Annual Phosphorus Loss Estimator (APLE) Model

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APLE Model Capabilities

	APLE
Language	It is a Microsoft Excel spreadsheet
Time Step	Annual
Units	Metric/ US
Edge-of-field P loss	YES
Simulates dissolved phosphorus loss in surface runoff	YES
Simulates sediment bound phosphorus loss in surface runoff	YES
Consider subsurface loss of P through leaching or artificial drainage.	NO
Consider all kinds of animal manure, applied either by machine or by grazing cattle, but consider only highly soluble commercial fertilizers	YES
Simulate P loss through grassed waterways or buffers that may occur beyond the field edge	NO

APLE Model Inputs

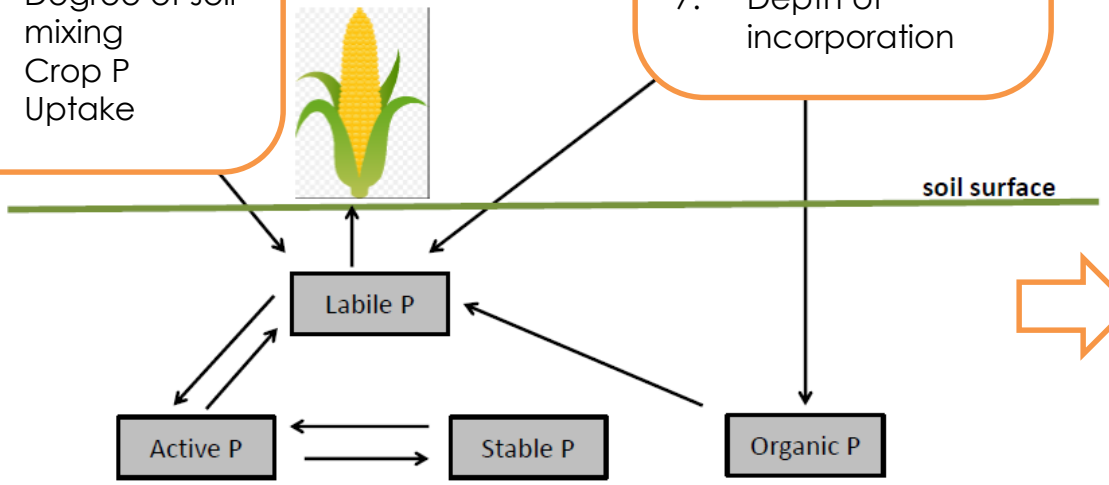
	APLE
Texture,organic matter and soil bulk density	YES
The type of soil cover	NO
The initial concentration of soil Labile P	YES
Day of manure or fertilizer applications	NO
Manure applications	Wet manure
For fertilizer applications	P2O5 applied per acre
Precipitation and Runoff	Annual
Temperature	-
Sediment	Annual
When grazing animals are present	YES

Diagram of APLE Nutrient Inputs and Soil Pools

Transport
1. Rain
2. Runoff
3. Sediment loss

Fertilizer Applications
1. Fertilizer P2O5 applied
2. Fertilizer incorporated
3. Depth of incorporation
4. Degree of soil mixing
5. Crop P Uptake

Manure Applications
1. Manure applied
2. Manure solids
3. Manure P2O5
4. Manure WEP/TP
5. Manure injection
6. Manure incorporated
7. Depth of incorporation



1. Eroded sediment P loss
2. Soil dissolved P
3. Manure
4. Fertilizer

Soil Properties
1. Depth of layers
2. P soil content
3. Clay %
4. OM %
5. Area

Equations to estimate Manure runoff P, Fertilizer runoff P, Sediment P loss, and Dissolved Soil P runoff

(Adapted from Vadas, et al. 2007)

Soil test P Datasets

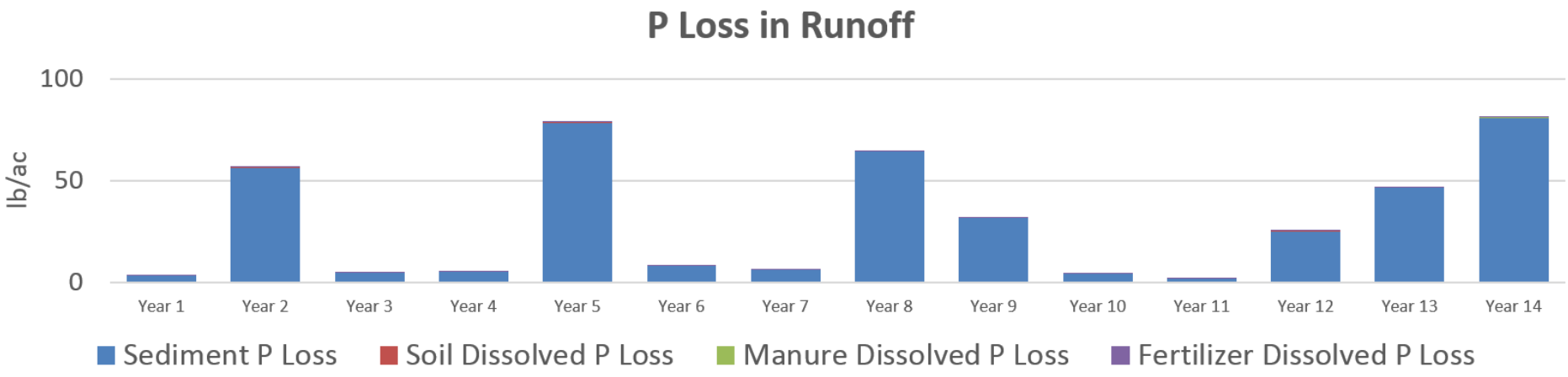
- **AgriAnalysis Lab (2003-2014)** for all zip codes in the Chesapeake Bay

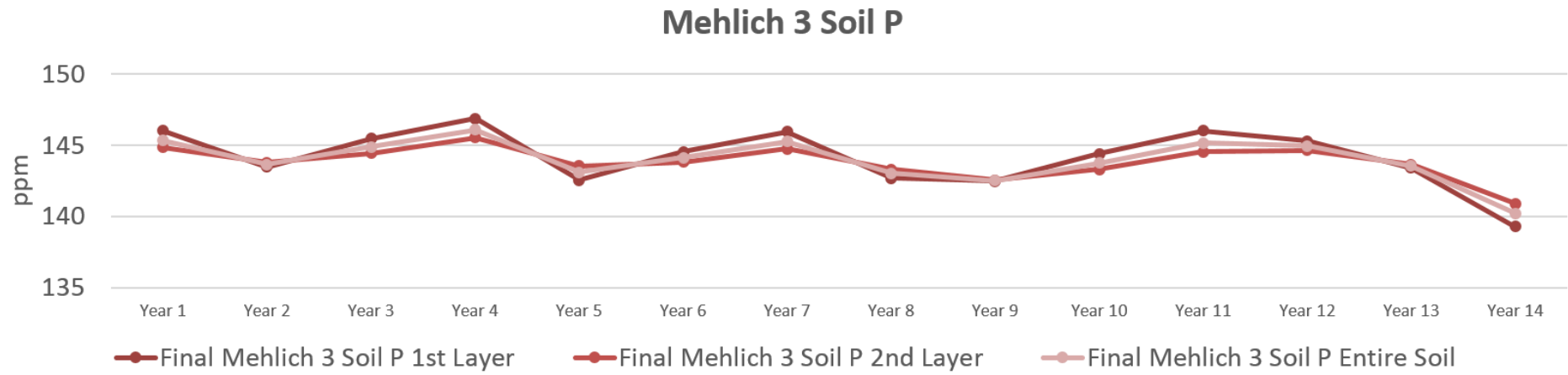
- **Spectrum Analysis (2006-2013)** data are at the scale of state

- **Penn State (2001-2014)** data is comparable to the AgriAnalysis data

Lancaster PA – high till with manure (hwm)

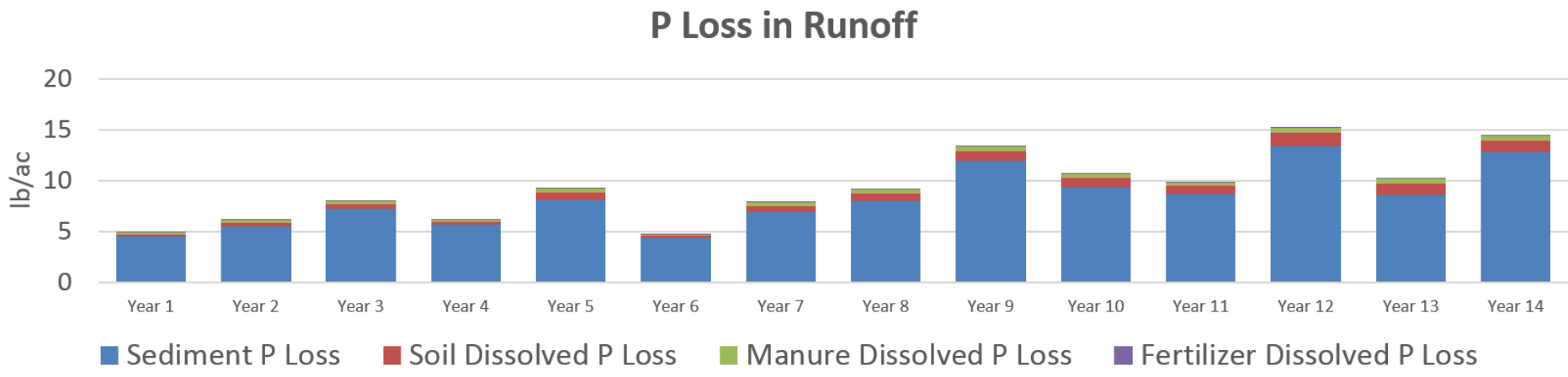
YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
ANNUAL_RAIN_IN	37.7	48.8	49.0	41.5	60.1	33.0	43.2	45.5	42.3	32.0	44.2	58.1	54.5	46.6
ANNUAL_RUNOFF_IN	0.2	2.2	0.4	0.4	4.2	0.6	0.4	1.6	1.5	0.4	0.2	3.8	1.9	2.1
SEDIMENT_TONACRE	0.9	21.6	1.5	1.7	30.6	3.2	2.4	25.8	13.2	1.5	0.5	10.3	19.5	34.6

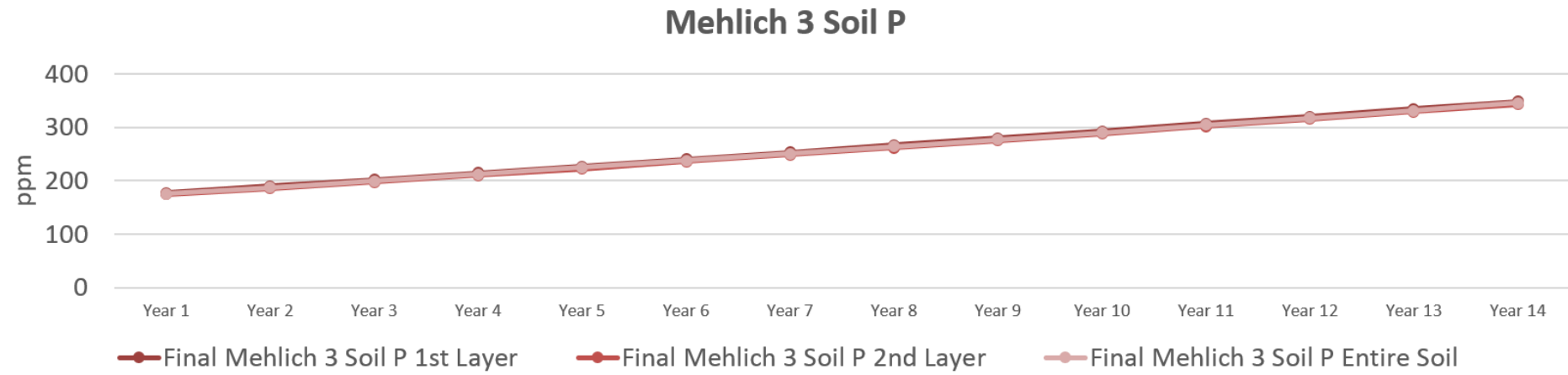




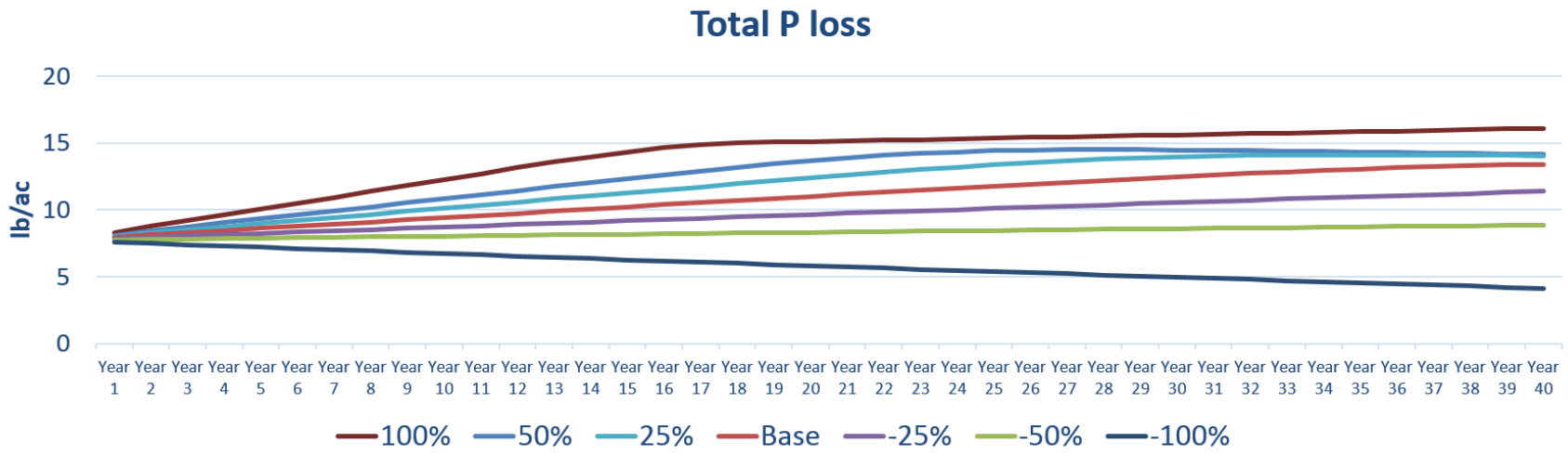
Somerset MD – high till with manure (hwm)

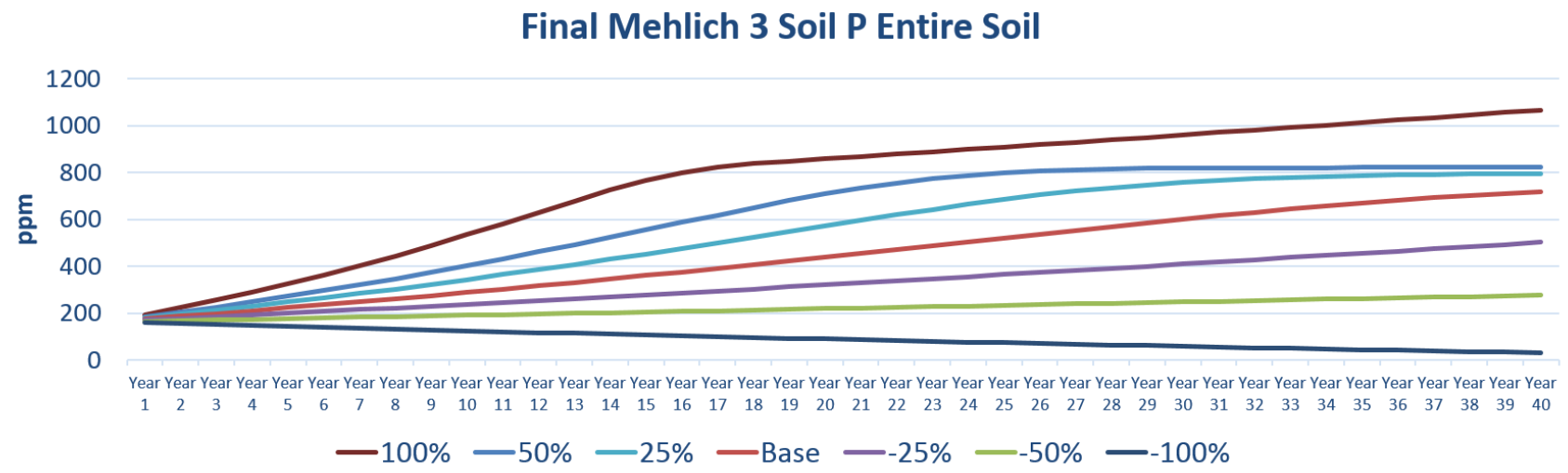
YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
ANNUAL_RAIN_IN	47.0	46.0	46.7	37.1	57.5	41.6	44.6	50.2	50.8	46.1	48.7	62.0	51.6	49.3
ANNUAL_RUNOFF_IN	2.5	3.8	4.3	2.2	6.2	2.2	4.2	5.6	6.3	5.8	4.7	7.8	6.6	6.4
SEDIMENT_TONACRE	1.3	1.7	2.4	1.7	2.7	1.1	2.1	2.4	3.8	2.9	2.6	4.1	2.4	3.8



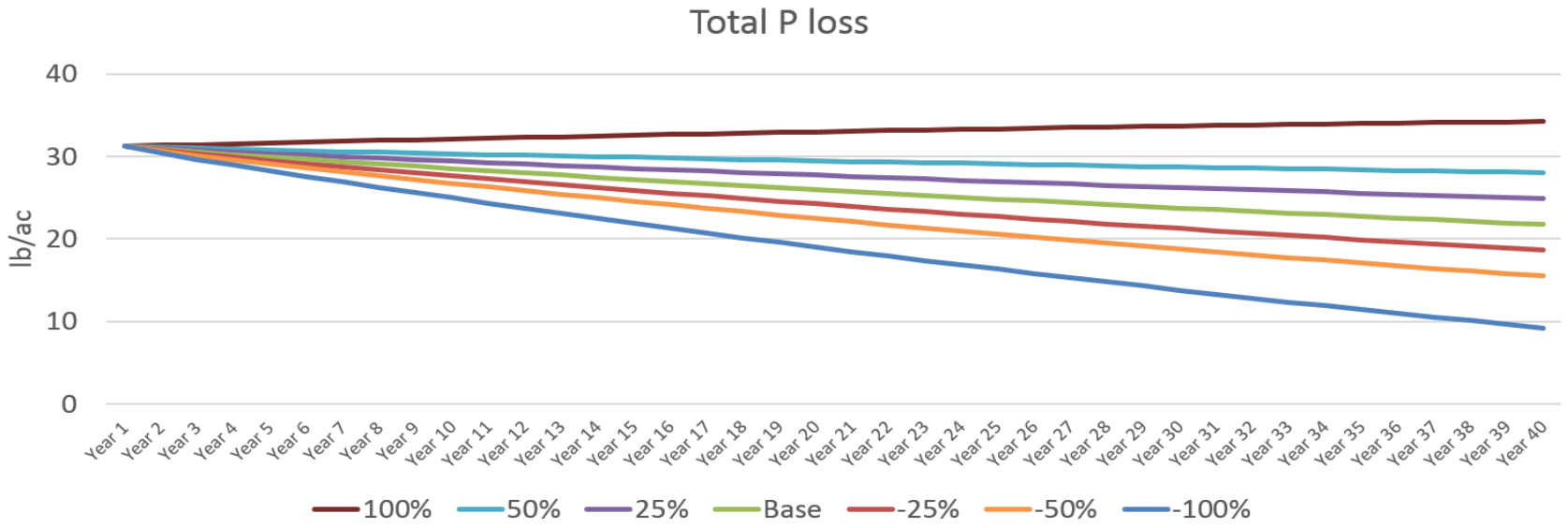


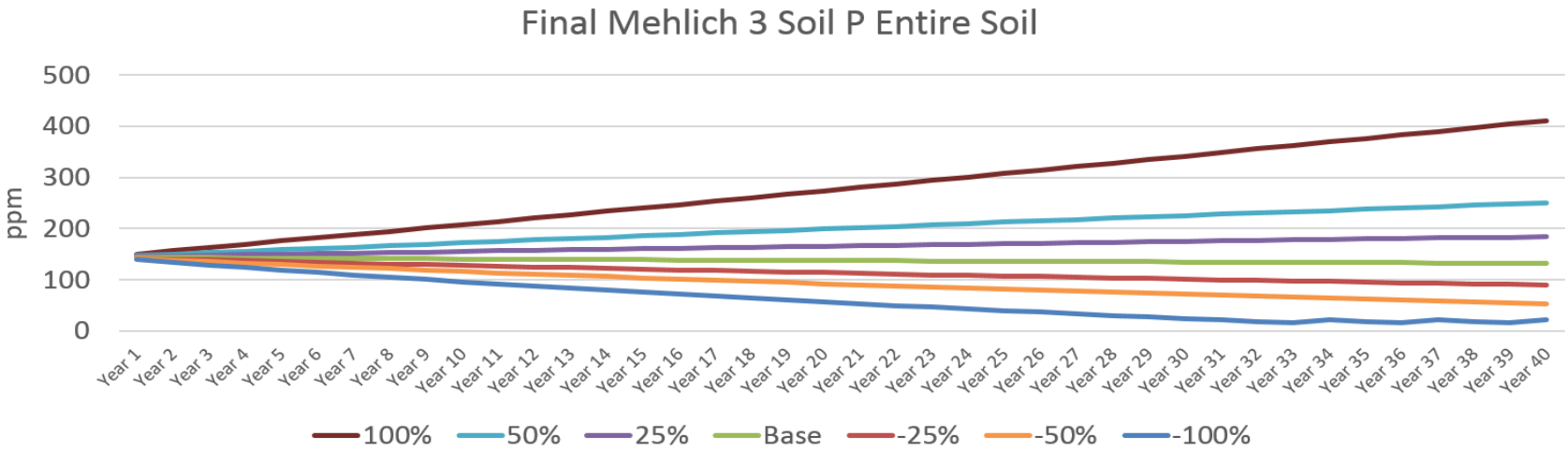
APLE Sensitivity to fertilizer inputs – Somerset MD (hwm)





APLE sensitivity to fertilizer inputs - Lancaster PA (hwm)





APLE Model in Phase 6

- APLE has been Implemented in Phase 6
- Soil P test data has been acquired
- Long term sensitivity analysis vs a 10 year analysis?