

**Water Quality Assessment  
of  
Osage Creek & West Fork, White and Kings  
Rivers**

**2008 & 1/2 2009**

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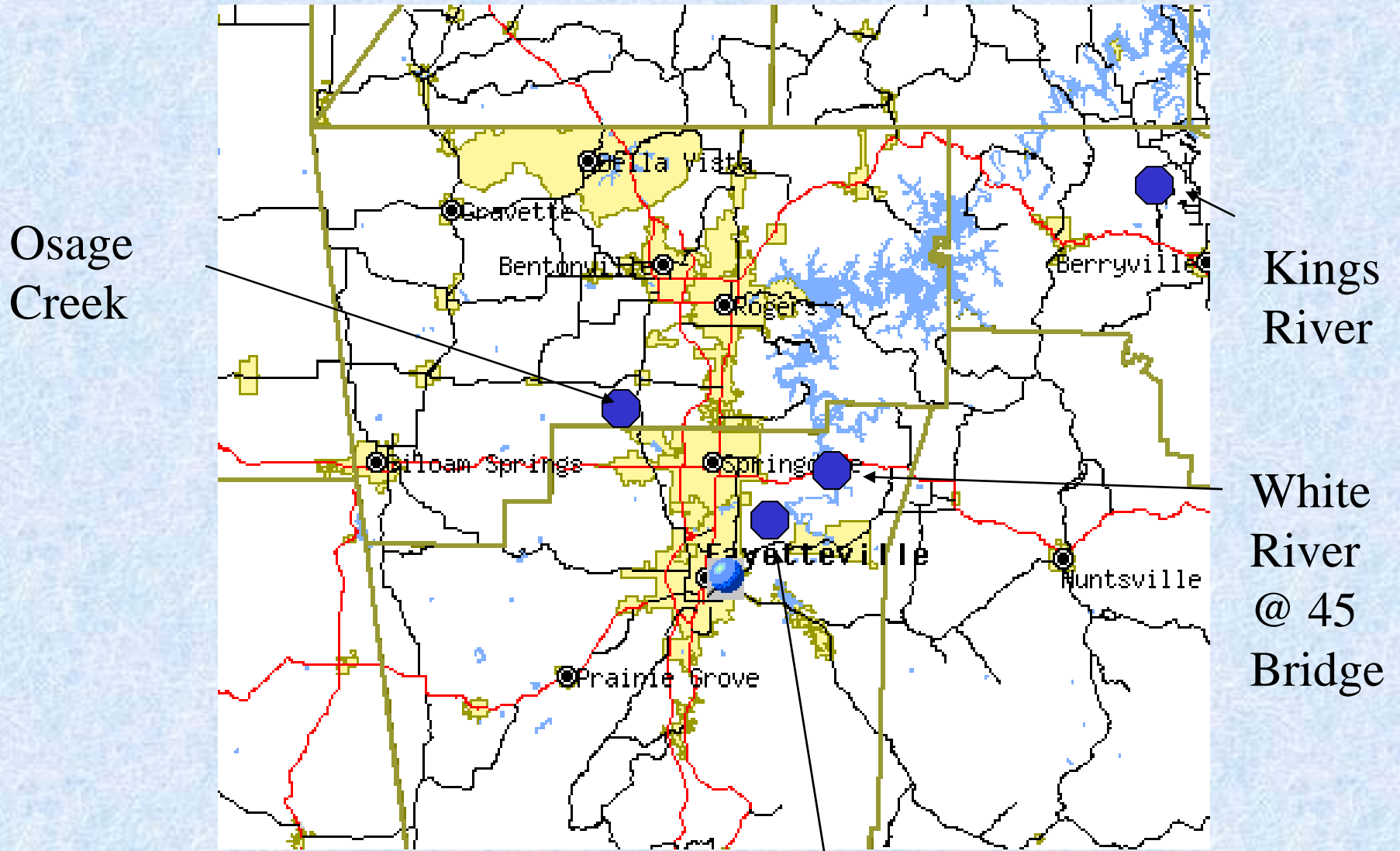
To :

Northwest Arkansas Conservation Authority - Osage  
City Of Fayetteville - West Fork  
Beaver Water District - White  
Kings River Watershed Partnership - Kings

# Summarize Water Quality Assessment

- Four watersheds NWA
- 2008 and first half of 2009 results
- Phosphorus
- Trends
- Watershed comparisons

# Northwest Arkansas Water Quality Monitoring Sites



West Fork of White River



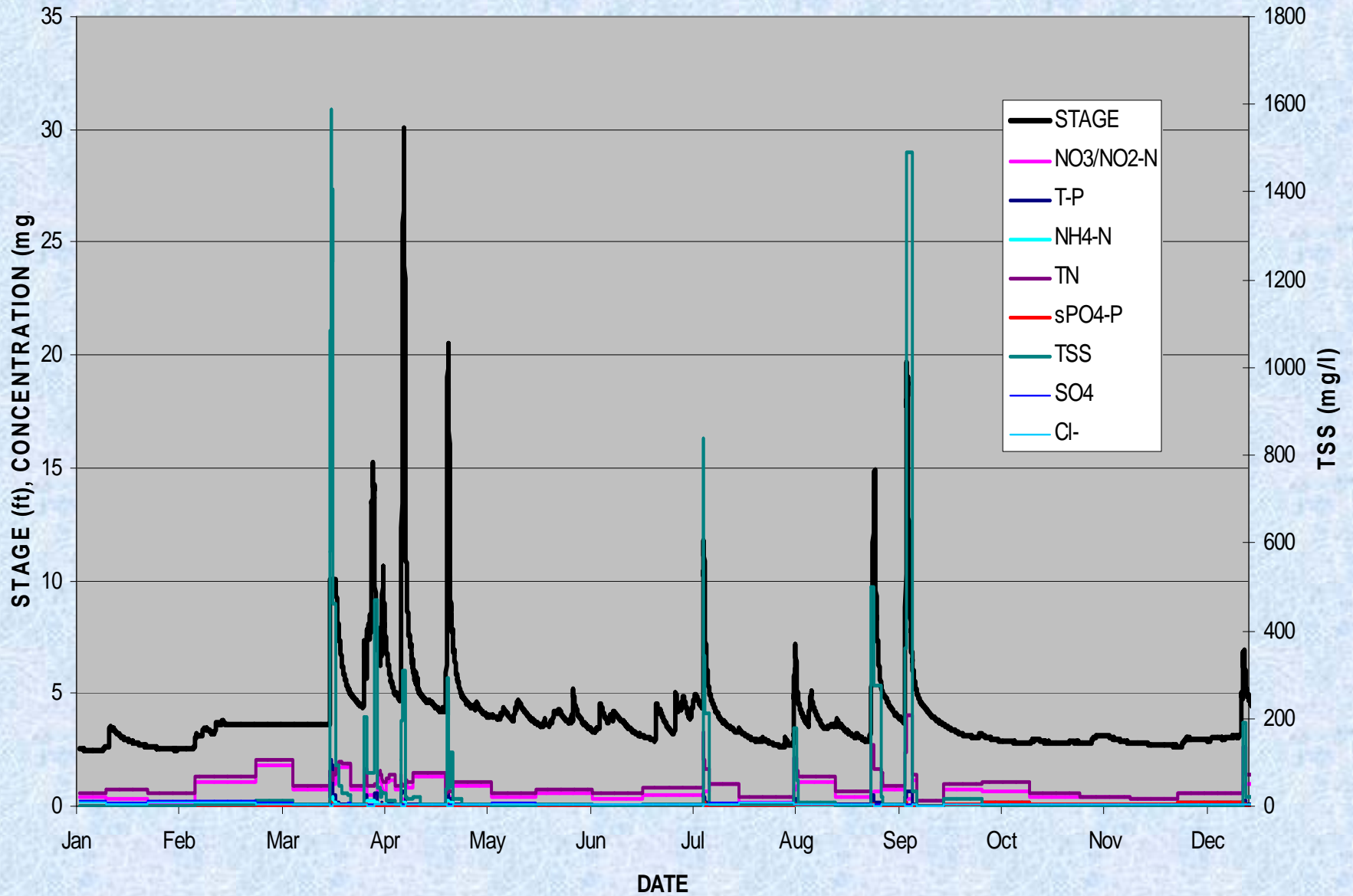


# Water Quality Sampling

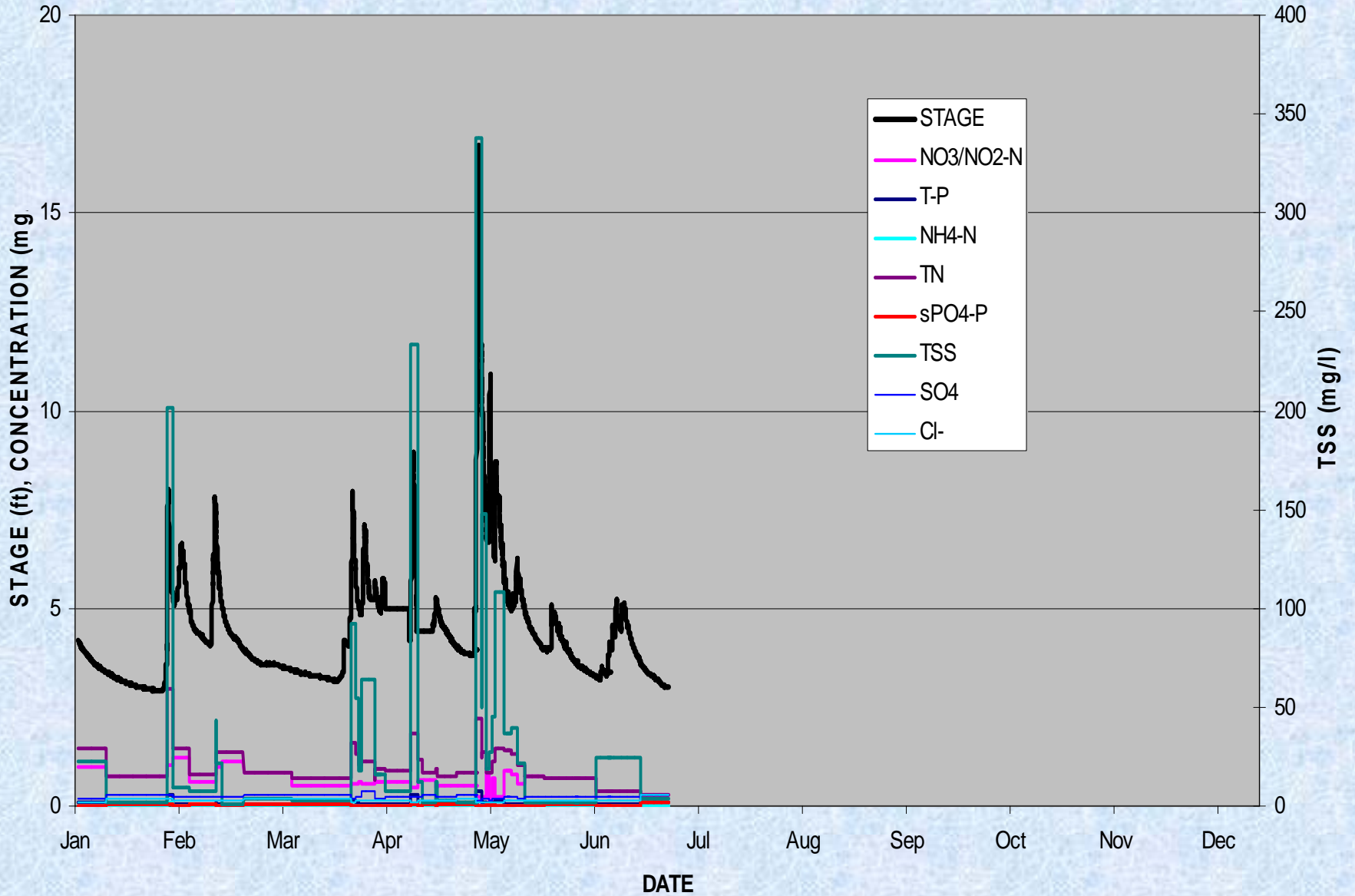
- Grab samples every two weeks
- Auto-sampler samples all storm events > trigger level
- Flow-weighted composite samples (except White)
- $\text{SO}_4$ ,  $\text{Cl}^-$ ,  $\text{NH}_4$ ,  $\text{NO}_3/\text{NO}_2$ , T-N, T-P,  $\text{sPO}_4$ , and TSS
- Concentrations assigned to all times
- USGS discharge for all times
- Loads calculated by multiplying and summing for the year
- Sondes reading turbidity, conductivity and temp (except Kings River)



KINGS RIVER  
HIGHWAY 143  
2008



KINGS RIVER  
HIGHWAY 143  
2009





## Kings River near Berryville 2008 Loads and Mean Concentrations

<b>Parameter</b>	<b>Total Discharge (m<sup>3</sup>/yr)</b>	<b>Total Load (kg/yr)</b>
	<b>796,964,238</b>	
<b>SO<sub>4</sub></b>		<b>3,680,000</b>
<b>Cl<sup>-</sup></b>		<b>2,265,835</b>
<b>NO<sub>3</sub>/NO<sub>2</sub>-N</b>		<b>524,321</b>
<b>TP</b>		<b>217,473</b>
<b>NH<sub>4</sub>-N</b>		<b>49,313</b>
<b>TN</b>		<b>1,048,175</b>
<b>sPO<sub>4</sub>-P</b>		<b>28,059</b>
<b>TSS</b>		<b>166,344,864</b>

## Kings River near Berryville 2008 Loads and Mean Concentrations

Parameter	Total Discharge (m <sup>3</sup> /yr)	Total Load (kg/yr)	Average Discharge (m <sup>3</sup> /s)	Mean Concentrations (mg/l)
	<b>796,964,238</b>		<b>25.3</b>	
SO <sub>4</sub>		<b>3,680,000</b>		<b>4.62</b>
Cl <sup>-</sup>		<b>2,265,835</b>		<b>2.84</b>
NO <sub>3</sub> /NO <sub>2</sub> -N		<b>524,321</b>		<b>0.66</b>
<b>TP</b>		<b>217,473</b>		<b>0.27</b>
NH <sub>4</sub> -N		<b>49,313</b>		<b>0.06</b>
TN		<b>1,048,175</b>		<b>1.32</b>
sPO <sub>4</sub> -P		<b>28,059</b>		<b>0.04</b>
TSS		<b>166,344,864</b>		<b>208.72</b>

## Kings River near Berryville 2008 Storm and Base-flow Loads and Mean Concentrations

<b>Parameter</b>	<b>Storm Loads (kg)</b>	<b>Base Loads (kg)</b>	<b>Storm Concentrations (mg/l)</b>	<b>Base Concentrations (mg/l)</b>
<b>Discharge (m<sup>3</sup>)</b>	<b>510,695,939</b>	<b>286,268,299</b>		
<b>SO<sub>4</sub></b>	<b>1,976,692</b>	<b>1,703,308</b>	<b>3.87</b>	<b>5.95</b>
<b>Cl<sup>-</sup></b>	<b>1,083,426</b>	<b>1,182,408</b>	<b>2.12</b>	<b>4.13</b>
<b>NO<sub>3</sub>/NO<sub>2</sub>-N</b>	<b>318,395</b>	<b>205,925</b>	<b>0.62</b>	<b>0.72</b>
<b>TP</b>	<b>203,841</b>	<b>13,632</b>	<b>0.40</b>	<b>0.05</b>
<b>NH<sub>4</sub>-N</b>	<b>44,040</b>	<b>5,273</b>	<b>0.09</b>	<b>0.02</b>
<b>TN</b>	<b>780,366</b>	<b>267,809</b>	<b>1.53</b>	<b>0.94</b>
<b>sPO<sub>4</sub>-P</b>	<b>18,542</b>	<b>9,516</b>	<b>0.04</b>	<b>0.03</b>
<b>TSS</b>	<b>165,148,911</b>	<b>1,195,953</b>	<b>323.38</b>	<b>4.18</b>

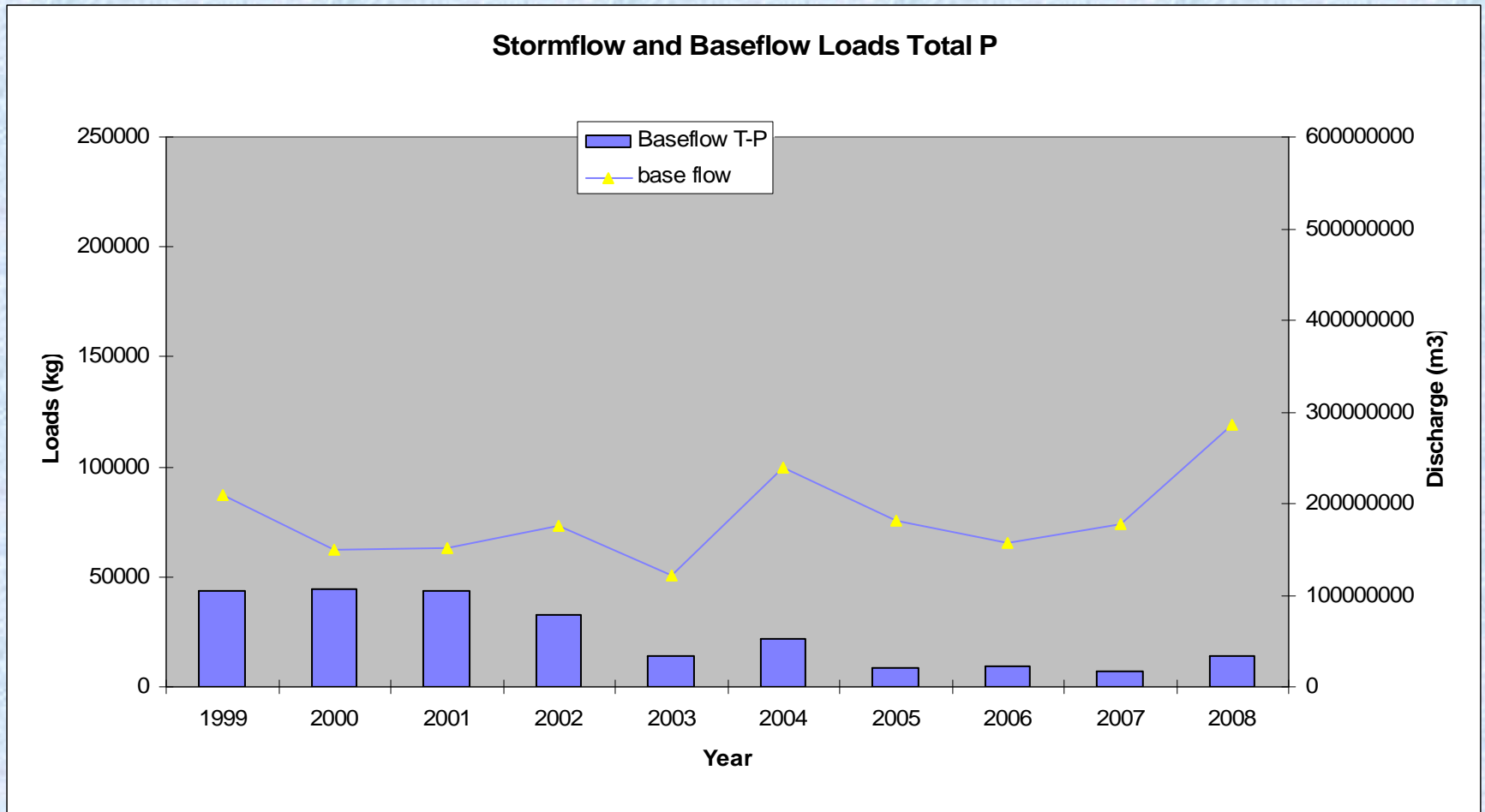
# Kings River near Berryville

First Half of 2009 Storm and Base-flow Loads and Mean Concentrations

<b>Parameter</b>	<b>Storm Loads (kg)</b>	<b>Base Loads (kg)</b>	<b>Storm Concentrations (mg/l)</b>	<b>Base Concentrations (mg/l)</b>
<b>Discharge (m<sup>3</sup>)</b>	<b>283,881,933</b>	<b>216,878,594</b>		
<b>SO<sub>4</sub></b>	<b>1,220,122</b>	<b>1,062,575</b>	<b>4.30</b>	<b>4.90</b>
<b>Cl<sup>-</sup></b>	<b>689,341</b>	<b>674,990</b>	<b>2.43</b>	<b>3.11</b>
<b>NO<sub>3</sub>/NO<sub>2</sub>-N</b>	<b>160,241</b>	<b>133,527</b>	<b>0.56</b>	<b>0.62</b>
<b>TP</b>	<b>39,355</b>	<b>8,936</b>	<b>0.14</b>	<b>0.04</b>
<b>NH<sub>4</sub>-N</b>	<b>5,103</b>	<b>3,442</b>	<b>0.02</b>	<b>0.02</b>
<b>TN</b>	<b>418,119</b>	<b>175,055</b>	<b>1.47</b>	<b>0.81</b>
<b>sPO<sub>4</sub>-P</b>	<b>5,716</b>	<b>5,850</b>	<b>0.02</b>	<b>0.03</b>
<b>TSS</b>	<b>31,103,491</b>	<b>1,603,502</b>	<b>109.56</b>	<b>7.39</b>

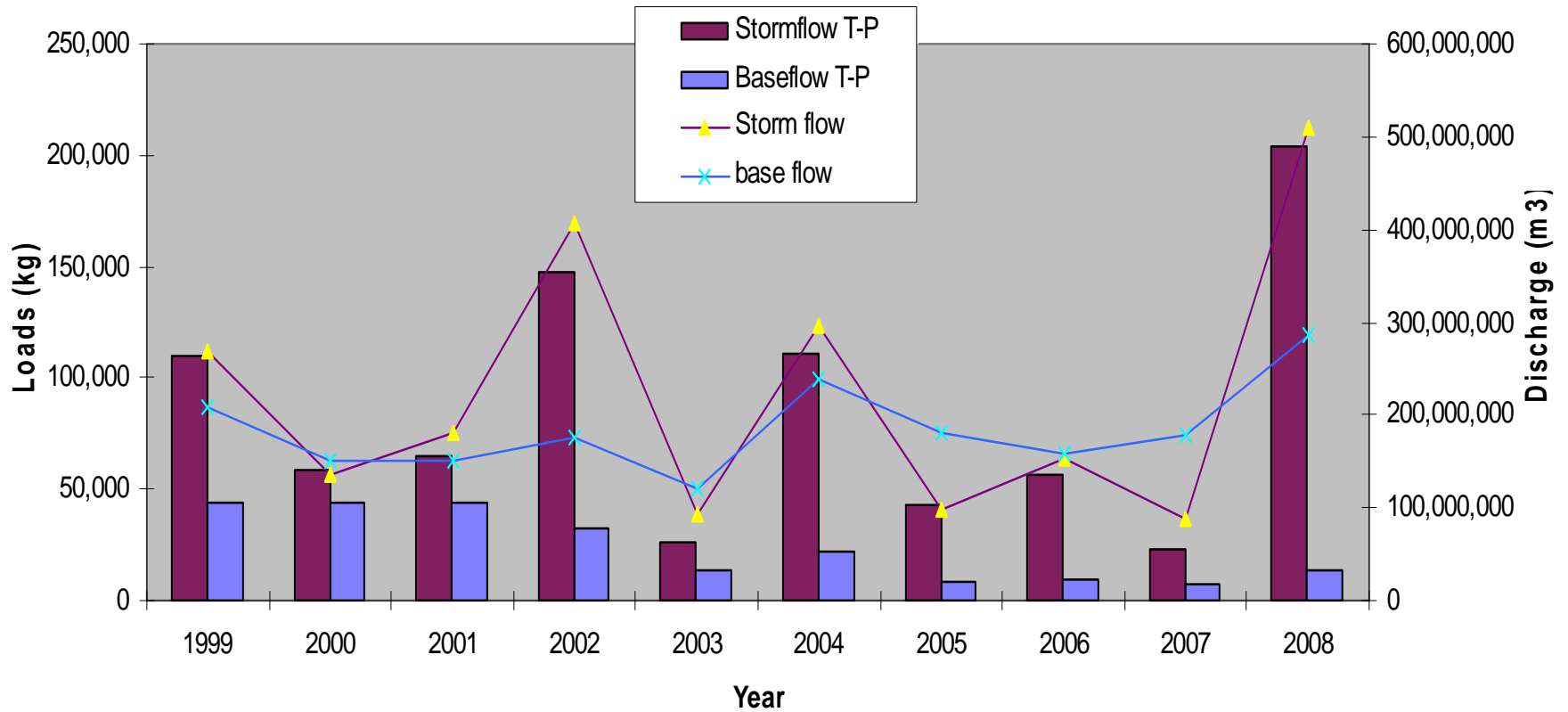


# Kings River P trends

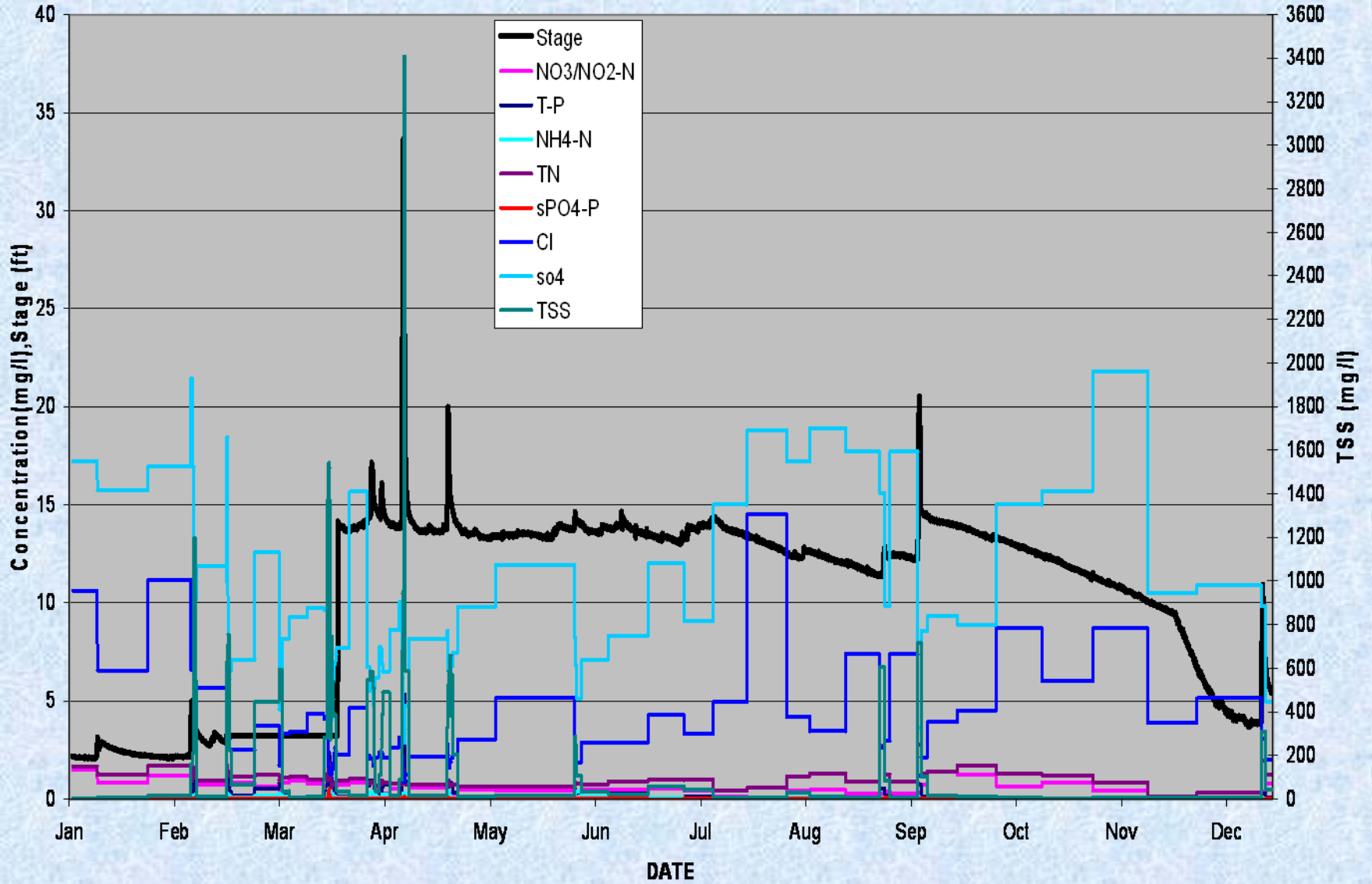


# Kings River P trends

Stormflow and Baseflow Loads  
Total P



White River  
at Goshen  
2008



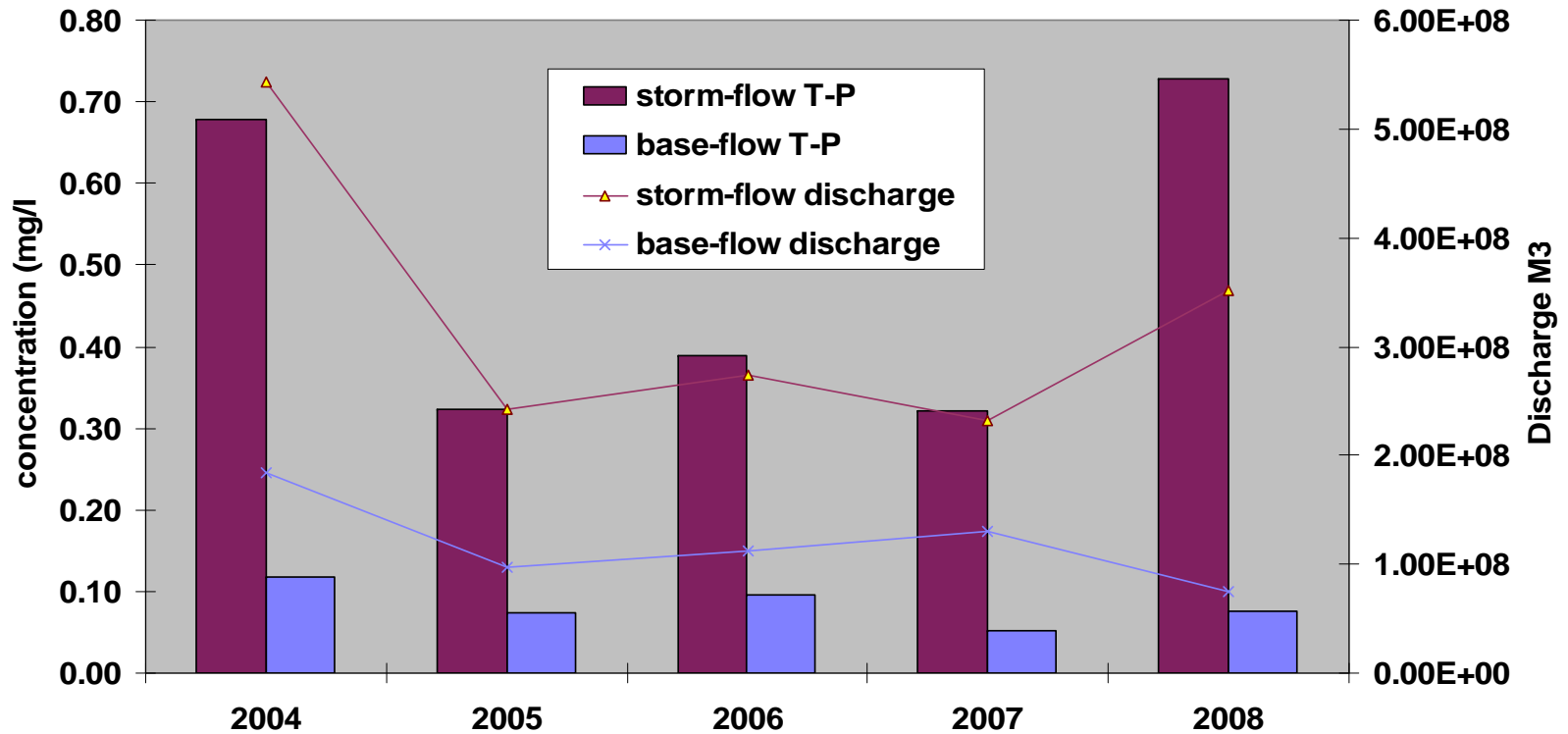
## White River near Goshen 2008 Storm and Base-flow Loads and Mean Concentrations

<b>Parameter</b>	<b>Storm Loads (kg)</b>	<b>Base Loads (kg)</b>	<b>Storm Concentrations (mg/l)</b>	<b>Base Concentrations (mg/l)</b>
<b>Discharge (M3)</b>	<b>352,003,227</b>	<b>75,214,118</b>		
<b>SO<sub>4</sub></b>	<b>2,412,067</b>	<b>883,714</b>	<b>6.85</b>	<b>11.75</b>
<b>Cl<sup>-</sup></b>	<b>783,554</b>	<b>373,661</b>	<b>2.23</b>	<b>4.97</b>
<b>NO<sub>3</sub>/NO<sub>2</sub>- N</b>	<b>130,167</b>	<b>54,950</b>	<b>0.37</b>	<b>0.73</b>
<b>T-P</b>	<b>256,002</b>	<b>5,690</b>	<b>0.73</b>	<b>0.08</b>
<b>NH<sub>4</sub>-N</b>	<b>53,875</b>	<b>2,469</b>	<b>0.15</b>	<b>0.03</b>
<b>T-N</b>	<b>403,793</b>	<b>74,907</b>	<b>1.15</b>	<b>1.00</b>
<b>sPO<sub>4</sub>-P</b>	<b>11,246</b>	<b>626</b>	<b>0.03</b>	<b>0.01</b>
<b>TSS</b>	<b>168,910,069</b>	<b>1,324,206</b>	<b>479.85</b>	<b>17.61</b>

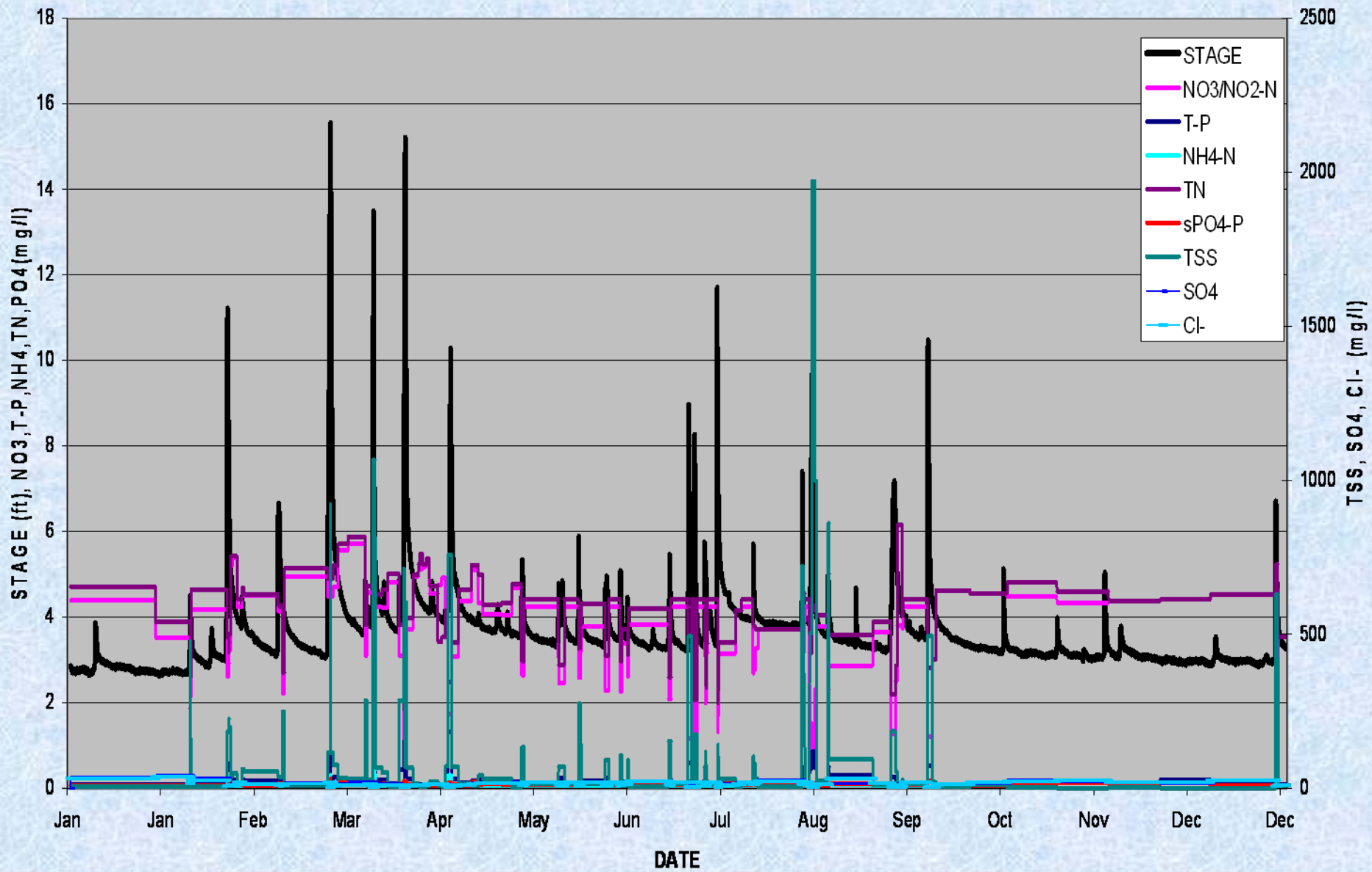


# White River near Goshen

## Trends in Storm-flow and Base-flow P Concentrations



Osage Creek  
Elm Springs  
2008



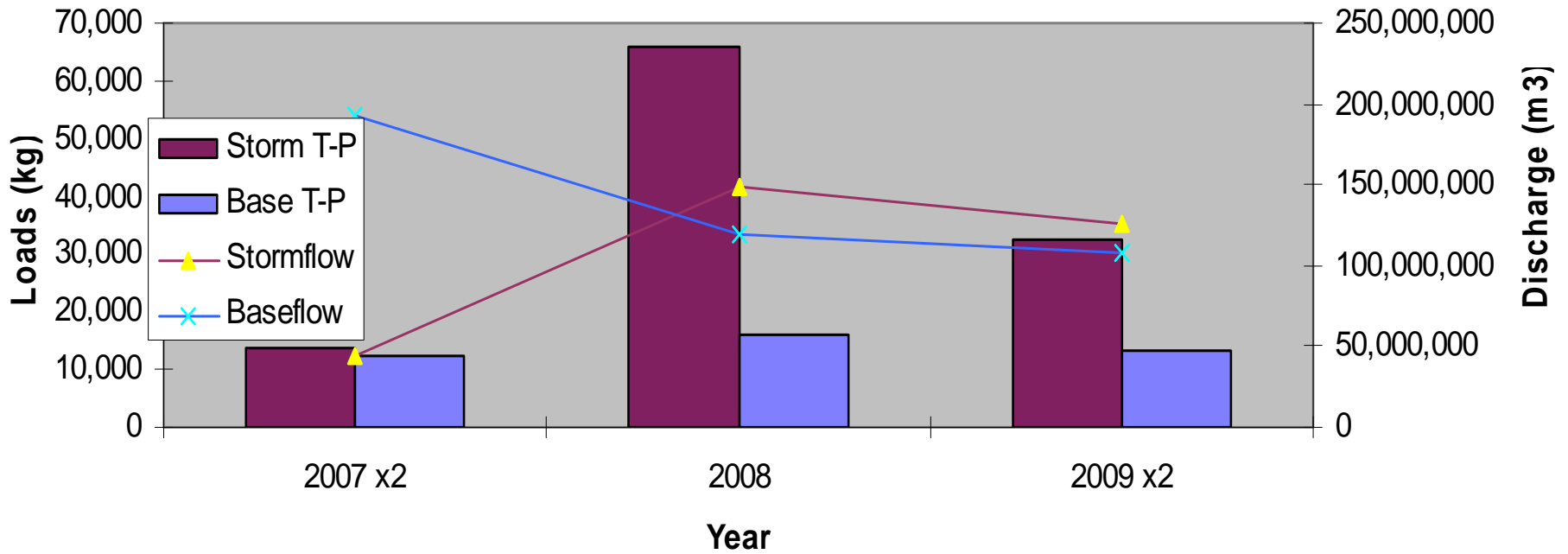
# Osage Creek near Elm Springs

## 2008 Storm and Base-flow Loads and Mean Concentrations

	<b>Storm Loads (kg)</b>	<b>Base Loads (kg)</b>	<b>Storm Concentrations (mg/l)</b>	<b>Base Concentrations (mg/l)</b>
<b>Discharge (M3)</b>	<b>148,229,762</b>	<b>119,349,947</b>		
<b>SO<sub>4</sub></b>	<b>1,806,811</b>	<b>2,485,784</b>	<b>12.19</b>	<b>20.83</b>
<b>Cl<sup>-</sup></b>	<b>1,520,040</b>	<b>2,433,803</b>	<b>10.25</b>	<b>20.39</b>
<b>NO<sub>3</sub>/NO<sub>2</sub> -N</b>	<b>460,819</b>	<b>507,235</b>	<b>3.11</b>	<b>4.25</b>
<b>T-P</b>	<b>65,665</b>	<b>16,108</b>	<b>0.44</b>	<b>0.13</b>
<b>NH<sub>4</sub>-N</b>	<b>12,357</b>	<b>2,930</b>	<b>0.08</b>	<b>0.02</b>
<b>T-N</b>	<b>566,285</b>	<b>530,292</b>	<b>3.82</b>	<b>4.44</b>
<b>sPO<sub>4</sub>-P</b>	<b>16,706</b>	<b>11,319</b>	<b>0.11</b>	<b>0.09</b>
<b>TSS</b>	<b>42,376,056</b>	<b>2,130,036</b>	<b>285.88</b>	<b>17.85</b>

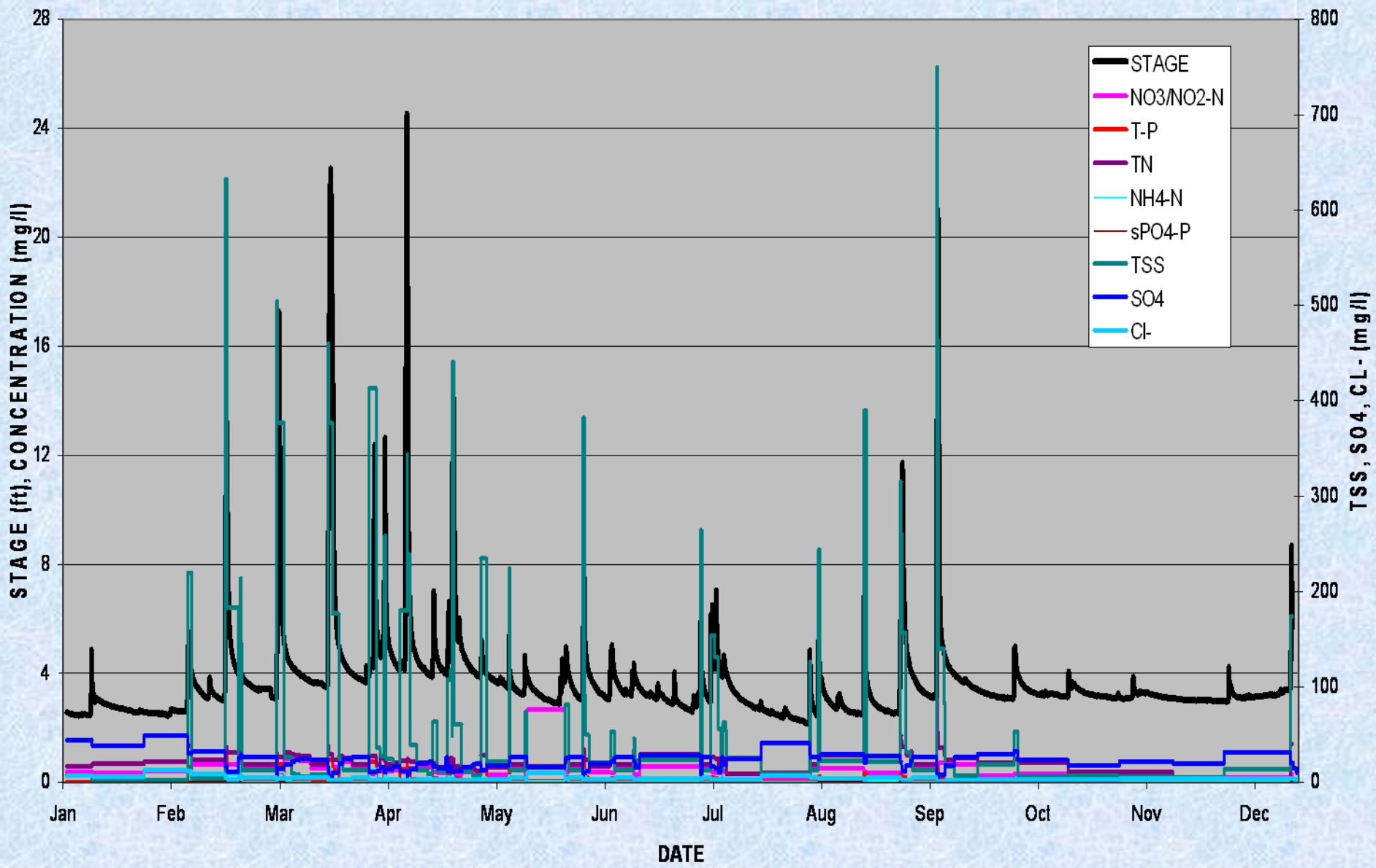
# Osage Creek near Elm Springs

## Storm-flow and Base-flow Loads Total P





# West Fork 2008



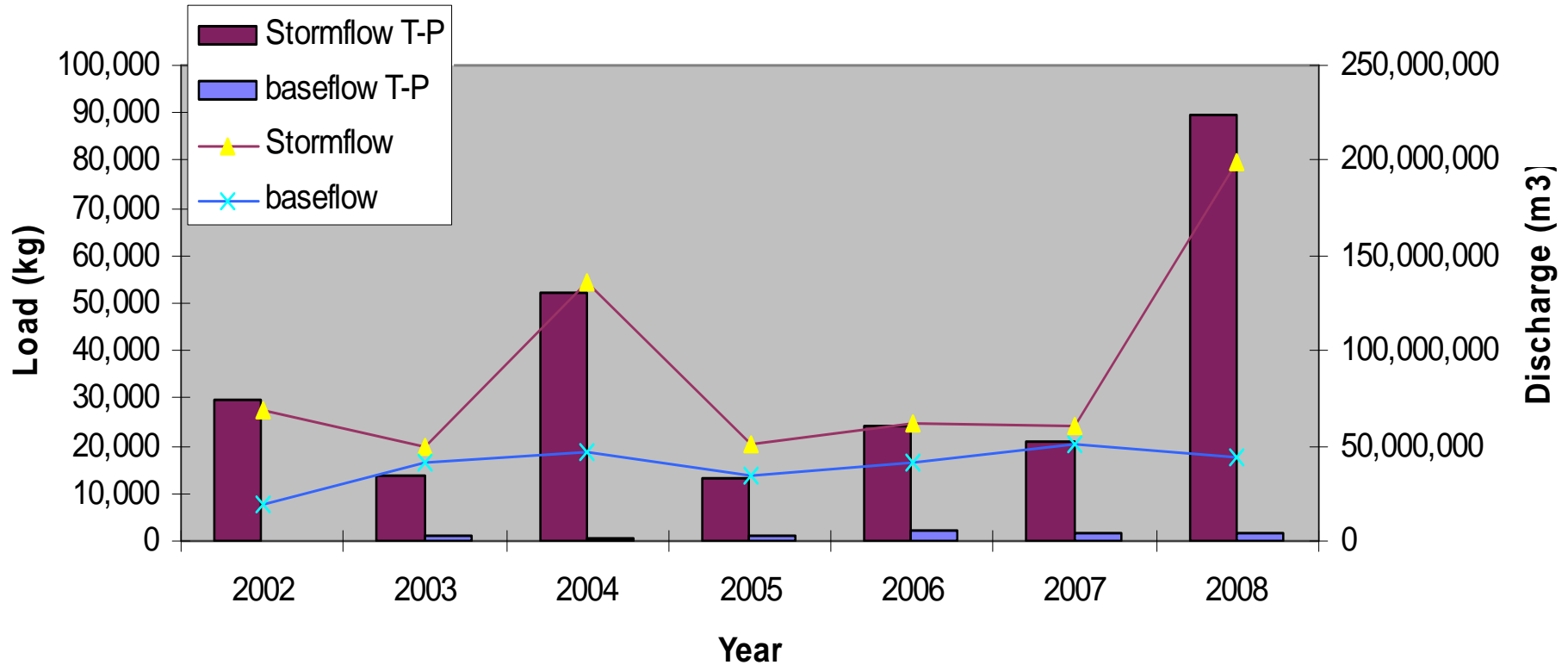
## West Fork near Baldwin

### 2008 Storm and Base-flow Loads and Mean Concentrations

Parameter	Storm Loads (kg)	Base Loads (kg)	Storm Concentrations (mg/l)	Base Concentrations (mg/l)
<b>Discharge (M3)</b>	<b>199,282,249</b>	<b>44,218,901</b>		
<b>SO<sub>4</sub></b>	<b>2,528,236</b>	<b>1,162,181</b>	<b>12.69</b>	<b>26.28</b>
<b>Cl<sup>-</sup></b>	<b>559,928</b>	<b>214,005</b>	<b>2.81</b>	<b>4.84</b>
<b>NO<sub>3</sub>/NO<sub>2</sub>- N</b>	<b>83,995</b>	<b>22,172</b>	<b>0.42</b>	<b>0.50</b>
<b>T-P</b>	<b>89,294</b>	<b>1,586</b>	<b>0.45</b>	<b>0.036</b>
<b>NH<sub>4</sub>-N</b>	<b>40,322</b>	<b>1,025</b>	<b>0.20</b>	<b>0.02</b>
<b>T-N</b>	<b>198,834</b>	<b>29,530</b>	<b>1.00</b>	<b>0.67</b>
<b>sPO<sub>4</sub>-P</b>	<b>5,851</b>	<b>376</b>	<b>0.03</b>	<b>0.009</b>
<b>TSS</b>	<b>46,775,101</b>	<b>573,090</b>	<b>234.72</b>	<b>12.96</b>

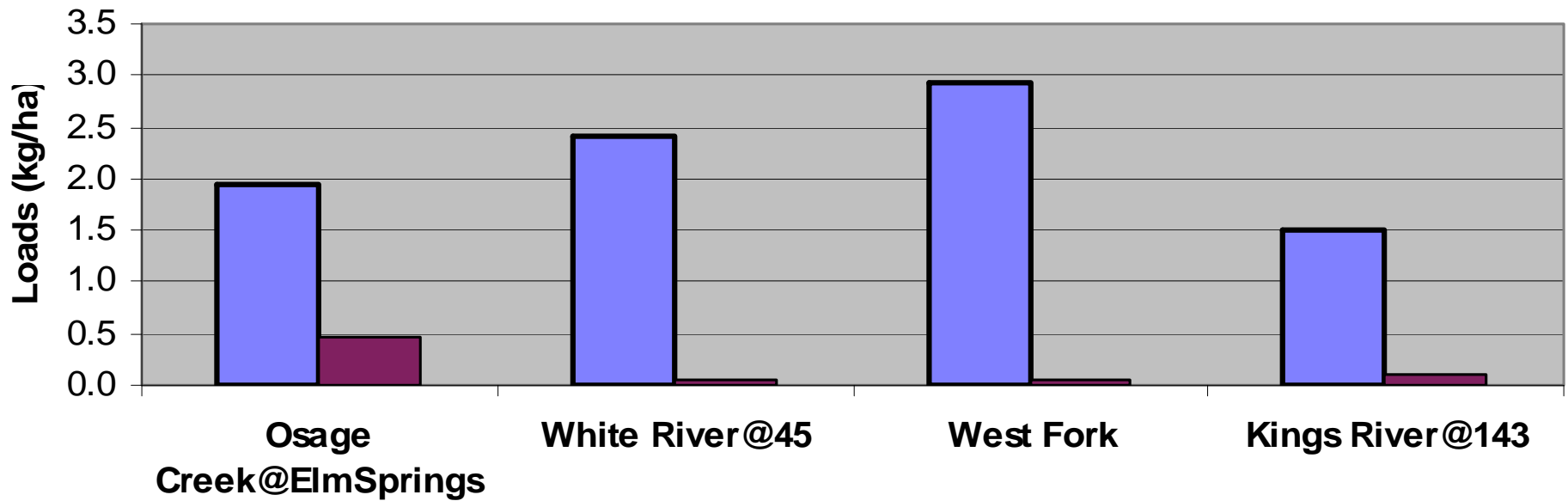
# West Fork near Elm Springs

## Stormflow and Baseflow Loads Total P



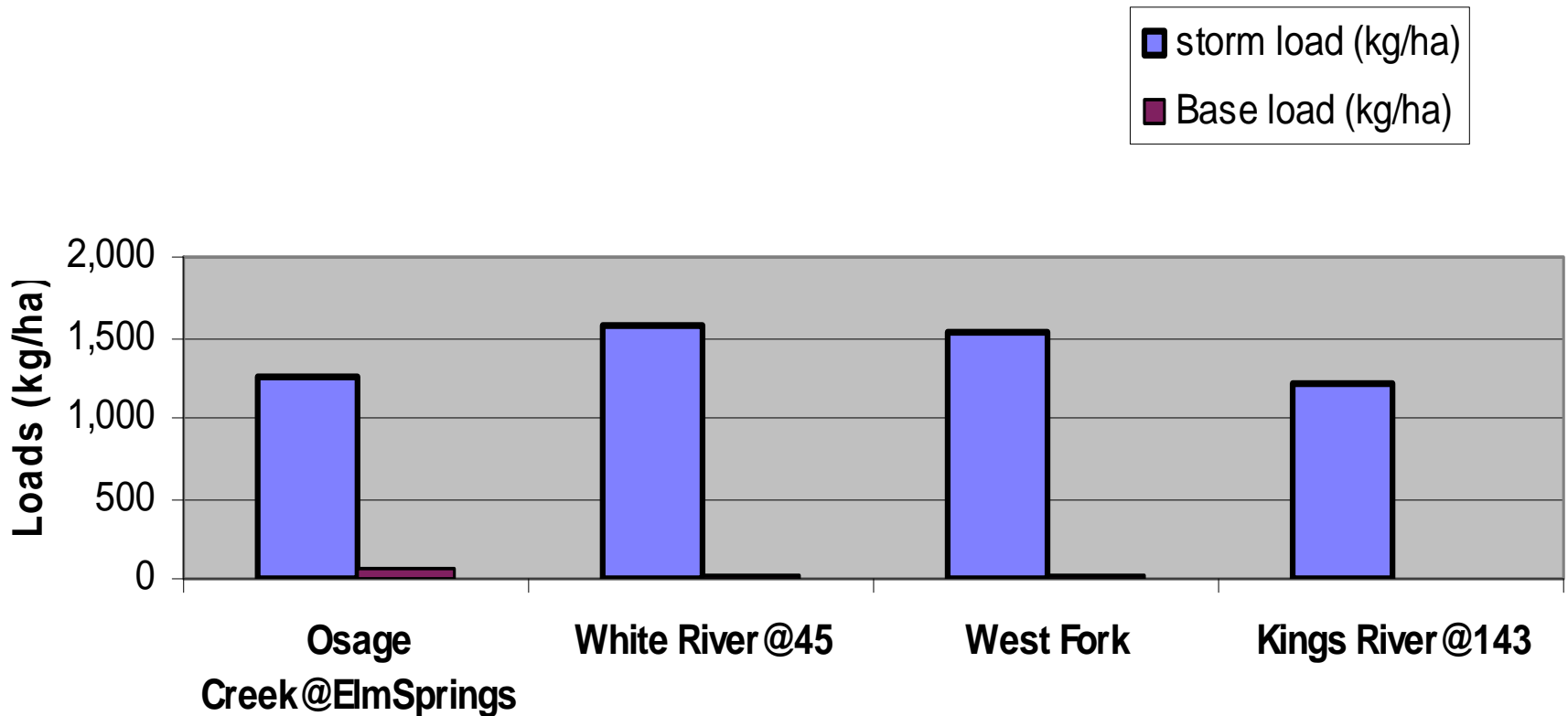
# Watershed comparison

**T-P Storm and Base-Flow Annual Loads per Hectare  
2008**



# Watershed comparison

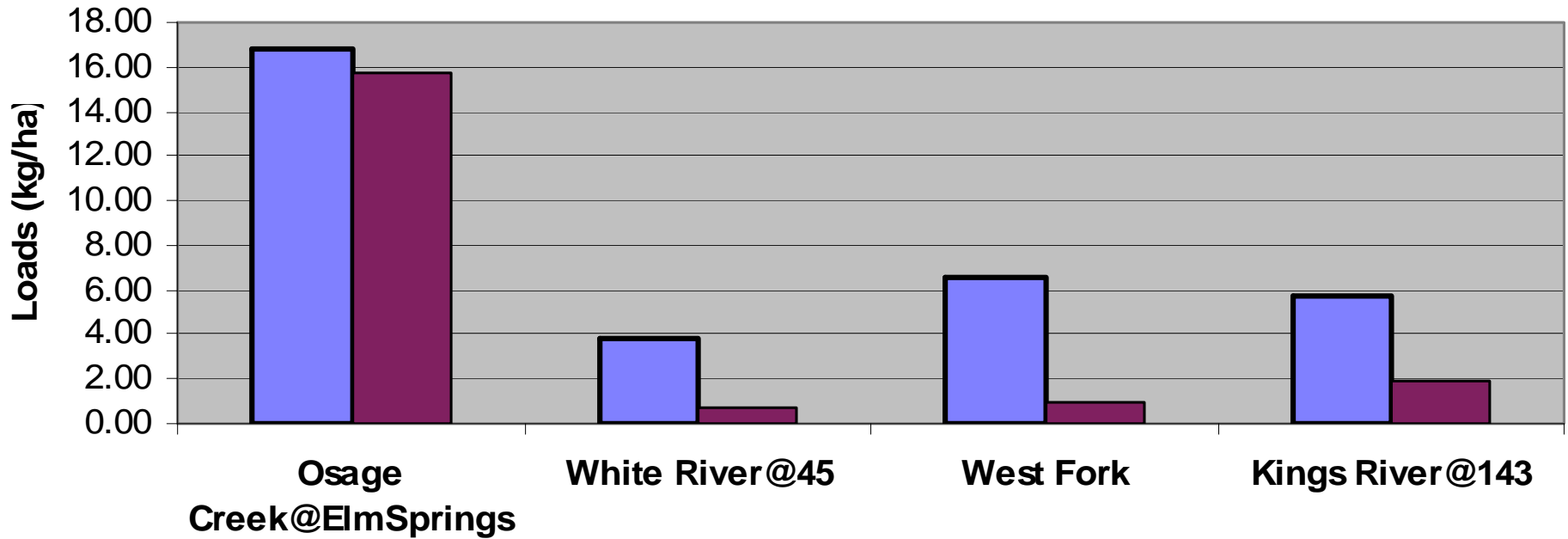
**TSS Storm and Base-Flow Annual Loads per Hectare  
2008**





# Watershed comparison

**Total Nitrogen Storm and Base-Flow Annual Loads per Hectare  
2008**





Questions?

# Osage Creek Sonde Data 2008

