

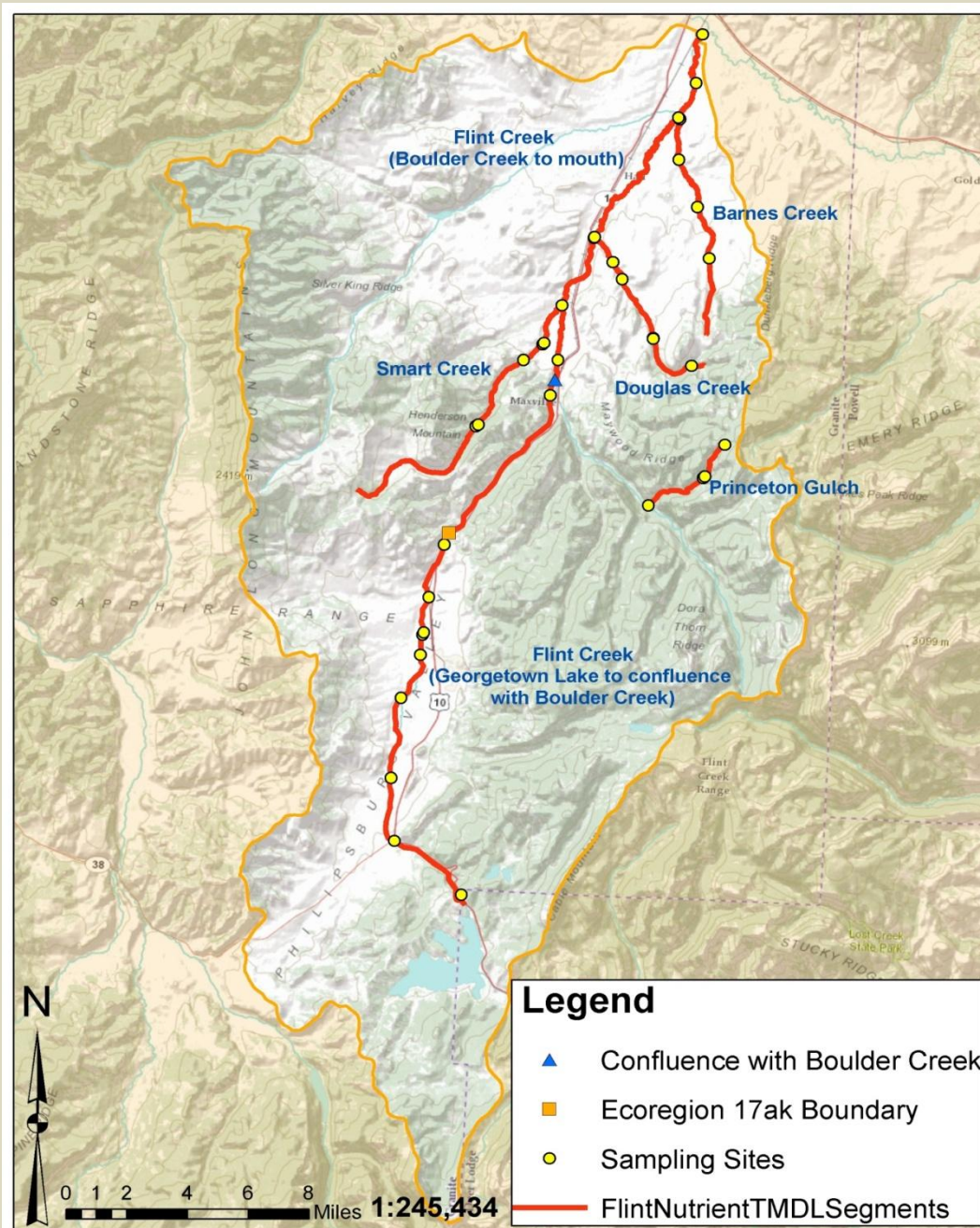
Flint Creek TMDL Planning Area Nutrient TMDLs

Stakeholder Presentation 9/26/13



Princeton Gulch

Flint Creek TPA and nutrients impaired segments



Current (2012 IR) 303(d) Nutrients Listed segments and Causes that will be addressed

Waterbody & Location Description ¹	Waterbody ID	Impairment Cause ²	Pollutant Category	Impairment Cause Status ²	Included in 2012 Integrated Report ³
Barnes Creek , from headwaters to mouth (Flint Creek)	MT76E003_070	TN	Nutrients	TN TMDL in this document	Yes
		Nitrate	Nutrients	Addressed by TN TMDL in this document	Yes
		TP	Nutrients	TP TMDL in this document	Yes
		Chlorophyll- <i>a</i>	Not Applicable; Non-pollutant	Addressed by TN and TP TMDLs in this document	Yes
Douglas Creek , confluence of Middle and South forks to mouth (Flint Creek), T9N R13W S10	MT76E003_020	Nitrate	Nutrients	Nitrate TMDL in this document	Yes
		TP	Nutrients	TP TMDL in this document	No
Flint Creek , Georgetown Lake to confluence with Boulder Creek	MT76E003_011	TP	Nutrients	TP TMDL in this document	No
Flint Creek , Boulder Creek to mouth (Clark Fork River)	MT76E003_012	TN	Nutrients	TN TMDL in this document	Yes
		TP	Nutrients	TP TMDL in this document	Yes
Princeton Gulch , headwaters to mouth (Boulder Creek)	MT76E003_090	Nitrate	Nutrients	Nitrate TMDL in this document	Yes
Smart Creek , headwaters to mouth (Flint Creek), T9N R13W S21	MT76E003_110	TN	Nutrients	TN TMDL in this document	No
		TP	Nutrients	TP TMDL in this document	Yes

¹ All waterbody segments within Montana's Water Quality Integrated Report are indexed to the National Hydrography Dataset (NHD)

² TN = Total Nitrogen, TP = Total Phosphorus, Nitrate = Nitrates = Nitrogen, Nitrate = NO₂+NO₃ = Nitrite + Nitrate; The term "nitrate" is used throughout the document and refers to any of the various nitrate-related impairment causes listed in the "2012 Water Quality Integrated Report."

³ Impairment causes not in the "2012 Water Quality Integrated Report" were recently identified and will be included in the 2014 Integrated Report.

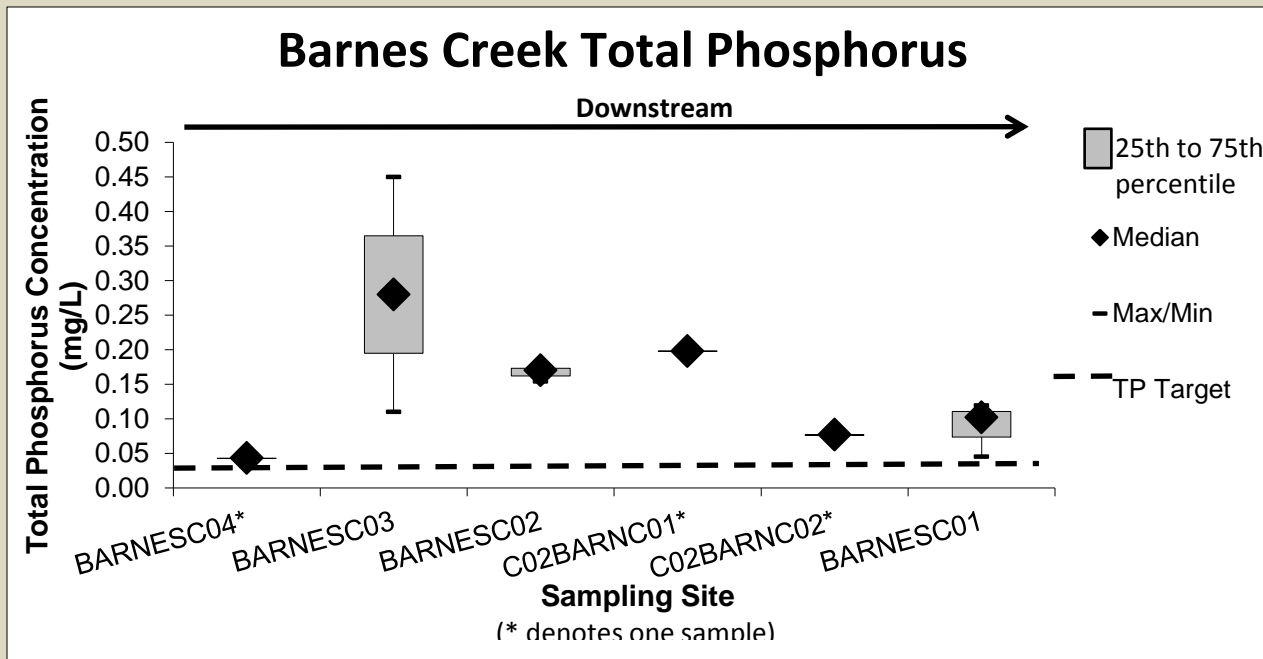
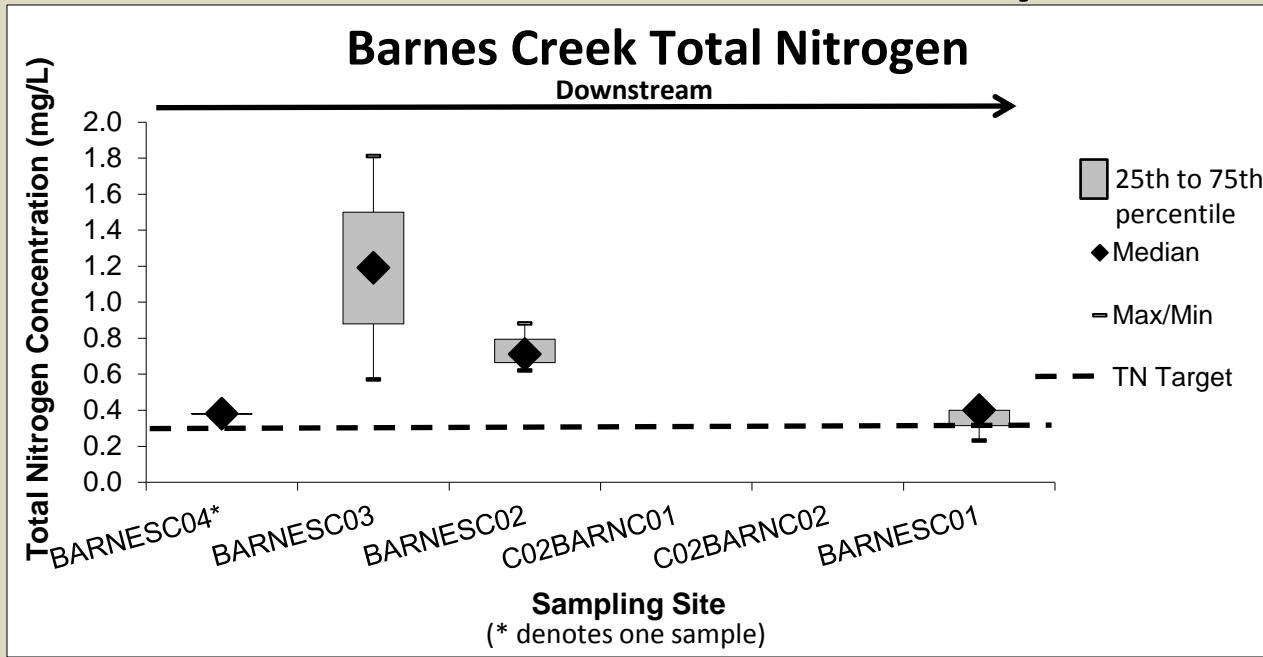
The Process

- Determine potential nutrient sources within the watershed for each listed segment (SWAT Model)
- There are up to two load allocations for each TMDL: 1) Composite load (all non-point sources and 2) Philipsburg WWTP
- Set TMDL based on Middle Rockies Level III Ecoregion proposed nutrient criteria¹ (TN Criteria: 0.300 mg/L; TP Criteria: 0.030 mg/L; Nitrate²: 0.100 mg/L) and the proposed criteria specific to Flint Creek from the Georgetown Lake Dam to the ecoregion 17ak boundary (TN Criteria: 0.500 mg/L; TP Criteria: 0.072 mg/L; Nitrate²: 0.100 mg/L).
- Used data collected from the impaired streams to determine the current loading and necessary reductions
- Used SWAT model to demonstrate scenarios where reductions could occur

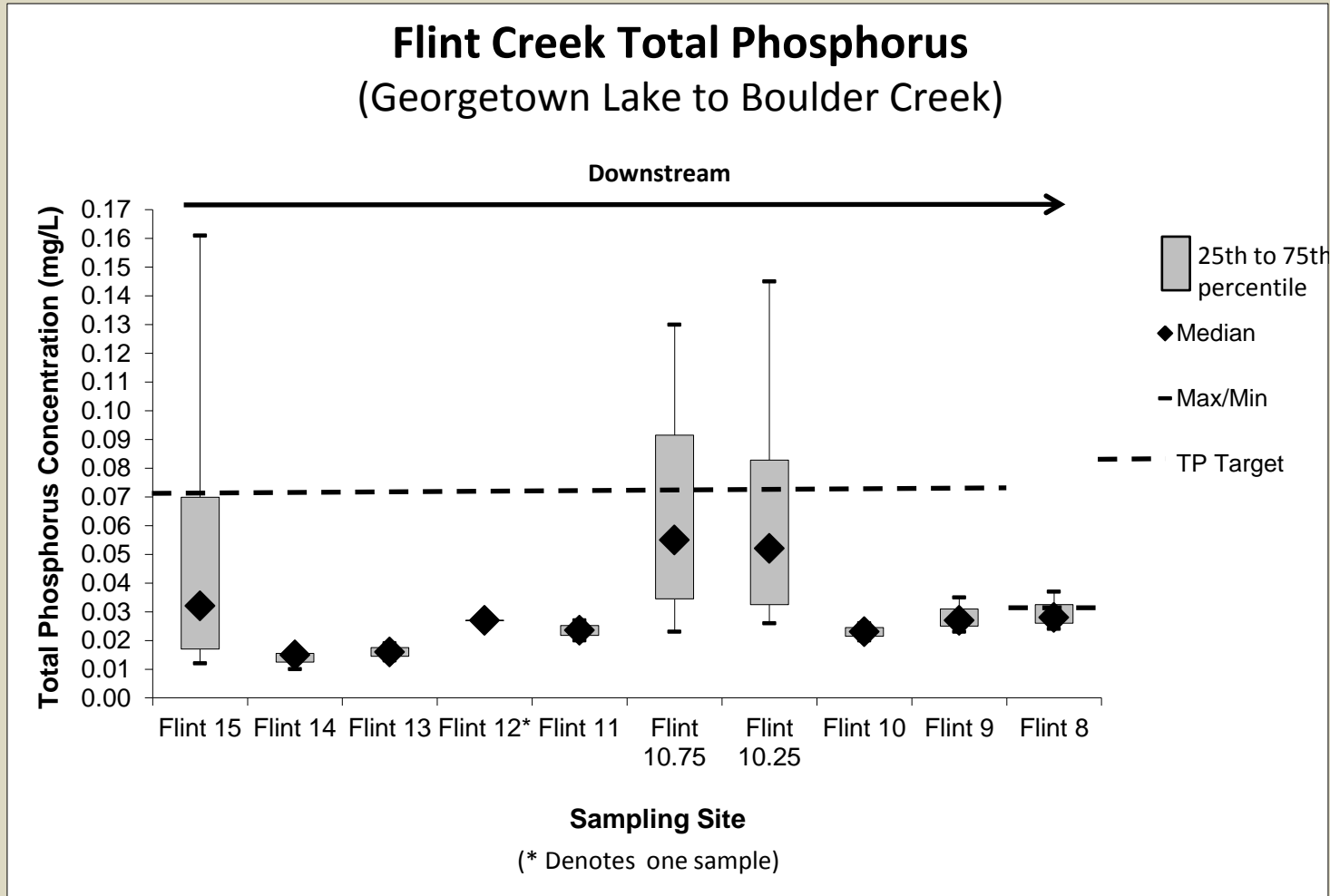
¹ <http://deq.mt.gov/wqinfo/standards/NumericNutrientCriteria.mcp>

² Suplee et al. 2008

Source Assessment – Water Quality data

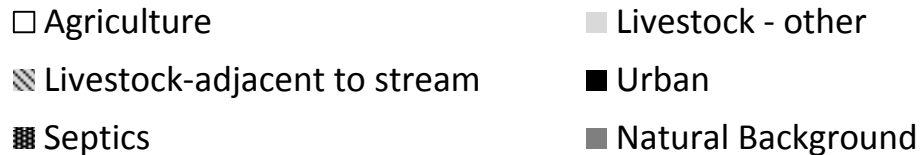
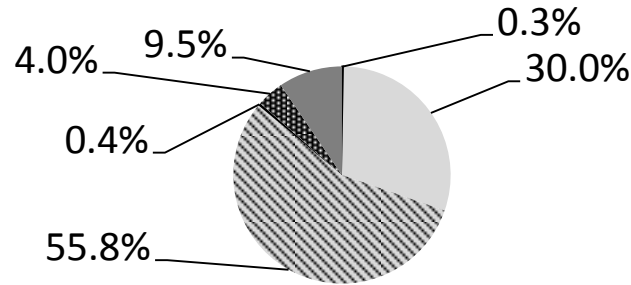


Source Assessment – Water Quality data

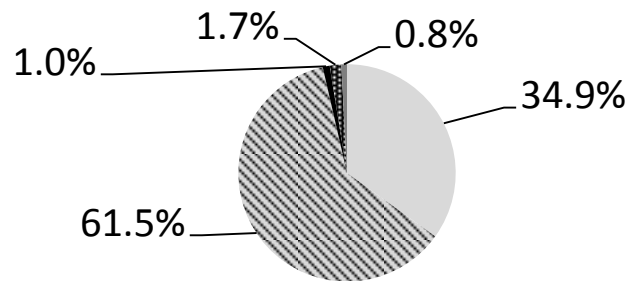


Source Assessment – SWAT Model Results

Barnes Creek - Total Nitrogen Percent Loading from Existing Conditions Land Uses

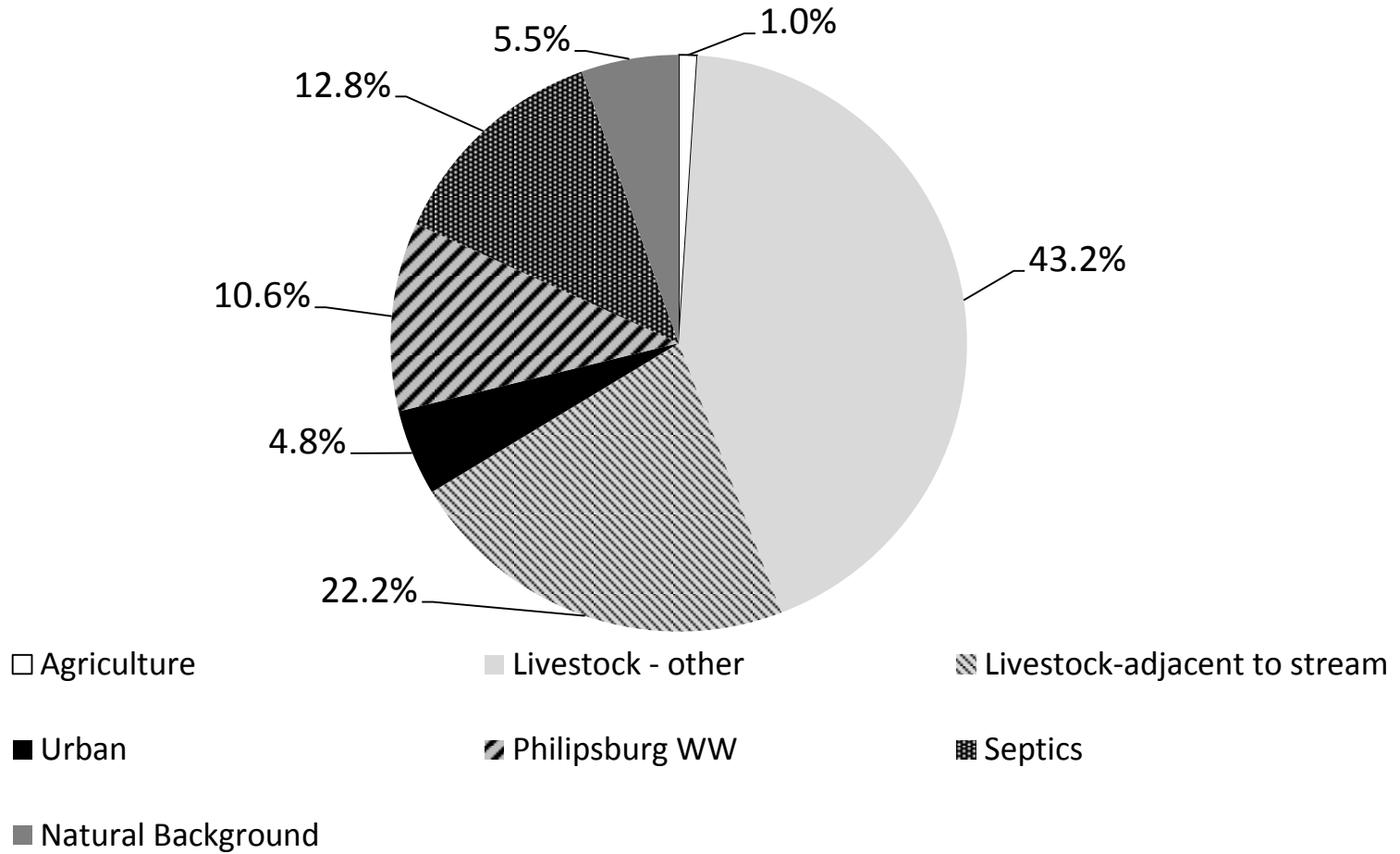


Barnes Creek - Total Phosphorus Percent Loading from Existing Conditions Land Uses



Source Assessment – SWAT Model Results

Upper Flint - Total Phosphorus Percent Loading from Existing Conditions Land Uses



TMDL Equations

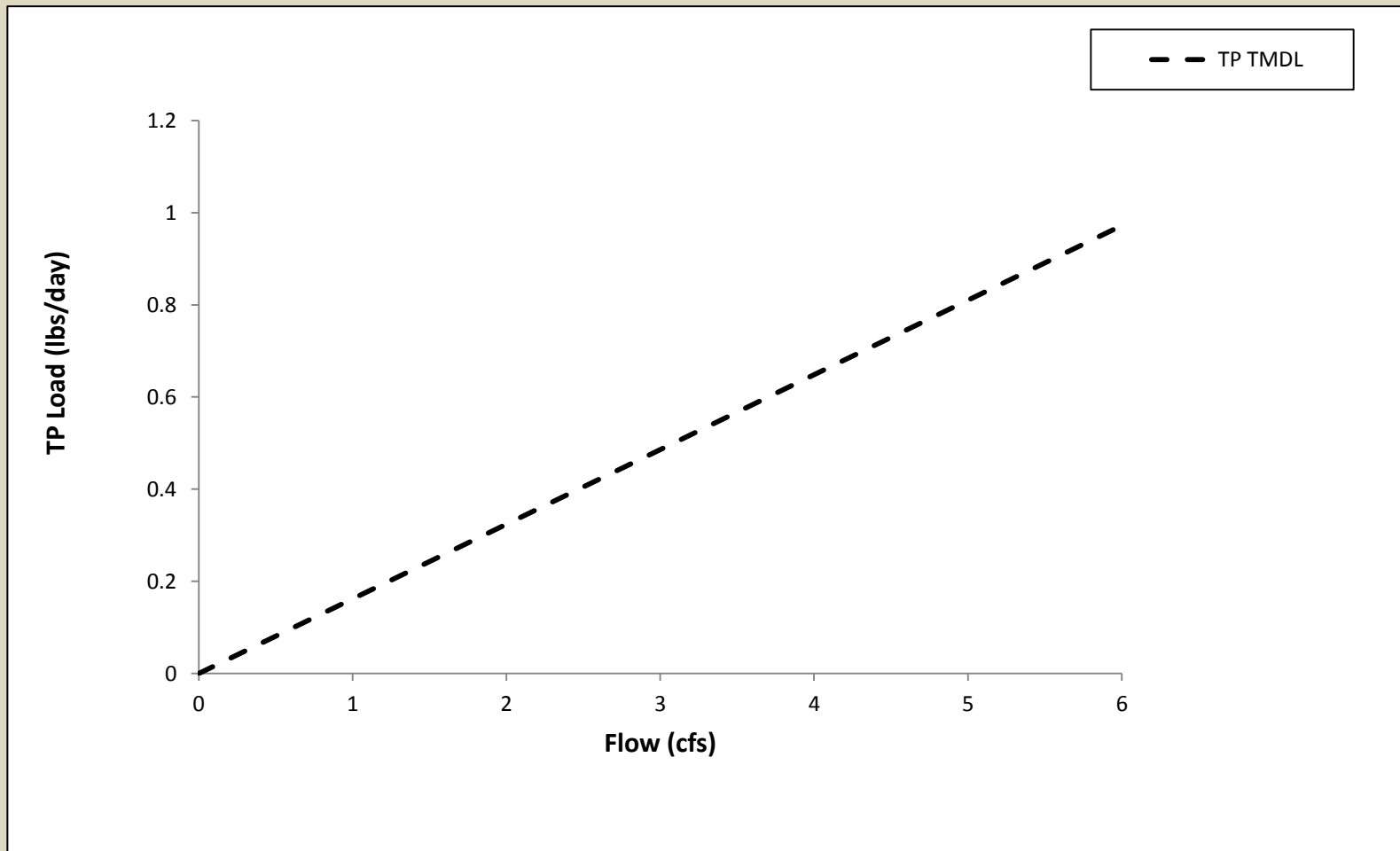
Equation 1: $TMDL = (X) (Y) (5.4)$

TMDL = Total Maximum Daily Load in lbs/day

X = water quality target

Y = streamflow in cubic feet per second

5.4 = conversion factor



TMDL Equations

Equation 2: $TMDL = LA$

LA = Composite Load Allocation to all nonpoint sources including natural background sources

Equation 3: $TMDL = LA + WLA$

LA = Composite Load Allocation to all nonpoint sources including natural background sources

WLA = Waste Load Allocation to the Philipsburg WWTP (for the two Flint Creek segments only)

TMDL Equations

Equation 4: $WLA_{TP} = (X) (Y) (5.4)$

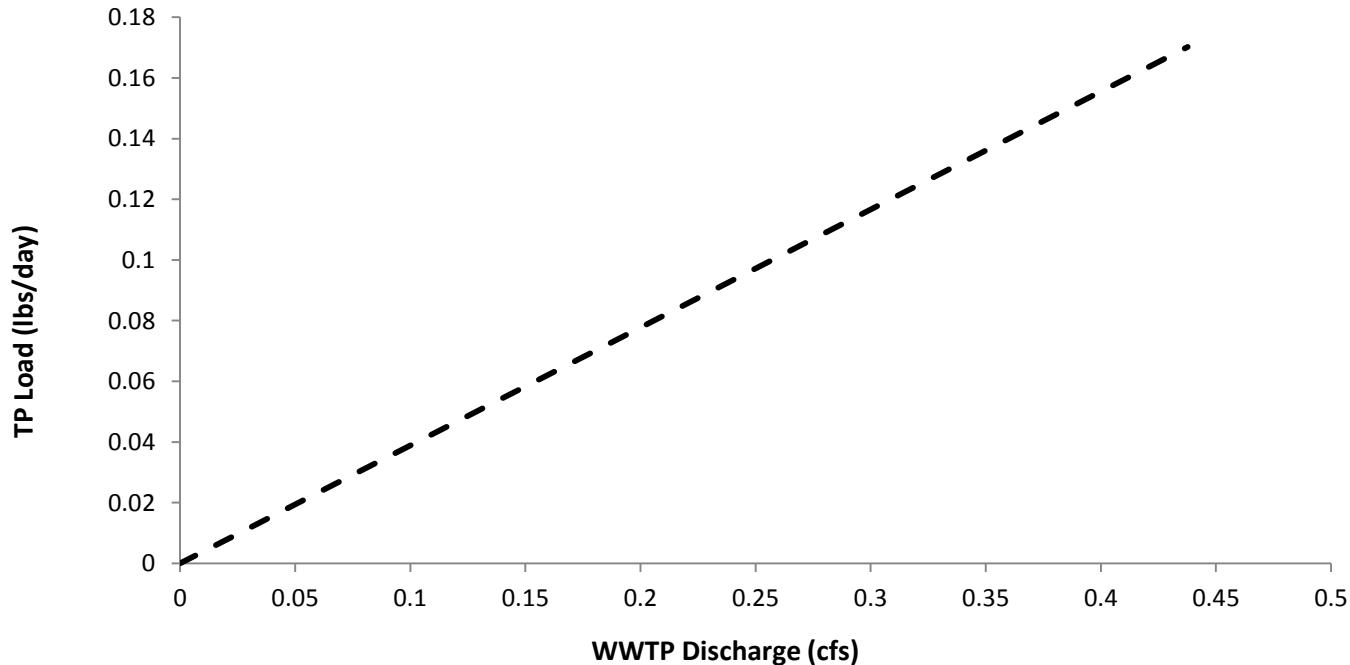
WLA_{TP} = Total Phosphorus Wasteload Allocation in lbs/day

X = water quality target for Flint Creek from Georgetown Lake outlet to the ecoregion 17ak boundary (0.072 mg/L; **Table 5-2**)

Y = WWTP discharge in cubic feet per second

5.4 = conversion factor

Philipsburg Wastewater Treatment Plant TP Wasteload Allocation



TMDL Equations

Equation 5: *Total Existing Load = (X) (Y) (5.4)*

X = measured concentration in mg/L (associated with the median reduction for measured loads that exceed the TMDL or with the median measured load if none exceed the TMDL)

Y = streamflow in cubic feet per second (associated with the median reduction for measured loads that exceed the TMDL or with the median measured load if none exceed the TMDL)

5.4 = conversion factor

Equation 6: *Existing Composite Load = Total Existing Load – Existing WWTP Load*

Equation 7: *Load Reduction = ((Measured Load – TMDL) / Measured Load)*100*

*Measured Load = measured nutrient concentration in mg/L*measured flow in cfs*5.4*

*TMDL = target concentration in mg/L*measured flow in cfs*5.4*

Equation 8: *Concentration Reduction = ((Measured Concentration in mg/L – Target Concentration in mg/L) / Measured Concentration in mg/L)*100*

TMDLs, Allocations, and Current Loading

Example: Barnes Creek

Table 5-19. Barnes Creek TN Example TMDL, Load Allocation, and Current Loading

Source Category	Allocation & TMDL (lbs/day)¹	Existing Load (lbs/day)¹
Composite Load	4.1	7.7

¹ Based on a flow of 2.5 cfs

Table 5-20. Barnes Creek TP Example TMDL, Load Allocation, and Current Loading

Source Category	Allocation & TMDL (lbs/day)¹	Existing Load (lbs/day)¹
Composite Load	1.1	4.2

¹ Based on a flow of 6.53 cfs

TMDLs, Allocations, and Current Loading

Example: Flint Creek (Georgetown Lake to Boulder Creek)

Table 5-23. Flint Creek (Georgetown Lake to ecoregion 17ak boundary) TP TMDL, Load Allocations, Wasteload Allocation, and Current Loading Example 1

Source Category	Allocation & TMDL (lbs/day) ¹	Existing Load (lbs/day) ¹
Composite Load	25.55	6.9
Wasteload (Philipsburg WWTP)	0.06	2.7 ²
	TMDL = 25.61	Total = 9.6

¹ Based on a median growing season flow of 65.87 cfs

² Based on summer growing season monthly averages from the Philipsburg WWTP

Table 5-24. Flint Creek (ecoregion 17ak boundary to confluence with Boulder Creek) TP TMDL, Load Allocations, Wasteload Allocation, and Current Loading Example 2

Source Category	Allocation & TMDL (lbs/day) ¹	Existing Load (lbs/day) ¹
Composite Load	28.26	19.96
Wasteload (Philipsburg WWTP)	0.06	2.7 ²
	TMDL = 28.32	Total = 22.66

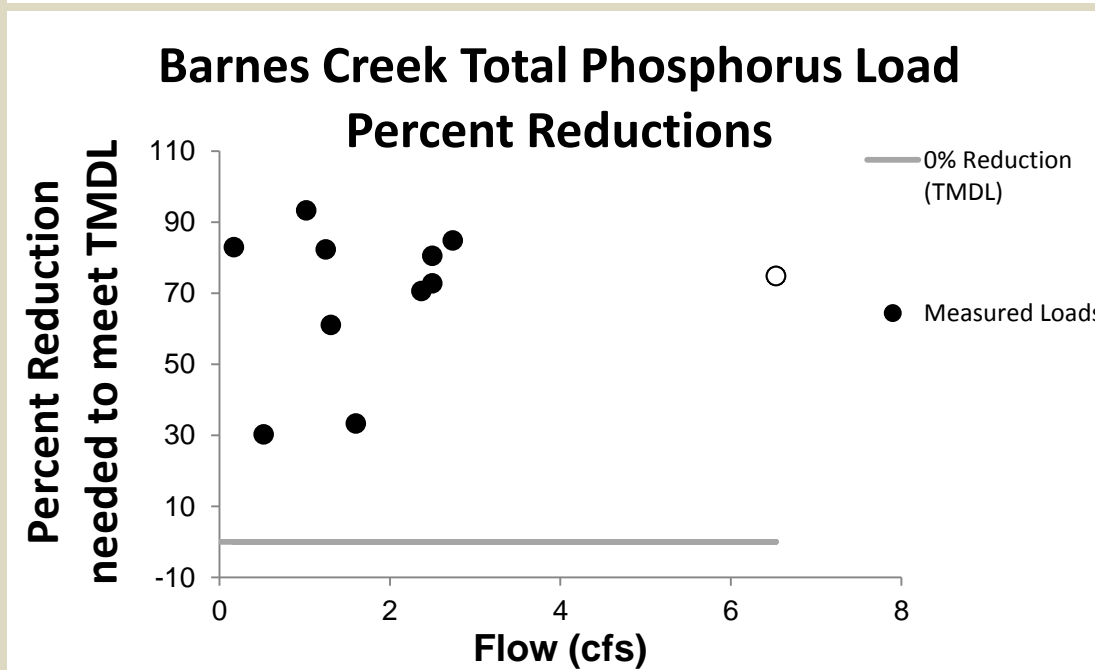
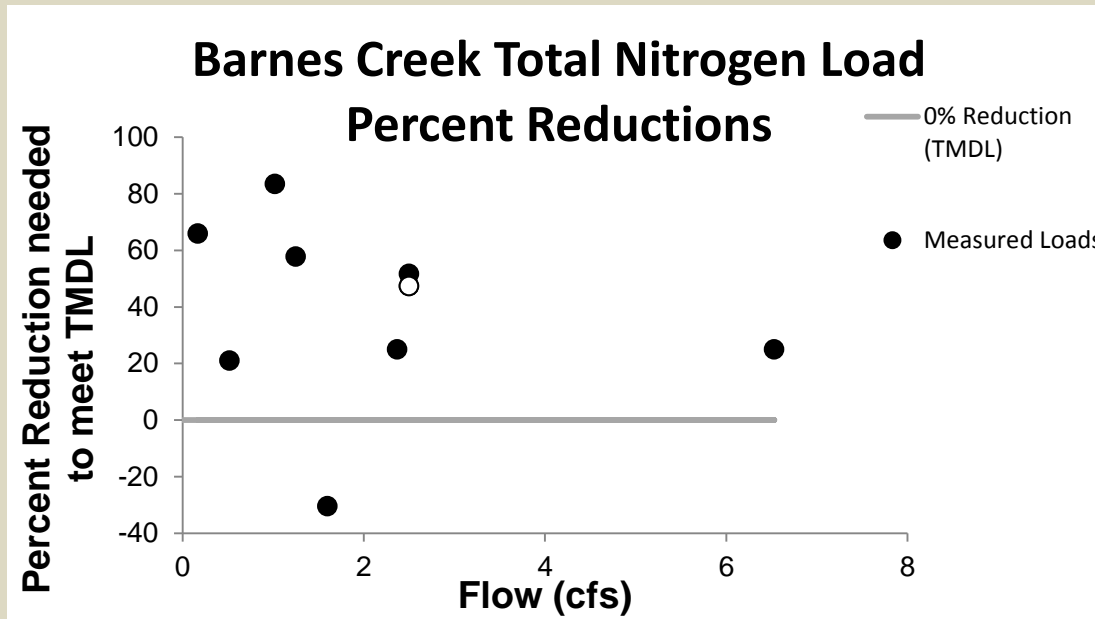
¹ Based on a median growing season flow of 174.84 cfs

² Based on summer growing season monthly averages from the Philipsburg WWTP

Nutrient Uptake Complications

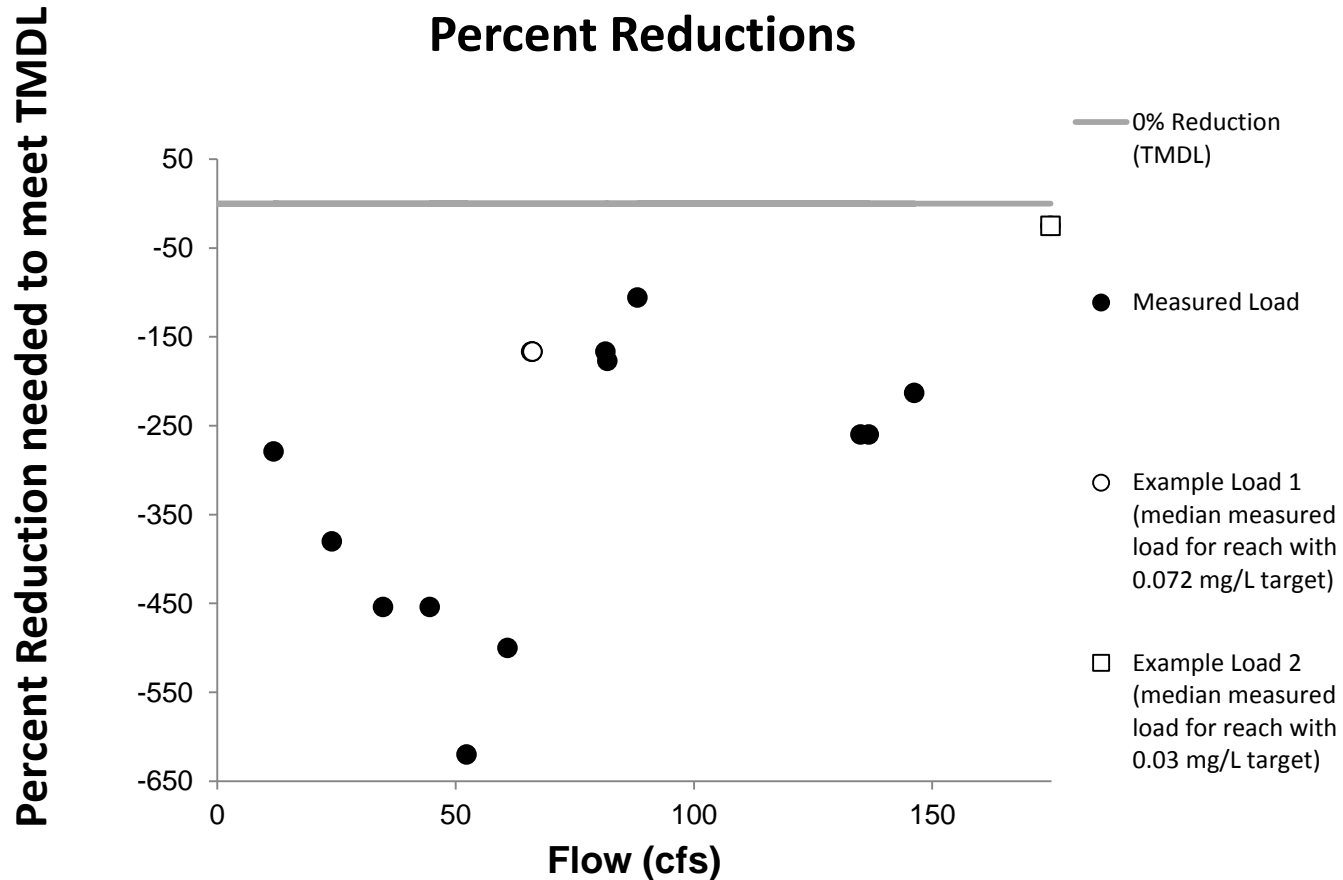
- Instream measured load does not necessarily equal the total load from all sources
- When nutrients enter a stream there is uptake by organisms in the water (e.g., algae, aquatic plants), which reduces the amount of nutrients in the water column
- Excessive loading can occur while measured nutrient values meet targets
 - Expect to see excessive algal growth and we have seen that on these streams

Reductions



Reductions

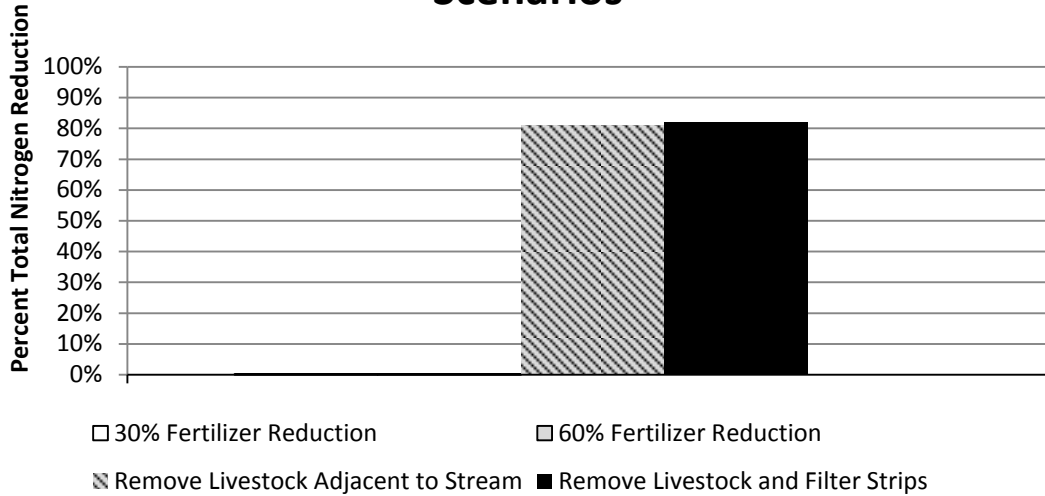
Flint Creek (Georgetown Lake to confluence with Boulder Creek) Total Phosphorus Load Percent Reductions



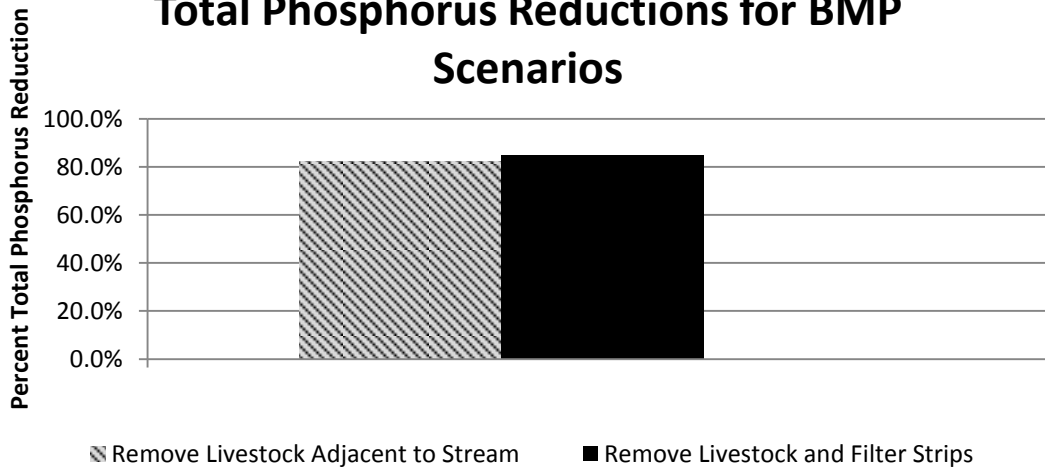
Based on concentration data with no associated flow, reductions of 1% to 55% are required

Reduction Scenarios

Barnes Creek Total Nitrogen Reductions for BMP Scenarios

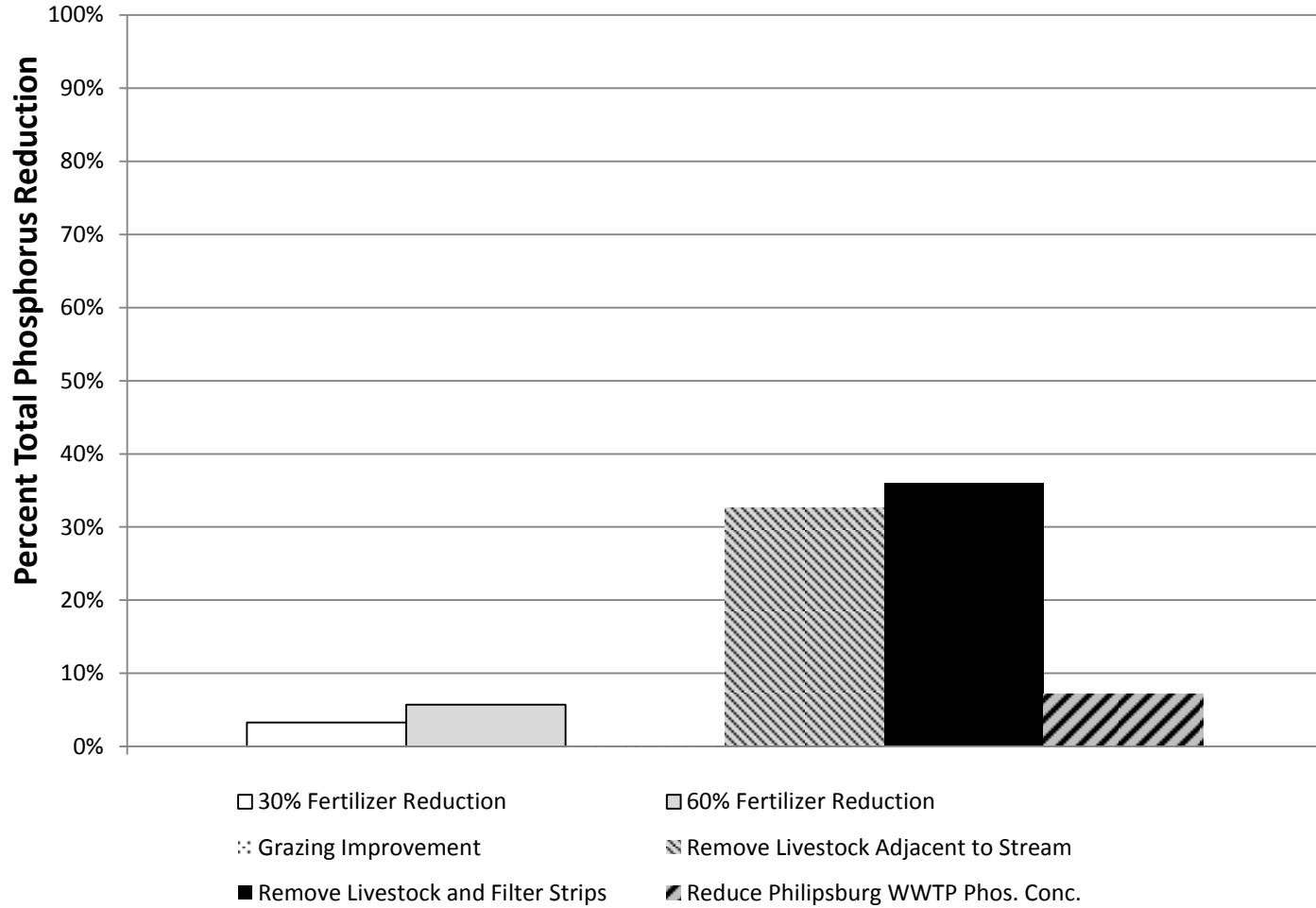


Barnes Creek Total Phosphorus Reductions for BMP Scenarios



Reductions

Flint Creek (Georgetown Lake to Confluence with Boulder Creek) Total Phosphorus Reductions for BMP Scenarios



Next Steps

- Public Comment Period and Meeting – October?
- Submission to EPA – November?

QUESTIONS?