The Icing on the Cake

Revegetation on the Flat Creek Iron Mountain Mine Superfund Site

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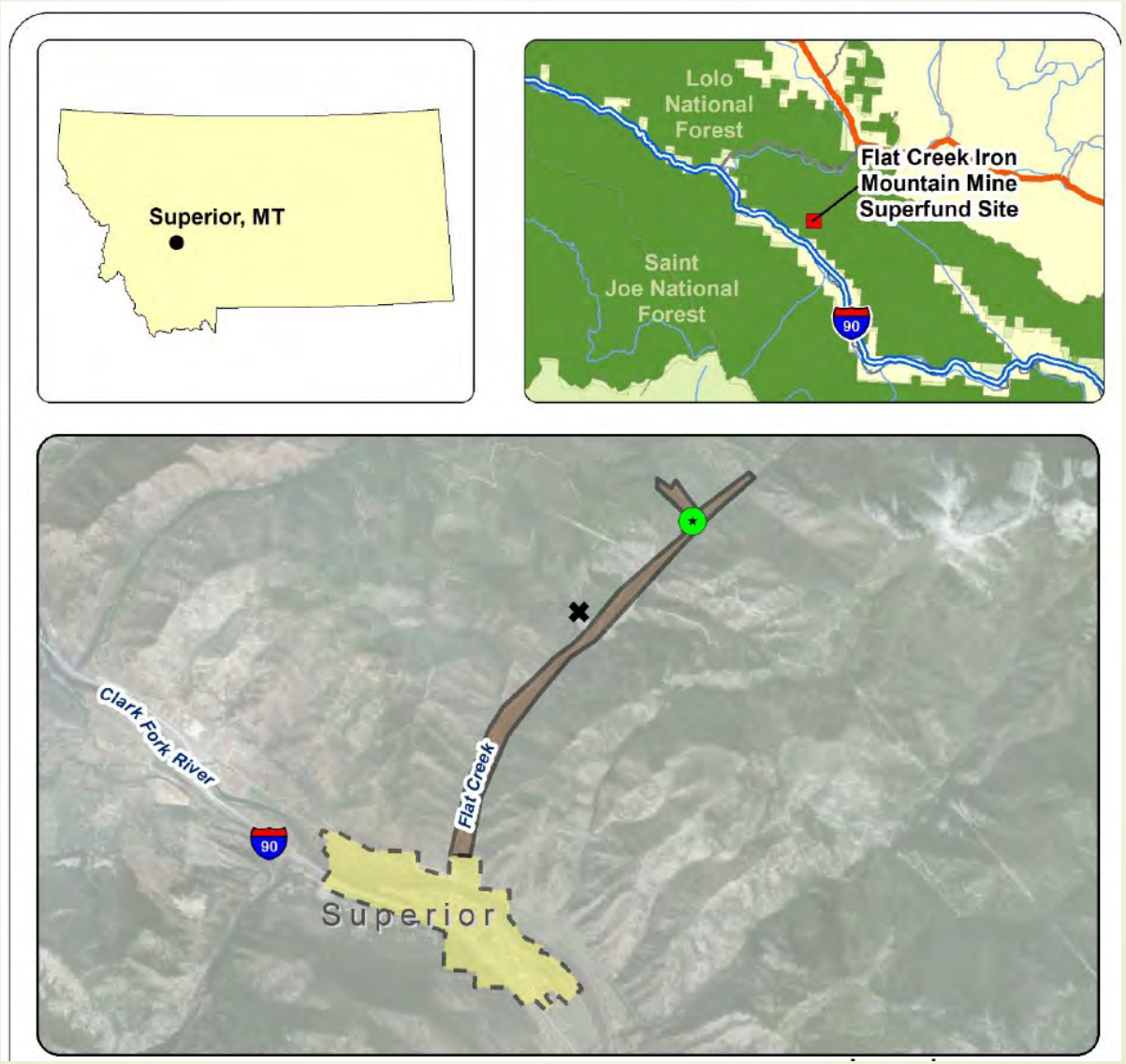
Today

- History of the Iron Mountain Mine Superfund Project
- OU2 Revegetation
  - Goals
  - Process
  - Outcome
- Lessons Learned

Iron Mountain Mine



Iron Mountain Mine

- Silver, Gold, Lead, Copper and Zinc
- Operated from 1909 – 1930 and again 1947 – 1953
- All that remains
  - Tunnels
  - Tailings
  - Discharging Adit
  - Mill Remnants and other buildings

Iron Mountain Mine

- The issue begins

Iron Mountain Mine – Flash Forward

- Mine operations produced tailings and soils contaminated with heavy metals
- During operation tailings had been disposed of along Flat Creek (source of Superior's drinking water) using gravity drainage which washed tailings all the way to the Clark Fork River
- Mine waste was also used as fill in Superior
  - Yards
  - Roadways
  - School Track
  - Fairgrounds

Iron Mountain Mine – Flash Forward

- 2000 Forest Fire triggered a large runoff event furthering contamination
- EPA assessment 2001
- Listed on EPA National Priority List in 2009
- Site Divided into three Operating Units (OU's)
  - OU1 Town of Superior
  - ***OU2 Flat Creek Watershed***
  - OU3 Wood Gulch Mine Waste Repository

Iron Mountain Mine – Flash Forward

- Removal and remediation began in 2002 on OU1 due to results of assessment
- This removal continued off and on into 2012
- OU2 – Flat Creek Drainage was priority 2
- Cleanup of contamination completed in 2018
- We were called in prior to seeding of OU2 to consult on revegetation efforts.

Flat Creek OU2 Project – Contaminated soils removed where possible and remaining contamination capped with imported soils

Flat Creek OU2 Project – Goals

- Stabilize new soils with vegetation
- Begin restoration of stream corridor to native condition

Flat Creek OU2 Restoration - Partners

- CDM Smith - Engineers
- ACF West - Distributors
- Profile Products – Consultant and Supplier
- Potter Frame Enterprises - Contractor

Flat Creek OU2 Restoration - Process

Create Optimal Soil Conditions

Pick the Right Plant Species

Select the Correct Erosion Control Material

Ensure Proper Installation

Follow-up Inspection and Maintenance Practices

Flat Creek – Challenges

- Imported Soils
  - Low Organic Matter
  - High Silt Content
  - Moderately high pH

Soil Test Results

Sample	% Organic Matter	Soil Respiration mg CO2/kg soil/week5	Sand %	Silt %	Clay %	Texture USDA
1	1.1	Not Tested	9.2	80.8	10	Silt
2	0.9	Not Tested	11.2	80.8	8	Silt
	(> 5%)	(> 1,000)	(20 - 60%)	Silt & Clay (40 - 80%)		

Sample	Soil pH6	Buffer Index	TDS7 ppm	Soluble Salts mmhos/cm	Sodium ppm	SAR8	g/cm3	oz/in3
1	8.2	7.5	192	0.3	16	0.53	1.26	0.73
2	8.2	7.5	204.8	0.32	16	0.67	1.19	0.69
	(6.3 - 7.3)		(<256)	(< 0.75)		(<2)		

Prescription

- Biotic Soil Media (BSM) 3,920 kg/ha
  - To address low Organic matter and biological activity
- BioAmendments
  - Provides Nutrients, Mycorrhizae, Humic Acid, Beneficial Soil Bacteria and Cytokinins
- Biosol Organic Slow Release Fertilizer
- Custom Seed blend
  - 20% Slender Wheatgrass
  - 15% Bluebunch Wheatgrass
  - 10% Sandberg's Bluegrass
  - 20% Idaho Fescue
  - 20% Mountain Brome
  - 10% Streambank Wheatgrass
  - 5% Sterile Wheatgrass
- Engineered Fiber Matrix (EFM) 3,360 kg/ha

BSM, Amendments, Fertilizer and Seed Application

Protecting Stream, BSM and Seed with EFM

Early Emergence at Four Months


One year after installation – strong establishment of permanent seed blend


One year after
installation
Solid root development

Three years after installation
Thriving vegetation

- Great establishment on very low organic matter soils
- BSM and EFM teamed to provide excellent erosion control on these highly erodible soils.

Best practices –
To get the *Icing on The Cake!*

- Test your soils and amend as needed
- Choose the correct seed blend
- Prepare the site correctly – decompact!
- Install properly with the correct HECP's
- Follow up visit to assess and correct any issues

Questions?

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