County...**  
State of Iowa | geodata\_iowa  
Two-Foot Contours County Downloads
- High Resolution Land Cover in 2009 County...**  
State of Iowa | geodata\_iowa  
High Resolution Land Cover in 2009 County Downloads
- Public Land Survey System County...**  
State of Iowa | geodata\_iowa  
PLSS County Downloads

# Geospatial Data Gateway

- Elevation data (coarse)
- Watershed boundaries

**USDA** Natural Resources Conservation Service  
United States Department of Agriculture

GeoSpatialDataGateway

Home Status Maps Help FAQ Contact Us A<sup>+</sup> A<sup>-</sup> AA<sup>=</sup>

### 1-WHERE

### 2-WHAT

The list in the middle pane indicates the available map layers for your area of interest. The number of maps and total size of the map layers are listed next to the description. Clicking on the **i** icon will provide a pop-up window with that map layer's description. Use the **+** icon to get a list of individual maps for that map layer. Within the list of maps, use the **m** icon to get metadata for the specific map and the **g** icon for an individual map preview. You may collapse this map list with the **-** icon. Your selections will be added to the YOUR ORDER Panel on the far right.

You may change your map layers after this step but all of the subsequent choices made for your order will be removed.

Maps in layers that are **By State** cover an entire state.

### 3-HOW

### 4-WHO

### 5-REVIEW

## WHAT

Here are the available map layers for your selected area of interest.

#### Easements

- NRCS Conservation Easement Areas by State, 1 map 0.836 MB **i** **+**
- NRCS Conservation Easement Points by State, 1 map 0.324 MB **i** **+**

#### Elevation

- LIDAR Elevation Dataset - Bare Earth DEM - 1 Meter, 20 maps 14298.481 MB **i** **+**
- National Elevation Dataset 3 Meter, 20 maps 1282.07 MB **i** **+**
- National Elevation Dataset 10 Meter, 20 maps 123.734 MB **i** **+**
- National Elevation Dataset 30 meter, 2 maps 90.444 MB **i** **+**

#### Elevation Derivatives

- LIDAR Elevation Dataset - Bare Earth Hillshade - 1 Meter, 20 maps 3878.922 MB **i** **+**

#### Geographic Names

- Geographic Names - Populated Places, 1 map 0.011 MB **i** **+**
- Geographic Names - Non-Populated Places, 1 map 0.167 MB **i** **+**

#### Geology

- National scale Geology by State, 1 map 34.592 MB **i** **+**

#### Government Units

- NRCS Counties by State, 1 map 1.9 MB **i** **+**
- NRCS States by State, 1 map 0.132 MB **i** **+**
- TIGER/NRCS Congressional Districts by State, 1 map 0.68 MB **i** **+**
- TIGER Urban Areas by State, 1 map 1.548 MB **i** **+**
- Federal, State, Tribal, etc. Protected Areas Land Ownership, 1 map 0.732 MB **i** **+**

#### Hydrologic Units

- 8 Digit Watershed Boundary Dataset **NRCS Version**, 4 maps 0.582 MB **i** **+**

**YOUR ORDER**

Order Area (Where): Cerro Gordo County, Iowa

Order Map Layers (What):


Order Format (How): None  
Order Projection (How): None  
Order Inclusion (How): None  
Order Delivery Method (How): None

Order Recipient (Who):

**CONTINUE**

# National Ag Statistics Service

- Yields and acres grown
- Some values by HUC-08


**Select Commodity** (one or more) 

**Program:**  
CENSUS SURVEY


**Sector:**  
ANIMALS & PRODUCTS  
CROPS  
DEMOGRAPHICS  
ECONOMICS  
ENVIRONMENTAL

**Group:**  
ANIMAL TOTALS  
AQUACULTURE  
COMMODITIES  
CROP TOTALS  
DAIRY  
ENERGY  
EXPENSES  
FARMS & LAND & ASSETS  
FIELD CROPS

**Commodity:**  
AG LAND  
AG SERVICES  
AG SERVICES & RENT  
ALCOHOL COPRODUCTS  
ALMONDS  
ALPACAS  
AMARANTH  
ANIMAL PRODUCTS, OTHER  
ANIMAL SECTOR

**Select Location** (one or more) 

**Geographic Level:**  
AGRICULTURAL DISTRICT  
AMERICAN INDIAN RESERVATION  
COUNTY  
NATIONAL  
PUERTO RICO & OUTLYING AREAS  
REGION : MULTI-STATE  
REGION : SUB-STATE  
STATE  
WATERSHED

**Select Time** (one or more) 

**Year:**  
2024  
2023  
2022  
2021  
2020  
2019  
2018  
2017  
2016

## 2022 STATE AGRICULTURE OVERVIEW

### Iowa

#### Farms Operations<sup>†</sup>

Farm Operations - Area Operated, Measured in Acres / Operation	359
Farm Operations - Number of Operations	84,900
Farm Operations - Acres Operated	30,500,000

#### Livestock Inventory<sup>†</sup>

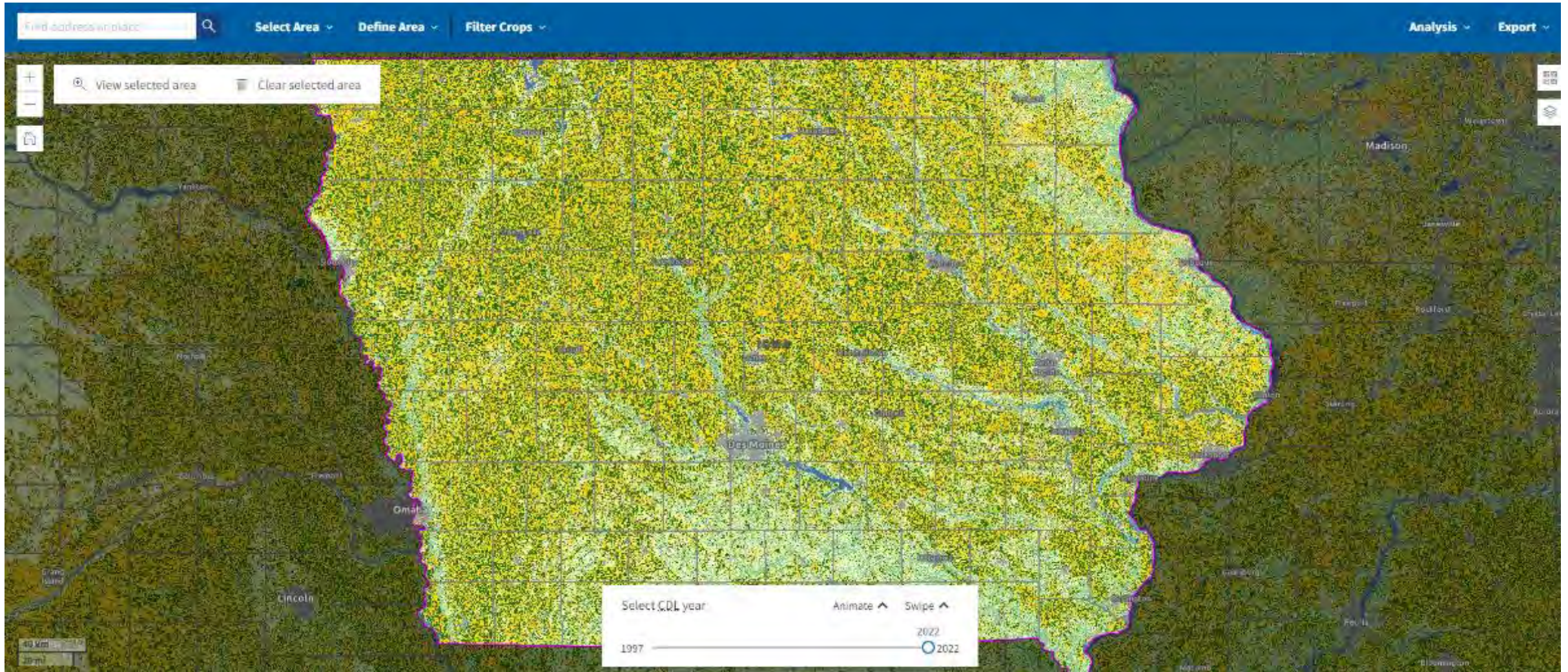
Cattle, Cows, Beef - Inventory ( First of Jan. 2023 )	860,000
Cattle, Cows, Milk - Inventory ( First of Jan. 2023 )	240,000
Cattle, Incl Calves - Inventory ( First of Jan. 2023 )	3,650,000
Cattle, On Feed - Inventory ( First of Jan. 2023 )	1,150,000
Goats, Meat & Other - Inventory ( First of Jan. 2023 )	46,000
Goats, Milk - Inventory ( First of Jan. 2023 )	26,000
Sheep, Incl Lambs - Inventory ( First of Jan. 2023 )	162,000
Hogs - Inventory ( First of Dec. 2022 )	24,100,000
Turkeys - Production, Measured in Head	11,700,000

#### Milk Production<sup>†</sup>

Milk - Production, Measured in Lb / Head	24,658
Milk - Production, Measured in \$	1,413,650,000
Milk - Production, Measured in Lb	5,770,000,000

# Cropland CROS (Cropland Data Layer)

- 30-m raster
- Annual data



# USGS StreamStats

- Estimated stream flow
- Coarse watershed delineation

The screenshot displays the USGS StreamStats web application interface. The top left features the USGS logo and the text "StreamStats". The top right has navigation links for "Report", "About", and "Help". The main interface is divided into several sections:

- Left Panel:** Includes a "SELECT A STATE / REGION" dropdown set to "Iowa", a blue "IDENTIFY A STUDY AREA" button with "Basin Delineated" and a right arrow, a "Step 5" instruction box, a red "Clear Basin" button, a blue "Edit Basin" button, a "State/Region Specific Functions" section, a "Download Basin" button, and a blue "Continue" button.
- Map Area:** Shows an aerial view of a rural landscape with a yellow-shaded watershed boundary and a blue stream network. A blue location pin is placed on the stream. An "Exploration Tools" panel with zoom in (+) and zoom out (-) buttons is visible on the left side of the map.
- Right Panel:** A "Layers" panel with a list of map styles: National Geographic, National Map, Streets, World Topographic, Gray, Dark Gray, Imagery (selected), and Shaded Relief. Below this are expandable sections for "Application Layers", "National Layers" (checked), and "IA Map Layers".
- Bottom Left:** A box displaying "Zoom Level: 16", "Map Scale: 1:9,027", and "Lat: 43.1777, Lon: -93.2691". Below this is a scale bar for 100 meters and 300 feet.
- Bottom Right:** A footer for the map provider: "Leaflet | Esri, DigitalGlobe, GeoEye, Earthstar, USDA, USGS, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community".

# ACPF Core Data

- HUC-12 geodatabase
- Boundaries, soils, land cover, etc.

The screenshot displays the ACPF Core Data Download web application. The top navigation bar includes the Agricultural Conservation Planning Framework logo, the title "ACPF Core Data Download", and logos for GISF, Iowa State University, and USDA. A search bar is located on the left, and a "How to use" link is on the right. The main area is a map of Iowa, with county boundaries highlighted in green. The counties shown include Emmet, Kossuth, Palo Alto, Pocahontas, Humboldt, Webster, Calhoun, Winnebago, Hancock, Cerro Gordo, Franklin, Hamilton, Boone, Worth, Mitchell, Floyd, Bremer, Tama, Story, Marshall, Hancock, Chickasaw, Butler, Grundy, Tama, Benton, Lincoln, Howard, Winnebago, Fayette, Buchanan, Delaware, Jones, Jackson, Allamakee, Crawford, Grant, Dubuque, and Clinton. A data layer list on the right side of the map shows a folder named "acpf\_huc070802030203" containing a geodatabase "acpf070802030203.gdb". This geodatabase contains several data layers, including "bnd070802030203", "buf070802030203", "CH\_070802030203", "FB070802030203", "gSURGO", "LU6\_070802030203", "SoilProfile070802030203", "SurfHrz070802030203", "SurfTex070802030203", and a series of "wsCDL" layers from 2010 to 2022. The bottom of the map shows a scale bar and coordinate information.

# Operational Tillage Information Systems (OpTIS)

- Cover crop and tillage
- HUC-8 or crop reporting district

CRD

HUC8

Select a State

Select a Crop Rotation

Select a Year Range

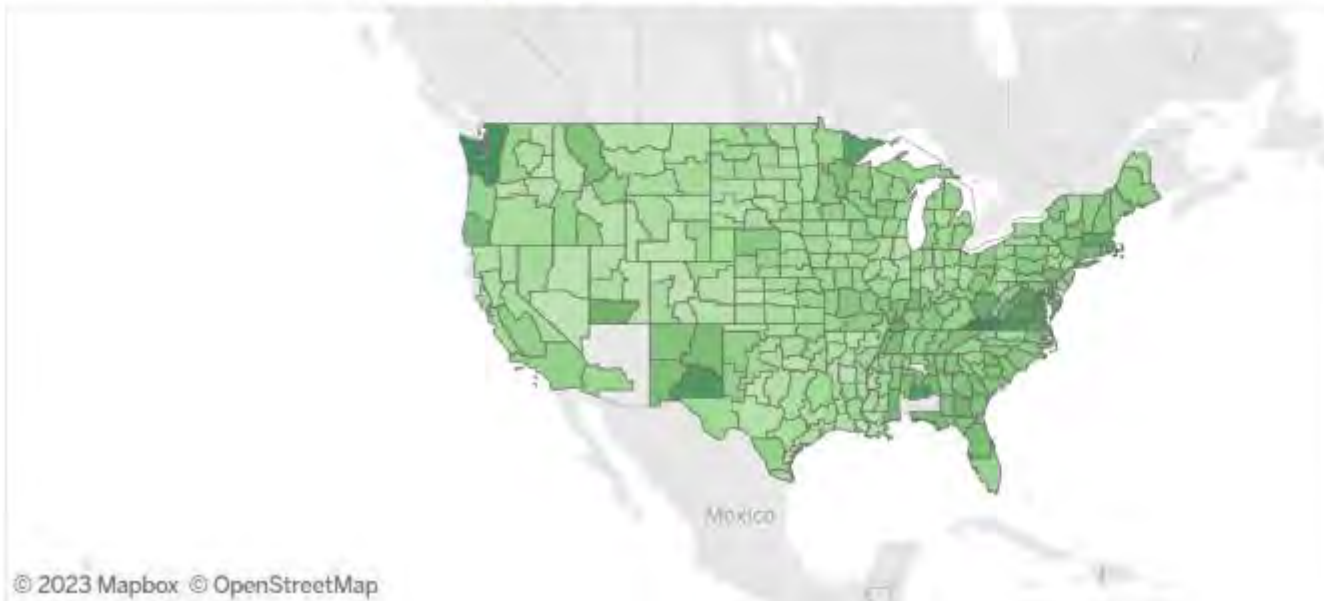
(All)

(All)

2015

Cover Crop Avg % across Selected Years

Cover Crop % Change between Selected Years





# Another Great Resource...



- 14 tools
- Monthly webinars:

## Tools in 2023 Trainings\*

[May 3: Webinar Launch & PCOC](#) (recording)

[June 7: Model My Watershed](#) (recording)

[July 12: Nutrient Tracking Tool \(NTT\)](#) (recording)

[August 2: NRCS Cover Crop Economics Tool \(economic\)](#) (recording)

[September 6: FieldPrint Platform](#) (recording)

[October 4: EPA PLET \(water quality\)](#) (recording)

**November 1: PTMApp Web Tool (water quality)**

December 6: AFT Retrospective-Soil Health Economics (R-SHEC) Tool (economic)

## Tools in 2024 Trainings\*

January 10: SIPES Method/SIDMA Tool (social)

February 7: Fast-GHG (climate)

March 6: Cool Farm Tool (climate)

April 3: TBD

May 1: COMET-Farm & COMET-Planner (climate)

June 5: CAST Tool (water quality)

July 3: TBD

\*Subject to change



## A Guide to Water Quality, Climate, Social, and Economic Outcomes Estimation Tools

**QUANTIFYING OUTCOMES TO ACCELERATE FARM CONSERVATION PRACTICE ADOPTION**

Michelle Perez, PhD | Emily J. Cole, PhD

DECEMBER 2020

[farmland.org/guide-to-outcomes-estimation-tools/](https://farmland.org/guide-to-outcomes-estimation-tools/)

# Thank you!

---

Haleigh Summers, Ph.D.

---

[hsummers@sandcountyfoundation.org](mailto:hsummers@sandcountyfoundation.org)

