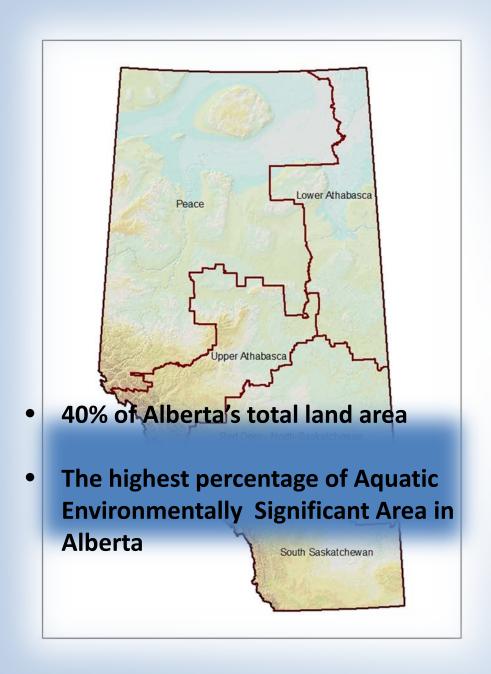


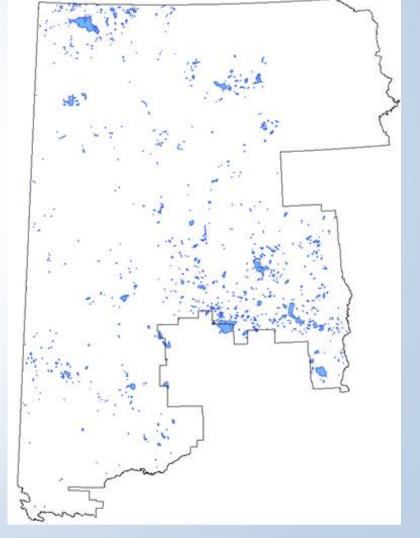
Lake Index and Lake Report Cards Peace Region Lakes

AEP Peace Region

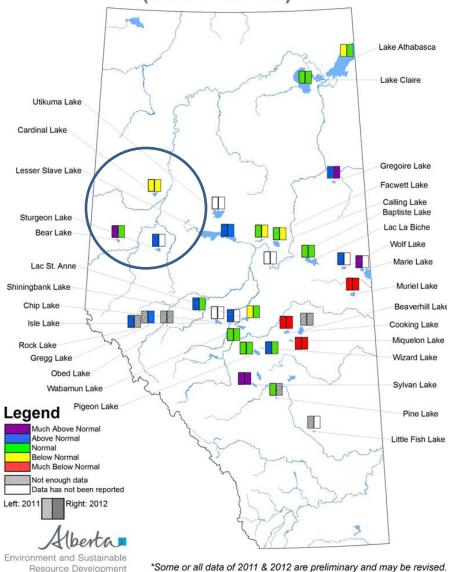
Resource Management

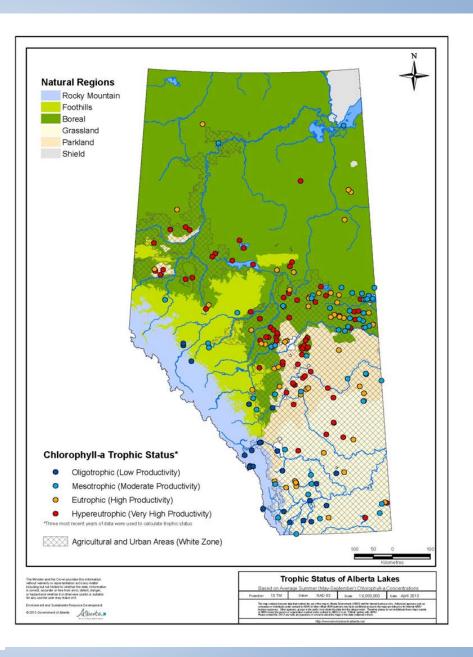


851 lakes - over 50 ha surface area



Alberta Lake Level Index (2011-2012)*





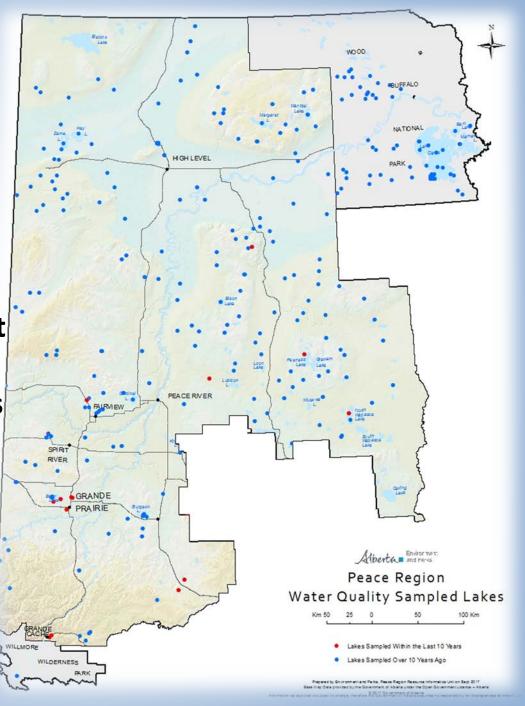
About 60 lakes undergo periodic fishery assessment

102 NAMED Lakes have been sampled 1976-2017

41 lakes sampled in the past 25 years

16 lakes in the past 10 years

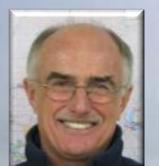




Objectives

Classify lakes to allow:

- An assessment of their status
 - Their relative importance to Albertans (ecological/recreational)
 - Their natural characteristics and resilience
 - Human disturbance (to land and water)
- For public, NGO's, governments and industry to proactively plan, knowing current stresses, mitigate those stresses and participate in the restoration of watersheds.



Dave Walty- former AEP Resource Manager, MPWA

Project Team

KayeDon Wilcox-AEF Resource Manager



Courtney Hughes-AEP Land Management

Josef McLeod – AEP Fishery Management



Bonnie Nicolai-AEP, Peace Region GIS/Mapping



Robert Magai-AEP
Environmental Modeller

Contributors: Brad Peter, ALMS and Arin MacFarlane-Dyer, AEP



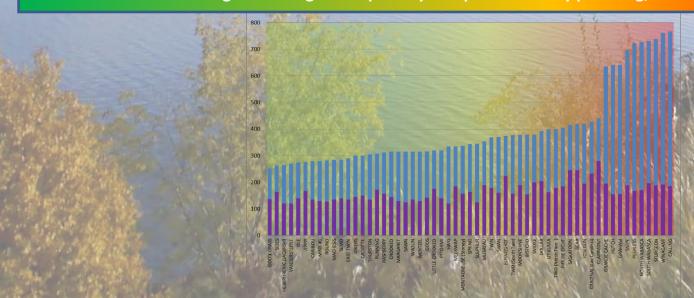
Project Products

- LAKE INDEX An information tool that based on a set of indicators (criteria) provides a qualitative measure of lake status using a relative ranking system.
- Relative lake ranking:
 - High ranking (or high Lake Index value) identifies lakes for precautionary management planning or monitoring and study.

Low Index Value-Low Ranking Lakes

High Index Value-High Ranking Lakes

Higher management priority and precautionary planning/monitoring



LAKE REPORT CARD/INDEX REFERENCE CARD

KE INDE	X REFERENCE CARD: B	EAR LAKE Region Code: 07GE Watershed: Peace River Sub-watershed: Wapiti River		Last Updated on July 17, 2017 Twp-072 Rge-07 Mer-6 Long: 118° 59.304' W Lat: 55° 15.318' N						
	CATEGORIES	INDICATOR	CLASSIFICATION	VALUE						
	HUMAN HEALTH	Potable Water Source	□ No □ Yes	No	or the second					
	RECREATION	Relative Status (based on lake surface area)	☐ 1000 - 3999 ha ☐ ≥4000 ha	3267.30	Region Code: (Watershed: Pe	eace River		Last Updated on July 17, 20: Twp-072 Rge-07 Mer Long: 118° 59.304"	17 -6 W	
		Regional Importance	Local Regional Provincial	Local	Sub-watershed LAKE CHARACT	l: Wapiti River FERISTICS AND CON	DITIONS	Lat: 55° 15.318'	N	
		Fishing pressures	Low	Low			Morphology			
			Medium High	Low			Lake Surface Ar	ea (ha): 3267.3		The state of the s
JES		Preferred Fish Species	□ No					e Area Ratio: 36 ed on Strahler Order): 6		
SOCIAL VALUES			Yes Yes	No			Lake Network N			
Λ.		Recreational Use based on	□ 0				Mean Depth (m			
CIA		recreational facility development	1 1 1	2	: 49		Max Depth (m):			
SO		Aquatic Sensitive Species	□ No				Physical Alterat	ion: No Diversion Licences - Lake		
	ECOLOGICAL		Yes	Yes	, Boat Launch and Bear Lake	Bible Camp		oliversion Licences - Lake se (m3): 39160		
-		Indigenous Fishery (based on	< 10 Licences				Max Annual Div	ersion (m3): 39160		AX SENTENCE DE LA COMPANION DE
	INDIGENOUS	issued licences)	■ 10 - 49 Licences	0			Fishery			
			> 50 Licences				Stocked Lake: Fishing Pressure			第二人们并不是一个独立的一个
			Social Value Inde	Moderate	E0260		Preferred Fish 5			
		Trophic Status	Eutrophic/Hypereutrophic					BRST,NRPK,SPSH,WHSC,YLPR		Hometead
	RESILIENCE	Trophic Status	Mesotrophic Mesotrophic	Hypereutrophic	ia.ca/apps/EdwReportVlewer/Detaller	dLakeWaterQuality.aspx				
			Oligotrophic		swq.requests@gov.ab.ca		Indigenous			
		Watershed to Lake Ratio	<10 10 - 20	36			Metis Settlemer Metis Settlemer			
							Indian Reserve:			
		Lake Mean Depth	□ > 5 m □ 3 - 5 m	1.6			Indian Reserve			
È			■ <3 m				Domestic Fishin	g Licences Yearly Avg. (1996-2016): 0		
BE		Lake Order base on Strahler Stream Order	□ <2 □ <2	6	IL AREA					
₹		Buffering Capacity (Forest and								
Z		Wetland Areas)	25-50 % < < 25 %	30	WATERSHED CHAR	ACTERISTICS AND (CONDITIONS			59 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ENVIRONMENTAL VULNERABILITY		Average Watershed Slope	□ <5°		r Network (km)	Stream Crossing		Ground Water Diversion Licen	res	
AL.			5° - 10° >10°	1		.50 # of Stream Crossing	gs: 416	# of Licences 200		
Σ		Human Footprint within 100m	□ ≤5 %			.53 Stream Crossing Der	nsity (#/km2): (
M.	PRESSURES	Riparian Zone	■ 6 - 25 %	49		.31 ABMI Land Cover		Max Annual Diversion (m3): Surface Water Diversion Licen		100 Maria
õ		Wastewater Discharge	>25 % No			.84 Grazing Dispositions		# of Licences: 337	ces	
2			Yes	Yes		.18 Disposition Coverage		Consumptive Use (m3): 2263	87.00	6 13 1 1 1 1 1 1 1 1 1 1
		Annual Surface Water	□ No		Density (km/km2): 1.	.40 Grazing Disposition 1	Types: FGL & G	RL Max Annual Diversion (m3):	528492.00	
			■ Yes	Yes	atershed	Hard Surface Features				
		Road Density (km/km2)	□ 0-0.2		Road - Paved or		1.0	Human-Created Water Bodie Borrow-Pits/Dugouts/Sumps:	0.0	
		, , , , , , , , , , , , , , , , , , , ,	0.3 - 0.8	1.40	3 Airport Runway		0.0	Canals:	0.0	
		Human Footprint Disturbance	> 0.8		Railway (%):		0.0	Muni Water and Sewage:	0.0	
			□ 5 - 25%	71		Soft Linear Features		Reservoirs:	0.0	Dear Dear
			>25%		I.2 Pipelines: Seismic Line:		0.9	Managed Forest Features CutBlocks (%):	2.3	Lake 12 Lake
		Environme	ental Vulnerability Inde	High	1.0 Transmission Li	ine:	0.6	Resource Extraction Feature		The state of the s
					9 Vegetat	ted Roads, Verges and Ditc		Resource Extraction Feature Peat Mine (%)	0.0	Sasiation Sasiat
		Total Social and Envi	ironmental Index Ratin	Moderate		os along railways (%):	0.0	Mine Site (%)	0.0	and the state of t
					Road/Trail with	hout gravel or pavement (%		Misc.		and make
					U6 Vegetated strip	os along paved/gravel road	s 1.5	Other Disturbed Vege (%):	0.1	
	Charles of the said		-	otal Human Footprint (%): 71						1985 1986 S
			STATE OF THE PARTY	oil Drainage: Moderately well	Watershed Slope (deg)	Natural Conditions	etlands (ha)			
				uffering Capacity (%): 30.4	Minimum Slope (deg)		etianos (na) pen Water:	5480.82 Fen:	1236.04	Protected Area
			F	sh and Wildlife Sanctuaries: Yes	Max Slope:		vamp:	4501.27 Bog:	378.39	bace) BEAR LAKE Landsover
			THE RESERVE TO SHARE THE PARTY NAMED IN	orest (%): 23	Mean Slope:	1 M:	arsh:	1623.86 TOTAL (%):	11	ti Oite print y Ohrubland

Mine Site/Other Disturbed Vegetation

Borrow-Pits/Dugouts/Sump//Muni Sewage/Reservoir

Alberta Britania

Index – not a new concept

USDA Watershed Condition Classification



Watershed Condition Classification Technical Guide





12 INDICATORS

- Water Quality
- 2. Water Quantity
- 3. Aquatic Habitat
- 4. Aquatic Biota
- 5. Riparian/Wetland Vegetation
- 6. Road and Trails
- 7. Soils
- s. Fire Regime or Wildfire
- 9. Forest Cover
- 10. Rangeland Vegetation
- 11. Terrestrial Invasive Species
- Forest Health

Environmentally Significant Areas in Alberta: 2014 Update FINAL REPORT FIRA BIOLOGICAL CONSULTING Leaders in Environmental Research and Monitoring

Saskatchewan State of the Watershed

2010 Condition, Stressor, and Response Ratings

Conditio

To assess the health of watersheds in Saskatchewan, nine condition indicators were developed (see Appendix A). Of these nine indicators, six have ecologically-based and scientifically-defensible rating schemes that allow for comparative assessments of watershed health. Only the six condition indicators for which rating schemes have been developed were used in determining the overall health of each watershed.

The health of each of Saskatchewan's watersheds was categorized into one of three classes based on ecosystem services, ecosystem function, and the watershed's resistance and resilience to change: healthy, stressed or impacted. A watershed was rated as:

- Healthy if the watershed has no apparent change in function or services provided by water, and the system is both resistant and resilient to change.
- Stressed if the watershed has no degradation in function and/or services it provides, but it has lost resistance to change.
- Impacted if the watershed has a change and/or degradation in function and/or services.

EVI Report

efore, a ndition ating for stressed; or

The

Environmental Vulnerability Index

(EVI) 2004



SOPAC

South Pacific Applied Geoscience Commission

December 2004

SOPAC Technical Report 384

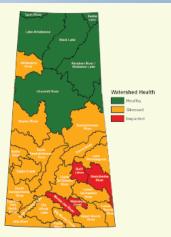


Figure 3. Health of watersheds based on condition indicators

Based on this assessment, six of Saskatchewan's watersheds were identified as being healthy, 19 watersheds were identified as being stressed, and four watersheds were identified as being impacted (Figure 3).

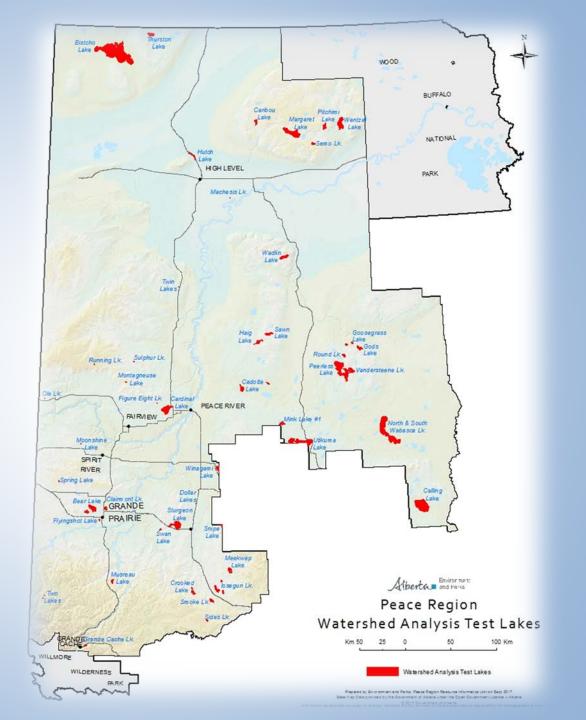
See Appendix A for a detailed assessment of condition indicators.

Stressor

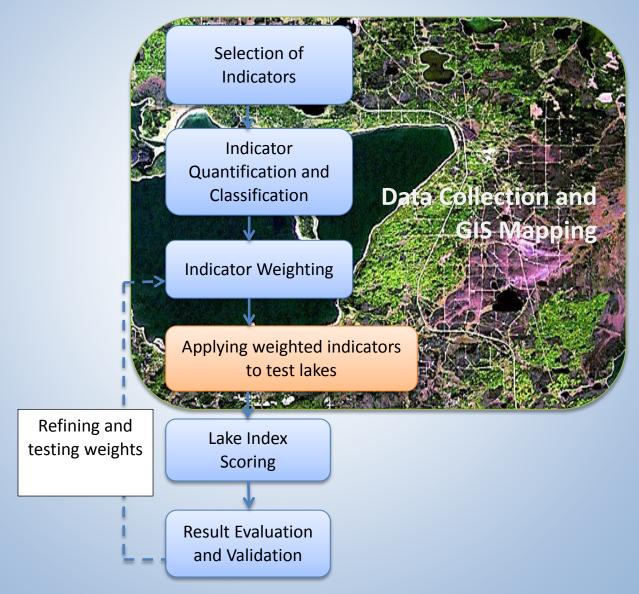
To assess the potential stress of human activities on watersheds in Saskatchewan, 22 stressor indicators were developed (see Appendix B). Stressor indicators were designed to focus on five issues associated with human activities: water use, human population, agricultural influences, industrial influences, and natural resource extractions. Each of the stressor indicators have rating schemes that allow stress to be rated at the watershed level. All of the stressor indicators were weighted equally to provide means of assessing the overall stress on each watershed.

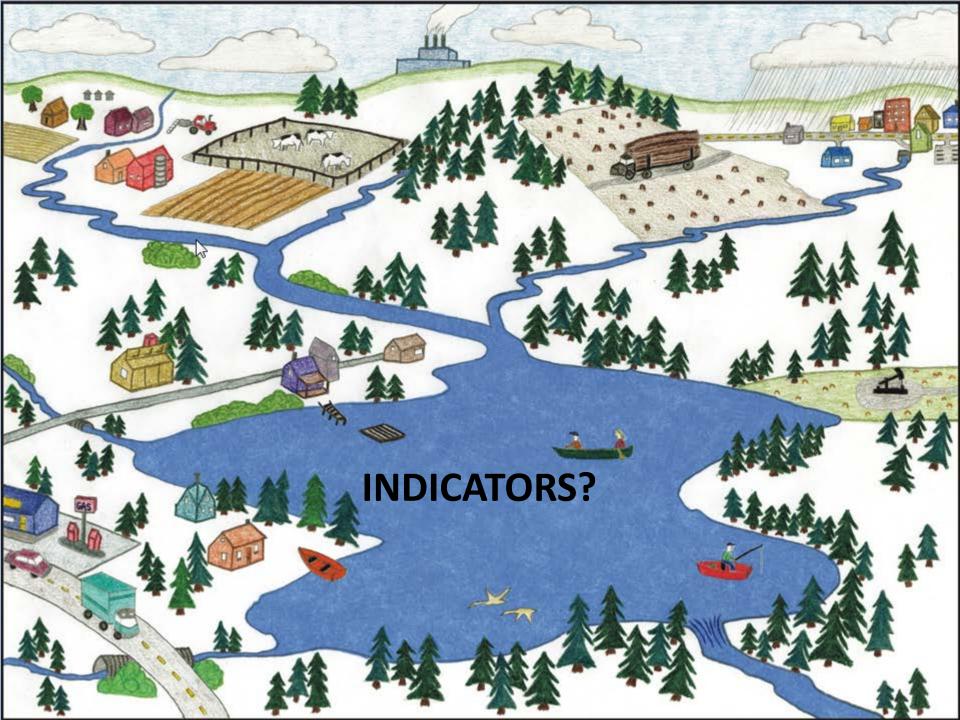
57 Test Lakes

- spatial distribution across the Peace Region
- diverse recreational opportunities and pressures
- core fishery and ecological values
- various lake sizes and morphological attributes



Lake Index Development





INDICATORS



Physical Attributes and Trophic Status

Social and Ecological Values

Watershed Conditions/Human Footprint-Stressors





3 Types of Lake Indexes

 <u>Lake Index</u> – a combination of social and environmental vulnerability sub-indices:

Higher management priority and precautionary planning/monitoring status

Lake Social Values Index – based on social value indicators

Low Index - Relatively Low Social Status

High Index - Relatively High Social Status

 Lake Environmental Vunerability Index – based on environmental conditions and anthropogenic pressure indicators

Low Index - Relatively Low Vulnerability

High Index - Relatively High Vulnerability



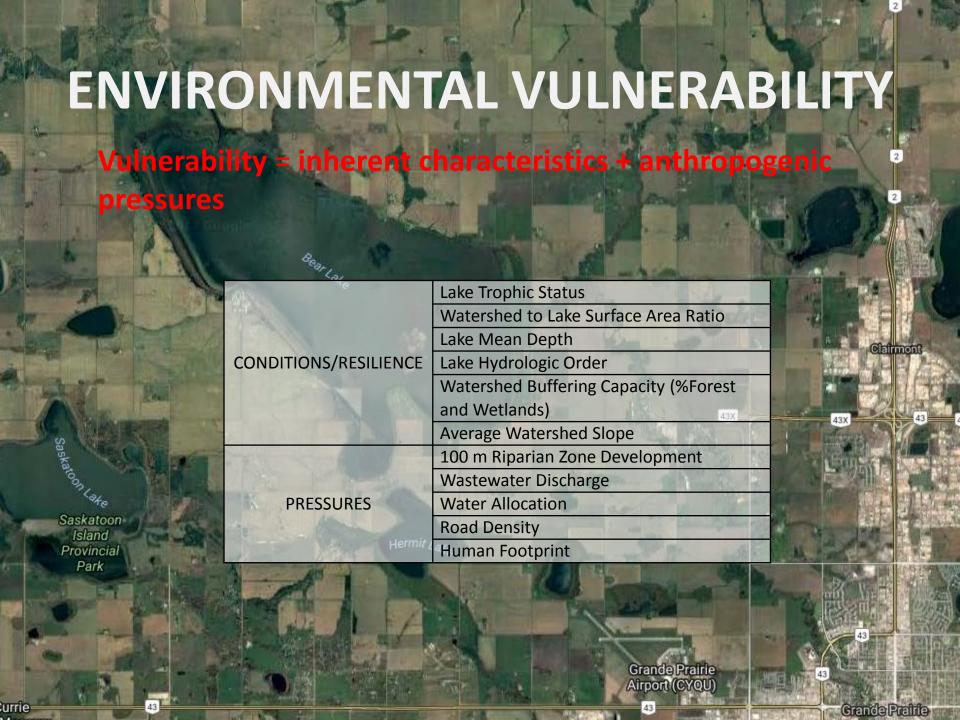
Source Water (potable water and for industrial activities

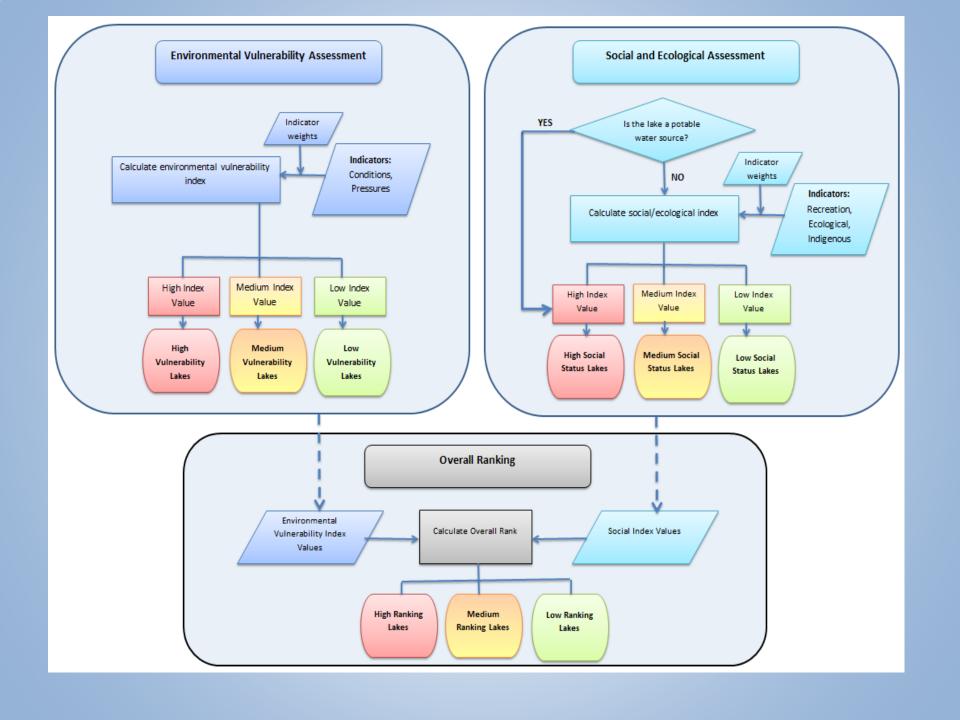
Important Fishery Resources (sport and aboriginal fisheries)

	HUMAN HEALTH	Potable Water Source				
		Relative Status (based on lake surface				
	RECREATON	area)				
out of the little of the littl		Regional Importance				
		Recreation on Lake Waterfront				
		Fishing Pressure				
		Presence of Preferred Fish Species				
	ECOLOGICAL	Presence of Aquatic Sensitive Species				
	INDIGENOUS	Indigenous Food Fishery				

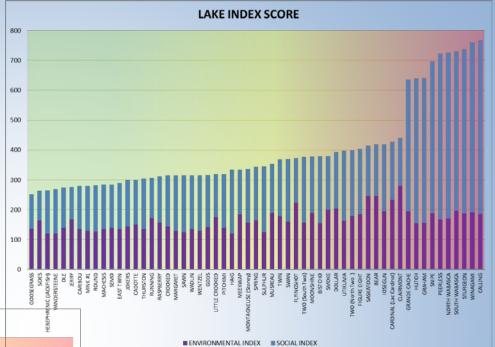
Important Recreational Resources

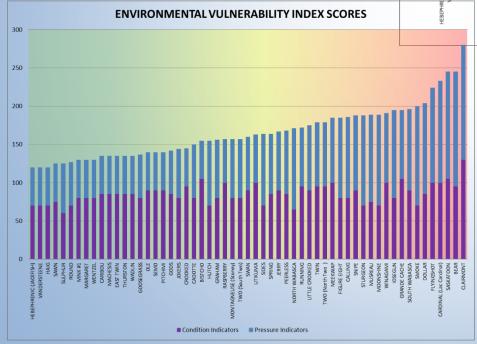
Ecologically Important

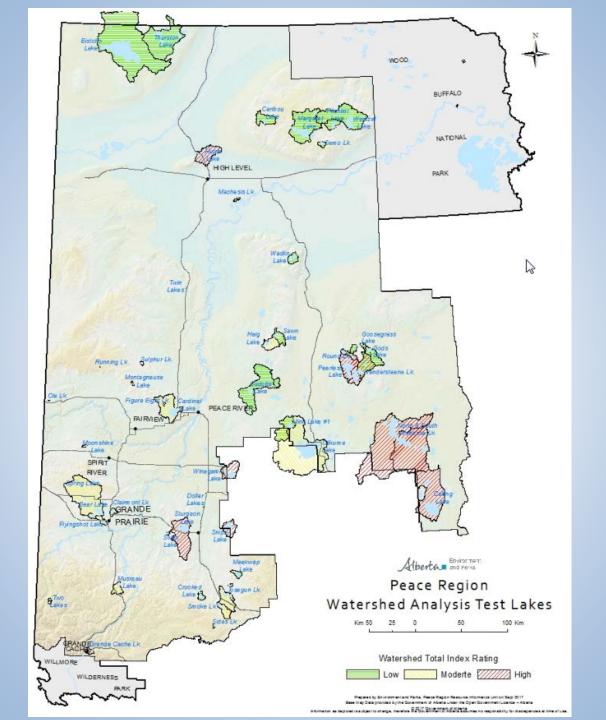




57 lakes







Lake Report Card (Index Reference Card)

Page 1-Index Information

 LAKE INDEX REFERENCE CARD: BEAR LAKE
 Last Updated on July 17, 2017

 Region Code:
 07GE
 Twp-072 Rg-607 Mer-6

 Watershed:
 Peace River
 Long:
 118° 59, 304° W

 Waterbody ID:
 4004
 Long:
 118° 59, 304° W

aterbody ib	. 4004	Sub-watersned. Wapiti River		Cat. 33 13.310 N	
	CATEGORIES	INDICATOR	CLASSIFICATION	VALUE	
		Potable Water Source	□ No		
	HUMAN HEALTH		Yes Yes	No	
	RECREATION	Relative Status (based on lake	< 1000 ha 1000 - 3999 ha	3267.30	
		surface area)	24000 ha		
		Regional Importance	Local		
			Regional	Local	
			Provincial		
		Fishing pressures	Low	Low	
			☐ Medium ☐ High		
ES		Preferred Fish Species	□ No		
3			Yes	No	
A.A.					
=		Recreational Use based on	□ 0	2	
5		recreational facility development	1 1 >1	-	
SOCIAL VALUES		Aquatic Sensitive Species	□ No		
	ECOLOGICAL	Aquatic Sensitive Species	Yes	Yes	
	INDIGENOUS	Indigenous Fishery (based on	< 10 Licences		
	INDIGENOUS	issued licences)	10 - 49 Licences	0	
			> 50 Licences		
		Moderate			
	RESILIENCE	Trophic Status	 ■ Eutrophic/Hypereutrophic ■ Mesotrophic 	Hypereutrophic	
			Oligotrophic		
		Watershed to Lake Ratio	<10 <10 <10 <10 <10 <10 <10 <10 <10 <10		
			10-20	36	
			>20		
		Lake Mean Depth	□ >5 m	1.6	
≥			□ 3-5 m □ <3 m	1.0	
=		Lake Order base on Strahler	■ -2		
8		Stream Order	■ ≤2	6	
2		Buffering Capacity (Forest and			
Z		Wetland Areas)	<u>25-50</u> %	30	
븀			■ <25 %		
>		Average Watershed Slope	□ <5° □ 5° - 10°	1	
2			>10°		
ENVIRONMENTAL VULNERABILITY		Human Footprint within 100m			
Ξ	PRESSURES	Riparian Zone	6 - 25 %	49	
ON			>25 %		
2		Wastewater Discharge	□ No □ Yes	Yes	
Ž			iii res		
E		Annual Surface Water	□ No		
		Consumptive Use (m3)	Yes	Yes	
			_		
		Road Density (km/km2)	0-0.2	1.40	
			0.3 - 0.8 > 0.8	2.40	
		Human Footprint Disturbance	□ -5%		
			5 - 25% >25%	71	
		10.4			
		Environme	High		
		Total Social and Envi	ronmental Index Rating	Moderate	

Lake Report Cardende Index Reference CARD: BEAR LAKE LAKE INDEX REFERENCE CARD: BEAR LAKE LAKE INDEX REFERENCE CARD: BEAR LAKE LAKE OF CORP. CORP.

Page 2- Lake and Watershed Characteristics, GIS Information

Potable Water: No

Community

Nearest City from Lake: Grande Prairie

Distance from City (Km): 0.24

Communities: City of Grande Prairie Total area of Community (%): 0.3

Human Footprint within 100m Riparian Zone (%): 49

Recreation

Relative Importance: Local

Facilities: Bear Lake Campground, Day Use Area, Boat Launch and Bear Lake Bible Camp

Water Quality

Atlas of Alberta Lakes:

ALMS: http://alms.ca/reports-2/

AEP Water Quality Sampling Station ID: AB07GE0260

AEP Latest Water Quality Sampling Year: 2014

AEP Water Quality Report: http://environment.alberta.ca/apps/EdwReportVlewer/Detailed.akeWaterQuality.aspx

AEP Water Quality Information Request email: swq.requests@gov.ab.ca

Blue Green Algae Advisory (year): 2017

Fish Kill: Not Reported

Trophic Status: Hypereutrophic Parks and Protected Areas

Protected Areas (Ha): 496.79

Fish and Wildlife Sanctuaries: Yes

Forest (%): 23

Protected Areas: PROVINCIAL PARK, NATURAL AREA

FW Sanctuaries: Yes

Aquatic Sensitive Species: Trumpeter Swan

orphology

Lake Surface Area (ha): 3267.3

Watershed/Lake Area Ratio: 36

Lake Order (based on Strahler Order): 6

Lake Network Number: 5

Mean Depth (m): 1.6 Max Depth (m): 2.5

Max Depth (m): 2.5
Physical Alteration: No

Surface Water Diversion Licences - Lake

Consumptive Use (m3): 39160

Max Annual Diversion (m3): 39160

Fishery

Stocked Lake: No Fishing Pressures: None Preferred Fish Species: No

Fish Presence: BRST,NRPK,SPSH,WHSC,YLPR

Indigenous

Metis Settlement: None Metis Settlement (%): 0 Indian Reserve: None

Indian Reserve (%): 0

Domestic Fishing Licences Yearly Avg. (1996-2016): 0

4501.27 Bog:

1623.86 TOTAL (%):

378.39

WATERSHED CHARACTERISTICS AND CONDITIONS

Watershed Area (ha): 118586.01	Network (km)		Stream Crossing			Ground Water Diversion Licences		
White Zone (%): 86	Paved Road:		117.50	# of Stream Crossings: 41	6		# of Licences 200	
Industrial	Gravel R	load:	845.53	Stream Crossing Density	#/km2):	0.35	Consumptive Use (m3):	827350.90
Contaminated Sites: 13	oved Road: 641.31		ABMI Land Cover		Max Annual Diversion (m3): 827350.9			
Industrial Facilities:	Winter F	Road:	0.00	Agriculture (%): 56			Surface Water Diversion	Licences
Electric Power Plant, Industrial Waste	Trail:		51.84	Grazing Dispositions		# of Licences: 337		
Landfill, Gas Processing Plant (x5)	Total Ro	ads:	1656.18	Disposition Coverage (%):	4		Consumptive Use (m3):	226387.00
	Road De	nsity (km/km2):	1.40	Grazing Disposition Type:	: FGL &	GRL	Max Annual Diversion (m	13): 628492.00
ABMI Human Footprint (2014) - % of T	otal Wate	rshed						
Urban and Rural Features			Hard	Surface Features			Human-Created Water	Bodies
Rural - Residential and Industrial		Road -	Paved or Gra	vel (%):	1.0	Borro	v-Pits/Dugouts/Sumps:	0.
Development: 1.3 Urban (Cities, Towns, Villages, Hamlets): 0.0		Airport Runway (%):			0.0	Canals	Canals:	
		Railwa	Railway (%):		0.0	Muni Water and Sewage:		0.
Industrial Features	Soft Linear Features				Reservoirs:			
Industrial Site Rural -	Pipelines:		0.9		Managed Forest Feat	tunes		
(Rural area developed for industrial use):		Seismic Line:			0.6	CutBle	cks (%):	2.
High Density Livestock Operation:		Transn	Transmission Line:				Resource Extraction Fe	_
Well Sites:	1.9			oads, Verges and Ditches	0.1		Resource Extraction Fe	
Cultivation Features				. 0		Peat N	Nine (%)	0.
Areas where evidence of cultivation is				ng railways (%):	0.0	Mine 9	lite (%)	0.
visible. Includes Crop/Pasture/ Bare			Road/Trail without gravel or pavement (%		0.6	Misc.		
Ground:	60.6	Vegeta	ated strips alo	ng paved/gravel roads	1.5	Other	Disturbed Vege (%):	0.
Total Human Footprint (%): 71								
			Natur	ral Conditions				
Soil Drainage: Moderately well		Watershed Slop	e (deg)	Wetlands (ha)				
Buffering Capacity (%): 30.4		Minimum Slope	5	Open W	ater:	54	180.82 Fen:	1236.0

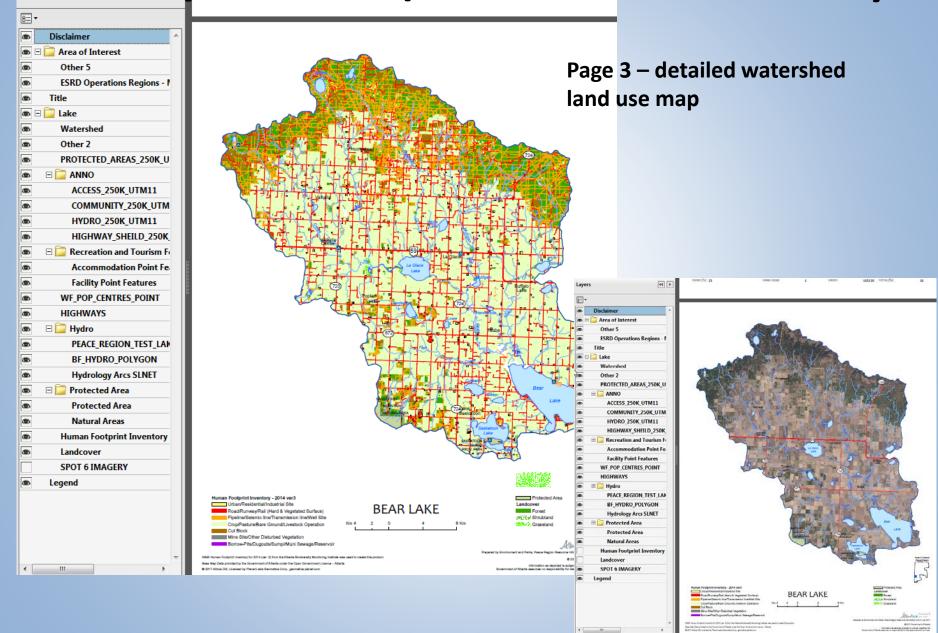
25

Swamp:

Max Slope:

Mean Slope:

Lake Report Card (Index Reference Card)



- Provides consistent approach in evaluating lakes and watershed conditions across the Peace Region
- Helps identify which lakes to prioritize for watershed monitoring, surveillance and research
- Identify lakes with potential management needs
- Provides consolidated and centralized information resources for agencies and individuals involved in developing and conducting a watershed assessments
- Increases awareness on environmental issues and education about the lakes in the Peace Region

