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TMDLs, Adaptive Management, and Trading – Are you up to Speed with the new Phosphorus Regulation Implementation Alternatives?

45th Annual WWOA Conference

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■ Outline

- Background and NR 102 WQBEL Criteria
- Example Effluent Limits from Recent Draft Permits
- Tertiary Treatment Technologies to Meet Limits
- Implementation Alternatives

■ Excessive Phosphorus

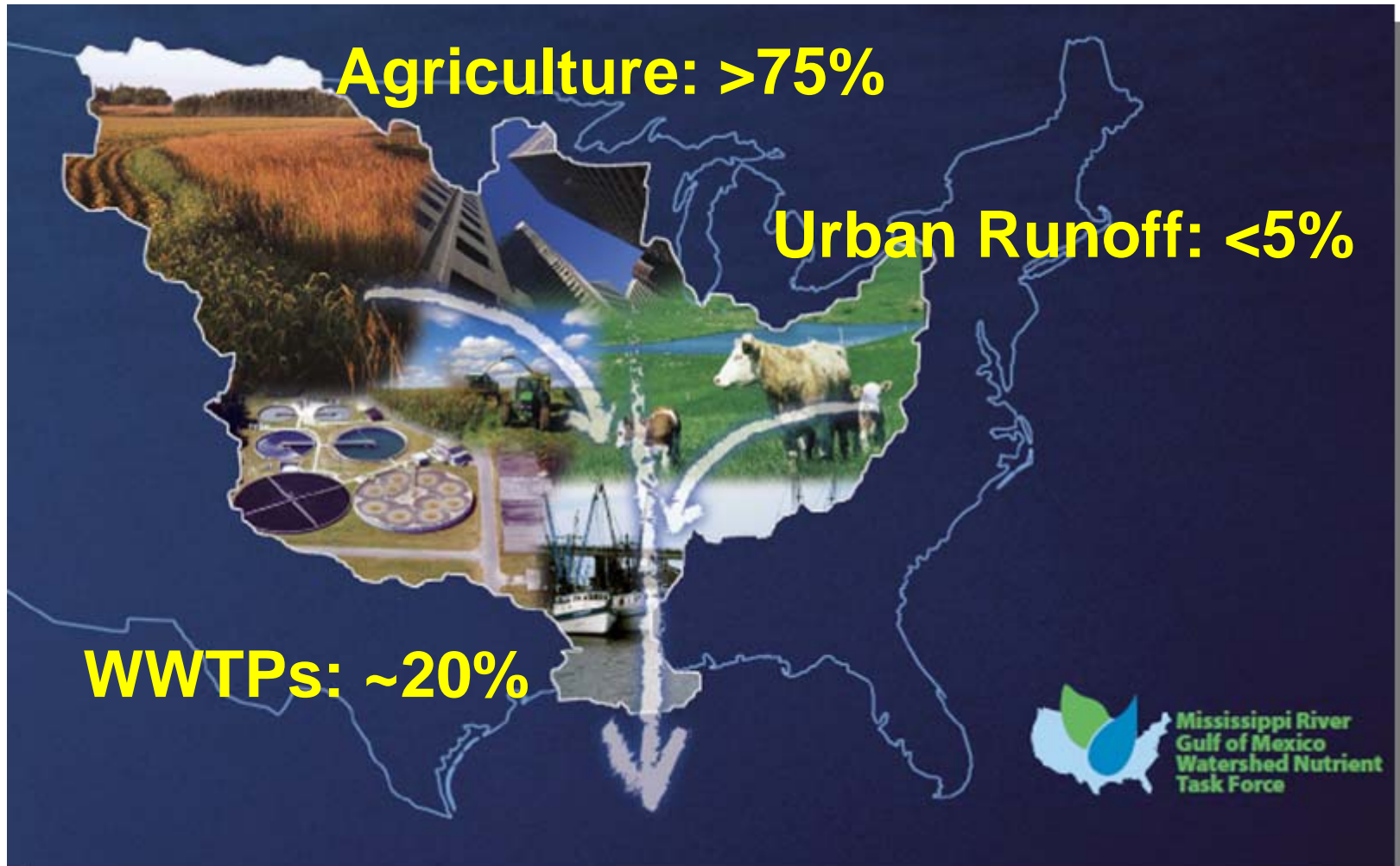


Source: DNR

Can cause:

- **Algae**
- **Low dissolved oxygen**
- **Aquatic life impacts**
- **Loss of tourism and property values**

■ Sources of P in Wisconsin



Source of image: USEPA. Example: Rock River Basin, WI

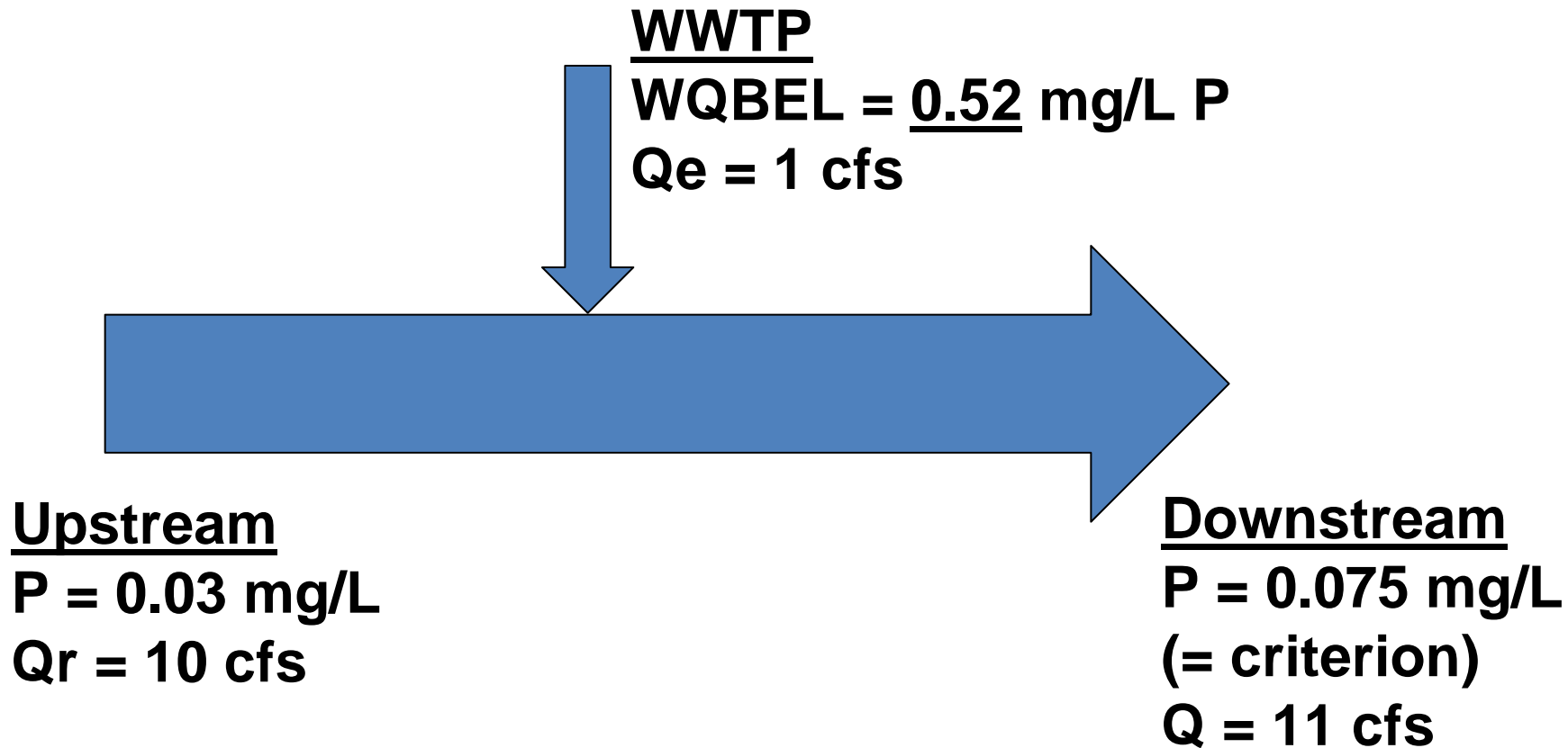
■ NR 102 Criteria

Waterbody Type	Phosphorus Criteria
Rivers (listed in NR 102)	0.10
Streams	0.075
Reservoirs	0.03-0.04
Inland Lakes	0.015-0.04
Great Lakes	0.005-0.007

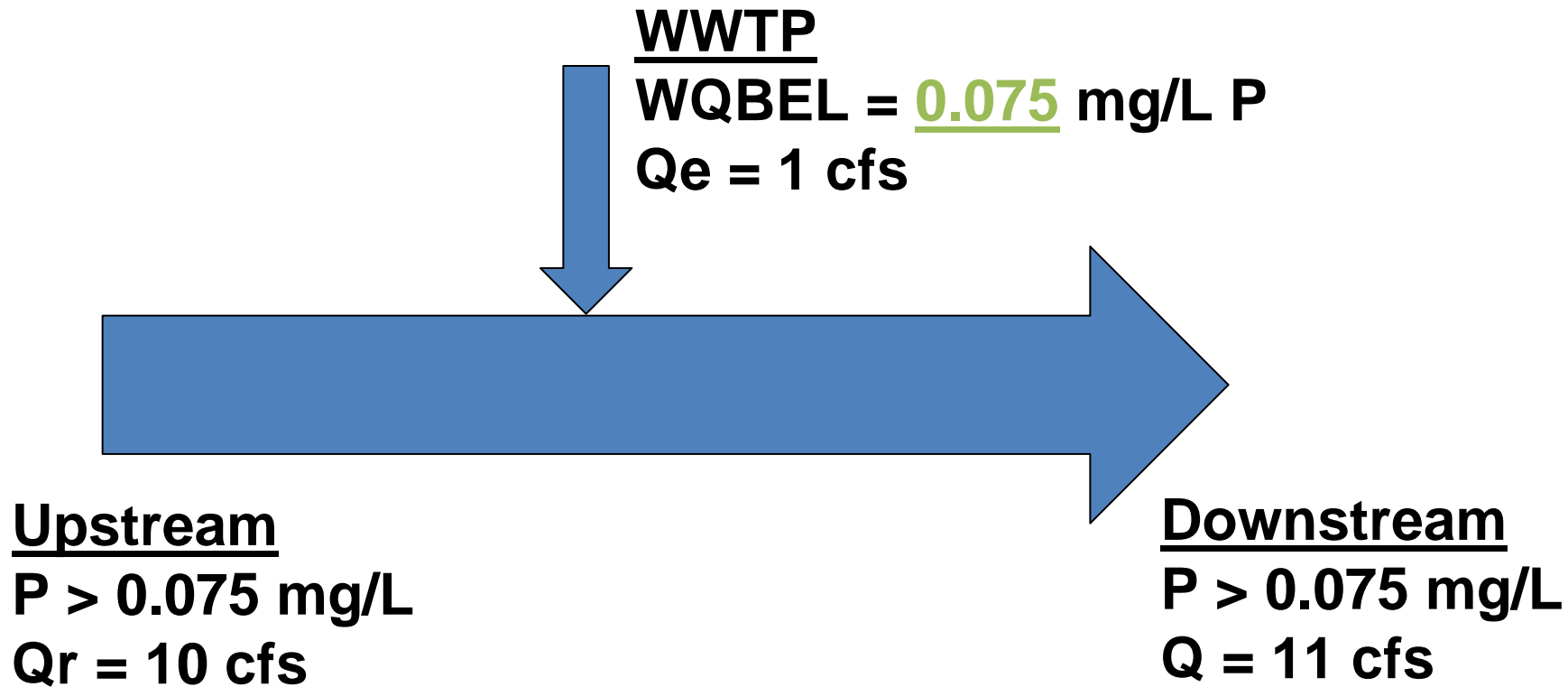
■ Revisions to NR 217 – Effluent Standards and Limits for P

- Effective 12/1/10, *partial USEPA approval*
- Procedure for calculating water quality based effluent limits (WQBELs) from NR 102 criteria
- Keeps the technology-based limit (~1 mg/L) if it's more stringent than the WQBEL
- Several important **OPTIONS!**

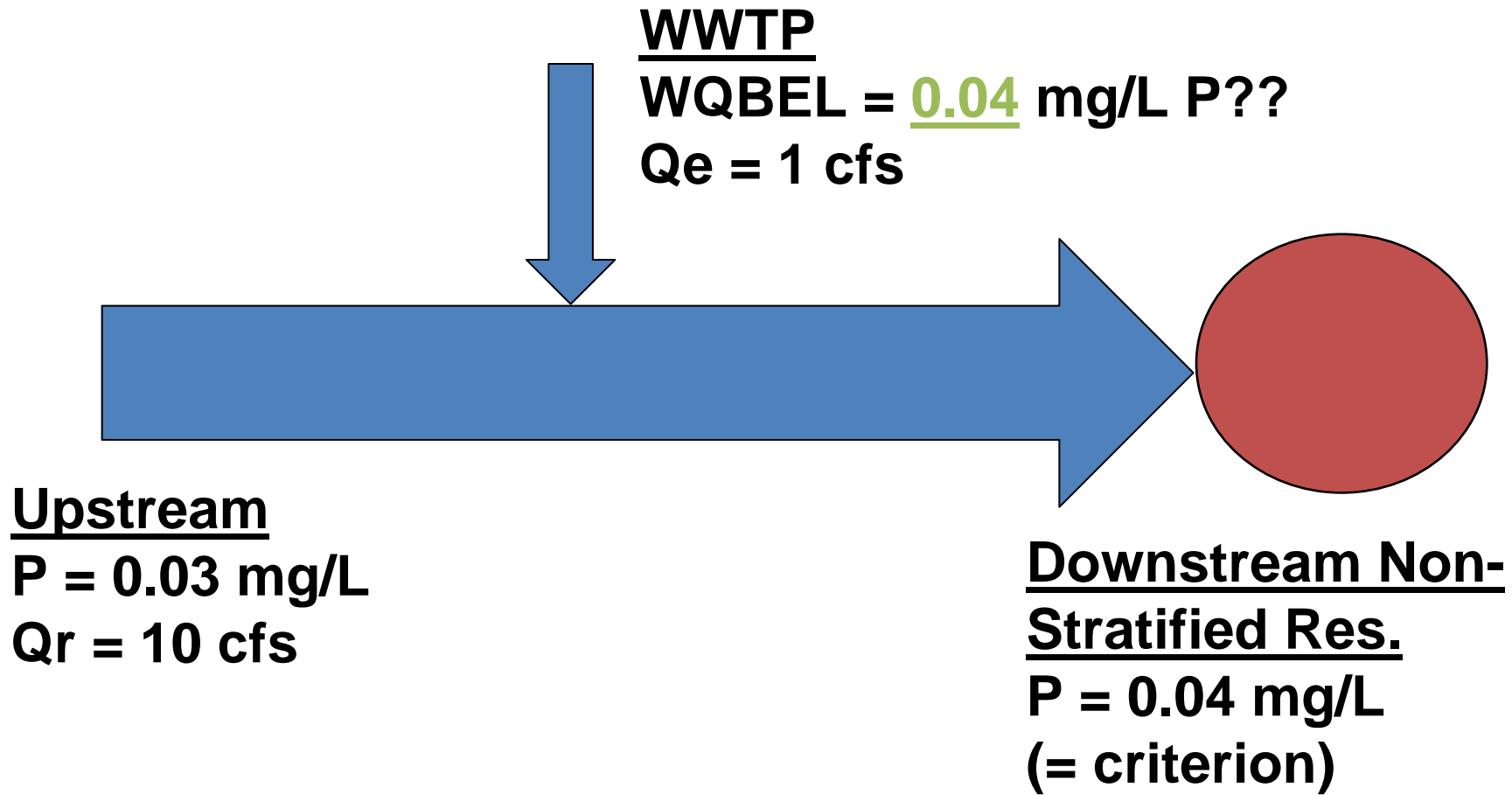
■ WQBEL Calculation



■ WQBEL Calculation



■ Protection of Downstream Waters



■ **WQBELs For Lakes**

- **Based on lake modeling or total maximum daily load (TMDL) type of approach**
- **Great Lakes discharger interim limit ~0.6 mg/L until nearshore/whole lake modeling can be completed**

■ Expression of Limits in Permits

- Usually concentration, monthly average
- If $WQBEL \leq 0.3$ mg/L, it is expressed as an annual average. A monthly average limit of 3X the WQBEL is also included
- Also mass-based limits in some cases (if discharge to lakes or if a TMDL limit, etc.)

Multiple Dischargers

- **Multiple dischargers to the same segment of a river or stream may have special limits calculated by WDNR**
- **Similar concept to BOD waste load allocations for the Wisconsin River**
- **Prevents penalizing the discharger that is farthest downstream**

■ NR 217 Compliance Schedules

- **Can be up to 7 to 9 years - *permittee must demonstrate the schedule is required***
- **Up to 5 years allowed for WQBEL compliance following the watershed adaptive management option**

Recent Draft Permits Show Status of WDNR Permitting

- Marinette: WQBEL = 10 mg/L; technology based limit (TBL) remains at 1 mg/L
- St.Croix Falls similar to Marinette
- Ladysmith 2 mg/L Alt P limit & study required
- Two northern WWTPs (lagoon and package plant 0.1 mgd) reissued – new limits not “necessary”

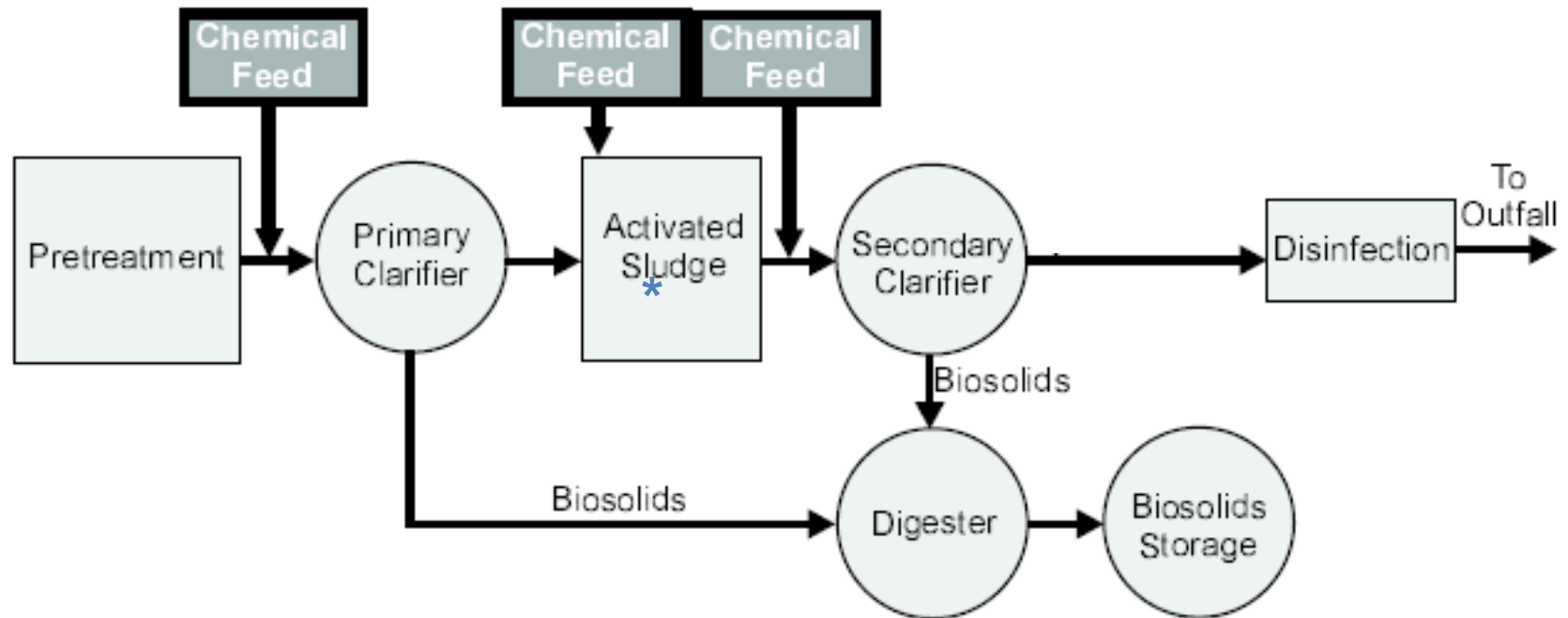
■ The Next Wave of Permits

- Hartford (Rubicon River in Washington County)
 - 0.075 mg/L annual average WQBEL
 - Interim limit 0.6 mg/L & long compliance schedule
 - Operation and Needs Review 9/30/12
 - Facilities Plan 9/30/14, if needed
 - Startup 9/30/20
 - Subject to change depending on earlier findings, watershed adaptive management, other
 - Rock River TMDL had higher mass based limits for Hartford.
- Lodi (Spring Creek – Lake Wisconsin Watershed, Lower Wisconsin River Basin in Columbia County)
 - Similar schedule and limits to Hartford
 - Interim limit 1 mg/L

■ Tertiary Treatment Technologies to Meet Low Phosphorus Limits

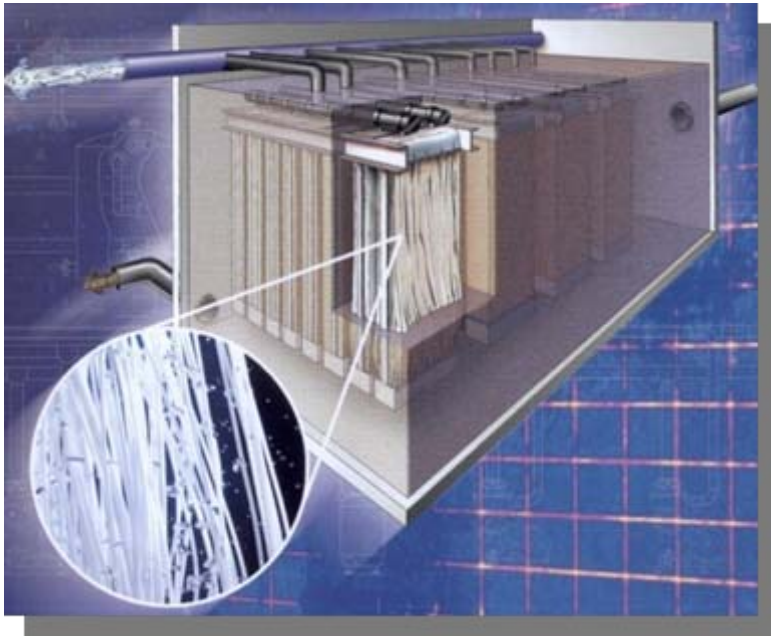
- Options include:
 - Multi-point chemical addition
 - Tertiary filtration/membrane separation
 - Reactive filtration

■ Potential Treatment Technologies (~0.5 mg/L P)



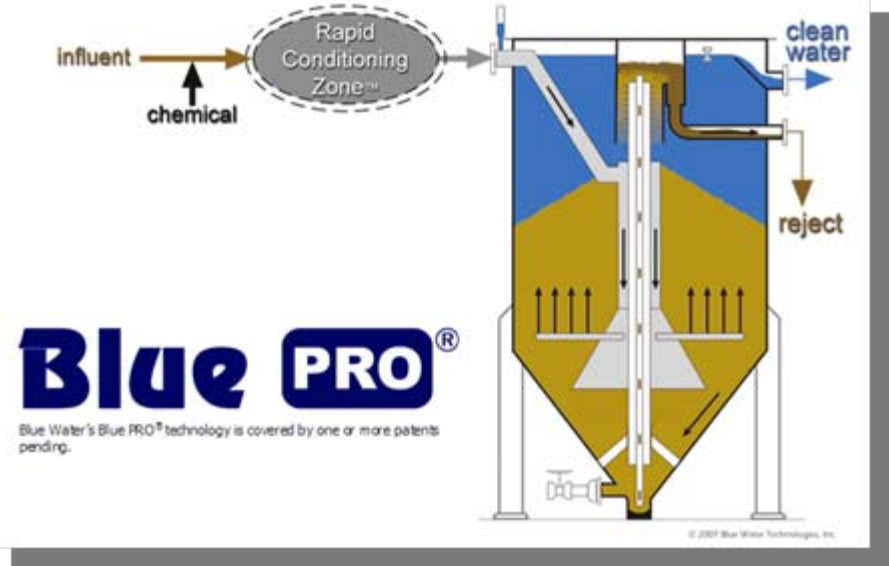
* Could include biological P removal (BPR)

Potential Treatment Technologies (Lowest Limits)



Membrane filter

Continuously backwashing filter (with adsorption)

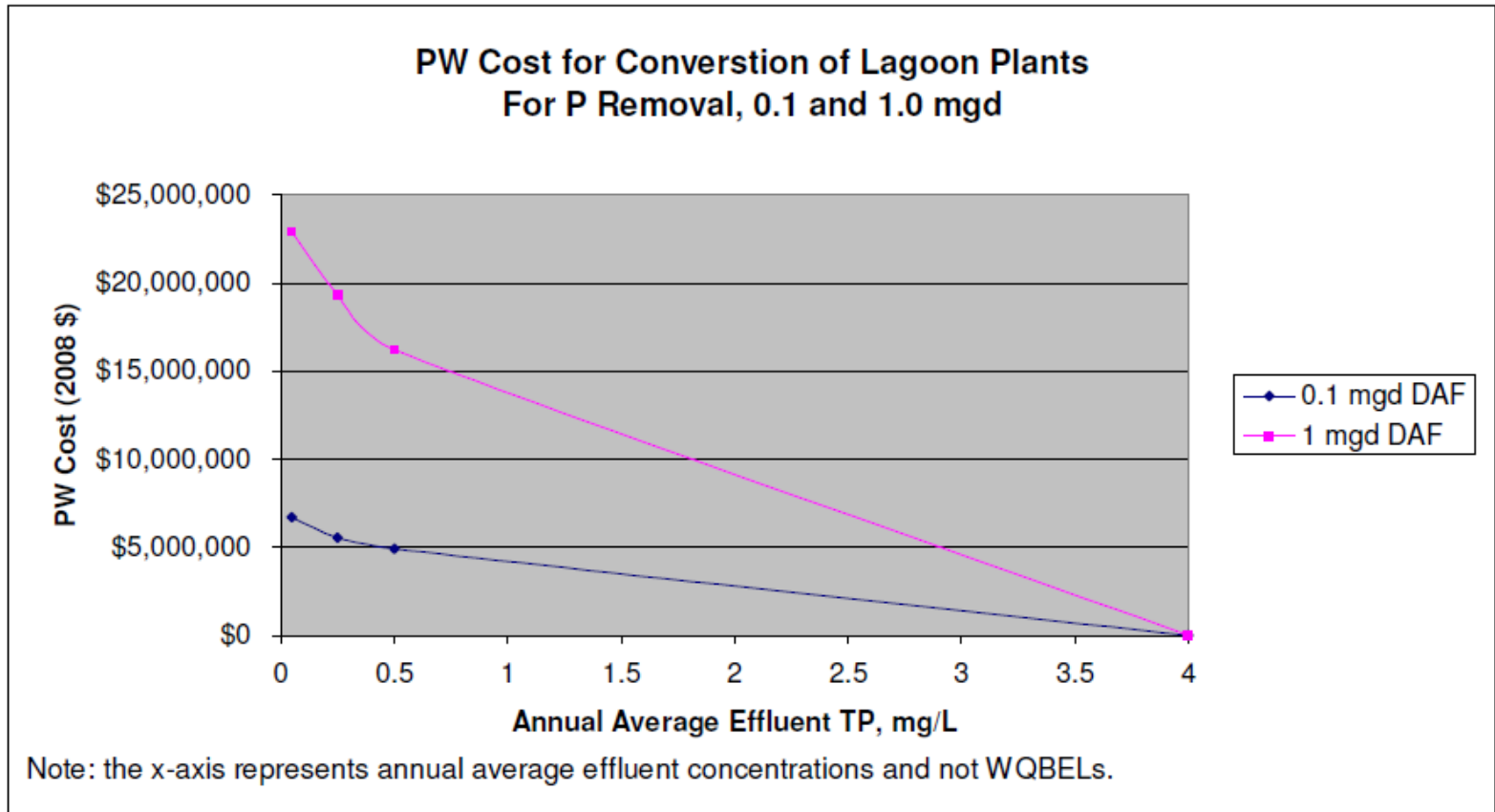


■ The Goal and Plan

- Demonstrate that DNR's analyses underestimated the cost to the state.
- Develop "generic" costs for incremental P removal for "typical" WWTPs:
 - 0.1 mgd, 1.0 mgd, and 20 mgd capacities
- Develop P removal costs at 4 large POTWs >20 mgd (site-specific costs): Green Bay, Madison, Milwaukee, and Racine
- Extrapolate to entire state to develop realistic costs for state-wide cost benefit analyses

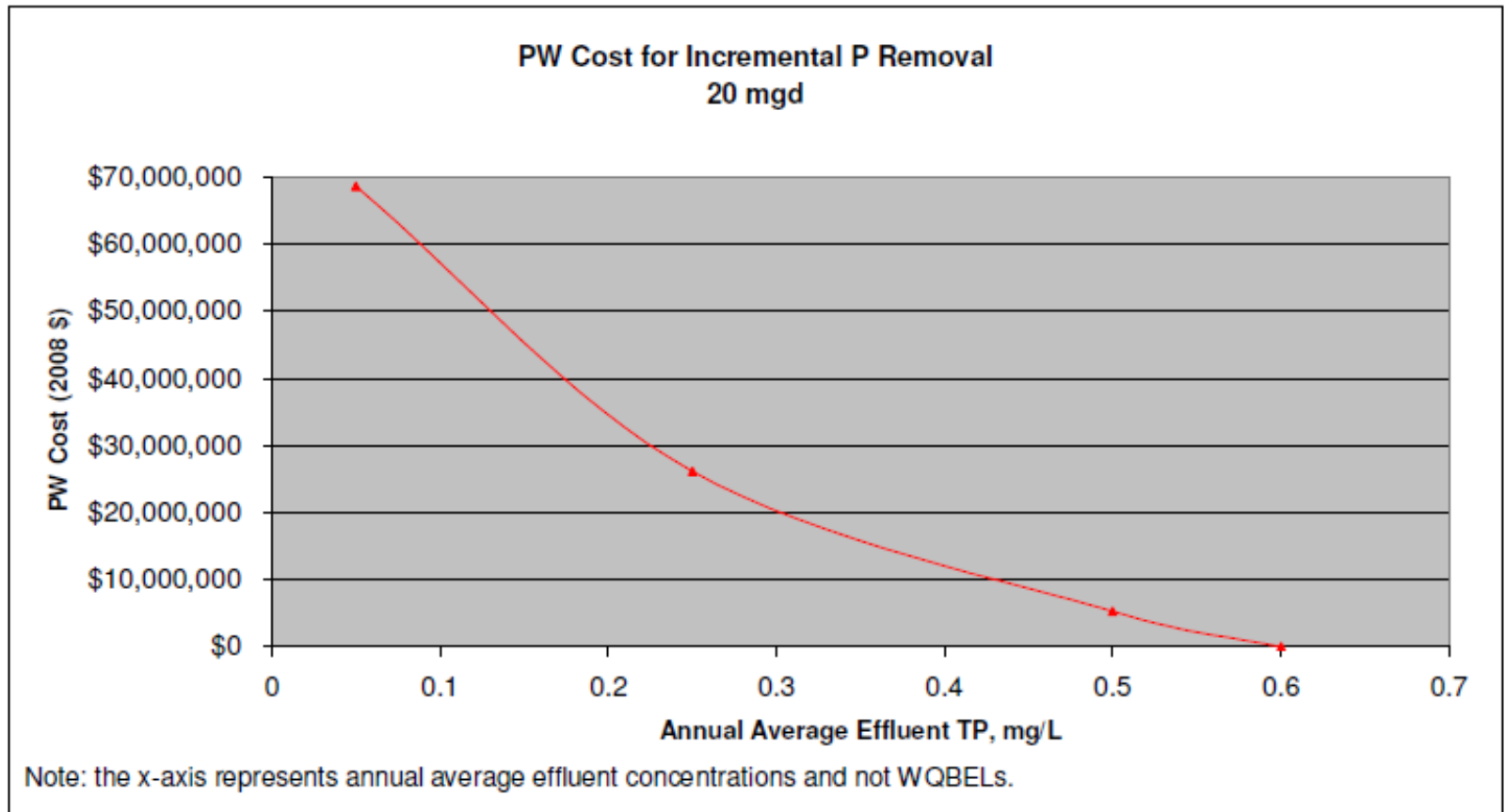
Results – Lagoon Plant Example

Present Worth



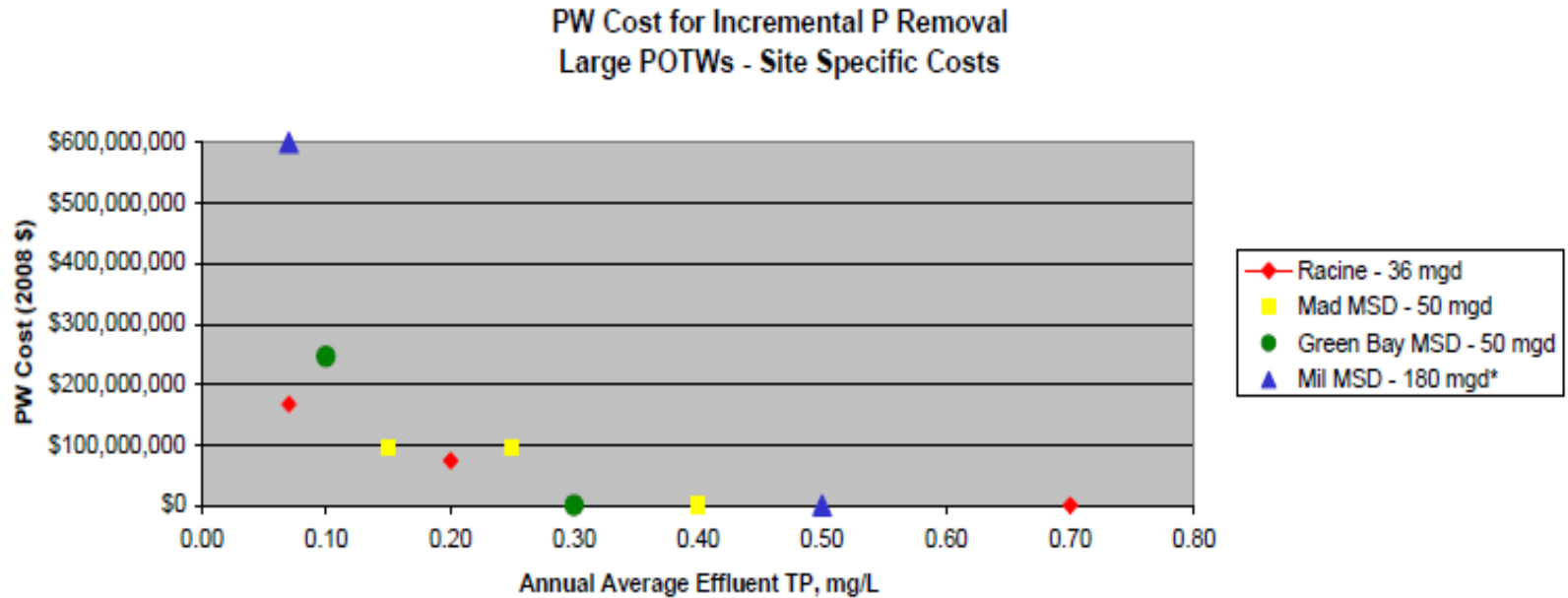
Results – 20 mgd WWTP

Incremental Present Worth



Results – Large Wisconsin POTWs

Incremental Present Worth



Note: the x-axis represents annual average effluent concentrations and not WQBELs.

■ Wisconsin Statewide Aggregate Costs

August 2008 Results

- ~500 POTWs discharging to surface waters would be impacted
- \$3 to \$5 billion in capital costs
- \$4 to \$7 billion in 20-year present worth costs

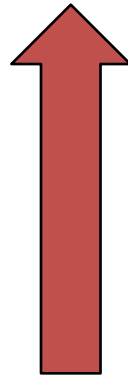
■ Putting the Costs in Perspective

- Currently:
 - P Limit = 1 mg/L (effluent ~ 0.6 mg/L)
 - Typically remove 5 – 8 mg/L of P
 - Typical cost ~ **\$3 to \$7 per lb of P**
- Proposed:
 - Remove additional ~ 0.5 mg/L of P
 - Incremental cost ~ **\$200 to \$300 per lb of P**

Additional Considerations – Biosolids Disposal

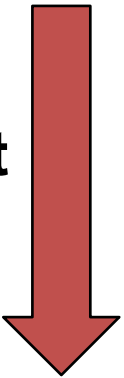
Biosolids Production

- Chemical sludge
- Improved TSS capture efficiency
- Growth



Land Availability

- Development
- Regulatory constraint
 - P indexing
 - Setbacks
- Competition for sites
- Public opinion



Wastewater P May be a Valuable Commodity Some Day

- World supplies of P are dwindling – harvest from wastewater?



Source: Ostara
Source: Ostara

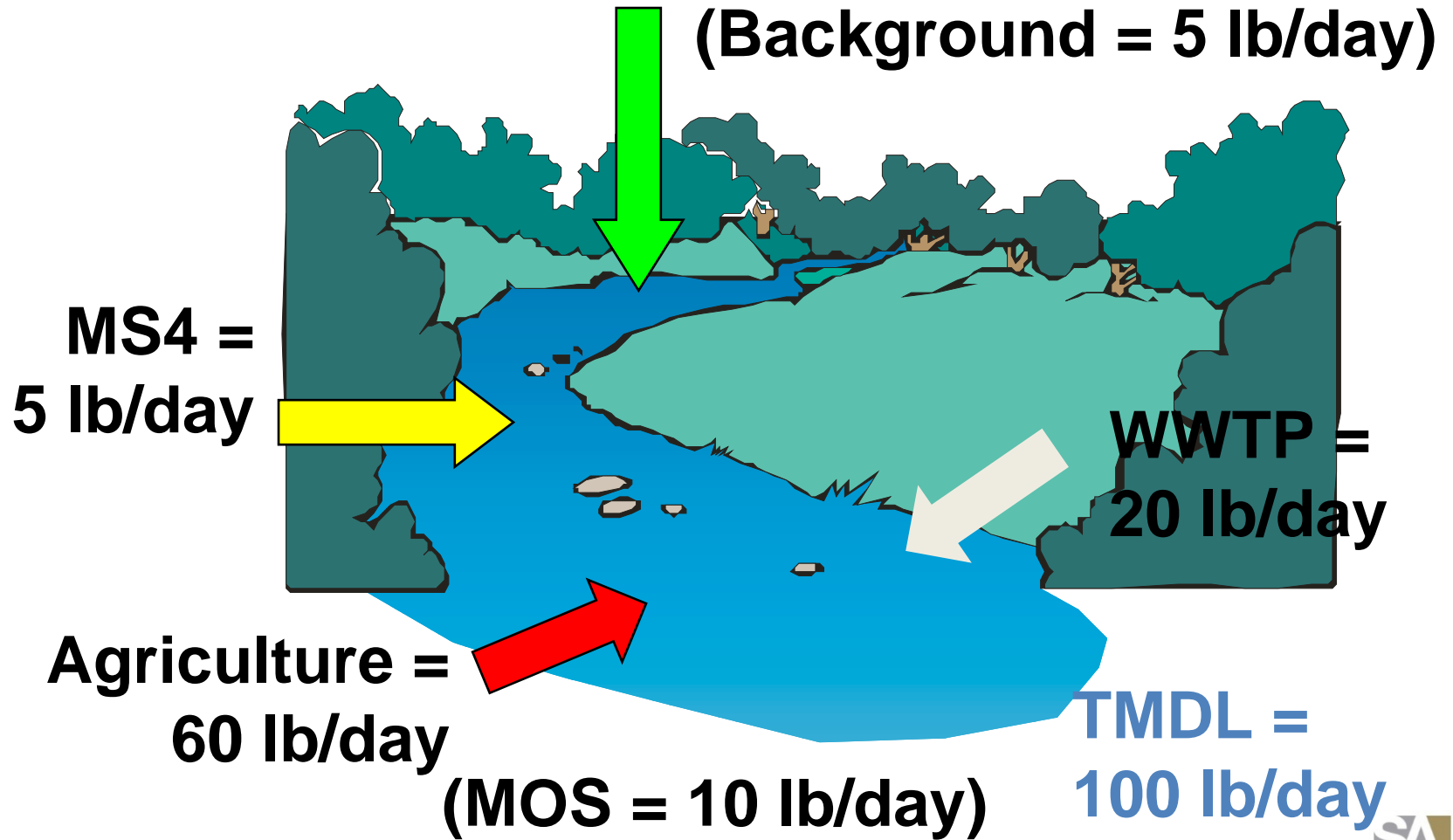


Source: Crystalactor
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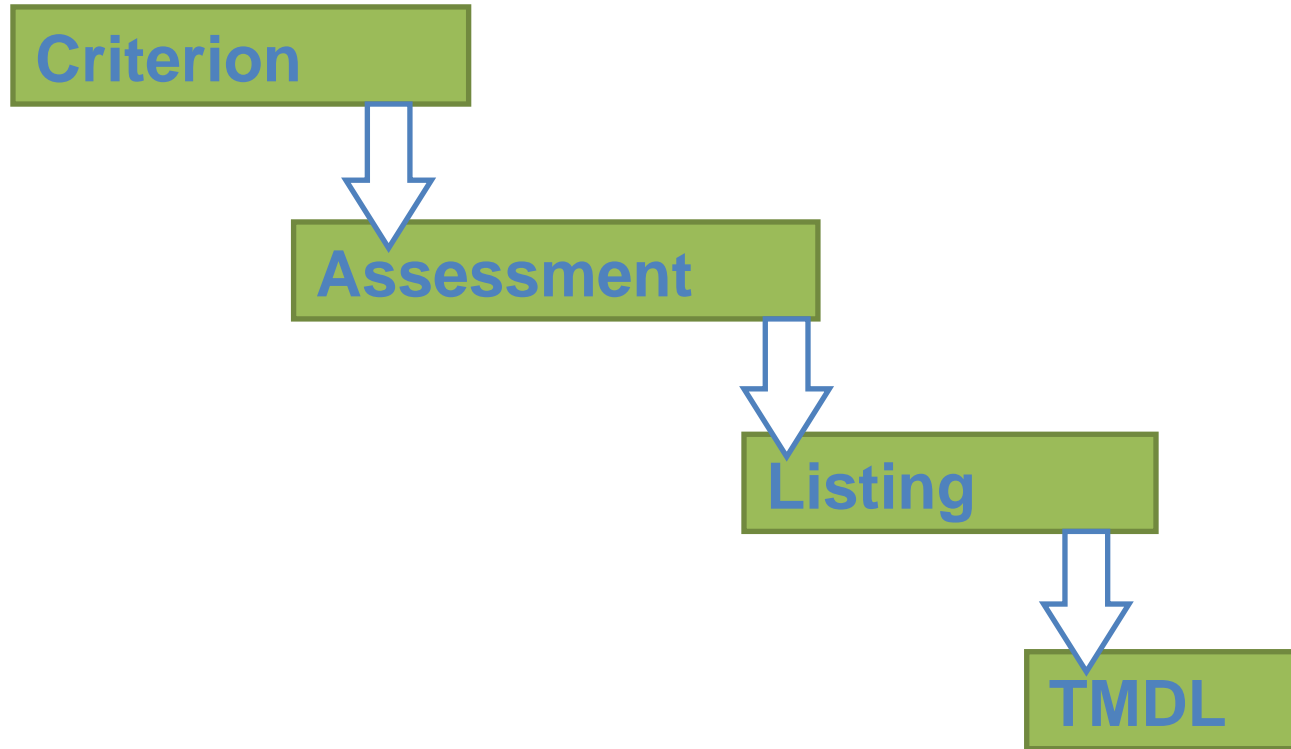
■ What if there is a TMDL?

- USEPA requires that, once a TMDL is approved, the regulatory agency must issue NPDES permits consistent with the TMDL.
- TMDLs consider all phosphorus sources – point and nonpoint.
- TMDLs also affect MS4 discharges.
- Communities that do not have a TMDL in the works and anticipate a low WQBEL may want to push for a TMDL or implement a 3rd party TMDL.

Simple Example TMDL



TMDLs Will Be Developed by WDNR for Impaired Waters



■ Rock River TMDL

- Rock River TMDL for sediment and phosphorus was finalized.
- Potential effluent limits for WWTPs in the watershed include:
 - A
 - B
 - C

■ Implementation Alternatives

- Adaptive Management
- Variances
- Water quality trading
- 3rd Party TMDL

Watershed Adaptive Management Option

- **Available if watershed is nonpoint source/ MS4 dominated**
- **Work with other dischargers to reduce P**
- **Submit WAM plan with permit application**
- **Allows two permit terms for upstream load reductions; interim effluent limits apply**
- **May eventually result in a higher WQBEL**

Adaptive Management: WDNR Activities

- **WDNR is developing guidance for this option.**
- **Consider applying for WAM in next permit application, after guidance is published**
 - **Interim limits are 0.5 – 0.6 mg/L**
 - **Need to work well with others**

■ **Variances**

- **Wastewater treatment ponds and lagoons have variance procedure in NR 217**
- **Other variances are available through NR 200 as always**
- **Usually based on economics**
- **Good for one permit term (5 years) then need to re-apply**

Water Quality Trading

- Partner with other sources of P in watershed for more economical P removal – eg., BMPs
- Other point sources, MS4s, nonpoint sources (ag.)
- USEPA toolkit & handbook is available
- WDNR released a Framework in July 2011. Related rules pending.



Water Quality Trading May Offer Cost Relief

