

Economic Activity and Ecosystem Services in the North Saskatchewan River Basin

Presentation to the NSWA, June 2010



Well-Being in Alberta

In 2007 the gross domestic product (GDP) of Alberta was \$256.9 Billion

- Average of \$74,354 for every person
 - 60% higher than the Canadian average (\$46,441)
 - 30% higher than 2nd place Newfoundland and Labrador (\$57,348)
 - 46% higher than 3rd place Saskatchewan (\$51,327).
- GDP is also referred to as the “standard of living”
- Some people consider GDP to be a key measure of “sustainable development”

But, GDP doesn't tell the whole story.....

Well-Being in Alberta

Many problems with GDP

- Doesn't distinguish “good” activity from “bad” activity
 - Money spent on environmental clean-up is still economic activity and contributes to economic “growth”
- Doesn't factor changes in resource inventories
 - Measures well-being based on what you spend; not what you save or own (capital)
 - Income can increase by selling or harvesting assets, but change in value of assets not included in GDP

Well-Being in Alberta

Many problems with GDP

- Doesn't measure non-economic factors that contribute to human-well-being
 - Social indicators (health, crime, etc.)
 - Environmental indicators (air quality, water quality, etc.)
- Doesn't measure the services that the environment provides for us and we don't have to pay for
 - Referred to as “Ecological Goods and Services (EGS)”

Presentation Outline

Study for NSW had two objectives:

- Measure economic activity in each sub-basin (GDP)
- Measure the value of EGS in each sub-basin

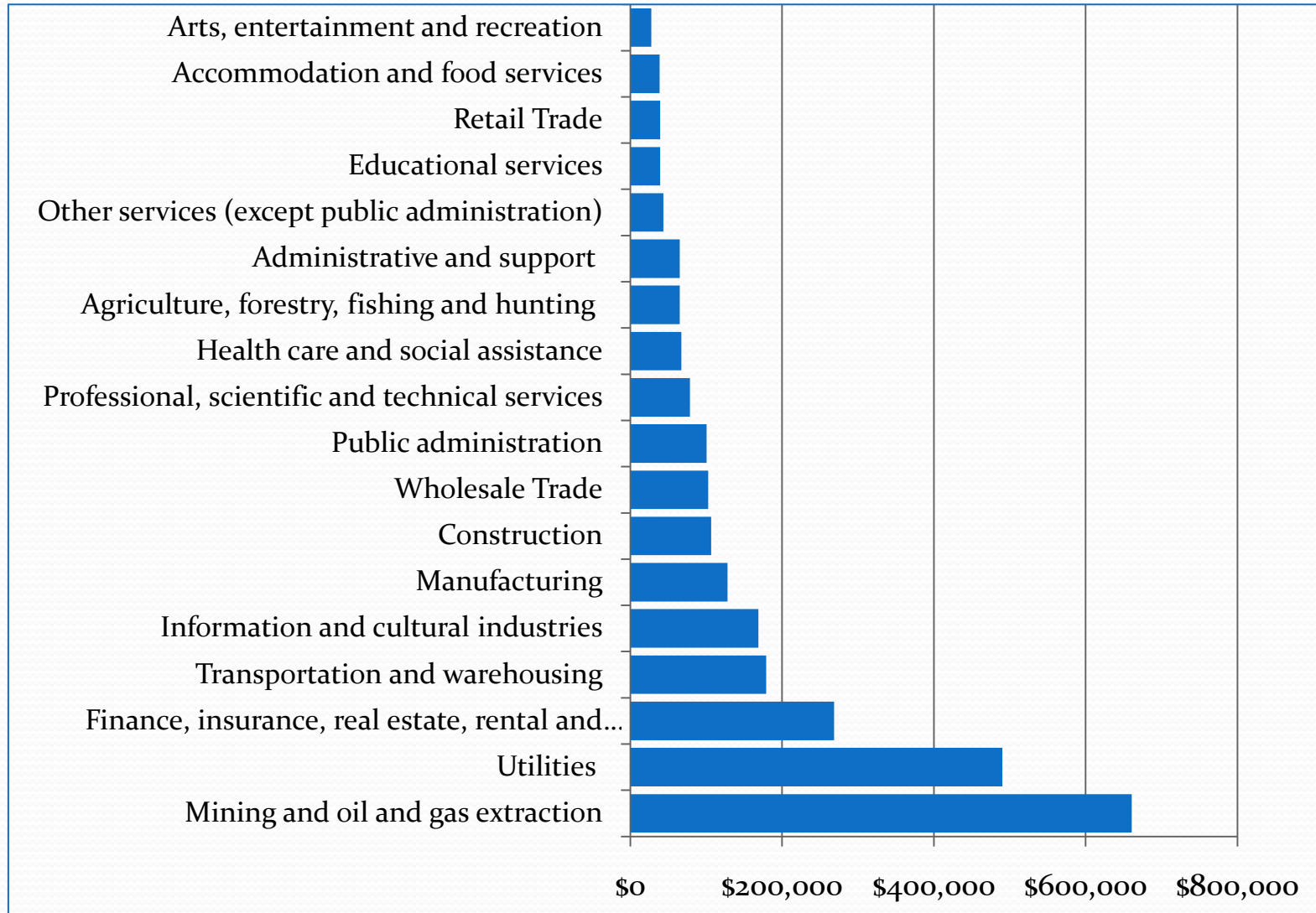
Presentation will briefly describe:

- What we did
- What we found
- What does it mean

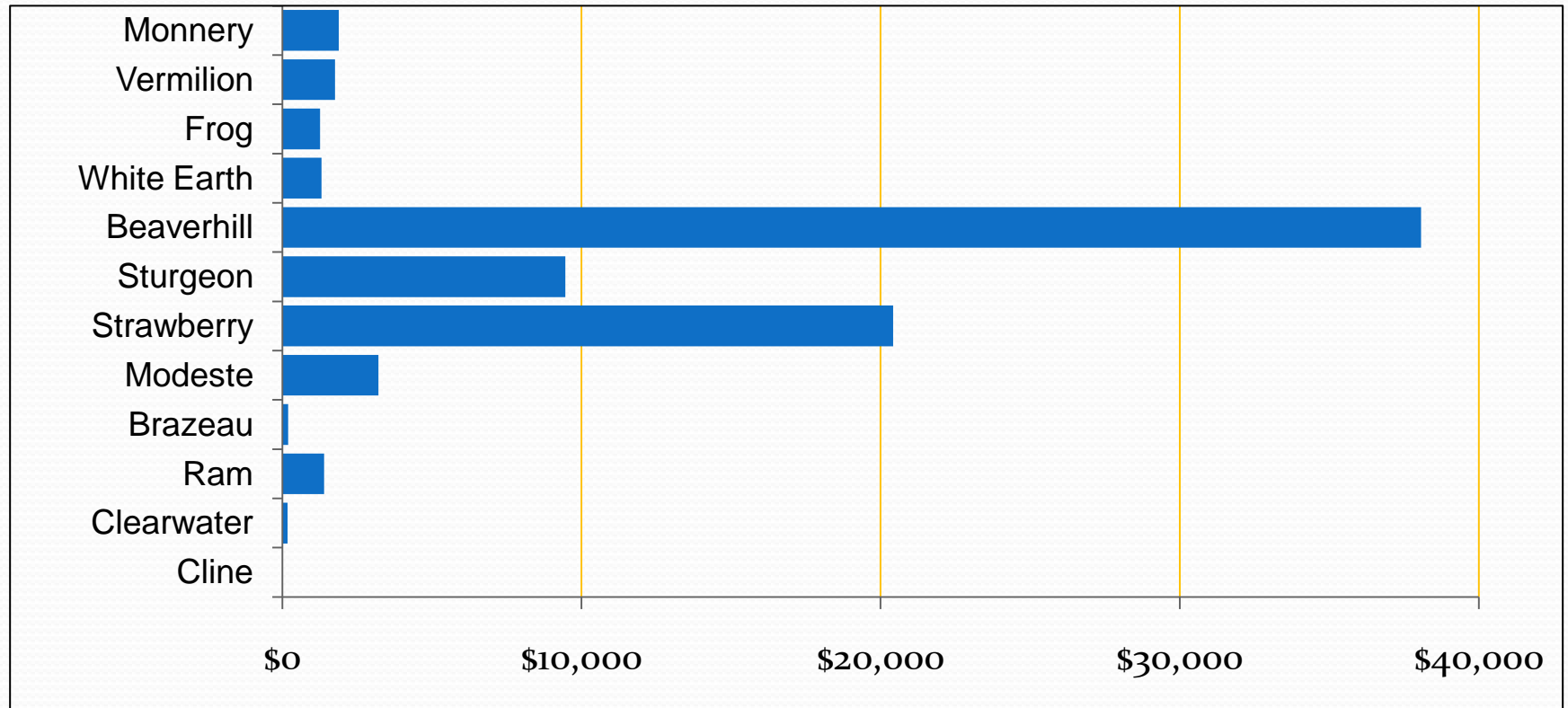
Economic Activity by Sub-Basin

- Measurement of GDP
 - Only measured at provincial scale
 - Difficult to estimate for regions, communities or watersheds
 - Developed new methodology based on employment
 - Calculate average GDP per job
 - GDP based on employment profile for each sub-basins
- Total GDP in NSWA calculated to be \$79.1 billion

Average GDP per Job in Selected Industries



GDP by Sub-basin (Millions)



Capital Region (3 sub-basins) account for

- 86% of economic activity
- 89% of the population

Ecological Goods and Services by Sub-Basin

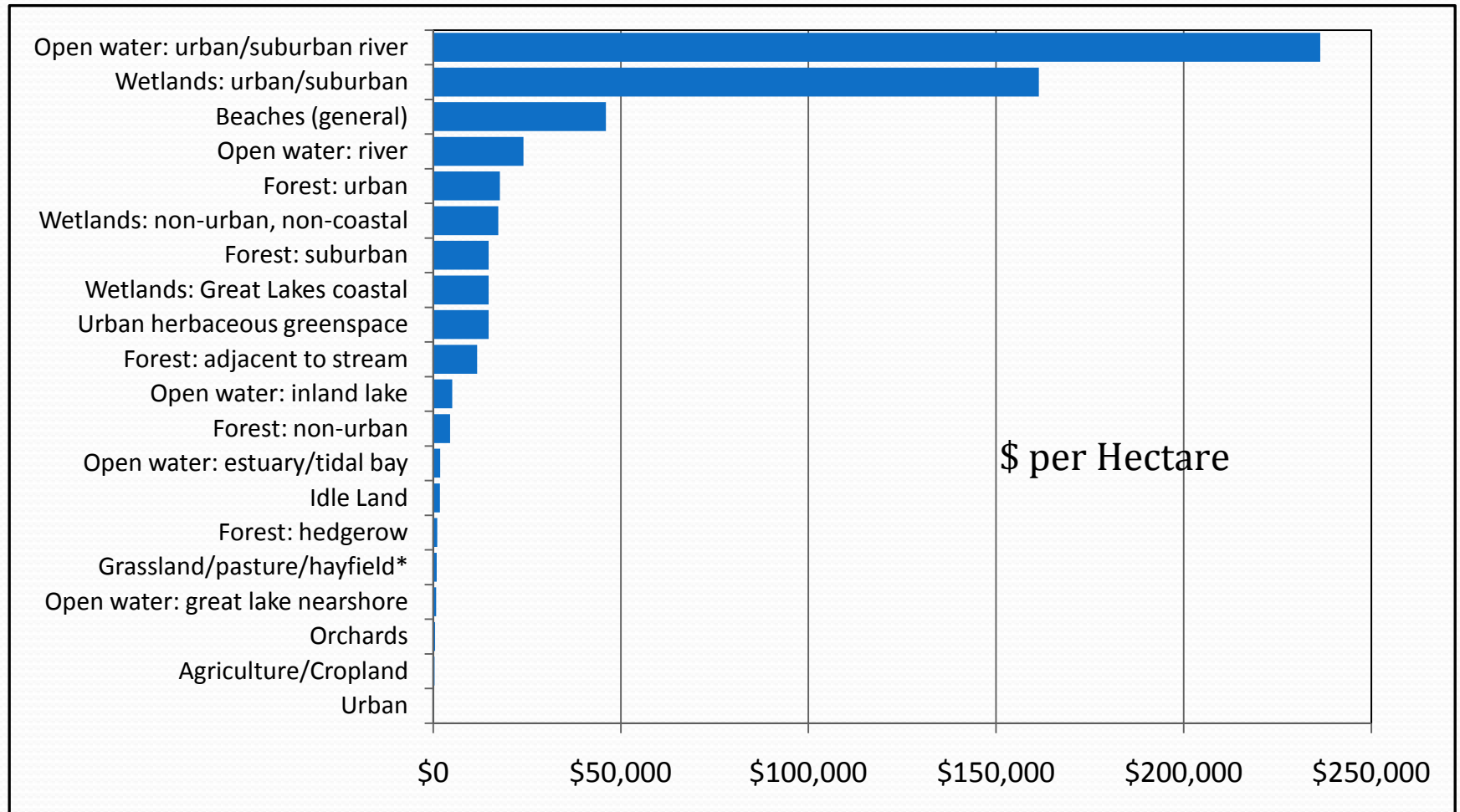
- Measurement of EG&S values
 - Previous studies have identified 18 different categories of ecosystem functions, goods and services
 - Ecosystem functions are related to land cover types
 - No studies directly relevant to the NSWA
- Drew values from recent studies in Ontario, Boreal ecosystem and Mackenzie watershed (\$ per hectare)
- Able to provide estimates for 10 ecosystem services for 14 land cover types
- Total EG&S values in NSWA calculated to be \$17.7 billion

Ecosystem Service	Ecosystem Function
1. Gas regulation	Role of ecosystems in bio-geochemical cycles (e.g. CO ₂ /O ₂ balance, ozone layer)
2. Climate regulation	Influence of land cover and biological mediated processes on climate
3. Disturbance prevention	Influence of ecosystem structure on environmental disturbances
4. Water regulation	Role of land cover in regulating runoff and river discharge
5. Water supply	Filtering, retention and storage of fresh water
6. Soil retention	Role of the vegetation root matrix and soil biota in soil retention
7. Soil formation	Weathering of rock, accumulation of organic matter
8. Nutrient cycling	Role of biota in storage and re-cycling of nutrients (e.g. nitrogen)
9. Waste treatment	Role of vegetation and biota in removal or breakdown of xenic nutrients and compounds
10. Pollination	Role of biota in the movement of floral gametes
11. Biological control	Population and pest populations
12. Habitat	Role of biodiversity to provide suitable living and reproductive space
13. Food production	Conversion of solar energy, and nutrient and water support for food
14. Raw materials	Conversion of solar energy, nutrient and water support for natural resources
15. Genetic resources	Genetic materials and evolution in wild plants and animals
16. Medicinal resources	Biochemical substances in and other medicinal uses of biota
17. Recreation	Variety in landscapes
18. Education, culture & spirituality	Variety in natural landscapes, natural features and nature

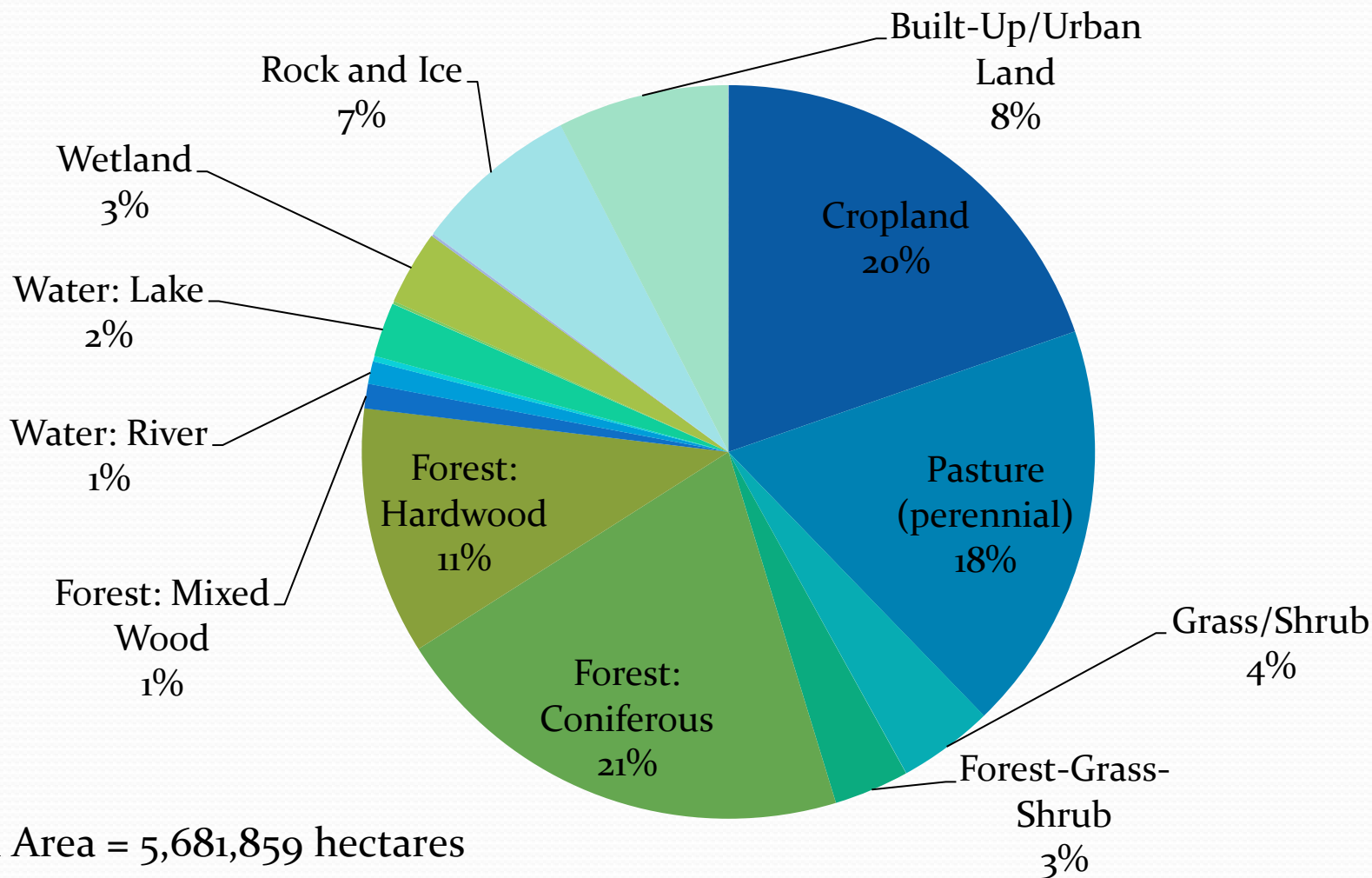
Value of Ecosystem Services by Land Cover Type (\$ per hectare)

Land Cover Type	Climate Regulation	Disturbance avoidance	Water regulation	Water supply	Soil retention	Pollination	Habitat Bio-diversity	Recreation	Culture Aesthetic Amenity	Other Cultural
Agriculture/ Cropland	\$31					\$28		\$137		\$95
Pasture/ grassland	\$19	\$5	\$25		\$4	\$19	95	\$53		\$134
Grass/Shrub	\$19	\$5	\$25		\$4	\$19	95	\$53		\$134
Forest-Grass-Shrub	\$992					\$25				\$7
Forest-Coniferous	\$992		\$513				2,428	\$270		\$240
Forest-Hardwood	\$992		\$513				2,428	\$270		\$240
Forest-Mixedwood	\$992		\$513				2,428	\$270		\$240
Water: River				\$9,599	\$4,011					
Water: Urban/ Suburban River			\$45,768	\$17,690				\$172,691	\$242	
Water: Stream				\$9,599	\$4,011					
Water: Lake			\$612					\$3,820	\$593	\$25
Water: other water			\$612					\$3,820	\$593	\$25
Wetland: Non-urban	\$14		\$2,779				75	\$3,551	\$6,446	\$2,286
Wetland: Urban	\$14	\$99,318	\$3,168	\$48,929				\$9,861	\$129	
Anthropogenic - Lentic			\$612					\$3,820	\$593	\$25
Anthropogenic - Lotic			\$612					\$3,820	\$593	\$25

EG&S Values of Various Landscape Types

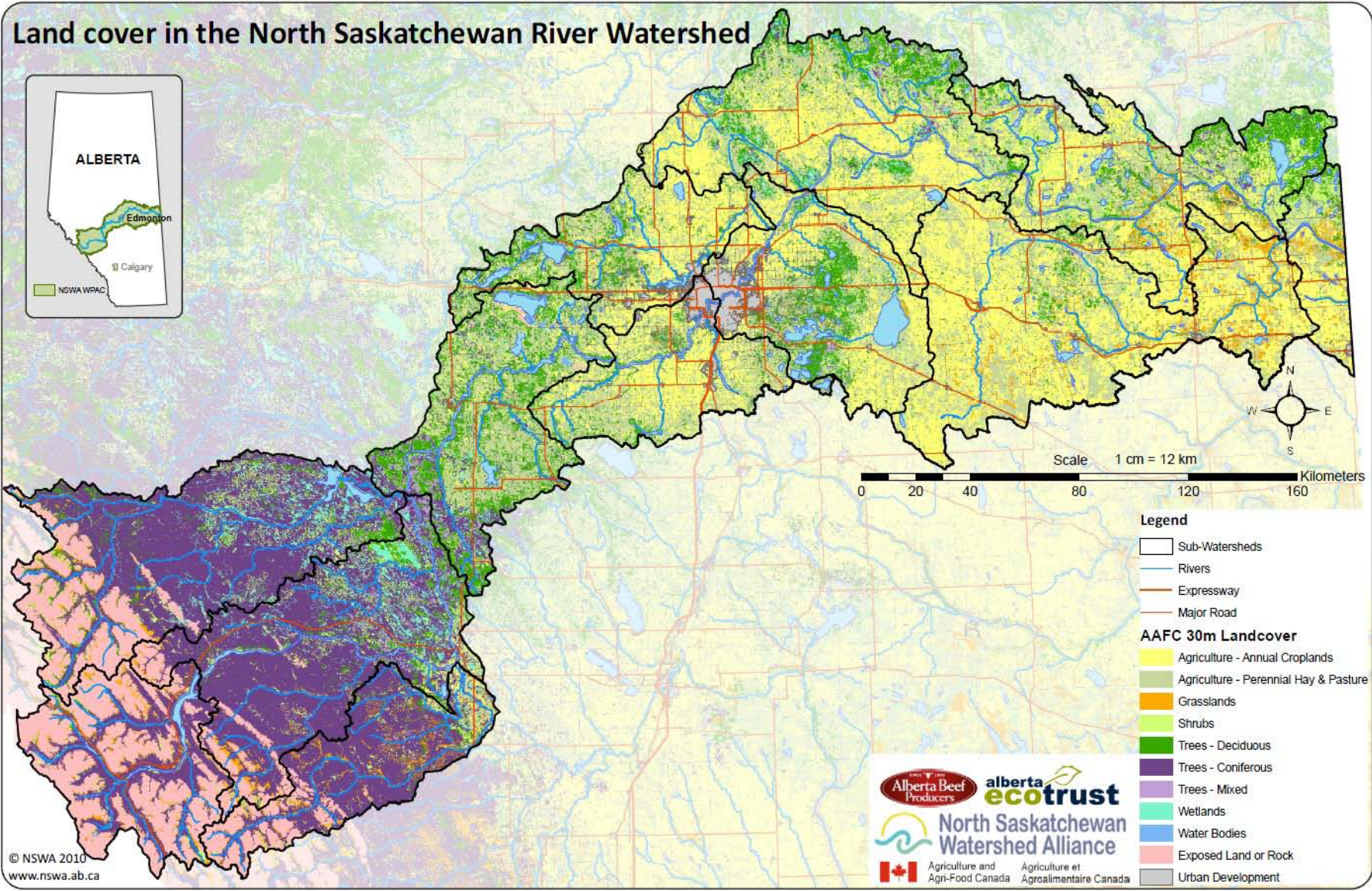


Land Cover in the North Saskatchewan River Basin



Total Area = 5,681,859 hectares

Land cover in the North Saskatchewan River Watershed

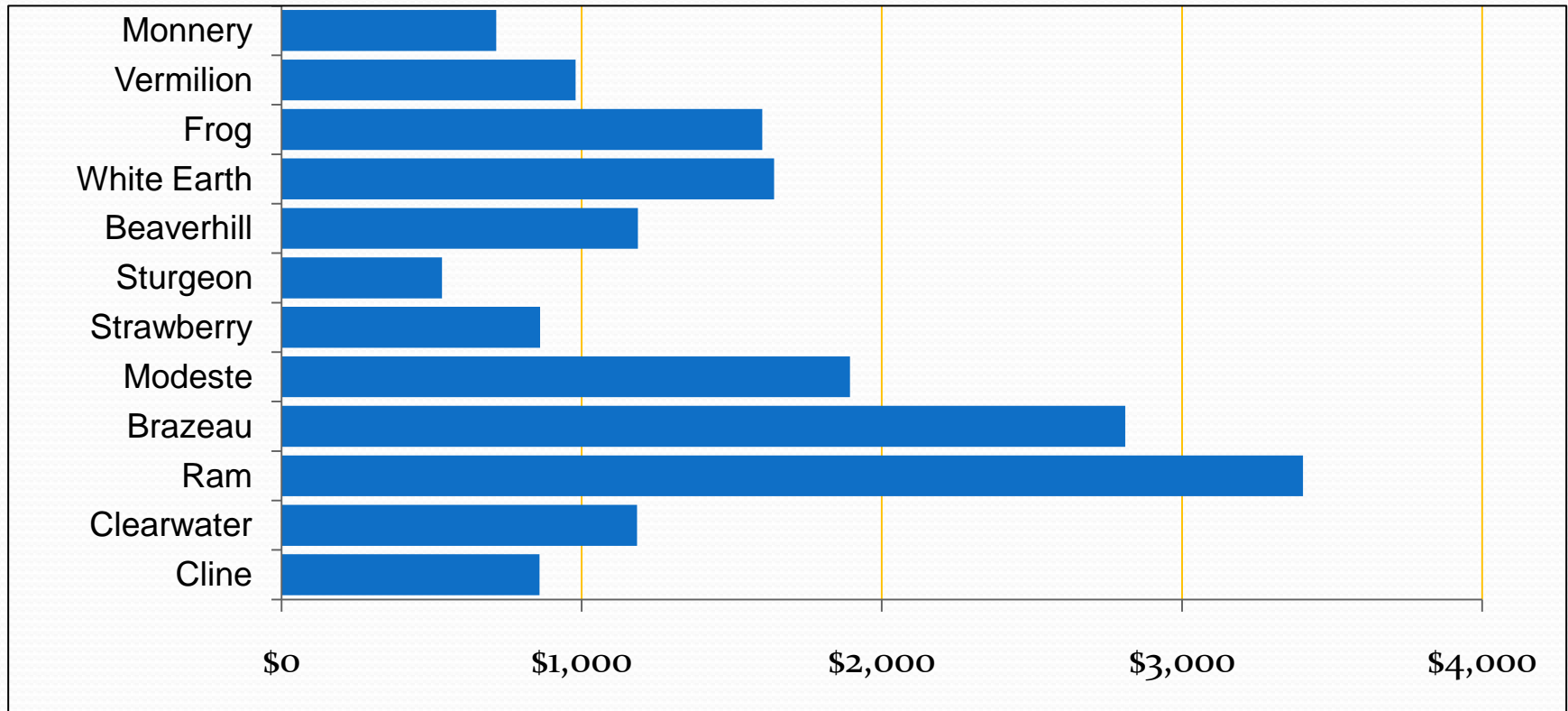


- Legend**
- Sub-Watersheds
 - Rivers
 - Expressway
 - Major Road
- AAFC 30m Landcover**
- Agriculture - Annual Croplands
 - Agriculture - Perennial Hay & Pasture
 - Grasslands
 - Shrubs
 - Trees - Deciduous
 - Trees - Coniferous
 - Trees - Mixed
 - Wetlands
 - Water Bodies
 - Exposed Land or Rock
 - Urban Development

© NSWA 2010
www.nswa.ab.ca



Value of EG&S by Sub-basin (Millions)



Majority of EG&S values in the upper sub-basins
Lower EG&S in the Capital Region (3 sub-basins) and
downstream (most populated & disturbed areas)

What does it mean?

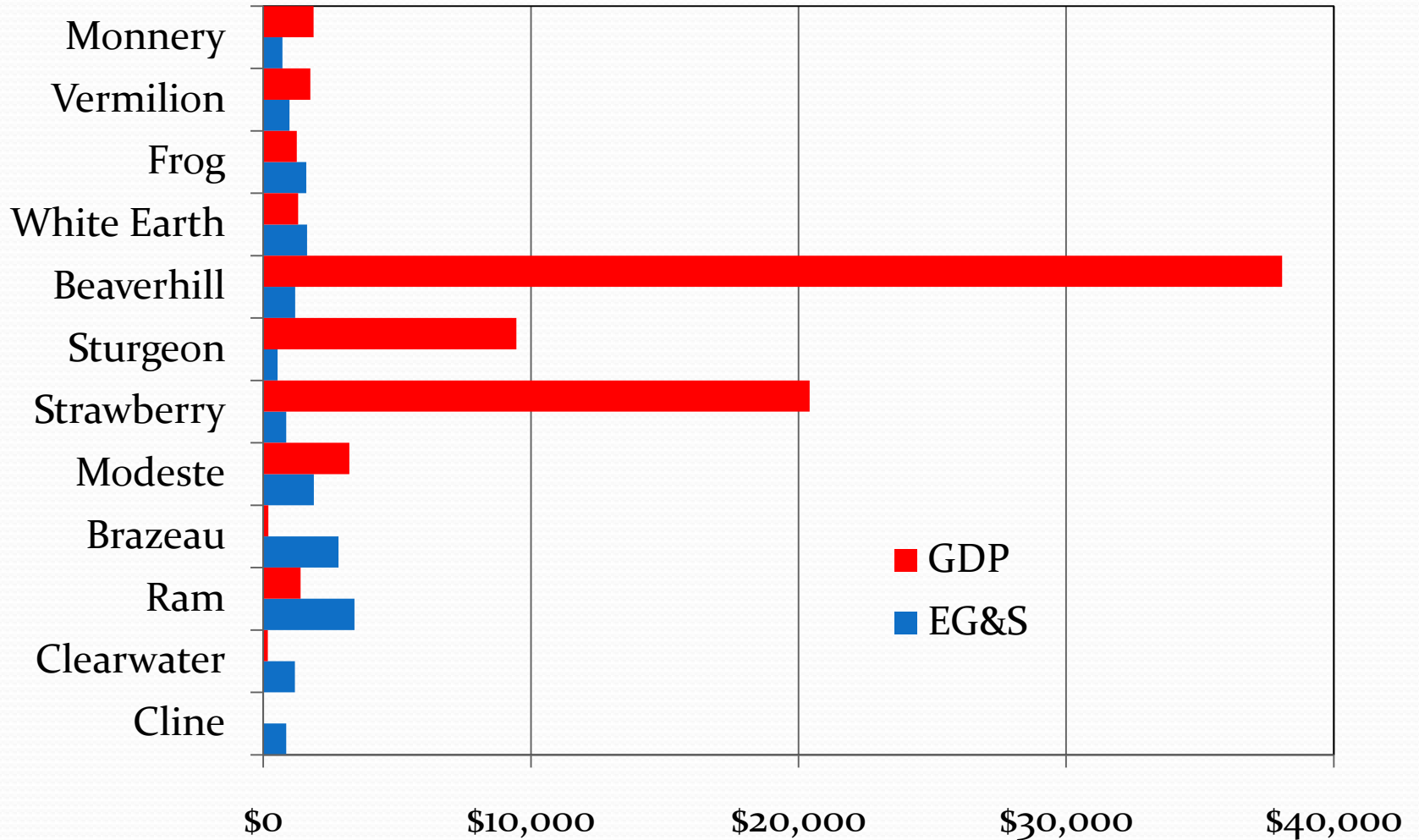
- Overall well-being of NSRB residents is \$96.8 billion
 - \$79.1 billion in GDP
 - \$17.7 billion in EGS (18% of the total)
- EGS values exceed GDP values in six sub-basins

Cline	Clearwater	Ram
Brazeau	White Earth	Frog

- These are primarily upstream of the Capital Region
- EGS values exceed GDP values in six sub-basins

Strawberry	Sturgeon	Beaverhill
Modeste	Vermilion	Monnery

Value of GDP and EG&S by Sub-basin (Millions)



What does it mean?

- Downstream residents benefit from EG&S in upper parts of the watershed
- Estimates of EG&S likely conservative because they include 10 of 18 ecosystems functions.
- Considerable opportunities to refine EG&S estimates:
 - Better accounting of carbon budgets
 - Evaluate changes in biological integrity
 - Undertake field studies on ecosystem functions in NSW
- Useful starting point for discussions of tradeoffs between EG&S and economic development
 - Key to sustainable development