

Crossing Paths

Landscape Planning for Human-
Wildlife Balance

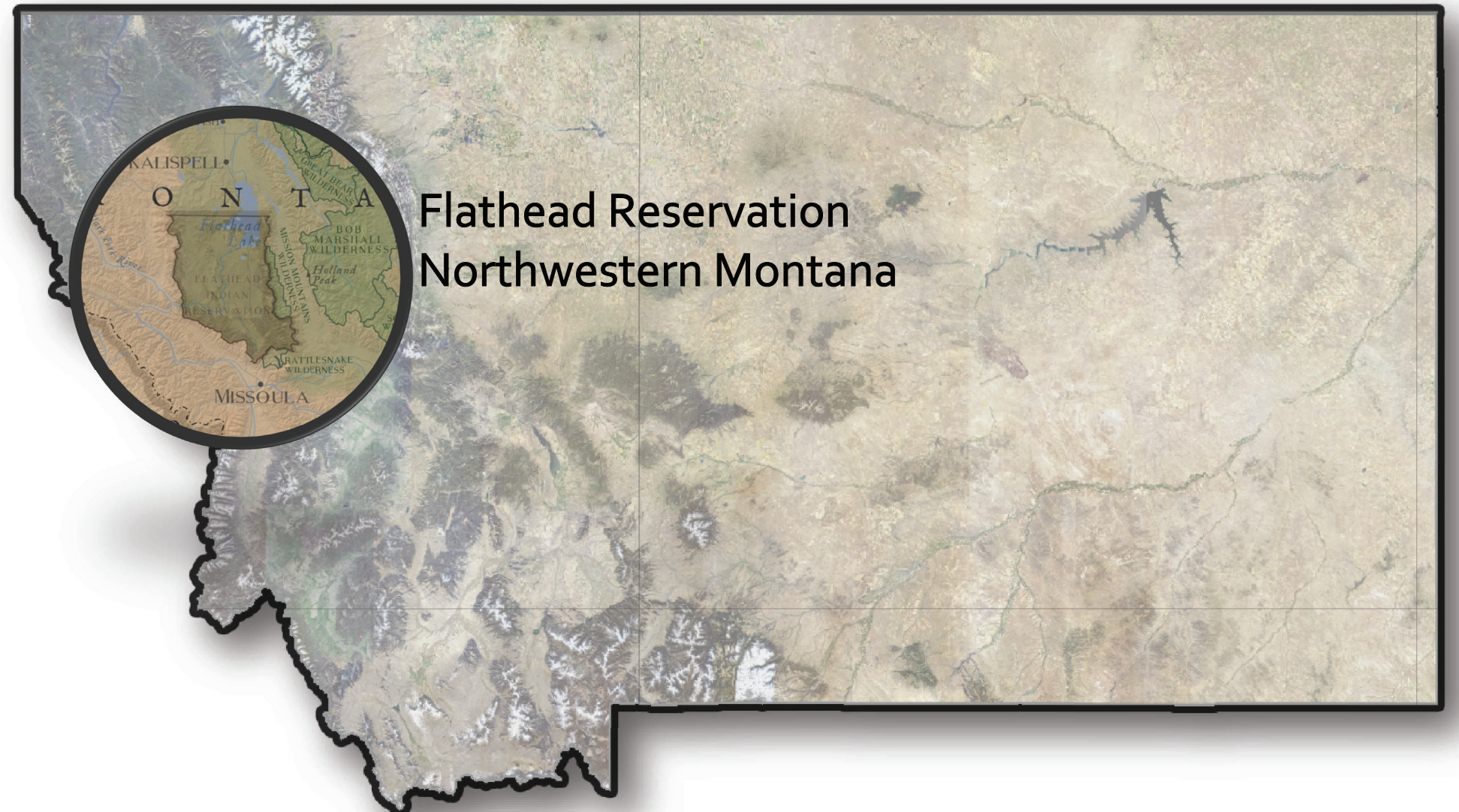
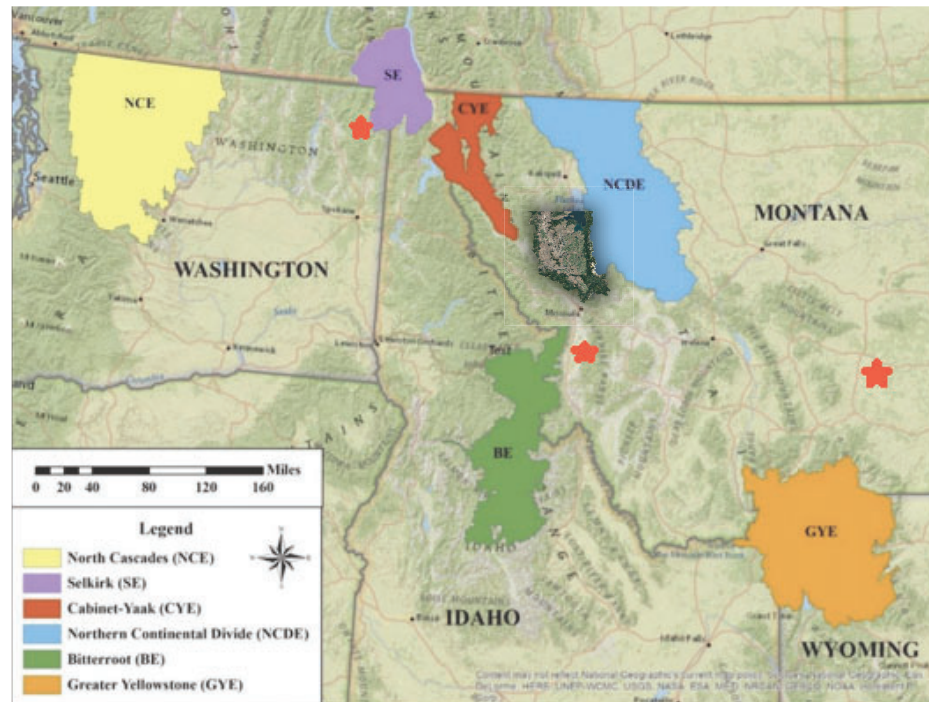


Benjamin Smail
Spring 2023

The Crown of The Continent

Site Location

- Crossroads between the North Continental Divide, Cabinet-Yaak, Bitterroot, and Greater Yellowstone Ecosystems

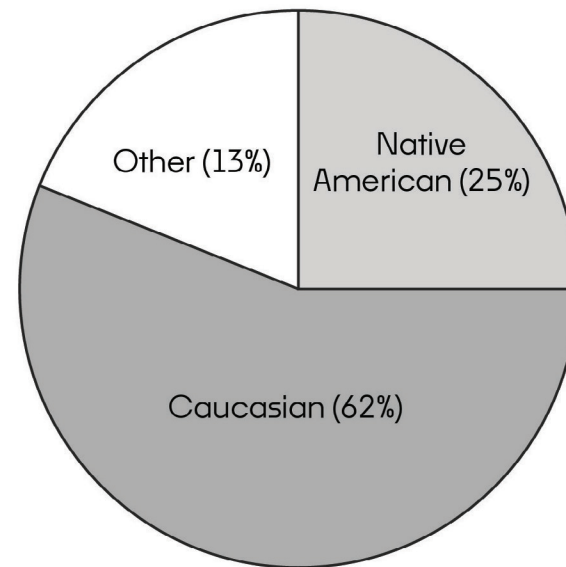
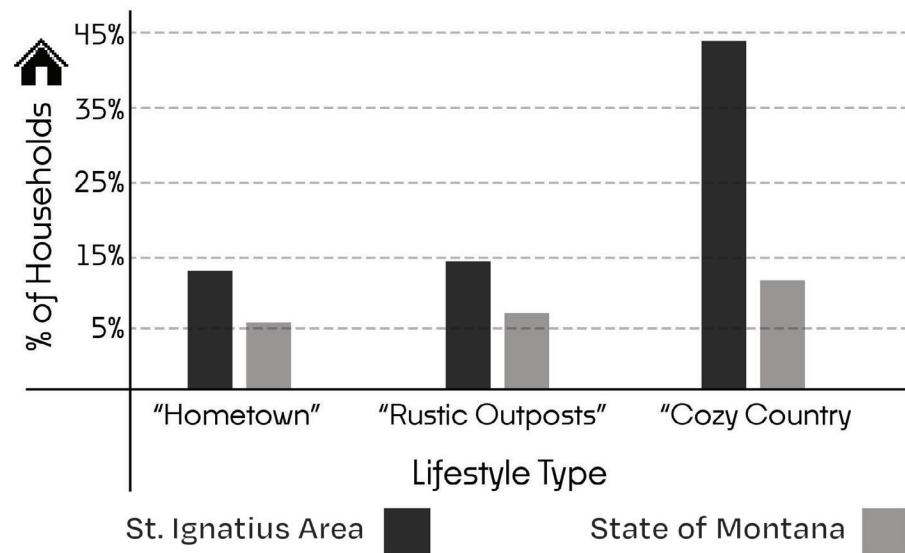


The Flathead Reservation

Site Location

- Ancestral lands of the Salish, Kootenai, and Pend Oreille Aboriginal Peoples
- Governed by the Confederated Salish and Kootenai Tribes (CSKT)
- 1,938 square miles
- 27,282 people

Community Profile

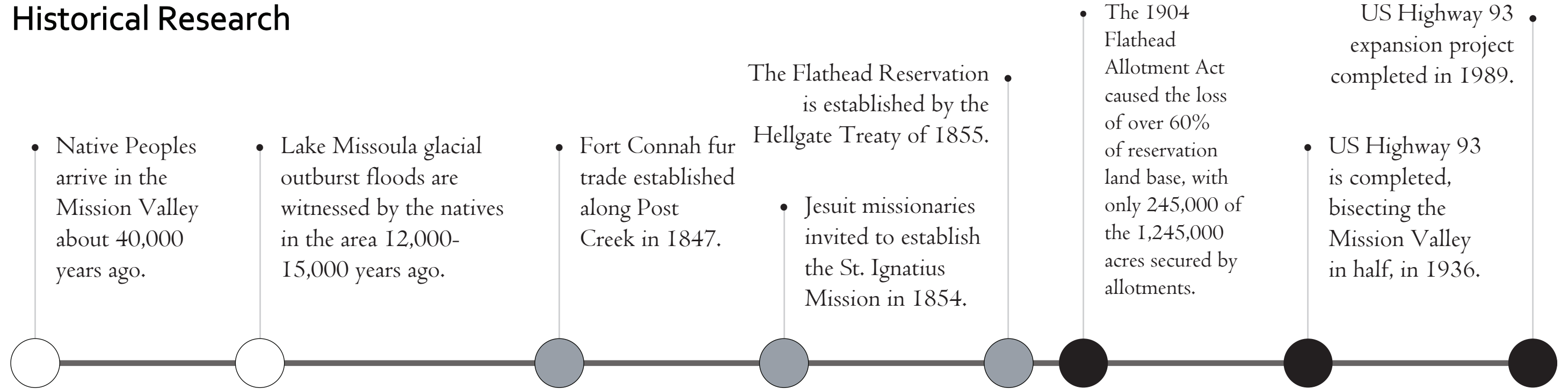


“In all things of nature there is something of the marvelous.”
- Aristotle



Development of The Mission Valley

Historical Research









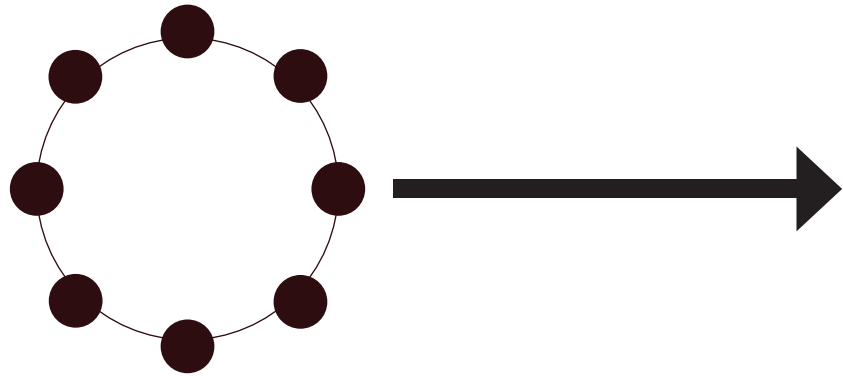




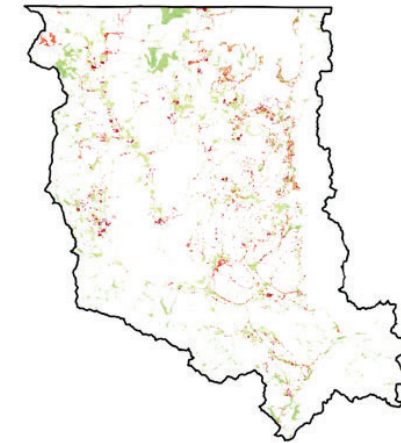
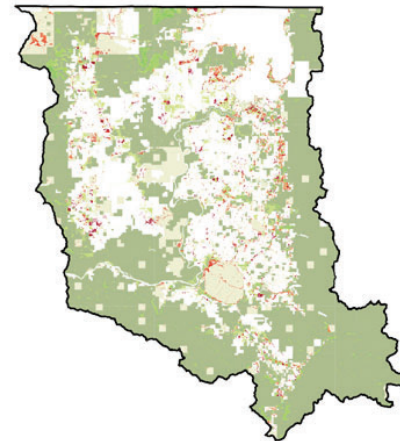


Casting a Wide Net

Research Methodology



- Hydrology
- Land Cover
- Geology + Steepness
- Infrastructure
- Public Attitudes Study
- Suitability Map



A Fragmented Mission Valley

Research Results

- US Highway 93 bisects one of Montana's most prime east-to-west wildlife migration corridors. Migration between the Northern Continental Divide and the Cabinet-Yaak Ecosystem is therefore extremely difficult.
- Large mammal collisions are a major problem



1.7%
Chance

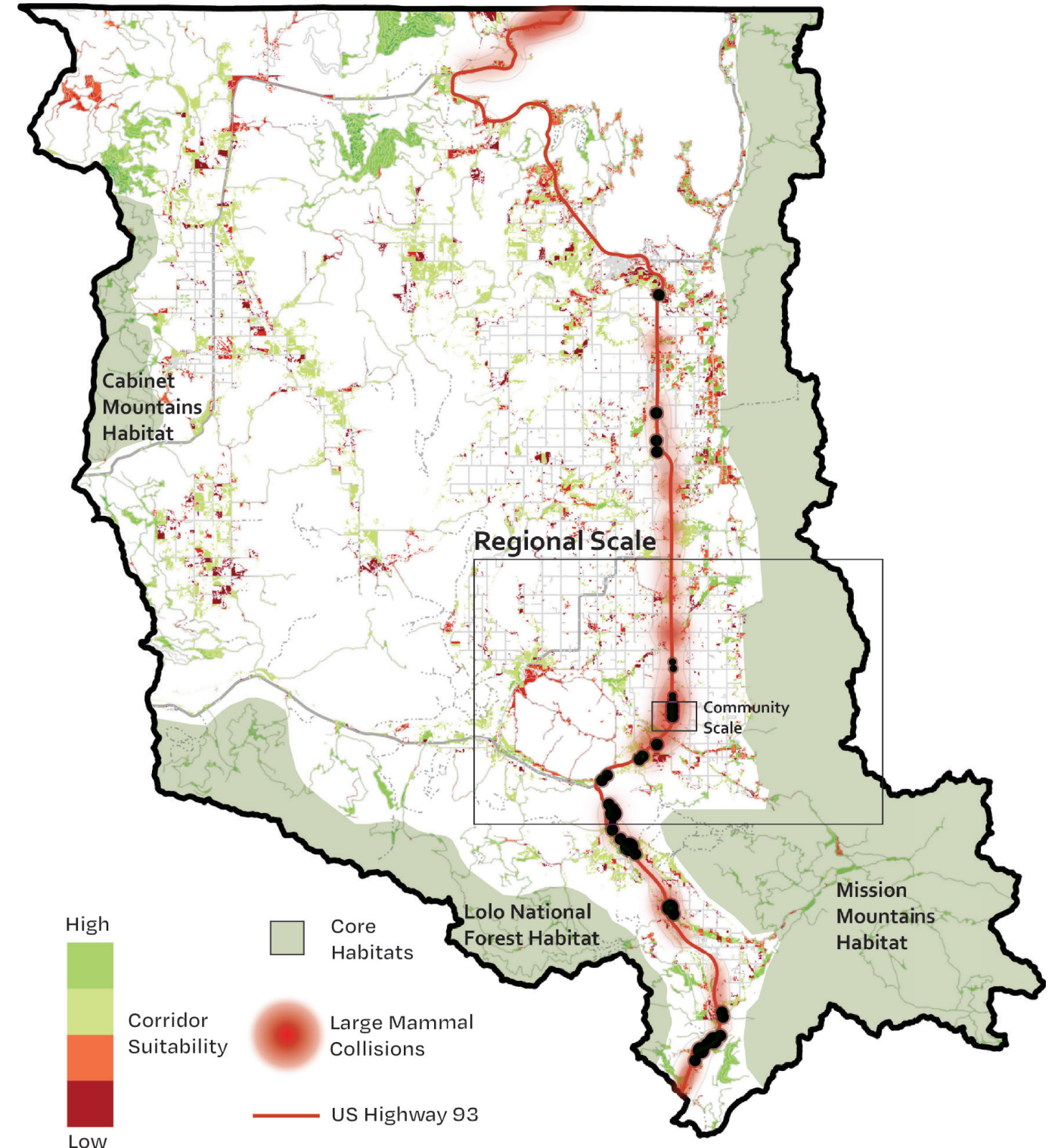


29,000
Injuries



\$8,000
(Deer)

20,000 yearly
crossings with 45
structures





Identified Project Objectives

An aerial photograph of a snowy landscape. In the foreground, there are snow-covered fields and a road. In the middle ground, there is a town or village with buildings and trees. In the background, there are large, snow-capped mountains under a cloudy sky.

Objective 1: Reduce Instances of Human-Wildlife Conflict.

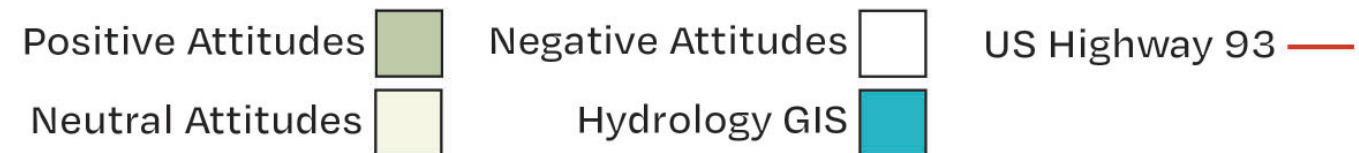
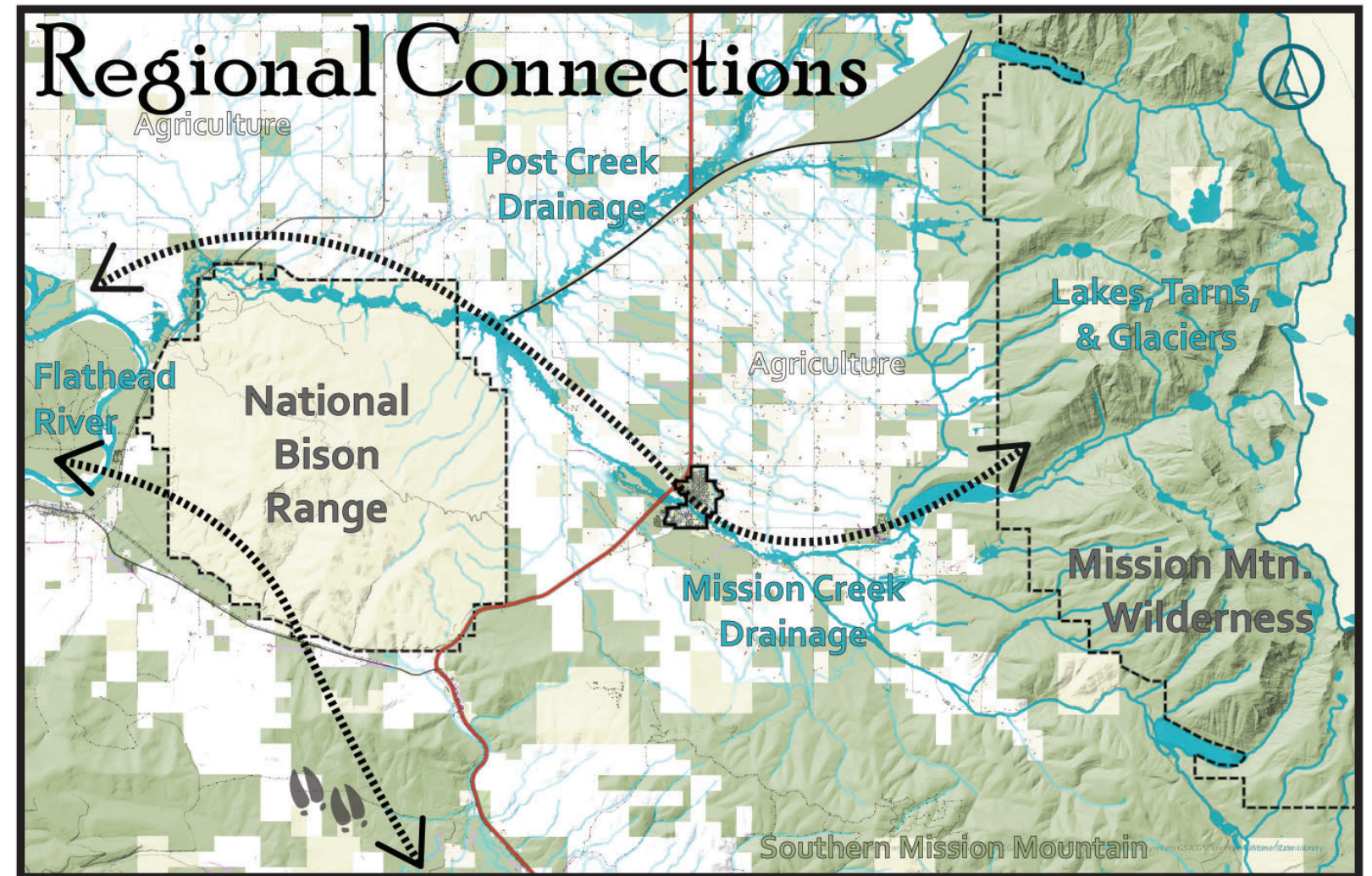
Objective 2: Improve the Ecological Health of the Mission Creek Riparian Corridor.

Objective 3: Create Opportunities for the Community to Experience the Native Landscape.

Regional Scale

Site Selection

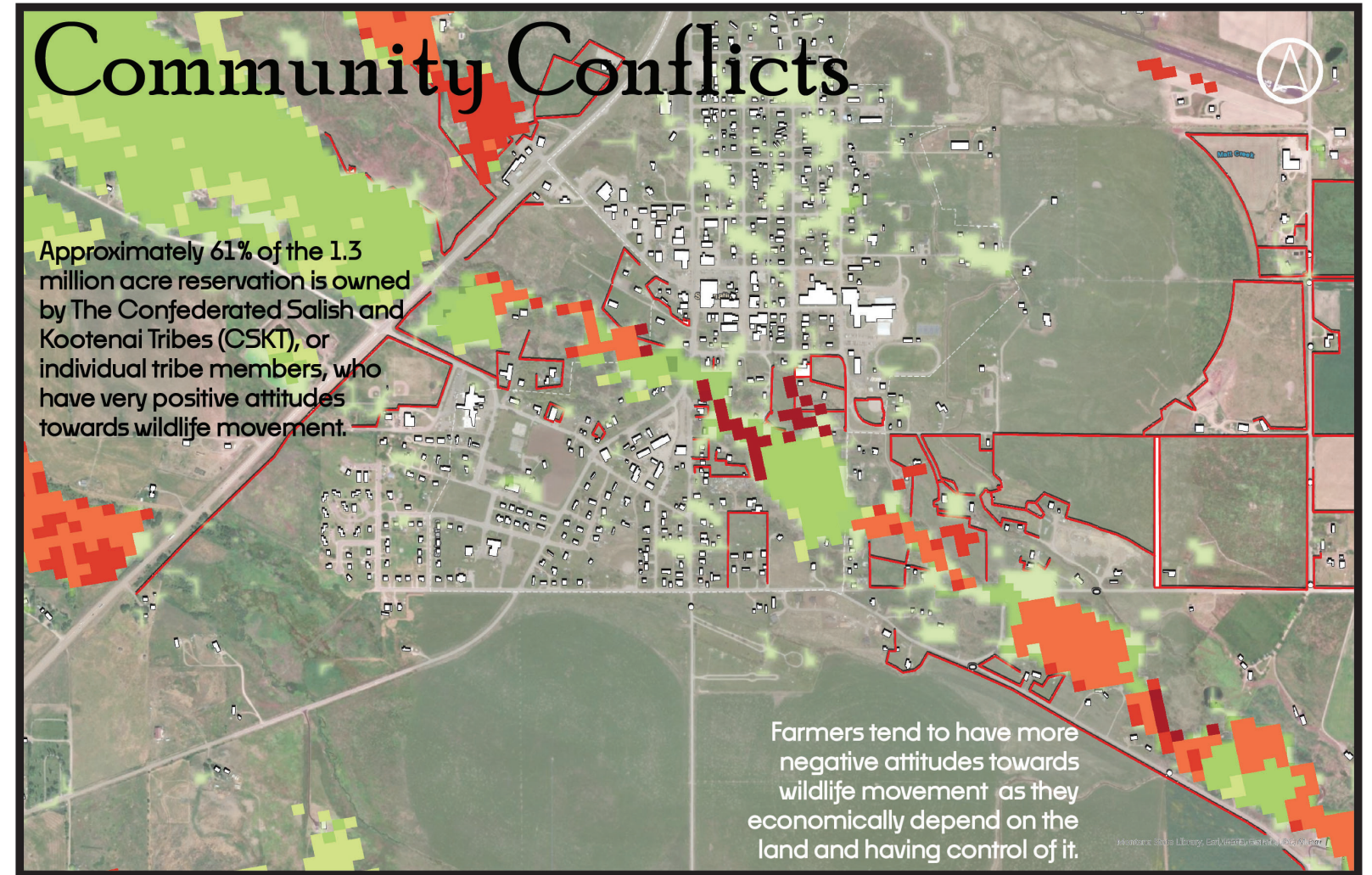
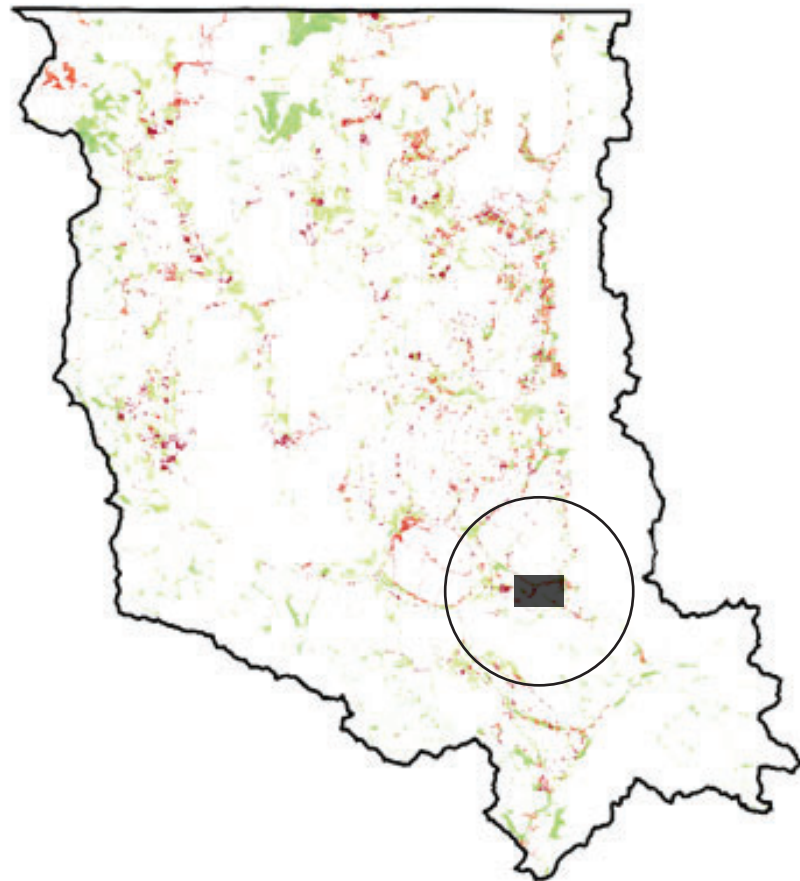
- Animals use the Mission and Post Creek drainages
- The Post Creek drainage is rural and largely privately owned
- The Mission Creek goes through the city of St. Ignatius
- Both drainages have been negatively affected by agriculture



Community Scale

Site Selection

- *Zoomed-In view of the Habitat Suitability Map*



Corridor Suitability Study



Existing Fencing

Building Footprints

←--- Mission Creek

US Highway 93

←--- Mission Creek







Mission Reservoir

North-town St. Ignatius (residential)



Crossing 2:
Main Street

US Highway 93

← Mission Creek

Tribal Resources
and Health

St. Ignatius
Mission



Mission Mountain Range (Looking Northeast)

US Highway 93

**North-town St.
Ignatius (residential)**

**Downtown St.
Ignatius**

**Community
Amphitheatre**







Conflicted Crossings

Site Selection

- Crossing 1: US Highway 93
- **Crossing 2: Main Street (Downtown)**
- Crossing 3: Mission Dam Road
- Crossing 4: St. Mary's Lake Road

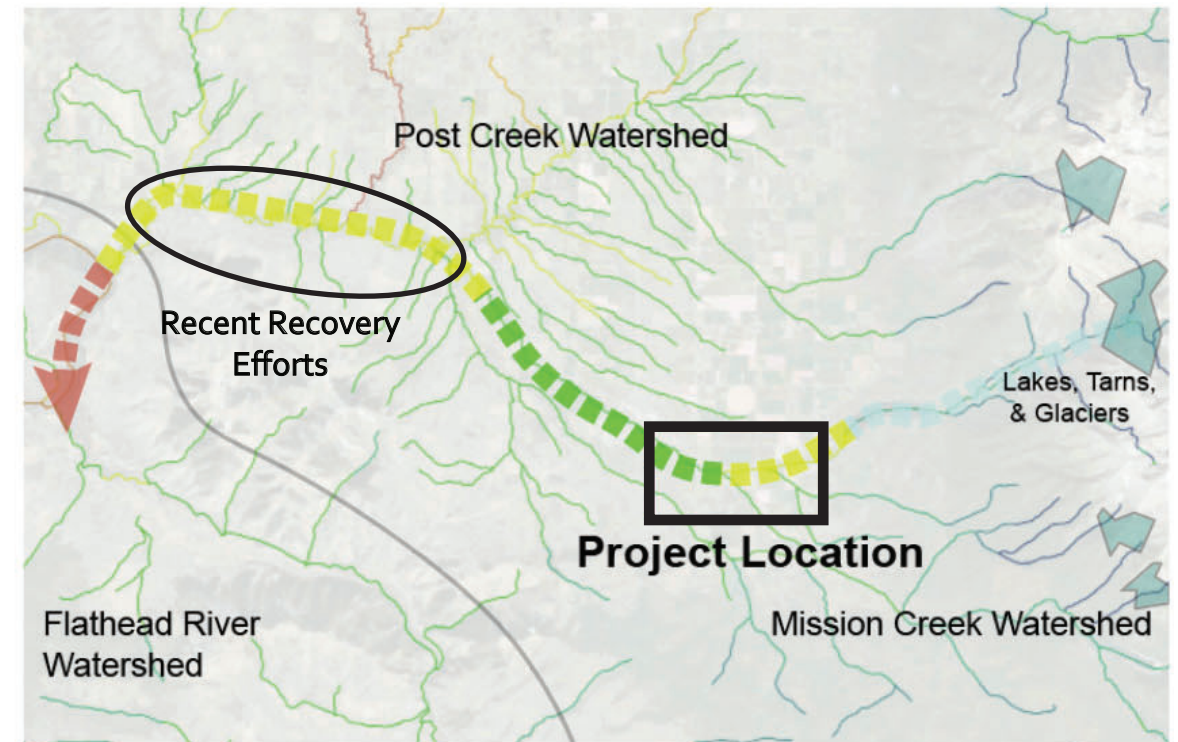
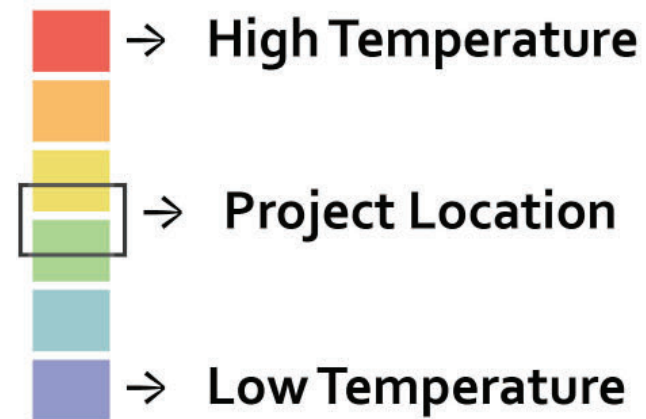




A Recovering Ecosystem

Objective 2: Improve the Ecological Health of the Mission Creek Riparian Corridor. | Site Analysis

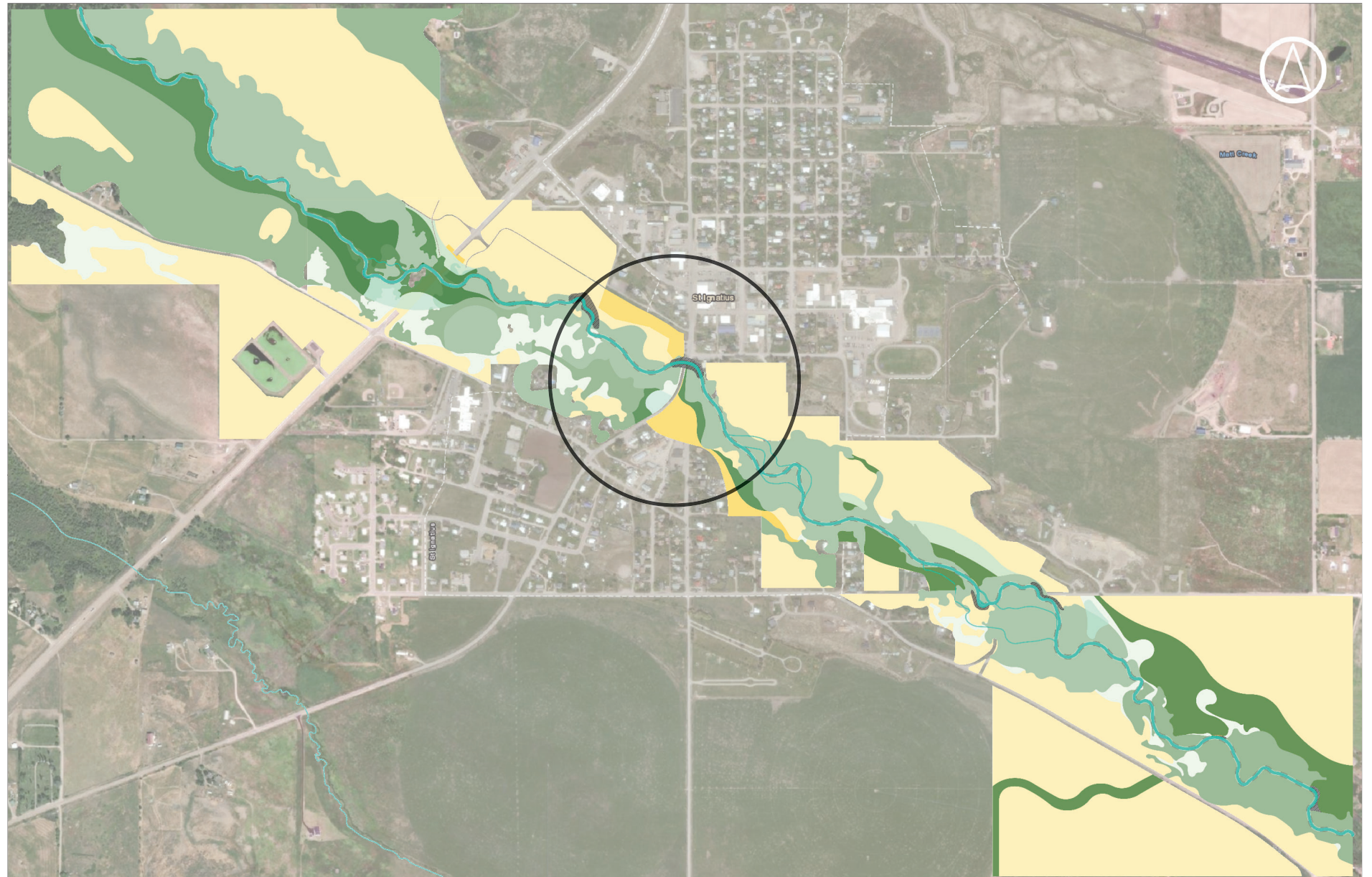
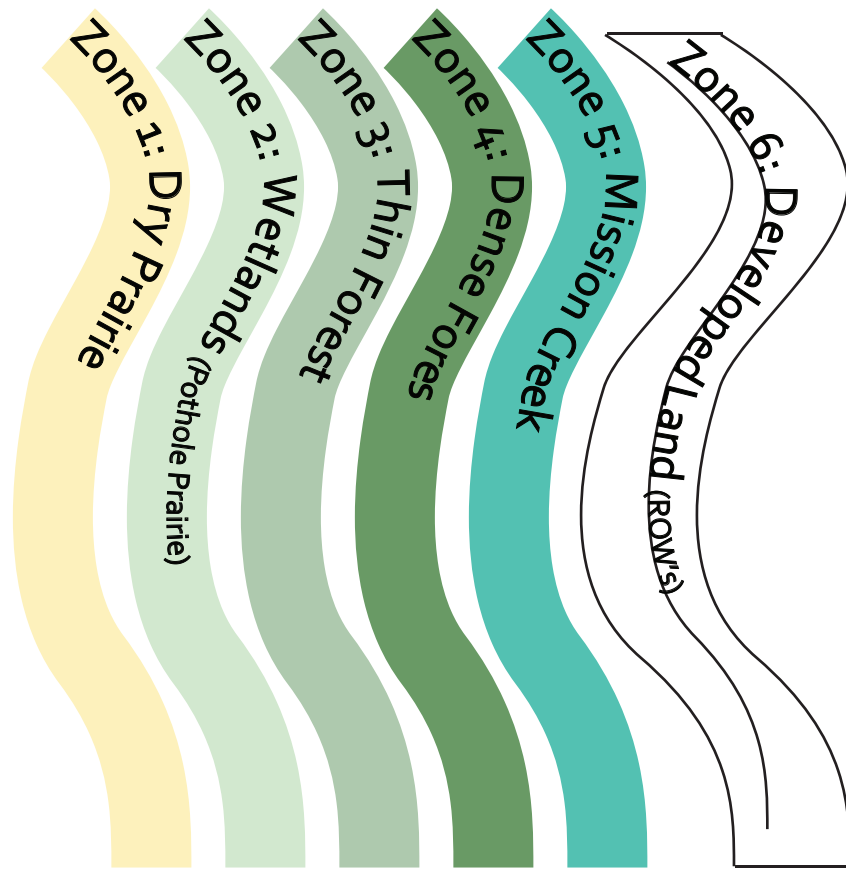
- Centuries of overfarming and livestock overgrazing has depleted the streamshed of vegetation.
- Warming temperatures are correlated to poor species diversity and health
- Recent efforts have addressed the Mission Creek north of the National Bison Range (2020).





The Riparian Ribbon

Objective 2: Improve the Ecological Health of the Mission Creek Riparian Corridor. | Site Analysis



Dry Prairie



Wetland Pothole Prairie



Thin Forest



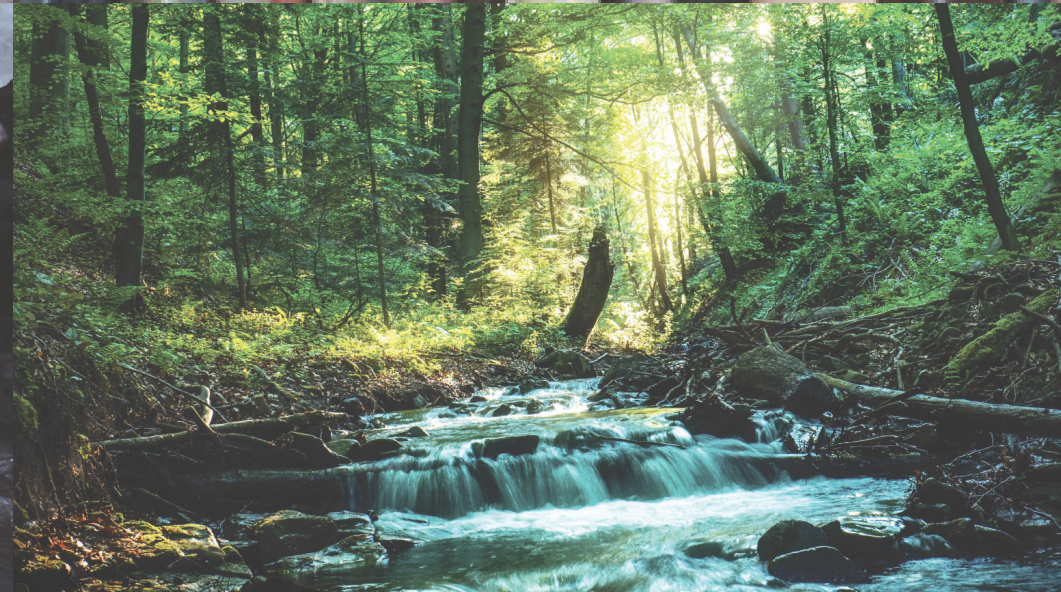
H10
NEAR THE NARROWS ON FLATHEAD LAKE POLSON MONT.



Dense Forest



Mission Creek



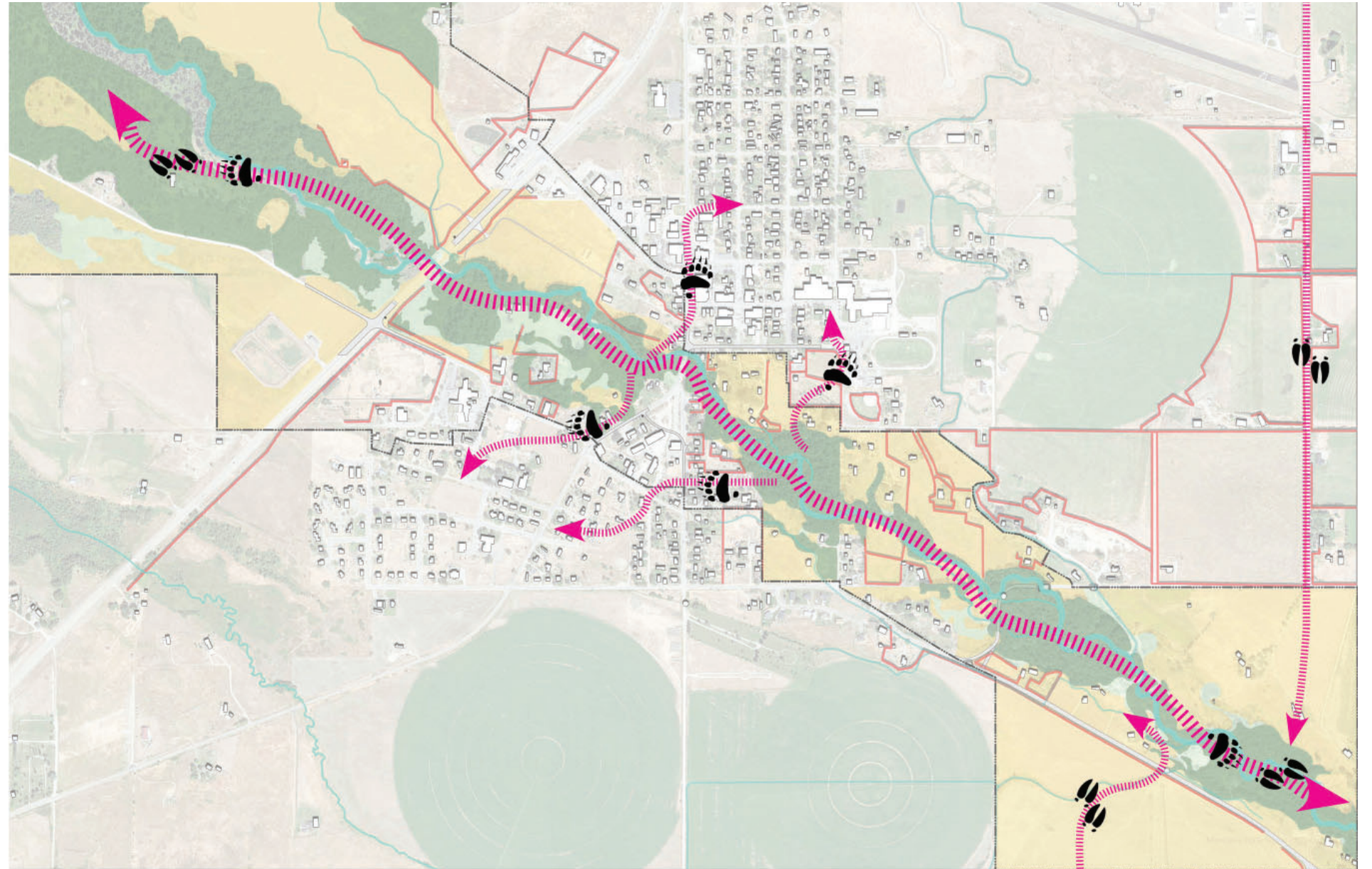
Developed Land



Large Mammal Movement

Objective 1: Reduce Instances of Human-Wildlife Conflict. | Site Analysis

- Undulates and bears use riparian corridors to travel, most frequently in the fall months.
- Black bears have become habituated to seeking out food in town at night.
- More increasingly, grizzly bears are becoming habituated to humans and eating crops.
- Deer prefer open areas in the fall and avoid the dense narrow crossings. They instead travel alongside ditches and irrigation canals.

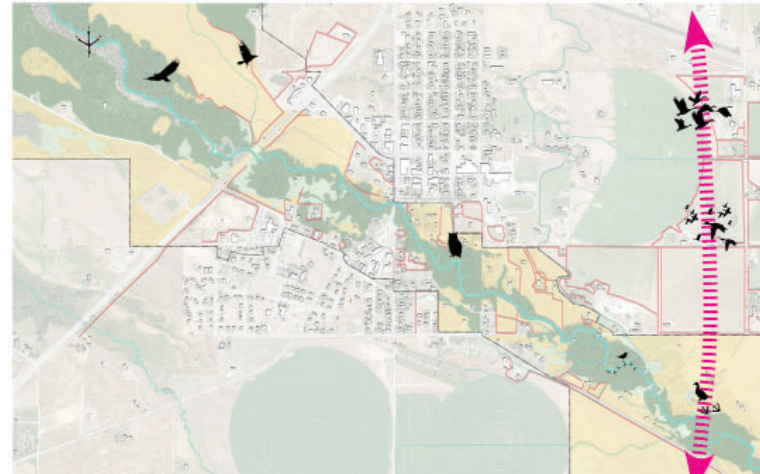


All Wildlife Movement & Health

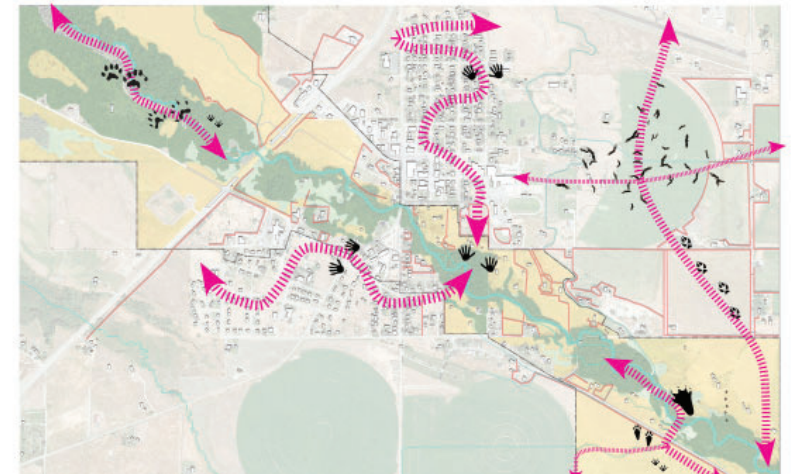
Objective 1: Reduce Instances of Human-Wildlife Conflict. | Site Analysis

- Migratory birds of the Pacific Flyway depend on wetland pothole prairies
- Raptors are killed frequently on roadways from seeking out roadkill.
- Predators will follow their prey, often undulates, into undesirable areas. Recently, wolves are more comfortable with humans.
- Small mammals such as otters have been absent for centuries but have been recently spotted.
- Bull trout do not travel up the Mission Creek anymore.
- Amphibian health is directly correlated to riparian health.

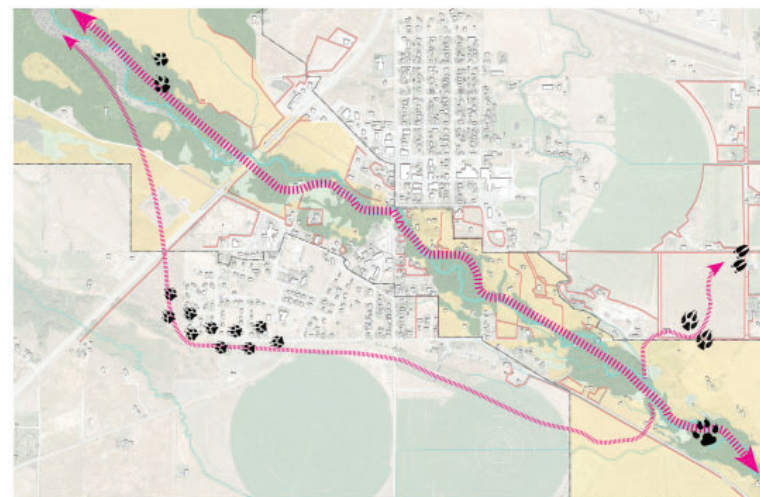
Birds



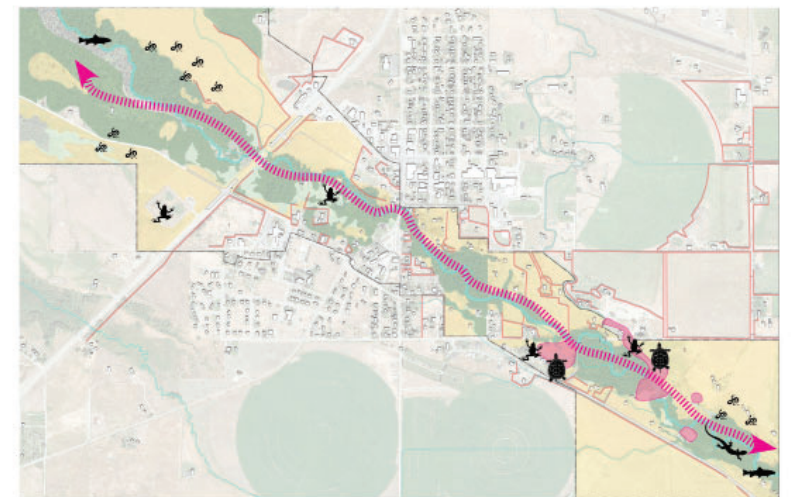
Small Sized Mammals

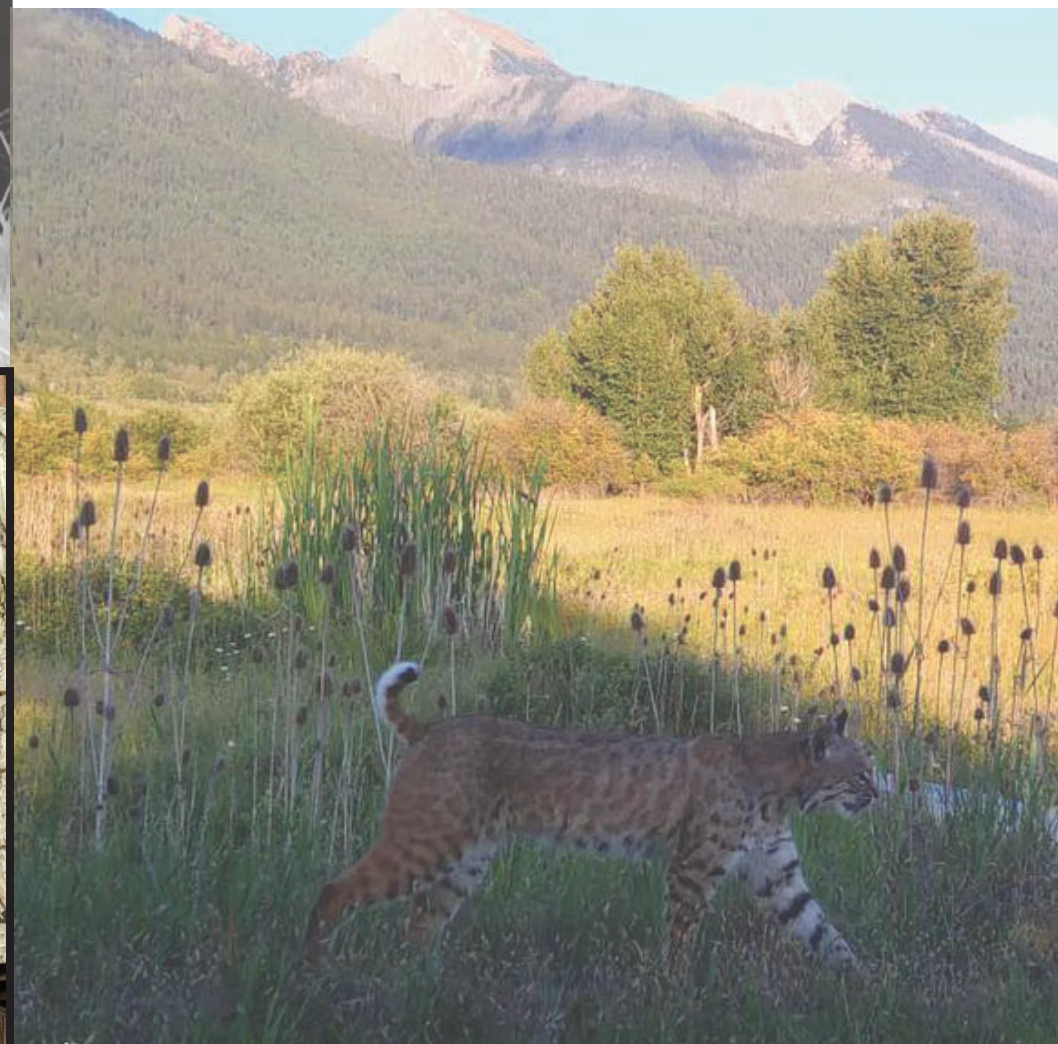


Medium Sized Mammals (Predators)



Fish, Reptiles, & Amphibians





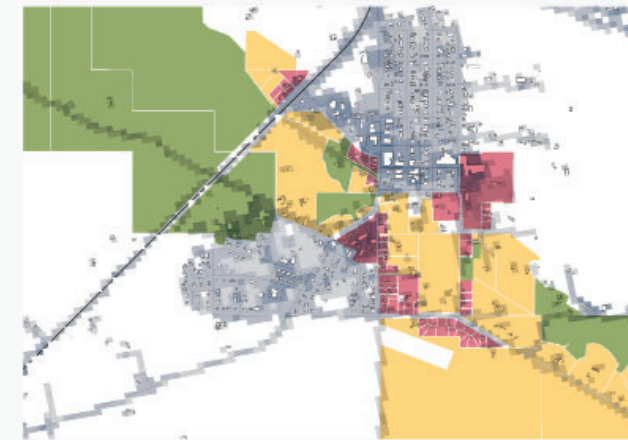
Beauty in Sight, But Out of Reach

Objective 3: Create Opportunities for the Community to Experience the Native Landscape.

- St. Ignace has less opportunity to recreate than the surrounding communities.
- Public attitudes and beliefs suggest a generally well received intervention.
- Both the existing amphitheatre and skate park and large works of concrete and have dated aesthetics.

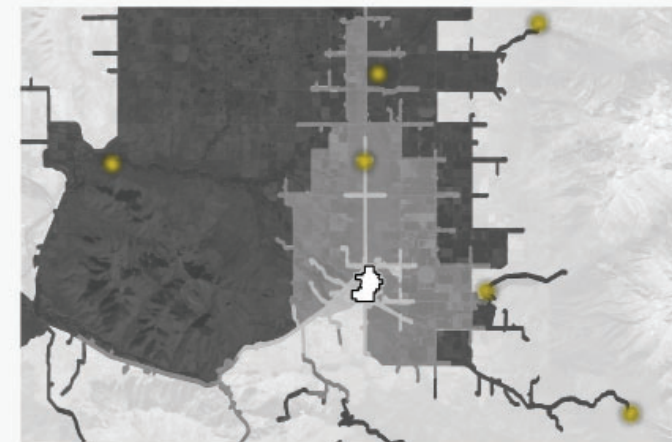


Public Attitude & Beliefs



- Positive (Low Conflict)
- Neutral (Moderate Conflict)
- Negative (High Conflict)
- Infrastructure GIS Layer

Local Recreation Opportunities



- >5 minute drive
- >15 minute drive
- <30 minute drive
- Recreation Opportunities

Beauty in Sight, But Out of Reach

Objective 3: Create Opportunities for the Community to Experience the Native Landscape.

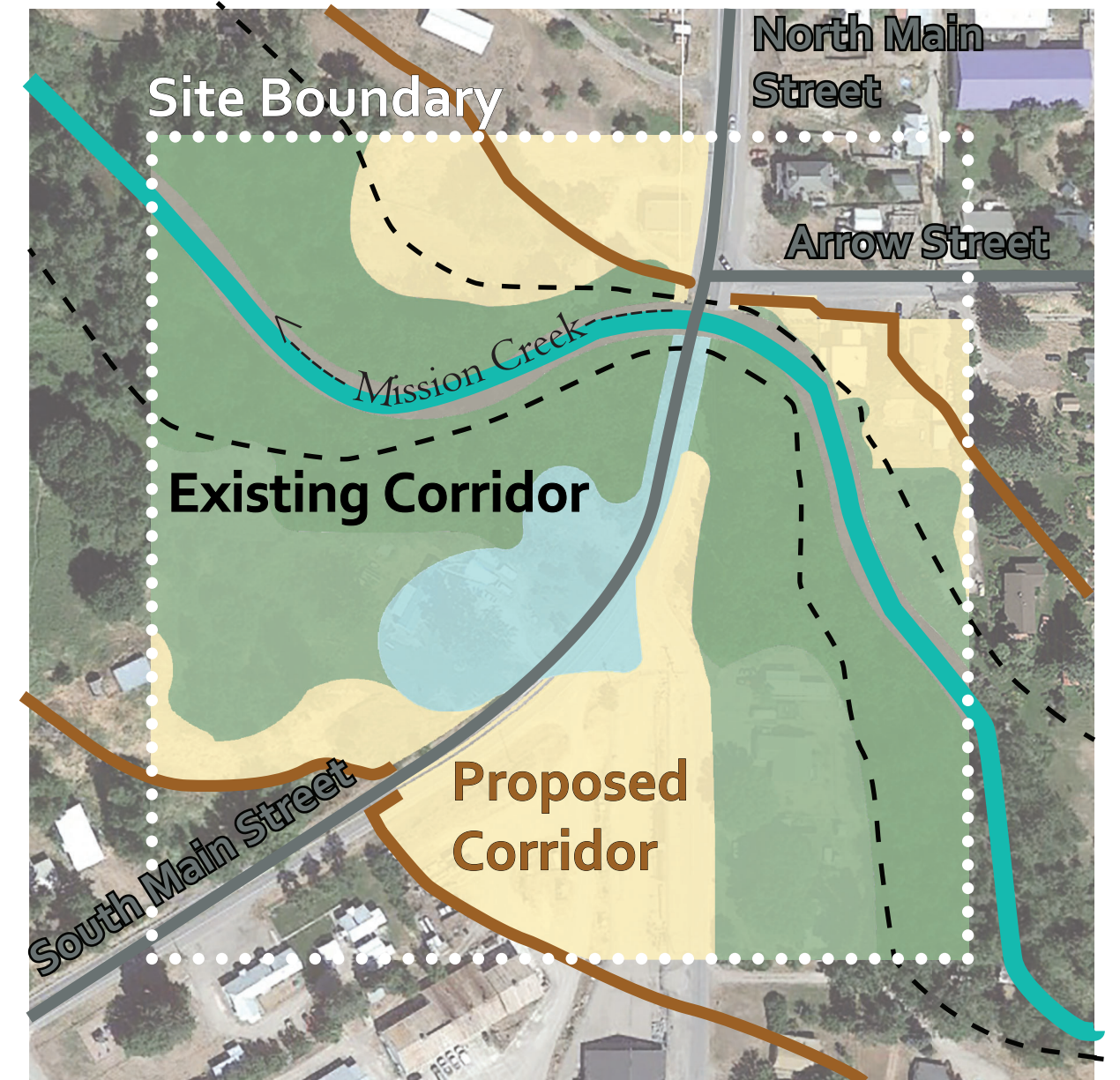
- Minimal trail and access road maintenance
- No wayfinding
- Minimal public resources for trail recreation
- Yearly fee for non-tribal members (recently updated to \$100/year)





Main Street Crossing

Site Design Location



Case Study Key Takeaways

Overpass Bridge Conceptual Framework

US Highway 93 'Animals' Bridge' US Highway 93, MT

- Wildlife crossing structures with exclusion fencing reduce wildlife-vehicle collisions
- Success rates increased with increasing width, openness, guardrail length, and shrub cover
- According to a 2015 study, US 93's crossings lowered animal collisions by 71%



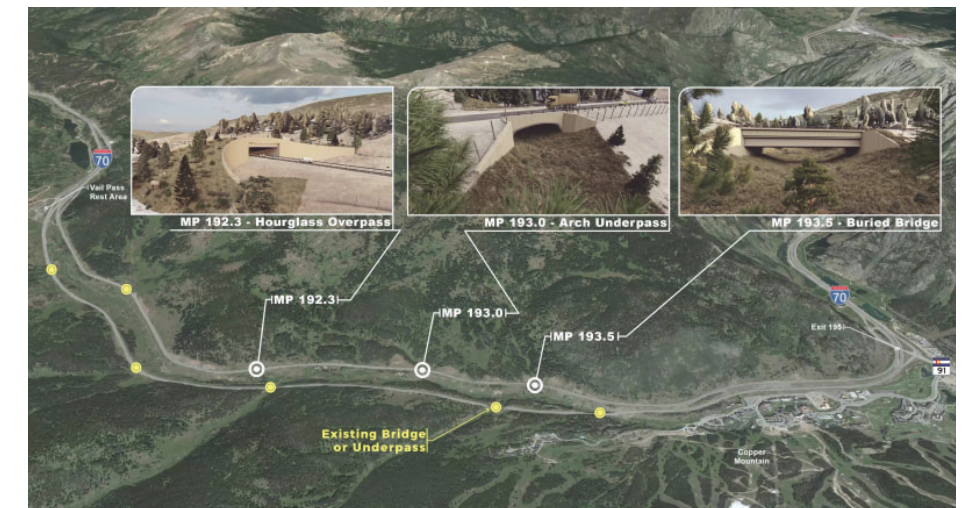
Wildlife Overpass in Banff National Park, Alberta Canada

- Wildlife corridors take time for animals to learn to use
- Different species have specific preferences for crossing design
- Wildlife crossings have been effective in reducing wildlife-vehicle collisions



I-70 East Vail Pass Wildlife Crossing Feasibility Study, CO

- Heavily trafficked stretch of I-70 sees 22,000 vehicles per day
- Environmental clearance will ensure impacts to wetlands and riparian areas are avoided or minimized
- Shading investigation conducted to determine potential impacts on snow and ice melt

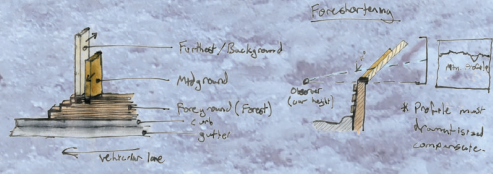


“How can the bridge be built FOR people just as much as it is for animals?”

“How can the bridge blend into the landscape to be more familiar to wildlife?”

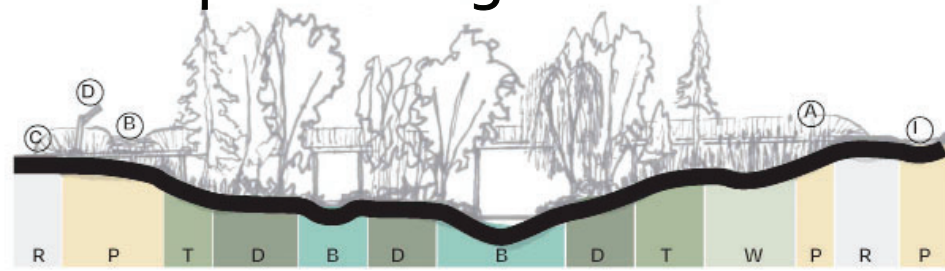
Acoustic Buffering

Wildlife Movement

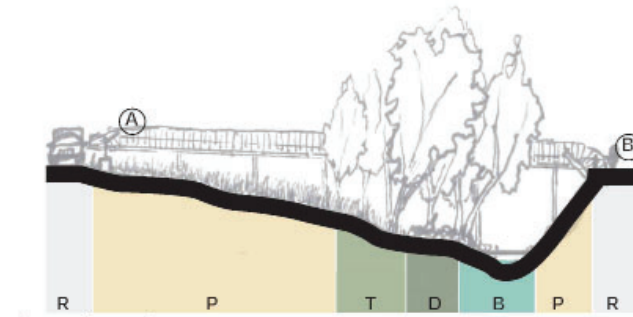


Completing the Ribbon

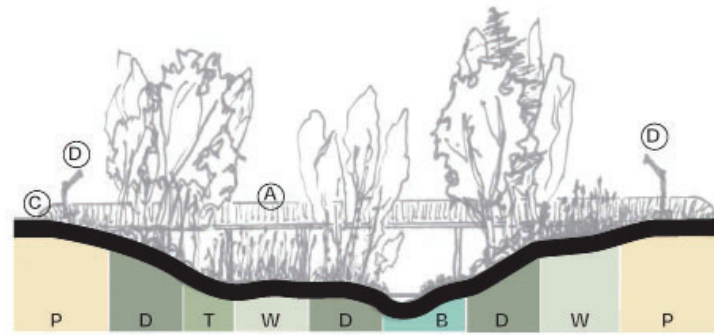
Conceptual Design



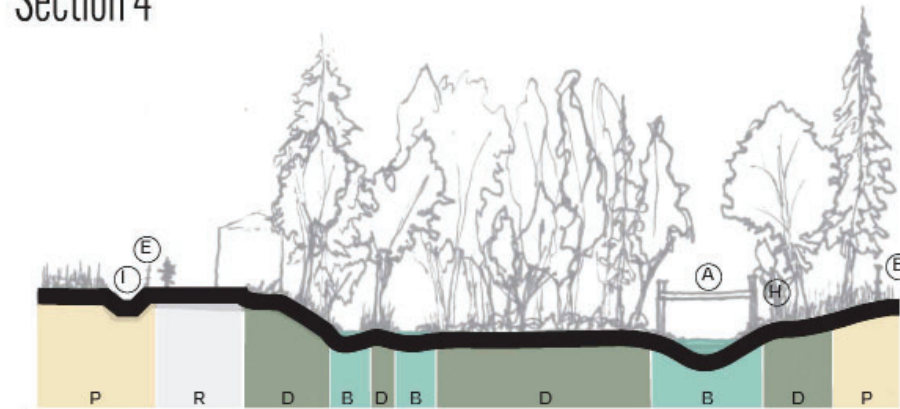
Section 1



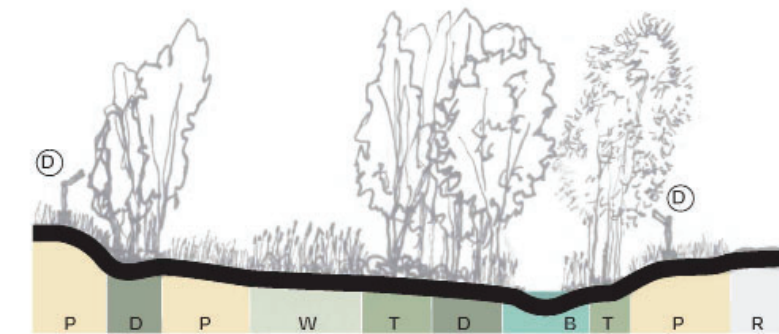
Section 4



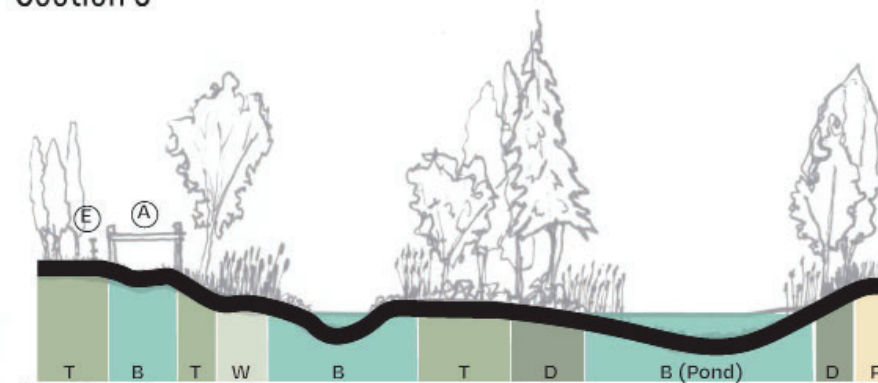
Section 2



Section 5



Section 3



Section 6

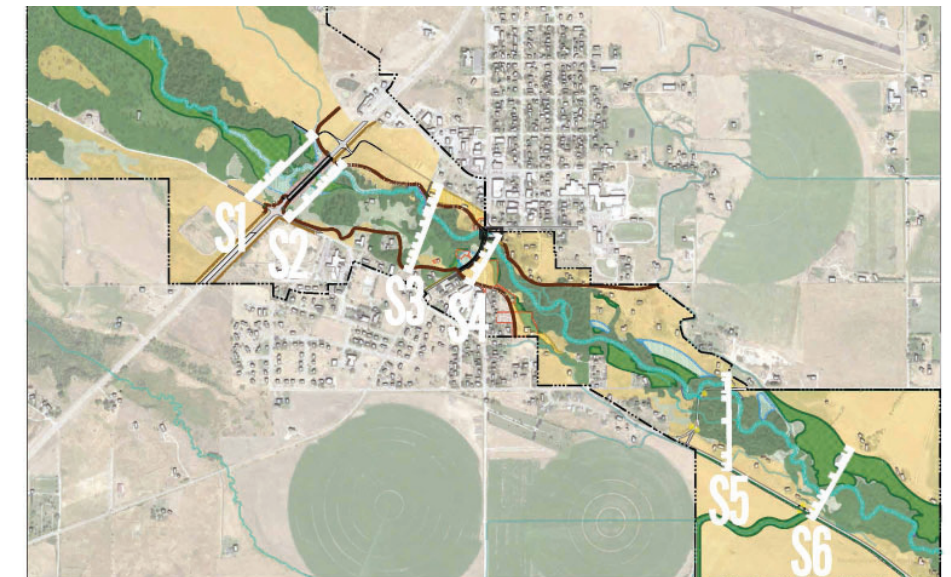
Schematic Design Sections

Key

-  → Prairie Restoration
-  → Reforestation
-  → Wetland Restoration
-  → Bank Stabilization
-  → Proposed Sculptural Fencing
-  → FDHW Fencing
-  → Mission Creek Watershed
-  → Acquirement/Demolition

Architectural Elements

- A. Overspan Bridge
- B. Outlook Platform
- C. Sculptural Signage
- D. Sculptural Fencing
- E. Wildlife Friendly Fencing
- F. Deer Jump-out
- G. Stormwater Filtration System
- H. Wildlife Traffic Signal
- I. Irrigation Canal





North-Town
St. Ignatius

Downtown
St. Ignatius

Main Street
Crossing

Tribal Resources
& Health Services

South-Town
St. Ignatius

Mission Creek Flow
Reforestation

Dry Prairie

US HWY 93

Masterplan Design

Proposed Mission Creek Corridor

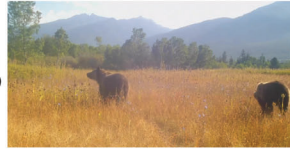
Completing the Ribbon

Site Design



Key Wildlife
Corridor
Species

Habituated Grizzly & Black Bears



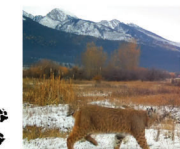
Deer and Moose (Undulates)



Coyote & Wolf



Cougar & Bobcat



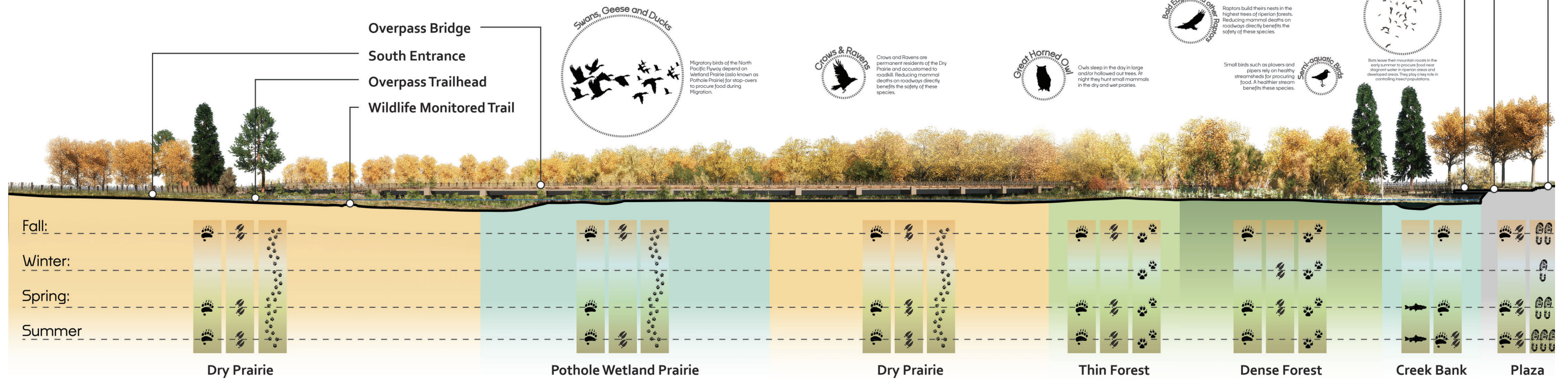
Bull Trout (Threatened)



Highest Level: Community Gathering Plaza

Middle Level: Small Group Programming

Lowest Level: Cantelevered Observation Deck



Wildlife Corridor Section [503]

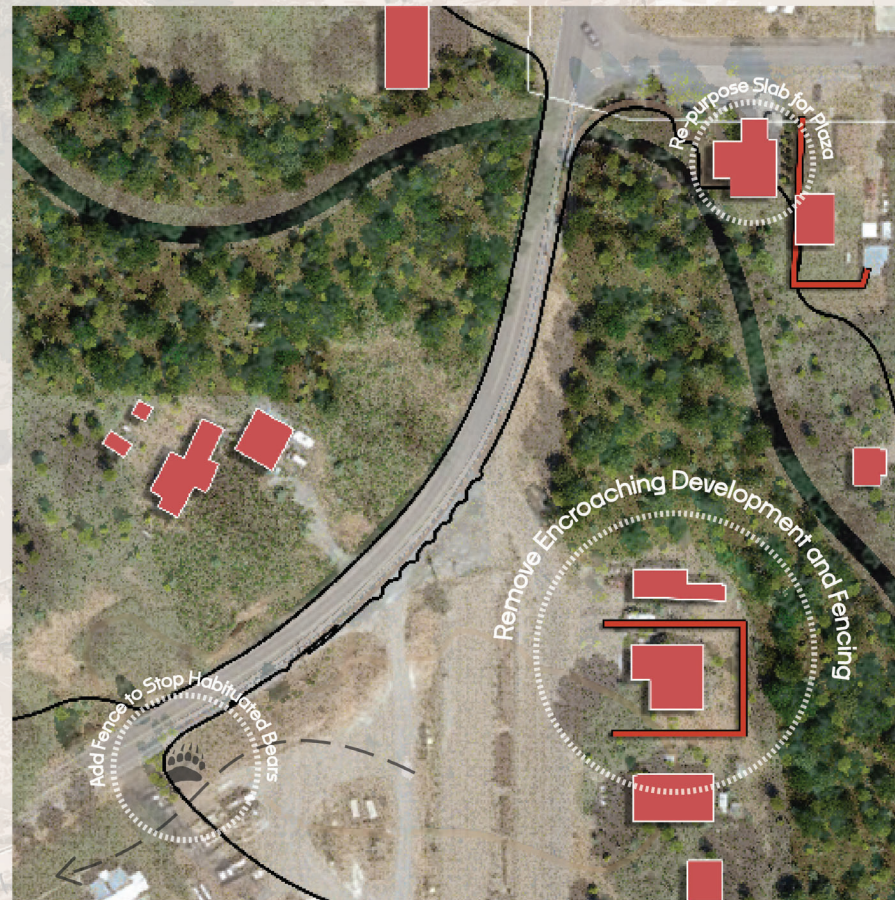
Scale: 1/16" = 1'0"

Main Street Crossing

Site Design

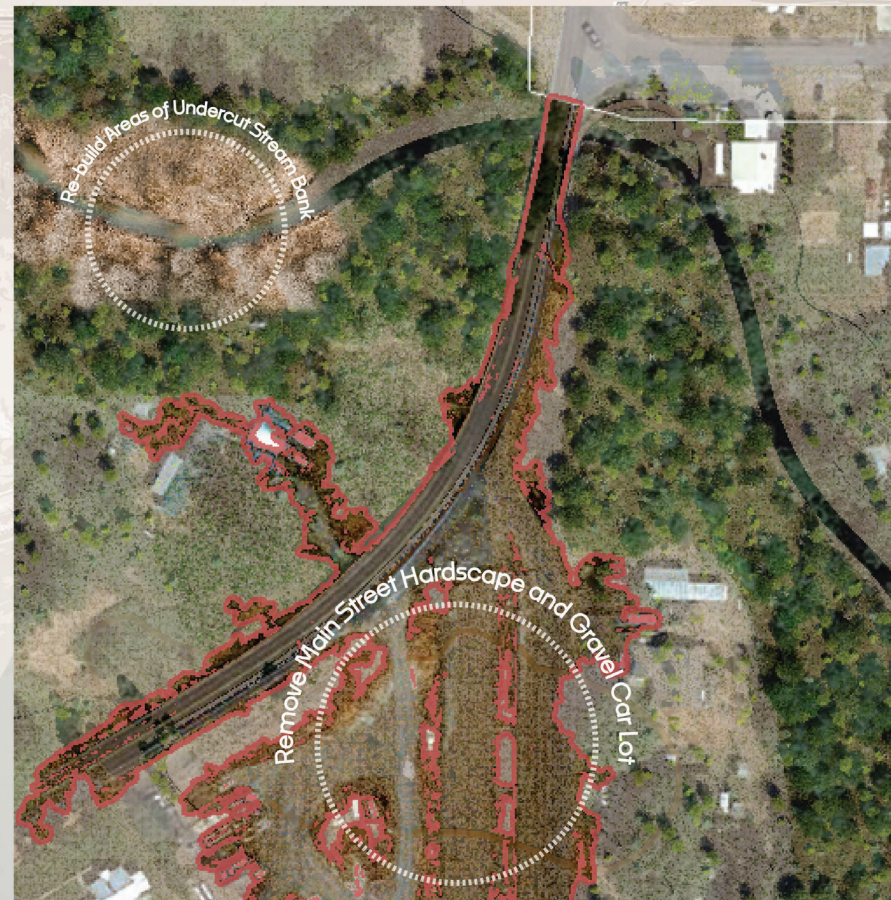
Objective 1:

Decrease Instances of Human-Wildlife Conflict.



Objective 2:

Improve Riparian Habitat Connectivity and Health.



Objective 3:

Enhance the Public's Access to Experience the Native Landscape.



North Entrance Plaza

Site Design

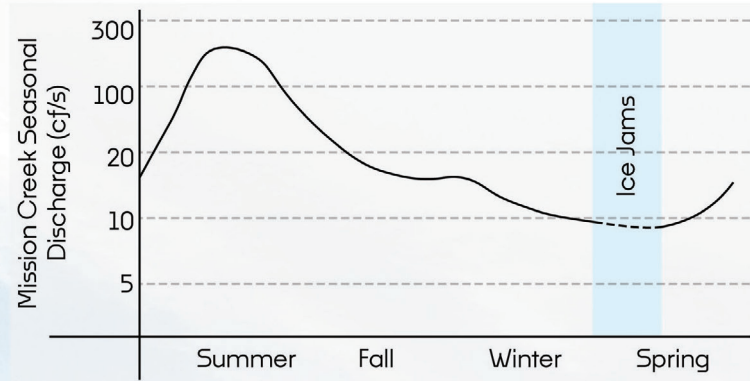


Site Plan Key North Entrance Plaza

- A Parallel Parking
- B Cedar Grove + Constructed Wetland
- C Teepee Inspired Canopy Tents
- D Natural Wood Stairs
- E Informal Corridor Entrance
- F Communal Firepits
- G Small Group Log Seating
- H Mixed Evergreen Buffer

Terraced Stormwater Treatment [S01]

Scale: 3/16" = 1'0"



Thuja plicata
Western Cedar



S01

65% Permeability

Historical Signage

"The streams, rivers, and lakes of the Mission Valley were used as meeting places for trade among Native Americans for thousands of years. This practice continued into the settlement of the Valley. Fort Connah, a fur trade settlement of the Hudson Bay Company, became the first white settlement in the Mission Valley. Setup along Post Creek, it became the hub for the exchange of ideas, culture, and goods in the valley. Fort Connah's success was a catalyst for inter-cultural marriages that many residents of the Mission Valley can trace their heritage to today."



Interpretive Signage (Abies)

Close Proximity to St. Ignatius Elementary

Terrace Stairs to Mid-Level

Belt Rock Flagstone Buffer

Belt Rock is a sedimentary group of rock characterized by cracks reminiscent of mud drying and cracking. These are scars of the Lake Missoula Glacial outwash floods that formed this Valley.

Fir & Pine timber stairs inset in the ground represent the deadfall that is abundant on the forest floors.

Flexible Community Spaces



Farmer's Markets

Outdoor Classrooms

Cultural Celebrations (Pow Wows)

Foot/Bike Race Staging (Fun Runs)

Wilderness Skills Workshops



Maintained Viewshed of Mountains

Community Members Provide Event Seating

Access for Adventure

Observation Deck

Small Group Log Seating

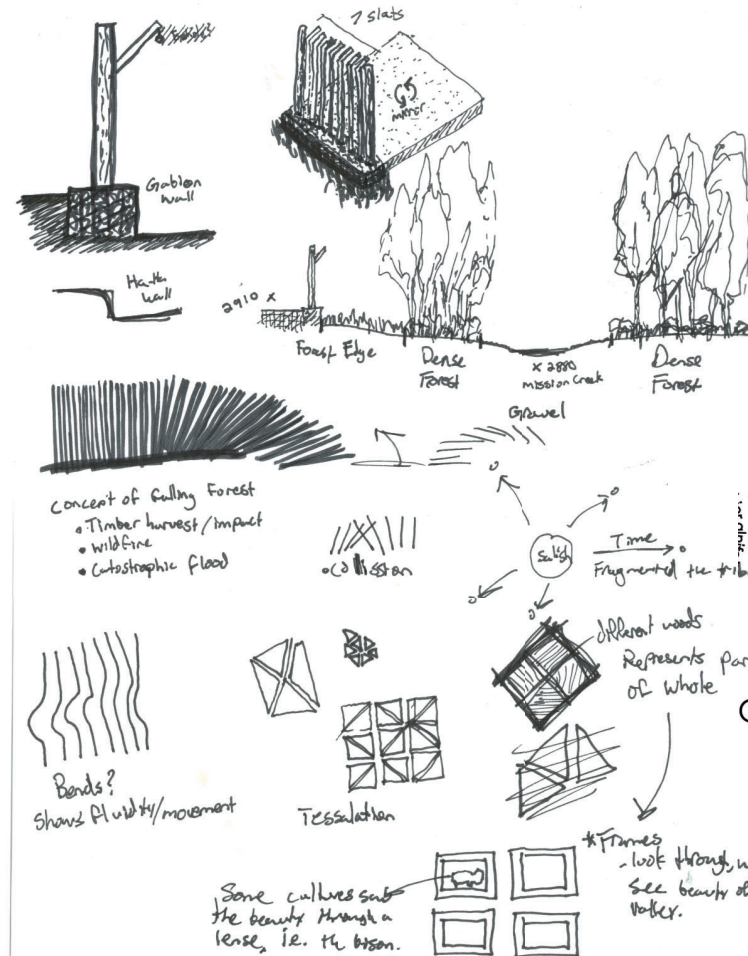
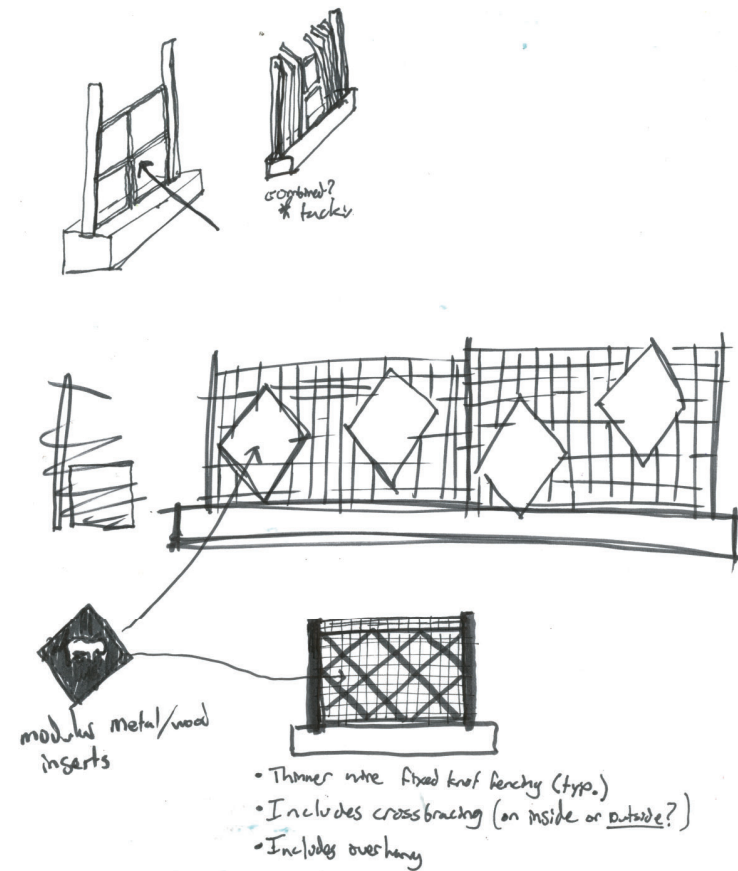
Communal Fire Rings



Wildlife Fencing

Design Detailing

- 13,000 Linal Feet
- Plus 900 Linal Feet (modified for overpass bridge)



8x8" Rough-cut Timber Post (typ.)
 2x4" Rough-cut Timber Overhang (typ.)
 Corten Steel Bracket Assembly (typ.)

8'0" Fence Height

(x3) 20 Gauge Galvanized Wire

3'0"



Straw Seed Mat (Native Prairie Mix)
 Gabion Wall (typ.)

Height Varies 6" - 2'0"

3'0"

Disturbed Soil

Compacted Aggregate (typ.)

Native Soil



Fence meets
Bridge

Lowered platform

Rotational

Street Level
Platform

Concrete Slab

Lowered

bank

Robbed Creek
Zook

Migratory Waterfowl



Ungulates Prefer Denser Habitat
in the Winter



Waterfowl Layover



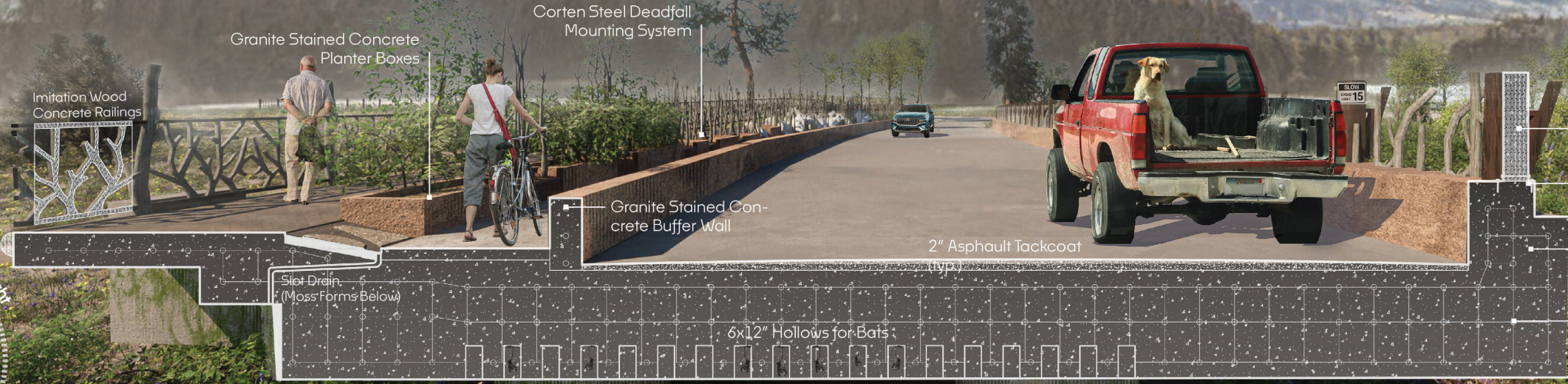
Returning River Otters



Overpass Bridge [502]

Scale: 3/8" = 1'0"

△ National Bison Range
-14 Miles



- 8x8" Rough-cut Timber Post (typ.)
- Wood-Concrete Bracket Assembly (typ.)
- Formed Concrete Structure
- #4 Rebar Reinforcement

Undulates Such as Pronghorn Move in The Daylight

Cougars & Bobcats Move in The Shadows and at Night

Betula papyrifera
B&B Paper Birch



Recycled Detritus

Disturbed Soil (Cut)

Seismic Resistant Bridge Footing (Depth Varies)

River Rock Stormwater Collection Channel

Seismic Resistant Bridge Footing (Depth Varies)

6" Tree Support Stake (typ.)

Recycled Detritus

Tree Planting Soil (typ.)

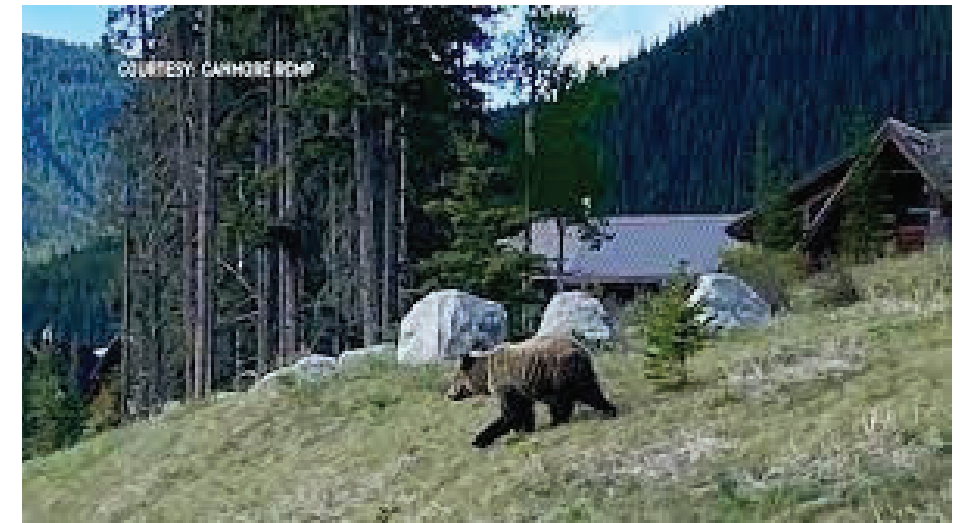
502

Wildlife Monitored Trail

Site Design



Smith Creek Wildlife Corridor Canmore, Alberta



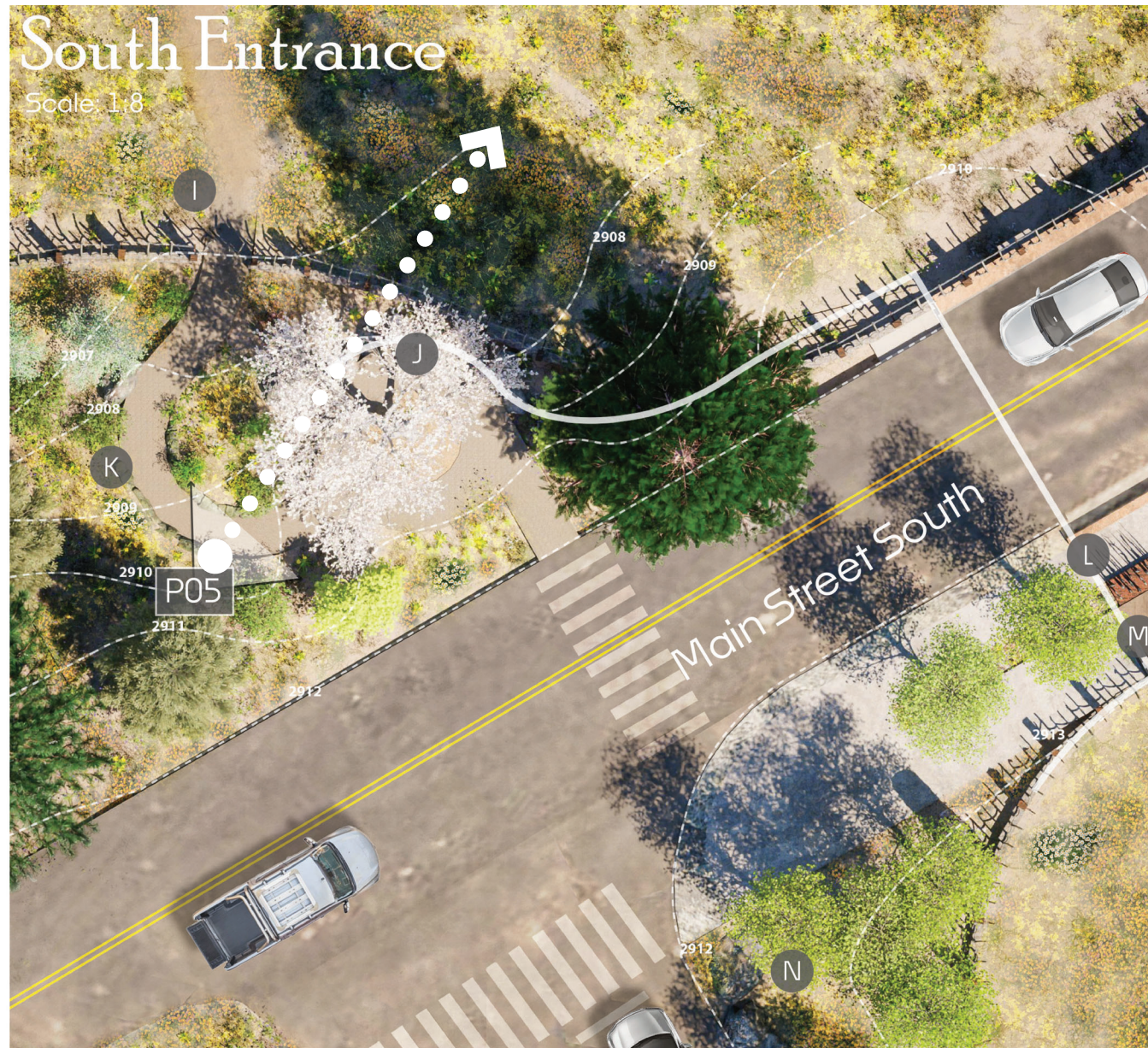
Overpass Bridge Trailhead

Site Design




South Entrance Trailhead

Site Design



Site Plan Key South Entrance

- I Trailhead Gate
 - J Boulder Retaining Wall (2-6' H)
 - K ADA Ramp
 - L Start of 5' Sidewalk (typ.)
 - M Start of 8' Cantelever Path
 - N Aspen Grove (*Populus tremula*)
-  P00 Perspective Callouts



Apple Tree (Malus) - Important Agricultural Crop

Saskatoon Serviceberry (Amelanchier alnifolia)

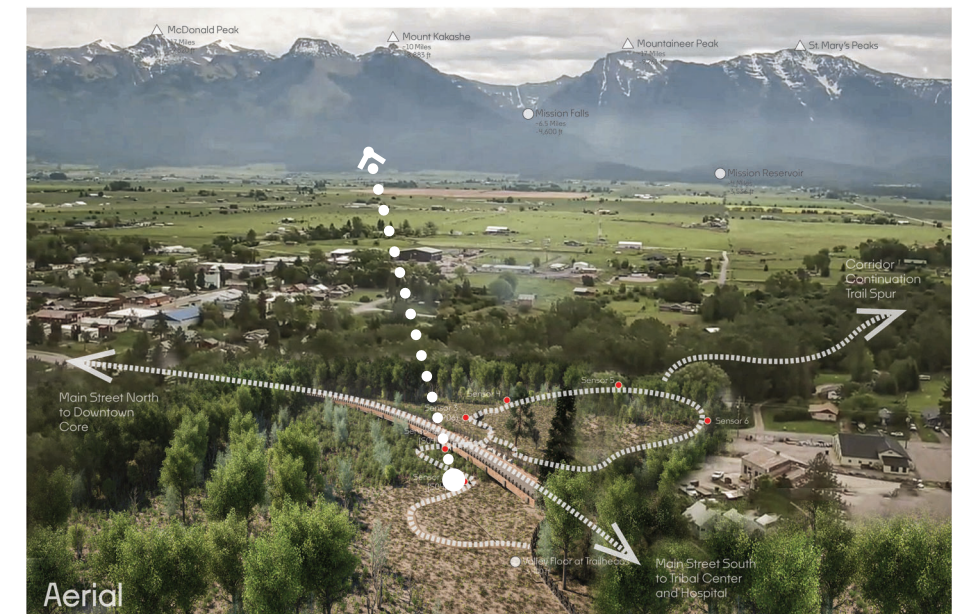
Trail Monitoring

Arrowleaf Balsamroot (Balsamorhiza sagittata)

Camas (Camassia quamash) - Culturally Significant

Trail Experience & Soil Remediation

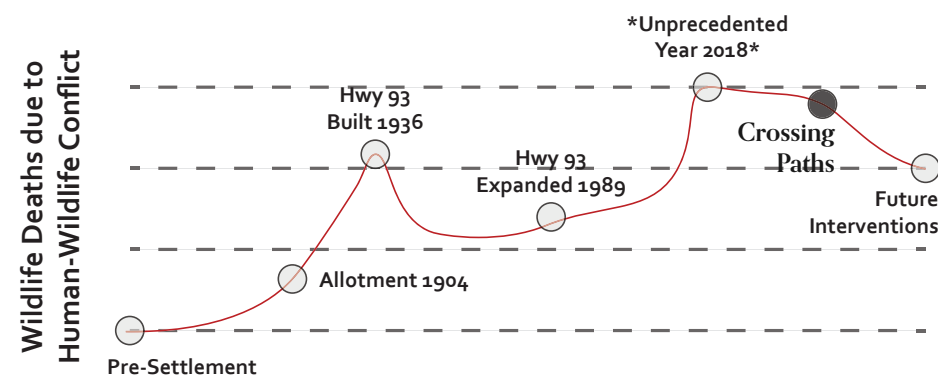
Site Design



Determining Project Success

Objective 1: Reduce Instances of Human-Wildlife Conflict.

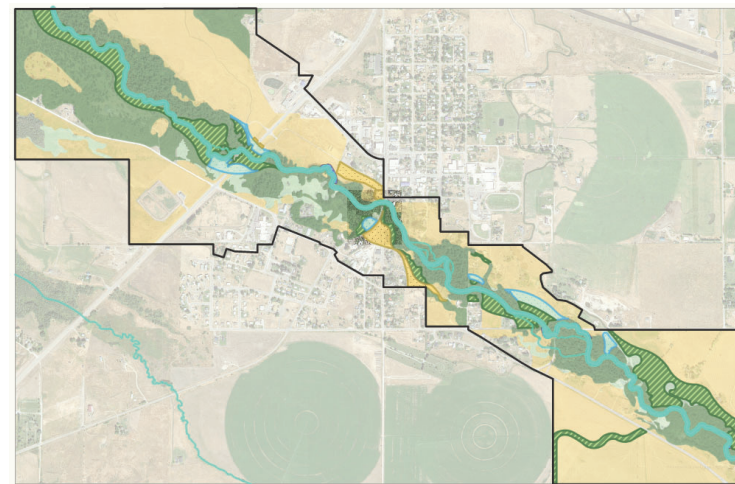
Reverse the trend.



Objective 2: Improve the Ecological Health of the Mission Creek Riparian Corridor.

Within the approximately 1,400 acre masterplan study area:

- **178 (13%)** acres of riparian corridor reclaimed
- **35 (2.5%)** acres of contaminated land remediated
- **29%** increase in forested corridor
- **34%** increase in wetland pothole prairie
- **3%** increase in dry prairie



Objective 3: Create Opportunities for the Community to Experience the Native Landscape.

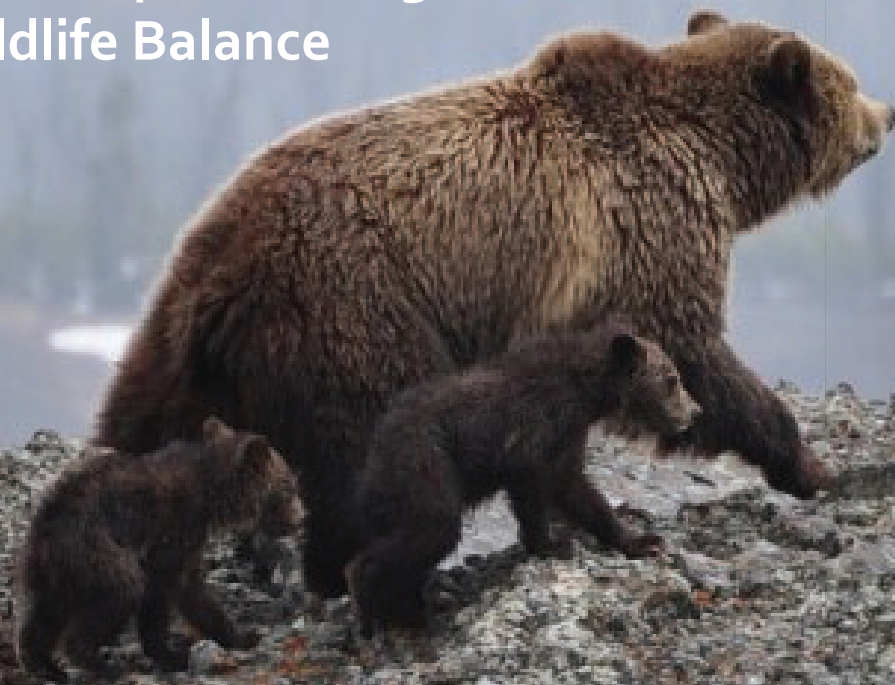
Increases in Recreational Opportunities:

- **10%** increase in programmable public space
- **.5** mile wildlife monitored nature trail
- **3.75** mile trail spur connecting to the Mission Reservoir and 45 miles of wilderness trails



Crossing Paths

Landscape Planning for Human-Wildlife Balance



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Spring 2023