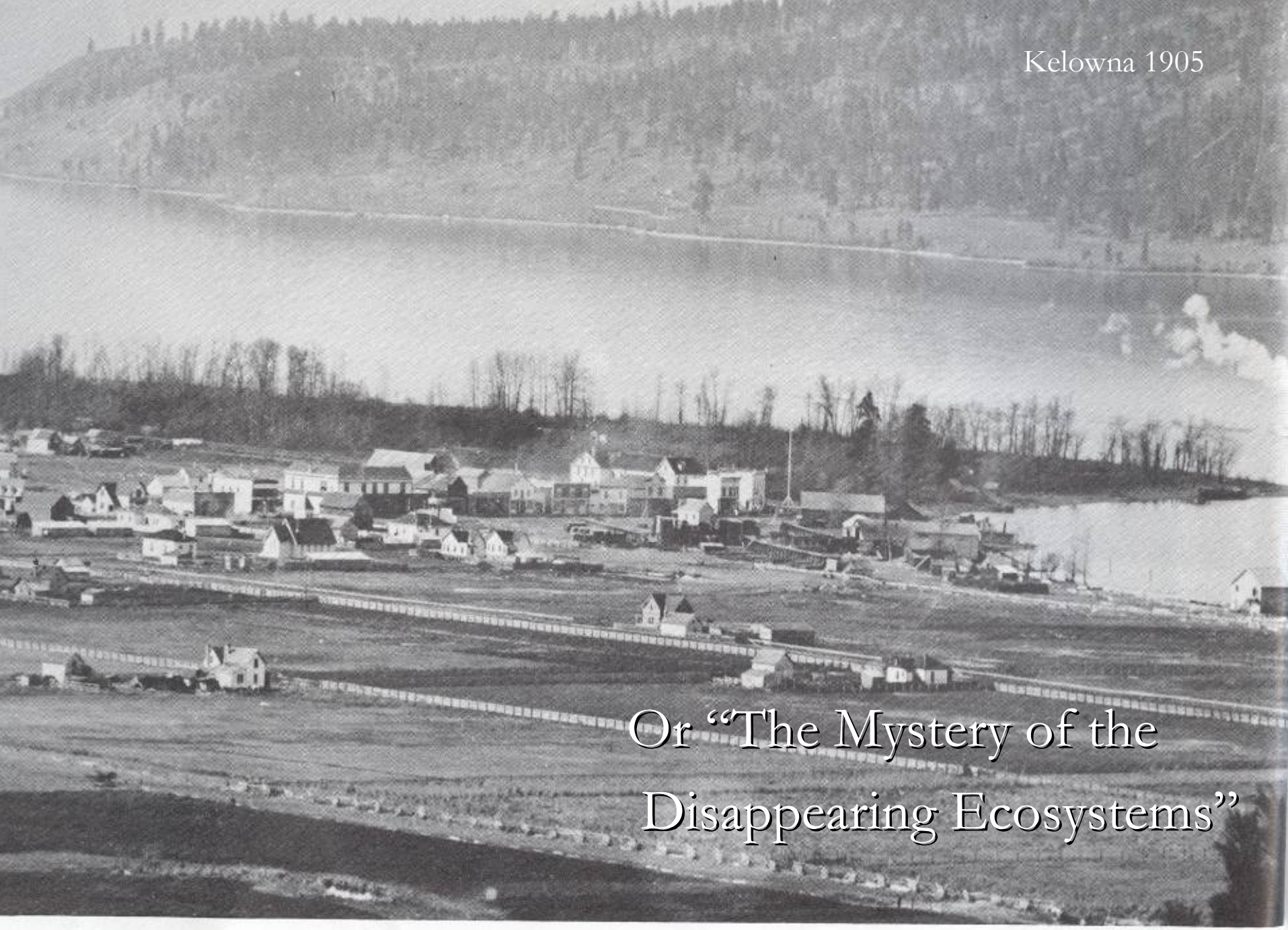
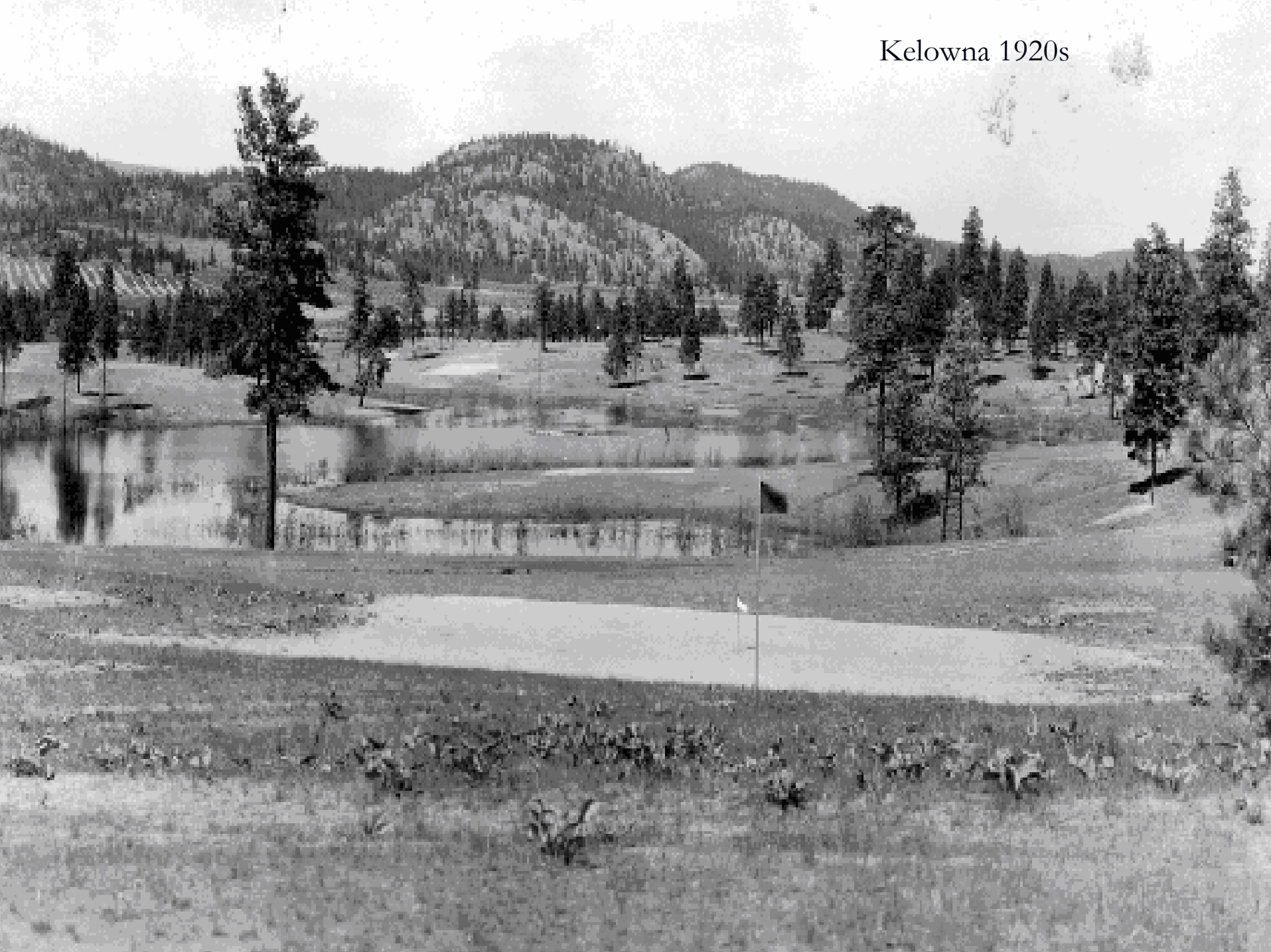
Historical (Pre-European Settlement) Ecosystems of the Kelowna Area and Okanagan Valley

Ted Lea, BC Environment

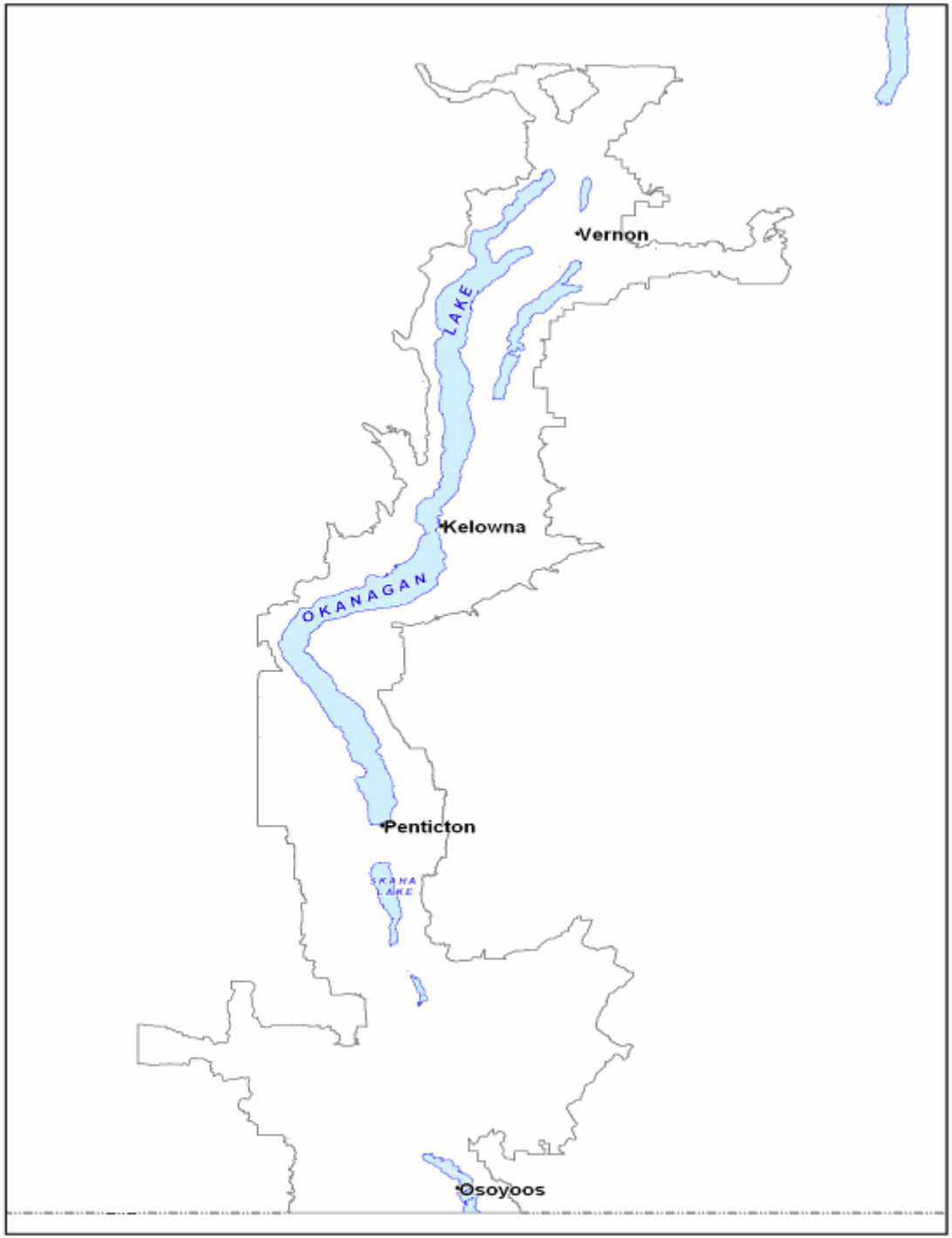


Kelowna about 1905, note the Aberdeen steaming


Kelowna 1905


Kelowna 1920s

Study Area


Vernon
LAKE
Kelowna
OKANAGAN
Penticton
SKAHA LAKE
Osoyoos

Summary

- Why map historical ecosystems?
- History of Area
- Methods
- Results

"I contend that we cannot even come close to attaining our goal of preserving biological diversity, let alone sustainability, if we continue to focus our efforts primarily on species."

(Jerry Franklin 1993)

Why map historical ecosystems?

- Determining loss of habitat for species at risk over time
- Potential areas for restoration
- Importance of the remaining pieces –what remains has many species at risk
- Many are ecosystems at risk
- Understanding regional heritage and how humans have affected ecosystems
- Shows that ecosystems can be mostly or completely lost in the landscape, caused by humans

Summary

- Why map historical ecosystems?
- Background
- Methods
- Results
- Uses of ecosystem mapping

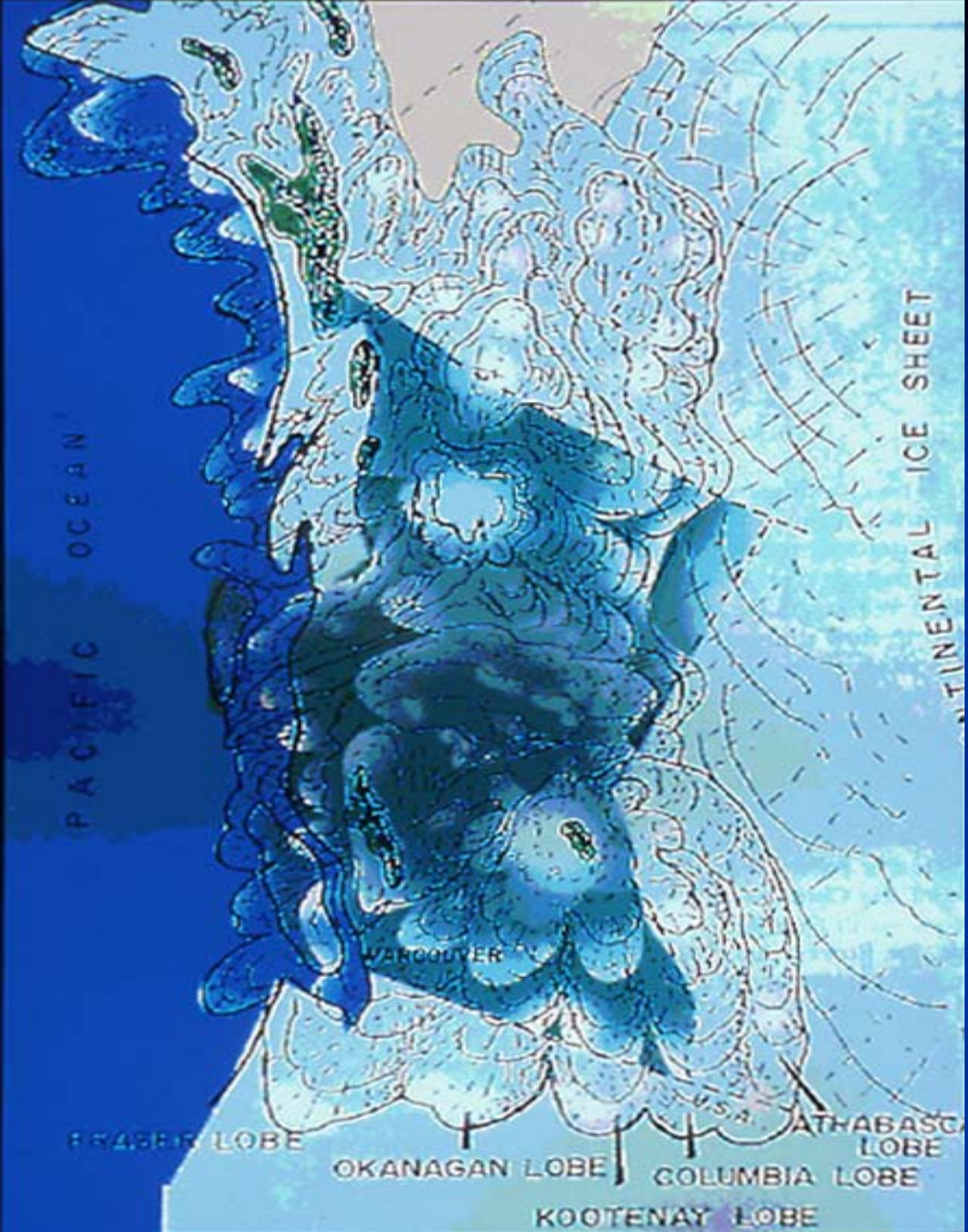
Present Study in Okanagan

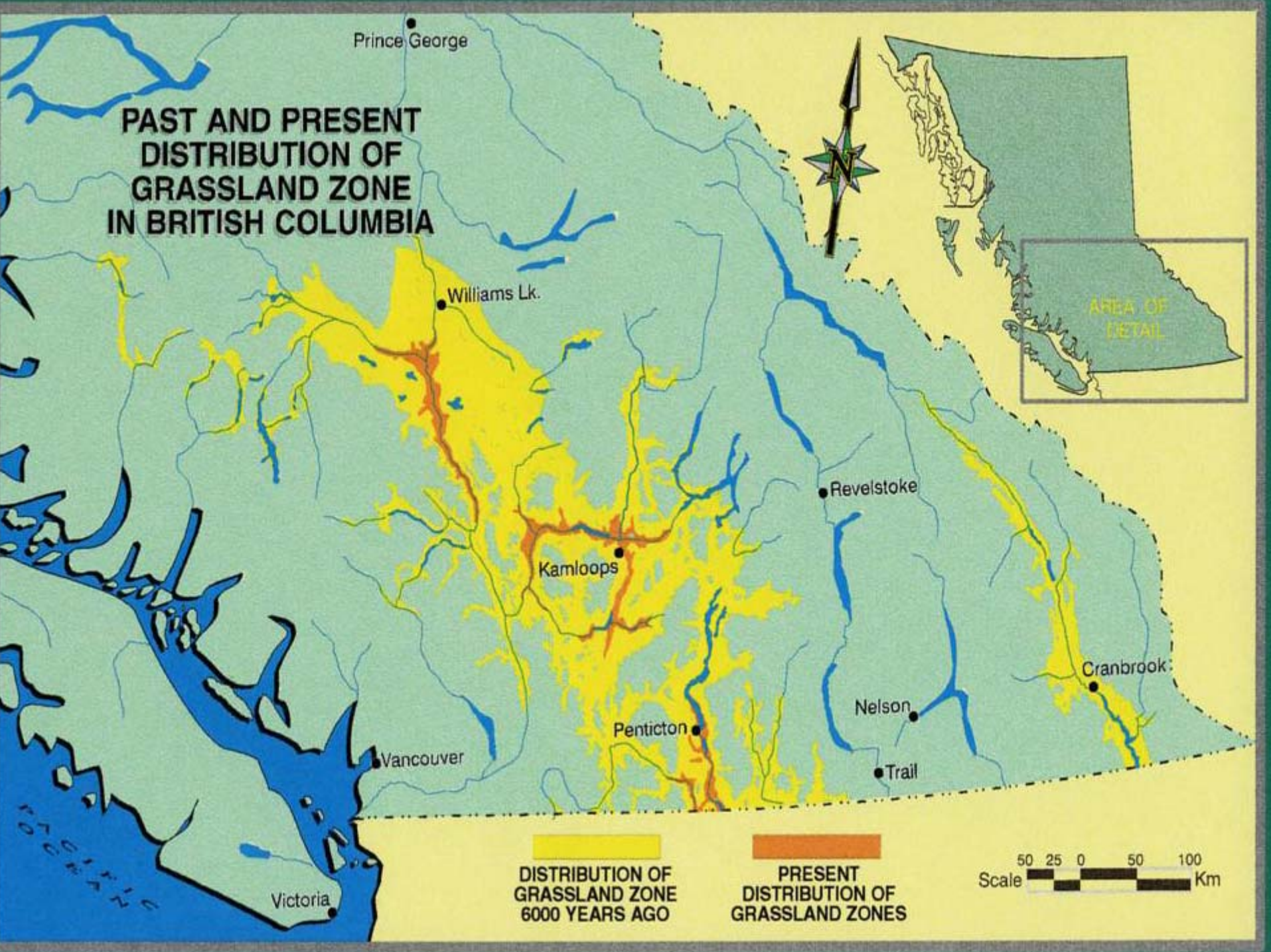
- Map historical and present day ecosystems for the Okanagan and Similkameen Valleys, Osoyoos to Enderby
  - Intense development pressure on remaining grasslands and riparian areas
  - Has been some present day sensitive ecosystem mapping recently in these areas but no historical perspective of what has been lost

Climatic history

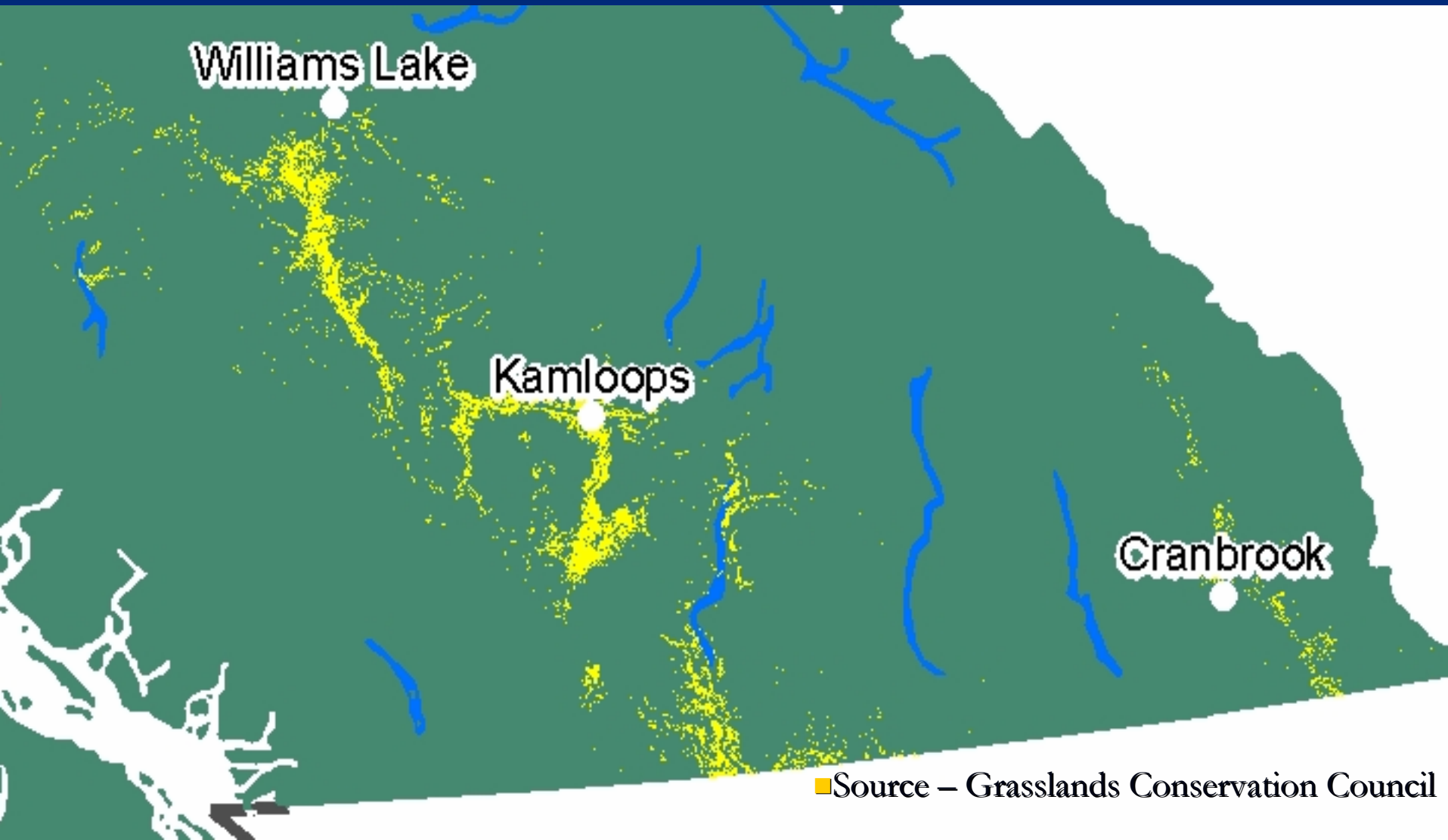
- 1.6 million - 13,000 Years Ago
  Four glacial advances and retreats
- 13,000 -12,000 Years Ago
  Valley glaciers receding, Upland glaciers gone, cold
- 12,000 – 9,000 years ago
  Warmer, moist, strong winds
- 9,000 – 8,000 years ago
  Cool, Most climate – Alpine glaciers advance
- 8,000 – 4,500 years ago
  Hypsithermal period. Maximum extent of Grassland, warm, dry climate
- 4,500 – 0 years ago
  Grassland at modern extent, Present climate

Glacial History




PAST AND PRESENT DISTRIBUTION OF GRASSLAND ZONE IN BRITISH COLUMBIA
Prince George
Williams Lk.
Kamloops
Revelstoke
Cranbrook
Nelson
Penticton
Vancouver
Trail
Victoria
N
AREA OF DETAIL
DISTRIBUTION OF GRASSLAND ZONE 6000 YEARS AGO
PRESENT DISTRIBUTION OF GRASSLAND ZONES
Scale 50 25 0 50 100 Km

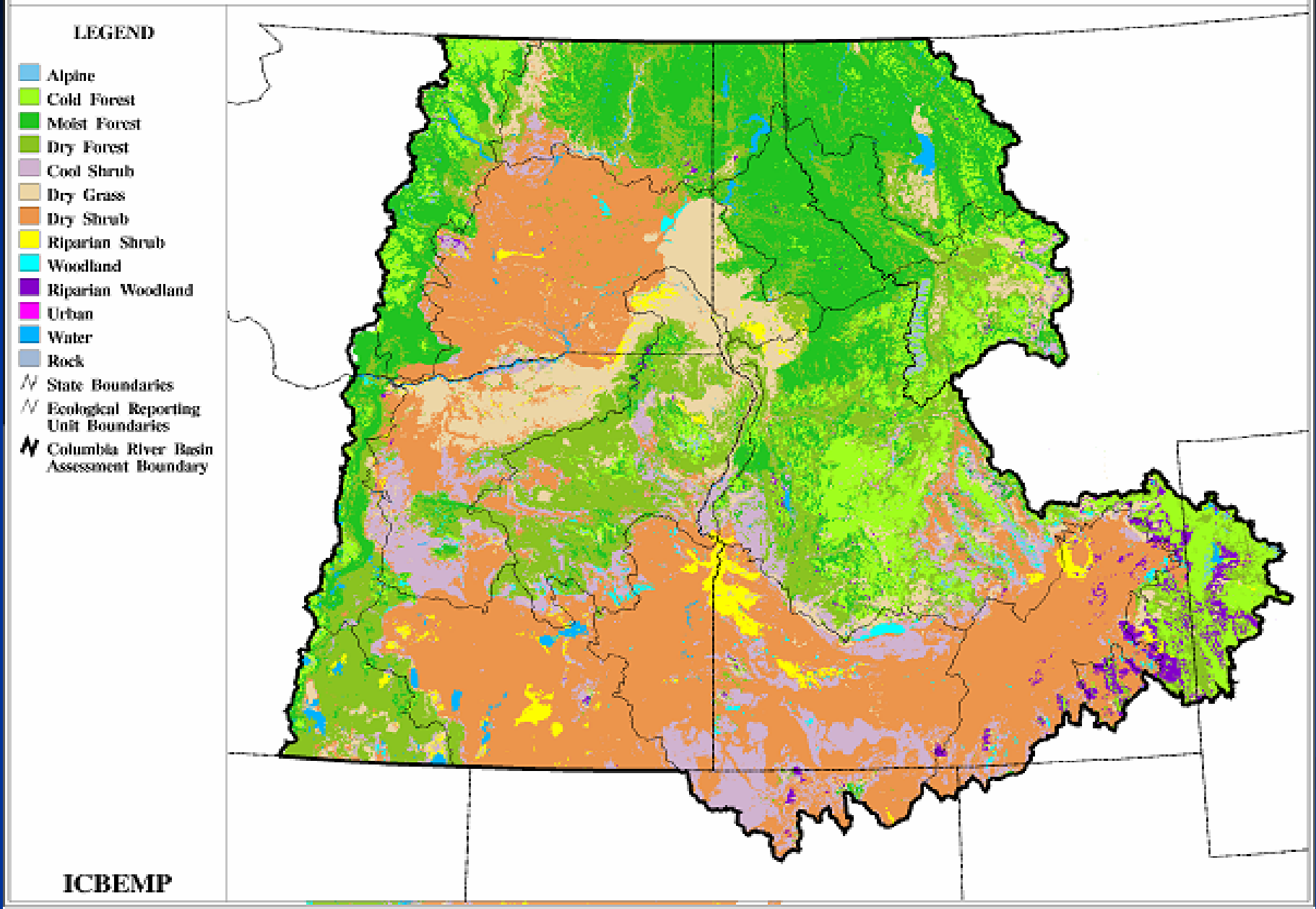
Present Day Grasslands



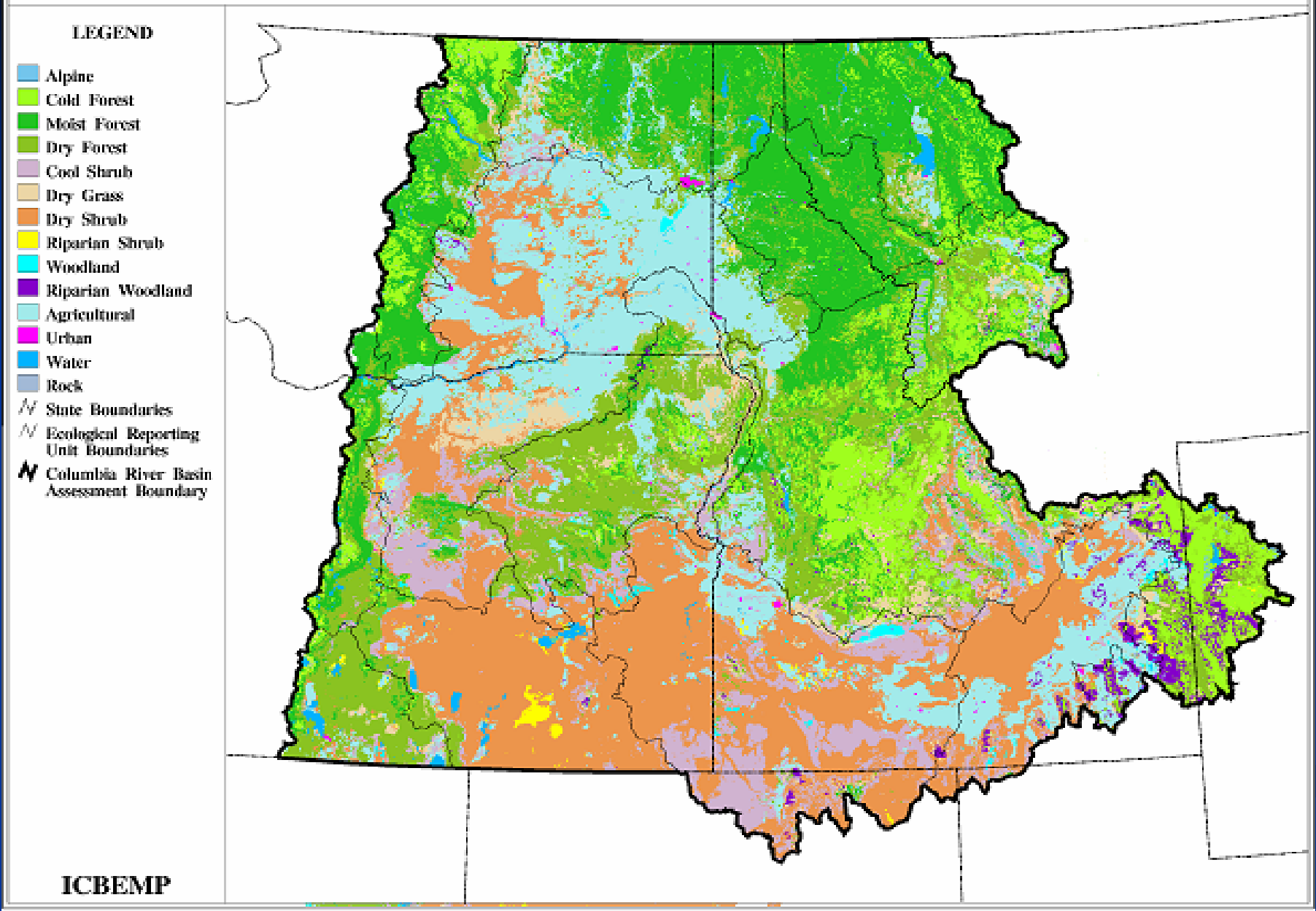
Source – Grasslands Conservation Council


Kamloops
Kelowna
Penticton
Vancouver
Seattle
Spokane
Columbia Basin
Portland
Image taken: Feb 2003

Historic Potential Vegetation Groups



Current Potential Vegetation Groups



Present Day Threats

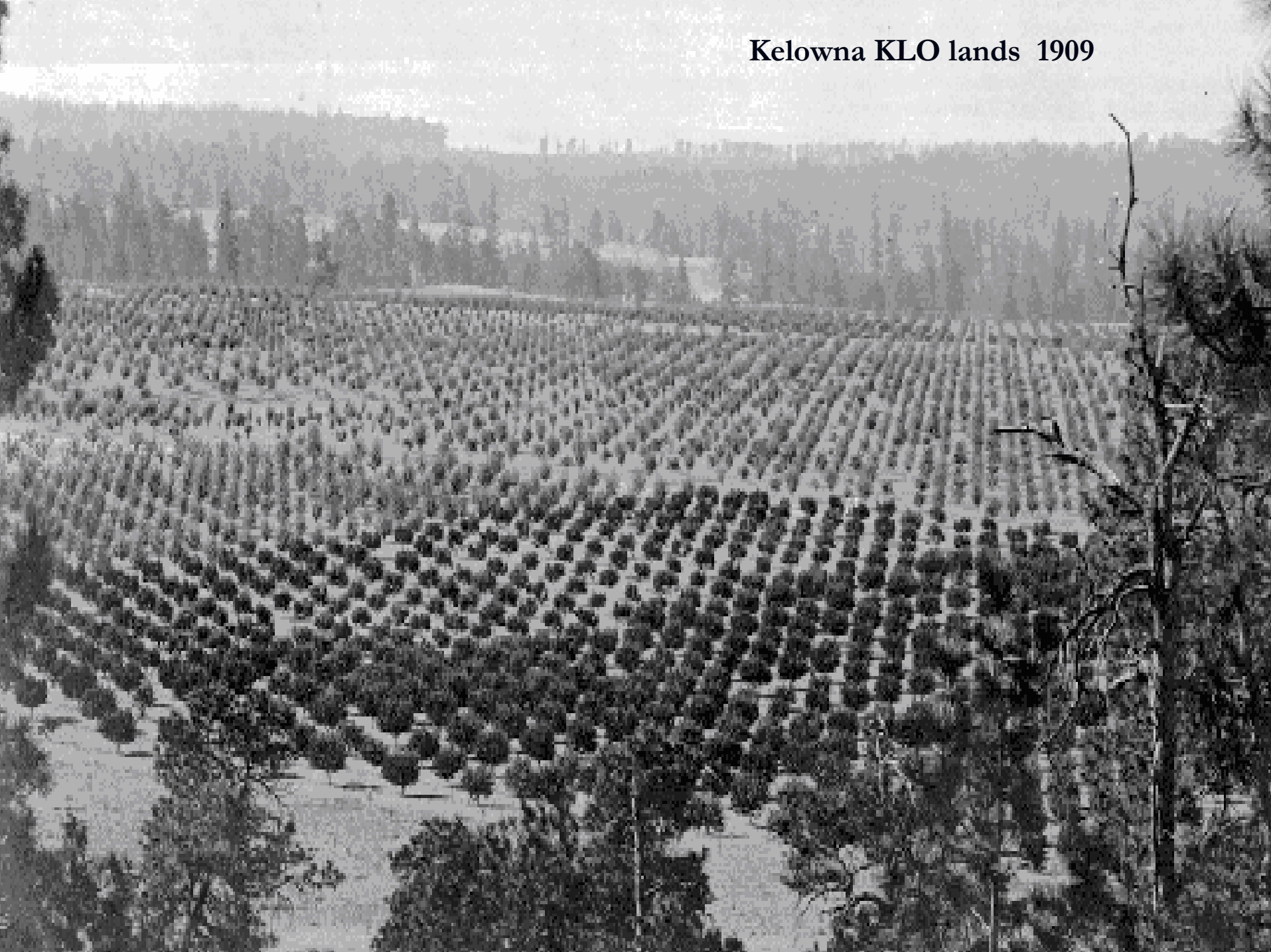
- Agriculture
- Urban Expansion
- Invasive Alien Species
- Climate change

Agriculture

- Commercial apple orchards were first tried in 1892; major success of commercial fruit crops began in the 1920s
- Many other field crops began in the late 1800s
- Livestock first came into the province in the 1840s and Okanagan ranching began in the 1860s
- Okanagan was a major route for livestock drives

Agriculture (cont'd)

- First vineyards in Okanagan in late 1800s
- In 2006 the province had about 2,600 hectares of wine grapes
- Area increase in vineyards over 20% in just two years between 2004 and 2006
- Predicted that acreage will peak at over 4,000 ha


Kelowna KLO lands 1909

Glenmore Valley 1910

From History of Rutland 1858-1958 prepared by the Rutland Centennial Committee, 1859. Orchard City Press and Calendar Co. Ltd. Kelowna, B.C. 128 pp

" Irrigation was provided by a subsidiary company, the Kelowna Irrigation Company, with water drawn from Mill Creek, by a long main ditch coming through Ellison among the benches.

It is worth noting that lands on the flat sold at $200 per acre, but the bench lots sold for only $150 per acre, as they required clearing of jack (ponderosa) pine. Today these are the best orchard locations, the flat lands having, in a fifty year cycle, gone from mixed farming to orchards and back to mixed farming again, due to frosts and seepage.“

Population Growth Projection in Okanagan/Similkameen

- First Nations believed to be present in the valley for thousands of years
- First non-native arrived in 1811
- European settlement began in 1859
- Population in 2005 approximately 325,000 for study area – projected to increase to about 460,000 in 2020

KELOWNA
(circa 1900)

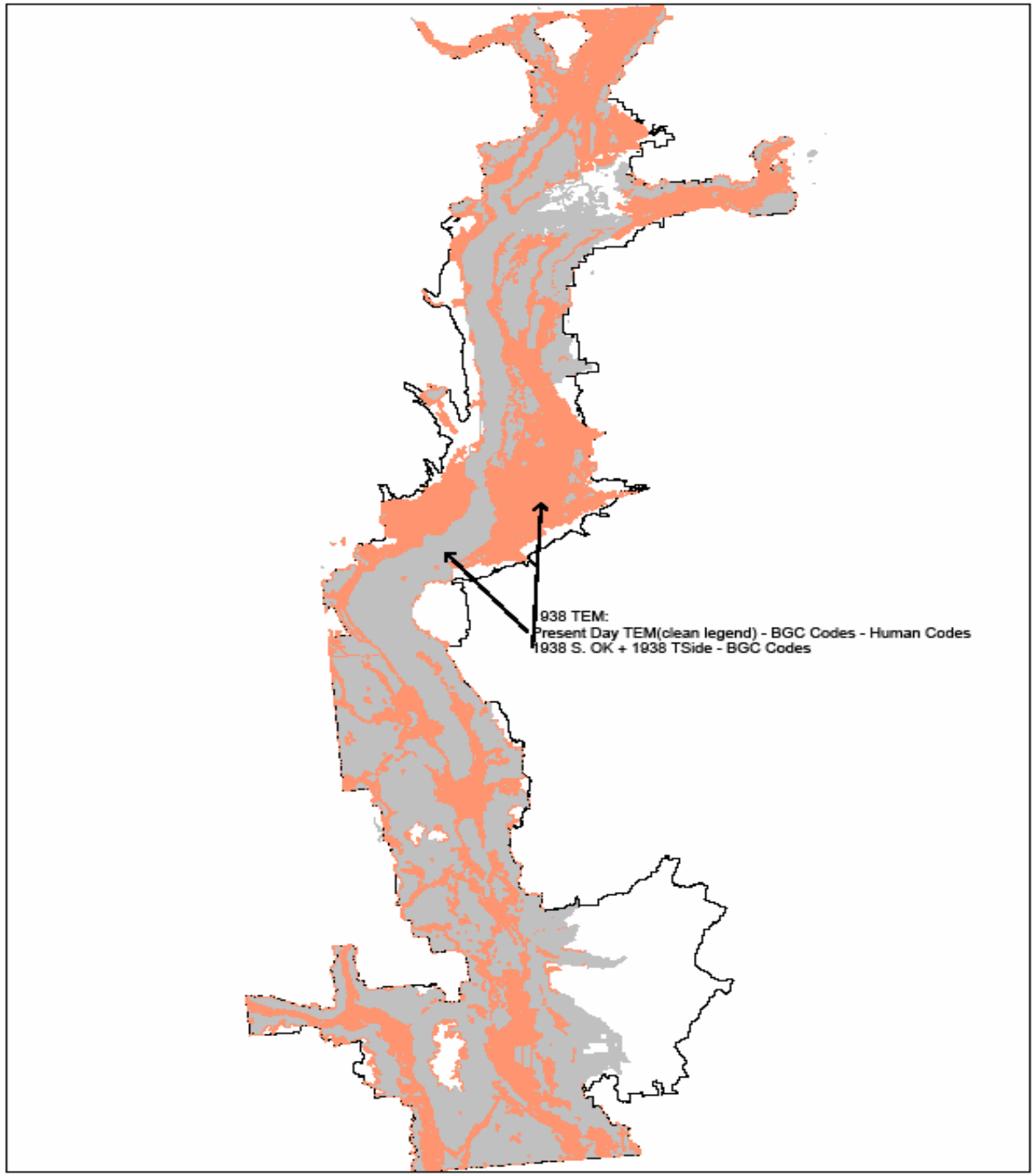

KELOWNA 2001

Invasive Alien Species

- The earliest recorded invasive species were cheatgrass and Canada thistle. Cheatgrass was initially reported in Summerland in 1912 and is currently the most widespread and common weed in the south Okanagan
- South Okanagan Similkameen Invasive Plant Committee now tracks over 45 invasive alien species

Latin name	Common Name	Earliest Record in BC	Earliest Record in the Okanagan
Arctium lappa	Great burdock	1895	1933
Arctium minus	Common burdock	1909	1917
Bromus tectorum	Cheatgrass	1890	1912
Centaurea diffusa	Diffuse knapweed	1936	1939
Centaurea maculosa	Spotted knapweed	1893	1944
Cirsium arvense	Canada thistle	1894	1913
Cuscuta pentagona	Dodder	1911	late 1970s
Cynoglossum officinale	Hound's-tongue	1922	1922
Echium vulgare	Blueweed	1917	1918
Hypericum perforatum	St. John's-wort	1913	1950
Linaria genistifolia var. dalmatica	Dalmatian toadflax	1940	1952
Lythrum salicaria	Purple loosestrife	1897	1963
Myriophyllum spicatum	Eurasian water milfoil	1971	1971
Potentilla recta	Sulphur cinquefoil	1914	1940
Senecio jacobaea	Tansy ragwort	1913	1991
Tribulus terrestris	Puncturevine	1974	1974

Overall Human Impact to date



Cultivation and Urban Development

58% of the City of Kelowna in 2001

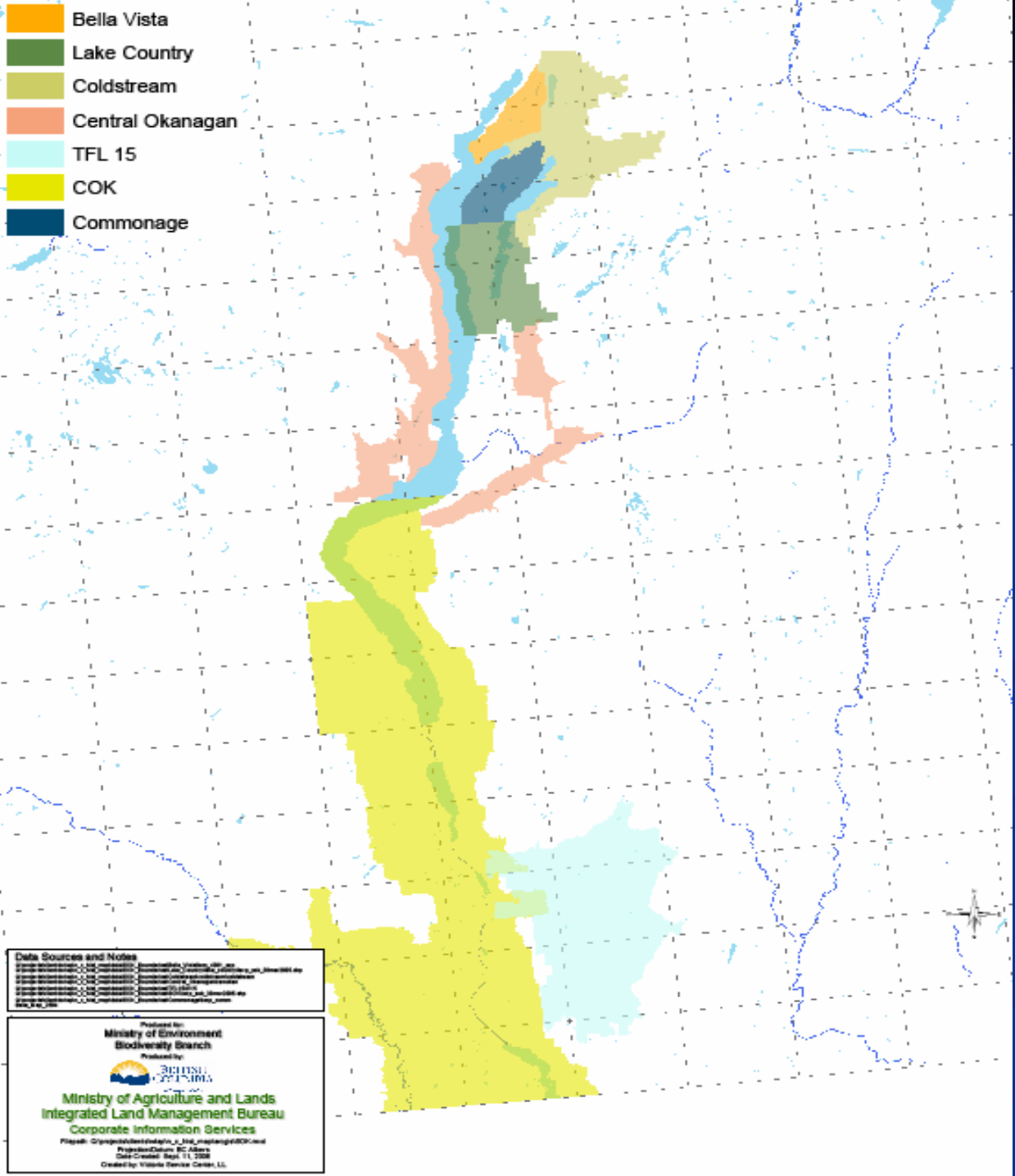
METHODS

Methods Used in Study

- Maps and Photographs including air photos*and orthophotos
- Forest Stand History – Observational Field evidence including present day Terrestrial Ecosystem Mapping*
- Geomorphology, Hydrology and Soils
- Land Surveys
- Written Records

Mapping Methods

- Used the Terrestrial Ecosystem Mapping (TEM) Standard to map plant community level
- Mapped TEM on 1938 Air photographs
- Extrapolated back to the 1800s using ecological attributes for each polygon
  - no structural stage or seral community information
- Used present day TEM mapping to see what was left.
- Able to compare changes over time 1800, 1938, 2000s – could use air photos to do intermediate stages



Present Day TEM Coverage

1938 Air photograph

Results – specific ecosystems

- Ponderosa pine – bluebunch wheatgrass gentle slope forest
- Riparian Shrub and Forest
  - Black cottonwood – red-osier dogwood
  - Western Birch – red-osier dogwood
- Shallow Open Water and Oxbow
- Idaho fescue – bluebunch wheatgrass grassland

Ponderosa pine – bluebunch wheatgrass gentle slope forest

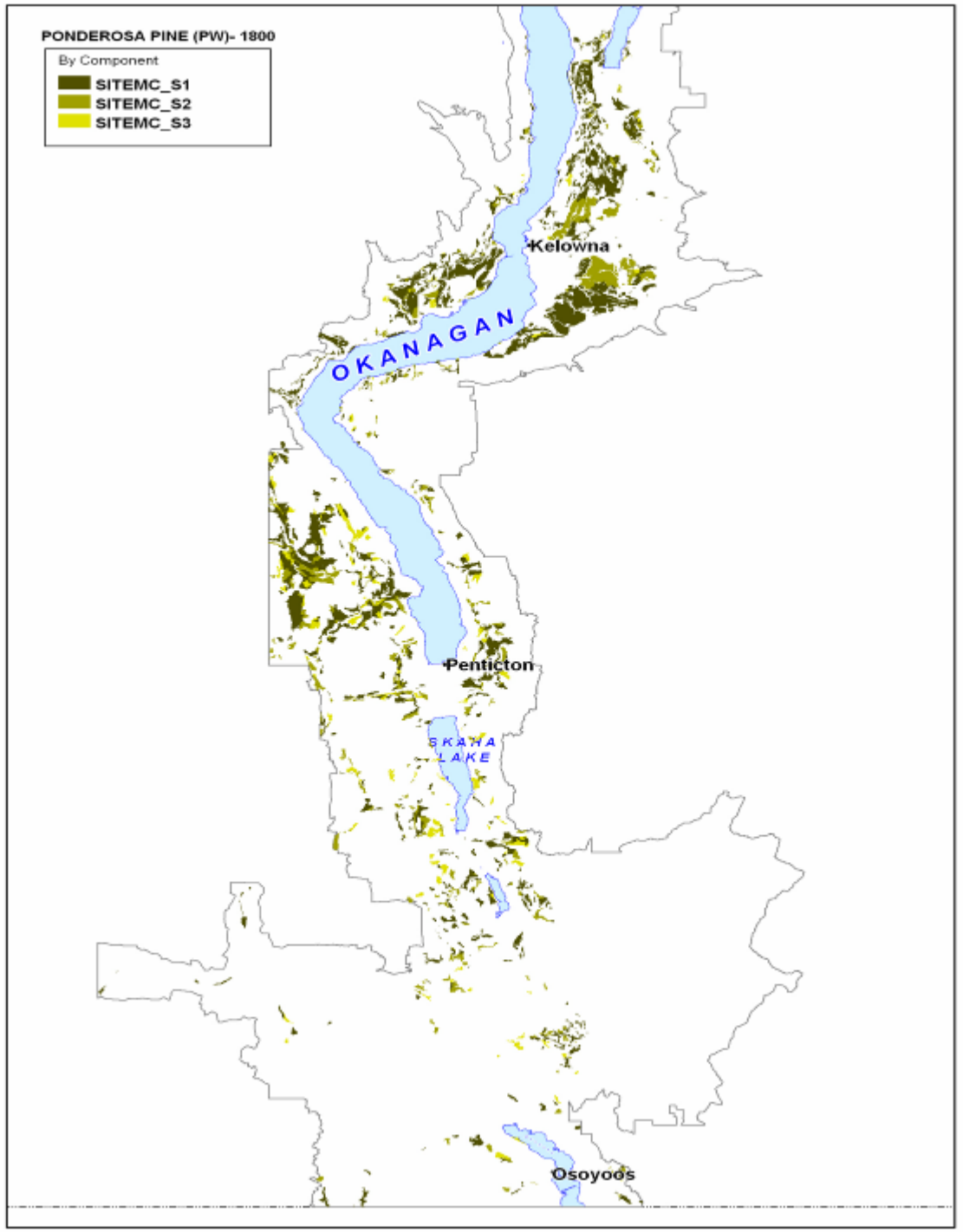
Description Ponderosa pine – bluebunch wheatgrass gentle slope

- Dominated by open forests of ponderosa pine, with a sparse shrub understory of saskatoon, and herb layer of bluebunch wheat grass, arrow-leaved balsamroot
- Mostly found on gentle slopes of glaciofluvial and morainal material

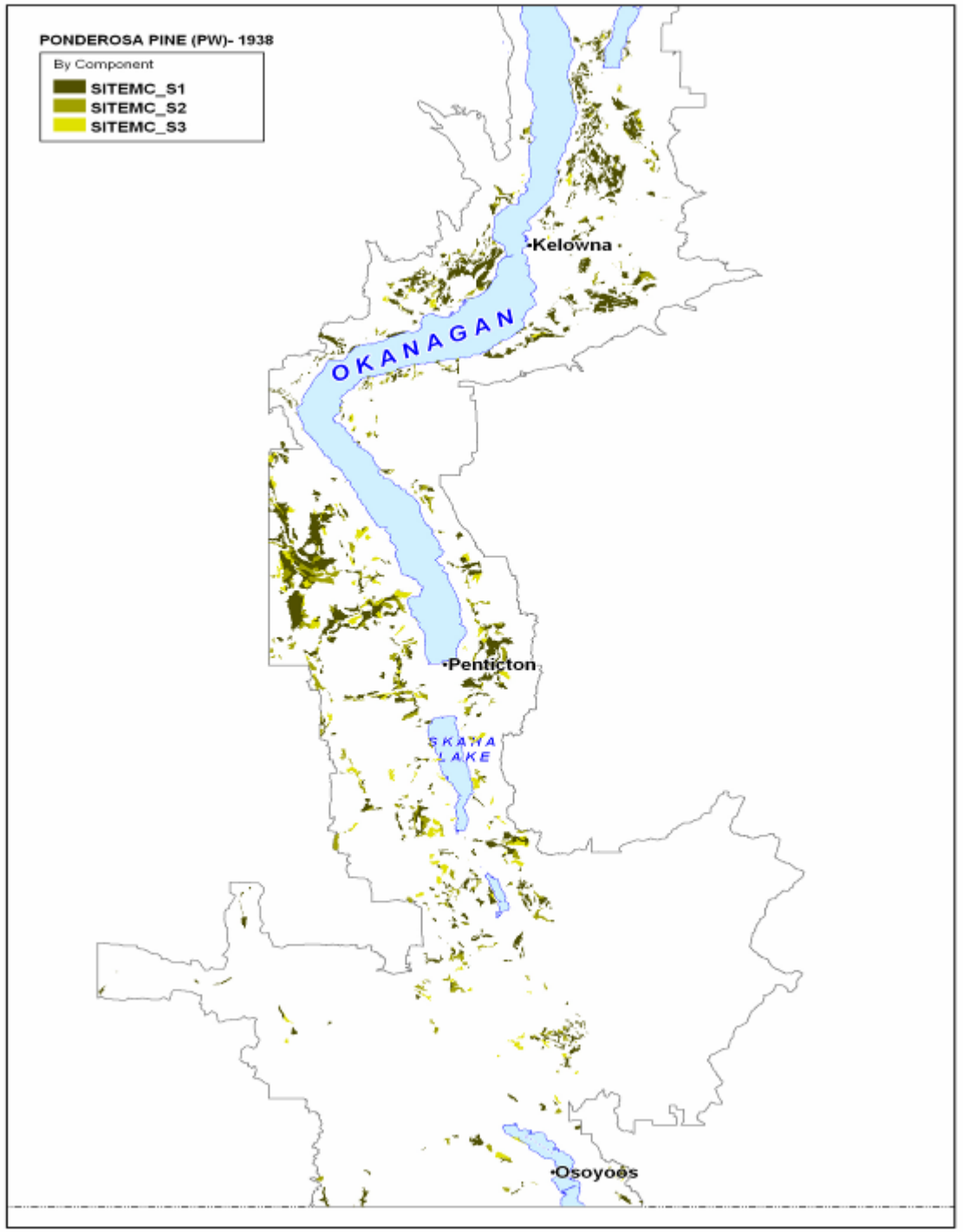
Species at Risk in Ponderosa pine – bluebunch wheatgrass

- White-headed Woodpecker
- Great Basin Gopher Snake
- Western Rattlesnake
- Spotted Bat
- Lewis's Woodpecker
- Rubber Boa

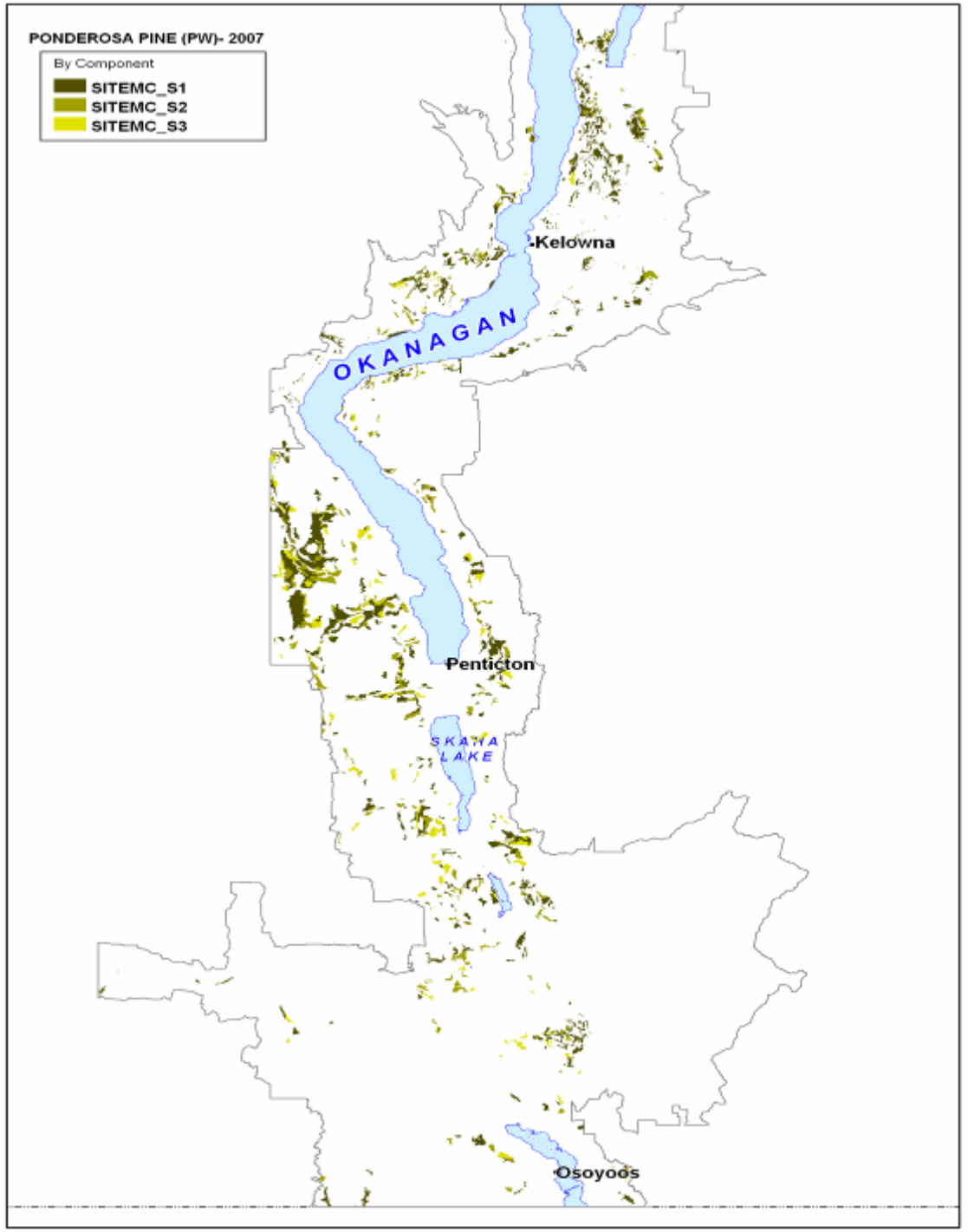
1800 Ponderosa pine – bluebunch wheatgrass



1938 Ponderosa pine – bluebunch wheatgrass



2005 Ponderosa pine – bluebunch wheatgrass

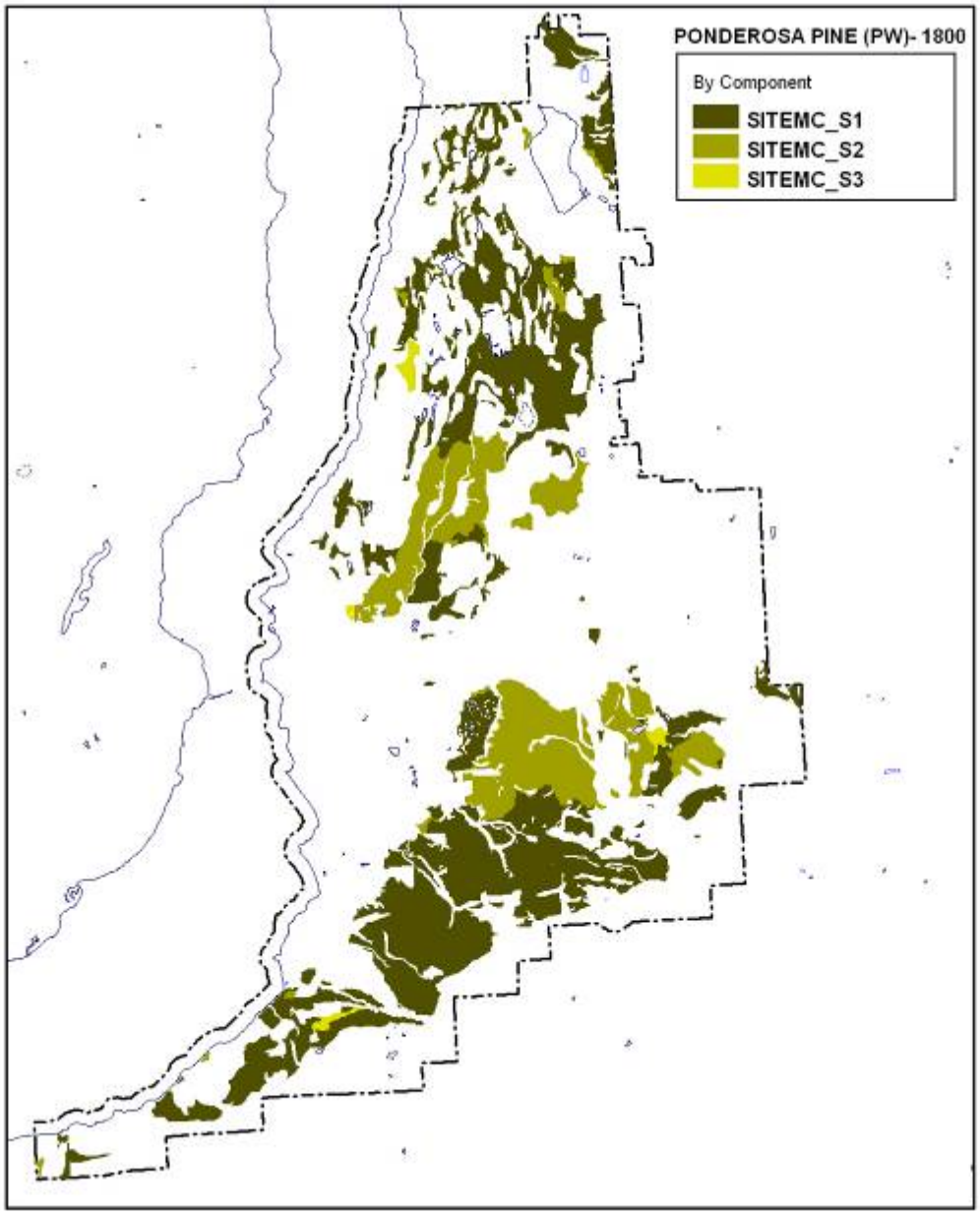


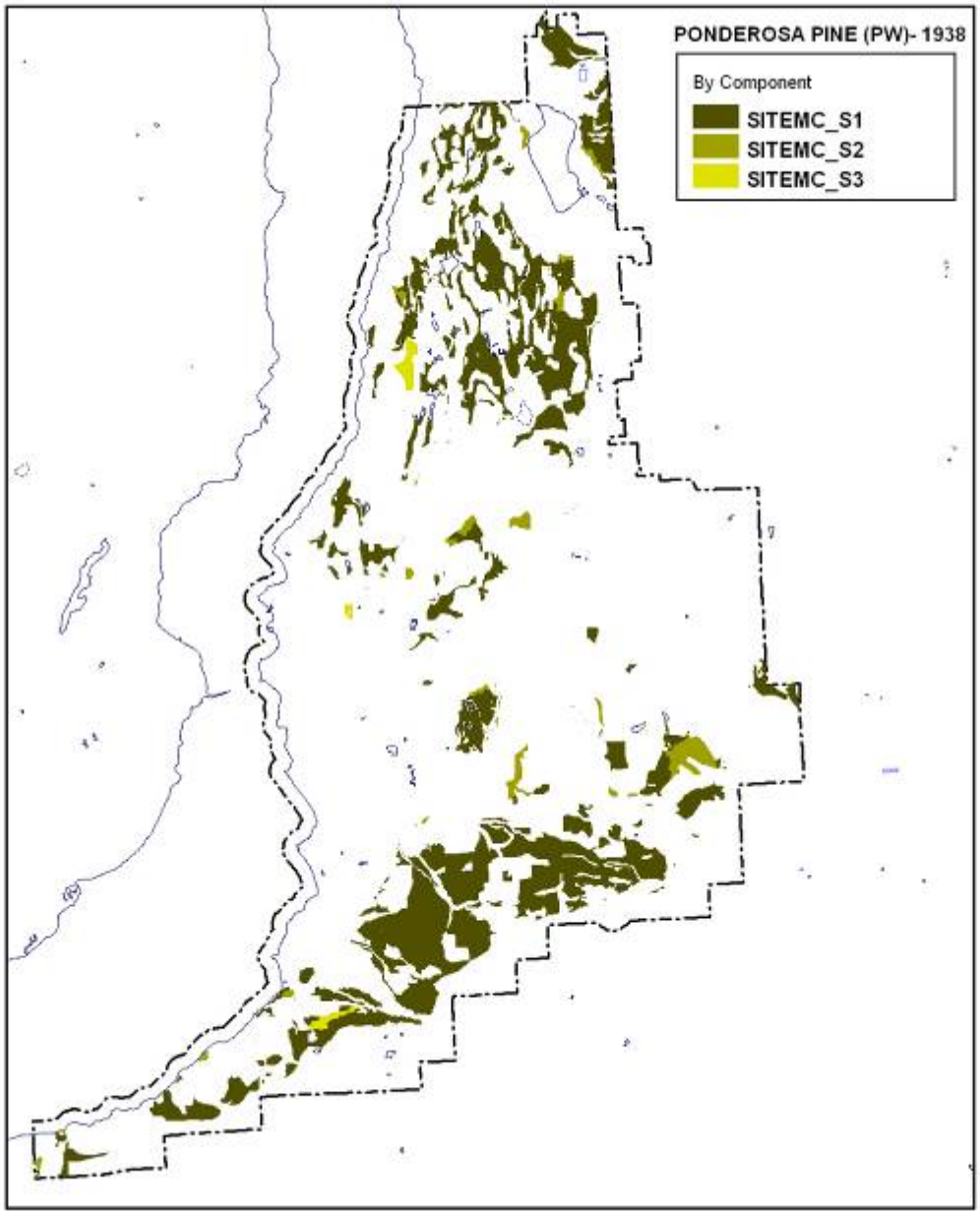
Ponderosa pine – bluebunch wheatgrass Area

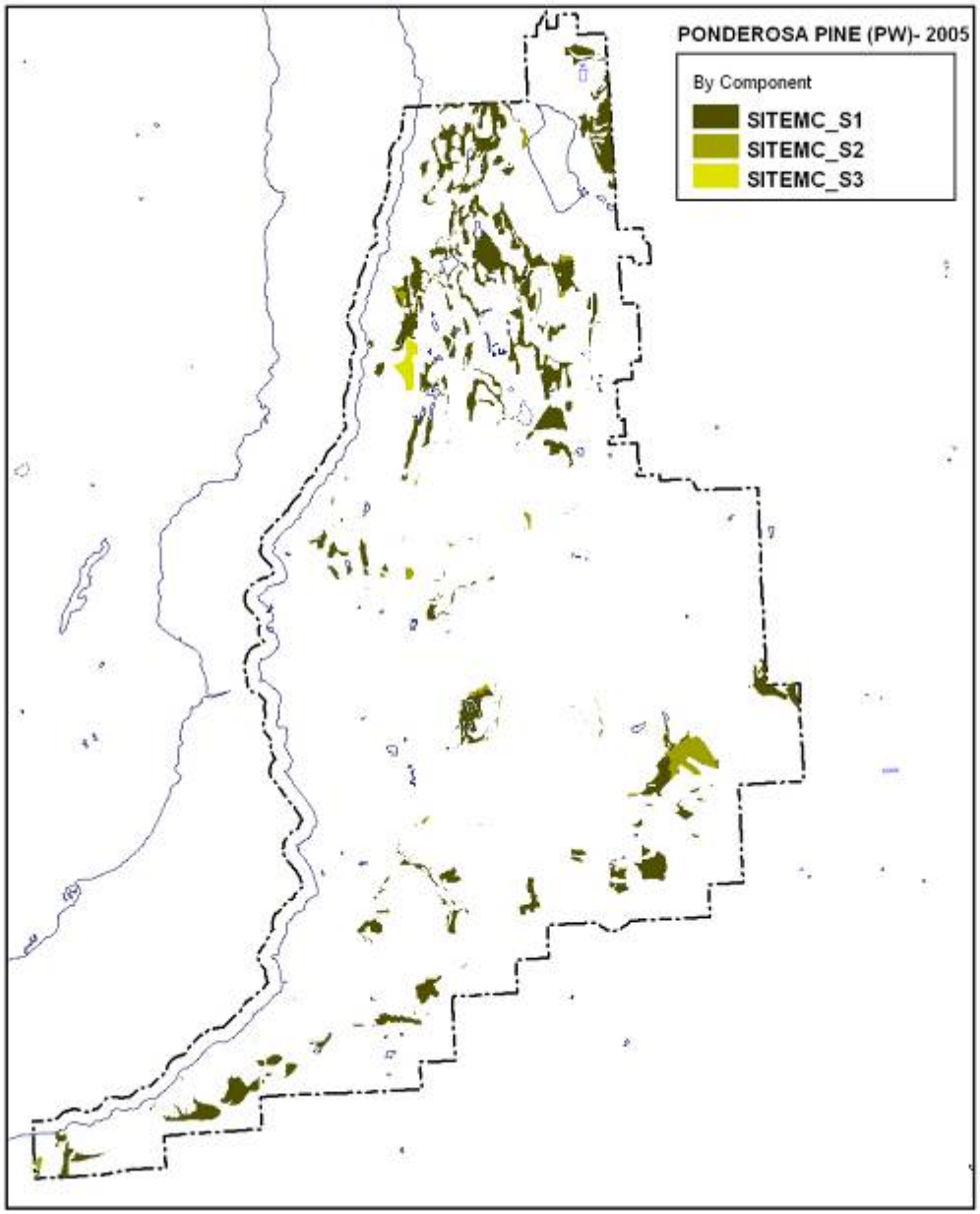
53 % of this ecosystem has been lost in the Okanagan

Ponderosa pine – bluebunch wheatgrass

City of Kelowna


PONDEROSA PINE (PW)- 1800
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3


PONDEROSA PINE (PW)- 1938
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3


PONDEROSA PINE (PW)- 2005
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3

Ponderosa pine – bluebunch wheatgrass

74 % of this ecosystem has been lost for the City of Kelowna

Western Birch – Red-Osier Dogwood riparian ecosystem

Benvoulin Road 1905

Benvoulin, Rd., Approx 1905

Kelowna, like every growing city had problems maintaining roads. Spring runoff often produced flooding, while heavy rains or prolonged dryspells produced mud - ruts - or dust.

Bernard Ave., rough for traffic, but the pedestrians had the luxury of a board walk.

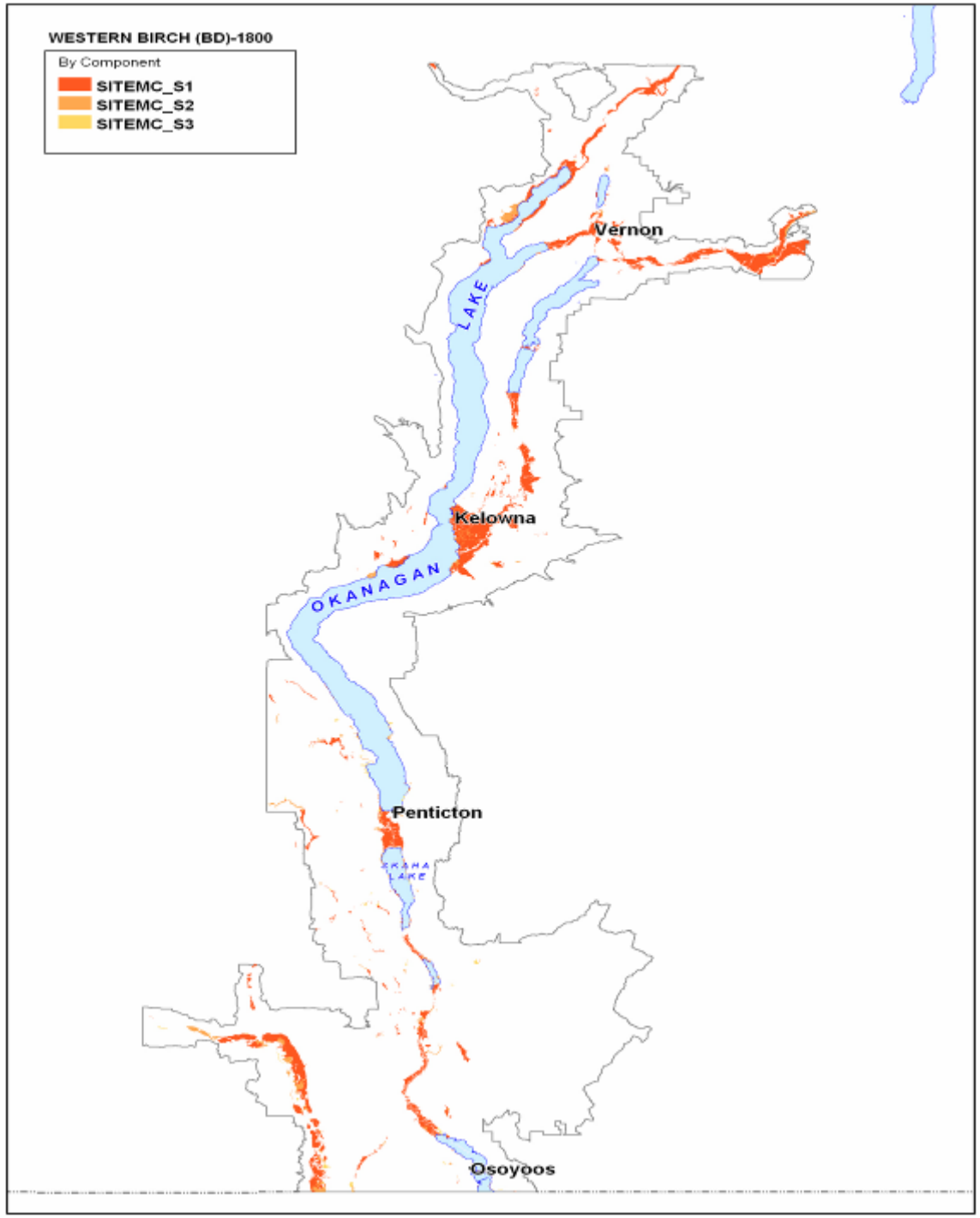
Description Western Birch – Red-Osier Dogwood

- Dominated by dense, tall shrub layer of water birch, red-osier dogwood, willows, roses, and herbs such as starflower, and horsetails.
- Floodplain or riparian areas – medium to coarse-textured materials.

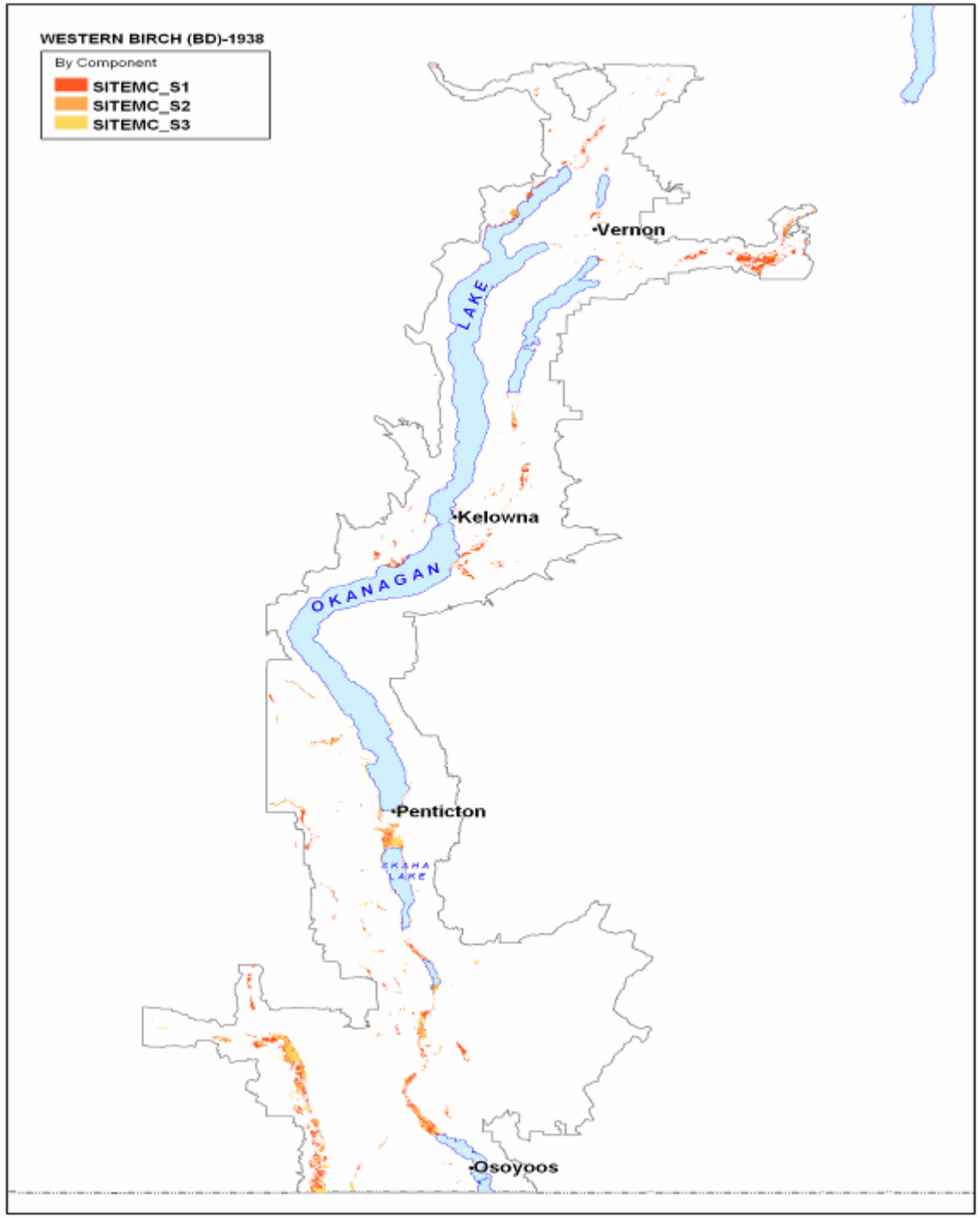
Species at Risk in Western Birch – Red-Osier Dogwood

- Yellow-breasted Chat
- Giant Helleborine
- Great Basin Gopher Snake
- Western Rattlesnake

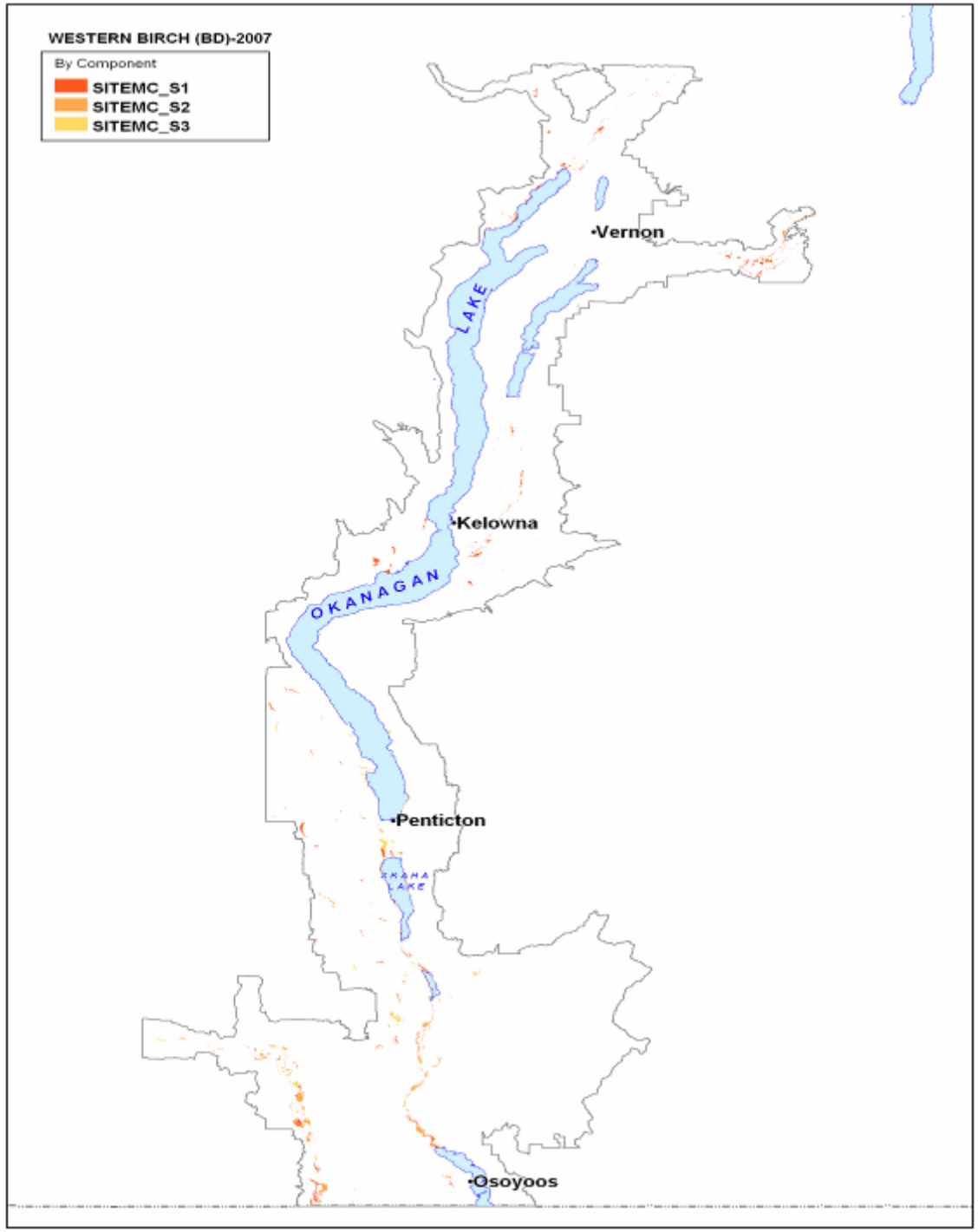
1800 Western Birch – Red-Osier Dogwood



1938 Western Birch – Red-Osier Dogwood



2000s Western Birch – Red-Osier Dogwood

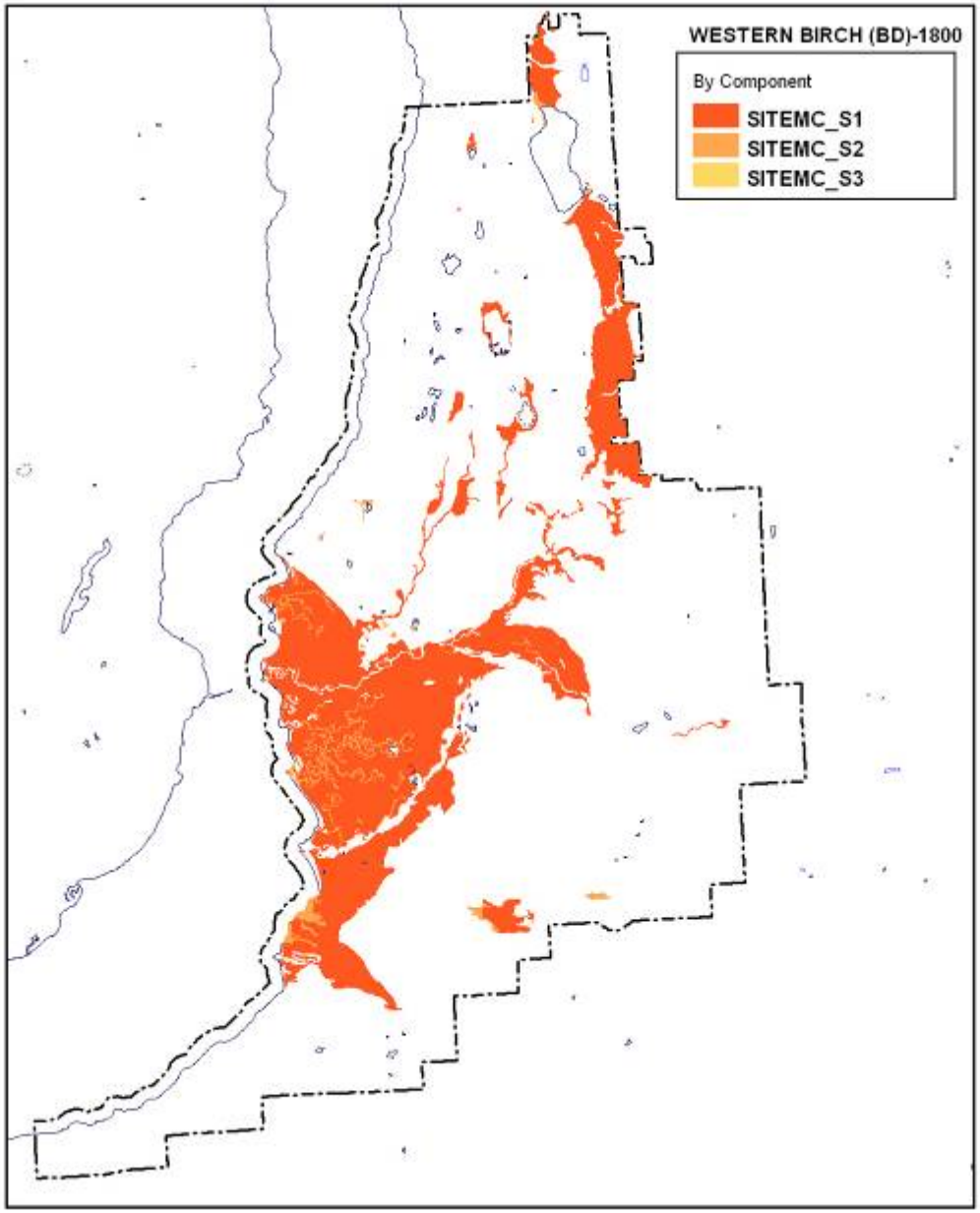


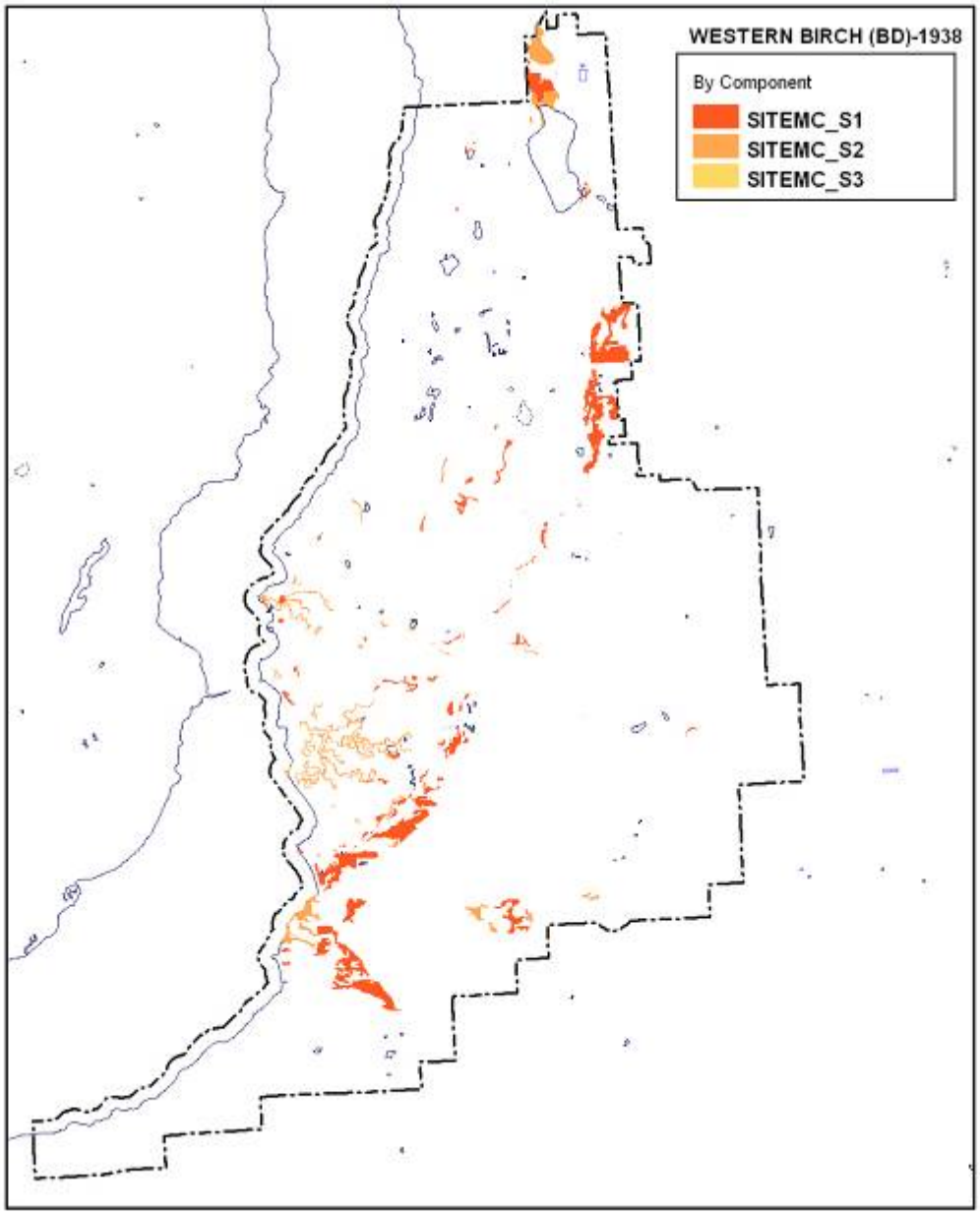
Water Birch – Red-Osier Dogwood

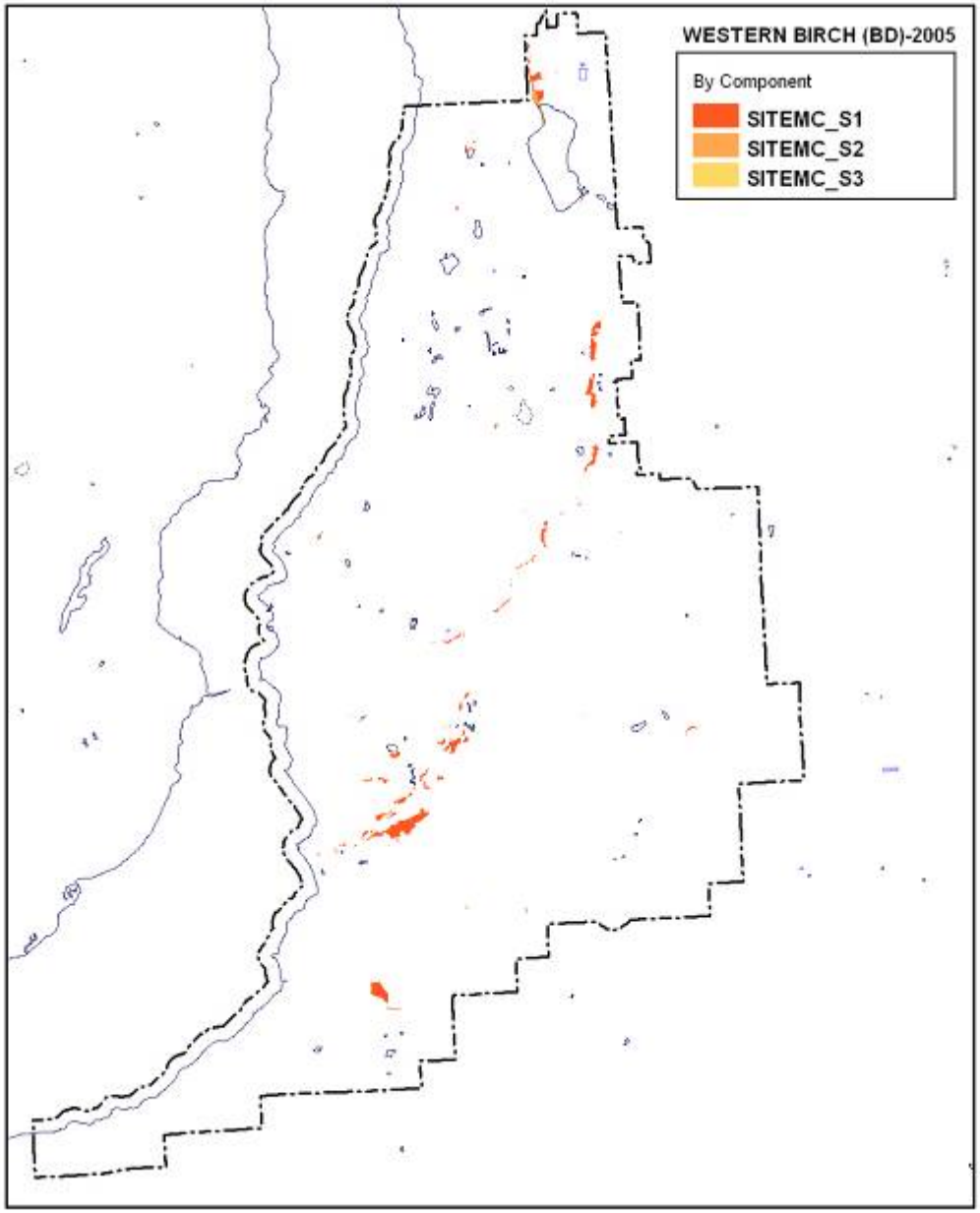
92 % of this ecosystem has been lost in the Okanagan

Water Birch – Red-Osier Dogwood

City of Kelowna


WESTERN BIRCH (BD)-1800
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3


WESTERN BIRCH (BD)-1938
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3


WESTERN BIRCH (BD)-2005
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3

Water Birch – Red-Osier Dogwood

96 % of this ecosystem
has been lost for the
City of Kelowna

FOCUS ON Yellow-Breasted Chat

Yellow-Breasted Chat Habitat

- Less than 50 pairs left in the Okanagan Valley
- Nests in Riparian Shrub areas – prefers wild rose shrubs as nest sites
- Small areas that were cleared for agriculture early in the 1900s are now being restored, with plantings of shrubs and attempts to bring back natural water courses
- Over 90 % of their habitat has been lost

Black Cottonwood – red-osier dogwood floodplain ecosystem

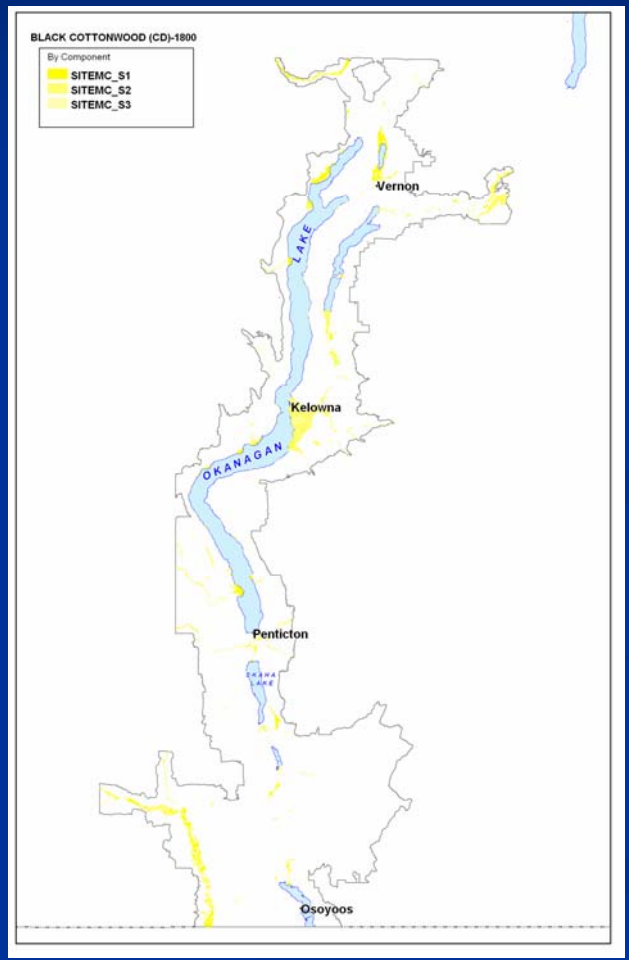
Description Black Cottonwood – red-osier dogwood

- Dominated by Black cottonwood with a dense shrubby understory of red-osier dogwood, western birch, roses, willows and starflower?
- Floodplain areas of medium to coarse-textured materials

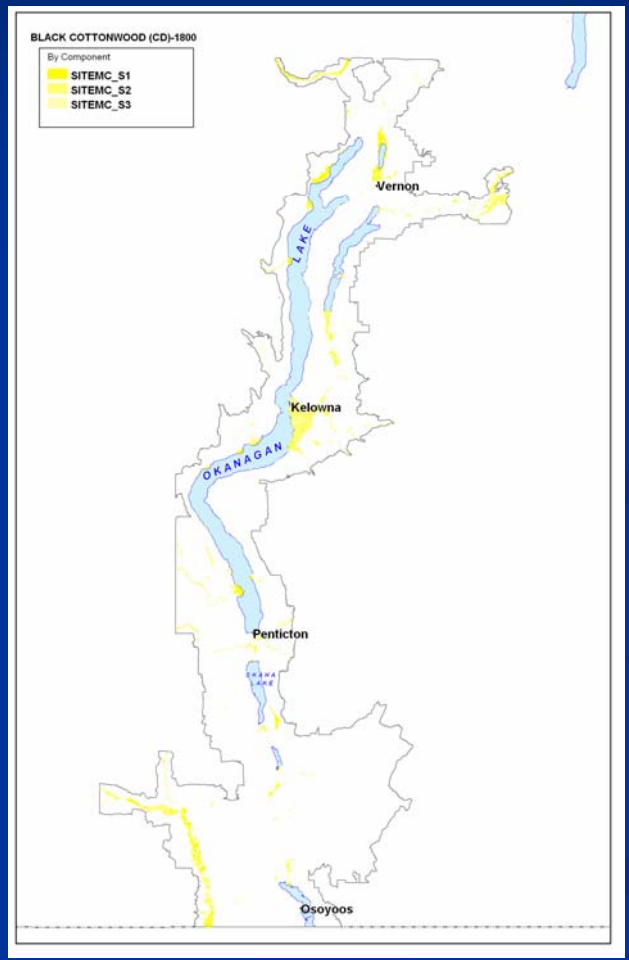
Species at Risk in Black Cottonwood – red-osier dogwood

- Western Screech Owl
- Lewis' Woodpecker
- Yellow-breasted Chat
- Rubber Boa

1800 Black Cottonwood – red-osier dogwood



1938 Black Cottonwood – red-osier dogwood



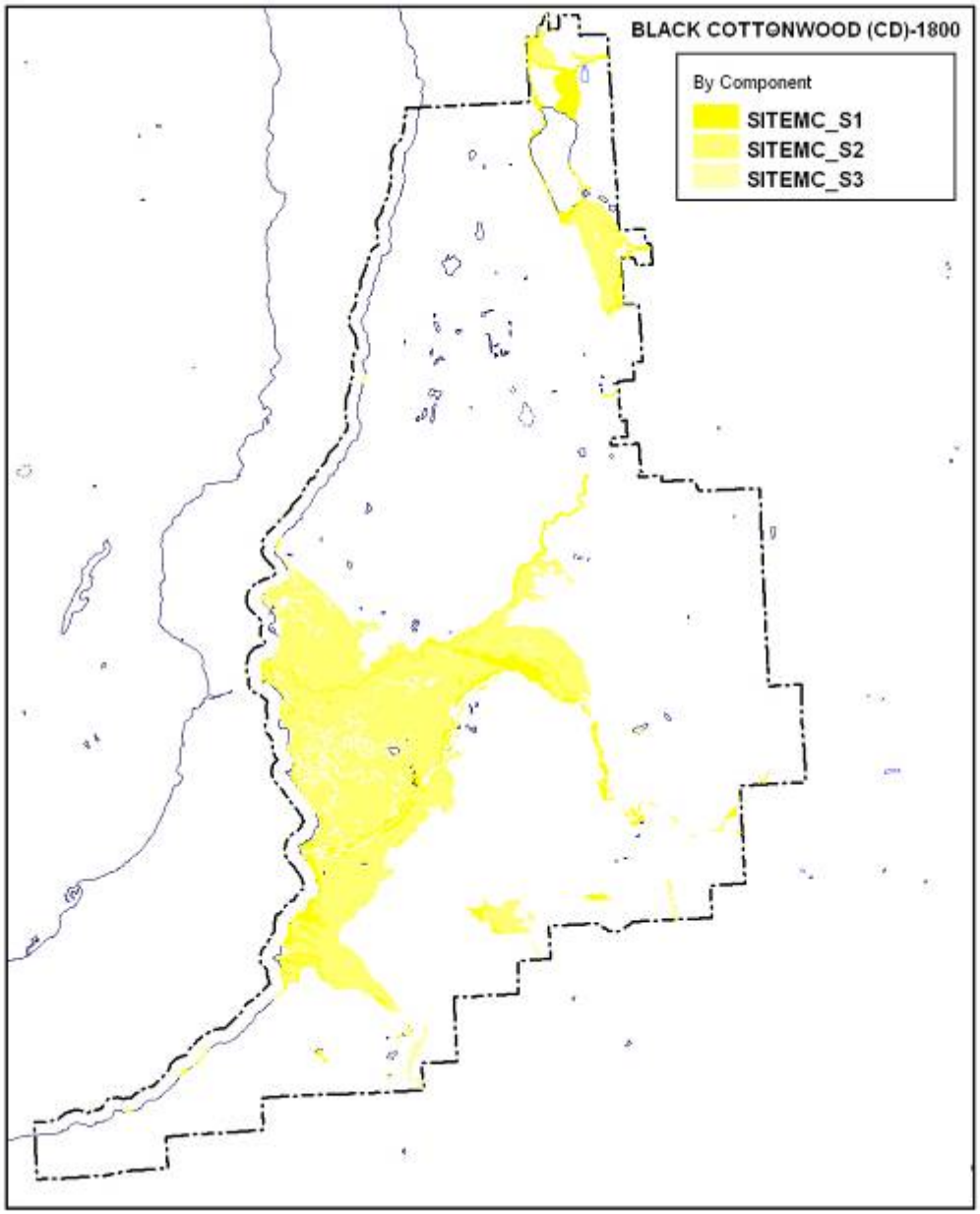
2000s Black Cottonwood – red-osier dogwood

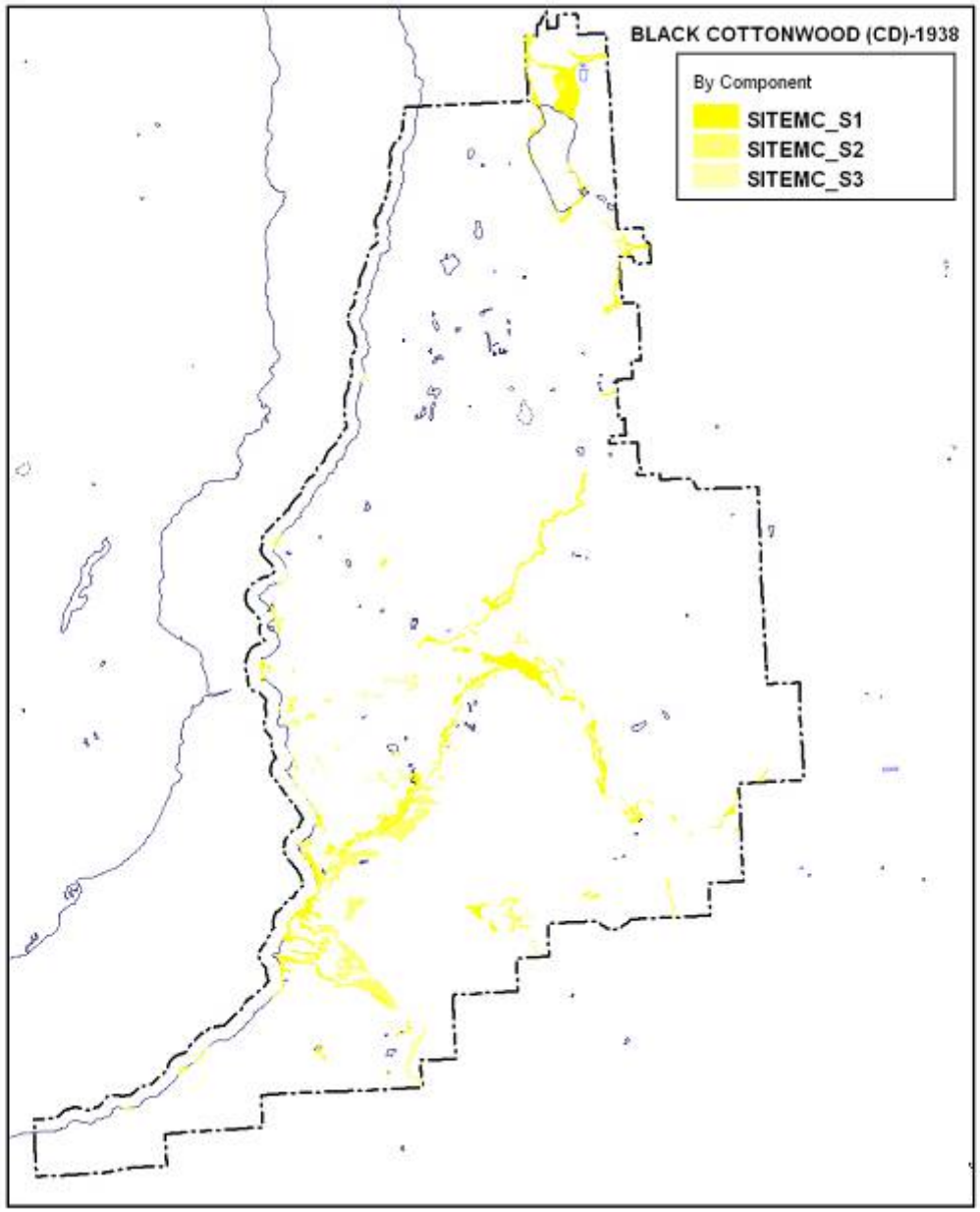
Black Cottonwood – red-osier dogwood Area

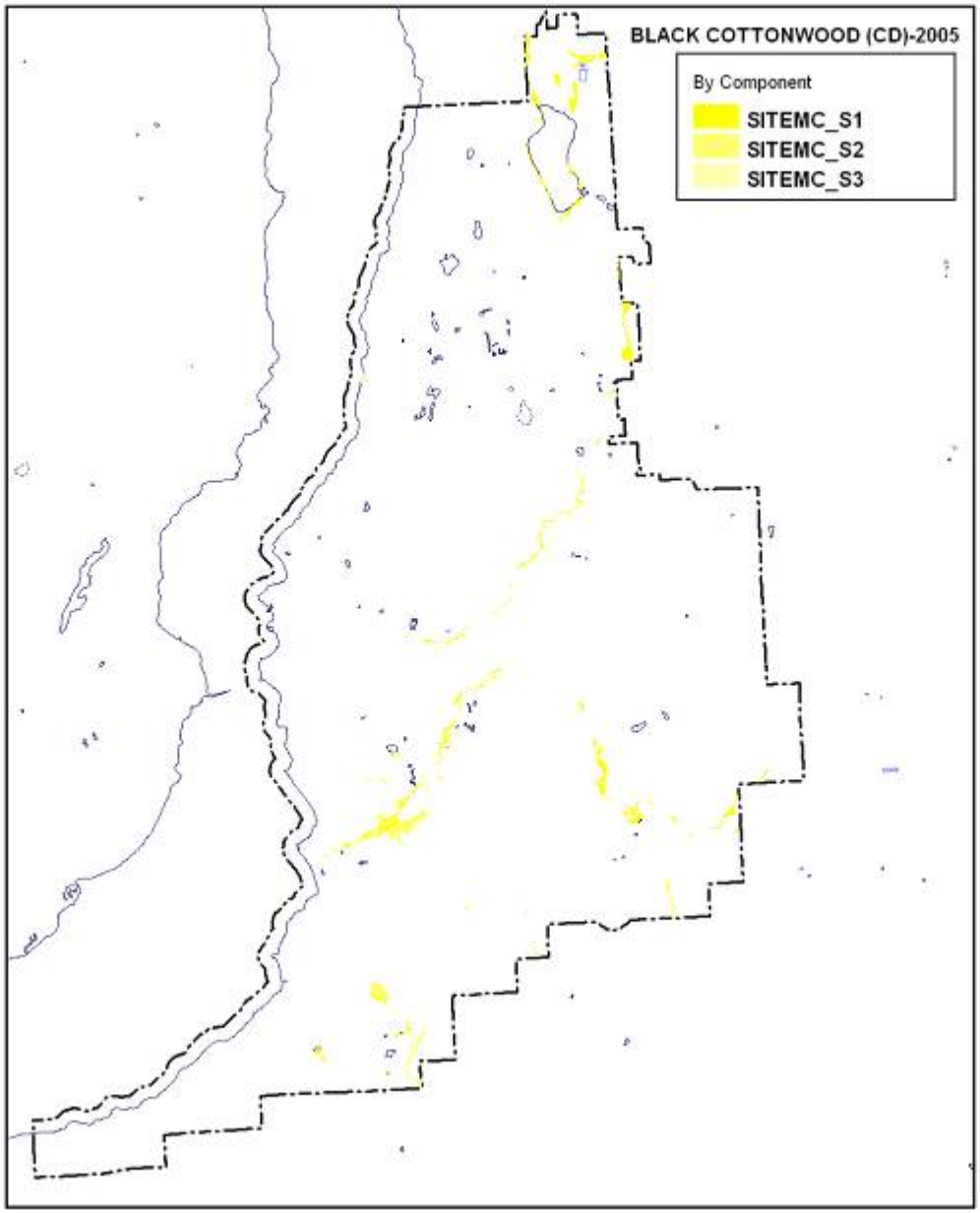
63% of this ecosystem has been lost in the Okanagan

Black Cottonwood – red-osier dogwood

City of Kelowna


BLACK COTTONWOOD (CD)-1800
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3

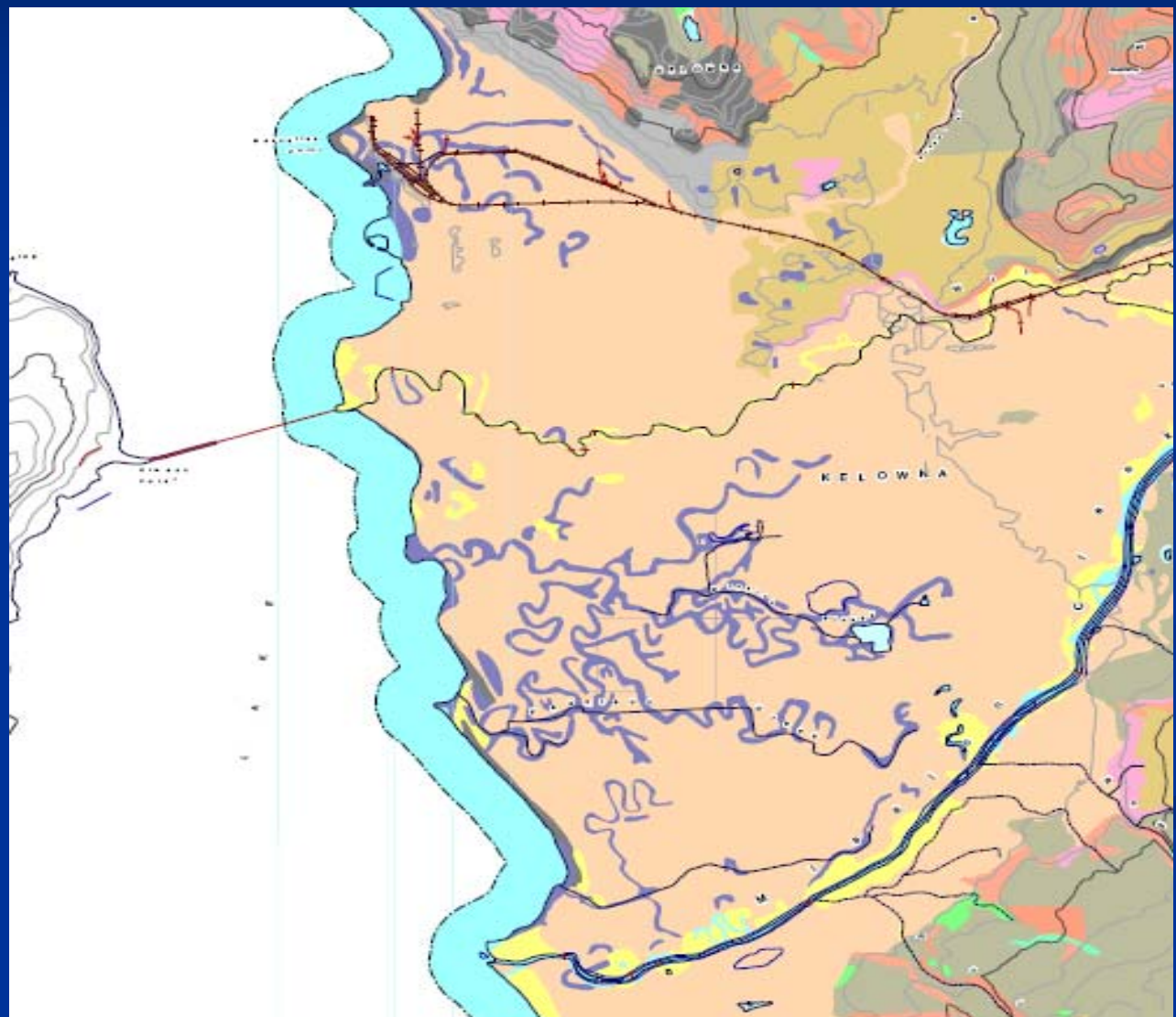

BLACK COTTONWOOD (CD)-1938
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3


BLACK COTTONWOOD (CD)-2005
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3

Black Cottonwood – red-osier dogwood

86 % of this ecosystem has been lost for the City of Kelowna

Shallow open water – oxbow ecosystem – 1938, 1800



Shallow open water – oxbow ecosystem

Over 80% is gone from the City of Kelowna

Idaho fescue – bluebunch wheatgrass ecosystem

Vernon area 1913
Idaho fescue – bluebunch wheatgrass grassland then

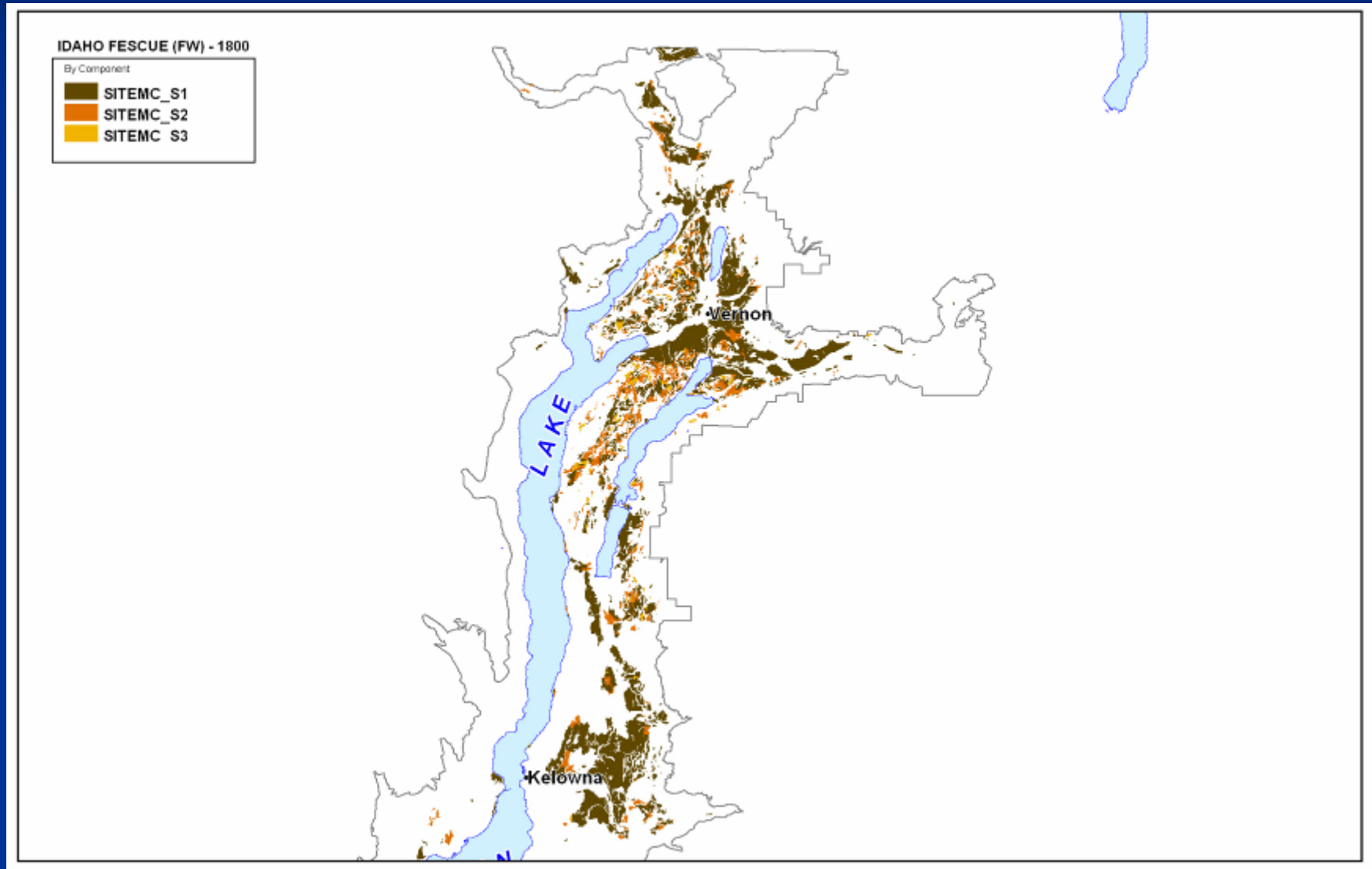
Description Idaho fescue – bluebunch wheatgrass

- Grasslands dominated by Idaho fescue, bluebunch wheatgrass, many forbs and other graminoids
- Occurs on glaciofluvial, fluvial and morainal materials

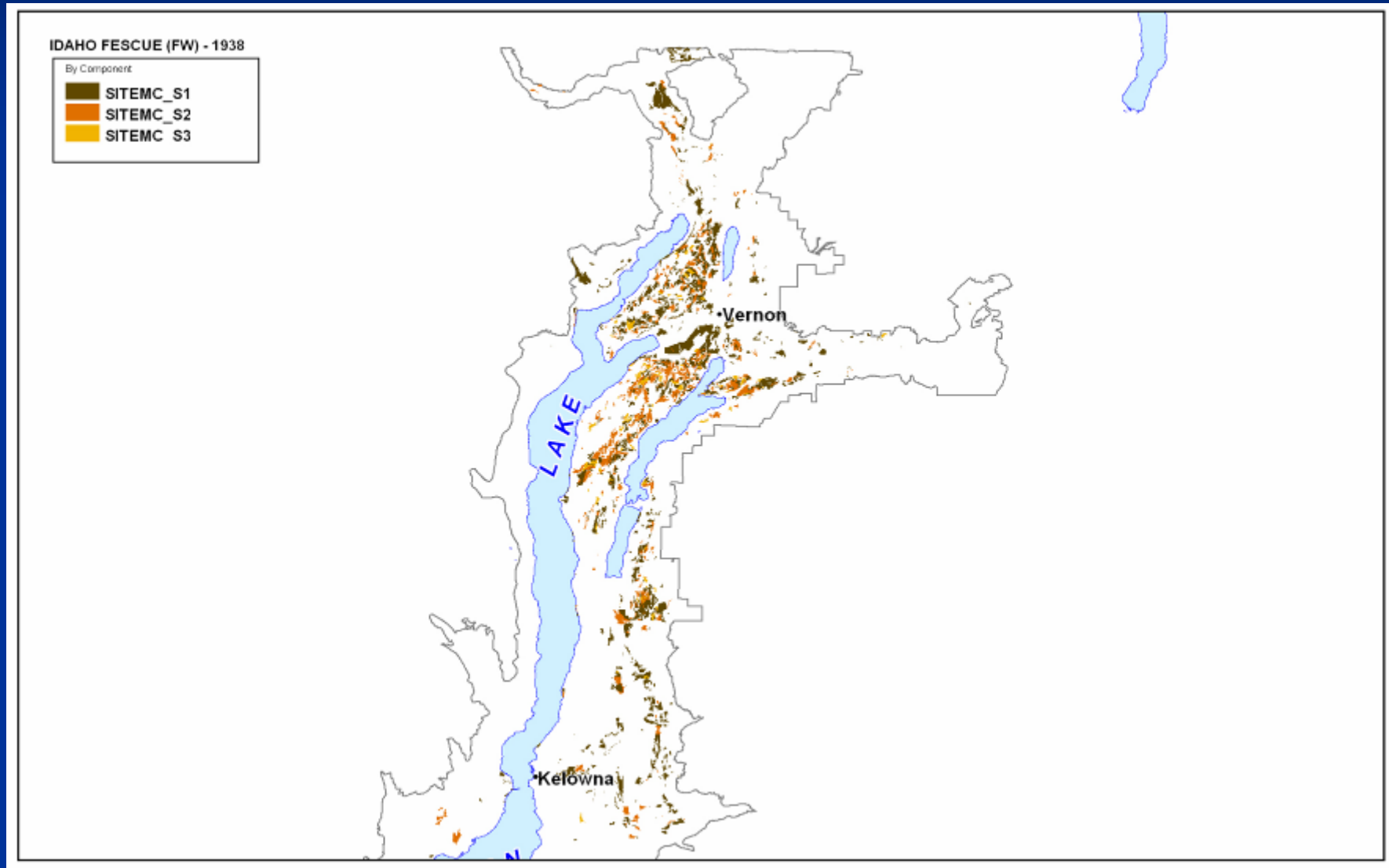
Species at Risk in Idaho fescue – bluebunch wheatgrass

- Badger
- Burrowing Owl
- Pallid Bat
- Great Basin Gopher Snake
- Western Rattlesnake
- Long-billed Curlew

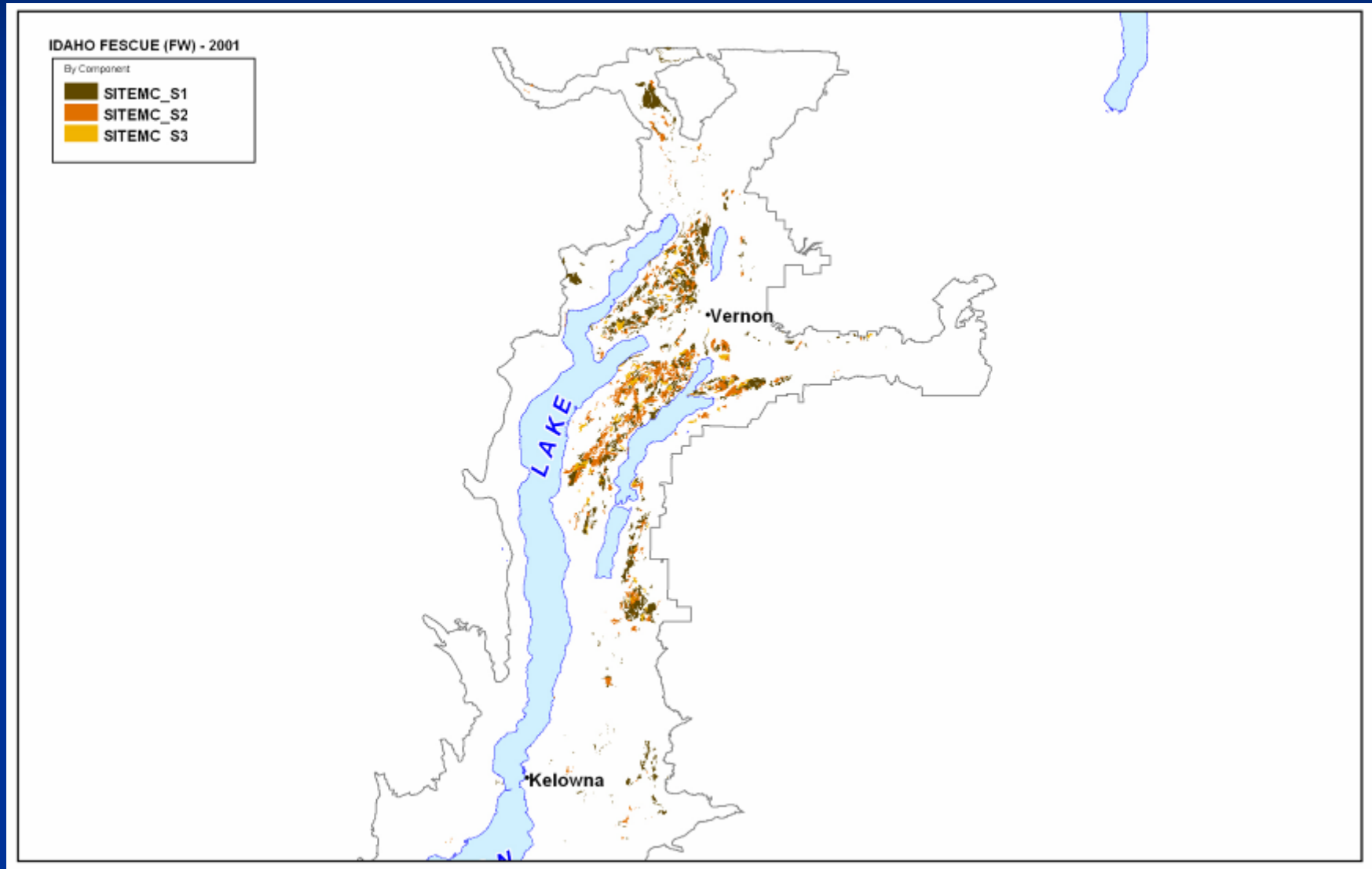
1800 Idaho fescue – bluebunch wheatgrass



1938 Idaho fescue – bluebunch wheatgrass



2005 Idaho fescue – bluebunch wheatgrass



Fescue Grasslands – one of few remaining pieces near Vernon

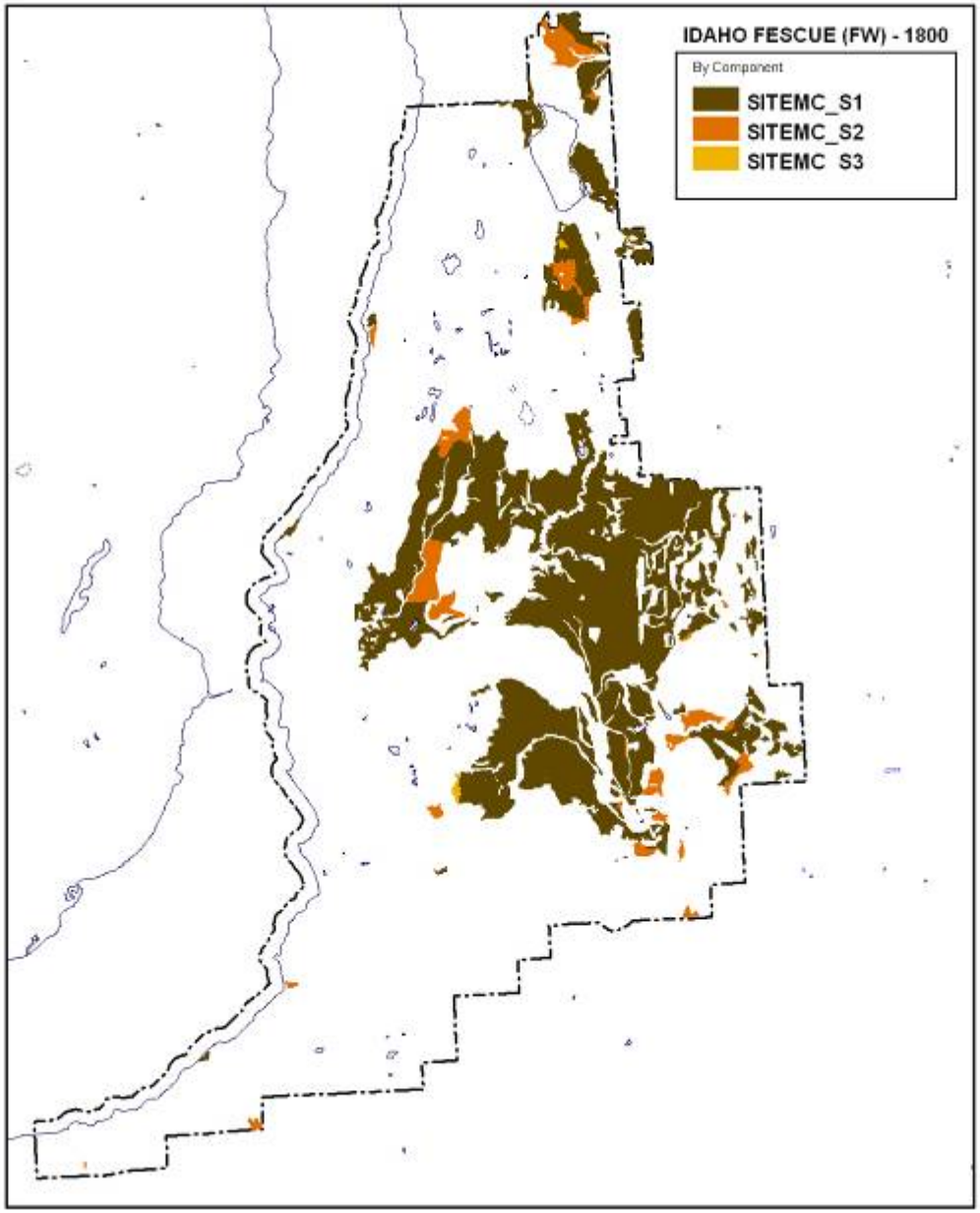
Idaho fescue – bluebunch wheatgrass

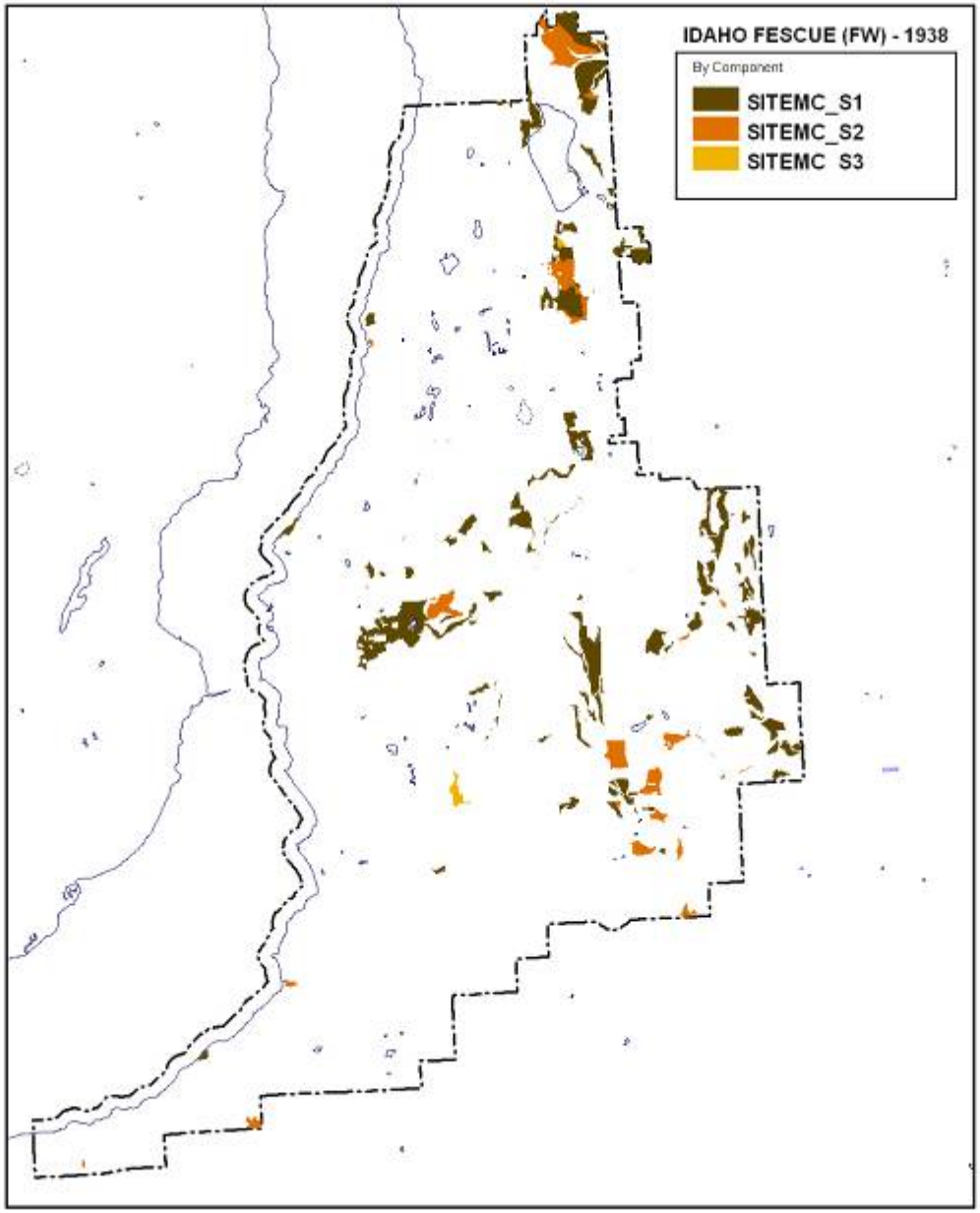
77 % of this ecosystem has been lost in the Okanagan

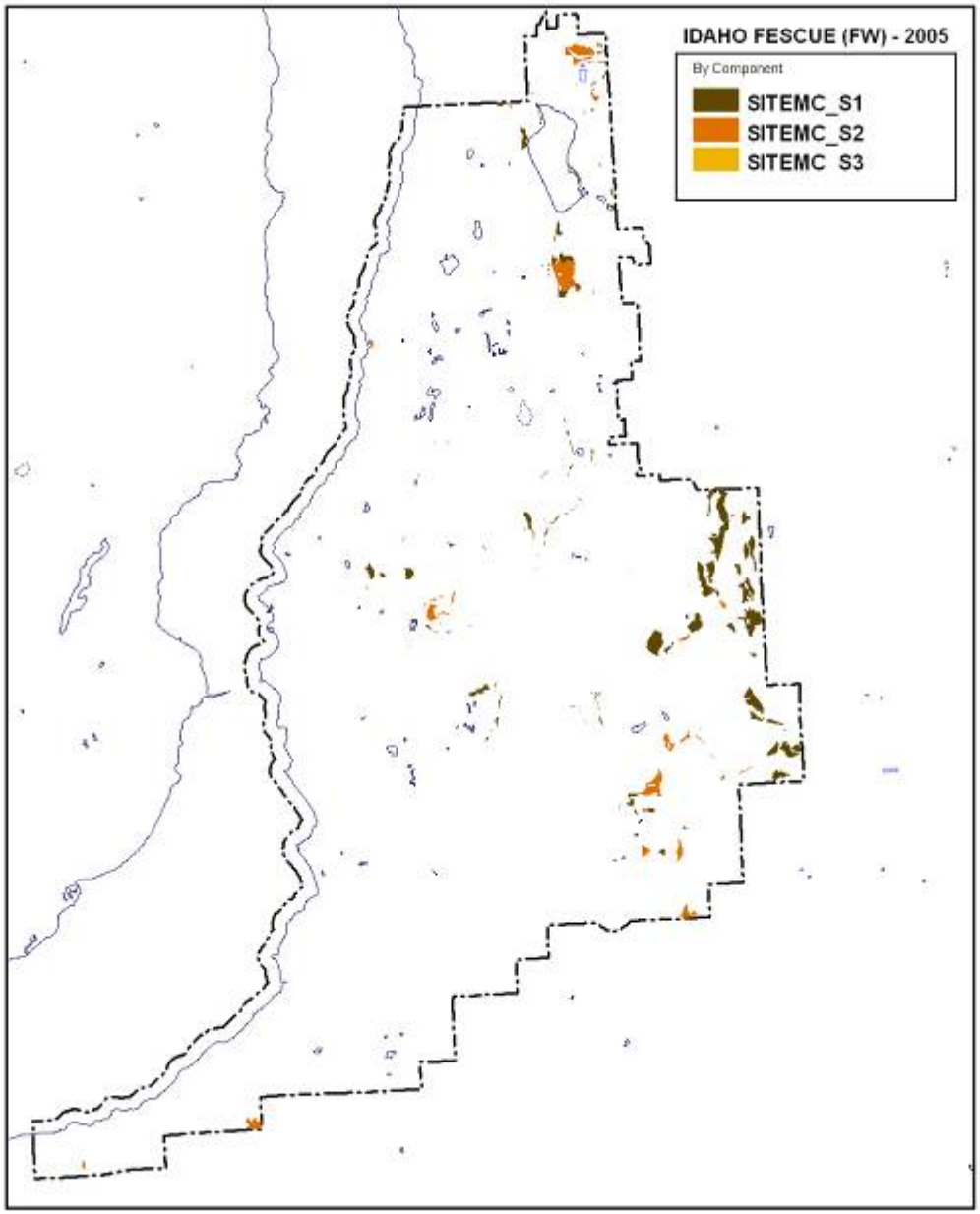
*Much of remaining is in poor condition – invasive aliens – early seral due to livestock grazing

Idaho fescue – bluebunch wheatgrass

City of Kelowna


IDAHO FESCUE (FW) - 1800
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3


IDAHO FESCUE (FW) - 1938
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3


IDAHO FESCUE (FW) - 2005
By Component
SITEMC_S1
SITEMC_S2
SITEMC_S3

Idaho fescue – bluebunch wheatgrass

93 % of this ecosystem has been lost for the City of Kelowna

Uses of Ecosystem Mapping #1

- Dramatic visual display to demonstrate extent of ecosystem loss to local and regional government and developers
- Helps to support requests for sustainable habitat protection/sustainable development by clearly demonstrating unsustainable practices
- Quantifies reasons for habitat loss when combined with current mapping (ie x% due to agriculture (or even types of agriculture); x% to urban, etc.)
- Quantifies threats to habitat and aids in target threat reduction efforts.

Uses of Ecosystem Mapping #2

- Determining loss of habitat for species at risk
- Used to determine habitat value for species at risk - present potential, capability; potential Critical Habitat
- Current mapping can be used to stratify inventory for species at risk (Dark Saltflats Tiger Beetle example – alkaline ponds)
- Prioritizing habitats for conservation based on importance for species and how much has been lost

Uses of Ecosystem Mapping #3

- Helps with species Status Reports assigning trends in habitat - (Sooty Hairstreak, Rocky Mountain Ridged Mussel, Nuttall's Cottontail, Yellow-breasted Chat, Behr's Hairstreak, Mormon Metalmark, Sage Thrasher, Sage Grouse)
- Used for restoration of habitats - e.g. riparian areas that were channelized, identifying what is capable of being restored, where restoration is most cost effective or probable (in combination with current maps and ownership)

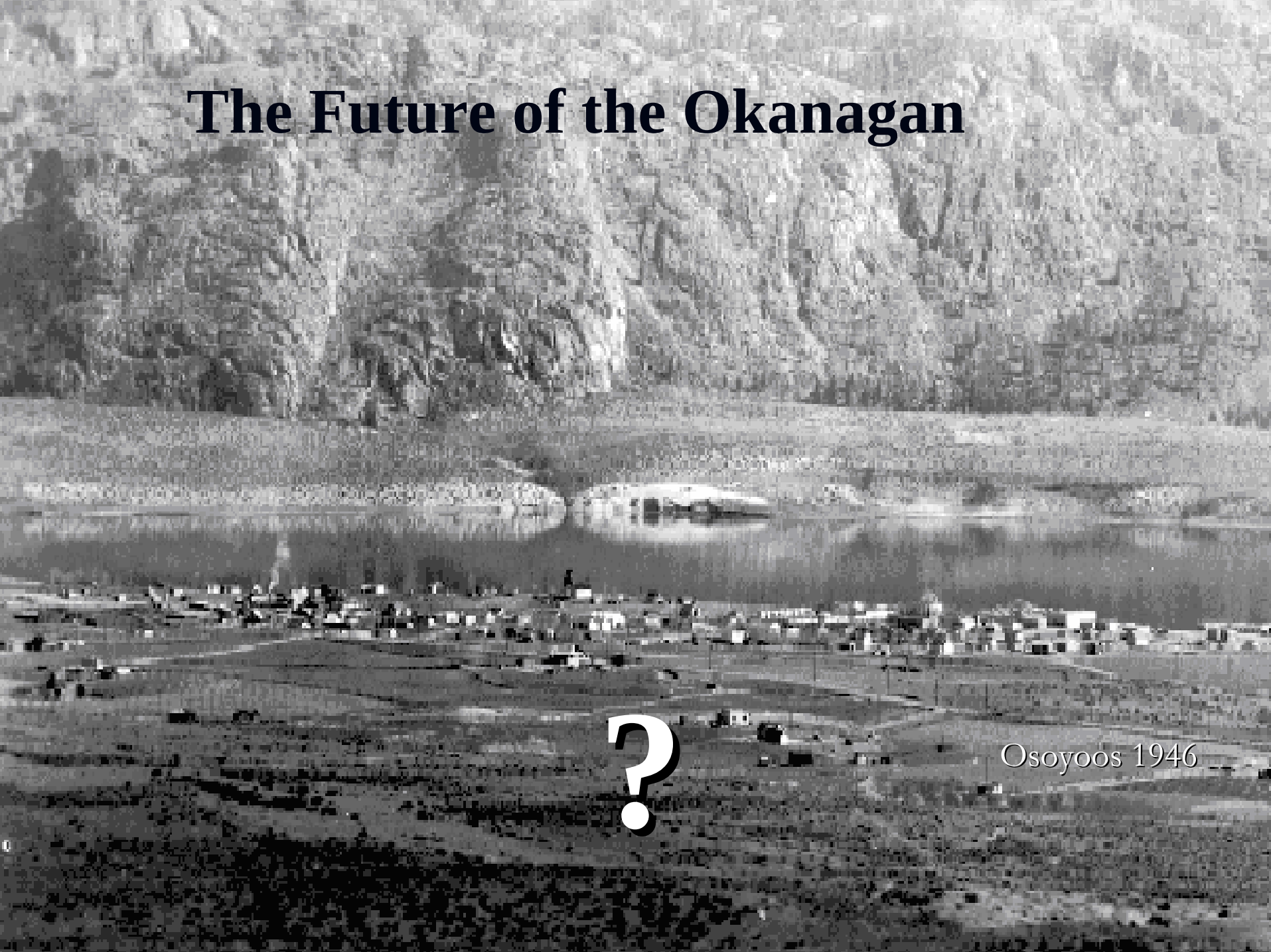
Uses of Ecosystem Mapping #4

- Indicates importance of remaining pieces - what is lost compared with targets for functional ecosystem conservation on a landscape scale
- Shows that ecosystems can be completely or mostly lost, caused by humans

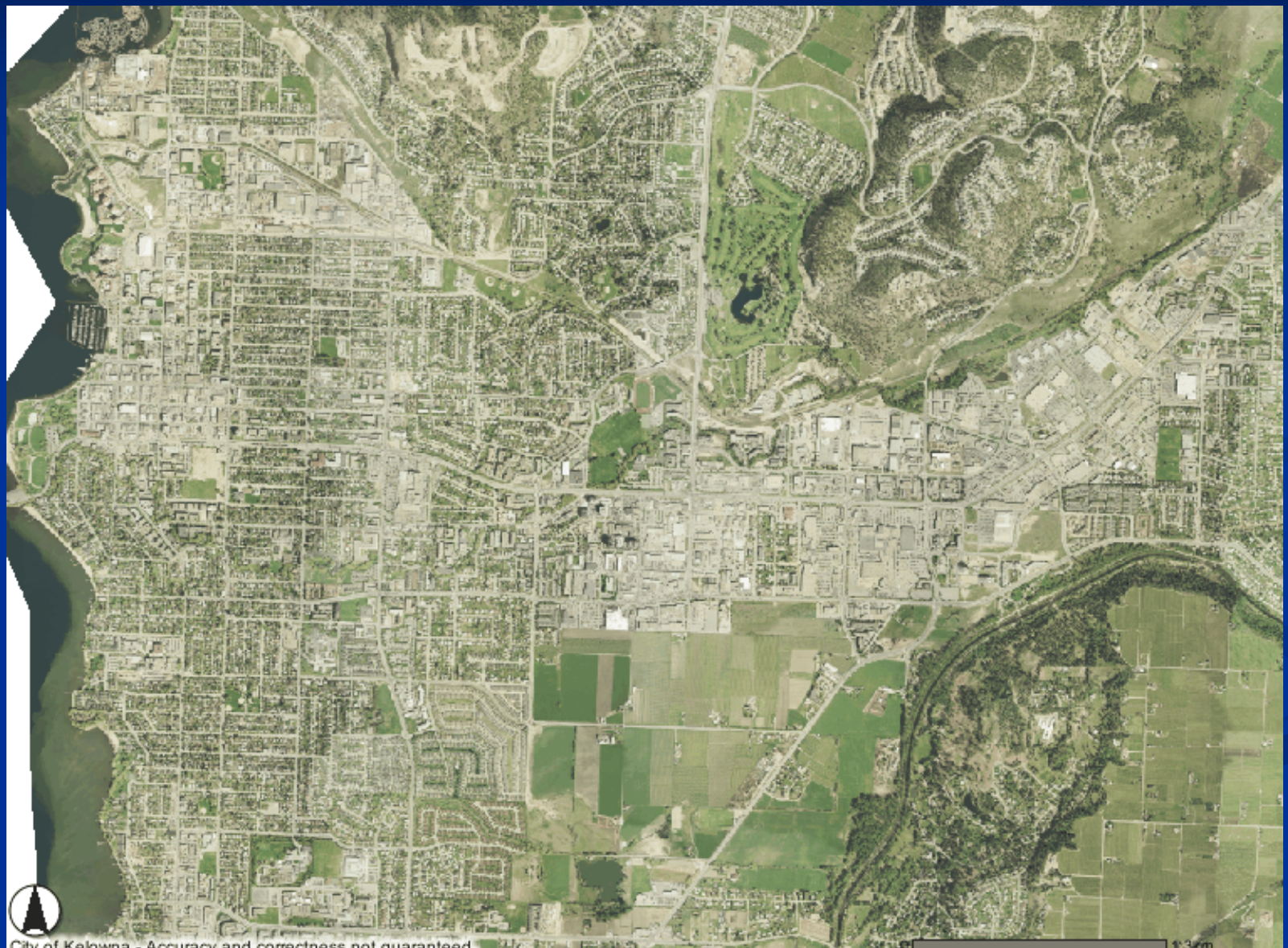
Need for Protection for Ecosystems at Risk

- The pieces we need to save to maintain species are the ecosystems that support them, many that are ecosystems at risk
- It is time to focus more effort on the ecosystems or we won't be able to maintain many of the species presently at risk and many more species will be added to the at risk lists
- Need for Ecosystems at Risk Legislation

The Future of the Okanagan



Urban Jungle



Wine for All

The SunRock Vineyard, overlooking Lake Okeypoo, is producing many highly

Planet of Weeds

A True Desert

Return of the glaciers

Acknowledgements

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- Lyle Ottenbreit, VISION-L Graphics
- Joe Boyd, Trackside Consulting Inc.
- Historical photos from BC and Vernon Archives
- Many others!

Final Results – Kelowna

	Western Birch – Red-osier dogwood riparian	Idaho Fescue blue-bunch wheat grass	Ponderosa pine Blue-bunch Wheat-grass	Black Cotton-wood -red-osier dogwood	Urban	Cultivated	
1800	3084 ha	3653	4510	1287	0	0	
1938	498	858	3061	558	290	7617	
2001	117	246	1211	188	5903	7459	
% Lost	96	93	74	86			

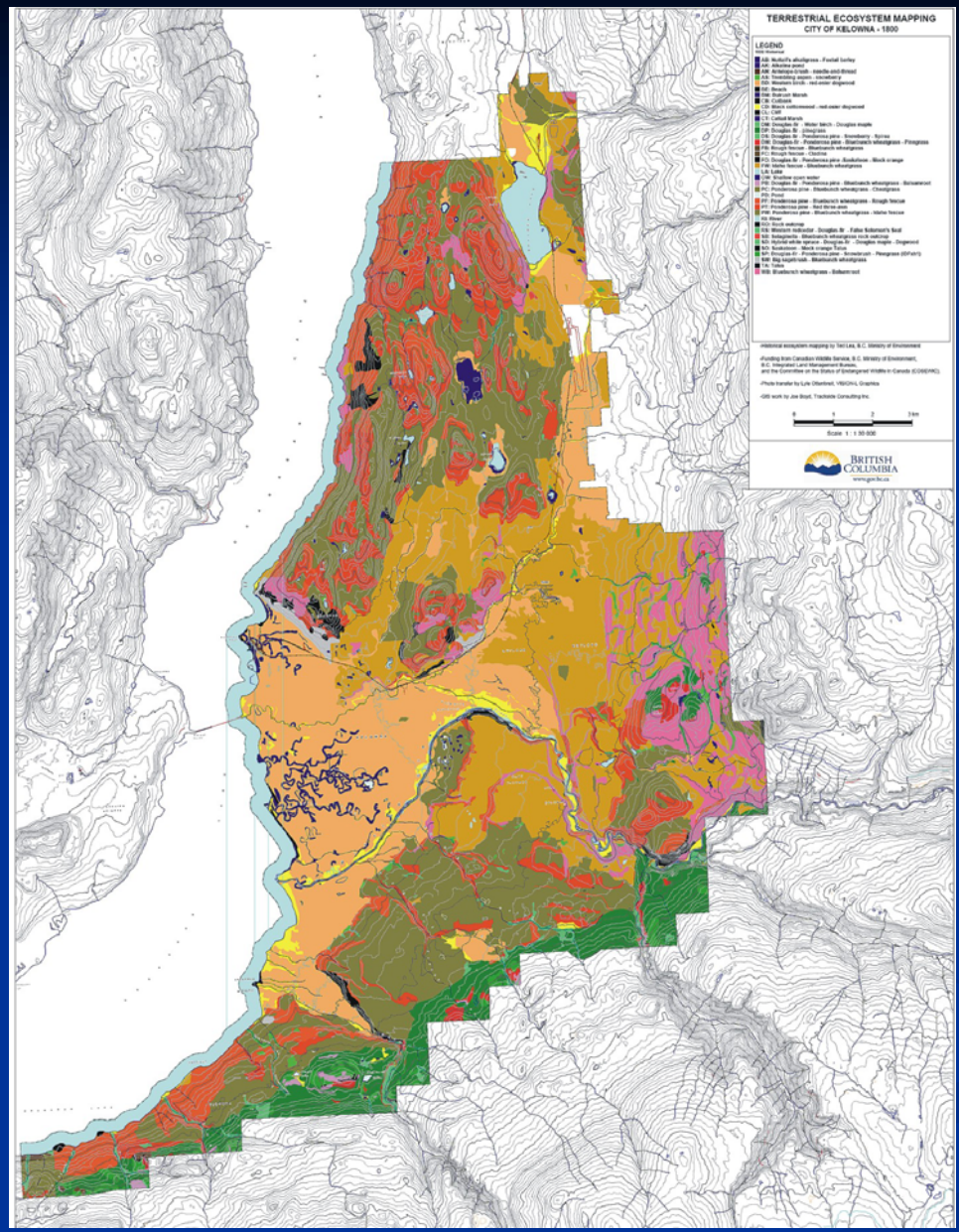
Final Results – Okanagan Valley

	Western Birch – Red-osier dogwood riparian	Idaho Fescue blue-bunch wheat grass	Antelope -brush shrub steppe	Big Sage shrub steppe	Ponderosa pine Blue-bunch Wheat-grass	Black Cotton-wood -red-osier dogwood	Cattail Marsh
1800	14,629 ha	19,253	9905	12,233	15,149	8111	430
1938	4557	8657	7325	10,314	11,471	5176	387
2005	1207	4395	3160	8266	7172	2964	257
% Lost	**92**	**77**	**68**	**33**	**53**	63	41

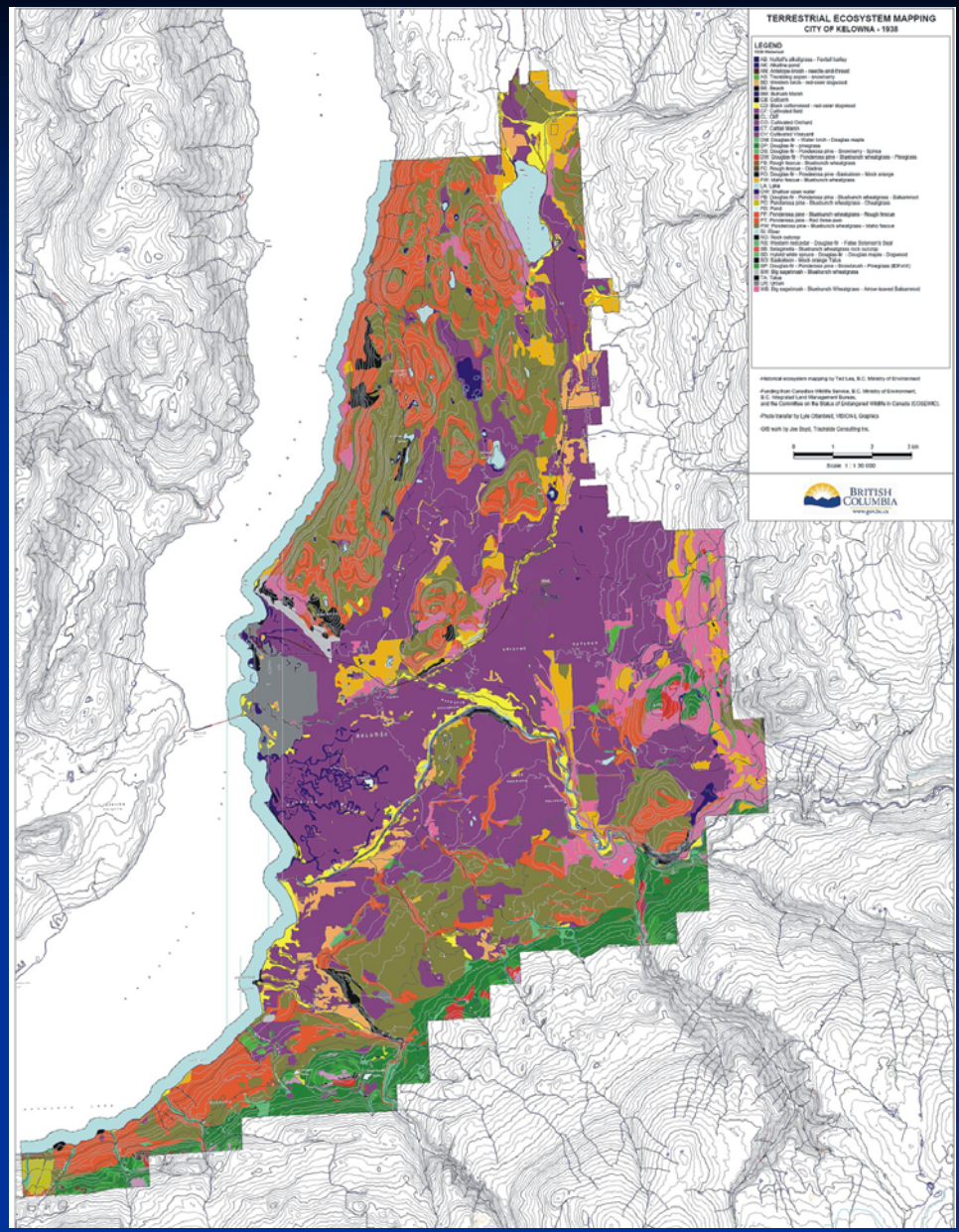
Quote - America's Endangered Ecosystems
Robert Peters and Reed Noss (1995)

"Until recently, most measures to save declining species have been upside down. Typically, what happens is that ecosystems are degraded without public concern until some of their component species approach extinction."

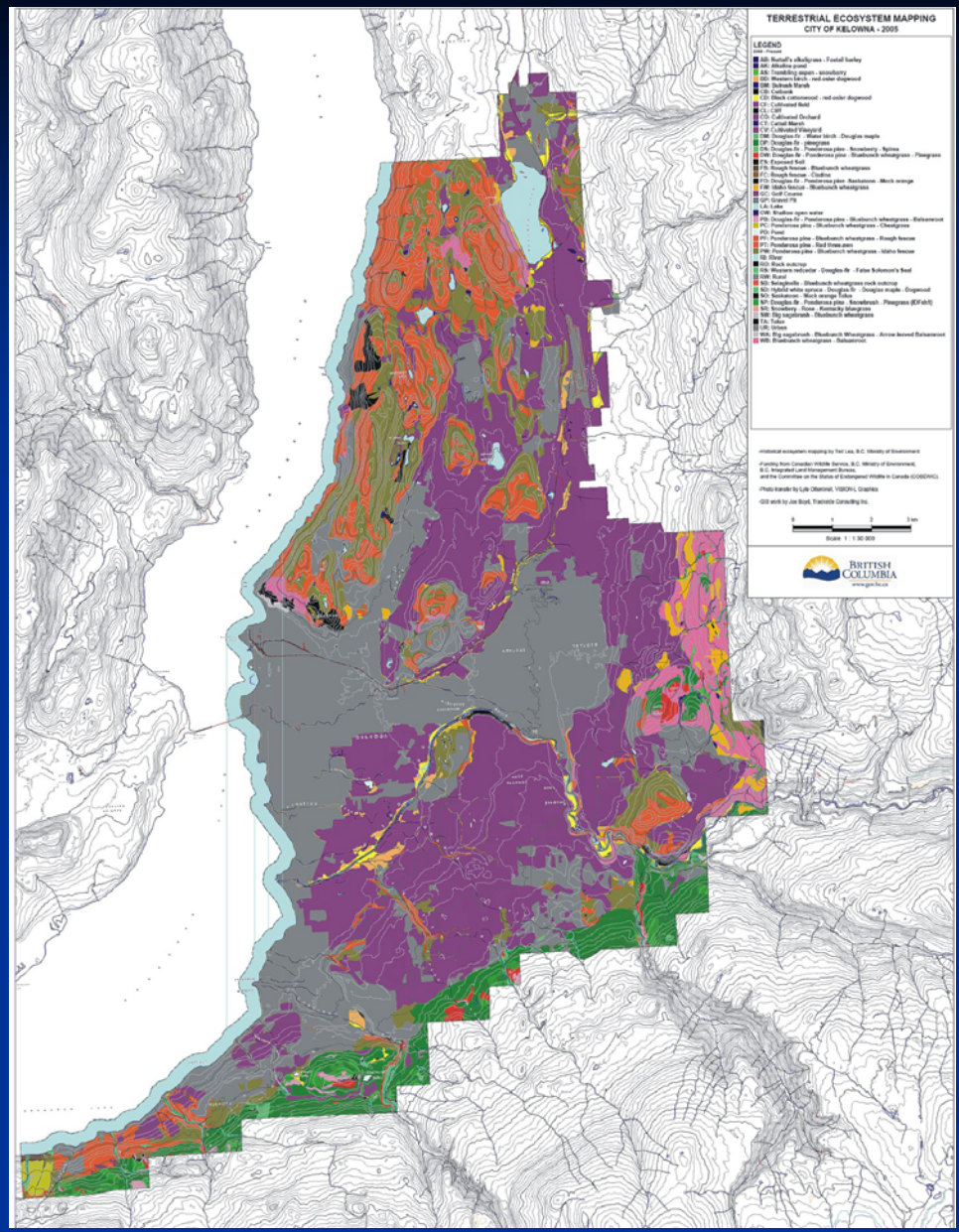
"It is grossly inefficient to wait until species are endangered and then work backwards to try to protect their habitat. Instead, conservation efforts should pre-emptively identify all ecosystems in present or potential danger and act decisively to save them before further decline. By conserving adequate expanses of all types of ecosystems, we would ensure that many vulnerable species are stabilized before listing is needed."


TERRESTRIAL ECOSYSTEM MAPPING
CITY OF KELOWNA - 1800
LEGEND
BRITISH COLUMBIA

1800


TERRESTRIAL ECOSYSTEM MAPPING
CITY OF KELOWNA - 1938
LEGEND
BRITISH COLUMBIA

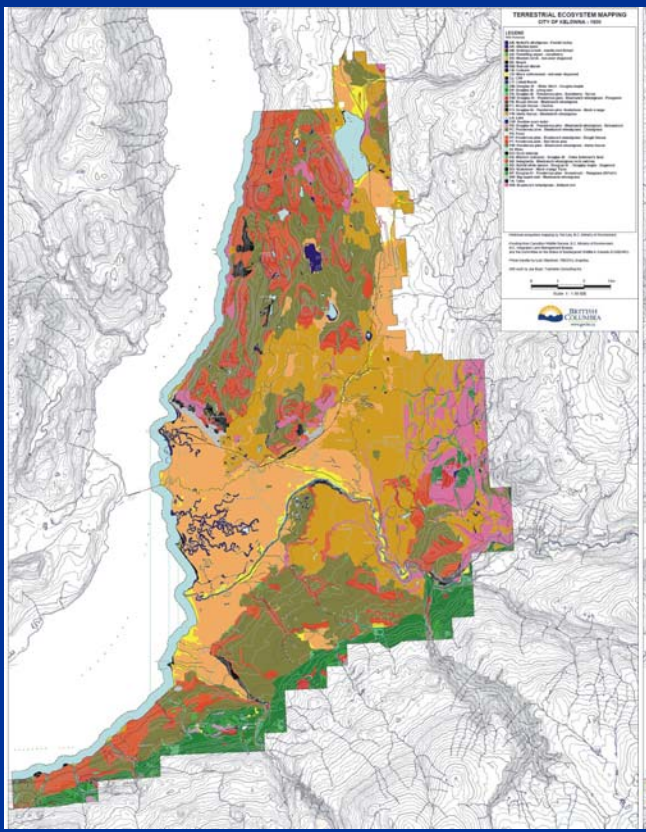
1938


TERRESTRIAL ECOSYSTEM MAPPING
CITY OF KELOWNA - 2005
LEGEND
BRITISH COLUMBIA

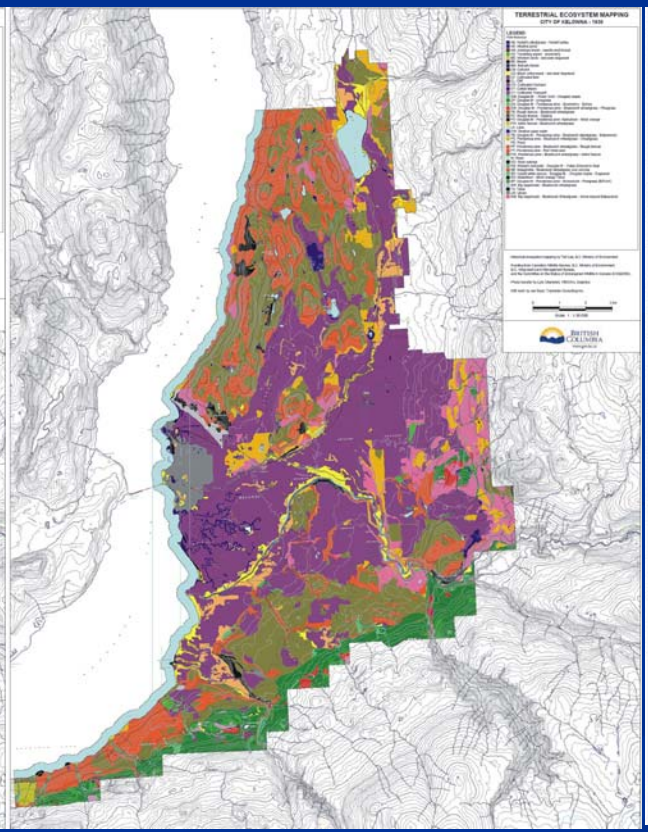
2001

THE END

1800



1938



2001