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Accounting of Agricultural Conservation Practice Implementation: *Integrating USDA and Pennsylvania Practice Keeper Agricultural Conservation Practices*

Mark Nardi and Olivia Devereux

U.S. Department of the Interior
U.S. Geological Survey

Agenda

- Integrating Pennsylvania's agricultural practice database with NRCS's data to evaluate duplication and omissions in each dataset when compared with each other
- Applying that workflow to Virginia and a watershed in Maryland
- Reviewing general project approach and expected timeline
- Discussion

Partners: Pennsylvania Department of Environmental Protection (DEP)
Pennsylvania State Conservation Commission (SCC)
United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
United States Environmental Protection Agency (US EPA)

USGS Team: James E. Colgin, Olivia Devereux, Mark Nardi, and Jeni Keisman

Photo: Thomas Carter, compliments of USDA-ARS, https://www.ars.usda.gov/oc/images/photos/nov08/d1258-1/

Purpose

- Understand the tracking and accounting of agricultural practices

Goals

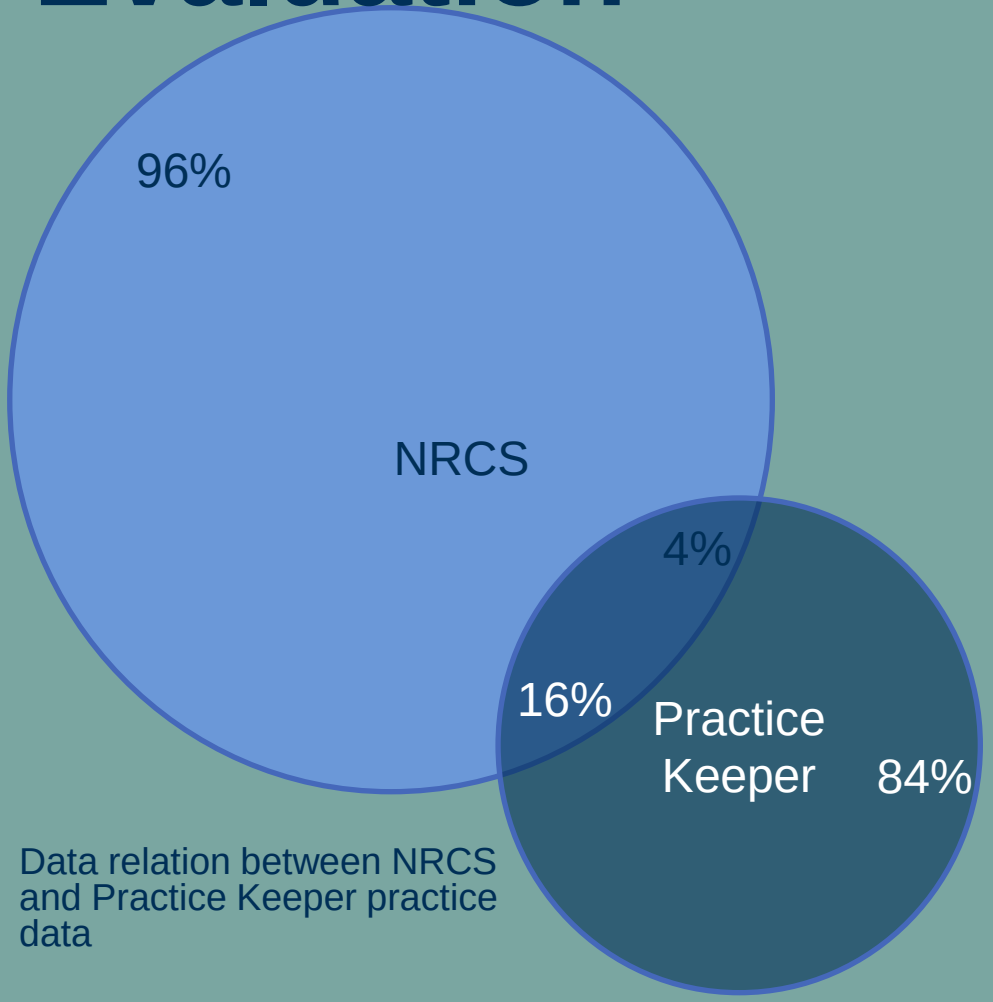
- Assist PA in understanding the extent of NRCS agricultural conservation practice data captured in the Practice Keeper database in four PA counties.
- Identify the effects of conservation practices (aka Best Management Practices also known as BMPs) on water-quality trends.

Protecting the Privacy of Farm Operators

Olberding, Susan D.; Huebner, Daniel P.; Edminster, Carleton B. 2007. Fort Valley Experimental Forest historical photographs. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. https://doi.org/10.2737/RDS-2007-0005

- All data used in the analysis contain Personally Identifiable Information (PII), meaning the data are privacy protected and obtained from NRCS and PA DEP through memoranda or letters of understanding:
  - USGS and NRCS have a Memorandum of Understanding (initial: 12/14/2010; most recent: 12/9/2020 for 5 years)
  - USGS, PA DEP, PA SCC established a Letter of Understanding (9/23/2020 for 5 years)
- Under both agreements, USGS can accept and perform analyses using these unaggregated data, and the results may be shared with PII removed, under conditions set forth in Section 1619 of the 2008 Farm Bill

Data Evaluation



Data relation between NRCS and Practice Keeper practice data

- Primary Goal - Determine level of duplication and omissions between two agricultural conservation practice datasets in four PA counties. Of the four counties, Lancaster and York have significantly more Practice Keeper (PK) records than Franklin and Juniata.

More PK Data Record Entries: Lancaster and York

Less PK Data Record Entries: Franklin and Juniata

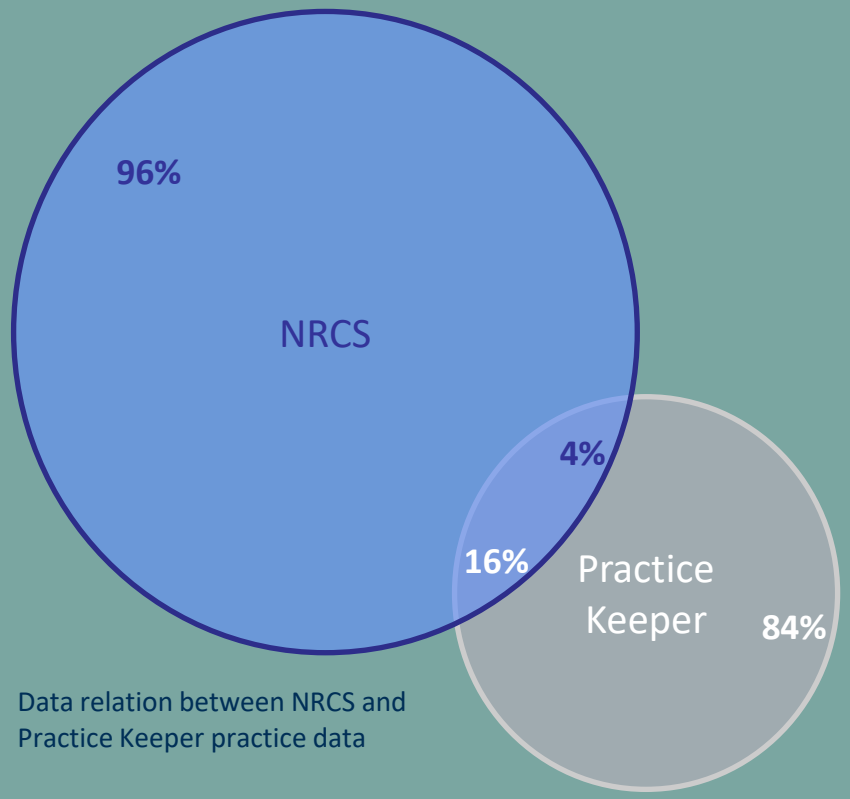
Data Sets Examined

1) USDA's NRCS data include cost-shared practices, easements, technical assistance by NRCS staff, and USDA Farm Service Agency (FSA) cost-shared practices for which NRCS provides technical assistance.

2) PA Practice Keeper (PK) data include farmer-funded, state and federal cost-shared practices, and technical farm assistance by conservation district staff

- Datasets Examined for 2006 through 2021
- NRCS data in this work may be underreported as NRCS does not reenter annual field practices in their data that goes to NPAD, where this project got its data.

Bottom Line Up Front



Data relation between NRCS and Practice Keeper practice data

- The NRCS dataset contains a larger number of records and more varied practice types than Pennsylvania's Practice Keeper data
- The ideal dataset would contain a de-duplicated combination of both NRCS and Practice Keeper data. But, were Pennsylvania to use only one dataset to account for agricultural practice implementation, the NRCS dataset would be more comprehensive than Pennsylvania's Practice Keeper dataset
  - NRCS duplication with Practice Keeper was 4%
  - Practice Keeper duplication with NRCS data is 16%
- The comparison methods used in this analysis determined that there are improved approaches that could be used for Practice Keeper data collection and input that would allow for more direct comparisons with the NRCS data including using units consistent with NRCS and not overwriting practice implementation dates with the most recent inspection date
- The comparison method developed for this analysis is automated and can be reliably replicated for any geographic area within the Practice Keeper geographic domain

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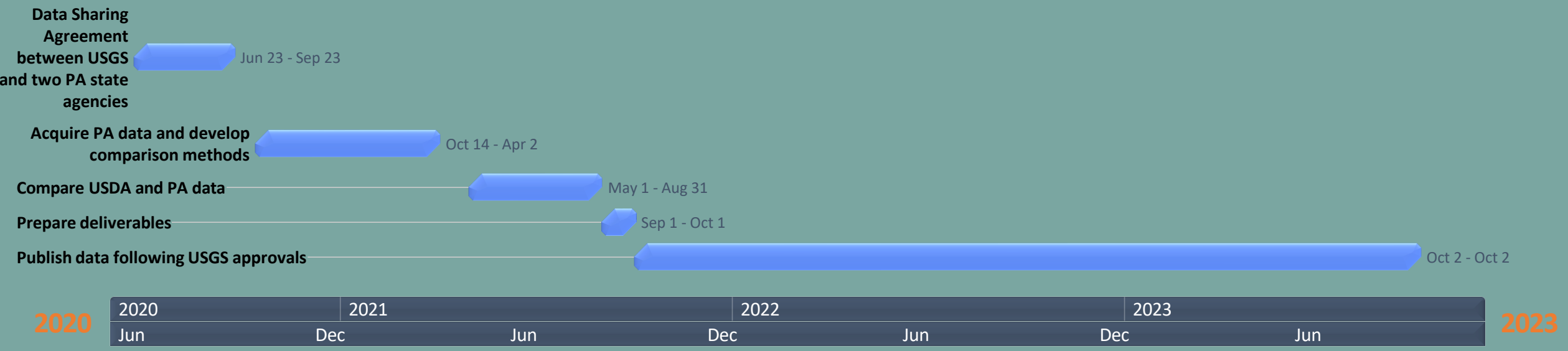
Pennsylvania Data Integration Project Timeline

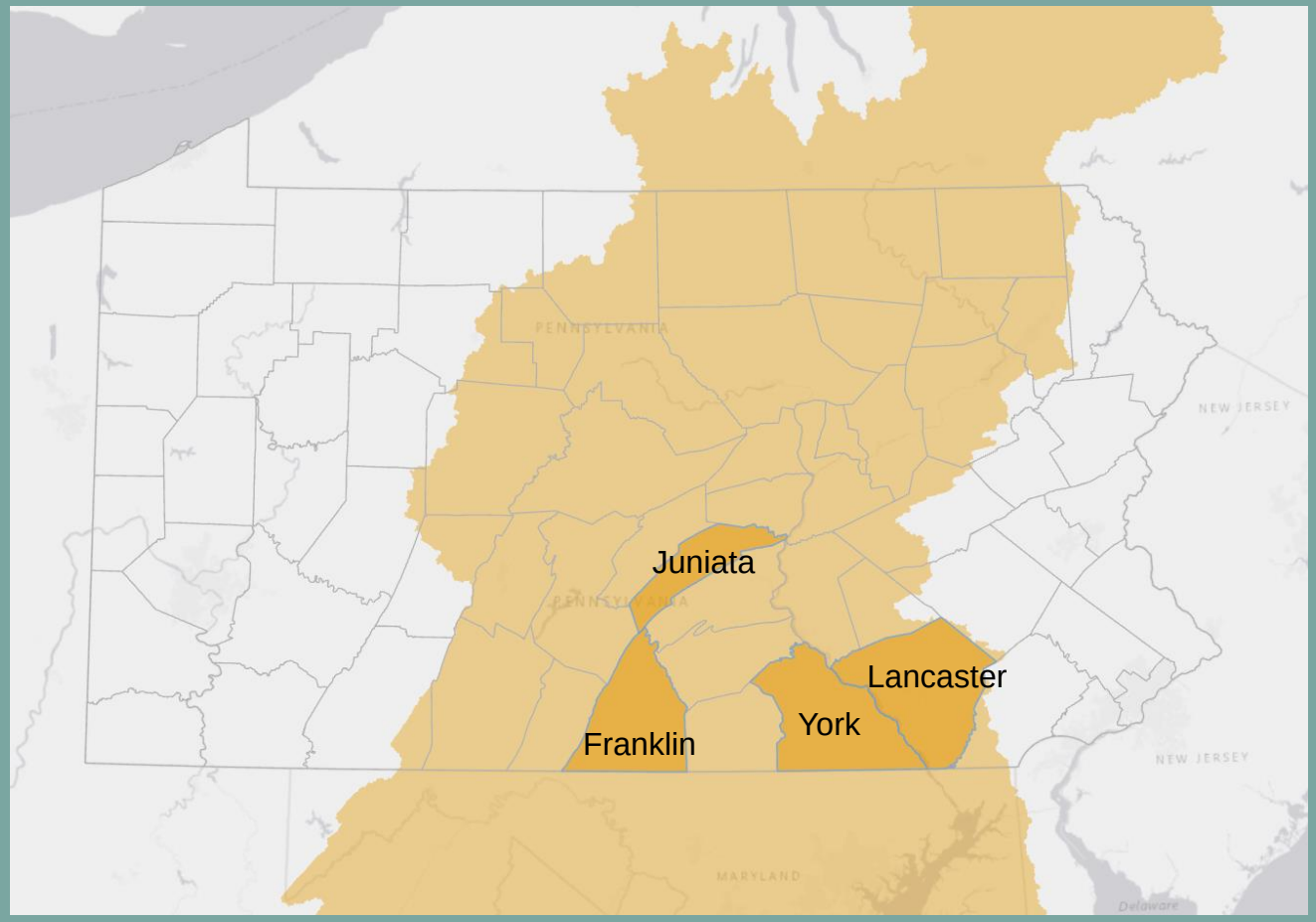


Study Area and Record Counts by County

	NRCS Practices	PA PK Practices
Lancaster Co.	19,166	9,148
York Co.	14,452	1,640
Franklin Co.	7,679	152
Juniata Co.	9,518	41

	NRCS Plans*	PA PK Plans*
Lancaster Co.	2,272	1,749
York Co.	1,086	222
Franklin Co.	1,042	267
Juniata Co.	475	114

* Prior to comparison, plan datasets were divided to include only Practice Keeper Act 38 and 590 plans. PA PK Act 38 and 590 plans were considered equivalent to NRCS 590 plans. Other Practice Keeper plans were not comparable to 590 plans.



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Analogues Between Practice Keeper and NRCS Datasets

Description of Data Element	NRCS	Practice Keeper
Responsible Agency	USDA, NRCS	PA SCC and PA DEP
Geographic Identifiers	Latitude and longitude of the centroid of each practice	GIS file with the polygon, point, or line of each practice
Practice or plan name	Practice name and code for conservation technical assistance, funded, and enhancement practices	Practice or plan name and code. Plans include nutrient management and manure management plans
Practice or plan amount or count	Practice certified quantity	Amount, Total acres
Practice or plan units	Practice measurement unit name	Unit, unit of measure
Date of practice implementation (or reverification), or plan approved	Practice certified date	Implementation Date or most recent inspection date
Practice types	227 unique practice or plan types, of which 77 are considered by PA DEP to be identical to NRCS practices	84 unique practices of which 77 are considered by PA to be identical to NRCS practices
Plan types	590 Nutrient Management plans	PA Act 38 nutrient management plans and NRCS 590 plans entered into Practice Keeper
Spatial extent analyzed	Franklin, Juniata, Lancaster, and York	Franklin, Juniata, Lancaster, and York
Date Range	2006 to 2020	2000 to 2020

Plans

- This Analysis looked at 2 types of plans
  - In NRCS Data - NRCS Field Office Technical Guide (FOTG) Standard 590 Nutrient Management Plans (NRCS 590 plans)
  - In PA PK Data – NRCS's 590 plans and Act 38 Plans (nutrient management plans developed under Pennsylvania's Act 38 Nutrient Management Program), both entered into Practice Keeper by PA

- Pennsylvania requires an Act 38 plan for concentrated animal feeding operations (CAO or CAFOs) or farms with more than 2 animal units (AU) per acre (an AU is 2000 lbs of live weight). Farms that generate or utilize manure are required to develop a Manure Management Plan based on PA DEP Manure Management Manual. These plans may be developed by the farmer. If only inorganic fertilizer is used on a farm, Pennsylvania does not require a nutrient management plan (https://extension.psu.edu/pennsylvanias-nutrient-management-act-act-38-who-is-affected).

- Practice Keeper data entry standard for plans is to enter only the most recent approval date as they are revised. Plans were for farms and are not necessarily composed of contiguous fields.
  - In the comparison process, no date was considered, and more than one NRCS plan can match a single PK plan.

Comparing Practice Keeper and NRCS record dates

- **There are differences in date tracking procedures in Practice Keeper and NRCS databases. In an attempt to overcome this during the matching process:**
  - **Plan dates were ignored during comparison. However, this likely over-estimates the matching results between plan records.**
  - **Practice comparisons were limited to within 31 days apart. This may under-estimate the matching results between practices.**

Date	NRCS	Practice Keeper
Implementation	Date the practice or plan was ***first*** implemented	Ideally the date of practice implementation, but if not known represents the date of reverification.
Inspection	Occur but are not in the data available to USGS	Practice implementation dates may be date of reverification. Plan approval dates are overwritten as they are revised.
Preserves Historical Data	Yes	Practices: Difficult to assess due to PK data entry standards Plans: No

Practice Keeper Funders

- The following funder information was not used in our comparison methods but is provided as supplemental information to help explain the data in Practice Keeper. The funding programs listed below are represented in Practice Keeper, though not all programs were represented in each of the four counties

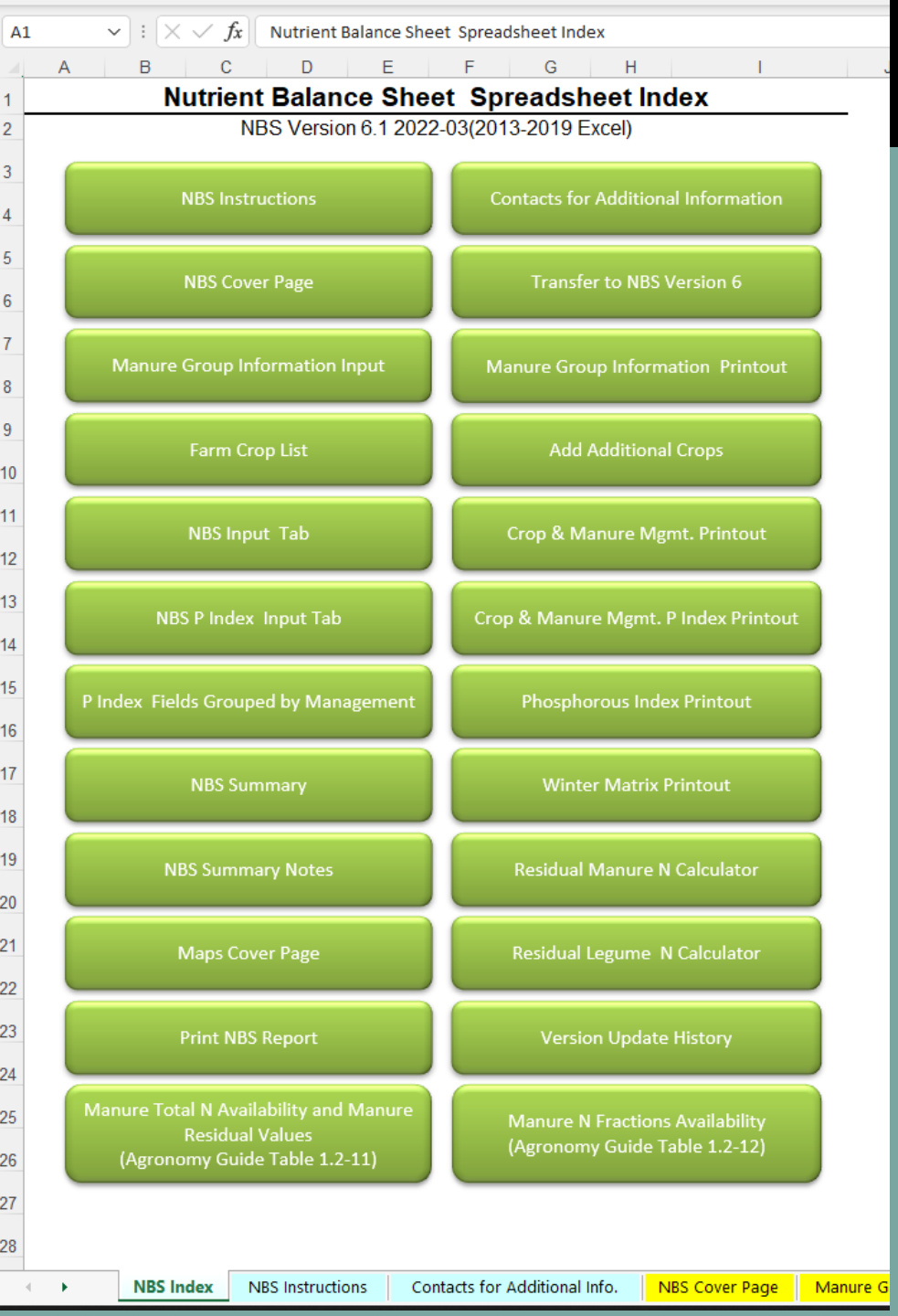
- Some practices are co-cost-shared by multiple funders, but Practice Keeper doesn't have the ability to link multiple funders to a single conservation practice implementation record (in other words Practice Keeper does not allow many to one relationships in the case of funding). To capture all funders by conservation practice implementation, Practice Keeper may store multiple records representing a given practice, each with the same information except the funding source. This shortcoming could be overcome in Practice Keeper by changing the database structure to allow one-to-many relationships between practice implementations to funders.

- Agricultural Plan Reimbursement Program
- Agrilink
- CEG Program
- DCNR C2P2
- DCNR NFWF
- DCNR PennVest
- DCNR Special Project Fund
- Growing Greener Grant
- PA Act 13 Unconventional Gas Funds
- Pennvest
- TreeVitalize

- Exelon
- Private funders

- CBP-SP
- EPA 319 Water Programs
- National Fish and Wildlife Fund

- NRCS Chesapeake Bay Watershed Initiative
- NRCS Environmental Quality Incentives Program
- NRCS Regional Conservation Partnership Program
- NRCS Rural Energy for America
- NRCS Farm Services Agency Conservation Reserve Program/Conservation Reserve Enhancement Program, administered by NRCS



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Understanding Practice Keeper Data Entry Workflow and Data

Practice Keeper data comprise two main themes Practices and Plans

- Practices
  - Practices are tools that farmers can use to reduce soil and fertilizer runoff, properly manage animal waste, and protect water and air quality on their farms while achieving multiple positive environmental outcomes. These tools can be management actions, such as cover crops, conservation tillage, irrigation efficiency, and contour farming; or structural practices such as waste management storage and streambank fencing.
  - Practice identifiers (IDs) are unique to individual farm fields and components.
  - Practice Keeper users draw a practice on a map. Practice Keeper calculates the size of the shape unless user explicitly defines it.
  - Historical plan data were converted to match field sizes automatically. Some duplicates within Practice Keeper were due to the data transfer from historical data. These duplicates were identified and not included in analysis.
  - Dates are the date implemented or reverified.
- Plans
  - Plans, such as nutrient management, are used to determine the correct amount and form of plant nutrients needed to achieve optimum yields and at the same time, prevent excess nutrients from impacting waterways. Farmers use these plans to guide fertilizer applications.
  - IDs may be duplicated for non-contiguous fields.
  - Only the most recent plan date is saved for Nutrient Management Act 38 plans; historical dates are not preserved.

NRCS Conservation Practices Data

- Practices marked as applied and reported in Performance Results System (PRS) are included
- GIS points the GIS data are all confidential
- Practices (annual, vegetative, and structural)
- Plans
- Conservation Technical Assistance (CTA) practices and plans, where planning is performed by NRCS staff; funding is provided by another source
- Practices on NRCS easements, which prevent conversion to non-agricultural land and provide environmental quality, historic preservation, wildlife habitat and protection of open space
- NRCS implemented 227 different practices or plans; 72 of these were classified the same as (or similar to) a Practice Keeper practice

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Methods: NRCS and Practice Keeper Data Organization

- This table shows the data fields in NRCS and Practice Keeper that were pertinent to the records comparison study.
- Not all data fields were used to build a relationship between NRCS and Practice Keeper datasets but were used for tracking records and maintaining confidentiality.

NRCS Data Field	Practice Keeper Data Field	Data Field Information
Record Id	Bmp Id, identifier	Practice or plan record ID. Each dataset used a different identifier scheme. Used for records tracking only, not for matching records between datasets.
Practice FIPS	FIPS	Federal Information Processing System (FIPS) state and county code.
Practice longitude	Longitude	Longitude component of practice or plan centroid coordinates.
Practice latitude	Latitude	Latitude component of practice or plan centroid coordinates.
Practice name	Practice Name, Plan Type	Practice or Plan name.
Practice code	(not provided)	NRCS practice or plan code. DEP provided a crosswalk from Practice Keeper practices to NRCS codes.
Practice certified quantity	Amount, Total Ac	Practice or plan amount or count.
Practice measurement unit name	Unit	Practice or plan units.
Practice certified date	Implementation Date, Approved On	Date of practice implementation (or reverification), or plan approved.
Progress Year	(not provided)	Begins July 1 and ends June 30. Automatically assigned if not provided.
Practice core customer id	(not provided)	NRCS practice or plan participant (for example, farm owner or producer) unique ID. Used in this comparison study for maintaining data confidentiality, not for matching records between datasets.

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Methods: Geospatial Comparisons

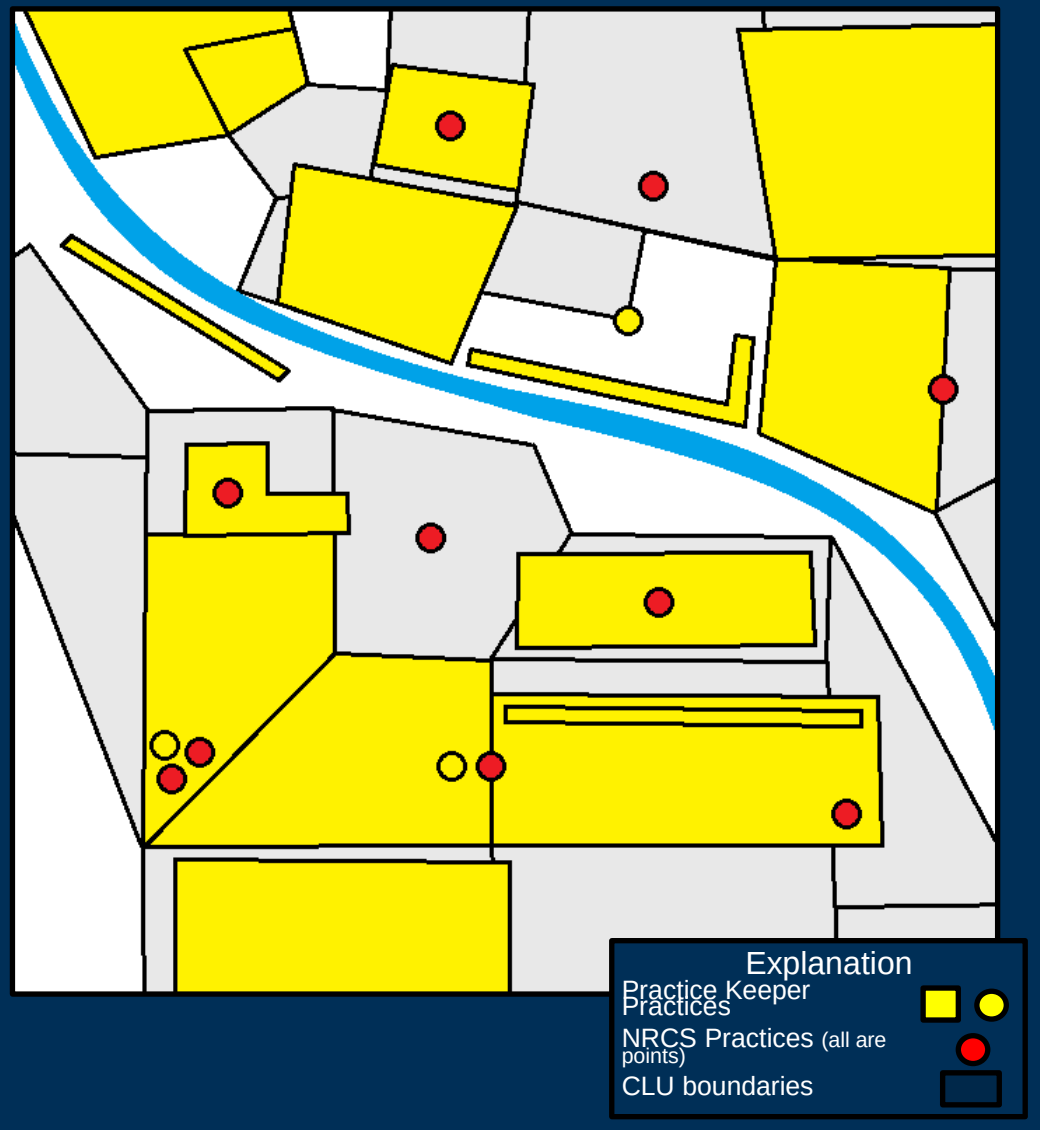
- CLUs* were assigned to each NRCS and Practice Keeper record to help link the two datasets geospatially

- Practice and plan records may overlap geospatially, and these records may not line up perfectly with CLU land data

- Data were variable. Some counties had relatively dense implementation of conservation practices and plans; other counties had sparse data.

* CLU = The USDA Farm Service Agency's (FSA) Common Land Unit (CLU) boundary data composed of uniquely identified polygon delineations that represent land units subdivided by tract, farm, and common land unit numbers.

Hypothetical map showing conservation data overlaying CLU land data with a stream separating the two production areas.



Methods: Practice Comparisons

1

Calculate the percent intersection ("spatial overlap") between CLU data and all practice locations from NRCS and PA PK. Assign to each practice record a CLU with the highest percent intersection.

- Practices represented by points have either a 100% or 0% intersection with CLU polygons, as points are either inside or out.
- Practices represented by lines or polygons can overlap more than one CLU. Choose the CLU with the highest percent intersection.
- If 0% overlap, assign the nearest CLU.

2

Estimate the distance between NRCS and PA PK practices.

- A max distance of 2 miles was used for processing purposes only. Step 3 filters down the distances to the width of a common land unit (max of about half a mile).
- For line or polygon features, distances were estimated from the nearest edge of the feature (not the center or centroid).

3

Compile a list of "1:1" matches.

- Same practice, county, tract number, and farm number.
- If distance between practices > 120 feet*:
  - common land unit numbers must be the same, and;
  - if practice units are in acres, difference in implementation amount must be < 2 acres
- Dates are ≤ 31 days apart.
- Chose the matches closest in distance, followed by days apart, followed by difference in practice amounts. This rule helps to ascertain matches in dense spatial groups.

*** The 120-foot distance was determined based on visual inspection using satellite imagery, CLU polygons, and feedback from USDA and PA DEP personnel**

Methods: Plan Comparisons

1

Calculate the percent intersection ("spatial overlap") between CLU data and all plan locations from NRCS and PA PK. Assign to each plan record a CLU with the highest percent intersection.

- Plans represented by points have either a 100% or 0% intersection with CLU polygons, as points are either inside or out.
- Plans represented by polygons can overlap more than one CLU. Choose the CLU with the highest geospatial overlap.
- If 0% overlap, assign the nearest CLU.

2

Estimate the distance between NRCS and PA PK plans.

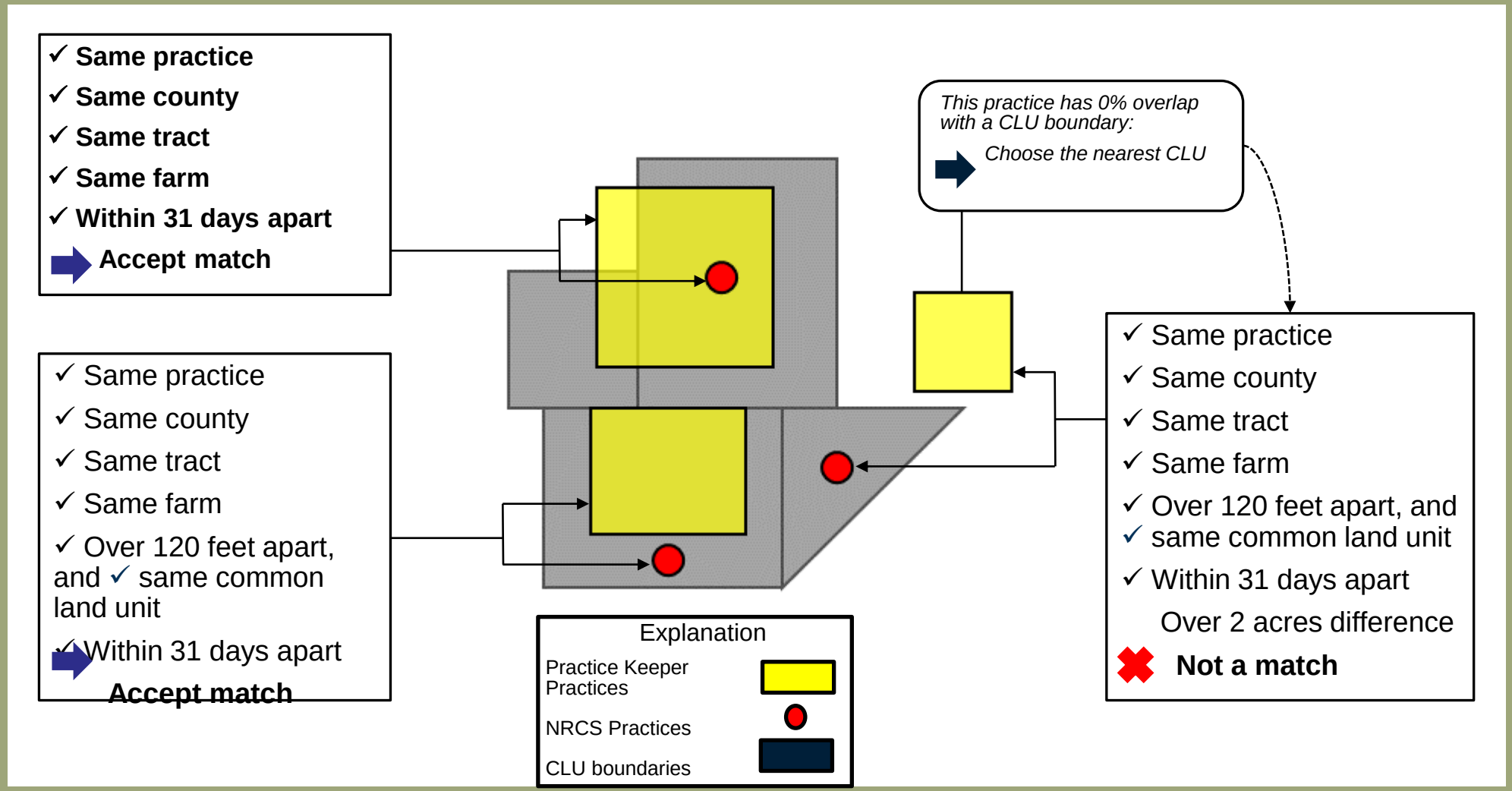
- A max distance of 120 feet was used:
  - NRCS plans are provided as points and represent plan coverage on a single common land unit.
  - Practice Keeper plans are provided as polygons and cover entire CLU farms, which have a larger geospatial footprint than common land units.
  - Because of the difference in scale, a max of 120 feet from polygon to point was sufficient to detect matches between plans.

3

Compile a list of "1:many" matches.

- Same plan: compare NRCS 590 plans to PA PK 590 and Act 38 plans.
- If distance between practices is between 0 and 120 feet, the farm number must be the same.
- Ignore plan dates.
- Because of the difference in scale, match one Practice Keeper plan to multiple NRCS plans.

Methods: Logic Used to Match Practices

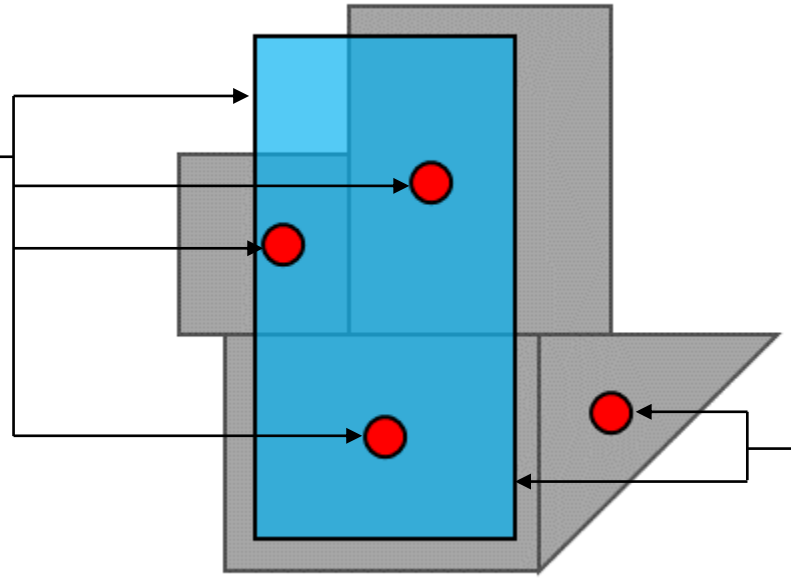


Methods: Logic Used to Match Plans

✓ Same plan

Accept matches

Three NRCS plans match to one Practice Keeper plan



✓ Same plan

but ✓ Less than 120 feet apart, different farm number

Not a match

Explanation

Practice Keeper plans

NRCS plans

CLU boundaries

Method Used Minimizes Omissi

Key Point

Omissions could be larger except,

- Unit is considered only if both practices are in acres and the distance is over 120 feet
- In all other cases, the units are ignored and only the practice amount is used.
- Process errs in the direction of a match whenever practices are in the same CLU and same unit

Some data elements were considered more important than others in the matching process.

- For instance, when practices were reported with geospatial locations less than 120 feet but with different practice amounts, the same tabular data such as location and date, they were matched on tabular data.
- Example
  - Dataset A = cover crop of 45 acres and Dataset B = cover crop of 15 acres
  - A & B Plot less than 120 feet from each other
  - A & B data report the same location and date
  - They match in our process even though there is a large quantity difference

When harmonizing a dataset, it would be difficult to ascertain the correct practice amount reported in the tabular data as we had no basis to decide which correctly represented the condition on the ground, but no ground truthing was performed.

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Results: Duplication Between NRCS and Practice Keeper Data (all years)

- This table shows the number of duplicate, unique, and total records in the non-contiguous four-county study area for all years analyzed.
- NRCS practice data were compared to PA PK practice data.
- Plans data were split before comparison: only NRCS 590 plans were compared to Practice Keeper Act 38 and 590 plans.
- Where the objective is to show no duplication between the datasets, then the 1,807 duplicate practices must be included in one dataset but not the other when appending data across the two datasets. The percent of duplicate records over time ranges from 2 to 7 percent annually in the NRCS dataset and 10 to 34 percent annually in the Practice Keeper dataset.
- This information shows that there is a higher percent of duplicate practices in the Practice Keeper dataset than in the NRCS dataset.
- Because of the difference in scale, plans were matched using a "1:many" approach. 1,063 NRCS plans were found to match to 388 Practice Keeper plans.

Data Source	Duplicate Records	Unique Records	Total Records
NRCS: practice data	1,807 (4%)	49,008 (96%)	**50,815**
Practice Keeper: practice data	1,807 (16%)	9,174 (84%)	**10,981**
NRCS: 590 plan data	1,063 (22%)	3,812 (78%)	**4,875**
Practice Keeper: Act 38 and 590 plan data	388 (16%)	1,964 (84%)	**2,352**

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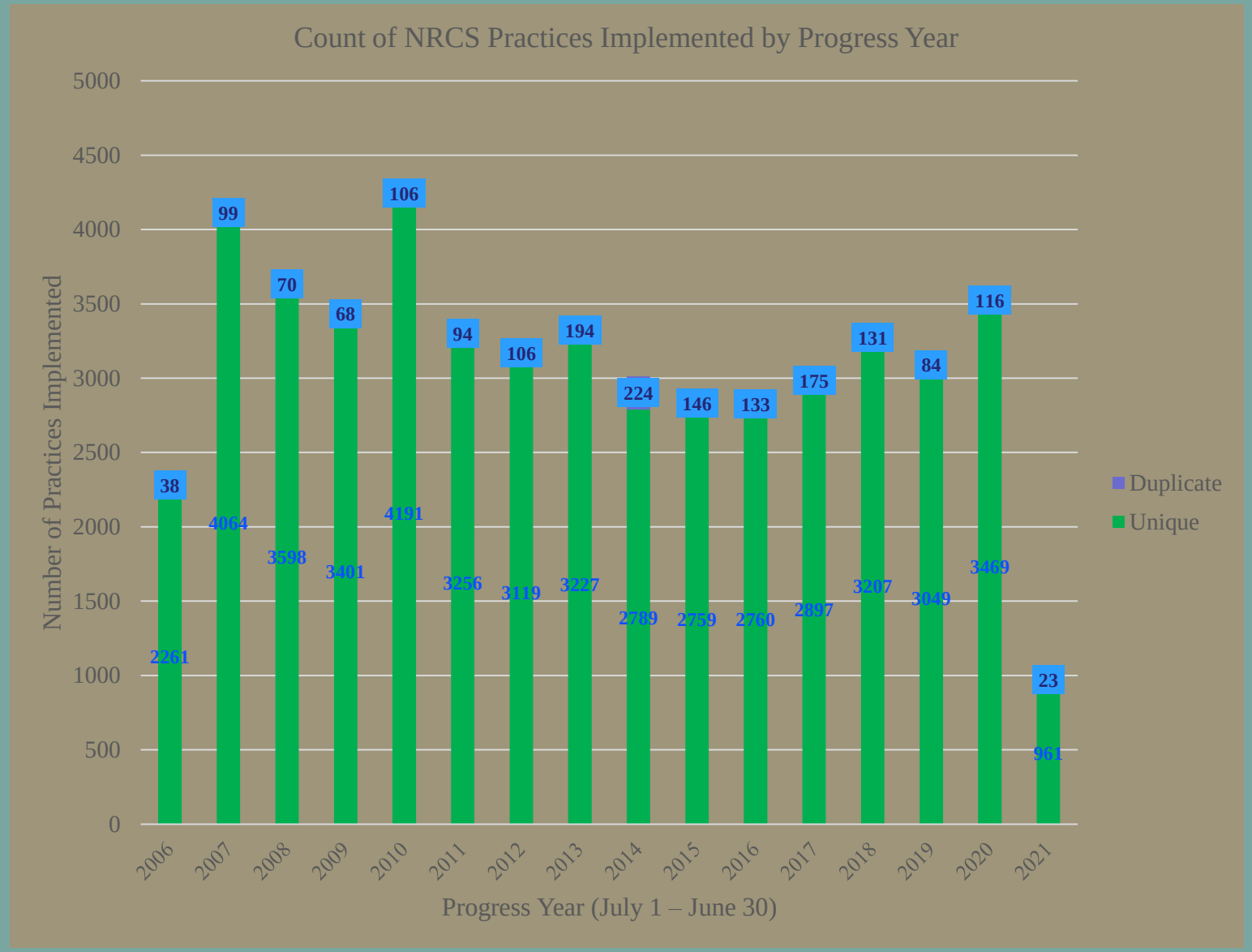
Results: Duplication of Practice Records between NRCS and Practice Keeper, by Year (7/1 to 6/30)

- This tables lists by year the percent of duplicate records between practice datasets in the noncontiguous, four-county study area and all years.
- Because there are more NRCS records than PA PK, NRCS is a more comprehensive dataset with lower opportunity of duplication.
- Fewer Practice Keeper records overall, with 26% duplicated in the NRCS dataset in the most recent year.

Year (7/1 to 6/30)	Percent of duplication, NRCS (NRCS:PK)	Percent of duplication, Practice Keeper (PK:NRCS)
2006	2%	28%
2007	2%	32%
2008	2%	34%
2009	2%	24%
2010	2%	11%
2011	3%	14%
2012	3%	10%
2013	6%	22%
2014	7%	24%
2015	5%	14%
2016	5%	20%
2017	6%	17%
2018	4%	11%
2019	3%	14%
2020	3%	12%
2021	2%	26%

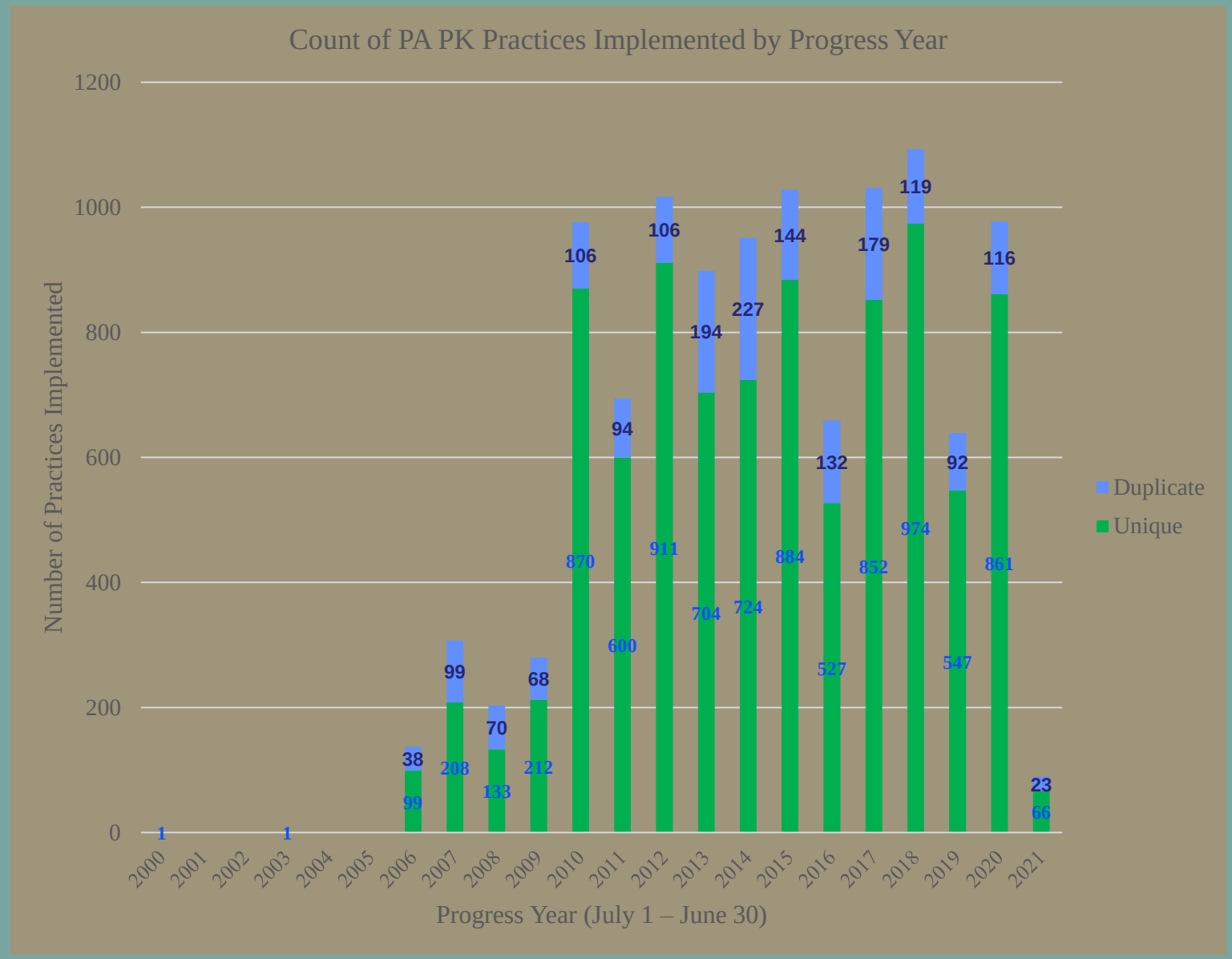
Results: Bar Chart Showing Annual NRCS Practices Implementations by Progress Year (four-county area)

- **Green** bars show the number of NRCS records that were found to be duplicates in the Practice Keeper database
- **Blue** bars show records unique to NRCS
- Includes Lancaster, Juniata, Franklin, and York counties
- 2006 and 2021 are partial years



Results: Bar Chart Showing Annual Practice Keeper Practices Implementations by Progress Year (four-county area)

- **Green** bars show the number of Practice Keeper records that were found to be duplicates in the NRCS database
- **Blue** bars show records unique to Practice Keeper
- Includes Lancaster, Juniata, Franklin, and York counties
- 2006 and 2021 are partial years



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Results: Records Duplication in Both NRCS and Practice Keeper Datasets (NRCS:PK)

Lancaster County only, Progress Year 2020

- **This table lists the top 10 practices that are duplicated across Practice Keeper and NRCS datasets when aligning units, where there are 5 or more farmers implementing the practice.**
- **Data shown only for Lancaster County and the year 2020.**
- **Lancaster is selected because it has the most comprehensive data in Practice Keeper.**

NRCS Practice	Practice Name	Unit	Practice Keeper Amount	Practice Keeper Record Count	NRCS Amount	NRCS Record Count
561	Heavy Use Area Protection	Square Feet	21,544	6	33,311	6
382	Fence	Feet	5,531	10	5,694	10
600	Terrace	Feet	3,875	5	4,101	5
620	Underground Outlet	Feet	2,760	8	2,906	8
468	Lined Waterway or Outlet	Feet	--		367	8
511	Forage Harvest Management	Acres	85.48	6	109.6	6
558	Roof Runoff Structure	No.	--		9	9
412	Grassed Waterway	Acres	6.96	12	7.5	12
313	Waste Storage Facility	No.	6	6	6	6
484	Mulching	Acres	4.78	9	4.5	9

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Results: Omission Records in Practice Keeper but not in NRCS dataset (PK:NRCS)

Lancaster County, Progress Year 2020

- **Top 10 practices that are in Practice Keeper but not NRCS data where there are 5 or more farmers implementing the practice.**
- **While some of the practice names are the same as the top 10 in of the omissions from NRCS, the dates and locations did not match.**
- **Units do not match NRCS in several cases, as is the case for example with Heavy Use Area Protection.**
- **If consistent units, several are likely to be duplicates.**

Practice Code	Practice Name	Amount in Practice Keeper	Unit
561	Heavy Use Area Protection	84,281	Square Feet
382	Fence	33,452	Feet
600	Terrace	7,053	Feet
620	Underground Outlet	4,081	Feet
558	Roof Runoff Structure	2,357	Feet
328	Conservation Crop Rotation	1,860	Acres
575	Animal Trails and Walkways	1,716	Feet
340	Cover Crop	1,566	Acres
329	Residue and Tillage Management, No-Till/Strip Till/Direct Seed	1,146	Acres
590	Nutrient Management Plan	1,087	Acres

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Results: Omission
Practice records that are in NRCS but not found in Practice Keeper (NRCS:PK)

Lancaster County, Progress Year 2020

- The top 10 practices that are in NRCS data but not Practice Keeper data.
- While some of the practice names are the same as the top 10 in of the omissions from Practice Keeper, the dates and locations did not match.
- PII data are protected by showing only records where five or more farmers implemented the practice.

Practice Code	NRCS Practice name	NRCS Amount	Unit
561	Heavy Use Area Protection	25,253	Square Feet
382	Fence	22,878	Feet
620	Underground Outlet	8,738	Feet
600	Terrace	8,132	Feet
362	Diversion	3,963	Feet
606	Subsurface Drain	3,542	Feet
329	Residue and Tillage Management, No Till	3,476.8	Acres
328	Conservation Crop Rotation	2,620.2	Acres
511	Forage Harvest Management	1,928.9	Acres
340	Cover Crop	1,670.4	Acres

Best Practices for Data Entry, Storage, and Comparison

When compiling a "de-duplicated" combined NRCS and Practice Keeper dataset:

- Option A: Select non-duplicates from each dataset and select only one instance of a duplicate record between both datasets.
  - –One of the sources should be chosen as the primary (more comprehensive) and the other as the secondary from which duplicates will be removed.
  - –NRCS data are more comprehensive and would be a good primary source.
  - –Select only non-duplicate records from Practice Keeper for inclusion into a combined dataset.
- Option B: Select all records by practice type from one or the other dataset.
  - –Select only one practice type from each dataset.
  - –Select the practices with the greatest amount from one dataset.
  - –Example:
    - Most of the heavy use area protection, fencing, underground outlets, roofs and covers, and waste transfer (feet) are in Practice Keeper but not in NRCS.
    - Report all entries of these practice types from Practice Keeper (the primary data source in this example) and not NRCS (secondary data source).

Best Practices for Data Entry, Storage, and Comparison

- Future data collection of practices at the local conservation district level and entry into Practice Keeper should include data for implementation date as well as last observed or inspected dates. This will retain historical information instead overwriting previous date values.
- Use consistent conservation practice units so that the data may more easily be compared (next slide shows details).
- Include the CLU attributes (CLU unique ID, tract, farm, field, and common land unit number) in the tabular data. These CLU attributes likely can be assigned automatically by the mapping function within Practice Keeper.

Best Practices for Data Entry, Storage, and Comparison

Aligning measurement units between the two data sets

- If we alter the units from ‘sq ft’ to ‘square feet’ and/or ‘square feet’ to ‘acres’ by assuming a width for linear practices based on the practice standards, we can achieve a slightly better match.
- Slightly more than 20 practices from Practice Keeper and slightly more than 22 practices from NRCS would match.
- Table shows 2020 in Lancaster County. Exact numbers are not provided to maintain producer confidentiality.

Practice Code	Practice Name	Practice Keeper Amount	NRCS Amount
561	Heavy Use Area Protection	21,544	33,311
382	Fence	5,531	5,694
600	Terrace	3,875	4,101
620	Underground Outlet	2,760	2,906
468	Lined Waterway or Outlet	6,007.05	367
511	Forage Harvest Management	85.48	109.6
558	Roof Runoff Structure	976	9
412	Grassed Waterway	6.96	7.5
634	Waste Transfer	1,131	7
313	Waste Storage Facility	6	6
484	Mulching	4.78	4.5
500	Obstruction Removal	17,494	0.6

This table lists the amount that matches when aligning

BMP Inspections

- While not originally a part of this project, USGS was asked to evaluate the practices that would require inspections in order to continue to receive credit in the Chesapeake Assessment Scenario Tool CAST (https://cast.chesapeakebay.net/About)

- We selected the most common BMPs in Lancaster county (the county with the largest number of conservation practice implementation data records) to illustrate the BMPs that would be credited if they were inspected

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BMP Inspections

Implications to Bay Model Credit

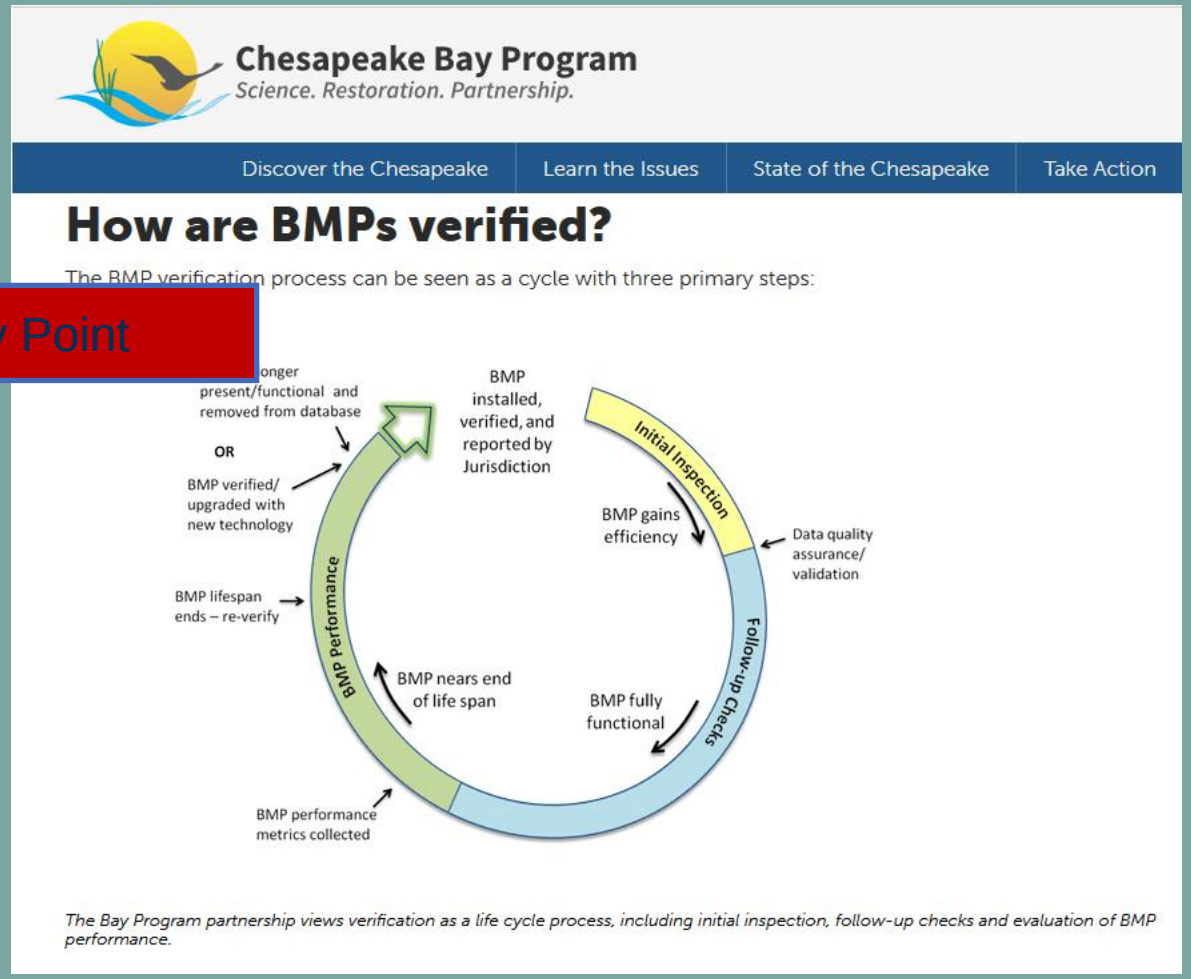
- This table lists the top practices that are removed from model credit by year (rounded to nearest whole number).
- Inspection dates are not recorded by NRCS. Some implementation dates in Practice Keeper are entered as the reverification date, if the implementation date is unknown.
- Lancaster County and NRCS data only.
- Using CBP credit durations.

			Total Expired Per Year									
Practice	Unit	2016 Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Streambank and Shoreline Protection	Ft	3,770	4700	100	1400	4270	2100	2970	100	450	500	233
Windbreak/Shelterbelt Establishment	Ft	1,247	0	0	30	623	1905	5901	0	3167	1686	790
Grassed Waterway	Ac	1,140	1468	809	638	400	3555	7341	11495	6647	6742	2005
Animal Trails and Walkways	Ft	1,050	0	0	0	1210	1882	462	1160	3495	2196	2113
Prescribed Grazing	Ac	247	199	413	406	182	346	197	386	406	414	105
Riparian Forest Buffer	Ac	122	24	90	76	40	45	41	42	65	31	8
Roof Runoff Structure	Ft	87	1325	552	1393	591	2214	2523	4335	2740	1599	1826
Waste Storage Facility	No	34	0	0	0	0	0	27	36	33	29	44
Tree/Shrub Establishment	Ac	24	3	45	4	0	24	0	2	40	2	0
Roof Runoff Structure	No	22	22	29	24	19	16	16	11	24	13	8
Riparian Forest Buffer	Ac	20	29	9	21	102	42	61	70	135	0	62
Grassed Waterway	Ac	15	1730	102	36	31	26	43	28	22	1263	53
Watering Facility	No	14	5	27	40	16	58	5	37	16	22	4
Structure for Water Control	No	12	17	10	22	15	24	53	38	25	54	22
Critical Area Planting	Ac	11	0	1	14	4	3	3	0	6	11	27
Conservation Cover	Ac	8	149	65	30	6	2	0	84	116	144	68
Riparian Herbaceous Cover	Ac	6	1	0	2	0	3	2	2	0	2	0
Pasture and Hay Planting	Ac	5	88	270	75	221	63	12	27	22	3	19
Field Border	Ac	4	1	1	4	5	0	6	0	1	0	1
Vegetated Treatment Area	Ac	2	0	0	1	1	1	1	2	3	0	2
Animal Mortality Facility	No	1	0	0	0	0	0	0	1	0	1	4

BMP Inspections

- The Chesapeake Bay Program developed a Verification Framework in 2014.
- The ***most recent verification date*** overwrites the ***implementation date*** for some practice records in Practice Keeper. Act 38 plan ***approval dates*** are overwritten as they are ***revised***.
- This Practice Keeper workflow results in BMPs appearing as ***newly implemented*** each time they are inspected and ***shortens the amount of time they are credited*** in the model.
- This framework requires inspection of BMPs, and reporting of the inspection date and the status as pass or fail.
- Without regular inspection, the Chesapeake Bay Program no longer credits the practice in its models.

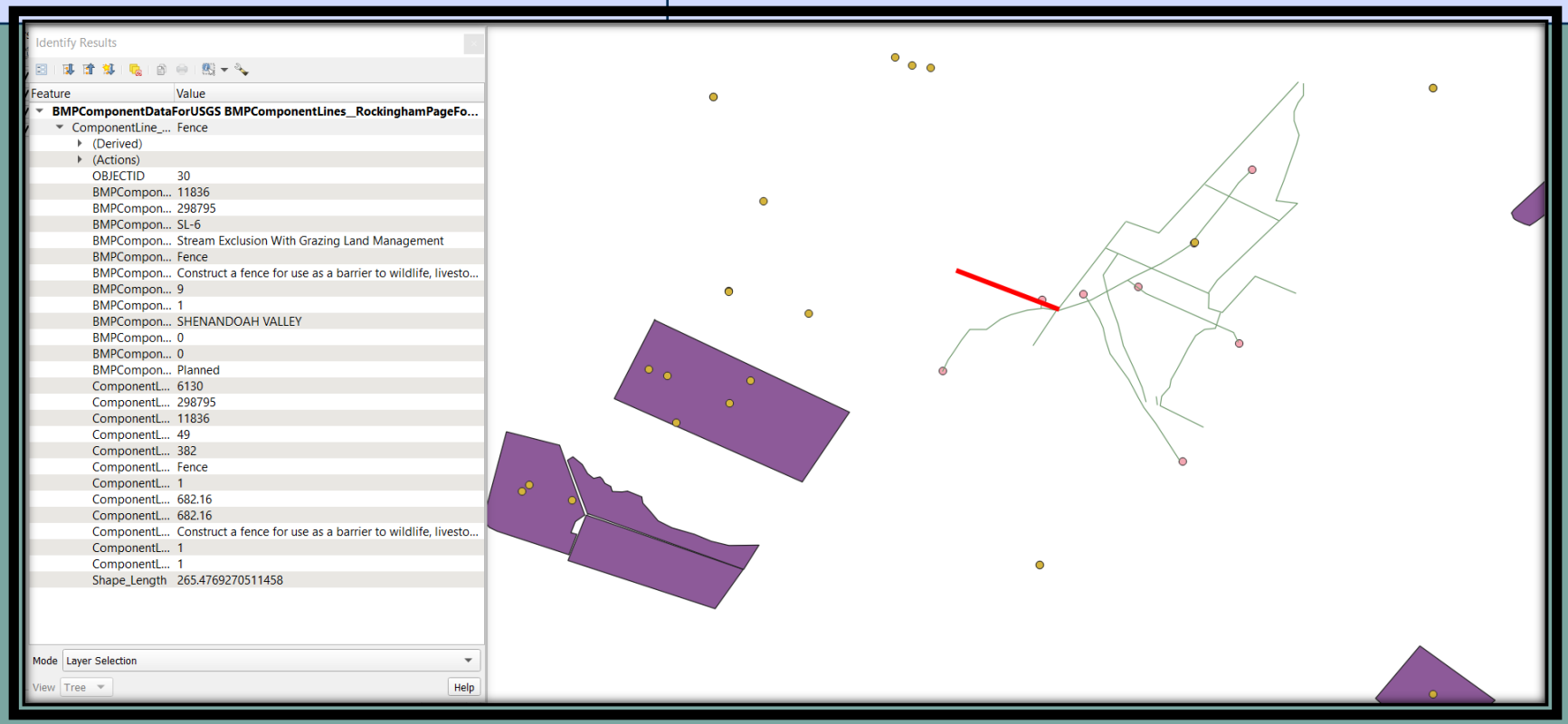
Key Point



https://cast.chesapeakebay.net/Home/TMDLTracking#verificationSection

VIRGINIA DATA HARMONIZATION

Data	VACS	NRCS
Geography	BMP component data lines, points and polygons	Latitude and longitude practice center point
Dates	All components complete	Practice certified date
Practices	Geodatabase with the BMP points and components for all practices implemented	Funded, conservation technical assistance (CTA), and easement practices and plans, marked as applied and reported in Performance Results System (PRS)



VACS and NRCS Practice Names: Many to Many

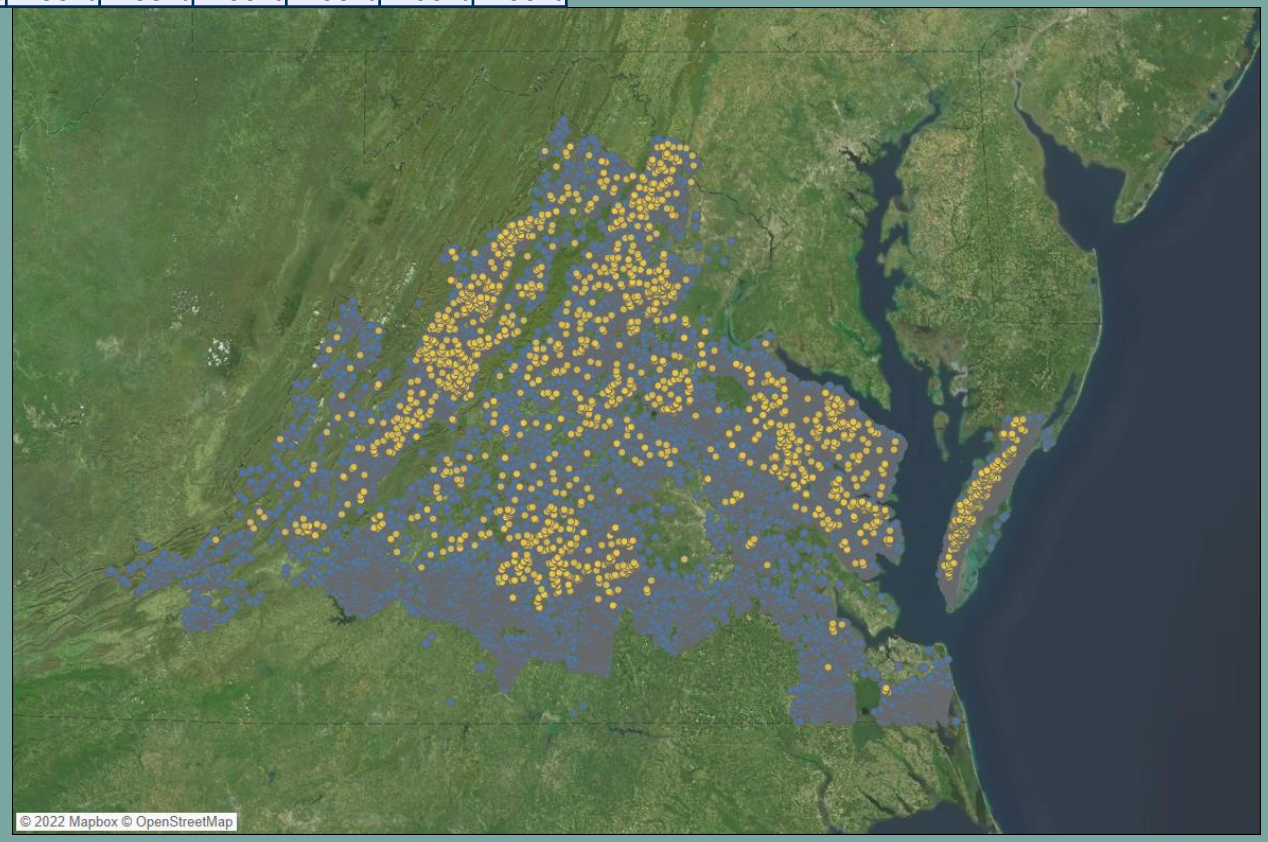
Practice_ID	Code	Practice Name	PracticeComponentType_ID	Component Code	Component Name
51	WP-4	Animal waste control facilities	20	313	Waste Storage Facility
52	WP-4B	Loafing lot management system	20	313	Waste Storage Facility
53	WP-4C	Composter Facilities	20	313	Waste Storage Facility
60	WP-8	Relocation of Confined Feeding Operations From Environmentally Sensitive Areas	20	313	Waste Storage Facility
157	VWP-4	Voluntary Animal waste control facilities	20	313	Waste Storage Facility
158	VWP-4B	Voluntary Loafing lot management system	20	313	Waste Storage Facility
159	VWP-4C	Voluntary Composter Facilities	20	313	Waste Storage Facility
166	VWP-8	Voluntary Relocation of Confined Feeding Operations From Environmentally Sensitive Areas	20	313	Waste Storage Facility
181	GEN	Generic Practice	20	313	Waste Storage Facility
214	WP-4LC	Animal Waste Control Facility for Confined Livestock Operations	20	313	Waste Storage Facility
215	WP-4LL	Loafing Lot Management System with Manure Management (Excluding Bovine Dairy)	20	313	Waste Storage Facility
216	WP-4SF	Seasonal Feeding Facility with Attached Manure Storage	20	313	Waste Storage Facility
52	WP-4B	Loafing lot management system	34	342	Critical Area Planting
52	WP-4B	Loafing lot management system	40	356	Dike
52	WP-4B	Loafing lot management system	43	362	Diversion
52	WP-4B	Loafing lot management system	45	367	Roofs and Covers
52	WP-4B	Loafing lot management system	49	382	Fence
52	WP-4B	Loafing lot management system	52	391	Riparian Forest Buffer
52	WP-4B	Loafing lot management system	53	393	Filter Strip
52	WP-4B	Loafing lot management system	58	412	Grassed Waterway
52	WP-4B	Loafing lot management system	81	516	Pipeline
52	WP-4B	Loafing lot management system	91	561	Heavy Use Area Protection
52	WP-4B	Loafing lot management system	93	574	Spring Development
52	WP-4B	Loafing lot management system	94	575	Animal Trails and Walkways
52	WP-4B	Loafing lot management system	96	580	Streambank and Shoreline Protection
52	WP-4B	Loafing lot management system	102	590	Nutrient Management
52	WP-4B	Loafing lot management system	111	614	Watering Facility
52	WP-4B	Loafing lot management system	115	633	Waste Recycling Utilization
52	WP-4B	Loafing lot management system	192	BPEM	Bank Protected by Exclusion Measurement
52	WP-4B	Loafing lot management system	84	533	Pumping Plant
52	WP-4B	Loafing lot management system	95	578	Stream Crossing (578)
52	WP-4B	Loafing lot management system	114	632	Solid/Liquid Waste Separation Facility
52	WP-4B	Loafing lot management system	116	634	Waste Transfer
52	WP-4B	Loafing lot management system	120	642	Water Well

Implementation Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NRCS and VACS Cost Share	176	273	178	271	223	368	204	107	100	91	145	58	76	66	47
NRCS only	27,089	28,786	31,627	26,046	28,442	33,361	19,029	12,079	12,791	11,400	11,386	13,425	15,854	19,312	17,666
VACS only	3,228	4,759	9,783	10,220	4,743	8,815	9,726	9,991	12,899	11,536	14,720	10,035	13,698	23,169	17,767
All NRCS	27,265	29,059	31,805	26,317	28,665	33,729	19,233	12,186	12,891	11,491	11,531	13,483	15,930	19,378	17,713
All VACS	3,404	5,032	9,961	10,491	4,966	9,183	9,930	10,098	12,999	11,627	14,865	10,093	13,774	23,235	17,814
Implementation Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
VACS co-cost share	5%	5%	2%	3%	4%	4%	2%	1%	1%	1%	1%	1%	1%	0%	0%
NRCS co-cost share	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%
VACS only	95%	95%	98%	97%	96%	96%	98%	99%	99%	99%	99%	99%	99%	100%	100%
NRCS only	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%	100%	100%	100%	100%

Almost zero duplication!

Yellow dots indicate practice is in both VACS and NRCS data; Grey dots are NRCS

Study Area and Record Counts



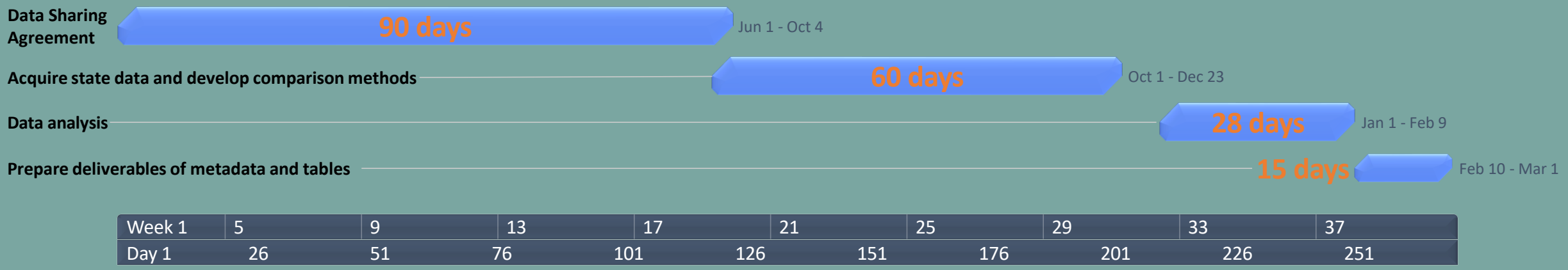
6/1/2022

MARYLAND DATA HARMONIZATION
UPPER CHESTER WATERSHED

Data	MACS		NRCS
Geography	MD 02-13-05-10 Tax grid parcel number with latitude/longitude		Latitude and longitude practice center point
Dates	1994 to 2021		2006 to 2021
Practices	Tabular files for cover crops and capital program		Funded, conservation technical assistance (CTA), and easement practices and plans, marked as applied and reported in Performance Results System (PRS)
MD 8 DIGIT	**MD 8 NAME**	**HUC 12**	**HUC 12 NAME**
2130510	Upper Chester River	20600020401	Cypress Branch
2130510	Upper Chester River	20600020402	Andover Branch
2130510	Upper Chester River	20600020403	Unicorn Branch
2130510	Upper Chester River	20600020404	Red Lion Branch
2130510	Upper Chester River	20600020406	Upper Chester River

Anticipated Timeline for Future Efforts

**Depends on funding and USGS availability*



Discussion

- Strategy—What problem are we trying to solve?
  - Verification
  - Data duplication
  - Something else?
- Operationally—USGS can do this work quickly, depending on data sharing agreement and state data availability. Assuming states do not require a USGS-reviewed publication
- Tactically—Methods are expected to vary depending on the data, but not by much

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