Agricultural conservation practice implementation in the Chesapeake Bay watershed supported by the U.S. Department of Agriculture

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Chesapeake Bay Program Partnership Agricultural Working Group meeting, Feb 21st, 2019

Supported by USGS Land Resources and Ecosystems mission areas and by USEPA

A new publication

- **USGS Data Series**

Agricultural Conservation Practice Implementation in the Chesapeake Bay Watershed Supported by the U.S. Department of Agriculture

Data Series 1102

Prepared in cooperation with the U.S. Department of Agriculture

By: W. Dean Hively , Olivia H. Devereux , and Jennifer L.D. Keisman

https://doi.org/10.3133/ds1102

- **With corresponding data release**

ScienceBase-Catalog Communities Help

ScienceBase Catalog → USGS Lower Mississi... → Aggregated Data Rec...

Aggregated Data Records Describing USDA Conservation Practices Implemented Within the Chesapeake Bay Watershed

https://doi.org/10.5066/P93Y903B.

A new publication

- Public release of aggregated USDA conservation data
  - Data for all farms participating in USDA programs within the Chesapeake Bay watershed
  - Aggregated by county
  - Aggregated by 8-digit hydrologic unit code watersheds
  - Annual implementation totals, 2006 to 2017

- Documents methods used by USGS each year to acquire, process, aggregate, and release USDA conservation data

- Foreword by USDA Natural Resources Conservation Service (Terrell Ann Erickson, Acting Northeast Regional Conservationist)

(thank you to Barry Frantz, NRCS Chesapeake Bay Coordinator, for review and input)

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The process

- USGS is established as a USDA Conservation Cooperator
  - Allows access to privacy protected, farm-specific data
  - Agreements with USDA NRCS and FSA were established in 2010, following the 2009 Executive Order for Chesapeake Bay Protection and Restoration
  - Renewed in 2015, valid through 2020, plan to renew
  - "to monitor, assess, or evaluate conservation benefits"
- We acquire updated USDA farm implementation data at the end of each fiscal year
- The conservation cooperator agreements are a two way street ~ USDA expects data analyses that assist them in increasing the effectiveness of conservation delivery

Renewal of USGS-USDA Conservation Cooperator Agreement is planned for 2020

The dataset

- Natural Resource Conservation Service (NRCS) data:
  - NRCS funded practices
  - NRCS conservation technical assistance (CTA)
- Farm Service Agency (FSA) data:
  - Conservation Reserve Program, Conservation Reserve Enhancement Program, Common Land Use boundaries
- The dataset does not include:
  - State, local, and privately-funded or non-funded practices, except those for which NRCS provided conservation technical assistance

USGS

The dataset

- Verified implemented practices
- Identified by USDA practice code and technical guidelines

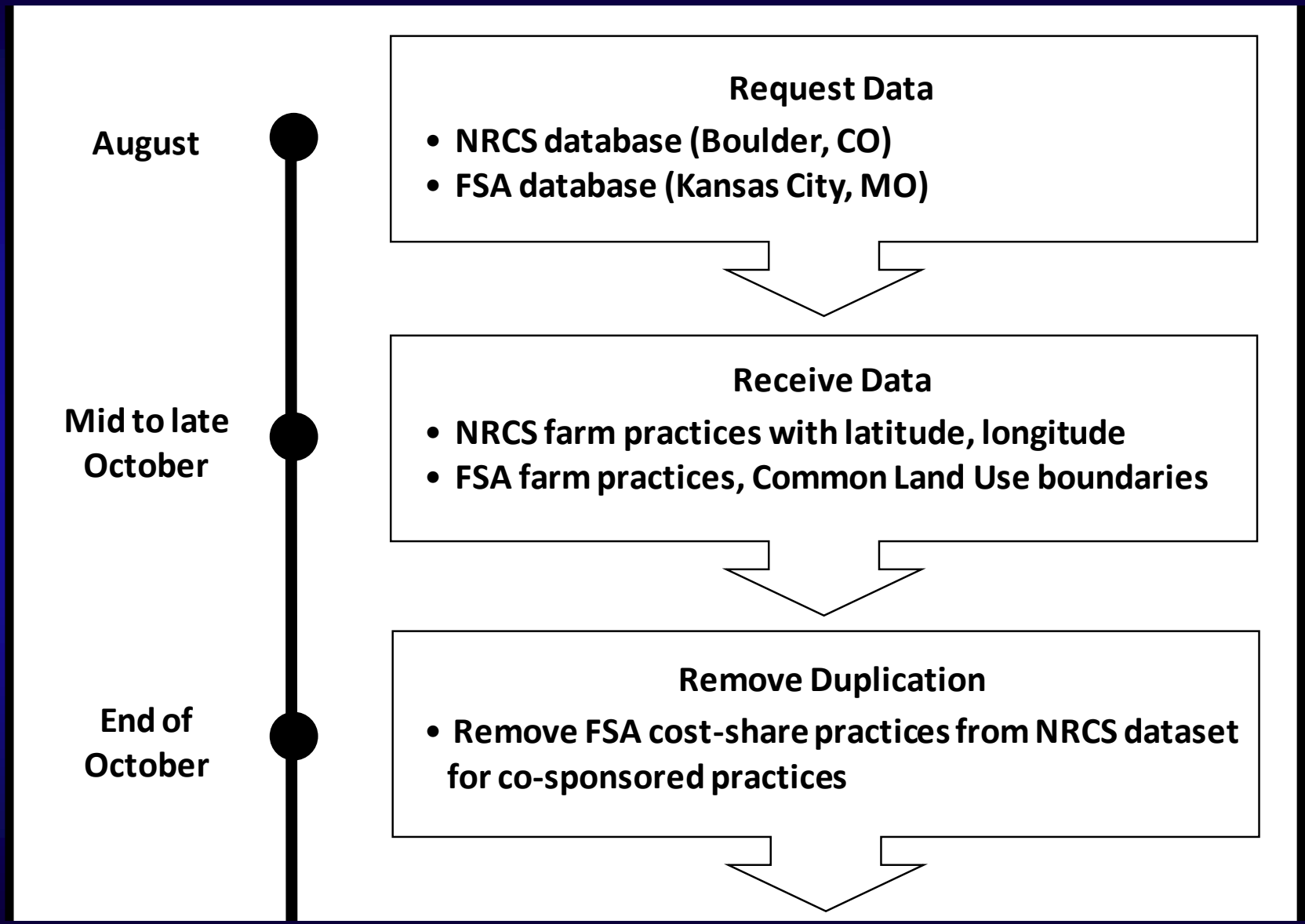
Table 1. Top ten most frequently implemented USDA-funded conservation practices in 2017, by state jurisdicion.

A. Delaware		*B.* Maryland	
Code	**Practice**	**Code**	**Practice**
340	Cover crop	590	Nutrient management
561	Heavy use area protection	595	Integrated pest management
590	Nutrient management	561	Heavy use area protection
345	Residue and tillage management, reduced till	382	Fence
367	Roofs and covers	528	Prescribed grazing
114	Integrated pest management plan—written	340	Cover crop
591	Treatment of agricultural waste	484	Livestock pipeline
449	Irrigation water management	516	Mulching
316	Animal mortality facility	614	Watering facility
595	Integrated pest management	315	Herbaceous weed treatment

USGS

Hively at al., 2018; https://doi.org/10.3133/ds1102

Annual USGS work flow



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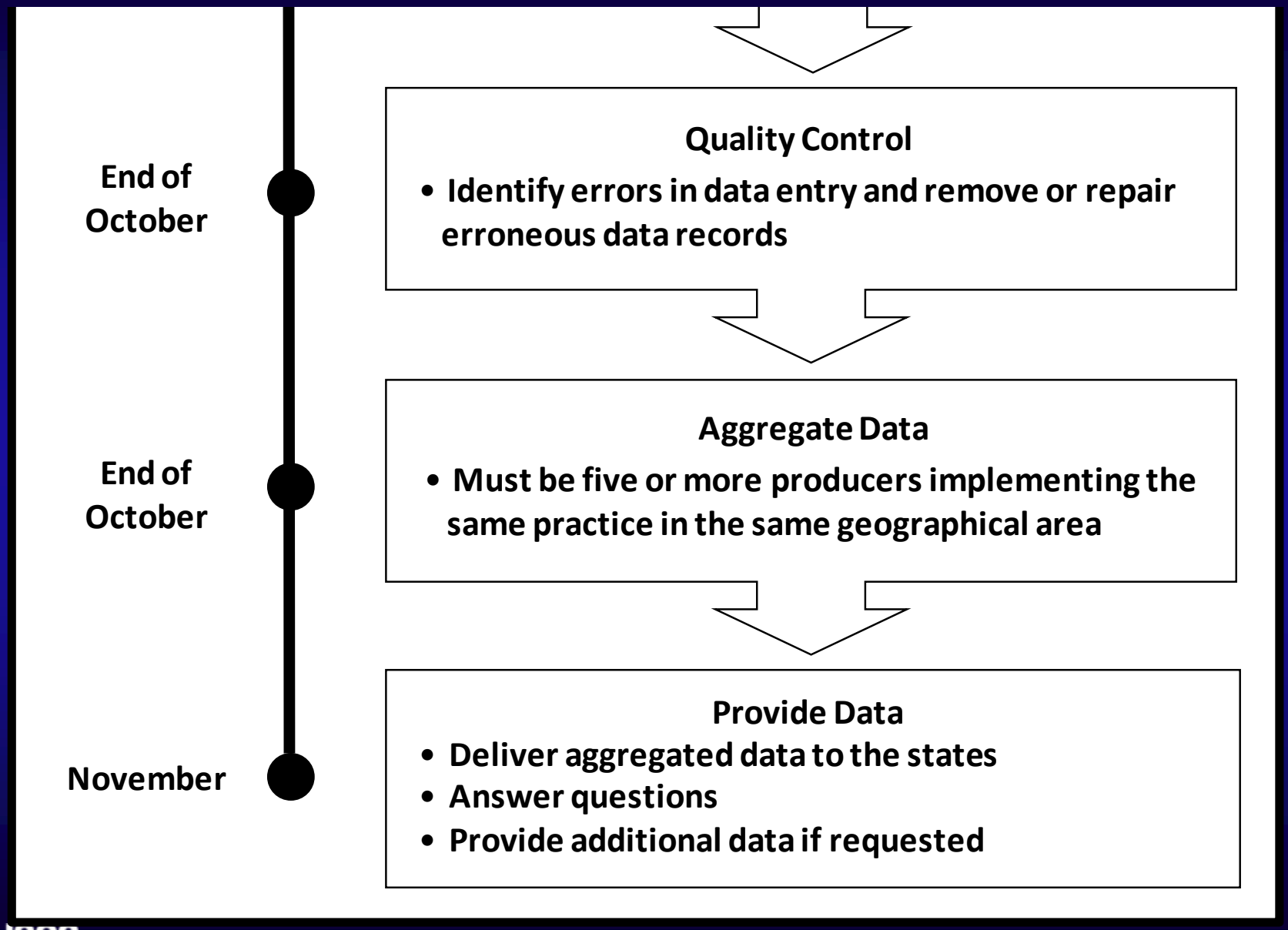
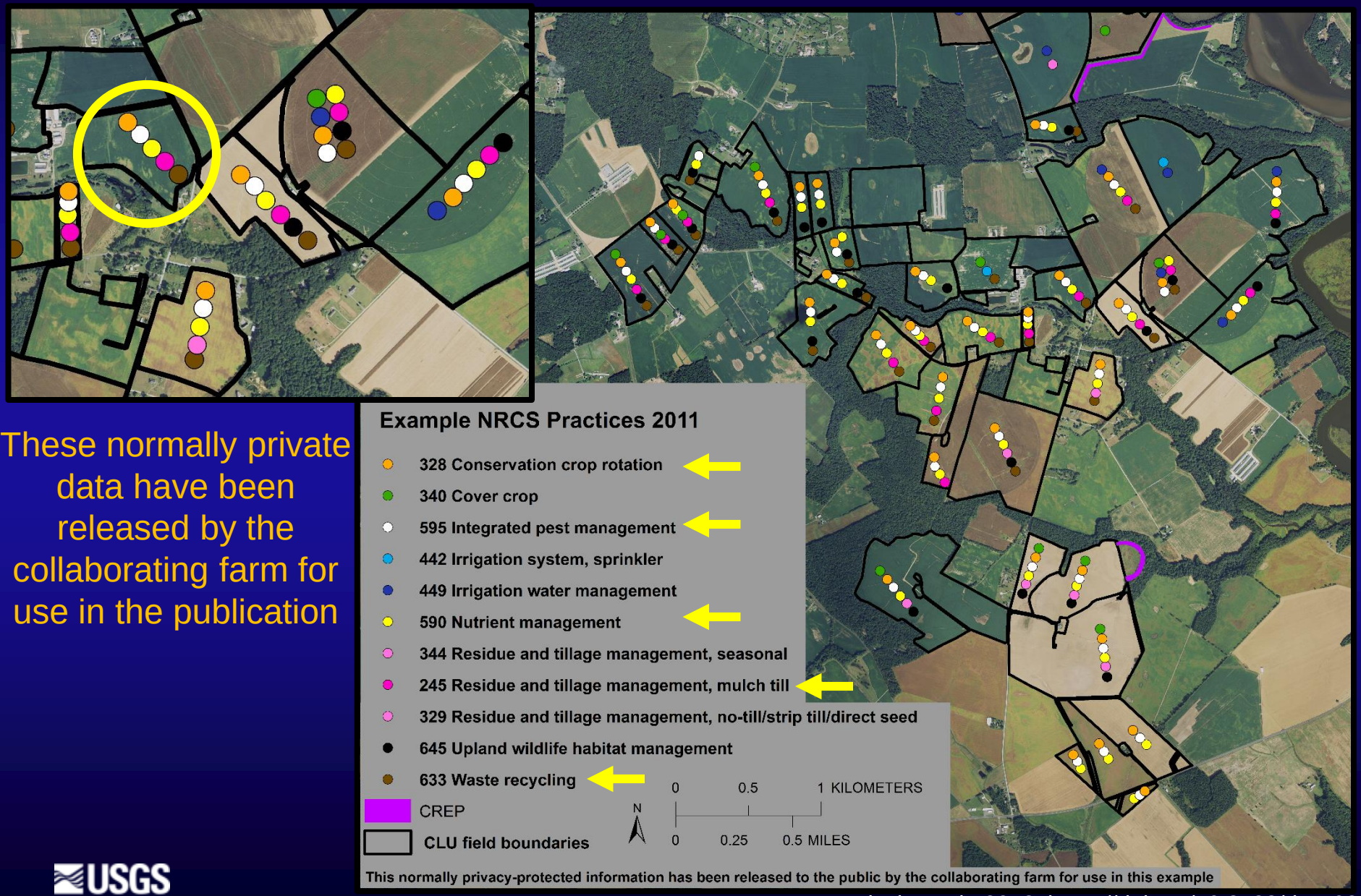


USGS

Hively at al., 2018; https://doi.org/10.3133/ds1102

Site-specific data records (private)



These normally private data have been released by the collaborating farm for use in the publication

USGS

Hively at al., 2018; https://doi.org/10.3133/ds1102

Data aggregation

- USDA has approved our aggregation methods
  - If five or more farmers participate in a specific practice within an aggregation unit, the data can be made public
  - Data drops out when using smaller aggregation units

Table 2. Number of reported practices and percent of total recorded practices associated with each aggregation scale (HUC-8, county, HUC-12), according to source of support (U.S. Department of Agriculture-funded practices versus conservation technical assistance [CTA]).

Source	All records	HUC-8 aggregaton		County aggregation		HUC-12 aggregation	
	Number	Number	Percent	Number	Percent	Number	Percent
Funded	348,855	321,116	92.0	310,411	89.0	255,066	73.1
CTA	494,132	476,235	96.4	469,788	95.1	412,920	83.6
Total	842,987	797,351	94.6	780,199	92.6	667,986	79.2

  - 59% of the dataset is conservation technical assistance

USGS

Hively at al., 2018; https://doi.org/10.3133/ds1102

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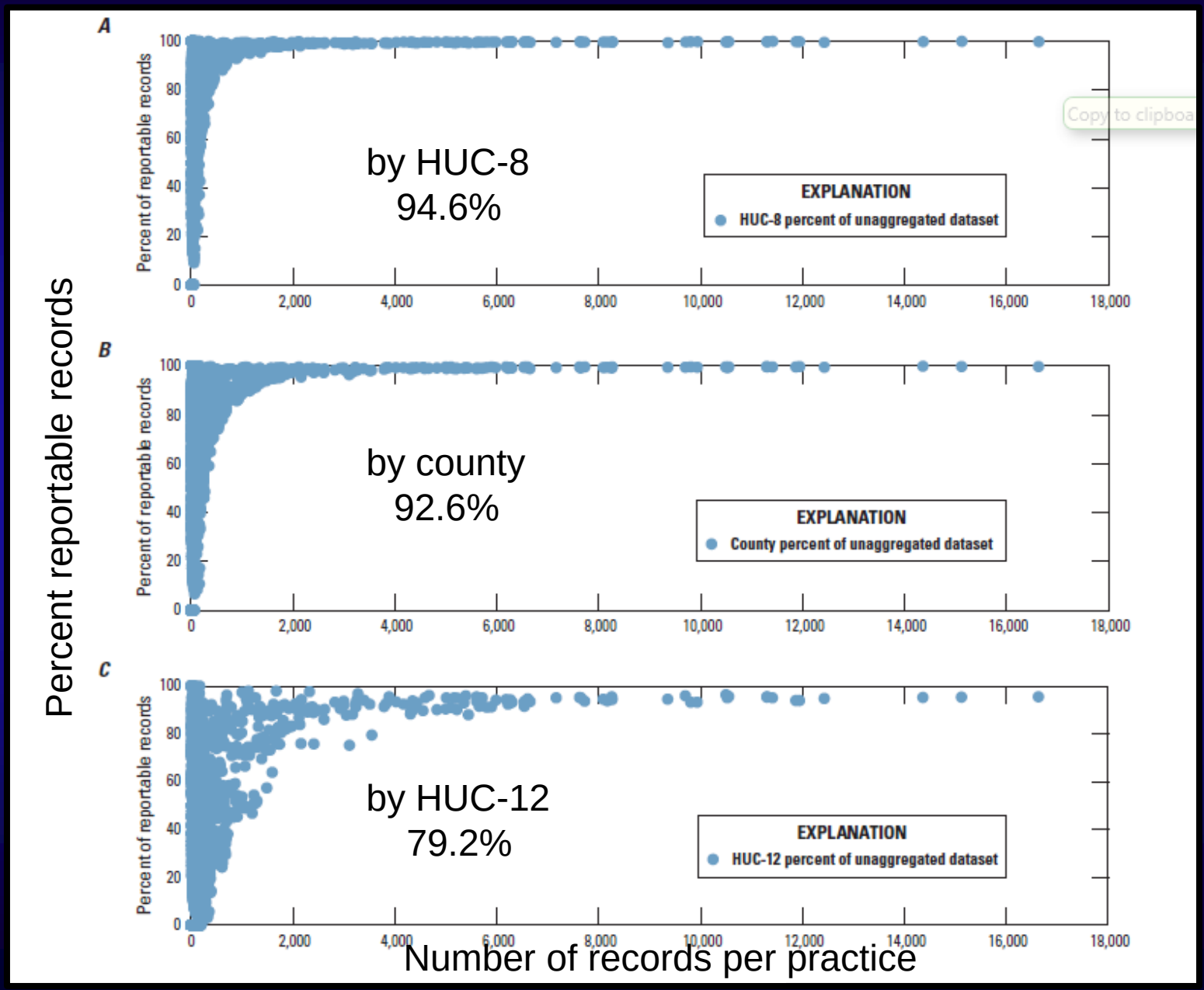
Data aggregation



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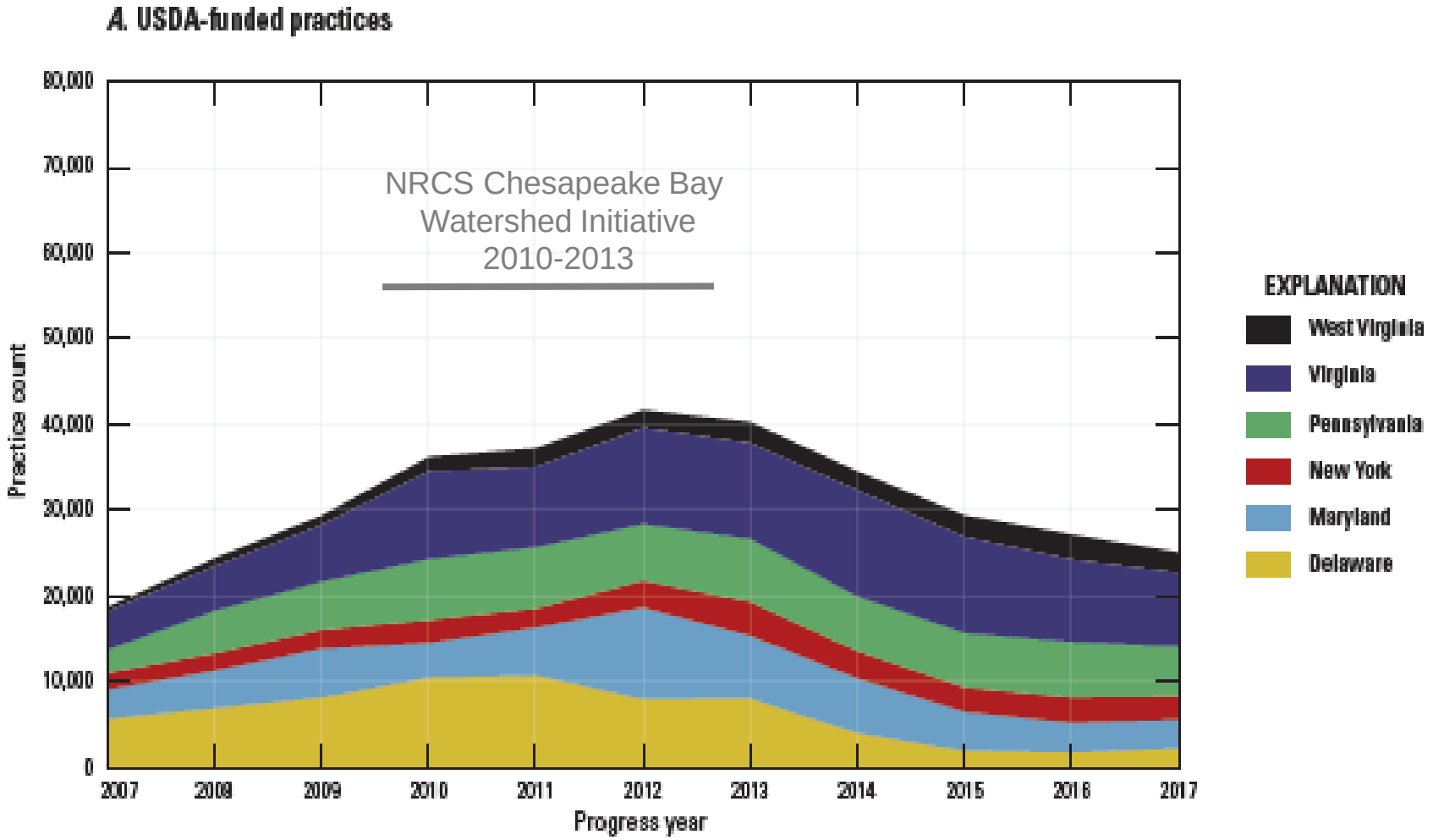
Data aggregation

- We are publishing the data aggregated by county and by HUC-8 watershed
- Aggregation to smaller scales is also available upon request, including HUC-12, Chesapeake Bay model segments, and USGS non-tidal network watersheds, rim stations, etc…
- For USGS scientists, point data are also available
- USGS scientists, for highest accuracy in small watersheds, can obtain a privacy-protected summation of implementation totals by watershed of interest

Trends in annual implementation

- **Total number of new practices per year – funded practices**

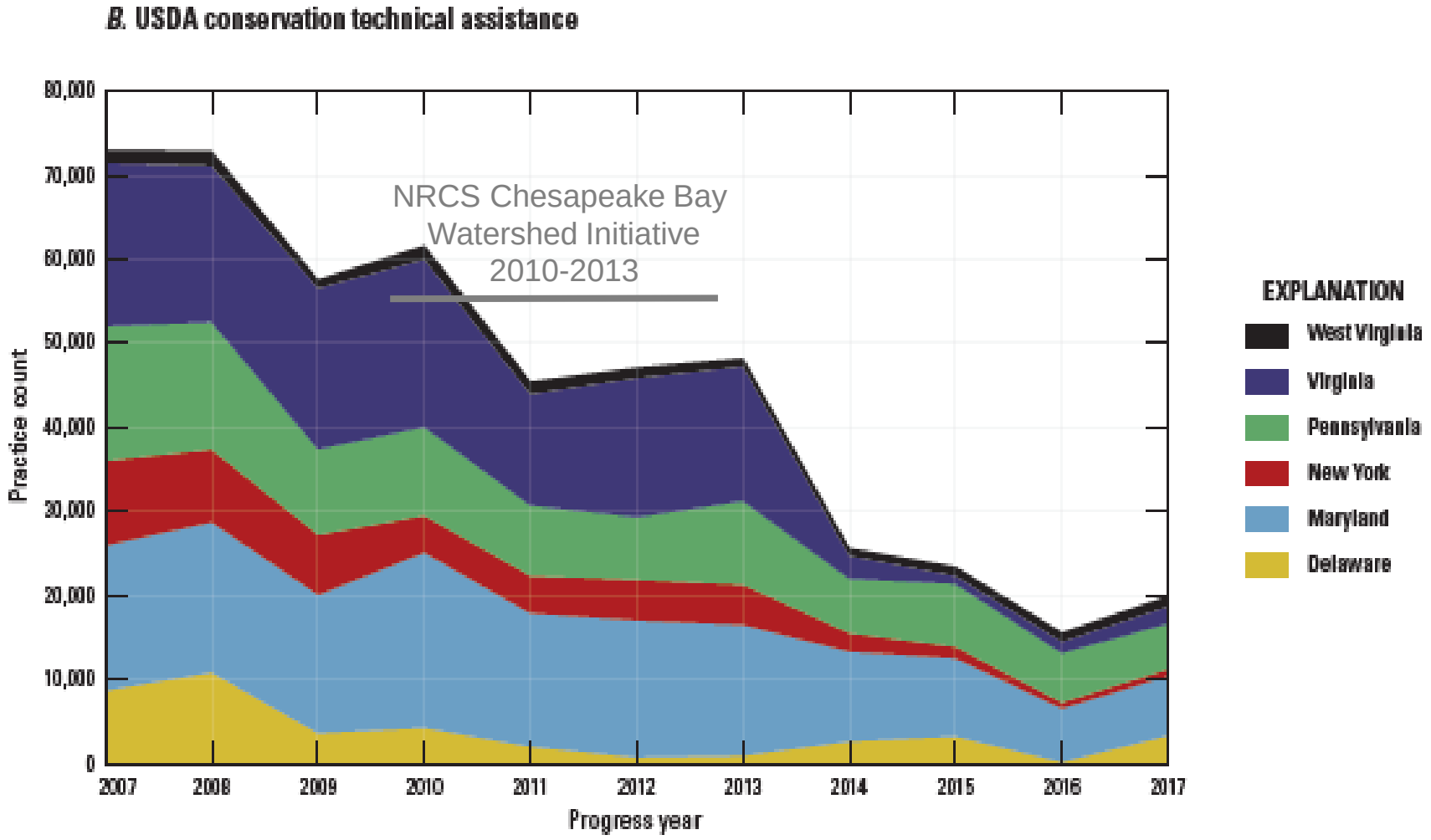


USGS

Hively at al., 2018; https://doi.org/10.3133/ds1102

Trends in annual implementation

- **Total number of new practices per year - CTA**

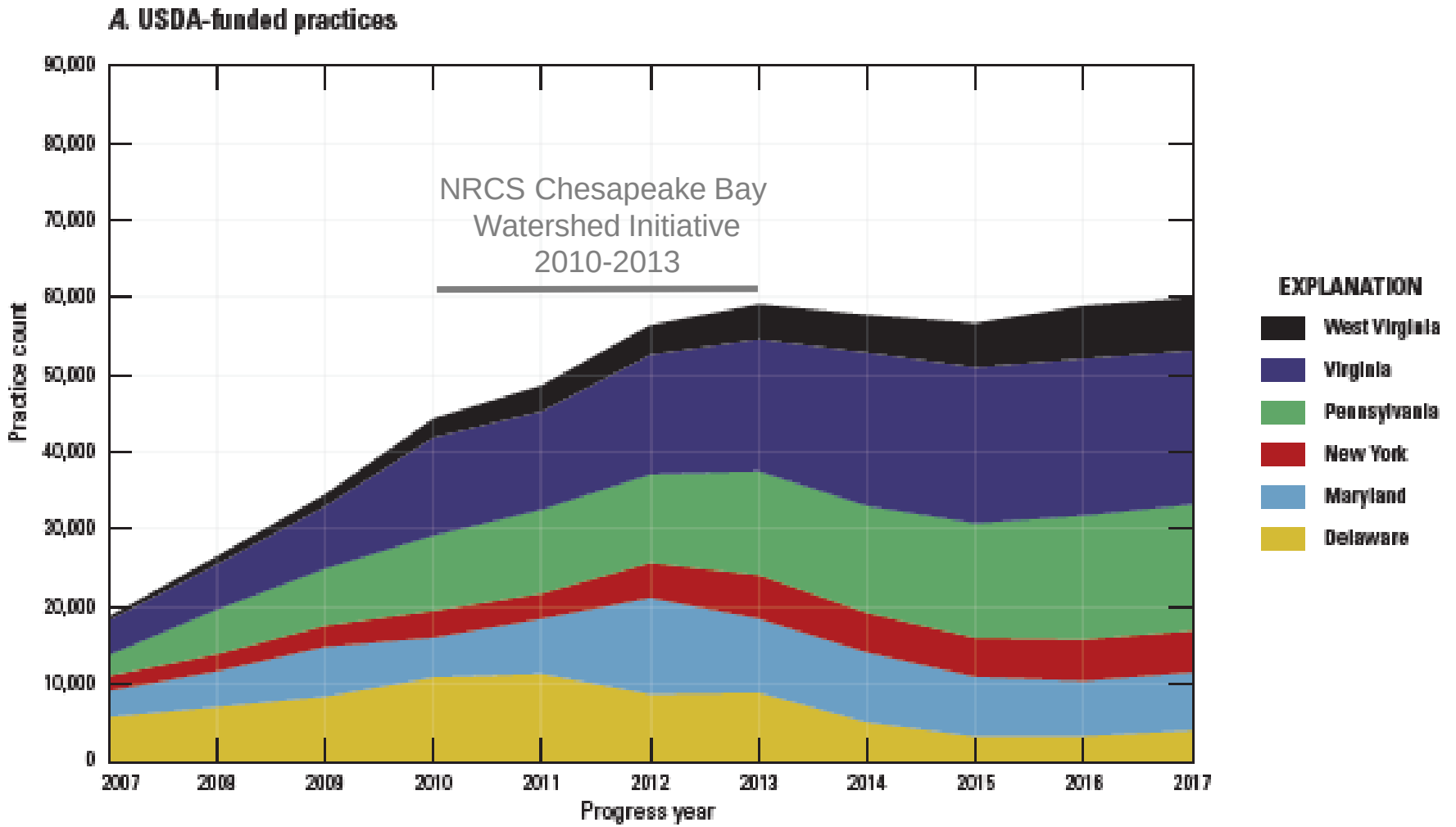


USGS

Hively at al., 2018; https://doi.org/10.3133/ds1102

Trends in accumulated practices

- **Everything that has not exceeded its lifespan – funded**



USGS

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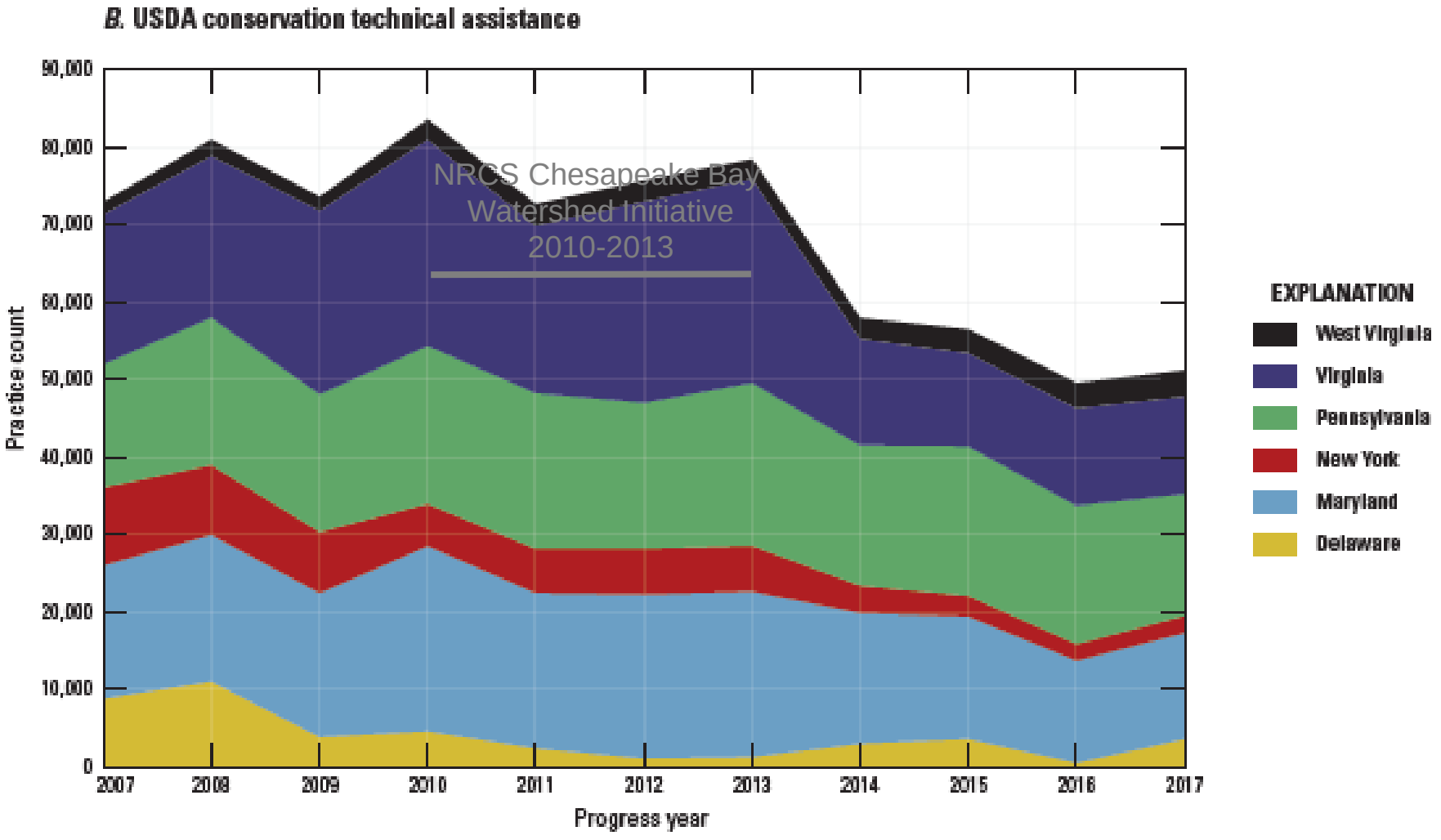
- **Everything that has not exceeded its lifespan - CTA**



USGS

Hively at al., 2018; https://doi.org/10.3133/ds1102

Jurisdictional data use

- Aggregated data are released to the public
- Transmitted each November 1st to the state jurisdictions within Chesapeake Bay (DE, MD, NY, PA, VA, WV)
- Used to report USDA-supported conservation practices to the Annual Progress Review (DE, PA, VA, WV)
- Used as quality control for jurisdictional datasets (MD, NY)
- As it is becoming increasingly difficult for the state agencies to form Conservation Cooperator agreements directly with NRCS, the jurisdictions depend on the USGS-aggregated dataset to meet their Annual Progress Review reporting requirements

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Applications and data users

- **Hively et al., 2013 – Open File Report describing data handling methods and jurisdictional use of the dataset**

Integrating Federal and State Data Records to Report Progress in Establishing Agricultural Conservation Practices on Chesapeake Bay Farms

By W. Dean Hively, Olivia H. Devereux, and Peter Claggett

Open-File Report 2013–1287

This work led to a national team award for "Outstanding Leadership in Collaborative Problem Solving," given by the U.S. Environmental Protection Agency, Sept 2016.
"For the development of the Chesapeake Bay Basin-wide BMP Verification Framework, bringing transparency and increased public confidence to quantifying pollutant reduction progress."

USGS

Applications and data users

- **Hively et al., 2018 - USGS Data Series**

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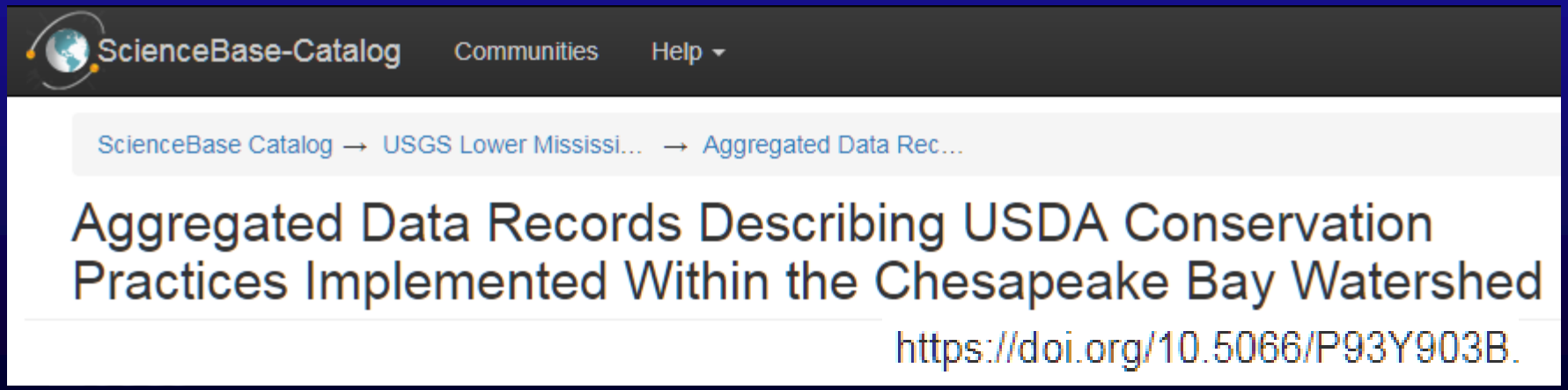
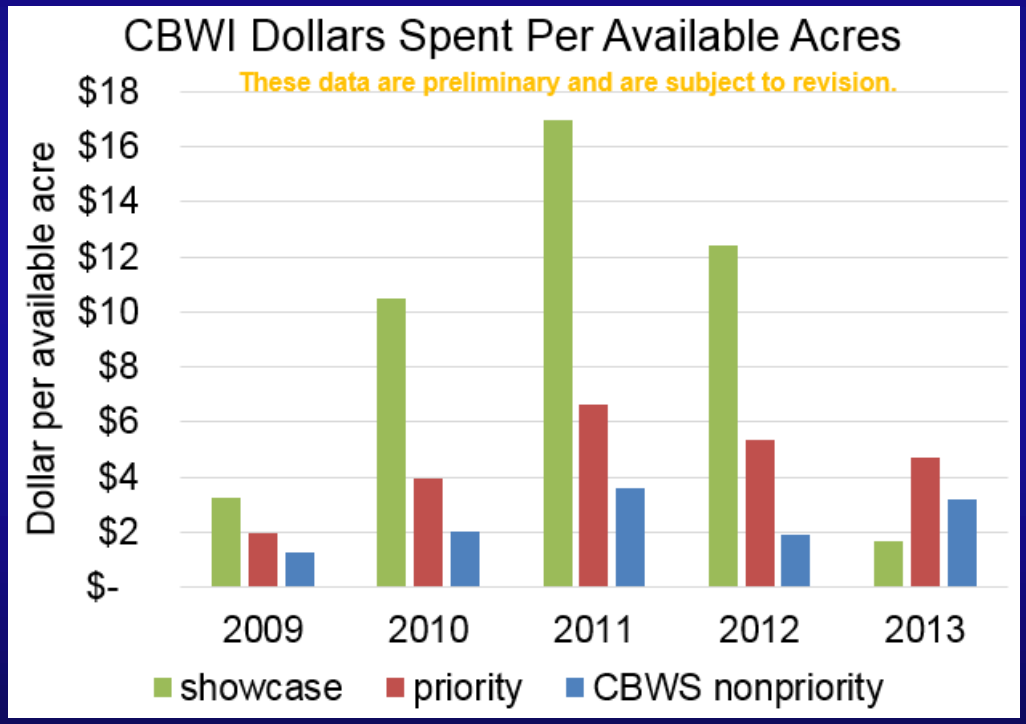


Applications and data users

- **Devereux, 2014 – Analysis of conservation targeting under the NRCS Chesapeake Bay Watershed Initiative (unpublished)**



These data are preliminary and are subject to revision. They are being provided to meet the need for timely 'best science' information.

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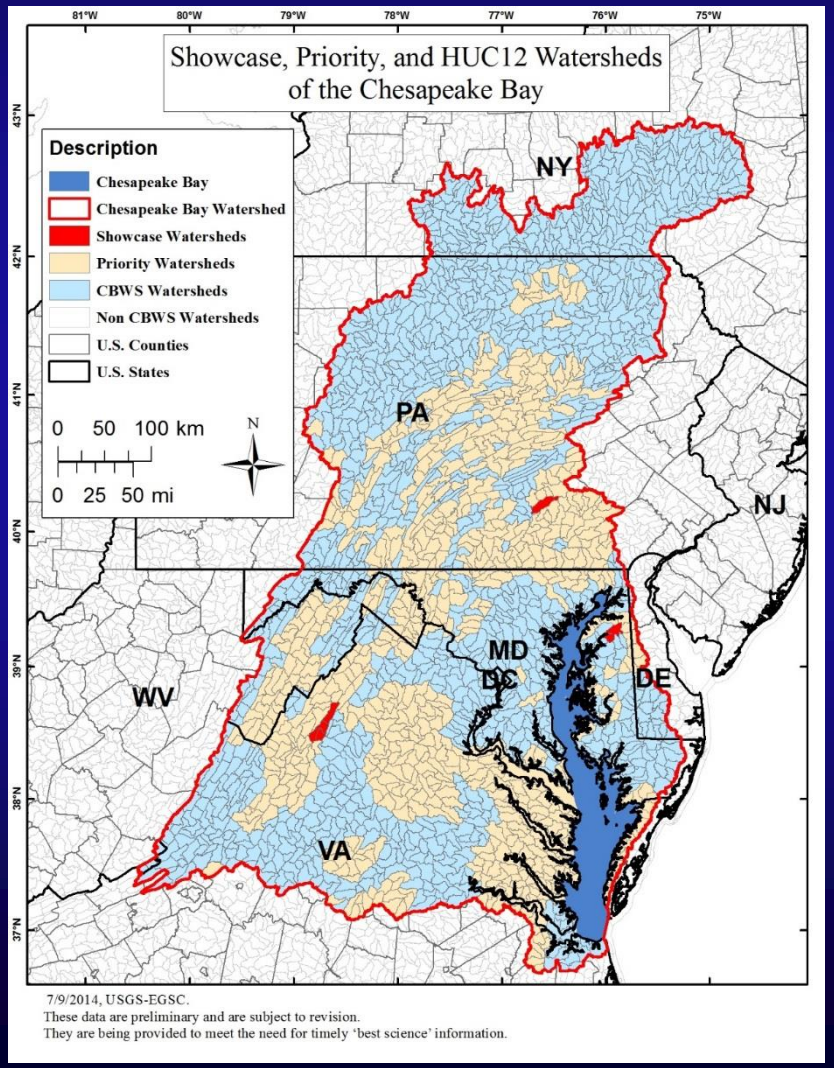
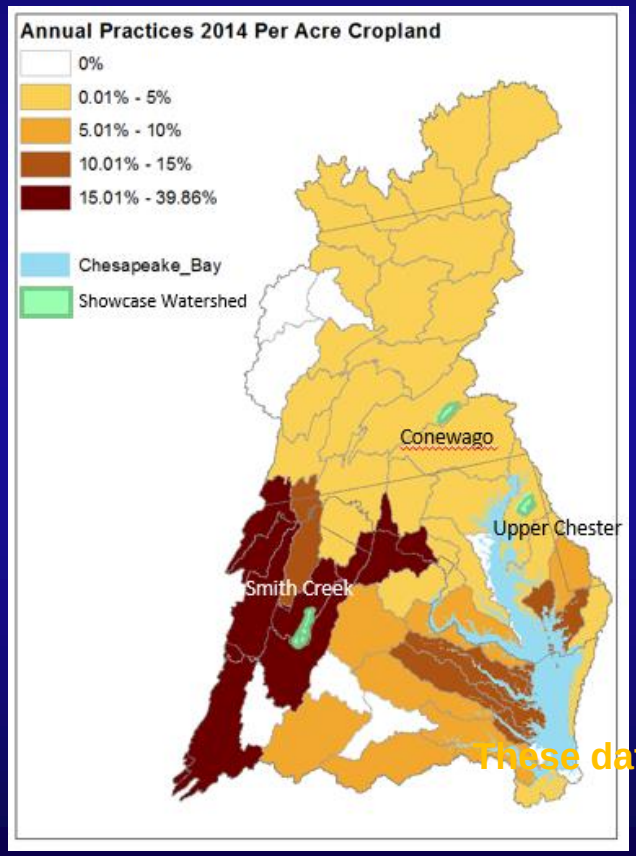
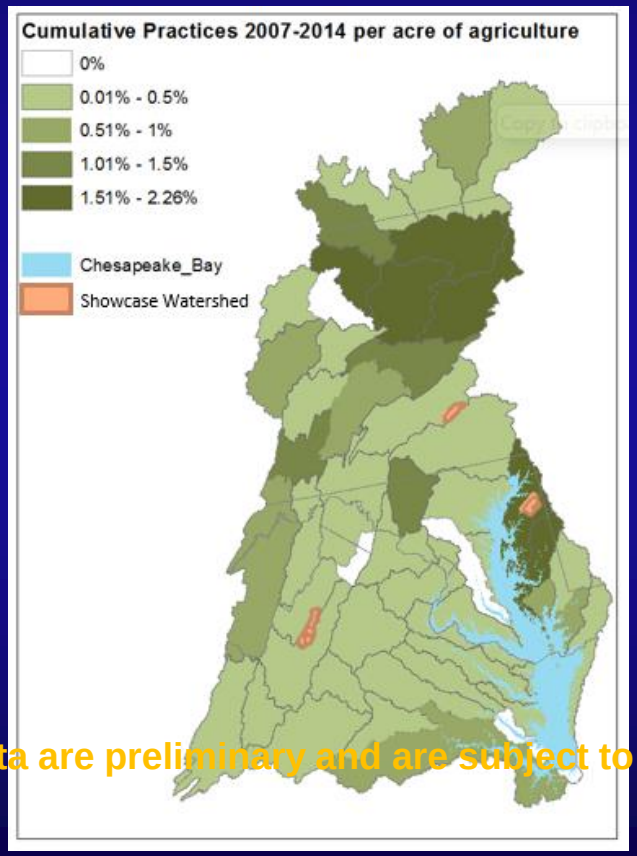
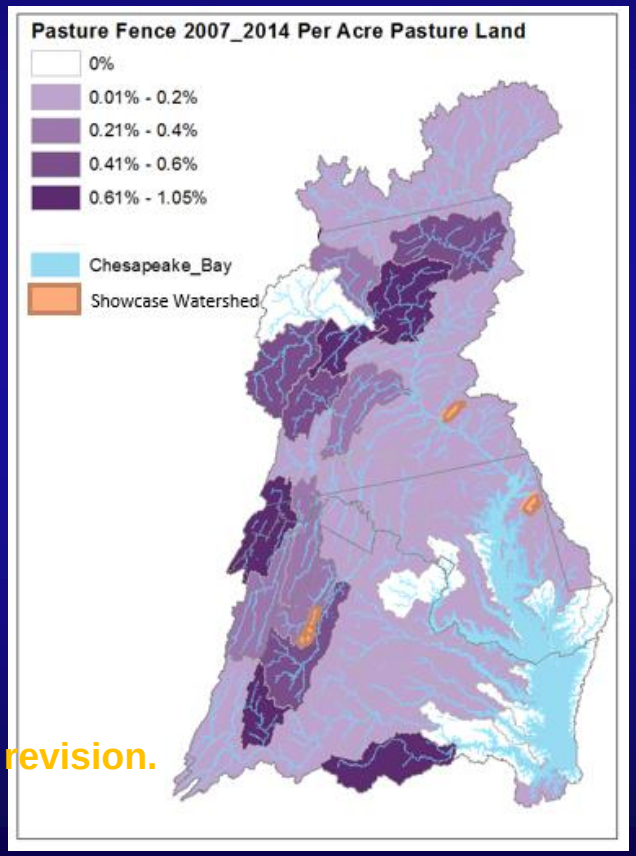


Applications and data users

- **Emma Geise, 2015 – Exploration in mapping funded practices** (unpublished)







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Applications and data users

- **Hyer et al., 2016 – Showcase watersheds baseline report**
  - **Compiled 6-year trends in USDA conservation practice implementation for Conewago, Smith Creek, Corsica**

Table 21. Implementation of USDA-compliant conservation practices within the Upper Chester River watershed for water years 2007 through 2013.

[USDA, U.S. Department of Agriculture; —, values are privacy protected due to fewer than five customers participating; the most frequently implemented practices oriented toward controlling nutrients and sediment are listed in **bold**]

Practice code	Practice name	Lifespan (years)	Units	2007	2008	2009	2010	2011	2012	2013	Aggregate implementation: 2007 to 2013[1]
[2]340	**Cover Crop**	**1**	**acres**	**1,211**	**732**	**—**	**646**	**2,774**	**2,647**	**—**	8,170
[2]590	**Nutrient Management**	**1**	**acres**	**766**	**—**	**152**	**1,790**	**—**	**685**	**—**	4,125
[2]328	**Conservation Crop Rotation**	**1**	**acres**	**—**	**—**	**—**	**1,936**	**—**	**1,243**	**—**	4,747
[2]595	Integrated Pest Management	1	acres	551	—	—	891	—	—	—	1,746
[2]645	Upland Wildlife Habitat Management	1	acres	412	—	494	—	—	—	—	1,451
[2]329	Residue and Tillage Management, No-Till	1	acres	—	—	—	—	—	663	—	1,839
[3]CP21	Filter Strips	10	acres	19	30	56	69	37	76	127	414

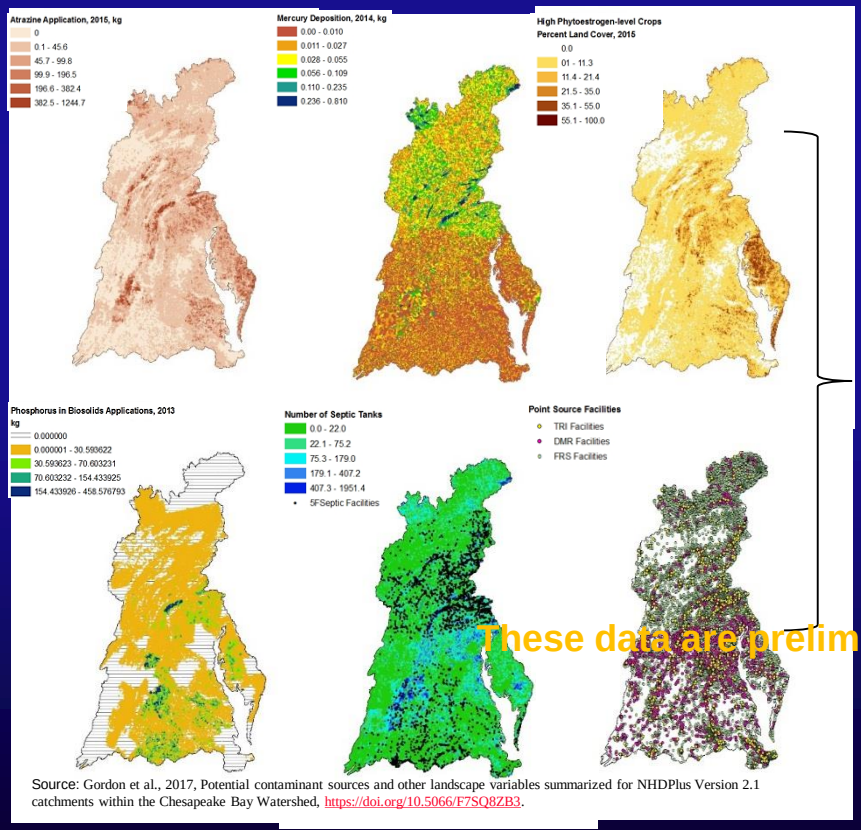
USGS

Scientific Investigations Report 2016-5093
https://doi.org/10.3133/sir20165093

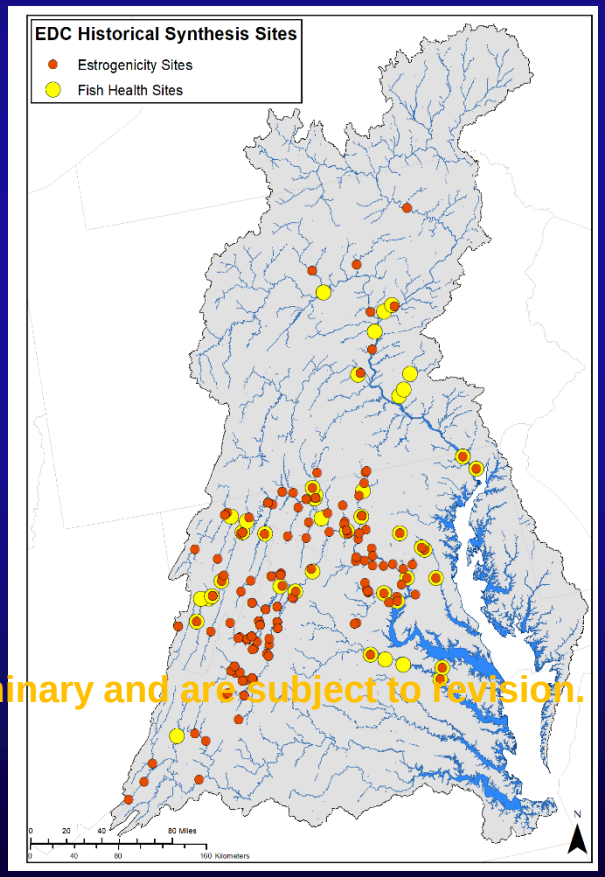
Applications and data users

- **2018 - Fish Health – Endocrine Disrupting Compounds**
  - **Conservation implementation data for immediate and upstream catchments will assist in the local and bay-wide risk analysis**

"A next step in this historical analysis will be to assess relationships between BMP presence, density, and type of conservation practice on biological response in fish at similar scales." - Source: Stephanie Gordon



Source: Gordon et al., 2017, Potential contaminant sources and other landscape variables summarized for NHDPlus Version 2.1 catchments within the Chesapeake Bay Watershed, https://doi.org/10.5066/F7SQ8ZB3.



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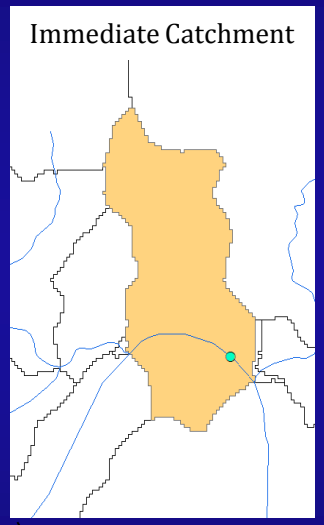

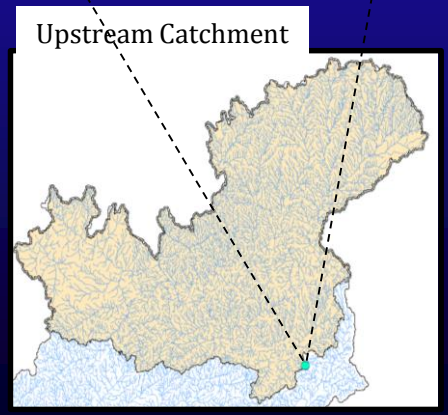

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Examples of known and suspected sources of endocrine disrupting compounds, summarized at the immediate NHDPlus Version 2 scale.

Additional opportunities

- Input for SPAtially Referenced Regression on Watershed attributes (SPARROW) modeling
- Analysis of water quality trends in specific watersheds including non-tidal network
- Possibility of achieving broader scope in the USGS-USDA Conservation Cooperator agreement, to acquire, aggregate, and publish USDA conservation data throughout the U.S.
- We are open to suggestions from the AgWG as to how the data can be best used to explore the links between conservation implementation and water quality outcomes

USGS

Renewal of USGS-USDA Conservation Cooperator Agreement is planned for 2020

How to obtain the data

- **The aggregated datasets (county, HUC-8) are available from the new publication (https://doi.org/10.3133/ds1102) and the associated data release (https://doi.org/10.5066/P93Y903B)**

Click on title to download individual files attached to this item or download all files listed below as a compressed file.

Appendix 2 Record_Counts.csv
"Appendix 2"

Appendix 3a NRCS_County_Funded.csv
"Appendix 3a"

Appendix 3b NRCS_County_CTA.csv
"Appendix 3b"

Appendix 3c NRCS_HUC8_Funded_CBW.csv
"Appendix 3c"

Appendix 3d NRCS_HUC8_CTA_CBW.csv
"Appendix 3d"

Appendix 3e FSA_County.csv
"Appendix 3e"

Aggregated_Data_Records_Describing_USDA_Conservation_Practices_Implemented_Within_the_Chesapeake_B
"Metadata"
Original FGDC Metadata

USGS

How to obtain the data

- Aggregation at other watershed scales, or for specific watersheds such as the non-tidal network, is available upon request
- Site-specific data are available to USGS scientists who sign a data-handling agreement and follow guidelines to maintain data privacy
- For additional information, please contact:

W. Dean Hively, Physical Scientist
USGS Lower Mississippi-Gulf Water Science Center
Email: whively@usgs.gov
Phone: 301-504-9031

With much appreciation to the USGS SPN team for supporting the publication process, including Kent Warren, Kate Jacques, Joseph Battista, and Angela Timms, as well as Heather Welch at LMG.

USGS

Remaining questions

- How much overlap is there between CTA and state-funded practices?
- How might the jurisdictions best integrate USDA datasets with records of state- and privately-funded practices?
- How might the dataset be used to assist verification?

The USGS plans to maintain Conservation Cooperator status, and will provide annual updates of USDA implementation data aggregated to the county and HUC-8 watershed scale

USGS

Thank you!

- W. Dean Hively, whively@usgs.gov, 301-504-9031
- Olivia Devereux, olivia@devereuxconsulting.com
- Jeni Keisman, jkeisman@usgs.gov

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