

# Implementing Adaptive Nutrient Management as Part of a 590 Plan

Carrie Laboski

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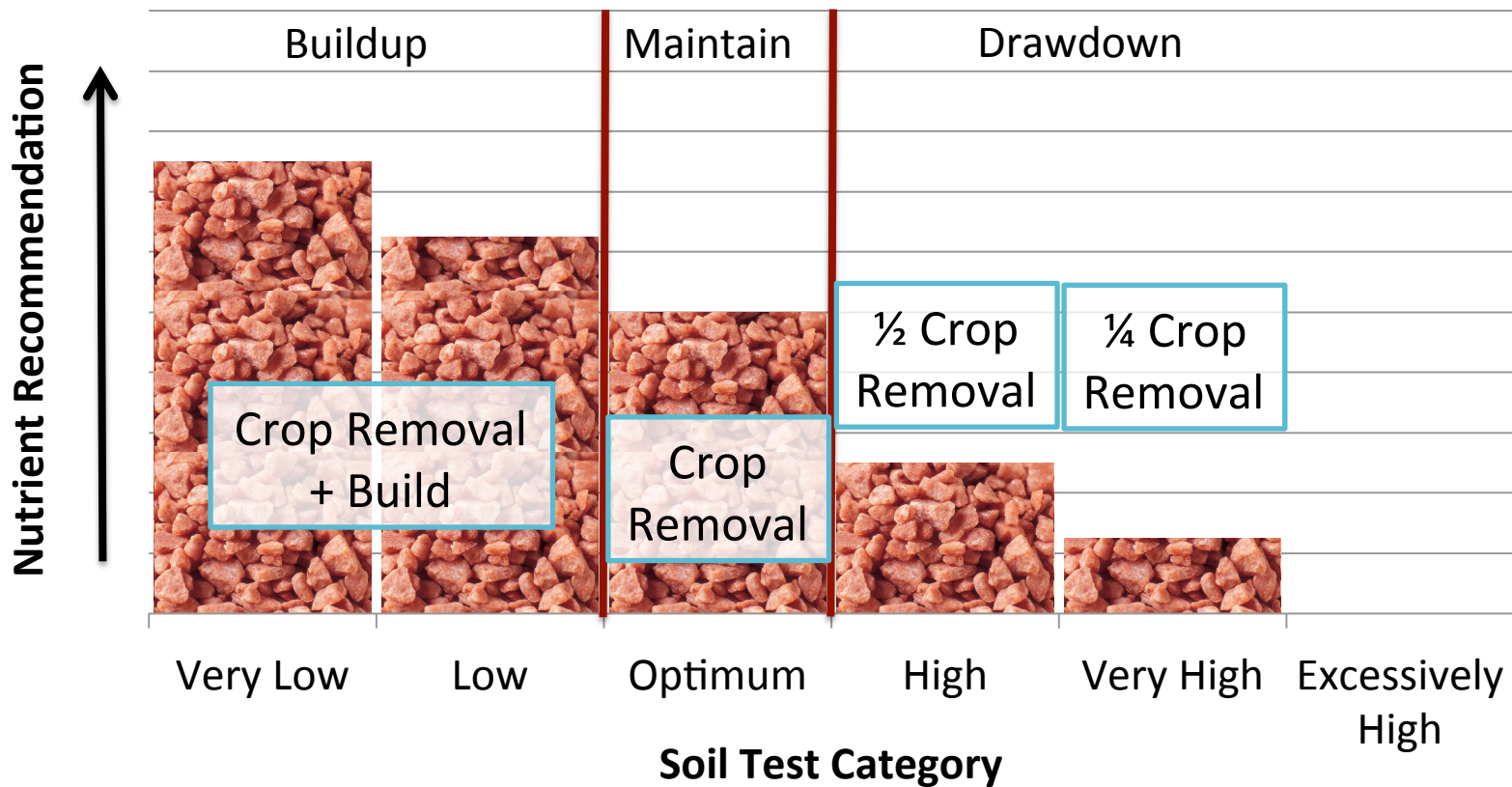
# What is Adaptive Nutrient Management?

- Goal – To enable growers to use on-farm data to refine nutrient management strategies to adapt to conditions on their farm
- ANM in the context of the 590 standard can be used to:
  1. Document the need for and amount of rescue N applications after excessive rainfall
  2. Adjust P and K application rates when documented crop yield levels are greater than ranges provided in UWEX Pub. A2809
  3. Refine any nutrient application rate (primarily N) or management strategy using on-farm research data

# ADJUST P AND K APPLICATION RATES

# Adjust P and K application rates

- When to use
  - Documented yield levels are greater than or less than ranges published in A2809
- How to adjust
  - Read A2809 Chapter 7

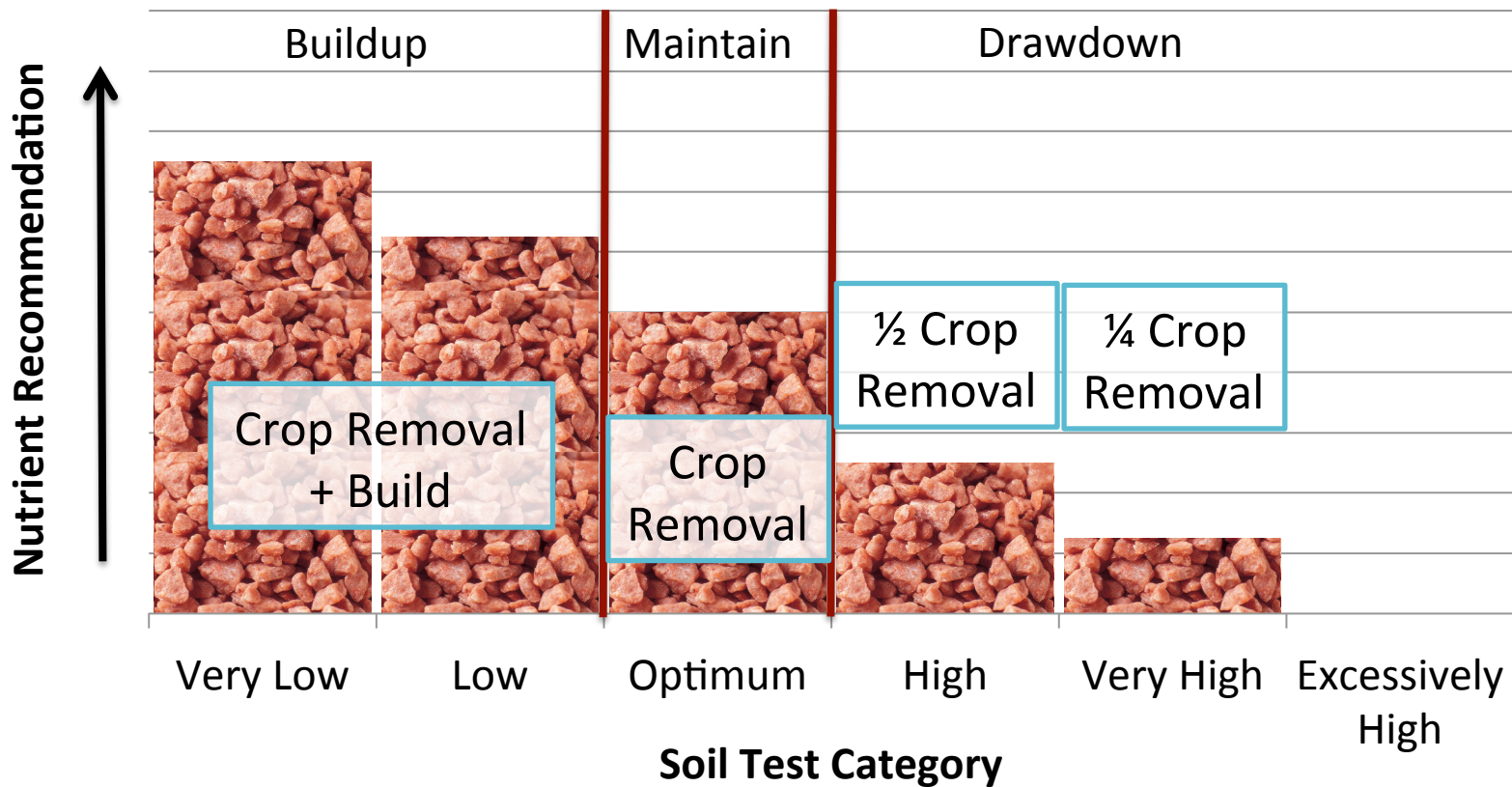


Crop removal = Documented yield level x nutrient removal from Table 4.2 in A2809

Build rate = Rate at optimum – rate at low or very low (See Table 7.4)

**Table 7.4.** Phosphorus (P) and potassium (K) fertilizer application rate guidelines.

Crop name	Yield goal (per acre)	P <sub>2</sub> O <sub>5</sub> rate guidelines					K <sub>2</sub> O rate guidelines					
		VL	L	O	H	EH	VL	L	O	H	VH	EH
		-----lb P <sub>2</sub> O <sub>5</sub> /a to apply <sup>a</sup> -----					-----lb K <sub>2</sub> O/a to apply <sup>b</sup> -----					
Alfalfa, seeding	1.5–2.5 ton	65	55	25	15	0	160	145	105	55	25	0
Alfalfa, established <sup>c</sup>	2.6–3.5 ton	80	70	40	20	0	235	220	180	90	45	0
	3.6–4.5 ton	90	80	50	25	0	295	280	240	120	60	0
	4.6–5.5 ton	105	95	65	35	0	355	340	300	150	75	0
	5.5–6.5 ton	120	110	80	40	0	415	400	360	180	90	0
	6.6–7.5 ton	130	120	90	45	0	475	460	420	210	105	0
	7.6–8.5 ton	145	135	105	55	0	535	520	480	240	120	0
	8.6–9.5 ton	155	145	115	60	0	595	580	540	270	135	0
Apple, establishment <sup>d</sup>	all	200	150	—	—	—	275	200	—	—	—	—
Asparagus	2,000–4,000 lb	90	65	10	5	0	120	90	20	10	5	0
Barley, grain	25–50 bu	55	45	15	10	0	60	45	15	10	5	0
	51–75 bu	65	55	25	15	0	65	50	20	10	5	0
	76–100 bu	75	65	35	20	0	75	60	30	15	10	0
Barley, grain + straw <sup>e</sup>	25–50 bu	75	65	35	20	0	120	105	75	40	20	0
	51–75 bu	85	75	45	25	0	130	115	85	45	20	0
	76–100 bu	95	85	55	30	0	140	125	95	50	25	0



Crop removal = Documented yield level x nutrient removal from Table 4.2 in A2809

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# REFINING NM THROUGH ON-FARM RESEARCH



# Refining NM through on-farm research

- Purpose: to validate the need for
  - Nutrient application rates greater than those outlined in A2809
  - Management practices which may vary from this standard
- The bar is set high for this level of flexibility

# References for general background and detail on conducting on-farm research

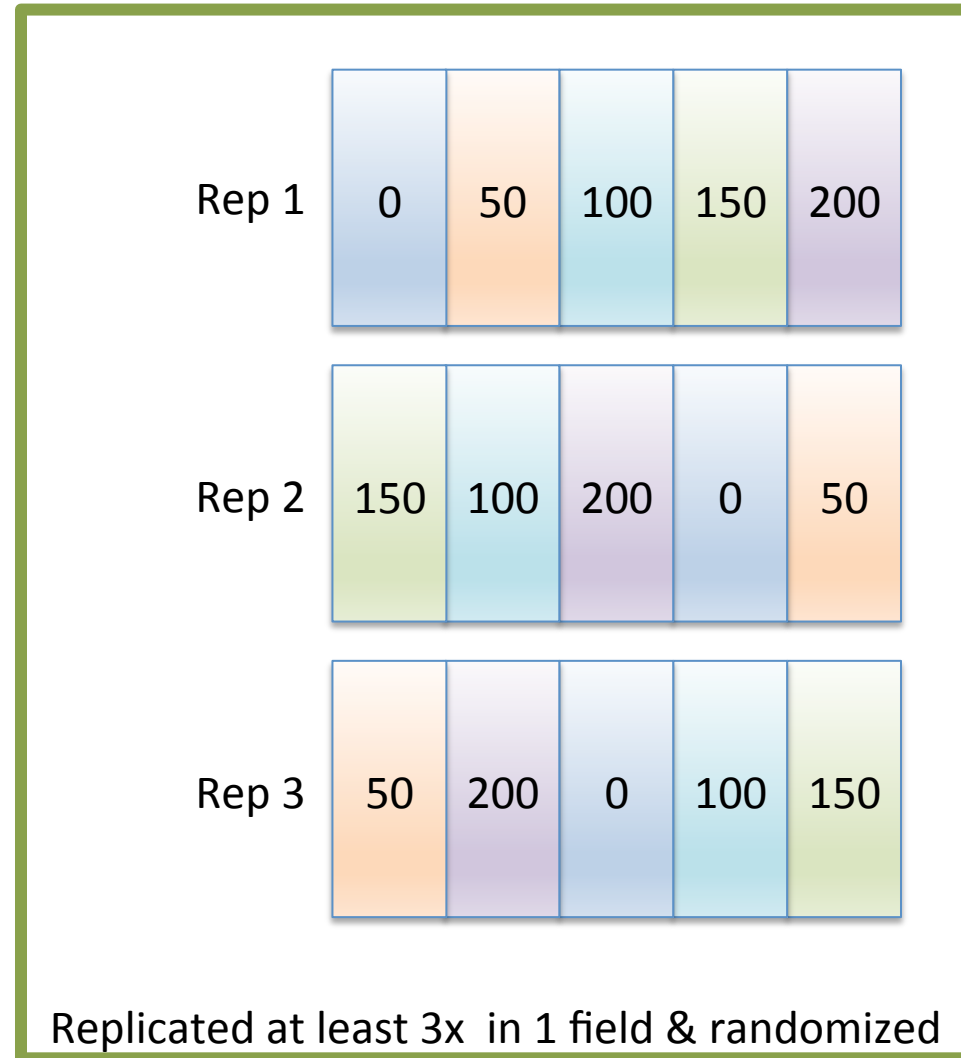
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<http://corn.agronomy.wisc.edu/Management/L016.aspx>
- Nielsen, R.L. A Practical Guide to On-Farm Research. 2010. Purdue University, Department of Agronomy Corny News Network.  
<https://www.agry.purdue.edu/ext/corn/news/timeless/onfarmresearch.pdf>
- NRCS Agronomy Technical Note No. 6 Adaptive Nutrient Management, September 2011.

# Criteria for Experimental Design

- Plots can be small plots or field strips
- Plot layout should account for field variability
  - Follow the guidance in Lauer, 2013; Nielsen, 2010; or University of Nebraska, 2013

# Criteria for Experimental Design - Rate

- Use at least 5 rates, incl. 0
- Starter fert can't exceed
  - 20-10-10 lb/a N-P-K
- The study should be conducted on at least 1 field each year
  - Field conditions should be similar for comparison purposes
  - Including at a minimum tillage, previous crop, and fertilizer/ manure application history
- The study should be conducted a minimum of 3 years



# Criteria for Experimental Design – Practices Other than Rate

- When comparing two or more practices not including rate (eg. source of N fertilizer), NRCS Agronomy Technical Note No. 6 Adaptive Nutrient Management, September 2011 suggests:
  - 5 replications at a minimum when 2 practices are compared
  - 4 replications at a minimum when 3 or more practices are compared

# Criteria for Data Analysis

- Data must be statistically analyzed before conclusions can be drawn!
- When evaluating nutrient application rates, use the Crop Nutrient Response Tool (<http://nane.ipni.net/article/NANE-3068>) developed by IPNI to calculate the economic optimum nutrient rate
- For a comparison of practices, analysis on variance (ANOVA) with Fisher's least significant difference (LSD) is an appropriate statistical analysis
  - Excel can compute an ANOVA, but not a LSD
  - Alternatively AgStats (<http://pnwsteep.wsu.edu/agstatsweb/>) is an online tool that can be used

# Criteria for Data Collection

- Data collected may vary based on the trial objectives
- Some key pieces of data may include:
  - Yield, moisture, test weight
  - Routine soil test levels
  - Preplant profile nitrate test (PPNT), presidedress nitrate test (PSNT), soil nitrate testing at other times
  - Plant analysis
  - Manure analysis – required if manure is an objective of the trial

# Other Necessary Documentation

- For all field trials, document the following:
  - Year study was conducted
  - Town and county
  - Latitude and longitude of field
  - Soil map unit(s) in the field
  - Previous crop history for the past 5 yr
  - All nutrients applied for the past 5 yr incl. source, rate, time, & placement
  - Hybrid/variety, relative maturity, planting date, seeding rate, row spacing



# Other Necessary Documentation - Continued

- For all field trials, document the following:
  - Tillage and time of tillage
  - Percentage of surface residue coverage at planting
  - Is the field tile drained?
  - Is the field irrigated?
    - If so, N content of irrigation water and amount irrigated in season.
  - Weekly precipitation and general commentary about weather with regard to precipitation and temperature during the growing season
  - Observations on weed, insect, and disease pressure

# Example of on-farm trial for corn MRTN

- [http://www.npketc.info/?page\\_id=289](http://www.npketc.info/?page_id=289)

# Approval required to implement ANM, may not be available every where or for every thing

- NRCS
  - Available to growers in select watersheds
  - Requested at local office, coordinated at state office
  - Approvals are made by Judy Derricks (State Resource Conservationist)
  - Want to get more adoption of standards
- DNR
  - For CAFOs will need to apply for research exemption
  - Approval made by Joe Baeten
- DATCP
  - Not available until ATCP 50 is revised to include new 590
  - Current ATCP 50 allows some flexibility if there is credible information to document need
  - Contact Sara Walling with questions

# Summary

- ANM designed to provide flexibility
- Comes with a responsibility to:
  - Thoroughly document site conditions
  - Develop appropriate replicated on-farm research trials
  - Statistically analyze data
  - Properly interpret data
- Many producers may find that they need the assistance of extension personnel or crop consultants to adequately conduct ANM

# Questions?



## Carrie Laboski

Professor and Extension  
Soil Fertility/Nutrient  
Management Specialist

608-263-2975

[laboski@wisc.edu](mailto:laboski@wisc.edu)

[www.NPKetc.info](http://www.NPKetc.info)