Hangman Creek TMDL

- **Progress of Technical Report –**additional analyses & findings
- **WARMF model** – a quick overview and scenario brainstorming
- **Latest schedule**

Progress of the Fecal Coliform TMDL

- ✓ Complete methods and results narrative
- ✓ Finish historical data comparisons and decided critical season & period of record
- ✓ Examine loading between mainstem sites and estimate non-tributary contributions
- ✓ Calculate statistical rollback terms and reductions
- ✓ Ensure that cumulative reductions are adequate for downstream protection
- Assign load allocations to nonpoint sources and wasteload allocations to MS4 stormwater sources
- Summarize primary areas for implementation

WARMF Modeling of Hangman Creek

- WARMF = Watershed Analysis and Risk Management Framework
- Multiple sub-watershed loads individually run and linked by a stream course network.
- Stream channel erosion and other water quality features simulated in the stream course network.
- Daily time-step loads calculated

WARMF Model Structure

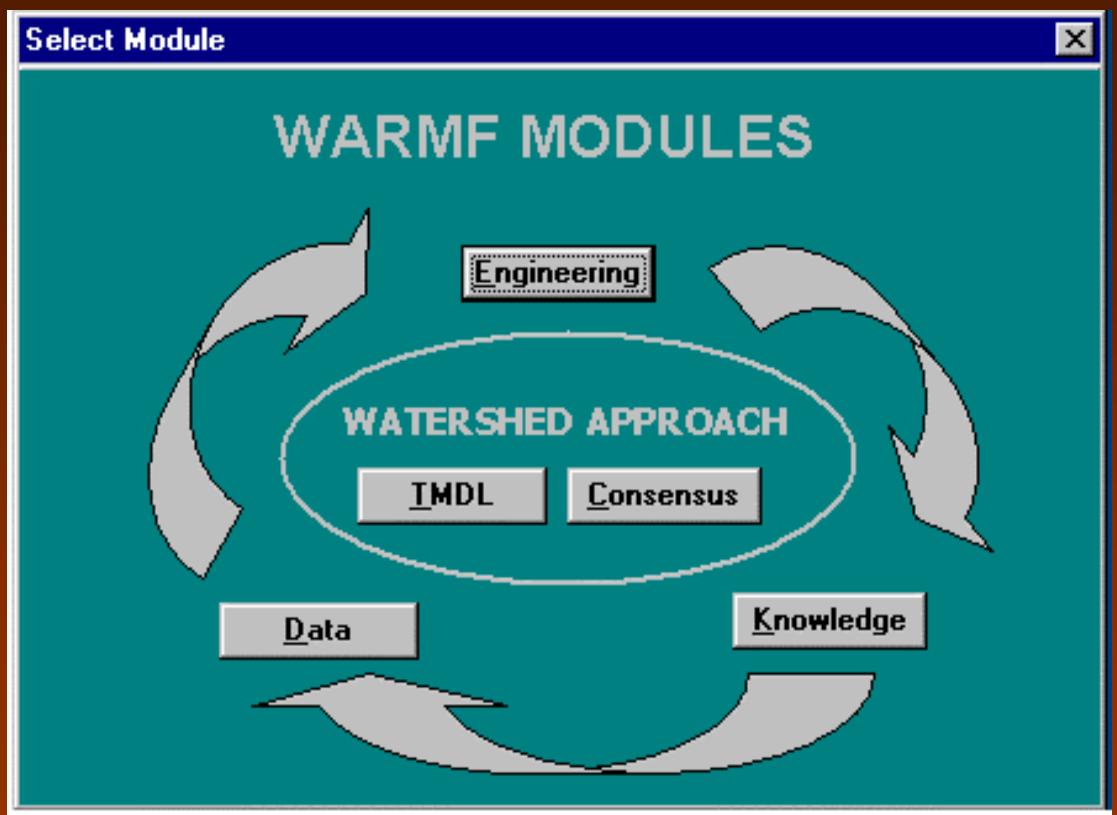
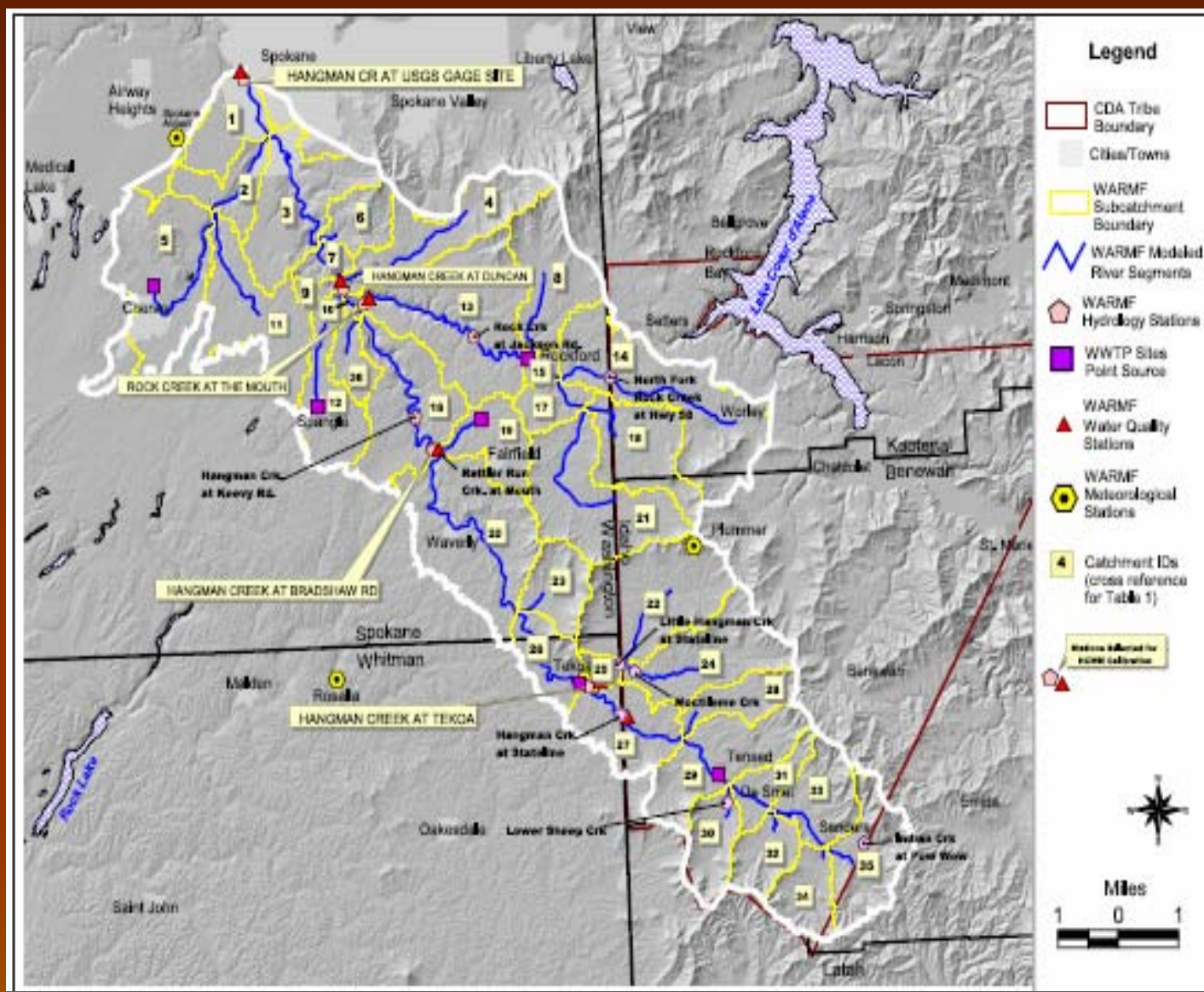


Figure 2.1
The Five Modules of WARMF.

- Open code and EPA-Supported (Ecosystem Research Division) – contractor has experience
- Performs well compared to other medium-complex landscape models
- User-friendly interface that allows stakeholders to examine implementation alternatives

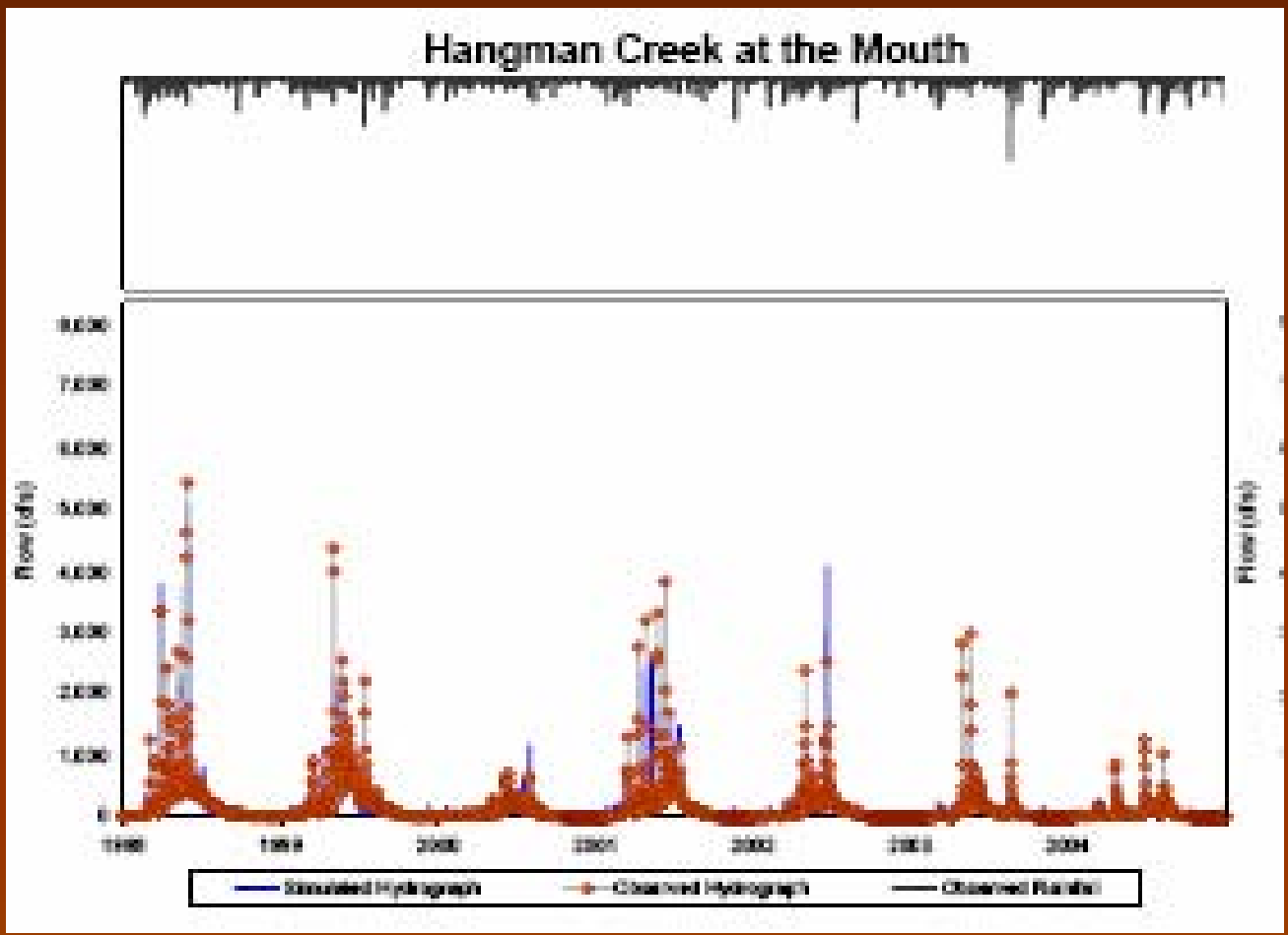
Hangman Creek

- WARMF model developed for 36 Hangman Creek sub-watersheds



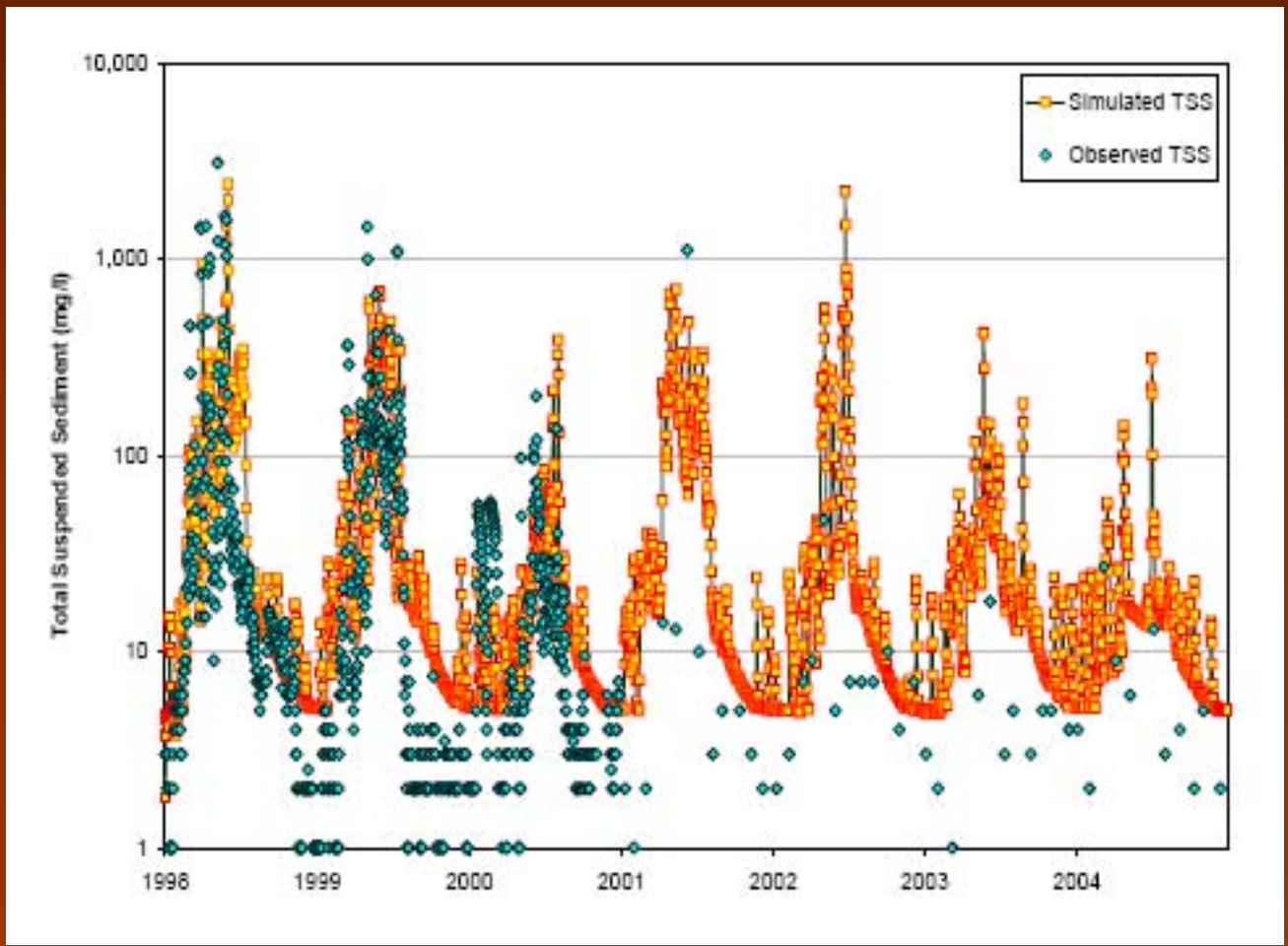
Hangman Creek WARMF

Hydrologic simulation of Hangman Creek at the mouth



Hangman Creek Example

Water Quality Calibration



WARMF Calibrated Loads

Table 8
Distribution of Pollutant Sources for TSS and TP

Hangman Creek at the Mouth

Source Category	TSS (kg/d)	TP (kg/d)
Deciduous	0.6	0.00
Coniferous	5,430	3.76
Mixed Forest	84	0.25
Cropland / Pasture	36,700	15.80
Rangeland	7,460	3.07
Forested Wetland	9	0.02
Non-forested Wetland	15	0.02
Barren	5	0.00
Residential	3,200	1.18
Comm./Industrial	491	0.14
General Nonpoint Sources	3,050	0.00
Stream Bank Erosion	74,700	13.80
Type 1 Septic System	-	5.23
General Point Sources	-	6.83
TOTAL	131,134	50.20

Hangman Creek at Dunoan

Source Category	TSS (kg/d)	TP (kg/d)
Deciduous	0.8	0.00
Coniferous	6,170	3.88
Mixed Forest	115	0.30
Cropland / Pasture	48,300	17.40
Rangeland	7,670	2.79
Forested Wetland	11	0.02
Non-forested Wetland	17	0.01
Barren	4	0.00
Residential	2,450	0.96
Comm./Industrial	637	0.16
General Nonpoint Sources	471	0.00
Stream Bank Erosion	739	0.12
Type 1 Septic System	-	5.96
General Point Sources	-	5.16
TOTAL	66,585	36.77

Hangman Creek at Rook Creek Mouth

Source Category	TSS (kg/d)	TP (kg/d)
Deciduous	0.2	0.00
Coniferous	1,880	1.30
Mixed Forest	40	0.10
Cropland / Pasture	25,400	11.30
Rangeland	3,120	1.43
Forested Wetland	3	0.00
Non-forested Wetland	7	0.00
Barren	0	0.00
Residential	1,360	0.62
Comm./Industrial	141	0.05
General Nonpoint Sources	6	0.00
Stream Bank Erosion	0	-
Type 1 Septic System	-	1.56
General Point Sources	-	2.14
TOTAL	31,958	18.51

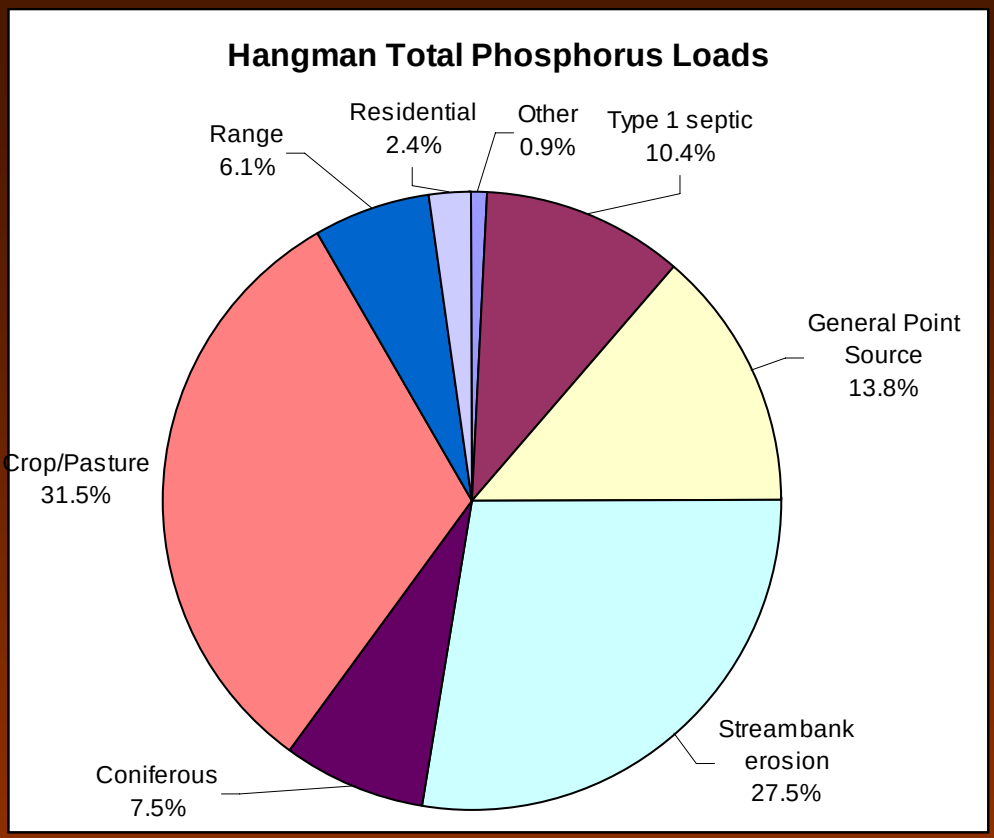
Hangman Creek at Bradshaw Road

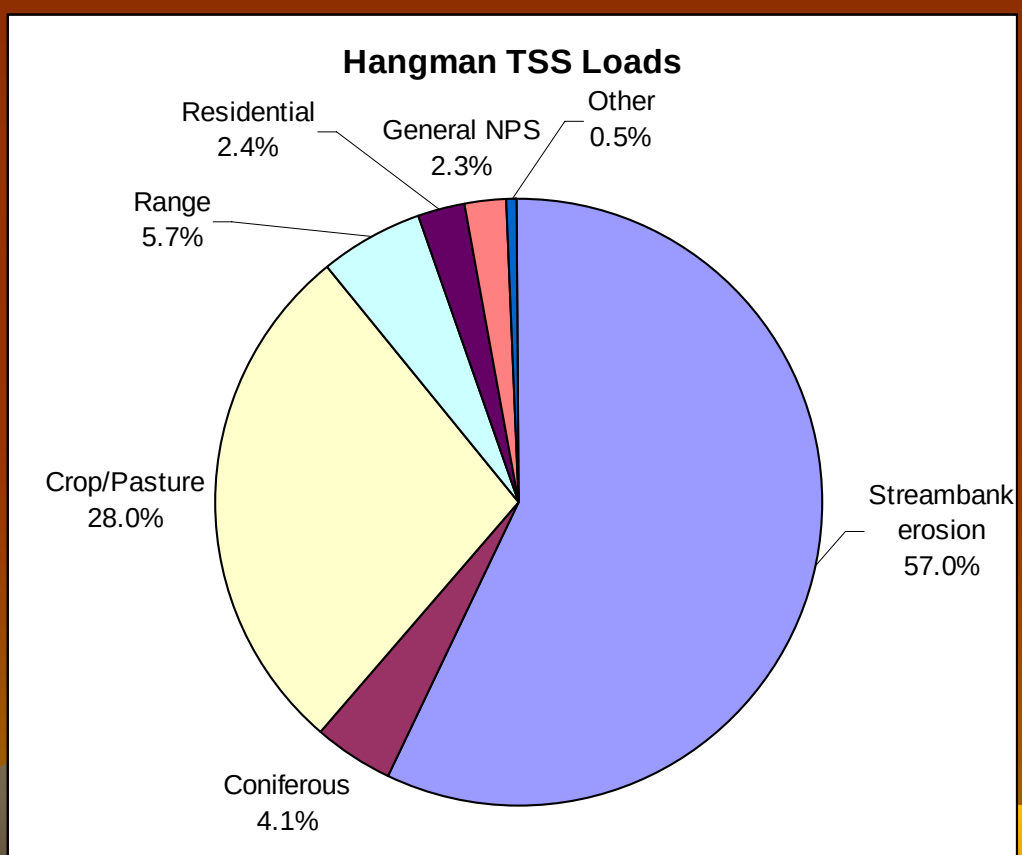
Source Category	TSS (kg/d)	TP (kg/d)
Deciduous	0.8	0.002
Coniferous	5,580	2.76
Mixed Forest	111	0.22
Cropland / Pasture	30,700	6.17
Rangeland	5,770	1.41
Forested Wetland	9	0.02
Non-forested Wetland	13	0.01
Barren	6	0.001
Residential	1,440	0.36
Comm./Industrial	623	0.10
General Nonpoint Sources	401	0.00
Stream Bank Erosion	1,160	0.14
Type 1 Septic System	-	3.64
General Point Sources	-	2.32
TOTAL	45,813	17.14

Hangman Creek at Tekoa

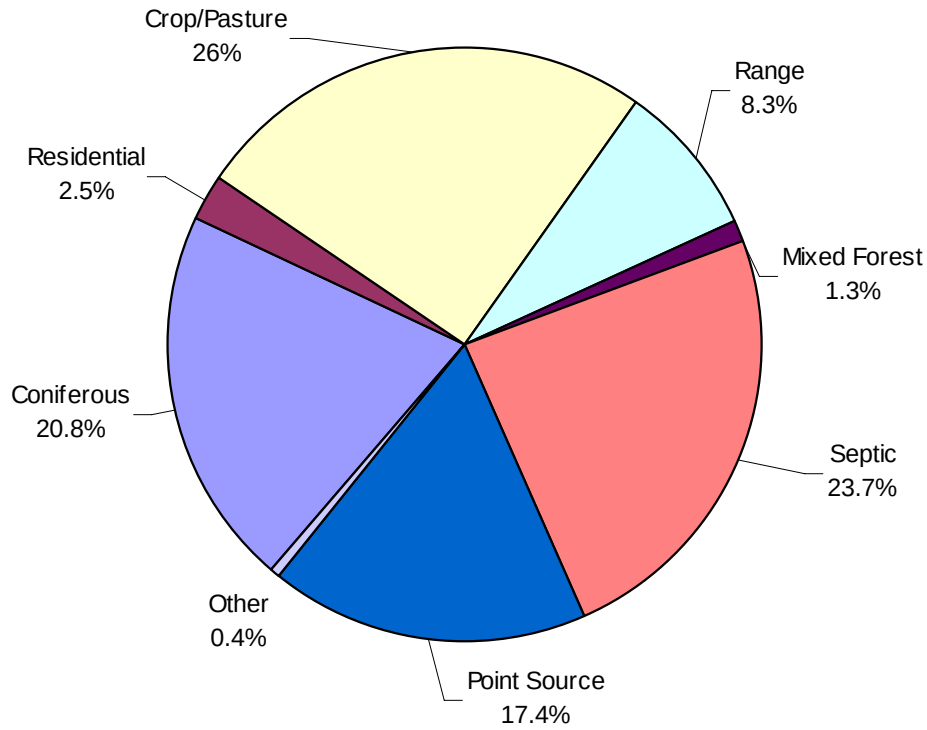
Source Category	TSS (kg/d)	TP (kg/d)
Deciduous	0.3	0.001
Coniferous	6,980	2.99
Mixed Forest	59	0.18
Cropland / Pasture	16,600	3.68
Rangeland	4,880	1.19
Forested Wetland	13	0.02
Non-forested Wetland	18	0.01
Barren	9	0.001
Residential	1,620	0.36
Comm./Industrial	189	0.03
General Nonpoint Sources	64	0.00
Stream Bank Erosion	15	0.00
Type 1 Septic System		3.41
WWTP Effluent		2.50
TOTAL	30,447	14.38

Note: Source characterization is cumulative. The mouth results account for everything. Bradshaw accounts for Tekoa, etc... A net loss in some source sediments are a result of downstream settling.

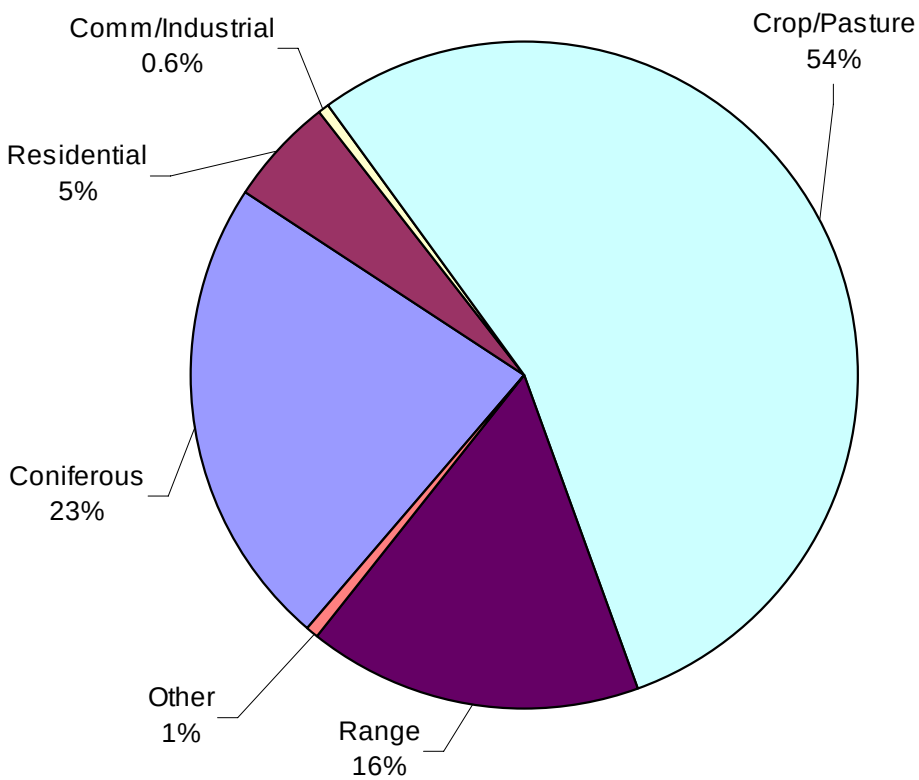

Hangman Total Phosphorus Loads
Range
6.1%
Residential
2.4%
Other
0.9%
Type 1 septic
10.4%
General Point
Source
13.8%
Crop/Pasture
31.5%
Coniferous
7.5%
Streambank
erosion
27.5%


Hangman TSS Loads
Residential
2.4%
General NPS
2.3%
Other
0.5%
Range
5.7%
Crop/Pasture
28.0%
Streambank
erosion
57.0%
Coniferous
4.1%

Tekoa Total Phosphorus Loads



Tekoa TSS Loads



Data Gaps

- Verify current land use and obtain future land use projection for the watershed
- Obtain better meteorological data, especially for the upper watershed (Idaho)
- More water quality monitoring data for the tributaries
- Obtain basic information to add the periphyton module so that phosphorus assimilation can be address
- Obtain more data from the WWTPs

WARMF Model Tasks

- Check model coefficients and assumptions
- Run monthly load summaries to compare to Spokane River TMDL allocation
- Run scenarios
- Develop Load Allocations and Wasteload Allocations

Possible Scenarios

- Reference condition or ‘natural condition’
- Point source controls or alternative treatment
- Agriculture best management practices
- Land use conversions
- State line action/non-action
- Other?

Next Steps / Tentative Schedule

- **January**: Work with WARMF model.
  - Check model calibrations
  - Conduct scenario simulations
  - Analyze results for TMDL targets
- **February / March**: Complete writing on fecal coliform, temperature, turbidity, and total phosphorus targets
  - Send technical portion of report to advisory committee for review
- **April / May:** Public Meetings