Workshop Example Application

- Eagle River (Edwards Reach) Case Study
  - Description
- DFMEA
  - Project Design → Compare RPNs
  - Implement Corrective Actions
  - Improve DFMEA
- Result → lowest risk design

Case Study Description

- Eagle River – Edwards Reach
  - Reach length – 1.6 miles
  - Drainage area – 600 square miles
  - Very flat – 0.25 percent slope
  - Expansive floodplain along reach

Case Study Description

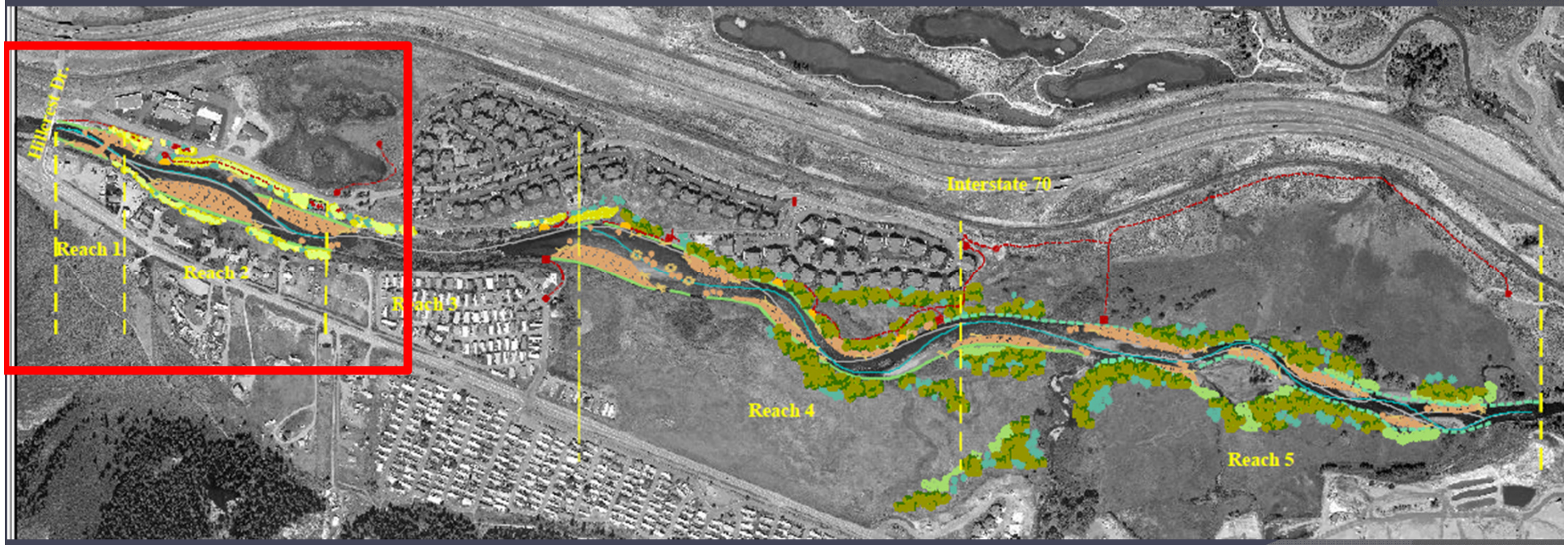
- Bounded by two bridges
  - Begins 0.5 miles downstream of Edwards Spur Road Bridge
  - Ends at Hillcrest Drive Bridge
- Adjacent Land Use
  - 5000 people live adjacent to reach (gated drives to trailer park courts)
  - Upstream - Eagle River Preserve (72-acre park)
  - Downstream - unimproved public boat launch – serving 800 people/day
  - Used heavily by boating enthusiasts

Case Study Description

- Goals
  - Restore 1.6 miles of river and 80 acres riparian corridor
  - Reconnect 50 continuous miles of habitat
  - Improve habitat and function of river
- Objectives
  - Surface Water Quality
  - Sediment Control
  - Stream Health and Function
  - Aquatic Habitat
  - Riparian and Wildlife Habitat
  - Land Use Management

Case Study Description

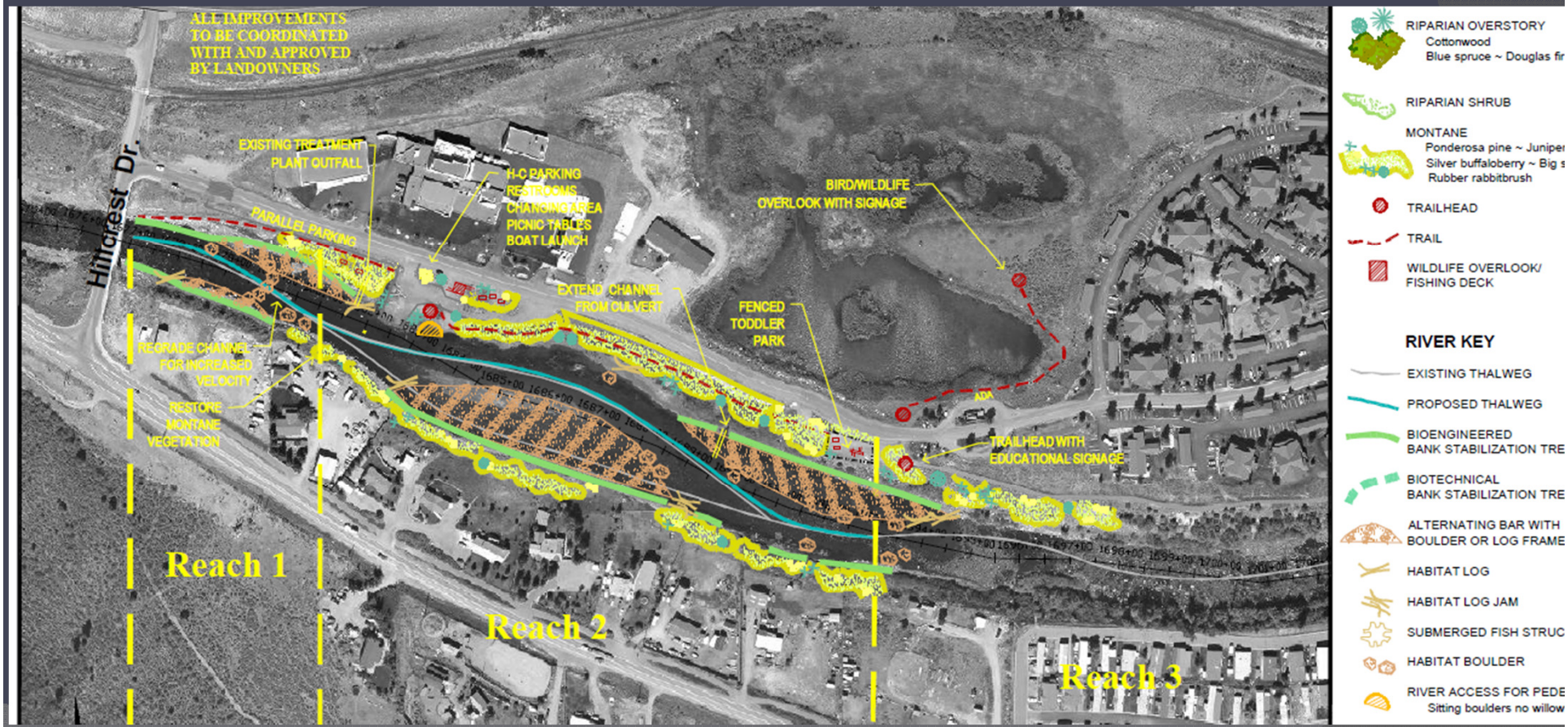
- Five Reaches



- Focus on Reaches 1 and 2
  - Most urban and constricted

Case Study Description

- Reaches 1 and 2



Restoration Treatments

- Channel Improvements
  - Cross Sectional Geometry Change - modifications in width and depth
    - Regime Approach
      - HEC-RAS Hydraulic Modeling
      - Chang's/Parker's regime relationships for sand and gravel bed rivers
  - Longitudinal Slope Adjustment
    - Create positive gradient in Reach 1
      - increase velocities and decrease sediment deposition
    - Cross rock vane grade control structure

Restoration Treatments

- Channel Geometry - Cobble/Gravel Bars
  - Alternating point bars – natural and constructed – restore low flow and bankfull regime widths, but still allow flooding
  - Constructed out of boulder or log frames with smaller material on top to replicate substrate appropriate to system
  - Project Goals – surface water quality, sediment control, and improvement of health, function, and habitat

Before

After

Cobble/gravel point bar in lower reach

Restoration Treatments

- Bank Stabilization
  - Biotechnical Treatments
    - High erosion areas
    - Geocellular confinement systems, topsoil loaded and vegetated
    - Geogrids
    - Sloping of banks
    - Photodegradable erosion control fabiric – to protect until vegetation established
- Project Goals
  - Sediment control, health and function improvement, revegetation for riparian and habitat

Restoration Treatments

- Bank Stabilization
  - Bioengineered Treaments
    - Willow and Pole Treatments (in less severely eroded areas) – with boulder/cobble toe protection
    - Willow wattles and log toes, brush mattressing, brush revetments, soil reinforcement lifts

Photos illustrate, from left to right, typical degraded condition, target bank condition, and newly constructed condition

Restoration Treatments

- Aquatic Habitat Features
  - Habitat boulders
  - Habitat logs and log spurs
  - Clusters and keyed into bank
- Project Goals
  - stream health and function improvement, enhance aquatic habitat, reconnection of fisheries

Restoration Treatments

- Native Plantings
  - Vegetation restoration with native plants
  - Ten different plants associations developed (willows, cottonwords and shrubs)
  - Project Goals – riparain and wildlife and aquatic habitat

Reach 1 Restoration Components

- Channel Geometry – Alternating Bars
- Longitudinal Slope Adjustment
- Cross Rock Vane
- Bioengineered Bank Treatments
- Biotechnical Bank Treatments
- Habitat Boulder, Logs, and Spurs
- Native Plantings
- Current Design Controls for All
  - Incipient Motion and Standard Design Guidelines

DFMEA – Eagle River Reach 1 Design

- In Groups:
  - Each group take 1 (one) design component
  - For your design component identify:
    - Potential Failure Modes
    - Potential Effects of Failure on Other Components
    - Potential Effects of Failure on the Whole System
      - Consequence Rating (C)
    - Potential Causes of Failure
      - Likelihood of Occurrence Rating (O)
    - Current Design Controls
      - Likelihood of Detection Rating (D)
    - Calculate a RPN

DFEMA Initial Design

- Results – Initial Design
  - Alternating Bars
    - RPN's - _____
  - Long Profile Change
    - RPNs - _____
  - Cross Rock Vane
    - RPNs - _____
  - Bank Stabilization
    - RPNs - _____
  - Habitat Improvements
    - RPNs - _____