Pesticide Safety 2009 - Nutrient Management BMPs

Nutrient Management BMPs

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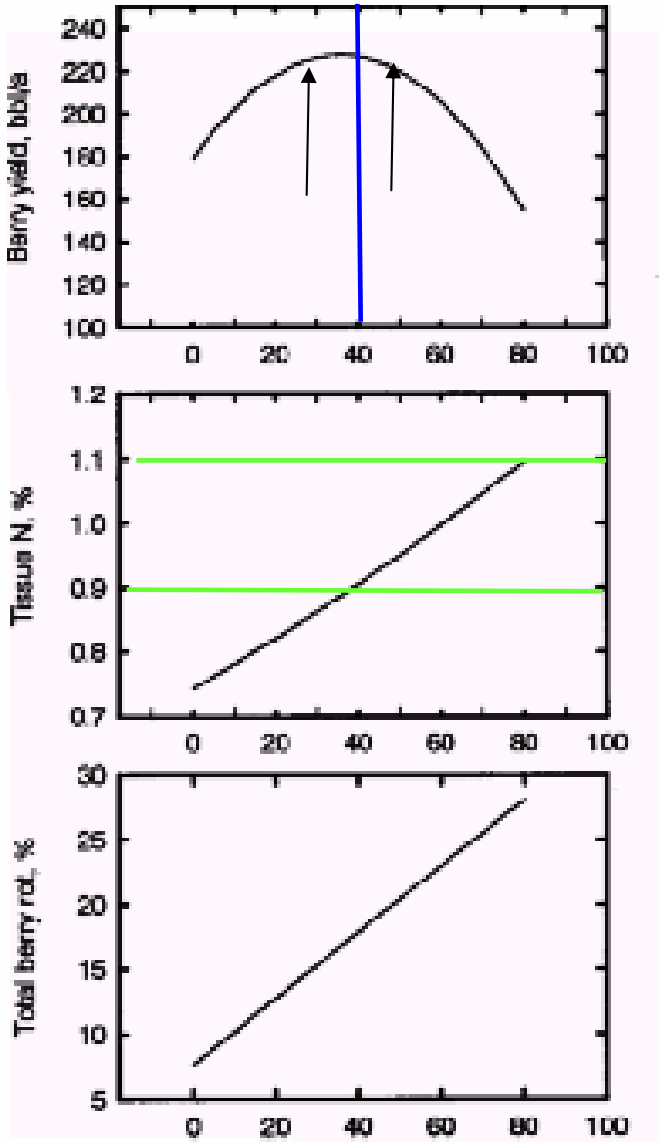
N and P

- These are the primary focus from an environmental viewpoint
  - Nitrogen – coastal, estuarian waters
  - Phosphorus – inland, fresh water bodies
- Waters of the Commonwealth – Federal Clean Water Act - TMDL
- N is most important for production, P more an environmental issue

Nitrogen – horticultural

- Nitrogen is arguably the most important fertilizer element applied to cranberries.
- If you get N wrong – you pay a price in plant growth and crop
- Most growers base their fertilizer program on the amount of N they think the bog needs
- There is a body of research on N needs and rates

Figure 11.—Yield, tissue N, and rot of cranberries with various N fertilizer rates.*



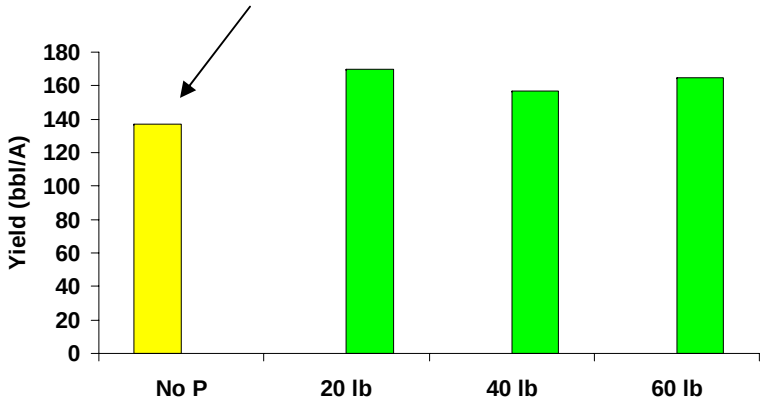
*Massachusetts-grown 'Stevens'

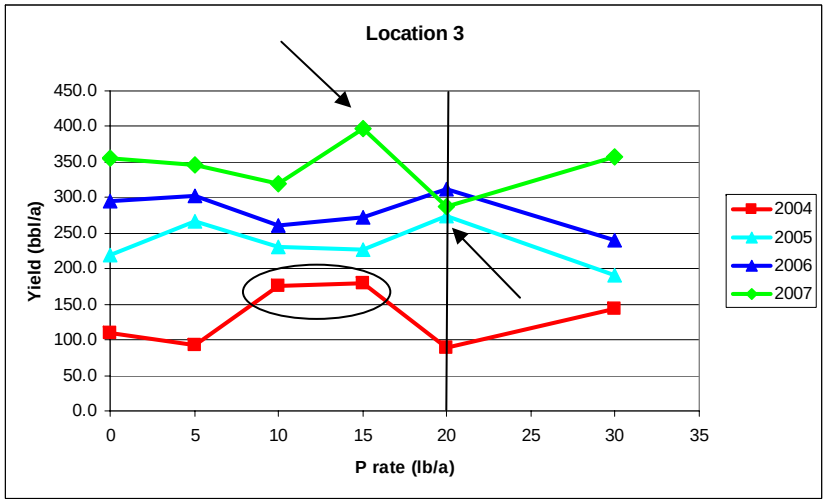
N - environmental

- Do the right thing on rates and timing for horticultural side
- Applications
  - Avoid water
  - Avoid huge applications on sandy soil – splits
- Water management
  - Tailwater
  - Attenuation
  - Impounding

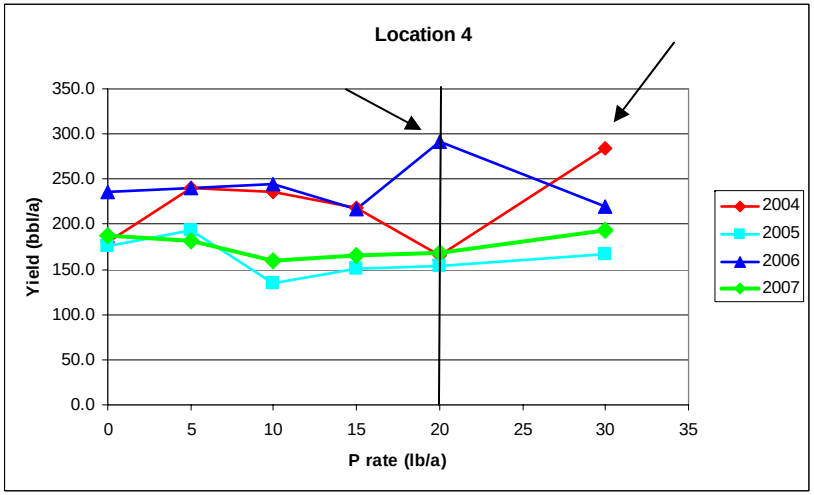
Phosphorus horticultural

- Plot scale research – no additional response above 20 lb/A if tissue P in normal range (~45 lb/A P_2O_5)
- Plot research in WI – no yield decline with zero P after 6 years – tissue P still in normal range
- Large scale P reduction experiments
  - One site with 5 year average ~10 lb/A P - no yield reduction
  - Grower that began reduction in 2008 (to less than 20 lb/A) had record crop





Tissue P in normal range



Tissue P below normal range

Fertilizer and yield – peat-based older bogs

(P in lb·a^{-1}; Yield in bbl·a^{-1})

	Site 1		Site 2	
Year	**P rate**	**Yield**	**P rate**	**Yield**
2002	17.8	117	24.9	117
2003	14.4	119	22.3	119
2004	5.6	172	17.3	196
2005	16.5	190	24.0	121
2006	6.4	163	5.7	244
2007	10.4	156	11.4	136
2008	5.9	221	7.6	272
pre-reduction	17.8	117	22.1	138
post-reduction	9.9	170	8.2	217

Fertilizer and yield – mineral soils bogs

(P in lb·a^{-1}; Yield in bbl·a^{-1})

	Site 3		Site 4	
Year	**P rate**	**Yield**	**P rate**	**Yield**
2002	28.8	221	35.5	[65]*
2003	19.8	136	32.4	150
2004	21.2	218	28.0	277
2005	26.1	134	24.8	159
2006	7.1	256	12.9	286
2007	14.7	197	16.7	252
2008	19.7	220	9.1	359
pre-reduction	28.8	221	30.2	195
post-reduction	18.1	194	12.9	299

*Insect infestation at this site in 2002

Site 3 has biennial trends so we looked at 2-year periods

	Avg. Yield (bbl/a)				Fertilizer P lb/a			
Site #	2001-2002	2003-2004	2005-2006	2007-2008	2002	2003-2004	2005-2006	2007-2008
3	187	177	196	209	28.8	20.5	16.6	17.2

Phosphorus - environmental

mean mg/L TP in flood discharges

Bog	2002	2003	2004	2005
1	0.377	0.424	0.237	0.097
2	0.384	0.439	0.528	0.408
3	0.100	0.170	0.118	
4	0.109	0.127	0.147	

reduction

Fertilizer P (lb/acre)

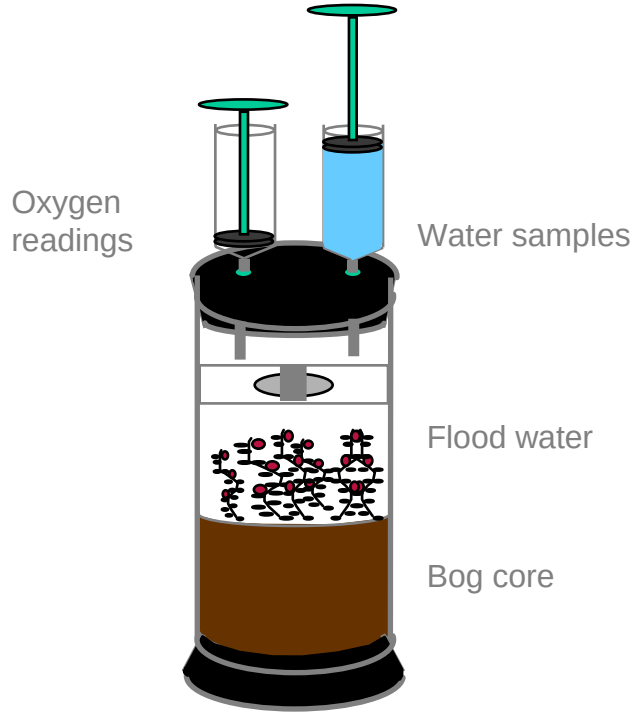
Bog	2002	Post-2002
1	18	12
2	25	21
3	29	21
4	35	35

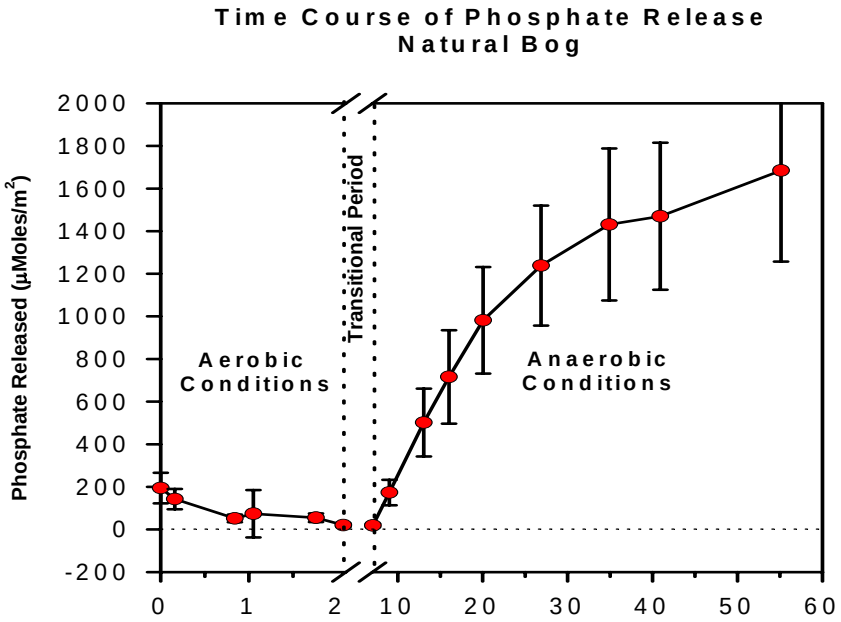
Cranberry Bog Total Phosphorus – water quality

	TP Fertilization ($lb \cdot a^{-1}/yr$)	TP incoming ($lb \cdot a^{-1}/yr$)	TP leaving ($lb \cdot a^{-1}/yr$)	TP export (net) ($lb \cdot a^{-1}/yr$)
Bog ID	**Mean 2003-04**			
1	10.0	0.5	2.0	1.5
2	19.8	1.9	4.6	2.7
3	20.5	2.1	1.5	-0.6
4	38.0	1.9	1.7	-0.2

Lab experiment – Flooding and P

- Varied fertilizer practices
- Collected soil and subjected to flooding in the lab
- Followed P release into headwater and oxygen depletion

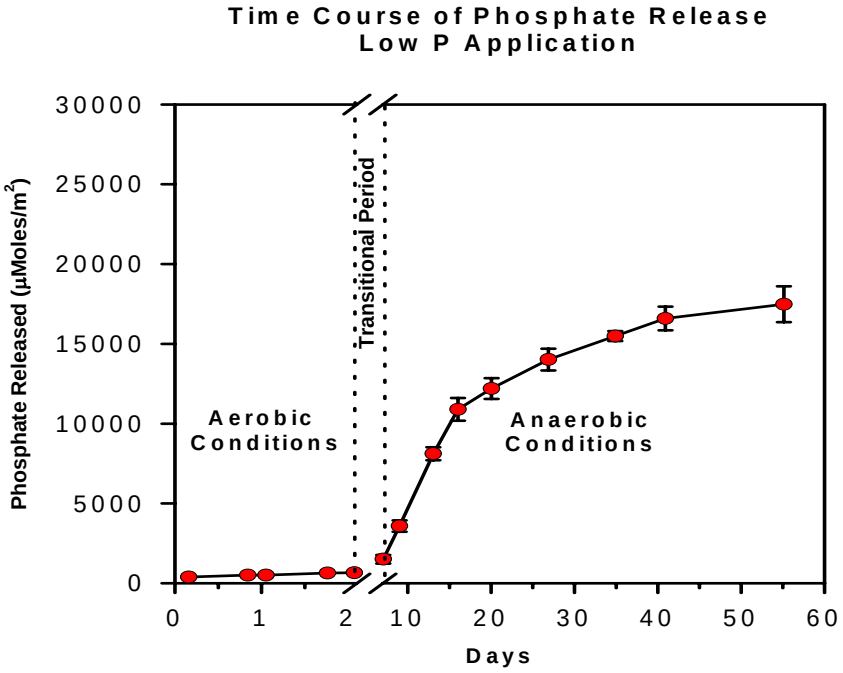


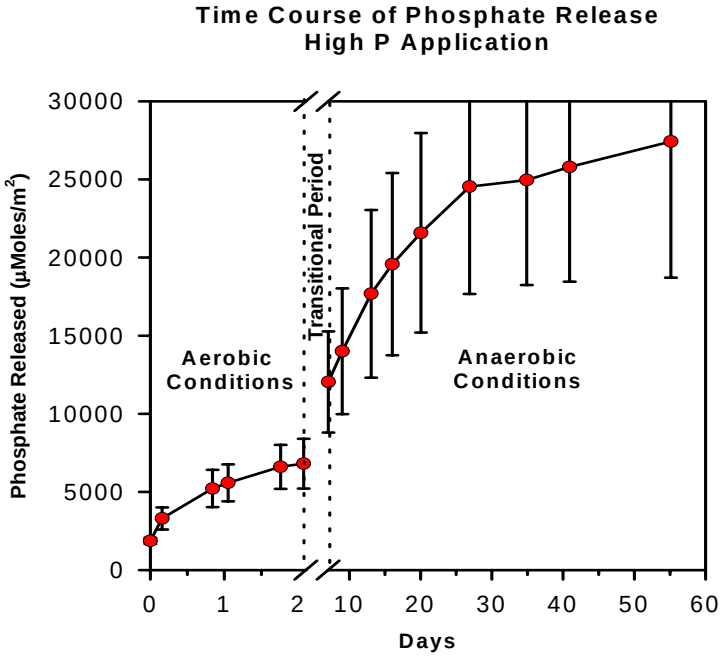


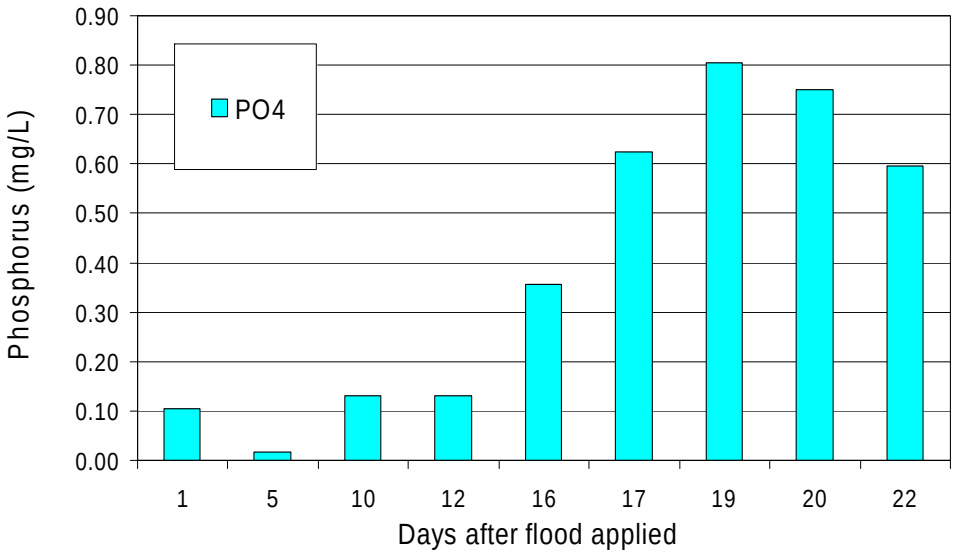
Native bog

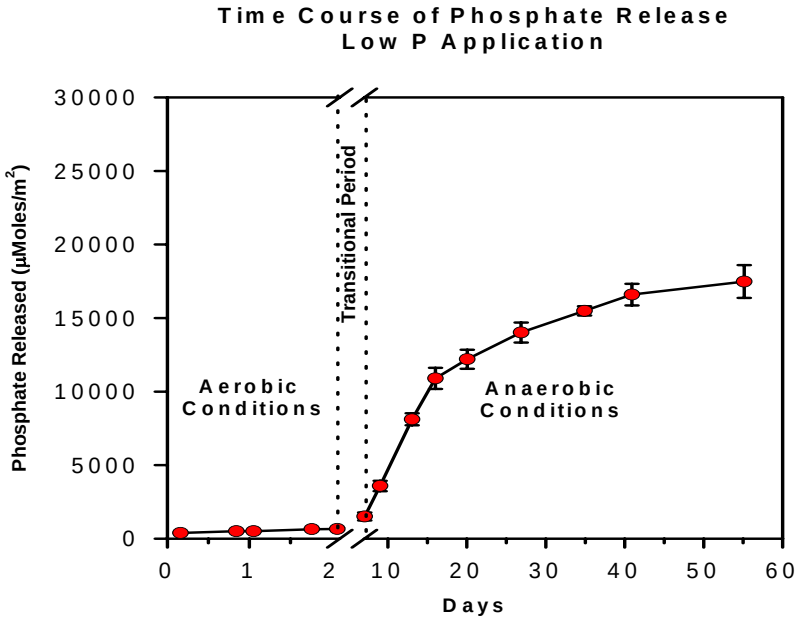
10-18 lb▪a^{-1} P

>20lb▪a^{-1} P

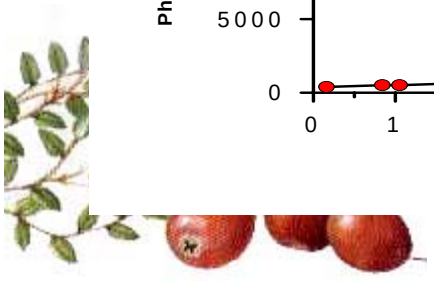








- Laboratory results were similar to those in water collected from a harvest flood



Change set fertilizer to reduce P

Material used	Pounds applied	Pounds N per acre	Pound P per acre
12-24-12	375	45	40
18-8-18	250	45	9
15-15-15	300	45	20

Set fertilizers: Max N applied to maintain P<20 lb/acre

Material used	Pounds P per acre	Pounds fertilizer	Pounds N per acre
12-24-12	20	188	22.5
18-8-18	20	568	102
10-12-24	20	379	38
15-10-18	20	454	68
15-15-15	20	300	45
19-19-19	20	235	45

Low N materials – how much P in 100 lbs.

Material used	Pounds fertilizer	Pounds N per acre	Pounds P per acre
3-13-26	100	3	5.7
5-15-30	100	5	6.6
5-10-10	100	5	4.4
6-24-24	100	6	10.6
8-32-16	100	8	14.1
5-5-20	100	5	2.2

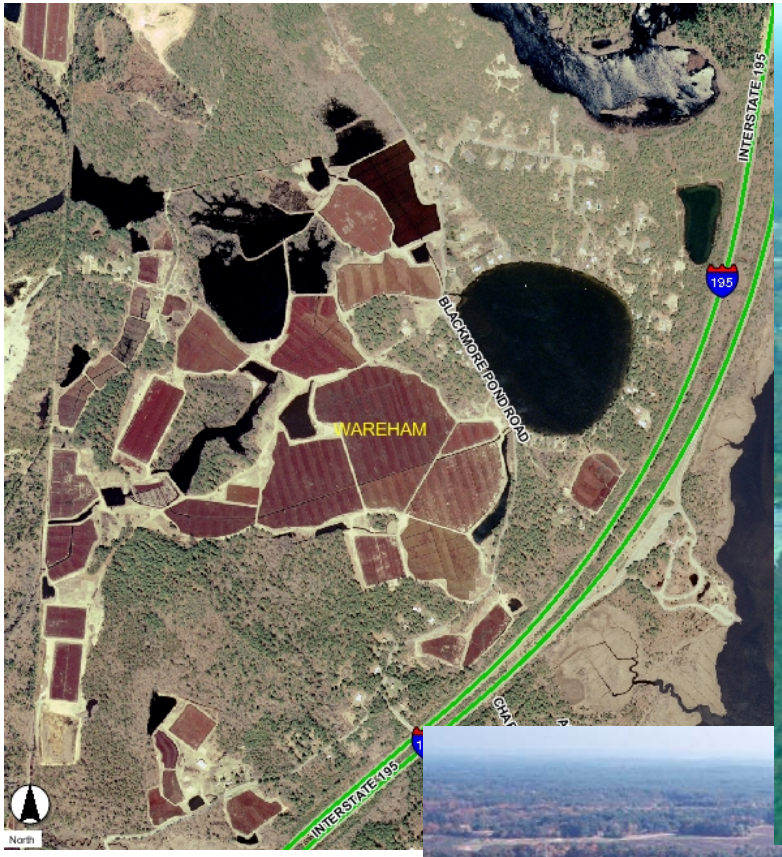
BMPs for P reduction

- Use no more than 20 lb/acre (~45 as P_2O_5)
  - Based on the laboratory study, highest risk for P mobilization - bogs receiving >20 lb·a^{-1} P
- Especially at sensitive sites or on native cultivars, reduce below 20 lb/acre

BMPs for P reduction

- 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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