# West Fork of the White River Stream Restoration Monitoring


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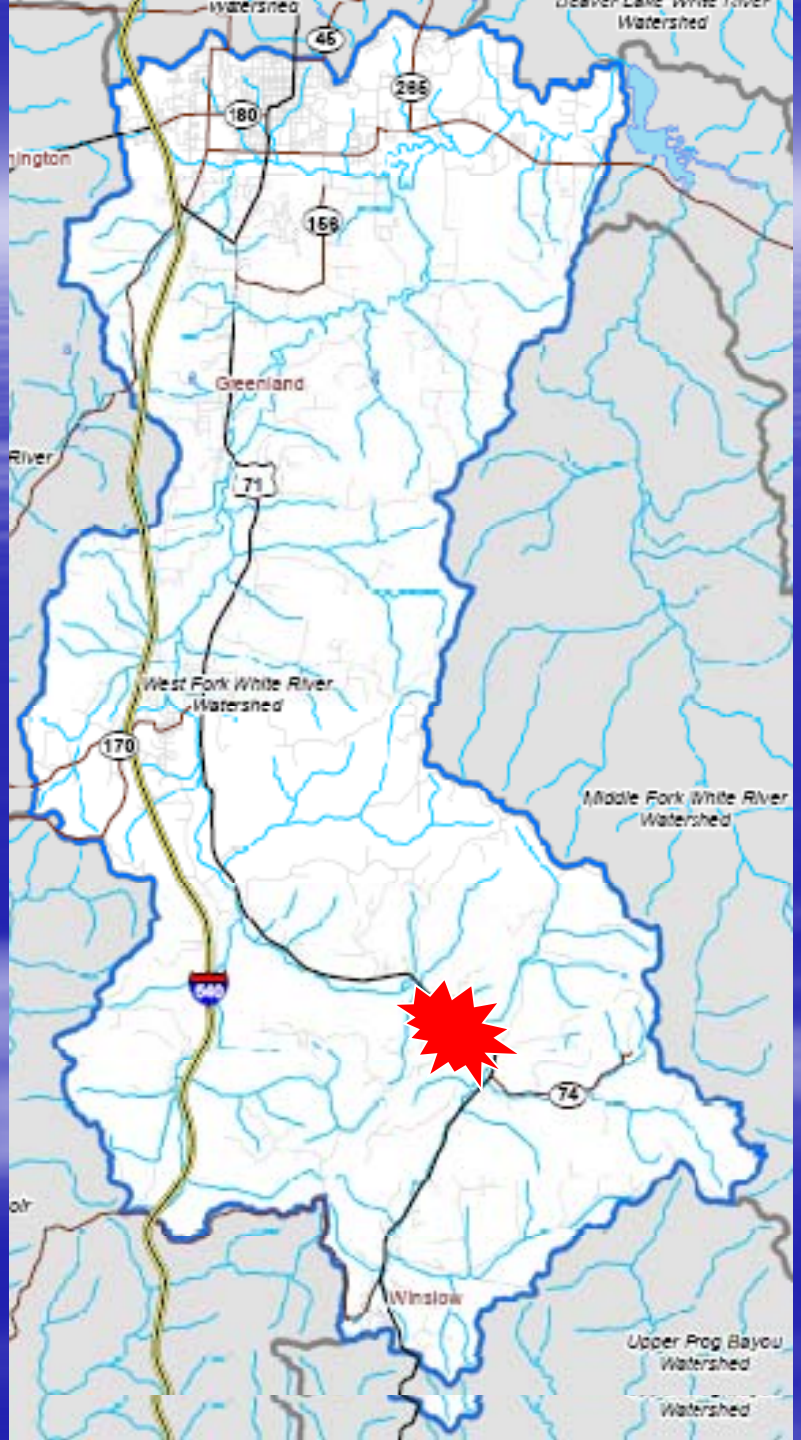
# Introduction

Collect water quality samples before, during, and after the implementation of the restoration project at locations upstream and downstream of the restoration site.




# Goals/Objectives

- establish two water quality monitoring stations that are representative of the area and the restoration project

- accurately determine nutrient and sediment loading at the monitoring stations

- determine the effects of the restoration project on water quality

- gain a better understanding for the chemical and physical dynamics of project area in the watershed

# LOADING

- Requires daily DISCHARGE data, therefore continuous STAGE data.
- Requires daily sample concentrations.
- No USGS Station
- Flashy River, short and steep hydrograph.
- River has no mercy on costly instruments.

Problems that we face

# Development of Discharge Rating Curve

- Sontec Rivercat

Marsh McBirnney Flowmate 2000

Wading Rod

Objective: Determine river's discharge at as many different river stages as possible to generate a correlation between river stage and river discharge.


RiverCAT

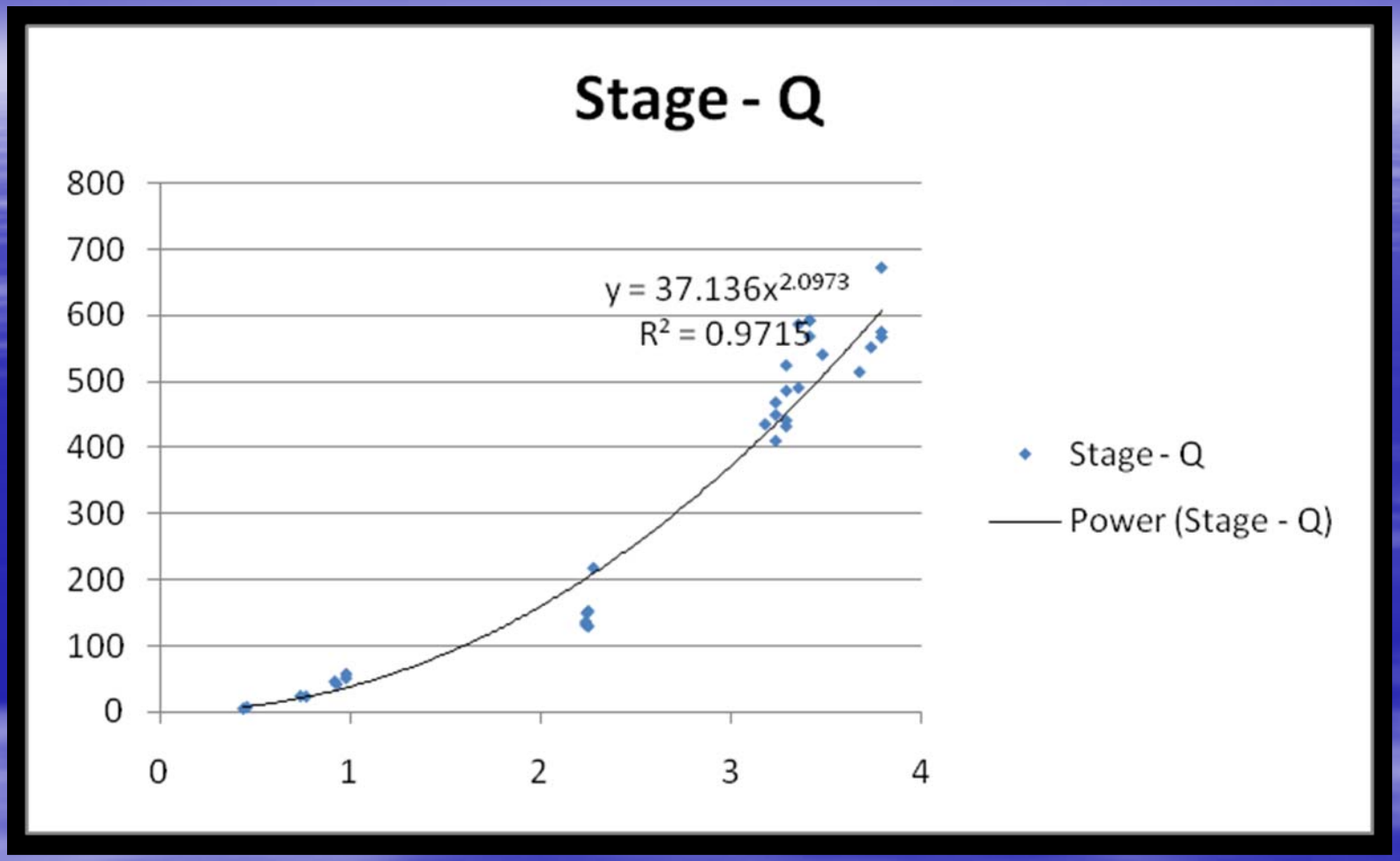

QUIKRETE
QUIKRETE

# Sampling Methods

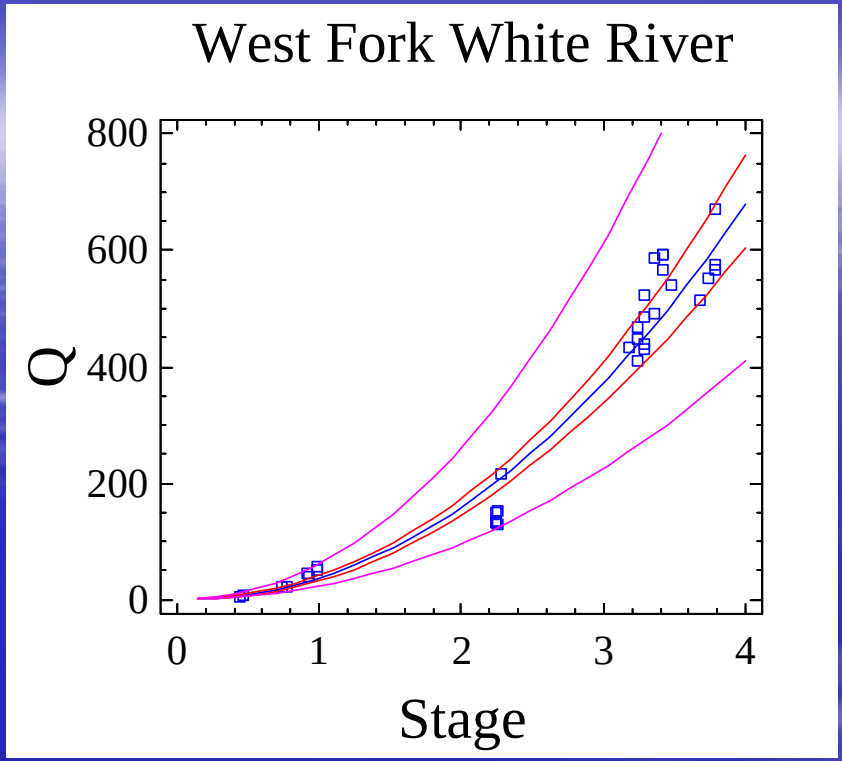
- Routine Sampling
  - Composite samples
  - One sample every 14 hours
- Storm Sampling
  - Composite samples
  - One sample every two hours
  - Triggers 0.5 ft rise in 3 hours
- Grab sampling
  - ~ 1 every 7 days
- Use auto sampler to continuously Monitor Stage

# Results

- Stage – Discharge Rating Curve
- Sample Concentrations
- Loading Estimations




# Stage Rating-Discharge Curve




- Multiplicative Model
- R-square = 97.15%
- Correlation Coefficient = 0.9856
- Q = 37.1363*Level^2.09726

# Sample Concentrations

- Analyses were determined from three types of samples; grab samples, composite samples and storm samples.

Outliers for grab and composite samples were defined and then removed from the data set (3*STDEV).

| Parameter | WF-1 Grab Samples (mean) | WF-2 Grab Samples (mean) |
|---|---|---|
| Orthophosphate (mg/L) | 0.008 | 0.008 |
| Nitrate-Nitrogen (mg/L) | 0.414 | 0.384 |
| TSS (mg/L) | 3 | 4 |
| Turbidity (NTU) | 4 | 4 |
| TP (mg/L) | 0.026 | 0.025 |
| TKN (mg/L) | 0.084 | 0.092 |
| Ammonia-Nitrogen (mg/L) | 0.011 | 0.011 |
| Sulfate (mg/L) | 3.223 | 4.538 |
| Chloride (mg/L) | 2.324 | 2.423 |

| Parameter | WF-1 | WF-2 |
|---|---|---|
| | Composite Samples (mean) | Composite Samples (mean) |
| Orthophosphate (mg/L) | 0.013 | 0.014 |
| Nitrate-Nitrogen (mg/L) | 0.366 | 0.368 |
| TSS (mg/L) | 5 | 7 |
| Turbidity (NTU) | 6 | 4 |
| TP (mg/L) | 0.042 | 0.049 |
| TKN (mg/L) | 0.120 | 0.139 |
| Ammonia-Nitrogen (mg/L) | 0.024 | 0.019 |
| Sulfate (mg/L) | 3.155 | 4.592 |
| Chloride (mg/L) | 2.920 | 2.261 |

| Parameter | WF-1 (17 Events) Storm Samples (mean) | WF-2 (17 Events) Storm Samples (mean) |
|---|---|---|
| Orthophosphate (mg/L) | 0.028 | 0.022 |
| Nitrate-Nitrogen (mg/L) | 0.595 | 0.617 |
| TSS (mg/L) | 188 | 172 |
| Turbidity (NTU) | 155 | 158 |
| TP (mg/L) | 0.383 | 0.334 |
| TKN (mg/L) | 0.858 | 0.663 |
| Ammonia-Nitrogen (mg/L) | 0.025 | 0.029 |
| Sulfate (mg/L) | 4.303 | 4.434 |
| Chloride (mg/L) | 3.320 | 3.281 |

# Loading Estimations

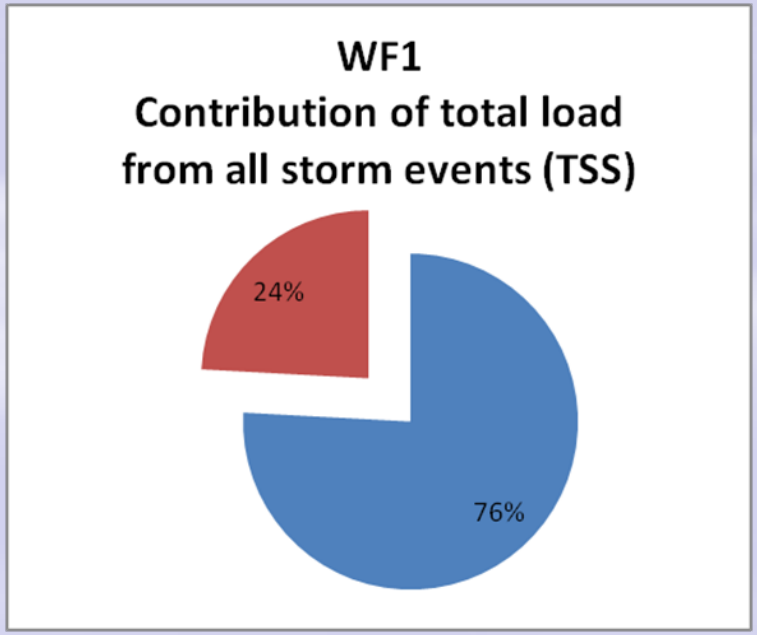
- Discharge was estimated for the project period.

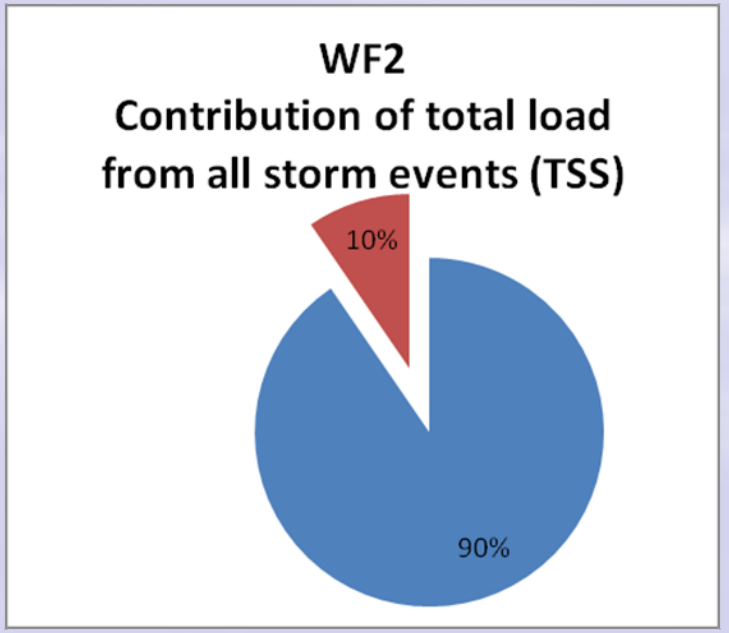
Loading was calculated from all samples by numeric integration method.

| LOADING (lbs/project period) | WF1 (lbs) | WF2 (lbs) |
|---|---|---|
| ORP | 5,765 | 4,506 |
| Nitrate | 113,752 | 114,603 |
| TSS | 11,938,985 | 23,296,819 |
| TP | 30,065 | 60,917 |
| TKN | 69,817 | 129,365 |
| NH3 | 4,550 | 5,091 |
| Sulfate | 968,090 | 1,088,864 |
| Chloride | 748,453 | 705,720 |

# Loading Estimations
# A sobering thought...

| Storm Event Loadings | WF1 (18 events) | WF2 (22 events) |
|---|---|---|
| TSS (lbs) | 9,056,509 | 21,070,583 |
| Compared Storms | WF1 (17 events) | WF2 (17 events) |
| TSS (lbs) | 8,991,961 | 8,053,128 |

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