



FLOODING IN THE ELK VALLEY RISKS AND MITIGATION MEASURES

AN ELK RIVER ALLIANCE PRESENTATION

The background of the image is a light beige, crumpled paper texture. Overlaid on this are several thin, faint red lines that form a grid-like pattern, though the lines are not perfectly straight and are somewhat obscured by the paper's creases.

HISTORY OF ELK VALLEY FLOODING

HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916

1948

1954

1974

1995

2013

2013



HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916

1948

1954

1974

1995

2013

2013

GLACIAL LAKE ELK



HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916

1948

1954

1974

1995

2013

2013



Photo of fish trap taken near Tobacco Plains Band Reserve

HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916, June 19

1948, May 25

1954, May 20

1974, January 13

1995

2013

2021



HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916

1948

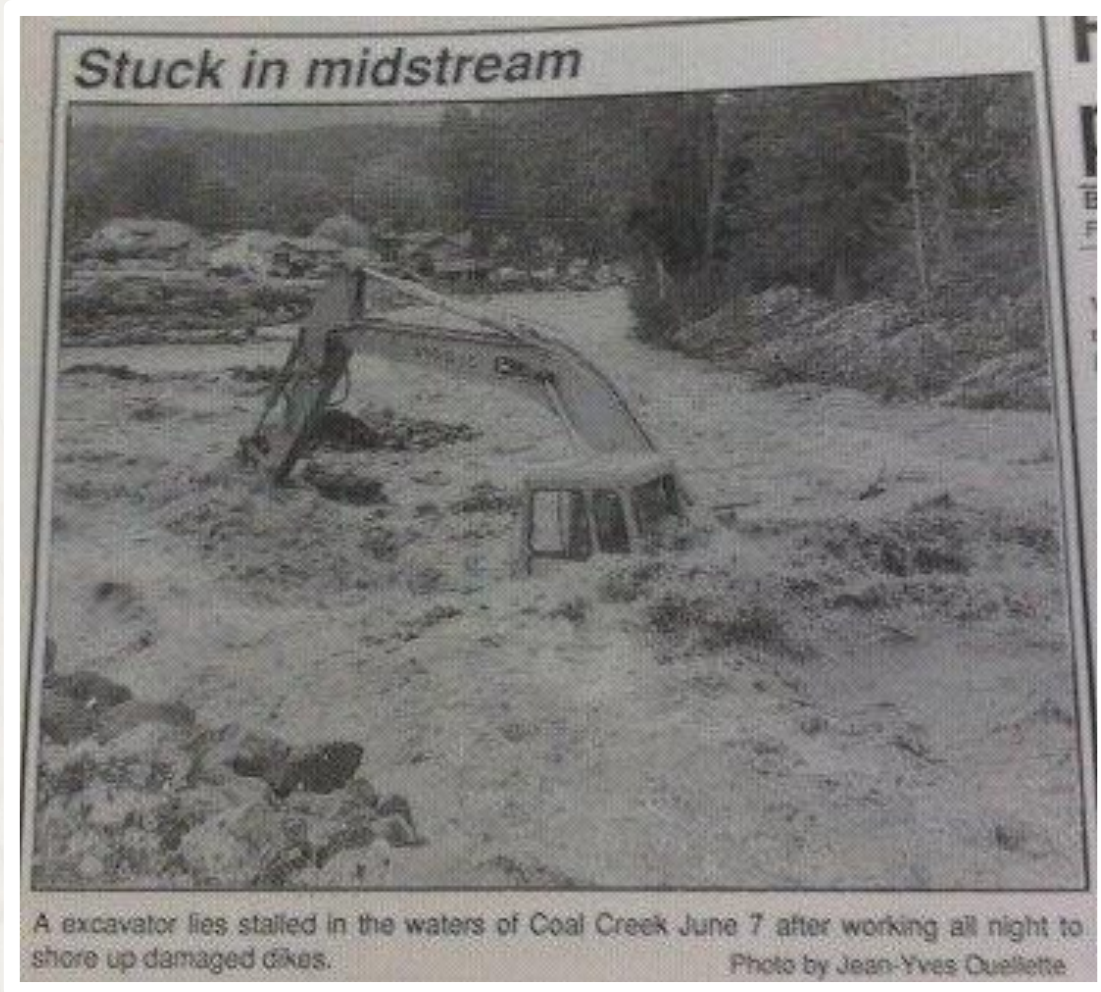
1954

1974

1995, June 7

2013

2021



HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916

1948

1954

1974

1995

2013, June 21

2021



HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916

1948

1954

1974

1995

2013

2021, Nov 17



HISTORY OF ELK VALLEY FLOODING

Geological history

Ktunaxa history

1916

1948

1954

1974

1995

2013

2021, Nov 17



WHAT CAUSES FLOODING?

WHAT CAUSES FLOODING?

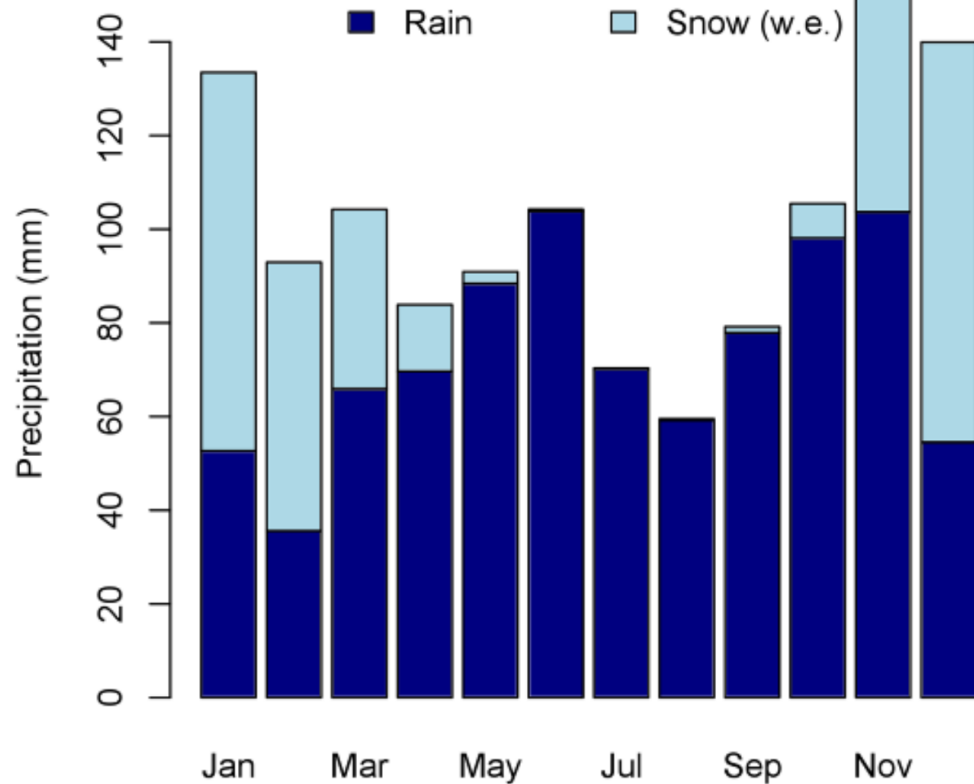


WHAT CAUSES FLOODING?

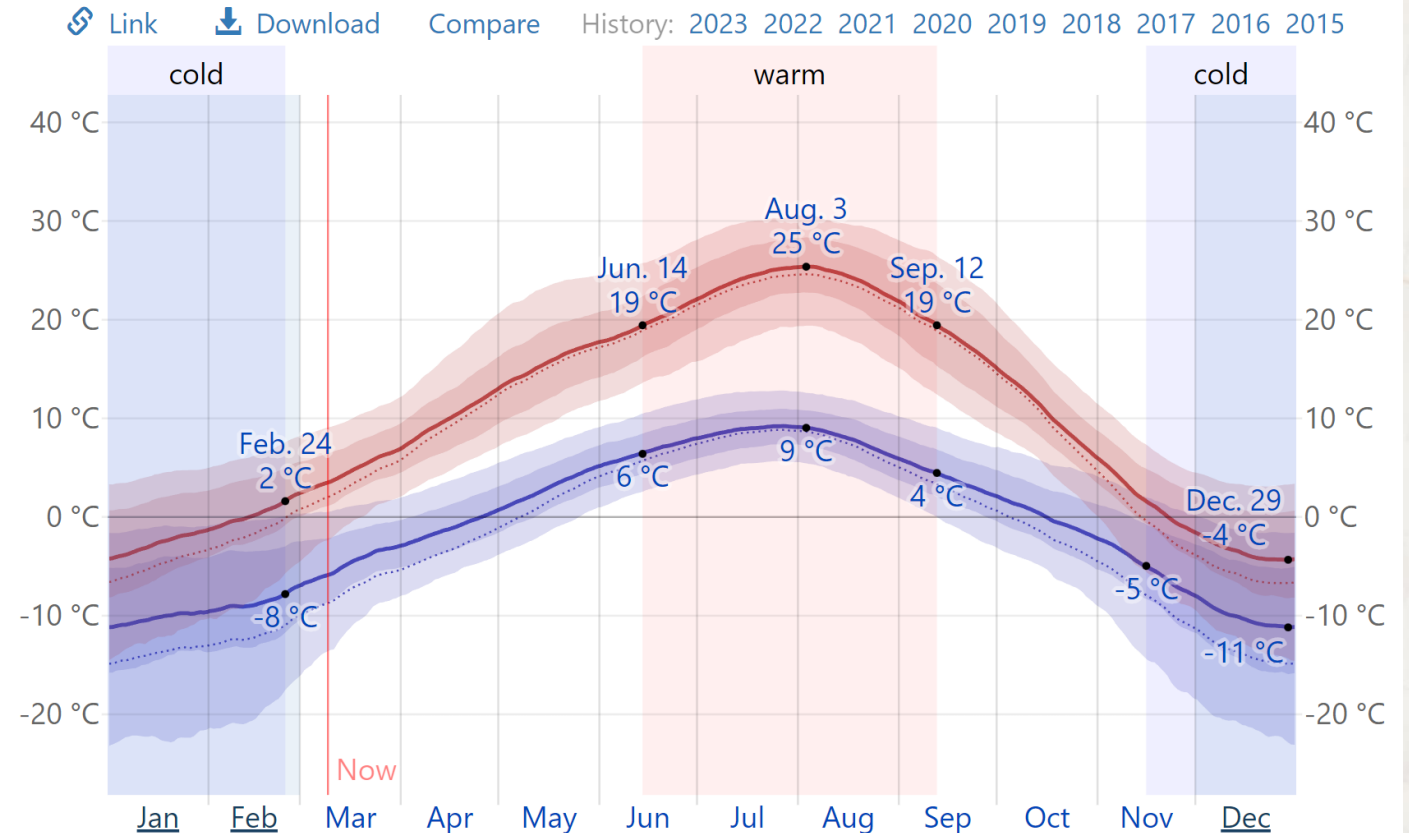
PRECIPITATION AND SNOWMELT

Fernie AWS

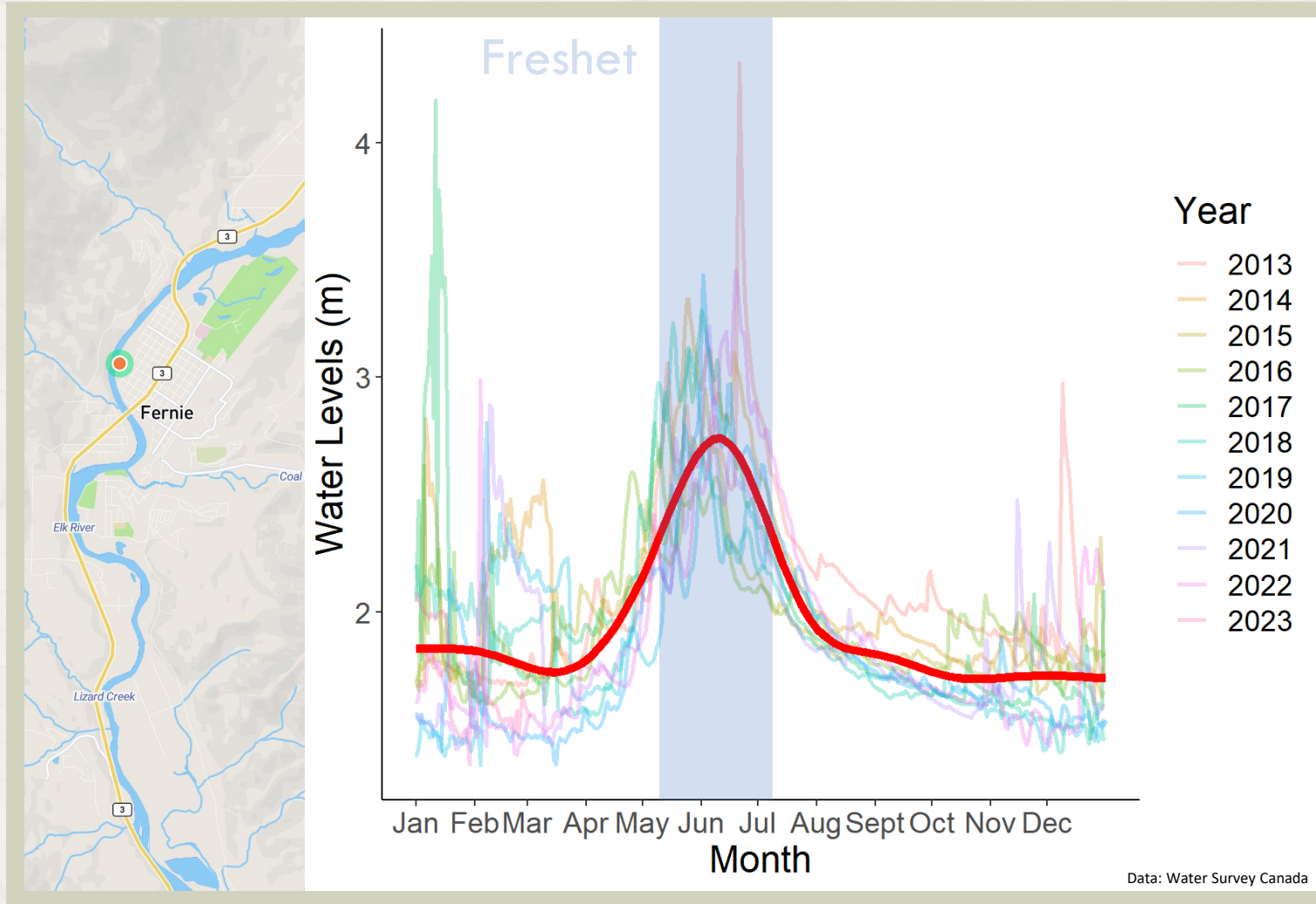
1970 - 2014



Average High and Low Temperature in Fernie



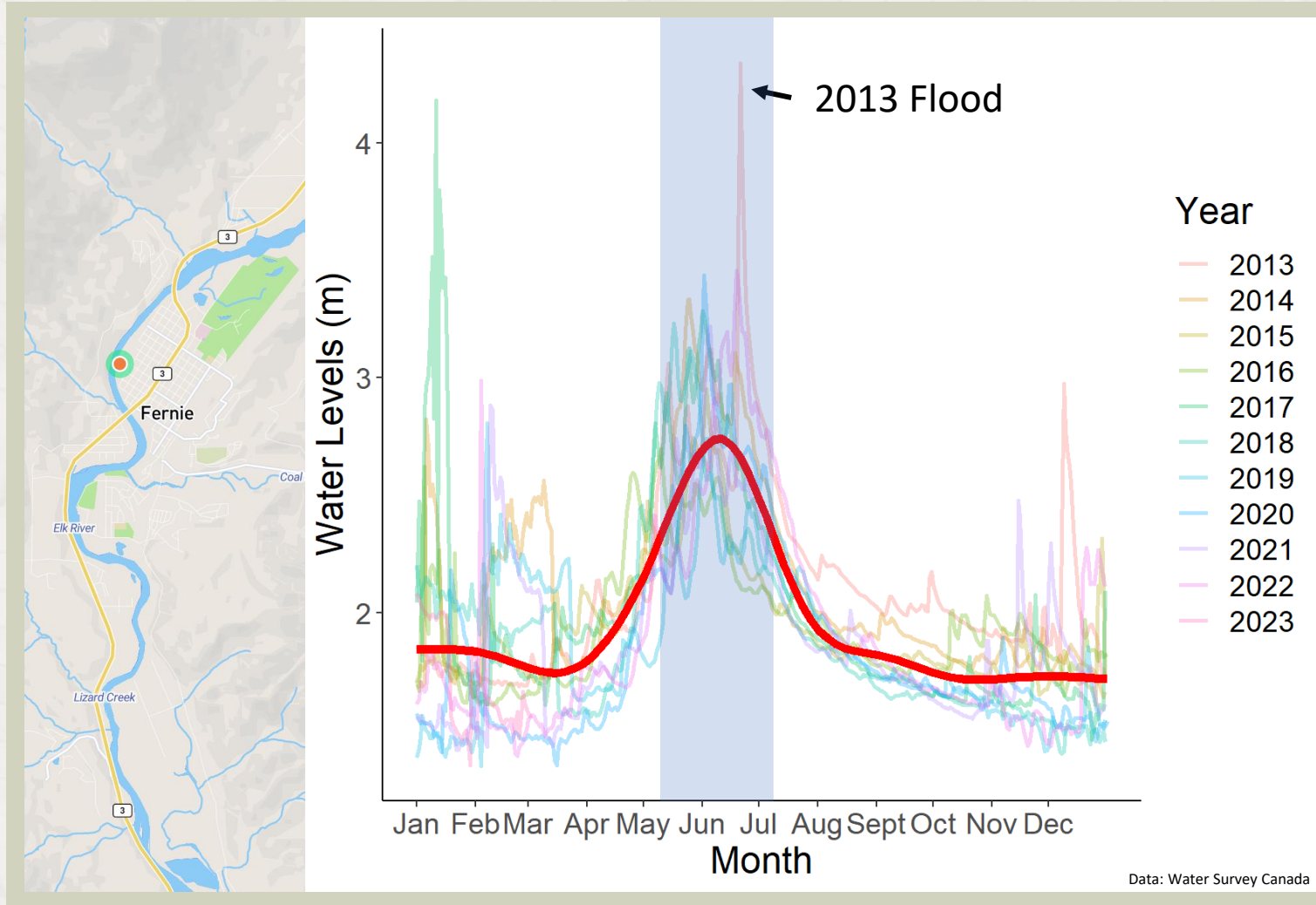
WHAT CAUSES FLOODING?



Most floods happen during 'freshet'



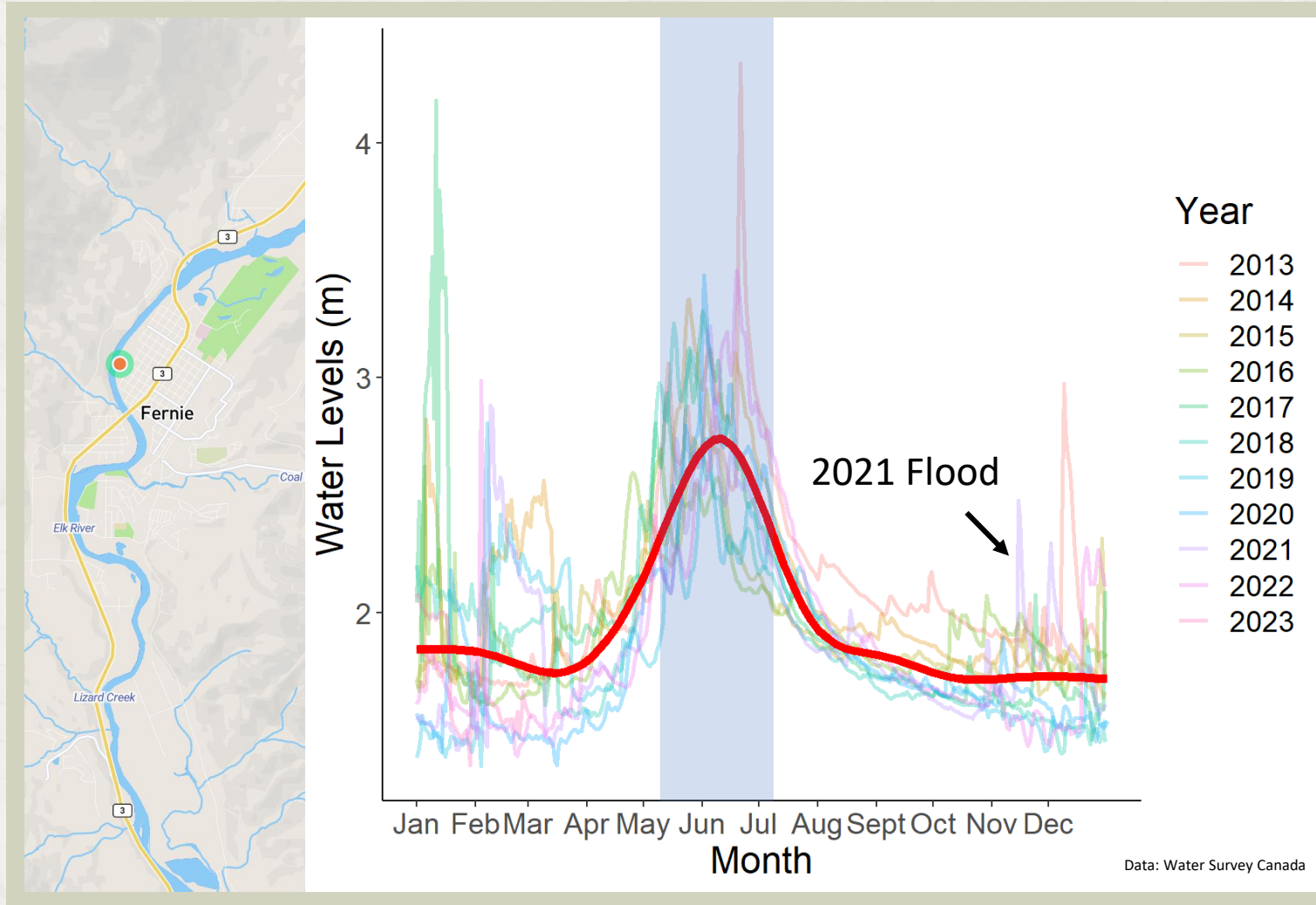
WHAT CAUSES FLOODING?



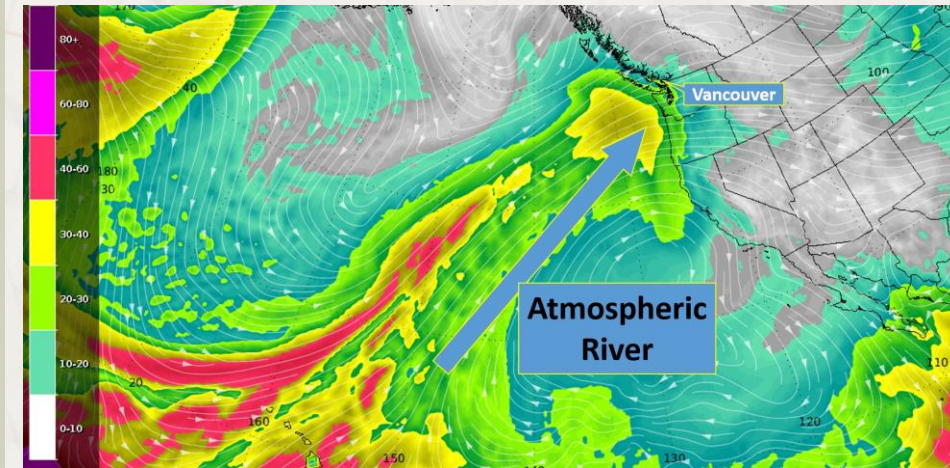
2013 flood was a combination of snow melt and high precipitation



WHAT CAUSES FLOODING?



Atmospheric Rivers



Long bands of water vapour, that can cause mass precipitation when they make landfall

The background of the image is a light beige, crumpled paper texture. Overlaid on this are several thin, faint red lines that form a grid-like pattern, though they are not perfectly straight and appear to be part of a larger, partially visible diagram or map.

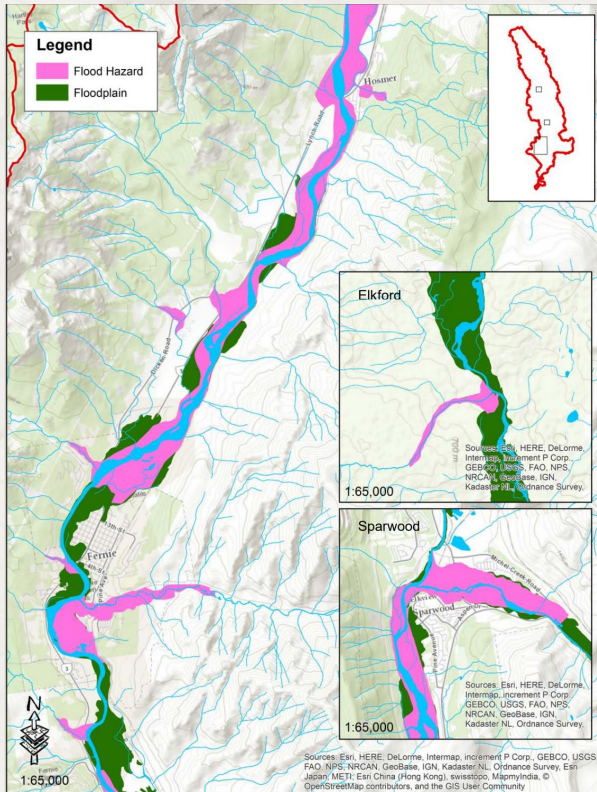
HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

FLOOD DAMAGE= WATER AMOUNT x WATER SPEED

HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

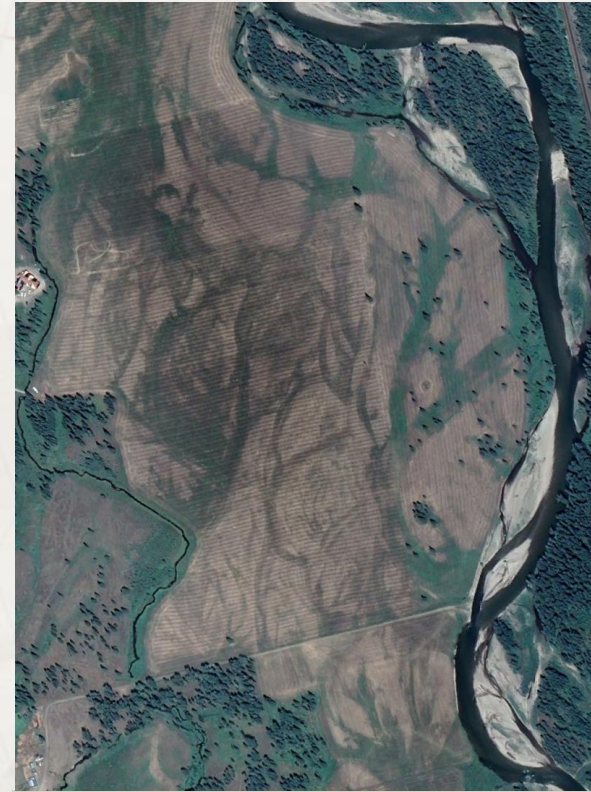
FLOOD DAMAGE= WATER AMOUNT x WATER SPEED



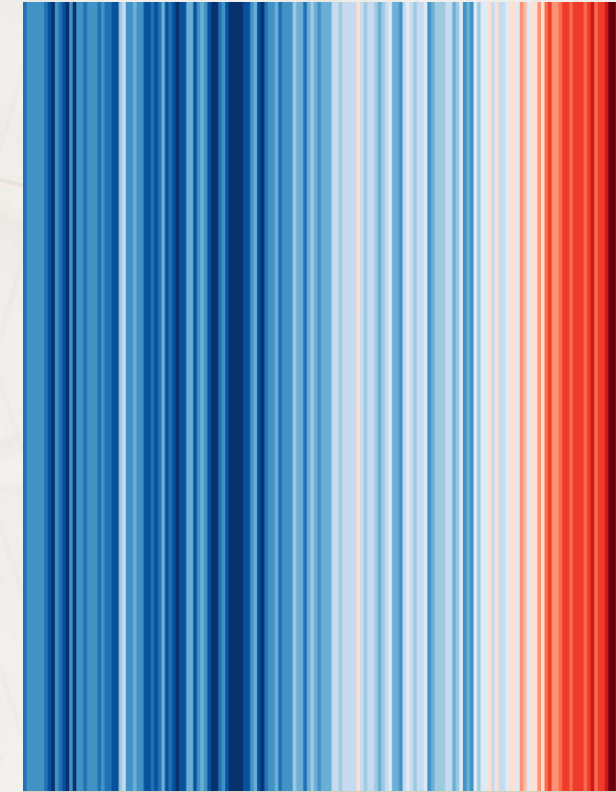
BUILDING ON A FLOODPLAIN



STREAM CHANELLISATION



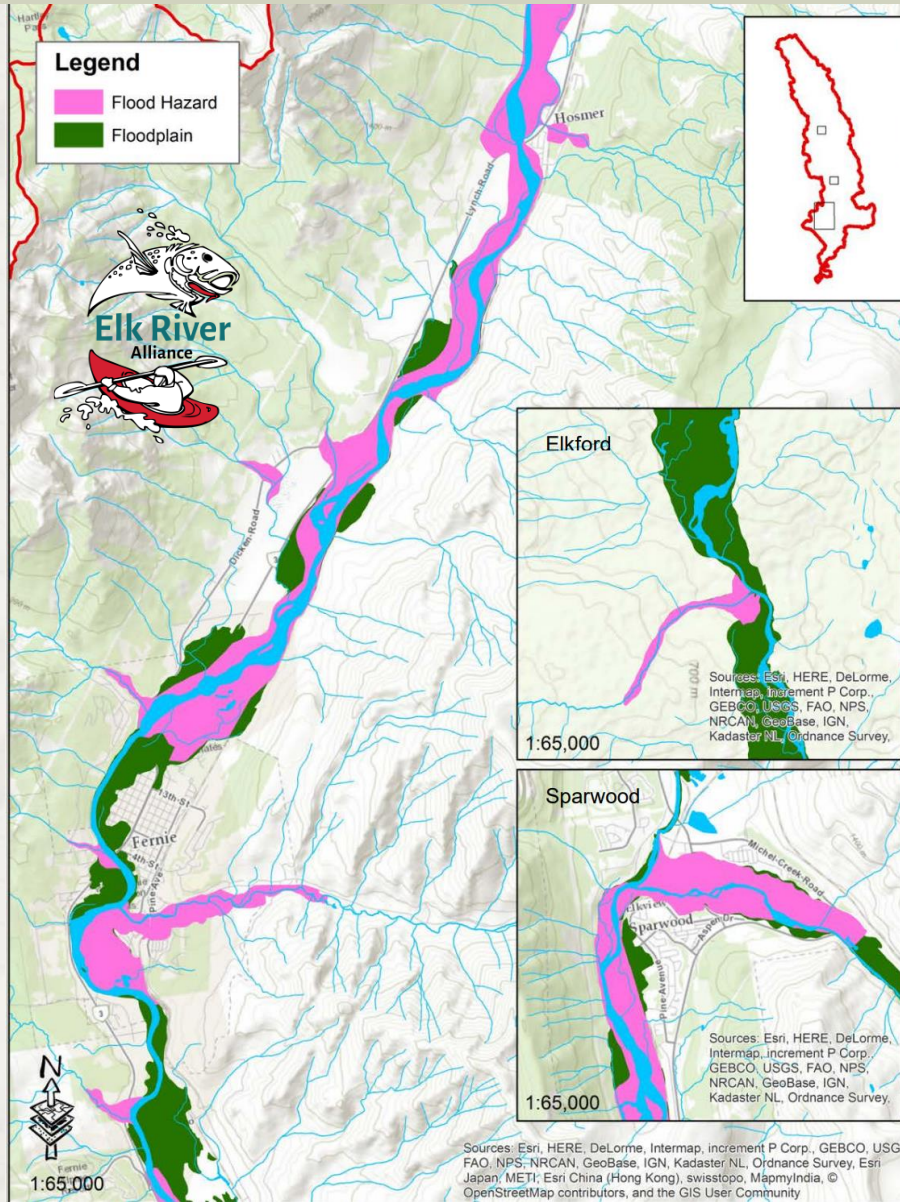
VEGETATION REMOVAL



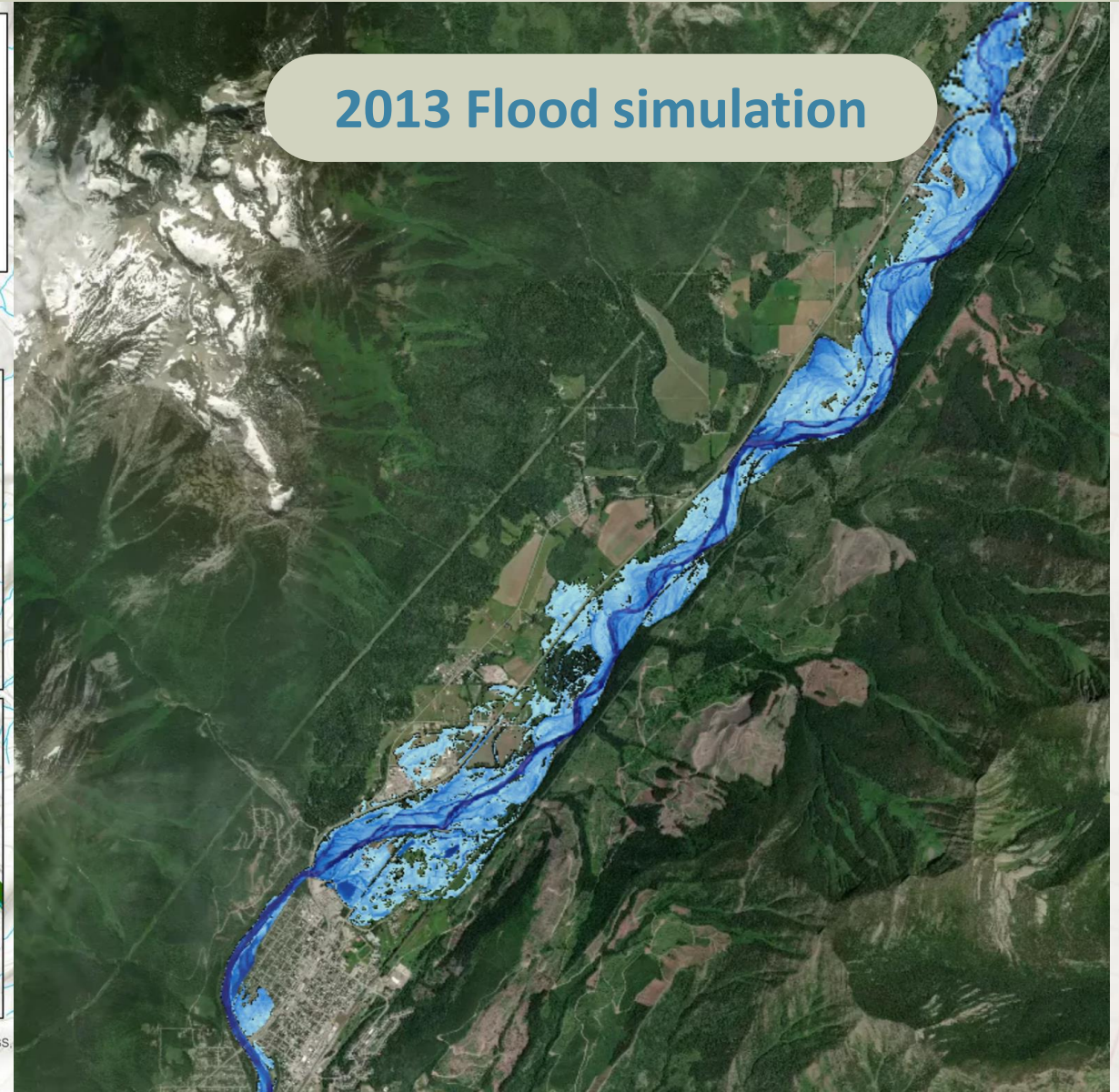
CLIMATE CHANGE

HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

BUILDING ON A FLOODPLAIN

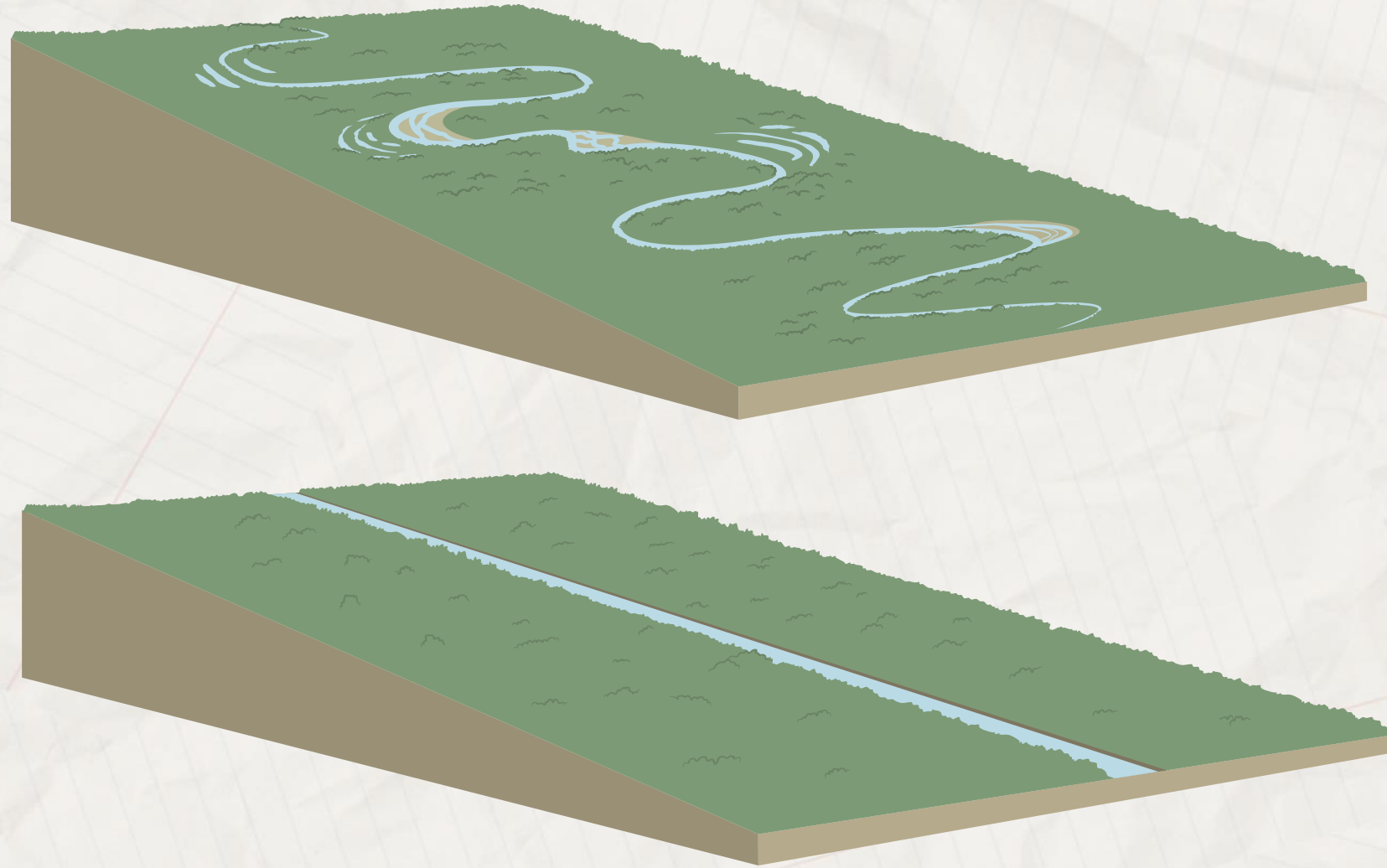


2013 Flood simulation



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Stream Channelisation



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Stream Channelisation



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Stream Channelisation



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Stream Channelisation



Okanagan River, Osoyoos

HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

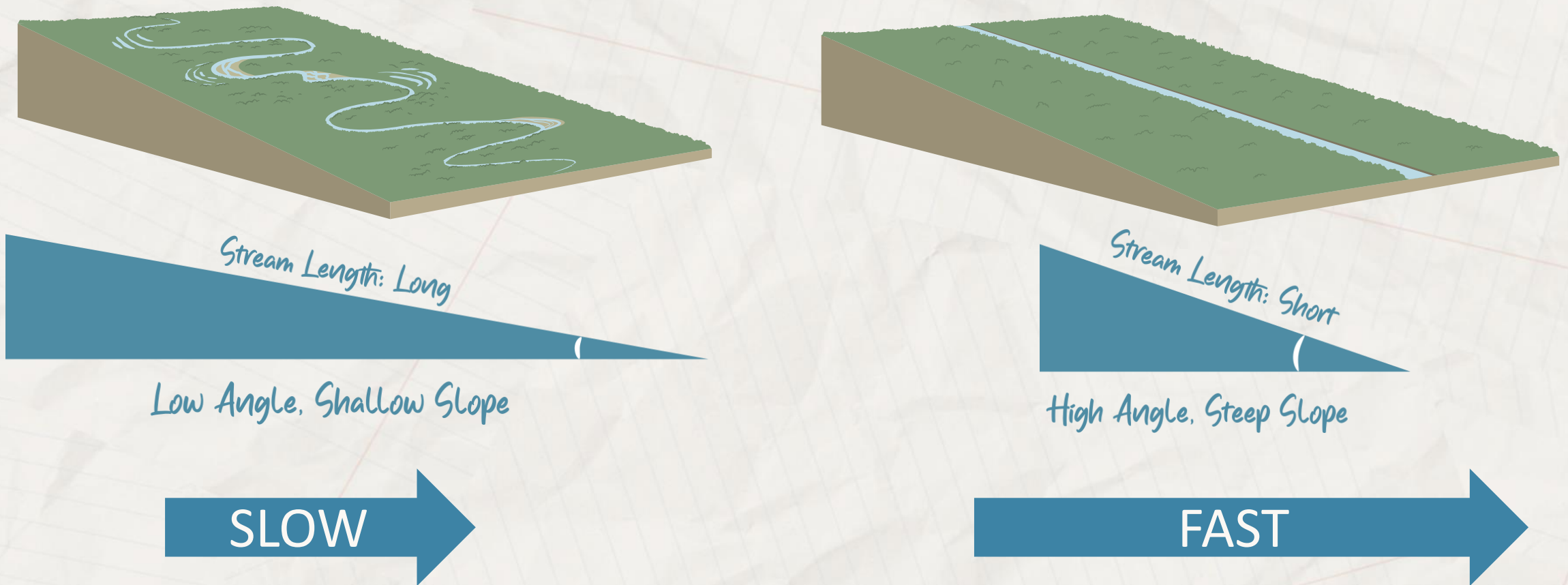
Stream Channelisation



Okanagan River, Osoyoos

HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Stream Channelisation



Channelization decreases habitat diversity and increases flood impacts downstream.

HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Stream Channelisation



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Vegetation Removal



Roots hold soil
and prevent
erosion

Tree trunks and
shrubs slow down
floodwaters



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

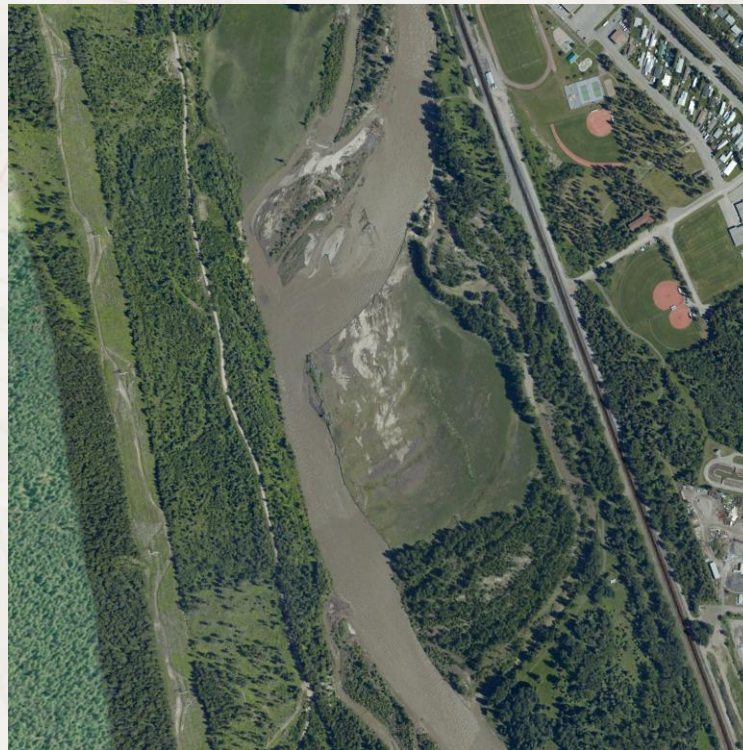
Vegetation Removal

2004



Before Flood

2013



A few days after flood

2021



A few years after flood

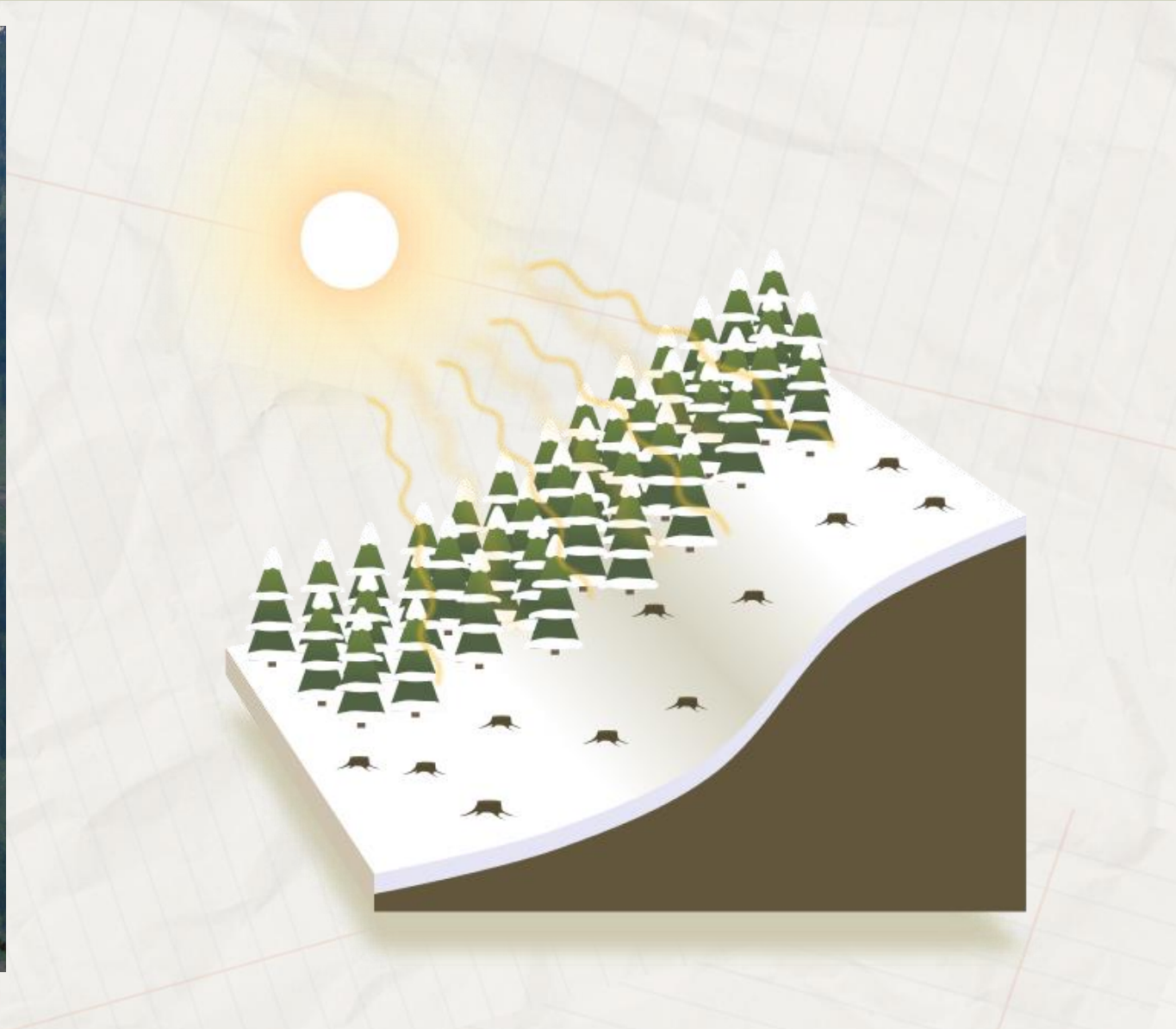
HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Vegetation Removal



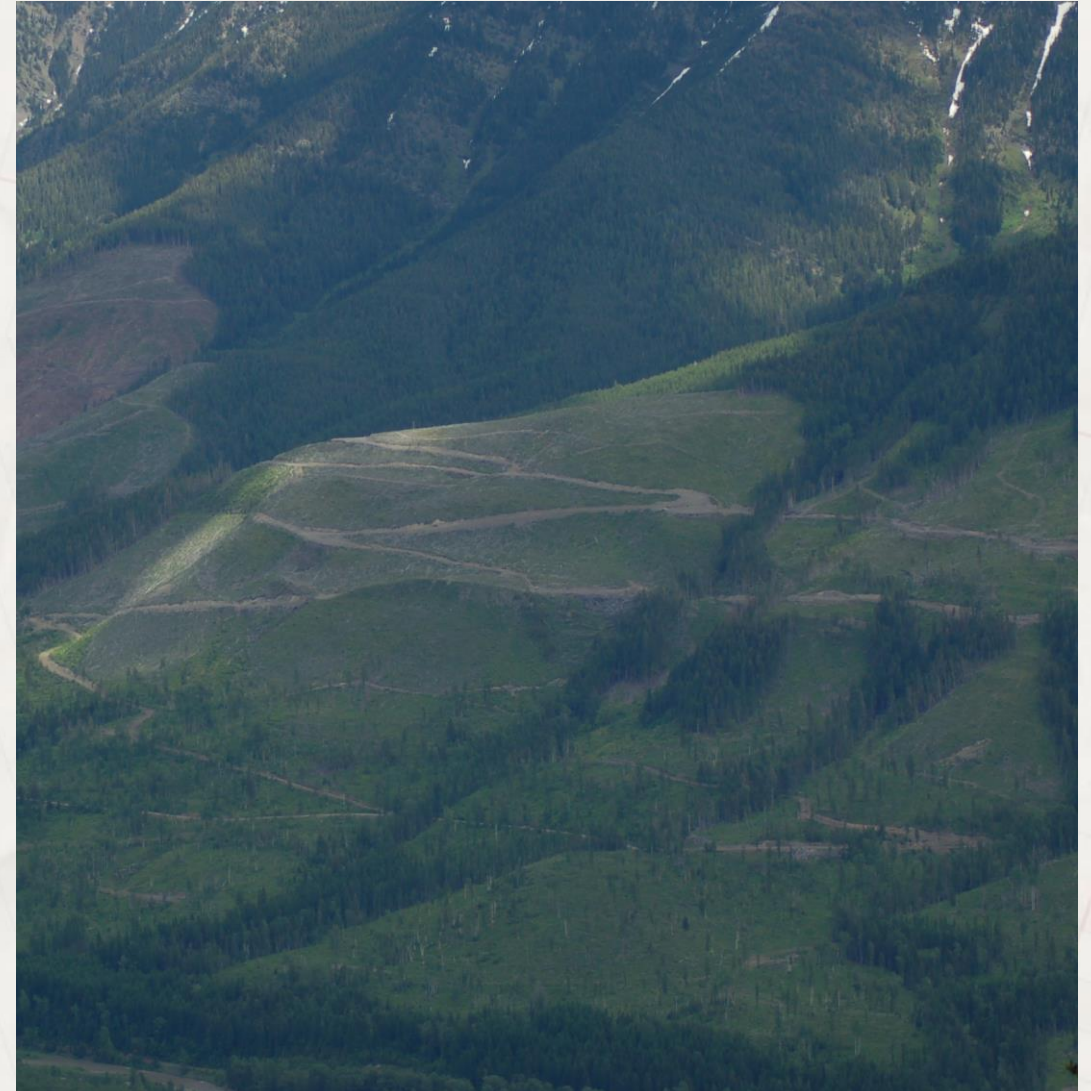
HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Vegetation Removal



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Vegetation Removal



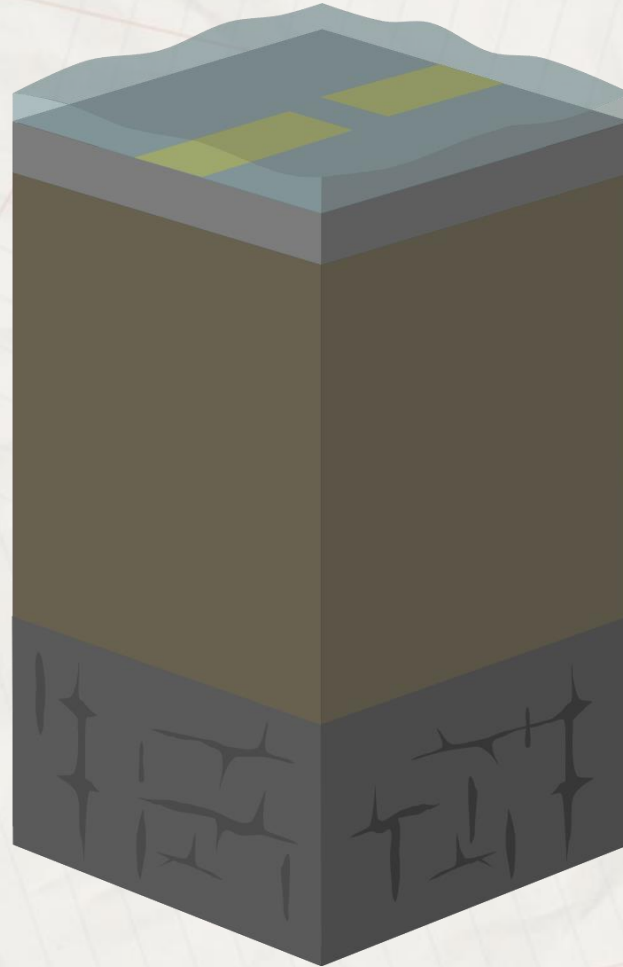
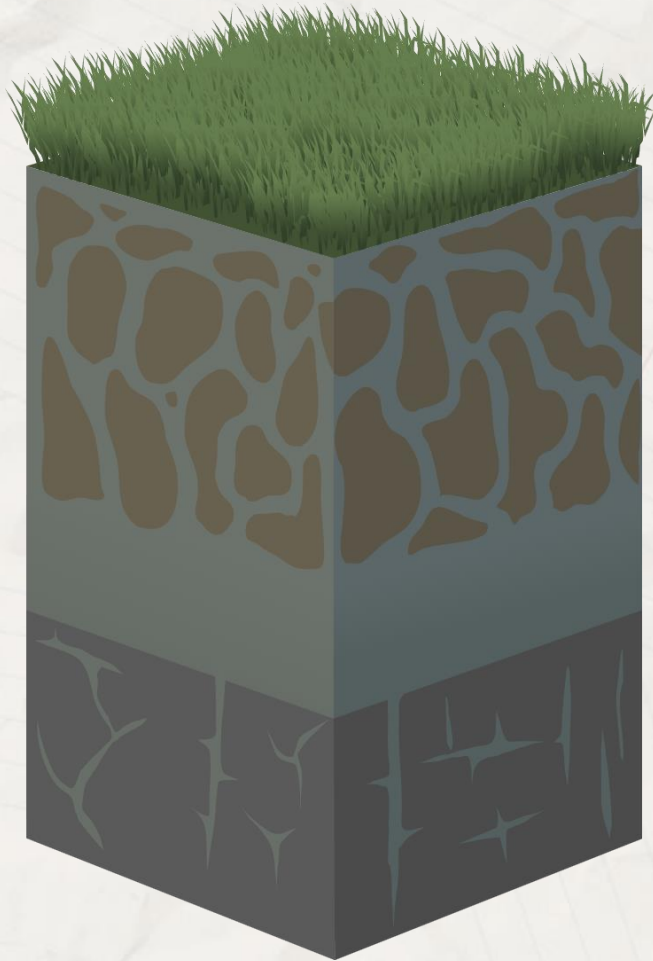
HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Vegetation Removal

Soil Permeability

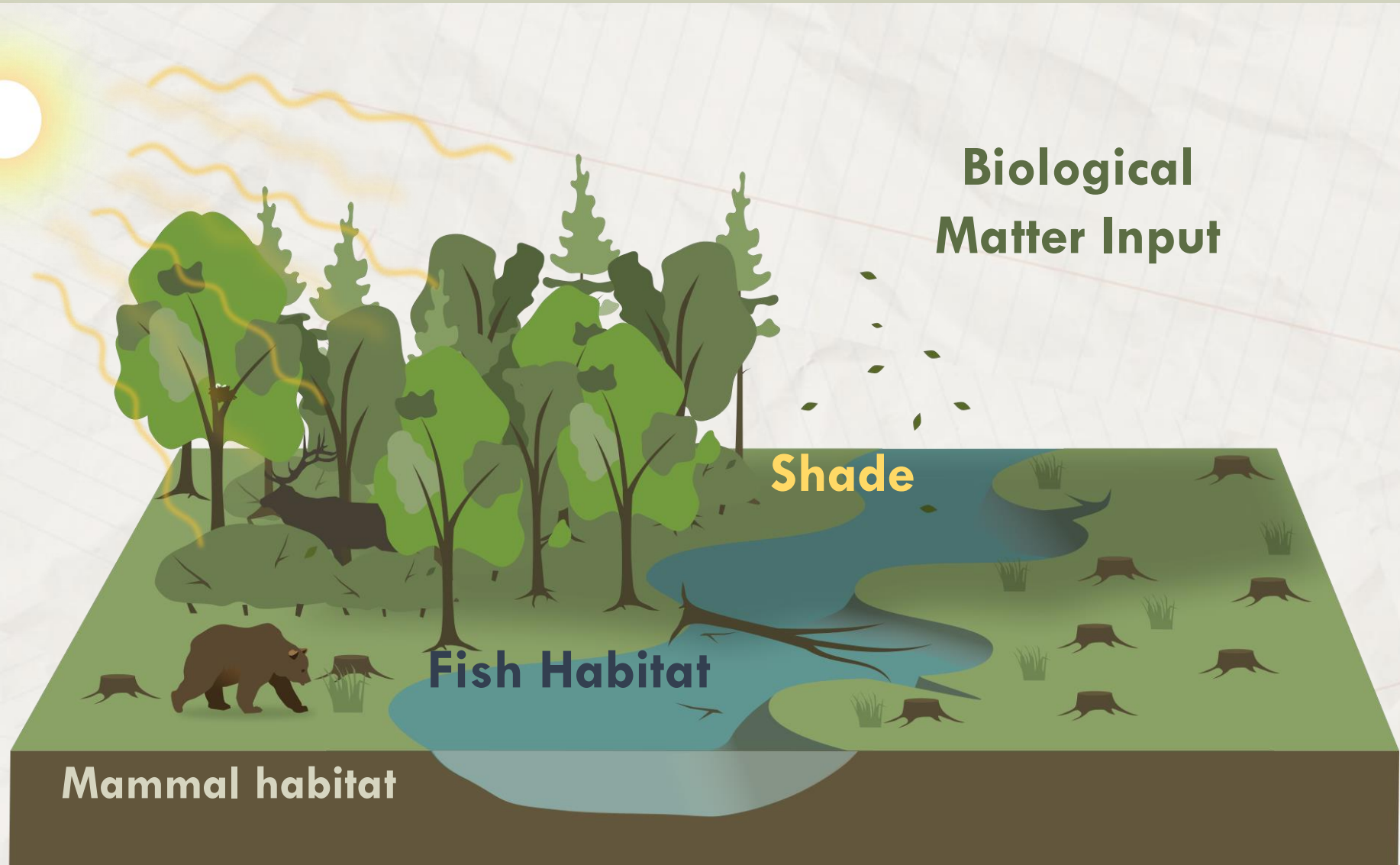
Permeable soil absorbs water, decreasing flood intensity

Non permeable surfaces, such as paved areas, don't absorb water and lead to higher flood levels



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Vegetation Removal



HOW DOES HUMAN ACTIVITY AFFECT FLOOD DAMAGE?

Climate Change



More extreme precipitation

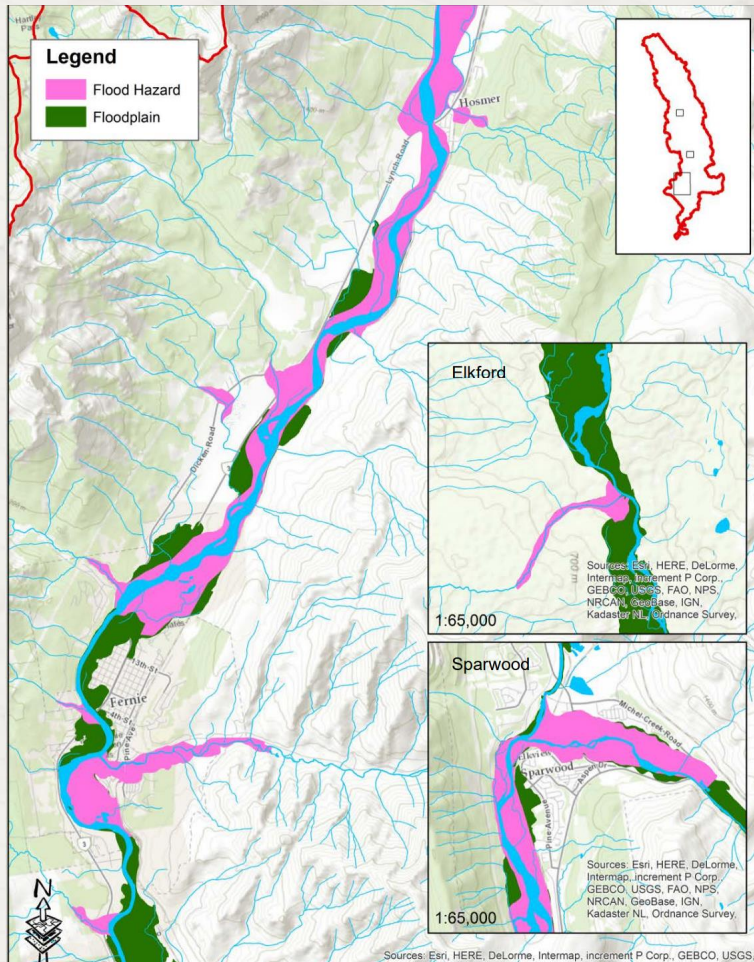


Faster Snowmelt



MITIGATING FLOOD DAMAGE

MITIGATING FLOOD DAMAGE



PLANNING



FLOOD PROTECTION STRUCTURES

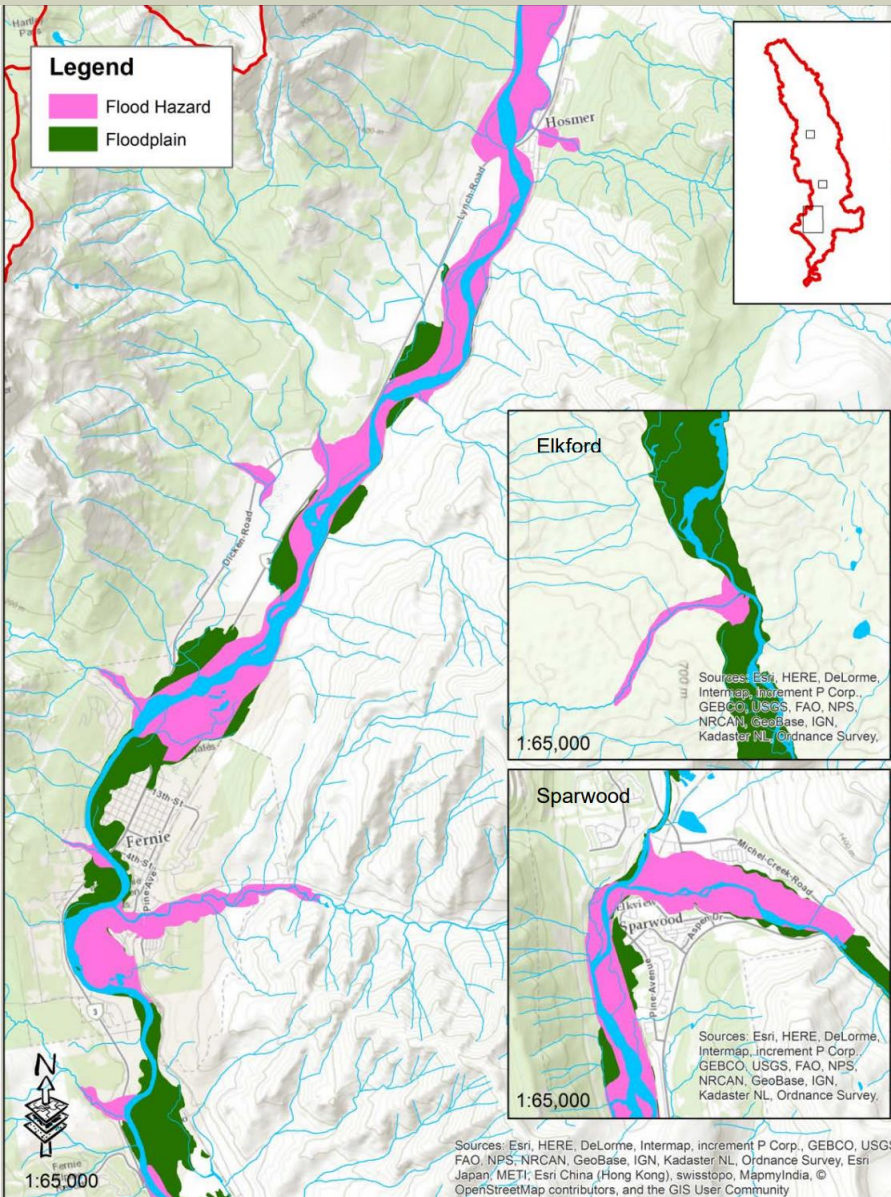


UPSTREAM FLOOD SEQUESTRATION

MITIGATING FLOOD DAMAGE

PLANNING

Don't build on a flood plain



MITIGATING FLOOD DAMAGE

FLOOD PROTECTION STRUCTURES

Dikes: raised banks to prevent overflow from river



Pros

- Effective protection of property
- Rapid construction

Cons

- Expensive
- Degraded animal habitat
- Channelizes stream
- Results in more intense downstream flooding

MITIGATING FLOOD DAMAGE

FLOOD PROTECTION STRUCTURES

Rip rap: river banks reinforced with boulders, or synthetic material



Pros

- Effective bank stabilization
- Rapid construction

Cons

- Expensive
- Highly degraded habitat
- Channelizes stream
- Results in more intense downstream flooding

MITIGATING FLOOD DAMAGE

FLOOD PROTECTION STRUCTURES

Vegetated rip rap: rip rap interspersed with plants



Pros

- Effective property protection
- Slowing of flood waters
- Some recovery of habitat values

Cons

- More labour intensive than rip rap
- Channelizes stream

MITIGATING FLOOD DAMAGE

FLOOD PROTECTION STRUCTURES

Flood retention ponds



Pros

- Cleans Stormwater
- Pretty
- Provides animal habitat

Cons

- Limited flood protection
- Takes up space

MITIGATING FLOOD DAMAGE

UPSTREAM FLOOD SEQUESTRATION

Riparian area revegetation



SKC Farm, Morrissey Meadows NCC Conservation Area



Pros

- Provides aquatic and terrestrial habitat
- Relatively cheap
- Longterm
- Decreases downstream impacts
- Property protection

Cons

- Takes time
- Not a good flood solution for urban centers

The background of the image is a light beige, crumpled paper texture. Overlaid on this are several thin, faint red lines that form a grid-like pattern, with some lines intersecting at right angles. A solid dark blue horizontal band runs across the middle of the image, containing white text.

ERA COTTONWOOD SURVEY + RESTORATION PROJECT

ERA COTTONWOOD SURVEY + RESTORATION PROJECT

Black cottonwood
Populus trichocarpa



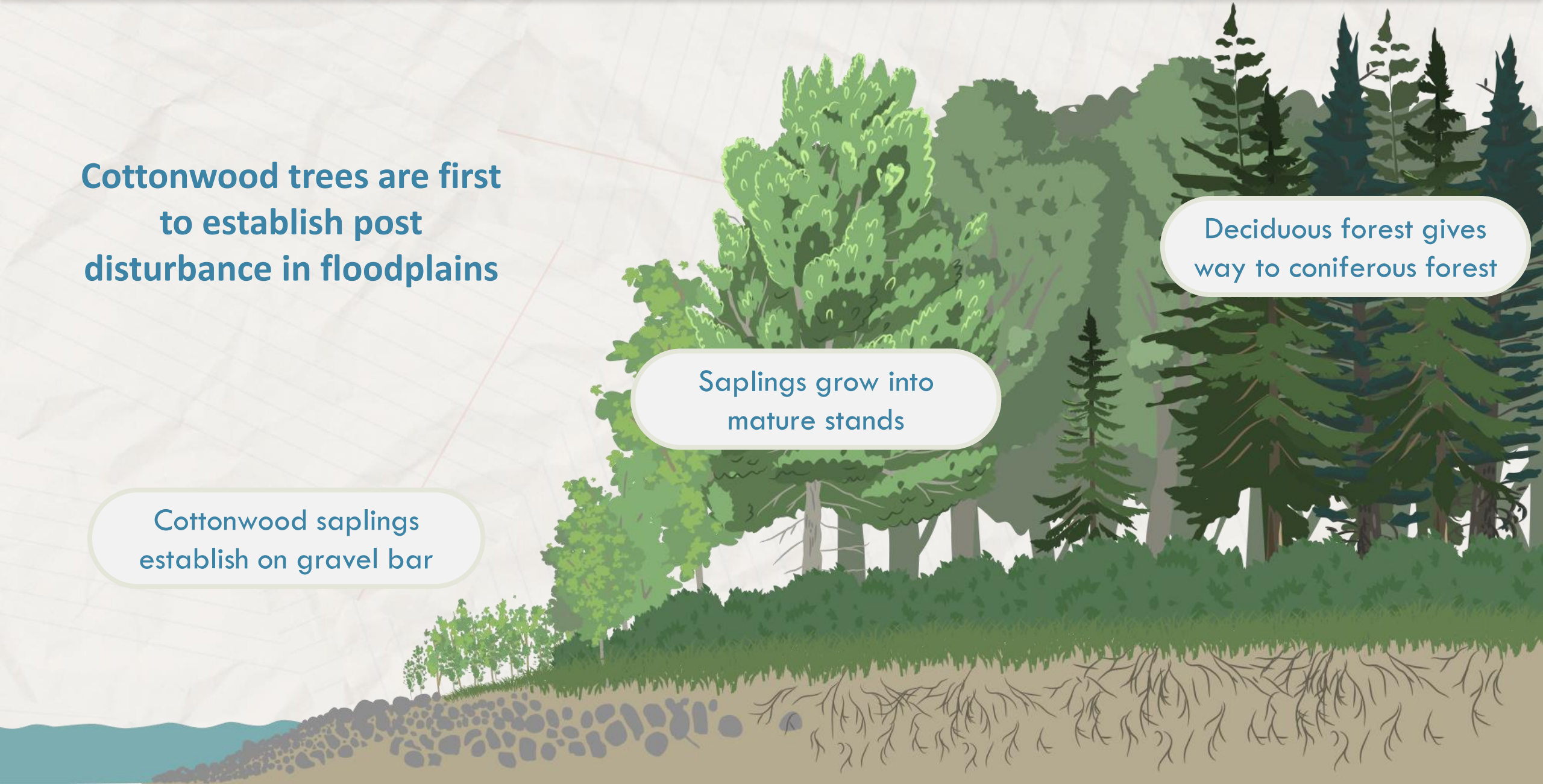
ERA COTTONWOOD SURVEY + RESTORATION PROJECT

Cottonwood trees are first to establish post disturbance in floodplains

Cottonwood saplings establish on gravel bar

Saplings grow into mature stands

Deciduous forest gives way to coniferous forest



ERA COTTONWOOD SURVEY + RESTORATION PROJECT



**Currently 10% of the
floodplain is cottonwood
dominated**

ERA COTTONWOOD SURVEY + RESTORATION PROJECT

PART 1 | COTTONWOOD SURVEY



1. Examine where most cottonwood loss happened
2. Determine where restoration is needed
3. Reach out to landowners about restoration potential
(76% of restoration potential properties are on private land)

PART 2 | COTTONWOOD RESTORATION



1. Planting cottonwood trees in restoration areas
2. Fencing off Elk exclusion zones to prevent grazing early on
3. Planting understory plants to enhance habitat

ERA COTTONWOOD SURVEY + RESTORATION PROJECT

BENEFITS

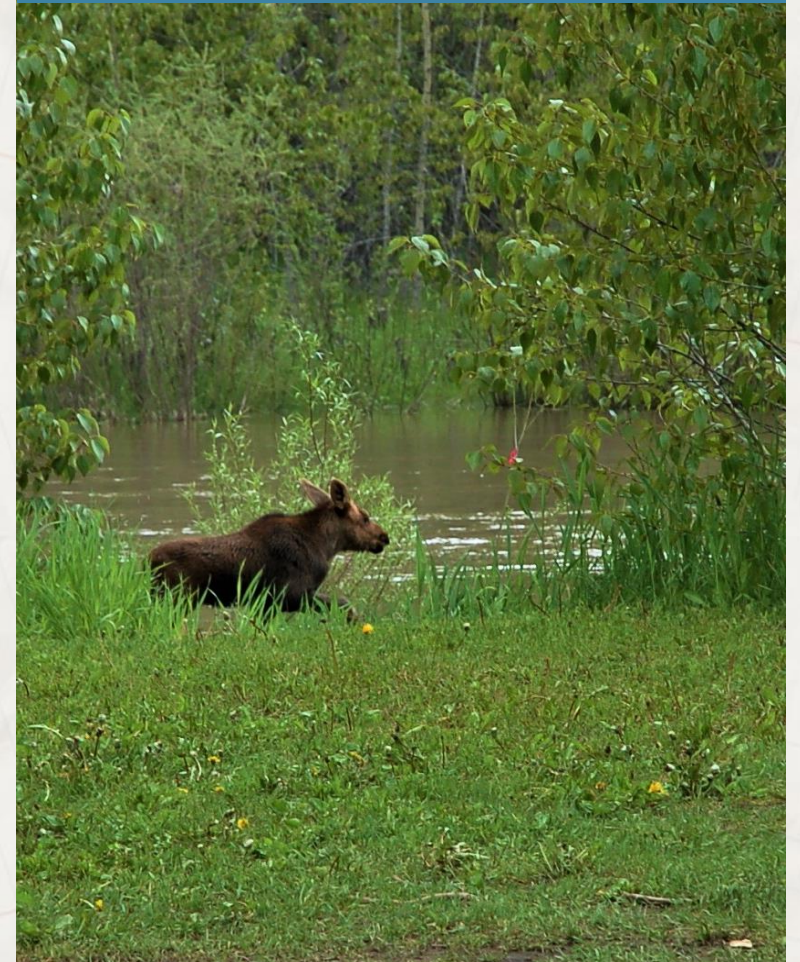
Flood Resilience



Aquatic habitat



Terrestrial Habitat



ERA COTTONWOOD SURVEY + RESTORATION PROJECT

VOLUNTEER!



THANKS FOR LISTENING!



PROJECT FUNDERS

