

# Flint TMDL Planning Area Nutrient TMDLs: Source Assessment, Load Allocation, TMDL, and Load Reduction Process

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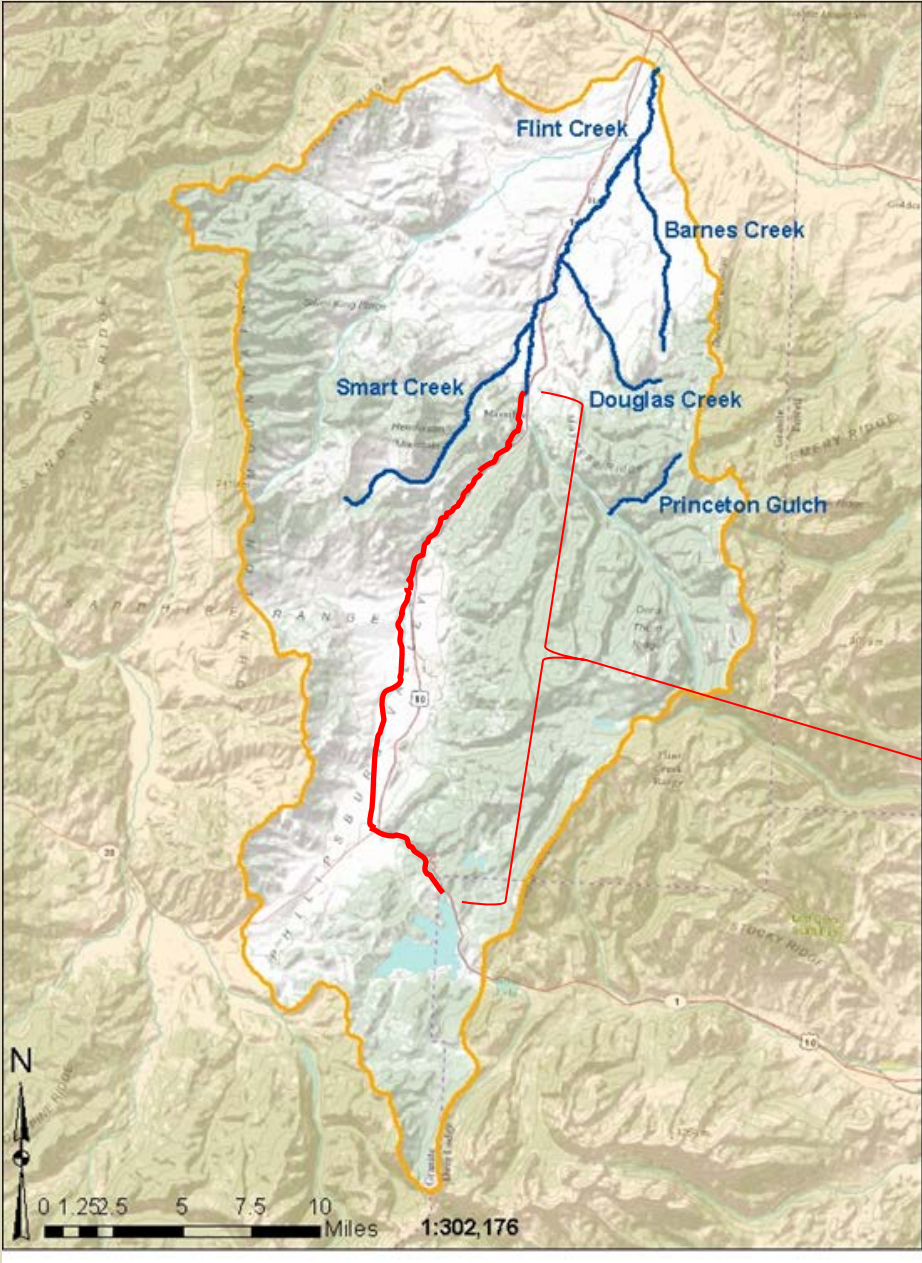
Smart Creek

## Flint TMDL Planning Area

Location of the Flint TMDL planning area within  
Granite and Deer Lodge counties, MT



## Current 303(d) listed Segments



“Upper Flint”  
Not in the 2012  
Integrated  
Report (IR) but  
will be added to  
the 2014 IR



## Current (2012 IR) 303(d) listed segments and TMDLs that will be addressed

Waterbody	Waterbody ID	Nutrient Probable Causes (From 2012 IR)	Causes that will be Addressed (due to recent assessment work)
<b>Barnes Creek</b>	MT76E003_070	Chl- <i>a</i> , Nitrate, TN, TP	Chl- <i>a</i> , Nitrate, TN, TP
<b>Douglas Creek</b>	MT76E003_020	Nitrate	Nitrate, TP
<b>Flint Creek<sup>1</sup></b> , Georgetown Lake to confluence with Boulder Creek	MT76E003_011	None	TP
<b>Flint Creek</b> , Boulder Creek to mouth (Clark Fork River)	MT76E003_012	TN, TP	TN, TP
<b>Princeton Gulch</b>	MT76E003_090	Nitrate	Nitrate
<b>Smart Creek</b>	MT76E003_110	TP	TN, TP
<sup>1</sup> Segment did not have any nutrient probable causes in the 2012 IR. Total phosphorus will appear in the 2014 IR			

**NOTE:** Differences between the Nutrient probable causes and Causes that will be addressed columns are the result of new data collection and assessments performed by the Monitoring and Assessment Section. Chlorophyll-*a* is a non-pollutant listing for Barnes Creek that will be addressed by the nitrate, total nitrogen, and total phosphorus TMDLs for that segment.

## The Process

- Determine loading from different nutrient sources within the watershed for each impaired waterbody segment using the SWAT Model
- Will have at least three<sup>1</sup> load allocations for each TMDL: 1) Natural Background, 2) Septic, and 3) All Other Nonpoint Sources
- Set TMDL based on Middle Rockies Level III Ecoregion proposed nutrient criteria<sup>2</sup> (TN Criteria: 0.300 mg/L; TP Criteria: 0.030 mg/L; Nitrate: 0.100 mg/L<sup>3</sup>); Natural Background will be based on the median values from the dataset used to develop the criteria – these values are applicable during the growing season for algae in the area (July 1 – September 30)
- Use data output from the SWAT Model and measured values to determine the current loading and necessary reductions in impaired streams

<sup>1</sup> Flint Creek segments will also have waste load allocations

<sup>2</sup> <http://deq.mt.gov/wqinfo/standards/NumericNutrientCriteria.mcp>

Values for Flint Creek from Georgetown Lake to ecoregion 17ak boundary are: TN – 0.500 mg/L and TP – 0.072 mg/L

<sup>3</sup> Suplee et al. 2008

# **SWAT Model Description**

**Eric Regensburger**

# TMDL Development and Load Allocation

## TMDL:

- Will use proposed nutrient criteria values for the Middle Rockies Level III Ecoregion (Suplee et al., 2012<sup>1</sup>) and median growing season flow measured from each stream:

**TN Criteria: 0.300 mg/L**

**TP Criteria: 0.030 mg/L**

**Nitrate Target: 0.100 mg/L <sup>2</sup>**

$$TMDL = (X) (Y) (5.4)$$

*TMDL= Total Maximum Daily Load in lbs/day*

*X= water quality target in mg/L (TN=0.300; TP=0.030; Nitrate = 0.100)*

*Y= median growing season streamflow in cubic feet per second*

*5.4 = conversion factor*

<sup>1</sup> Values for Flint Creek from Georgetown Lake to ecoregion 17ak boundary are: TN – 0.500 mg/L and TP – 0.072 mg/L

<sup>2</sup> Suplee et al., 2008

# TMDL Development and Load Allocation

## Natural Background Load ( $LA_{NB}$ ):

- Will use data from nutrient criteria development for the Middle Rockies Level III Ecoregion (Suplee et al., 2012<sup>1</sup>) and median growing season flow measured from each stream.

**Median TN: 0.095 mg/L**

**Median TP: 0.010 mg/L**

**Median Nitrate: 0.02 mg/L<sup>2</sup>**

Source Category	Load Allocation Descriptions	LA Calculation
Natural Background	<ul style="list-style-type: none"><li>• soils and local geology</li><li>• natural vegetative decay</li><li>• wet and dry airborne deposition</li><li>• wild animal waste</li><li>• natural biochemical processes that contribute nutrients to nearby water bodies</li></ul>	$LA_{NB} = (X) (Y) (5.4)$ <p><i>X = median value from criteria development dataset in mg/L (TN=0.095; TP=0.010, Nitrate=0.02)</i></p> <p><i>Y = median growing season streamflow in cubic feet per second</i></p> <p><b>5.4 = conversion factor</b></p>

<sup>1</sup> Values for Flint Creek from Georgetown Lake to ecoregion 17ak boundary are: TN – 0.340 mg/L and TP – 0.036 mg/L

<sup>2</sup> Suplee et al., 2007



# TMDL Development and Load Allocation

## Nonpoint Source Load ( $LA_{NP}$ ) = Septic + Agriculture + Silviculture + Mining

- The nonpoint source load allocation will be split as necessary to effectively describe the most substantial sources

Source Category	Load Allocation Descriptions	LA Calculation <sup>1</sup>
Combination of Septic, Agriculture and Silviculture Land Uses, and Mining	<ul style="list-style-type: none"><li>• Human waste from septic systems</li><li>• domestic animal waste</li><li>• loss of riparian and wetland vegetation along stream banks</li><li>• fertilizer from agricultural fields</li><li>• limited nutrient uptake due to loss of overstory</li><li>• Cyanide breakdown from leaching</li><li>• Runoff from exposed rock containing natural background nitrate</li><li>• Residual chemicals left over from mining practices</li></ul>	$LA_{NP} = TMDL - LA_{NB}$
<sup>1</sup> The equation for Flint Creek Segments will be $LA_{NP} = TMDL - LA_{NB} - WLA$		

# TMDL Development and Load Allocation

**TP Example:** Median growing season stream flow = 2.7 cfs

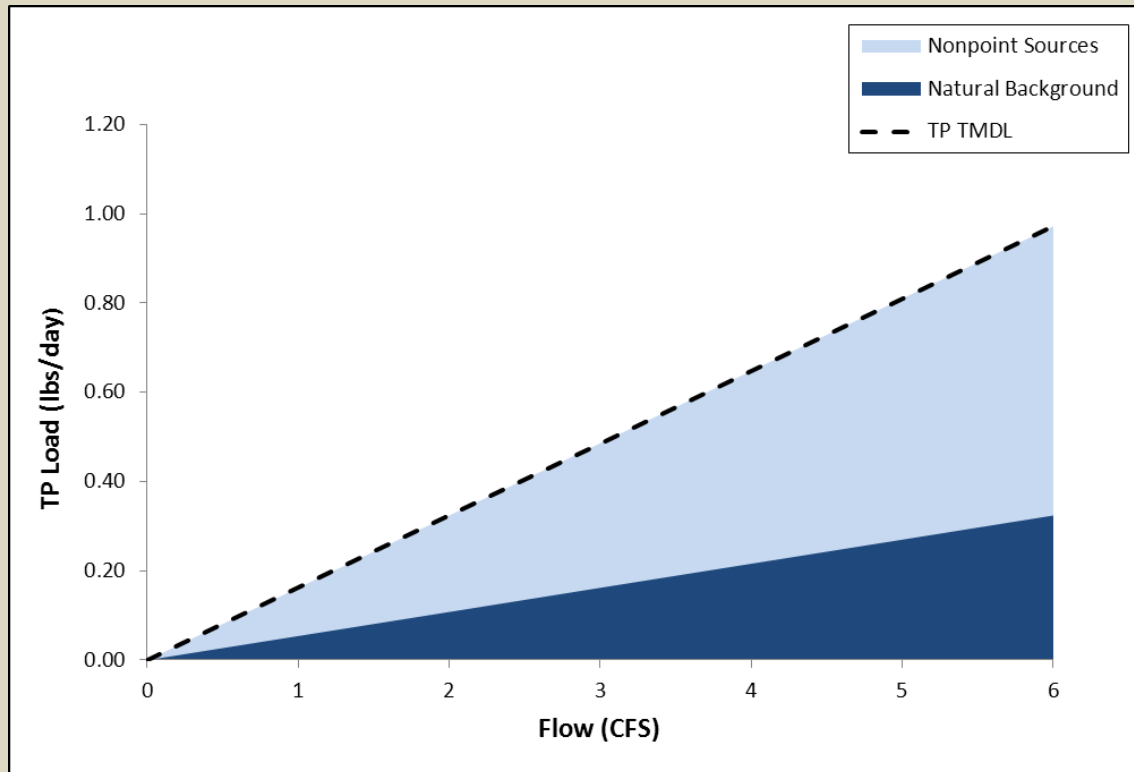
$$\text{TMDL} = \text{LA}_{\text{NB}} + \text{LA}_{\text{NP}}$$

$$\text{TMDL} = 0.030 \text{ mg/L} * 2.7 \text{ cfs} * 5.4 = \boxed{0.44 \text{ lbs/day}}$$

$$\text{LA}_{\text{NB}} = 0.010 \text{ mg/L} * 2.7 \text{ cfs} * 5.4 = \boxed{0.15 \text{ lbs/day}}$$

$$\text{LA}_{\text{NP}} = \text{TMDL} - \text{LA}_{\text{NB}}$$

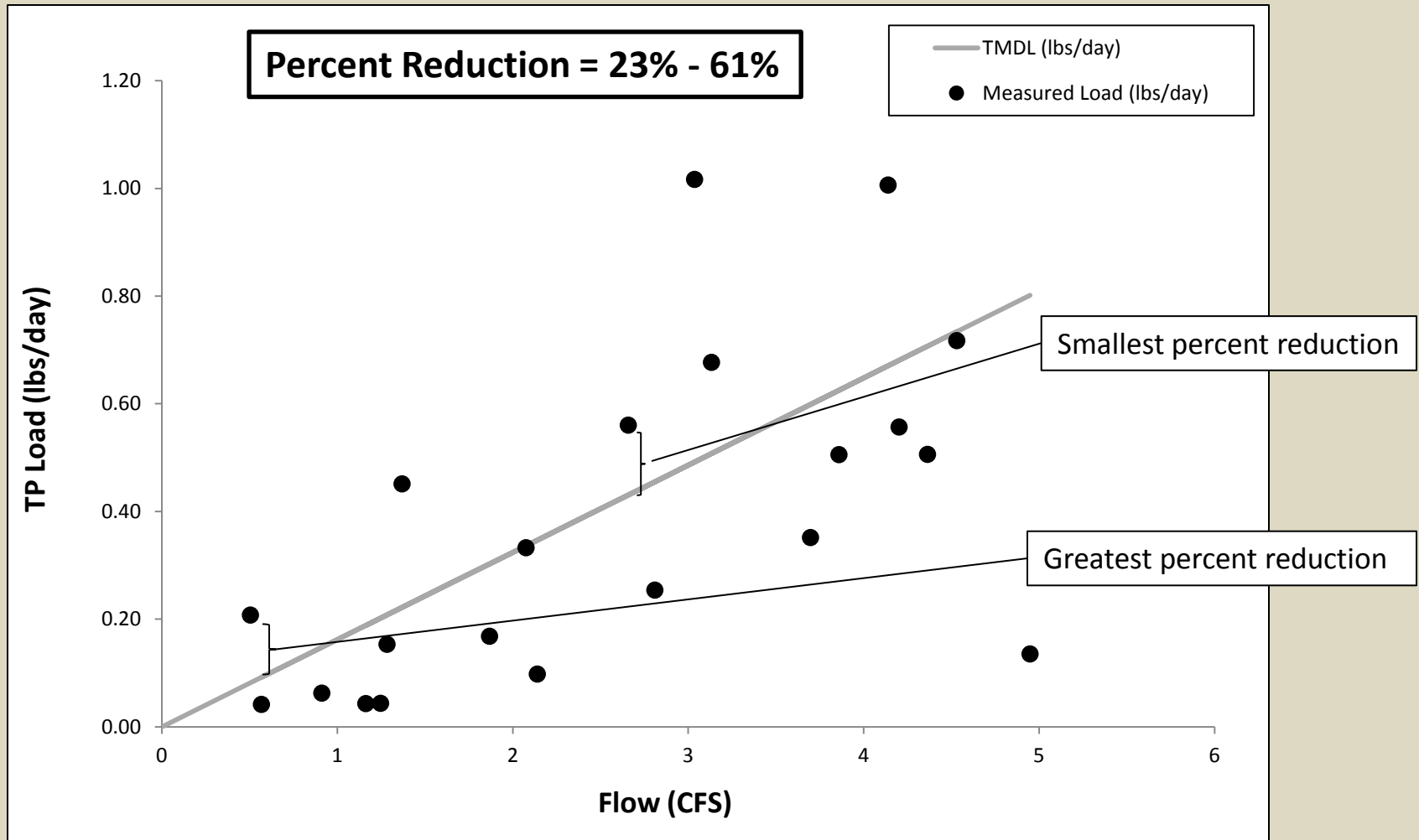
$$\text{Therefore: } \text{LA}_{\text{NP}} = 0.44 \text{ lbs/day} - 0.15 \text{ lbs/day} = \boxed{0.29 \text{ lbs/day}}$$



# Load Reductions

## TP Example :

Compare growing season measured loads to TMDL. Estimated percent reduction will be a range.



**QUESTIONS?**