Department of the Environment

Understanding the Decisions in the Bay Allocation Process

Water Quality Goal Implementation Team

September 21st, 2009

Attachment C2

MDE

Purpose of Presentation

- Propose a risk metric to minimize the number of decisions in the allocation method
- Provide a better understanding of what the allocation curve/line shapes mean when making decisions
- Show results of using various objective functions (e.g. minimize loads reduced)

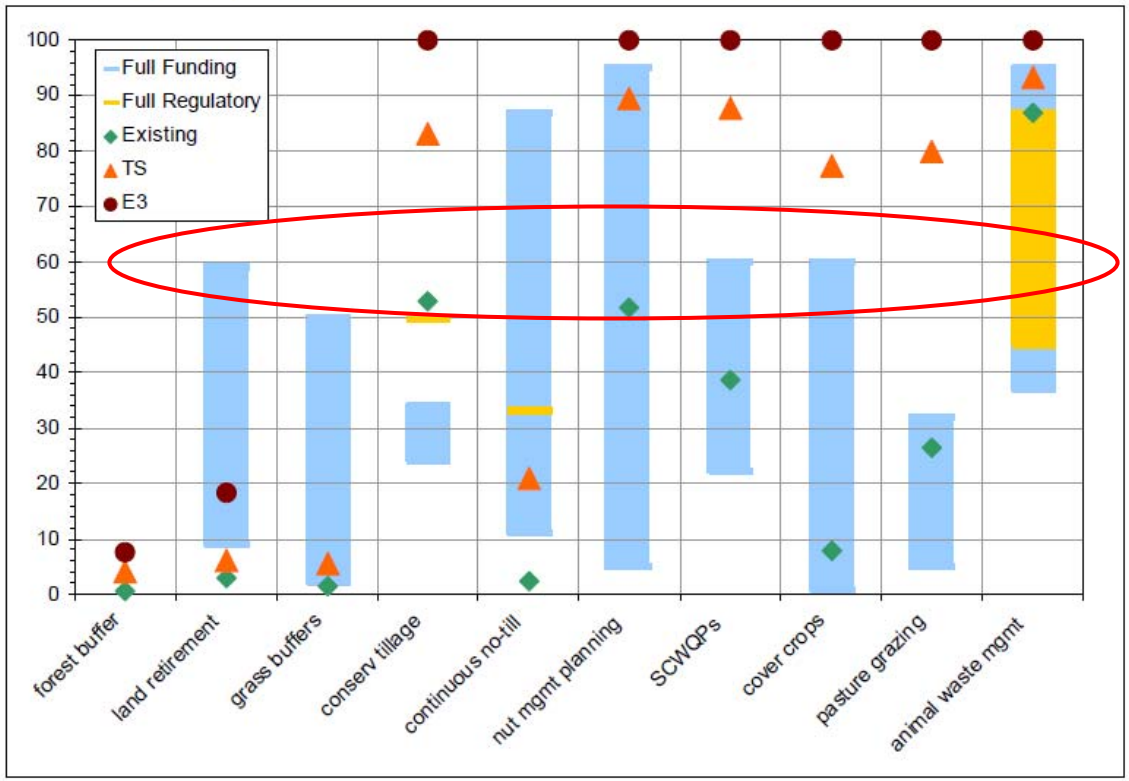
Define Risk of Success/Failure

- Probability of failing to meet required reductions (allocations)
- Consider point source, agricultural source and urban source sector
- Use information from maximum feasible implementation research
- Define mathematically

Agricultural Sector

Literature Review

Range of percent of land area treated for agriculture BMPs



Average land area with BMP under Full Funding is approx 60% - assume maximum feasible

From CBP

Urban Sector

EPA Review and Enhancement: Urban and Suburban Stormwater

Sector Area	Workgroup Estimates – Funding[1]	Workgroup Estimates – Regulatory[2]	EPA Revisions – Regulatory
Regulated Land-MS4			
New Development (2001 +)	Not applicable	75% of available urban land (ESD, LID, or equivalent) (TN=50, TP=60, TSS=90))	100% of available urban land (ESD, LID, or equivalent) (TN=50, TP=60, TSS=90)
Recent Development (1986-2000)	10% of available urban land (60% stormwater quality and quantity management (TN=27, TP=40, TSS=65))	5% of available urban land (60% stormwater quality and quantity management (TN=27, TP=40, TSS=65))	20% of impervious surface (retrofit using ESD, LID principles) (TN=27, TP=40, TSS=65)
Old Development (Pre-1986)	10% of available urban land (60% stormwater quantity management (TN=20, TP=30, TSS=65))	4% of available urban land (60% stormwater quantity management (TN=20, TP=30, TSS=65))	20% of impervious surface (retrofit using ESD, LID principles) (TN=27, TP=40, TSS=65)
Unregulated Land-Non MS4			
New Development (2001 +)	Not applicable	30% (ESD, LID, or equivalent) (TN=50, TP=60, TSS=90))	100% of available urban land (ESD, LID, or equivalent) (TN=50, TP=60, TSS=90)
Recent Development (1986-2000)	5% of available urban land (60% stormwater quantity and quality management (TN=27, TP=40, TSS=65))	0.5%* of available urban land (60% stormwater quality and quantity management (TN=27, TP=40, TSS=65))	20% of impervious surface (retrofit using ESD, LID principles) (TN=27, TP=40, TSS=65)
Old Development (Pre-1986)	5% of available urban land (60% stormwater quantity management (TN=20, TP=30, TSS=65))	0.5%* of available urban land (60% stormwater quantity management (TN=20, TP=30, TSS=65))	20% of impervious surface (retrofit using ESD, LID principles) (TN=27, TP=40, TSS=65)

From CBP

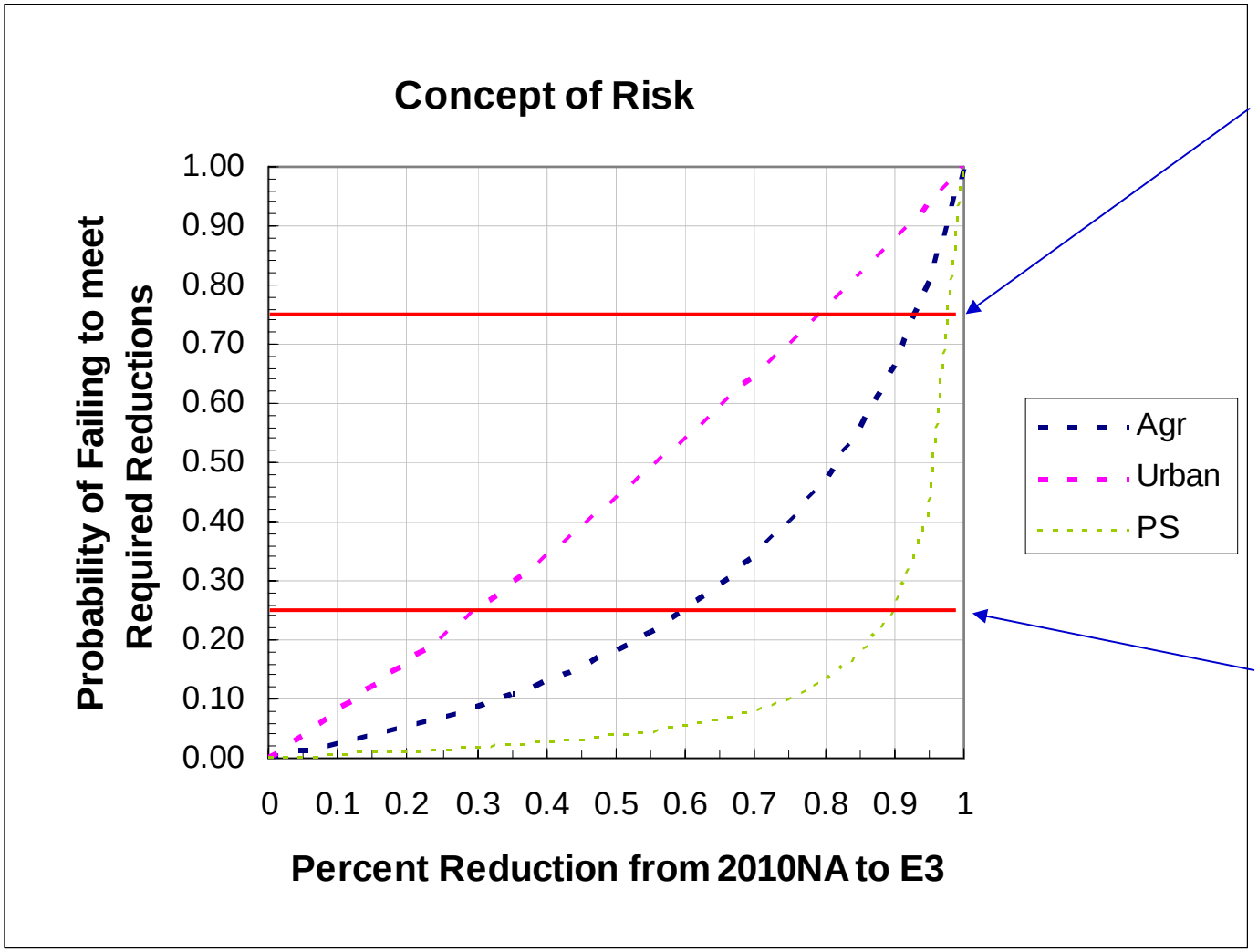
Approx 30% Land area retrofitted under full regulatory

MARYLAND

WWTP

- Approx 90%, E3 is about ENR level in permits

Defining Risk of Failing to Meet percent reduction from 2010NA to E3



With 75% Risk level we can set the following reduction from 2010NA to E3
Agr = 0.92
Urban =0.8
PS = 0.96

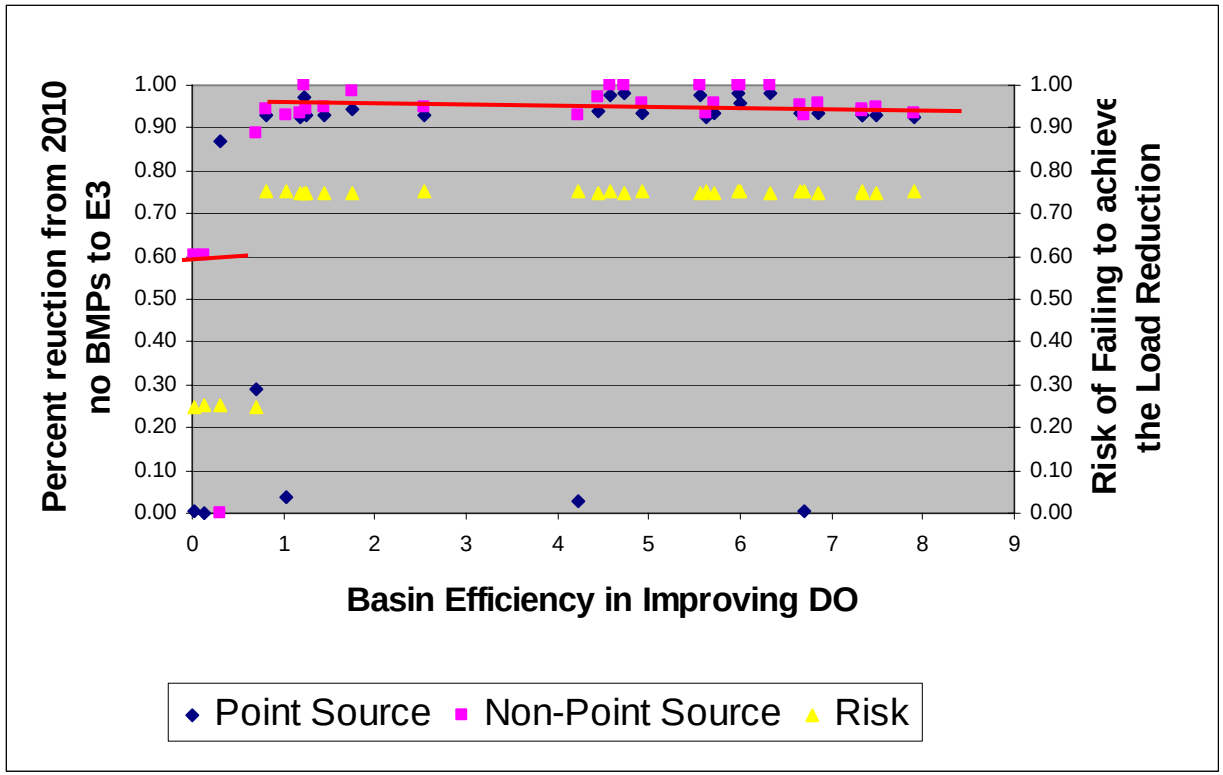
Assume that 25% is Max feasible, (allows curve to be defined)
Agr = 0.3
Urban =0.6
PS = 0.9

An option is that all source levels for percent reduction from 2010NA to E3 can be defined by selecting a risk level

Applying an optimization model to understand the shape of the lines

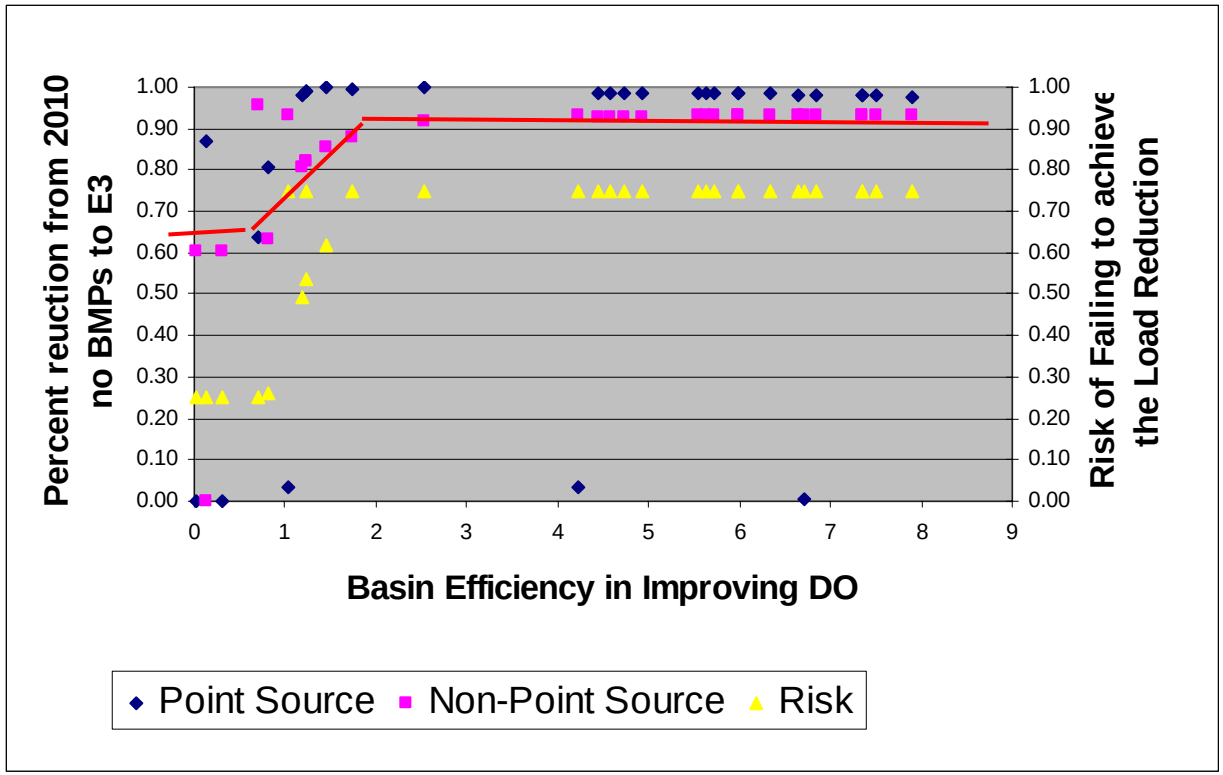
- Evaluate four different objective functions
  1. Minimize the total EOS stream reduced
  2. Minimize the total EOS stream reduced but consider risk vs reward
  3. All basin-jurisdictions have the same likelihood of success/failure
  4. Minimize the total EOS stream reduced but assume risk proportionally increases from least efficient to most efficient basins
- Meet goal of TN=185 (water quality standards)

Minimize total EOS load reduced



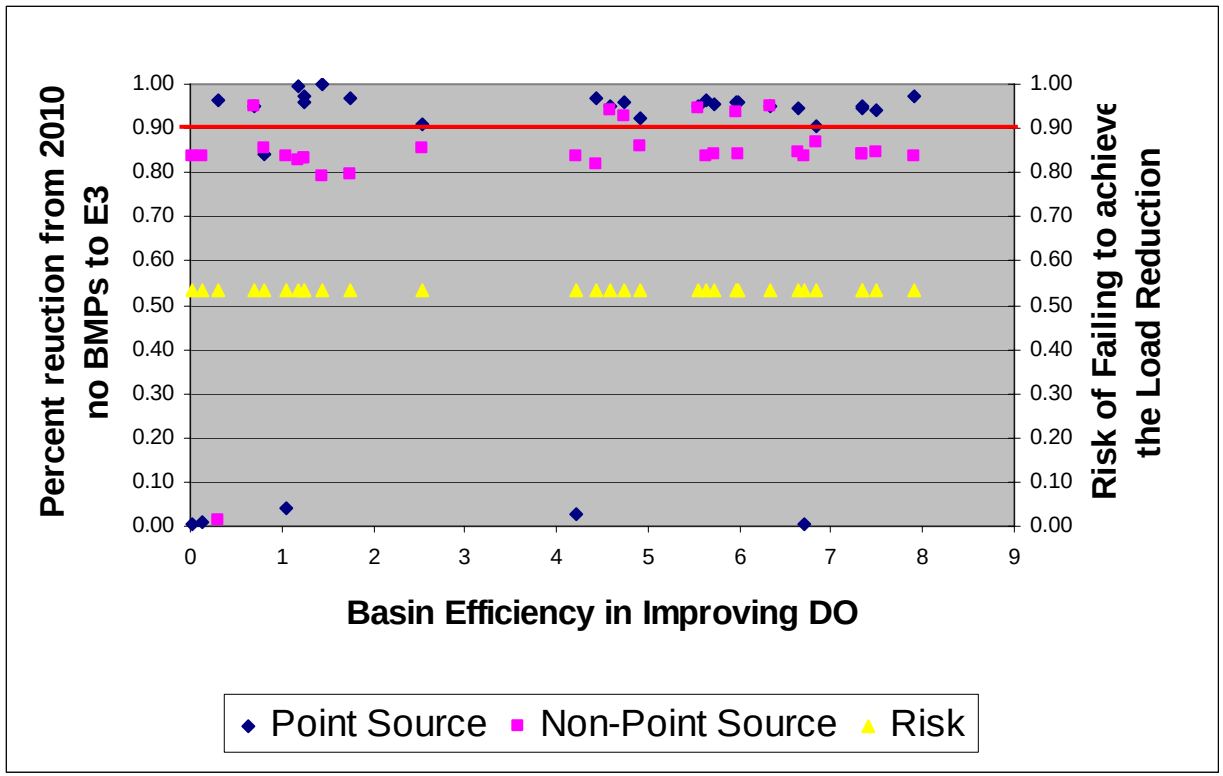
- Set upper and lower bounds on basin-jurisdiction risk, 25% and 75% respectively
- Concentrates efforts on most efficient basins
- Z-curve, which is basically two tiers
- Points on bottom of graph represent basin-jurisdictions with very low proportion of ps and/or nps load that can be reduced. Reducing them does not significantly improve the objective
- Overall likelihood of failure approx 73%

Minimize total EOS load reduced but considering risk vs reward



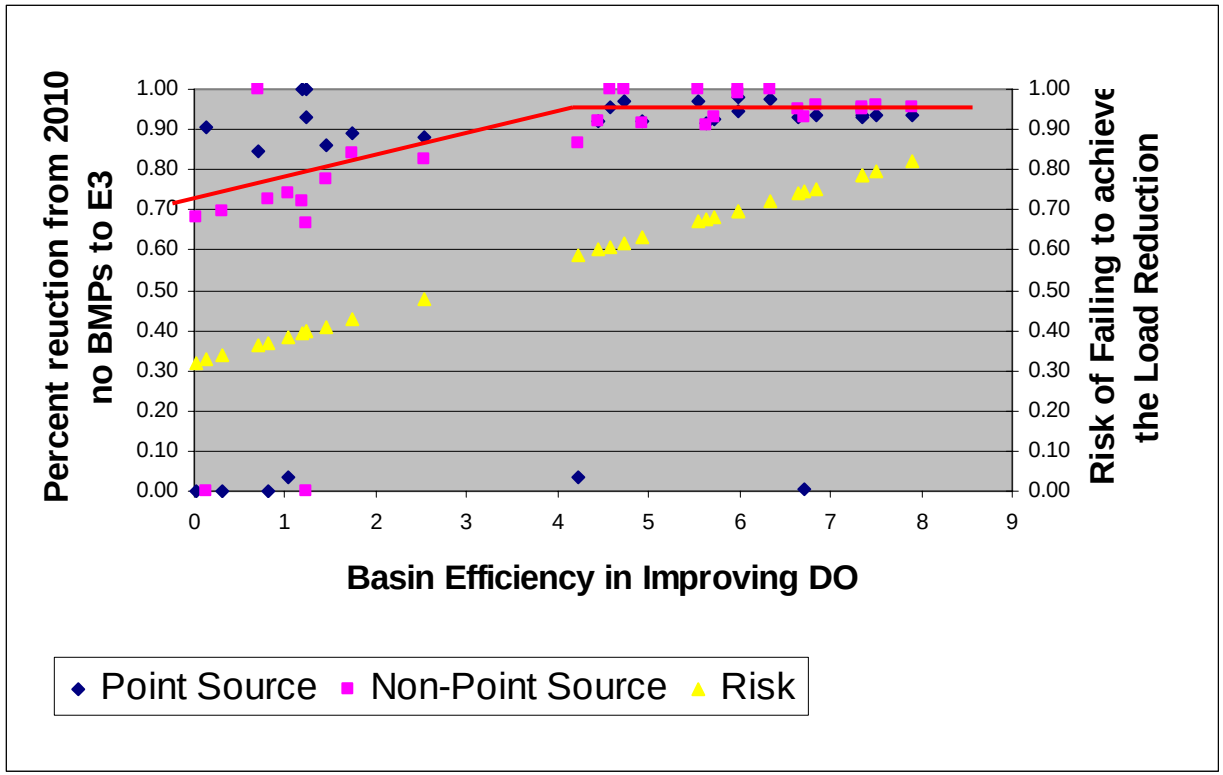
- Set upper and lower bounds on basin-jurisdiction risk, 25% and 75% respectively
- Concentrates efforts on most efficient basins
- Z-curve with a more sloping middle line that creates a third tier
- Points on bottom of graph represent basin-jurisdictions with very low proportion of ps and/or nps load that can be reduced. Reducing them does not significantly improve the objective
- Overall likelihood of failure approx 68%

Everyone has the same Risk



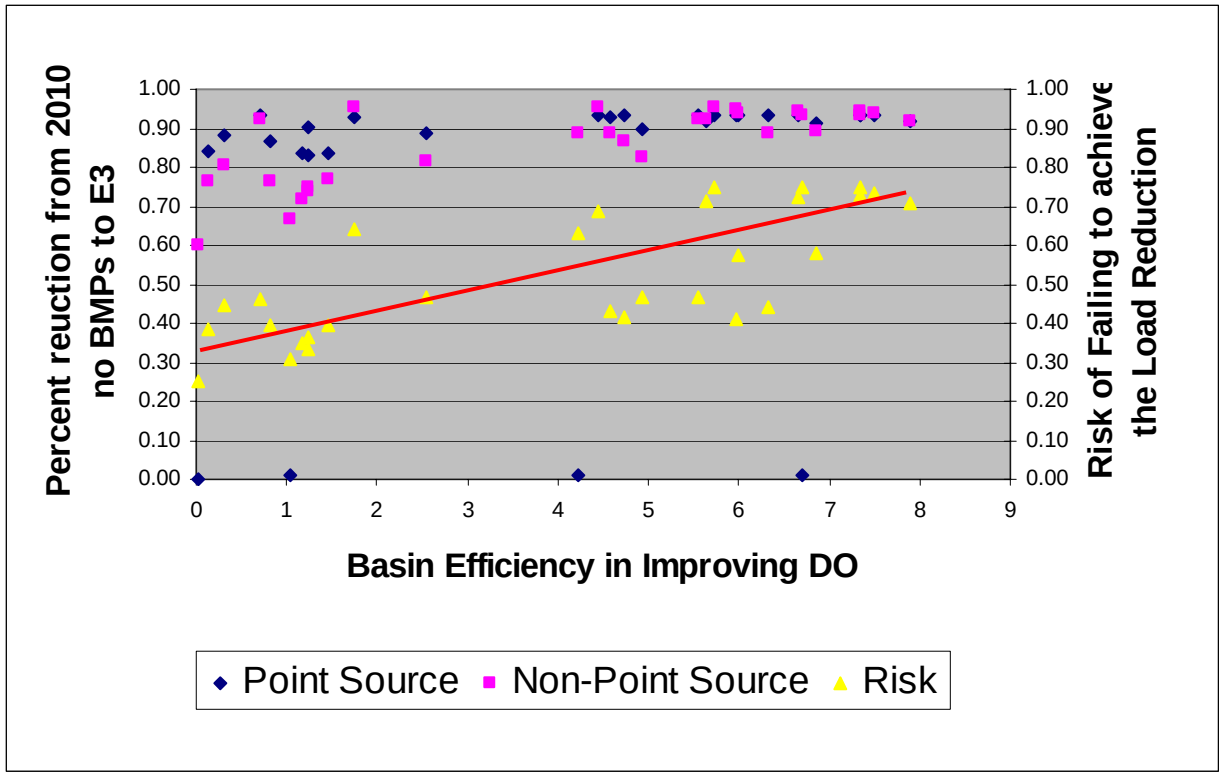
- Basically two lines, point source and non-point source, set at different levels
- All basin-jurisdictions have the same likelihood of success in achieving the loads
- Points on bottom of graph represent basin-jurisdictions with very low proportion of ps and/or nps load that can be reduced. Reducing them does not significantly improve the objective
- Overall likelihood of failure approx 56%

Minimize total EOS load reduced and assume proportional risk



- Set upper and lower bounds on the maximum difference in basin-jurisdiction risk as 50% and assume linear proportional risk.
- Concentrates efforts on most efficient basins
- Shape is more of a hockey stick and endpoint set themselves based on risk
- Points on bottom of graph represent basin-jurisdictions with very low proportion of ps and/or nps load that can be reduced. Reducing them does not significantly improve the objective
- Overall likelihood of failure approx 65%

Minimize total EOS load Risk



- Set upper and lower bounds on the maximum difference in basin-jurisdiction risk as 50% and assume linear proportional risk.
- Similar to proportional risk results
- Points on bottom of graph represent basin-jurisdictions with very low proportion of ps and/or nps load that can be reduced. Reducing them does not significantly improve the objective
- Overall likelihood of failure approx 51%

Observations

- Shape of lines can be derived using risk assumptions for basin-jurisdictions
- Different objectives result in flat line, z-curve and hockey stick
- Risk level can be used to objectively set or guide decisions on basin-jurisdiction reduction requirements (2010NA to E3)

Thank You!!!

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