

2008

# Pesticide Safety 2008 - Nutrient Management BMPs Phosphorus

Carolyn J. DeMoranville

*University of Massachusetts - Amherst*, carolynd@umext.umass.edu

Follow this and additional works at: [https://scholarworks.umass.edu/cranberry\\_extension](https://scholarworks.umass.edu/cranberry_extension)



Part of the [Horticulture Commons](#)

---

## Recommended Citation

DeMoranville, Carolyn J., "Pesticide Safety 2008 - Nutrient Management BMPs Phosphorus" (2008). *Cranberry Station Extension meetings*. 25.

Retrieved from [https://scholarworks.umass.edu/cranberry\\_extension/25](https://scholarworks.umass.edu/cranberry_extension/25)

This Article is brought to you for free and open access by the Cranberry Station Outreach and Public Service Activities at ScholarWorks@UMass Amherst. It has been accepted for inclusion in Cranberry Station Extension meetings by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact [scholarworks@library.umass.edu](mailto:scholarworks@library.umass.edu).



# Nutrient Management BMPs

## Phosphorus

Carolyn DeMoranville  
UMass Amherst Cranberry Station



# Topics to be covered

- Phosphorus reduction
  - Monitoring tissue levels
- Water quality
  - Data from P reduction
  - Flood handling BMP



# Background – why P reduction?

- Nationally, cranberry farmers, like all farmers, are being pressured to develop nutrient management plans
- P management has become the primary issue for cranberry planning on the environmental side
- Cranberry farming involves discharging surface water into streams, pond, and lakes – most of these are P limited



# Background

- Since growers apply based on N requirements, P applications may be in excess
- Actual P requirement based on plant composition/ growth is low
  - “trash” plus 200 bbl crop removes 4.2 lb P/acre
- Soil testing is problematic for planning due to lack of calibration ability – acid soils



# Background

- Tissue testing should be a better tool (established standard value of 0.1 to 0.2%)
- For best planning, a target P application range should also be established
- If growers are exceeding the target range - the nutrient management plan would call for a reduction strategy



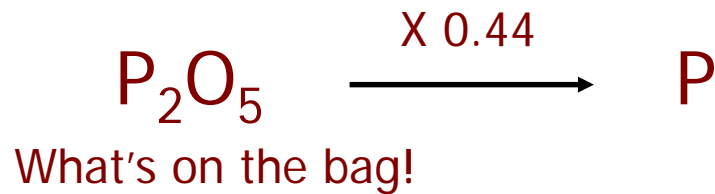
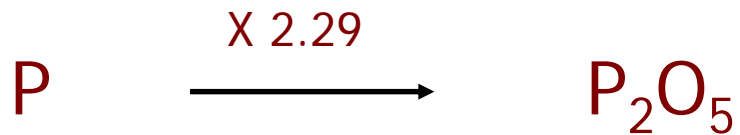
# Recommended target

- No more than 20 lb P/acre
- This is ~45 lb/a  $P_2O_5$  (what's on the bag)



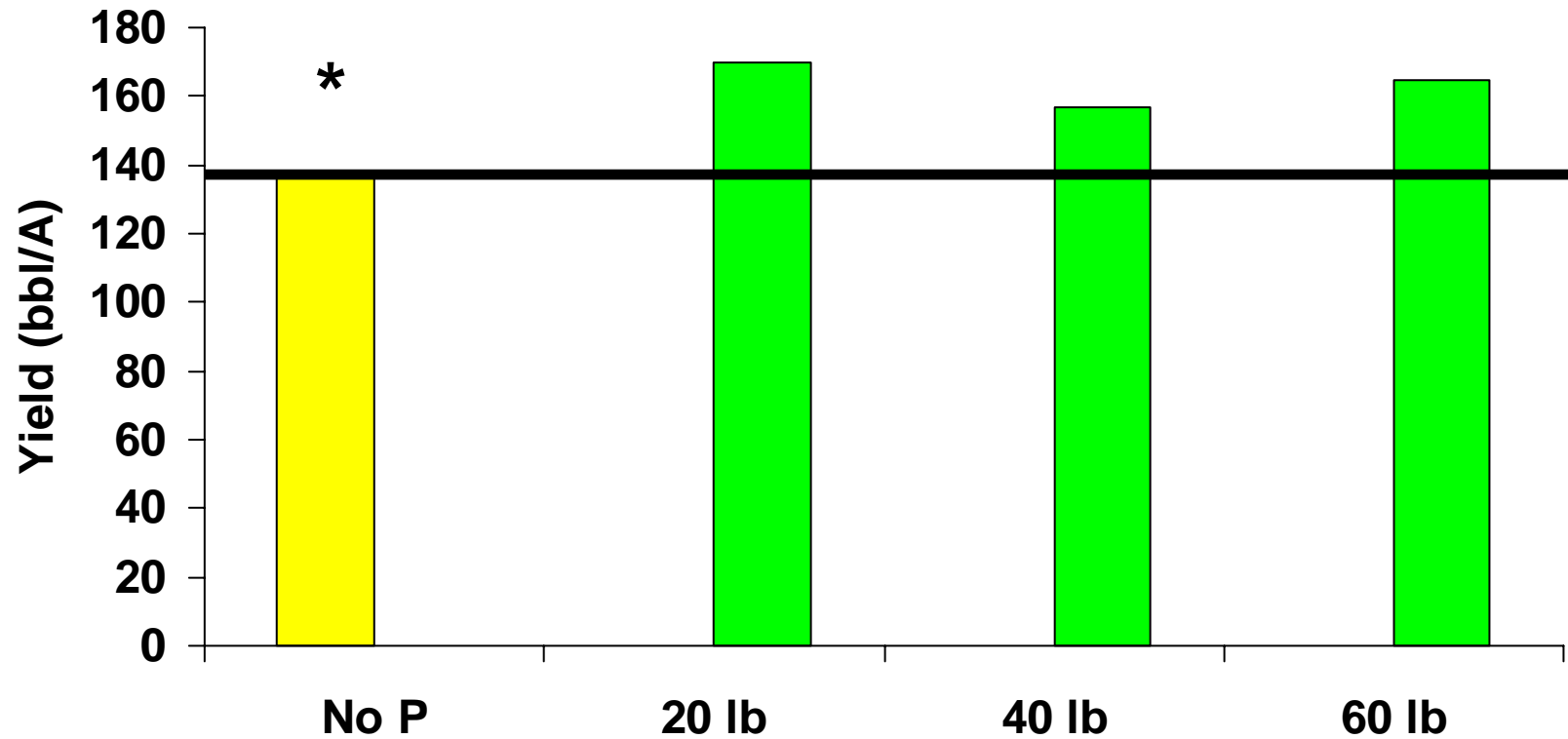
# Calculations

- The number on the bag is not actual P!!





No difference among P rates, all > 0 rate



DeMoranville and Davenport, 1997



# Yield comparisons – field scale P reduction

<u>Year</u>	<u>EH</u>		<u>PV</u>	
	<u>P rate</u>	<u>Yield</u>	<u>P rate</u>	<u>Yield</u>
2002	17.8	117	24.8	117
2003	14.3	119	22.3	119
2004	5.6	172	17.3	195
2005	16.5	190	24.0	121
2006	6.4	162	5.7	244
pre-reduction	17.8	117	22.1	138
post-reduction	10.7	161	5.7	244



# Compare formulations

## ● High P ratio

- 5-15-30
- 3-13-26
- 12-24-12

## ● Low P ratio

- 15-15-15
- 10-12-24
- 18-8-12 (custom)
- 18-8-18 (custom)

Advantage of 18-8-18:

Fewer pounds to apply (based on N requirement)

Lower application cost



- Environmental benefit to P reduction
- P concentration in outlet water decreased with fertilizer reduction and was lower on mineral sites

mean mg/L TP in flood discharges

<u>Bog</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>
EH	0.377	0.424	0.237	0.097
PV	0.384	0.439	0.528	0.408
M-K	0.100	0.170	0.118	
ASH	0.109	0.127	0.147	

↑  
reduction



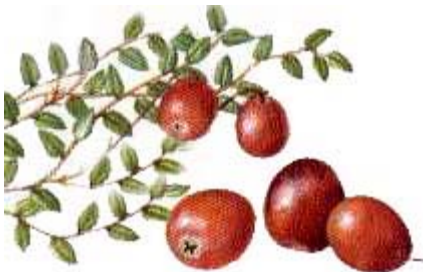
# Net P loading from bog systems (organic soil)

lb/a/yr

PO4

TP

<u>Bog/year</u>	<u>in discharge</u>	<u>minus incoming</u>	<u>in discharge</u>	<u>minus incoming</u>
EH 2002	1.11	1.02	1.64	<u>1.15</u>
EH 2003	1.82	1.78	2.84	2.31
EH 2004	0.82	0.74	1.09	<u>0.53</u>
PV 2002	3.53	2.67	4.58	2.94
PV 2003	3.68	2.99	5.14	3.22
PV 2004	3.20	2.62	3.92	<u>2.16</u>



# Net P loading from bog systems (mineral soil)

lb/a/yr

PO4

TP

<u>Bog/year</u>	<u>in discharge</u>	<u>minus incoming</u>	<u>in discharge</u>	<u>minus incoming</u>
M-K 2002	0.49	0.35	1.02	0.01
M-K 2003	0.69	0.32	1.42	0.05
M-K 2004	0.94	0.01	1.66	<u>-1.10</u>
ASH 2002	0.51	0.45	1.09	0.24
ASH 2003	0.40	0.26	1.32	-0.56
ASH 2004	1.09	0.95	1.97	0.17



# Calculating amounts to apply changing from known practice

- What is your current material and fertilizer rate?
- How much N did that contain?
- Decide on new product
- Calculate amount of that product to apply based on previous N rate



# Calculations

- 45 lb N using 12-24-12

I used 375 lb/acre 12-24-12 – how much P?

$$375 \times 0.24 \times 0.44 = 39.6 \text{ lb/acre}$$

0.24 is the bag number converted to a decimal

0.44 converts  $P_2O_5$  to actual P

How to implement P reduction?





# Calculating amounts to apply changing from known practice example #1

Currently using 375 lb/acre 12-24-12

Fertilizer contains 12% N

375 lbs contains 45 lbs N  $[375 \times (12 \times 0.01)]$

New choice is 18-8-18 – still want 45 lbs N

Use 250 lbs  $[45 / (18 \times 0.01)]$



How much P is in that?



# Calculations

## ● How much P?

I used 250 lb/acre 18-8-18 – how much P?

$$250 \times 0.08 \times 0.44 = 8.8 \text{ lb/acre}$$

0.08 is the bag number converted to a decimal

0.44 converts  $P_2O_5$  to actual P



Calculation examples are also  
in the 2008 Chart Book



# Phosphorus reduction and monitoring

- Plot and whole farm research shows P reduction is viable
- But for how long and how do we monitor?
- Yield records and tissue sampling
  - Tissue to 'catch' a problem before yield declines
  - Also yield can be up or down due to other factors



# Tissue standard is 0.1-0.2% P

<0.1% --- increase P rate and retest next year

0.1 – 0.11% -- stay the course but retest next year

0.12 – 0.15% -- test again in 2-3 years

0.16% or greater – test again in 3-4 years

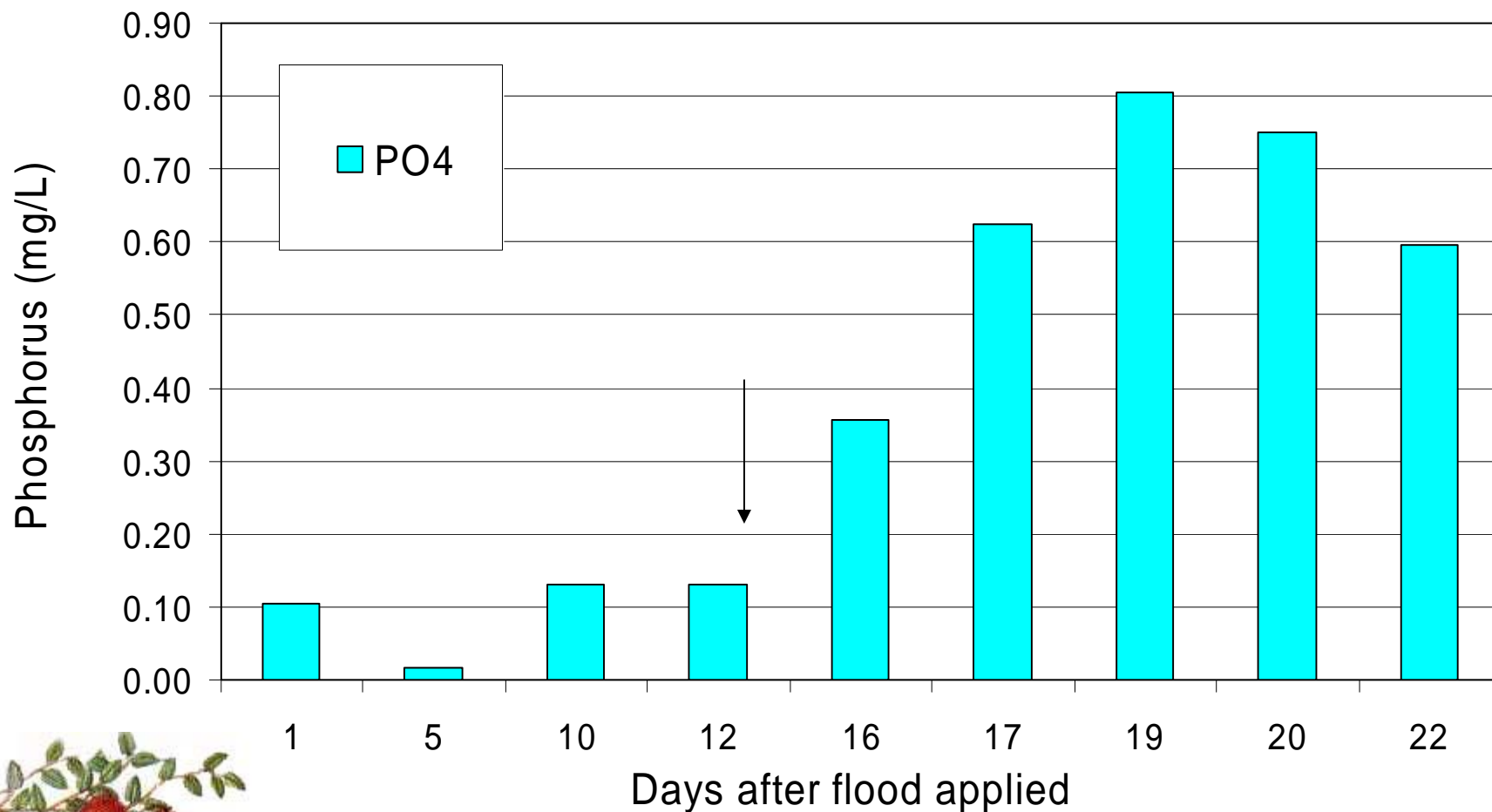


# BMPs for P reduction

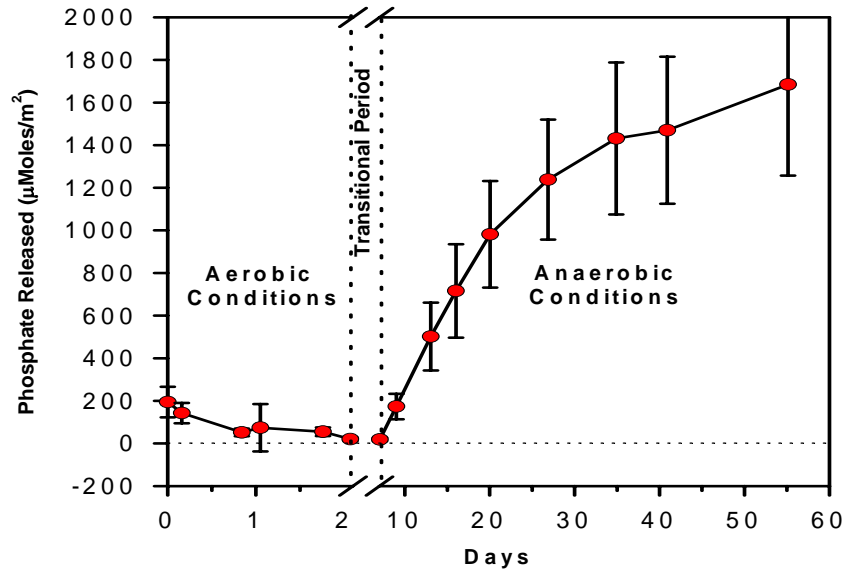
- Use no more than 20 lb/acre
- At sensitive sites, reduce below 20 lb/acre
- If possible avoid discharge of water after fertilizer applications – impound or tailwater
- Flood management is critical
  - Harvest -- hold 2-4 days then discharge at a moderate pace to finish by no later than day 10
  - Winter -- Release from beneath ice ASAP



## Most Phosphorus Loss occurs during flooding/draining as inorganic P released from the soil



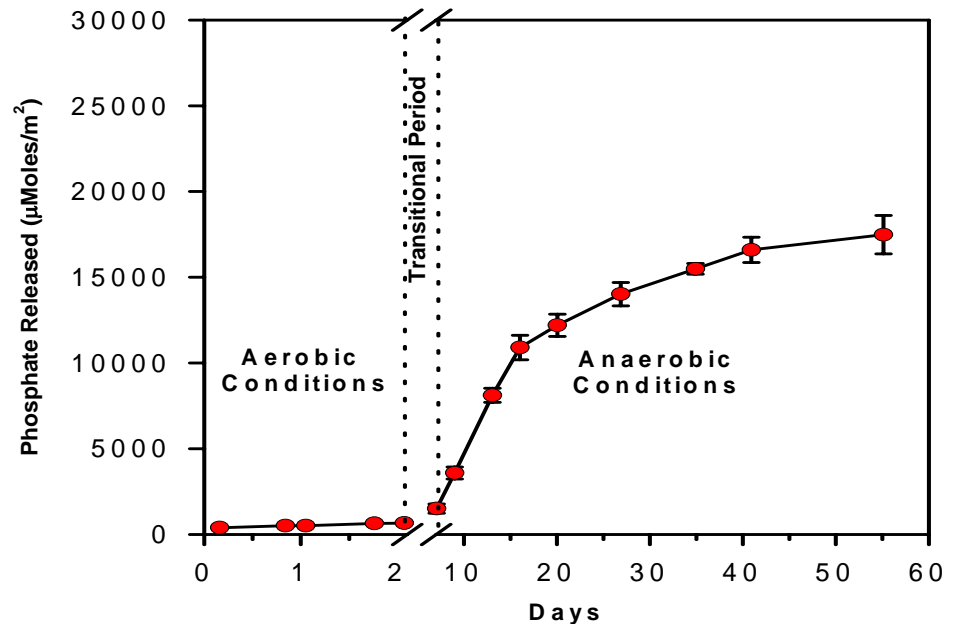
Time Course of Phosphate Release  
Natural Bog



**P Release increased with amount of P Fertilization**

**Total P Release primarily when soil became anoxic  
(rapid rise after day 10)**

Time Course of Phosphate Release  
Low P Application



**10 fold  
difference in  
release**





