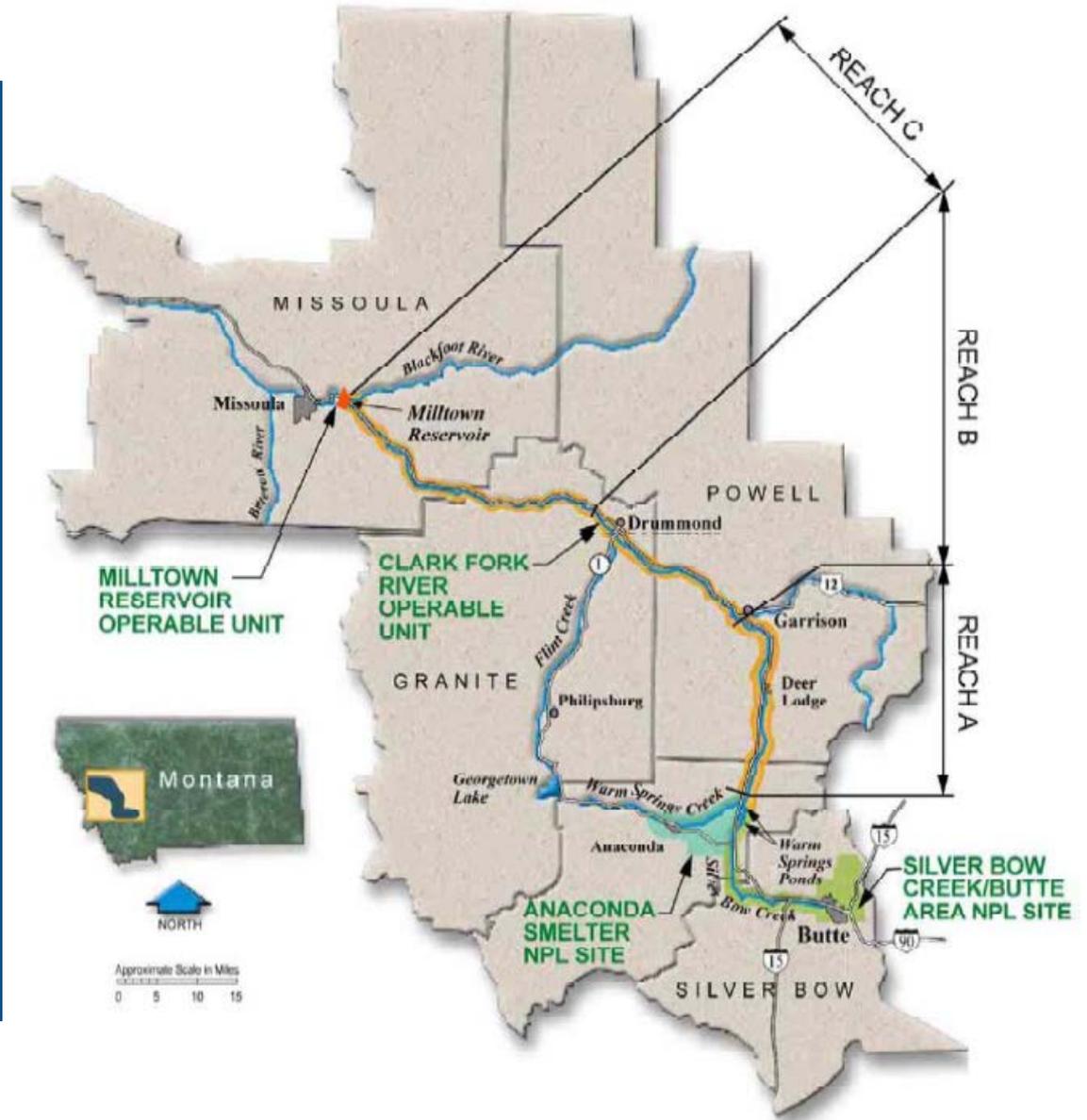


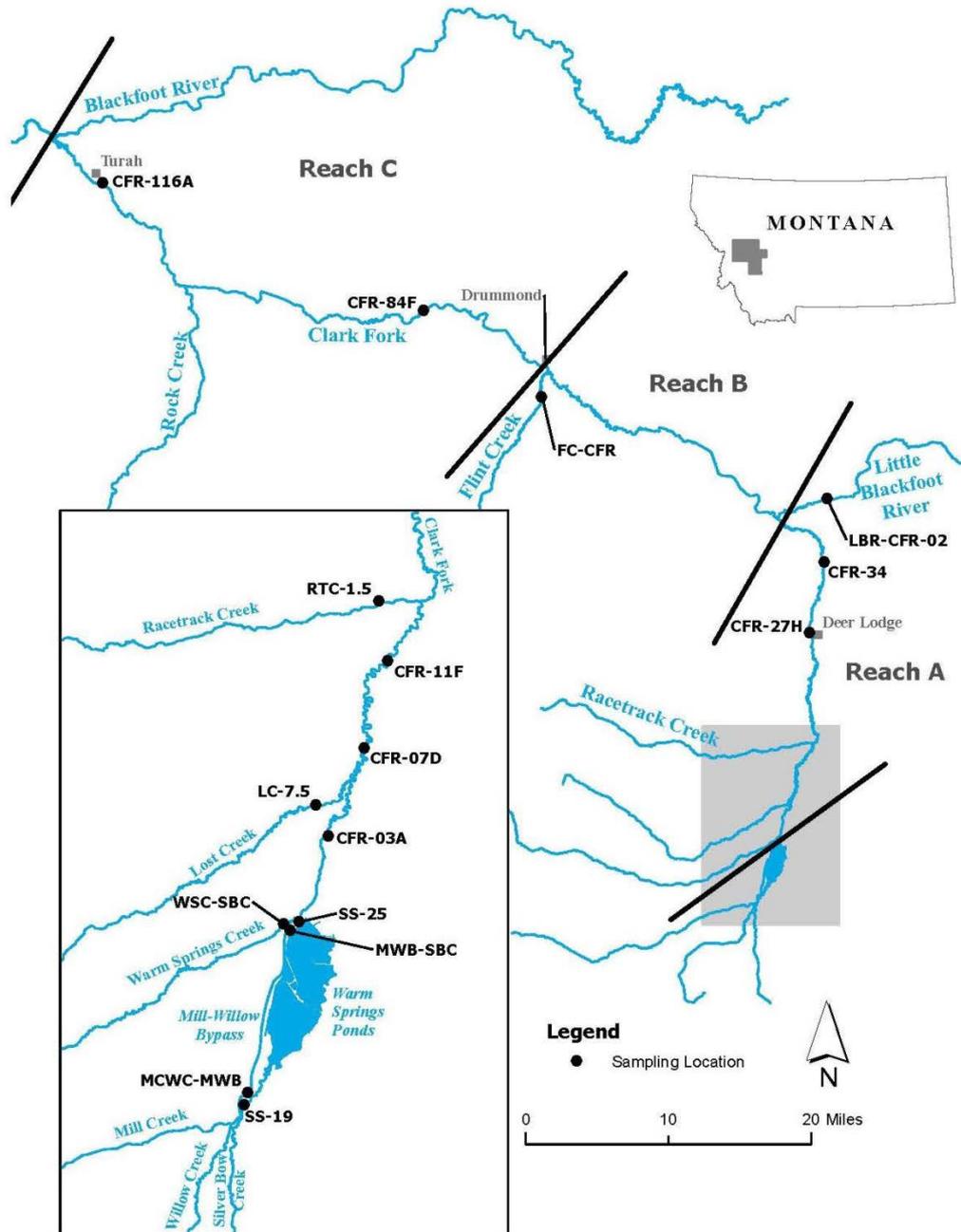
Clark Fork River Operable Unit

Water Quality & Sediment Monitoring

2010 - 2017



- DEQ monitors water quality and sediment at 16 locations in Reach A, which runs from Warm Springs to Garrison.
- DEQ monitors one site in Reach B, which is below Garrison.
- DEQ monitors two sites in Reach C from Drummond to Milltown.
- Monitoring locations include the main Clark Fork and some tributaries.





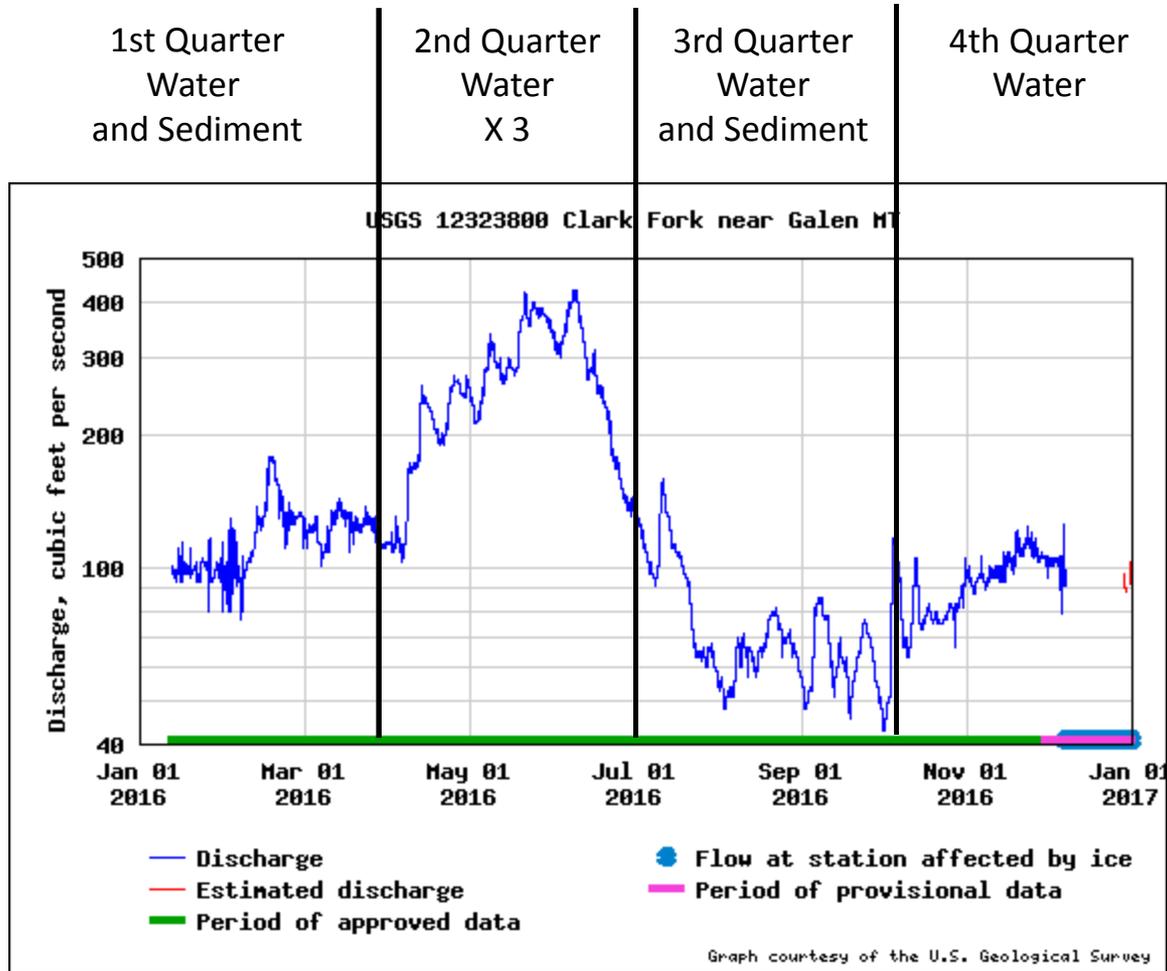
DEQ began monitoring the Clark Fork River (CFR) in 2010 and monitors 6 times per year:

Jan – March: Water and sediment sampling.

April – June: Water is sampled three times in order to catch high water events.

July – September: Water and sediment sampling.

October – December: Water sampling.



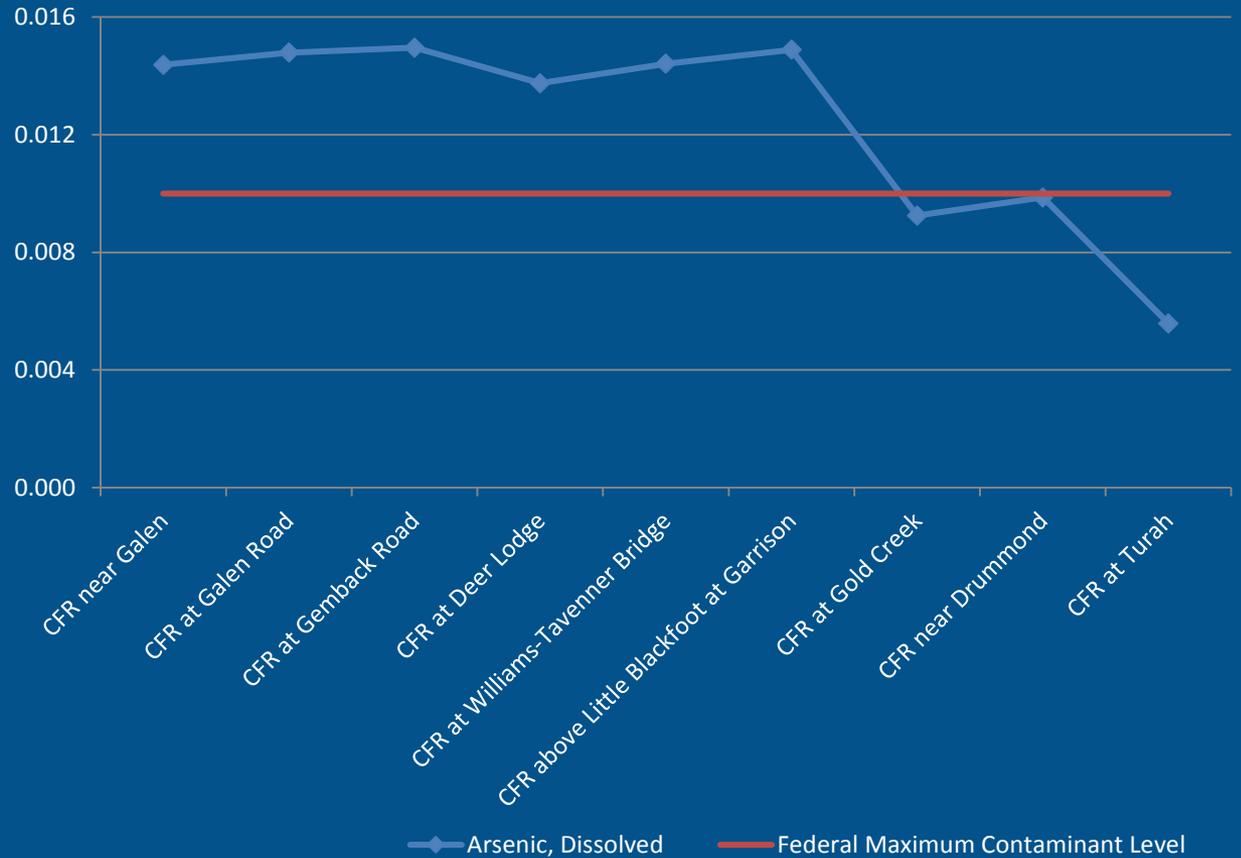
Clark Fork River Surface Water Executive Summary:

- Every year DEQ gathers extensive water quality and sediment data in the Clark Fork Operable Unit, with monitoring dating back to 2010 for most sites. This data will enable us to assess the long-term impacts of past and future cleanup work, however it will take many years to establish meaningful trends.
- The data has clearly established that arsenic and lead have exceeded water quality standards in some areas.
- All concentrations presented are the average of all samples for the monitoring period of record at each site (most conservative values shown).

The Federal Maximum Contaminant Level is the maximum allowable arsenic (dissolved) in drinking water, which is 0.01 milligrams per liter (mg/L).

As seen in the graph at right, most monitoring stations exceed the Federal Maximum Contaminant Level for arsenic.

Surface Water Arsenic - Dissolved (mg/L)

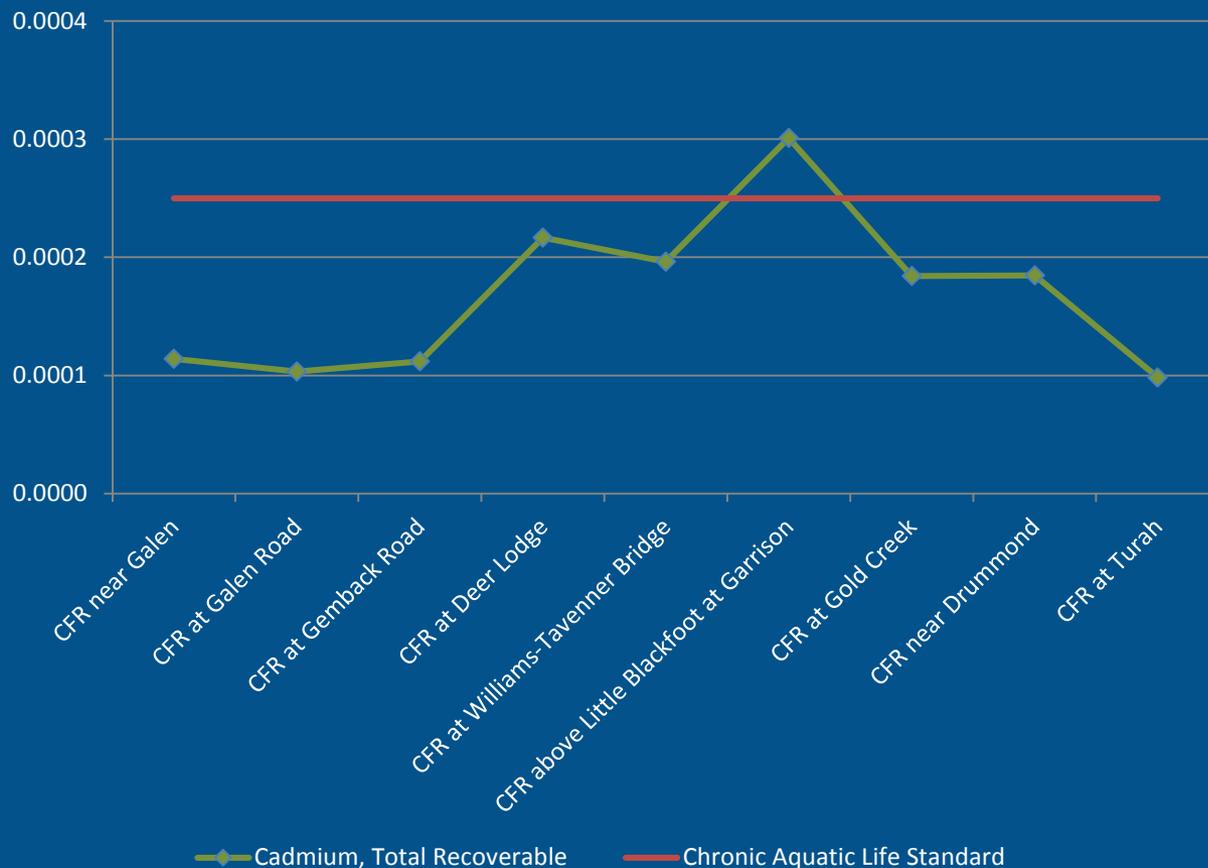


The Chronic Aquatic Life Standard (CALs) is a concentration considered to be protective of aquatic organisms over long-term exposure (as opposed to short-term or “acute” exposure).

The CALs is generally more stringent than the acute standard. Since the exposure to a substance takes place over a much longer period of time, a lower concentration may result in adverse effects.

Cadmium was below the CALs at most monitoring stations. The CALs is dependent upon the hardness of the water and thus varies from station to station.

Surface Water Cadmium - Total Recoverable (mg/L)

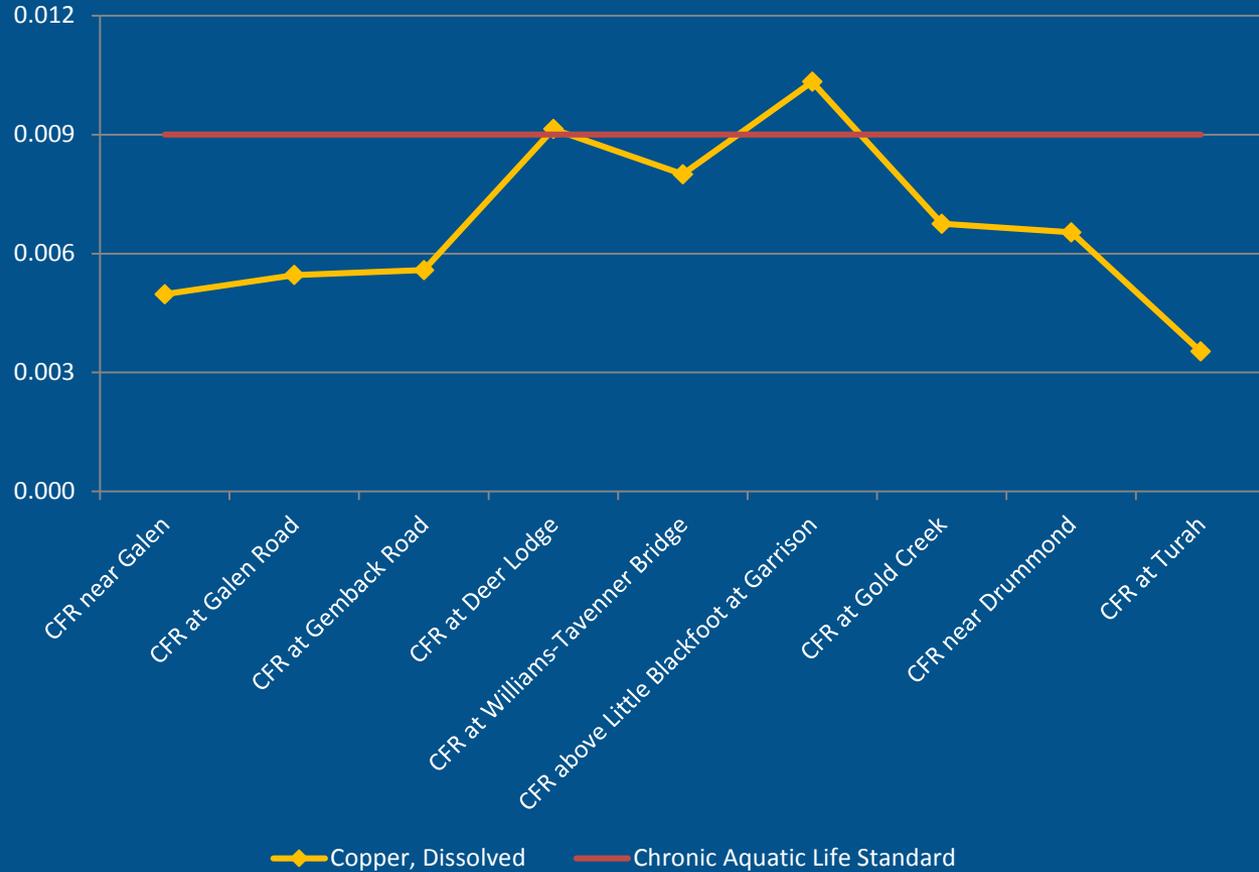


The Chronic Aquatic Life Standard (CALs) is a concentration considered to be protective of aquatic organisms over long-term exposure (as opposed to short-term or “acute” exposure).

The CALs is generally more stringent than the acute standard. Since the exposure to a substance takes place over a much longer period of time, a lower concentration may result in adverse effects.

Average copper concentrations were above the CALs at two monitoring stations – CFR at Deer Lodge and CFR above Little Blackfoot at Garrison. The CALs is dependent upon the hardness of the water and thus varies from station to station.

Surface Water Copper - Dissolved (mg/L)

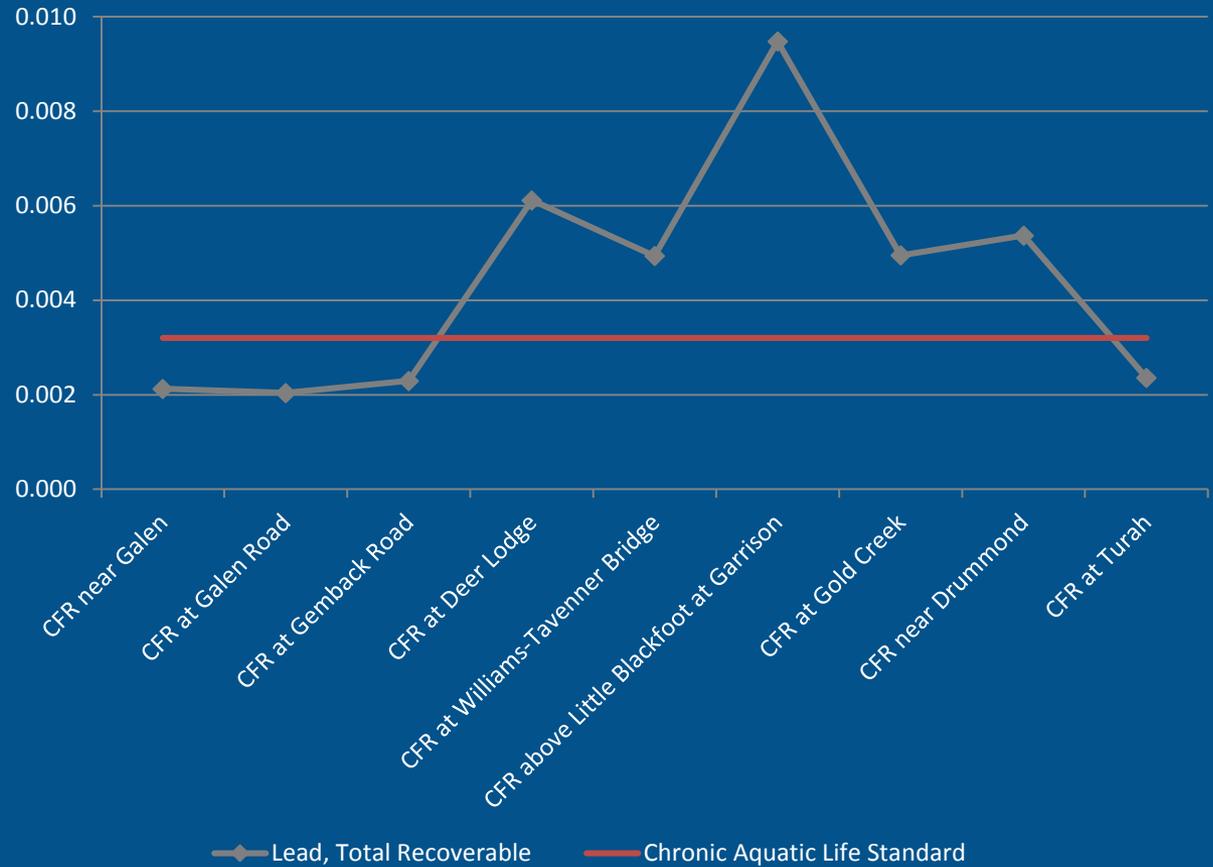


The Chronic Aquatic Life Standard (CALs) is a concentration considered to be protective of aquatic organisms over long-term exposure (as opposed to short-term or “acute” exposure).

The CALs is generally more stringent than the acute standard. Since the exposure to a substance takes place over a much longer period of time, a lower concentration may result in adverse effects.

Average lead concentrations were above the CALs at many monitoring stations. The CALs is dependent upon the hardness of the water and thus varies from station to station.

Surface Water Lead - Total Recoverable (mg/L)

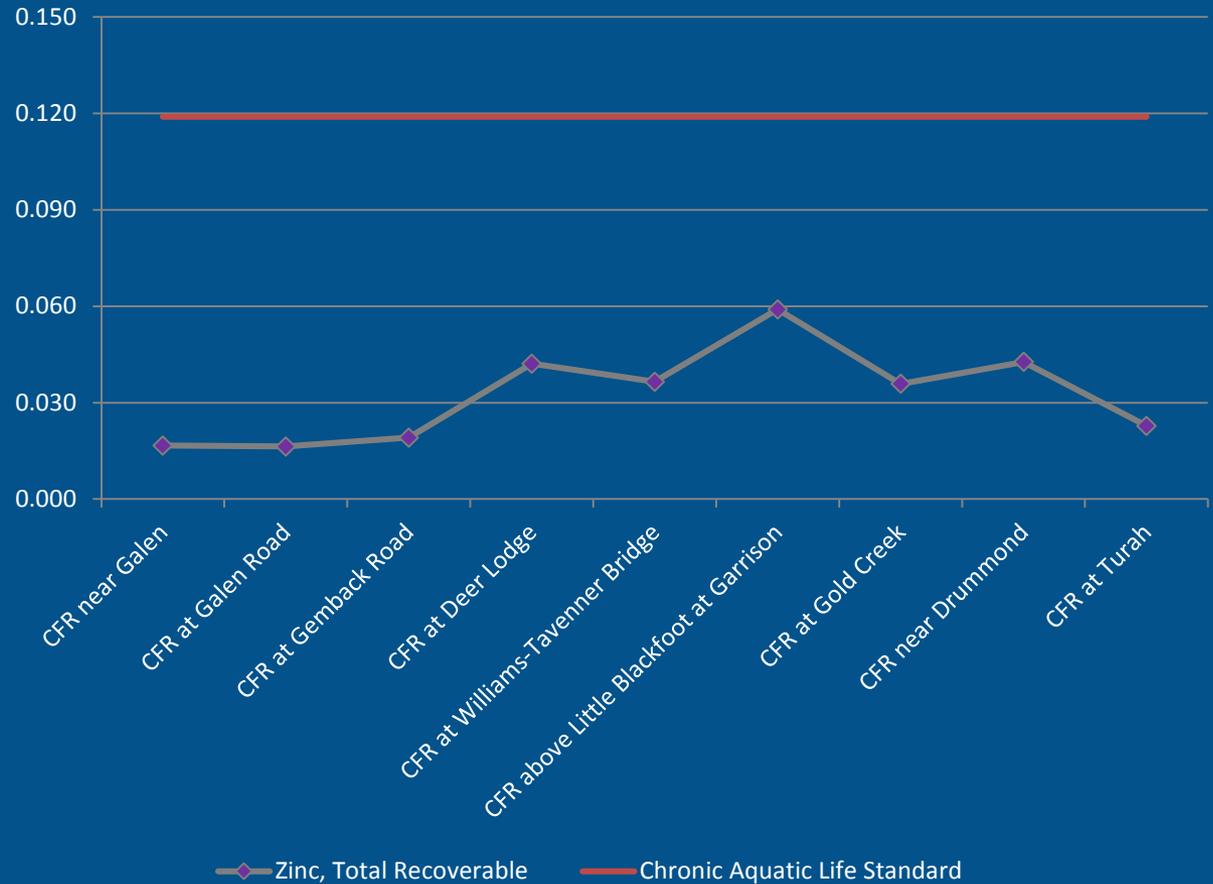


The Chronic Aquatic Life Standard (CALs) is a concentration considered to be protective of aquatic organisms over long-term exposure (as opposed to short-term or “acute” exposure).

The CALs is generally more stringent than the acute standard. Since the exposure to a substance takes place over a much longer period of time, a lower concentration may result in adverse effects.

Average zinc concentrations were below the CALs at all monitoring stations. The CALs is dependent upon the hardness of the water and thus varies from station to station.

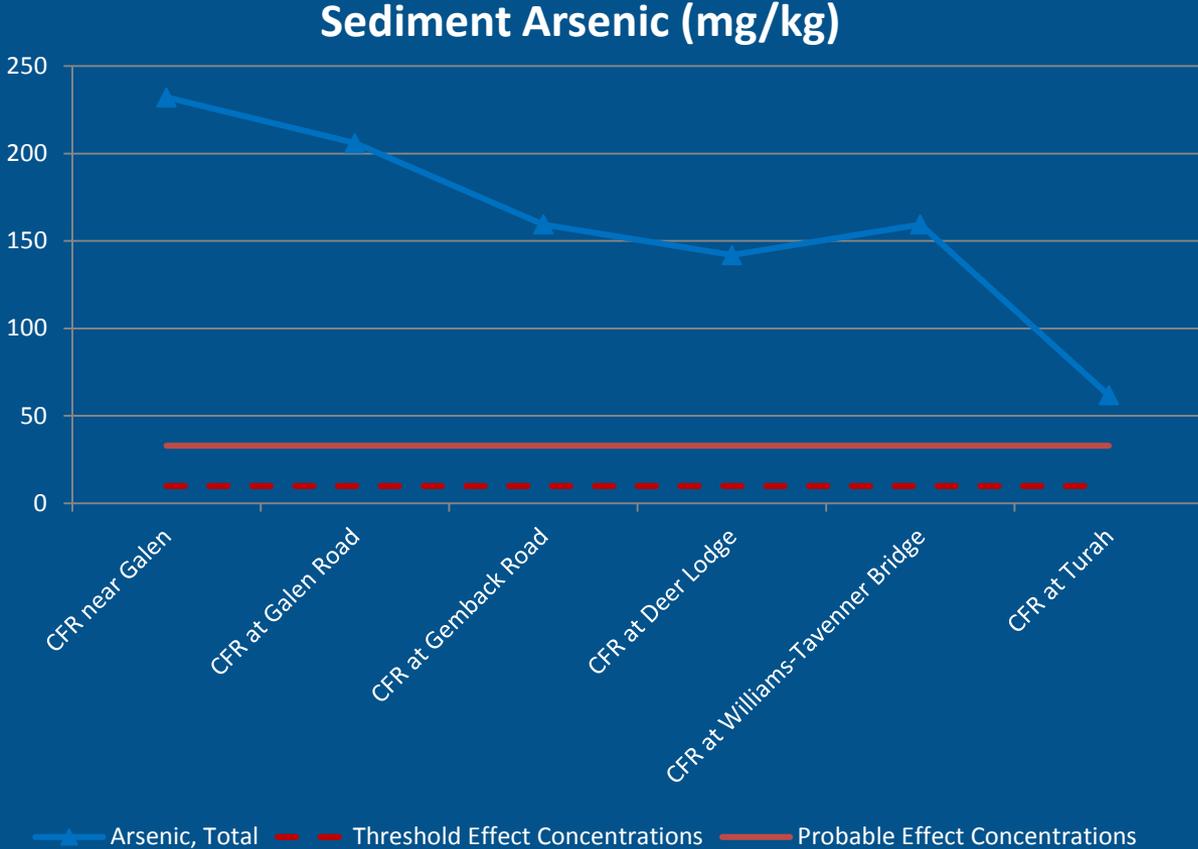
Surface Water Zinc - Total Recoverable (mg/L)



Clark Fork River Sediment:

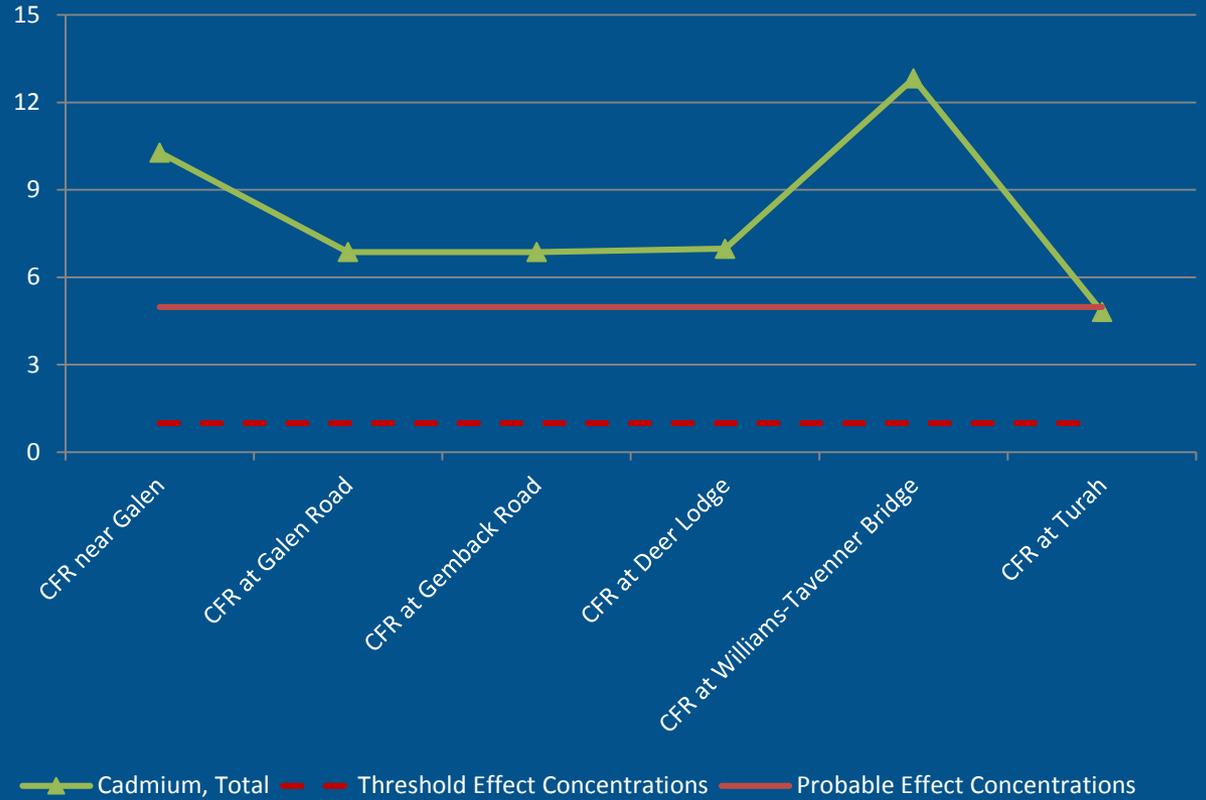
1. It's too early to determine trends other than that metals concentrations appear to decrease further downstream.
2. The ROD (Record of Decision) did not establish performance standards for Contaminants of Concern.
 - DEQ adopted two reference values for the Clark Fork Operable Unit: "Threshold Effect Concentrations" (TEC) – the level at which contaminants may begin causing adverse effects to plant and animal health and the environment – and "Probable Effect Concentrations" (PEC) – the level at which it is likely that contaminants will have adverse effects on plant and animal health and the environment.
3. All concentrations are dry weight, fine fraction (<0.065 mm).
4. Concentrations shown are the average of all samples for the monitoring period of record at each site.
5. Period of record for all sites is 2014-2016, except for CFR at Williams-Tavenner (2015-2016)

Average arsenic concentrations in sediment were above both the Threshold Effect and the Probable Effect concentrations at all monitoring stations.

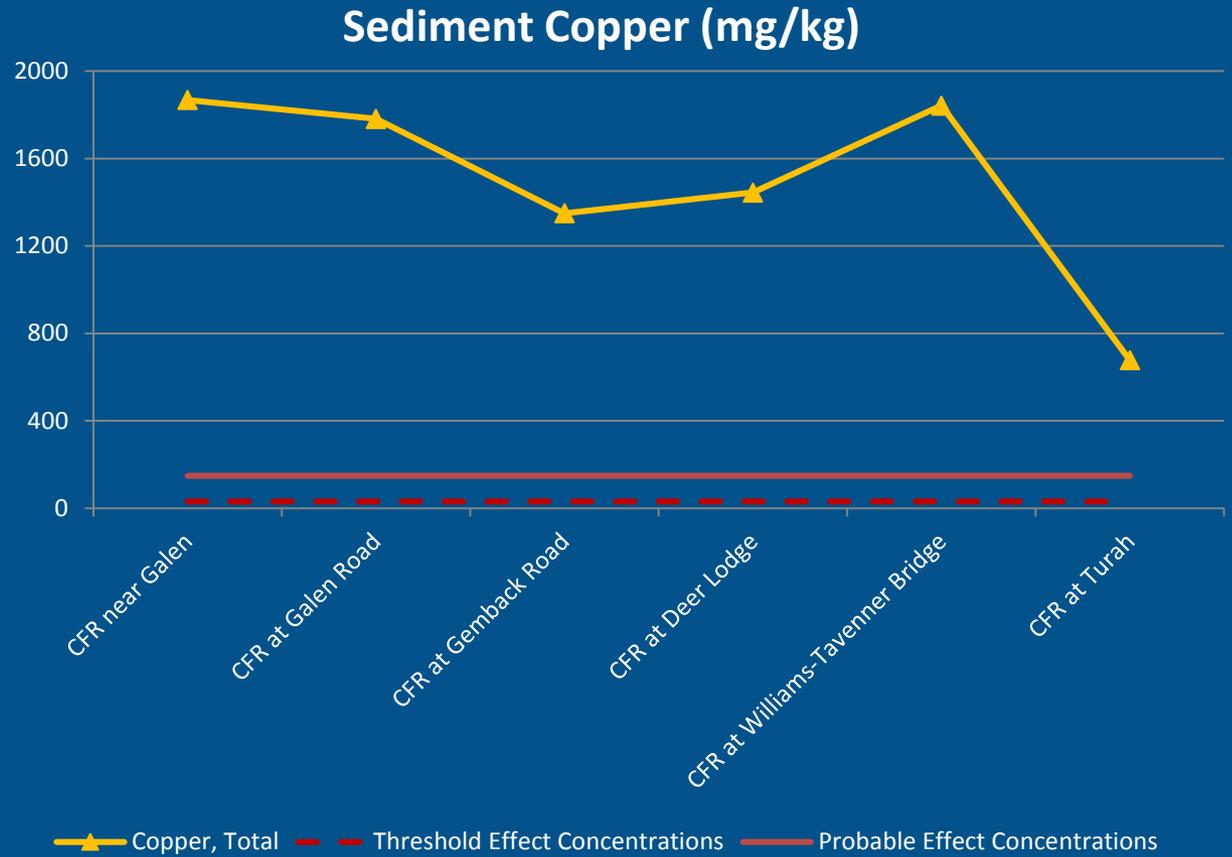


Average cadmium concentrations in sediment were above both the Threshold Effect and the Probable Effect concentrations at all but the Turah monitoring station.

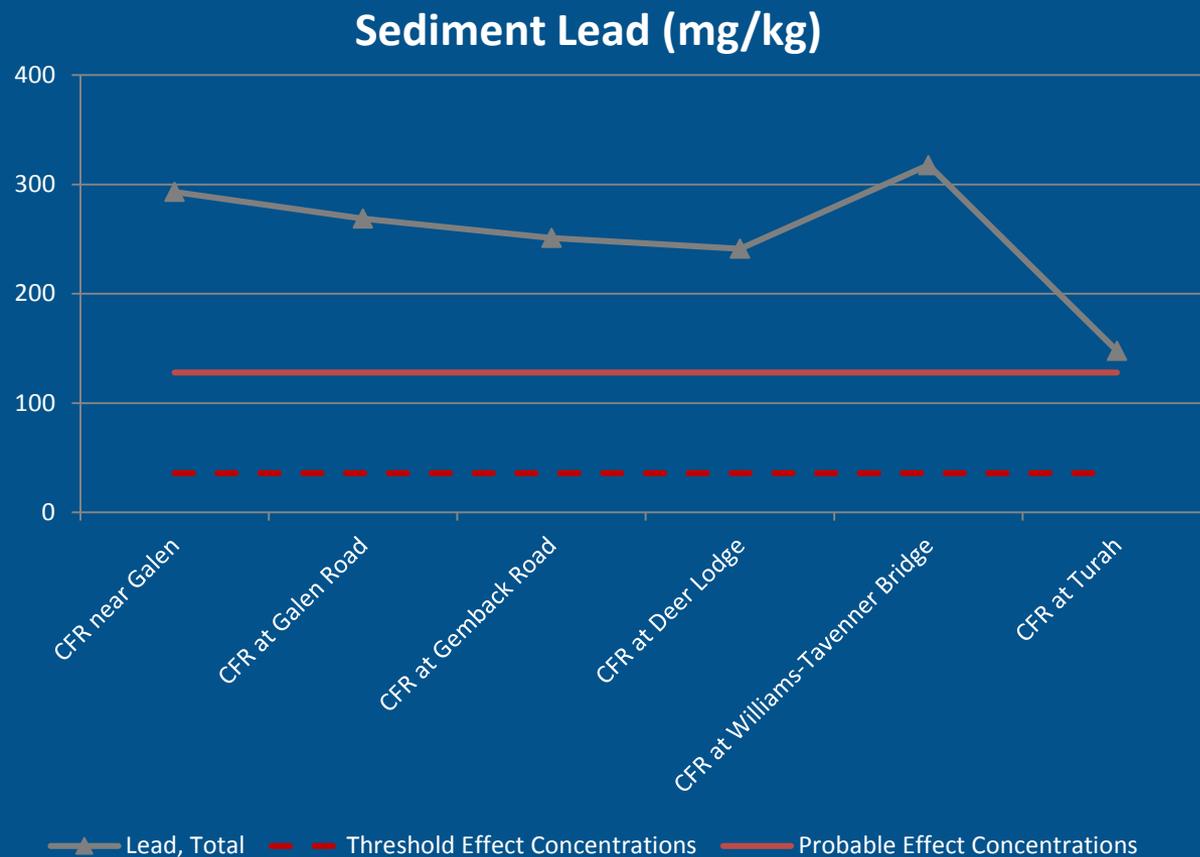
Sediment Cadmium (mg/kg)



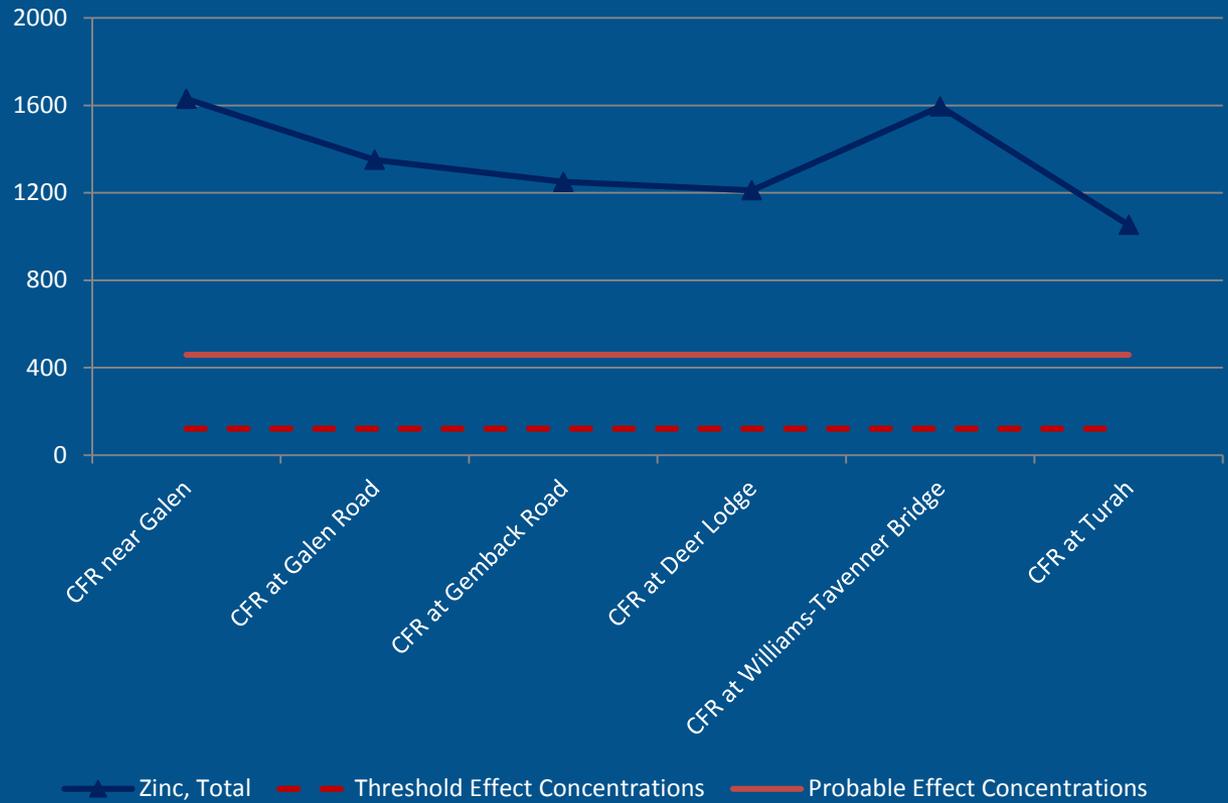
Average copper concentrations in sediment were above both the Threshold Effect and the Probable Effect concentrations at all monitoring stations.



Average lead concentrations in sediment were above both the Threshold Effect and the Probable Effect concentrations at all monitoring stations.

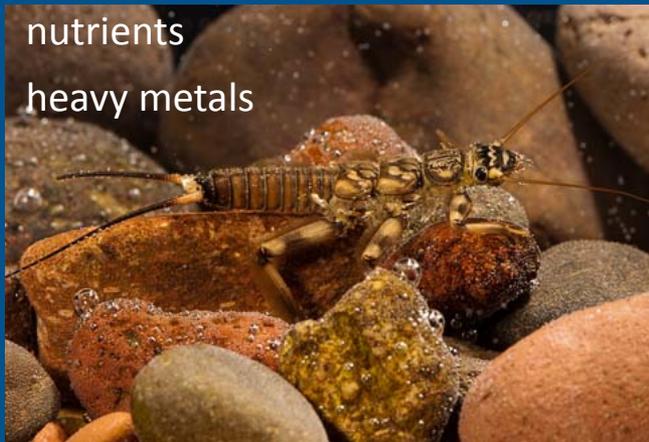


Sediment Zinc (mg/kg)



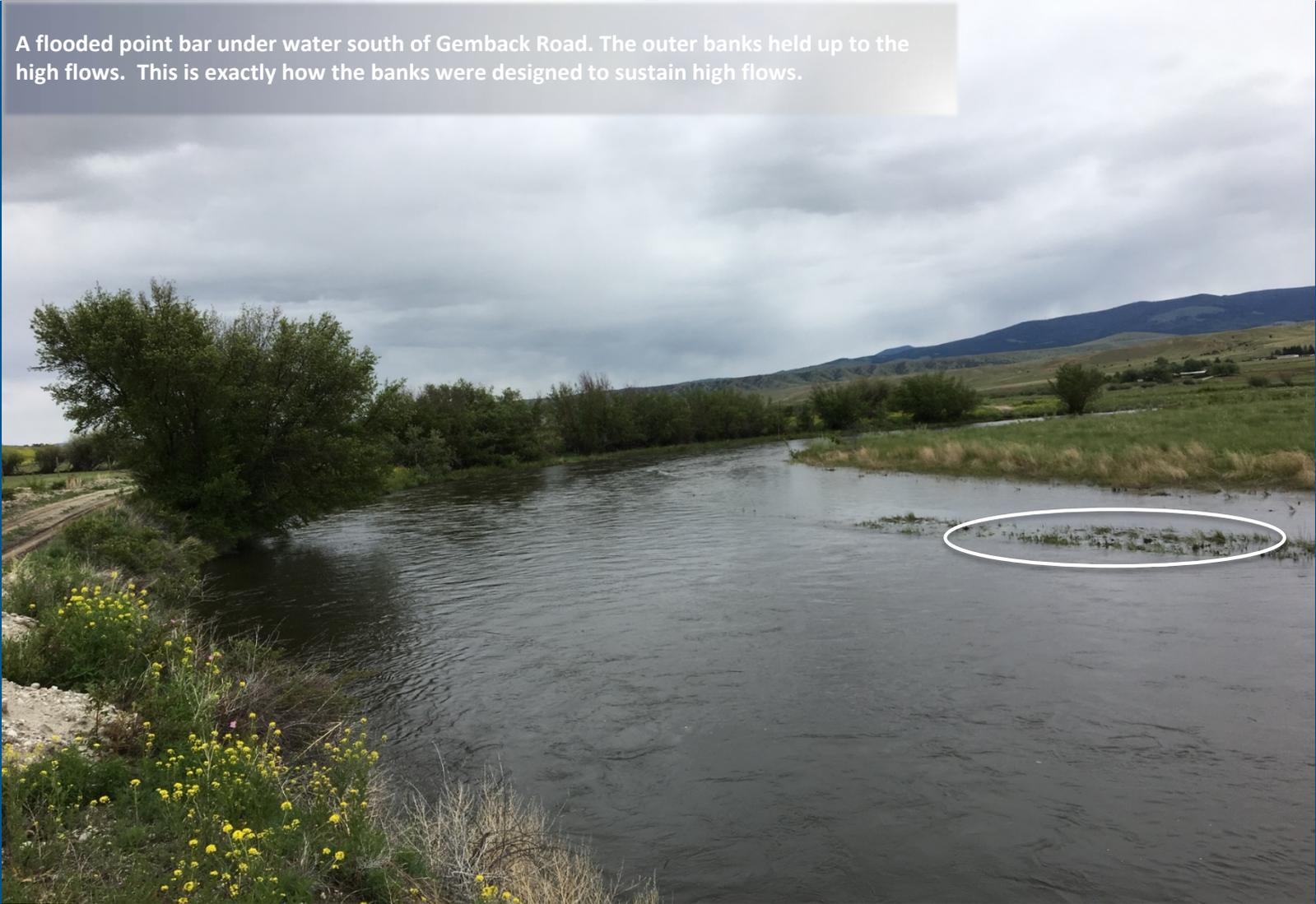
2016 Mainstem Clark Fork River macroinvertebrates and periphyton impairment:

- nutrients
- heavy metals



2017 High Water

A flooded point bar under water south of Gemback Road. The outer banks held up to the high flows. This is exactly how the banks were designed to sustain high flows.



2017 High Water

This photo taken south of Gemback road shows an inundated island in the river, and river banks holding up to high flows. This is exactly how the banks were designed to sustain high water.



2017 High Water

Woody transplants hold firm against high water.
The river and floodplain behaved as designed.

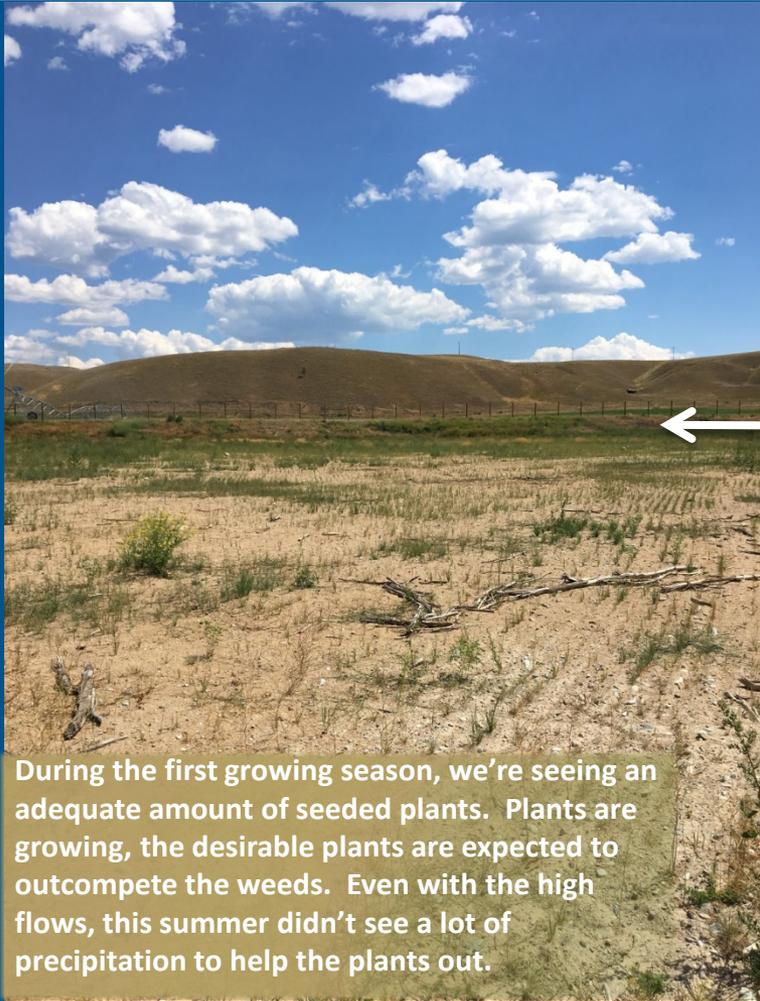


2017 Vegetation Monitoring



Last summer, we monitored vegetation in the completed phases. Generally, two years after seeding we saw excellent plant coverage and diversity. The mature trees in the photo were preserved during the remediation.

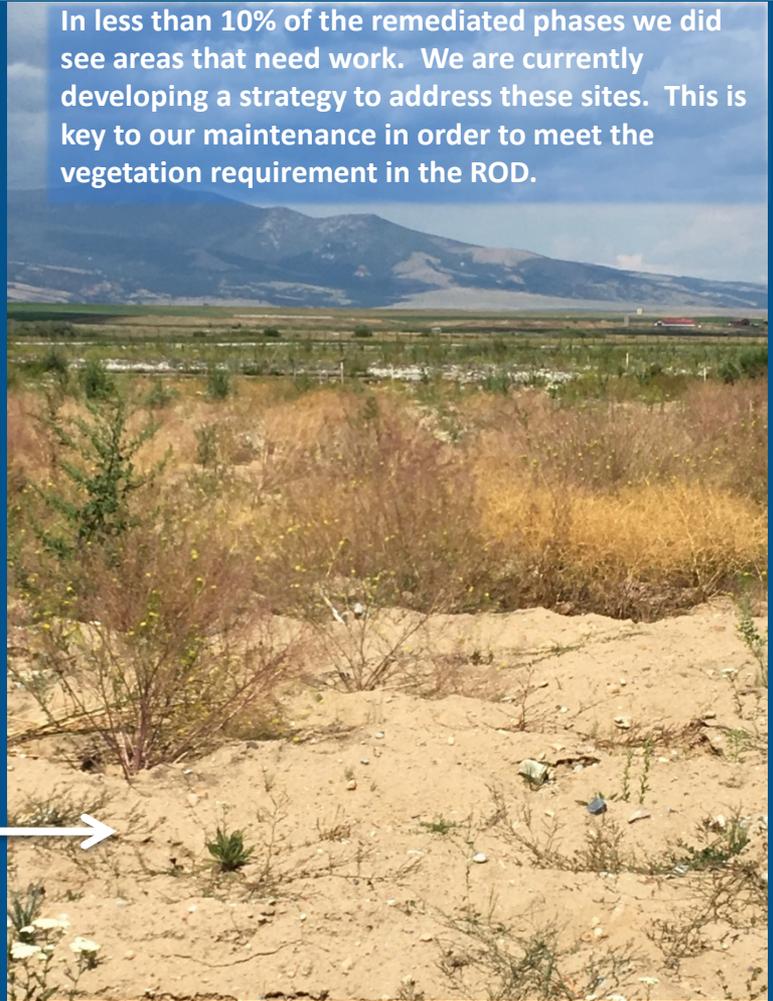
2017 Vegetation Monitoring



During the first growing season, we're seeing an adequate amount of seeded plants. Plants are growing, the desirable plants are expected to outcompete the weeds. Even with the high flows, this summer didn't see a lot of precipitation to help the plants out.

ONE
SUCCESSFUL
GROWING
SEASON

NEEDS
MAINTANCE



In less than 10% of the remediated phases we did see areas that need work. We are currently developing a strategy to address these sites. This is key to our maintenance in order to meet the vegetation requirement in the ROD.

Upper Clark Fork River Weed Treatment

The primary noxious weeds targeted include Canada thistle, leafy spurge, spotted knapweed, whitetop.

All weeds on the county noxious lists are sprayed.

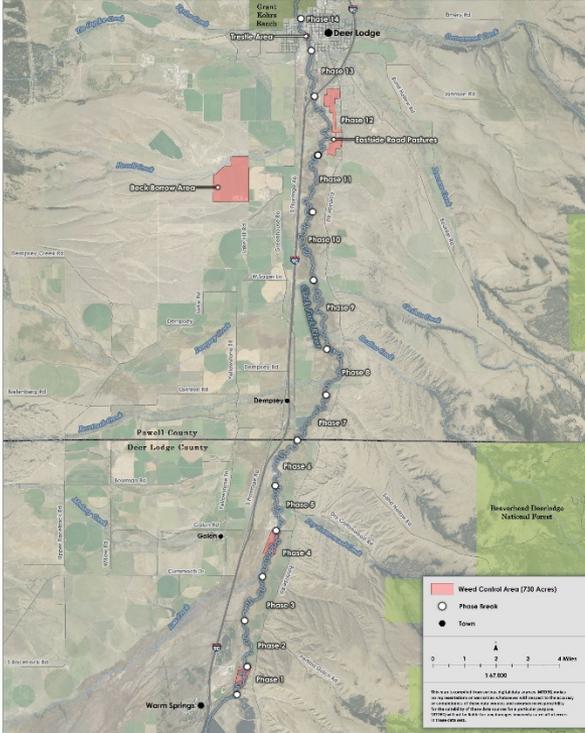


Clark Fork River Weed Control Program:

Pretreat project areas up to two years prior to construction

- Reduces noxious weed seedbed
- Reduces spread of noxious weeds throughout project and adjacent areas
- Slowed Clark Fork River project pace has paused pretreatment
- DEQ contracts with private weed control companies
 - Phases 15 & 16 (Grant-Kohrs Ranch) pretreated using National Park Service weed team

Weed Control Areas, 2010
Clark Fork River Federal Superfund Project



2010 Pretreatment Weed Control:

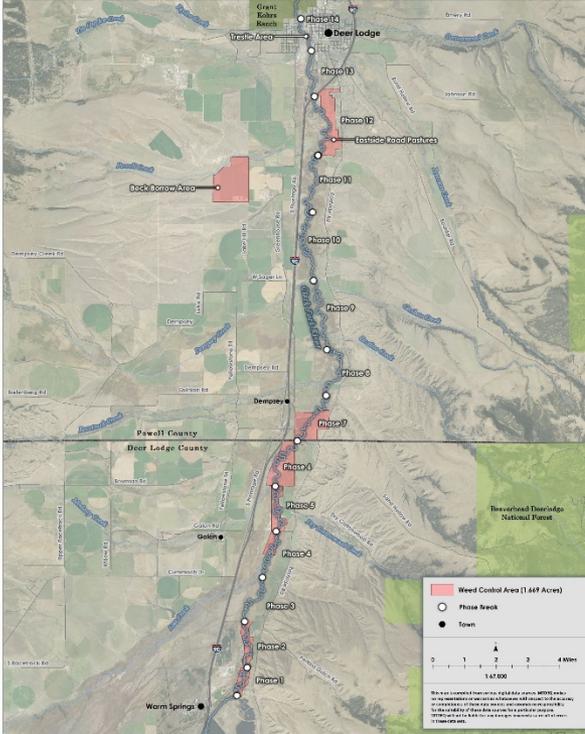
- Trestle
- Eastside Road Pastures
- Beck Borrow
- Phases 1 & 4

Weed Control Expenses: \$84,088.70

Zoom in for map details



Weed Control Areas, 2011
Clark Fork River Federal Superfund Project



2011 Pretreatment Weed Control:

- Trestle
- Eastside Road Pastures
- Beck Borrow
- Phases 1, 2, 4, 5, 6, & 7

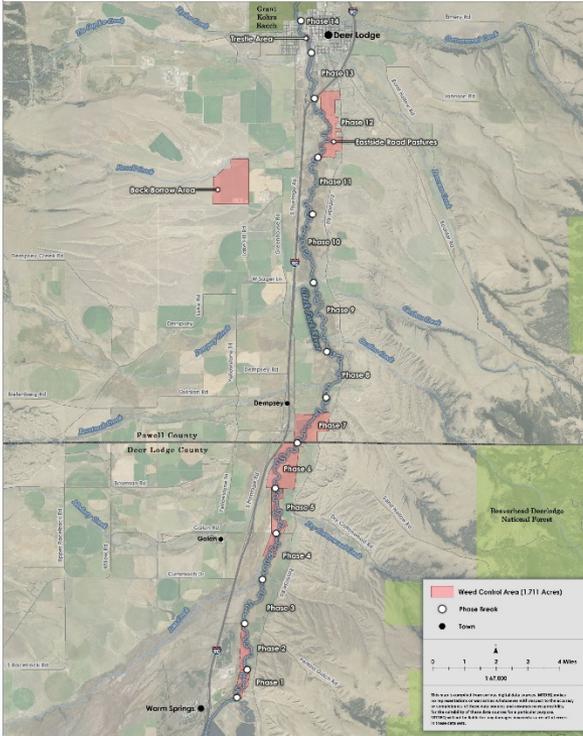
Begin Trestle Remediation - Fall 2011

Weed Control Expenses: \$114,253.75

Zoom in for map details



Weed Control Areas, 2012
Clark Fork River Federal Superfund Project



2012 Pretreatment Weed Control:

- Eastside Road Pastures
- Beck Borrow
- Phases 1, 2, 4, 5, 6, & 7

Eastside Road Pastures Remediation- Fall

Active & Post-Remediation Weed Control:

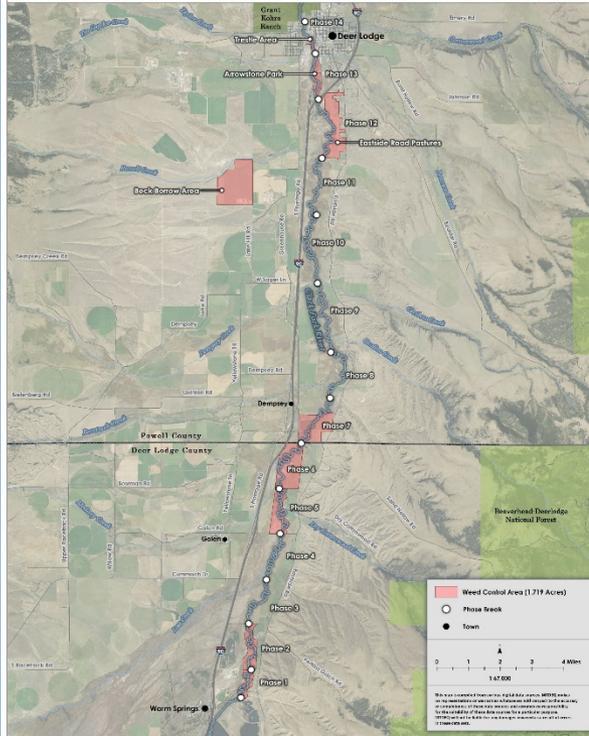
- Trestle Remediation

Weed Control Expenses: \$116,215.12

Zoom in for map details



Weed Control Areas, 2013
Clark Fork River Federal Superfund Project



2013 Pretreatment Weed Control:

- Phases 1, 2, 5, 6, & 7
- Assist with Arrowstone Park

Begin Phase 1 Remediation

Active & Post-Remediation Weed Control:

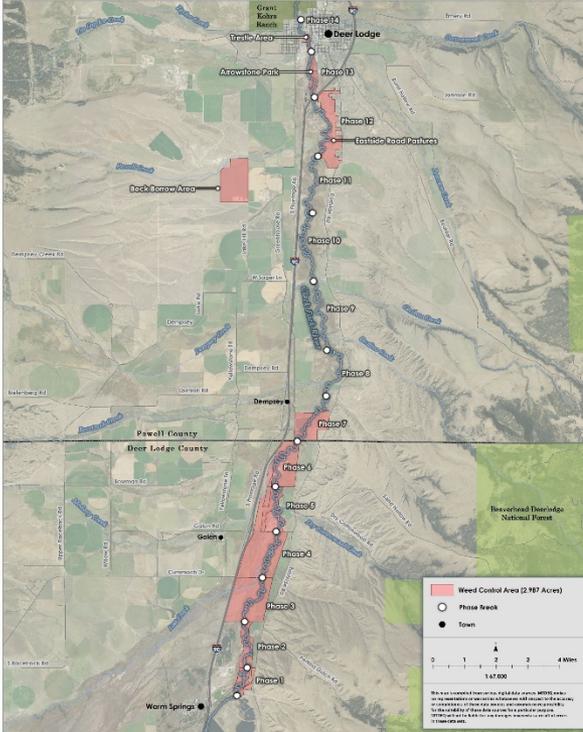
- Trestle Remediation
- Eastside Road Pastures
- Beck Borrow

Weed Control Expenses: \$195,559.66

Zoom in for map details



Weed Control Areas, 2014
Clark Fork River Federal Superfund Project



2014 Pretreatment Weed Control:

- Phases 2, 3, 4, 5, 6, 7, 15, & 16
- Assist with Arrowstone Park

Begin Phases 5 & 6 Remediation

Active & Post-Remediation Weed Control:

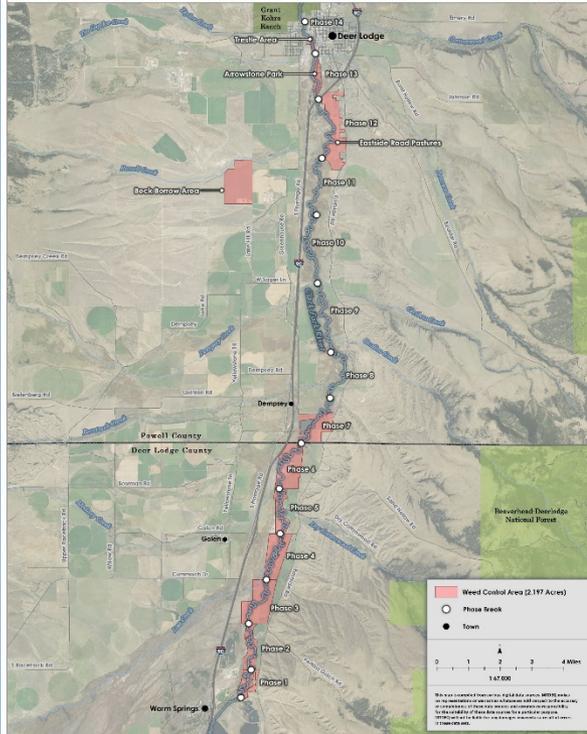
- Trestle Remediation
- Eastside Road Pastures
- Beck Borrow
- Phase 1

Weed Control Expenses: \$236,135.10

Zoom in for map details



Weed Control Areas, 2015
Clark Fork River Federal Superfund Project



2015 Pretreatment Weed Control:

- Phases 2, 3, 4, 7, 15, & 16
- Assist with Arrowstone Park

Begin Phase 2 Remediation

Active & Post-Remediation Weed Control:

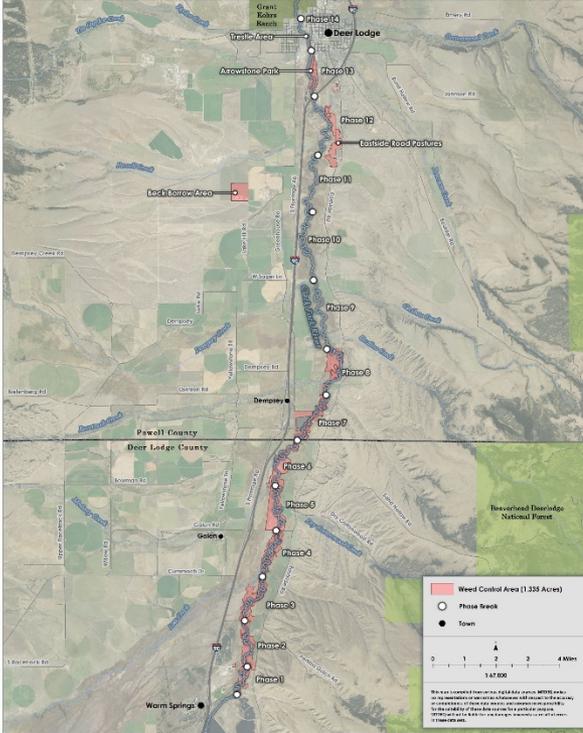
- Trestle Remediation
- Eastside Road Pastures
- Beck Borrow
- Phases 1, 5, & 6

Weed Control Expenses: \$336,182.54

Zoom in for map details



Weed Control Areas, 2016
Clark Fork River Federal Superfund Project



2016 Pretreatment Weed Control:

- Phases 3, 4, 7, 8, 15, & 16
- Assist with Arrowstone Park

Active & Post-Remediation Weed Control:

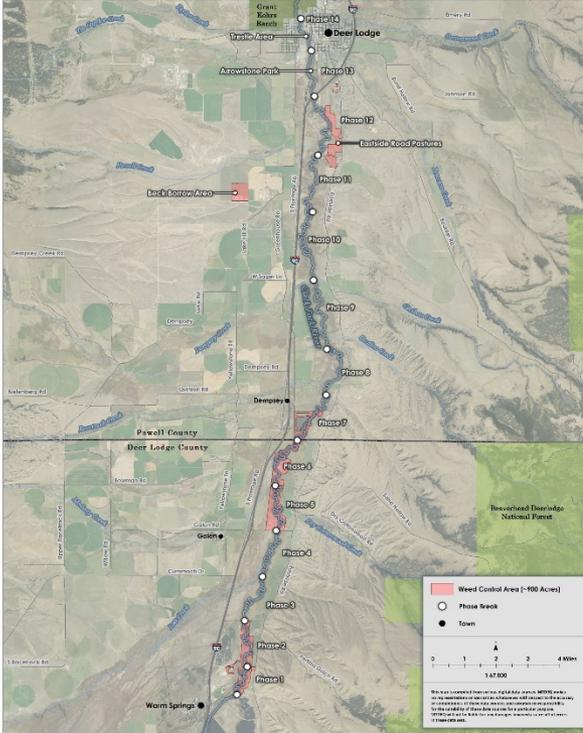
- Trestle Remediation
- Eastside Road Pastures
- Beck Borrow
- Phases 1, 2, 5, & 6

Weed Control Expenses: \$311,199.28

Zoom in for map details



Weed Control Areas, 2017
Clark Fork River Federal Superfund Project



2017 Pretreatment Weed Control:

- None

Active & Post-Remediation Weed Control:

- Eastside Road Pastures
- Beck Borrow
- Phases 1, 2, 5, & 6

Post-investigation & characterization:

- Unremediated Phases 3 & 4

Weed Control Expenses: \$ 126,528.75

Zoom in for map details

