# Hangman (Latah) Creek

An update of water quality programs and processes in the watershed

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Spokane County Conservation District

Bringing People and Resources Together

# Who and Why

- The Conservation District and Ecology have been working with local stakeholders to assess Hangman Creek water quality issues
- Hangman Creek does not always meet the water quality standards
- The Clean Water Act mandates Ecology develop water clean up plans
- Spokane River TMDL may set some limits for Hangman Creek

# Workgroup Activities

- A workgroup of diverse stakeholders was formed to identify and discuss issues
- The workgroup met in Fairfield on the third Thursday of most months
- Idaho and the CdA Tribe are active and involved
- Today’s information is a result of the group’s work

# Water Quality Concerns

- **Hangman Creek**

Fecal coliform bacteria
Turbidity and sediment
Dissolved oxygen
pH
Temperature

- **Little Hangman Creek**

Fecal coliform bacteria
Turbidity and sediment

- **Rock Creek**

Fecal coliform bacteria
Turbidity and sediment
Dissolved oxygen

- **Rattlers Run Creek**

Turbidity and sediment

# Water Quality Issues Being Addressed in this TMDL Report

Fecal coliform bacteria

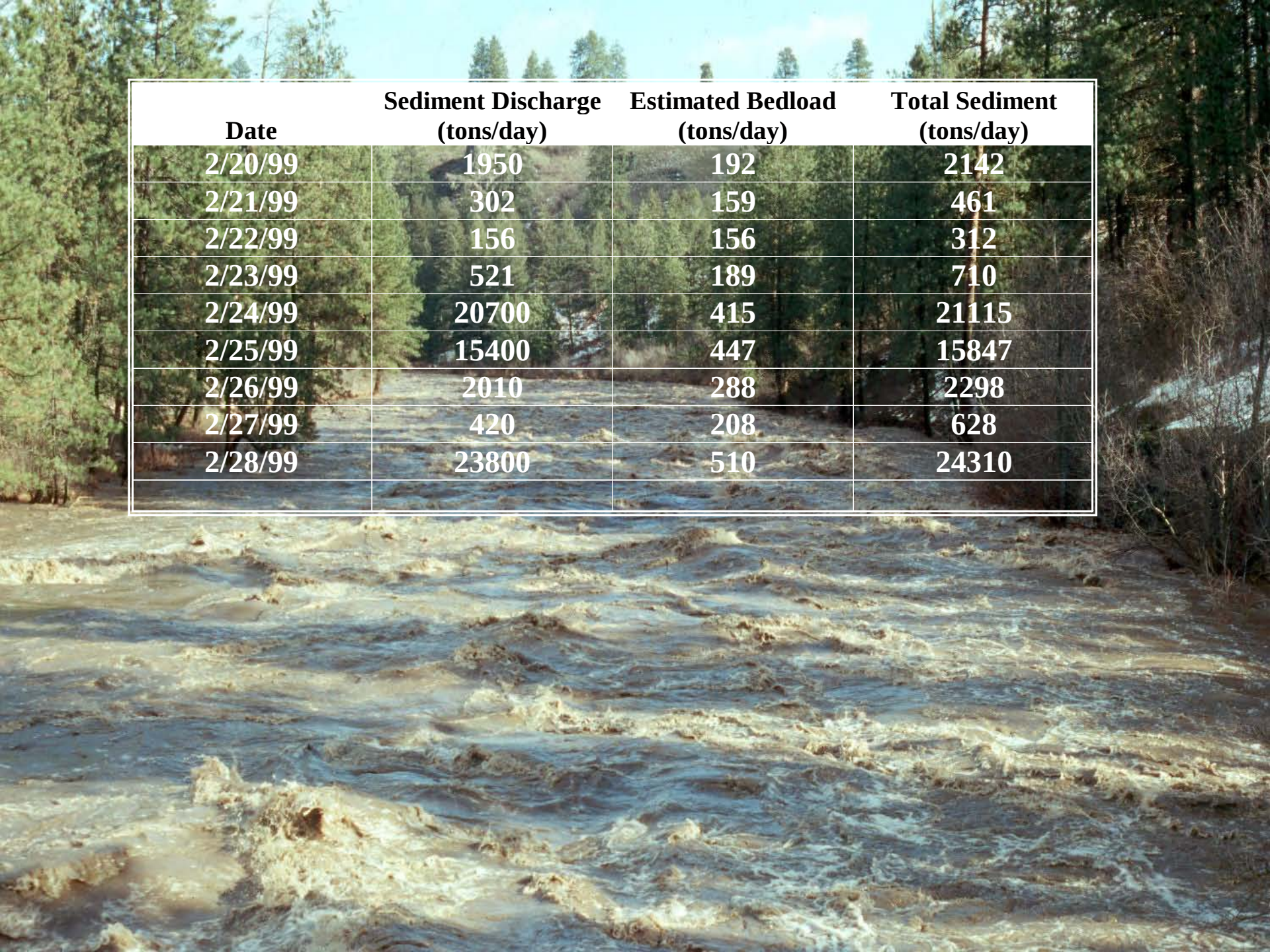
Turbidity and sediment

Temperature

Confluence of Hangman Creek and the Spokane River

Rock Creek confluence on 5/4/03

# Stable Outside Meander



| Date | Sediment Discharge (tons/day) | Estimated Bedload (tons/day) | Total Sediment (tons/day) |
|---|---|---|---|
| 2/20/99 | 1950 | 192 | 2142 |
| 2/21/99 | 302 | 159 | 461 |
| 2/22/99 | 156 | 156 | 312 |
| 2/23/99 | 521 | 189 | 710 |
| 2/24/99 | 20700 | 415 | 21115 |
| 2/25/99 | 15400 | 447 | 15847 |
| 2/26/99 | 2010 | 288 | 2298 |
| 2/27/99 | 420 | 208 | 628 |
| 2/28/99 | 23800 | 510 | 24310 |

# Where Are We Now?

- Ecology has completed the water quality goals for each sub-watershed
- The TMDL report is finished and Ecology is seeking comments about the report
- Workgroup will submit this report outlining the issues, recommendations, and goals to the EPA
- After EPA approval, develop an implementation plan including who will be involved, possible funding sources, and goals and timelines

# Total Maximum Daily Loads

## TMDLs

## Water Quality Improvement Plans

What?

Why?

How?

# What is a TMDL?

- It's a CLEAN-UP PLAN

- It's a PROCESS

- It's a DOCUMENT

- It's an AMOUNT OF A POLLUTANT

# What is a TMDL?

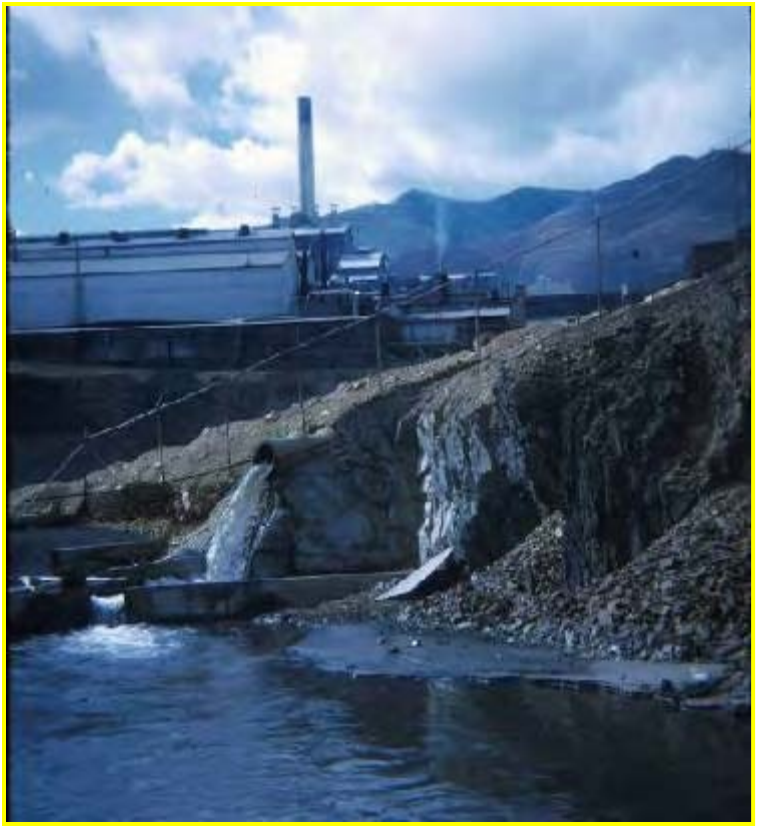
**TMDL = T**otal **M**aximum **D**aily **L**oad

**“the amount of a pollutant that a waterbody can receive and still meet water quality standards”**

# Allocations

**Waste Load Allocations (WLA) - are allocations for point sources of pollution**

- **End of pipe discharge**
- **Usually from a facility such as a wastewater treatment plant, a factory, or stormwater sewer outfall**

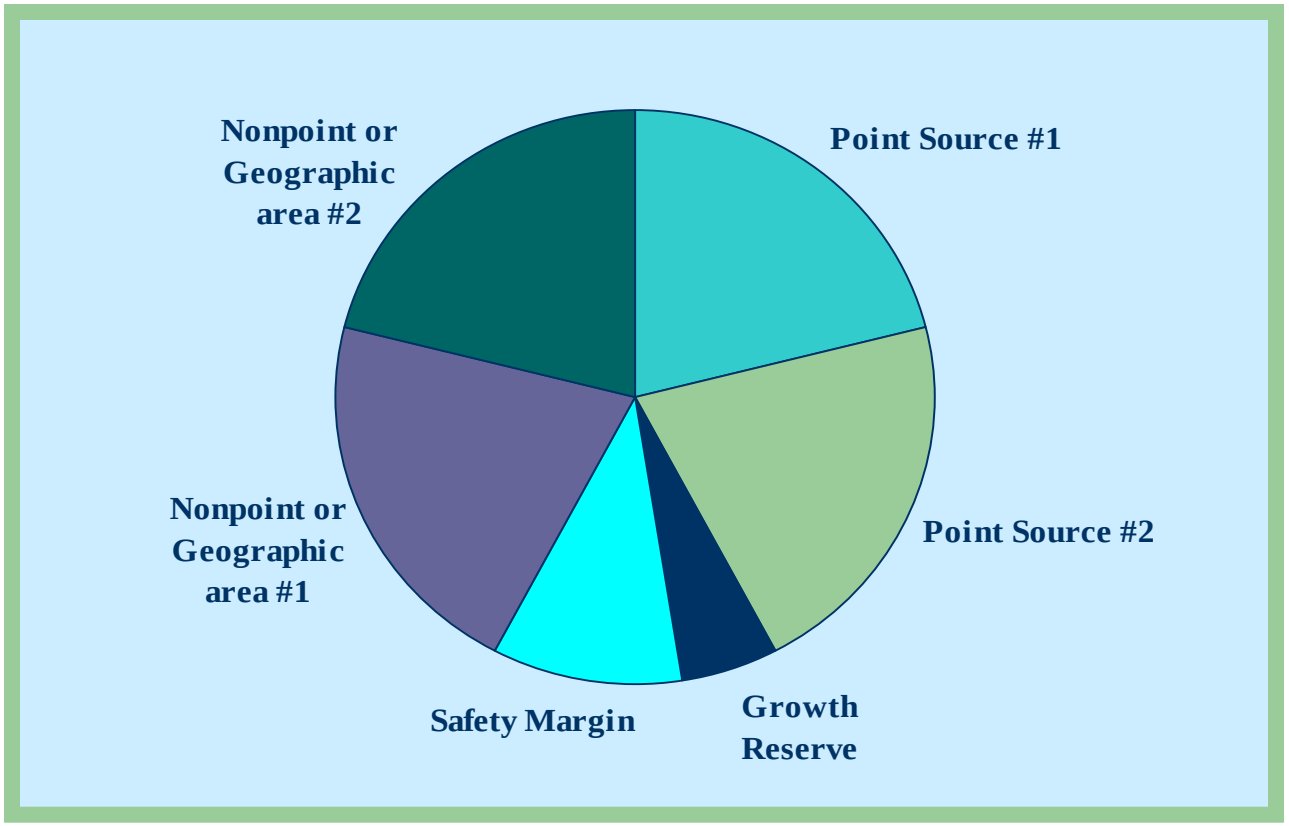


# Allocations - continued-

- **Load Allocations (LA) - allocations from nonpoint sources of pollution**
  - **From diverse sources**
  - **Exact source not easily determined**
  - **Examples include:**

- **Runoff from streets**
- **Fertilizer from lawns and crops**
- **Runoff from pastures**
- **Faulty septic tanks**

# The TMDL pie contains the maximum amount of pollutant divided into allocations for each source



# Parts of the Process

- **Problem Assessment**
- **Technical Analysis and Allocation**
- **Implementation Strategy**
- **Implementation Plan**
- **Monitor effectiveness**

# Why do TMDLs?

1) To protect water
2) It's the law
3) Lawsuit compliance

# The Law

- The Clean Water Act (CWA) requires states to set water quality standards for surface waters to protect public and environmental health.

- These standards protect water for beneficial uses such as:

  - Drinking Water
  - Recreation
  - Fishing
  - Aquatic Habitat
  - Irrigation
  - Livestock

# The Clean Water Act

- Streams and lakes not providing these beneficial uses are placed on a list of impaired waterbodies
  - The 303(d) list

- Waterbodies on the 303(d) list must have a TMDL developed for them to correct the impairment

# Lawsuit Compliance

- **1990's:** several citizen lawsuits around the US claimed that EPA and states were not implementing section 303(d) of the Clean Water Act in a timely manner.
- **1998:** In January 1998, Ecology, EPA, and two environmental advocate groups agreed to a clean up schedule directing how Washington state will improve the health of nearly 700 water segments by the year 2013.
- This agreement was outlined in a Memorandum of Agreement (MOA).

# How the process works?

- Hangman Creek and its tributaries failed to meet the state water quality standards
- Placed on a list of impaired water bodies (the 303(d) list) in 1996, 1998, 2004, & 2008
- The water body was prioritized and then scheduled for a TMDL

# The Hangman Creek TMDL

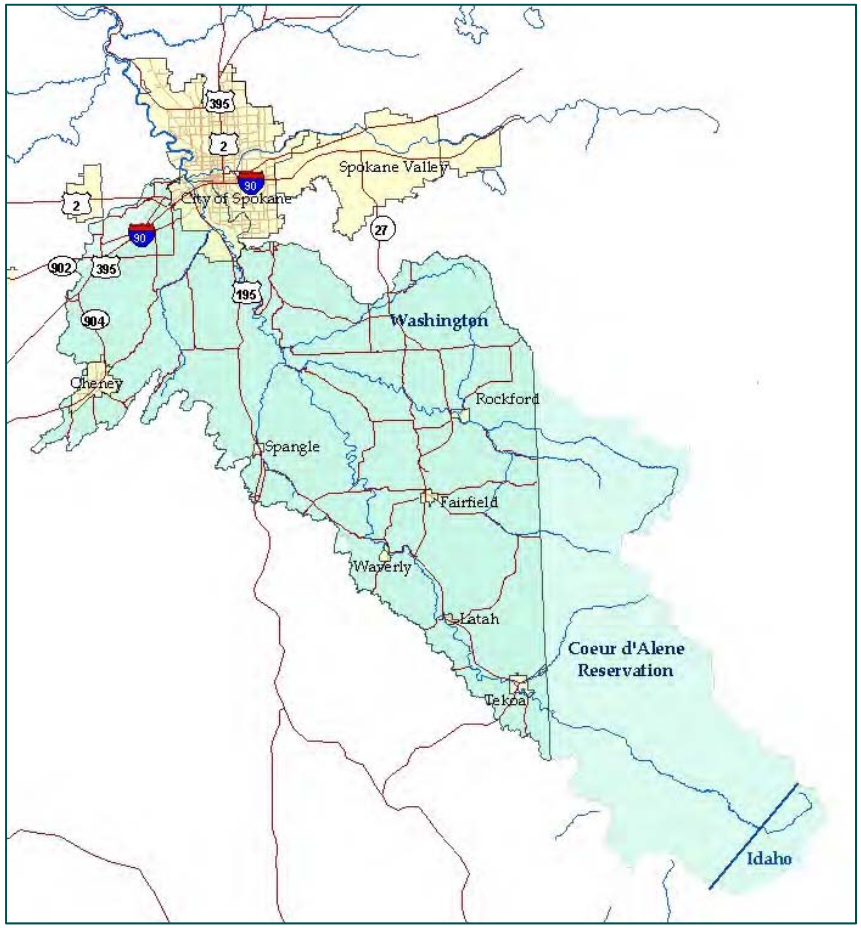
- Began Hangman Creek TMDL in 2003
  - Study December 2003-August 2004
  - Public meetings to announce effort March 2004
  - Advisory group formed April 2004
- Addresses
  - fecal coliform bacteria
  - temperature
  - turbidity/total suspended solids
- Also listed for dissolved oxygen and pH

# Ecology worked with

- Cities and towns in watershed
- Spokane County
- Spokane County Conservation District
- Hangman Creek Watershed Planning Unit
- Coeur d'Alene Tribe
- Agricultural representatives
- Individual citizens
- Businesses
- Landowners

To develop the plan to reduce the pollution.

# The Hangman (Latah) Creek Watershed



# Quick Review of TMDL Process

Water body violates water quality standards

Water body is listed on 303(d) list
[Section 303(d) of the Clean Water Act]

Problem(s) verified

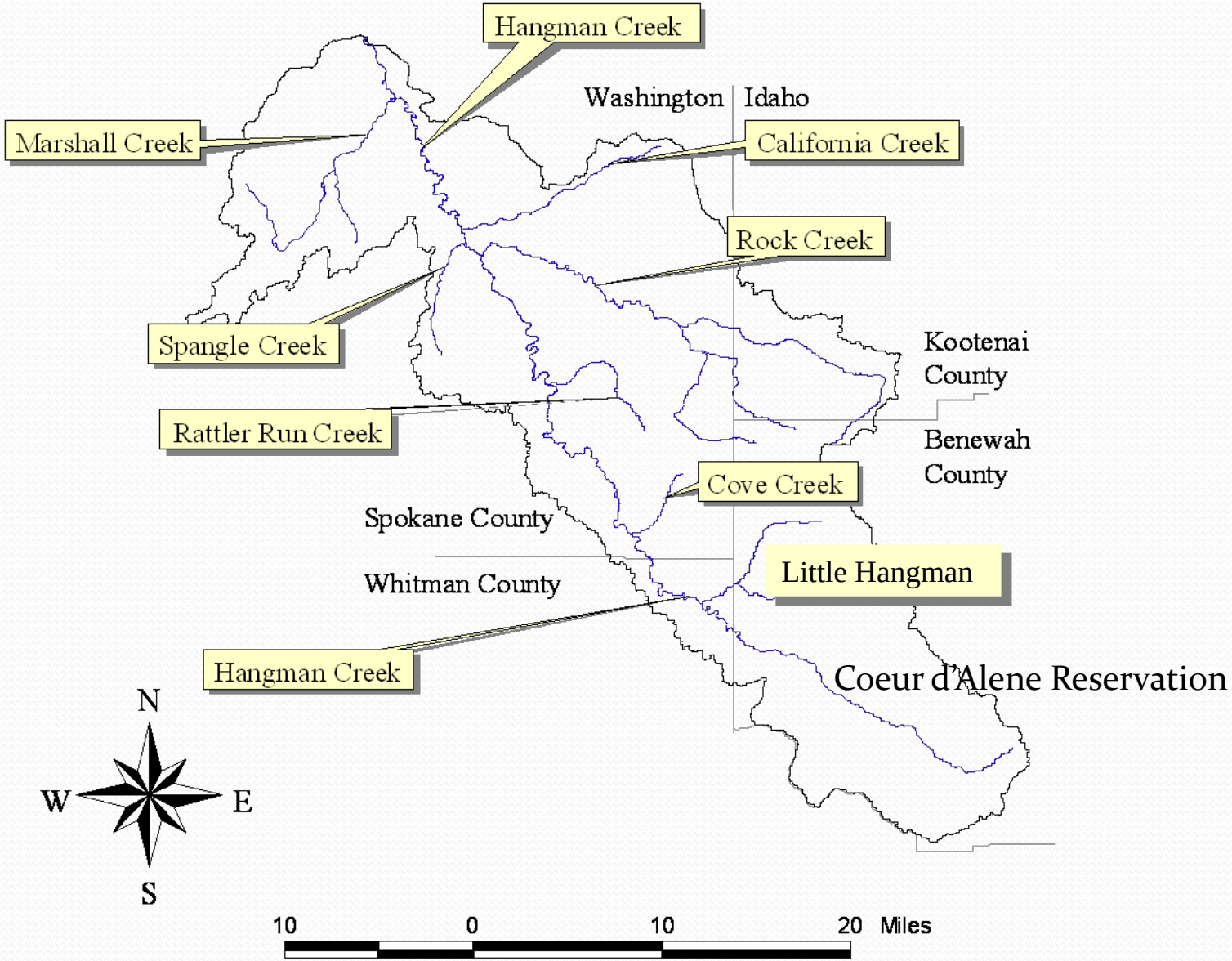
TMDL Study to determine water's capacity to assimilate pollutant

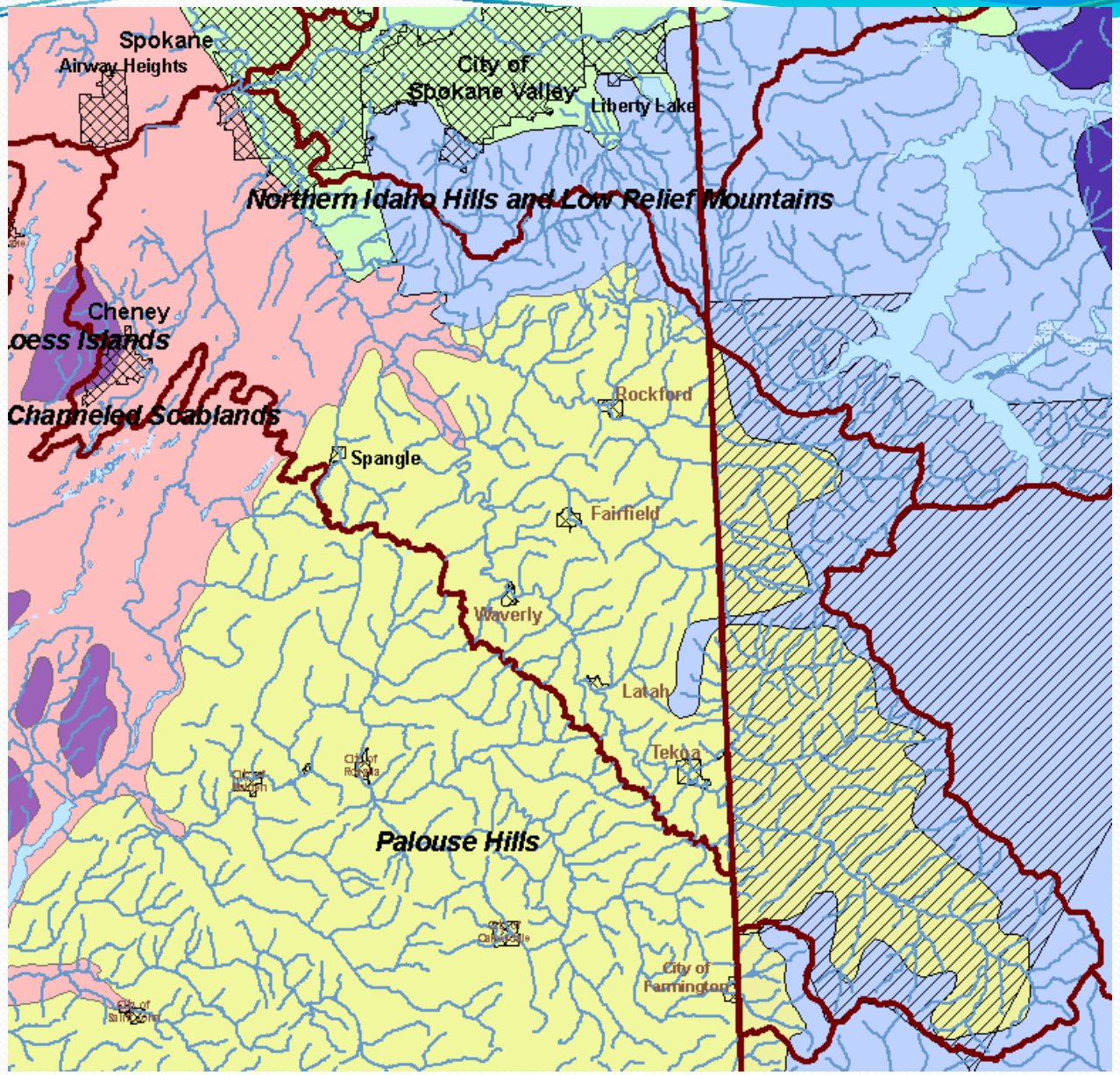
TMDL Study used as a tool to develop strategies to reduce pollution

We are here

TMDL Study and strategies (SIS) sent to EPA for approval

After EPA approval develop a detail implementation plan
(1 year to complete)


Hangman Creek
Washington
Idaho
Marshall Creek
California Creek
Rock Creek
Spangle Creek
Kootenai County
Rattler Run Creek
Benewah County
Cove Creek
Spokane County
Little Hangman
Whitman County
Hangman Creek
Coeur d'Alene Reservation
N
W
E
S
10
0
10
20
Miles


Spokane
Airway Heights
City of
Spokane Valley
Liberty Lake
Northern Idaho Hills and Low Relief Mountains
Cheney
oess Islands
Channeled Scablands
Rockford
Spangle
Fairfield
Waverly
Latah
Tekoa
Palouse Hills
City of
Farmington

# Where's the Problem?

| Waterbody Name | Listed Parameter | Listing Identification Number |
|---|---|---|
| Hangman Creek | Fecal Coliform | 16862 |
| | | 16863 |
| | | 6726 |
| | | 41992 |
| | Turbidity | 40942 |
| Little Hangman Creek | Fecal Coliform | 41994 |
| | Turbidity | 40940 |
| Rattler Run Creek | Turbidity | 40941 |
| Rock Creek | Fecal Coliform | 41996 |
| Hangman Creek | Temperature | 3736 |
| Rock Creek | Turbidity | 40943 |

# Hangman Creek TMDLs

- Reduce **Fecal coliform bacteria** to protect human health
- Lower **Temperature** to protect aquatic life
- Decrease **Suspended Sediment and Turbidity** to protect aquatic life, reduce flooding potential, reduce nutrient and toxics transport, and reduce the need for dredging in the Spokane River

# Sampling and Measurements

- Spokane County Conservation District studies from 1994 – 2008
- Washington Department of Ecology monthly sampling at the mouth since 1970; treatment plant and aquatic organism surveys
- Monthly sampling reports from treatment plants in Tekoa, Fairfield, Rockford, Spangle, Cheney, and others
- Watershed Planning Unit contracted studies 2000 – 2003
- US Geological Survey streamflow measurements
- Coeur d'Alene Tribe water quality and fisheries studies
- Eastern Washington University and Washington Department of Fish & Wildlife fish surveys

# Analysis

- **Statistical tests**
- **Comparisons to water quality standards**
- **Pollutant load calculations**:
  - streamflow x concentration = lbs/day load
- **Computer models**
  - Statistical models
  - Water quality models
  - Watershed models

# Fecal Coliform Bacteria TMDL

- Standards set to **protect primary and secondary contact recreation** (swimming, fishing, boating, etc.)
- Allowed **100** coliform units/ 100 milliliters on **average**, but not more than **200** coliform units/100 milliliters **10%** of the time
- **Critical condition** determines which samples are included when comparing to the standards

# Fecal Coliform Bacteria TMDL

- Bacteria loads show a **decreasing trend**, but it may have to do with decreasing streamflows
- **High water and storm events** any time of the year are the usual cause of high bacteria counts
- Most places in the watershed **do not meet** the 'not more than **10%** of samples shall exceed **200** coliform/100 milliliters', **<u>but</u>** <u>none exceed the average</u>

# Fecal Coliform Bacteria TMDL

- Ran **statistical tests to determine the reductions** needed at each site that did not meet standards
- **Adjusted treatment plant limits** to ensure instream protection (2002 -2005 reports)
- **Assigned wasteloads** to **stormwater** jurisdictions
- **Compared** upstream **loads** to downstream loads to evaluate possible sources

# Fecal Coliform Bacteria TMDL

## Recommended Reductions

- **50% - 75%**: Hangman, Little Hangman, and Rock Creek
- **80% - 85%**: Cove Creek and Rattler Run – mainly as nonpoint source
- **~50%**: Marshall and California Creek in some reaches, others less

**Targets do not replace the standard**

# Temperature TMDL

- *To protect the designated aquatic life uses of "Salmonid Spawning, Rearing, and Migration, and Salmonid Rearing and Migration Only" the highest 7-day, average daily maximum temperature must not exceed 17.5°C (63.5°F) more than once every ten years on average.*

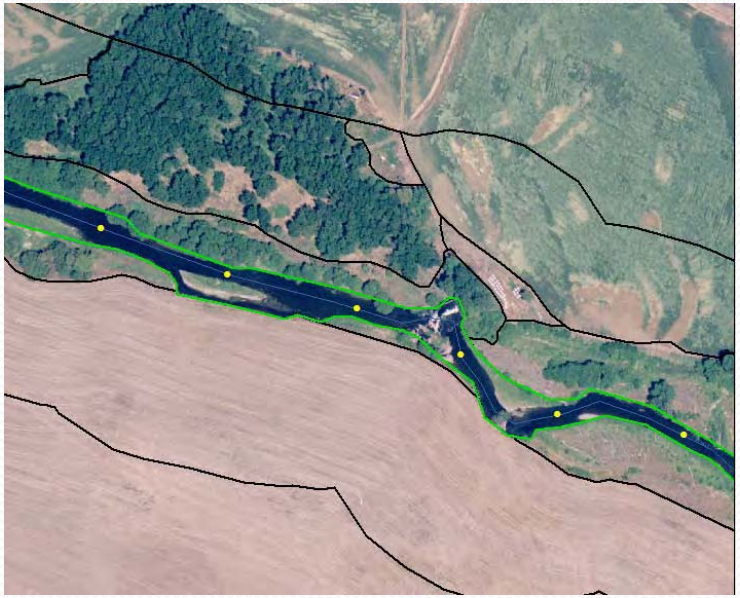
- *When a waterbody is naturally warmer than the criterion, the state provides an additional allowance for additional warming due to human activities. In this case, the combined effects of all human activities must not cause more than a 0.3°C (0.54°F) increase above the naturally higher (inferior) temperature condition.*

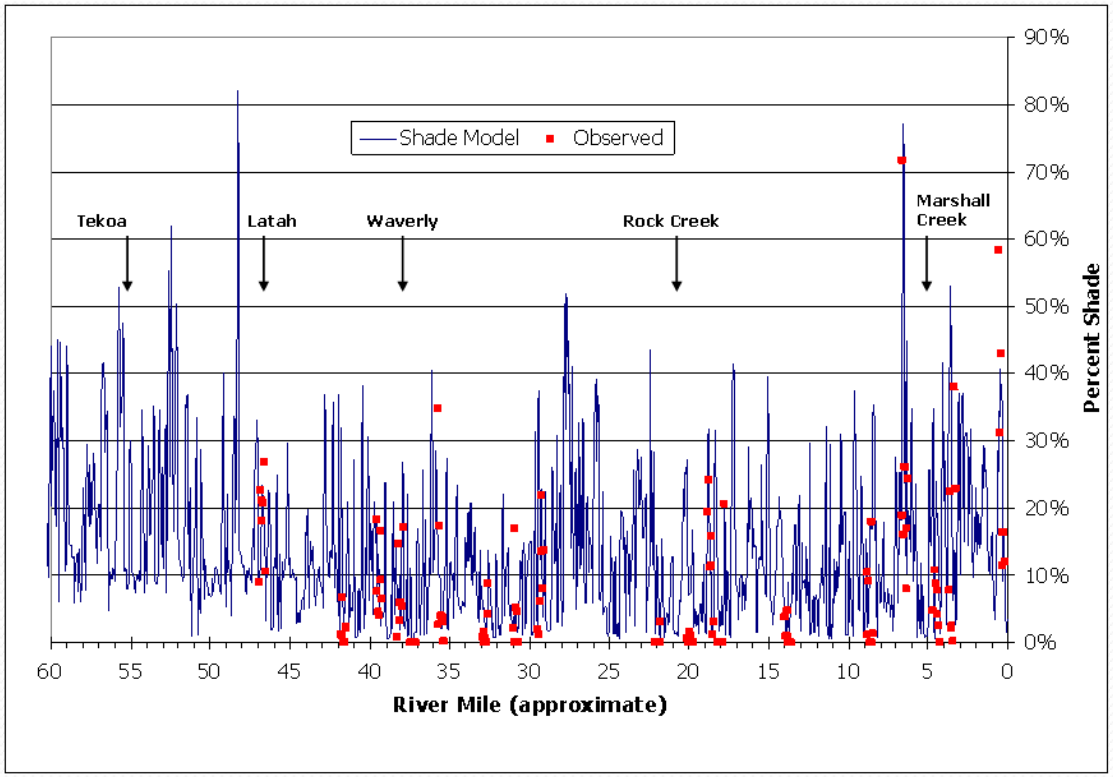
# Temperature TMDL

- Hardin-Davis (2003) collected temperature and streamflow data with assistance from the Spokane County Conservation District. Applied data to a Stream Network Temperature (SNTEMP) model.

# Temperature TMDL

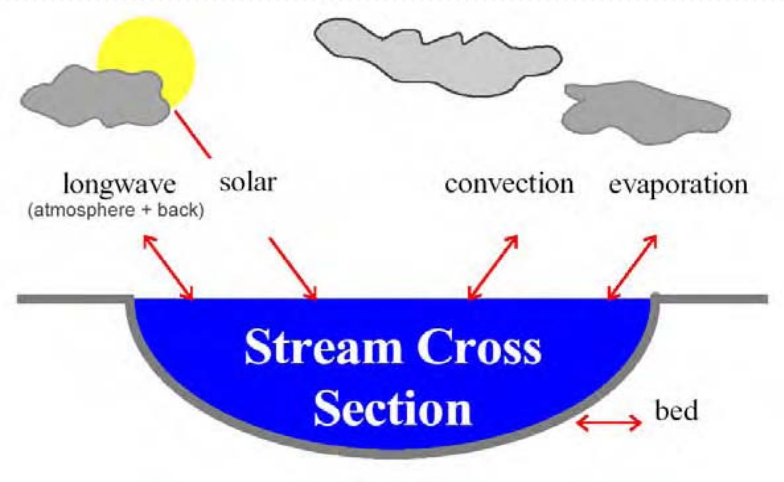
- Calculate current shade conditions using digitized aerial photos and GIS and then compared to field measurements

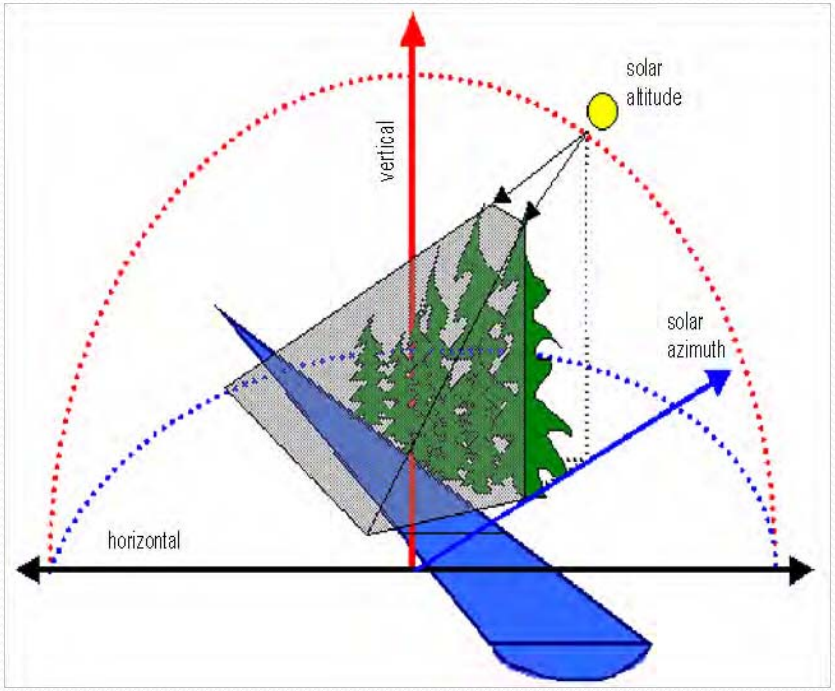




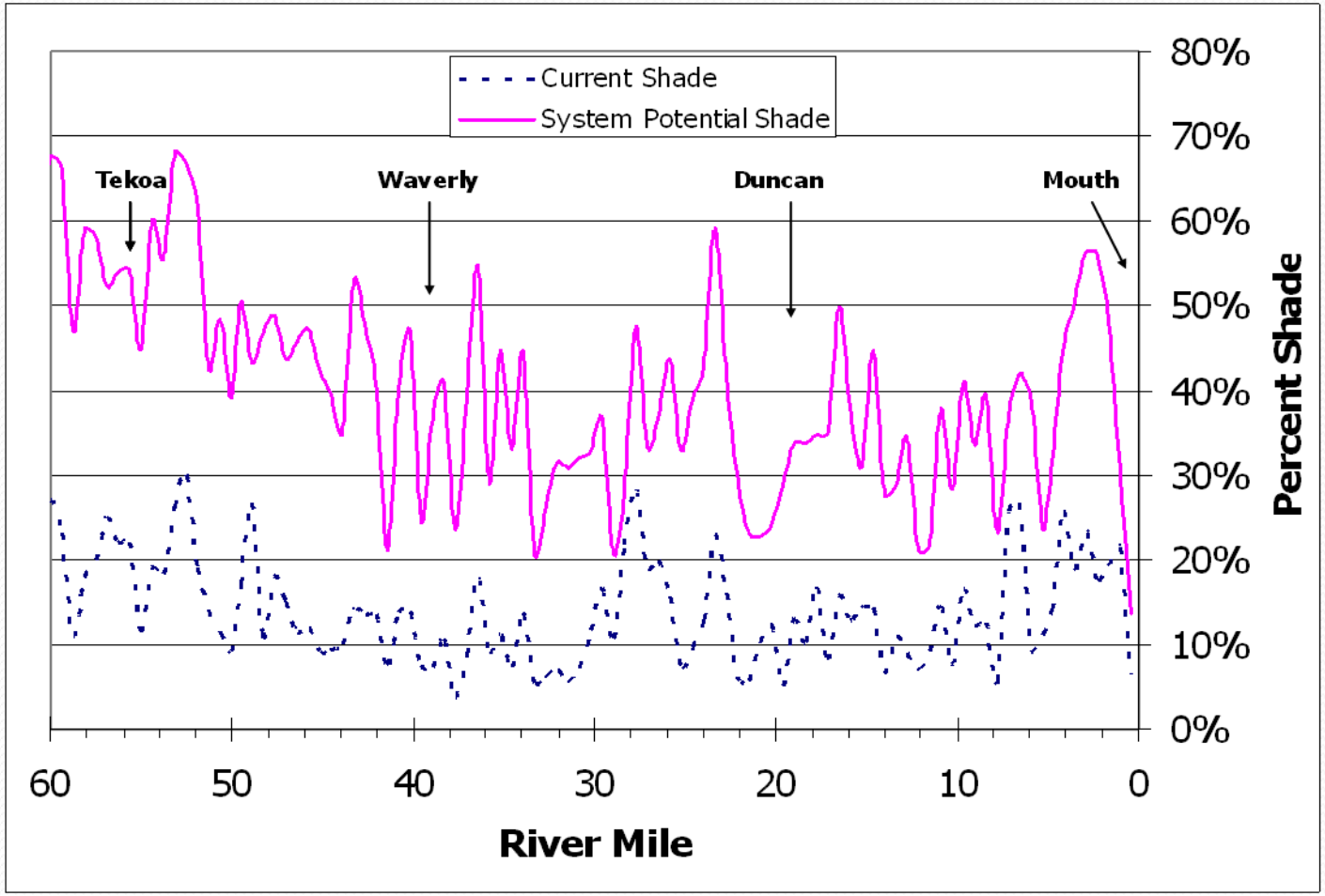
# Temperature TMDL

- Calculate solar radiation influx for current shade conditions and potential shade with the modeling tools.
- Potential shade vegetation estimates based on historical land surveys and soils data, and consulting Spokane County Conservation District



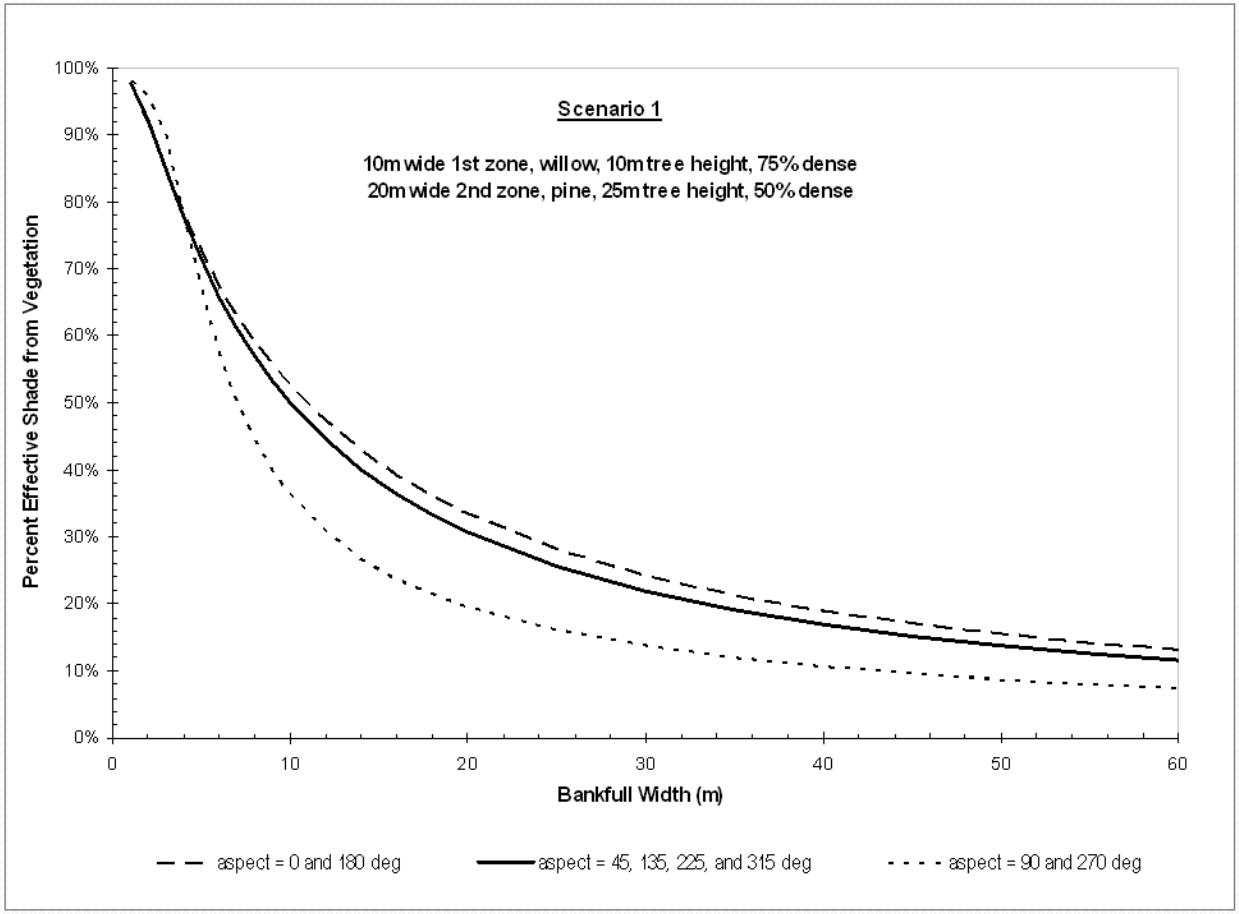



# Temperature TMDL




**Increases of 7% to 43%** along the mainstem to meet effective shade requirements

# Temperature TMDL




Tributary shade requirements will be determined using a shade curve based on the mainstem assumptions

# Temperature TMDL

- Tekoa and Spangle WWTPs
  - Maximum temperature effluent limits recommended to prevent addition instream heating - **7DADMs in June, July, and August of 18.2º C, 21.5º C, and 17.7º C**, respectively
  - Temperature monitoring is now required at all WWTPs – any new discharges will need to meet limits
- Stormwater jurisdictions
  - The most critical season (June through August) rarely has storm events of enough intensity and duration to generate significant municipal stormwater that would increase stream temperatures over a 7-day period.
  - Spokane County, the City of Spokane, and WSDOT will ensure stormwater does not heat the creek or tributaries

# Turbidity and Suspended Sediment TMDL

- *"Salmonid Spawning, Rearing and Migration" and "Non-anadromous Interior Redband Trout,"* ***turbidity*** *must not exceed:*
  - ***5 NTU over background*** *when the background is 50 NTU or less; or*
  - ***a 10% increase in turbidity*** *when the background turbidity is more than 50 NTU.*

- Under the narrative water quality standard - toxics and aesthetics criteria.
  - *Toxic, radioactive, or deleterious material concentrations must be below those which have potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health…*[(WAC 173-201A-260 (1) (b)]

# Turbidity and Suspended Sediment TMDL

- **Effects on aquatic communities**:
  - (1) acting directly on the fish swimming in the water and either killing them or reducing their growth rate, resistance to disease, etc.;
  - (2) preventing the successful development of fish eggs and larvae;
  - (3) modifying behavior, natural movements, and migrations; and
  - (4) reducing the abundance of available food.

# Turbidity and Suspended Sediment TMDL

- **Other effects of concern**:
  - Significant correlation of suspended sediment with phosphorus – **phosphorus transport**
  - Some **pesticides, metals, and polynuclear aromatic hydrocarbons** from city and farm sources transported by sediments
  - **Sediments fill** creek **channels** and river **pools**:
    - Flooding hazard
    - Decrease pool capacity for river and dam operations

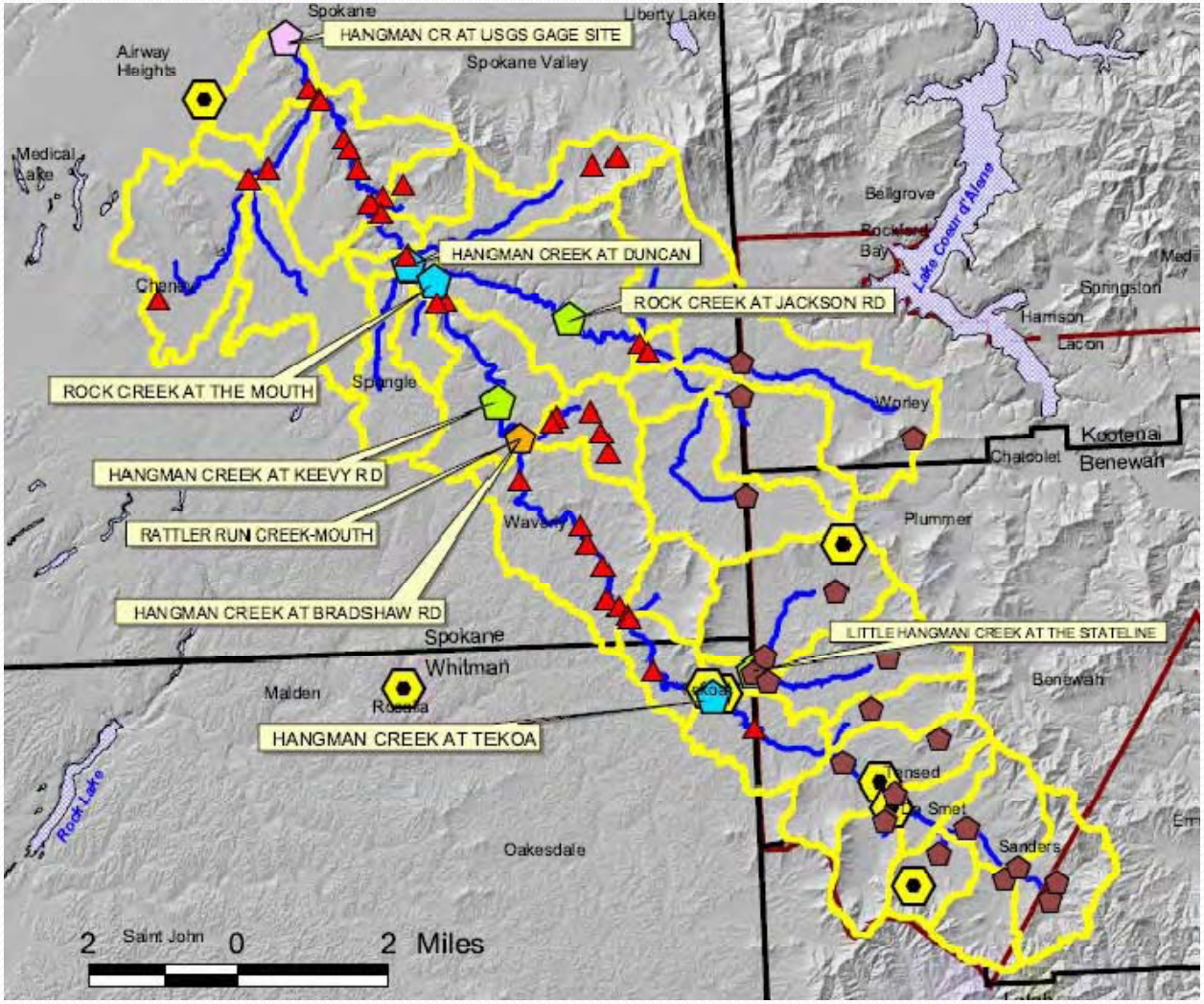
# Turbidity and Suspended Sediment TMDL

- Total suspended solids (TSS) concentrations and turbidity show a **decreasing trend** over the past 10 years, <u>but</u> may have to do with decreasing streamflows
  - Recent **efforts to improve** the stream channel, restore riparian areas, and a switch to less erosion-prone farming practices **may also have helped** reduce loads
- **Highest concentrations and loads** occur during **winter and spring** snowmelt and runoff events
- **Naturally eroding (Lake Missoula flood sediment) streambanks** and **highly erodible (Palouse) soils** are present in various parts of the watershed
  - Further destabilized by poor road-building and construction practices, channel modification, and some agricultural practices.

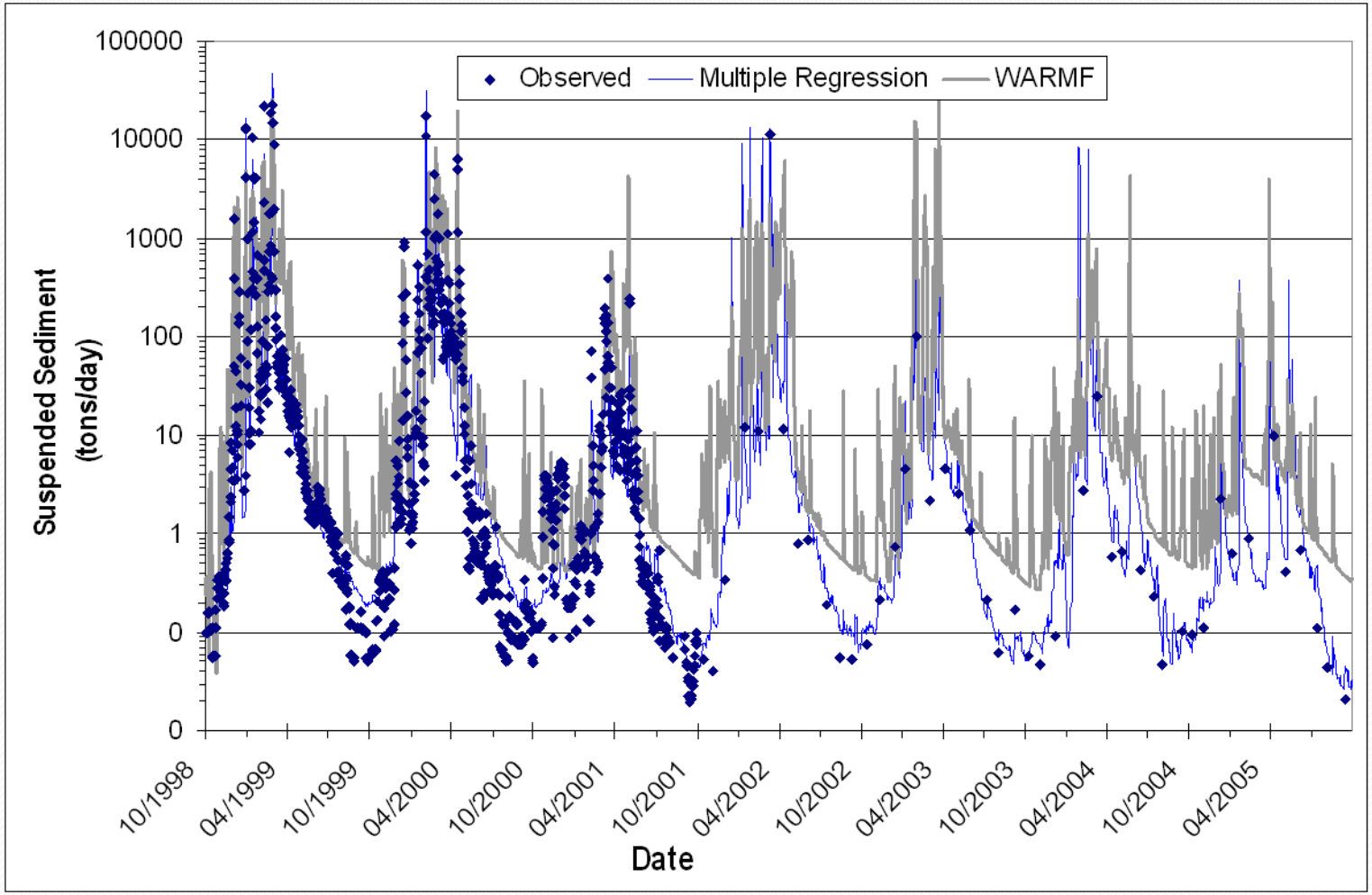
# Turbidity and Suspended Sediment TMDL

- **Analytical tools** used to examine the suspended sediment and turbidity data:
  - **Statistical tests** were run to compare sediment and turbidity values.
  - A **multiple regression** analysis method to simulate the suspended sediment loading at the mouth of Hangman Creek over 14 years.
  - A **watershed pollutant delivery model** was developed to see where sediment loads were coming from and how they were transported through the watershed.
  - **Severity scores** calculated to determine level of harm to trout

# Turbidity and Suspended Sediment TMDL



# Turbidity and Suspended Sediment TMDL



# Turbidity and Suspended Sediment TMDL

## Full protection scenario in WARMF to determine reductions of total suspended solids

- The following actions were identified by the Advisory Committee for the full protection scenario:
  - Convert 60% of the agriculture in the watershed to direct seed or conservation practices.
  - Reduce the streambank erosion in the upper watershed (above Fairfield) by 50%, and high-bank erosion in the lower watershed from Lake Missoula flood sediments by 10%.
  - Increase forest cover in catchments above Rockford and Tensed by 50%.
  - Limit residential growth to levels below 10% in the lower watershed (catchments 3, 4, 7, 9 and 10).
  - Riparian buffers established all along the mainstem channels and tributaries.

# Turbidity and Suspended Sediment TMDL

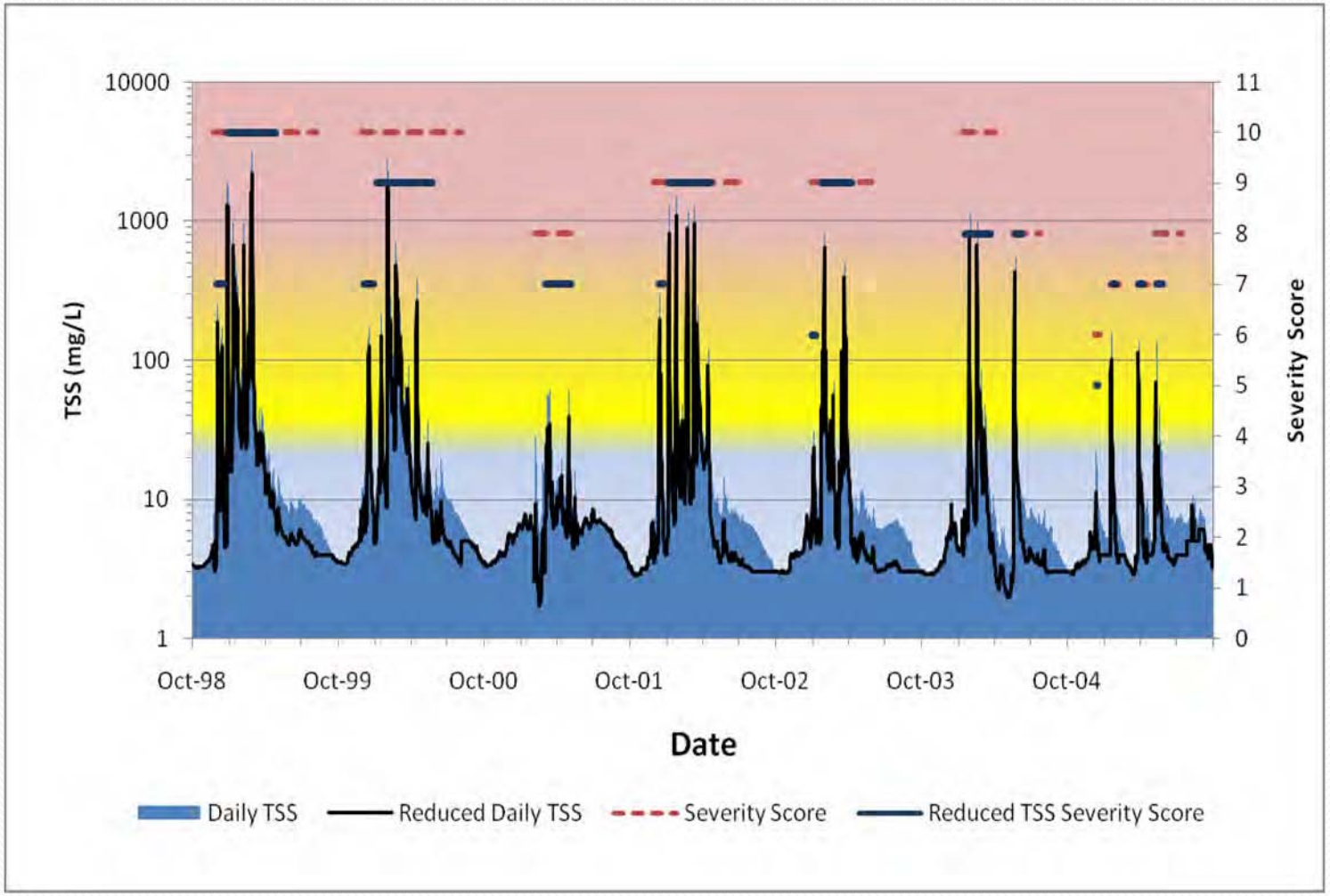
| Water Year | Estimated Annual Suspended Load (tons/year) | Estimated Reduction | Estimated Load Capacity (tons/year) |
|---|---|---|---|
| 1999 | 188,252 | 22% | 147,206 |
| 2000 | 90,677 | 25% | 67,872 |
| 2001 | 1,604 | 31% | 1,109 |
| 2002 | 73,770 | 28% | 53,326 |
| 2003 | 16,503 | 21% | 13,101 |
| 2004 | 30,605 | 32% | 20,846 |
| 2005 | 2,832 | 29% | 2,022 |

| Site | Overall Reduction | Primary Sources | Reduction to Sources |
|---|---|---|---|
| Hangman Creek at Bradshaw Road | 19% | Conventional Agriculture | 56% |
| | | Streambanks | 74% |
| | | Rangelands | 31% |
| Little Hangman Creek | 15% | Conventional Agriculture | 55% |
| Rattler Run Creek | 15% | Conventional Agriculture | 54% |
| Rock Creek at Jackson Road | 17% | Conventional Agriculture | 55% |
| | | Rangelands | 18% |
| | | Streambanks | 90% |

# Turbidity and Suspended Sediment TMDL

| Severity Scale | Description of Effect |
|---|---|
| **No Effect** | |
| **0** | No behavioral effects |
| **Behavioral Effects** | |
| **1** | Alarm reaction |
| **2** | Abandonment of cover |
| **3** | Avoidance response |
| **Sub-lethal Effects** | |
| **4** | Short-term reduction in feeding rates or feeding success |
| **5** | Minor physiological stress; increased coughing, increased respiration rate |
| **6** | Moderate physiological stress |
| **7** | Moderate habitat degradation; impaired homing |
| **8** | Indications of major physiological stress; long-term |
| **Lethal and Paralethal Effects** | |
| **9** | Reduced growth rate; delayed hatching; reduced fish density |
| **10** | 0 – 20% mortality; increased predation; moderate to severe habitat degradation |
| **11** | >20 – 40% mortality |
| **12** | >40 – 60% mortality |
| **13** | >60 – 80% mortality |
| **14** | >80 – 100% mortality |

# Turbidity and Suspended Sediment TMDL



# Hangman TMDL Recommendations

- Ecology will need to work with EPA, the Coeur d'Alene Tribe, and Idaho to reduce cross-border bacteria and TSS loads and to reduce instream temperatures in upper Hangman Creek, Little Hangman Creek, and Rock Creek.
- Most sites require more sampling to better identify sources of bacteria and seasonal patterns, especially where livestock, wildlife, and waterfowl sources are suspected.
- Direct livestock access to riparian areas should be limited to prevent fecal wastes and streambank sediment from directly or indirectly entering the waterways.
- Municipal Phase 2 Stormwater NPDES Permit, permit holders must map their stormwater systems, and determine if stormwater may be contributing bacteria, heated water, or TSS to surface water.
- Sources of fecal coliform and sediment from rural, suburban and urban areas should be addressed through best management practices (BMPs).

# Hangman TMDL Recommendations

- Channel restoration measures, including the restoration of a functioning riparian area, should be implemented throughout the watershed to reduce erosion and heat loads on the stream.
- All WWTP facilities should monitor receiving water and effluent temperatures, and discharge volumes during spring through fall. These data will help us to understand thermal and dilution cycles so that compliance schedules and operational/facility options can be designed.
- Aquatic communities and suspended sediment loads should continue to be monitored to establish baselines and to measure success with erosion control and other improvements.
- Conversions of conventional agricultural practices to conservation practices is needed to meet the load allocations in this TMDL as this action will have the biggest impact in reducing TSS in the watershed.
- WARMF or a similar model should be supported with better local data for calibration and scenario-building.

SCCD

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# Workgroup Issues of Concern

**Identified Issues (not prioritized)**

- Sediment/nutrients from agricultural operations
- Sediment/fecal bacteria from livestock
- Sediment from agricultural field ditches
- Nutrient/chemicals from residential uses
- Improper functioning septic systems
- Sediment from gravel and summer roads
- Sediment from stream banks
- Sediment from storm water
- Forestry management
- Sediment from roadside ditches

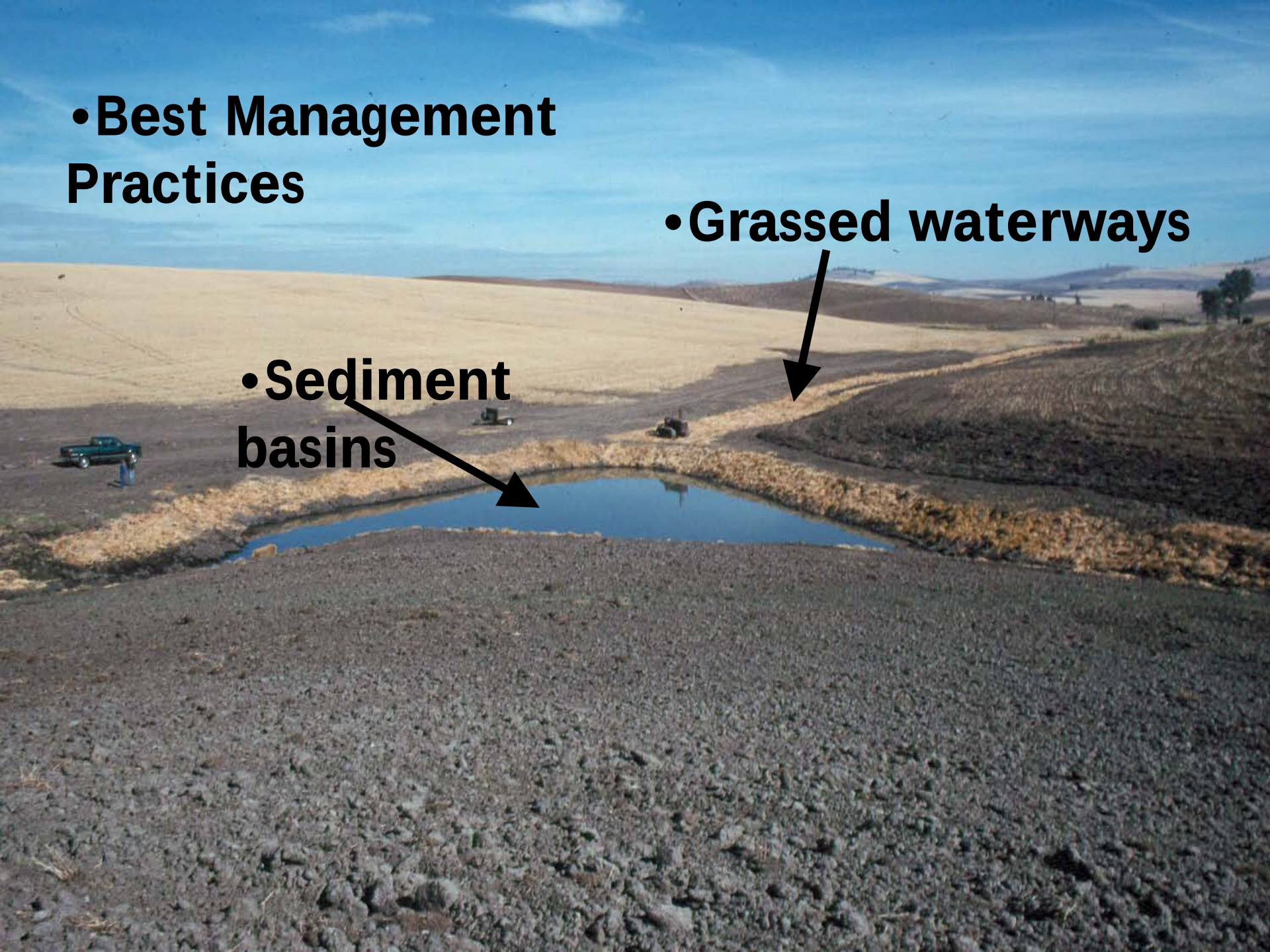
# Improvement Ideas

**Identified practices that may help improve water quality**

- Minimum till and direct seed
- Riparian buffers/livestock fencing/off-creek watering
- Sediment basins and grassed waterways
- Filter strips
- Divided slopes
- Proper ditch maintenance and construction
- Uphill plowing around ditches
- Nutrient management and manure retention facilities
- Grazing management

# Future Prospects

- Ecology recognizes a lot of the work growers have already done
- Some long-term water quality trends do suggest improvement
- Non-point source improvement programs are available


•Best Management Practices
•Grassed waterways
•Sediment basins

- Riparian buffer plantings

- Livestock Management

# What’s Being Done?

- The Conservation District provides cost-share funds and technical assistance
- NRCS has a variety of conservation programs
- Completion of this TMDL report will help obtain future grants and funding
- Spokane River TMDL and dischargers could help fund some non-point source improvement work

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# State Revolving Fund Loan Program

- Funds are made available by:
  - The Washington State Department of Ecology
  - The Environmental Protection Agency
  - Spokane County Conservation District

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CD Partners: Spokane, Palouse, Palouse-Rock Lake, Pine Creek, Whitman, Asotin, Columbia, Adams, Walla Walla, Pomeroy, Lincoln, Grant, Franklin , Stevens, Benton, South Douglas, and Eastern Klickitat Conservation Districts.

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- Eligible Purchases include:
  - Implements which aid in the direct placement of seed and/or fertilizer in one or two passes (No-till and Minimum tillage drills, air drills, fertilizer placement implements, sprayers, and power units).

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- Eligible Purchases include:
  - Implements that aid in the removal or management of residue (Heavy harrows, mowers/shredders, swathers, balers and bale handling equipment).

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- Direct Seed Mentor Program
  - Program designed to pair an established direct seeder with a producer Interested in direct seeding.
  - Funding provided by the State of Washington's Ag Pilots Program.

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- Direct Seed Mentor Program
  - Program Funding Ends June of 2009
  - Currently have 8 mentor-producer teams participating in the program.

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- Direct Seed Mentor Program
  - Goal is to take the learning curve out of direct seeding
  - Gain some needed economic data from both the mentor and the producer operations.

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Conservation
is in our hands

Handle With Care

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