



**Sport Fish Distribution and Relative
Abundance on the Lower Red Deer
River from Dickson Dam to Joffre,
Alberta, 2005**



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Sport Fish Distribution and Relative Abundance on the
Lower Red Deer River from Dickson Dam to Joffre, Alberta, 2005

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EXECUTIVE SUMMARY

Sport fish relative abundance and distribution data were collected on a 97-km reach of the Lower Red Deer River from Dickson Dam to the Highway 11 Bridge near Joffre. A total of 50 1-km sample sites were boat electrofished at 2-km intervals. A concurrent mark-recapture population estimate was also attempted on five consecutive river kilometres immediately downstream of Dickson Dam. The mark-recapture component was not completed because of high river flows and resulted in no viable estimate from two passes and a single recapture. Excluding the first pass of the population estimate, a total of 3,105 fish were captured or enumerated across 50 sample sites. A total of 15 species were identified, of which ten were sport fish species. Mountain whitefish was the most abundant species representing 53.9% of the total sample and occurred at 33.5 fish/km, followed by goldeye at 18.7% and 11.6 fish/km. Walleye were the next most abundant sport species at 2.9% of the total and 1.8 fish/km, followed by brown trout at 1.4% and 1.2 fish/km. The remaining sport species, including mooneye, burbot, northern pike, lake whitefish, rainbow trout and sauger, each represented less than 1% of the total sample and occurred at less than 1 fish/km. The most abundant species were also the most widely distributed throughout the study area. In comparison with 1991 data, goldeye showed the greatest increase in overall abundance from 1.0 to 11.6 fish/km followed by an increase in walleye from 0.7 to 1.8 fish/km. The remaining sport species decreased in overall abundance. Most notably, brown trout decreased from 2.6 to 0.9 fish/km, northern pike from 1.4 to 0.2 fish/km and lake whitefish from 1.4 to 0.1 fish/km. Species that increased in abundance also increased in distribution, and species that decreased in abundance showed reductions in distribution throughout the study area; with the exception of lake whitefish which decreased in abundance but remained in three of six reaches in both 1991 and 2005.

Key words: Red Deer River, abundance, distribution, brown trout, walleye, electrofishing, Dickson Dam, Joffre.

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1.0 INTRODUCTION

Current data on relative abundance and distribution is essential to effectively manage sport fish populations. In 2004, an assessment of distribution and relative abundance of sport fish was conducted on the Lower Red Deer River below Joffre (Cooper and Council 2004; Blackburn and Cooper 2006). In that study, the survey area extended 473 km from the Joffre (Highway 11) bridge crossing to the Alberta / Saskatchewan border. An additional 97 km of the river extends upstream from the Joffre Bridge to the Dickson Dam, which separates the upper cold-water fishery from the cool and warm water fisheries in the mid and lower reaches downstream of the dam (Alberta Environment 2000). The purpose of this study was to assess sport fish distribution and relative abundance on this 97-km section of the Lower Red Deer River. Assessment of the remaining 97 km of river will provide a current depiction of fisheries abundance and distribution for the entire Red Deer River below Dickson Dam. Since the construction of the Dickson Dam in 1983, numerous fisheries studies have been conducted immediately downstream of the dam to monitor its effects. Water flowing from the bottom of Gleniffer Reservoir has extended a downstream cold-water zone which has pushed northern pike (*Esox lucius*), goldeye (*Hiodon alosoides*), and mooneye (*Hiodon tergisus*) populations downstream of historic ranges, while enhancing a cold water fishery favouring mountain whitefish (*Prosopium williamsoni*) and brown trout (*Salmo trutta*) immediately downstream of the dam (Alberta Environment 2000).

1.1 Study rationale

This survey aligns with Alberta Conservation Association (ACA) fisheries goals by assessing general sport fish population health and complements the 2004 assessment of sport fish distribution and relative abundance in the Lower Red Deer River. Data from this study will provide a baseline for determining future effects on fish communities, such as those that might occur from proposed changes in water allocation in the South Saskatchewan River Basin (AMEC Earth and Environmental 2004). A population estimate of sport fish was also conducted concurrently with this assessment on a 5-km portion of the study area downstream of Dickson Dam to provide data to help Alberta Sustainable Resource Development (ASRD) manage sport fish populations, particularly walleye (*Sander vitreus*) and brown trout populations.

1.2 Study objectives

The objectives of this study were to:

- i. Determine the current distribution and relative abundance of sport fish species in the Lower Red Deer River downstream of Dickson Dam;
- ii. Assess changes in relative abundance, distribution, and status of focal species through comparison with past surveys; and
- iii. Gather population size data for locally-important walleye and brown trout populations to assist ASRD with monitoring these species.

2.0 STUDY AREA

The Red Deer River originates northeast of Lake Louise at its headwaters in Banff National Park and terminates in the South Saskatchewan River 708 km downstream at its mouth in eastern Saskatchewan. From the Rocky Mountains, the Red Deer River flows eastward through the foothills boreal forest and the Town of Sundre (Roth 1999). From Sundre, the river veers northeast through the Parkland region and into the only major impoundment, the Dickson Dam, forming Gleniffer Reservoir. The river continues northeast through the City of Red Deer and then turns south near the Town of Stettler and flows southward through the City of Drumheller where a transition occurs from Parkland to Badlands. The Red Deer River continues into Dinosaur Provincial Park where it begins an eastward trajectory through rolling grasslands across the Alberta / Saskatchewan border where it converges with the South Saskatchewan River approximately 17 km into Saskatchewan (Figure 1).

The study area for this assessment was a 97-km segment of the Red Deer River immediately downstream of Dickson Dam to the Highway 11 crossing at Joffre. Downstream of the Dickson Dam, the river meanders eastward and is joined by two of three major tributaries in the study area. The first tributary is the Little Red Deer River, followed by the Medicine River. The Red Deer River continues to flow eastward nearly to the Town of Innisfail where it turns north and flows past the Town of Penhold. The Red Deer River continues northwest through the City of Red Deer and converges

northeast of the city with the third major tributary, the Blindman River, where it shifts to a southeast trajectory flowing past the Highway 11 bridge crossing and out of the study area (Figure 2).

3.0 MATERIALS AND METHODS

The assessment was conducted in late summer and fall of 2005. The study area was grouped into five reaches (A – F) of similar habitat as per Rees et al. (1992) to facilitate comparison with previous fall surveys conducted in 1990 and 1991 (Table 1 and Figures 3 to 5). Late summer sampling occurred from 6 to 8 September and focused primarily on Reach A and a small portion of Reach B. The remainder (and majority) of the assessment was conducted in the fall from 3 to 5 October.

River-kilometers in the 97-km study area were numbered eastward starting at the Saskatchewan border (Wieliczko and Buchwald 1998). The study area began at river-kilometer 570 immediately downstream of Dickson Dam to river-kilometer 473 at the Highway 11 crossing at Joffre (Table 1).

Table 1. Five reach divisions sampled along the Red Deer River, 2005.

Reach	River km	Reach length (km)	Location description
A	569 – 556	13	Dickson Dam to 500 m downstream of the confluence with Medicine River
B	556 – 527	29	Medicine River to railway bridge southeast of City of Red Deer
C	527 – 518	9	Railway bridge to the City of Red Deer (Highway 2 crossing)
D	518 – 505	13	The City of Red Deer: Highway 2 crossing to corporate city limits boundary
E	505 – 482	23	Red Deer city limits to the Canyon Ski Area
F	482 – 473	9	Canyon Ski area to Highway 11 (Joffre Bridge)

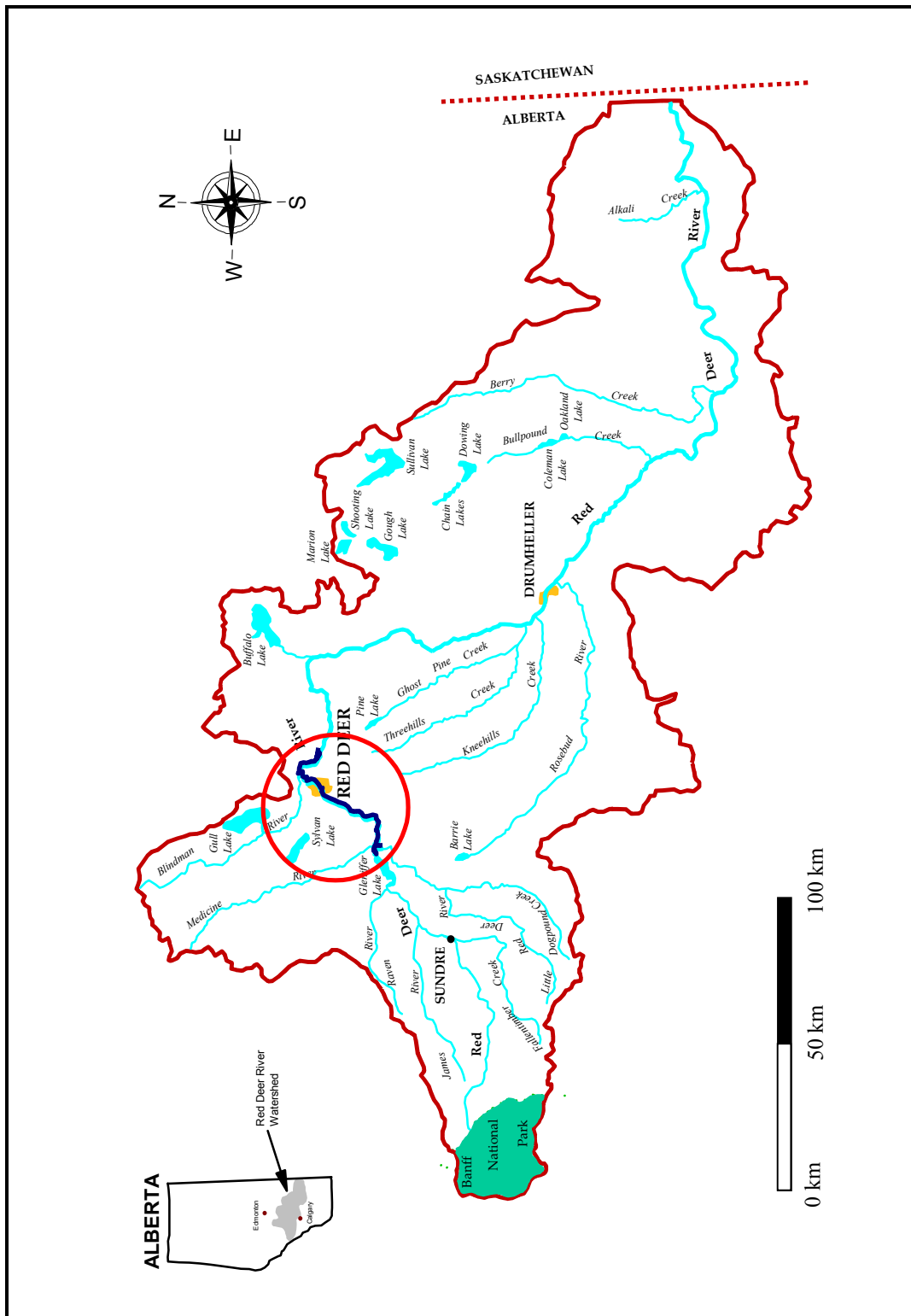


Figure 1. Location of the Red Deer River watershed in Alberta and the 2005 study area (circled).

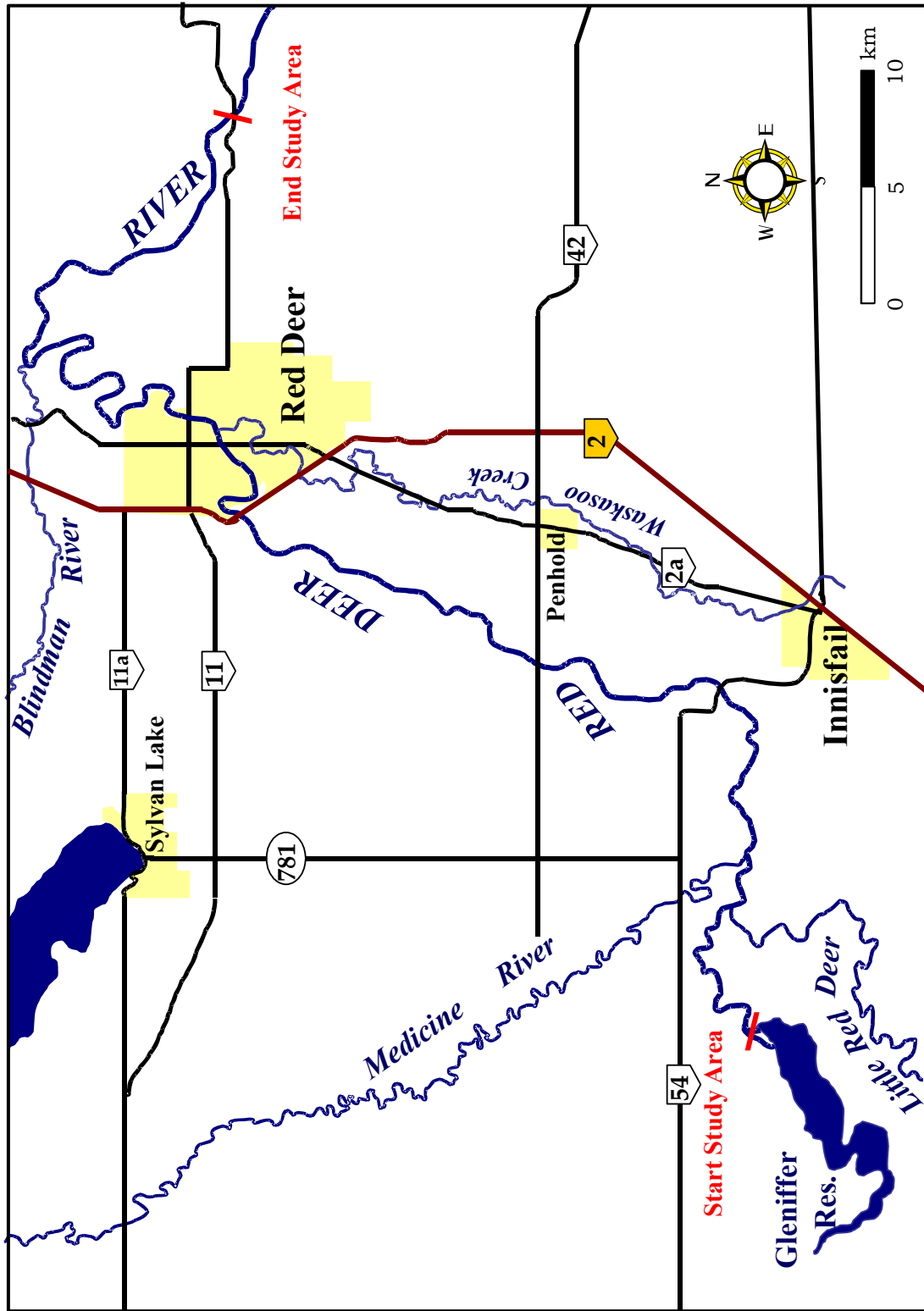


Figure 2. Map of the study area sampled along the Red Deer River, 2005.

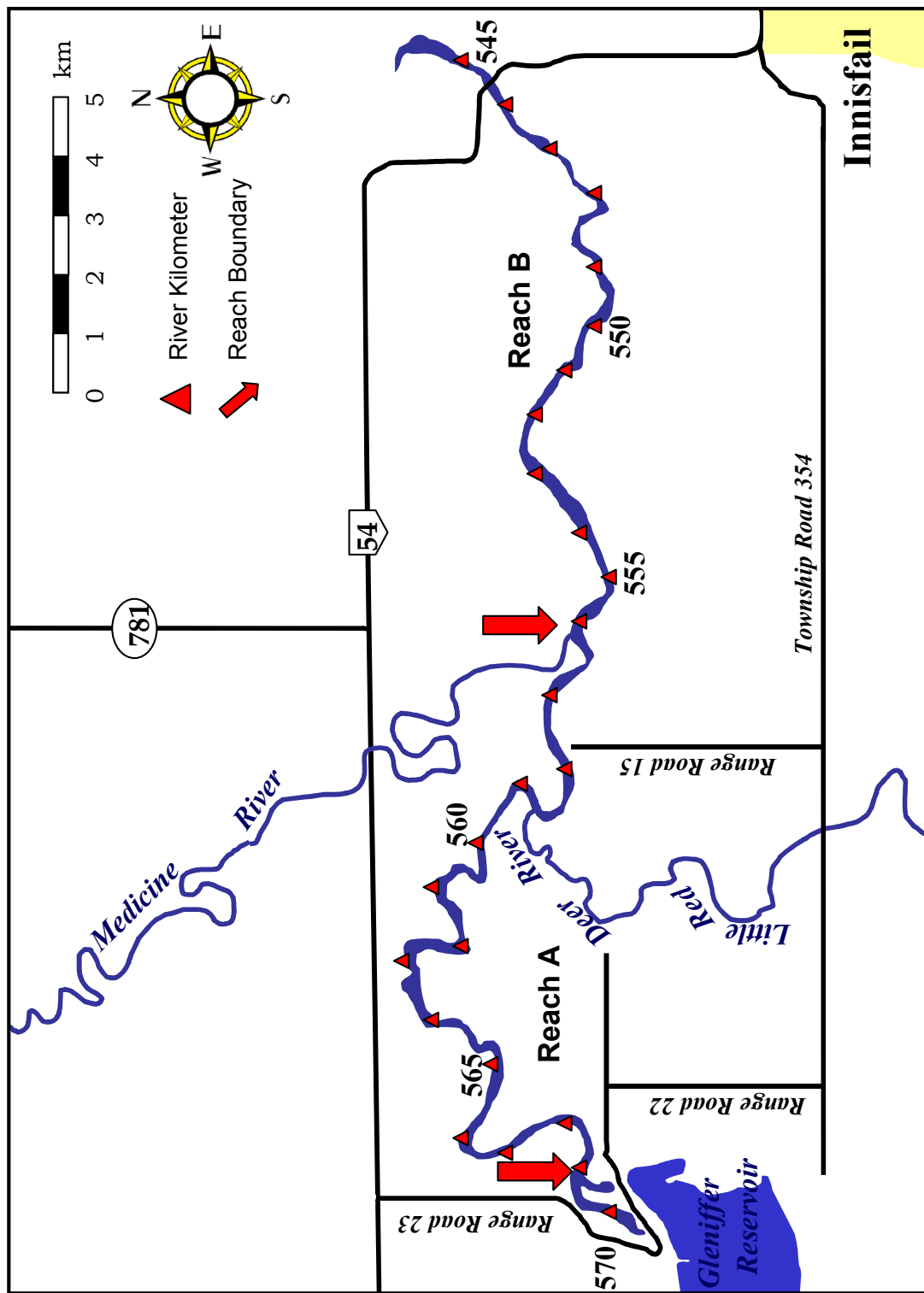


Figure 3. River kilometer divisions and reaches A to B of the study area.

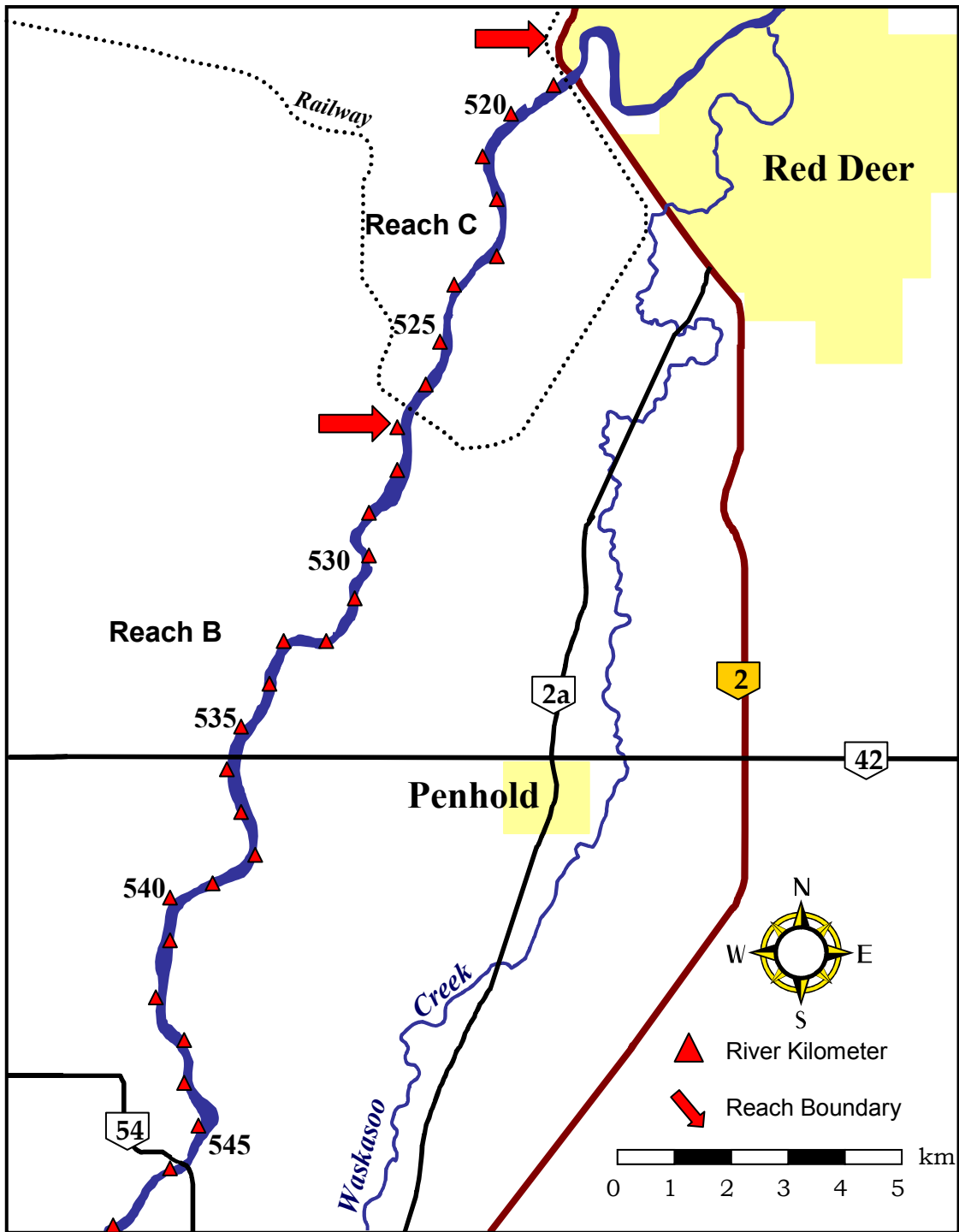


Figure 4. River kilometer divisions and reaches B to C of the study area.

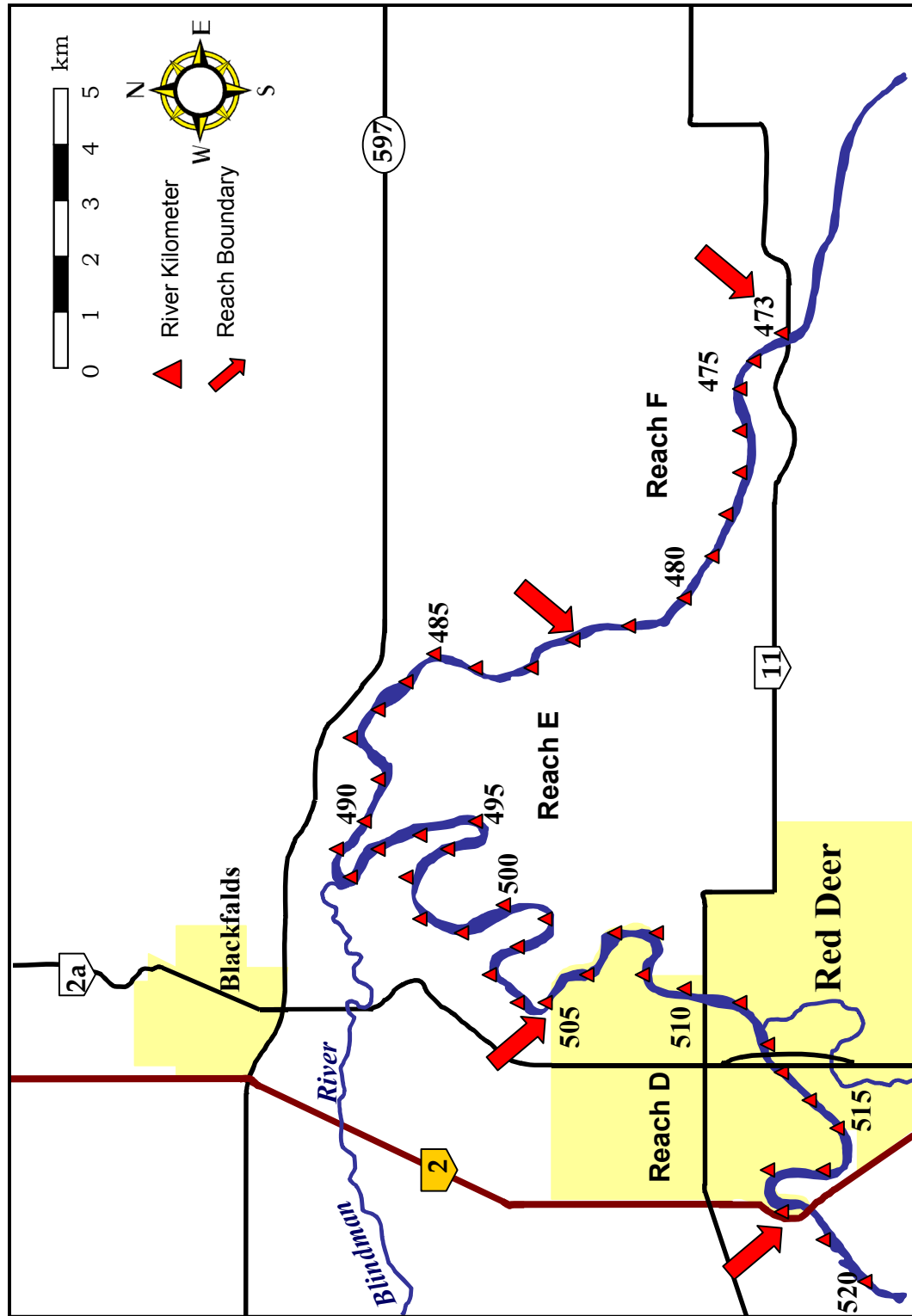


Figure 5. River kilometer divisions and reaches D to F of the study area.

3.1 Sample sites

The study area was divided into 50 1-km segments and each river kilometer was assigned corresponding geographic (Universal Transverse Mercator, UTM) coordinates (Figures 3 to 5 and Appendix 1). Sample sites used in this study coincided with sites sampled during previous electrofishing surveys in 1990, 1991 and 1992. Sample sites were each one river kilometer in length and located using a Garmin Etrex GPS uploaded with UTM coordinates from Garmin Map Source Metro Guide Canada V4 Software. Sampling for the mark-recapture population estimate occurred consecutively for five river kilometers immediately downstream of Dickson Dam. Sample sites not in the population estimate section occurred systematically every two river kilometers.

3.2 General sampling method

Electrofishing was conducted from a 4.5 meter flat bottom “gator” boat equipped with a Coffelt model VVP 15 electrofisher and 7,500 watt Homelite generator. Continuous (smooth) DC current was used with an approximate output of 8 to 10 amps and 300 volts. Electrofishing was conducted in a downstream progression in various types of riverine habitat using a 6-ft throwing-probe with a stainless-steel “egg beater” style anode. Captured fish were contained in a live-well until the end of each respective 1-km sample stretch. Fish were then sampled and transported back upstream to the midpoint of the sample-kilometer where they were released back into the river. Measurements were recorded of electrofishing output in voltage and amperage, and effort in seconds.

3.3 Fish sampling

Fin-ray samples from the left pelvic fin of all captured walleye were collected for aging purposes. All captured walleye, northern pike, rainbow trout, brown trout and subsamples of goldeye were measured (± 1 mm) for fork length (FL) and total length (TL) and weighed (± 1 g). Mountain whitefish were enumerated and subsamples of approximately ten per sample km were measured and weighed. Sucker species were also enumerated.

3.4 Species distribution and abundance analysis

All data collected were compiled into a Microsoft Access database and were submitted to the Alberta Fisheries Management Information System (FMIS) database. Species composition, distribution, relative abundance, and presence per river kilometer were determined. Catch-per-unit-effort (CPUE) was calculated for all species that were physically captured in catch per 10 minutes of electrofishing. Species relative abundance was calculated in fish per km using combined captured and enumerated fish totals. For comparisons among species, abundance was calculated using only one of the passes from the population assessment portion of the study to avoid disproportionate representation of species predisposed to that section (e.g., mountain whitefish and brown trout). The second pass was chosen because of equipment issues that occurred during first pass sampling.

3.5 Comparative analysis of abundance and distribution

Comparisons of abundance and distribution were made between data collected in this survey with similar data collected in a survey in 1991. Specifically, comparisons were made between species presence per reach, abundance of species per reach, and CPUE. Only data collected in the fall of 1991 (8 to 21 October) were used for comparison with 2005 data that were mainly collected in October, but also in early September.

3.6 Population estimate

Within the population estimate area, all captured walleye, northern pike, rainbow trout and brown trout were tagged with hallprint® T-bar anchor fish tags. Fish that were < 200 mm FL were marked with a fin-clip/hole-punch combination depicting the sample day and kilometer of capture. A minimum of three passes of the 5-km survey section were needed to allow for calculation of multiple mark–recapture estimates using two methods. The first method, the Schnabel (Krebs 1999, 2003), was calculated from the formula:

$$N = \frac{\sum_t (C_t M_t)}{\sum_t R_t + 1}$$

where,

N = population estimate,

C_t = total number of fish captured in the sample t ,

M_t = number of marked fish in the population just before sample t is taken,

R_t = number of marked fish caught in sample t .

The second method, the Schumacher-Eschmeyer (Krebs 1999, 2003), was calculated from the formula:

$$N = \frac{\sum_{t=1}^s (C_t M_t^2)}{\sum_{t=1}^s (R_t + M_t)}$$

where,

N = population estimate,

C_t = total number of fish captured in the sample t ,

M_t = number of marked fish in the population just before sample t is taken,

R_t = number of marked fish caught in sample t ,

s = total number of samples.

Confidence intervals for Schnabel and Schumacher-Eschmeyer were calculated following Krebs (1999).

4.0 RESULTS

All 50 sampling sites were electrofished during the study. During the mark-recapture portion of the study, two passes of the 5-km sampling section were completed. Excluding data from one pass (the first pass) of this 5-km section, a total of 3,105 fish were captured across the 50 sample kilometers. Ten of the 15 species collected during the assessment were sport fish species (Table 2).

Table 2. Fish species captured during fall electrofishing on the Lower Red Deer River, 2005.

Family	Species	Taxonomic name	Acronym
Sport fish			
Esocidae	Northern Pike	<i>Esox lucius</i>	NRPK
Gadidae	Burbot	<i>Lota lota</i>	BURB
Hiodontidae	Goldeye	<i>Hiodon alosoides</i>	GOLD
	Mooneye	<i>Hiodon tergisus</i>	MOON
Percidae	Sauger	<i>Sander canadense</i>	SAUG
	Walleye	<i>Sander vitreus</i>	WALL
Salmonidae	Brown Trout	<i>Salmo trutta</i>	BNTR
	Rainbow Trout	<i>Oncorhynchus mykiss</i>	RNTR
	Mountain Whitefish	<i>Prosopium williamsoni</i>	MNWH
	Lake Whitefish	<i>Coregonus clupeaformis</i>	LKWH
Non-sport fish			
Catostomidae	White Sucker	<i>Catostomus commersoni</i>	WHSC
	Longnose Sucker	<i>Catostomus catostomus</i>	LNSC
	Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	SHRD
Cyprinidae	Lake Chub	<i>Couesius plumbeus</i>	LKCH
	Longnose Dace	<i>Rhinichthys cataractae</i>	LNDC

4.1 Species abundance

The two most plentiful species in the assessment were sport fish species. Mountain whitefish comprised 53.9% (n = 1,674) of the fish sample and 33.5 fish/km followed by goldeye at 18.7% (n = 581) of fish sampled and 11.6 fish/km. Longnose sucker and white sucker represented 13.8% (8.6 fish/km, n = 430) and 5.3% (3.3 fish/km, n = 165) of the sample, respectively, followed by walleye at 2.9% and 1.8 fish/km (n = 91), shorthead redhorse sucker at 2.1% and 1.3 fish/km (n = 64), and brown trout at 1.4% and 0.9 fish/km (n = 44). The remaining species represented less than 1% of the total fish sample and averaged less than 1 fish/km. These species included mooneye (0.7% and 0.5 fish/km, n = 23), burbot (0.5%, 0.3 fish/km, n = 17), northern pike (0.3%, 0.2 fish/km, n = 9), lake whitefish (0.1 fish/km, n = 4), rainbow trout (0.04 fish/km, n = 2), and sauger (0.02 fish/km, n = 1).

4.2 General species distributions and abundance

Brown trout occurred in modest numbers in the upper half of the study area in reaches A through D, with a large gap in distribution between kilometers 540 to 527 (Figure 6). Walleye was captured at regular intervals throughout the study area, whereas sauger was encountered only once with a single fish observed at kilometer 495 to 494. Goldeye was plentiful throughout five of the six reaches, but was not observed upstream of the Medicine River confluence. Mooneye occupied three reaches (B, C, and D), occurring periodically from kilometer 508 to 553. Northern pike was sparsely distributed throughout the study area occurring in isolated backwaters, and was absent from a 35-km stretch between kilometers 565 to 530. Rainbow trout was captured only twice during the survey, both in kilometer 568 to 567 (reach A). Lake whitefish occurred in only three sample kilometers in reaches A, B, and D. Mountain whitefish was abundant throughout the survey area, but became less abundant toward the end of the study area (reaches E and F). Burbot was occasionally encountered in reaches B through E. The three sucker species all occupied wide ranges in the study area. Longnose and white suckers occupied all reaches, whereas shorthead redhorse occurred in all reaches except reach F (Figure 6).

4.3 Comparison of sport fish species distributions between 1991 and 2005

In the 1991 survey brown trout occurred much further downstream (36 km) than in 2005 (Figure 7). In contrast, walleye extended its range since the 1991 survey, occurring more frequently and further downstream in 2005. Sauger was more sparsely distributed in 2005 than in 1991. The distribution of goldeye increased dramatically between surveys, from sporadic occurrences in reaches B and F in 1991 to frequent abundance in all reaches downstream of section A in 2005. The range of northern pike decreased dramatically since the 1991 survey when it was captured in all reaches and occurred frequently in reach B. In 2005, northern pike was nearly absent from reach B and was not encountered for 35 river kilometers between reaches A and B. Rainbow trout has diminished to a few individuals in the uppermost portion of the study area since 1991. Lake whitefish has also shown a reduction in its distribution since 1991, from occasional occurrence in reaches A, B and E to only four individuals in 2005. Burbot was encountered slightly more frequently in 2005 in four reaches, B, C, D and E, compared to only two locations in 1991 in reaches B and E.

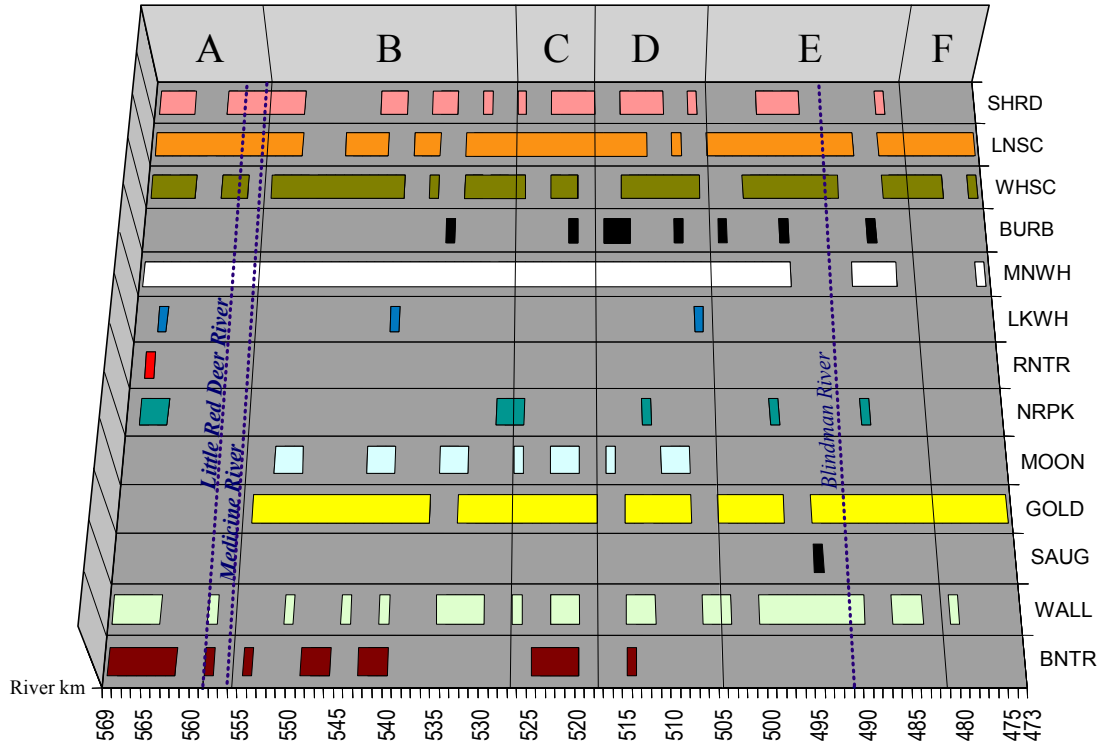


Figure 6. Species distributions in the Red Deer River, Dickson Dam to Joffre, 2005.

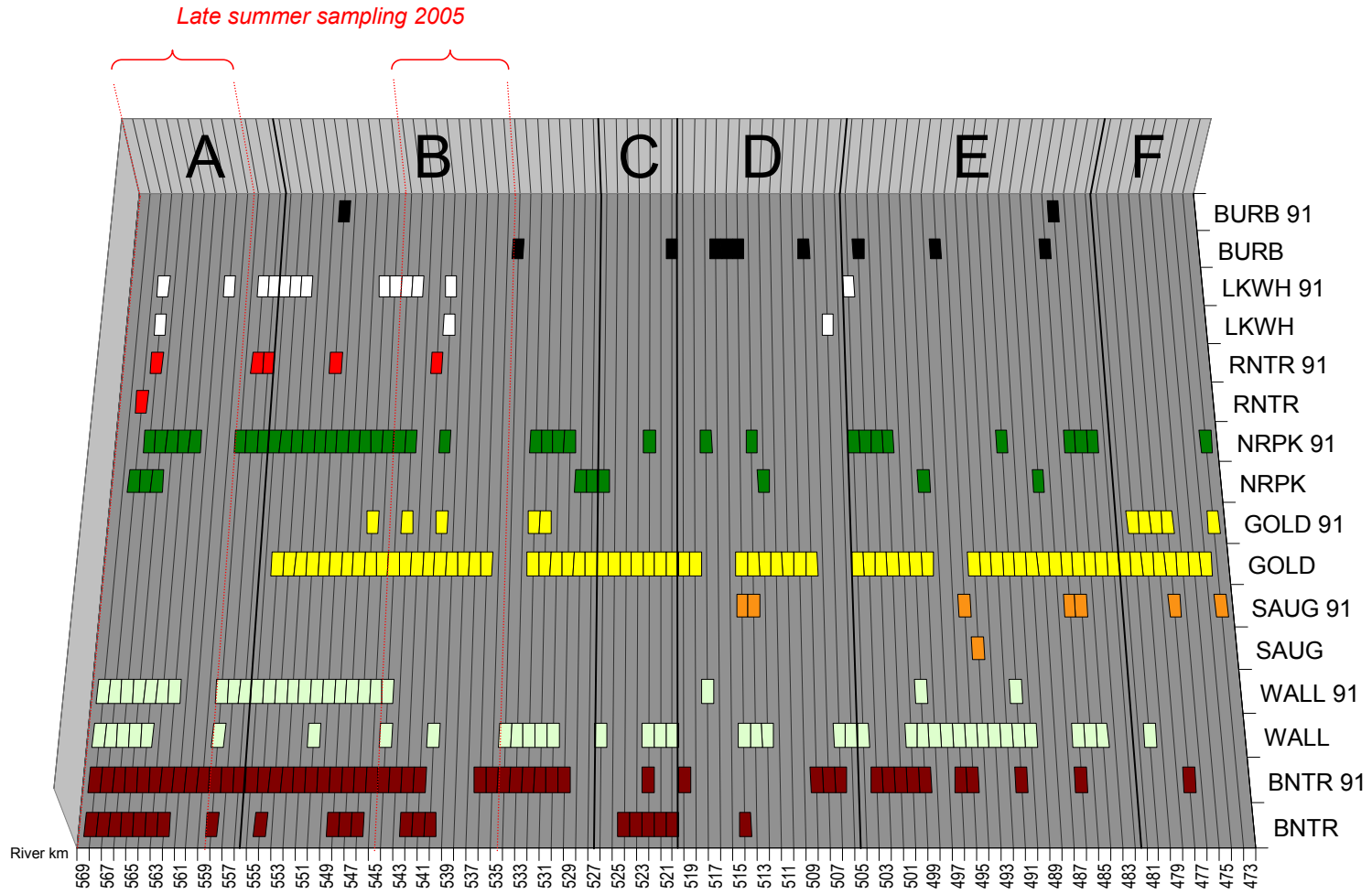


Figure 7. Comparison of sport fish species presence by river kilometer and reach in the Red Deer River, October 1991 and September and October 2005.

4.4 Comparison of species abundance between 1991 and 2005

A comparison of abundance by species revealed several trends in the fish community over time. Since 1991, the number of goldeye per km has increased ten-fold, the number of walleye per km has more than doubled, and the number of brown trout per km has declined by half (Figure 8). In contrast, the number of northern pike per km has declined seven-fold since 1991 and the number of lake whitefish per km has declined 14-fold (figure 8). Brown trout capture success per hour of electrofishing declined by half and northern pike capture success declined seven-fold (Figure 9). However, walleye capture success per hour of electrofishing increased three-fold (Figure 9).

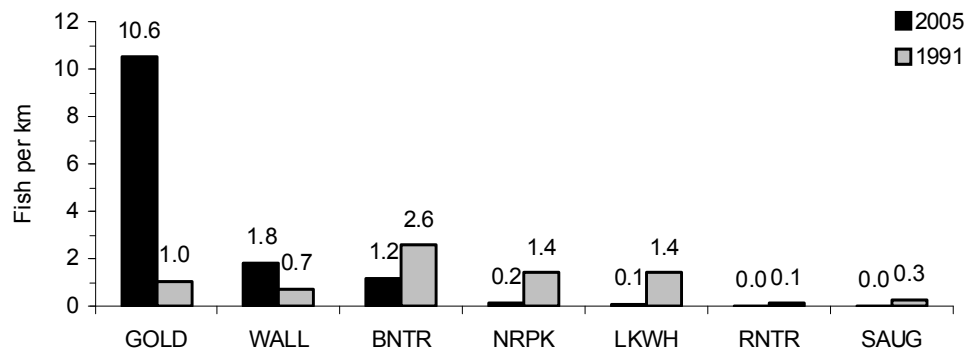


Figure 8. Comparison of fish abundance (fish/km) in the Red Deer River between 1991 and 2005.

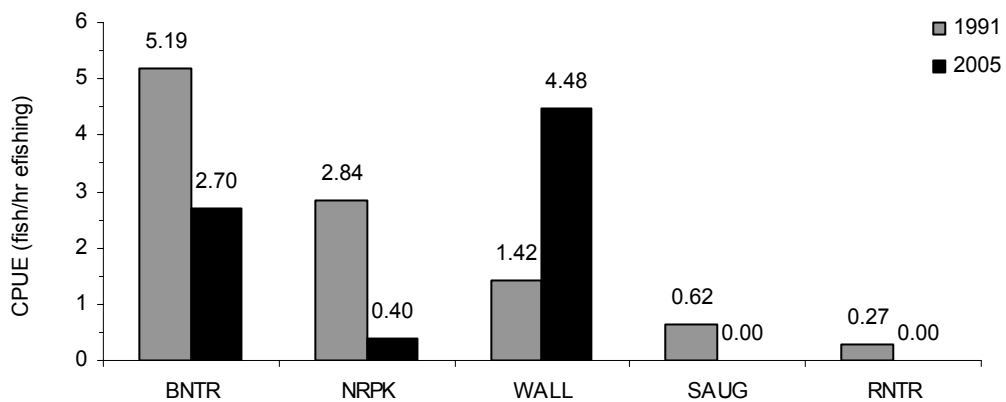


Figure 9. Comparison of fish abundance (catch-per-unit-effort, CPUE) in the Red Deer River between 1991 and 2005.

4.5 Comparison of species abundance per reach between 1991 and 2005

4.5.1 Walleye

Relative abundance of walleye in the study area increased between 1991 and 2005. The largest increases in relative abundance occurred in reaches A, C and E (Figure 10). Relative abundance of walleye in reach B was similar between study years. Walleye CPUE was greater in 2005 for all reaches surveyed, with particularly large increases in reaches A and E (Figure 11).

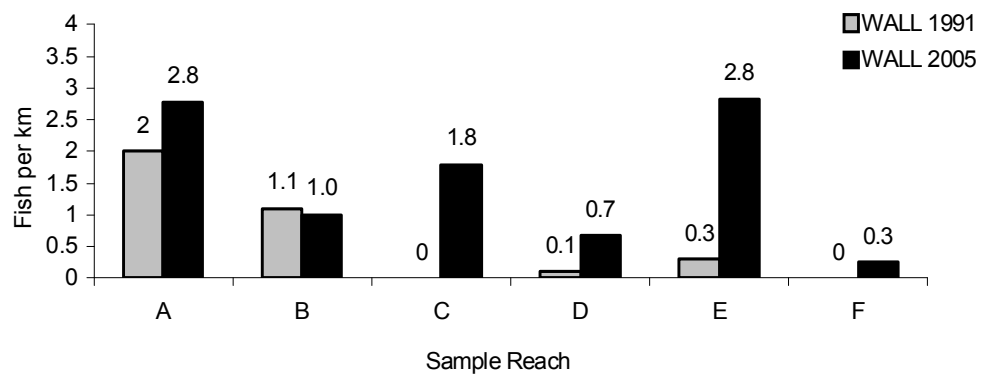


Figure 10. Comparison of walleye abundance (fish/km) in the Red Deer River between 1991 and 2005.

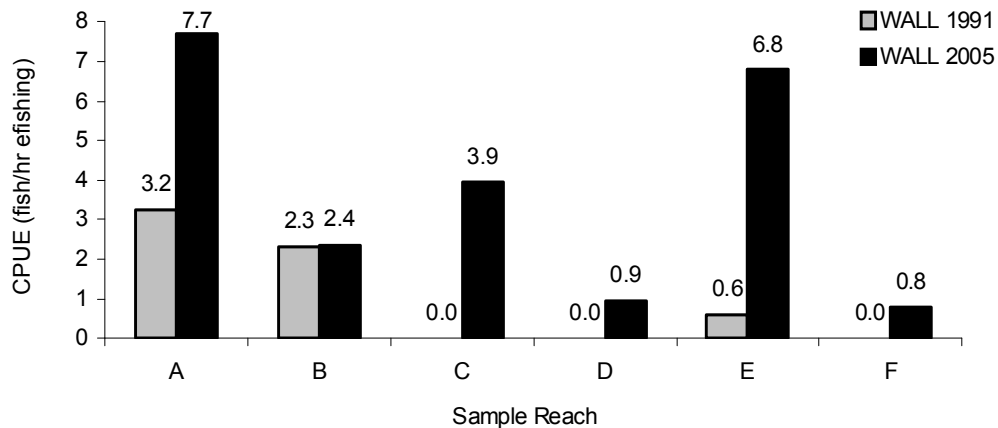


Figure 11. Comparison of walleye abundance (catch-per-unit-effort, CPUE) in the Red Deer River between 1991 and 2005.

4.5.2 Brown trout

Relative abundance (fish/km) of brown trout declined throughout the study area since 1991 (Figure 12). CPUE of brown trout was higher in 2005 only in reach C where it increased only by 0.1 fish/km (Figure 13).

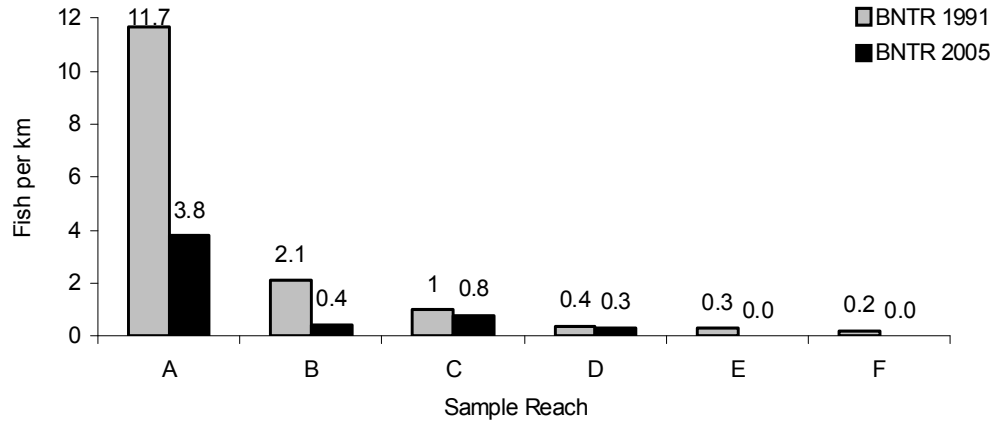


Figure 12. Comparison of brown trout abundance (fish/km) in the Red Deer River between 1991 and 2005.

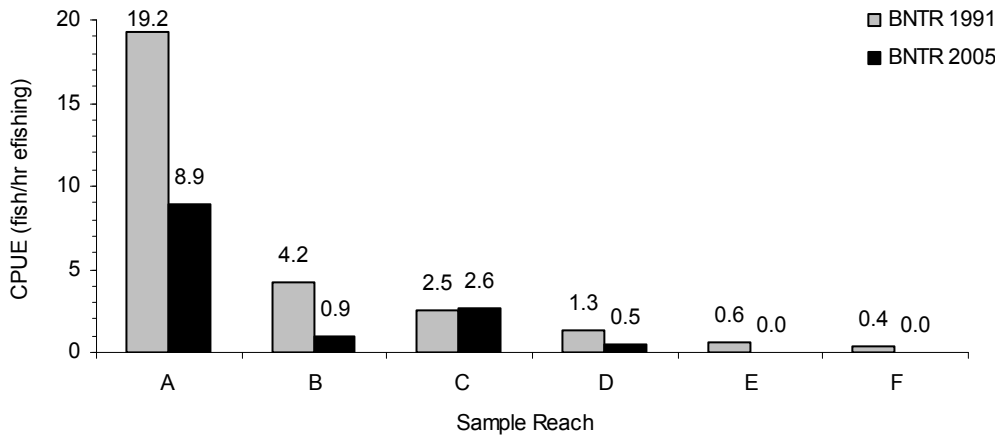


Figure 13. Comparison of brown trout abundance (catch-per-unit effort, CPUE) in the Red Deer River between 1991 and 2005.

4.5.3 Northern pike

Relative abundance of northern pike decreased in all reaches since 1991 (Figure 14). The greatest declines occurred in reaches A and B with 29-fold and 19-fold decreases in fish per km, respectively. The decline in northern pike abundance since 1991 was even more apparent using data on CPUE. Total CPUE in all reaches was negligible in 2005 (Figure 15).

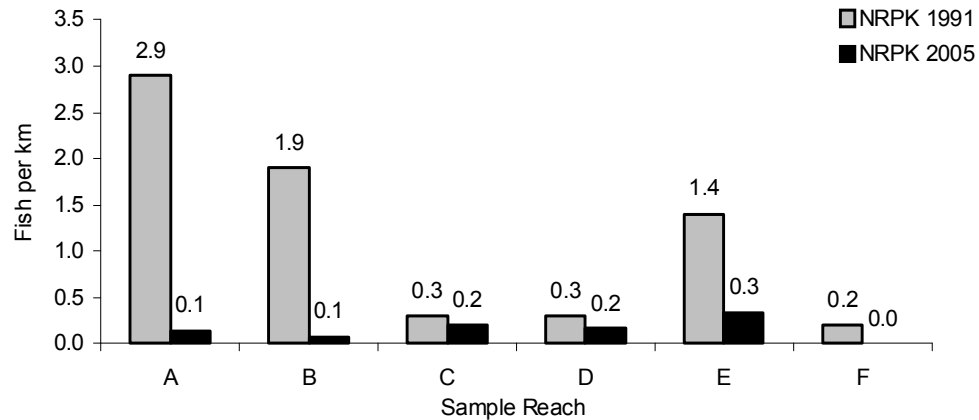


Figure 14. Comparison of northern pike abundance (fish/km) in the Red Deer River between 1991 and 2005.

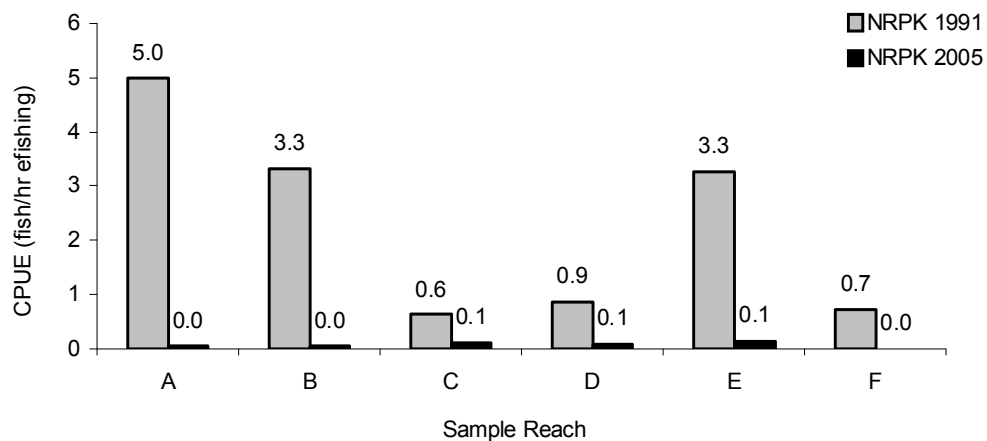


Figure 15. Comparison of northern pike abundance (catch-per-unit-effort, CPUE) in the Red Deer River between 1991 and 2005.

4.5.4 Sauger

Sauger relative abundance per reach declined in all reaches where it was previously encountered. Sauger was only sparsely distributed in the study area in 1991, but declined in abundance in 2005 (based on fish/km and CPUE), with only a single fish encountered (Figures 16 and 17).

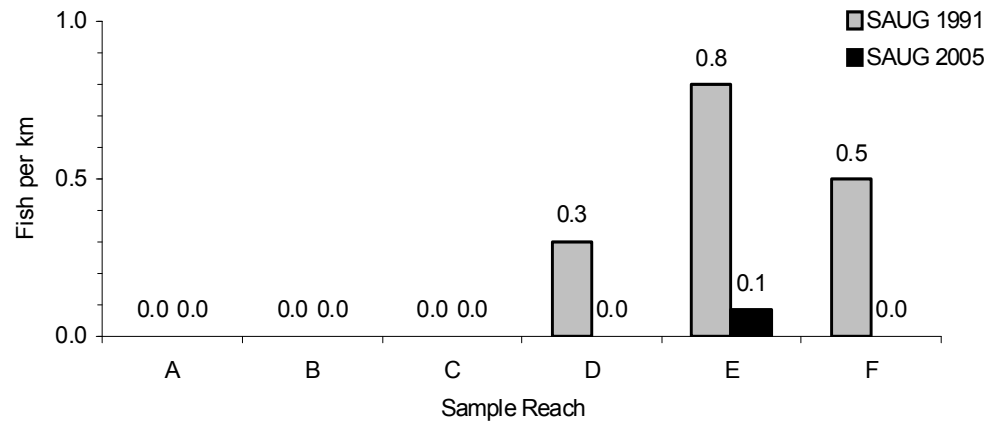


Figure 16. Comparison of sauger abundance (fish/km) in the Red Deer River between 1991 and 2005.

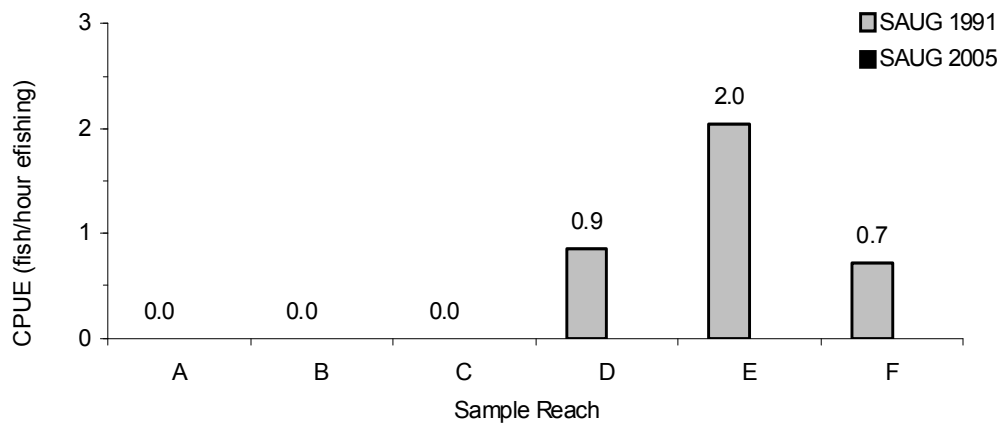


Figure 17. Comparison of sauger abundance (catch-per-unit-effort, CPUE) in the Red Deer River between 1991 and 2005.

4.5.5 Goldeye

Relative abundance of goldeye in the study area increased more than any other species since the 1991 survey. Large increases in abundance were observed in reaches B through F (Figure 18). Catch-per-unit-effort could not be calculated.

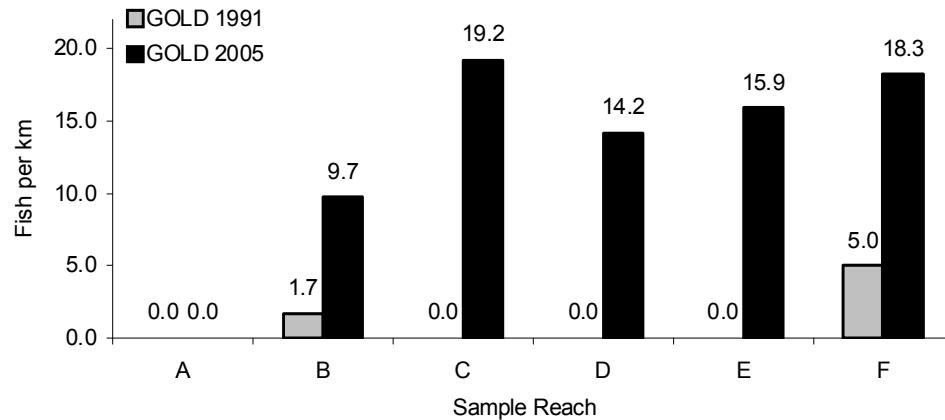


Figure 18. Comparison of goldeye abundance (fish/km) in the Red Deer River between 1991 and 2005.

4.6 Fork length frequency analysis, fall 2005

Walleye, which increased in abundance and distribution in 2005, was represented by a wide and continuous distribution of sizes (Figure 19). Conversely, brown trout, which declined in abundance, showed a bimodal distribution of sizes with an absence of fish between 205 to 336 mm in length (Figure 19). Goldeye, which showed the greatest increase in abundance since 1991, ranged in size from 201 to 411 mm (Figure 19, Appendix 5). Of goldeye captured, 91% were 300 to 350 mm in length.

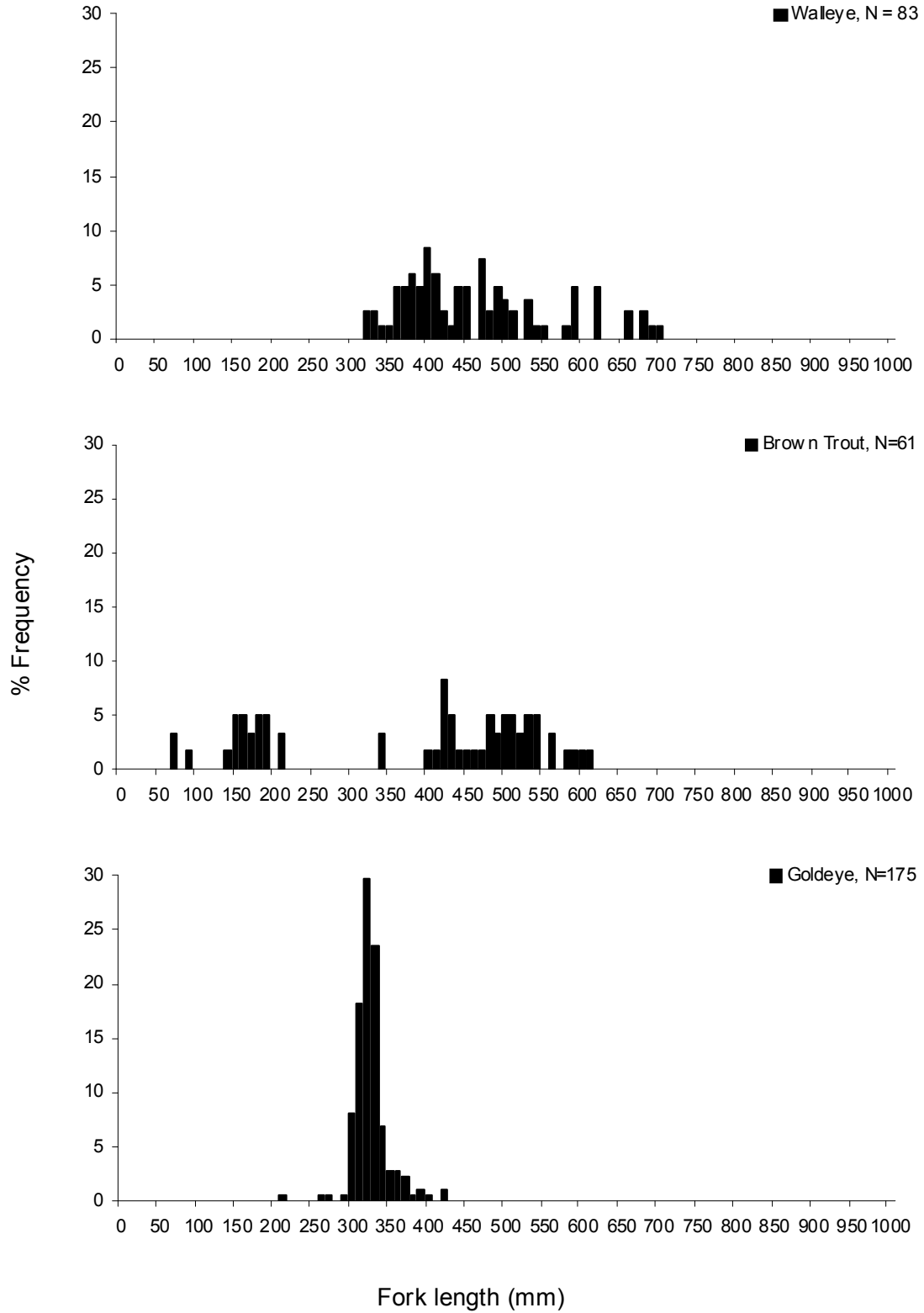


Figure 19. Fork length frequency distributions for walleye, brown trout and goldeye in 2005.

4.7 Walleye age analysis, 2005

Walleye measured in 2005 included eight age classes (Figure 20). The majority of individuals measured (56%) were age-5 and 6, representing 2000 and 1999 year classes, respectively.

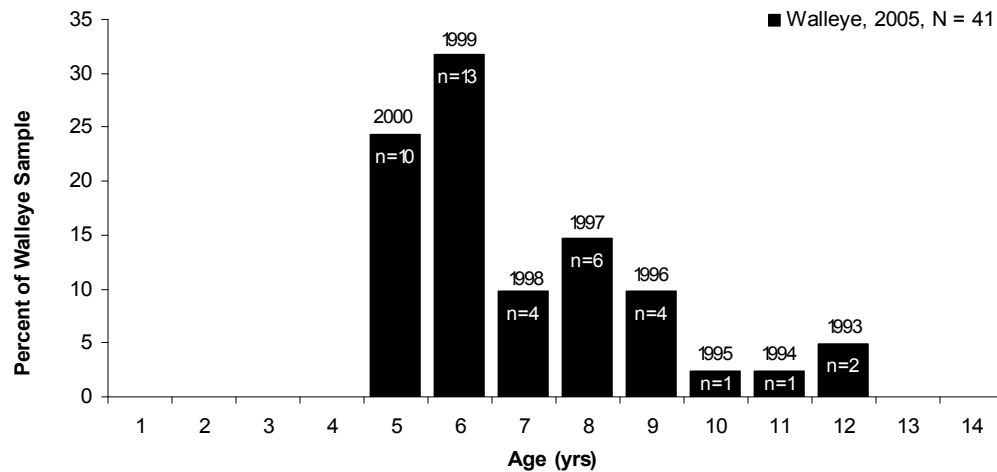


Figure 20. Walleye age-class frequency distribution, fall 2005.

4.8 Population estimate

As a result of high river flows, only two of the minimum three passes needed to calculate population estimates were made of the 5-km study reach used for the mark-recapture portion of the study. The second pass resulted in the recapture of only a single fish. Consequently, population estimates could not be calculated. Across the ten sample kilometers (i.e., two passes), a total of 72 sport fish were marked and released, including 44 brown trout, 26 walleye, one northern pike and one rainbow trout (Appendices 2 to 4).

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6.0 APPENDICES

Appendix 1. Universal Transverse Mercator (UTM, NAD 83) coordinates for each river kilometer along the Red Deer River.

River Kilometer	Easting	Northing	UTM Zone
473	323128	5794169	12
474	322637	5795023	12
475	321756	5795246	12
476	320757	5795059	12
477	319823	5795386	12
478	318977	5795921	12
479	318137	5796502	12
480	317389	5797168	12
481	317230	5798125	12
482	317097	5799085	12
483	316618	5800017	12
484	316351	5800946	12
485	316853	5801807	12
486	316334	5802601	12
487	315745	5803409	12
488	314965	5803490	12
489	314082	5803309	12
490	313244	5803829	12
491	312464	5804353	12
492	312715	5803708	12
493	313214	5802860	12
494	313387	5801869	12
495	312971	5801201	12
496	312755	5802142	12
497	312053	5802763	12
498	311251	5802360	12
499	311032	5801469	12
500	311489	5800668	12
501	311166	5799876	12
502	310635	5800476	12
503	310125	5801192	12
504	309363	5800587	12
505	309664	5799999	12
506	309979	5799121	12

Appendix 1. Continued.

River Kilometer	Easting	Northing	UTM Zone
507	310693	5798608	12
508	310496	5797735	12
509	309594	5797860	12
510	309300	5796912	12
511	308950	5795962	12
512	308088	5795568	12
513	307323	5794931	12
514	306608	5794226	12
515	305685	5793931	12
516	305492	5794847	12
517	305147	5795661	12
518	304791	5794895	12
519	303980	5794321	12
520	303160	5793792	12
521	302768	5792924	12
522	303041	5791969	12
523	302575	5791161	12
524	301934	5790410	12
525	301751	5789445	12
526	301239	5788634	12
527	300825	5787765	12
528	300656	5786762	12
529	299974	5786043	12
530	299735	5785309	12
531	299458	5784429	12
532	299030	5783593	12
533	298129	5783565	12
534	297669	5782673	12
535	297197	5781861	12
536	296870	5780926	12
537	297037	5779963	12
538	296996	5778987	12
539	295982	5778579	12
540	295353	5777844	12
541	295132	5776918	12
542	295083	5775980	12
543	295610	5775255	12

Appendix 1. Continued.

River Kilometer	Easting	Northing	UTM Zone
544	295699	5774310	12
545	295751	5773489	12
546	295068	5772838	12
547	294407	5772189	12
548	705005	5771519	11
549	704366	5771750	11
550	703558	5771281	11
551	702847	5771699	11
552	702136	5772201	11
553	701196	5772279	11
554	700441	5771631	11
555	699537	5771177	11
556	698775	5771611	11
557	698163	5771917	11
558	697219	5771992	11
559	696579	5772458	11
560	695795	5772891	11
561	695156	5773500	11
562	694343	5773163	11
563	693989	5773773	11
564	693244	5773490	11
565	692996	5772709	11
566	692129	5772714	11
567	691429	5772790	11
568	691878	5771924	11
569	691478	5771260	11
570	691032	5770902	11

Appendix 2. Summary of fish marked for the attempted population estimate on the Red Deer River, 2005. Codes: BNTR = brown trout; WALL = walleye; NRPK = northern pike; RNTR = rainbow trout; FL = fork length; TL = total length.

Km	Species	Tag number	FL (mm)	TL (mm)	Weight (g)	Sex	Mark type	Comments	Date
569	BNTR	13099	421	439	683				6-Sep-05
569	BNTR	13090	471	490	919				8-Sep-05
569	BNTR	13091	416	438	755				8-Sep-05
569	BNTR	13087	411	425	690				8-Sep-05
569	BNTR		171	181	56		Fin Clip: Right Pectoral		8-Sep-05
568	BNTR	13055	575	581	1,578	M			6-Sep-05
568	BNTR	13051	419	429	632				6-Sep-05
568	BNTR	13081	531	552	1,476				8-Sep-05
568	BNTR	13083	458	469	1,007				8-Sep-05
568	BNTR	13082	427	449	772				8-Sep-05
568	BNTR		153	163	32		Fin Clip: Right Pectoral; Punched: Upper Caudal Lobe		8-Sep-05
568	BNTR		142	151	34		Fin Clip: Right Pectoral; Punched: Upper Caudal Lobe		8-Sep-05
568	BNTR		141	148	41		Fin Clip: Right Pectoral; Punched: Upper Caudal Lobe		8-Sep-05
567	BNTR	13062	609	615	2,345	M			6-Sep-05
567	BNTR	13060	514	527	1,287				6-Sep-05
567	BNTR	13065	491	503	1,121				6-Sep-05
567	BNTR	13058	486	505	1,126				6-Sep-05
567	BNTR	13066	474	489	1,102				6-Sep-05
567	BNTR	13077	435	454	871				8-Sep-05
567	BNTR	13052	507	524	1,197				8-Sep-05
567	BNTR	13529	336	355	379				8-Sep-05

Appendix 2. Continued.

Km	Species	Tag number	FL (mm)	TL (mm)	Weight (g)	Sex	Mark type	Comments	Date
566	BNTR	13070	415	441	734				6-Sep-05
566	BNTR	13071	401	413	604				6-Sep-05
566	BNTR		177	187	60		Fin Clip: Left Pectoral; Punched: Lower Caudal Lobe		6-Sep-05
566	BNTR		163	172	46		Fin Clip: Left Pectoral; Punched: Lower Caudal Lobe		8-Sep-05
565	BNTR	13097	540	552	1,592				6-Sep-05
565	BNTR	13072	525	542	1,482				6-Sep-05
565	BNTR	13093	525	535	1,480	F			6-Sep-05
565	BNTR	13095	523	529	1,379	M			6-Sep-05
565	BNTR	13094	500	515	1,289	M			6-Sep-05
565	BNTR	13073	489	503	1,232				6-Sep-05
565	BNTR		177	184	31		Fin Clip: Left Pectoral		6-Sep-05
565	BNTR		155	163	34		Fin Clip: Left Pectoral		6-Sep-05
565	BNTR	13095	523	529	1,379	M		Recapture	8-Sep-05
565	BNTR	13545	516	535	1,363				8-Sep-05
565	BNTR	13540	505	520	1,139				8-Sep-05
565	BNTR	13544	472	487	995				8-Sep-05
565	BNTR	13541	415	434	787				8-Sep-05
565	BNTR		205	216	89		Fin Clip: Right Pectoral and Adipose		8-Sep-05
565	BNTR		189	200	73		Fin Clip: Right Pectoral and Adipose		8-Sep-05
565	BNTR		170	179	53		Fin Clip -Right Pectoral and Adipose		8-Sep-05
565	BNTR		147	155	31		Fin Clip: Right Pectoral and Adipose		8-Sep-05
565	BNTR		139	146	29		Fin Clip: Right Pectoral and Adipose		8-Sep-05
565	BNTR		85	89			Fin Clip -Right Pectoral and Adipose	No weight avail.	8-Sep-05
564	BNTR	13092	587	595	1,905	M			6-Sep-05

Appendix 2. Continued.

Km	Species	Tag number	FL (mm)	TL (mm)	Weight (g)	Sex	Mark type	Comments	Date
568	WALL	13050	446	464	958				6-Sep-05
568	WALL	13056	325	343	383				6-Sep-05
568	WALL	13086	540	569	1,488				8-Sep-05
568	WALL	13080	444	465	925				8-Sep-05
567	WALL	13057	674	700	3,650				6-Sep-05
567	WALL	13061	399	420	694				6-Sep-05
567	WALL	13059	394	417	666				6-Sep-05
567	WALL	13528	530	553	1,541				8-Sep-05
567	WALL	13463	473	498	1,085				8-Sep-05
567	WALL	13088	470	492	1,103				8-Sep-05
567	WALL	13526	466	491	1,098				8-Sep-05
567	WALL	13527	463	485	1,015				8-Sep-05
567	WALL	13078	425	445	752				8-Sep-05
567	WALL	13076	400	424	632				8-Sep-05
567	WALL	13063	391	413	617				8-Sep-05
567	WALL	13079	387	406	581				8-Sep-05
567	WALL	13074	367	386	457				8-Sep-05
567	WALL	13064	355	378	422				8-Sep-05
566	WALL	13068	419	445	721				6-Sep-05
566	WALL	13069	404	424	715				6-Sep-05
566	WALL	13067	585	609	2,409				6-Sep-05
566	WALL	13531	450	474	935			Leeches on fins	8-Sep-05

Appendix 2. Continued.

Km	Species	Tag number	FL (mm)	TL (mm)	Weight (g)	Sex	Mark type	Comments	Date
566	WALL	13530	615	639	2,421				8-Sep-05
566	WALL	13533	438	457	860				8-Sep-05
565	WALL	13543	450	469	925				8-Sep-05
565	WALL	13542	375	395	545				8-Sep-05
568	NRPK	13084	599	635	1,521				8-Sep-05
568	RNTR	13085	381	406	512				8-Sep-05

Appendix 3. Species totals per sample kilometer. See Table 2 for species codes.

Km	BNTR	BURB	GOLD	LKWH	LNDC	LNDC	MNWH	MOON	NRPK	RNTR	SAUG	SHRD	WALL	WHSC	Effort (s)	Comments
569 - 568	1	-	-	-	-	(16)	9 (110)	-	-	-	-	(2)	-	1	NA	Pass 1
569 - 568	4	-	-	-	-	(27)	16 (152)	-	-	-	-	(1)	1(1)	-	NA	Pass 2
568 - 567	2	-	-	-	-	(20)	10 (121)	-	-	-	-	(2)	3	1	1,509	Pass 1
568 - 567	6	-	-	-	-	(21)	14 (197)	-	1	2	-	-	2(1)	-	NA	Pass 2
567 - 566	5	-	-	-	-	(4)	1 (142)	-	-	-	-	-	3	1(1)	1,619	Pass 1
567 - 566	3	-	-	-	-	(17)	3 (109)	-	-	-	-	(1)	11	-	2,075	Pass 2
566- 565	3(1)	-	-	-	-	(17)	10 (26)	-	-	-	-	(2)	3(1)	1(2)	1,708	Pass 1
566 - 565	1	-	-	(1)	-	(9)	6 (39)	-	1	-	-	(3)	9	12	2,316	Pass 2
565 - 564	8	-	-	-	-	(12)	3 (172)	-	-	-	-	-	-	1(1)	1,066	Pass 1
565 - 564	11(2)	-	-	-	-	(21)	9 (151)	-	-	-	-	-	2	-	1,745	Popn est end
563 - 562	1(1)	-	-	-	-	(4)	6 (41)	-	-	-	-	-	-	-	1,176	
561 - 560	-	-	-	-	-	(1)	41	-	-	-	-	(1)	-	(2)	1,042	
559 - 558	4	-	-	-	-	(2)	109	-	-	-	-	(9)	2	(13)	1,560	Little RD confl
557 - 556	-	-	-	-	-	(4)	27	-	-	-	-	(2)	-	-	1,138	Med. River confl
555 - 554	2	-	1(1)	-	-	(7)	1 (41)	-	-	-	-	(9)	-	(14)	NA	
553 - 552	-	-	(18)	-	-	(12)	33	(2)	-	-	-	(2)	-	(4)	1,221	
551 - 550	-	-	(12)	-	-		24	(1)	-	-	-	-	1	(2)	1,122	
549 - 548	1	-	1(7)	-	-		1 (4)	-	-	-	-	-	-	(1)	1,206	
547 - 546	1	-	(5)	-	-	(25)	24	-	-	-	-	-	-	(1)	1,118	
545 - 544	-	-	1	-	-	(4)	11 (94)	-	-	-	-	-	2(1)	(6)	1,222	
543-542	1	-	1	-	-	(4)	4 (3)	1	-	-	-	2	-	(3)	1,296	
541-540	1	-	2(5)	(2)	-		8 (10)	1	-	-	-	(2)	5(1)	(8)	966	
539-538	-	-	1	-	-	(2)	14 (27)	-	-	-	-	-	-	-	1,757	
537-536	-	-	10 (8)	-	-	(3)	10 (24)	-	-	-	-	(2)	-	(4)	1,731	

Appendix 3. Continued.

Km	BNTR	BURB	GOLD	LKWH	LNDC	LNDC	MNWH	MOON	NRPK	RNTR	SAUG	SHRD	WALL	WHSC	Effort (s)	Comments
535-534	-	1	-	-			5	2	-	-	-	1	1(1)	-	NA	
533-532	-	-	13 (2)	-	2	2(13)	12 (4)	1	-	-	-	-	1	1(3)	1,293	
531-530	-	-	13 (5)	-	-	(8)	9 (8)	-	-	-	-	1(2)	1	(1)	1,181	
529-528	-	-	8 (22)	-	-	(16)	10 (18)	-	1	-	-	-	-	(13)	1,088	
527-526	-	-	16 (15)	-	-	(10)	6 (12)	3	1	-	-	1	4 (2)	(3)	1,107	
525-524	1	-	(12)	-	-	(8)	37	-	-	-	-	-	-	-	1,004	
523-522	1	-	10 (7)	-	-	(14)	4 (23)	3	-	-	-	1	1 (1)	(4)	1,175	
521-520	2	1 (3)	18 (17)	-	-	(21)	2 (9)	2	-	-	-	1 (3)	1	(12)	1,239	
519-518	-	-	(1)	-	-	(2)	53	-	-	-	-	(2)	-	-	958	
517-516	-	(1)	-	-	-	(15)	15 (11)	(2)	-	-	-	-	-	-	1,272	
515-514	1(1)	2	9 (46)	-	-	(14)	3 (35)	-	-	-	-	(2)	1(1)	(2)	1,635	
513-512	-	-	(6)	-	-	(9)	57	-	1	-	-	(2)	(1)	(6)	1,501	
511-510	-	-	(5)	-	-		10	(1)	-	-	-	(3)	-	(2)	1,096	
509-508	-	(3)	(19)	-	-	(20)	14	(4)	-	-	-	-	-	(3)	1,197	
507-506	-	-	-	1			1 (19)	-	-	-	-	(1)	1	(3)	931	
505-504	-	(3)	(12)	-	-	(7)	9	-	-	-	-	-	1(1)	-	1,008	
503-502	-	-	(1)	-	-	(4)	4	-	-	-	-	-	-	-	983	
501-500	-	-	(13)	-	-	(11)	5	-	-	-	-	-	(1)	(5)	1,095	
499-498	-	-	(5)	-	-	(12)	6	-	2 (1)	-	-	(5)	12 (2)	(5)	1,830	
497-496	-	(1)	-	-	-	(11)	2	-	-	-	-	(2)	4(1)	(8)	1,245	
495-494	-	-	2	-	-	(7)	-	-	-	-	(1)	(2)	5	(5)	1,331	
493-492	-	-	(5)	-	-	(3)	-	-	-	-	-	-	1	(1)	1,029	Blindman confl
491-490	-	-	(19)	-	-	(4)	-	-	-	-	-	-	1	(2)	1,079	
489-488	-	-	14 (21)	-	-	(4)	6	-	1	-	-	-	-	-	867	

Appendix 3. Continued.

Km	BNTR	BURB	GOLD	LKWH	LNDC	LNDC	MNWH	MOON	NRPK	RNTR	SAUG	SHRD	WALL	WHSC	Effort (s)	Comments
487-486	-	(2)	(43)	-	-	-	2	-	-	-	-	-	(2)	-	1,296	
485-484	-	-	3 (19)	-	-	(17)	1	-	-	-	-	(1)	3	(3)	1,332	
483-482	-	-	17 (17)	-	-	(9)	-	-	-	-	-	-	-	(3)	1,223	
481-480	-	-	18 (14)	-	1	1 (6)	-	-	-	-	-	-	1	(2)	1,087	
479-478	-	-	10 (6)	-	-	(4)	-	-	-	-	-	-	-	(6)	1,296	
477-476	-	-	5 (7)	-	-	(9)	-	-	-	-	-	-	-	-	946	
475-474	-	-	2 (11)	-	-	(6)	4 (2)	-	-	-	-	-	-	(2)	1,304	
55 km	64	17	581	4	3	499	2,278	23	9	2	1	70	101	174		
Total 3,826 fish																

Values in parentheses indicate observed fish.

Appendix 4. Summary of fish captured, fish tallied and catch-per-unit-effort (CPUE) per species during the attempted population estimate on the Lower Red Deer River, 2005.

Km	Pass	Effort	BNTR		RNTR		WALL		NRPK		WNWH		LKWH	
		(s)	BNTR	CPUE	RNTR	CPUE	WALL	CPUE	NRPK	CPUE	MNWH	CPUE	LKWH	CPUE
569	1	NA	1	NA	---	NA	---	NA	---	NA	9 (110)	NA	---	NA
568	1	1,509	2	0.13	---	0	3	0.2	---	---	10 (121)	8.68	---	0
567	1	1,619	5	0.31	---	0	3	0.19	---	---	1 (142)	8.83	---	0
566	1	1,708	3 (1)	0.23	---	0	3 (1)	0.23	---	---	10 (26)	2.11	---	0
565	1	1,066	8	0.75	---	0	---	0	---	---	3 (172)	16.42	---	0
569	2	NA	4	NA	---	NA	1 (1)	NA	---	NA	16 (152)	NA	---	NA
568	2	NA	6	NA	2	NA	2 (1)	NA	1	NA	14 (197)	NA	---	NA
567	2	2,075	3	0.14	---	0	11	0.53	---	0	3 (109)	5.40	---	0
566	2	2,316	1	0.043	---	0	9	0.39	1	0.043	6 (39)	1.94	0 (1)	0.043
565	2	1,745	11 (2)	0.74	---	0	2	0.11	---	0	9 (151)	9.17	---	0

Values in parentheses denote observed fish. 'NA' denotes data unavailable.

Appendix 5. Fish measurement summary data from fall electrofishing on the Lower Red Deer River, 2005.

Species	Total Measured	Fork Length (mm)				Weight (g)			
		Max	Min	Mean	S.D.	Max	Min	Mean	S.D.
NRPK	8	815	420	660.3	131.1	5,242	522	2,412.2	1,753.4
WALL	83	700	312	459.4	97.6	3,650	292	1,164.2	821.8
BNTR	60	609	85	386.3	157.6	2,345	29	826.2	611.0
MNWH	195	462	97	328.7	83.7	1,381	8	540.9	325.5
GOLD	175	411	201	320.4	22.8	949	227	405.1	104.8
RNTR	2	381	251	316.0	91.9	512	163	337.5	246.8
MOON	13	294	263	272.5	8.4	362	238	277.1	36.0

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Alberta



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Association