Soil P Data and Simulation in the Chesapeake Bay Program Watershed Model

Gary Shenk – Chesapeake Bay Program Office

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Phase 6 Model Structure

Average Load + ΔInputs * Sensitivity

*

Land Use Acres

*

BMPs

*

Land to Water

*

Stream Delivery

*

River Delivery

Direct Loads

Phase 6

Keep It Simple

Average Load + ΔInputs * Sensitivity

*

Land Use Acres

*

BMPs

*

Land to Water

*

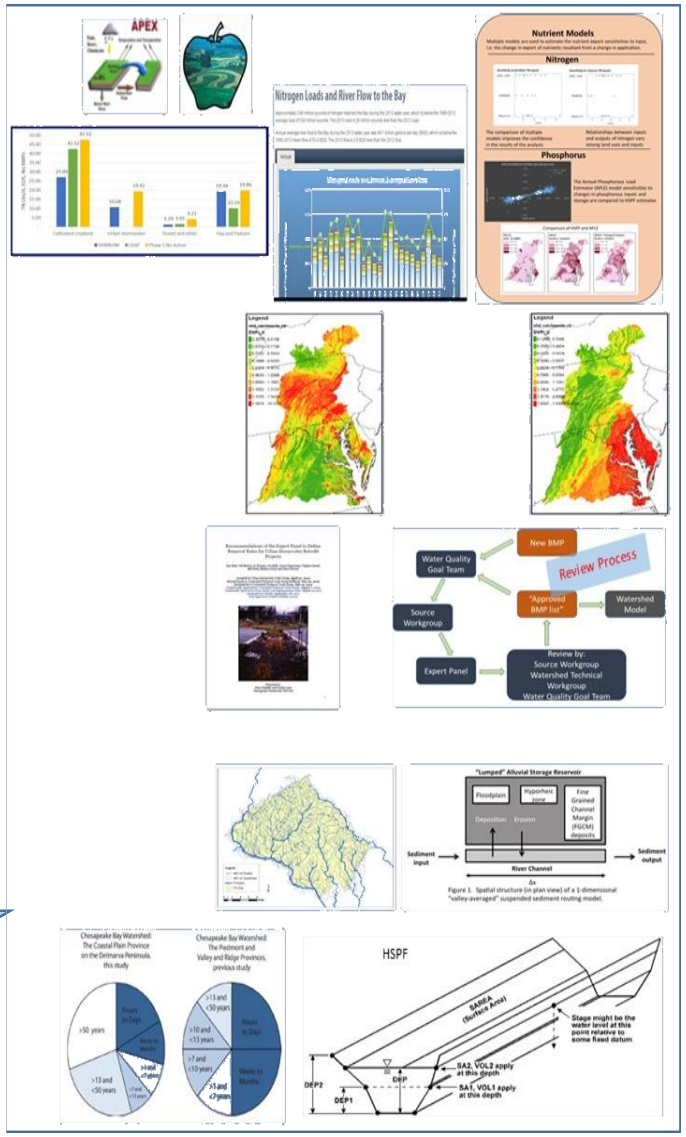
Stream Delivery

*

River Delivery

Direct Loads

Include Everything







Phase 6 Model Structure

Average Load + Δ Inputs * Sensitivity

*

Land Use Acres

*

BMPs

*

Land to Water

*

Stream Delivery

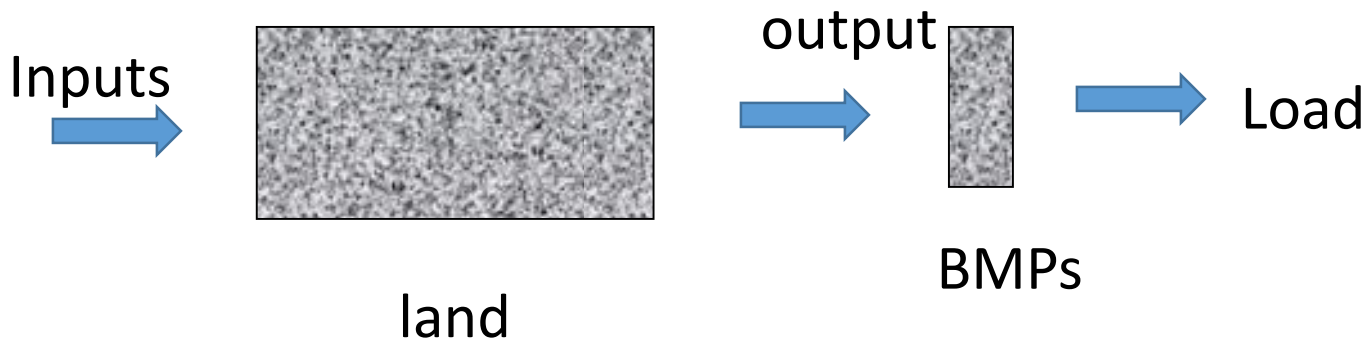
*

River Delivery

Direct Loads

Phase 6

Nitrogen Conceptual Model

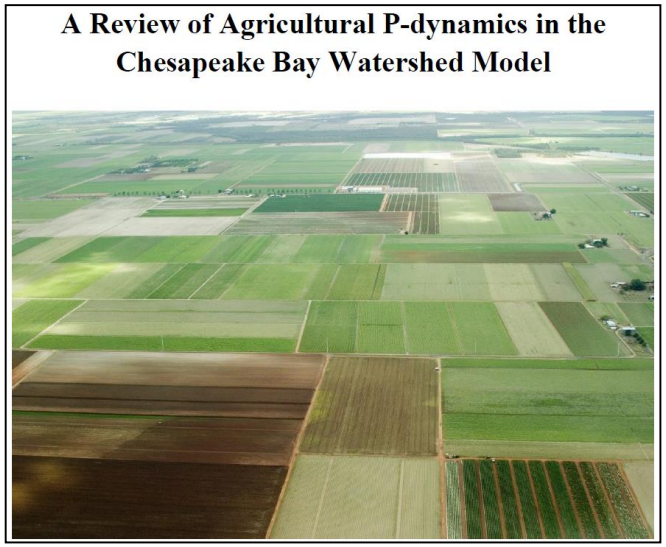


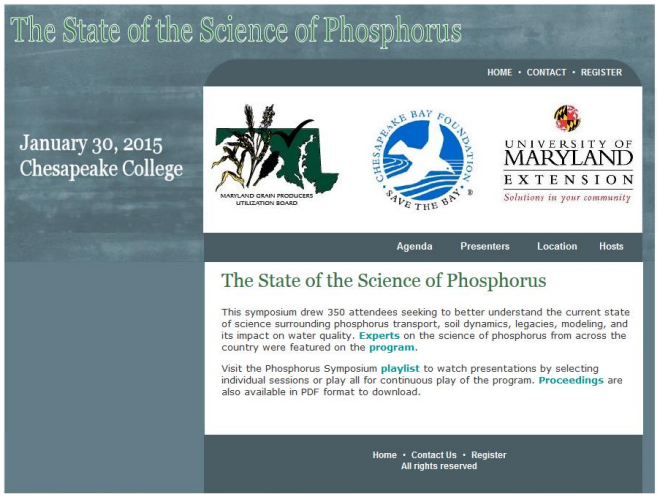
1 lb reduction in fertilizer is about a quarter lb reduction in output

Sensitivity of Phase 5 Hightill with Manure land use

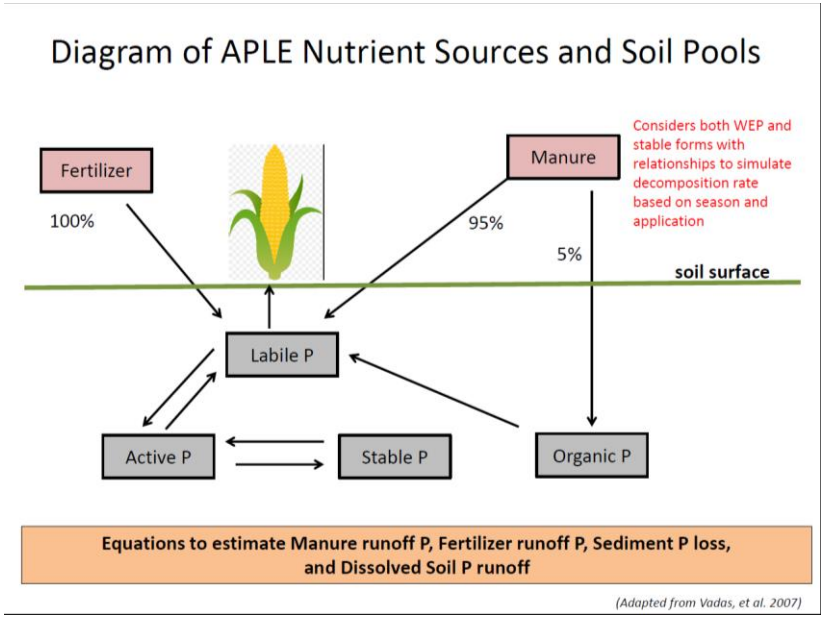
	NH3	NO3	ORGN
Atmospheric Deposition	0.01	0.226	0.083
Fertilizer	0.018	0.19	0.073
Manure	0.005	0.067	0.104
Fixation	0.01	0.19	0.101
Crop Uptake	0	-0.057	0
Vegetative Cover	-0.012	0.012	-0.404

Scientific Direction on Ag

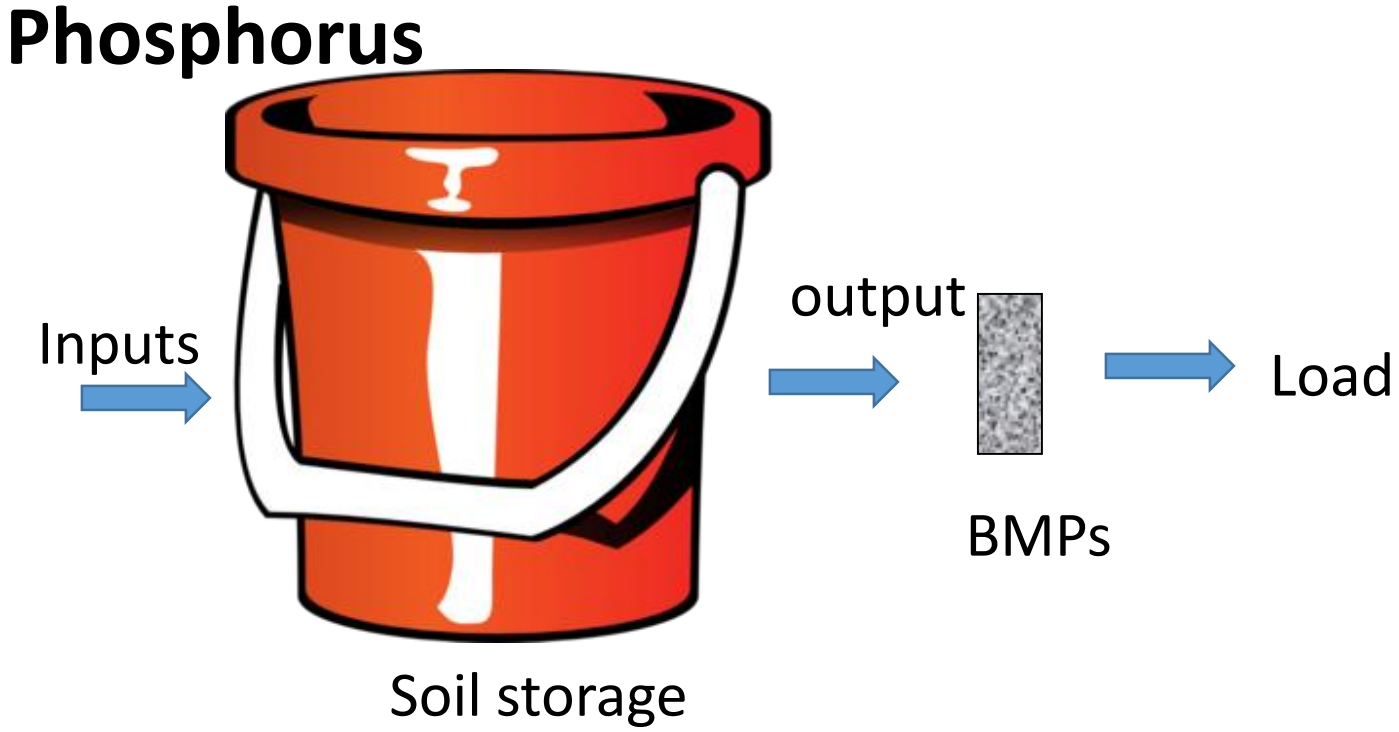




- **Track drawdown and buildup of soil P reservoirs by segment as a source of P runoff**
- **Get better manure, fertilizer, application method, and soil P data**
- **Account for management (method, timing, tillage, etc)**



Phosphorus Conceptual Model



APLE Landuse Sensitivities using Constant Mehlich 3 Soil P

Input	Input Unit	Average Slope	Median Slope	Median S_R	Relative Sensitivity
Soil P	ppm	0.017	0.015	0.696	Moderately sensitive
Sediment Washoff	ton/ac	0.181	0.168	0.633	Moderately sensitive
Stormflow	Inches	0.064	0.057	0.403	Moderately sensitive
Water Extractable P	lbs/acre	0.021	0.018	0.187	Slightly sensitive
Manure	lbs/acre	0.008	0.007	0.111	Slightly sensitive
Fertilizer	lbs/acre	0.005	0.004	0.068	Slightly sensitive
Uptake	lbs/acre	0.000	0.000	0.000	Insensitive

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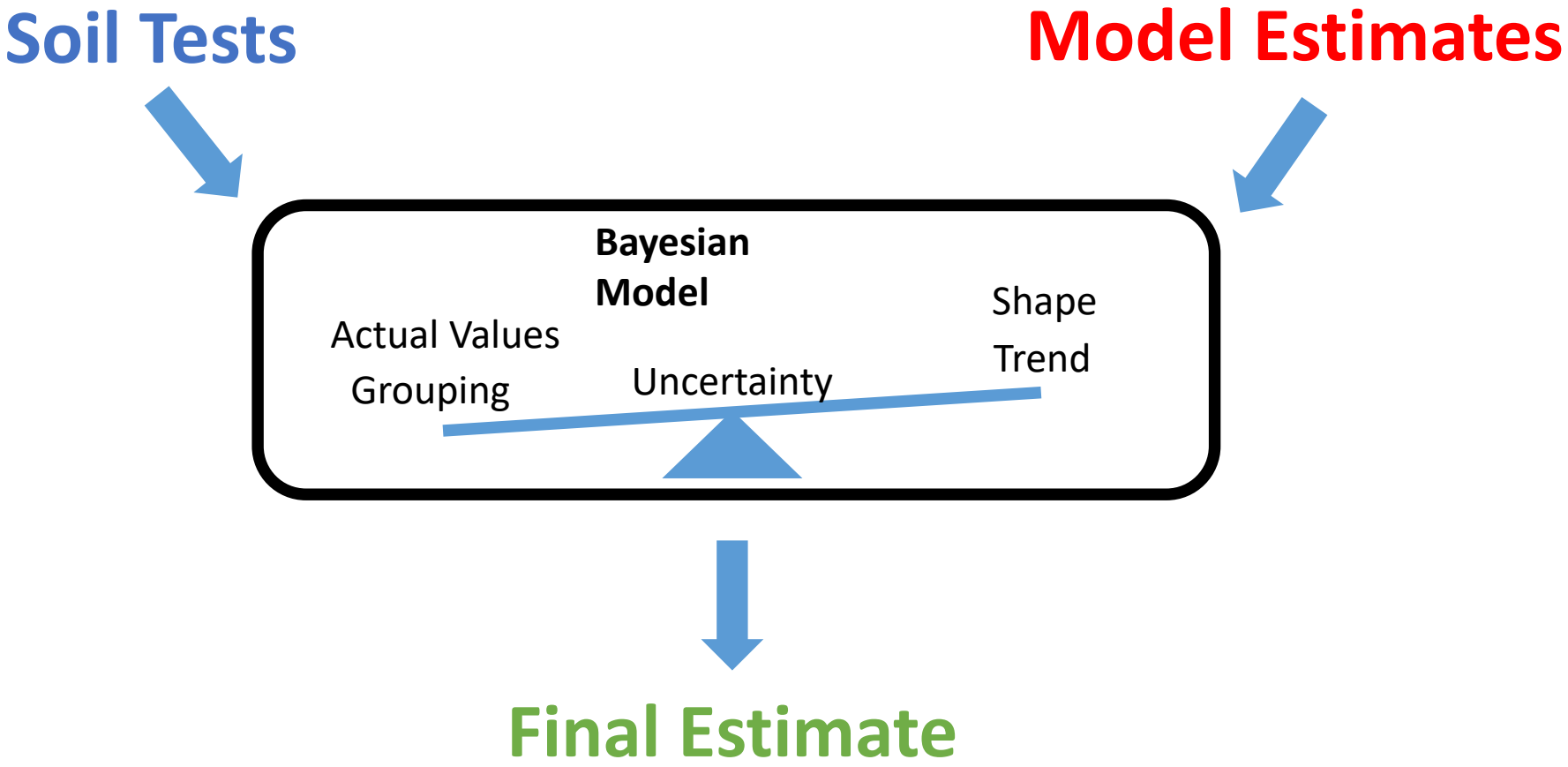
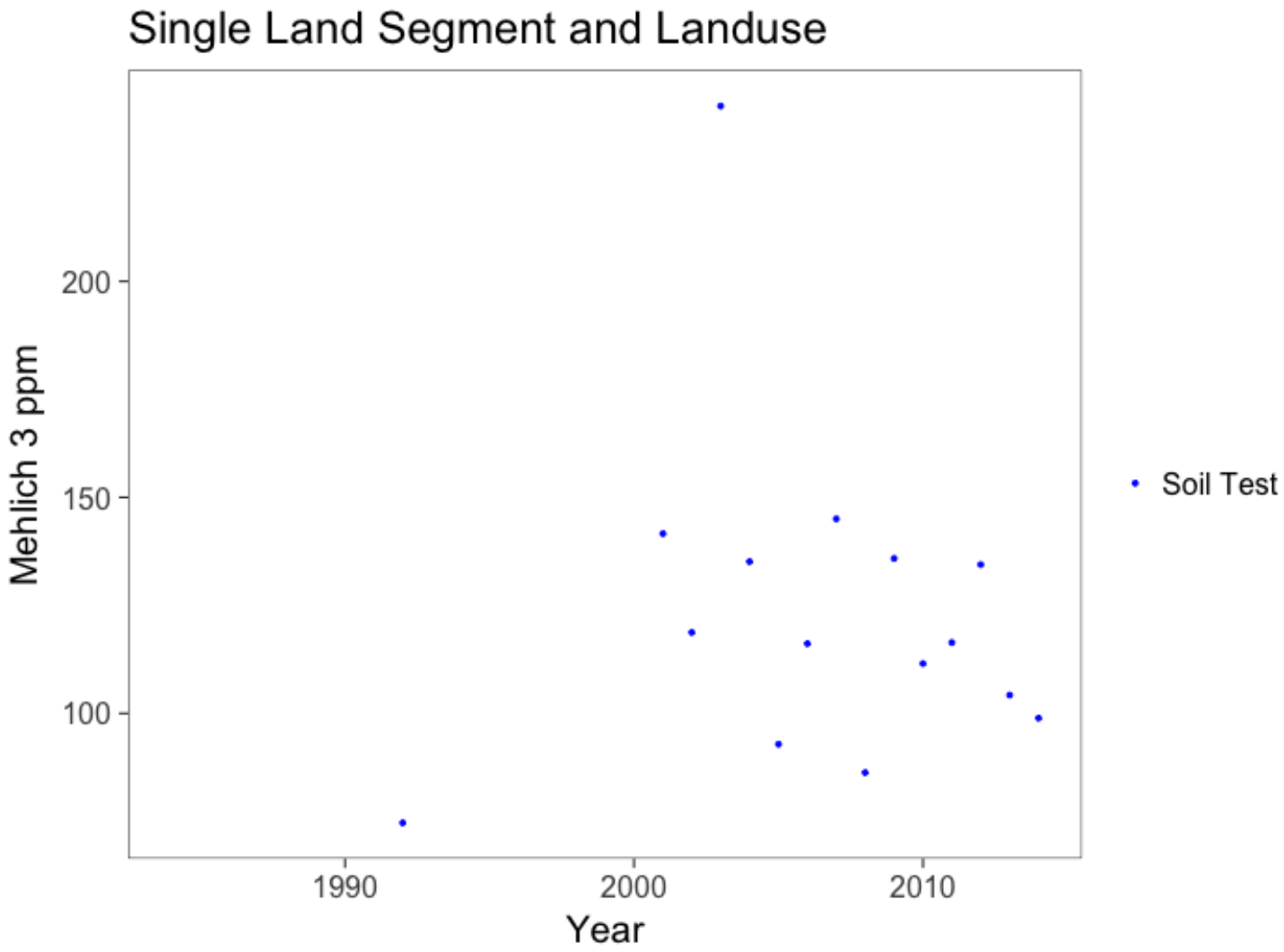
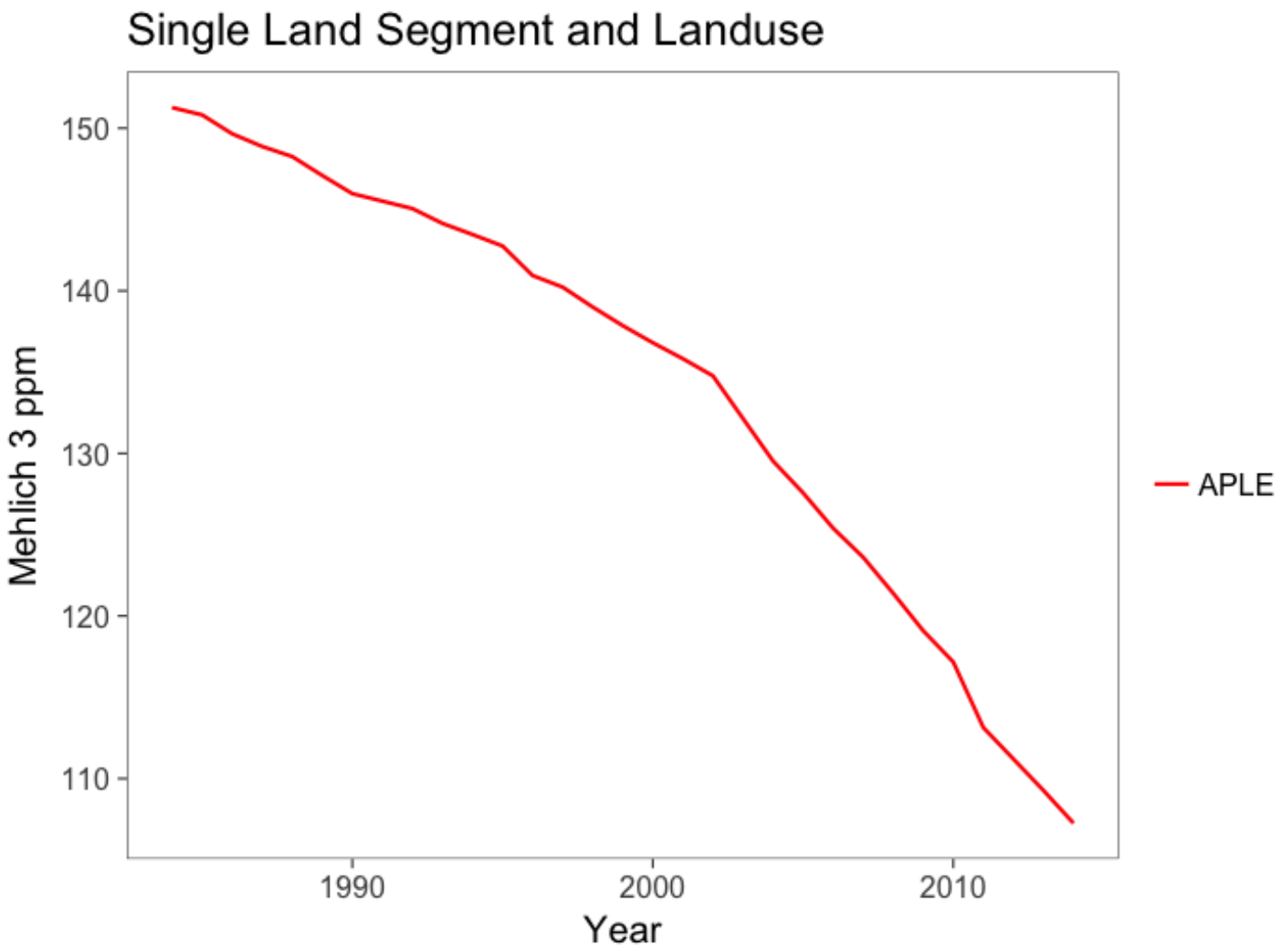
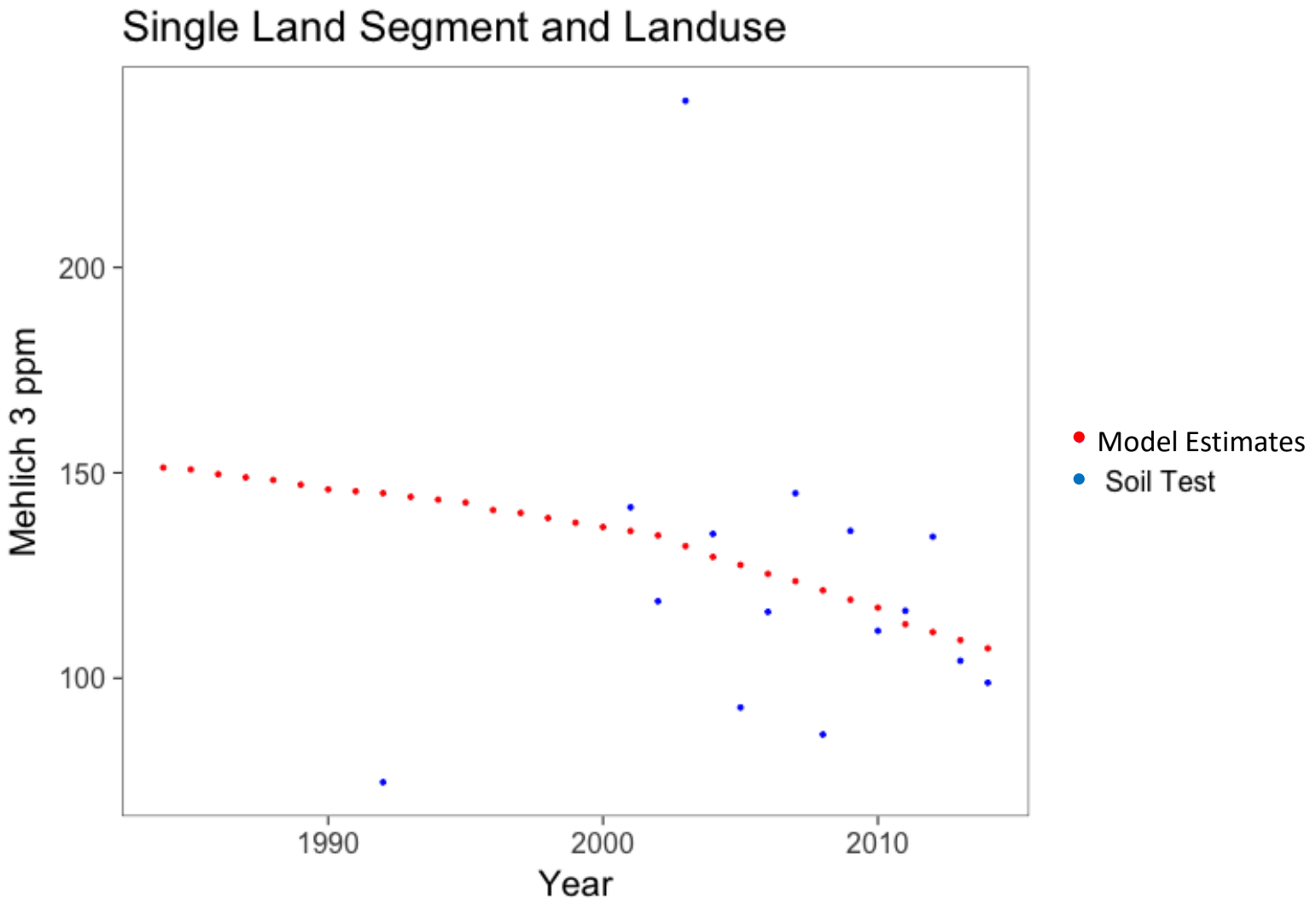
Requires estimate of soil P

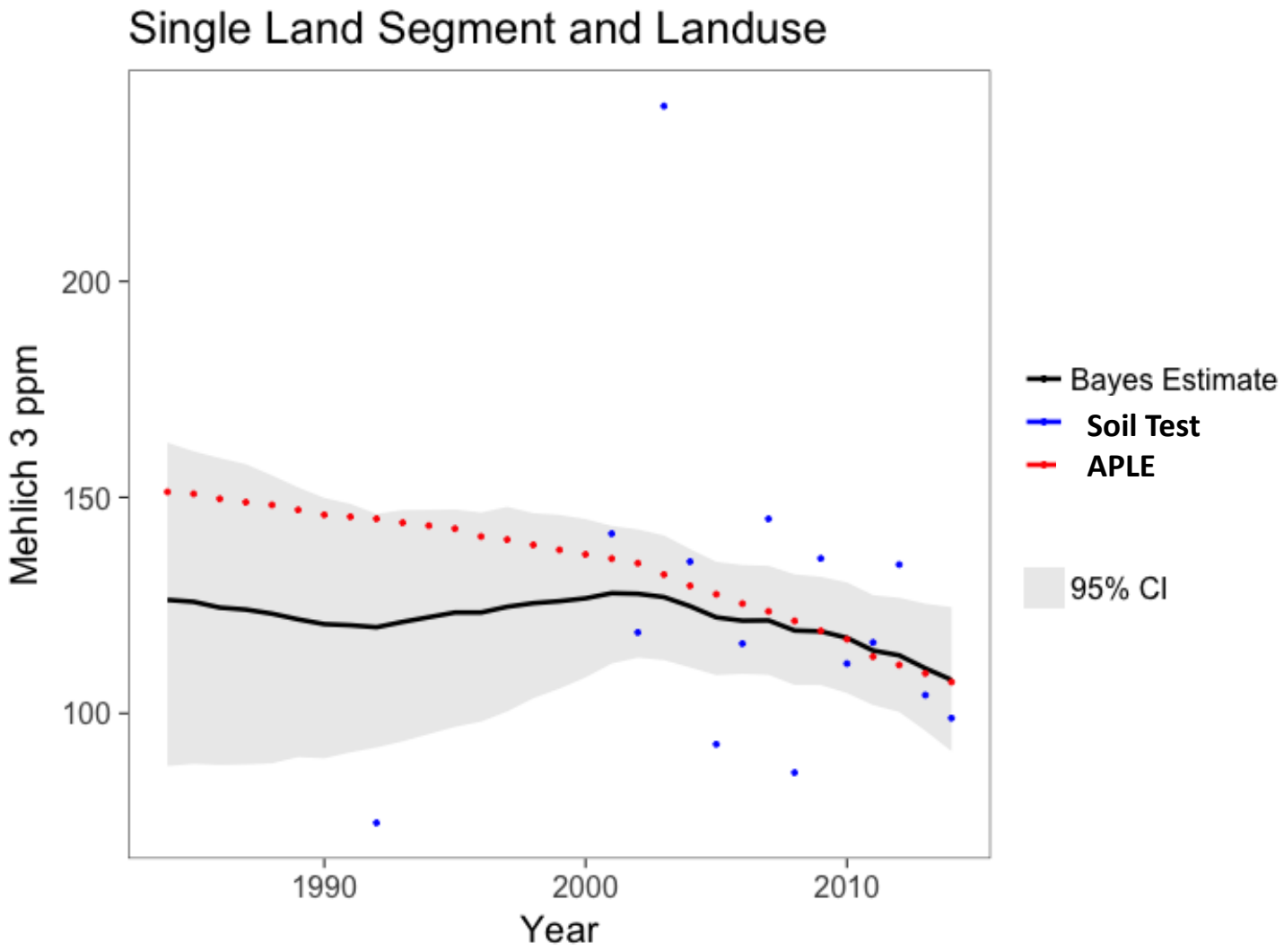
Balance of what the two data sets are telling us




Single Land Segment and Landuse
Mehlich 3 ppm
200
150
100
1990
2000
2010
Year
Soil Test


Single Land Segment and Landuse
Mehlich 3 ppm
150
140
130
120
110
1990
2000
2010
Year
APLE


Single Land Segment and Landuse
Mehlich 3 ppm
200
150
100
1990
2000
2010
Year
Model Estimates
Soil Test


Single Land Segment and Landuse
Mehlich 3 ppm
200
150
100
1990
2000
2010
Year
Bayes Estimate
Soil Test
APLE
95% CI

Soil P Data Sources

- UMD soil lab
  - Percent in ranges
  - 1954-2002
  - MD
- AgriAnalysis
  - Min, mean, max, median, count
  - 2003-2014
  - All States, mostly MD and PA
- Penn State
  - Samples
  - 2001-2014
  - PA
- Gene Yagow
  - County averages
  - 2013
  - VA

UMd

- PDF
- Percentages in each category
- Based on 179,085 Field Samples
  - Average of 343 per county per year – high variability
- Also have lawn and garden

Maryland

- 1960s-1996
  - Low (0-25)
  - Medium (26-50) & Optimum (51-100)
  - Optimum (51-100) & excessive (101-250+)
- 1997-2002:
  - low(0-25)
  - medium (26-50)
  - optimum (51-100)
  - Excessive (101-150)
  - Excessive (151-250)
  - Excessive (>250)

2002 Maryland Soil P data

PHOSPHORUS P	low(0-25)	medium (26-50)	optimum (51-100)	Excessive (101-150)	Excessive (151-250)	Excessive (>250)	
	12.5	38.00	75.5	125.5	200.5	250	Calculated Av
ALLEGANY	26%	20%	24%	13%	9%	6%	78.3
ANNE ARUNDEL	5%	13%	30%	21%	18%	12%	120.7
BALTIMORE CITY	0%	0%	0%	0%	0%	0%	0.0
BALTIMORE COUNTY	21%	23%	25%	9%	8%	11%	85.1
CALVERT	5%	12%	19%	14%	25%	23%	144.7
CAROLINE	0%	6%	20%	20%	23%	29%	161.1
CARROLL	9%	23%	28%	16%	14%	8%	99.2
CECIL	14%	26%	27%	10%	14%	7%	90.1
CHARLES	8%	25%	28%	15%	14%	8%	98.5
DORCHESTER	1%	12%	38%	20%	15%	12%	118.6
FREDERICK	9%	30%	32%	15%	10%	3%	83.1
GARRETT	31%	38%	20%	5%	3%	1%	48.2
HAR/!ORD	14%	26%	25%	15%	13%	4%	85.4
HOWARD	26%	24%	25%	12%	6%	3%	65.8
KENT	9%	26%	39%	13%	7%	4%	80.8
MONTGOMERY	29%	25%	18%	12%	7%	7%	73.3
OTHER	0%	50%	50%	0%	0%	0%	56.8
PENNSYLVANIA	0%	0%	0%	0%	0%	0%	0.0
PRINCE GEORGES	6%	13%	23%	16%	20%	20%	133.2
QUEEN ANNES	9%	17%	24%	10%	18%	21%	126.8
ST MARYS	5%	17%	28%	18%	17%	13%	117.4
SOMERSET	6%	9%	13%	7%	17%	47%	174.4
TALBOT	7%	0.16	35%	17%	12%	10%	103.8
UOFMD	4%	6%	15%	10%	13%	51%	180.2
VIRGINIA	19%	31%	25%	7%	8%	7%	75.4
WASHINGTON	17%	29%	26%	11%	7%	6%	75.6
DIST OF COLUMBIA	40%	10%	20%	0%	0%	30%	98.9
WICOMICO	13%	11%	11%	8%	18%	37%	152.7
WORCESTER	2%	6%	12%	10%	14%	56%	192.2

AgriAnalysis data

- Olivia Devereux received from AgriAnalysis in 2014
- 226,383 samples in watershed counties
- 2003-2014
- Max, Min, Median, Mean, and Count by Zip code and year. Individual values not given

Number of Samples in AgriAnalysis Data

FIPS	County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
10001	DE KENT	0	0	0	9	31	5	3	1	0	11	4	8
10003	DE NEW CASTLE	0	0	10	0	0	15	9	10	10	4	43	12
10005	DE SUSSEX	0	34	81	57	55	14	61	28	19	4	16	0
11001	DC DIST OF COLUMBIA	0	0	1	1	0	0	0	0	0	0	1	0
24001	MD ALLEGANY	0	0	29	172	107	146	126	42	1014	477	521	471
24003	MD ANNE ARUNDEL	3	21	95	18	58	31	65	56	46	66	77	66
24005	MD BALTIMORE	8	51	38	37	64	73	132	118	281	103	73	28
24009	MD CALVERT	0	8	0	0	9	4	3	4	9	14	0	33
24011	MD CAROLINE	13	6	0	3	15	4	4	1	8	6	0	0
24013	MD CARROLL	12	20	21	35	3	99	14	40	73	54	15	73
24015	MD CECIL	0	1	6	31	42	92	31	88	59	82	66	52
24017	MD CHARLES	2	19	5	8	3	0	5	0	0	1	5	0
24019	MD DORCHESTER	0	7	0	0	10	28	4	2	0	0	0	0
24021	MD FREDERICK	18	55	464	648	756	714	941	782	702	1147	1610	715
24023	MD GARRETT	0	0	0	40	30	7	9	0	11	0	3	0
24025	MD HARFORD	27	129	179	87	175	146	126	151	200	248	139	96
24027	MD HOWARD	0	31	5	40	12	9	10	8	9	44	18	14
24029	MD KENT	3	34	108	10	6	4	6	15	6	63	8	62
24031	MD MONTGOMERY	48	415	202	365	219	199	146	180	279	674	380	300
24033	MD PRINCE GEORGES	9	38	23	24	12	13	5	11	6	19	10	0
24035	MD QUEEN ANNES	0	0	116	265	210	229	198	188	0	0	25	0
24037	MD ST MARYS	13	20	25	14	18	19	12	1	8	3	14	11
24039	MD SOMERSET	0	0	0	2	0	0	0	0	0	0	0	0
24041	MD TALBOT	0	0	3	5	1	2	5	0	0	0	0	0
24043	MD WASHINGTON	0	6	32	1	48	71	175	378	573	572	839	449
24045	MD WICOMICO	0	0	2	0	0	0	0	0	0	4	0	0
24047	MD WORCESTER	0	2	16	5	177	35	0	2	7	1	0	0
24510	MD BALTIMORE	1	0	11	49	62	57	27	22	21	8	20	7

Number of Samples in AgriAnalysis Data

FIPS	County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
36003	NY ALLEGANY	18	0	7	0	10	0	0	0	9	0	0	0
36007	NY BROOME	0	0	0	0	0	0	0	0	0	0	0	0
36011	NY CAYUGA	0	0	0	0	0	4	0	0	0	0	0	0
36015	NY CHEMUNG	0	0	0	1	0	0	1	0	0	0	0	0
36017	NY CHENANGO	0	0	0	0	0	0	0	0	0	0	0	0
36023	NY CORTLAND	0	0	0	0	0	0	0	0	0	0	0	0
36025	NY DELAWARE	0	0	0	0	0	0	0	0	0	0	0	0
36043	NY HERKIMER	0	0	0	0	0	0	0	0	0	0	0	0
36051	NY LIVINGSTON	0	0	43	94	105	99	5	8	4	2	2	0
36053	NY MADISON	0	1	0	0	0	0	0	0	0	0	0	0
36065	NY ONEIDA	0	0	0	0	0	0	0	0	0	0	0	0
36067	NY ONONDAGA	0	0	0	0	0	0	0	0	1	2	3	0
36069	NY ONTARIO	0	0	0	0	0	0	0	1	0	0	0	0
36077	NY OTSEGO	0	0	0	0	0	0	0	0	0	0	0	0
36095	NY SCHOHARIE	0	0	0	0	0	0	0	0	0	0	0	0
36097	NY SCHUYLER	0	0	0	0	0	0	0	0	0	0	0	0
36101	NY STEUBEN	13	0	43	68	11	11	0	0	0	0	0	1
36107	NY TIOGA	0	0	0	0	0	0	0	0	0	0	0	0
36109	NY TOMPKINS	0	0	0	0	0	0	0	0	0	0	0	0
36123	NY YATES	0	4	102	0	0	0	0	0	0	0	2	0

Number of Samples in AgriAnalysis Data

FIPS	County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
42001	PA ADAMS	207	913	593	1407	798	884	1022	825	764	1319	879	472
42009	PA BEDFORD	0	0	2	1	10	381	193	125	138	148	111	23
42011	PA BERKS	716	874	649	1024	738	475	911	1282	927	1666	1601	795
42013	PA BLAIR	230	500	610	671	567	591	492	422	352	634	452	208
42015	PA BRADFORD	0	0	0	0	12	0	0	0	0	13	0	0
42021	PA CAMBRIA	0	0	1	0	0	0	0	0	0	77	101	75
42023	PA CAMERON	0	0	0	0	0	0	0	0	0	0	0	0
42025	PA CARBON	0	0	0	0	0	3	0	0	0	0	10	1
42027	PA CENTRE	0	10	10	20	0	4	0	0	1	0	63	17
42029	PA CHESTER	1982	2246	2433	2504	2333	1906	1618	2006	1540	1815	1499	798
42033	PA CLEARFIELD	0	0	0	0	0	2	11	3	4	3	0	0
42035	PA CLINTON	2	0	0	0	0	0	0	0	23	9	13	12
42037	PA COLUMBIA	0	4	33	11	10	6	13	0	1	12	10	21
42041	PA CUMBERLAND	1342	2826	3163	2667	2455	3064	2669	3402	2571	3560	1325	761
42043	PA DAUPHIN	2	4	3	32	37	13	60	74	76	123	63	45
42047	PA ELK	0	0	0	0	0	0	0	0	0	0	0	0
42055	PA FRANKLIN	238	834	920	1170	1167	1680	1585	1769	2017	2661	2231	1533
42057	PA FULTON	0	0	90	57	26	91	47	90	43	33	95	38
42061	PA HUNTINGDON	1	8	2	7	4	7	0	1	13	70	5	28
42063	PA INDIANA	0	0	0	0	0	0	3	0	0	1	0	0
42065	PA JEFFERSON	0	0	0	0	9	0	0	0	0	0	0	0
42067	PA JUNIATA	0	0	18	0	15	820	1	35	1	78	51	33
42069	PA LACKAWANNA	0	0	1	0	0	0	0	0	5	0	0	0
42071	PA LANCASTER	3243	5672	5433	6756	6042	7012	6556	9414	8272	9874	9456	4428
42075	PA LEBANON	3	121	172	157	113	188	175	216	154	378	519	202
42079	PA LUZERNE	0	0	0	0	0	0	0	0	0	0	0	2
42081	PA LYCOMING	3	12	9	39	12	0	0	50	45	4	1	4
42083	PA MCKEAN	10	0	0	0	0	0	0	0	0	0	0	0
42087	PA MIFFLIN	49	101	18	31	0	8	13	47	0	49	17	1
42093	PA MONTOUR	0	36	35	0	16	3	0	72	0	32	2	4
42097	PA NORTHUMBERLAND	0	0	0	3	18	0	18	23	16	112	100	36
42099	PA PERRY	0	17	18	9	62	18	34	29	61	53	250	50
42105	PA POTTER	52	12	20	0	10	58	14	0	7	0	0	1
42107	PA SCHUYLKILL	0	21	14	51	24	48	16	39	47	77	44	74
42109	PA SNYDER	10	59	6	1	15	0	0	63	6	18	76	9
42111	PA SOMERSET	0	0	0	0	0	0	69	29	0	30	26	17
42113	PA SULLIVAN	0	0	2	0	0	32	38	1	0	0	0	0
42115	PA SUSQUEHANNA	0	0	0	0	0	0	0	0	0	0	0	3
42117	PA TIOGA	0	0	0	0	30	0	0	5	44	5	7	0
42119	PA UNION	11	60	84	123	185	135	185	298	220	435	476	236
42127	PA WAYNE	0	0	0	0	0	0	0	0	0	0	40	4
42131	PA WYOMING	0	0	0	0	0	0	0	0	0	0	0	146
42133	PA YORK	238	998	629	851	867	208	270	355	564	359	495	388

Number of Samples in AgriAnalysis Data

FIPS	County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	sum
51069	VA FREDERICK	0	0	23	11	8	7	17	102	8	87	58	10	331
51015	VA AUGUSTA	0	0	13	41	29	30	35	30	44	23	59	1	305
51059	VA FAIRFAX	0	1	3	40	0	0	5	5	24	7	29	4	118
51165	VA ROCKINGHAM	0	1	2	1	3	0	66	4	26	2	5	3	113
54037	WV JEFFERSON	0	0	0	0	0	8	0	0	0	27	12	15	62
51043	VA CLARKE	0	0	1	0	8	0	52	0	0	0	0	0	61
51075	VA GOOCHLAND	0	0	0	9	16	0	14	14	0	0	0	0	53
51001	VA ACCOMACK	0	0	21	20	0	1	0	0	0	2	0	0	44
51107	VA LOUDOUN	0	0	9	23	8	0	0	0	0	0	0	0	40
51085	VA HANOVER	0	0	0	0	0	0	0	0	0	0	16	21	37
51790	VA STAUNTON	0	0	0	0	7	0	3	0	0	26	0	0	36
51113	VA MADISON	0	0	0	0	0	10	0	12	13	0	0	0	35
51033	VA CAROLINE	0	0	16	0	0	0	18	0	0	0	0	0	34
51550	VA CHESAPEAKE	0	0	0	0	0	0	0	0	0	0	27	0	27
51199	VA YORK	0	0	0	0	0	0	0	0	0	0	16	5	21
51131	VA NORTHAMPTON	0	0	1	0	0	0	0	0	17	0	0	0	18
51061	VA FAUQUIER	0	0	0	0	0	3	0	0	0	13	0	0	16
51047	VA CULPEPER	0	0	0	0	0	0	8	0	0	0	6	0	14
51137	VA ORANGE	0	0	2	1	4	0	0	0	0	7	0	0	14
51510	VA ALEXANDRIA	9	0	0	0	0	0	0	0	3	0	0	0	12
51760	VA RICHMOND	0	0	0	0	0	0	0	0	0	0	6	3	9
54003	WV BERKELEY	0	0	0	0	0	0	6	0	0	2	0	0	8
54057	WV MINERAL	0	0	0	0	0	0	0	0	0	0	7	0	7
51179	VA STAFFORD	0	3	0	3	0	0	0	0	0	0	0	0	6
54027	WV HAMPSHIRE	0	0	0	0	0	0	6	0	0	0	0	0	6
51003	VA ALBEMARLE	0	0	0	5	0	0	0	0	0	0	0	0	5
51029	VA BUCKINGHAM	0	0	0	2	0	0	2	0	0	1	0	0	5
51125	VA NELSON	0	0	3	0	0	0	0	0	0	2	0	0	5
51177	VA SPOTSYLVANIA	0	4	1	0	0	0	0	0	0	0	0	0	5
54077	WV PRESTON	0	0	0	0	0	5	0	0	0	0	0	0	5

All others in VA and WV 3 or fewer observations

Penn State data

- Olivia Devereux received from Penn State in 2014
- 59,390 samples in watershed counties
- 2001-2014
- Zip Code, land use, value

Penn State Data – number of points

County	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
PA ADAMS	16	20	13	52	30	20	39	17	8	25	40	78	111	96
PA BEDFORD	115	160	204	218	207	58	34	85	77	51	40	64	35	46
PA BERKS	18	153	34	178	224	162	156	120	241	169	35	106	173	42
PA BLAIR	98	204	81	99	51	95	89	123	49	102	76	57	55	28
PA BRADFORD	239	313	314	195	134	261	247	348	196	211	108	328	293	239
PA CAMBRIA	30	95	71	68	59	64	88	125	87	97	107	133	109	117
PA CAMERON	1	3	1	1	2	3	1	2	2	1	2	3	5	1
PA CARBON	1	12	4	8	2	0	0	6	10	12	15	5	22	10
PA CENTRE	305	577	595	613	618	565	604	568	540	447	632	867	958	628
PA CHESTER	38	59	24	55	15	93	42	19	31	71	23	44	22	10
PA CLEARFIELD	52	90	74	77	57	54	101	110	53	77	104	150	72	147
PA CLINTON	53	34	119	21	28	153	70	73	41	77	27	74	39	16
PA COLUMBIA	95	222	52	161	135	153	211	206	143	180	316	359	429	201
PA CUMBERLAND	64	166	135	152	227	134	131	184	85	110	73	221	112	56
PA DAUPHIN	69	181	70	120	132	95	129	122	98	74	89	129	142	66
PA ELK	2	17	9	10	26	19	16	11	21	13	25	22	25	20
PA FRANKLIN	125	95	134	59	96	45	55	27	25	25	54	82	37	31
PA FULTON	24	43	28	18	7	24	41	11	53	58	27	42	20	11
PA HUNTINGDON	105	188	44	60	29	63	50	55	14	59	50	43	123	24
PA INDIANA	61	139	174	173	142	121	229	152	193	208	228	230	283	145
PA JEFFERSON	21	61	73	67	60	101	79	135	79	81	131	275	137	158
PA JUNIATA	56	76	33	72	100	77	127	83	102	125	125	207	146	173

Penn State Data – number of points

County	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
PA LACKAWANNA	40	8	27	10	61	10	131	203	29	55	10	159	126	7
PA LANCASTER	52	196	199	196	146	284	209	157	109	89	92	132	108	37
PA LEBANON	73	53	61	71	57	106	93	285	150	153	69	275	125	167
PA LUZERNE	25	43	58	29	49	34	36	27	54	67	82	94	147	138
PA LYCOMING	51	146	84	107	74	87	126	87	139	104	135	175	147	132
PA MCKEAN	0	12	8	6	9	5	3	1	4	0	5	30	13	27
PA MIFFLIN	8	12	16	6	4	1	49	9	6	11	1	21	8	29
PA MONTOUR	29	112	93	66	77	95	109	97	103	137	83	104	72	80
PA NORTHUMBERLAND	80	119	174	139	160	101	203	199	186	230	88	337	185	157
PA PERRY	58	106	39	116	63	112	100	177	148	249	178	251	263	156
PA POTTER	26	52	31	48	70	39	70	27	52	43	54	29	20	26
PA SCHUYLKILL	51	186	114	168	129	86	75	133	71	136	98	161	77	110
PA SNYDER	50	134	41	49	67	76	110	61	72	150	85	170	144	83
PA SOMERSET	10	70	30	111	18	24	67	46	169	151	58	131	68	42
PA SULLIVAN	0	10	9	15	22	22	38	33	20	7	18	25	16	41
PA SUSQUEHANNA	95	134	69	92	62	61	74	88	74	66	37	113	89	69
PA TIOGA	87	179	85	81	221	138	129	117	114	92	106	101	100	141
PA UNION	76	91	79	64	46	57	70	80	83	155	68	105	57	55
PA WAYNE	1	7	14	16	8	17	7	12	18	18	22	19	18	4
PA WYOMING	39	41	18	32	28	16	55	23	37	18	2	85	68	12
PA YORK	80	203	108	88	191	193	171	110	145	87	86	373	136	86

Virginia Tech data

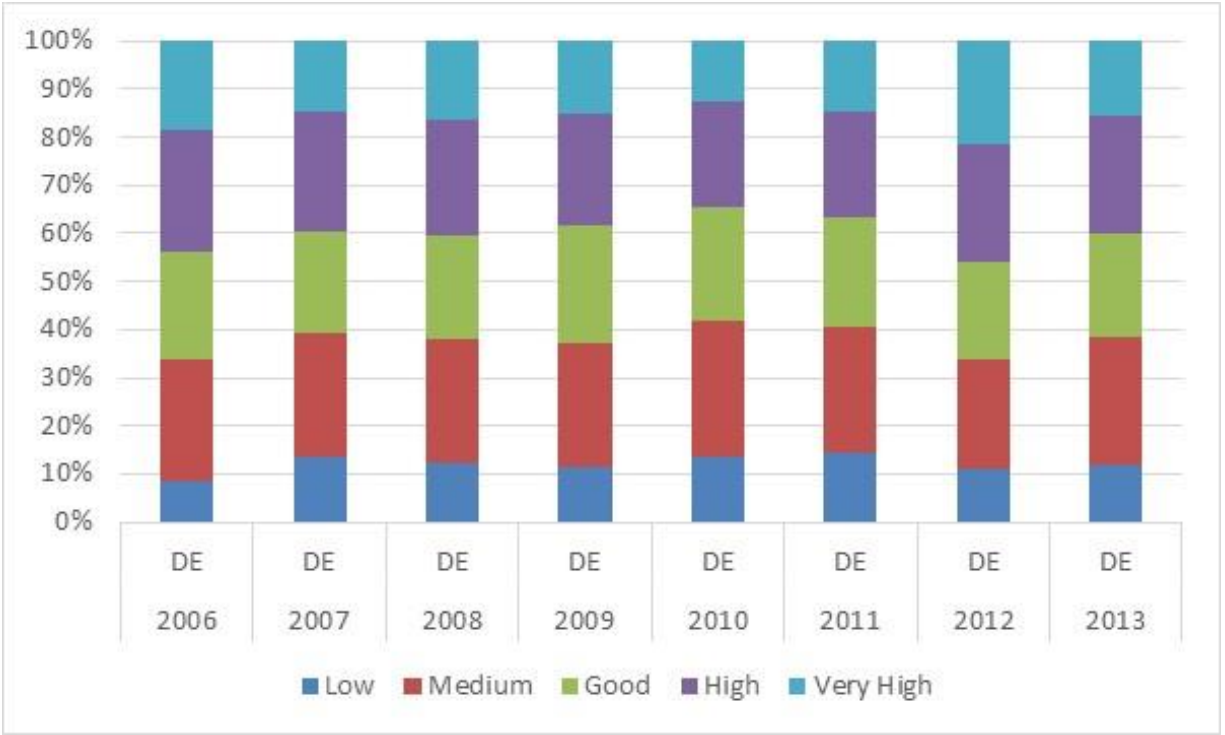
- Compiled by Gene Yagow
- VA Tech Soil Testing Lab
- By land use
- Seems to be a lot more data available through the extension intranet, including developed data
- Averages by county and crop type
- 64,758 observations

Number of observations in 2012

County	2012		County	2012		County	2012
VA MATHEWS	65		VA ROANOKE	397		VA GOOCHLAND	802
VA CHARLES CITY	105		VA SPOTSYLVANIA	422		VA CULPEPER	841
VA YORK	126		VA HIGHLAND	429		VA CHARLOTTE	863
VA LANCASTER	130		VA CRAIG	458		VA PRINCE WILLIAM	881
VA ALLEGHANY	148		VA BUCKINGHAM	480		VA ROCKBRIDGE	957
VA GREENE	158		VA HENRICO	493		VA BOTETOURT	985
VA KING GEORGE	160		VA RICHMOND	507		VA FAIRFAX	1046
VA BATH	163		VA RICHMOND	507		VA CAMPBELL	1097
VA FLUVANNA	189		VA CAROLINE	519		VA ESSEX	1152
VA WARREN	194		VA HANOVER	541		VA ALBEMARLE	1227
VA KING WILLIAM	198		VA PRINCE EDWARD	541		VA APPOMATTOX	1244
VA RAPPAHANNOCK	214		VA NEW KENT	542		VA LOUDOUN	1244
VA CHESTERFIELD	220		VA JAMES CITY	572		VA FAUQUIER	1391
VA STAFFORD	231		VA ORANGE	579		VA SHENANDOAH	1505
VA ARLINGTON	255		VA FREDERICK	581		VA SURRY	1729
VA KING AND QUEEN	281		VA NOTTOWAY	583		VA NORTHAMPTON	1907
VA NORTHUMBERLAND	307		VA AMELIA	644		VA MONTGOMERY	2132
VA POWHATAN	316		VA MADISON	670		VA ROCKINGHAM	2275
VA AMHERST	319		VA WESTMORELAND	739		VA BEDFORD	2840
VA LUNENBURG	328		VA NELSON	754		VA BEDFORD	2840
VA MIDDLESEX	345		VA GLOUCESTER	757		VA ACCOMACK	3126
VA CUMBERLAND	371		VA PRINCE GEORGE	757		VA AUGUSTA	3181
VA GILES	375		VA PAGE	779		VA DINWIDDIE	3285
VA LOUISA	376		VA CLARKE	786		VA ISLE OF WIGHT	6200

Spectrum analytic

- 822,311 individual samples
- Available in bins by state
- 2006-2013
- Not used



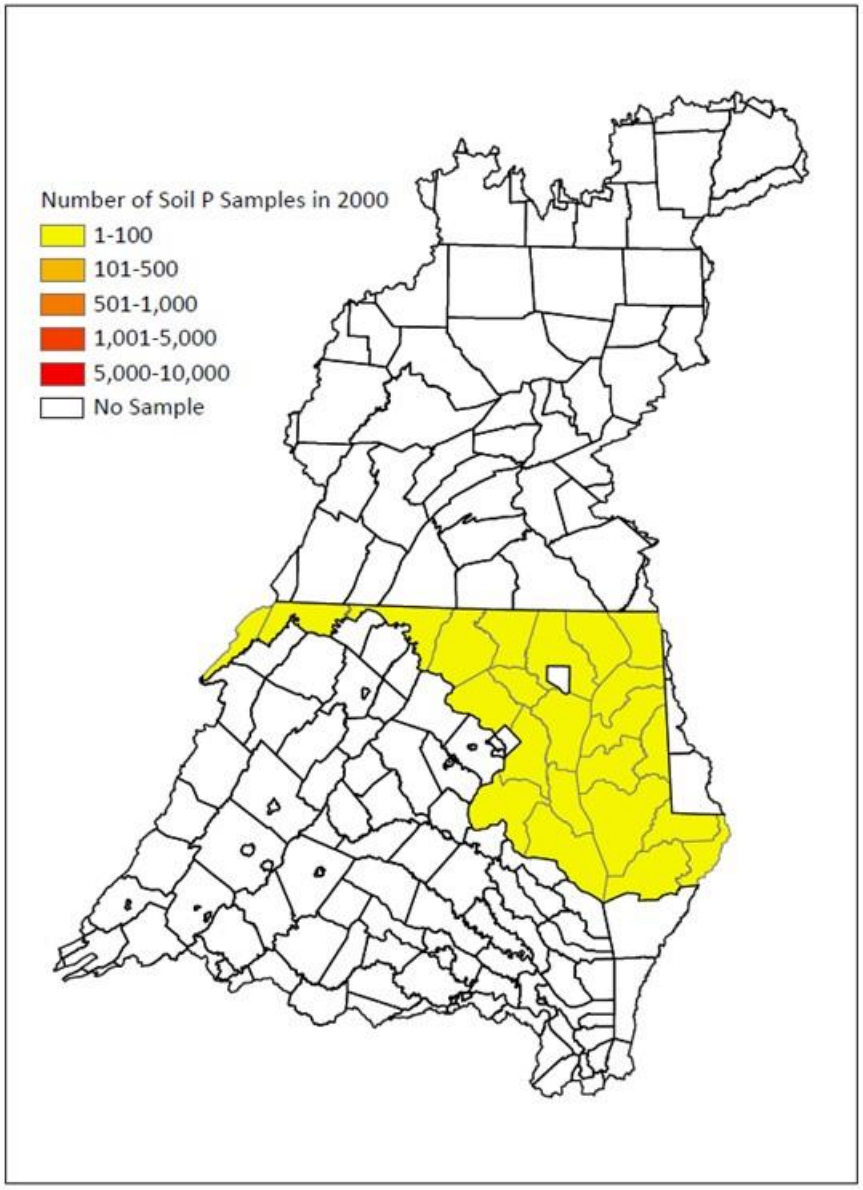
FIP10	County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
10001	DE KENT	0	0	0	0	0	0	9	31	5	3	1	0	11	4	8	72
10003	DE NEW CASTLE	0	0	0	0	0	10	0	0	15	9	10	10	4	43	12	113
10005	DE SUSSEX	0	0	0	0	34	81	57	55	14	61	28	19	4	16	0	369
11001	DC DIST OF COLUMBIA	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	3
24001	MD ALLEGANY	50	50	50	50	50	79	222	157	196	176	92	1064	527	571	521	3855
24003	MD ANNE ARUNDEL	50	50	50	53	71	145	68	108	81	115	106	96	116	127	116	1352
24005	MD BALTIMORE	50	50	50	58	101	88	87	114	123	182	168	331	153	123	78	1756
24009	MD CALVERT	50	50	50	50	58	50	50	59	54	53	54	59	64	50	83	834
24011	MD CAROLINE	50	50	50	63	56	50	53	65	54	54	51	58	56	50	50	810
24013	MD CARROLL	50	50	50	62	70	71	85	53	149	64	90	123	104	65	123	1209
24015	MD CECIL	50	50	50	50	51	56	81	92	142	81	138	109	132	116	102	1300
24017	MD CHARLES	50	50	50	52	69	55	58	53	50	55	50	50	51	55	50	798
24019	MD DORCHESTER	50	50	50	50	57	50	50	60	78	54	52	50	50	50	50	801
24021	MD FREDERICK	50	50	50	68	105	514	698	806	764	991	832	752	1197	1660	765	9302
24023	MD GARRETT	50	50	50	50	50	50	90	80	57	59	50	61	50	53	50	850
24025	MD HARFORD	50	50	50	77	179	229	137	225	196	176	201	250	298	189	146	2453
24027	MD HOWARD	50	50	50	50	81	55	90	62	59	60	58	59	94	68	64	950
24029	MD KENT	50	50	50	53	84	158	60	56	54	56	65	56	113	58	112	1075
24031	MD MONTGOMERY	50	50	50	98	465	252	415	269	249	196	230	329	724	430	350	4157
24033	MD PRINCE GEORGES	50	50	50	59	88	73	74	62	63	55	61	56	69	60	50	920
24035	MD QUEEN ANNES	50	50	50	50	50	166	315	260	279	248	238	50	50	75	50	1981
24037	MD ST MARYS	50	50	50	63	70	75	64	68	69	62	51	58	53	64	61	908
24039	MD SOMERSET	50	50	50	50	50	50	52	50	50	50	50	50	50	50	50	752
24041	MD TALBOT	50	50	50	50	50	53	55	51	52	55	50	50	50	50	50	766
24043	MD WASHINGTON	50	50	50	50	56	82	51	98	121	225	428	623	622	889	499	3894
24045	MD WICOMICO	50	50	50	50	50	52	50	50	50	50	50	50	54	50	50	756
24047	MD WORCESTER	50	50	50	50	52	66	55	227	85	50	52	57	51	50	50	995
24510	MD BALTIMORE	0	0	0	1	0	11	49	62	57	27	22	21	8	20	7	285

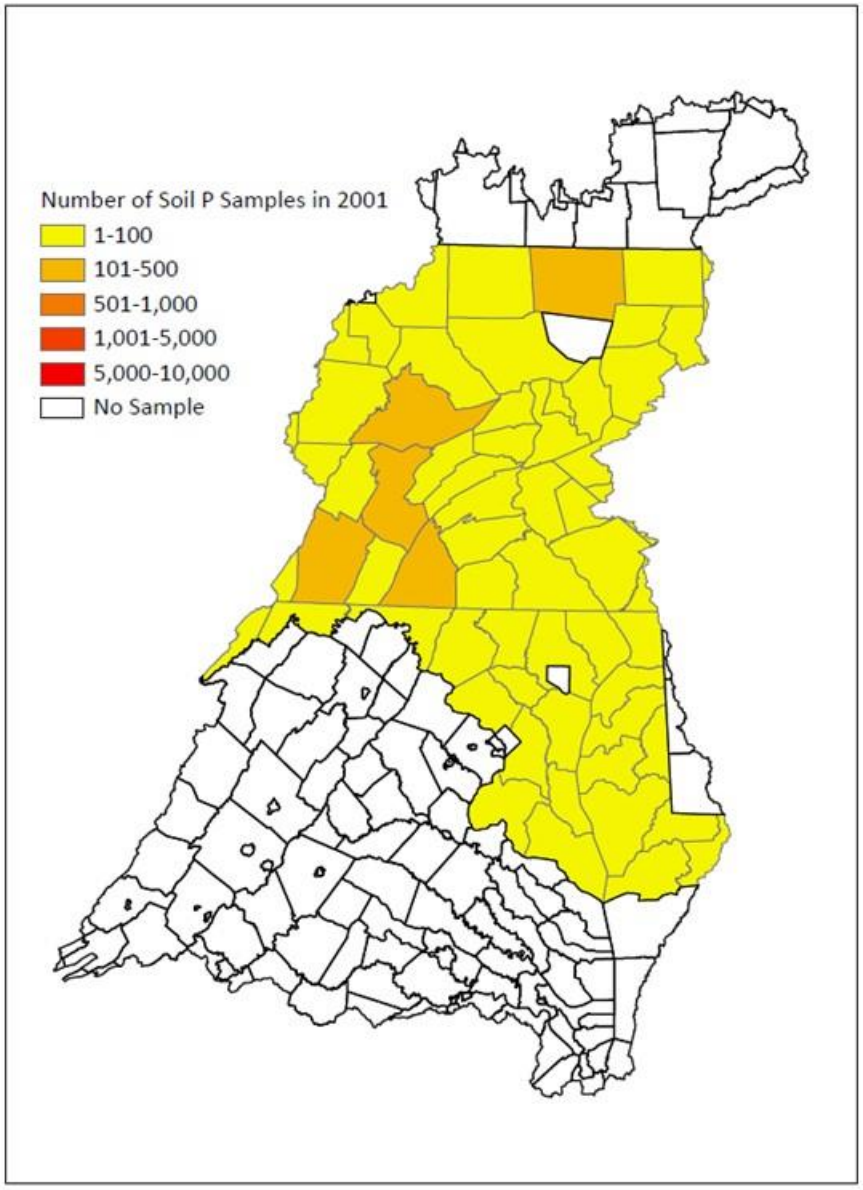
FIP10	County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
36003	NY ALLEGANY	0	0	0	18	0	7	0	10	0	0	0	9	0	0	0	44
36007	NY BROOME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36011	NY CAYUGA	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4
36015	NY CHEMUNG	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
36017	NY CHENANGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36023	NY CORTLAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36025	NY DELAWARE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36043	NY HERKIMER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36051	NY LIVINGSTON	0	0	0	0	0	43	94	105	99	5	8	4	2	2	0	362
36053	NY MADISON	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
36065	NY ONEIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36067	NY ONONDAGA	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	6
36069	NY ONTARIO	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
36077	NY OTSEGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36095	NY SCHOHARIE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36097	NY SCHUYLER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36101	NY STEUBEN	0	0	0	13	0	43	68	11	11	0	0	0	0	0	1	147
36107	NY TIOGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36109	NY TOMPKINS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36123	NY YATES	0	0	0	0	4	102	0	0	0	0	0	0	0	2	0	108
54003	WV BERKELEY	0	0	0	0	0	0	0	0	0	6	0	0	2	0	0	8
54023	WV GRANT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54027	WV HAMPSHIRE	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	6
54031	WV HARDY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54037	WV JEFFERSON	0	0	0	0	0	0	0	0	8	0	0	0	27	12	15	62
54057	WV MINERAL	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7
54063	WV MONROE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54065	WV MORGAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54071	WV PENDLETON	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
54077	WV PRESTON	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	5
54093	WV TUCKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

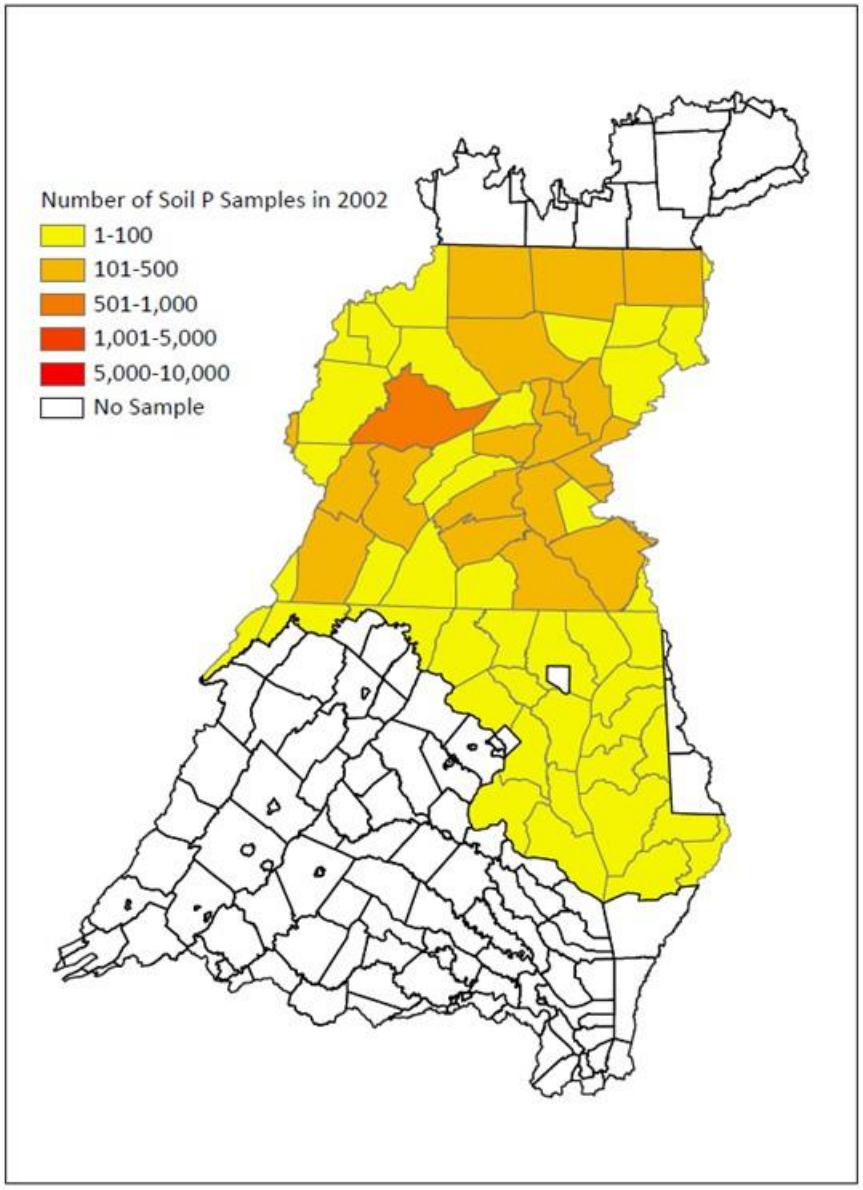
County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
PA ADAMS	0	16	20	220	965	623	1427	837	901	1030	850	804	1397	990	568	10648
PA BEDFORD	0	115	160	204	218	209	59	44	466	270	176	178	212	146	69	2526
PA BERKS	0	18	153	750	1052	873	1186	894	595	1152	1451	962	1772	1774	837	13469
PA BLAIR	0	98	204	311	599	661	766	656	714	541	524	428	691	507	236	6936
PA BRADFORD	0	239	313	314	195	134	261	259	348	196	211	108	341	293	239	3451
PA CAMBRIA	0	30	95	71	68	60	64	88	125	87	97	107	210	210	192	1504
PA CAMERON	0	1	3	1	1	2	3	1	2	2	1	2	3	5	1	28
PA CARBON	0	1	12	4	8	2	0	0	9	10	12	15	5	32	11	121
PA CENTRE	0	305	577	595	623	628	585	604	572	540	447	633	867	1021	645	8642
PA CHESTER	0	38	59	2006	2301	2448	2597	2375	1925	1649	2077	1563	1859	1521	808	23226
PA CLEARFIELD	0	52	90	74	77	57	54	101	112	64	80	108	153	72	147	1241
PA CLINTON	0	53	34	121	21	28	153	70	73	41	77	50	83	52	28	884
PA COLUMBIA	0	95	222	52	165	168	164	221	212	156	180	317	371	439	222	2984
PA CUMBERLAND	0	64	166	1477	2978	3390	2801	2586	3248	2754	3512	2644	3781	1437	817	31655
PA DAUPHIN	0	69	181	72	124	135	127	166	135	158	148	165	252	205	111	2048
PA ELK	0	2	17	9	10	26	19	16	11	21	13	25	22	25	20	236
PA FRANKLIN	0	125	95	372	893	1016	1215	1222	1707	1610	1794	2071	2743	2268	1564	18695
PA FULTON	0	24	43	28	18	97	81	67	102	100	148	70	75	115	49	1017
PA HUNTINGDON	0	105	188	45	68	31	70	54	62	14	60	63	113	128	52	1053
PA INDIANA	0	61	139	174	173	142	121	229	152	196	208	228	231	283	145	2482
PA JEFFERSON	0	21	61	73	67	60	101	88	135	79	81	131	275	137	158	1467
PA JUNIATA	0	56	76	33	72	118	77	142	903	103	160	126	285	197	206	2554
PA LACKAWANNA	0	40	8	27	10	62	10	131	203	29	55	15	159	126	7	882
PA LANCASTER	0	52	196	3442	5868	5579	7040	6251	7169	6665	9503	8364	10006	9564	4465	84164
PA LEBANON	0	73	53	64	192	229	263	206	473	325	369	223	653	644	369	4136
PA LUZERNE	0	25	43	58	29	49	34	36	27	54	67	82	94	147	140	885
PA LYCOMING	0	51	146	87	119	83	126	138	87	139	154	180	179	148	136	1773
PA MCKEAN	0	0	12	18	6	9	5	3	1	4	0	5	30	13	27	133
PA MIFFLIN	0	8	12	65	107	22	32	49	17	19	58	1	70	25	30	515
PA MONTOUR	0	29	112	93	102	112	95	125	100	103	209	83	136	74	84	1457
PA NORTHUMBERLAND	0	80	119	174	139	160	104	221	199	204	253	104	449	285	193	2684
PA PERRY	0	58	106	39	133	81	121	162	195	182	278	239	304	513	206	2617
PA POTTER	0	26	52	83	60	90	39	80	85	66	43	61	29	20	27	761
PA SCHUYLKILL	0	51	186	114	189	143	137	99	181	87	175	145	238	121	184	2050
PA SNYDER	0	50	134	51	108	73	77	125	61	72	213	91	188	220	92	1555
PA SOMERSET	0	10	70	30	111	18	24	67	46	238	180	58	161	94	59	1166
PA SULLIVAN	0	0	10	9	15	24	22	38	65	58	8	18	25	16	41	349
PA SUSQUEHANNA	0	95	134	69	92	62	61	74	88	74	66	37	113	89	72	1126
PA TIOGA	0	87	179	85	81	221	138	159	117	114	97	150	106	107	141	1782
PA UNION	0	76	91	90	124	130	180	255	215	268	453	288	540	533	291	3534
PA WAYNE	0	1	7	14	16	8	17	7	12	18	18	22	19	58	8	225
PA WYOMING	0	39	41	18	32	28	16	55	23	37	18	2	85	68	158	620
PA YORK	0	80	203	346	1086	820	1044	1038	318	415	442	650	732	631	474	8279

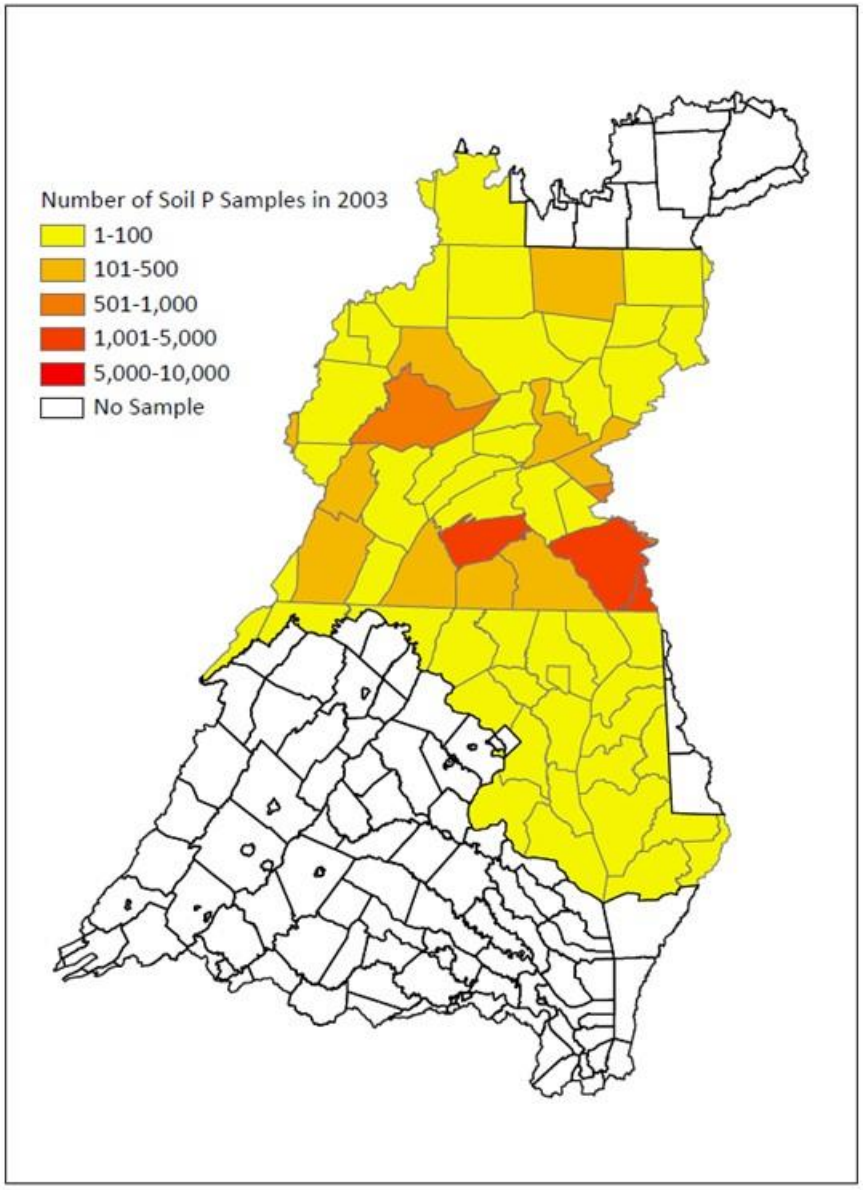
County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
VA ACCOMACK	0	0	0	0	0	21	20	0	1	0	0	0	3128	0	0	3170
VA ALBEMARLE	0	0	0	0	0	0	5	0	0	0	0	0	1227	0	0	1232
VA ALLEGHANY	0	0	0	0	0	0	0	0	0	0	0	0	148	0	0	148
VA AMELIA	0	0	0	0	0	0	0	0	0	0	0	0	644	0	0	644
VA AMHERST	0	0	0	0	0	0	0	0	0	0	0	0	319	0	0	319
VA APPOMATTOX	0	0	0	0	0	0	0	0	0	0	1	0	1244	0	0	1245
VA ARLINGTON	0	0	0	0	0	0	0	0	0	1	0	0	255	0	0	256
VA AUGUSTA	0	0	0	0	0	13	41	29	30	35	30	44	3204	59	1	3486
VA BATH	0	0	0	0	0	0	0	0	0	0	0	0	163	0	0	163
VA BEDFORD	0	0	0	0	0	0	0	0	0	0	0	0	2842	0	0	2842
VA BOTETOURT	0	0	0	0	0	0	0	0	0	0	0	0	985	0	0	985
VA BUCKINGHAM	0	0	0	0	0	0	2	0	0	2	0	0	481	0	0	485
VA CAMPBELL	0	0	0	0	0	0	1	0	0	0	0	0	1097	0	0	1098
VA CAROLINE	0	0	0	0	0	16	0	0	0	18	0	0	519	0	0	553
VA CHARLES CITY	0	0	0	0	0	0	0	0	0	0	0	0	105	0	0	105
VA CHARLOTTE	0	0	0	0	0	0	0	0	0	0	0	0	863	0	0	863
VA CHESTERFIELD	0	0	0	0	0	0	0	0	0	0	0	0	220	0	0	220
VA CLARKE	0	0	0	0	0	1	0	8	0	52	0	0	786	0	0	847
VA CRAIG	0	0	0	0	0	0	0	0	0	0	0	0	458	0	0	458
VA CULPEPER	0	0	0	0	0	0	0	0	0	8	0	0	841	6	0	855
VA CUMBERLAND	0	0	0	0	0	0	0	0	0	0	0	0	371	0	0	371
VA DINWIDDIE	0	0	0	0	0	0	0	0	0	3	0	0	3285	0	0	3288
VA ESSEX	0	0	0	0	0	0	0	0	0	0	0	0	1152	0	0	1152
VA FAIRFAX	0	0	0	0	1	3	40	0	0	5	5	24	1053	29	4	1164
VA FAUQUIER	0	0	0	0	0	0	0	0	3	0	0	0	1404	0	0	1407
VA FLUVANNA	0	0	0	0	0	0	0	0	0	0	0	0	189	0	0	189
VA FREDERICK	0	0	0	0	0	23	11	8	7	17	102	8	668	58	10	912
VA GILES	0	0	0	0	0	0	0	0	0	0	0	0	375	0	0	375
VA GLOUCESTER	0	0	0	0	0	0	0	0	0	0	0	0	757	0	0	757
VA GOOCHLAND	0	0	0	0	0	0	9	16	0	14	14	0	802	0	0	855
VA GREENE	0	0	0	0	0	0	0	0	0	0	0	0	158	0	0	158
VA HANOVER	0	0	0	0	0	0	0	0	0	0	0	0	541	16	21	578
VA HENRICO	0	0	0	0	0	0	0	0	0	0	0	0	493	0	0	493
VA HIGHLAND	0	0	0	0	0	0	0	0	0	0	0	0	429	0	0	429
VA ISLE OF WIGHT	0	0	0	0	0	0	0	0	0	0	0	0	6200	0	0	6200
VA JAMES CITY	0	0	0	0	0	0	0	0	0	0	0	0	572	0	0	572
VA KING AND QUEEN	0	0	0	0	0	2	0	0	0	0	0	0	281	0	0	283
VA KING GEORGE	0	0	0	0	0	0	0	0	0	0	0	0	160	0	0	160
VA KING WILLIAM	0	0	0	0	0	0	0	0	0	0	0	0	198	0	0	198
VA LANCASTER	0	0	0	0	0	0	0	0	0	0	0	0	130	0	0	130
VA LOUDOUN	0	0	0	0	0	9	23	8	0	0	0	0	1244	0	0	1284
VA LOUISA	0	0	0	0	0	0	0	0	0	0	0	0	376	0	0	376
VA LUNENBURG	0	0	0	0	0	0	0	0	0	0	0	0	328	0	0	328
VA MADISON	0	0	0	0	0	0	0	0	10	0	12	13	670	0	0	705
VA MATHEWS	0	0	0	0	0	0	0	0	0	0	0	0	65	0	0	65
VA MIDDLESEX	0	0	0	0	0	0	0	0	0	0	0	0	345	0	0	345
VA MONTGOMERY	0	0	0	0	0	0	0	0	0	0	0	0	2132	0	0	2132
VA NELSON	0	0	0	0	0	3	0	0	0	0	0	0	756	0	0	759
VA NEW KENT	0	0	0	0	0	0	0	0	0	0	0	0	542	0	0	542
VA NORTHAMPTON	0	0	0	0	0	1	0	0	0	0	0	17	1907	0	0	1925

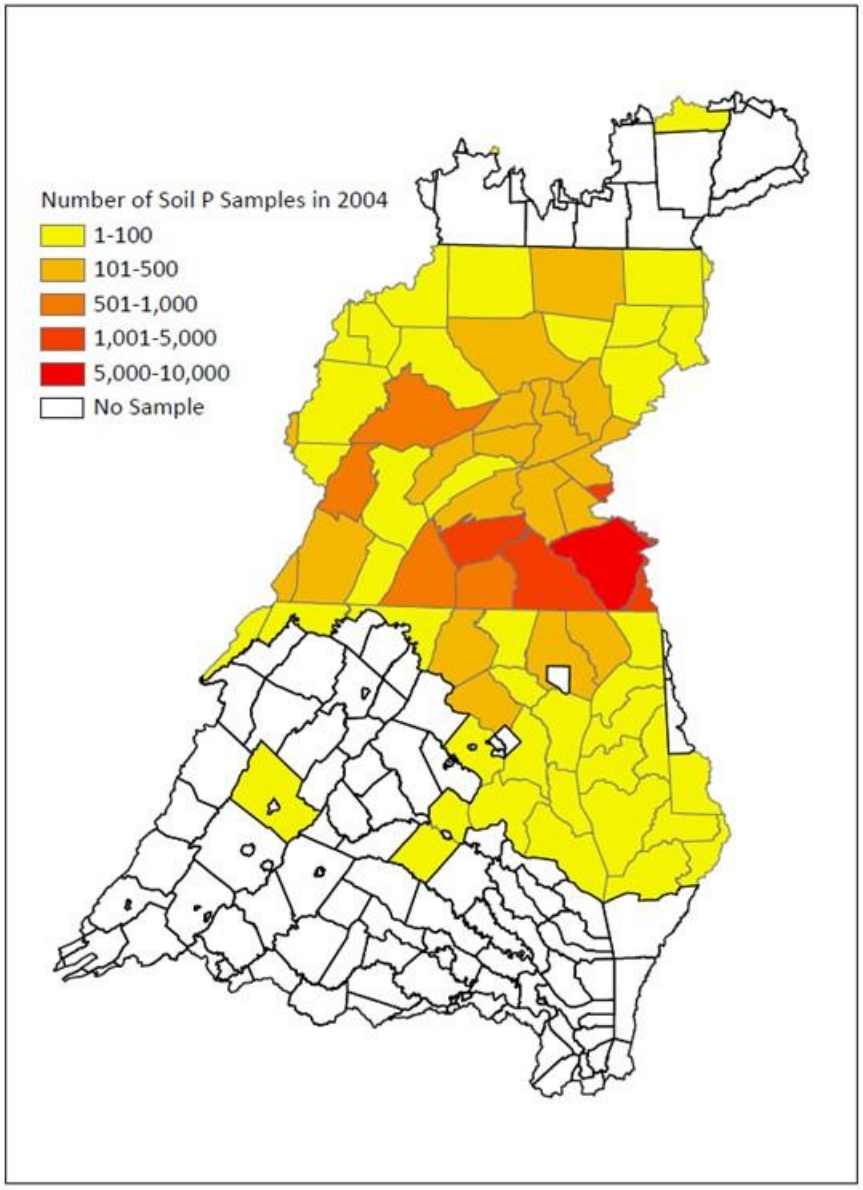
County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
VA NORTHUMBERLAND	0	0	0	0	0	0	0	0	0	0	0	0	307	0	0	307
VA NOTTOWAY	0	0	0	0	0	0	0	0	0	0	0	0	583	0	0	583
VA ORANGE	0	0	0	0	0	2	1	4	0	0	0	0	586	0	0	593
VA PAGE	0	0	0	0	0	0	0	0	0	0	0	0	779	0	0	779
VA POWHATAN	0	0	0	0	0	0	0	0	0	0	0	0	316	0	0	316
VA PRINCE EDWARD	0	0	0	0	0	0	0	1	0	0	0	0	542	0	0	543
VA PRINCE GEORGE	0	0	0	0	0	0	0	0	0	0	0	0	757	0	0	757
VA PRINCE WILLIAM	0	0	0	0	0	0	0	0	0	0	0	0	881	0	0	881
VA RAPPAHANNOCK	0	0	0	0	0	0	0	0	0	0	0	0	214	0	0	214
VA RICHMOND	0	0	0	0	0	0	0	0	0	0	0	0	507	0	0	507
VA ROANOKE	0	0	0	0	0	0	0	0	0	0	0	0	397	0	0	397
VA ROCKBRIDGE	0	0	0	0	0	0	0	3	0	0	0	0	957	0	0	960
VA ROCKINGHAM	0	0	0	0	1	2	1	3	0	66	4	26	2277	5	3	2388
VA SHENANDOAH	0	0	0	0	0	0	0	0	0	1	0	0	1505	0	0	1506
VA SPOTSYLVANIA	0	0	0	0	4	1	0	0	0	0	0	0	422	0	0	427
VA STAFFORD	0	0	0	0	3	0	3	0	0	0	0	0	231	0	0	237
VA SURRY	0	0	0	0	0	0	0	0	0	0	0	0	1729	0	0	1729
VA WARREN	0	0	0	0	0	0	0	0	0	0	0	0	194	0	0	194
VA WESTMORELAND	0	0	0	0	0	0	0	0	0	0	0	0	739	0	0	739
VA YORK	0	0	0	0	0	0	0	0	0	0	0	0	126	16	5	147
VA ALEXANDRIA	0	0	0	9	0	0	0	0	0	0	0	3	0	0	0	12
VA BEDFORD	0	0	0	0	0	0	0	0	0	0	0	0	2840	0	0	2840
VA BUENA VISTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA CHARLOTTESVILLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA CHESAPEAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	27
VA COLONIAL HEIGHTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA COVINGTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA FAIRFAX CITY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA FALLS CHURCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA FREDERICKSBURG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA HAMPTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA HARRISONBURG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA HOPEWELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA LEXINGTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA LYNCHBURG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA MANASSAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA MANASSAS PARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA NEWPORT NEWS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA NORFOLK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA PETERSBURG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA POQUOSON	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
VA PORTSMOUTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA RICHMOND	0	0	0	0	0	0	0	0	0	0	0	0	507	6	3	516
VA ROANOKE	0	0	0	0	0	0	0	0	0	0	0	0	397	0	0	397
VA STAUNTON	0	0	0	0	0	0	0	7	0	3	0	0	26	0	0	36
VA SUFFOLK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA VIRGINIA BEACH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA WAYNESBORO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA WILLIAMSBURG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA WINCHESTER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

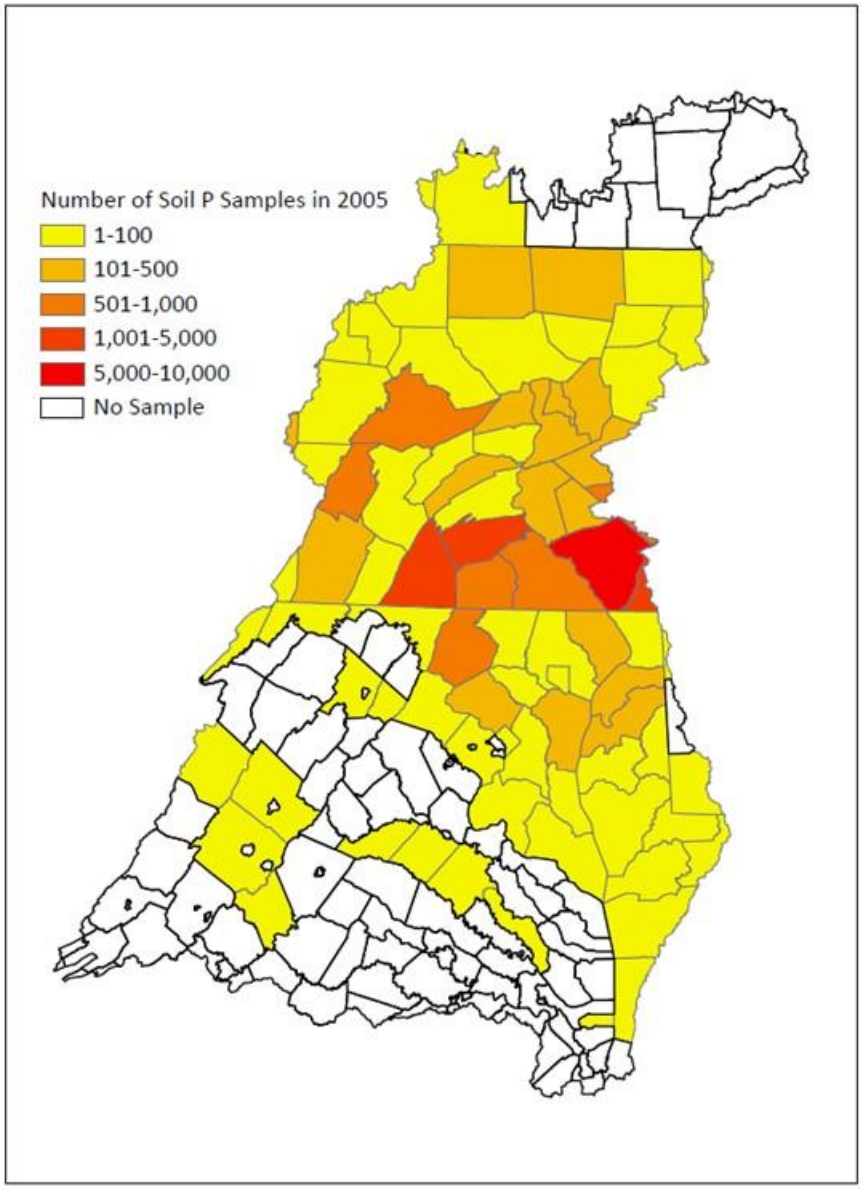

Number of Soil P Samples in 2000
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

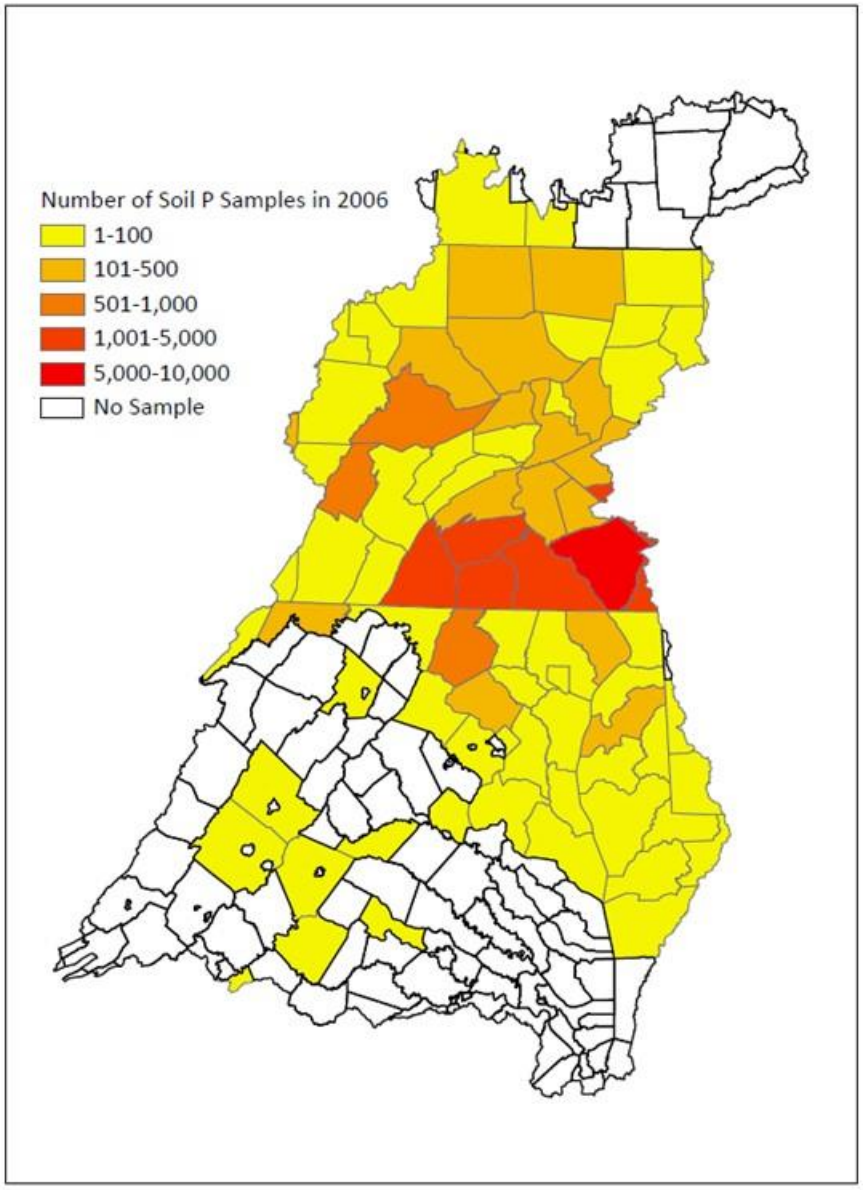

Number of Soil P Samples in 2001
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

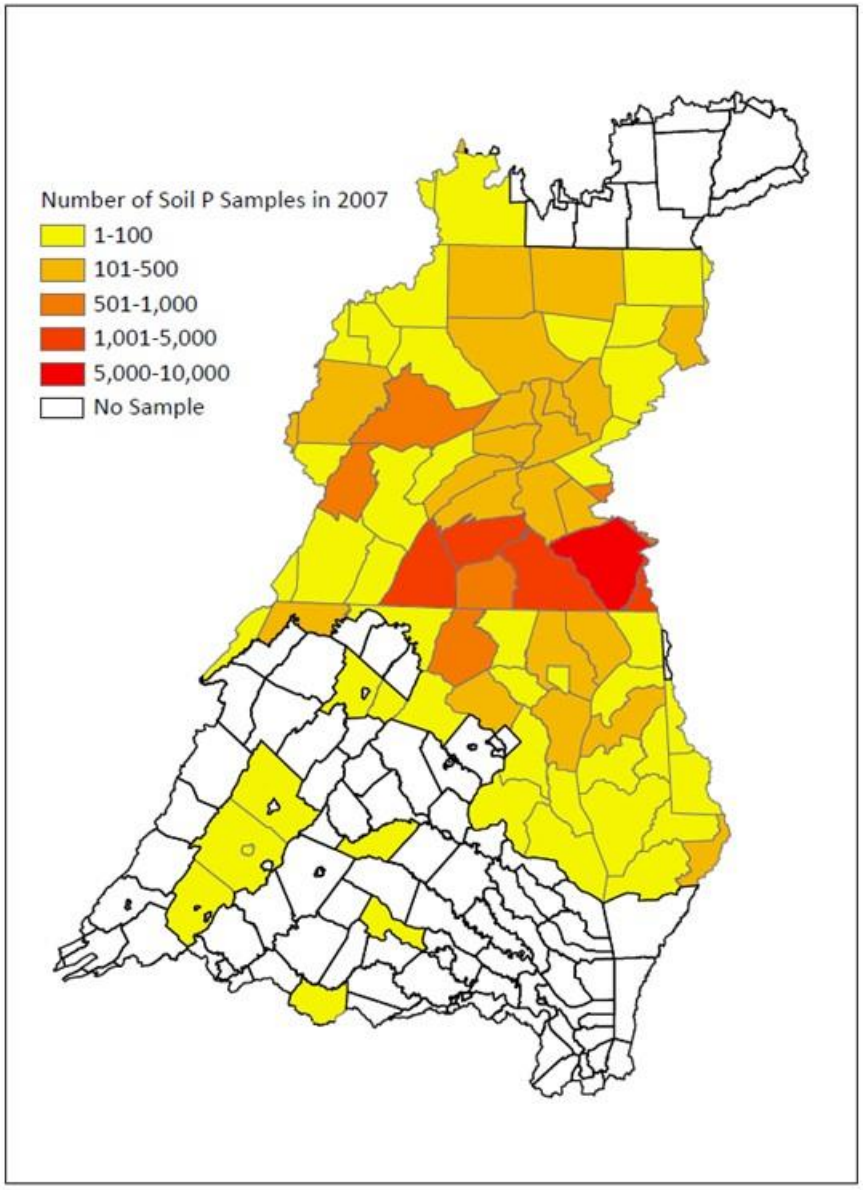

Number of Soil P Samples in 2002
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

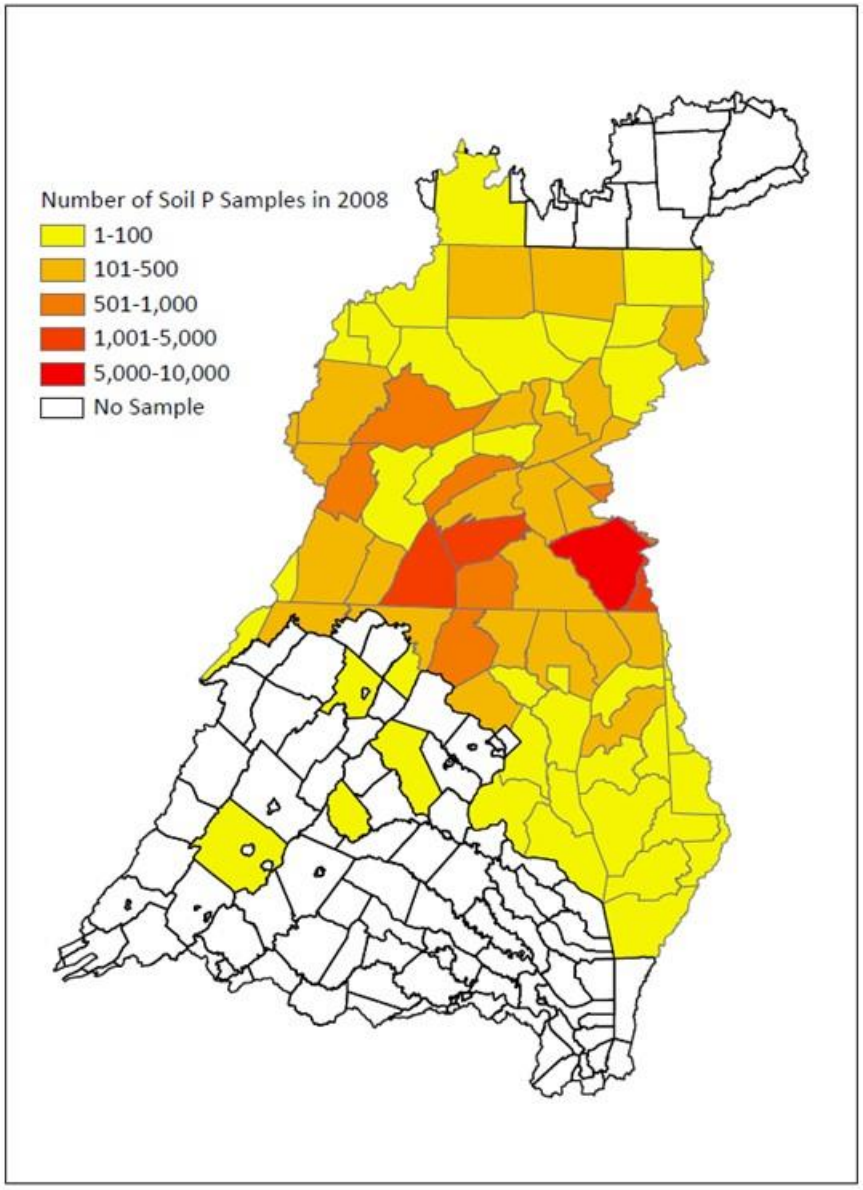

Number of Soil P Samples in 2003
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

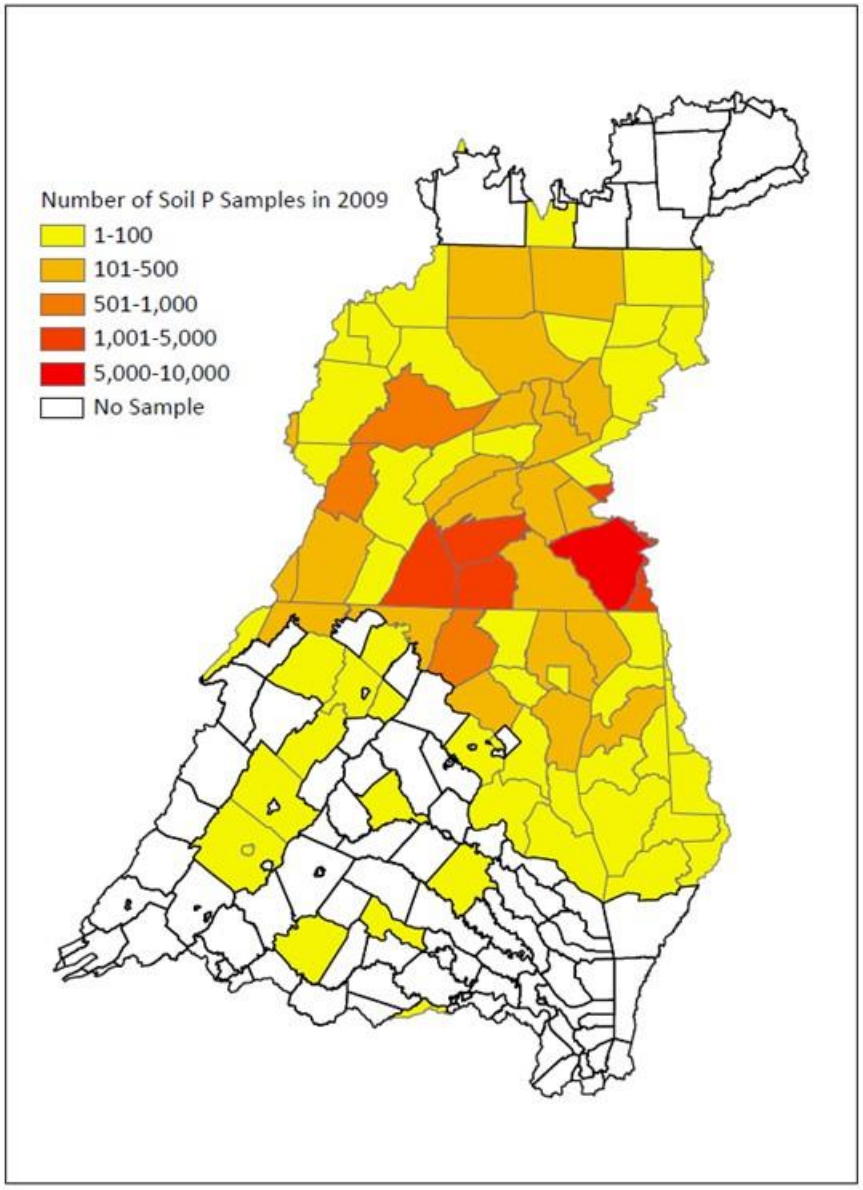

Number of Soil P Samples in 2004
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

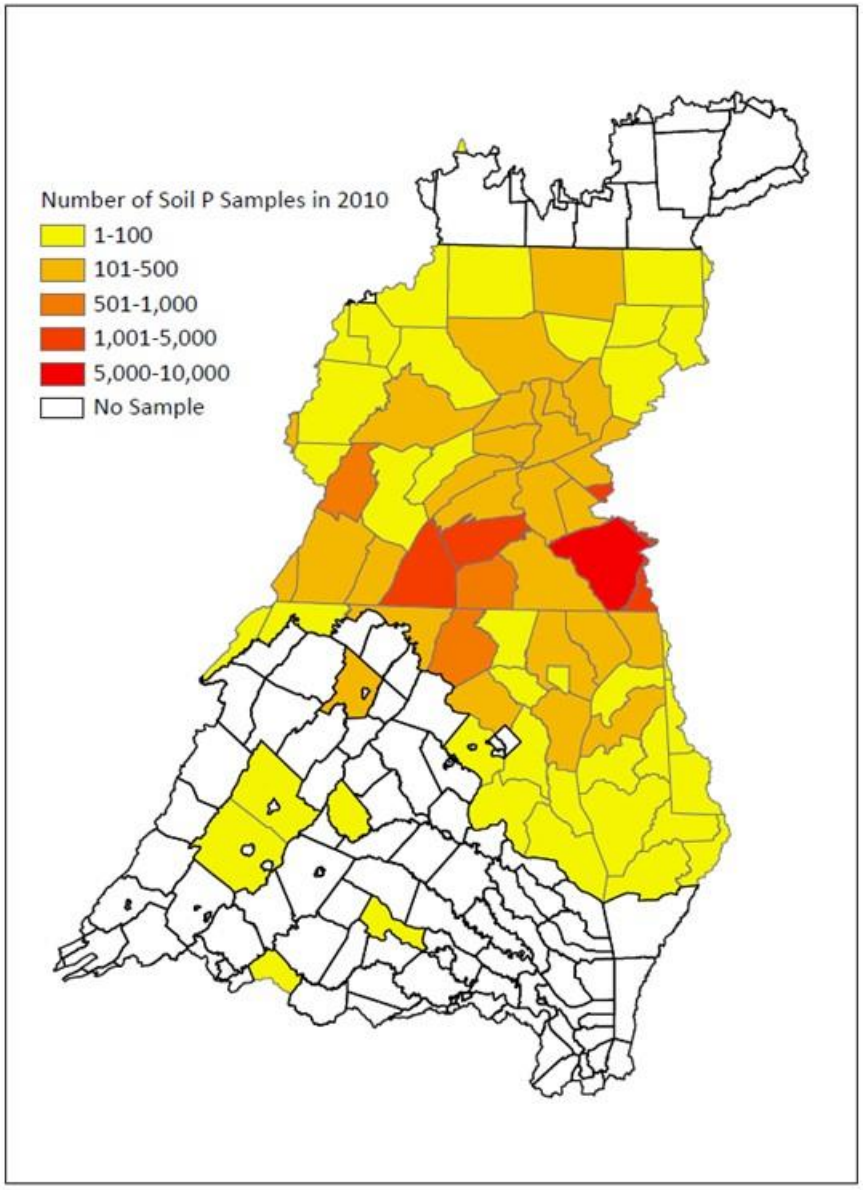

Number of Soil P Samples in 2005
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

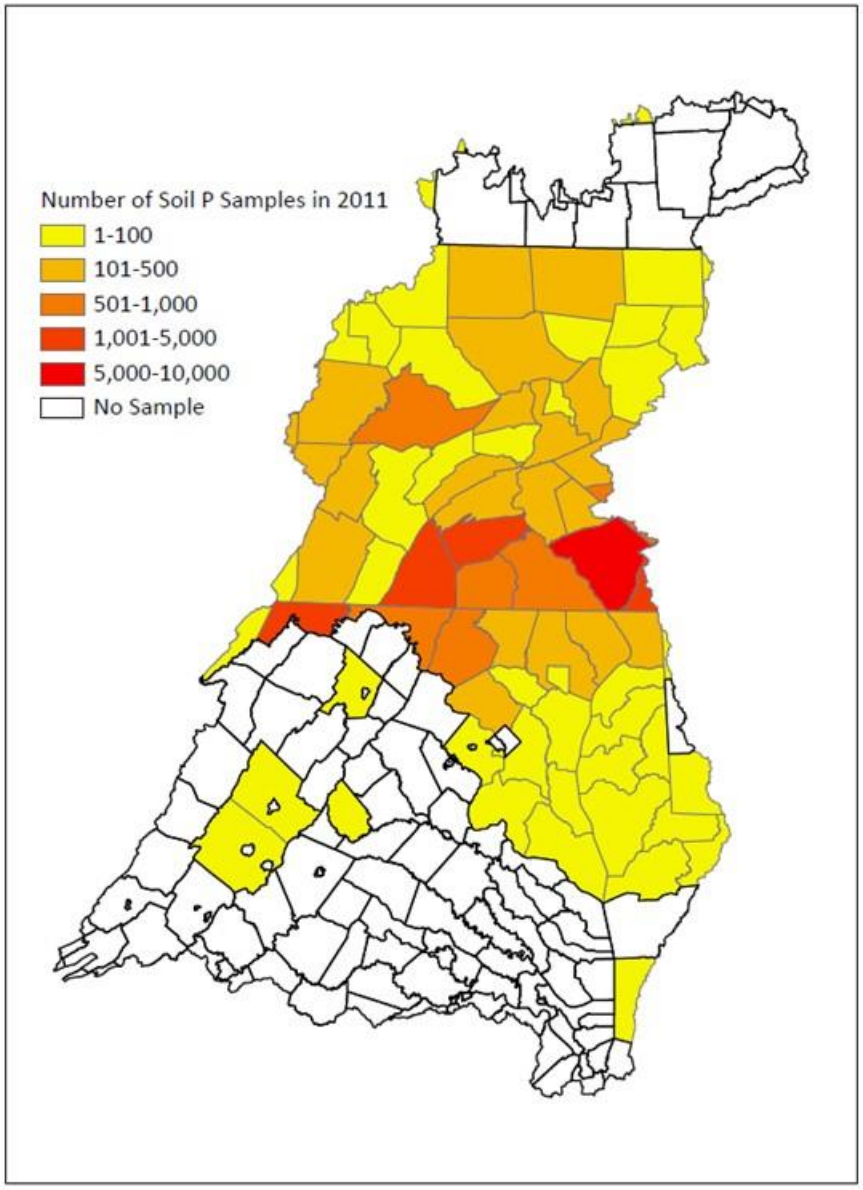

Number of Soil P Samples in 2006
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

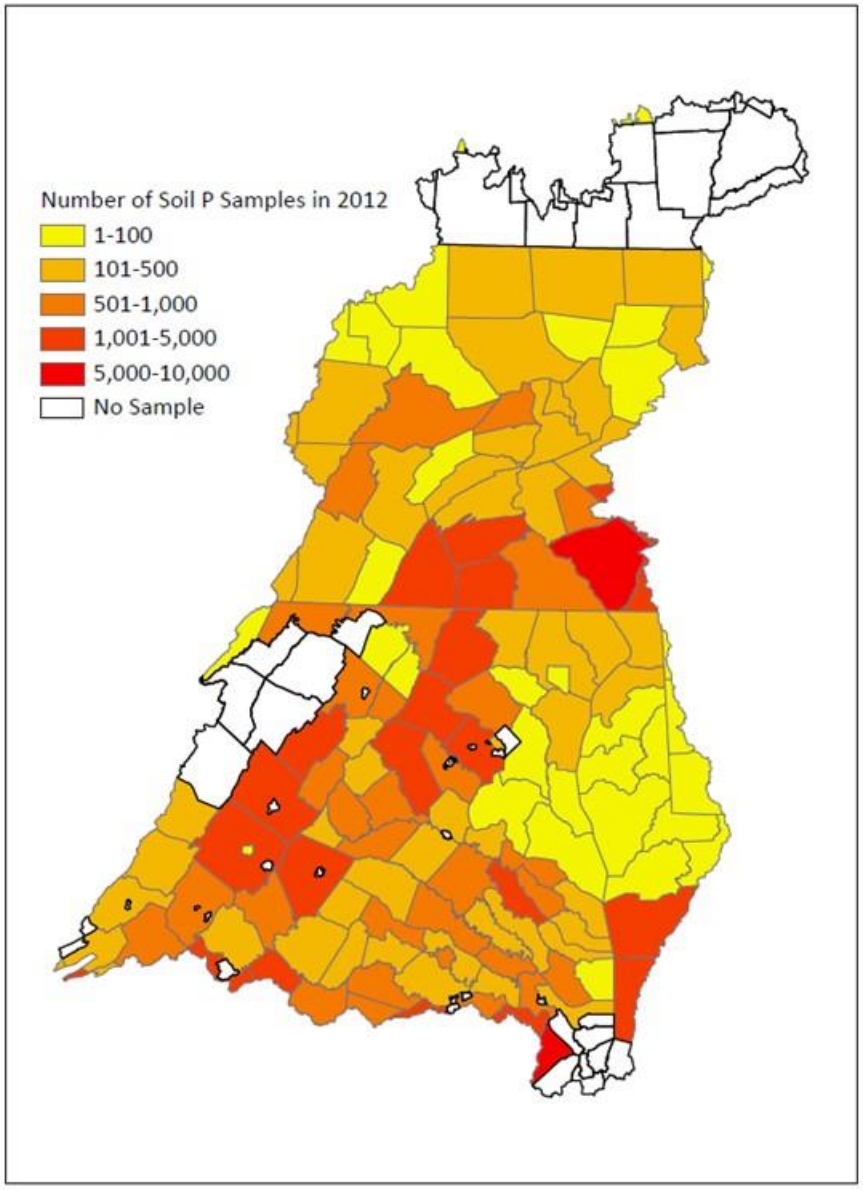

Number of Soil P Samples in 2007
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

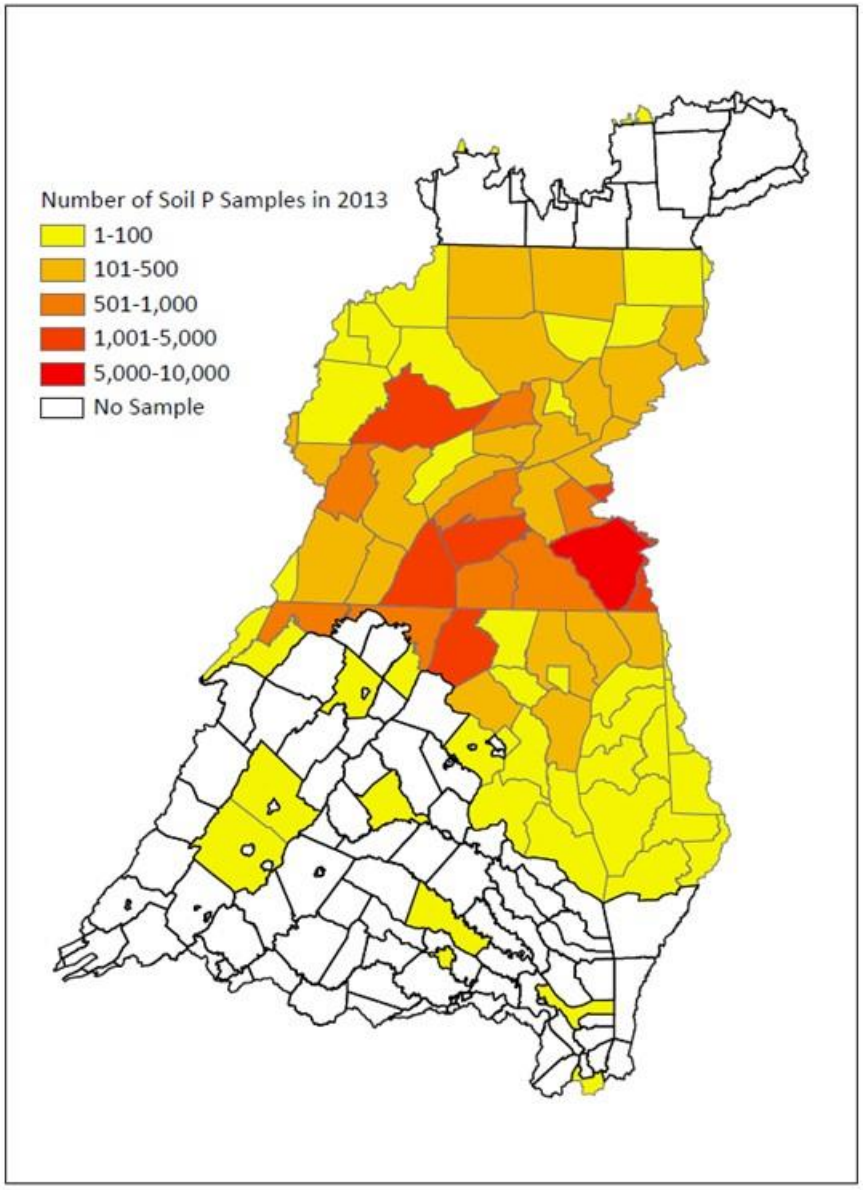

Number of Soil P Samples in 2008
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

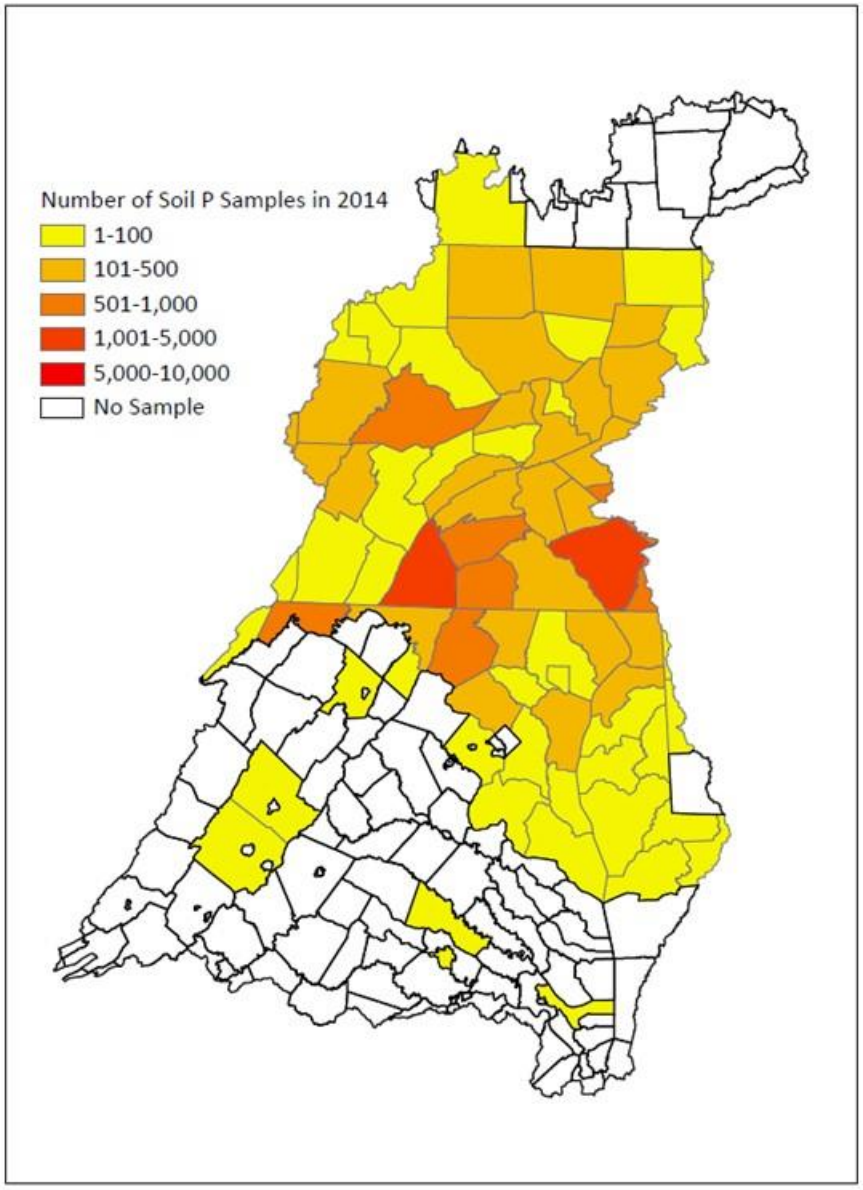

Number of Soil P Samples in 2009
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample

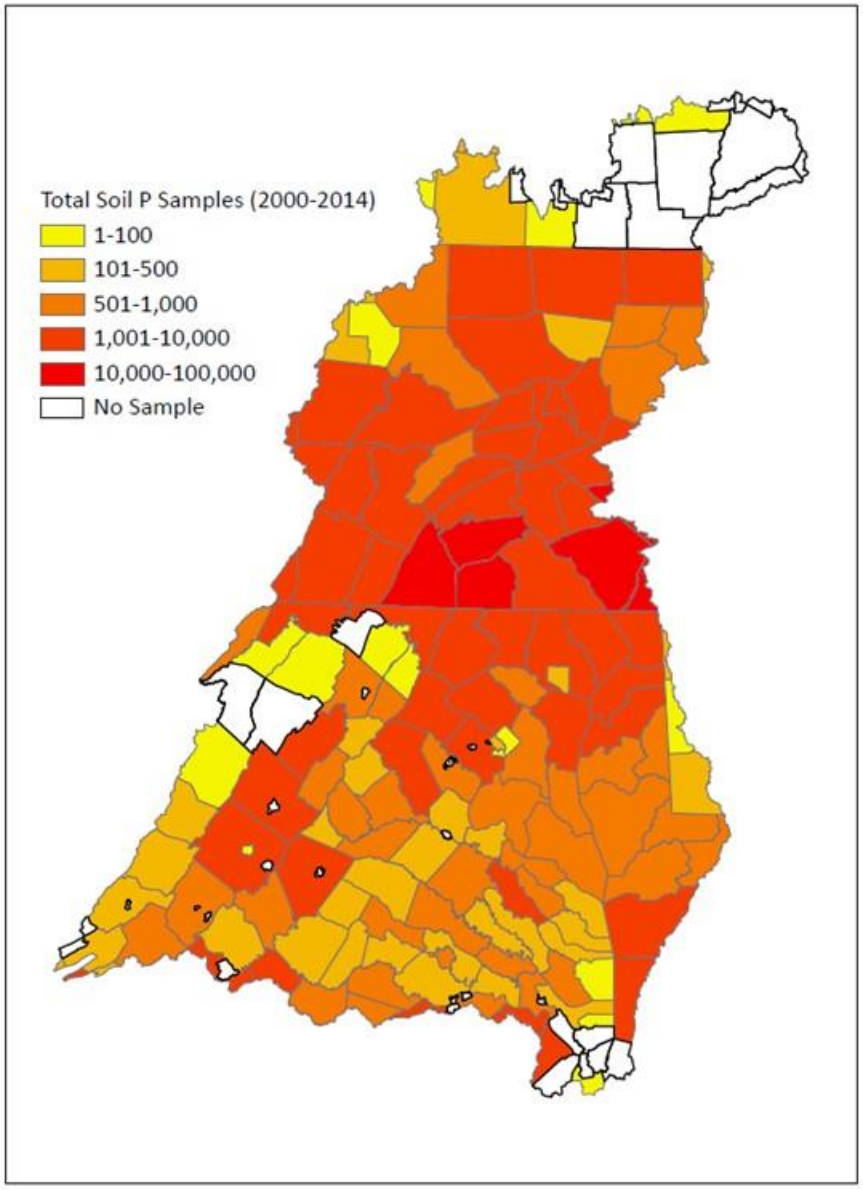

Number of Soil P Samples in 2010
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample


Number of Soil P Samples in 2011
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample


Number of Soil P Samples in 2012
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample


Number of Soil P Samples in 2013
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample


Number of Soil P Samples in 2014
1-100
101-500
501-1,000
1,001-5,000
5,000-10,000
No Sample


Total Soil P Samples (2000-2014)
1-100
101-500
501-1,000
1,001-10,000
10,000-100,000
No Sample

CBP Soil P data

- Based on more than half a million observations
- Uneven coverage between counties
- Uneven coverage between states
- Uneven coverage in time
- Many of the largest agricultural counties are well-covered.

Management Board Commitments (abridged)

- Grant or contract for analysis of existing data
- Develop standards
- Build into nutrient management and permitting
- Establish QA system across jurisdictions
- Develop state-specific reference datasets
- STAC workshop on urban land uses
- Biennial collection for milestones

Thank you!

Credits: Chesapeake Bay Program Office and 100s of Chesapeake Bay Program partners