



**ACA PROJECT  
REPORT**

# **Summer Angler Surveys on Four Walleye-Pike Fisheries in Central Alberta, 2022**



Alberta Conservation  
Association

wildlife | fish | habitat



**Summer Angler Surveys on Four Walleye-Pike Fisheries  
in Central Alberta, 2022**

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## EXECUTIVE SUMMARY

High angling effort on populations of slow-growing and late-maturing species has previously resulted in the over-harvest of many of Alberta's sport fish populations, including walleye (*Sander vitreus*) and northern pike (*Esox lucius*). In 2018, Alberta Environment and Parks released updated management objectives for walleye and northern pike fisheries that included manipulations with different harvest regimes at 35 select lakes. To aid in evaluating these manipulations, ACA conducted angler surveys on four impacted fisheries (Lac Ste. Anne, Gull, Buck, and Pigeon lakes) during the summer angling seasons of 2020, 2021, and 2022. Here, we report on the 2022 survey only. A more comprehensive report on the larger study, including human dimensions surveys, will be completed by the Government of Alberta.

Between May 15 and August 31, 2022, we conducted instantaneous count angler surveys on the four lakes using boats, or from shore during unsafe weather conditions. Estimated total angler effort was 11,743.76 hours (2.08 h/ha) at Lac Ste. Anne, 24,821.73 hours (3.03 h/ha) at Gull Lake, 28,703.68 hours (11.30 h/ha) at Buck Lake, and 20,369.57 hours (2.09 h/ha) at Pigeon Lake. Trip lengths were very similar at all four lakes, which ranged between 3.14 and 3.57 h/trip.

We conducted a total of 310 angler interviews at Lac Ste. Anne, Pigeon Lake, Gull Lake, and Buck Lake. Anglers primarily caught walleye and northern pike. Mean catch rates across the four lakes were variable for walleye but were similar for pike: 1.02 walleye/h and 0.24 northern pike/h at Lac Ste. Anne; 3.68 walleye/h and 0.21 northern pike/h at Pigeon Lake; 1.70 walleye/h and 0.20 northern pike/h at Gull Lake; and 1.10 walleye/h and 0.29 northern pike/h at Buck Lake. Mean walleye harvest rates were 0.06 walleye/h at Gull Lake and 0.10 walleye/h at Buck Lake. We did not calculate walleye harvest at Lac Ste. Anne or Pigeon Lake as they are regulated by a specific number of tags. We did not estimate northern pike harvest as they are not legally harvestable at any of the four lakes.

**Key words:** northern pike, walleye, angler survey, Lac Ste. Anne, Pigeon Lake, Gull Lake, Buck Lake.

## **ACKNOWLEDGEMENTS**

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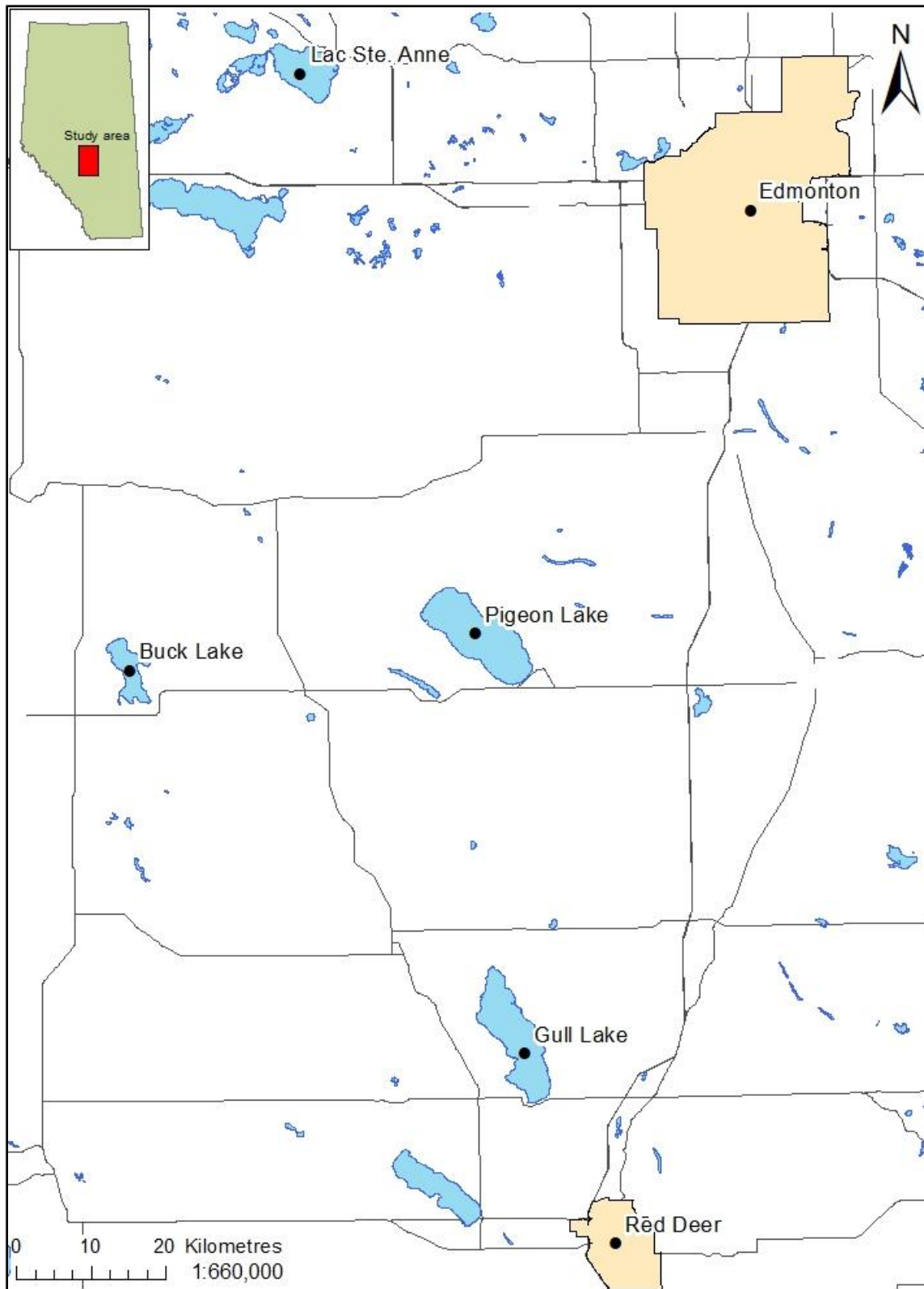
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## **1.0 INTRODUCTION**

High angling effort on populations of slow-growing and late-maturing species has previously resulted in the over-harvest of many of Alberta's sport fish populations (Sullivan 2003), including walleye (*Sander vitreus*) and northern pike (*Esox lucius*). In 2018, Alberta Environment and Parks (AEP) released updated management objectives for walleye and northern pike fisheries that included manipulations with different harvest regimes, including the addition of slot limits, at 35 lakes (Government of Alberta 2018a, 2018b). To aid in evaluating these manipulations, ACA conducted angler surveys on four impacted fisheries during the summer angling seasons of 2020, 2021, and 2022: Lac Ste. Anne, Gull Lake, Buck Lake, and Pigeon Lake. Here, we report on only the 2022 surveys conducted on these four lakes. A more comprehensive report on the larger study, including human dimensions components, will be completed by the Government of Alberta (GOA).

## **2.0 STUDY AREA**

All four study waterbodies are walleye and northern pike fisheries in central Alberta, near the cities of Edmonton and Red Deer, and are accessible by major highways (Figure 1). While regulated walleye harvest is allowed on all four lakes, pike harvest is not permitted on any lake.



**Figure 1.** Location of Lac Ste. Anne, Pigeon, Gull, and Buck lakes relative to Edmonton and Red Deer, Alberta. The inset map shows the study area within Alberta.

## **2.1 Lac Ste. Anne**

Located in the North Saskatchewan River drainage approximately 60 km west of Edmonton, Alberta (Figure 1), Lac Ste. Anne (53°42'N, 114°25'W) has a surface area of 5,659 ha, a maximum depth of 9.1 m, and a mean depth of 4.8 m (GOA n.d.). There are several access points to Lac Ste. Anne, including public boat launches within residential communities, private campgrounds, and docks at private residences. For the 2022 angling season, walleye were harvestable by 713 Class A and 713 Class B walleye special harvest licences (GOA 2022a).

## **2.2 Pigeon Lake**

Located in the Battle River drainage approximately 68 km southwest of Edmonton, Alberta (Figure 1), Pigeon Lake (53°1'N, 114°3'W) has a surface area of 9,731 ha, a maximum depth of 10.2 m, and a mean depth of 6.2 m (GOA n.d.). There are several access points to Pigeon Lake, including boat launches within residential communities, Pigeon Lake Provincial Park, private campgrounds, and docks at private residences. For the 2022 angling season, walleye were harvestable by 701 Class A and 701 Class B walleye special harvest licences (GOA 2022a).

## **2.3 Gull Lake**

Located in the Red Deer River drainage approximately 25 km northwest of Red Deer, Alberta (Figure 1), Gull Lake (52°32'N, 113°59'W) has a surface area of 8,110 ha, a maximum depth of 8.0 m, and a mean depth of 5.4 m (GOA n.d.). There are several access points to Gull Lake, including boat launches within residential communities, Aspen Beach Provincial Park, private campgrounds, and docks at private residences. For the 2022 angling season, the walleye harvest regulation was one fish between 45–50 cm (GOA 2022b).

## **2.4 Buck Lake**

Located in the North Saskatchewan River drainage approximately 103 km southwest of Edmonton, Alberta (Figure 1), Buck Lake (52°59'N, 114°45'W) has a surface area of 2,540 ha, a maximum depth of 12 m, and a mean depth of 6.2 (GOA n.d.). There are several access points to Buck Lake, including the community of Buck Lake, Calhoun Bay and Buck Lake provincial recreation areas, private campgrounds, and docks at private residences. For the 2022 angling season, the walleye harvest regulation was one fish between 45–50 cm (GOA 2022b).

### 3.0 MATERIALS AND METHODS

#### 3.1 Instantaneous angler count surveys

We used instantaneous counts to estimate angler effort on all four lakes between May 15 and August 31, 2022, using a two-stage sampling approach (Pollock et al. 1994, Sullivan and Patterson Unpubl. Report). In stage one, sampling days were randomly selected from available working days within the survey period and stratified by weekdays (WD) and weekends/holidays (WE). Dates were selected to have approximately five WD surveys for every two WE surveys to maintain proportional effort between strata (Table 1). In stage two, one instantaneous count time was selected for each survey day using random sampling of 1-hour periods between 08:00 – 21:00 hours (Appendix 1). This method of scheduling counts reduces bias by distributing counts across various times of day and days of the week. We combined instantaneous counts into early summer (May 15 to June 30) and late summer (July 1 to August 31) categories to provide more robust sample sizes for analysis, while maintaining separation of WD and WE sampling days.

**Table 1.** Number of available angler survey days, number of days surveyed, and percentage of available days covered per strata for Lac Ste. Anne, Pigeon, Gull, and Buck lakes, Alberta, 2022.

Lake	Strata		Days Available	Days Surveyed	Percentage Days Surveyed of Days Available
Lac Ste Anne	Early	Weekend	14	5	35.7
	Summer	Weekday	33	12	36.4
	Late	Weekend	20	5	25.0
	Summer	Weekday	42	13	31.0
Pigeon Lake	Early	Weekend	14	4	28.6
	Summer	Weekday	33	11	33.3
	Late	Weekend	20	7	35.0
	Summer	Weekday	42	15	35.7
Gull Lake	Early	Weekend	14	4	28.6
	Summer	Weekday	33	12	36.4
	Late	Weekend	20	7	35.0
	Summer	Weekday	42	15	35.7
Buck Lake	Early	Weekend	14	5	35.7
	Summer	Weekday	33	12	36.4
	Late	Weekend	20	7	35.0
	Summer	Weekday	42	15	35.7

During surveys, we used a boat to travel around the lake recording the number of angling boats, anglers per boat, and shore anglers. Shore and boat angler counts were combined for a total angler count. If unsafe weather limited boating, we completed counts from shore, with binoculars, by strategically accessing multiple viewpoints to obtain the most thorough count in the shortest period of time. Counts were recorded within the appropriate 1-hour time slot.

### **3.2 Angler interviews**

On survey days, when instantaneous counts were not being completed, we interviewed anglers on shore. We chose popular locations, based on observations, to obtain the largest possible number of interviews. Interviews included standardized questions on angler demographics, angler motivations and opinions, and lake-specific trip information (Appendix 2). Demographics and angler motivations and opinions data will be used by GOA when assessing multiple waterbodies and management manipulations in a separate report. For this report, we focus on the lake-specific trip questions on angler effort, catch, and harvest.

### **3.3 Data management and analysis**

Field data were immediately entered into Google Sheets for storage (Google LLC 2022). Data were transferred to .csv files in Microsoft Excel and analyzed using RStudio (Microsoft Corporation 2018, RStudio Team 2022).

#### ***3.3.1 Instantaneous count surveys***

We used bootstrapping (10,000 replicates) to derive estimates and 95% confidence intervals (CI) for angling effort (Haddon 2011). We produced distributions of mean angler counts for early summer WD, early summer WE, late summer WD, and late summer WE. These distributions were multiplied by the available daylight angling hours, set at 14 hours per day in May and August, and 15 hours per day for June and July, to maintain consistency between years and with other GOA angler surveys, to produce early and late summer angler effort estimates for each waterbody (Sullivan and Patterson Unpubl. Report). These estimates were combined to create whole-summer estimates for angler hours with 95% CI for each waterbody. A flow chart describing the steps used to calculate estimates is provided in Appendix 3. We standardized angler hour estimates by converting them to a per hectare value (h/ha) for between-lake comparisons and monitoring of trends over time.

#### ***3.3.2 Angler interviews***

Trip length data were bootstrapped (10,000 replicates) to derive a distribution of means and 95% CI (Haddon 2011). Angler catch and harvest rates were calculated as ratios of means (Malvestuto 1983). Catch rates were expressed as number of fish caught per hour, referred to as catch-per-

unit-effort (CPUE), and harvest rates as number of fish harvested per hour, referred to as harvest-per-unit-effort (HPUE). Estimated angler effort derived from instantaneous counts was divided by trip length to estimate number of angler trips with 95% CI. CPUE and HPUE were multiplied by estimated angler effort derived from instantaneous counts to estimate total catch and harvest estimates with 95% CI. Walleye harvest was not estimated for Lac Ste Anne and Pigeon lakes, where walleye harvest is regulated by special walleye licence tags. We did not estimate northern pike harvest as they are not legally harvestable at any of the four lakes.

## **4.0 RESULTS**

### **4.1 Lac Ste. Anne**

We counted 252 anglers during our 35 counts at Lac Ste. Anne (Appendix 4). Estimated total summer angler effort was 11,743.76 h (CI = 8,085.37–15,672.14) or 2.08 h/ha (CI = 1.43–2.77). Seasonal angler effort was 4,395.70 h (CI = 1,786.87–7,339.86) for early summer, and 7,348.06 h (CI = 4,910.347–9,933.64) for late summer.

We interviewed 42 anglers at Lac Ste. Anne. Anglers interviewed at Lac Ste. Anne fished for an average of 3.57 h/trip (CI = 3.15–4.00). Anglers made an estimated 3,301 trips (CI = 2,221–4,519). Mean CPUE was 1.02 walleye/h and 0.24 northern pike/h. Anglers caught an estimated 11,979 walleye (CI = 8,247–15,986) and 2,819 northern pike (CI = 1,940–3,761). Anglers did not report catching any other species.

### **4.2 Pigeon Lake**

We counted 502 anglers during our 37 counts at Pigeon Lake (Appendix 5). Estimated total summer angler effort was 20,369.57 h (CI = 15,442.63–25,581.17) or 2.09 h/ha (CI = 1.59–2.63). Seasonal angler effort was 3,434.68 h (CI = 1,873.83–5,156.53) in early summer, and 16,934.90 h (CI = 12,223.63–21,873.73) in late summer.

We interviewed 54 anglers at Pigeon Lake. Anglers interviewed at Pigeon Lake fished for an average of 3.20 h/trip (CI = 2.83–3.58). Anglers made an estimated 6,380 trips (CI = 4,722–8,208). Mean CPUE was 3.68 walleye/h and 0.21 northern pike/h. Anglers caught an estimated 74,961 walleye (CI = 56,829–94,139) and 4,278 northern pike (CI = 3,243–5,372). Anglers did not report catching any other species.

### **4.3 Gull Lake**

We counted 620 anglers during our 38 counts at Gull Lake (Appendix 6). Estimated total summer angler effort was 24,821.73 h (CI = 18,266.71–31,436.55) or 3.03 h/ha



(CI = 2.23–3.83). Seasonal angler effort was 2,592.49 h (CI = 1,243.17–4,322.17) in early summer, and 22,229.24 h (CI = 17,013.98–36,584.67) in late summer.

We interviewed 87 anglers at Gull Lake. Anglers interviewed at Gull Lake fished for an average of 3.14 h/trip (CI = 2.73–3.55). Anglers made an estimated 7,951 trips (CI = 5,728–10,412). Mean CPUE was 1.70 walleye/h and 0.20 northern pike/h. Mean HPUE was 0.06 walleye/h. Anglers caught an estimated 42,197 walleye (CI = 31,053–53,442) and 4,964 northern pike (CI = 3,653–6,287). Anglers harvested an estimated 1,489 walleye (CI = 1,096–1,886) during the same time period. One angler reported catching two yellow perch.

#### **4.4 Buck Lake**

We counted 637 anglers during our 37 counts at Buck Lake (Appendix 7). Estimated total summer angler effort was 28,703.68 h (CI = 18,950.29–40,386.51) or 11.30 h/ha (CI = 7.46–15.90). Seasonal angler effort was 11,249.18 h (CI = 3,660.92–21,127.87) in early summer, and 17,454.50 h (CI = 11,942.20–23,909.53) in late summer.

We interviewed 127 anglers at Buck Lake. Anglers interviewed at Buck Lake fished for an average of 3.28 h/trip (CI = 2.98–3.58). Anglers made an estimated 8,788 trips (CI = 5,752–12,464). Mean CPUE was 1.10 walleye/h and 0.29 northern pike/h. Mean HPUE was 0.10 walleye/h. Anglers caught an estimated 31,574 walleye (CI = 20,845–44,425) and 8,324 northern pike (CI = 5,496–11,712). Anglers harvested an estimated 2,870 walleye (CI = 1,895–4,039) during the same time period. Four anglers reported catching one yellow perch each, two yellow perch were harvested.

## **5.0 SUMMARY**

Angler surveys were completed at Lac Ste. Anne, Gull Lake, Pigeon Lake, and Buck Lake in central Alberta between May 15 and August 31, 2022. Buck Lake experienced significantly higher angler effort per hectare (11.30 h/ha) than the other waterbodies, which ranged from 2.08 to 3.03 h/ha. This was due to higher angler numbers, as trip length at all four lakes ranged between 3.14 and 3.57 h/trip. Pigeon Lake had the highest mean walleye catch rate at 3.68 walleye/h, roughly 2 walleye/h higher than the other lakes, which ranged from 1.02 to 1.70 walleye/h. Catch rates of northern pike were below 0.30 northern pike/h at all lakes. These results are important for understanding the angling effort and catch at individual waterbodies and distributions within a region, to inform sport fish management decisions. These data can be used for comparing angling effort and success between lakes and years, and evaluating of the effects of fisheries management manipulations.

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## 7.0 APPENDICES

### Appendix 1. Instantaneous angler count schedule for Lac Ste. Anne, Pigeon, Buck, and Gull lakes between May 15 and August 31, 2022.

#### May

Date	15-May	16-May	17-May	18-May	19-May	20-May	21-May	22-May	23-May	24-May	25-May	26-May	27-May	28-May	29-May	30-May	31-May
Day	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues
Lac Ste Anne	1100		1900		1400						1000		1600			1600	
Pigeon Lake		1200		1700						800		1400		800	1400		
Buck Lake	1100		1900		1400						1000		1600			1600	
Gull Lake		1200		1700						800		1400		800	1400		

#### June

Date	01-Jun	02-Jun	03-Jun	04-Jun	05-Jun	06-Jun	07-Jun	08-Jun	09-Jun	10-Jun	11-Jun	12-Jun	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun
Day	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri
Lac Ste Anne					1700		1100				1600		2100		1300		
Pigeon Lake		1700	1200	1000		1600		1900				2100		1900			
Buck Lake					1700		1100				1600		2100		1300		
Gull Lake		1700	1200	1000		1600		1900				2100		1900			

Date	18-Jun	19-Jun	20-Jun	21-Jun	22-Jun	23-Jun	24-Jun	25-Jun	26-Jun	27-Jun	28-Jun	29-Jun	30-Jun
Day	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs
Lac Ste Anne			900			1700		800	1400		2000		
Pigeon Lake				1000	1500		1800			2100			
Buck Lake			900			1700		800	1400		2000		
Gull Lake				1000	1500		1800			2100			

**Appendix 1** continued:

**July**

Date	01-Jul	02-Jul	03-Jul	04-Jul	05-Jul	06-Jul	07-Jul	08-Jul	09-Jul	10-Jul	11-Jul	12-Jul	13-Jul	14-Jul	15-Jul	16-Jul	17-Jul
Day	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Lac Ste Anne		1900		1500		1900						800		1100	1800		900
Pigeon Lake			2000		1400						900		1300			1600	
Buck Lake		1900		1500		1900						800		1100	1800		900
Gull Lake			2000		1400						900		1300			1600	

Date	18-Jul	19-Jul	20-Jul	21-Jul	22-Jul	23-Jul	24-Jul	25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul
Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Lac Ste Anne		1000						1800		1700		900	1300	
Pigeon Lake	1100		2100						1100		800			1100
Buck Lake		1000						1800		1700		900	1300	
Gull Lake	1100		2100						1100		800			1100

**August**

Date	01-Aug	02-Aug	03-Aug	04-Aug	05-Aug	06-Aug	07-Aug	08-Aug	09-Aug	10-Aug	11-Aug	12-Aug	13-Aug	14-Aug	15-Aug	16-Aug	17-Aug
Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed
Lac Ste Anne				2000			2000			1500		1200			1200		1800
Pigeon Lake					1600	1900					1900		1300	1700		1500	
Buck Lake				2000			2000			1500		1200			1200		1800
Gull Lake					1600	1900					1900		1300	1700		1500	

Date	18-Aug	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	30-Aug	31-Aug
Day	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed
Lac Ste Anne						1400		800		1000				
Pigeon Lake					1800		1000		900		900	1200		
Buck Lake						1400		800		1000				
Gull Lake					1800		1000		900		900	1200		

**Appendix 2.** Standardized angler interview sheet used by Alberta Conservation Association and Government of Alberta.

2022 Lake Angler HD Survey Circle one: BUCK / PIGEON / GULL / LSA / SMOKE / IOSEGUN / STURGEON / FAWCETT / AMISK / FLOATINGSTONE / GARNER / SKELETON

1. Month: 05 / 06 / 07 / 08 Date: \_\_\_\_\_
2. Day: (1 = Mon, 2 = Tue, 3 = Wed, 4 = Thu, 5 = Fri, 6=Sat, 7 = Sun, 8 = STAT) 1 2 3 4 5 6 7 8
3. Complete trip: 1 = NO or 2 = YES
4. Did you fish this lake in 2020: 1 = NO or 2 = YES
5. Did you fish this lake in 2021: 1 = NO or 2 = YES
6. What did YOU catch today? (record 0's):

Species	Caught:	Kept:
WALL	6.1	6.2
NRPK	6.3	6.4
YLPR	6.5	6.6
Other:	6.7	6.8

7. How many hours did you fish today? [multiples of .25hr]: \_\_\_\_\_
8. Motivation: "On a scale of 1-5, rank how important each of the following are in choosing \_\_\_\_\_ Lake today" [Remember 1= least important, 5 =most important and use any number in between]:

8.1 You can keep fish that you like to eat here	1 2 3 4 5
8.2 [SHL lakes]	
8.2.1 You chose to fish this lake because it has tags?	1 2 3 4 5
8.2.2 Do you have tags for this lake today?	Yes or No
8.2.3 Did you fill any tags today?	Yes or No (Number filled: )
8.3 [Slot/Min. size limit lakes]	
8.3.1 You chose to fish this lake because it doesn't have tags?	1 2 3 4 5

9. Satisfaction with catch/fishing experience: "On a scale of 1-5, score your level of satisfaction for each of these statements about this lake" [1 = lowest satisfaction, 5 = highest satisfaction, use any number in between]:

9.1 Your satisfaction with how many fish you caught today	1 2 3 4 5
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9.2 Your satisfaction with the size of fish caught here	1 2 3 4 5
9.4 From 1-5, how would you rate how many fish you catch here if 1 = catching few fish, and 5 = catching a lot	2 3 4 5

10. Fisheries management interest: "On a scale of 1-5, score your level of agreement with each statement" [1 = least agreement, 5 = highest agreement, use any number in between]:

10.1 Are you concerned about the future of Alberta's Provincial WALLEYE fisheries?	1 2 3 4 5
10.2 Are you satisfied with the WALLEYE fishing regulations at this lake?	1 2 3 4 5
10.3 Are you concerned about the future of Alberta's Provincial PIKE fisheries?	1 2 3 4 5
10.4 Are you satisfied with the PIKE fishing regulations at this lake?	1 2 3 4 5
10.5 Indicate your level of agreement that recreational fishing can cause a fish population to decline?	1 2 3 4 5
10.6 There should be more opportunities at this lake to keep WALLEYE?	1 2 3 4 5
10.7 There should be more opportunities at this lake to keep PIKE?	1 2 3 4 5

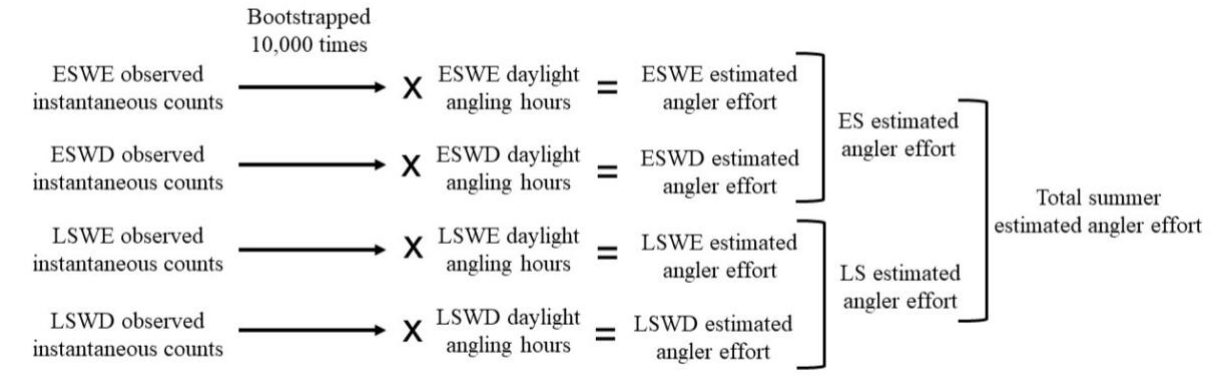
11. Do you own, or have access to, a nearby cabin/house or lake lot (within 5km): 1 = NO or 2 = YES

12. In 2021, how many days did you fish at this lake? \_\_\_\_\_

13. Demographics/social group:

13.1 Gender: 1 = Male or 2 = Female	13.2 Age Category: <16 or 16-30 or 31-40 or 41-50 or 51-60 or 60-64 or 65+
13.3 Respondents first 3 digits of postal code (or town or city):	13.4 Are you fishing under Indigenous Rights? 1 = NO or 2 = YES

**Appendix 3.** Flow chart outlining the process used to calculate estimates of angler effort using an instantaneous count methodology at Lac Ste. Anne, Pigeon, Gull, and Buck lakes, during the summer of 2022. ES = early summer (May and June), LS = late summer (July and August), WD = weekday, WE = weekend/holiday.



**Appendix 4.** Lac Ste. Anne instantaneous angler count data, May 15 to August 31, 2022.

Date	Time	Number of boats	Number of shore anglers	Total number of anglers
15-05-2022	11:00-11:15	14	3	27
17-05-2022	07:00-07:20	2	0	4
19-05-2022	14:00-14:20	0	0	0
25-05-2022	10:00-10:35	1	0	2
27-05-2022	16:00-16:25	2	0	3
30-05-2022	16:00-16:20	1	2	3
05-06-2022	17:00-17:10	0	0	0
07-06-2022	11:00-11:30	4	0	9
11-06-2022	16:00-16:38	7	0	12
13-06-2022	21:00-21:20	0	0	0
15-06-2022	13:00-13:20	0	0	0
20-06-2022	09:00-09:25	0	0	0
23-06-2022	17:00-17:15	0	0	0
24-06-2022	18:00-18:20	0	0	0
25-06-2022	08:00-08:30	3	0	4
26-06-2022	14:00-15:35	17	3	40
28-06-2022	20:00-20:20	1	0	2
02-07-2022	19:00-19:45	7	0	22
04-07-2022	15:00-15:40	4	0	9
12-07-2022	08:05-08:30	1	1	3
14-07-2022	11:00-11:25	4	0	10
17-07-2022	09:00-09:20	3	0	6
25-07-2022	18:00-18:35	2	0	2
27-07-2022	17:00-17:30	4	0	8
29-07-2022	09:00-09:25	5	0	7
30-07-2022	13:00-13:45	9	0	17
04-08-2022	20:00-20:15	0	0	0
07-08-2022	20:00-20:20	6	0	13
10-08-2022	15:00-15:45	7	0	21
12-08-2022	12:00-12:30	3	0	6
15-08-2022	12:00-12:30	1	0	2
17-08-2022	18:00-18:20	3	0	8
23-08-2022	14:00-14:25	5	0	10
25-08-2022	08:10-08:40	0	0	0
27-08-2022	10:00-10:20	0	2	2



**Appendix 5.** Pigeon Lake instantaneous angler count data, May 15 to August 31, 2022.

Date	Time	Number of boats	Number of shore anglers	Total number of anglers
16-05-2022	12:00-12:50	2	2	7
18-05-2022	17:00-17:40	0	0	0
24-05-2022	08:15-09:15	0	0	0
26-05-2022	14:00-15:00	7	0	14
28-05-2022	08:00-09:10	1	4	6
29-05-2022	14:00-14:50	1	0	4
02-06-2022	17:00-18:00	1	0	3
03-06-2022	12:00-13:15	4	3	16
04-06-2022	10:00-11:00	3	5	11
06-06-2022	16:00-17:00	0	3	3
08-06-2022	19:00-19:50	0	0	0
12-06-2022	21:00-21:50	0	0	0
14-06-2022	19:00-19:45	0	3	3
21-06-2022	10:00-11:25	3	0	5
27-06-2022	21:00-21:50	0	5	5
03-07-2022	20:00-21:00	5	20	28
05-07-2022	14:00-14:50	0	0	0
11-07-2022	09:00-10:00	8	0	17
13-07-2022	13:00-14:05	7	5	21
15-07-2022	18:00-19:25	8	2	27
16-07-2022	16:00-17:00	0	0	0
18-07-2022	11:00-11:45	4	0	11
20-07-2022	21:00-21:55	5	9	16
26-07-2022	11:00-12:10	5	3	16
28-07-2022	08:00-09:00	2	0	3
31-07-2022	11:00-11:55	15	4	38
05-08-2022	16:00-16:45	0	4	4
06-08-2022	19:00-20:00	18	0	35
11-08-2022	19:00-20:00	6	2	17
13-08-2022	13:00-14:10	29	7	71
14-08-2022	17:00-18:00	9	1	31
16-08-2022	15:00-15:50	3	2	11
22-08-2022	18:00-19:15	4	1	17
24-08-2022	10:00-10:45	9	0	17
26-08-2022	09:00-10:00	8	1	18
28-08-2022	09:00-09:45	2	1	5
29-08-2022	12:53-14:17	9	0	22

**Appendix 6.** Gull Lake instantaneous angler count data, May 15 to August 31, 2022.

Date	Time	Number of boats	Number of shore anglers	Total number of anglers
16-05-2022	11:43-12:56	6	0	11
18-05-2022	16:54-17:34	0	0	0
24-05-2022	08:29-09:15	0	0	0
26-05-2022	13:57-15:12	6	0	10
28-05-2022	08:18-08:57	1	0	2
29-05-2022	13:47-14:58	1	0	1
02-06-2022	16:57-17:48	3	0	3
03-06-2022	11:44-12:34	2	2	4
04-06-2022	09:58-11:23	1	0	2
06-06-2022	15:56-16:46	2	0	3
08-06-2022	19:02-20:04	0	0	0
12-06-2022	20:52-21:30	1	2	3
14-06-2022	18:59-19:43	1	0	2
21-06-2021	09:59-10:54	14	0	20
22-06-2022	14:55-15:54	0	0	0
27-06-2022	20:48-21:55	0	2	2
03-07-2022	19:59-21:09	8	7	23
05-07-2022	13:47-14:51	4	2	11
11-07-2022	09:43-10:43	18	0	33
13-07-2022	12:47-13:55	10	2	22
15-07-2022	17:51-19:24	7	1	21
16-07-2022	15:52-16:31	2	0	5
18-07-2022	10:59-12:03	2	5	8
20-07-2022	20:56-22:07	9	9	26
26-07-2022	11:02-12:19	12	4	31
28-07-2022	08:21-09:18	1	2	4
31-07-2022	10:48-12:25	45	0	91
05-08-2022	15:46-16:50	2	2	7
06-08-2022	18:46-20:15	27	3	65
11-08-2022	18:47-19:57	5	0	15
13-08-2022	12:52-14:13	53	0	65
14-08-2022	17:04-18:10	17	0	43
16-08-2022	14:46-15:52	1	1	2
22-08-2022	17:59-19:07	9	0	25
24-08-2022	09:55-10:36	6	0	11
26-08-2022	09:00-10:02	13	0	19
28-08-2022	08:55-09:23	7	0	16
29-08-2022	11:53-12:50	7	0	14

**Appendix 7.** Buck Lake instantaneous angler count data, May 15 to August 31, 2022.

Date	Time	Number of boats	Number of shore anglers	Total number of anglers
15-05-2022	11:42-12:50	28	10	57
17-05-2022	19:04-19:23	1	0	1
19-05-2022	13:50-14:48	0	0	0
25-05-2022	09:58-10:15	6	0	8
27-05-2022	15:45-16:01	1	0	2
30-05-2022	15:54-16:57	2	0	3
05-06-2022	17:14-17:56	0	0	0
07-06-2022	11:00-11:20	4	0	6
11-06-2022	16:04-16:39	12	0	22
13-06-2022	20:58-21:08	0	0	0
15-06-2022	12:58-13:58	0	0	0
20-06-2022	09:00-09:21	3	0	4
23-06-2022	17:17-18:11	0	0	0
24-06-2022	17:52-18:04	2	0	5
25-06-2022	08:21-08:54	12	0	19
26-06-2022	14:20-15:14	57	1	132
28-06-2022	19:48-21:06	1	0	2
02-07-2022	18:53-19:32	16	0	35
04-07-2022	14:54-15:34	1	0	2
06-07-2022	19:07-20:02	9	0	17
12-07-2022	08:23-08:49	5	0	7
14-07-2022	11:17-11:57	14	1	31
17-07-2022	08:54-09:31	6	0	11
19-07-2022	10:00-10:24	3	0	7
25-07-2022	17:57-18:35	5	1	11
27-07-2022	17:00-17:48	9	0	19
29-07-2022	09:01-09:49	26	0	46
30-07-2022	12:50-13:51	29	0	71
04-08-2022	19:47-20:43	1	0	2
07-08-2022	20:00-20:43	12	0	23
10-08-2022	14:55-15:54	8	0	21
12-08-2022	12:00-12:40	4	0	9
15-08-2022	12:10-12:36	8	0	17
17-08-2022	17:53-18:28	6	0	11
23-08-2022	13:54-14:23	6	0	14
25-08-2022	08:13-08:38	4	0	7
27-08-2022	10:02-10:49	7	0	15



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