Fishlake N.F. Aquatic Biota Monitoring

Pine Creek

Ten Mile Creek

Aquatic Biota (& Related) Monitoring

- Fish Population/Distribution
- Aquatic Macroinvertebrates
- Water Temperature
- Sediment and Sediment Sources
- Channel Dimension, Pattern, Profile
- Water Quality / Water Quantity
- Fish Habitat (GAWS, R1/R4)
- Riparian Habitat (IRE Level I, II, III)
  - Level II “Walk Through”
  - Level III Greenline, Cross-Sections, Woody Species
- Other (Photo Points, Genetics, Disease testing)

Inventory and Monitoring – Why?

- Characterization
- Prioritization
- Adaptive Management
  - Implementation Monitoring
  - Effectiveness Monitoring
  - Validation Monitoring

Key Site vs. Reach Scale

- Key Site (GAWS/Fish population stations)
  - Needs to be repeatable location (GPS, photo)
  - Reasonable cost
  - - Limited statistics and/or
  - - Unable to extrapolate to the entire reach
- Reach Scale (R1/R4)
  - Multiple samples (I.e. every 5th pool)
  - Expensive
  - + Good statistics
  - + Characterization of the entire reach
  - - Reach variability may “swamp” change

Native Trout

- Expand Distribution
- Preclude the Need for Listing
- Preserve Unique Genetic Stocks
  - Multiple populations – typically 3
- Conservation Agreement and Strategy
- Monitor the Fish Populations
  - 5-7 Year Schedule (7 years – 2008/2009)
  - Published Results for Southern Region GMU
- Integrated Riparian Evaluation (Level II)
- R1/R4 Habitat Surveys?

Pine Creek – Risks to Persistence

Pine Creek

Population Characteristics	Nature of Risk - Primary	Risk of Local Population Extinction			
		Low	Moderate	High	Extreme
Temporal Variability	Stochastic			X	
Population Size	Stochastic		X		
Growth/Survival	Deterministic	X---------*	X		
Isolation	Stochastic				X

*Effects from roads and trails would still impact the population.

Pine Creek (mixed) Stock

Population Characteristics	Nature of Risk - Primary	Risk of Local Population Extinction			
		Low	Moderate	High	Extreme
Replication	Stochastic	X----------	X		
Synchrony	Stochastic	X----------	X		

Ten Mile Creek – Risks to Persistence

Ten Mile Creek

Population Characteristics	Nature of Risk - Primary	Risk of Local Population Extinction			
		Low	Moderate	High	Extreme
Temporal Variability	Stochastic			X	
Population Size	Stochastic		X?		
Growth/Survival	Deterministic	X?			
Isolation	Stochastic				X

Deep Creek Stock

Population Characteristics	Nature of Risk - Primary	Risk of Local Population Extinction			
		Low	Moderate	High	Extreme
Replication	Stochastic			X*-----	X
Synchrony	Stochastic			X	

*Potential to lower this risk with a future reintroduction project into high quality habitat.

Fish Population / Distribution

- Electroshocking
  - Single Pass
    - Okay for general use if good shocking efficiency
  - Two-Pass/Three-Pass
    - Best for critical monitoring / Statistics
  - Number – Fish / Mile (or Fish / Km)
  - Biomass – Lbs / Acre (or Kg / Ha)
- "Spot-shocking"
  - Looking for changes
  - Upper and lower fish distribution limits

Aquatic Macroinvertebrates

- Key Site
- Forest Plan Standard and Guideline
  - Maintain a BCI of 75 or greater
- Riffle – 3 bottles (Buglab – composite of 8)
- Pros-
  - Quantitative – Species List / Relative density
  - Multiple indices
- Cons-
  - Expensive
  - Natural fluctuations
  - Lab results do not answer the “why”
  - Lab QA/QC

BCI

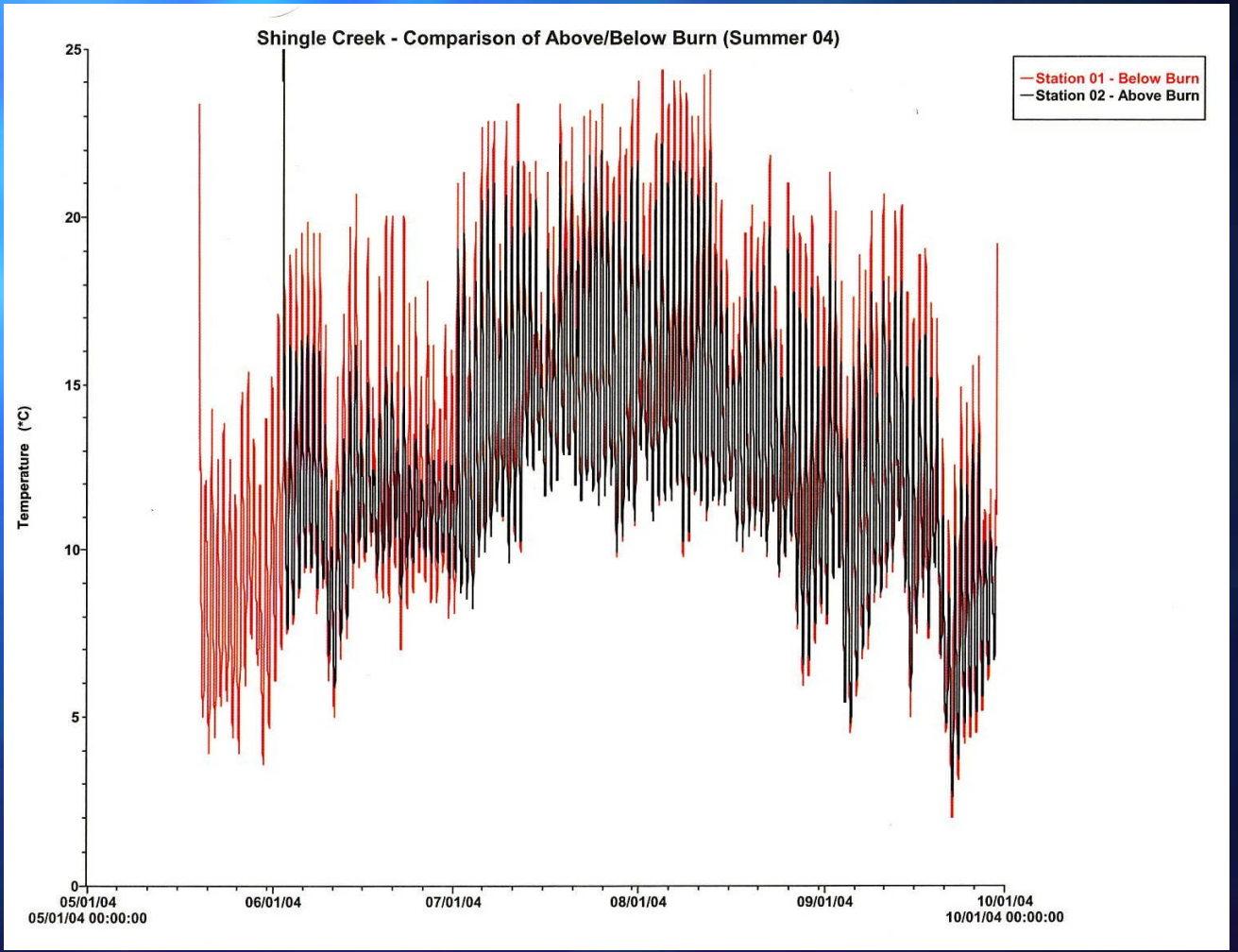
- BCI gives a relative ranking against stream potential
- BCI = CTQp/CTQd*100
- Predicted uses sulfate, alkalinity, gradient, substrate
- Predicted score relatively course
  - CTQp usually 50
  - Alkalinity curve weak
- May be best to use CTQd over BCI for trend
- Use as ancillary data
- Use caution when only have 1 data point
- Other indices
  - Diversity, # taxa, types of taxa (mayflies, tolerant, feeding group)
  - BIBI – weighting of 10 indices

Water Temperature

- Typical Fishlake N.F. stream 32-70F / 0-20C
- Water temperatures over 70 F stress trout
- Large daily fluctuations
- Shade important
  - (topography/overstory/understory)
- Thermal mass
  - (small streams change more rapidly)
- Important Consideration in Land Mgmt Treatments
- Cold Water Fisheries Criteria

Water Temperature Monitoring Example – Shingle Creek Burn (2002) Summer 2004

- Upper station max slightly above 20 deg C
- Lower/burned station typically ~3 deg C higher then unburned – near 25 deg C max



Sediment Monitoring / Source

- Percent Fines
  - Forest Plan Standard and Guideline
    - No more 25% fines less 3.2mm (1/8") *where natural conditions allow*
  - Sediment effects – spawning, macro/food, pool volume
  - Pebble Count
    - Simple to do – Easy to interpret graphs
    - Some observer bias issues
      - Embeddedness / Silt over gravels
  - Spawning Gravel
    - Shovel sample / Freeze Core
    - Sieve/Weigh
- Bank Damage / % Stable Banks
  - Good concept
  - Forest Plan Standard and Guideline
    - Maintain 50% or more in stable condition [ref Pfankuch]
  - Issues w/ observer bias, repeatability

Channel Dimension, Pattern, Profile

- Channel Geomorphology / Channel Type
  - A channel – Steep, entrenched, erosion, more resistant to livestock
  - B channel – Moderate gradient, moderately entrenched, more stable
  - C (and E) channels – Low gradient, floodplains, vulnerable
- Channel Cross-Section
  - Entrenchment Ratio, Width-Depth Ratio
  - Aggradation
  - Degradation / Downcutting
    - Loss of Access to the Floodplain
- Longitudinal Profile
  - Pool Volume
- Pattern – Sinuosity
- Complex interactions –
  - Geology, soils, riparian vegetation, channel morphology, past management, current management, sediment
  - "Equilibrium" – once disturbed may need to adjust over time
  - Channel may further degrade before recovery

Water Quality / Water Quantity

- Water Quality
  - Generally no limiting chemical parameters for fisheries
  - Ten Mile some sulfates
- Water Quantity
  - .5 cfs general lower limit for trout
- Hydrologists collecting data w/ state

Fish Habitat Survey Methods

- GAWS-General Aquatic Wildlife Survey
  - Outdated
  - Forest Plan Standard and Guideline
    - At or above 70% of optimum GAWS or COWFISH
  - Key Site
- R1/R4
  - More recent – generally mirrors NRIS database
  - Expensive
  - Reach scale
  - What does it mean?

Riparian Habitat Survey

- Integrated Riparian Evaluation
  - Level I office
  - Level II walk through
    - Reach characterization
    - Interdisciplinary
  - Level III detailed monitoring
    - Key site
    - Toolbox
    - Greenline
    - Cross-section
    - Woody Species Regeneration
  - Moderate costs

Other Methods:

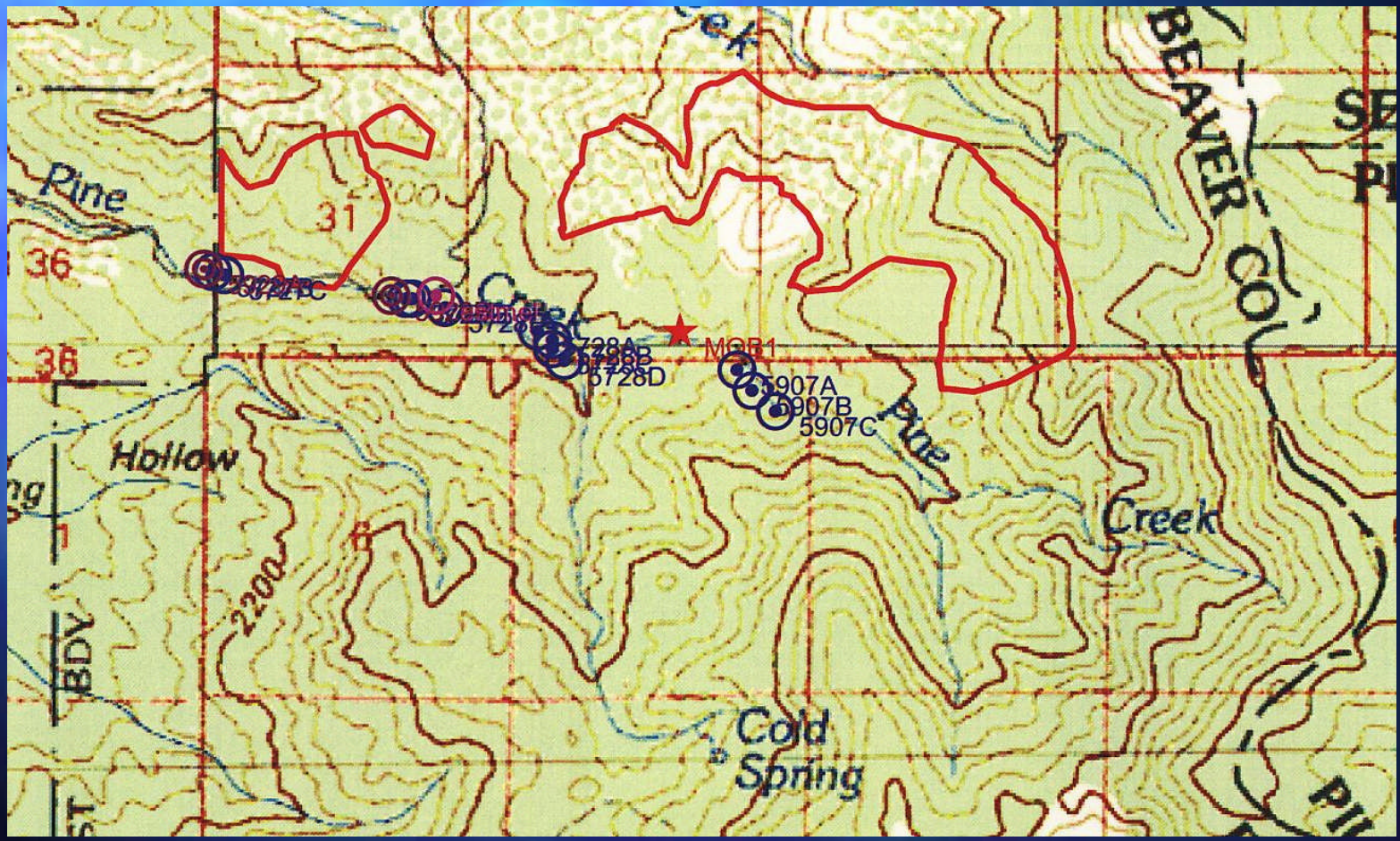
- Photo Point (w/ witness posts)
- Genetics
- Disease Testing

Pine Creek

Pine Creek (W) –

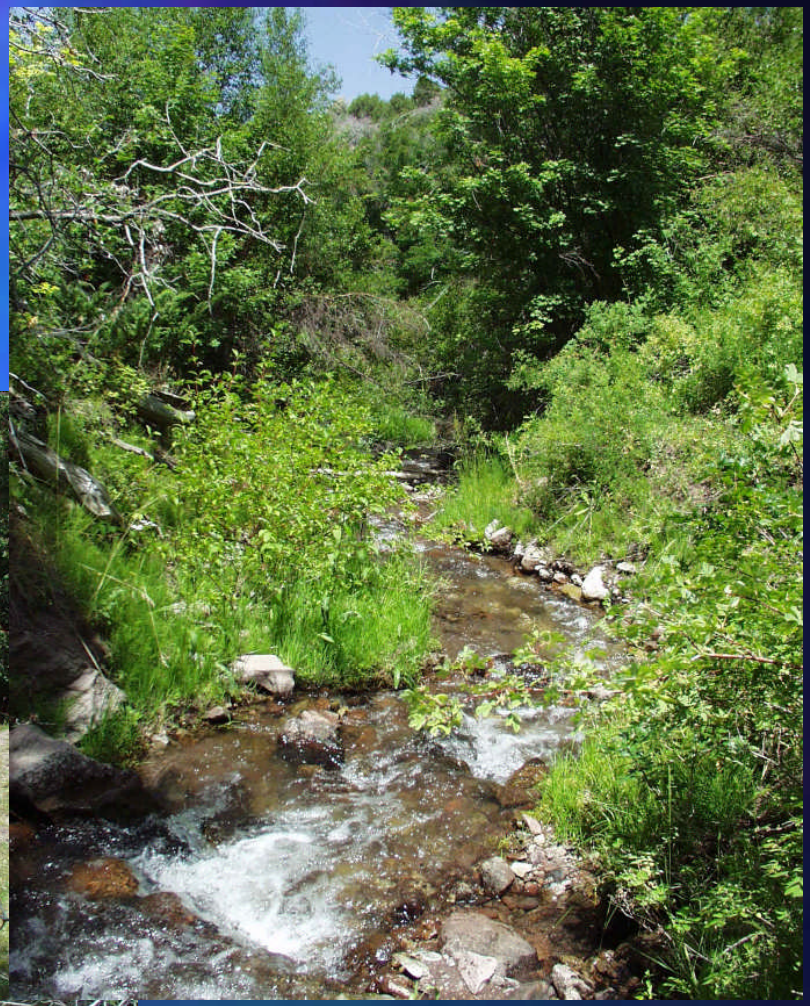
- Bonneville cutthroat trout stream
  - Reintroduced population – mixed stock
- Grazing / Road
- 1990s - Used to plant Manning Mdw Res.
  - Somewhat depressed population
- 2001 Fish population monitored
- 2004 Spring burn lower canyon
  - Escaped and burning stopped
  - Burned about ½ mile of riparian area
- Fall 2004 burned upper canyon
- 2005 Fish population monitored

Pine Creek (W) Prescribed Fire –



Pine Creek – Lower Station

Pine Creek (W) – Middle Stations



Pine Creek (W) – Upper Station, Upper Exclosure

Pine Creek (W) Prescribed Fire – Fish Populations

	2001		2005	
	Number	Biomass	Number	Biomass
Lower	401 (360-442)	35 (31.4-38.6)	209*/789 (-1649-3226)	22.8*/86.2 (-180-353)
Middle	412 (340-484)	17.1 (14.1-20.2)	322 (197-447)	41.0 (25.1-56.9)
Upper	363 (346-380)	16.7 (15.9-17.5)	197 (130-264)	31.1 (20.5-41.6)
Upper Exclosure	343 (311-375)	35.4 (32.1-38.7)	457 (434-480)	84 (79.8-88.2)

Pine Creek – Fish Population Trends

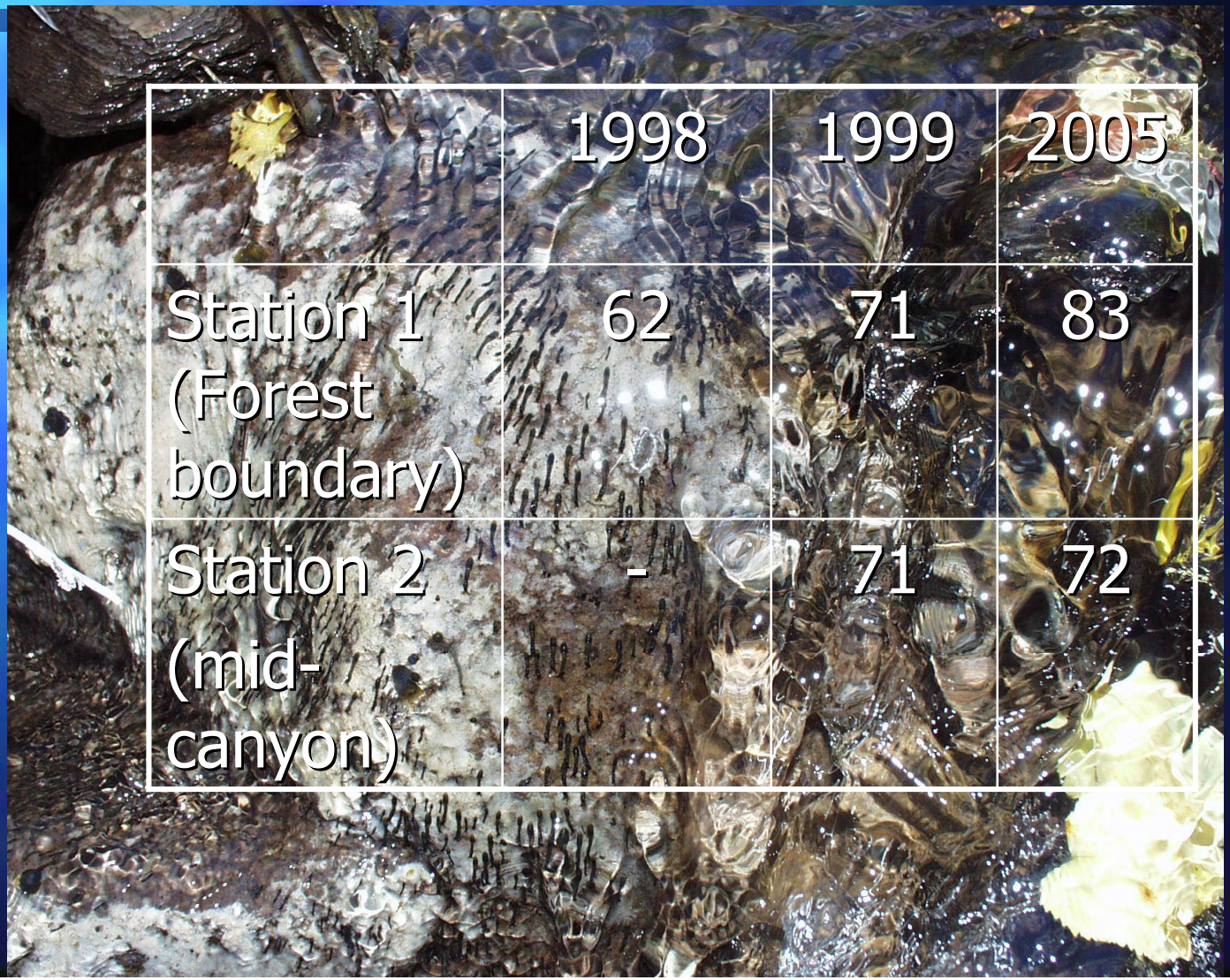
Table 1: Biomass (lbs/acre) trend of BCT in streams on the Fishlake N.F. (Hepworth et al. 2003)

Stream	1977	1994-1995	2001-2002	2004-2005
Birch Cr (W)	25.9	37.5	12.3	-
Briggs Cr	-	32.1	32.6	-
N.F.North Cr.	Unk.	32.1	31.2	-
Trib-Pole Cr.	-	-	0	-
Pine Cr.	-	24.1	23.8	31.6
Ten Mile Cr.	-	-	>0	37.2
Birch Cr. (E)	-	-	>0	-

Note: Does not include potential remnant populations that have not been genetically tested or remnant populations that have not yet been found. Table information for 2004-2005 is from Fishlake N.F. file data, not yet published.

Pine Creek (W) Prescribed Fire – Aquatic Macroinvertebrates

- BCI Values



	1998	1999	2005
Station 1 (Forest boundary)	62	71	83
Station 2 (mid-canyon)	-	71	72

Pine Creek – Pebble counts 2005

- Station 01 Forest boundary ~27% fines
  - Small sample size (30)
    - More for substrate characterization for CTQp
- Station 02 Upper ~28% fines
  - Small sample size (25)
    - More for substrate characterization for CTQp

Pine Creek IRE

- 13 of 15 reaches A channel
- 2 of 15 reaches B channel
- Mean Pfankuch stability 65.9 – good
- Forage trend down in 4 of 13 reaches
- Recommendations:
  - Improved livestock management
    - Upland burns, water developments, herding
  - Reintroduction of beaver (some concerns)
- South Fork
  - High gradient A channel, fair stability, forage trend down

Pine Creek – Other data

- No data –
  - Water data logger temperature
  - Channel cross-sections/profile
  - Detailed fish habitat data
- In progress –
  - Water quality
- Needs?
  - Photo points

Pine Creek - Summary

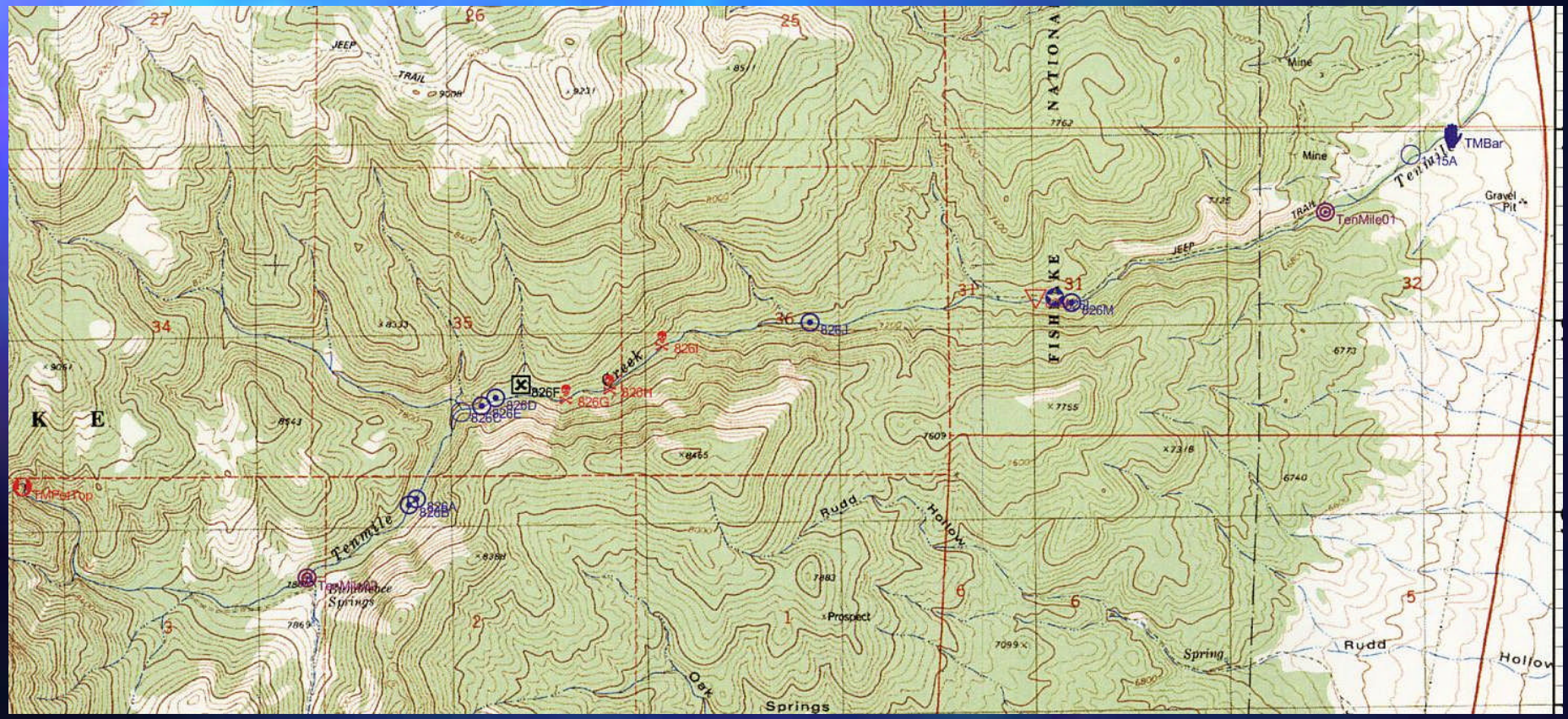
- Grazing / road primary habitat impacts
- Fish removal for transplant also affected fish numbers in 1990s
- Fish population below average 1996-2001
- Prescribed fire 2004 summary
  - Pine Creek watershed
    - ~4,560 acres
  - Pine Creek fire polygons burned 2004
    - ~500-600 acres
  - Burn ~11-13% of the watershed area
  - Fish populations up overall in 2005
  - Good water year and grazing rest offset prescribed fire impacts

Ten Mile Creek

Ten Mile Creek –

- Identified as potential Bonneville cutthroat trout reintroduction stream in late 1990s for Deep Creek stream stock
- Treated in 2000 and 2001 to remove non-native trout
- Rescued Deep Creek stock planted summer 2002 after Sanford fire.
  - About 225 fish transferred
- Rapid initial growth rates
- 2004 Population Monitored
- 2007 Disease sample (below barrier) / Genetic Sample Collected
- 2008 2nd year of disease sample
- Fall 2008 Transfers to Pine Creek (Bullion) and Deep Creek

Ten Mile Creek –



Ten Mile Creek
Upper Stream near S04, S03

Ten Mile Creek S02 and S01

Ten Mile Creek –Fish Populations

	2004	
	Number	Biomass
S01-Low	-	-
S02-Low Middle	97 / 161 - W fry	6.2 / 9.5 – Est. w fry, miss
S03-Meadow	225 / 579 - w fry	41.9 / 44 - Est. w fry, miss
S04- Below Bumblebee	129 / 644 - w fry	60.2 W/o fry

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Trib-Pole Cr.	-	-	0	-
Pine Cr.	-	24.1	23.8	31.6
Ten Mile Cr.	-	-	>0	37.2
Birch Cr. (E)	-	-	>0	-

Note: Does not include potential remnant populations that have not been genetically tested or remnant populations that have not yet been found. Table information for 2004-2005 is from Fishlake N.F. file data, not yet published.

Ten Mile Creek – Aquatic Macroinvertebrates

- BCI Values

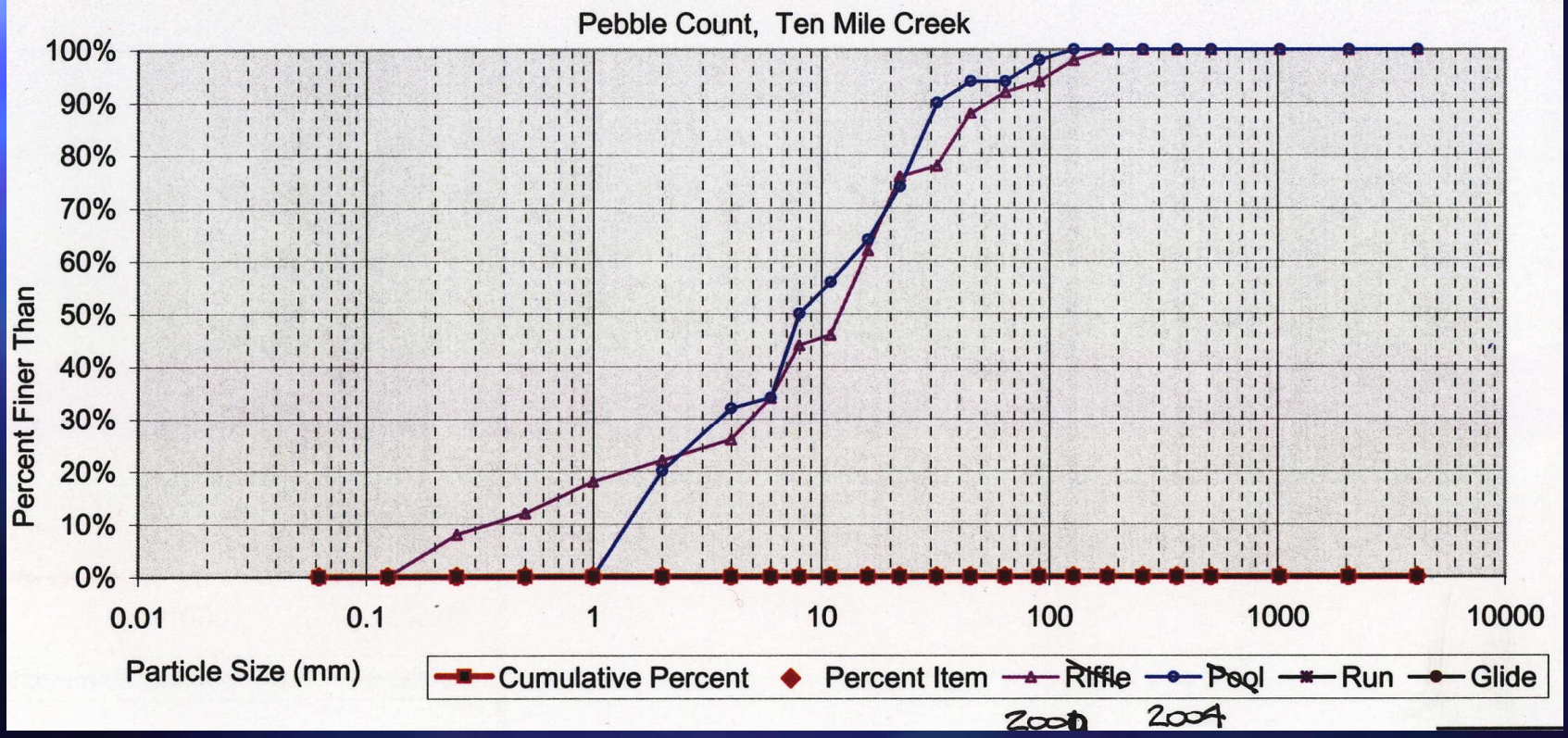
	2000	2004
Station 1 (Forest boundary)	94	88
Station 2 (Bumblebee)	81	75

Ten Mile Creek – Pebble counts 2004

- Station 01 Forest boundary
  - ~40-54% fines 2004
  - ~38-44% fines 2000
  - Somewhat small sample size (50)
    - More for substrate characterization for CTQp
  - Watershed supplies sediment in lower canyon
- Station 02 Bumblebee
  - ~20-32% fines 2004
  - ~22-26% fines 2000
  - Somewhat small sample size (50)
    - More for substrate characterization for CTQp

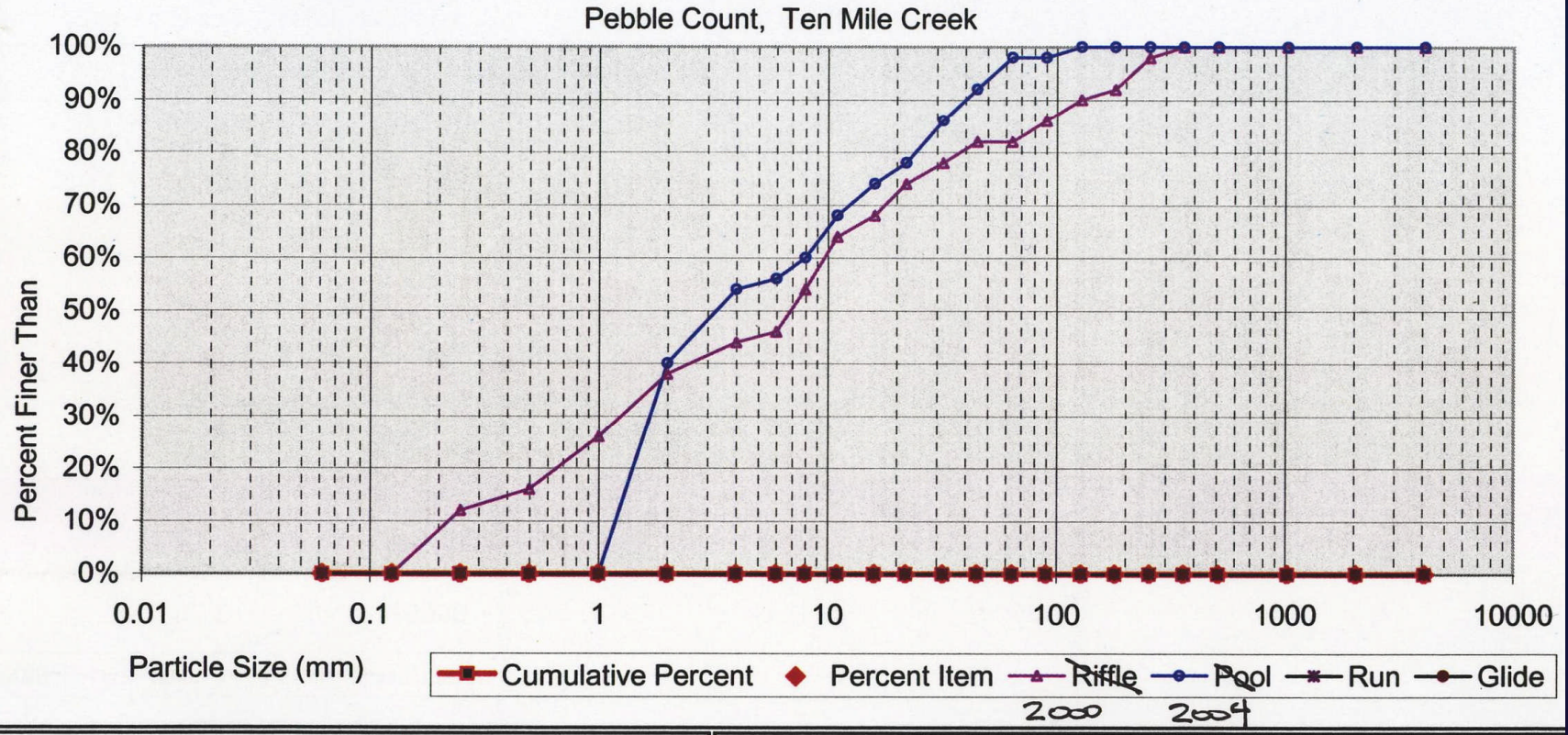
Ten Mile Creek - Upper Station Pebble Count

	Ten Mile Creek
	Sevier River
	Upper Station
Note:	



Ten Mile Creek - Lower Station Pebble Count

	Ten Mile Creek
	Sevier River
	Lower Station 01
Note:	



Ten Mile Creek IRE

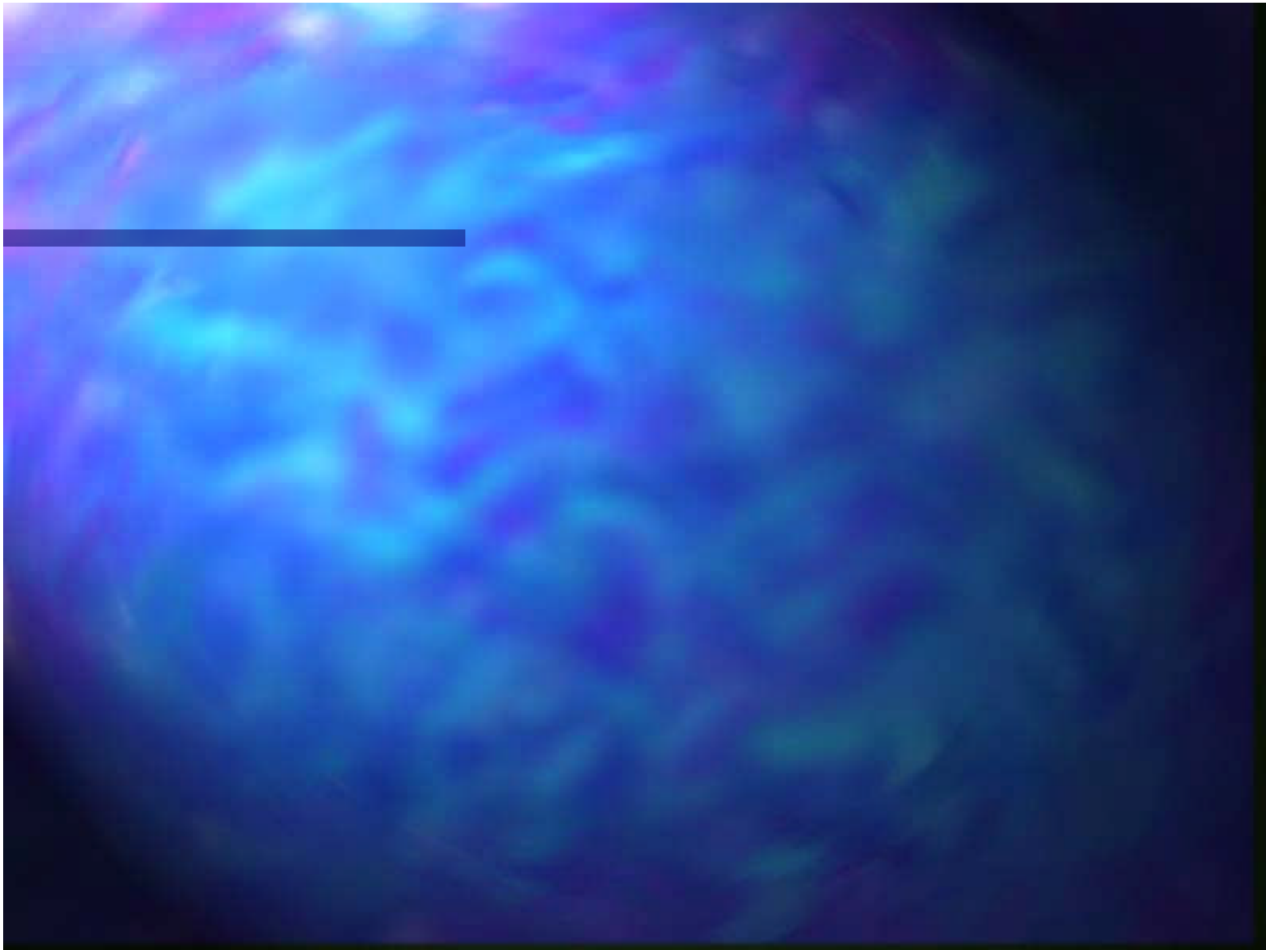
- Most of the reaches A channel
- 3 of 13 reaches B channel, 1 reach C channel
- Mean Pfankuch stability 79.2 – fair
- Forage trend stable
- Areas of deep entrenchment through alluvial deposits
- Recommendations:
  - ATV management
  - Conifer fuel loading / fire concerns
    - Careful use of prescribed fire / vegetation treatments
  - Livestock only of concern on 1 reach

Ten Mile Creek – Other data

- No data –
  - Water data logger temperature
    - 1 logger placed in 2004 but could not be found/recovered
  - Channel cross-sections/profile
  - Detailed fish habitat data
- In progress –
  - Water quality
  - Disease testing
  - Genetics
- Needs?
  - Photo points
- Fish population data of limited value during transfers

Ten Mile Creek – Aquatic Concerns and Monitoring Needs?

- Unique fish genetics (expand fall 2008)
  - Fish removal from population
- Relatively low elevation – potential temperature issues
- Downcut – access to floodplain cut off
- Non-cohesive substrate
- High fuel loading in watershed
- Conifer encroachment in riparian area
  - Limited willows/carex
- Vegetation treatments could open riparian area to increased livestock use/conflicts



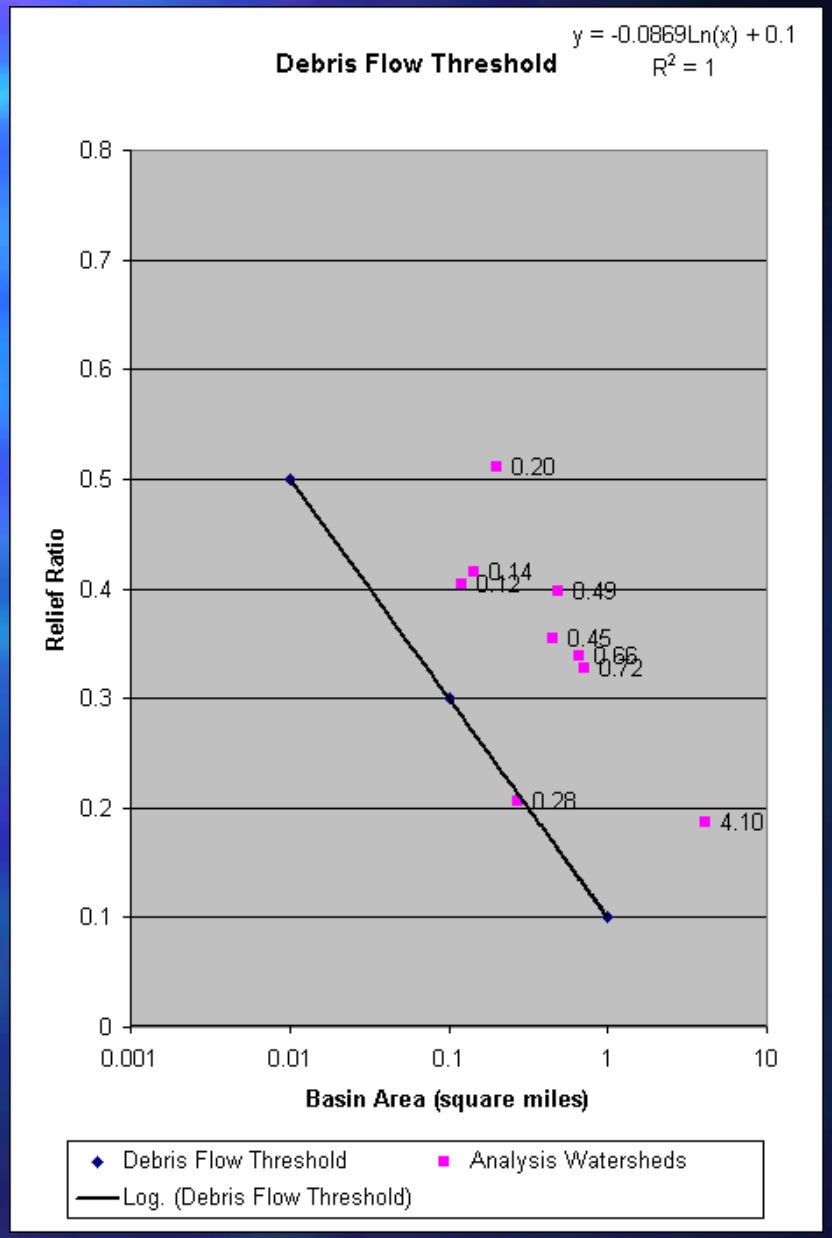
Some lessons on treatments and fish (primarily fire)

Riparian Charcoal Layers

- North Fork Corn Creek
- Oak Creek
- Sand Creek

Debris Flow Prone Sub-watersheds

- Cannon et al. 2003. Debris-flow response of basins burned by the 2002 Coal Seam and Missionary Ridge Fires, Colorado. In Boyer et al. eds., Engineering Geology in Colorado-Contributions, Trends, and Case Histories: AEG Special Publication 14, on CD-ROM.
- Model uses relief ratio and basin area



Lessons Learned:

- Short-term fire effects are not always as bad as first expected.
- Long-term fire effects are not always necessarily positive.
  - Condition of area before the burn
  - Land management uses/impacts during recovery
- Prescribed fire and back fires are not necessarily lower impact than wildfire
- ANS concerns / measures need to be communicated with fire personnel

Lessons Learned – continued:

- Conduct some type of pool monitoring
  - Pool volume, max pool depth/length stream
  - Longitudinal profile
- More intensive water quality monitoring
  - Phosphates in 303D listed watersheds
- Water temperature post-burn may be important / limiting
- Need better mapping of prescribed fire polygons

Lessons Learned - continued

- Removal of land uses/aquatic recovery before treatments could help
  - Pine Creek – grazing rest/water flows
  - Oak Creek – good condition riparian area handled flood
- Separate upland and riparian treatments in time/space
- Prescribed fire can be used in high aquatic resource value watersheds
  - Reasonable short-term effects
  - Long-term reductions of risk

Lessons Learned – continued:

- Some Forest watersheds have less fire effect concerns
  - High elevation, watershed slope
- Some Forest watersheds are prone to post-fire floods and debris flows
  - Flooding may be as big of a risk as the fire (WUI)
    - Affect fire use plans – scale, intensity, mechanical vs. fire treatments
    - Location of burned debris-flow prone watersheds in relationship to the fish
    - Needs to influence fish management decisions
      - Connections, replication, refugia (off-unit)

The End