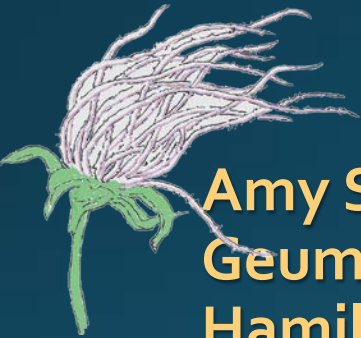


# Milltown Dam Floodplain Restoration – Status Update



**Amy Sacry, Restoration Ecologist**  
**Geum Environmental Consulting**  
**Hamilton, Montana**

**Cara Nelson, Associate Professor of**  
**Restoration Ecology**  
**University of Montana**



# History of Impacts



Beaver trapping



Milltown Dam



Infrastructure



Ice jams and fish kills

1800s

1900s

1950s

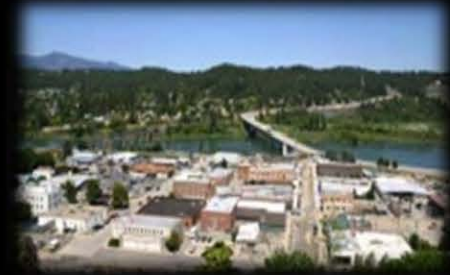
1980s

Mining

Logging

Railroads and agriculture

Contaminated aquifer



1908 flood of record  
Reservoir filled

Floodplain alteration



# Integrated Remediation & Restoration

EPA Record of Decision

Settlement Agreement



Bypass channel



2007-2009: Sediment removal  
2.2M cubic yards

March 2008: dam removal



Repositories & reclamation

2005

2006

2007

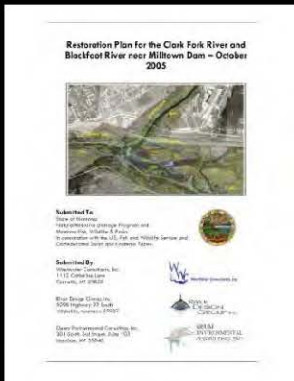
2008

2009

2010

2011

Restoration Plan



Peer review



2008-2011:  
Design and bid  
documents

2005-2007:  
Data collection and  
feasibility analysis

2008-2012 Implementation









## Grading Plan

### Restoration Plan for the Clark Fork River and Blackfoot River near Milltown Dam

#### Features

- Main Channel
- Secondary Channel
- Point Bar
- Wetland
- Bankfull Floodplain (bankfull elevation to 2 ft. above bankfull)
- Low Terrace (2 to 3 ft. above bankfull)
- High Terrace (greater than 3 ft. above bankfull\*)
- Existing Floodplain Surface (to remain undisturbed)
- Deer Creek Tributary (pending final design)
- Existing Spring
- Existing Secondary Channel



\*Final elevation to be determined based on final cut/fill quantities.





# Design for Deformability

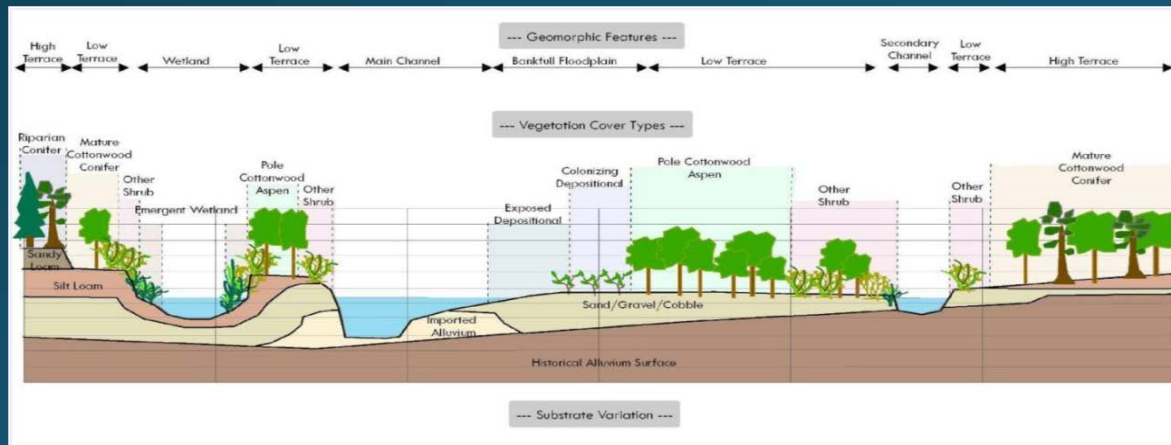
- Select hydraulic criteria from flood events less than 100-yr
- Design bank toe protection at depths less than scour
- Use biodegradable fabrics, plant material and wood
- Use round v. angular rock
- Allow bed mobility
- Integrate side channels
- Maintain floodplain connectivity at less than  $Q_2$





# Design for Floodplain Diversity

- Vary geomorphic surfaces
- Vary substrates to mimic floodplain stratigraphy
- Maximize floodplain surface roughness
- Construct large and small depression features
- Maintain floodplain connectivity at less than  $Q_2$







2010 Runoff ~ 6,000 cfs



Plant community succession in large alluvial river systems in the semi arid Rocky Mountain Region is initiated by cottonwoods colonizing bare, moist substrates





# 2011 Peak Flow

13,000 cfs

Estimated  $Q_{32}$

Out of banks for >60 days



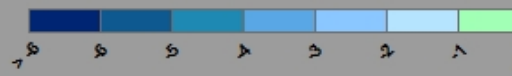
Photo: Gary Matson





2011 Floodplain elevation departure from

← Erosion





# Peak flow 2011



Last stockpile of  
growth media

CHANNEL  
AVULSION PATH  
THROUGH SIDE  
CHANNEL

Photo: Gary Matson























# Beaver Activity

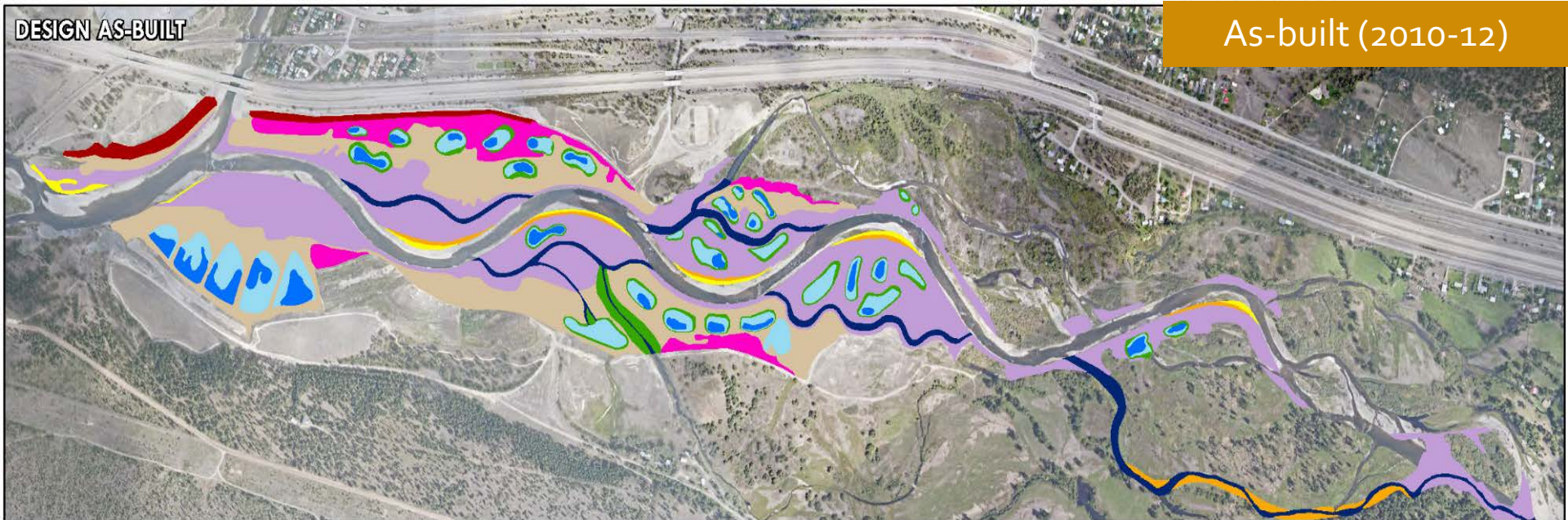




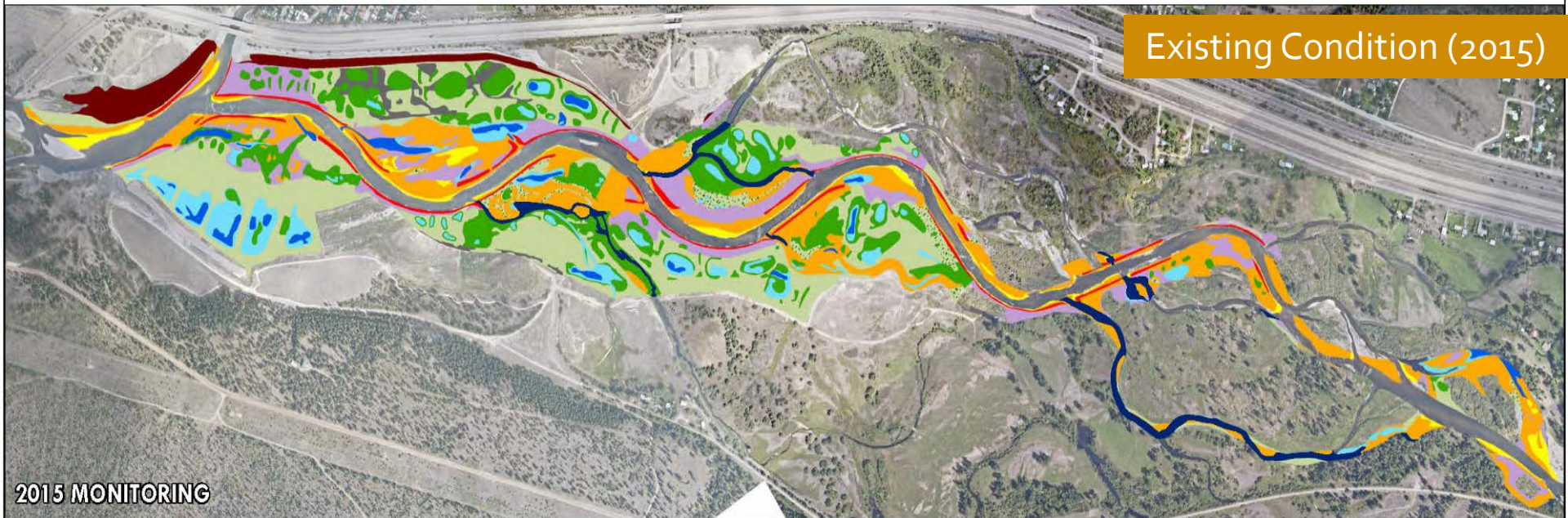
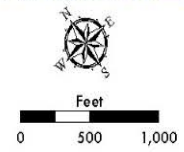
# Year 5 MONITORING - 2015

- Channel Monitoring to Determine if:
  - Maintained dynamic equilibrium (+/-20% of design dimensions)
  - Maintained floodplain connection
  - Maintained sediment transport continuity
- Vegetation Monitoring to Determine:
  - Percent Cover of Vegetation
  - Species Composition
  - Development of Floodplain Vegetation Communities
  - Wetland Development



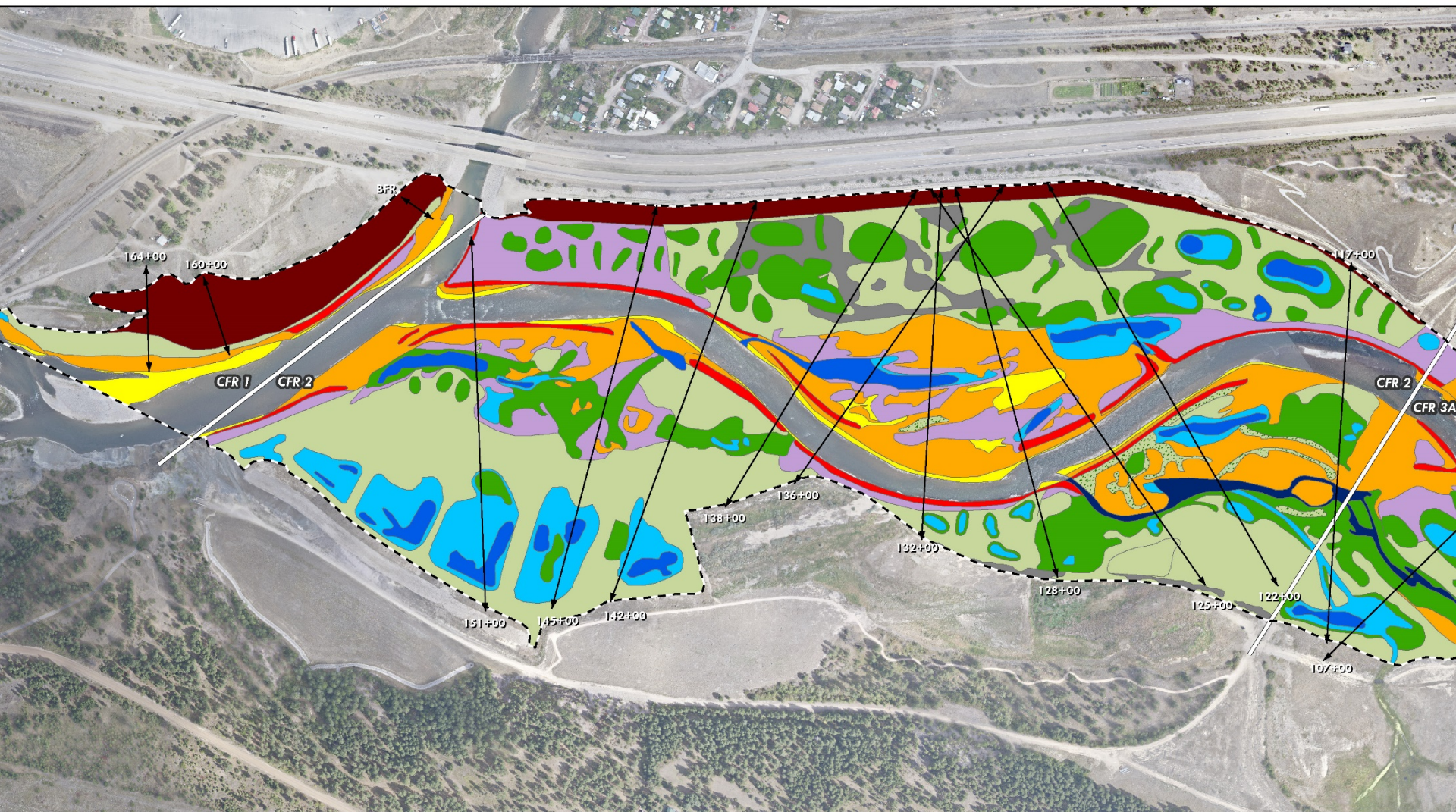


- |                         |                       |                           |                  |              |
|-------------------------|-----------------------|---------------------------|------------------|--------------|
| EXPOSED DEPOSITIONAL    | EMERGENT WETLAND      | MATURE COTTONWOOD CONIFER | RIPARIAN CONIFER | OPEN WATER   |
| COLONIZING DEPOSITIONAL | OTHER SHRUB           | HERBACEOUS                | UPLAND           | SIDE CHANNEL |
| STREAMBANK              | POLE COTTONWOOD ASPEN | HERBACEOUS DEPOSITIONAL   | UNVEGETATED      |              |





# FLOODPLAIN TRANSECTS



EXPOSED DEPOSITIONAL

COLONIZING DEPOSITIONAL

STREAMBANK

EMERGENT WETLAND

OTHER SHRUB

POLE COTTONWOOD ASPEN

MATURE COTTONWOOD CONIFER

HERBACEOUS

HERBACEOUS DEPOSITIONAL

UPLAND

OPEN WATER

SIDE CHANNEL

UNVEGETATED

FLOODPLAIN VEGETATION TRANSECT

PROJECT REACH BREAK

CONSTRUCTION EXTENTS

MILLTOWN - CFR 1 & 2

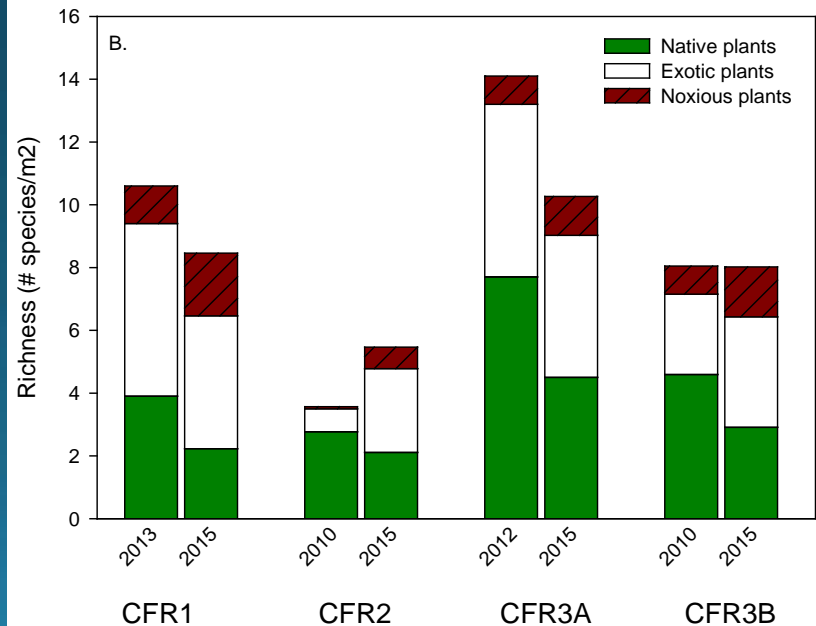
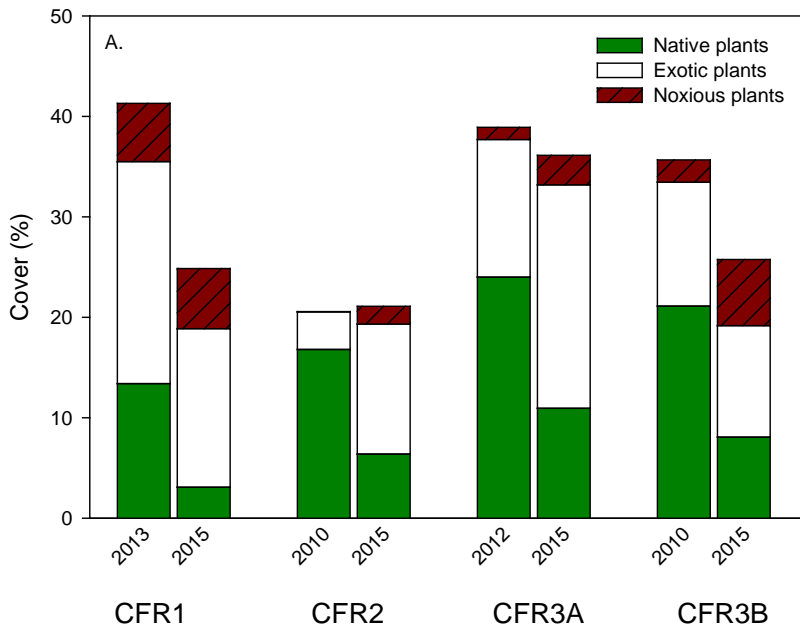


Feet  
0 125 250 500

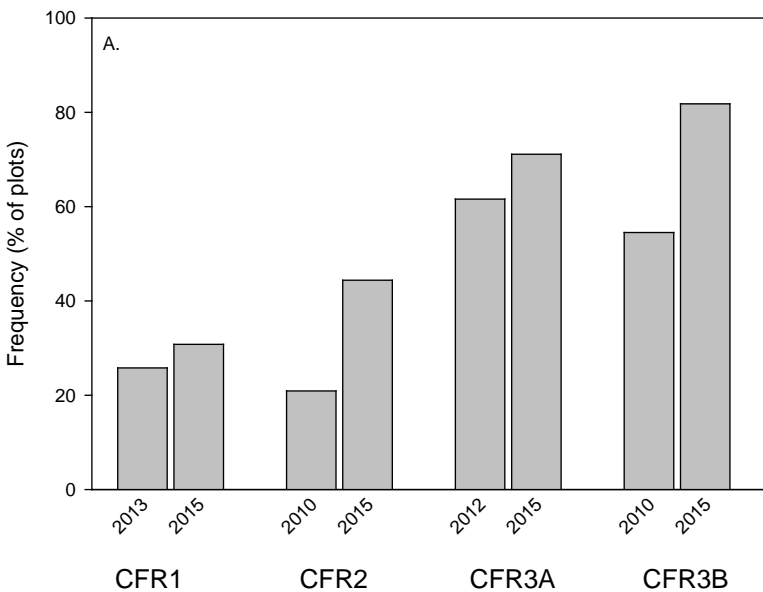


# Vegetation Monitoring – Yr 1 v. Yr 5

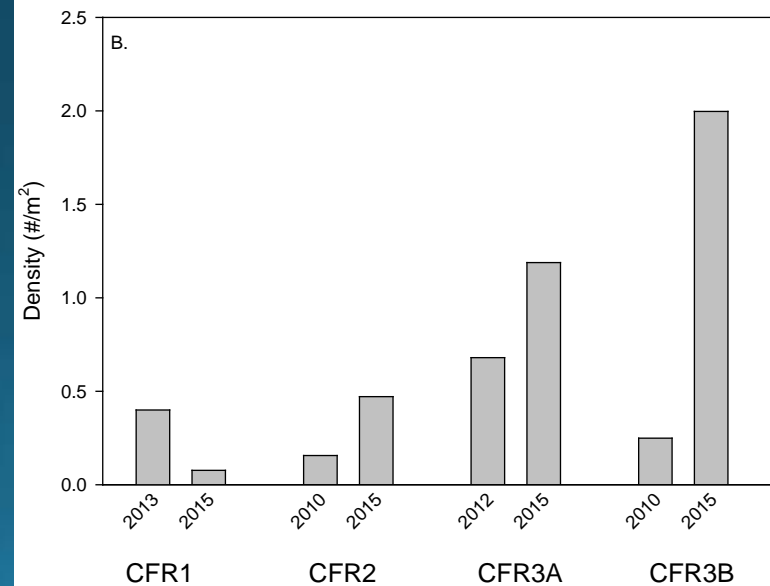
## Herbaceous Vegetation





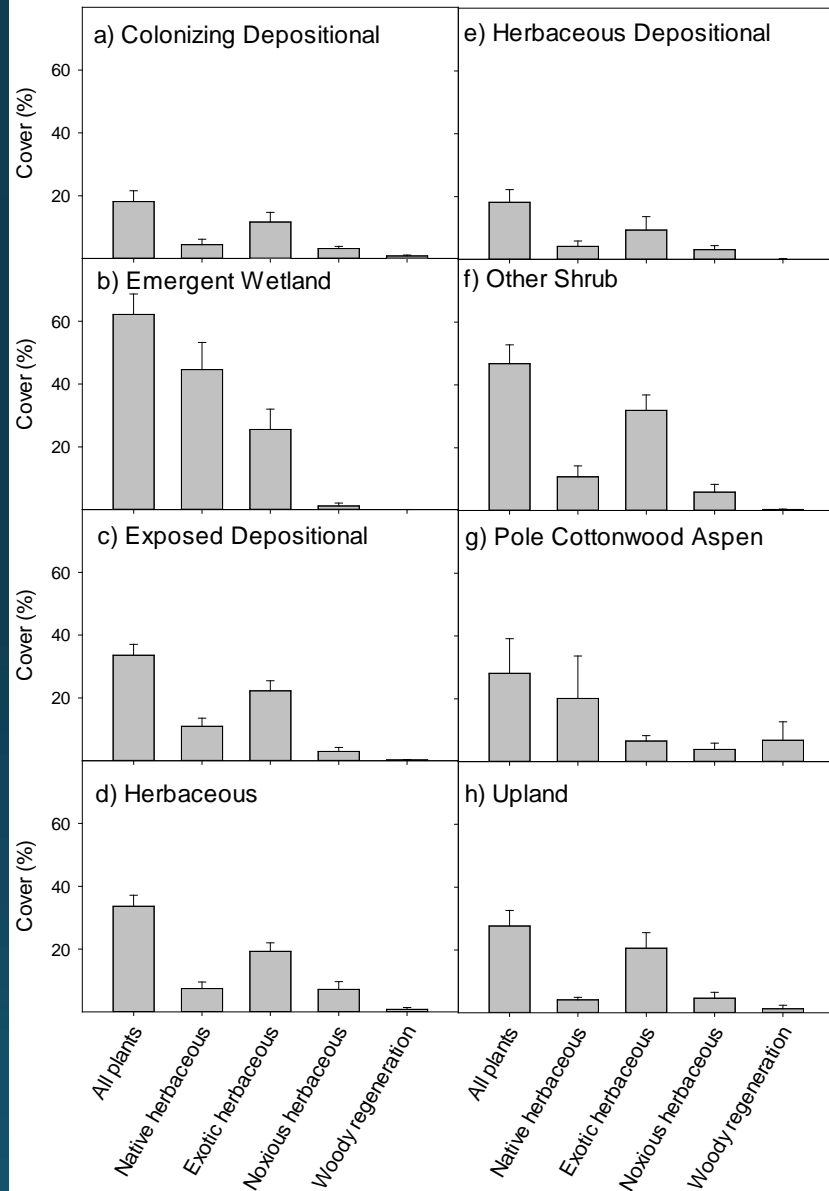


# Vegetation Monitoring – Yr 1 v. Yr 5 woody Vegetation

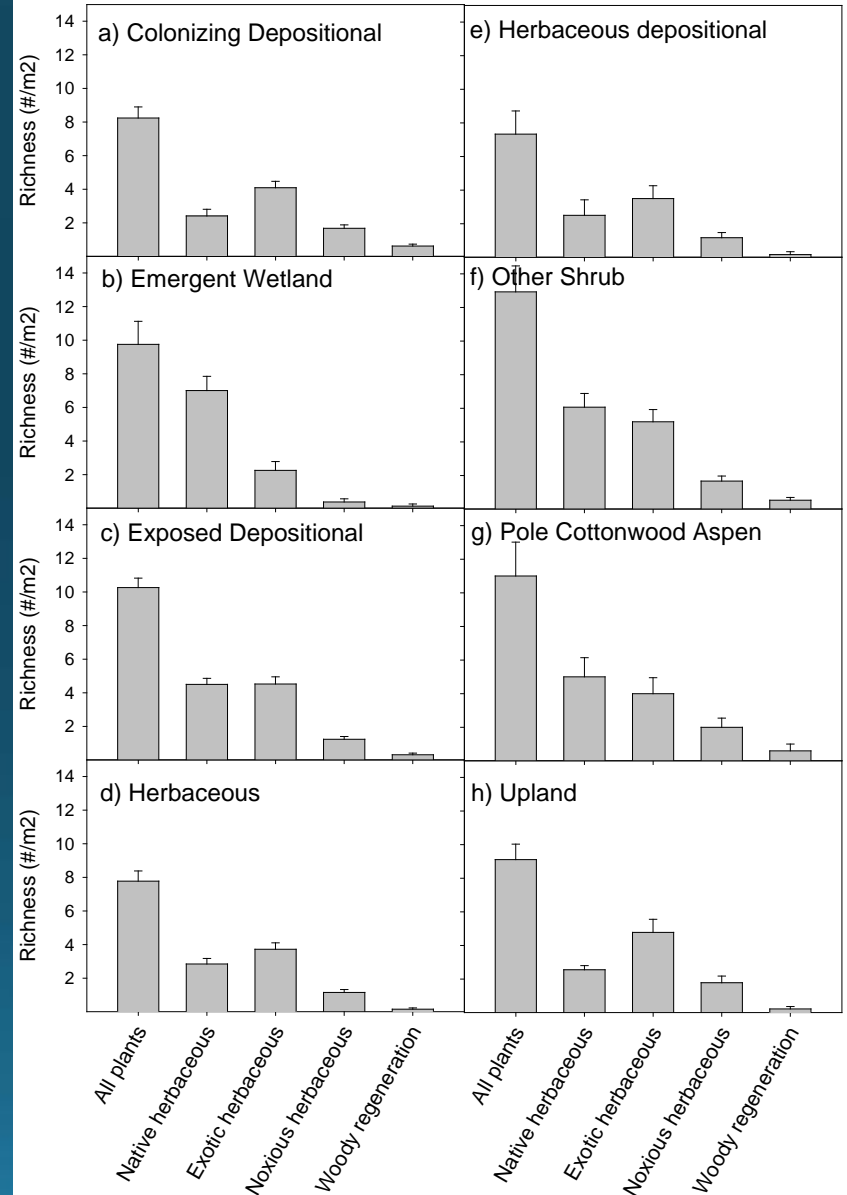




# VEGETATION COVER



# SPECIES RICHNESS





# Adaptive Management... Public Access





# Adaptive Management... Weeds









# Adaptive Management ... Residual Metals







# MILLTOWN VOLUNTEER PLANTING SATURDAY, APRIL 22 2:00-5:00 pm







Questions/Comments?

# Thank you!

<https://doj.mt.gov/lands/specific-site-information>