Camera-Based Sport Fishery Surveys at Ethel, Floatingstone, Garner, and Hilda Lakes, Alberta, 2009 - 2010

Alberta Conservation Association

Conserving Alberta's Wild Side

The Alberta Conservation Association is a Delegated Administrative Organization under Alberta's Wildlife Act.

Camera-Based Sport Fishery Surveys at Ethel, Floatingstone, Garner, and Hilda Lakes, Alberta, 2009 - 2010

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EXECUTIVE SUMMARY

To conserve and recover over-exploited sport fish populations, Alberta Sustainable Resource Development has instituted provincial management and recovery plans. These management plans require ongoing assessment of sport fisheries, including angler effort and harvest, to allow managers to set regulations that maintain or improve populations. To generate angler effort and harvest data, managers have largely relied on access (on site) creel surveys. However, these surveys typically require significant capital and staffing, which due to finite program resources, can result in only higher priority lakes being assessed. Collecting angling effort data using camera-based creel techniques could potentially reduce costs associated with monitoring fisheries, allowing managers to regularly assess more lakes than previously possible. During the summers of 2009 and 2010 the Alberta Conservation Association investigated the ability of programmed trail cameras and camera-based creel techniques to estimate angling effort on four small lakes (<1000 ha) in northeastern Alberta.

The estimated number of anglers at Ethel Lake during the summer of 2009 was 2,298 (95% CI = 1,463–3,434). Anglers fished for a combined 6,789 h (95% CI = 4,488–9,797), resulting in an angling pressure of 13.9 h/ha (95% CI = 9.2–20.0). Based on angler interviews, the estimated total yield of sport fish (harvest + incidental mortality) was 163 walleye (95% CI = 108-236), 645 northern pike (95% CI = 280-773), and 505 yellow perch (95% CI = 334-729).

The estimated number of anglers at Floatingstone Lake during the summer of 2010 was 1,093 (95% CI = 574–1,816), fishing for 1,907 h (95% CI = 1,050–3,022), resulting in an angling pressure of 3.8 h/ha (95% CI = 2.1–6.1). Based on angler interviews, the total yield of northern pike (harvest + incidental mortality) was 63 fish (95% CI = 34-100). Harvest of walleye at Floatingstone Lake was prohibited, and anglers did not report harvesting yellow perch; however incidental mortality was 8 walleye (95% CI = 5-13) and 38 yellow perch (95% CI = 21-61).

The estimated number of anglers at Garner Lake during the summer of 2010 was 1,360 (95% CI = 960–1,859). Anglers fished for 4,064 h (95% CI = 3,043–5,231), resulting in an angling pressure of 5.2 h/ha (95% CI = 3.9–6.7). Based on angler interviews, the total

yield of sport fish (harvest + incidental mortality) was 332 walleye (95% CI = 249-428), 454 northern pike (95% CI = 340-584), and 207 yellow perch (95% CI = 155-266).

The estimated number of anglers at Hilda Lake during the summer of 2009 was 2,039 (95% CI = 1,263–3,073). Anglers fished for a combined 4,195 h (95% CI = 2,675–6,111), resulting in an angling pressure of 11.8 h/ha (95% CI = 7.5–17.2). Based on angler interviews, the total yield of sport fish (harvest + incidental mortality) was 305 walleye (95% CI = 194-444) and 446 northern pike (95% CI = 284-649).

Key words: northern pike, walleye, yellow perch, trail camera, creel survey, Ethel Lake, Floatingstone Lake, Garner Lake, Hilda Lake

ACKNOWLEDGEMENTS

We thank the County of Bonnyville and the camp caretakers at Ethel Lake County Campground, for ensuring field staff always had a place to camp. Alberta Tourism, Parks and Recreation, especially the staff of Garner Lake Provincial Park, provided camping accommodations and a dry warehouse on rainy days. We also thank Alberta Sustainable Resource Development, Fish and Wildlife Division in Cold Lake, for their in-kind support of camera installations and data collection.

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1.0 INTRODUCTION

High fishing pressure, coupled with slow-growing and late-maturing populations, have resulted in the overharvest of many of Alberta's sportfish populations, including Walleye (*Sander vitreus*) and Northern Pike (*Esox lucius*) (Sullivan 2003). As a result, Alberta Sustainable Resource Development (ASRD) developed the Alberta Walleye Management and Recovery Plan (AWMRP) in 1995 (Berry 1995) and the Alberta Northern Pike Management and Recovery Plan (ANPWRP) in 1999 (Berry 1999). These management plans require ongoing assessment of sport fisheries, including the collection of data on angler effort and harvest, to allow managers to set regulations that maintain or improve populations. To generate angler effort and harvest data, managers have largely relied on access (on site) creel surveys. However, these surveys typically require significant capital and staffing, which due to finite program resources, can result in only a few priority lakes being assessed each year. A method that would monitor angling effort, while requiring less time and money, would be attractive for managers. In recent years the Alberta Conservation Association (ACA) has applied camera-based creel methods during surveys of stocked trout ponds (<50 ha) (Patterson 2011). Utilizing these methods the ACA was able to estimate angler effort and harvest on several ponds with minimal staffing effort. The goal of this study was to investigate the merit of applying similar camera-based methods for generating estimates of angling effort and harvest on small lakes (<1000 ha).

2.0 STUDY AREA

2.1 Ethel Lake

Ethel Lake (54°32' N, 110°21' W) is located in the Beaver River drainage, approximately 225 km northeast of Edmonton and 18 km northwest of Cold Lake, Alberta (Figure 1). It has a surface area of 490 ha, a mean depth of 6.6 m and a maximum depth of 30 m. The major inflows to the lake are Marie Creek on the north shore and an unnamed creek that flows in from Hilda Lake on the southwest shore. The lake is drained by Marie Creek on the southeast shore. Ethel Lake can be reached by both Ethel Lake Road and Primrose Lake Road, which is located north of Highway 55 and provides access to a provincial recreation area located on the northeast shore of the lake. The recreation area contains 14 campsites, a day use area and a boat launch. There are several cottage developments and a few permanent residences on the north side of the lake. During fall walleye index netting (FWIN) activities completed by the ACA in 2007, it was found that the Ethel Lake fish community included populations of walleye, northern pike, yellow perch, and lake whitefish, as well as cisco and white sucker (Ganton 2007).

Figure 1. Map of Ethel Lake, Alberta showing camera locations and their fields of view. Inset map shows the location within Alberta.

2.2 Floatingstone Lake

Floatingstone Lake (54°13' N, 111°38' W) is also located within the Beaver River drainage, approximately 145 km northeast of Edmonton, Alberta (Figure 2). Floatingstone Lake has a surface area of 598 ha, and a maximum depth of 19.8 m. The lake is fed and drained by Bunder Creek, which flows in from Upper and Lower Mann lakes and flows out to Bunder Lake. Floatingstone Lake is accessed by Range Road 115, located north of Highway 28. The majority of the shoreline is developed, including numerous subdivisions along the south, west and north sides of the lake. Floatingstone Lake Campground, located on the southeast corner of the lake, is operated by the County of St. Paul and offers more than 40 sites, a day use area and a boat launch. According to angler reports, Floatingstone Lake has supported walleye, northern pike, and yellow perch populations. During the angling season of 2009, anglers on Floatingstone Lake could apply for walleye harvest tags, as part of Alberta's special harvest licence program.

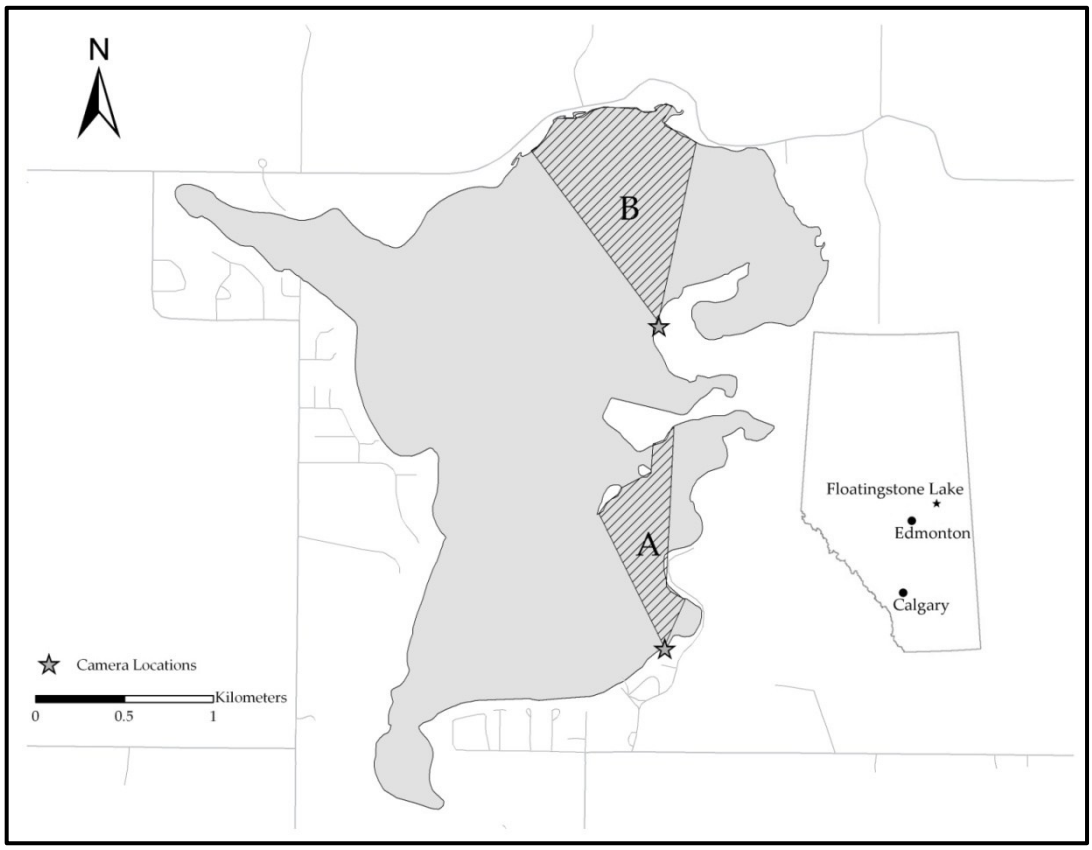

Figure 2. Map of Floatingstone Lake, Alberta showing camera locations and their fields of view. Inset map shows the location within Alberta.

2.3 Garner Lake

Garner Lake (54°11' N, 111°43' W), also located within the Beaver River drainage, is approximately 135 km northeast of Edmonton, Alberta (Figure 2). Garner Lake has a surface area of 776 ha, a mean depth of 8.0 m and a maximum depth of 15 m. There are no major inflows to the lake, and the outflow is intermittent. The lake is accessed by Range Road 123, located north of Highway 28 at Spedden, Alberta, and leads to Garner Lake Provincial Park on the southeast shore. The park includes 61 camping sites, a boat launch, a dock and a large parking area. The remainder of the lake is largely developed, with cottage subdivisions covering the east and west shores. Garner Lake supports populations of walleye, northern pike, yellow perch and lake whitefish. During the 2010 angling season, Garner Lake offered harvest tags for walleye, as part of Alberta's special harvest licence program.

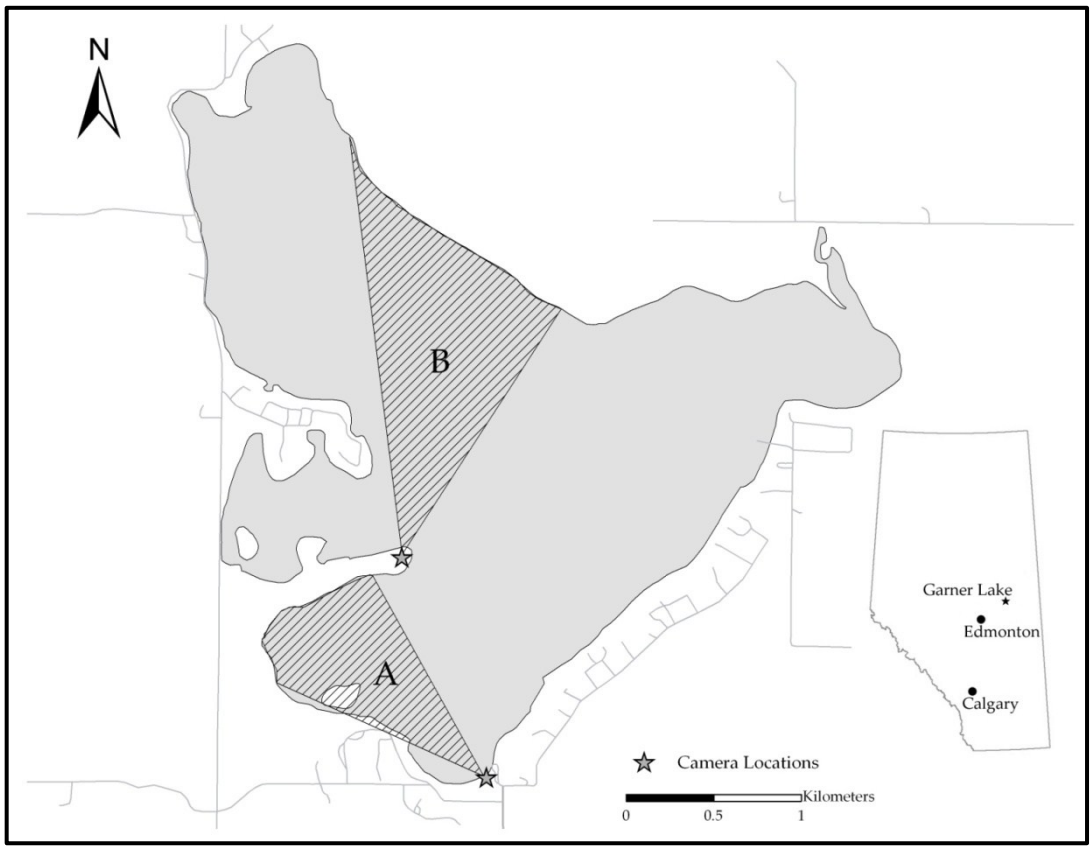

Figure 3. Map of Garner Lake, Alberta showing camera locations and their fields of view. Inset map shows the location within Alberta.

2.4 Hilda Lake

Hilda Lake (54°31' N, 110°25' W), also located within the Beaver River drainage, is approximately 220 km northeast of Edmonton and 20 km northwest of Cold Lake, Alberta (Figure 2). Hilda Lake has a surface area of 356 ha, a mean depth of 6.2 m and a maximum depth of 14 m. It is fed by several small creeks on the west shore, and is drained by an outflow on the east shore, which empties into Ethel Lake. Hilda Lake is accessed by Ethel Lake Road, located north of Highway 55, which leads to an unmaintained recreation area and boat launch on the southeast shore. The shoreline is relatively undeveloped, with the exception of a small cottage development on the northeast side of the lake. During FWIN activities completed by the ACA in 2007, it was found that the Hilda Lake fish community included populations of walleye, northern pike, and yellow perch, as well as cisco and white sucker (Ganton 2007).

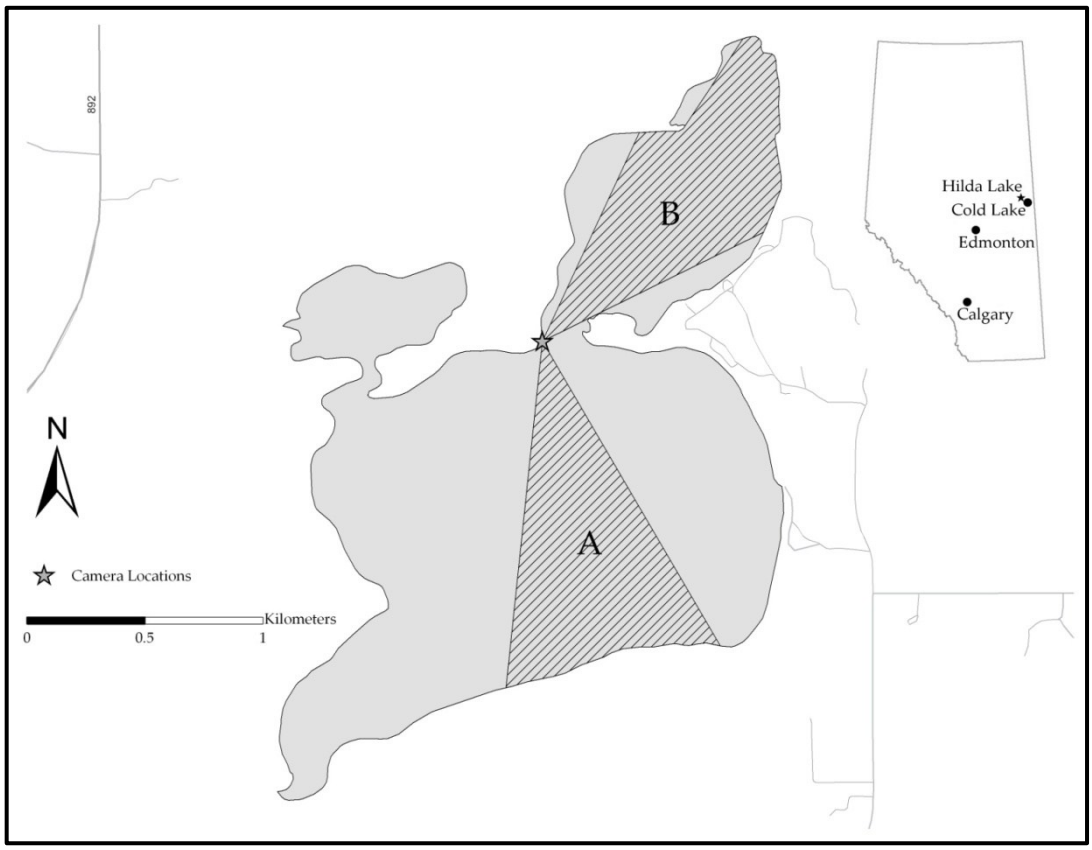

Figure 4. Map of Hilda Lake, Alberta showing camera locations and their fields of view. Inset map shows the location within Alberta.

3.0 MATERIALS AND METHODS

3.1 Camera-based creel

Angling effort at each lake was collected using digital trail cameras (Cuddeback Expert 3.0) that were programmed to take a photograph every hour, from 0800 – 2200 (i.e., 15 h angling day). These hourly photographs are equivalent to instantaneous counts of boats present on the lake within each camera's field of view. We installed two angling effort cameras (Camera A and Camera B) facing in different directions at each lake, for a total of eight cameras. Cameras were mounted at serviceable height (~2 m) to 2″ x 4″ x 8′ wooden posts pounded into the ground. We visited each camera every two weeks to download pictures and change batteries.

Based on their field of view, each camera captured only a portion of the lake area (Figures 1 - 4). To account for angling effort within the areas missed by the cameras, we performed a number of instantaneous on-the-ground counts, synchronized with the trail cameras. During each count we recorded the number of boats and anglers in each of three areas: Camera A, Camera B, and outside camera views. We then used the ratio of the number of boats within camera areas to those outside camera areas to extrapolate survey parameter estimates to the unsampled spatial strata (spatial correction).

The ability of observers to accurately identify anglers within the photographs had the potential to affect estimates of angler effort. For example, angler effort could be underestimated due to factors causing an observer not to identify anglers within the photograph (e.g. cloud cover, glare, distance, boat size and color, or composition of background shoreline). Alternately, angler effort could be overestimated by counting boats within photographs in which occupants were not angling (e.g. water skiing, or touring). To account for this, we again used the synchronized on-the-ground counts to assess the efficiency of each observer and, if needed, provide a correction factor. First we tested the efficacy of each observer at detecting angling effort by using a paired t-test to compare on-the-ground boat counts with the number of boats observed in the corresponding photographs. If the means of the two data sets were not different, we did not apply a correction. However, if a difference was detected, we used the ratio of

boats in photograph counts to boats in on-the-ground counts to correct estimates (observer correction).

To estimate angling effort, we stratified the survey period into weekdays versus weekend days/holidays, and from each strata we selected a proportional, random sample of angling effort photographs. We repeated this process for each of the eight cameras. In 2009, based on power analysis of expected values (instant counts) we selected and counted 100 photographs from each camera. In 2010, based on lower angling effort lakes, we selected and counted 200 photographs. We tallied the number of boats angling in each photograph. We then used a bootstrap technique to calculate the mean number of boats angling per hour and the associated 95% confidence intervals (CI), following Sullivan (2004). We then applied the spatial and observer corrections (when required) using binomial simulation, following Sullivan (2004).

Harvest and release rates were expressed as total ratio estimators (Malvestuto 1983) and were applied to total angler effort estimates to generate the number of fish harvested and released. To estimate the number of fish killed by catch-and-release, we applied a constant incidental mortality rate of 5.3% to the total number of fish released. We chose this incidental mortality rate based on data collected from previous studies (Reeves 2004). A flow chart describing the steps for calculating the angling effort and creel survey parameters is presented in Appendix 1.

3.2 Angler interviews

We conducted interviews with anglers as they were encountered by boat, and used this information to generate angler catch rates, harvest, and trip length, using a modification of the roving creel survey design described by Pollock et al. (1994). Angler interviews were conducted with an intercept approach, in which we interviewed anglers as they completed their angling trip. During the interviews, we collected information from each angler on trip length, species harvested, and species released. Daily summaries of the angler interviews at each lake are listed in Appendices 2, 3, 4 and 5.

3.3 Data management and analysis

Data from angler interviews were transcribed into Microsoft Excel® by a professional data entry service using double entry verification. Angling effort photographs were saved to compact flash cards and downloaded onto a computer every two weeks. Before analysis, we calculated frequency distributions and daily sums of each survey parameter to determine possible outliers. Outliers were then investigated using the original data sheets and daily summaries and removed if recording error was suspected.

4.0 RESULTS

4.1 Ethel Lake

4.1.1 Angler effort

At Ethel Lake, we interviewed 146 anglers, who fished for a total of 435.75 h. During on-the-ground counts, 222 of 466 anglers were observed inside camera areas, thus photographs captured 48% (95% CI = 43–52, n = 466) of the angling effort. In 100 randomly selected photographs, observers counted 18 and 25 boats in Camera A and B, respectively. There was a significant difference between photograph and field counts (Camera A: *paired t-test* = 2.55, df = 101, P = 0.01; Camera B: *paired t-test* = 3.93, df = 97, P = <0.0), therefore a correction was applied. Observers of Camera A and B were 56% (95% CI = 36–76, n = 25) and 54% (95% CI = 36–76, n = 54) efficient, respectively. Using these values, anglers made an estimated 2,298 trips (95% CI = 1,463–3,434) and fished for 6,789 h (95% CI = 4,488–9,797), resulting in a total pressure of 13.9 h/ha (95% CI = 9.2–20.0).

4.1.2 Sport fish harvest

Anglers at Ethel Lake reported harvesting two walleye and releasing 160, resulting in a harvest rate of 0.005 fish/h and a release rate of 0.37 fish/h. The estimated number of walleye harvested was 31 fish (95% CI = 21-45), while anglers released 2,493 fish (95% CI = 1,648–3,597). Of the 2,493 walleye released, 132 (95% CI = 87–191) died from catch

and release mortality. Therefore, the total yield of walleye (harvest + incidental mortality) was 163 fish (95% CI = 108-236).

Ethel Lake anglers, also reported harvesting seven northern pike and releasing 517, resulting in a harvest rate of 0.02 fish/h and a release rate of 1.19 fish/h. The estimated number of northern pike harvested was 109 fish (95% CI = 72-157), while anglers released 8,055 fish (95% CI = 5,325–11,624). Of the 8,055 northern pike released, 536 (95% CI = 354–773) died from catch and release mortality. Therefore the total yield of northern pike (harvest + incidental mortality) was 645 fish (95% CI = 280-773).

Anglers reported harvesting 30 yellow perch and releasing 46, resulting in a harvest rate of 0.07 fish/h and a release rate of 0.11 fish/h. We estimate anglers harvested 467 fish (95% CI = 309-675), while releasing 717 fish (95% CI = 474–1,034). Of the 717 yellow perch released, 38 (95% CI = 25-55) died from catch and release mortality. Therefore the total yield of yellow perch (harvest + incidental mortality) was 505 fish (95% CI = 334-729).

4.2 Floatingstone Lake

4.2.1 Angler effort

At Floatingstone Lake, we interviewed 28 anglers who fished for a total of 49.5 h. During on-the-ground counts, 35 of 138 anglers were observed inside camera areas, thus the cameras captured 25% (95% CI = 18–33, n = 173) of the angling effort. In 200 randomly selected photographs, observers counted five and 24 boats in Camera A and B, respectively. Comparison of the field counts to their corresponding photographs could not be completed for Camera A, because there were no anglers observed fishing within its field of view during the field counts. There was no difference between photograph and field counts (*paired t-test* = 0.43, df = 65, P = 0.34) for Camera B, thus no observer correction was made. We estimate anglers made 1,093 trips (95% CI = 574–1,816) and fished for 1,907 h (95% CI = 1,050–3,022), resulting in a total pressure of 3.8 h/ha (95% CI = 2.1–6.1).

4.2.2 Sport fish harvest

Harvest of walleye was prohibited at Floatingstone Lake in 2010, and no harvest was observed. However, anglers reported releasing four walleye, for a release rate of 0.08 fish/h, resulting in an estimated 154 fish released (95% CI = 85–244), including 8 (95% CI = 5–13) of which died from catch and release mortality.

Anglers at Floatingstone Lake reported harvesting just one northern pike and releasing 12, resulting in a harvest rate of 0.02 fish/h and a release rate of 0.24 fish/h. From these values we estimate anglers harvested a total of 39 fish (95% CI = 21-61) and released 462 fish (95% CI = 254-733), including 24 (95% CI = 13–39) of which died from catch and release mortality. Therefore the total harvest of northern pike (harvest + incidental mortality) was 63 fish (95% CI = 34-100).

In addition to walleye and northern pike, anglers reported releasing 19 yellow perch, for a release rate of 0.38 fish/h, resulting in an estimated release of 725 fish (95% CI = 399–1,148), including 38 (95% CI = 21-61) of which died from catch and release mortality.

4.3 Garner Lake

4.3.1 Angler effort

At Garner Lake, we interviewed 64 anglers who fished for a total of 193.5 h. During on-the-ground counts, 136 of 345 anglers were observed inside camera views, thus cameras captured 39% (95% CI = 34–45, n = 481) of the angling effort. In 200 randomly selected photographs, observers counted 55 and 34 boats in Camera A and B, respectively. Comparison of the field counts to their corresponding photographs did not indicate a significant difference between counts (Camera A: *paired t-test* = 1.45, df = 71, P = 0.08; Camera B: *paired t-test* = 0.24, df = 71, P = 0.41), thus no observer correction was made. We estimated anglers made 1,360 trips (95% CI = 960–1,859) and fished for 4,064 h (95% CI = 3,043–5,231), resulting in a total pressure of 5.2 h/ha (95% CI = 3.9–6.7).

4.3.2 Sport fish harvest

Anglers at Garner Lake reported harvesting 10 walleye and releasing 110, resulting in a harvest rate of 0.05 fish/h and a release rate of 0.57 fish/h. The estimated number of walleye harvested was 210 fish (95% CI = 157-270), while anglers released an estimated 2,310 fish (95% CI = 1,730–2,974), 122 (95% CI = 92–158) of which died from catch and release mortality. Therefore the total yield of walleye (harvest + incidental mortality) was 332 fish (95% CI = 249-428).

Garner Lake anglers reported harvesting 19 northern pike and releasing 49, resulting in a harvest rate of 0.10 fish/h and a release rate of 0.25 fish/h. The estimated number of northern pike harvested was 399 fish (95% CI = 299-514), while anglers released an estimated 1,029 fish (95% CI = 771–1,325), 55 (95% CI = 41–70) of which died from catch and release mortality. Therefore the total yield of northern pike (harvest + incidental mortality) was 454 fish (95% CI = 340-584).

Anglers also reported harvesting nine yellow perch and releasing 16, resulting in a harvest rate of 0.05 fish/h and a release rate of 0.08 fish/h. Anglers harvested an estimated 189 fish (95% CI = 142-243), while releasing an estimated 336 fish (95% CI = 252-433), 18 (95% CI = 13-23) of which died from catch and release mortality. Therefore the total yield of yellow perch (harvest + incidental mortality) was 207 fish (95% CI = 155-266).

4.4 Hilda Lake

4.4.1 Angler effort

In total, we interviewed 68 anglers who fished for a total of 141.25 hours. During on-the-ground counts, 154 of 288 anglers were observed inside camera views, thus cameras captured 53% (95% CI = 48-59, n = 288) of the angling effort. In 100 randomly selected photographs, observers counted 27 and 23 boats in Camera A and B, respectively. There was a significant difference between field counts and the corresponding observed values for Camera A (*paired test-t* = 2.92, df = 92, P = 0.01), but there was no difference for Camera B (*paired t-test* = 1.35, df = 68, P = 0.09). Observers of Camera A were 65%

(95% CI = 47-79, n = 34) efficient. Using these values, anglers took an estimated 2,039 trips (95% CI = 1,263–3,073) and fished for 4,195 h (95% CI = 2,675–6,111), resulting in a total pressure of 11.8 h/ha (95% CI = 7.5–17.2).

4.4.2 Sport fish harvest

Anglers at Hilda Lake reported harvesting three walleye and releasing 137, resulting in a harvest rate of 0.02 fish/h and a release rate of 0.97 fish/h. The estimated number of walleye harvested was 89 fish (95% CI = 57-130), while anglers released an estimated 4,069 fish (95% CI = 2,595–5,927), 216 (95% CI = 138-314) of which died from catch and release mortality. Therefore the total yield of walleye (harvest + incidental mortality) was 305 fish (95% CI = 194-444).

Hilda Lake anglers reported harvesting six northern pike and releasing 170, resulting in a harvest rate of 0.04 fish/h and a release rate of 1.20 fish/h. The estimated number of northern pike harvested was 178 fish (95% CI = 114-260), while anglers released an estimated 5,049 fish (95% CI = 3,220–7,355), 268 (95% CI = 171-390) of which died from catch-and-release mortality. Therefore the total yield of northern pike (harvest + incidental mortality) was 446 fish (95% CI = 284–649).

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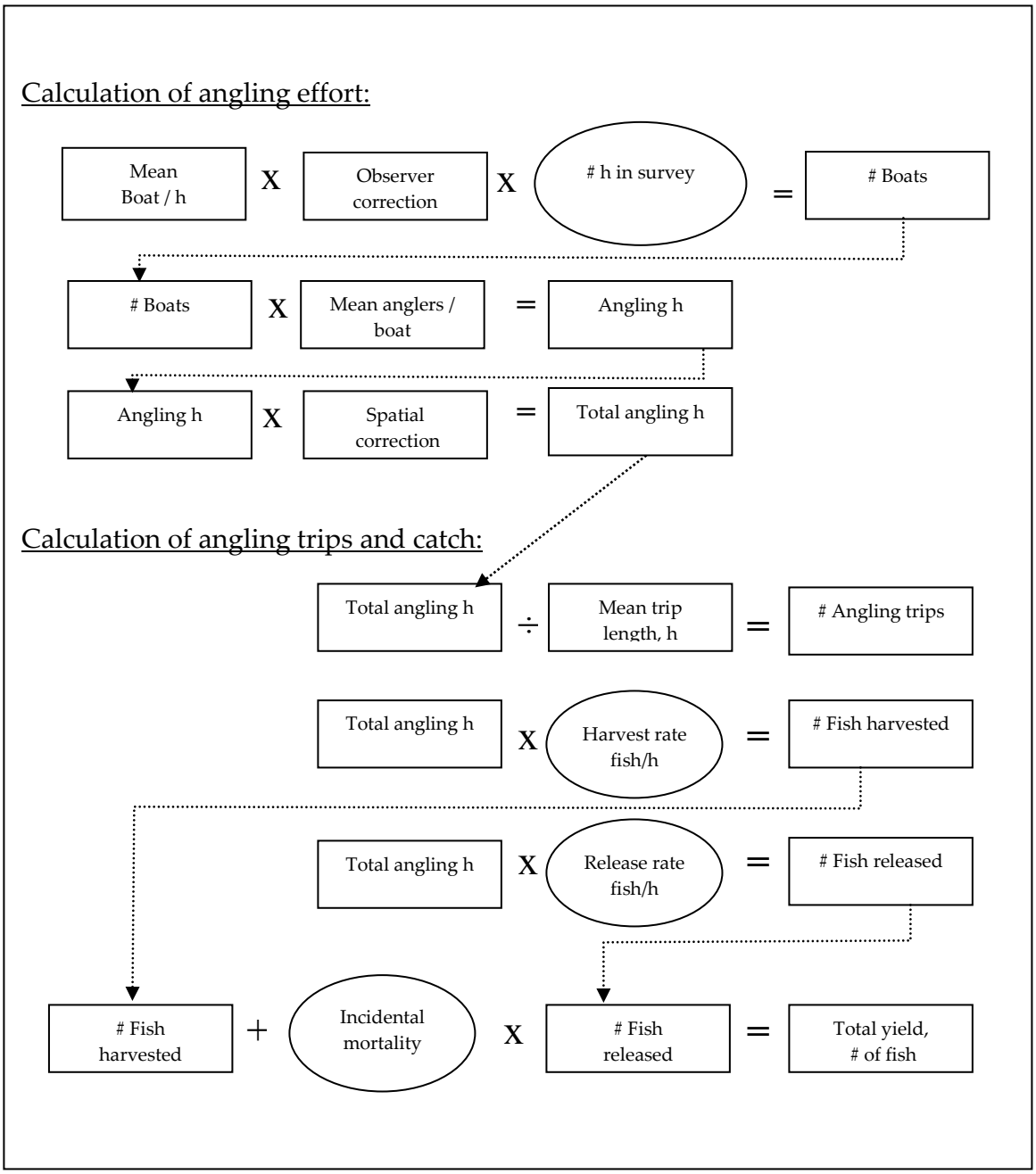
6.0 APPENDICES

Appendix 1. Flow chart outlying the process used to estimate creel parameters at Ethel, Floatingstone, Garner, and Hilda lakes. Circles represent values with no variance and rectangles represent data with variation.



Appendix 2. Summary of information collected from anglers during the roving creel survey of Ethel Lake, 2009. Codes: walleye = WALL, northern pike = NRPK, yellow perch = YLPR.

Date	Number of Anglers	Fishing effort, (h)	WALL harvested	WALL released	NRPK harvested	NRPK released	YLPR harvested	YLPR released
18-May-09	14	61.5	0	1	1	16	0	0
27-May-09	5	25	0	2	0	8	0	0
2-Jun-09	3	8.5	0	2	1	26	0	0
3-Jun-09	2	4	0	0	0	15	0	0
5-Jun-09	5	14	0	3	0	48	0	0
11-Jun-09	3	10.5	0	0	1	13	0	0
12-Jun-09	5	4.5	0	0	0	3	0	0
13-Jun-09	9	30	0	3	1	55	0	0
24-Jun-09	5	14.5	0	22	0	25	0	0
9-Jul-09	4	8	0	1	0	17	0	0
17-Jul-09	5	8	0	8	0	16	0	0
21-Jul-09	2	6	0	21	0	8	0	0
23-Jul-09	21	52.5	0	38	0	63	0	2
1-Aug-09	24	99.75	0	16	3	124	17	17
9-Aug-09	3	7.5	0	2	0	2	5	21
10-Aug-09	3	7.5	0	0	0	6	0	0
11-Aug-09	10	25	2	19	0	30	0	6
26-Aug-09	5	10.5	0	14	0	8	0	0
29-Aug-09	18	38.5	0	8	0	40	8	0
Total	**146**	**435.75**	**2**	**160**	**7**	**517**	**30**	**46**

Appendix 3. Summary of information collected from anglers during the roving creel survey of Floatingstone Lake, 2010. Codes: walleye = WALL, northern pike = NRPK, yellow perch = YLPR.

Date	Number of Anglers	Fishing effort, (h)	WALL harvested	WALL released	NRPK harvested	NRPK released	YLPR harvested	YLPR released
11-Jun-10	2	6	0	0	0	3	0	0
11-Jun-10	3	4.5	0	0	0	0	0	0
11-Jun-10	2	3	0	0	1	0	0	0
17-Jun-10	1	2.5	0	0	0	0	0	0
8-Jul-10	3	6	0	1	0	2	0	18
8-Jul-10	1	2	0	0	0	1	0	0
18-Jul-10	2	8	0	1	0	1	0	1
18-Jul-10	2	2	0	0	0	0	0	0
18-Jul-10	1	4	0	0	0	0	0	0
7-Aug-10	4	6	0	2	0	5	0	0
7-Aug-10	5	3.5	0	0	0	0	0	0
26-Aug-10	2	2	0	0	0	0	0	0
Total	**28**	**49.5**	**0**	**4**	**1**	**12**	**0**	**19**

Appendix 4. Summary of information collected from anglers during the roving creel survey of Garner Lake, 2010. Codes: walleye = WALL, northern pike = NRPK, yellow perch = YLPR.

Date	Number of Anglers	Fishing effort, (h)	WALL harvested	WALL released	NRPK harvested	NRPK released	YLPR harvested	YLPR released
10-Jun-10	6	1.5	1	0	0	0	0	0
19-Jun-10	4	8	0	0	3	0	0	0
19-Jun-10	8	33	0	9	2	2	0	0
19-Jun-10	2	20	0	4	1	3	0	0
19-Jun-10	2	3	0	3	2	2	0	1
19-Jun-10	2	12	1	2	2	12	0	0
1-Jul-10	4	8	0	0	0	0	0	0
1-Jul-10	4	16	2	26	1	3	0	0
2-Jul-10	4	6	0	1	0	11	0	0
9-Jul-10	2	4	0	0	1	0	0	0
9-Jul-10	3	15	6	33	1	2	0	0
9-Jul-10	2	11	0	12	2	2	4	0
9-Jul-10	2	2	0	6	0	3	0	0
10-Jul-10	2	3	0	1	1	0	0	0
19-Jul-10	3	4.5	0	3	0	2	0	0
19-Jul-10	2	12	0	3	0	2	0	0
5-Aug-10	1	2.5	0	1	0	0	5	15
5-Aug-10	3	3	0	2	0	0	0	0
17-Aug-10	4	12	0	4	0	2	0	0
18-Aug-10	1	2	0	0	0	0	0	0
28-Aug-10	3	15	0	0	3	3	0	0
Total	**64**	**193.5**	**10**	**110**	**19**	**49**	**9**	**16**

Appendix 5. Summary of information collected from anglers during the roving creel survey of Hilda Lake, 2009. Codes: walleye = WALL, northern pike = NRPK, yellow perch = YLPR.

Date	Number of Anglers	Fishing effort, (h)	WALL harvested	WALL released	NRPK harvested	NRPK released	YLPR harvested	YLPR released
3-Jun-09	2	17	0	1	0	20	0	0
10-Jun-09	2	4	0	12	0	16	0	0
13-Jun-09	11	16	0	10	0	6	0	0
25-Jun-09	4	10	0	2	0	9	0	0
27-Jun-09	4	10	1	24	0	14	0	0
10-Jul-09	14	31	1	44	2	38	0	0
16-Jul-09	9	20.5	1	11	2	14	0	0
22-Jul-09	6	10	0	2	2	23	0	0
24-Jul-09	3	3.75	0	1	0	3	0	0
2-Aug-09	5	5	0	0	0	4	0	0
12-Aug-09	1	0.5	0	0	0	1	0	0
27-Aug-09	3	5.5	0	5	0	9	0	0
28-Aug-09	4	8	0	25	0	13	0	0
Total	**68**	**141.25**	**3**	**137**	**6**	**170**	**0**	**0**

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