



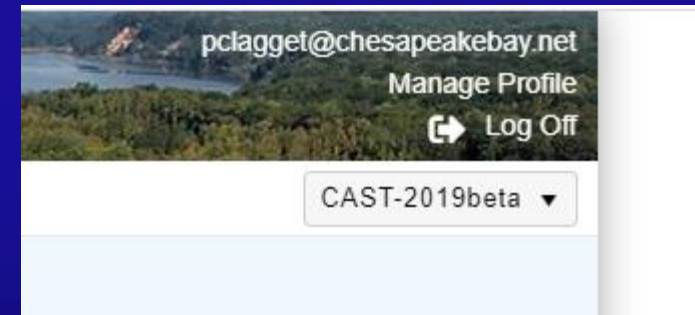
2019 Milestone Land Use, Loads, and New Classification System

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U.S. Geological Survey

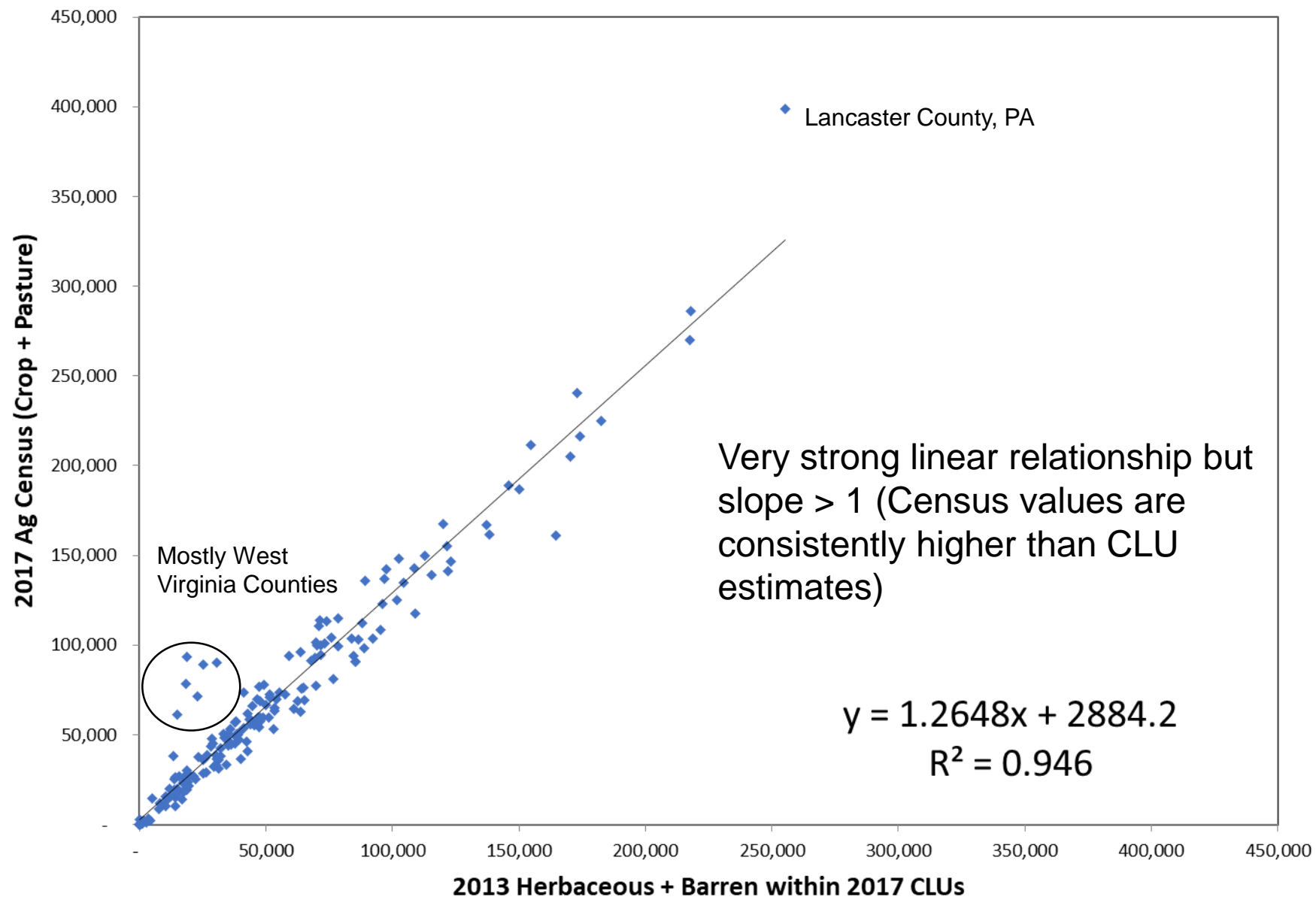
March 4, 2020 (revised March 5th)
Land Use Workgroup

Milestone Status

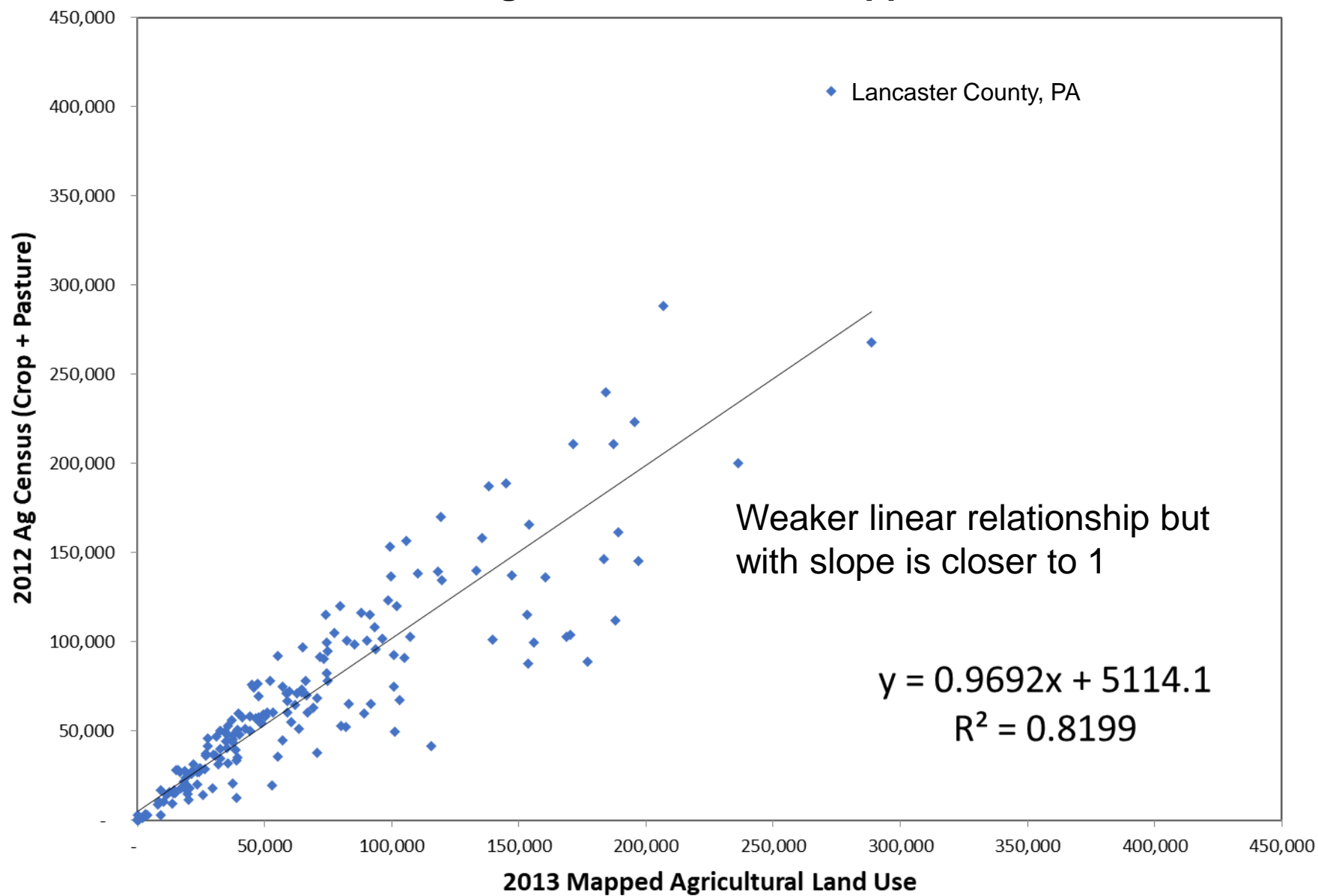
- Agriculture Workgroup agreed with use of 2012 Census error rates throughout the forecast period (2013-2025), consistent with calibration.
- 2019 Milestone land use now in CAST
 - Version CAST-2017d: used for 2017 WIPs
 - Version CAST-2019beta: used for 2019 Milestones



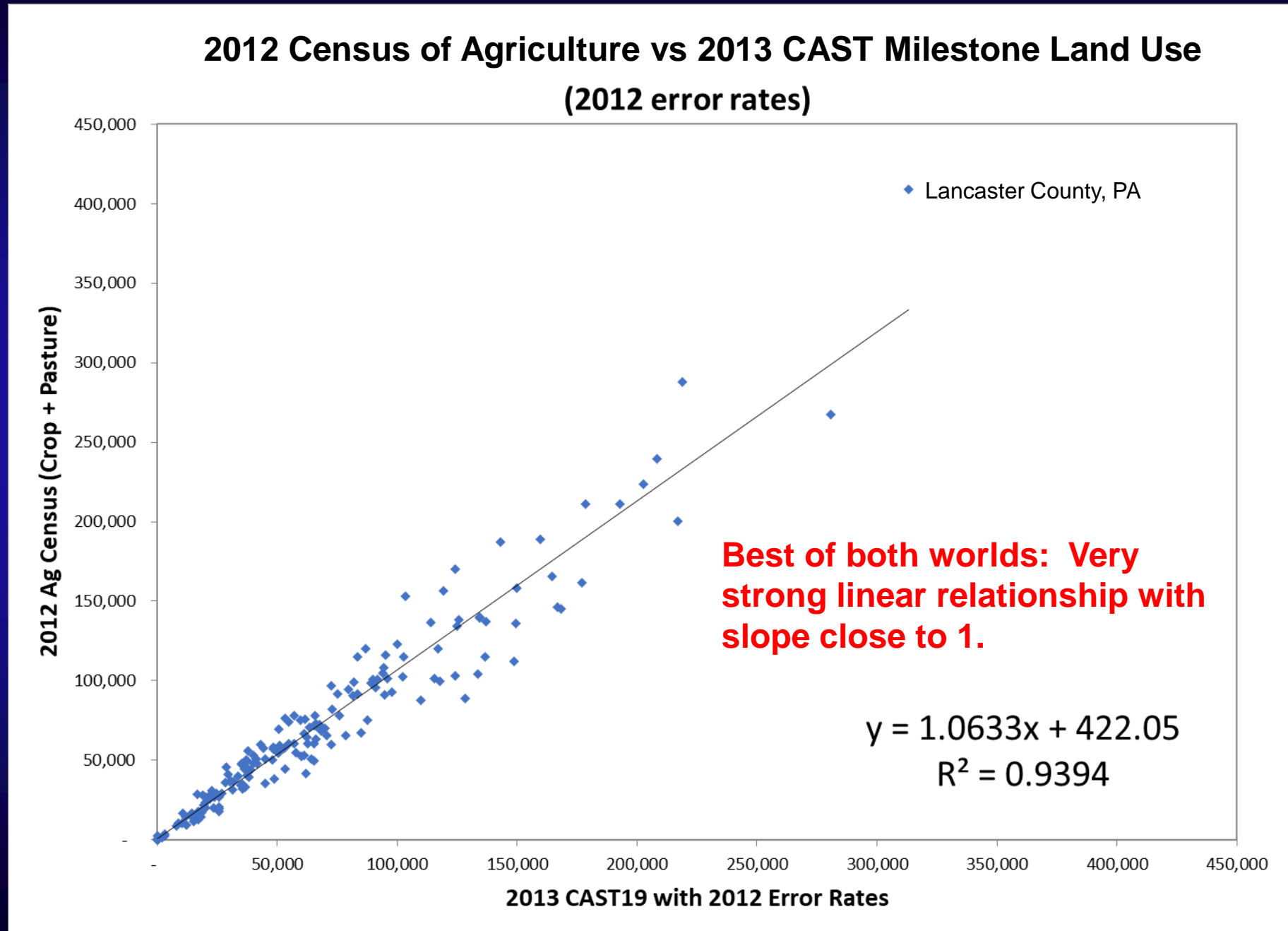
Census vs CLUs



2012 Census of Agriculture vs 2013 Mapped Land Use



Balancing the Errors in the Census and Mapped Land Uses (True-up Method)



Generalized Phase 6 Land Use Key

Ag Open Space	Construction	CropLow	CropHigh	PervDev	ImpDev
AOS	CNS	CPL	CPH	PRV	IMP
AOSpace	Regulated Construction	Full Season Soybeans	Double Cropped Land	Non-Regulated Turf Grass	MS4 Tree Canopy over Impervious
	CSS Construction	Other Agronomic Crops	Specialty Crop High	Non-Regulated Tree Canopy over Turf Grass	MS4 Roads
		Small Grains and Grains	Silage with Manure	MS4 Turf Grass	MS4 Buildings and Other
		Specialty Crop Low	Grain without Manure	MS4 Tree Canopy over Turf Grass	CSS Tree Canopy over Impervious
			Grain with Manure	CSS Turf Grass	CSS Roads
			Silage without Manure	CSS Tree Canopy over Turf Grass	CSS Buildings and Other
					Non-Regulated Tree Canopy over Impervious
					Non-Regulated Roads
					Non-Regulated Buildings and Other

FeedSpace	MixedOpen	Natural	Other	Pasture	Septic	Water
FDS	MO	NAT	OTH	PAS	SEPTIC	
Permitted Feeding Space	Mixed Open	True Forest	Stream Bed and Bank	Pasture	Septic	Water
Non-Permitted Feeding Space	CSS Mixed Open	Non-tidal Floodplain Wetland	Shoreline	Other Hay		
		Headwater or Isolated Wetland		Legume Hay		
		Harvested Forest		Riparian Pasture Deposition		
		CSS Forest				

2018 Change in Nitrogen Loads (2017CAST vs 2019CAST)

Jurisdictions	IMP	PRV	CNS	NAT	CPH	CPL	PAS	AOS	FDS	MO	Septic
DC	(589)	206	2,166	(23)	-	-	-	-	-	(52)	-
DE	(1,546)	(31,446)	2,376	(5,635)	(939,085)	1,221,768	(13,811)	(4,849)	51,418	(4,937)	4,757
MD	29,875	33,982	4,759	(7,491)	(1,229,667)	2,079,549	(383,579)	50,914	88,784	(35,356)	(11,470)
NY	37,534	34,996	12,629	52,156	(37,720)	55,005	(111,818)	(25,944)	120,668	(18,576)	12,288
PA	(81,005)	(79,401)	(24,485)	26,349	(489,272)	2,711,389	(746,647)	188,923	(127,794)	(50,115)	(28,270)
VA	43,454	(47,823)	(94)	(21,247)	(917,260)	1,855,472	(363,978)	133,217	767,551	(3,126)	(8,842)
WV	(12,883)	(14,136)	(92)	(16,762)	188,868	182,026	(182,552)	62,010	(18,573)	(3,368)	14,681
Grand Total	14,840	(103,622)	(2,741)	27,347	(3,424,136)	8,105,209	(1,802,385)	404,271	882,054	(115,530)	(16,856)

2018 Change in Land Use (2017CAST vs 2019CAST)

Jurisdictions	ImpDev	PervDev	Construc	Natural	CropHigh	CropLow	Pasture	AOSpace	FeedSpace	MixedOpe	SepticSys
DC	(126)	(52)	238	(24)	-	-	-	-	-	(36)	-
DE	213	(2,509)	135	(9,274)	(40,911)	59,368	(2,297)	(2,117)	-	(2,606)	80
MD	2,534	3,860	440	(6,562)	(71,761)	137,950	(60,746)	19,187	26	(24,929)	(6,240)
NY	4,709	7,513	1,073	70,358	(21,656)	6,389	(33,475)	(14,966)	99	(20,040)	(2,944)
PA	198	1,888	(1,218)	25,095	(58,069)	115,799	(106,658)	60,409	31	(37,481)	(11,237)
VA	4,333	(8,702)	(13)	(34,915)	(65,766)	137,860	(111,101)	80,053	(8)	(1,746)	(8,566)
WV	(1,207)	(1,673)	-	(17,827)	7,726	19,364	(30,577)	26,213	(30)	(1,986)	2,568
Grand Total	10,654	325	655	26,851	(250,437)	476,730	(344,854)	168,779	118	(88,824)	(26,339)

2019CAST has more impervious cover and nitrogen loads from impervious cover compared to 2017CAST

2025 Change in Nitrogen Loads (2017CAST vs 2019CAST)

Jurisdictions	IMP	PRV	CNS	NAT	CPH	CPL	PAS	AOS	FDS	MO	Septic
DC	537	606	123	(65)	-	-	-	-	-	(52)	-
DE	(3,504)	(14,437)	11,429	(5,792)	(829,720)	1,087,270	(12,334)	(4,441)	60,325	(4,023)	(6,760)
MD	33,902	59,612	18,768	9,606	(1,481,593)	1,970,041	(429,159)	56,736	40,455	(35,777)	(79,601)
NY	56,430	53,796	13,325	81,583	(216,243)	(24,615)	(210,142)	(39,477)	99,897	(23,492)	11,983
PA	(75,495)	(102,299)	8,967	60,421	(380,366)	2,108,272	(841,552)	208,552	(126,637)	(36,768)	(77,837)
VA	26,750	35,294	(117)	(23,975)	(973,106)	1,735,832	(405,452)	147,298	791,425	(3,848)	(120,456)
WV	2,015	(17,186)	3,047	(17,940)	153,470	197,096	(201,513)	66,140	(44,691)	(3,544)	20,456
Grand Total	40,635	15,386	55,542	103,838	(3,727,558)	7,073,896	(2,100,152)	434,808	820,774	(107,504)	(252,214)

2025 Change in Land Use (2017CAST vs 2019CAST)

Jurisdictions	ImpDev	PervDev	Construc	Natural	CropHigh	CropLow	Pasture	AOSpace	FeedSpace	MixedOpe	SepticSys
DC	55	42	9	(69)	-	-	-	-	-	(36)	-
DE	1	(864)	421	(9,218)	(38,668)	54,589	(2,111)	(1,937)	10	(2,224)	(1,020)
MD	3,232	8,141	1,244	8,155	(76,050)	126,217	(66,728)	21,579	(22)	(25,761)	(15,079)
NY	7,043	11,344	1,100	109,381	(27,585)	(1,882)	(51,251)	(23,113)	98	(25,134)	(3,143)
PA	886	(1,747)	236	52,881	(49,312)	84,273	(122,951)	66,001	41	(30,320)	(14,329)
VA	2,663	10,566	-	(38,077)	(69,272)	133,839	(125,105)	88,492	(12)	(3,071)	(16,209)
WV	237	(2,293)	210	(17,967)	6,713	20,392	(33,107)	27,954	(69)	(2,077)	3,803
Grand Total	14,117	25,189	3,220	105,086	(254,174)	417,428	(401,253)	178,976	46	(88,623)	(45,977)

2018 Change in Animals (2017CAST vs 2019CAST)

Jurisdictions	Broilers	Dairy	Hogs	Cattle	Turkeys
DC	-	-	-	-	-
DE	38,650	736	3,905	(154)	2
MD	(93,787)	13,769	5,211	403	(247)
NY	286	50,823	(4,258)	12,416	678
PA	23,764	14,791	35,470	(16,533)	5,762
VA	30,519	9,725	7,147	(4,089)	(1,599)
WV	(31,316)	1,119	384	(3,690)	(15,101)
Grand Total	(31,886)	90,963	47,859	(11,647)	(10,505)

2025 Change in Animals (2017CAST vs 2019CAST)

Jurisdictions	Broilers	Dairy	Hogs	Cattle	Turkeys
DC	-	-	-	-	-
DE	82,979	592	1,469	(193)	4
MD	(176,054)	11,918	-	(352)	(508)
NY	205	51,058	(4,365)	13,218	877
PA	37,242	14,112	40,183	(17,599)	14,875
VA	62,484	8,995	6,978	(4,841)	(4,541)
WV	(64,689)	804	-	(3,927)	(25,246)
Grand Total	(57,832)	87,479	44,265	(13,694)	(14,538)

Proposed New Classification Status

- No additional comments received from LUWG
- Proposed classification will be presented to the WQGIT for comment and then to the Management Board for approval.

IMPORTANT:

- Revised classification will not impact Phase 6 2013 baseline land uses!
- Classification will be applied to revised 2013 land cover and the new 2017 land cover.
- Change across all 58 classes will be assessed and rolled up to current Phase 6 land uses.
- Change in Phase 6 land uses, 2013-2017, will be applied to the current 2013 Phase 6 land use to update it to 2017 conditions.

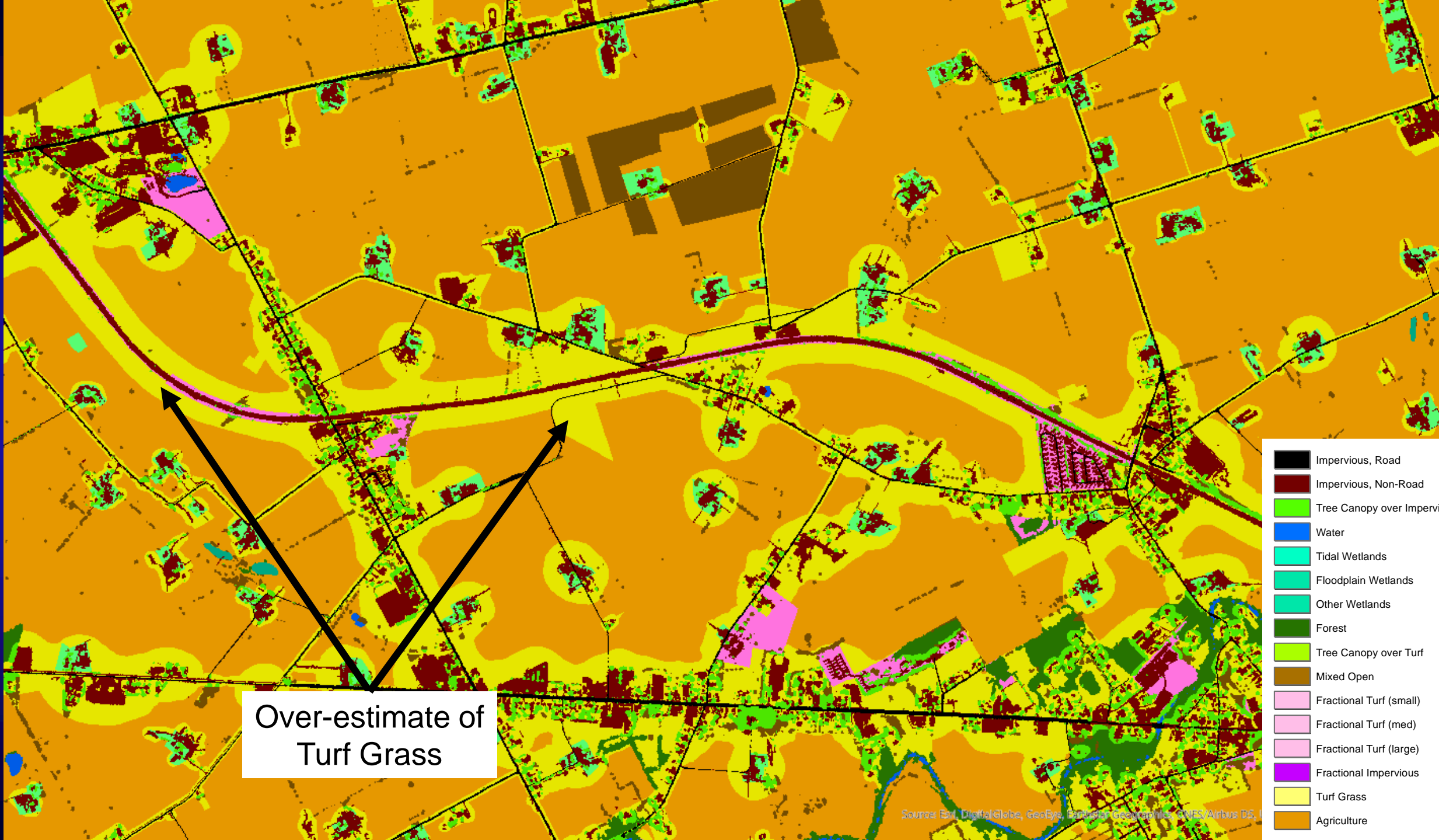
Land Use Decision Rules: Why update and/or revise?

- **Correct errors in current land use**
 - Localized over-estimates of turf grass
 - Localized over-estimates of agriculture
 - Omission of Marcellus shale activities
- **Improve accuracy**
 - Reduce heterogeneity within P6 classes, e.g., mixed open and impervious surfaces
 - Remap tidal and floodplain areas used in wetland classification
- **Improve utility of data**
 - Add forested wetland subclasses
 - Eliminate 1-meter resolution fractional classes
 - Eliminate “burning in” 30-meter Cropland Data Layer and 60-meter extractive data
 - Map early and mid-successional forests
 - Map shaded vs daylighted streams

Frederick County, 340/85 wedge

Over-estimate of
Turf Grass

- 
- This is a detailed land use map of the Frederick County, 340/85 wedge. The map is color-coded to represent various land cover types. A large area of orange is labeled as 'Agriculture'. Darker brown areas represent 'Impervious, Road' and 'Impervious, Non-Road'. Green areas represent 'Tree Canopy over Impervious' and 'Tree Canopy over Turf'. Blue areas represent 'Water'. Cyan areas represent 'Tidal Wetlands', 'Floodplain Wetlands', and 'Other Wetlands'. Brown areas represent 'Forest' and 'Mixed Open'. Pink areas represent 'Fractional Turf (small)', 'Fractional Turf (med)', and 'Fractional Turf (large)'. Purple areas represent 'Fractional Impervious'. Yellow areas represent 'Turf Grass'. Three black arrows point from the 'Over-estimate of Turf Grass' text to specific areas of the map: one points to a large orange area, another points to a small yellow area, and a third points to a small green area.
- Impervious, Road
 - Impervious, Non-Road
 - Tree Canopy over Impervious
 - Water
 - Tidal Wetlands
 - Floodplain Wetlands
 - Other Wetlands
 - Forest
 - Tree Canopy over Turf
 - Mixed Open
 - Fractional Turf (small)
 - Fractional Turf (med)
 - Fractional Turf (large)
 - Fractional Impervious
 - Turf Grass
 - Agriculture



- Impervious, Road
- Impervious, Non-Road
- Tree Canopy over Impervious
- Water
- Tidal Wetlands
- Floodplain Wetlands
- Other Wetlands
- Forest
- Tree Canopy over Turf
- Mixed Open
- Fractional Turf (small)
- Fractional Turf (med)
- Fractional Turf (large)
- Fractional Impervious
- Turf Grass
- Agriculture

Cropland, Pasture, or Successional?



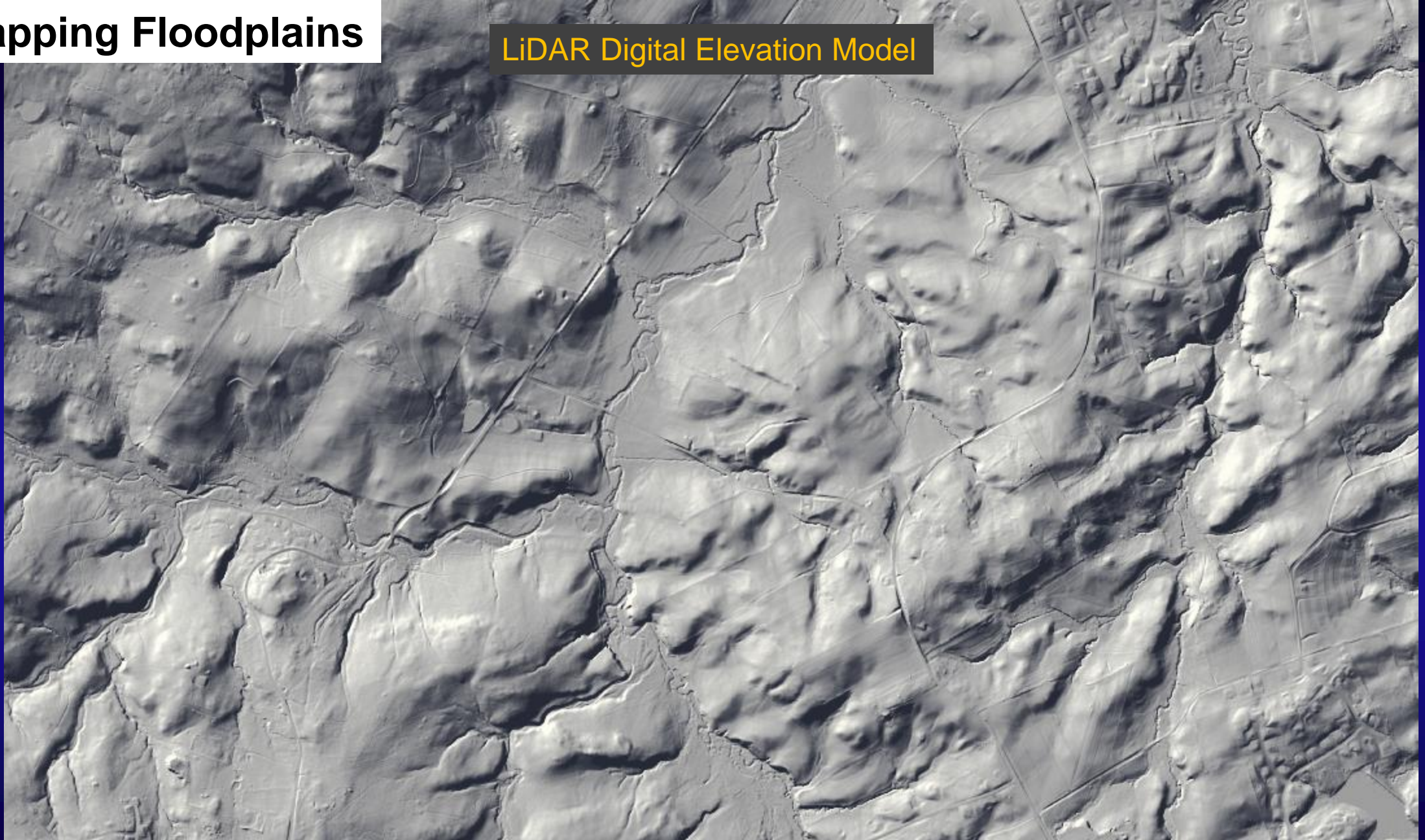
NASS C2017 Cropland Data Layer says:
grassland, pasture, hay, or alfalfa.



Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS

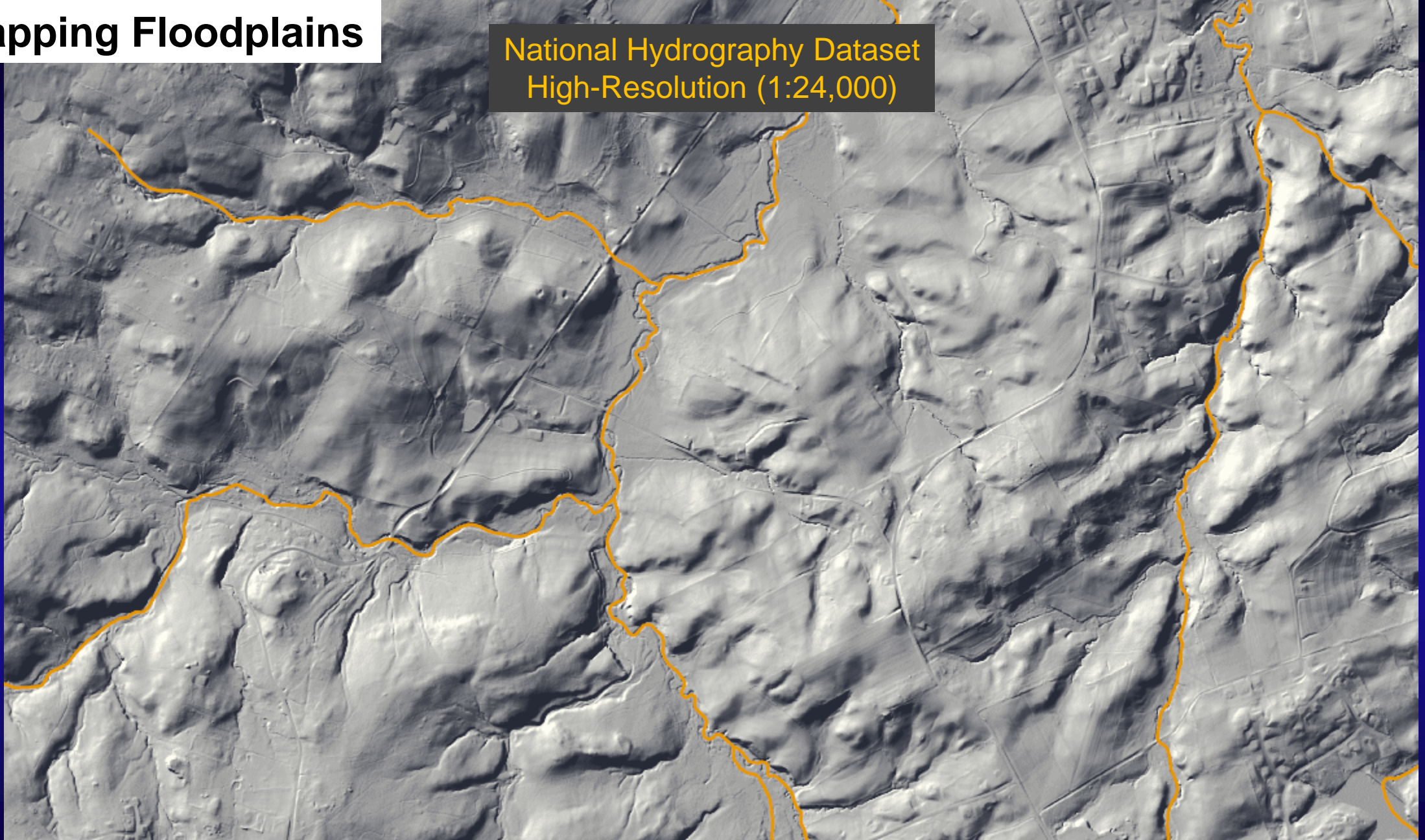
Remapping Floodplains

LiDAR Digital Elevation Model



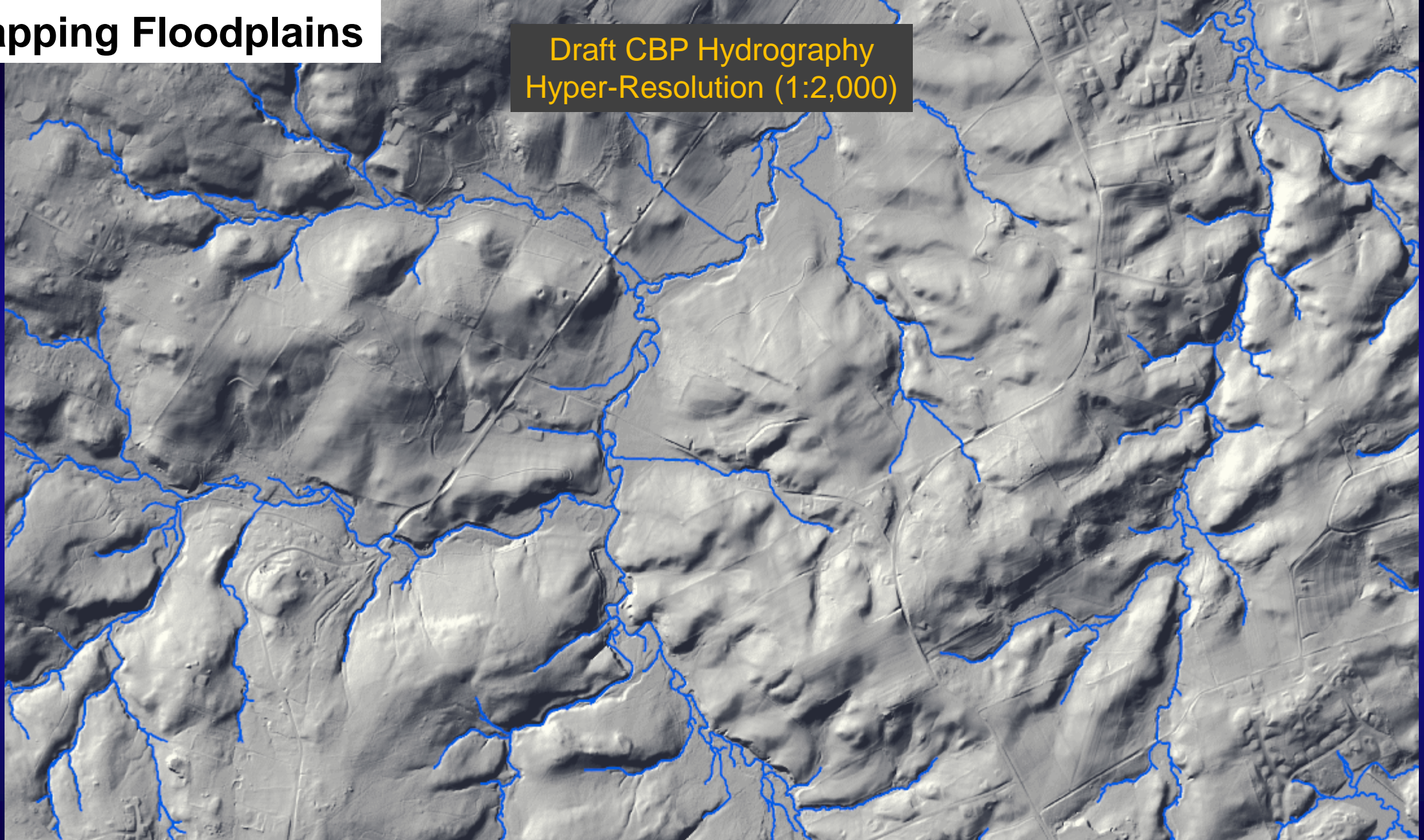
Remapping Floodplains

National Hydrography Dataset
High-Resolution (1:24,000)



Remapping Floodplains

Draft CBP Hydrography
Hyper-Resolution (1:2,000)

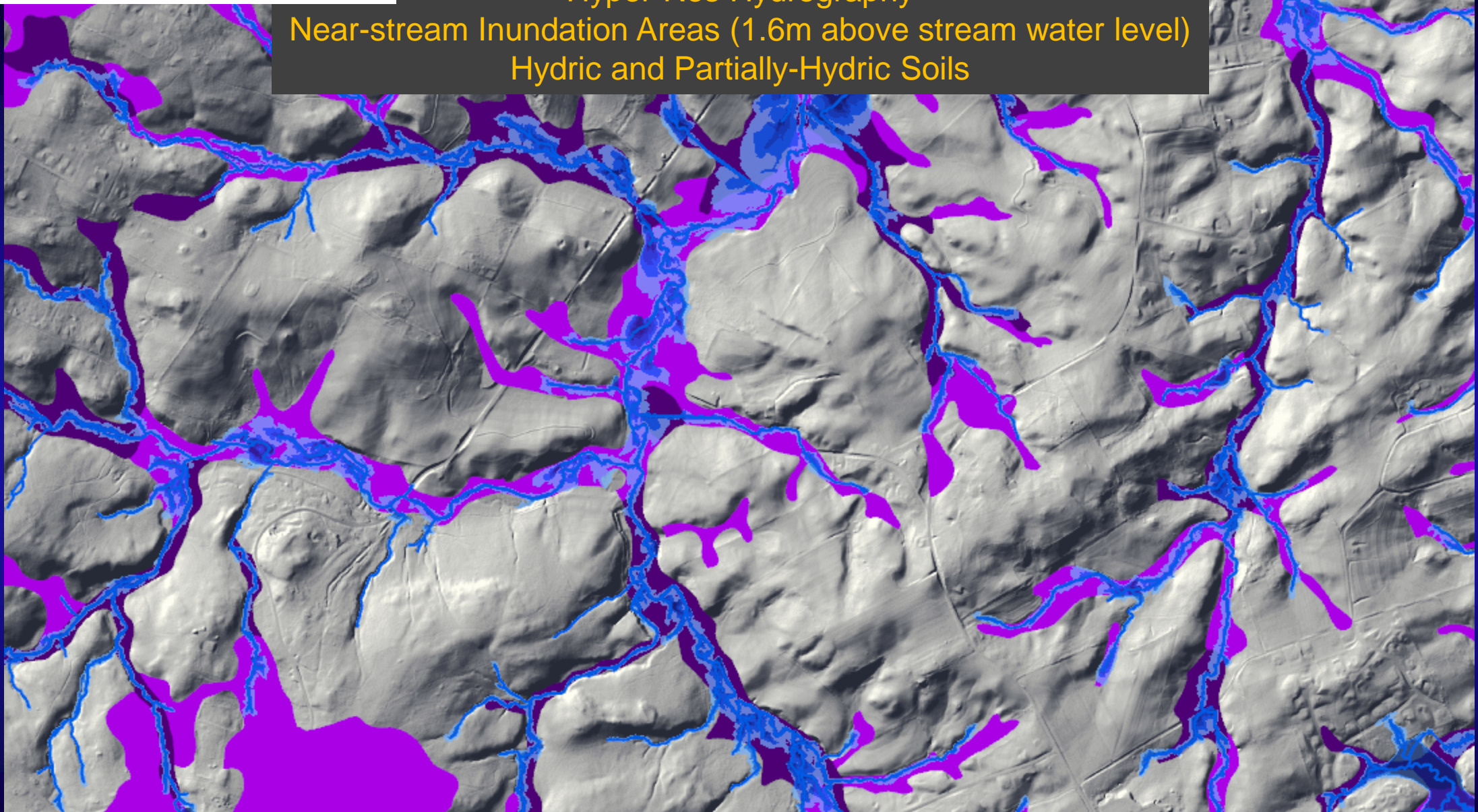


Remapping Floodplains

Hyper-Res Hydrography

Near-stream Inundation Areas (1.6m above stream water level)

Hydric and Partially-Hydric Soils



Proposed Final CBP Land Use Classification

1. Water (7)

1.1 Lotic

- 1.1.1 Estuary
- 1.1.2 Lakes & Ponds

1.2 Lentic

- 1.2.1 Streams
 - 1.2.1.1 Daylighted
 - 1.2.1.2 Shaded
 - 1.2.1.3 Buried
- 1.2.2 Ditches
 - 1.2.2.1 Daylighted
 - 1.2.2.2 Shaded

2. Developed (13)

2.1 Infrastructure

- 2.1.1 Roads
- 2.1.2 Railroads
- 2.1.3 Tree Canopy over Roads
- 2.1.4 Structures
- 2.1.5 Tree Canopy over Structures
- 2.1.6 Other Impervious
- 2.1.7 Tree Canopy over Other Impervious
- 2.1.8 Rights-of-ways
 - 2.1.8.1 Barren
 - 2.1.8.2 Herbaceous
 - 2.1.8.3 Scrub-shrub

2.2 Bare Construction

2.3 Turf Grass

2.4 Tree Canopy over Turf Grass

3. Forest (5)

- 3.1 Contiguous (> 1 acre)
- 3.2 Fragmented (< 1 acre)
- 3.3 Natural Succession (e.g., Fallow)
 - 3.3.1 Barren
 - 3.3.2 Herbaceous
 - 3.3.3 Scrub-shrub

4. Production (14)

4.1 Agriculture

- 4.1.1 Cropland
 - 4.1.1.1 Barren
 - 4.1.1.2 Herbaceous
- 4.1.2 Pasture
 - 4.1.2.1 Barren
 - 4.1.2.2 Herbaceous
- 4.1.3 Orchard/vineyard
 - 4.1.3.1 Barren
 - 4.1.3.2 Herbaceous
 - 4.1.3.3 Scrub-shrub

4.2 Timber Harvest (managed succession)

- 4.2.1 Barren
- 4.2.2 Herbaceous
- 4.2.3 Scrub-shrub

4.3 Extractive

- 4.3.1 Barren
- 4.3.2 Herbaceous
- 4.3.3 Scrub-shrub

4.4 Solar fields

5. Wetland (19)

5.1 Tidal

- 5.1.1 Open water
- 5.1.2 Barren
- 5.1.3 Herbaceous
- 5.1.4 Scrub-shrub
- 5.1.5 Contiguous Forest
- 5.1.6 Fragmented Forest

5.2 Non-tidal

- 5.2.1 Floodplain/ Headwater
 - 5.2.1.1 Open water
 - 5.2.1.2 Barren
 - 5.2.1.3 Herbaceous
 - 5.2.1.4 Scrub-shrub
 - 5.2.1.5 Contiguous Forest
 - 5.2.1.6 Fragmented Forest
- 5.2.2 Other
 - 5.2.2.1 Open water
 - 5.2.2.2 Barren
 - 5.2.2.3 Herbaceous
 - 5.2.2.4 Scrub-shrub
 - 5.2.2.5 Contiguous Forest
 - 5.2.2.6 Fragmented Forest

5.3 Bare shore

LUWG Role in Reviewing Land-Use Decision Rules

- **CBPO will complete documentation of original Phase 6 land use rules (Chapter 5)**
- **CBPO will:**
 1. **propose changes to previous rules; and**
 2. **propose new rules for new land uses**
- **LUWG will review changes to existing rules and proposed new ones**