

# Grand County Stream Management Plan

Prepared for Grand County, Colorado



Tetra Tech, Inc.  
HabiTech, Inc.





# Grand County Stream Management Plan

## Goals:

*Identify target flows that will benefit and **protect stream health,***

*Manage for target flows while maintaining water supply requirements through **coordinated** water operations; and*

*Identify **opportunities** for enhancements and **physical restoration.***





# *Indicators of stream health*

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Focus on environmental flows for support of fish species and life stages, including suitable aquatic habitat for self-sustaining populations

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What are the conditions that best maintain ecological needs of stream in relation to fisheries

Flows

Stream temperatures

Water quality

Riparian health and stability





# Outline

- **Provide a brief overview of work completed**
- Review methodology and key findings
- Present general recommendations
- Discuss important monitoring parameters and the 'learning by doing' process
- Questions, discussion



# Timeline

- Phase 1 : Assess existing information, develop approach
- Phase 2: Implementation (field work, analysis, documentation)
- Phase 3a: Additional field work
- Phase 3b: Prioritize reaches based on existing conditions, assess potential future conditions, and develop restorative concepts
- Monitoring: Spawning Bar Core Sampling

	2007												2008												2009												2010											
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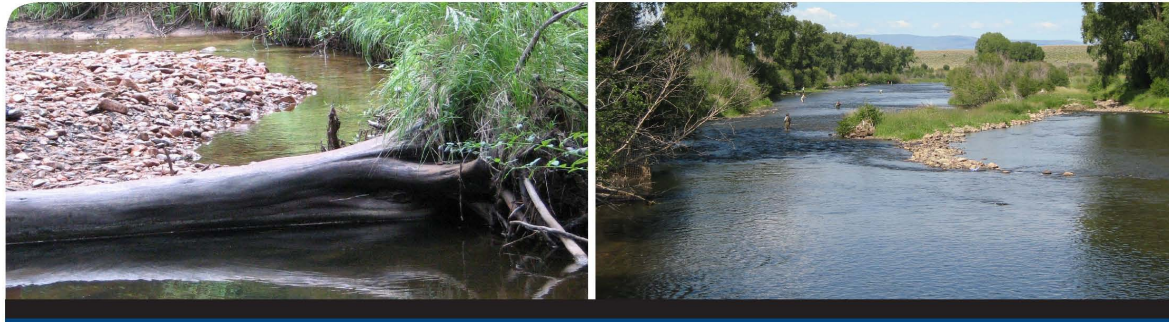


# Draft Report

[http://co.grand.co.us/WRM/Draft\\_Report/draft.html](http://co.grand.co.us/WRM/Draft_Report/draft.html)



AUGUST 2010



## DRAFT REPORT

STREAM MANAGEMENT PLAN  
GRAND COUNTY, COLORADO  
PHASE 3

PREPARED FOR GRAND COUNTY, COLORADO  
WITH SUPPORT FROM  
DENVER WATER  
NORTHERN COLORADO WATER CONSERVANCY DISTRICT

PREPARED BY  
TETRA TECH, INC.  
HABITECH, INC.  
WALSH AQUATIC CONSULTANTS, INC.



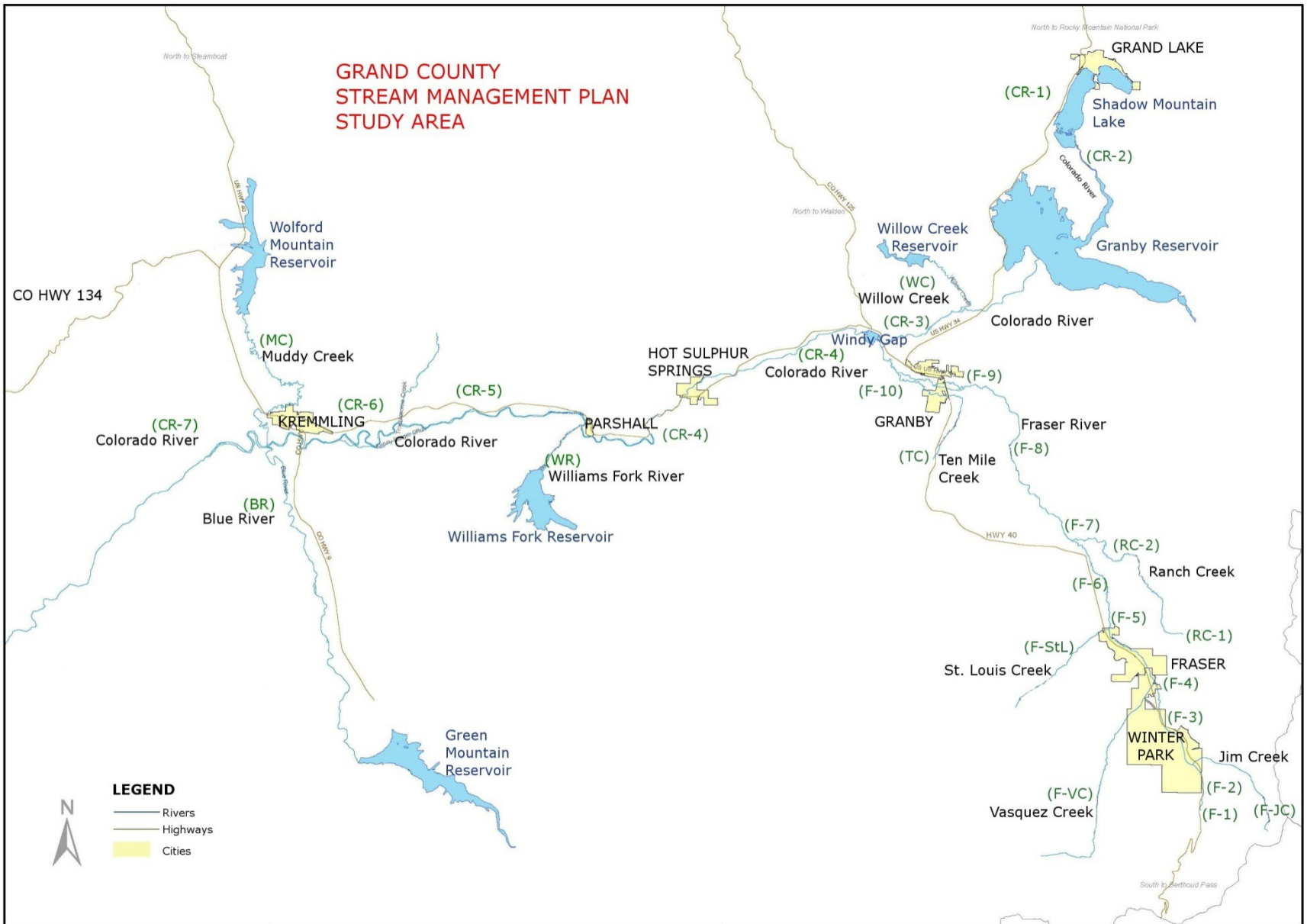


# Stream Management Plan

- **Executive Summary**
  - Objectives and Key Findings
  - Restoration Overview
  - Learning by Doing
- **Reaches Summaries**
  - Reach Description
  - Flow Recommendations
  - Study Results
  - Restoration Opportunities
- **Appendices**
  - Methods
  - Review of Temperature Data
  - Review of Water Quality Data
  - Water Users and Recreation
  - Survey Data
  - Restoration Measures



# Study Area







# Project study area

- 80 River miles including:
  - Colorado River
  - Willow Creek
  - Williams Fork
  - Blue River
  - Muddy Creek
  - Fraser River
  - Jim Creek
  - Vasquez Creek
  - Ranch Creek
  - St. Louis Creek





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# Aquatic Habitat

- Field based
- Focus
  - Species- browns, rainbows, brook trout
  - Life stages- adult, juvenile, spawning/incubation
- Recommendations for target flows
  - Summer (April-September)
  - Winter (Oct-March)
  - Spawning bar flush





# METHODS

## Channel Surveys and Hydraulic Measurements



- Foot, float & fly surveys
- Detailed instream flow surveys
- EPA rapid assessments
- Channel stability evaluation
- Riffle stability evaluations
- Spawning surveys
- Barrier surveys for fish passage
- Core Sampling in spawning bars

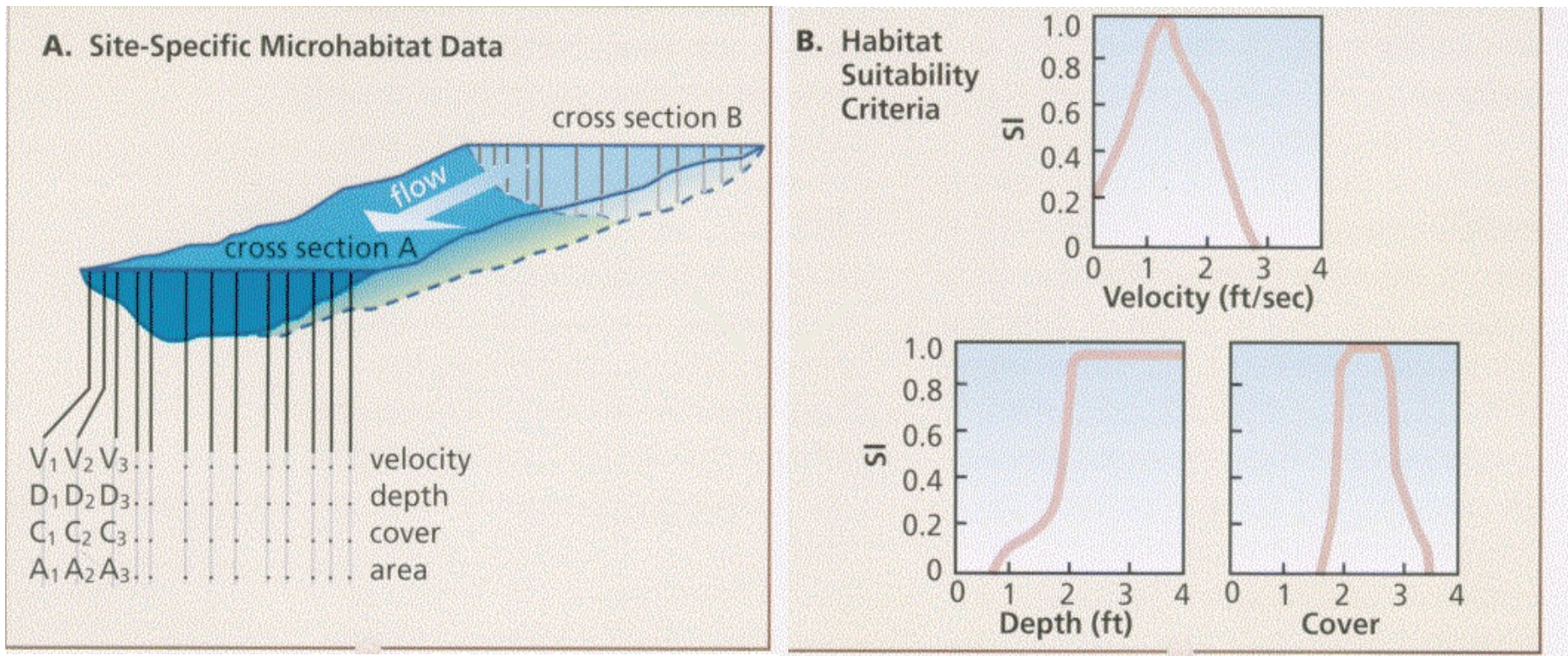




# PHABSIM

A Tool for Determining Instream Flow Targets

Physical **HAB**itat **SIM**ulation

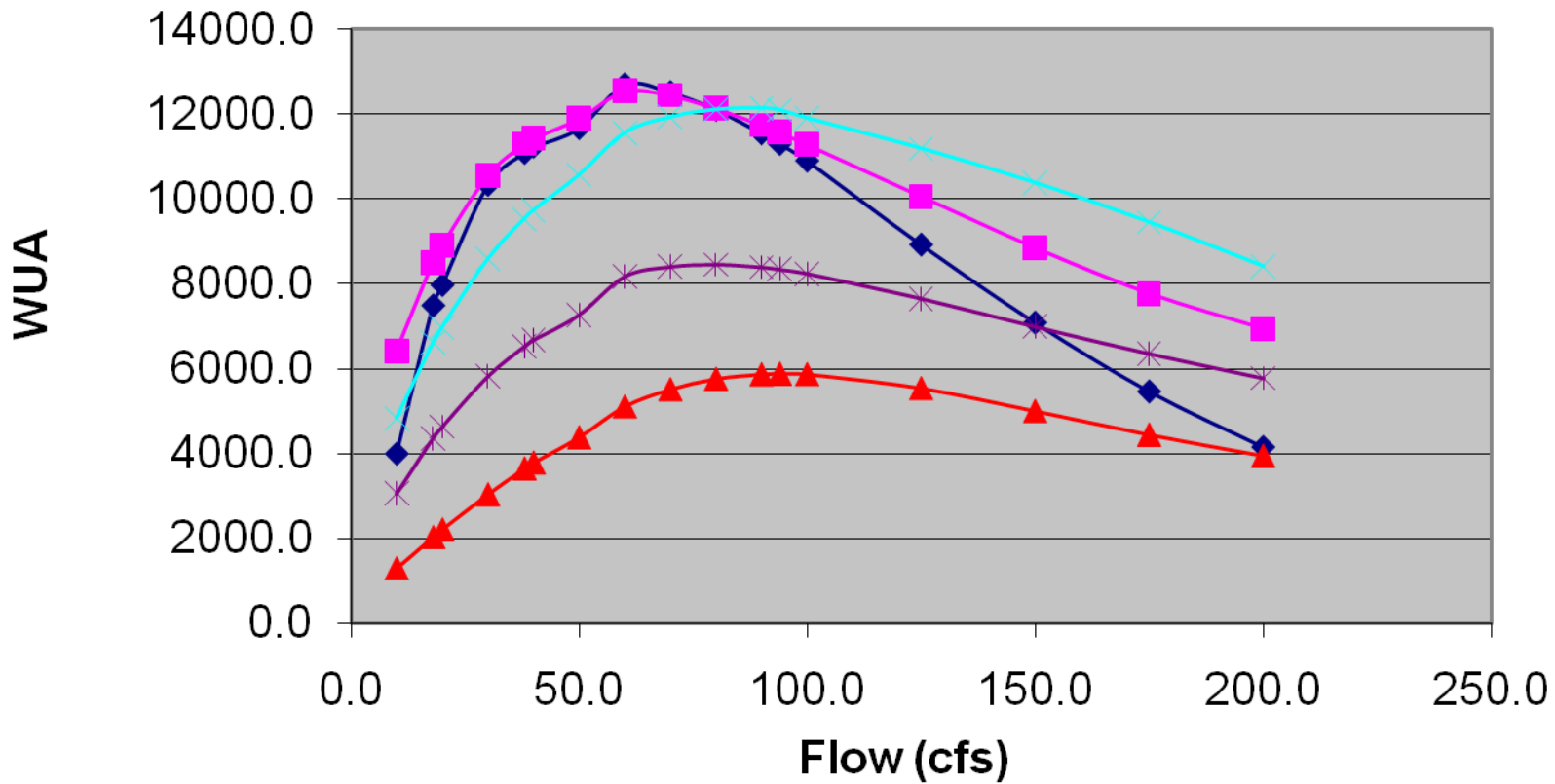
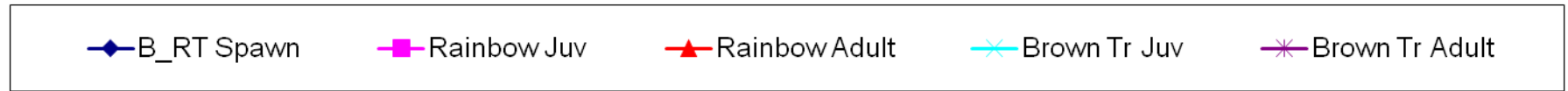


FISRWG 1998





# Example of Phabsim Output





# Colorado River Below Windy Gap

- Environmental Flows
  - Target Flow Range
  - April through September  
200-400 cfs
  - Oct-March 125-250 cfs
- Spawning bar flush
  - Minimum 600 cfs, 1  
year in 2 for 3 day duration



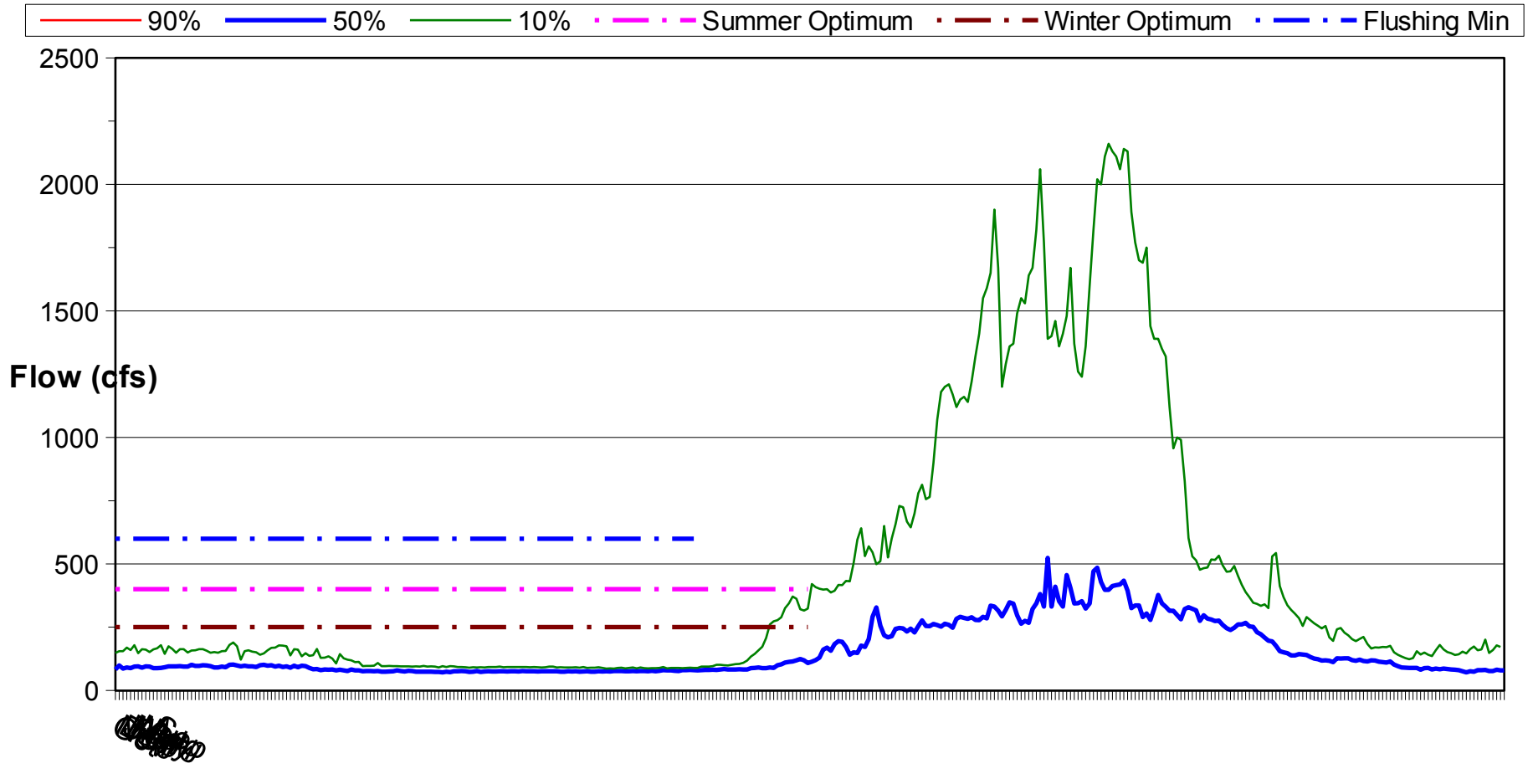
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# Hydrographs from Existing Gage Data Colorado River at HSS USGS 9034250

Flows Equal or Exceeded, Water Years 1986-2007







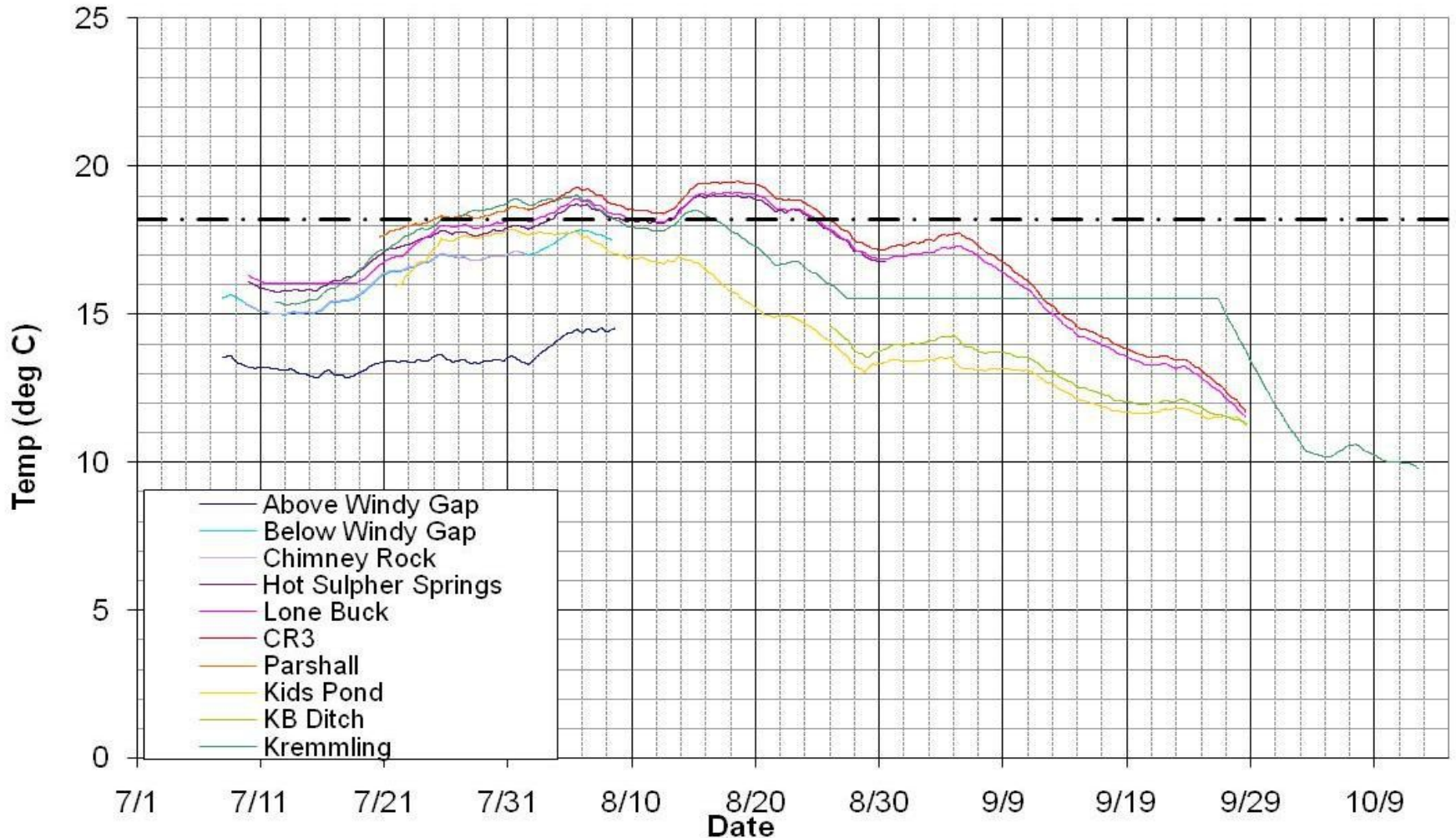
# Surface Water Temperature

- Review existing available data
- Chronic temps based on State standards **17.0°C** (Tier I), and **18.2°C** (Tier II), 7 day rolling average (**MWAT**)
- Daily Maximum **21.2°C** and **23.8°C** for Tier I and II respectively (**DM**)
- **Key Findings:** most segments are within State standards most of the time with the general exception of July and August when:
  - Colorado River from Windy Gap to Williams Fork exceed state stds for the MWAT
  - Ranch Creek daily temperatures frequently exceed the state stds for the DM

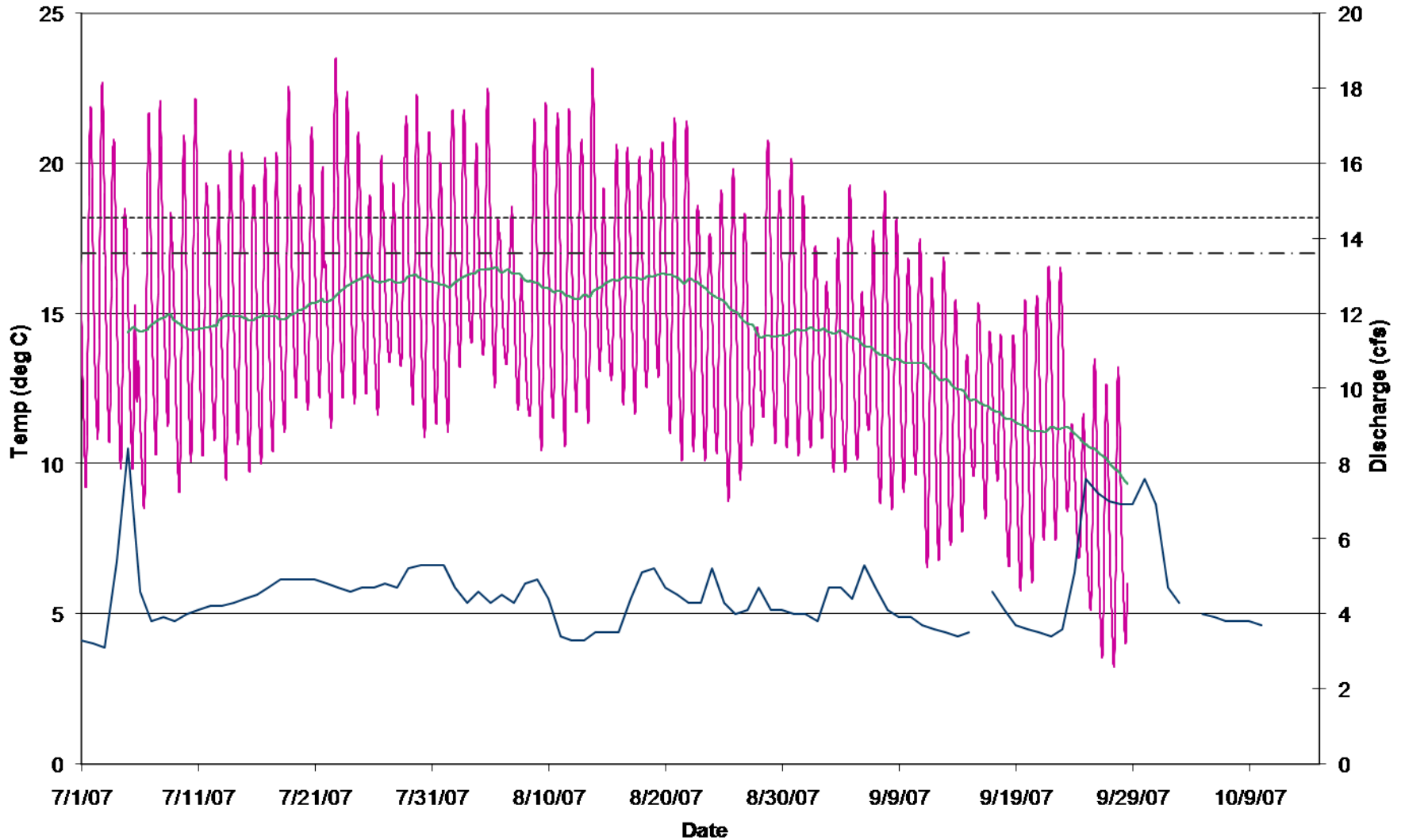
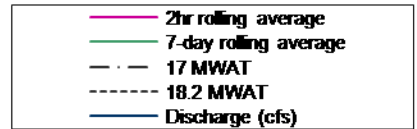




# Key Findings: Colorado River Water Temperatures, 7-day MWAT Summer 2007



# Ranch Creek Water Temperatures 2007 GCWIN





# Water Quality of Streams

- Existing available data
- Generally found most samples taken after mid 1990's (following WWTP upgrades) within standards.
- Parameters
  - Dissolved Oxygen
  - pH (F6/F7) (may be related to algae)
  - Turbidity
  - Nitrates
  - Phosphorus
  - Ammonia
  - Manganese
  - Iron
  - Copper (F6-F10 on 303(d) list for monitoring and evaluation)
  - Hardness
- Union Pacific Moffat Tunnel discharge
- Algae (filamentous, didymo)
- Whirling disease





## Key Findings-Aquatic Habitat (relative to existing conditions)

- ✓ **Late summer flows typically lower than target ranges on most reaches, especially portions of Fraser, Ranch Creek, Colorado River below Granby Reservoir, Colorado River below Windy Gap.**
- ✓ Temperature exceedences occur on Colorado River below Windy Gap and on Ranch Creek.
- ✓ **Summer flow targets based on adult trout habitat; adult trout habitat in short supply in comparison to juvenile.**
- ✓ Trout spawning is generally occurring system-wide with the exception of below Windy Gap.





## Key Findings-Aquatic Habitat (relative to existing conditions)

- ✓ Localized fine sediment issues system-wide, but most severe in upper Fraser, Muddy Creek and below Windy Gap.
- ✓ **Flushing flows too infrequent on some reaches (Colorado River below Granby and below Windy Gap; Upper Fraser, Ranch Ck)**
- ✓ Winter flows are low and infrequently meet target ranges.
- ✓ **Fish passage hampered by variety of control structures throughout system.**





# Outline

- Provide a brief overview of work completed
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- **Present general recommendations**
  - **Enhancement proposal**
  - **Physical restoration**
- Discuss important monitoring parameters and the ‘learning by doing’ process
- Questions, discussion





## **Enhancement Proposal** (from east slope) Enhancements to improve existing river conditions

- Stream flow/water supply management-potentially adds water to streams
- Stream restoration

Proposed enhancements are voluntary and under negotiations. If successful, the enhancements should provide habitat benefits







## Physical Restoration-general list

- Increase aquatic structure-provide refuge for fisheries under stressful flow conditions
- Narrow low flow channel
- River bank restoration
- Remove man-made barriers (improve fish passage and sediment transport)
- Implement BMPs/reduce sediment
- Implement ramping guidelines (improve spawning habitat)

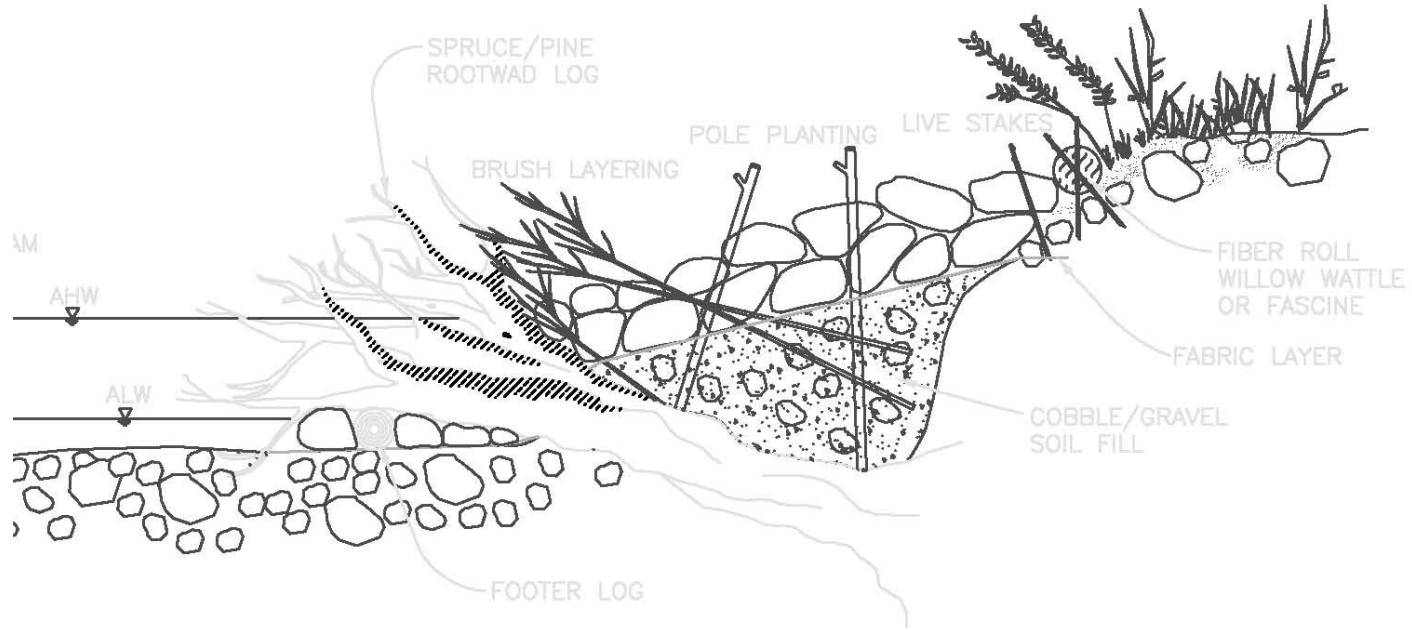
(See SMP)





# In-stream Habitat Features

## Woody Debris





# In-stream Habitat Features

## Woody Debris

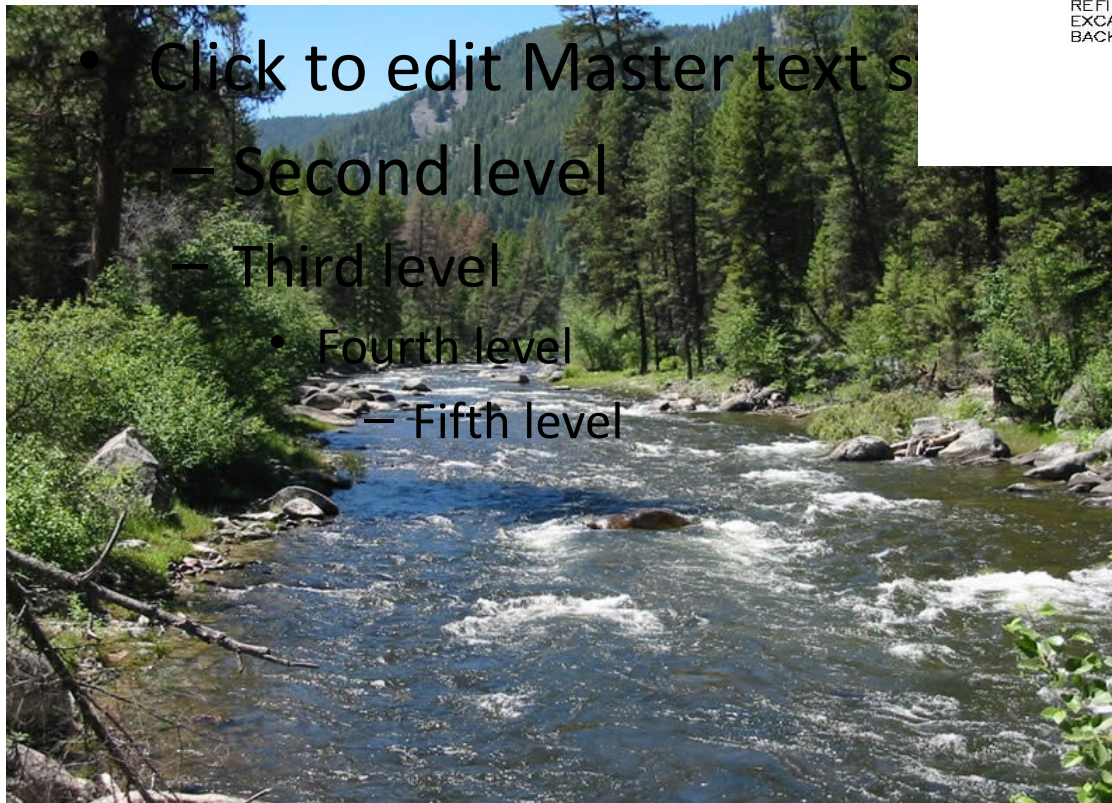
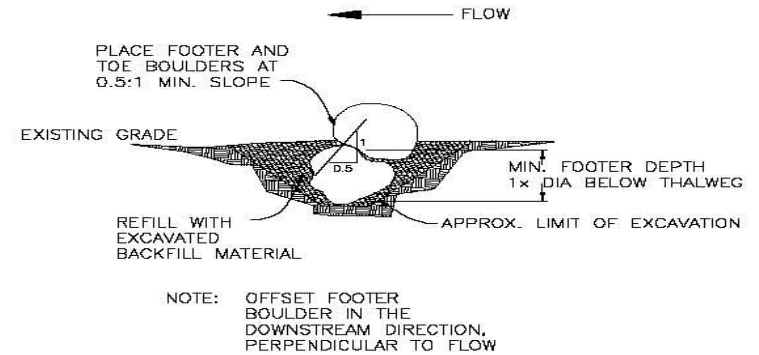
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    - Fifth level





# In-stream Habitat Features

## Boulders



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    - Fifth level





# In-stream Habitat Features

## Woody Debris and Revegetated Bank

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# In-stream Habitat Features

## Cover and Pool with Bank Protection

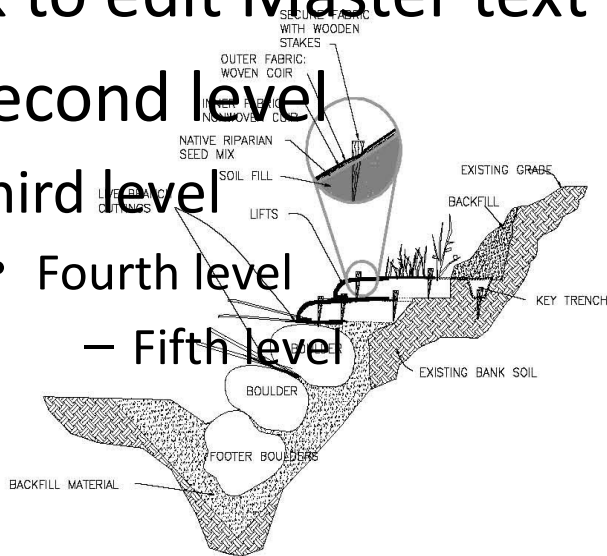
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## Learning by doing Cooperative Agreement

Recognizes that participants have a mutual interest in protecting the aquatic environment and commits to work together in a cooperative and comprehensive manner to address issues...enhance conditions

- Cooperative, iterative and on-going process
- Monitor and respond to potential changes or desired improvements
- When reasonably possible, restore or enhance the aquatic environment

<http://co.grand.co.us/CRCA.html>







# Learning by doing

- Restoration
- Monitoring
- Evaluation
- Adjustment





## Potential Monitoring Parameters-General

- Surface water temperatures
- Air temperatures
- Stream flows
- **Intergravel fine sediment concentrations**
- Fish population and diversity
- Benthic macro invertebrates
- **Channel cross sections and assessments**
- Water quality and algae





# Spawning Bar Monitoring, 2010-2012

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Second level

Third level

- Fourth level

- Fifth level



- Monitor spawning gravel quality (e.g.% fines) over time and effectiveness of flushing flows
- Core samples and RSI at spawning bars
  - 9 sites
  - 2 times/year; post-peak and fall
  - 6 cores/site/time; McNeil-Ahnell sampler
- Some preliminary findings
  - High spring runoff in 2010/2011 resulted in mostly “good” quality spawning habitat
  - Trout survival-to emergence likely most impaired in MC2, CR5 and CR6
  - Gravel depletion in CR below Windy Gap





# Fraser River Reach 2 Monitoring, 2011 and 2012

- Monitor bed material and channel conditions in response to new sediment retention pond
- Methods
  - 90 ft riffle site 200 yds below diversion
  - 2 surveyed cross-sections
  - 6 core samples
  - RSI
  - Post-runoff and fall sampling
- Preliminary findings
  - Straight, low gradient riffle
  - Stable banks
  - Unstable bed (“knee-deep” sand in places)
  - Bed material ~ 65% sand and finer





Questions, discussion





Back up slides



F2



F3



RC2



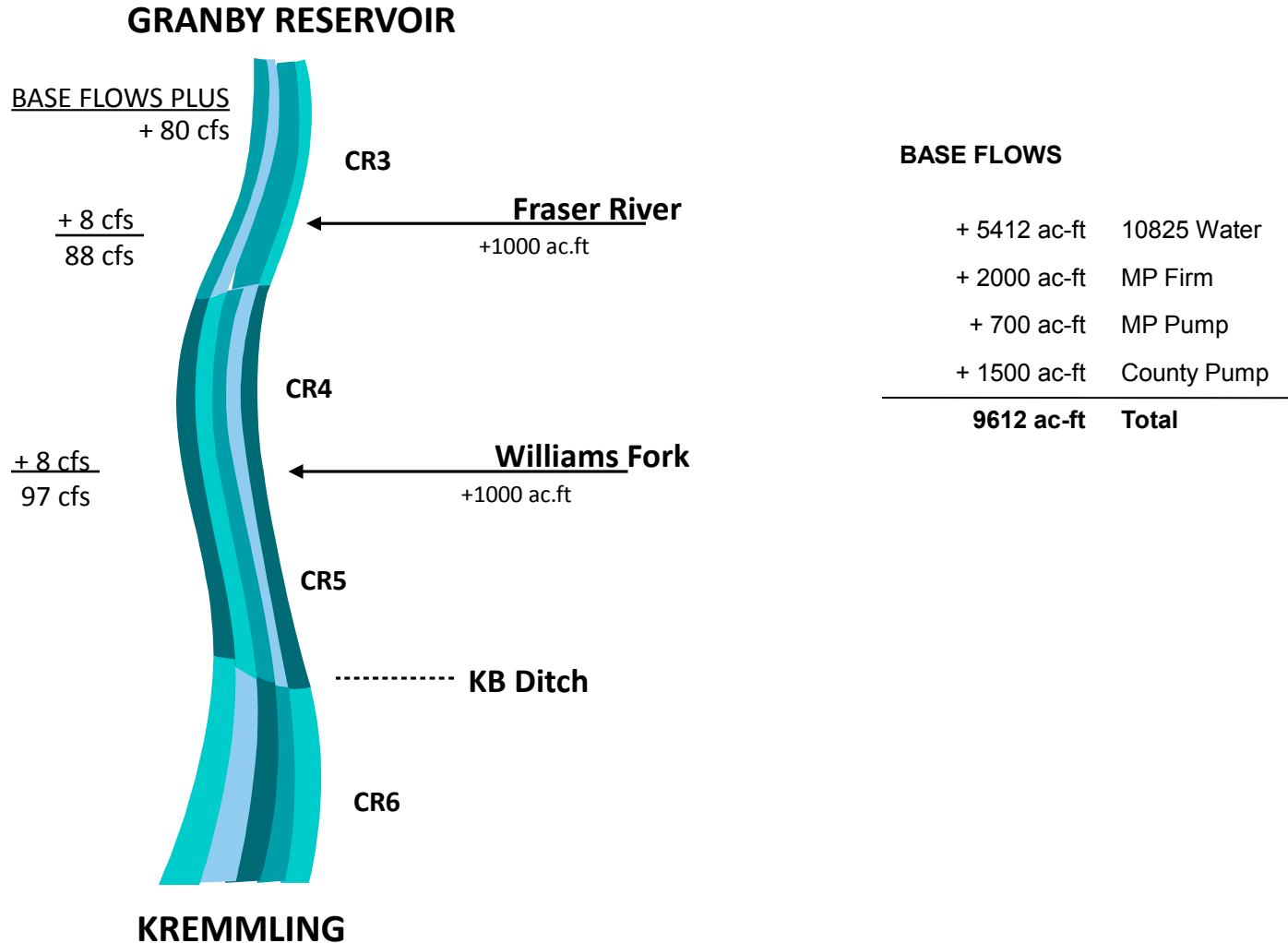
CR3





# An Example

## Enhancement Proposal-Stream Flows for August and September



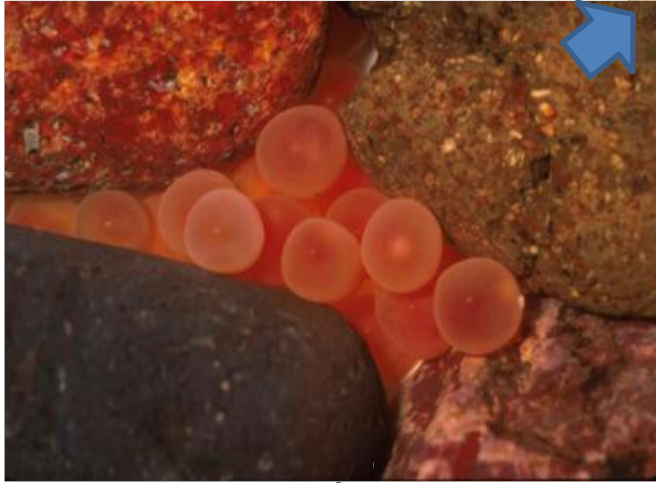




# In-stream Habitat Features

## Boulder Structures





## Trout Life Cycle



Photos used with permission from Richard Grost





# Conclusions

Are streams at or near their potential?

*Likely not, some reaches in better condition than others.*

Why?

*Streamflow alterations, high water temperatures, fine sediment accumulation (natural and man-caused), localized water quality (e.g. nutrients/algae), fish passage barriers.*

In general, it is acknowledged that target flows can not always be met. So under low flow conditions, what can be done to protect the stream health?

*Manage for target flows and implement physical **restoration**.*



