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2014 Update Mtg: Recommendations for Reducing Phosphorus Loss in Cranberry Floodwaters

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**Recommendations For Reducing
Phosphorus Loss in Cranberry
Floodwaters**

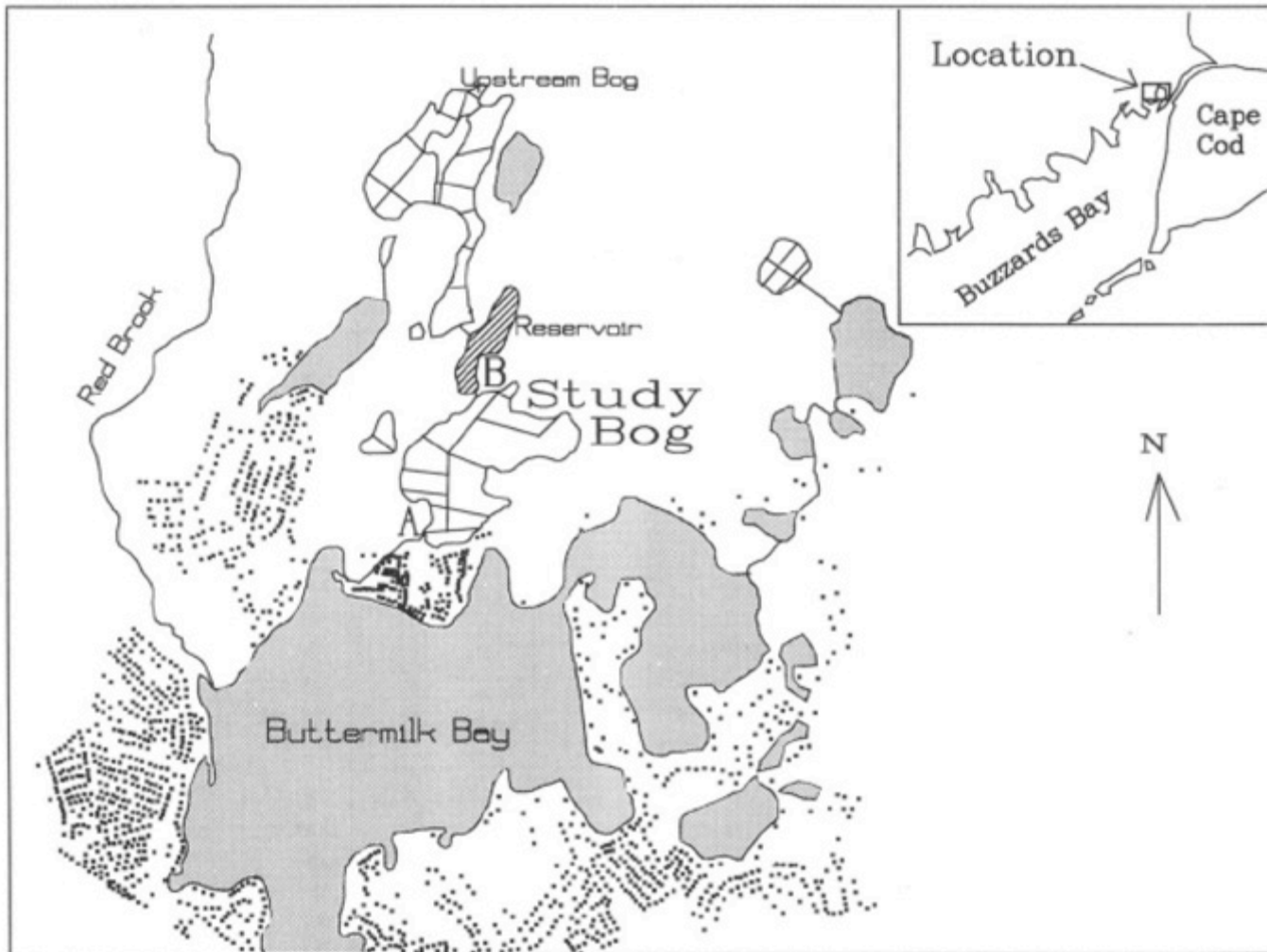
Who Cares?

- The State (Mass DEP)
 - Total Maximum Daily Load (TMDL) established on White Island Pond
 - TMDL for Monponsett Pond in development
- The Industry
 - Perception matters
 - Cascading effect – you may not be the problem, but may suffer the consequences
- The Research Community
 - Multiple groups, academic and advocacy, are pursuing this research

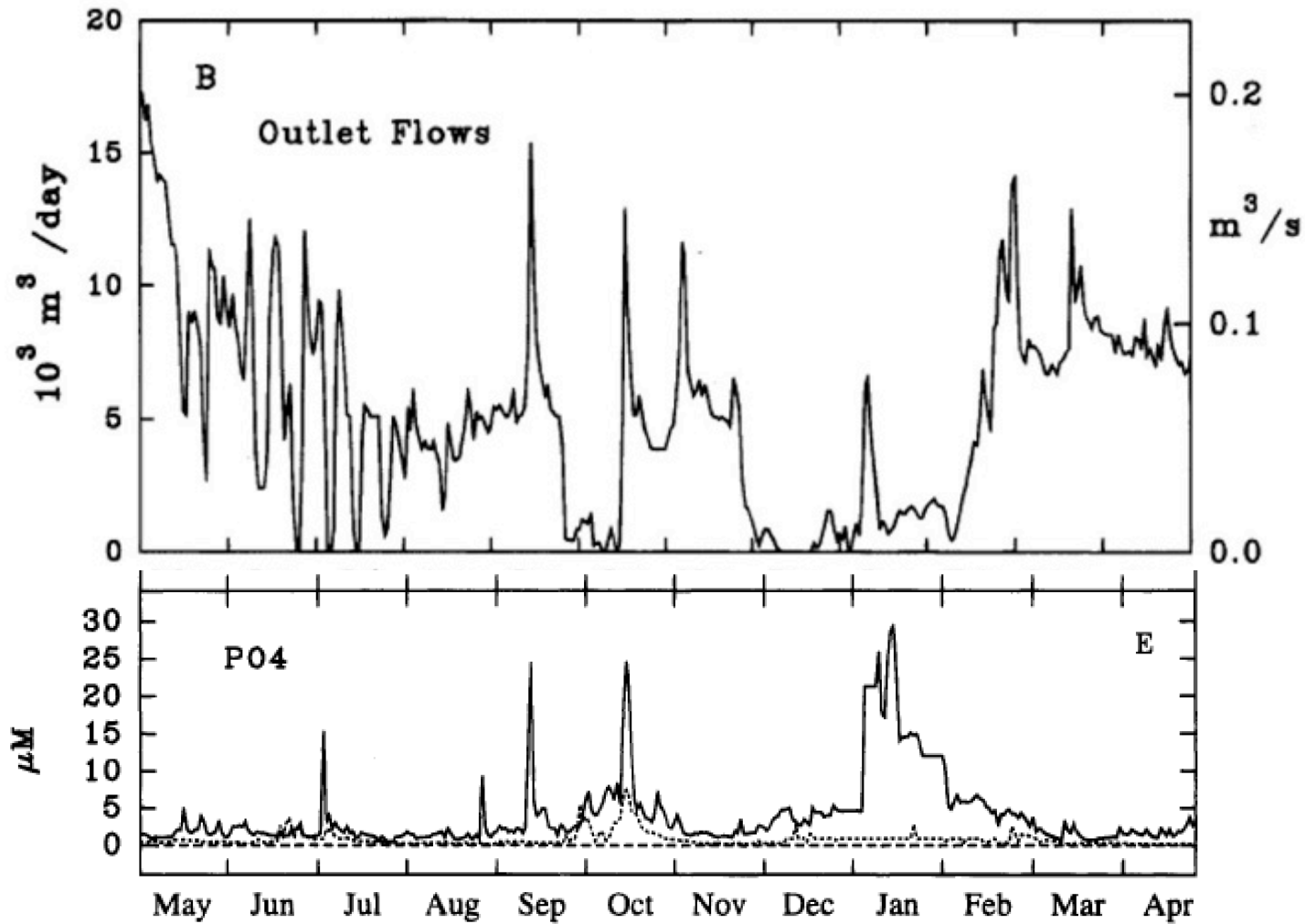
What Do We Know?

- Not a whole lot, but some
- Two studies on cranberry P loss
 - Howes and Teal (1995)
 - “Most rigorous” of nutrient loss studies
 - Concentration-discharge approach
 - Daily measurements, assumed negligible groundwater loss
 - Cranberry bog P loss of $9.9 \text{ kg ha}^{-1} \text{ yr}^{-1}$
 - DeMoranville and Howes
 - Assumed steady state to calculate discharge, measured P in grab samples
 - Cranberry bog P loss of $3.5 \text{ kg ha}^{-1} \text{ yr}^{-1}$ for organic non-flow through bog

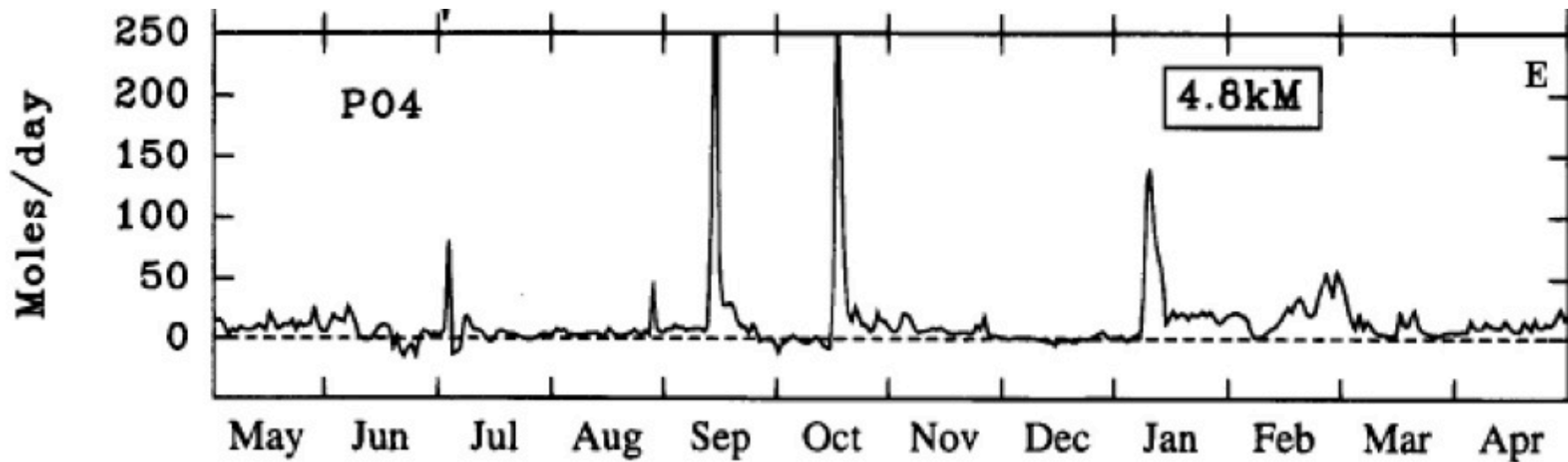
Howes and Teal



Howes and Teal



Howes and Teal



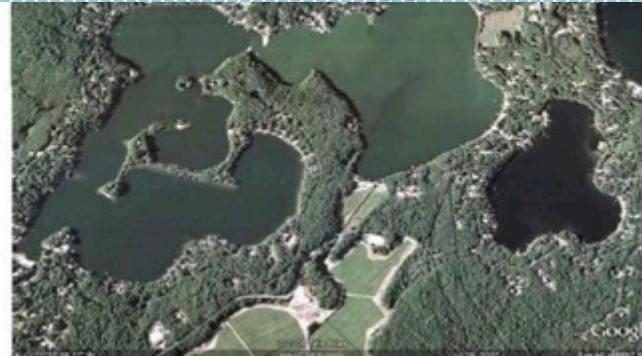
Cranberry Bog P loss = 9.9 kg P ha⁻¹ yr⁻¹

White Island Pond

Final Total Maximum Daily Load of Total Phosphorus for
White Island Pond, Plymouth/Wareham, MA



Assuming these same bogs are acting as flow-through bogs, the high land use export coefficient of 9.9 kg/ha/yr from Howes and Teal (1995) is applied to the bog areas listed above. This results



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Monponsett Pond

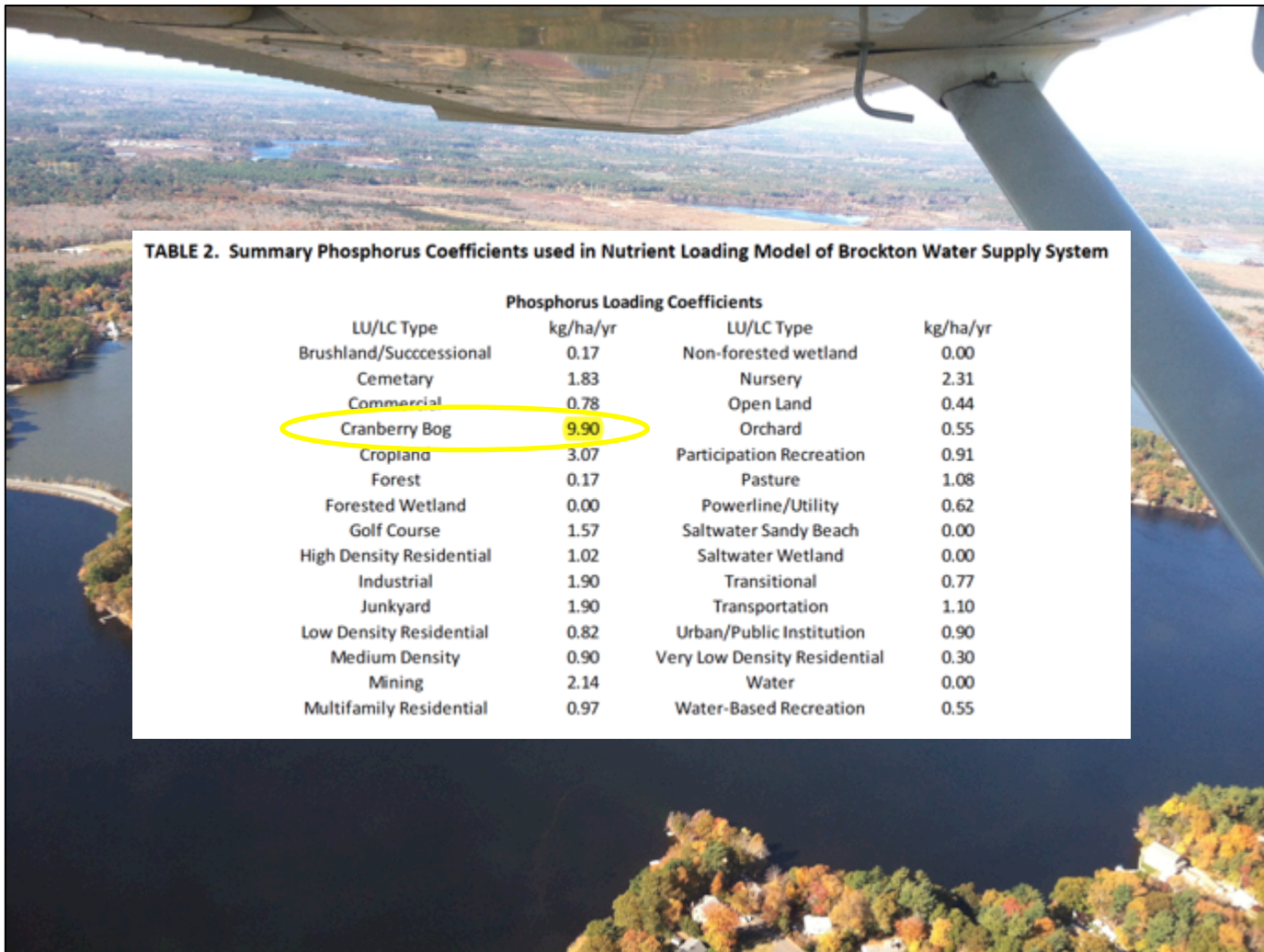
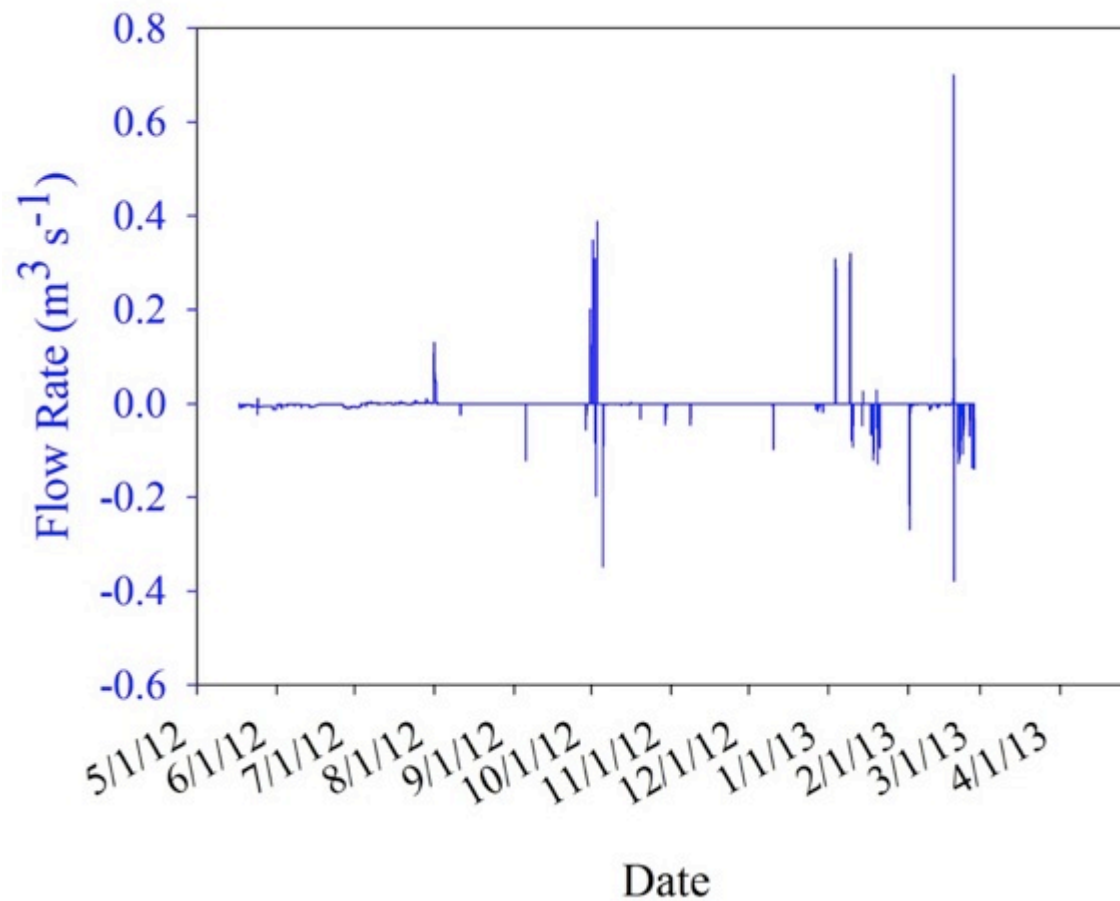


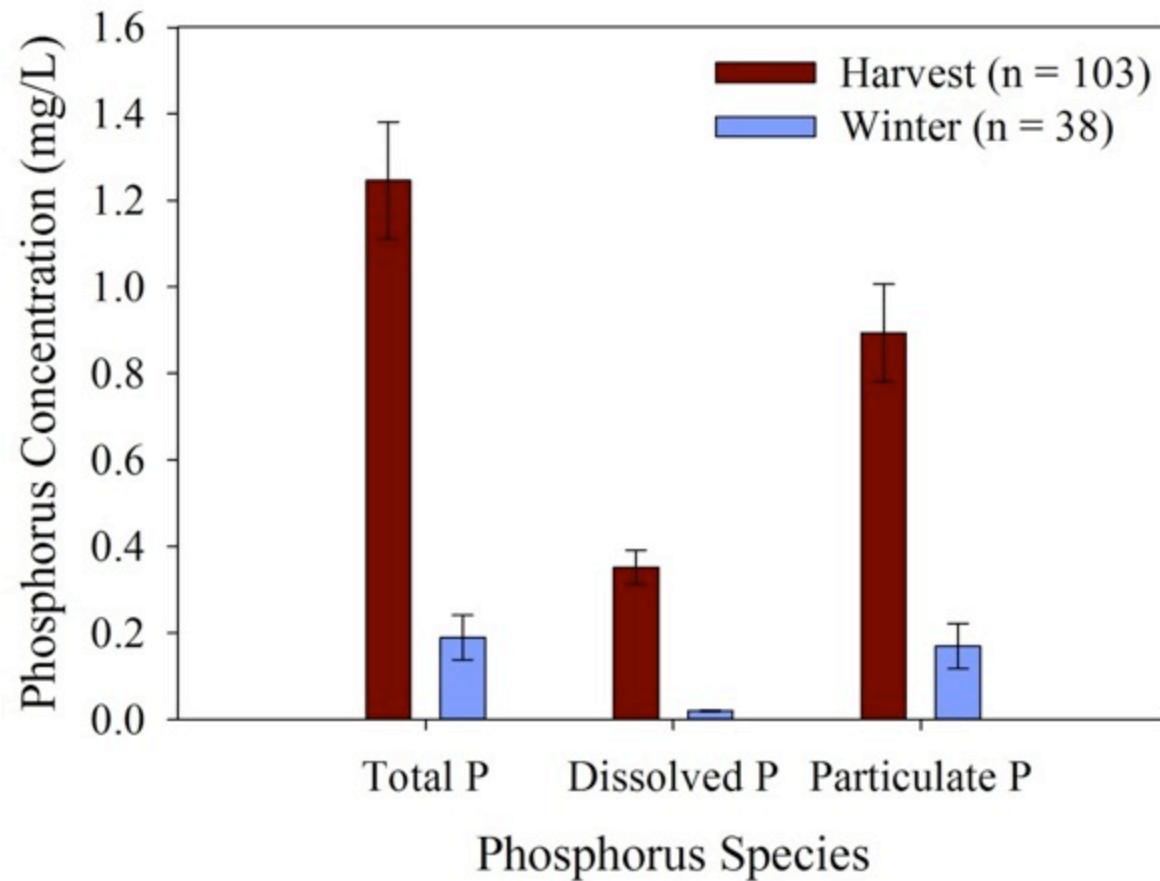
TABLE 2. Summary Phosphorus Coefficients used in Nutrient Loading Model of Brockton Water Supply System

Phosphorus Loading Coefficients			
LU/LC Type	kg/ha/yr	LU/LC Type	kg/ha/yr
Brushland/Successional	0.17	Non-forested wetland	0.00
Cemetery	1.83	Nursery	2.31
Commercial	0.78	Open Land	0.44
Cranberry Bog	9.90	Orchard	0.55
Cropland	3.07	Participation Recreation	0.91
Forest	0.17	Pasture	1.08
Forested Wetland	0.00	Powerline/Utility	0.62
Golf Course	1.57	Saltwater Sandy Beach	0.00
High Density Residential	1.02	Saltwater Wetland	0.00
Industrial	1.90	Transitional	0.77
Junkyard	1.90	Transportation	1.10
Low Density Residential	0.82	Urban/Public Institution	0.90
Medium Density	0.90	Very Low Density Residential	0.30
Mining	2.14	Water	0.00
Multifamily Residential	0.97	Water-Based Recreation	0.55

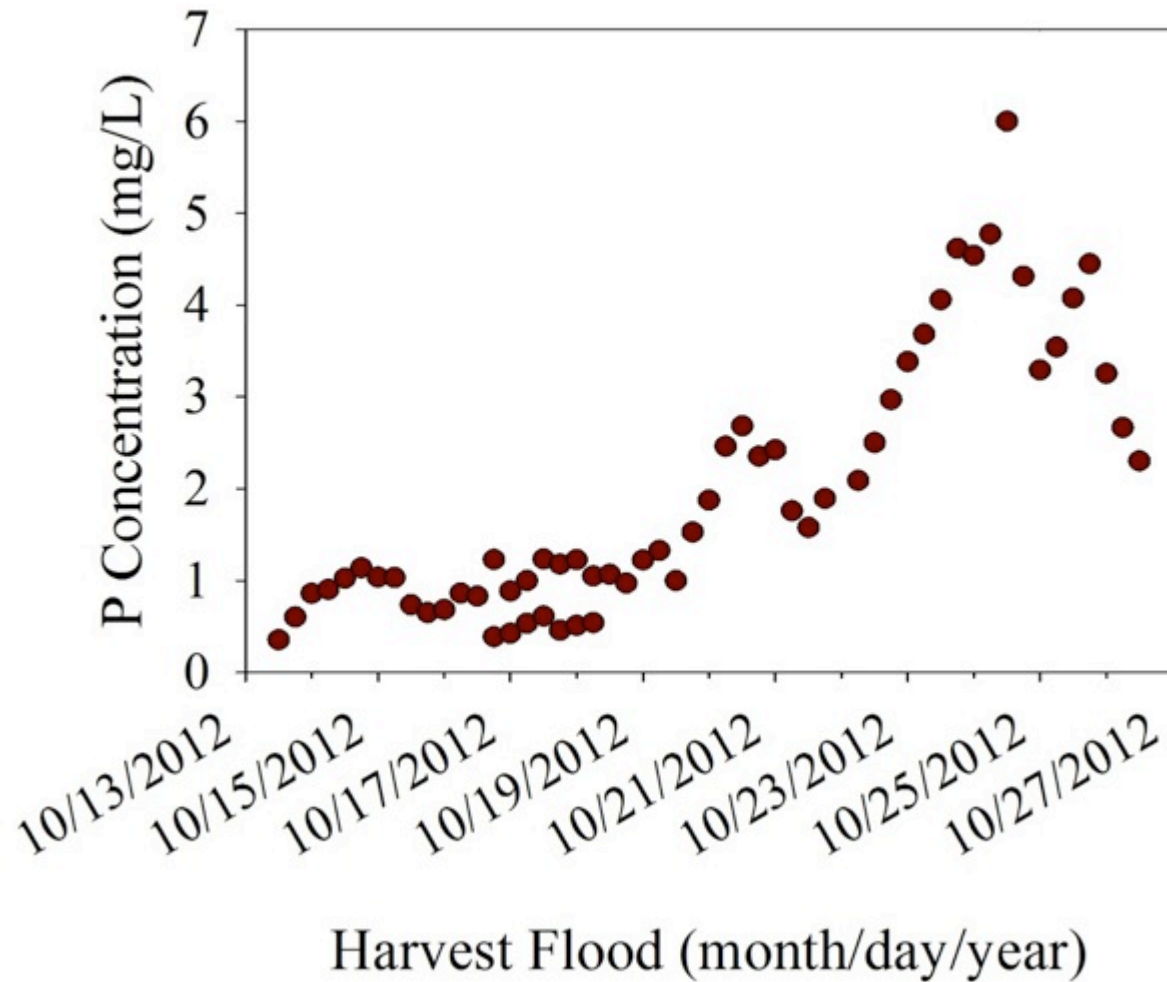
Managing P in Floodwaters



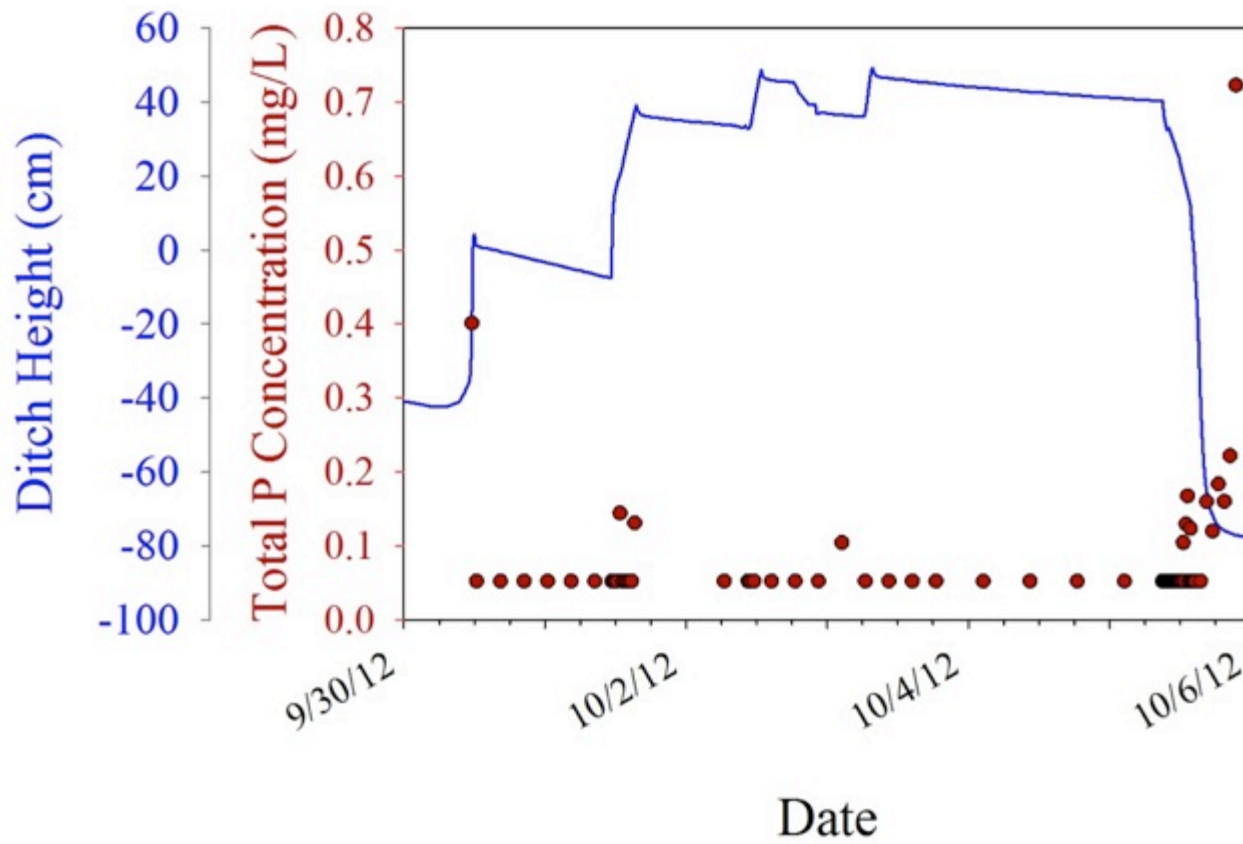
Enhance Particulate Settling



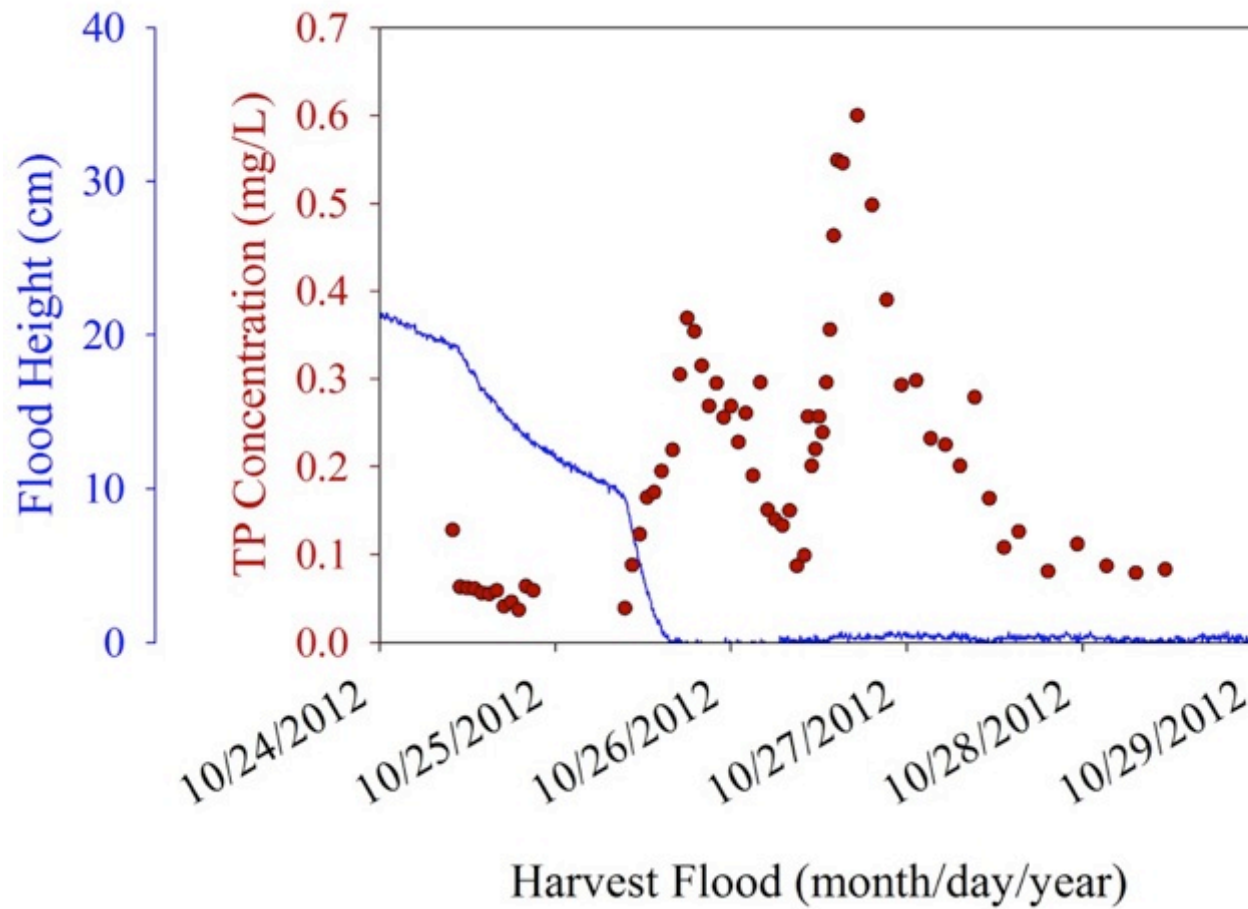
Peak TP in Harvest Release Water



Depth Effect



Depth AND Velocity Effect



Recommendation 1: Emphasis on Harvest Flood

- All floods are NOT created equal
- Mean harvest TP concentration is 7 times higher than that in the winter flood
- P mass loss needs to be more fully explored for winter flood, but initial results suggest greater P loss during the harvest flood

Recommendation 2: Increase Settling of Particulate P

- Most of the P loss is in the particulate fraction, between 70-90% of total P
- Increased holding times is NOT enough, need to slow the releases, too
- Secondary holding structure may facilitate slow release of P laden water

Recommendation 3: Target High P Floodwaters

- Moments of high P occur during the later part of the release
- If feasible, use lower pump rate to discharge these floodwaters
- Alternatively, route these high P water to secondary holding ponds
- Amendments may be available to immobilize P in floodwaters

Recommendation 4: Identify High P Sites

- Working on developing environmental threshold test for identifying high P sites
- These sites should receive highest priority in terms of reducing P loss

Recommendation 5: Grower Cooperation

- I am here to help... No, REALLY!
- Excellent relationships with many growers
 - Gary Weston and Curt Young (Federal Furnace)
 - George Rogers, Niki D'Azortino, and others (ADM)
 - Matt Rhodes and Dan Bruffee (Edgewood Farms)
 - Jim Moores and Davie Townes/Boom Boom (Cranberry Station)
- More will be needed for future success

Acknowledgements

- Technical assistance from Cassie Rogers (UMass/ARS) and Peter Kleinman (ARS, University Park, PA)
- Support from Carolyn DeMoranville and the Cranberry Station
- Several grower participants

Questions (for me, not Frank)

