

Spokane River Phosphorus Ratios

Preliminary Analysis Approach

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Concept of Ratios

Simplified method of accounting for the fate and transport of pollutants.

Because of the varied physical, chemical, and biological factors present – where phosphorus is introduced to the river is a factor on the ultimate effect it has at the TMDL compliance location.

Phosphorus Load = 100 lb/yr

Mall Parking Lot

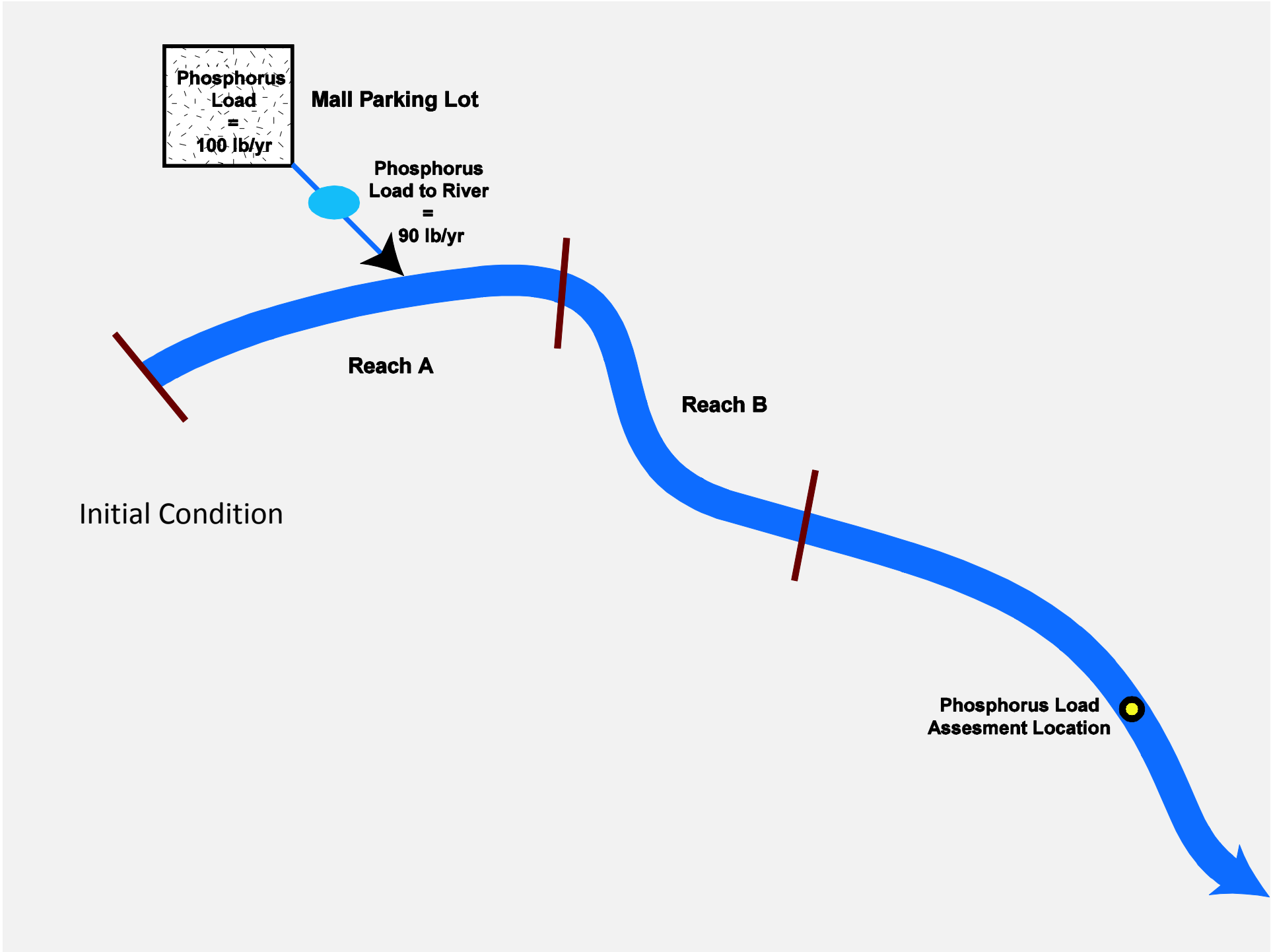
Phosphorus Load to River = 90 lb/yr

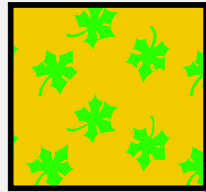
Reach A

Reach B

Initial Condition

Phosphorus Load Assessment Location





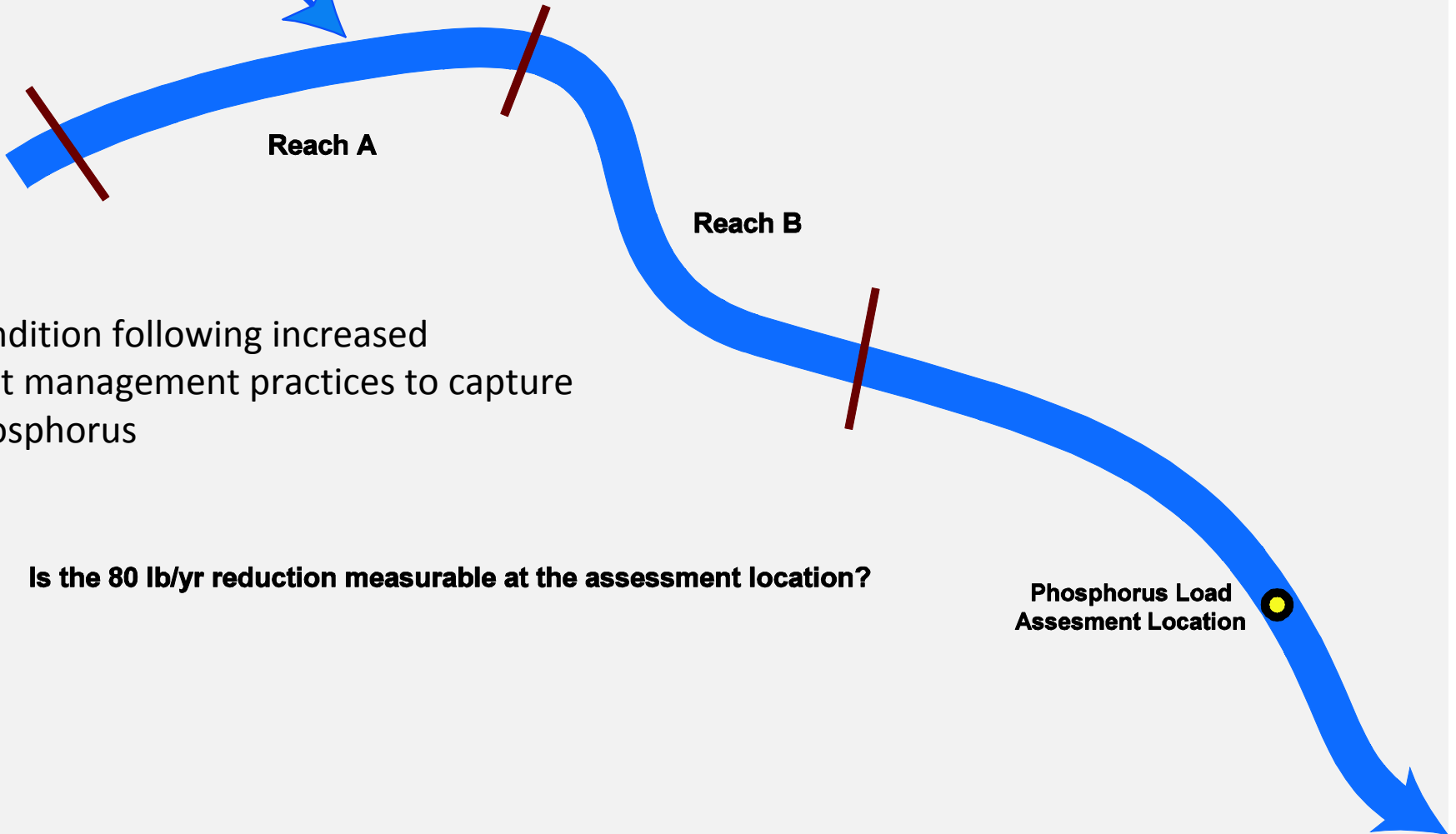
Mall Parking Lot

Phosphorus
Load to River
=
10 lb/yr

The phosphorus load to the river has been reduced from 90 lb/yr to 10 lb/yr or an 80 lb/yr reduction.

The phosphorus load to Reach A has been reduced by 80 lb/yr.

The 'gross' credit is 80 lb/yr.



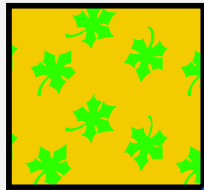
Reach A

Reach B

Condition following increased best management practices to capture phosphorus

Is the 80 lb/yr reduction measurable at the assessment location?

Phosphorus Load Assessment Location



Mall Parking Lot

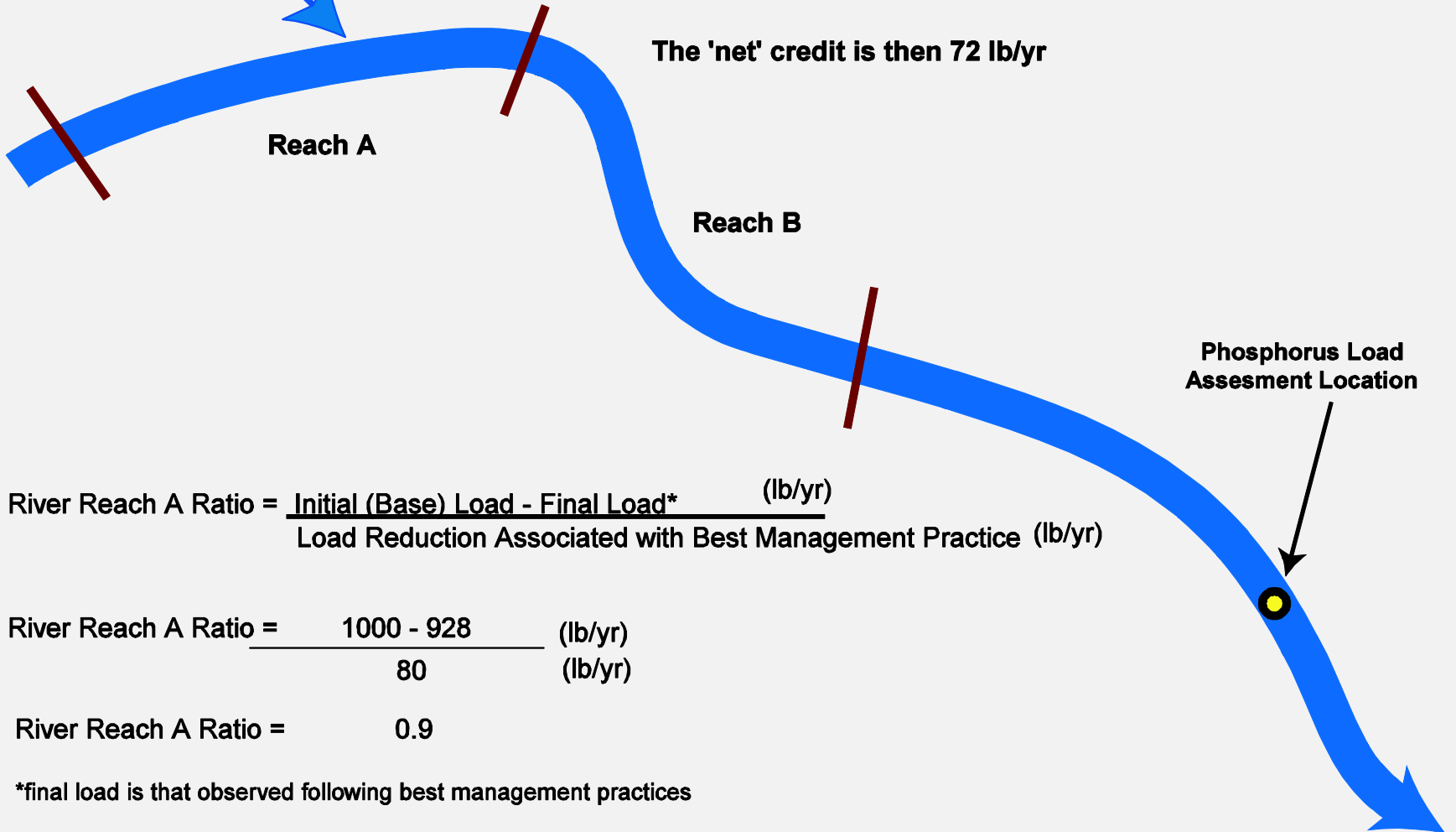
Phosphorus
Load to River
=
10 lb/yr

Assume that the base phosphorus load = 1000 lb/yr

Following the measures to reduce phosphorus, annual load is now 928 lb/yr.

Therefore, the reduction in load is 1000 - 928 = 72 lb/yr.

The 'net' credit is then 72 lb/yr



$$\text{River Reach A Ratio} = \frac{\text{Initial (Base) Load} - \text{Final Load}^*}{\text{Load Reduction Associated with Best Management Practice}} \quad \frac{(\text{lb/yr})}{(\text{lb/yr})}$$

$$\text{River Reach A Ratio} = \frac{1000 - 928}{80} \quad \frac{(\text{lb/yr})}{(\text{lb/yr})}$$

$$\text{River Reach A Ratio} = 0.9$$

*final load is that observed following best management practices

Proposal for Determining River-Based Ratios

Step 1: Establish Spokane River reaches.

The reach size would be based on physical and environmental factors as well as model considerations.

Proposal for Determining River-Based Ratios

Step 2: Set up initial load condition that serves as the reference.

- Apply TMDL CE-QUAL W2 model to establish base phosphorus load at TMDL assessment location.
- Model run based on the same year and conditions present for the study year though based on the following assumptions.....

The model would be run to establish the base load condition as observed at the TMDL assessment point above Lake Spokane.

Proposal for Determining River-Based Ratios

Initial Condition Model Assumptions:

- Waste load allocations have been achieved. Point source discharges have met anticipated phosphorus reduction levels.
- Load allocations have been achieved. TMDL-based nonpoint phosphorus loads associated with tributary inflow and storm-water have been achieved.
- The assessment period, used to generate the ratios, will conform to the critical period defined in the TMDL.
- The analysis period will remain the same as that used in the TMDL.
- The TMDL total phosphorus compliance locations will be the ratio assessment points as opposed to specific NPDES permit discharge locations.

Proposal for Determining River-Based Ratios

Step 3. Conduct reach assessment.

Selectively reduce phosphorus loading within each of the assessment reaches and determine the resulting change in load at the TMDL assessment point.

Proposal for Determining River-Based Ratios

Step 4. Calculate ratios.

$$\text{River Reach Ratio} = \frac{\text{Base Load} - \text{Scenario Load}^* \text{ (kg/d)}}{\text{Reach Load Reduction (kg/d)}}$$

.....change in load at the compliance location....in relation to the change in load at the assessment reach.

*Load observed at Spokane River TMDL compliance location following reach load reduction

Questions / Comments