Lake Tahoe Basin Management Unit Ecosystem Restoration Program

Preparing for Climate Change: a Management Perspective

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Overview

- Forest Service Policy
- Expected climate change impacts
- How to prepare for climate change
- Project Examples

USDA Forest Service National Ecological Restoration Guidance

FSM 2000 – National Forest Resource Management
Chapter 2020 – Ecological Restoration and Resilience

2020.3.2 – "Establish ecological restoration goals and objectives in strategic plans to maintain the adaptive capacity of ecosystems – recognizing uncertainty related to climate change."

USDA Forest Service National Ecological Restoration Guidance

National Roadmap for responding to Climate Change (FS-957b, February 2011)

USDA Forest Service Region 5 Ecological Restoration Leadership Intent Summary – R5-MR-048, March 2011

- Goal: "Retain and restore ecological resilience of the National Forest lands to achieve sustainable ecosystems….especially under changing and uncertain future environmental conditions such as those driven by climate change" R5-MR-048, March 2011

USDA Forest Service Region 5 Ecological Restoration Leadership Intent Summary – R5-MR-048, March 2011

Restore at least 50% accessible, degraded forest meadows to improve their habitat function and ability to hold water longer into the summer and deliver clean water when most needed….within 15-20 years

Ecosystem Services and Community Economic Benefits Enhanced

- Delivery of clean water and improved flow regime that benefits people, fish and wildlife
- Fish, wildlife and plant habitat for common and rare species
- Maintenance of biodiversity
- Forest resilience in the face of climate change and changing disturbance processes

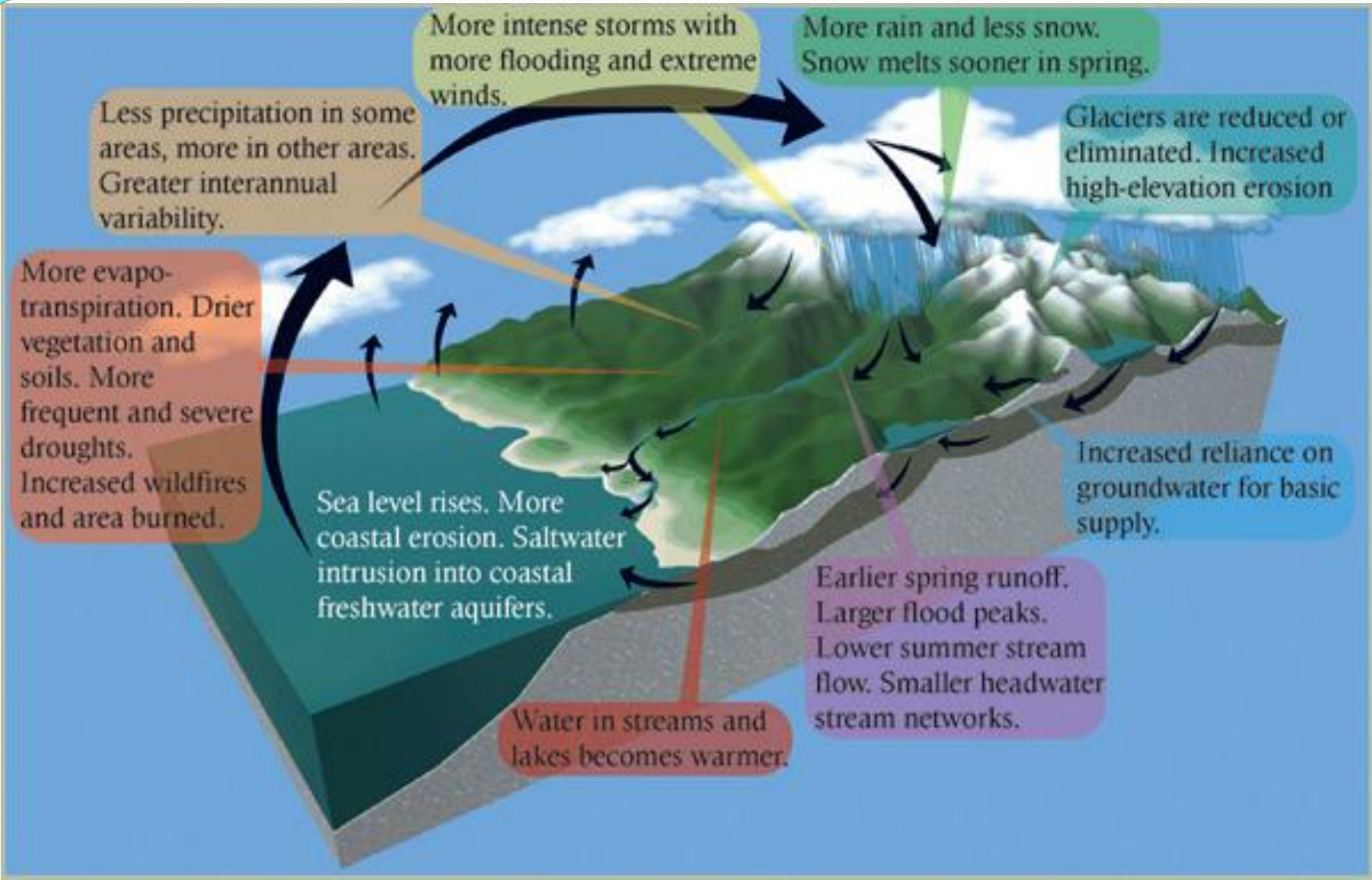
Lake Tahoe Basin Management Unit Ecological Restoration Program

Mission Statement:

- **Restore ecosystems to healthy, diverse, and productive conditions that meet the needs of present and future generations.**

- Program objectives:
  - **Restore natural processes that sustain healthy ecosystem function.**
  - Coordinate with other LTBMU programs to facilitate an interdisciplinary approach to ecosystem restoration that meets the goals of the Land and Resource Management Plan.
  - Promote holistic ecosystem management through collaboration with public and private organizations, adjacent landowners, and the public.
  - Develop internal and external outreach, environmental education, and information technology transfer

What are the Anticipated Effects of Climate Change in Tahoe?


More intense storms with more flooding and extreme winds.
More rain and less snow. Snow melts sooner in spring.
Less precipitation in some areas, more in other areas. Greater interannual variability.
Glaciers are reduced or eliminated. Increased high-elevation erosion
More evapo-transpiration. Drier vegetation and soils. More frequent and severe droughts. Increased wildfires and area burned.
Increased reliance on groundwater for basic supply.
Sea level rises. More coastal erosion. Saltwater intrusion into coastal freshwater aquifers.
Earlier spring runoff. Larger flood peaks. Lower summer stream flow. Smaller headwater stream networks.
Water in streams and lakes becomes warmer.

What does this mean for planning restoration activities?

- Increased percent rain, decreased percent snow, earlier snowmelt
  - Earlier and increased peak flows
  - Earlier onset of base flows and reduced base flows
  - Greater potential for flood flows
- Warmer stream temperatures
  - Impaired conditions for aquatic wildlife
  - Increased vulnerability to invasive species
  - Greater algal growth
- Drier site conditions
  - Increased likelihood of wildfire
  - Drier vegetation outcompetes wetter species
  - Increased frequency of drought

How to prepare for these effects in restoration projects?

Manage for desired future processes rather than desired future condition

1. Increase **Resistance** to change
2. Promote **Resilience** to change
3. Enable Ecosystems to **Respond** to change
4. **Realign** condition to current and future dynamics
5. **Reduce** greenhouse gases and **Reduce** non-renewable energy use

(http://www.fs.fed.us/ccrc/)

Increase Resistance to Change

"Homeland Security" approach

Most appropriate for:
- Endangered/Threated species
- Extreme fire risk
- Invasive species

Promote Resilience to Change

Healthy ecosystems are more resilient to change

- Important to take preventative steps to “heal” impaired ecosystem
- Improve the capacity to return to desired prior conditions after climate-induced disturbance.

Enable Ecosystems to Respond to Change

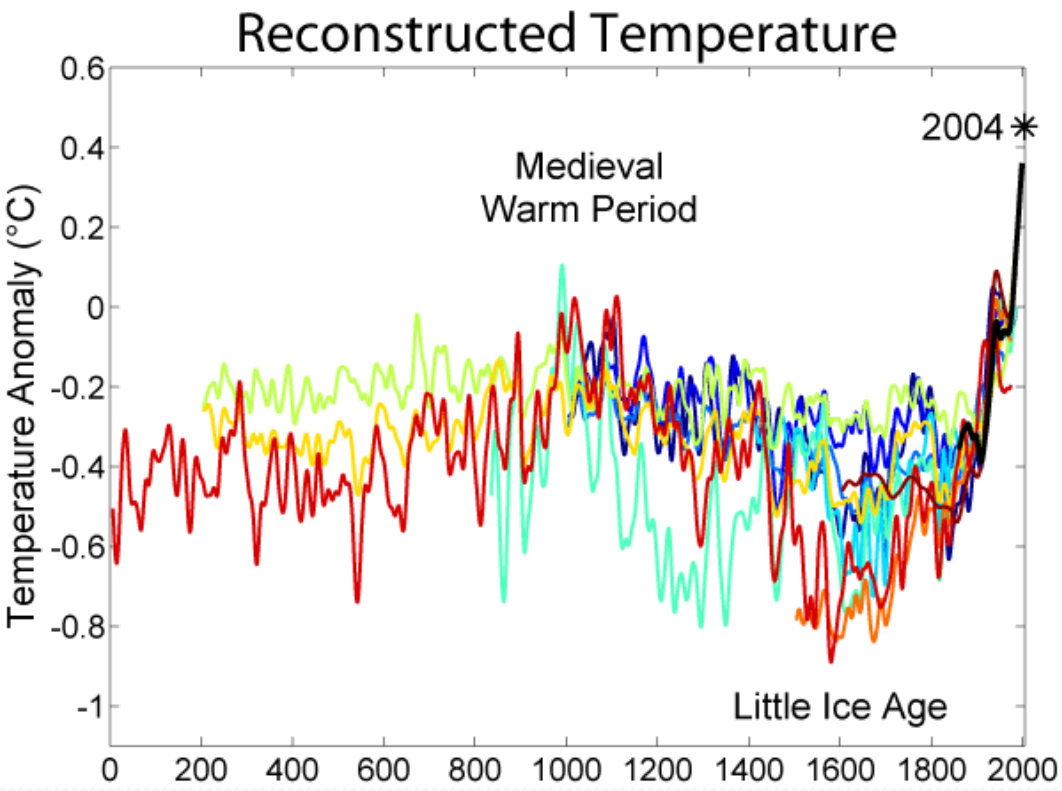
- Anticipate and plan for risk

What are the risks of climate change?

- Increased percent rain, decreased percent snow, earlier snowmelt
- Drier site conditions
- Warmer stream temperatures

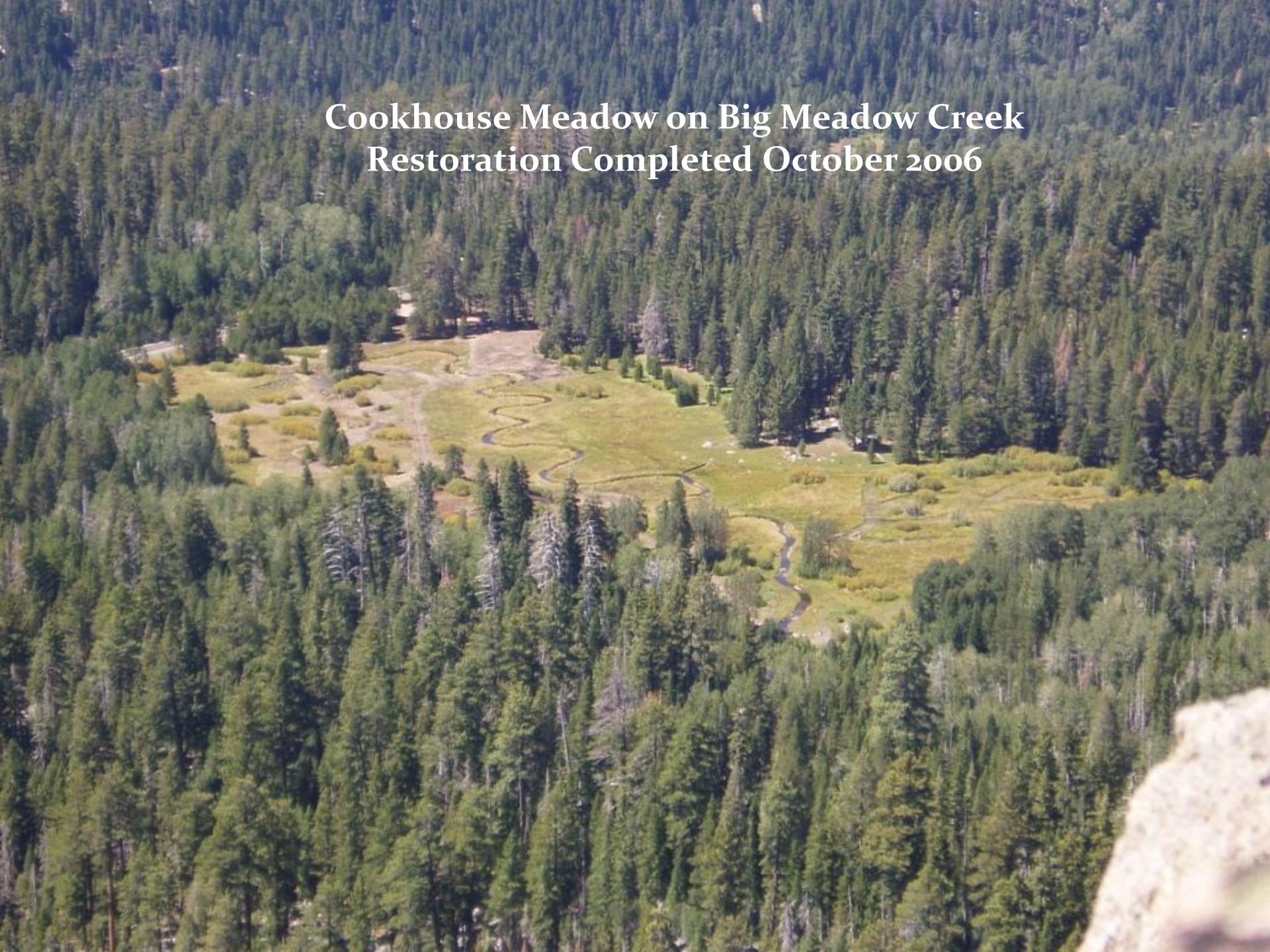
- Experiment creatively and learn from experiments
  - "Bet-hedging practices"
- Increase diversity
  - Heterogeneous ecosystems better able to withstand change
- Promote connected landscapes
  - Allows species to move in response to change

Realign condition to current and future dynamics



- Design projects for current conditions, not pre-European settlement.
- Use historic record to inform future coditions.

Project Examples

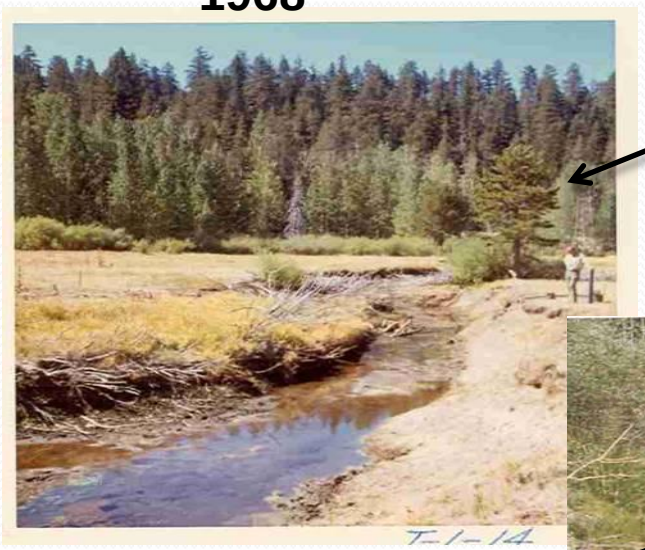

Cookhouse Meadow on Big Meadow Creek
Restoration Completed October 2006

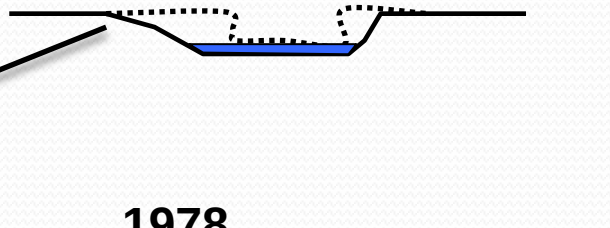
Cookhouse Meadow on Big Meadow Creek

1968

Historic channel condition

Current channel condition

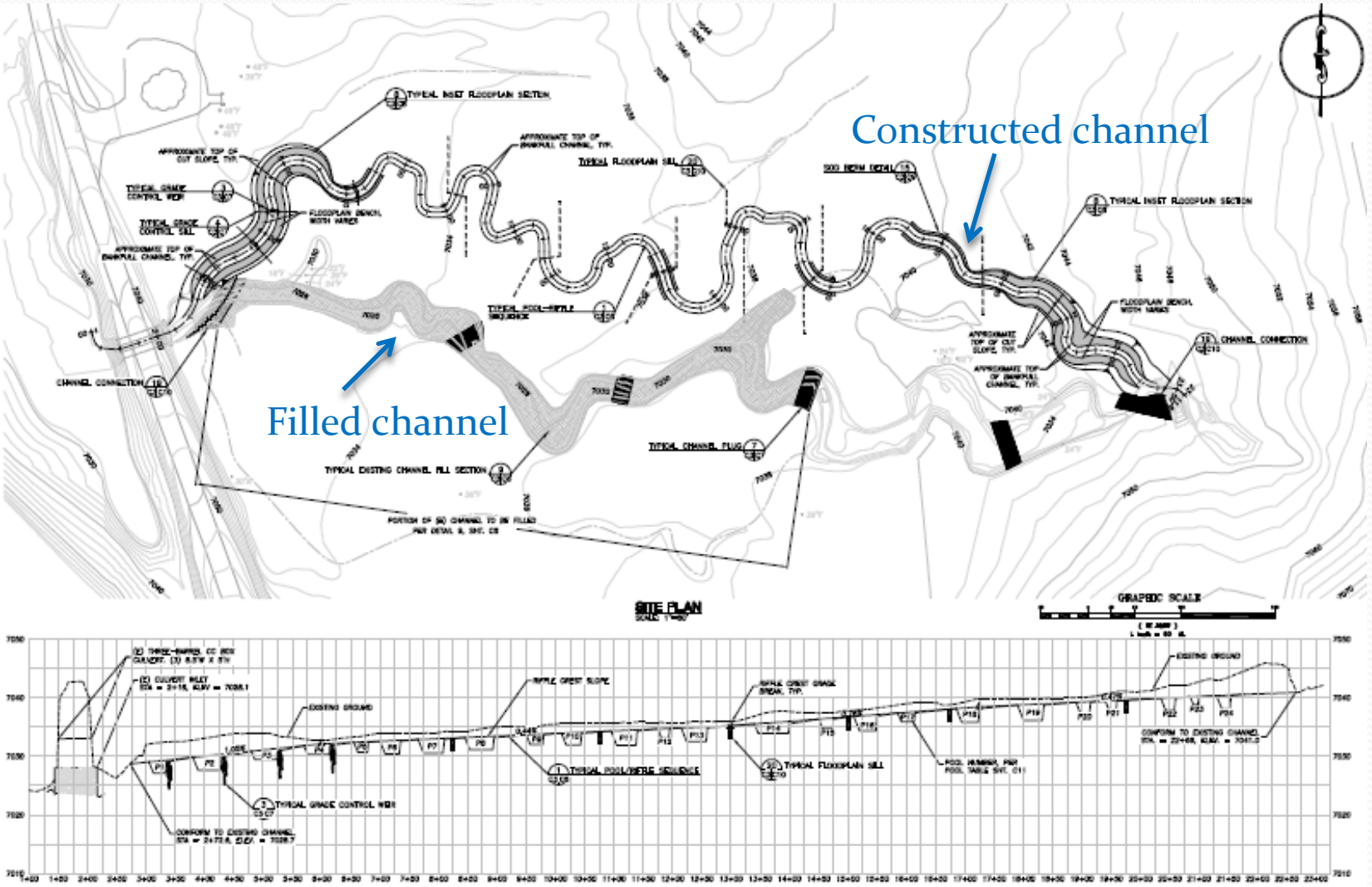




1978

1981

Cookhouse Meadow on Big Meadow Creek
Restoration Plan Overview

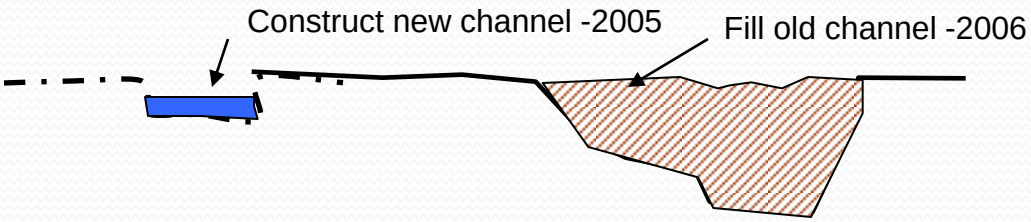


Cookhouse Meadow on Big Meadow Creek

Implementation 2005-2006

Block off old channel & put flow in new channel

Partial backfill of old channel



Cookhouse Meadow on Big Meadow Creek July 2011

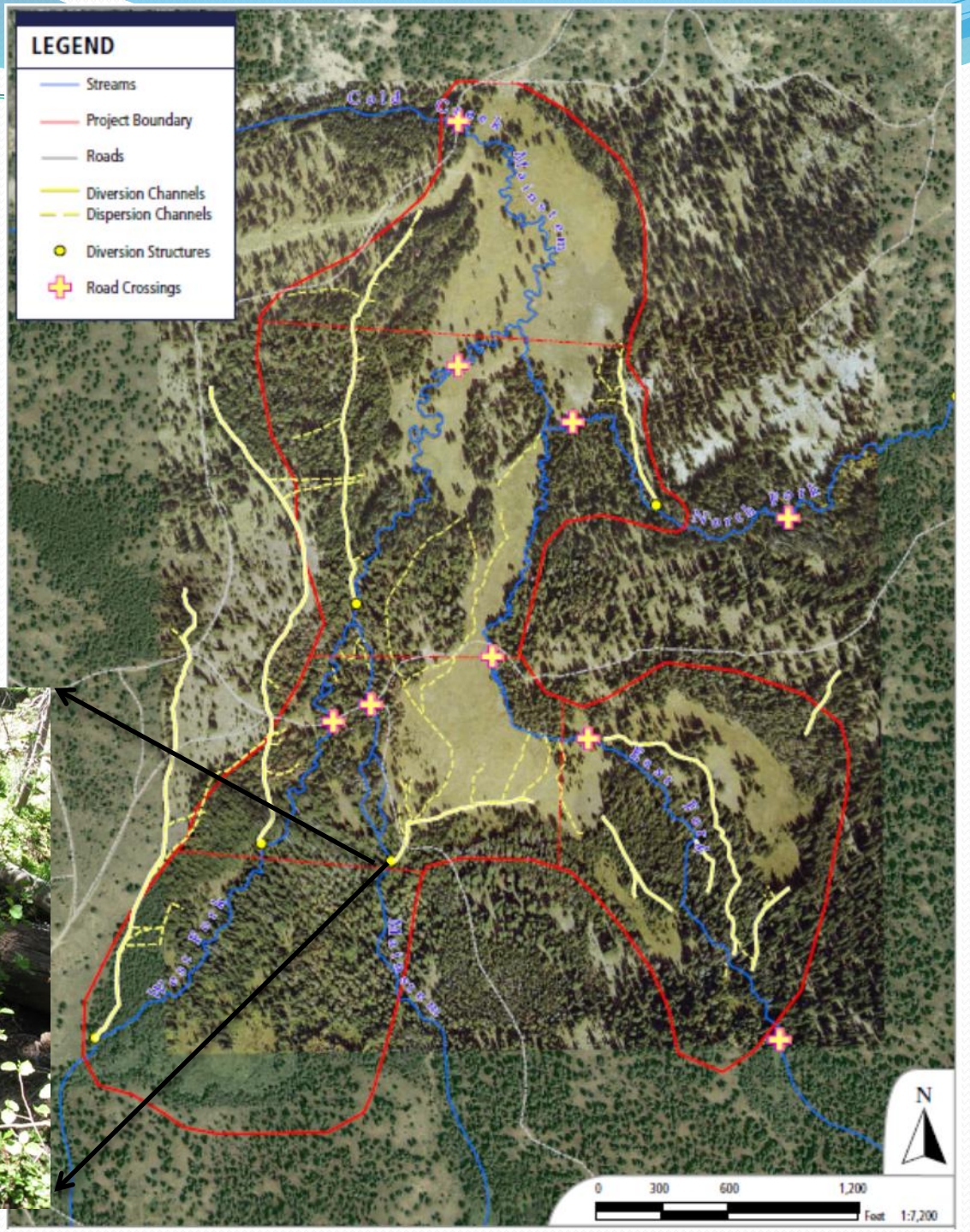
High Meadows Complex

Restoration Implementation 2010-2012 and beyond

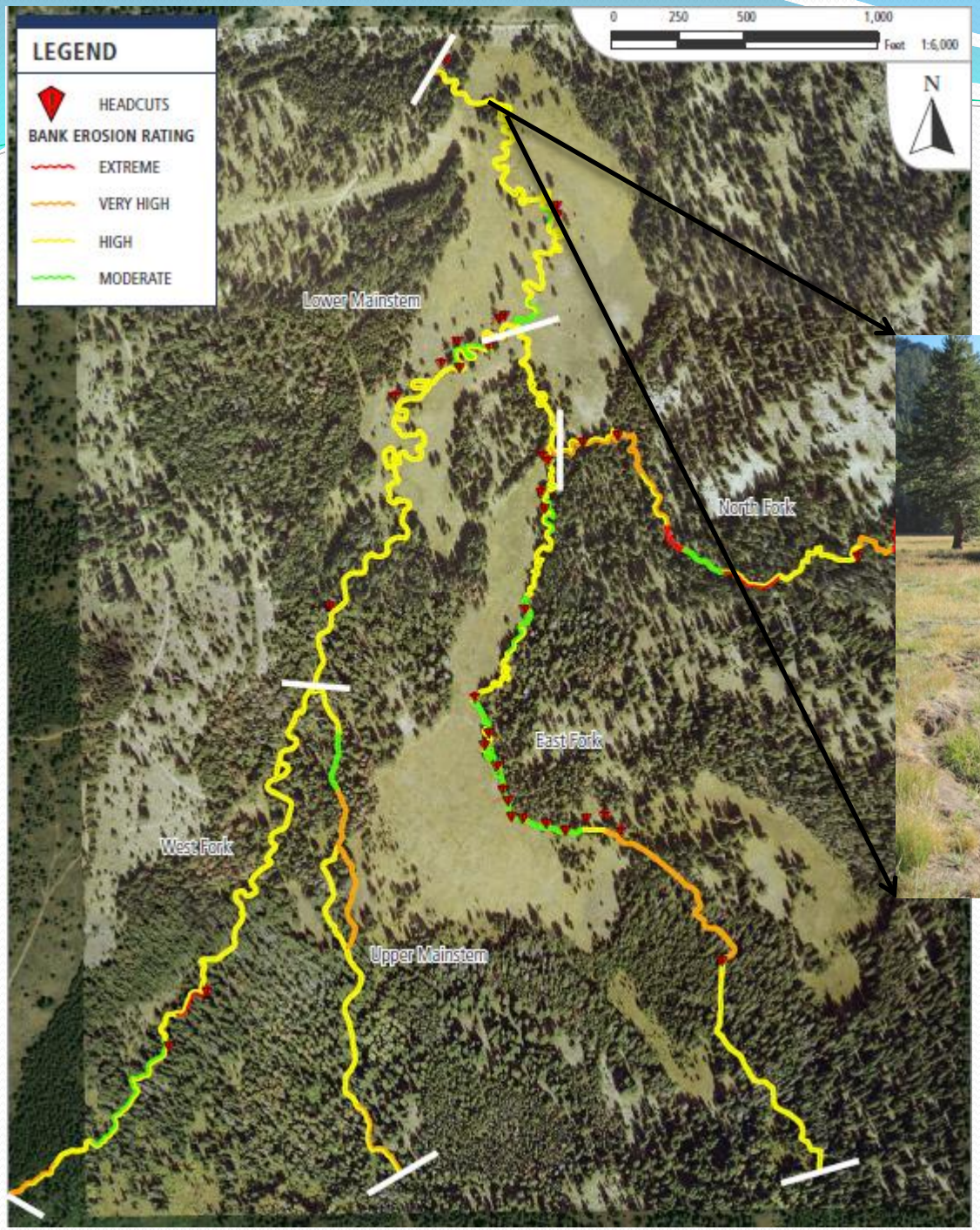
Photo August 2008

Cold Creek/ High Meadow Diversion System

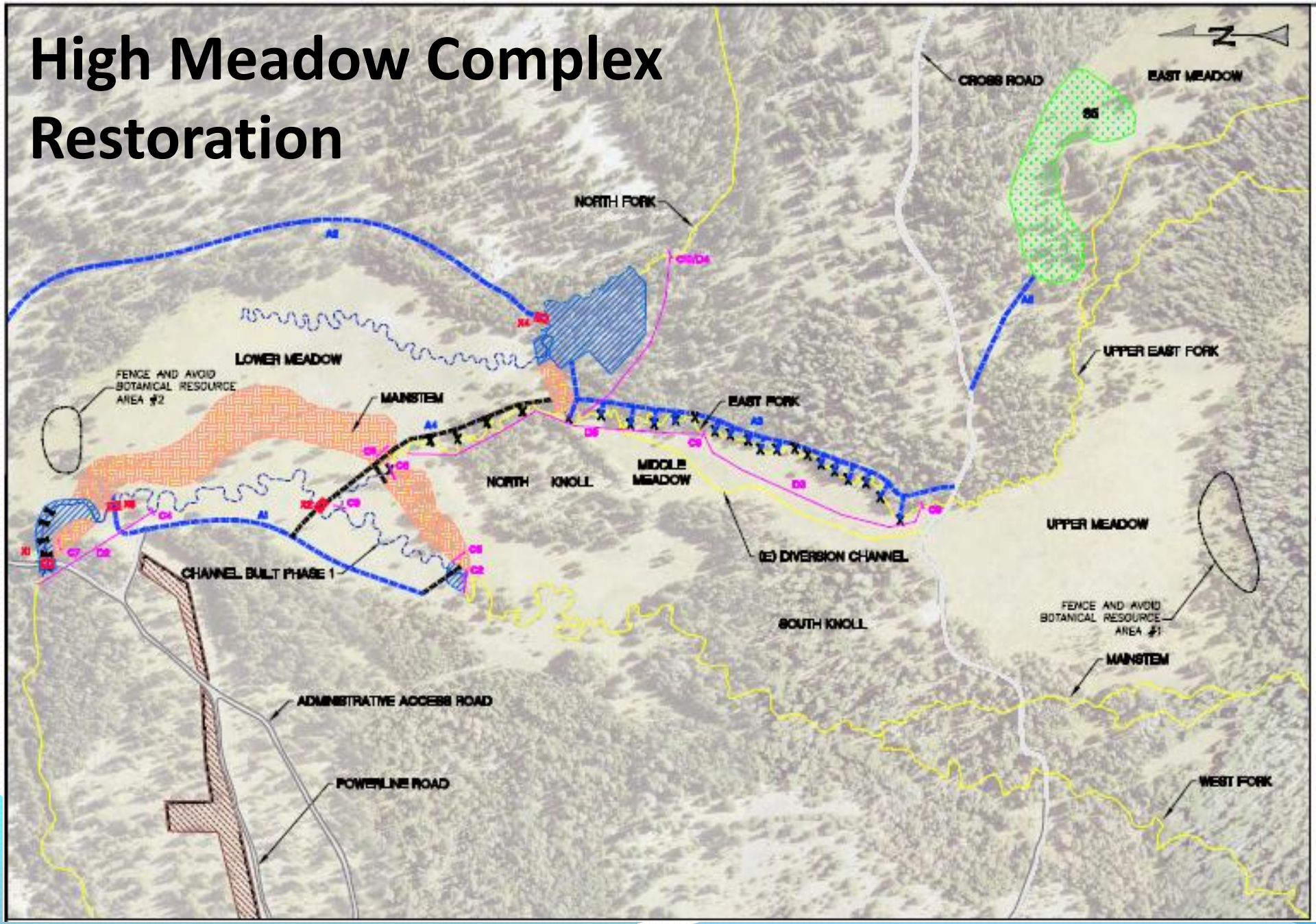
- Meadow Grazed from late 1800's to 2002
- Diversion system in place since at least 1940
  - Has not been maintained since 2002



Cold Creek/ High Meadow Bank Stability Rating, 2006



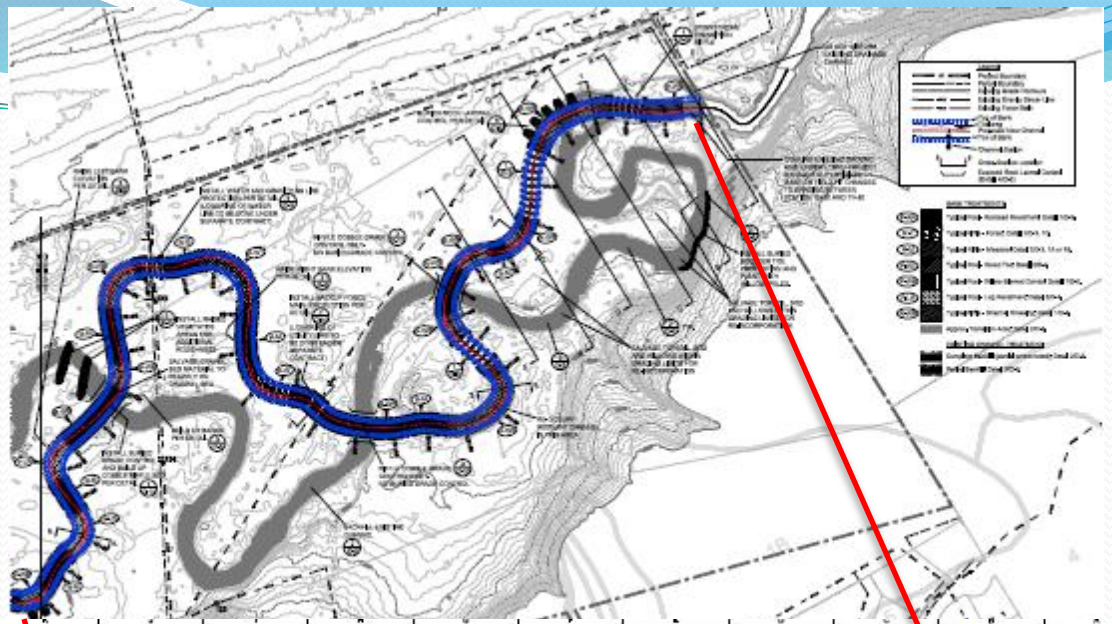
High Meadow Complex Restoration

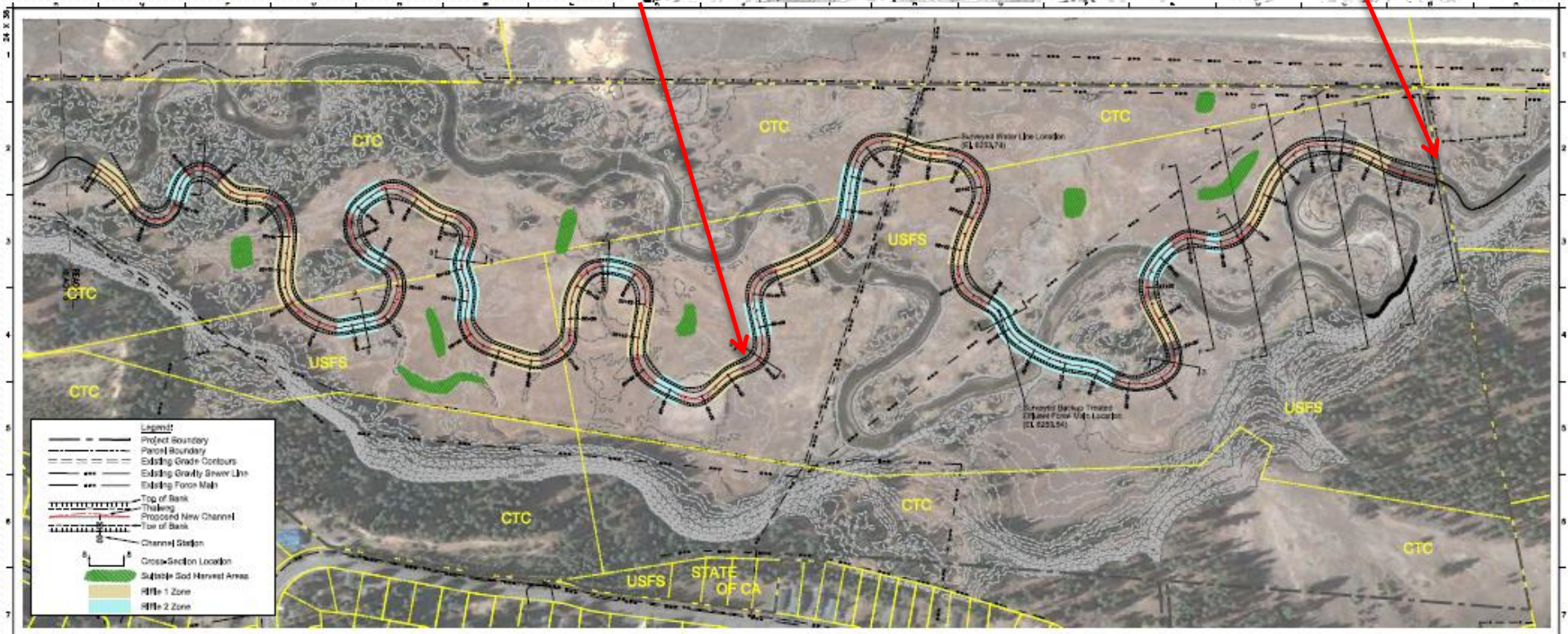



New Cold Creek main stem channel with substrate

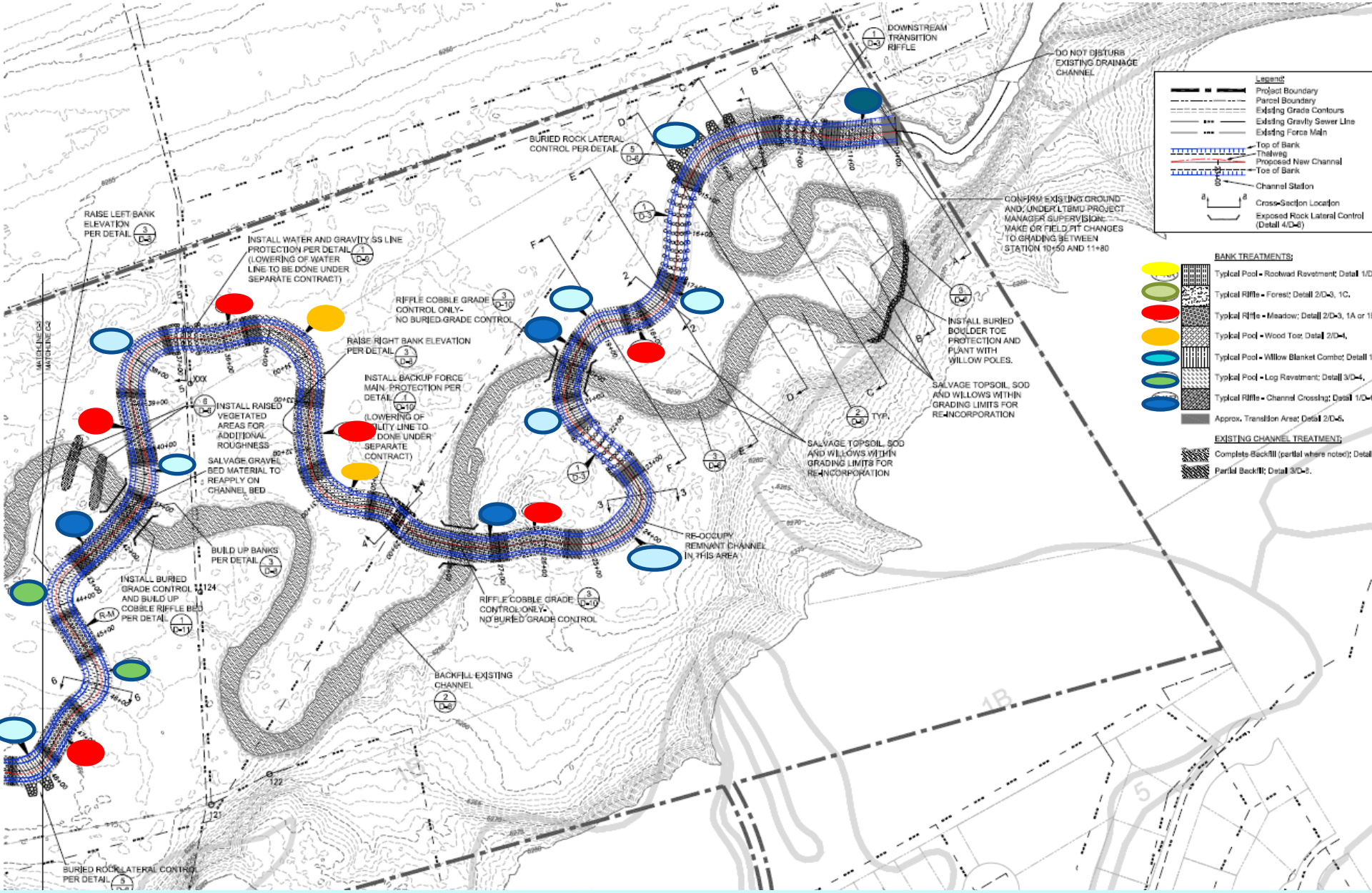
Upper Truckee Reach 5 Restoration Implementation 2013-2016

Upper Truckee Reach 5 Restoration Proposed Alignment Overview





REACH 5 PROPOSED ALIGNMENT


DOWNSTREAM TRANSITION RIFFLE
DO NOT DISTURB EXISTING DRAINAGE CHANNEL
BURIED ROCK LATERAL CONTROL PER DETAIL
RAISE LEFT BANK ELEVATION PER DETAIL
INSTALL WATER AND GRAVITY SS LINE PROTECTION PER DETAIL (LOWERING OF WATER LINE TO BE DONE UNDER SEPARATE CONTRACT)
RIFFLE COBBLE GRADE CONTROL ONLY- NO BURIED GRADE CONTROL
RAISE RIGHT BANK ELEVATION PER DETAIL
INSTALL BACKUP FORCE MAIN PROTECTION PER DETAIL (LOWERING OF UTILITY LINE TO BE DONE UNDER SEPARATE CONTRACT)
INSTALL RAISED VEGETATED AREAS FOR ADDITIONAL ROUGHNESS
SALVAGE GRAVEL BED MATERIAL TO REAPPLY ON CHANNEL BED
BUILD UP BANKS PER DETAIL
INSTALL BURIED GRADE CONTROL AND BUILD UP COBBLE RIFFLE BED PER DETAIL
RIFFLE COBBLE GRADE CONTROL ONLY- NO BURIED GRADE CONTROL
BACKFILL EXISTING CHANNEL
RE-OCCUPY REMNANT CHANNEL IN THIS AREA
SALVAGE TOPSOIL, SOD AND WILLOWS WITHIN GRADING LIMITS FOR RE-INCORPORATION
INSTALL BURIED BOULDER TOE PROTECTION AND PLANT WITH WILLOW POLES.
SALVAGE TOPSOIL, SOD AND WILLOWS WITHIN GRADING LIMITS FOR RE-INCORPORATION
TYP.
CONFIRM EXISTING GROUND AND, UNDER LTBMU PROJECT MANAGER SUPERVISION, MAKE OR FIELD FIT CHANGES TO GRADING BETWEEN STATION 10+50 AND 11+80
BURIED ROCK LATERAL CONTROL PER DETAIL
Legend
Project Boundary
Parcel Boundary
Existing Grade Contours
Existing Gravity Sewer Line
Existing Force Main
Top of Bank
Thalweg
Proposed New Channel
Toe of Bank
Channel Station
Cross-Section Location
Exposed Rock Lateral Control (Detail 4/D-6)
BANK TREATMENTS:
Typical Pool - Rootwad Revetment; Detail 1/D
Typical Riffle - Forest; Detail 2/D-3, 1C.
Typical Riffle - Meadow; Detail 2/D-3, 1A or 1
Typical Pool - Wood Toe; Detail 2/D-4,
Typical Pool - Willow Blanket Combo; Detail 1
Typical Pool - Log Revetment; Detail 3/D-4,
Typical Riffle - Channel Crossing; Detail 1/D-
Approx. Transition Area; Detail 2/D-5.
EXISTING CHANNEL TREATMENT:
Complete Backfill (partial where noted); Detail
Partial Backfill; Detail 3/D-5.

Remember the 5 R's

1. Resistance
2. Resilience
3. Response
4. Realign
5. Reduce

For more information visit the Forest Service Climate Change Resource Center
http://www.fs.fed.us/ccrc/