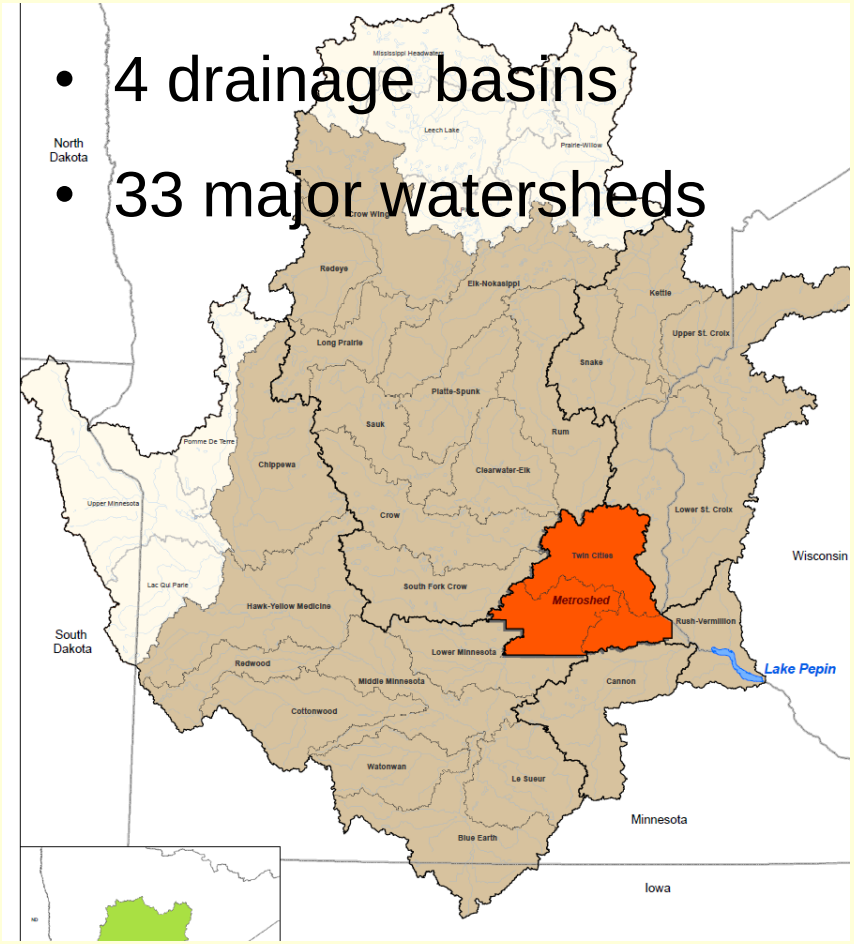
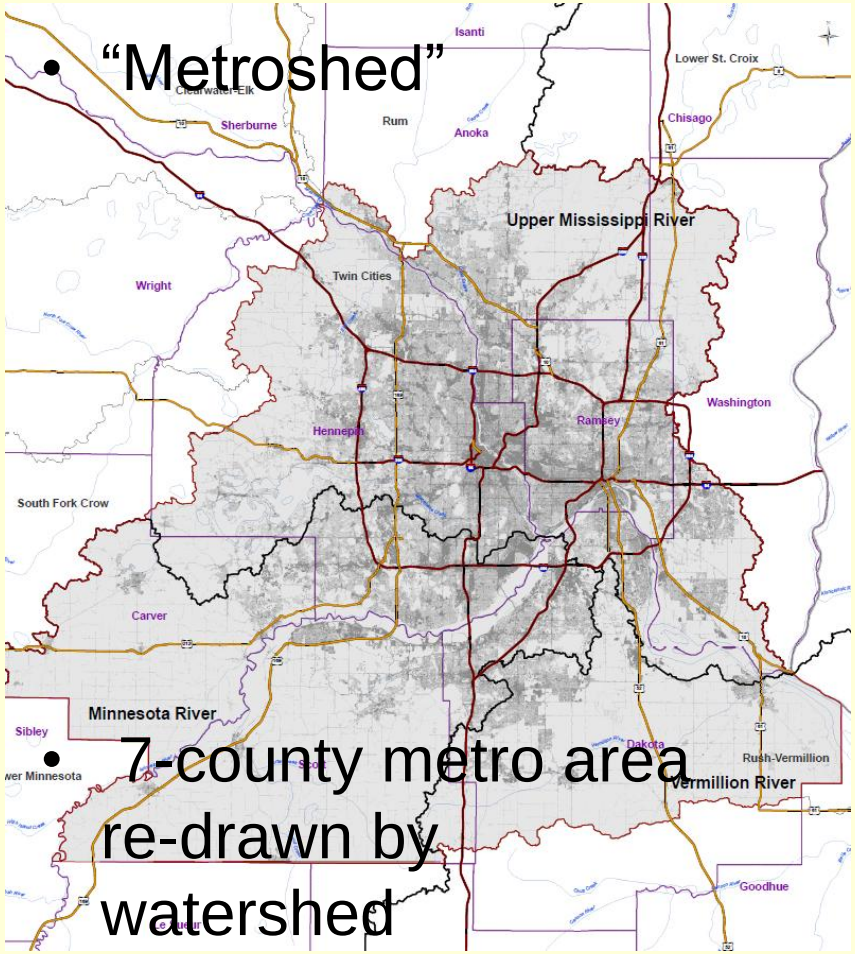
Meeting Site-Specific Standards for the Mississippi River and Lake Pepin

Dennis Wasley
Minnesota Pollution Control Agency
August 25, 2009
Lake Pepin Stakeholder Advisory Committee

Management by Hydrologic Scale Pepin~Basins~Majors



- 4 drainage basins
- 33 major watersheds



- "Metroshed"
- 7-county metro area re-drawn by watershed boundaries

Site-Specific Standards

- Mississippi River Total Suspended Solids (Turbidity)
  - 32 ppm TSS
  - 21% frequency submerged aquatic vegetation
  - June-September average at Lock and Dams 2 & 3 (south metro Mississippi)
- Lake Pepin Eutrophication
  - 32 ppb chlorophyll a
  - 100 ppb Total P
  - 0.8 meter Secchi transparency
  - June-September whole lake averages

Scenarios to Reduce Loads to Meet Site Specific Standard

- Modeled 19 scenarios
- Complex situation:
  - 2 stretches of the Mississippi River
  - 1 standard for turbidity in river with effect of doubling the rooted vegetation
  - 1 standard for Lake Pepin for Total Phosphorus, Chloropyhll-a and Secchi disk (clarity) with effect of minimizing algal blooms, even during low-flow conditions

Scenarios to Reduce Loads to Meet Site Specific Standard

- On one hand, continue status quo, which will continue deterioration of the south metro Mississippi and filling-in of Lake Pepin
- At the opposite end, looked at reverting land back to pre-settlement loads, or natural background loads only
- Somewhere in between is the answer

Scenarios to Meet Standards

Do Different Loads Allow South Metro Mississippi, Lake Pepin to Meet Standards Even Under Low-Flow Conditions?

Modeling Predictions to 2006 Conditions

Scenario in Model	Metroshed Wastewater Point Sources Total Phosphorus	Reductions in Total Phosphorus and Total Suspended Solids		South Metro Mississippi	Lake Pepin	
		Minnesota River Basin**	Upper Mississippi River Basin**	TSS* Standard: 32	Total P Standard: 100	Chl-a Standard: 32
	M Tons/Year	%	%	mg/L	µg/L	µg/L
2: No change	Current permit	0	0	32.7	163	36.6
19: Natural background	0	90	90	5.3	22	11
3: First step	Current permit***	20	20	28.4	133	36.5
8: Extreme non-point reduction	Current permit***	80	50	15.7	86	35.0
10: First step with point source freeze	Near current actual	20	20	28.4	111	33.1
17: Meets both standards	Near current actual	**50**	**20**	**20.7**	**89**	**31.3**

Notes: * TSS standard is relatively easy to meet in a dry year, reductions in scenario 17 are required to meet the standard in wetter years
** St. Croix reductions are fixed at 20% and Cannon River reductions are fixed at 50%, this reflects the reductions called for in local TMDLs.
***Represents 70% reduction from what permit allowed prior to 2005

Scenarios to Meet Standards: 2

Do Different Loads Allow South Metro Mississippi, Lake Pepin to Meet Standards Even Under Low-Flow Conditions?

Modeling Predictions to 2006 Conditions

Scenario in Model	Metroshed Wastewater Point Sources Total Phosphorus	Reductions in Total Phosphorus and Total Suspended Solids		South Metro Mississippi	Lake Pepin	
		Minnesota River Basin**	Upper Mississippi River Basin**	TSS* Standard: 32	Total P Standard: 100	Chlorophyll-a Standard: 32
	M Tons/Year	%	%	mg/L	µg/L	µg/L
2: No change	Current permit***	0	0	32.7	163	36.6

Notes: * TSS standard is relatively easy to meet in a dry year, reductions in scenario 17 are required to meet the standard in wetter years
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Scenarios to Meet Standards: 19

Do Different Loads Allow South Metro Mississippi, Lake Pepin to Meet Standards Even Under Low-Flow Conditions?

Modeling Predictions to 2006 Conditions

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	M Tons/Year	%	%	mg/L	µg/L	µg/L
19: Natural background	0	90	90	5.3	22	11

Notes: * TSS standard is relatively easy to meet in a dry year, reductions in scenario 17 are required to meet the standard in wetter years
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Scenarios to Meet Standards: 3

Do Different Loads Allow South Metro Mississippi, Lake Pepin to Meet Standards Even Under Low-Flow Conditions?

Modeling Predictions to 2006 Conditions

Scenario in Model	Metroshed Wastewater Point Sources Total Phosphorus	Reductions in Total Phosphorus and Total Suspended Solids		South Metro Mississippi	Lake Pepin	
		Minnesota River Basin**	Upper Mississippi River Basin**	TSS* Standard: 32	Total P Standard : 100	Chlorophyll-a Standard: 32
	M Tons/Year	%	%	mg/L	µg/L	µg/L
3: First step	Current permit***	20	20	28.4	133	36.5

Notes: * TSS standard is relatively easy to meet in a dry year, reductions in scenario 17 are required to meet the standard in wetter years
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***Represents 70% reduction from what permit allowed prior to 2005

Scenarios to Meet Standards: 8

Do Different Loads Allow South Metro Mississippi, Lake Pepin to Meet Standards Even Under Low-Flow Conditions?

Modeling Predictions to 2006 Conditions

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		Minnesota River Basin**	Upper Mississippi River Basin**	TSS* Standard: 32	Total P Standard : 100	Chlorophyll-a Standard: 32
	M Tons/Year	%	%	mg/L	µg/L	µg/L
8: Extreme non-point reduction	Current permit***	80	50	15.7	86	35.0

Notes: * TSS standard is relatively easy to meet in a dry year, reductions in scenario 17 are required to meet the standard in wetter years
** St. Croix reductions are fixed at 20% and Cannon River reductions are fixed at 50%, this reflects the reductions called for in local TMDLs.
***Represents 70% reduction from what permit allowed prior to 2005

Scenarios to Meet Standards: 10

Do Different Loads Allow South Metro Mississippi, Lake Pepin to Meet Standards Even Under Low-Flow Conditions?
Modeling Predictions to 2006 Conditions

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		Minnesota River Basin**	Upper Mississippi River Basin**	TSS* Standard: 32	Total P Standard: 100	Chlorophyll-a Standard: 32
	M Tons/Year	%	%	mg/L	µg/L	µg/L
10: First step with point source freeze	Near current actual	20	20	28.4	111	33.1

Notes: * TSS standard is relatively easy to meet in a dry year, reductions in scenario 17 are required to meet the standard in wetter years
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Scenarios to Meet Standards: 17

Do Different Loads Allow South Metro Mississippi, Lake Pepin to Meet Standards Even Under Low-Flow Conditions?

Modeling Predictions to 2006 Conditions

Scenario in Model	Metroshed Wastewater Point Sources Total Phosphorus	Reductions in Total Phosphorus and Total Suspended Solids		South Metro Mississippi	Lake Pepin	
		Minnesota River Basin**	Upper Mississippi River Basin**	TSS* Standard: 32	Total P Standard: 100	Chlorophyll-a Standard: 32
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17: Meets both standards	Near current actual	**50**	**20**	**20.7**	**89**	**31.3**

Notes: * TSS standard is relatively easy to meet in a dry year, reductions in scenario 17 are required to meet the standard in wetter years
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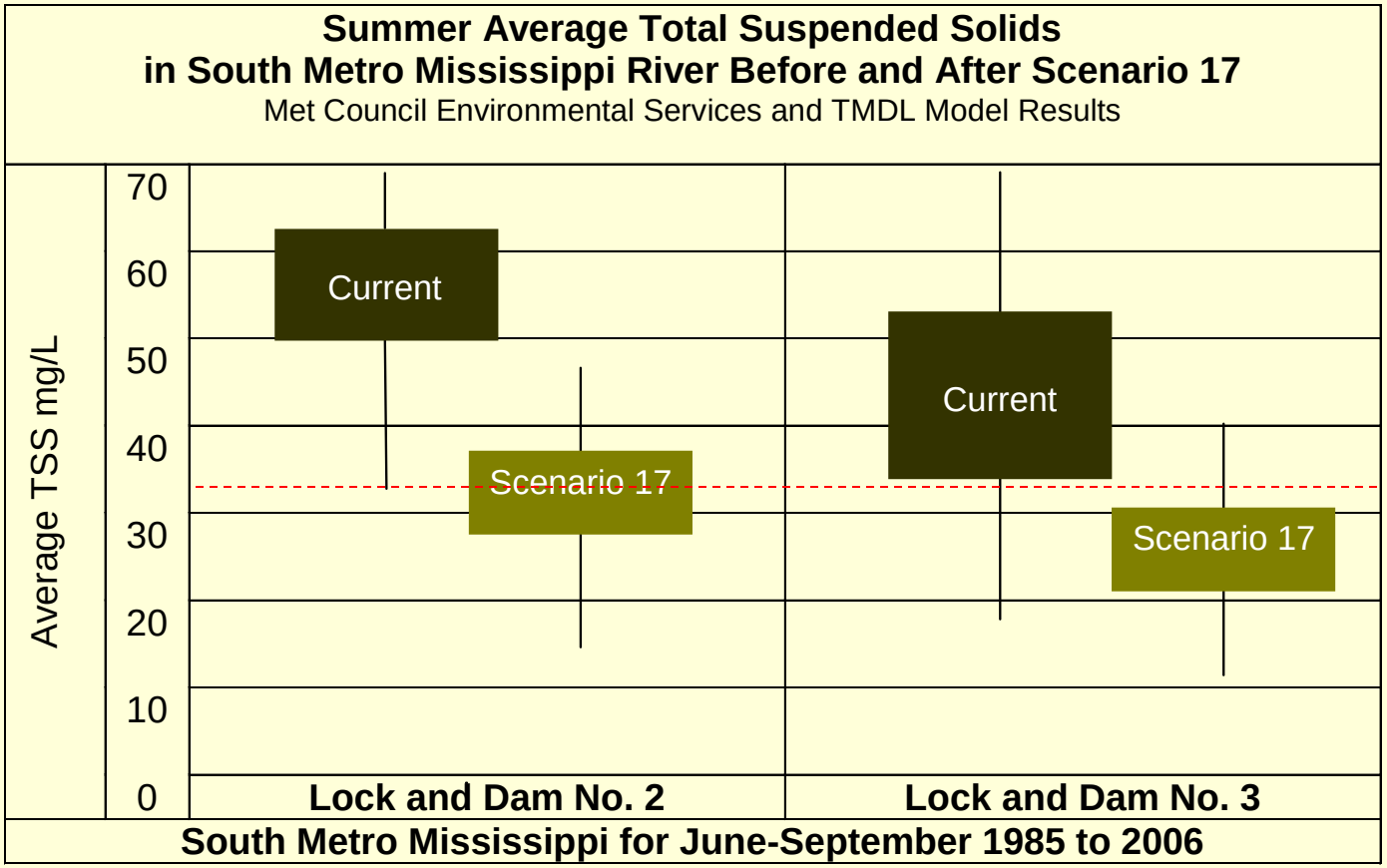
One Scenario Could Meet Both Standards

- Scenario 17
  - 50% reductions in TP and TSS loads from Minnesota River and Cannon River basins.
  - 20% reductions in TP and TSS loads from St. Croix and Upper Miss basins.
  - Metroshed reductions
    - Short term
      - Hold wastewater TP constant
      - 25 to 50% reduction in Stormwater runoff (urban v. urbanizing)
    - Long term (2030)
      - 70% reduction in permitted TP load from wastewater

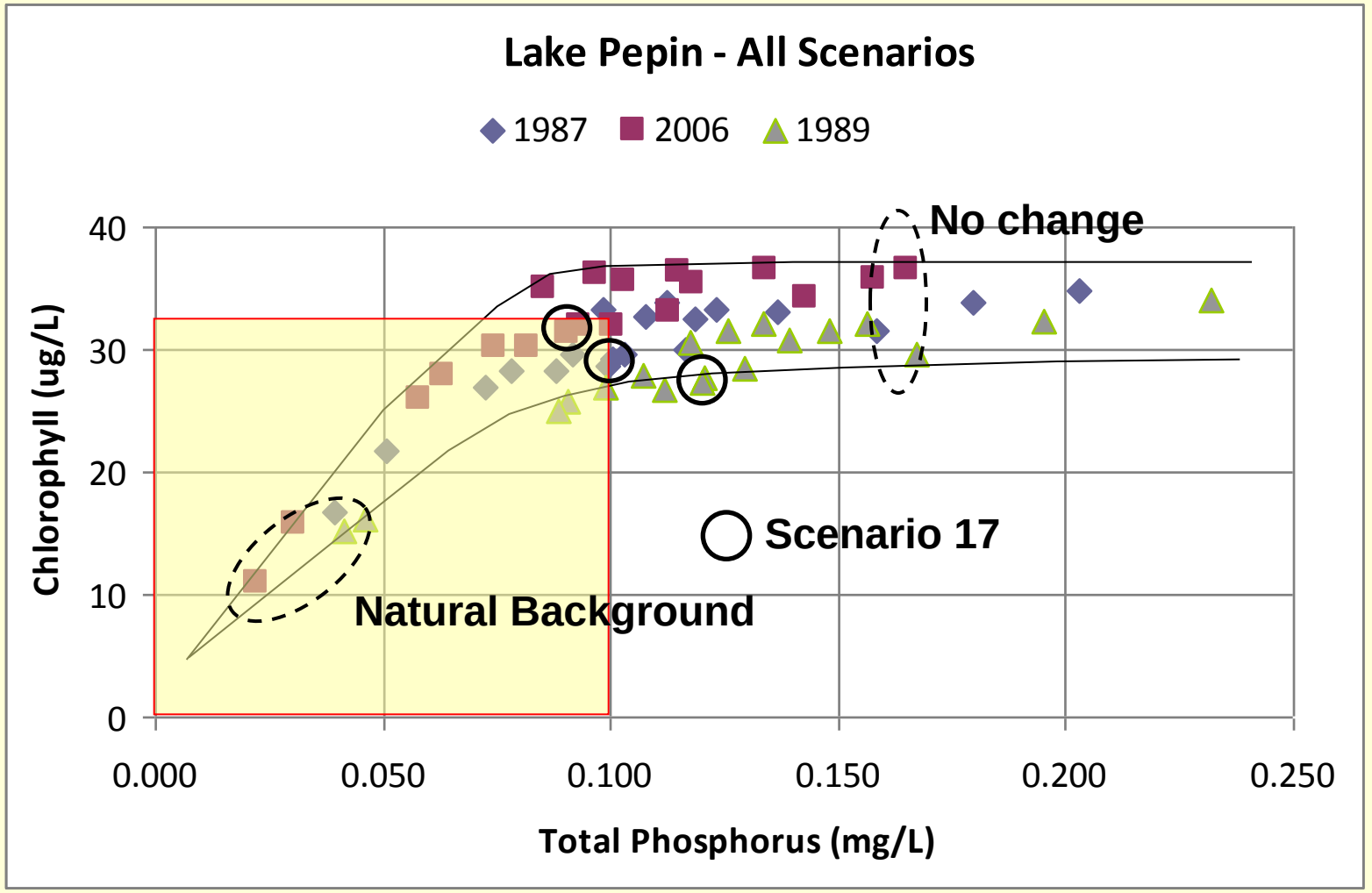
Scenario 17 Could Meet TSS Standard for South Metro Mississippi



Lake Pepin, July 2009

(Rob Burdis, MN DNR)

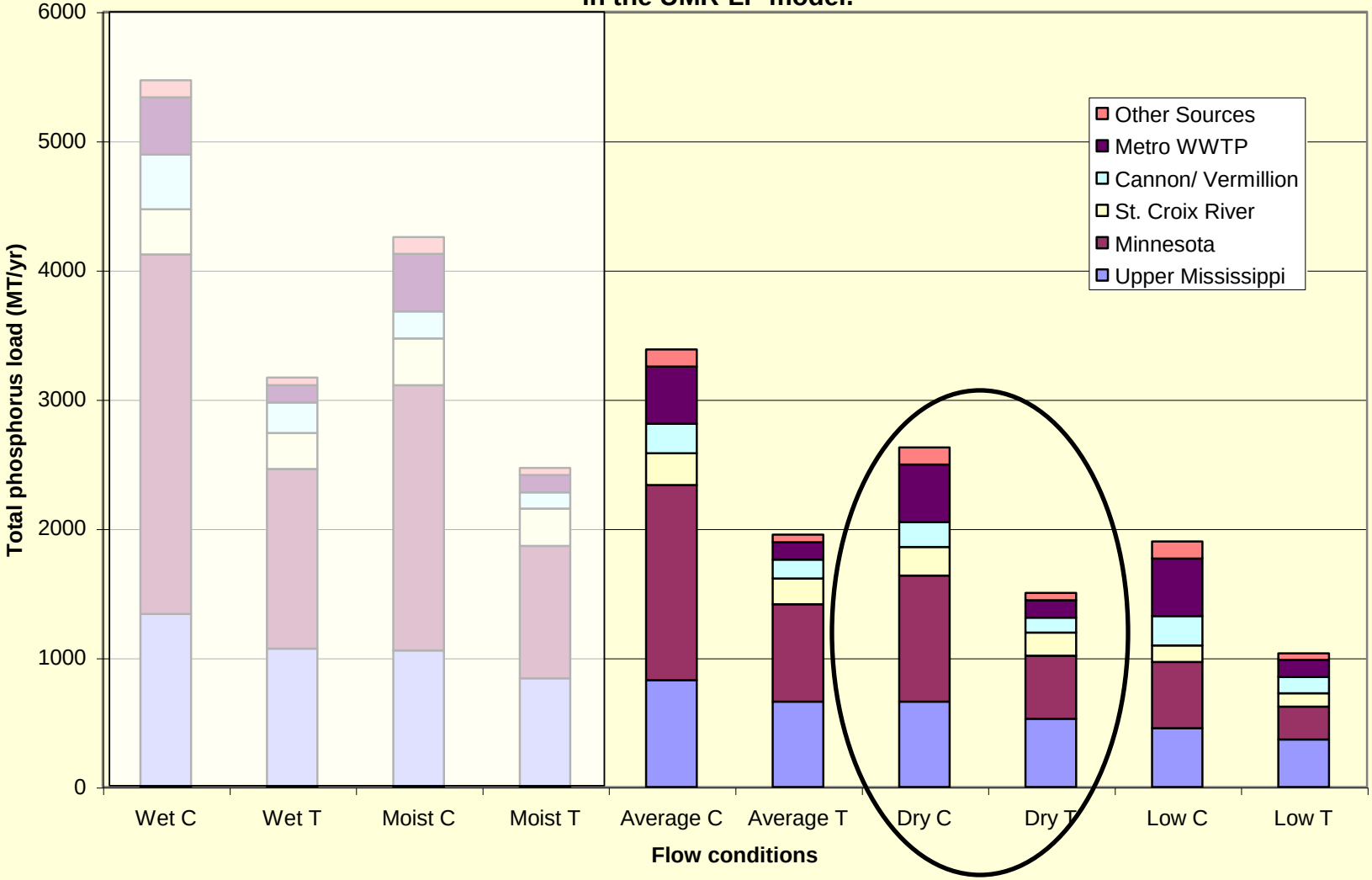
Low-Flow Year, Scenario 17 Appears to Meet the Standards



This TMDL covers more than dry flow years

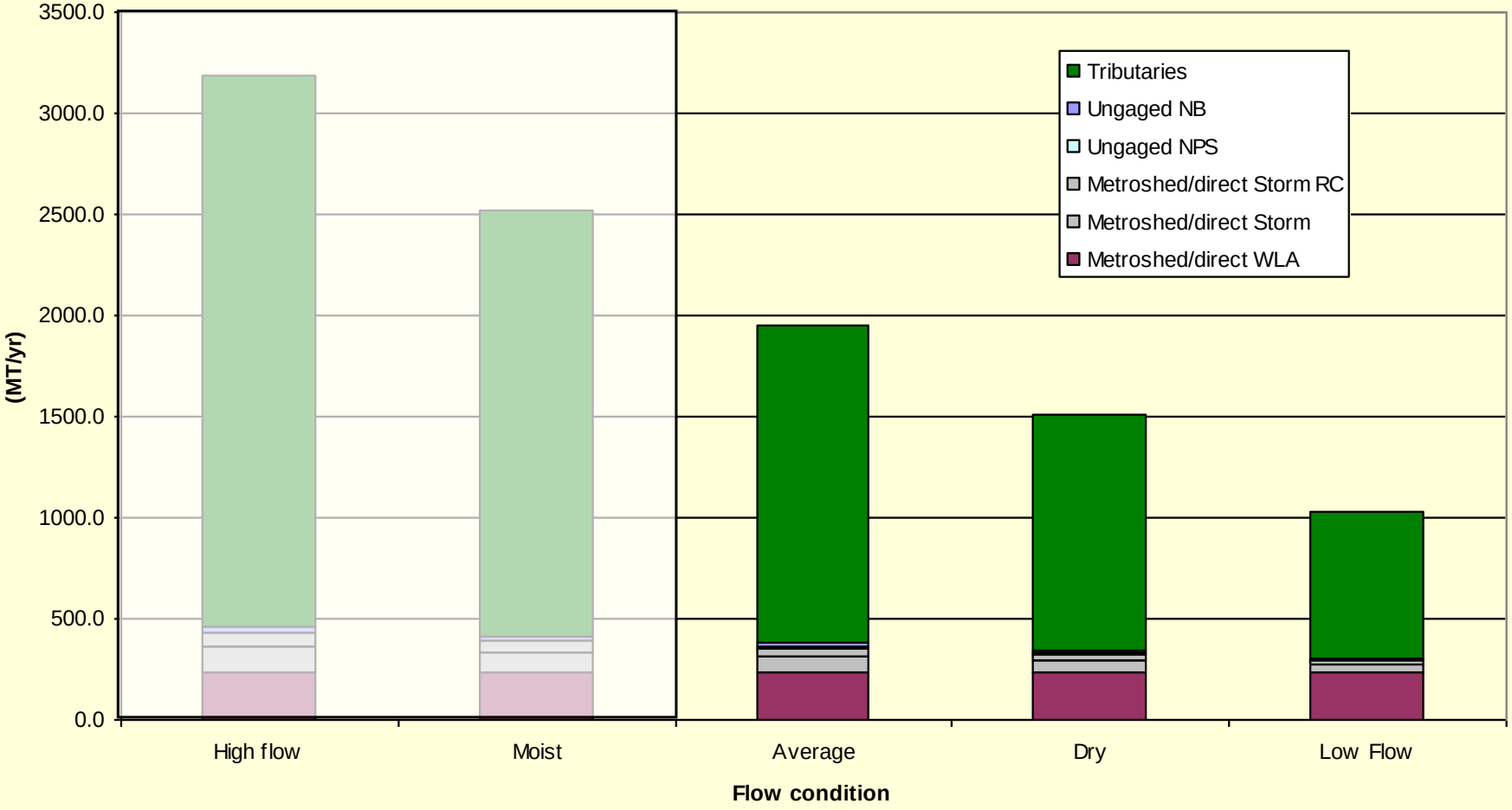
Total P: All Flow Conditions

Current (C) total phosphorus loads (MT/yr) during various flow conditions and tmdl (T) allocations. Current loads reflect permitted loads at Metro WWTP and other WWTPs included in the UMR-LP model.

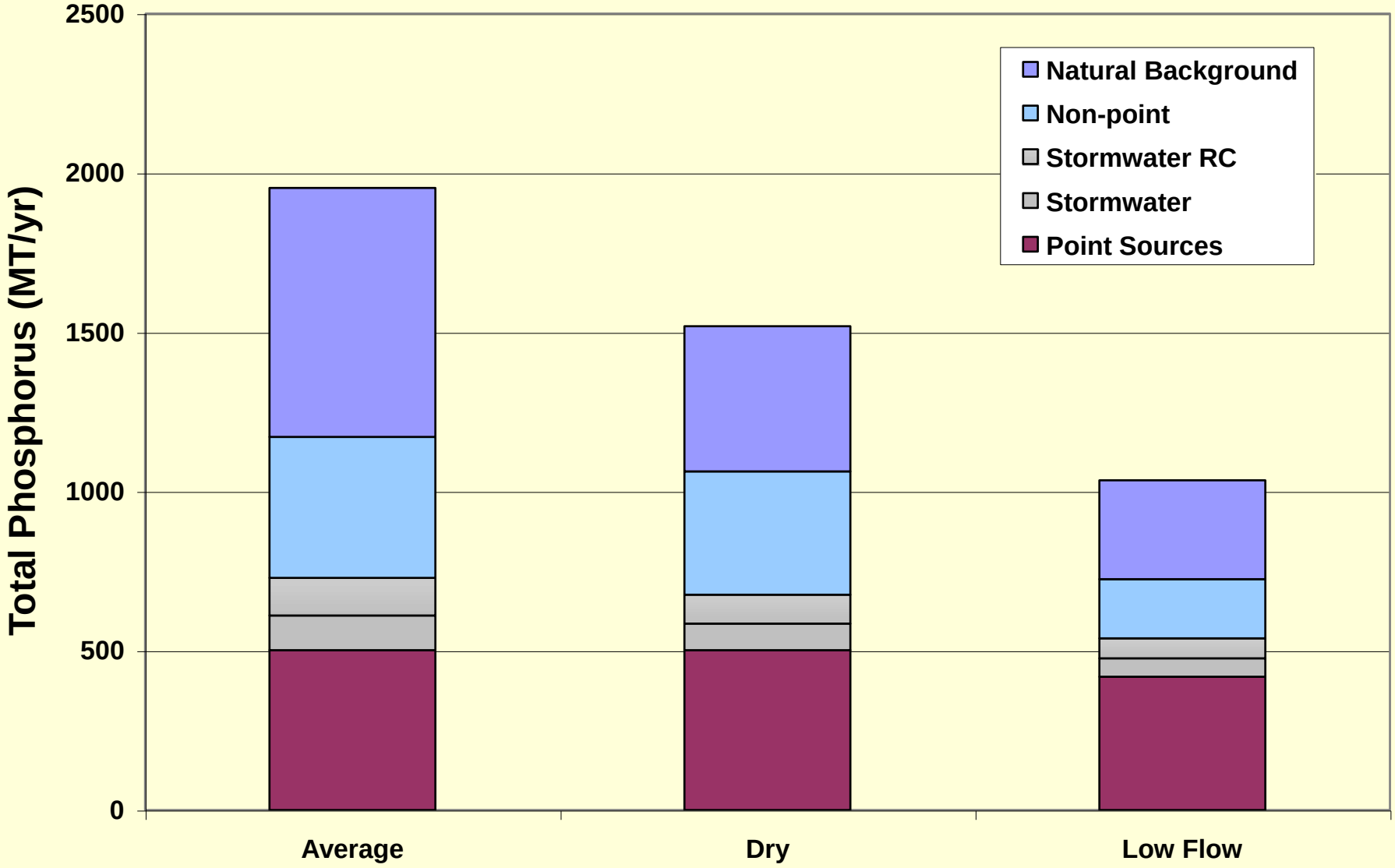


Metroshed and Tributary Loads

Lake Pepin total phosphorus allocations. Note that flushing rate in the lake limits algal response during moist to high flow conditions

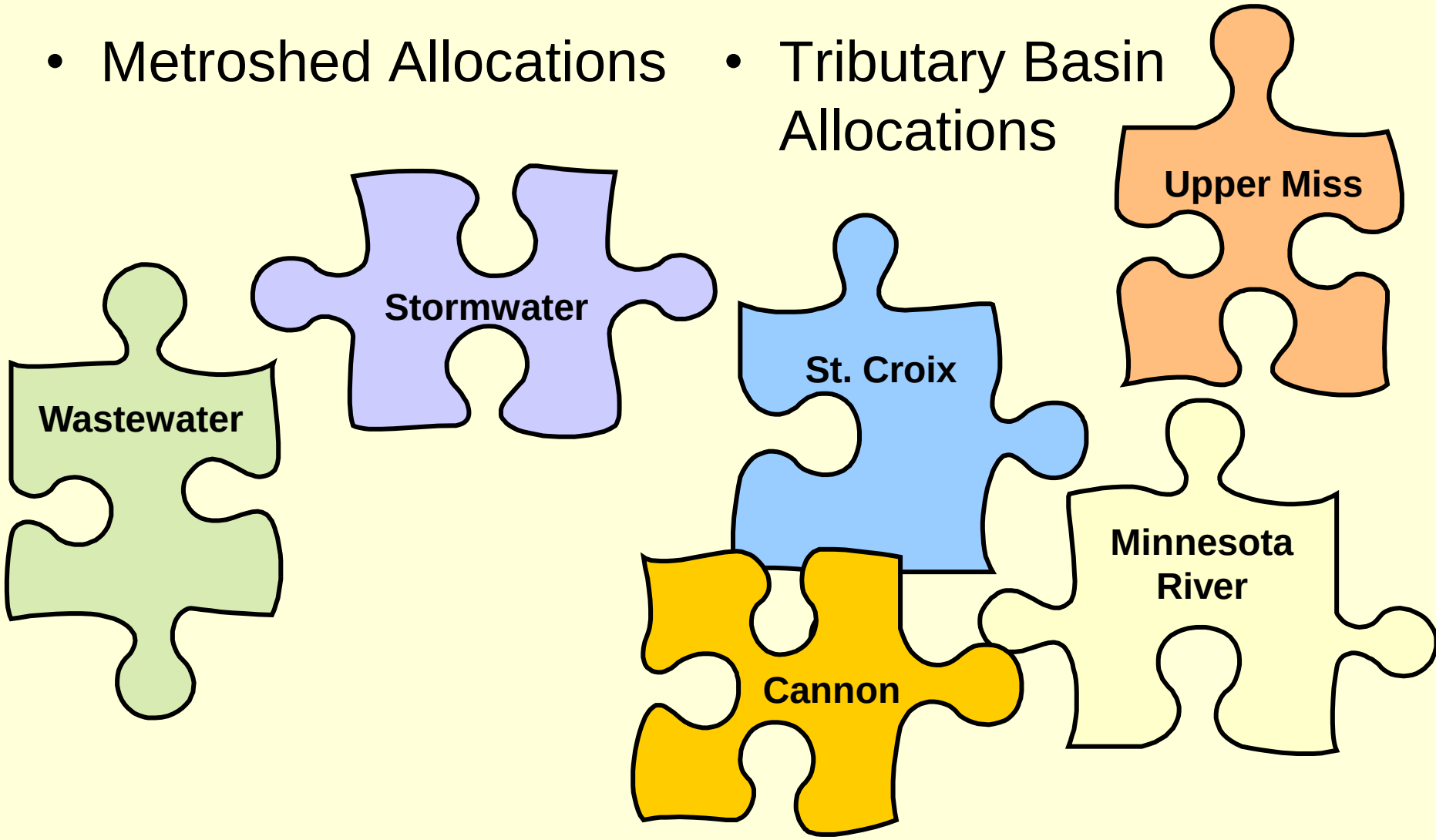


Entire Lake Pepin Basin



Summary

- Metroshed Allocations
- Tributary Basin Allocations



The End