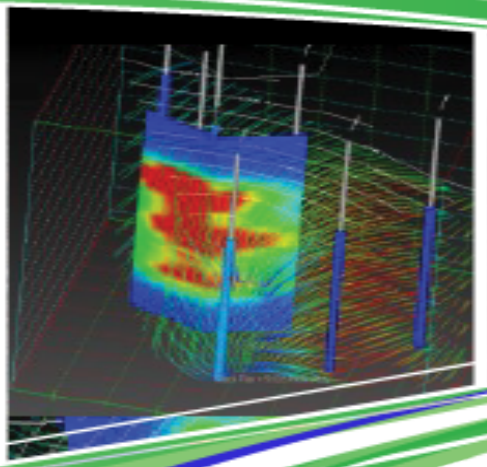




Adaptive Management: Overview and Superfund Task Force Pilot Case Studies

Kate Garufi, EPA HQ

Course Objectives

- Gain an understanding of adaptive management and its application and benefits at Superfund mining sites;
- Understand what site or project management tools are available to support adaptive management; and
- Progress and lessons learned from the Superfund task force adaptive management pilots

SUPERFUND ADAPTIVE MANAGEMENT OVERVIEW

So, why the focus? Superfund Task Force

- **SFTF Goal 1**: Expediting cleanup and remediation

- **Strategy 2**: Promote the application of Adaptive Management at **complex** sites and expedite cleanup through the use of early/interim RODs and removal actions

- **Recommendation 3: Broaden the use** of Adaptive Management (AM) at Superfund sites

Issues Common to Complex Sites

- ✓ Lack of consensus on site understanding and priorities
- ✓ No clear plan for managing uncertainty
- ✓ Lack of structured and documented decision-making
- ✓ Linear project management mentality
- ✓ Contracting and funding challenges to facilitate innovative and dynamic decision making

What is Adaptive Management?

- EPA's working definition:
  - Formal and systematic site or project management approach centered on rigorous site planning and firm understanding of site conditions and uncertainties
  - Rooted in sound use of science and technology
  - Decisions implemented consistent with CERCLA, the National Contingency Plan, and EPA policy and guidance

- Focus on taking action and learning: Encourages continuous re-evaluation and prioritization of activities to account for new information or changing conditions.

What Adaptive Management is NOT

- Trial and error
- An end in itself
- A silver bullet
- One size fits all
- Make it up as we go

"adaptive management is a very powerful, yet poorly understood natural resource management tool…but (it) must be understood by those who use, support, fund, and challenge it."

-Van Cleve et al. 2003

Current Adaptive Management Approach

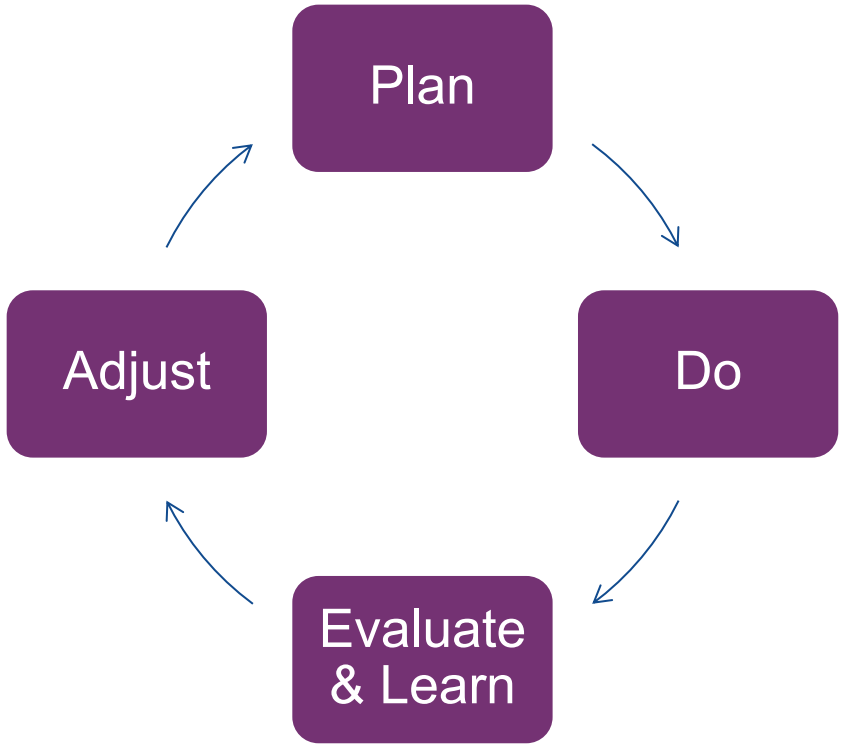
- Current applications are largely reactive versus proactive (informal)

"Formal" Adaptive Management	"Informal" Adaptive Management
Structured and predictable	Ad hoc, no formal rules
Scientific, hypothesis-based	Trial and error
Process with explicit success criteria	Undefined process, infinite loop
Identifies and reduces uncertainties	Adjusts to, but does not anticipate uncertainties

- Lack structured documentation (no plans)

Elements of AM

- Define Site/Project Objectives
- Model(s) the site being managed
- Identify potential actions
- Monitor and evaluate outcomes
- Incorporate learning into future decisions
- Stakeholder participation



Potential Advantages of AM at Superfund Sites

Streamline Decision Making

- Upfront planning and documentation to formalize and structure to the process
- Build stakeholder consensus and capture priorities
- Transparent documentation of management and resource decisions

Facilitate Site Progress

- Potential for earlier human health and ecological risk reduction
- Early source control
- Putting parts of sites back into beneficial reuse

Cost Control

- Helps to prioritize limited resources on collecting critical information to facilitate site completion
- Updating remedial approaches, as needed, based on new information

Adaptive Management Pilot Program

- Pilot program focuses on bringing Superfund Adaptive Management application from "*concept*" to "*reality*" by developing and/or implementing Adaptive Management Framework

- Application at the Site or Project Level

- Outcome: Adaptive Management Site or Project Management Plan (AM SMP or AM PMP)

Role of the AM SMP/PMP

- Provide a formal process to achieve objectives and maintain forward progress, while documenting the decisions made along the way

- Benefits
  - Increase process transparency
  - Standardize Documentation
  - Formal periodic review/updates
  - Formal process for prioritizing actions
  - Provide method for course adjustments based on evolving Site understanding (risk, technologies, effectiveness, stakeholder input, etc.)

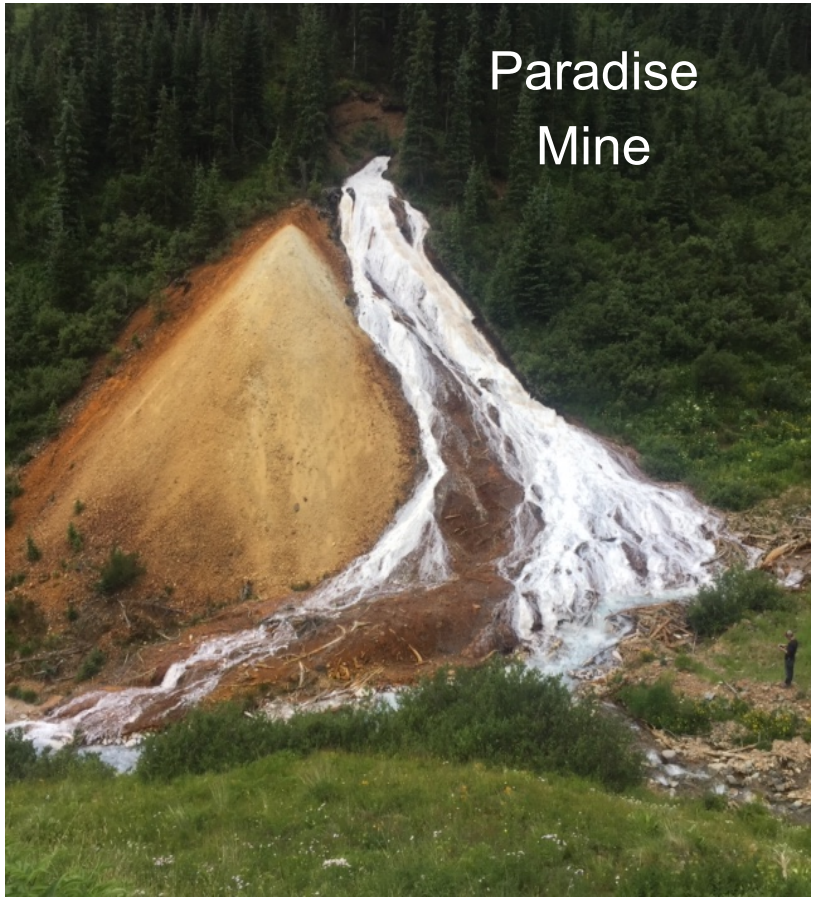
- Key Components
  - Site Principles
  - Adaptive Decision Making Process

Site Principles

- Site principles include:
  - Goals for the site or project;
  - Considers how these goals may be prioritized;
  - Identifies objectives or key adaptive management decision points for the site or project; and
  - Develops a preliminary site or project-level strategy and schedule
- Guides adaptive decision making
- Updated on a frequency determined on a site or project level

AM SMP: Lessons Learned on Developing Site Principles for a large, complex mining site

BONITA PEAK MINING DISTRICT

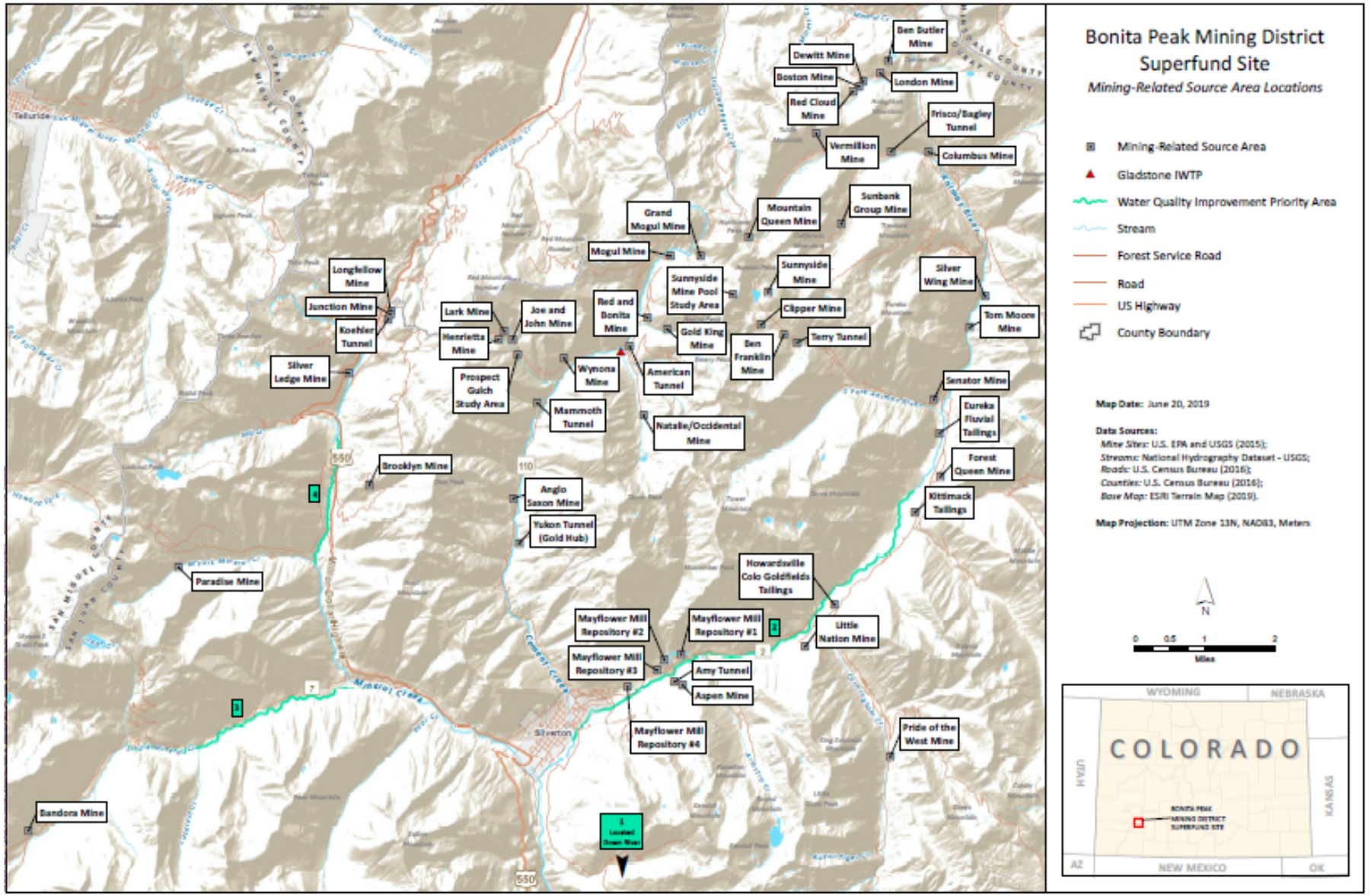


SITE CHALLENGES

Challenge #1: Size and Location

- Over 300 historic mines in the BPMD
- Silverton: 10,000 – 13,000 feet above sea level
- NPL site is 48 source areas across three drainages = >100 square miles

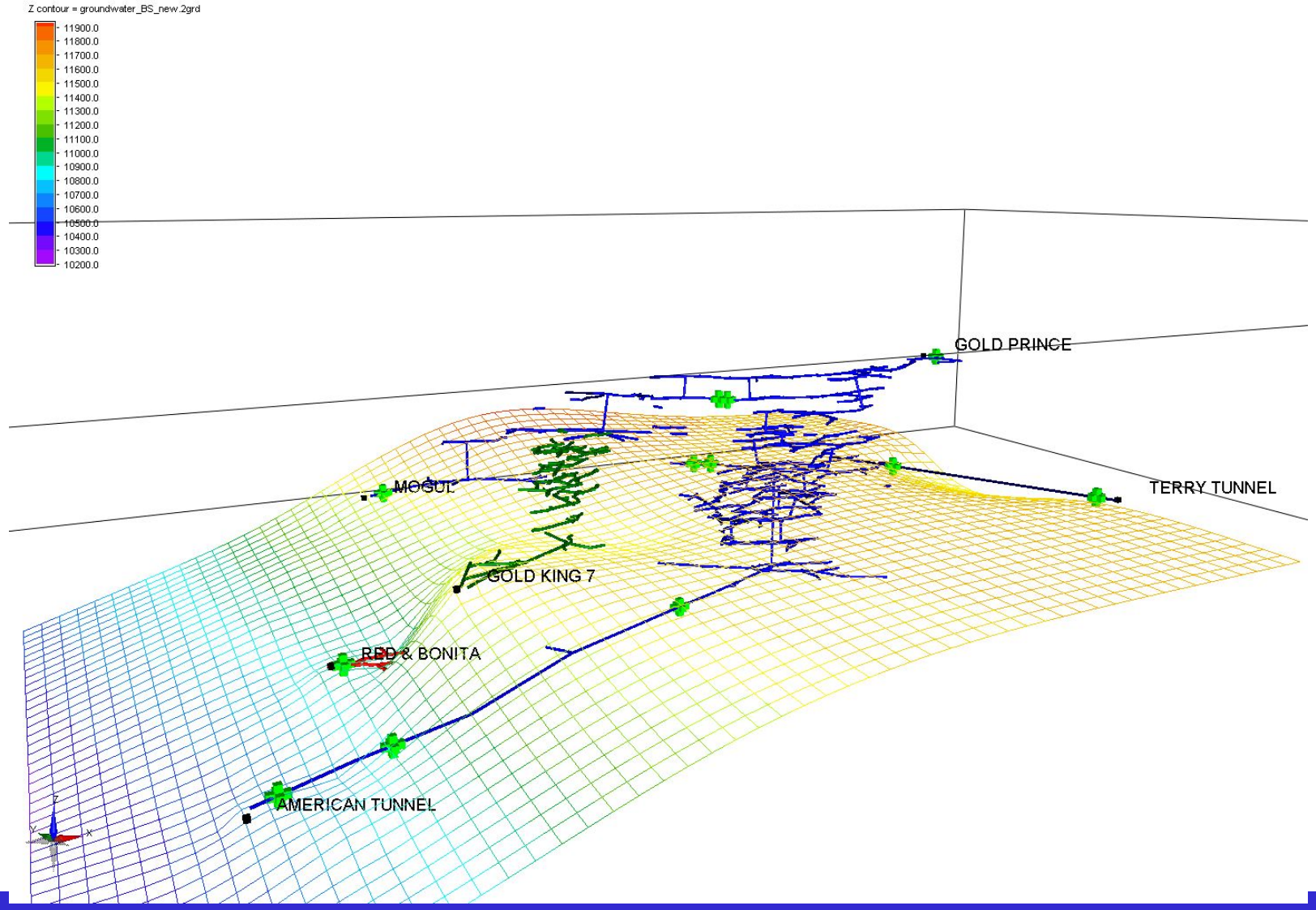
48 NPL Site Source Areas



Challenge #2: Source Area Complexities

Typical abandoned mine area at BPMD

Underground Mine Working Complexities



Challenge #3: High Social/Political/Legal Profile

- Gold King Mine release - 2015
- Interim Water Treatment System performance challenges
- Defensive Litigation challenges

Challenge #4: Numerous Stakeholders and Agencies

- State government interest
- Federal partner interest
- Tribal nation interest
- Local population interest

Water quality in the Animas River is key to all groups

BPMD: SITE PRINCIPLES DEVELOPMENT

BPMD Site Principles Development

- Establish EPA Goals: Status – Complete ☑
- Establish WQ Priority Reaches: Status – Complete ☑
- Develop a Site Strategy Status – Ongoing

EPA Initial Goals – Established In 2019

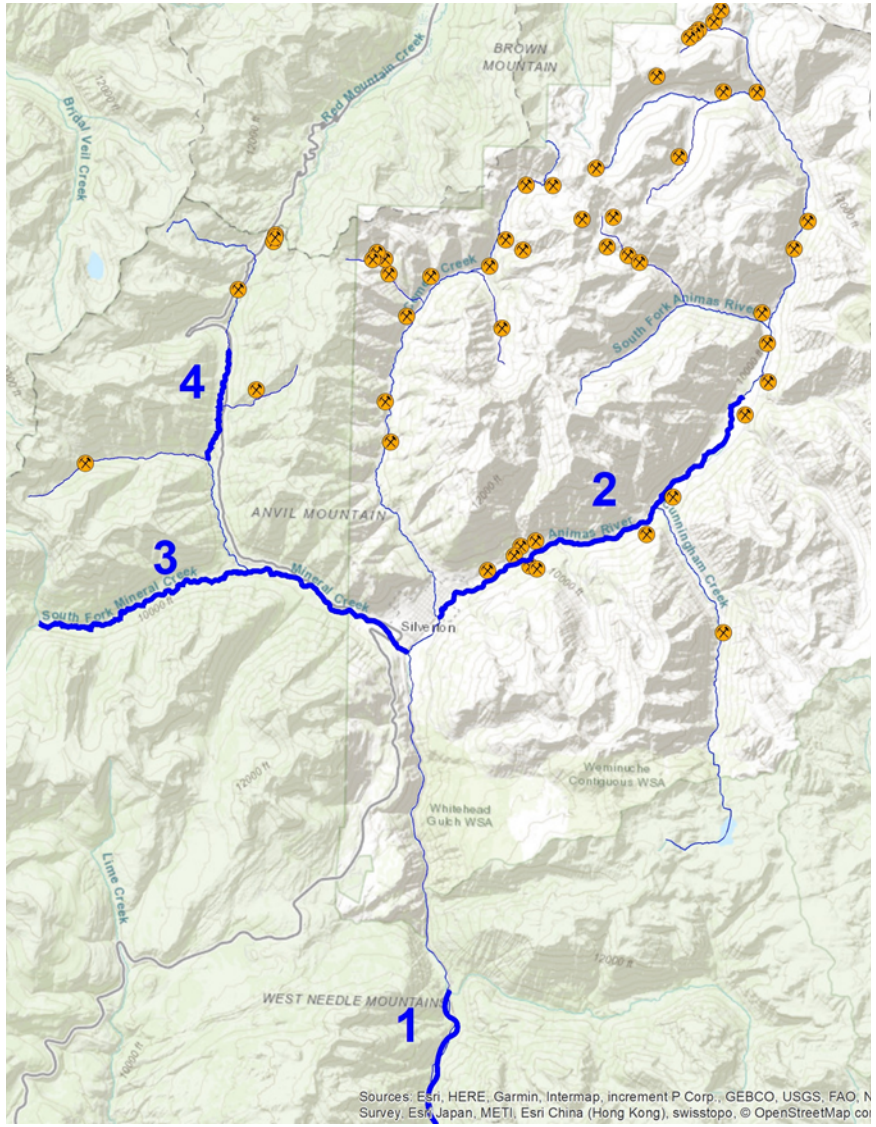
CERCLA Goal: Minimize Human Health and Ecological Risks

- Goal #1: Improve Water Quality
- Goal #2: Stabilize Source Areas
- Goal #3: Prevent uncontrolled Releases

Note: BLM and USFS have agency-specific goals for work done under their CERCLA authority

Result: 4 WQ Priority Reaches

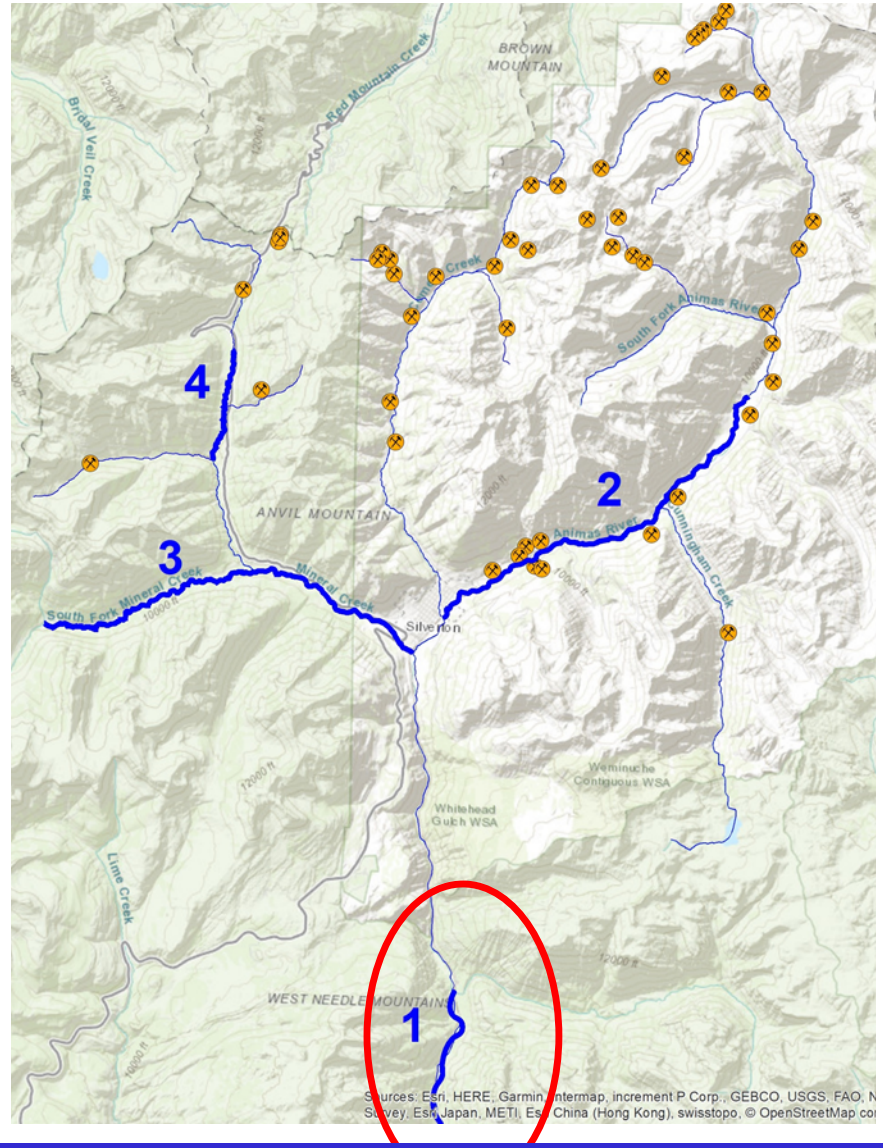
- Reach 1: Canyon Reach
- Reach 2: Upper Animas at Howardsville
- Reach 3: South Fork of Mineral Creek
- Reach 4: Upper Mineral Creek



Reach 1: Canyon Reach

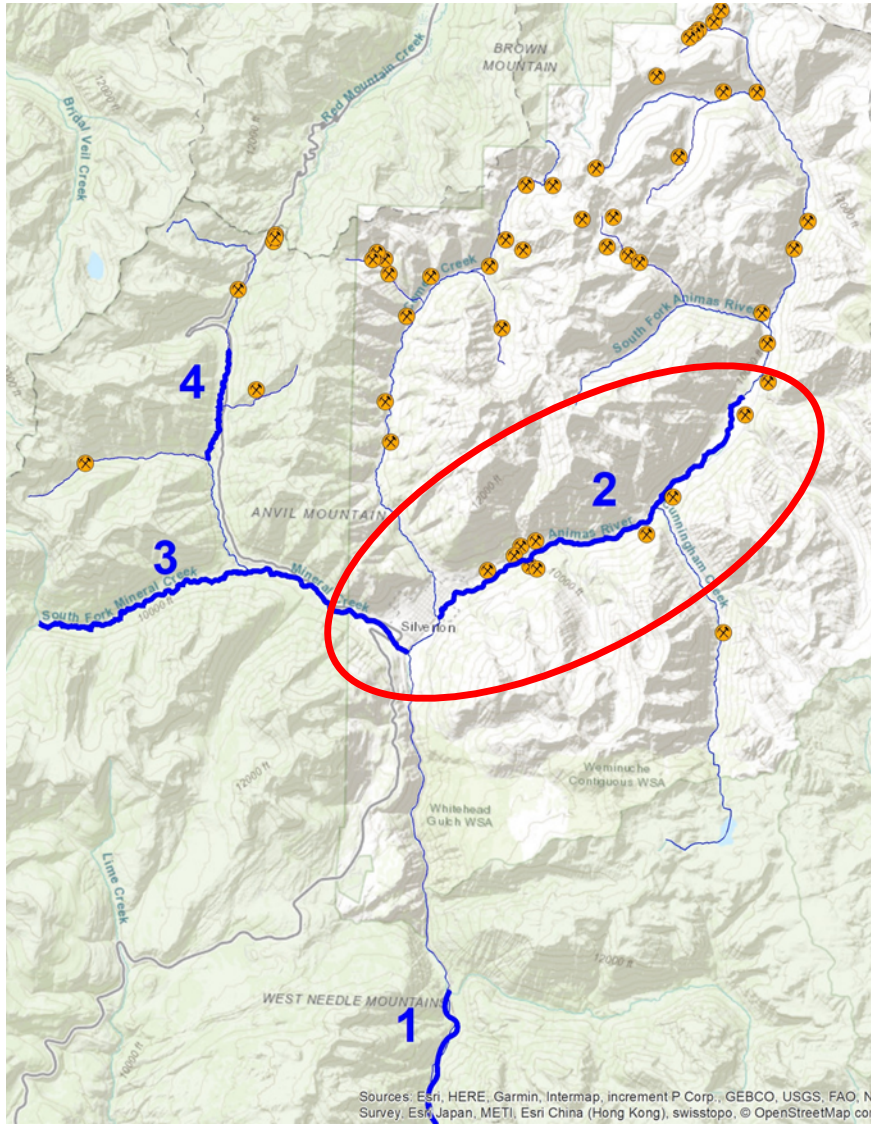
- Objective (Sitewide): Undertake activities necessary to meet Table Value Standards in the Animas River below Elk Creek

- Considerations:
  - Meeting goal requires addressing upstream NPL source areas
  - Limited data in Canyon Reach



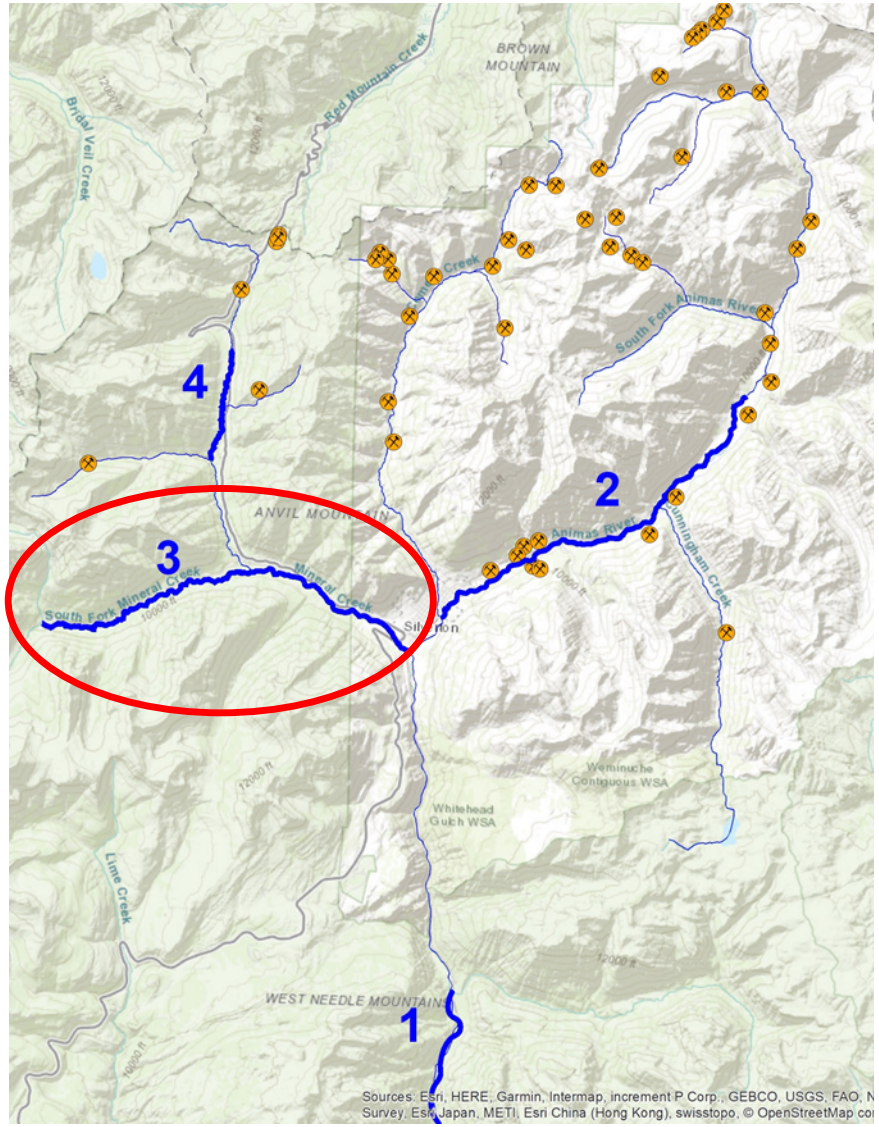
Reach 2: Upper Animas at Howardsville

- Objective: Improve numbers and spatial extent of the existing brook trout fishery
- Considerations:
  - PRP-lead RI at Mayflower Mill
  - Significant zinc loaders
  - Background data needs



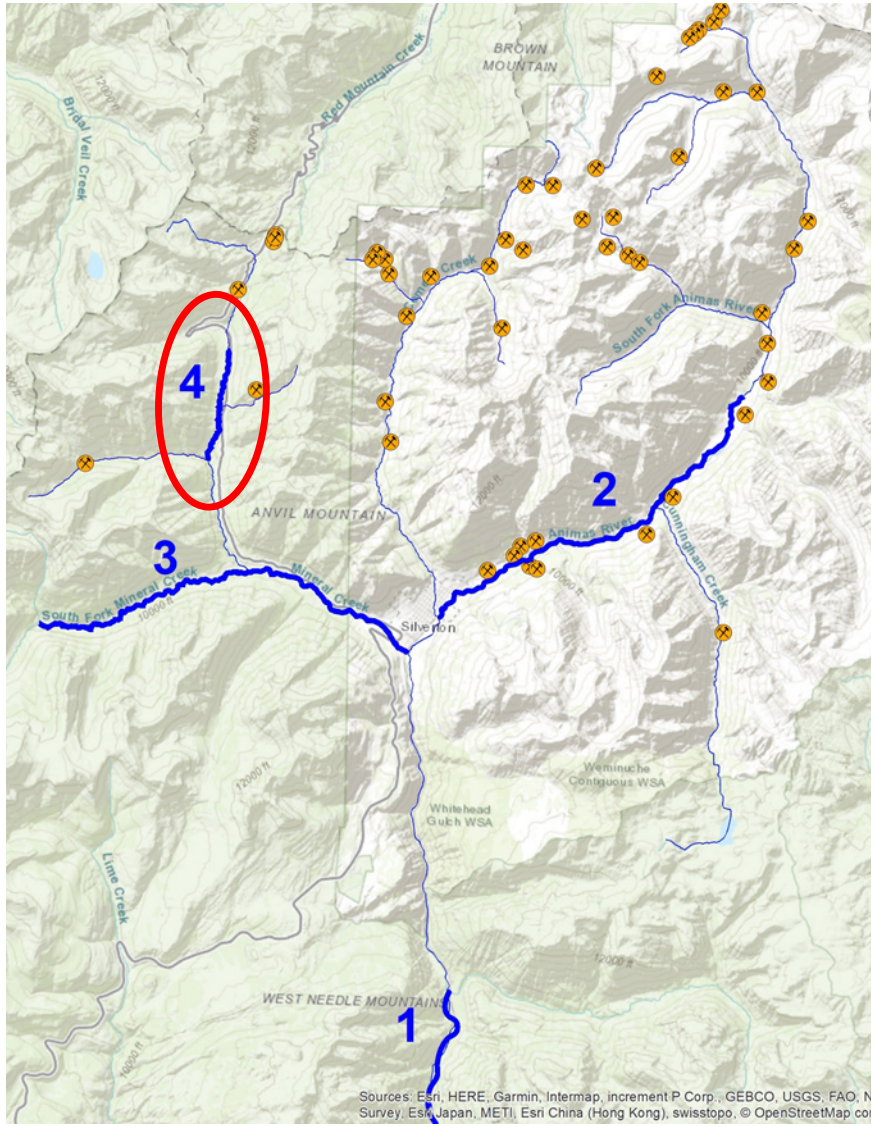
Reach 3: South Fork of Mineral Creek

- Objectives:
  - Improve numbers and diversity of the existing fishery.
  - Improve the benthic macroinvertebrate community.
  - Protect/enhance the trout corridor to Animas River.
- Considerations:
  - Existing trout population
  - Background data needs
  - Upgradient sources?



Reach 4: Upper Mineral Creek

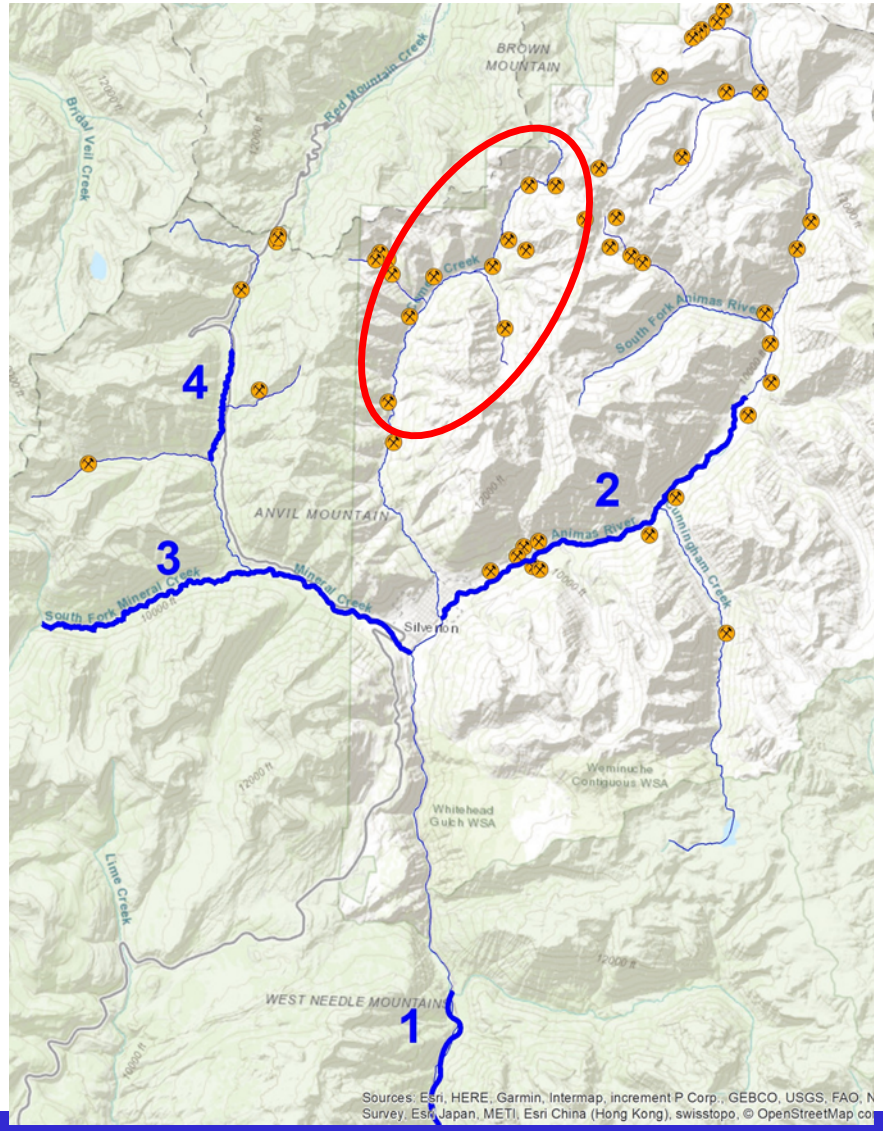
- Objectives:
  - Investigate the potential for expansion and improvement of the Mineral Creek fishery.
  - Improve the benthic macroinvertebrate community.
- Considerations:
  - Complicated area
  - Status of existing fishery?
  - Background needs



Other Reach Considerations: Cement Creek

- Objectives: N/A. No focused goals have been established for Cement Creek since viable aquatic life was never present there.

- Reducing metal loading in Cement Creek will be critical to the achieving EPA's water quality goals in Priority Area 1.

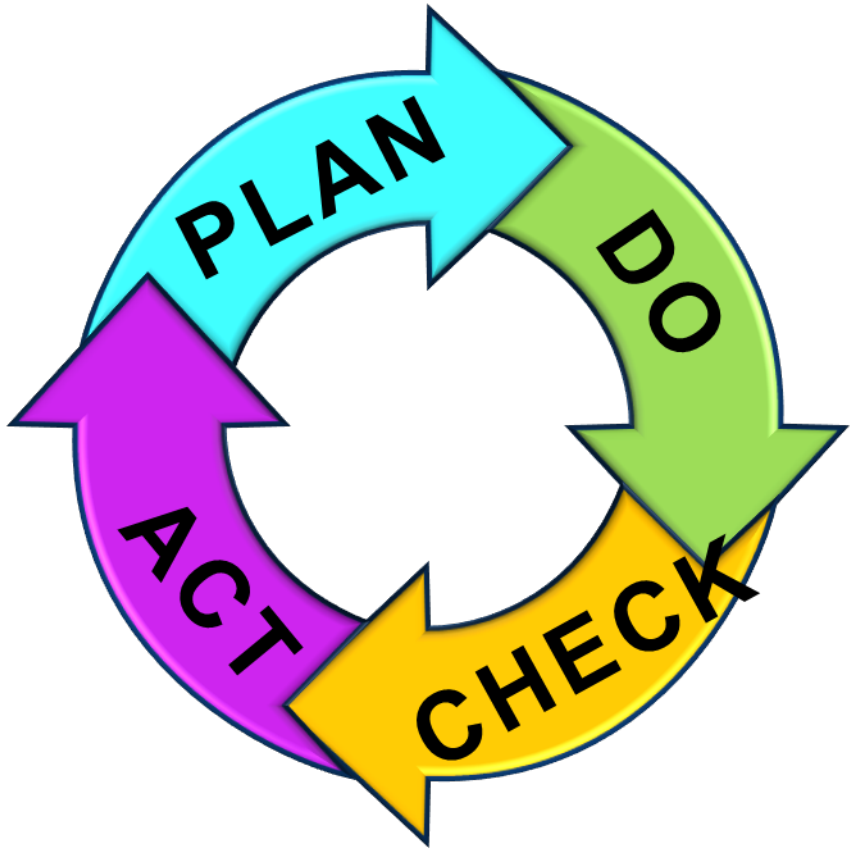


Site Strategy Development Approach

- Focus on high level implementation plan for next 10 years
- Develop and explore options
  - Consider pros and cons for each option
  - Be inclusive: Solicit stakeholder input on option development (stakeholder involvement in options)
- After stakeholder input, make recommendation to management for decision-making
- Goals, priorities, and site strategy will be revisited as part of the AM SMP Implementation

Adaptive Decision Making

- Structured and iterative decision-making process for prioritization of activities based on site principles;
- Requirements for developing actions including measurable objectives and monitoring/evaluation of selected actions
- Outline the tools and procedures for documenting and communicating decisions
- Process for incorporating lessons learned (e.g., results of performance monitoring)



AM PMP: Developing an Adaptive Decision Making Approach for the Lower Basin

BUNKER HILL: LOWER BASIN

Why Adaptive Management?

- Broad, vague RAOs
- Large area, minimal data
- Uncertainties
  - Contaminant source and deposition
  - Remedy effectiveness
  - Cost
  - Collateral impacts
  - O&M
- Multiple potential actions
- Stakeholders – ‘Do something now!’
- Insufficient funds
  - Constrained by UB work

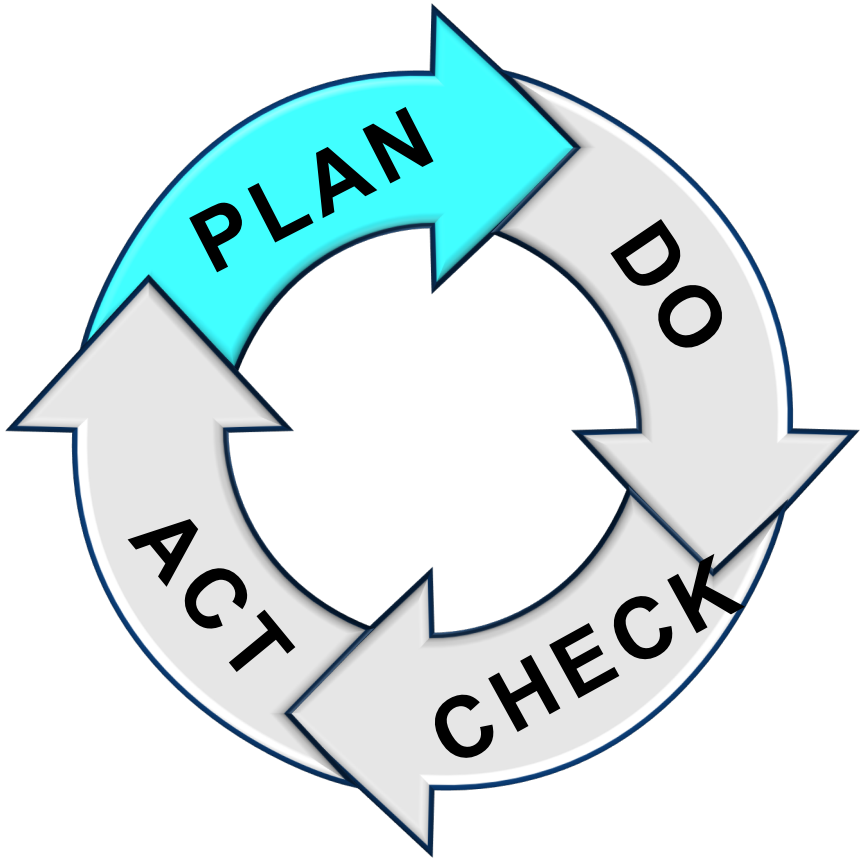
- *Provide protection to people from lead-contaminated soils and sediments and from contamination in aquatic food sources*
- *Provide protection to fish, waterfowl, migratory birds, and other plants and animals and contribute to a functioning ecosystem.*

- Coeur d'Alene Basin Commission
- State of Idaho, State of Washington
- Coeur d'Alene Tribe, Spokane Tribe
- Natural Resource Trustees → Restoration Partnership
- Community leaders

US Forest Service

Key elements supporting planning in Lower Basin

- Convene stakeholders
- Strategic Plan (2018)
- ECSM (Enhanced Conceptual Site Model)
- Modeling Tools
- MODA (Multi-objective Decision Analysis)
- Optimized BEMP (Basin Environmental Monitoring Plan)



Potential Actions

- Human health
- Wetlands
- Source Control

Multi-Objective Decision Analysis (MODA) Prioritization & Project Selection Approach

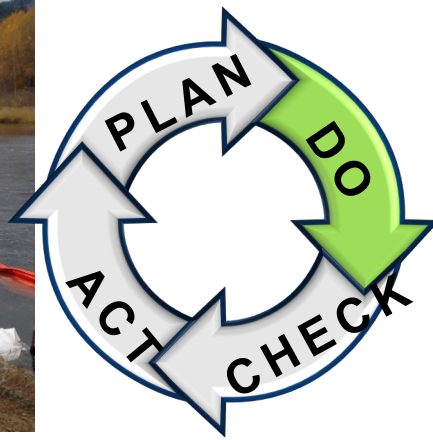
- What is MODA?
  - Theoretically sound, scalable approach for evaluating alternatives when multiple objectives exist
  - Evaluation criteria are weighted by relative importance, and the overall "decision score" of an alternative is the weighted sum of its rating against each criterion
- Why MODA?
  - Projects selected provide highest value for dollars spent
  - Framework for discussing key assumptions and values
  - Deliberate and transparent
  - Results are defensible and provide clear documentation about why one project is selected over another

Selected Action: Project Execution Plan

- Project Execution Plans (PEP) will be developed by EPA for reach project.
- Will serve as a high-level work plan for the project

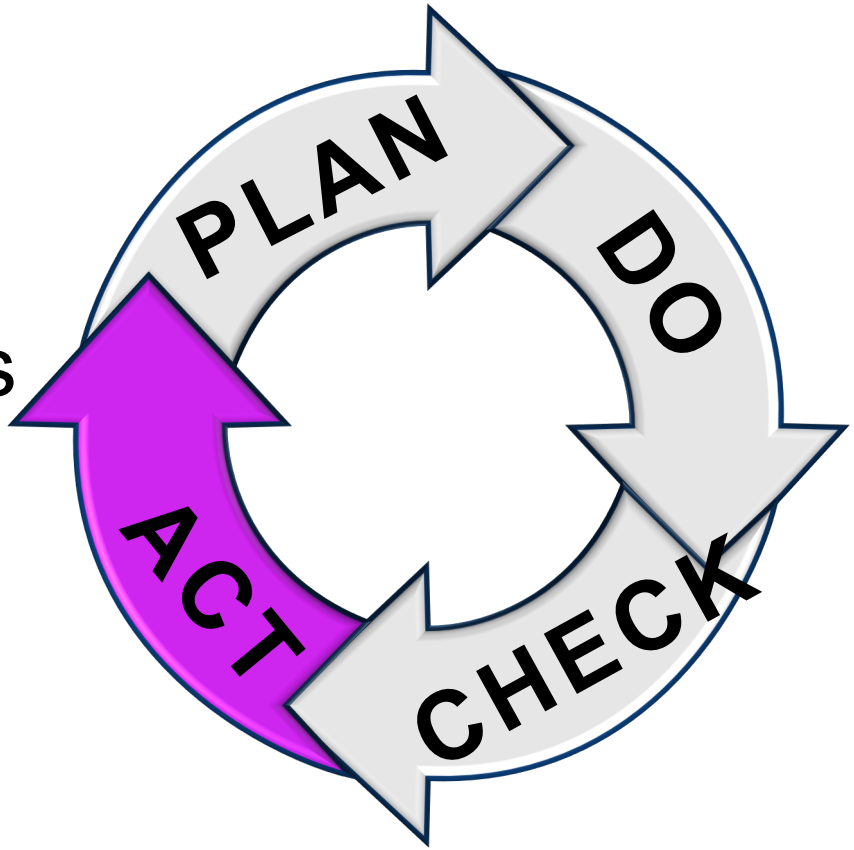
- Contents:
  - Goals and objectives of the project;
  - Summary of the stakeholders;
  - Schedule, milestones, monitoring; and
  - Lessons learned from papst projects

Project Execution

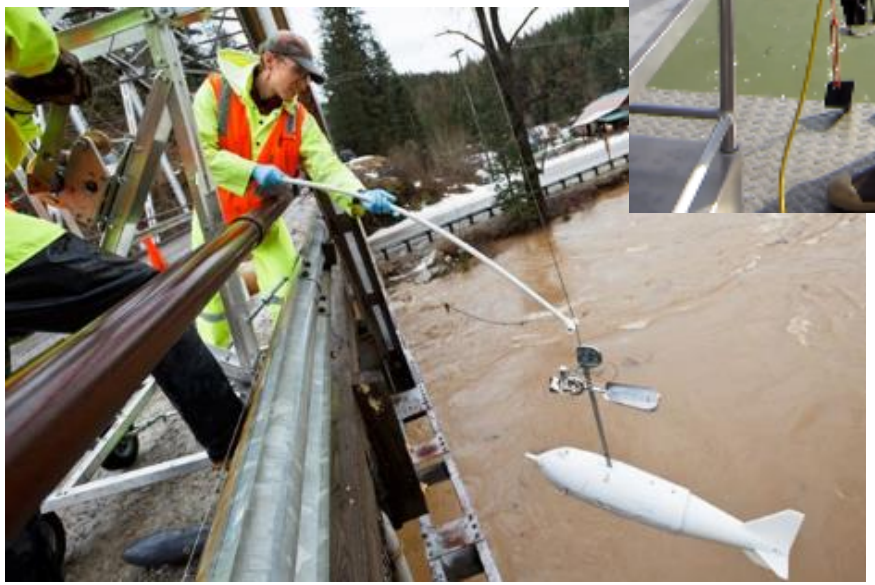


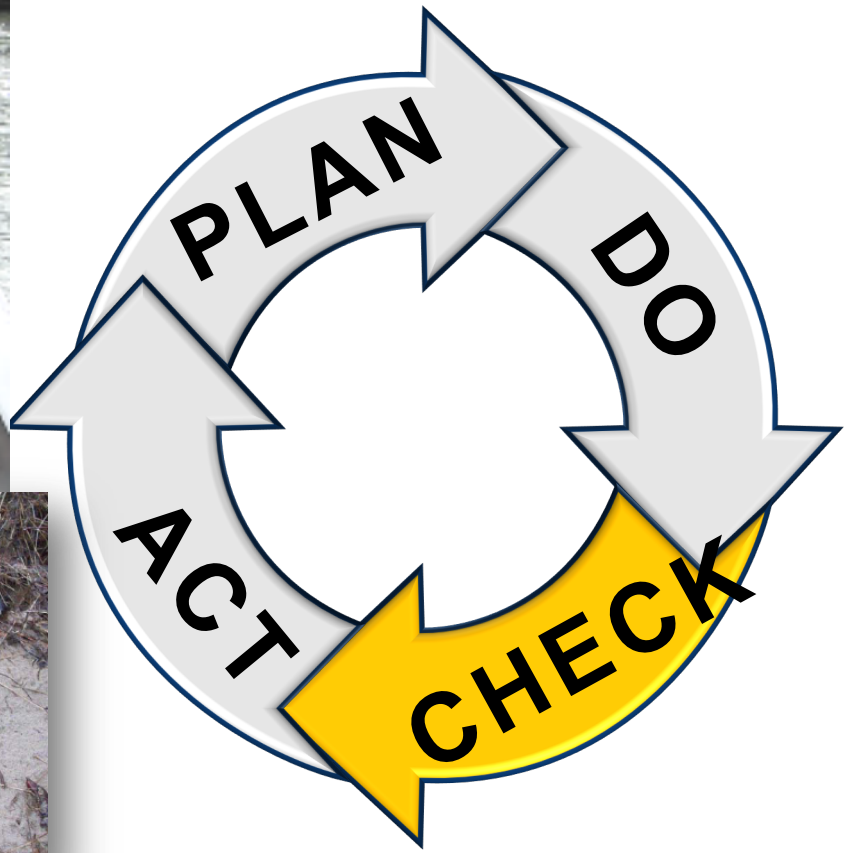
Apply data and lessons learned to actions

- Periodic review of options and budgets to assess priorities and opportunities
- Continue stakeholder participation as EPA's options and priorities evolve
- Ongoing use of models, monitoring data and MODA



Monitoring and Metrics for remedy effectiveness





QUESTIONS?