Upper Little Red Deer River Fisheries Investigation, 1998.

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Acknowledgements

The 1998 upper Little Red Deer River Fisheries Investigation would not have been possible without the assistance of the following staff and volunteers. From the Alberta Conservation Association (ACA), a job well done goes out to Nora Jenson, Kevin Gardner and Donna Rystephanuk. Thanks to Natural Resource Service, Fisheries Management Division (NRS, FMD) Vance Buchwald for the use of their boat and electrofishing equipment and Casey Klipperton for assisting in the spawning survey. Particular thanks to Brian Lajeunesse of NRS, FMD who assisted in electrofishing, spawning survey and in reviewing drafts of this report. I would also like to thank Francine Wieliczko who also reviewed drafts of this report. Volunteers Thanks also to volunteers Bruce Goodall and Dave Street who assisted with the fish sampling during the electrofishing and to the various member of the Westward Ho Chapter of Trout Unlimited and the Sundre Fly Tying Club who assisted in the brown trout redd survey. Without them, our job would have taken twice as long. The Fisheries Management Enhancement Program (FMEP) funded this project through the Cochrane General Services Budget.

Introduction

Located in West Central Alberta, the Little Red Deer River originates in the Eastern Slopes of the Foothills of Alberta, west of Cremona (Figure 1). A tributary to the Red Deer River, the main stem of the Little Red Deer River is 202.5-river kilometers long, has a drainage area of 2,356 km^2 and has a change in elevation of 735m from headwaters to confluence (Rees, K 1988). Tributaries such as Grease, Harold, Silver, Graham, Big Prairie, and Dogpound creeks feed it. Land uses activity within and adjacent to the river valley is primarily grazing, forage production and logging. The river valley is deeply entrenched with the stream channel generally wide with little instream cover. Because of this, the amount of suitable fish habitat is limited especially at low flows. The substrate primarily consists of cobble, shattered bedrock and silt with only a limited amount of gravel.

The purpose of this study was to gather information on fish population status in the upper reaches of the Little Red Deer River.

The objectives were to:

1) Establish two index sites to gather fisheries information to be used as baseline information that would evaluate new sport fishing regulations implemented in 1998.

2) Broadly determine the amount and location of brown trout spawning in the Little Red Deer River.

Limited fisheries information had previously been collected from the mainstem of the upper Little Red Deer River. Previous distribution and abundance data was collected by Rhude (1980) in 1979 and by Rees (1988) in 1986 and 1987. Both of these studies were "Phase 2 fisheries investigations which examined five, 300-m long sites on the upper Little Red Deer River using a backpack electrofisher. Both studies focused mainly on the tributaries to the Little Red Deer River and less on the mainstem Little Red Deer River.

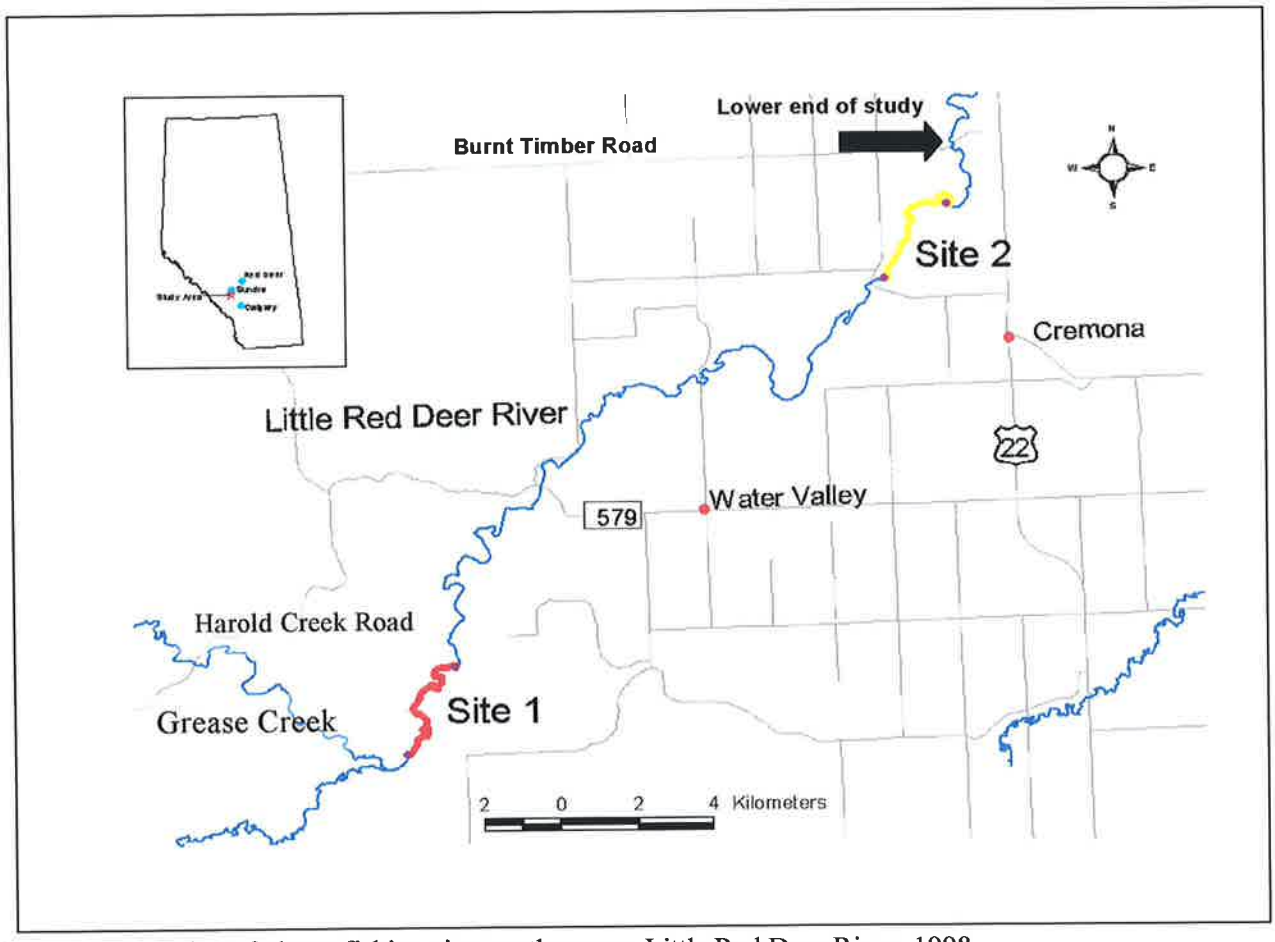


Figure 1 Location of electrofishing sites on the upper Little Red Deer River, 1998.

Methods

The two index sample sites chosen were both located upstream of the Burnt Timber Road bridge(11U 0672449/5718668) which was used to delineate between the upper and middle reaches of the Little Red Deer River. Site selection considered the following criteria; boat access, trout presence, habitat type and angling pressure. Located in the headwater area, Site 1 was 4.25 kilometers long and electrofished on June 10, 1998 (Figure 1). Sampling began at the Bates Bar J Ranch bridge (11U 0658068/5701638) and ended at Tyler's river ford (11U 0658068/5704140). Site 2 was located west of the Town of Cremona, and started at the Big Prairie Road Bridge (11U 0670605/ 5714717) and continued downstream four kilometers to a road allowance access (11U 0672256/ 5716769). Site 2 was chosen for the population estimate because it receives the most angling pressure and new regulations would likely affect it more than other reaches of the river. The marking run for the population estimate was done on June 4 with the recapture run occurring on June 11.

Sites 1 & 2 were float electrofished using a 16-foot fiberglass flat-bottom boat, equipped with throwing anode, 8500-watt generator and Coffelt (Model VVP-15) electrofisher. The electric current setting was approximately 160 volts at 5 to 9 amps. Stunned fish were retrieved using a long handled dip net and placed in a live well on board the boat.

Once a reasonable number of fish were captured for sampling, they were transferred to an accompanying canoe and sampling crew for processing. This was to facilitate the speedy sampling and release of captured fish to limit stress. Captured brown trout (*Salmo trutta*) had their forklength (nearest mm) and weight (nearest g) measured using an electronic scale. All mountain whitefish (*Prosopium williamsoni*) had their forklength measured while only the weights of 60 fish were taken because of their sensitivity to handling. During the marking run on Site 2, all captured sportfish had their adipose fin clipped for the population estimate. At both sample sites course fish abundance was noted but not enumerated. Various anesthetic methods were used from none at all to MS222 and Alki Salser. All fisheries data was entered into the Fisheries Management Information System (FMIS) database for future use. Raw data is presented in Appendix II and stored in the ACA office in Cochrane.

The mark/recapture population estimate used Chapman's modification of Peterson's population estimate formula. This formula and those used to calculate the 95% confidence intervals (95% CI) are found in Kraft et al. (1982) and have been set up in the software Population Estimate Program, Basic language, Version 2.4.

In addition to the inventory work, a brown trout spawning survey in the upper Little Red Deer River was conducted in the fall of 1998 to identify spawning areas (Figure 6). ACA and NRS, FMD staff surveyed the river from an oil well site (11U 0643660/ 5700679) to the confluence of Grease Creek on October 26, 1998. This well site was defined as being upper most portion of the spawning survey because of the high concentration of beaver ponds which limit suitable spawning area and make surveying very difficult. On November 1, 1998, ACA and NRS staff in conjunction with volunteers from the Westward Ho Trout Unlimited Club and the Sundre Fly Tying Club expanded the survey area. The Little Red Deer River from Grease Creek to the Anderson Ranch Bridge was examined, in addition Grease Creek was surveyed from its confluence to the mouth of Harold Creek.

The brown trout spawning survey had individuals walk downstream in or along the river looking for redds. These brown trout redds appeared as areas of clean gravel about one meter long and 1/3 m wide with a depression in the gravel at the top end. Redds were usually found at the head of pools or tail of riffles. Staff and volunteers wore polarized sunglasses to reduce glare from the water. Redd locations were plotted on maps by volunteers or recorded on hand held GPS units by staff. These locations were then entered into the FMIS database.

Water temperature data was collected using a Vemco Minilog deployable thermograph (which have an accuracy of ±0.1 °C). Water discharge information for the upper Little Red Deer River came from a gauging station near Water Valley (Anderson Ranch bridge) and was obtained from Alberta Environmental Protection, Water Monitoring Branch and collected by the Water Survey Branch of Canada and measured in cubic meters per second (m^3/sec). Fisheries, water flow and temperature data was entered into Excel™ spreadsheets and analyzed.

Results

Water Temperature and River Flow

A Minilog thermograph was deployed in the Little Red Deer River near the Bates Bar J Ranch Bridge from June to November. Water temperatures measured in the open water season of 1998 ranged from 0.5°C to 18.5°C (Figure 2) and only exceeded 18°C once during the deployment period. The gap in information between September 2 and 15 was a result of data being downloaded. Abnormal readings occurred three times during the deployment (July 29 -30, Aug 4 –15 and Aug 19 - Sept 2) and appeared as stable temperatures around 8°C that fluctuate by 0.5-1°C during the day as opposed to the normal 1.0-4°C. Low river flows during these periods likely resulted in the thermographs being isolated from the main flow of the river while cool ground water flow, kept the water temperature stable. The thermograph was placed in a new location when redeployed on September 16 to ensure continued recording.

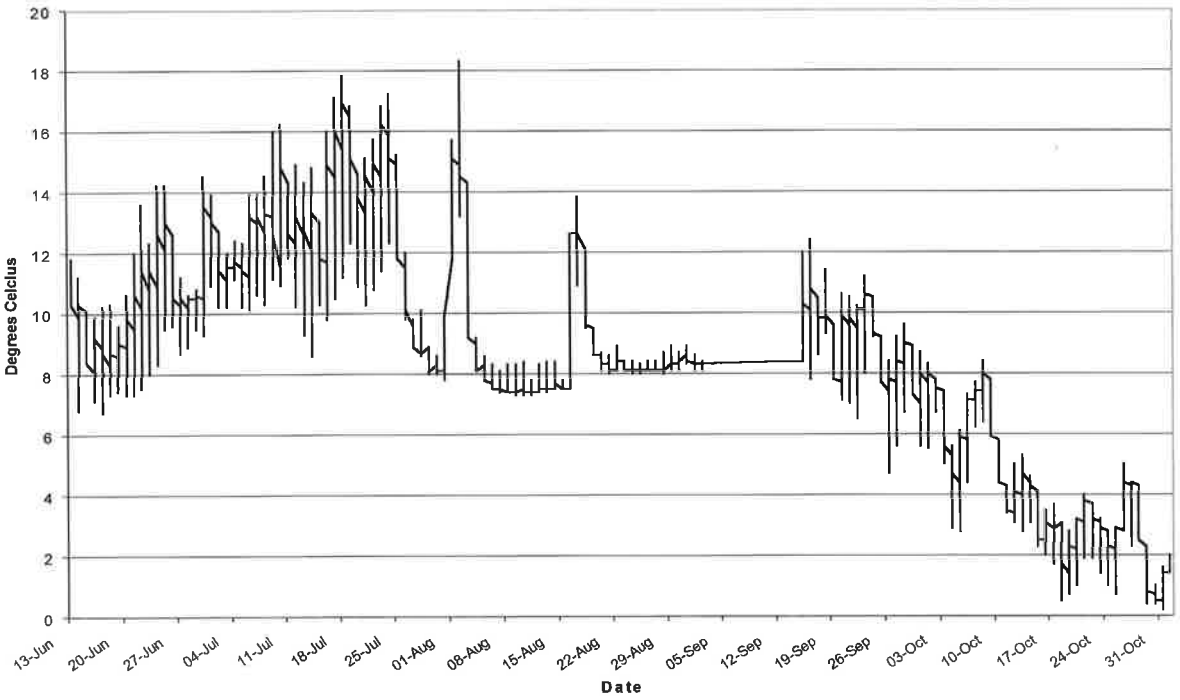


Figure 2 Daily water temperature range from the upper Little Red Deer River at Bates Bar J bridge, 1998

Data from the Water Survey Branch of Canada shows flow rates in 1998 for the Little Red Deer River ranged from 0.154 m^3/sec to 40 m^3/sec. Flows were lowest from March 1 to March 15 at 0.154 m^3/sec and less the 1.0 m^3/sec until April 4 (Figure 3). June flows ranged from 2.0 to 27.5 m^3/sec. Four times during the year, flows exceeded 25 m^3/sec and in each of these cases, flows rose very quickly and receded just as quickly. This indicates the Little Red Deer is influenced by spring thaw and flood events. It is interesting to note how very low the base flows get in March.

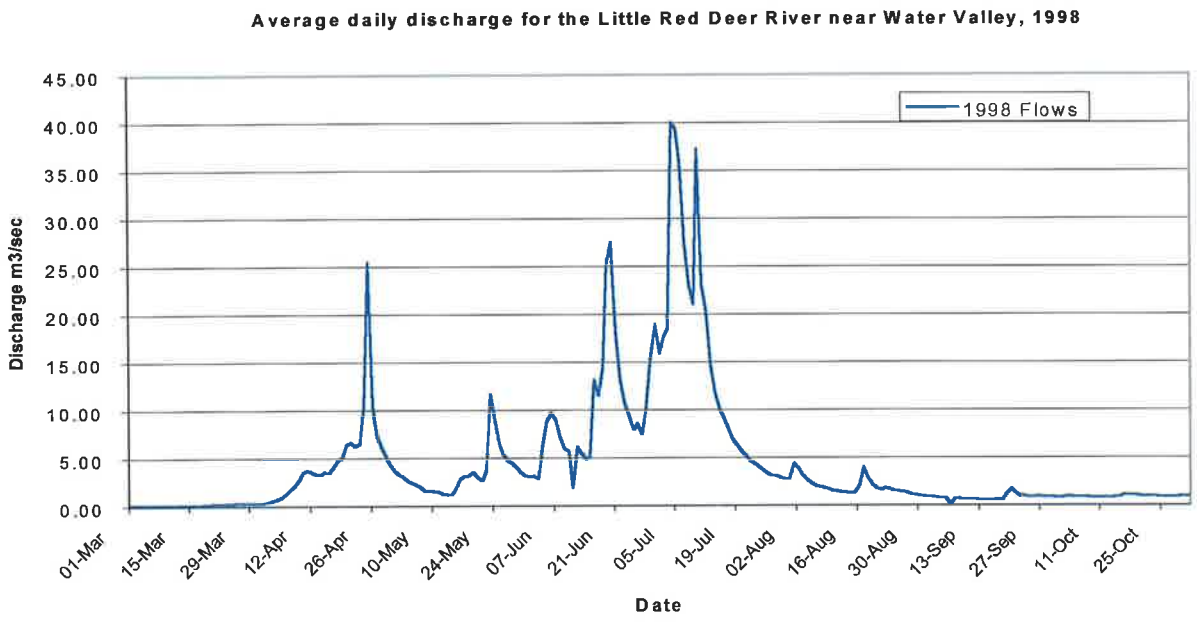


Figure 3 Average daily discharge for the Little Red Deer River near Water Valley, 1998 (Water Survey Branch of Canada).

Fish Sampling Data

Site 1

Water conditions during the distribution /abundance survey on June 10 were less than ideal with visibility <20 cm (vertical) due to rain the previous weekend. Water discharge was recorded at 5.80 m^3/sec and water temperature during sampling ranged from 9.9°C to 14°C.

Mountain whitefish were the most abundant sportfish captured at Site 1 with 250 fish caught, giving a relative abundance of 58.8 fish/km (Table 1). Their fork length ranged from 85 mm to 376 mm and a mean forklength of 224.7-mm (Table 2). The most prevalent size category was the 110-mm forklength range (Figure 4).

Brown trout were the second most abundant sportfish captured at Site 1 with 109 individuals caught (Table 1). Their abundance was calculated to 25.6 fish/km. While their forklength ranged from 86 – 443 mm (Table 2) with a mean forklength of 227 mm. The most prevalent forklength categories were 140-mm, 160-mm and 170 mm (Figure 5). There were only three fish with a forklength greater than 400 mm in Site 1.

A single burbot (*Lota lota*) was caught in Site 1 and had a forklength of 346-mm (Table 1 & 2).

Non sportfish species observed included longnose & white suckers (*Catostomus catostomus, C. commersoni*) and trout perch (*Percopsis omiscimaycus*).

Site 2

Water levels increased throughout the day during both the marking and recapture runs (June 4 and 11) resulting in reduced visibility. The recorded daily discharge was 6.61 m^3/sec for June 4 and 5.00 m^3/sec for June 11. The increase in flows was attributed to heavy rain further up the drainage. Water temperature recorded for each site throughout the day was 8 °C to 10°C on June 4 and 13°C to 17°C on June 11.

Mountain whitefish were the most abundant sportfish caught in Site 2. In the first run, 298 fish were marked while in the second run 279 fish were caught with 77 of these being recaptures from the first run (Table 1 & 3). Their abundance in the marking run was 74.5 fish/km. The population estimate was calculated at 1076 mountain whitefish over the four kilometer length of Site 2 (95%C.I. 900-1252, Table 3). The forklength for mountain whitefish in Site 2 ranged from 75 to 418 mm with a mean forklength of 253.9 mm. The weights of 58 mountain whitefish ranged from 35 to 612 g and a mean weight of 276.9-g (Table 2). The most prevalent forklength category was from 250 and 260 mm (Figure 4).

Brown trout were the second most abundant sportfish captured in Site 2. There were 122 fish caught in the first run and 108 caught in the second run of which 41 were recaptures (Table 1 & 3). Their abundance from the marking run was 30.5 fish/km while the population estimate for the four-kilometer section was calculated at 321 fish (95%CI 258-375, Table 3). The forklength for brown trout within Site 2 ranged from 92 mm to 534 mm with a mean forklength of 307.9-mm (Table 2). The most prevalent forklength categories were the 290-mm and 360-mm (Figure 5). Brown trout weights ranged from 11 g to 1602 g and a mean of 397.3 g.

There were nine burbot captured and measured in the two runs on Site 2 (Table 1) but were not marked so no population estimate was determined. Their forklength ranged from 361 mm to 688 mm with a mean length of 472.8-mm (Table 2).

Table 1. Little Red Deer River sportfish distribution and abundance, June 1998.

Location	Brown trout		Mountain Whitefish		Burbot	
	N	Fish/km	N	Fish/km	N	Fish/km
Site 1 (4.25 km)	109	25.6	250	58.8	1	0.24
Site 2, Run 1 (4.0 km)	122	30.5	298	74.5	4	1
Site 2, Run 2	108(41)[A]	27	279(77)[A]	69.8	5	1.25

[A] Recaptures in brackets: included in the second run's abundance.

Table 2 Sportfish forklength/weight data from Site 1 & 2(marking run) on the Little Red Deer River, 1998.

	Data	Brown trout	Mountain Whitefish	Burbot
Site 1	Forklength Range mm	86 – 443	85 – 376	346
	Mean (N)	227 (109)	224.7 (250)	346 (1)
	Weight Range g	7 – 791	5 – 828	
	Mean (N)	172.0(109)	216.6 (74)	
Site 2	Forklength Range mm	92 – 534	75- 418	307 - 688
	Mean (N) mm	307.9 (230)	253.9 (577)	472.8 (9)
	Weight Range g	11 – 1602	35 - 612	
	Mean (N) g	397.3 (159)	276.9 (58)	
Combined	Forklength Range mm	86-534	75-418	307-688
	Mean (N) mm	281.9 (339)	257.3 (827)	460.2 (10)
	Weight Range g	7-1602	5 - 828	
	Mean (N) g	305.7 (268)	243.1 (132)	

Table 3 Population estimate on the Little Red Deer River at Site 2, June 1998.

Species	Run 1	Run 2[A]	Recaps	Total	Population Estimate	Efficiency (%) R/C	95% Confidence	Fish/km [B]
Brown trout	**122**	**108**	**41**	**189**	**321**	**38.0**	**258-375**	**75.5**
Mountain whitefish	**298**	**279**	**77**	**500**	**1076**	**27.6**	**900-1252**	**253.2**

[A] Include recaps

[B] Study section was 4.0 km

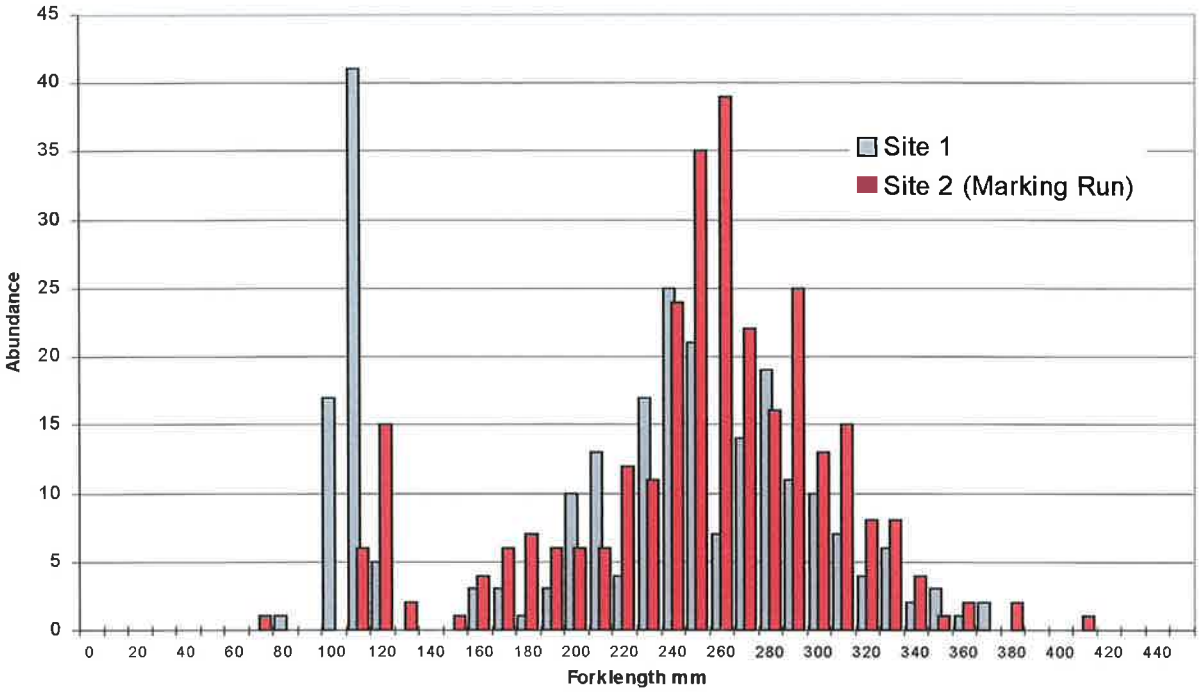


Figure 4 Comparative forklength frequency for mountain whitefish between Sites 1 & 2 (marking run) from the Little Red Deer River, 1998.

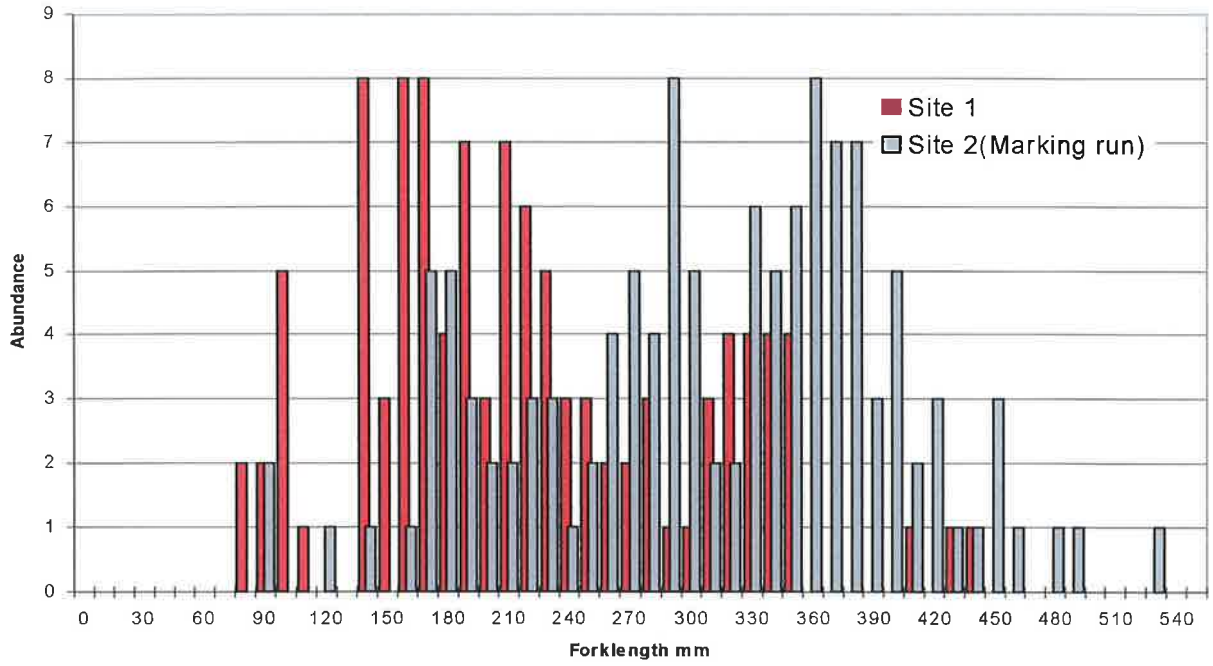


Figure 5 Comparative forklength frequency for brown trout between Sites 1 & 2 from the Little Red Deer River, 1998.

Brown trout Spawning Survey

The spawning survey area was separated into five reaches encompassing over 46.55 km of river (Figure 4). ACA and NRS fisheries staff inventoried reaches 1 & 2 while volunteers with NRS or ACA staff inventoried reaches 3 & 4 of the Little Red Deer and reaches 1 & 2 of Grease Creek. There were a total of 265 redds (258 BNTR redds + 7 BKTR redds) identified in the study area with the majority of redds found in the Little Red Deer River, reach 3 and Grease Creek, Reach 1. Table 4 details the abundance and location of brown trout redds in the Little Red Deer River and lower end of Grease Creek.

There were 258 brown trout redds enumerated over 46.55 km of river (Table 4, Figure 6) in the fall of 1998. The highest concentration of brown trout redds were in Reach 3 of the Little Red Deer River and Reach 1 on Grease Creek.

Table 4 Abundance and location of brown trout redds in the Little Red Deer River, Fall 1998.

Location [A]	Date	Distance Km	BNTR Redds	BKTR Redds
LRDR – Reach 1	26/10/98	12	34	7
LRDR – Reach 2	26/10/98	9.3	43	
LRDR – Reach 3	01/11/98	4.25	62	
LRDR – Reach 4	01/11/98	8.7	55	
Grease – Reach 1	01/11/98	8.3	58	
Grease – Reach 2	01/11/98	4	6	
Total		46.55	258	7

[A] Sample locations are defined as;

LRDR – Little Red Deer River

Reach 1 Oil well 11U 0643660/ 5700679 to 11U 0658130/ 5699652

Reach 2 11U 0658130/ 5699652 to 11U 0658068 /5701638

Reach 3 Bar J Bridge (11U 0658068 /5701638) to Tylor's Ford (11U 0659340/ 5704140)

Reach 4 Tylor's Ford (11U 0659340/ 5704140) to Anderson Ranch bridge (11U 0661650/ 5709090)

Grease Creek

Reach 1 Grease Bridge11U 0652550/ 5704380 to Little Red Deer River (11U 0657570/ 5701310)

Reach 2 Confluence of Harold Creek (11U 0650010/ 5705830) to Grease Bridge(11U 0652550/ 5704380)

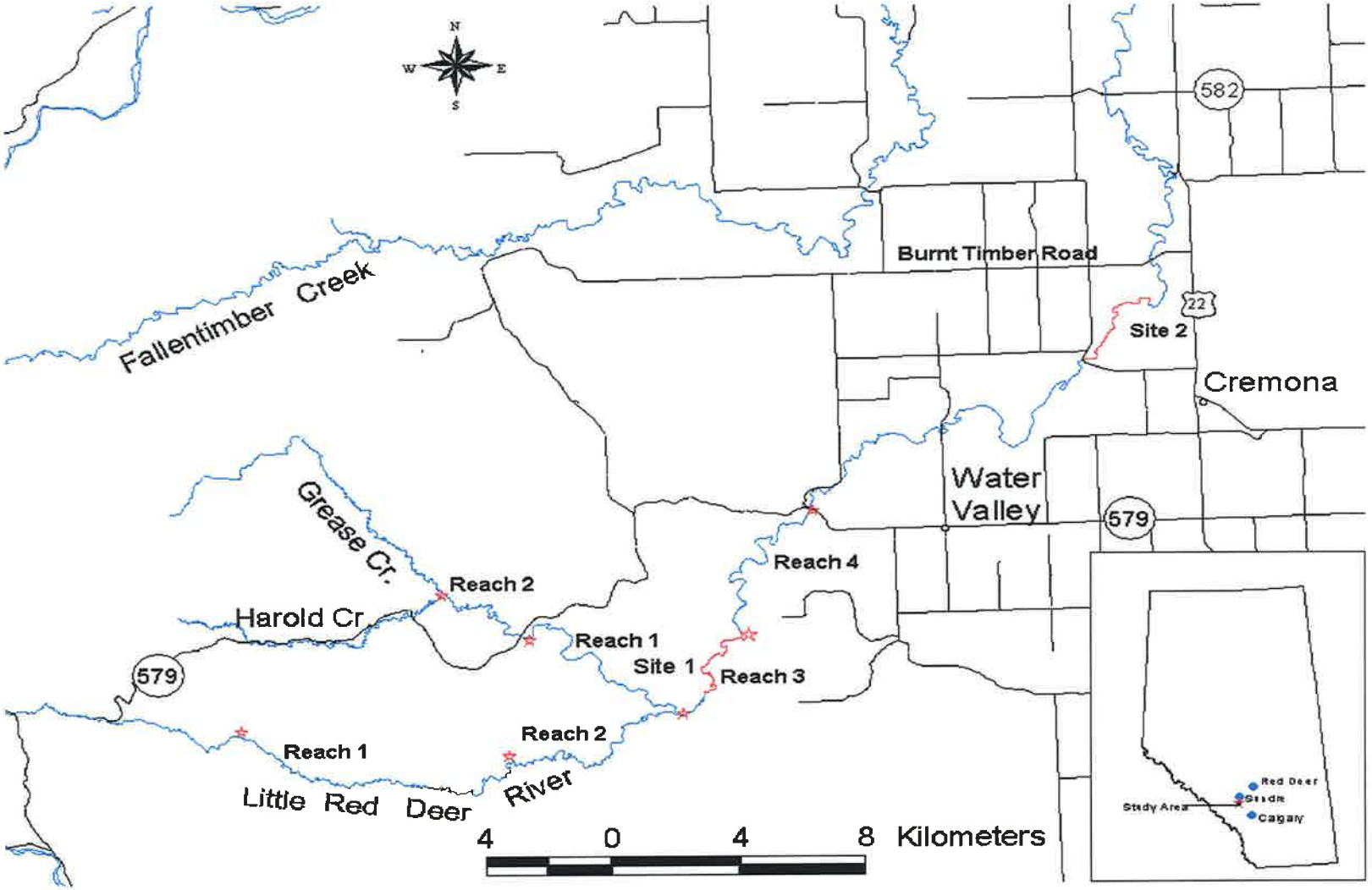


Figure 6 Location of brown trout spawning survey reaches on the upper Little Red Deer River, 1998

Condition Factor

Brown trout and mountain fish length/weight power regression was calculated for both Sites 1 and 2 but was not statistically examined. This information is presented to allow for comparisons with future fisheries work on the Little Red Deer River (Figure 7 & 8).

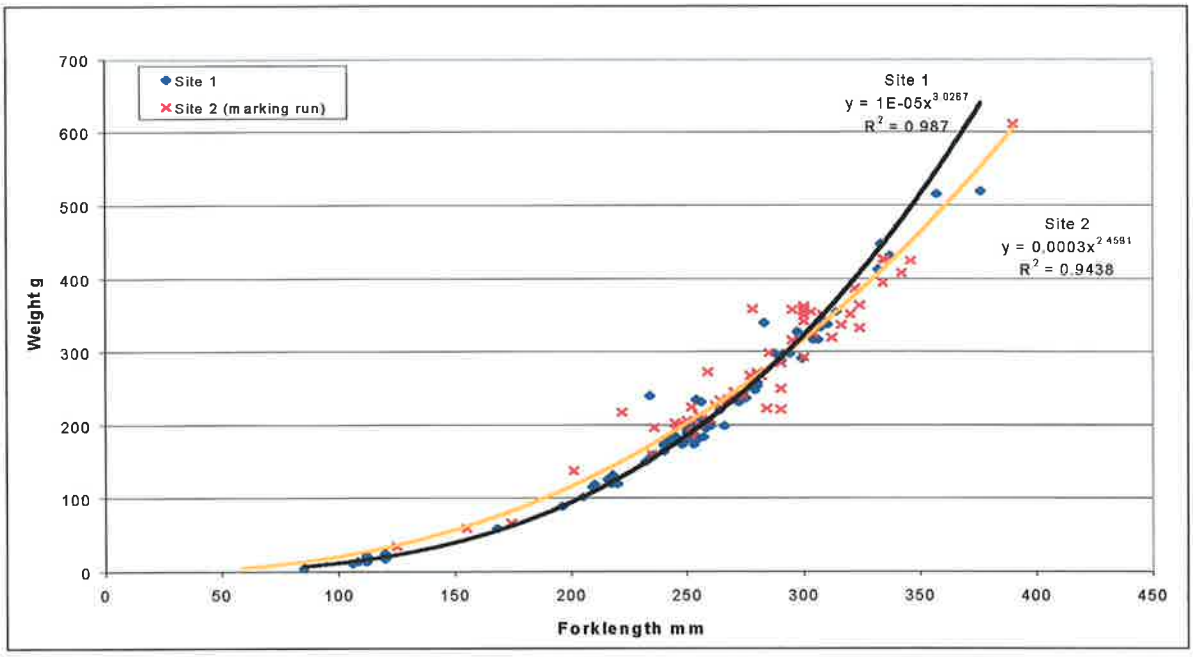


Figure 7 Forklength/weight power regression for mountain whitefish from Sites 1 & 2 from the Little Red Deer River, 1998.

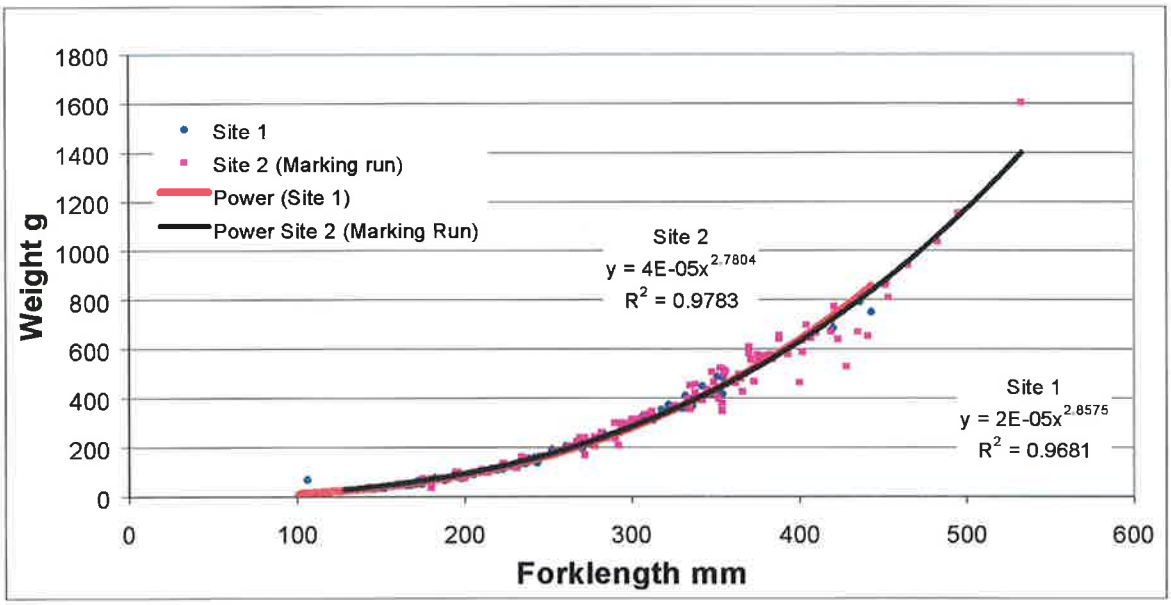


Figure 8 Forklength/weight power regression for brown trout from the Little Red Deer River, 1998.

Discussion

Historical Data – Fish stocking

In examining Alberta Environments sportfish stocking records (Appendix I), the mainstem of the Little Red Deer River was stocked in 1955 with 10, 450 brown trout yearlings and in 1956 with 10,800 brown trout fry. No other stocking was ever recorded for the mainstem, although a number of its tributaries were stocked on various occasions since that time. These include Harold, Grease, Stony, Big Prairie and Silver creeks. Brown trout made up the largest number of fish species stocked in the Little Red Deer drainage, accounting for more than 166,000 of the 188,632 fish stocked or 88%. Rainbow and brook trout were stocked into Silver and Stony creek prior to 1982.

Since 1985 (past 14 years), there has been only two stockings into the Little Red Deer drainage (1988 with 20,200 and 1997 with 9,500) and both of these were brown trout into Harold Creek. The last stocking was of 50 to 100 mm FL brown trout in July of 1997 (See Appendix I, for a summary of sportfish stocking in the Little Red Deer Drainage).

It is interesting to note the elevated numbers of brown trout in the 140, 160 and 170 mm – forklength frequency categories from Site 1 (Figure 8) which is located immediately downstream of the confluence of Grease Creek. The 1997 Harold Creek stocking area was located immediately upstream of the confluence with Grease Creek and was approximately four kilometers from Site 1 on the Little Red Deer River. No attempt was made in trying to determine whether any of the fish caught in Site 1were from the previous years stocking (ie aging).

Historical Data – Fisheries Surveys

Previous fisheries studies were conducted on the upper Little Red Deer River and tributaries by Rhude (1980) in 1979/80 and Rees (1988) in 1986/87. Rhude worked on the headwater area, while Rees worked from the Anderson Ranch Bridge downstream to Little Red Deer River Road. Both studies were Fish and Wildlife "Phase Two" fisheries surveys that examined water quality, habitat and fisheries abundance/distribution. Sample sites were generally 300 m in length and backpack electrofishers were predominantly used for collecting fisheries information, although a boat electrofisher was used by Rees for sites downstream of the Burnt Timber Road.

Rhude (1980) found no brown trout or mountain whitefish in the three sites he surveyed on the Little Red Deer River although did capture a number of bull trout upstream of Grease Creek. He noted that spawning habitat appeared to be a major factor limiting natural reproduction of brown trout. Grease and Turnball creeks were identified as having the best overall fisheries potential from his inventory finding although limited recruitment was observed. It is interesting to note bull trout were the most abundant Salmonid found during his survey

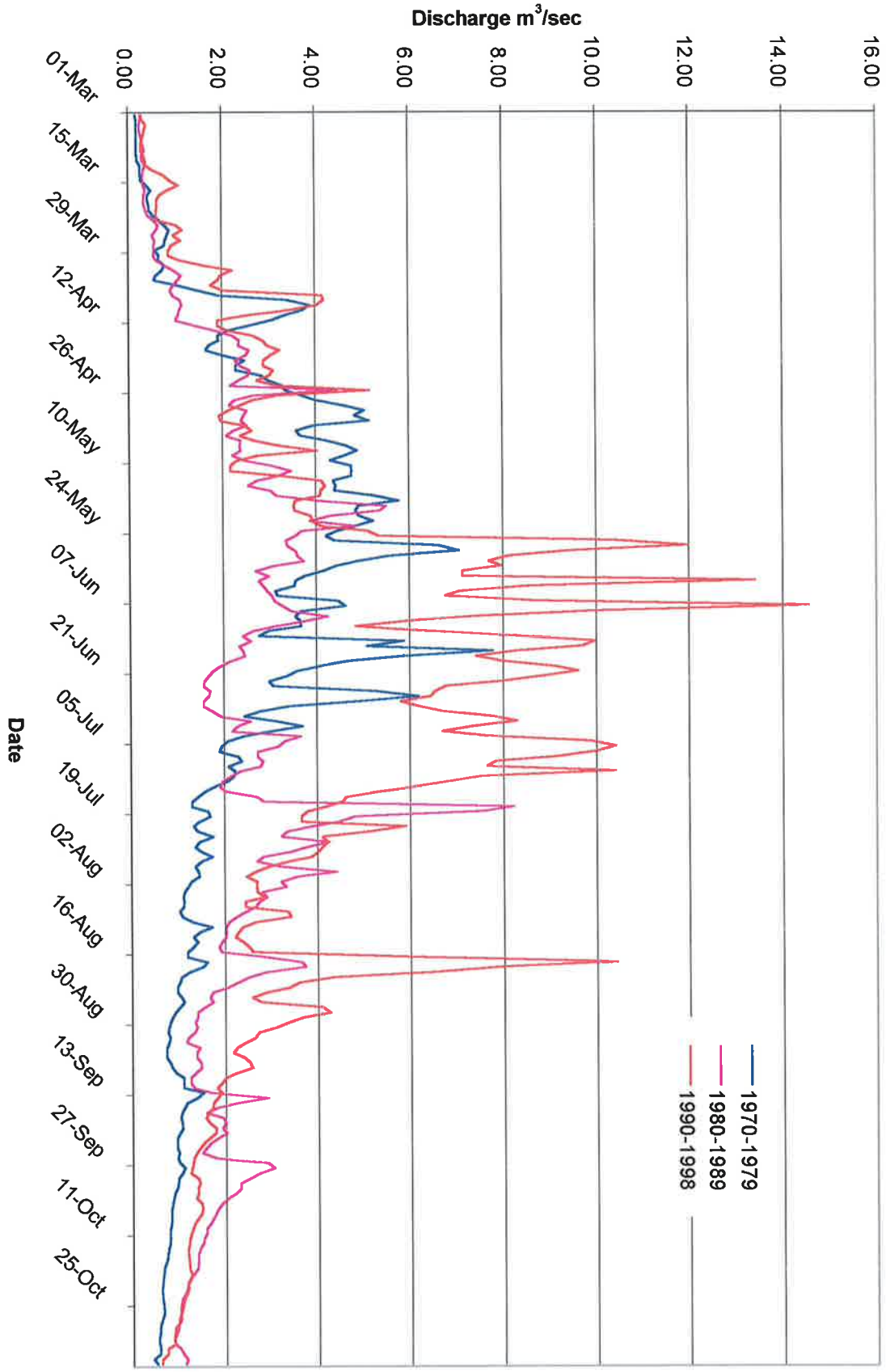
Rees (1988) examined five sites on the Little Red Deer River between the Burnt Timber Road Bridge and Anderson Ranch Bridge and found low numbers of brown trout and mountain whitefish. Brown trout were present in Site 11 (n=5) (located next to 1998's Site 2) and Site 13 (n=1) near Anderson Ranch bridge. Rees identified that availability of spawning habitat may be a limiting factor and that low quantity and quality of over wintering habitat may also be a limiting factor.

There are major limitations in comparing the work Rhude (1980) and Rees (1988) did, to the 1998 study. Past studies sampled 300 m sites using backpack electrofishers, whereas this study used a boat electrofisher and each sample site were >4000 m. No population estimates were conducted previously, therefore no statistical comparison could be made to those calculated in 1998. Rhude and Rees both identify spawning habitat as being a limited factor for brown trout. The 1998 brown trout spawning survey was the first time brown trout redd locations and abundance was determined. During this spawning survey, spawning habitat was observed as being limited and of poor quality. Redds were often viewed as being in somewhat atypical locations in comparison to brown trout redds from other rivers or stream in the area (e.g. Dogpound Creek, Fallen Timber Creek). The redds observed in the Little Red Deer River were often found in much higher velocity areas because lower velocity areas often were comprised of silt.

Water Temperature and River Flows

Rees (1988) stated that water temperature in the Little Red Deer River was not a limiting factor for brown trout or mountain whitefish. Temperature data collected in 1998 supports that conclusion, (Figure 2).

Water discharge recorded in 1998 at the Water Valley gauging station showed levels dropped very low in the late spring and fall (<1 m^3/sec). Late summer and fall average daily flows have been increasing since the1970's and may be one of the reasons for the improved fishery (Figure 9). Although low flows and high ice accumulation during the winter may be a limiting factor for salmonids in the Little Red Deer River. This combination has been identified in other stream as reducing available habitat and causing serious detrimental impact to fish populations (Canjak A. C, 1995).


Discharge m3/sec
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4.00
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01-Mar
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10-May
24-May
07-Jun
21-Jun
05-Jul
19-Jul
02-Aug
16-Aug
30-Aug
13-Sep
27-Sep
11-Oct
25-Oct
Date
1970-1979
1980-1989
1990-1998

Sportfish Community

Native to the Little Red Deer River, mountain whitefish were the most abundant sportfish captured in 1998. Their abundance in Site 1 was 58.8 fish/km and in Site 2 (marking run) was 74.5 fish/km. Brown trout were the second most abundant sportfish, with a relative abundance of 25.6 fish/km (Site 1) and 30.5 fish/km (site 2's marking run) respectively.

At Site 2 the mountain whitefish population estimate was calculated at 1076 fish (95% CI 900-1252) within the four kilometer site. While, the brown trout population estimate in Site 2 was calculated at 321 fish (95% CI. 258-375) for the same area (Table 3).

It appears that mountain whitefish abundance has increased since 1979, when Rhude (1980) did not catch any and in 1986/87 when Rees (1988) caught one. Any comparison of the 1998 data to these previous studies have limitations due to differences in site size and equipment type. The one mountain whitefish captured in 1986 was sampled in site 13, which is located near the Anderson Ranch Bridge.

No mountain whitefish spawning was identified in 1998, although a number of large individuals (>300 mm FL) were observed under the Bates Bar J Ranch Bridge during the fall brown trout spawning survey. The presence of various size categories in both Sites 1 & 2 illustrates a self-sustaining population. While, the especially strong <100 mm FL category (yearlings) in Site 1, would appear to suggest the use of this area for spawning and rearing. This coincides with Rhude's (1980) statement of the area downstream of the confluence of Grease Creek as being a major spawning area for mountain whitefish.

The presence of brown trout at Site 1 appears to be a range expansion upstream since they were previously only found downstream of the Anderson Ranch Bridge (Rees, 1989). Individual brown trout and redds were also observed upstream as far as the Forestry Reserve during the fall spawning survey.

Brown trout abundance in 1998 has increased since 1979 when Rhude (1980) caught none and in 1986/87 when Rees caught six above Burnt Timber Road Bridge (1988). In stating this though, one has to be cognizant of differences in sampling methods and study design between this study and previous works.

It is to early to conclusively know whether or not the Little Red Deer River brown trout population can be considered self-sustaining. The fact that numerous size categories were caught in both electrofishing sites in 1998, brown trout spawning was observed and that limited stockings have occurred in the past 14 years (both of which were on Harold Creek) suggest it already is.

What influence fish stocking has had on fish abundance in the mainstem of the Little Red Deer River is unknown. Stocking prior to 1985 appears to have provided the base for a self reproducing population to become established but whether it is able to sustain itself over the long term is not known. The elevated numbers of fish in the 140 mm, 160 mm and 170-mm forklength categories in Site 1 and it's close proximity to the 1997 Harold Creek stocking area suggests some influence from stocked fish. No confirmation of this was attempted.

Brown trout spawning was observed throughout the upper Little Red Deer River and lower Grease Creek. The primary spawning locations were located in and around the confluence of Grease Creek (Little Red Deer River reaches 2, 3 and Grease Creek reach 1, Figure 2). Rhude (1980) and Rees (1989) identified that brown trout spawning habitat was limited and that which was present was of lower quality. A large amount of the substrate in the upper Little Red Deer River are boulders, cobble, broken bedrock and silt, with only a limited amount suitable spawning gravel. Even though spawning habitat isn't abundant, natural recruitment is appears to be sufficient to enable this population to increase.

Burbot were the only other sportfish caught in the upper Little Red Deer River in 1998. They were found in very low abundance in both sample sites.

Brook trout were absent from both sites in 1998, although during that years spawning survey, brook trout were observed within the Forestry Reserve on redds. Rhude (1980) caught brook trout upstream of Site 1 as well as in several tributaries

No bull trout were captured in either study site in 1998. This appears to be a dramatic reduction in abundance since 1979 when Rhude (1980) reported catching 27 bull trout upstream of Salter Creek. The 1998 fall spawning survey also observed no bull trout. Over harvest by anglers, habitat degradation due to logging, grazing and beaver dams as well as competition between introduced trout may have all had negative impacts on the bull trout.

Northern pike were absent from both sample sites. During the 1987 study, Rees noted that northern pike were absent above the Shantz weir (located 3 km upstream of the Burnt Timber Road) , even though it was not a fish barrier. Rhude (1980) did catch northern pike in the upper reaches but only in very low numbers.

Conclusion

The ACA 1998 upper Little Red Deer River fisheries inventory established two index sites and collected baseline sportfish information for monitoring newly implemented Fisheries Management strategies. This included, catch and release regulations from April to October for all trout and mountain whitefish and an angling closure for the remainder of the year on the mainstem of the Little Red Deer River.

Boat electrofishing found that mountain whitefish and brown trout were the most abundant sportfish in both sample sites. Mountain whitefish abundance in Site 1 was 58.8 fish/km and in Site 2 (marking run) was 74.5 fish/km. Brown trout relative abundance was 25.6 fish/km in Site 1 and 30.5 fish/km in site 2 (marking run). The population estimate calculated 1076 mountain whitefish (95% CI 900-1252) and 321 brown trout (95% CI. 258-375) over the four kilometer section or convert to 269 fish/km for mountain whitefish and 80.25 fish/km for brown trout.

Native to the Little Red Deer River, the mountain whitefish forklength distribution shows a healthy self-sustaining population. Their abundance appears to have increased significantly since 1979 when none were caught (Rhude, 1980) and in 1986/87 when only one fish was caught (Rees, 1989). Comparison between previous studies and the work done in 1998 should be viewed cautiously because of differences in study design. Mountain whitefish spawning locations were not identified in 1998, however a large number of <100 mm forklength fish were caught in Site 1 and suggest possible spawn or rearing location. Rhude (1980) who suggests this area is used for spawning supports this conclusion.

It appears that brown trout distribution has expanded upstream from the Anderson Ranch Bridge into the Forestry Reserve. Their abundance appears to have increased when compared to previous studies done in 1979 and 1986/87 although should viewed cautiously because of differences in sampling technique and study design.

Brown, Rainbow and Brook trout were all stocked at various times and locations in the upper Little Red Deer River and tributaries since 1950. Brown trout have been stocked the most, although since 1985 they have been stocked only twice, both of which times were into Harold Creek. Natural recruitment of brown trout was evident in the Little Red Deer River in 1998. This is indicated by the wide range of fish sizes, presence of brown trout redds, and limited stockings in the past 14 years. Brown trout redds were observed throughout the upper Little Red Deer river with the primary spawning area defined as being in and around Grease Creek. The presence of juvenile brown trout and large number of redds observed in site 1, demonstrates the use of this area for spawning and rearing.

No bull trout, brook trout or northern pike were sample from either electrofishing sites in 1998.

Water temperature does not appear to be a limiting factor for brown trout, brook trout or other salmonids. Late summer and fall average daily flows have been increasing since the1970's and may be one of the reasons for the improved fishery. Although low flows and high ice accumulation during the winter may be a limiting factor for salmonids in the Little Red Deer River. This combination has been identified in other streams as reducing available habitat and causing serious detrimental impact to fish populations (Canjak A. C, 1995).

Recommendations

1) Duplicate study in five years to evaluate 1998 sportfish numbers and regulations.

2) Focus habitat retention/enhancement efforts to ensure key salmonid spawning areas are protected.

3) Collected age information from some fish to determine natural recruitment and assess stocking success.

Reference Cited

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2. Rhude, Larry. 1980. Survey of Habitat and Fish Population in the Little Red Deer River Drainage System, 1979. Energy and Natural Resources, Fish and Wildlife Division. Red Deer

3. Rees, Kerry. 1988. A Fisheries Phase II Survey in the Little Red Deer River Watershed. Forestry, Lands & Wildlife, Fish and Wildlife Division. Calgary

4. Water Survey Branch of Canada, 1970-1998. Ottawa

5. Canjuk A. R., 1996. Winter habitat of selected stream fishes and potential impacts from land use activities. Canadian Journal of Aquatic Science 53(1): 267-282

Appendix I Fish stocking summary for the upper Little Red Deer River,<1960 to 1998

	Little Red Deer River	Harold Creek	Silver Creek	Stony Creek	Big Prairie Creek	Total
Year	Number of brown trout stocked					
<1960	21,250		350, BKTR 350	RNTR 3,940	6,000	27,600, BKTR 350, RNTR 3,940
1960		13,200	RNTR 4,160			13,200, RNTR 4,160
1961		8,500		RNTR 4,180		8500, RNTR 4,180
1962			RNTR 2,000	RNTR 2,000		RNTR 4,000
1963						
1964			2,000	2,000		4,000
1965		4,000	2,000	3,200		9,200
1966			2,250	5,400, BKTR 3,000		7,650, BKTR 3,000
1967		12,000	5,100	5,950, BKTR 3,250		22,950, BKTR 3,250
1968						
1969						
1970						
1971						
1972		16,200				16,200
1973				6,000		6,200
1974		10,000				10,000
1975			RNTR 5,000			5,000
1976						
1977						
1978						
1979						
1980						
1981			RNTR 500			RNTR 500
1982		3,242	RNTR 200			3,242, RNTR 200
1983		4,000				4,000
1984		13,000				13,000
1985						
1986						
1987						
1988		20,200				20,200
1989						
1990						
1991						
1992						
1993						
1994						
1995						
1996						
1997		9,500				9,500
Total BNTR	21,500	104,342	11,700 RNTR 5,820, BKTR 350	22,550, RNTR 10,120 BKTR 6,250	6,000	166,092 RNTR 15,940 BKTR 6,600 =188632

^ Abbreviation; BNTR – Brown trout BKTR – Brook trout RNTR – Rainbow trout

Appendix II Fisheries Data for the Upper Little Red Deer River, June, 1998.

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
1.01	06-04-98	SITE 2	MNWF	346	425			1	effort 1504
1.02	06-04-98	SITE 2	MNWF	274	240			1	
1.03	06-04-98	SITE 2	MNWF	272				1	visibility 15 cm, high water
1.04	06-04-98	SITE 2	MNWF	308	351			1	using boat shocker
1.05	06-04-98	SITE 2	MNWF	303	355			1	
1.06	06-04-98	SITE 2	MNWF	278	359			1	
1.07	06-04-98	SITE 2	MNWF	342	408			1	
1.08	06-04-98	SITE 2	MNWF	324	364			1	
1.09	06-04-98	SITE 2	MNWF	255	200			1	
1.1	06-04-98	SITE 2	MNWF	304	325			1	
1.11	06-04-98	SITE 2	MNWF	324	333			1	
1.12	06-04-98	SITE 2	MNWF	312	320			1	
1.13	06-04-98	SITE 2	MNWF	280	272			1	
1.14	06-04-98	SITE 2	MNWF	277	268			1	
1.15	06-04-98	SITE 2	MNWF	264	234			1	
1.16	06-04-98	SITE 2	MNWF	250	206			1	
1.17	06-04-98	SITE 2	MNWF	278	264			1	
1.18	06-04-98	SITE 2	MNWF	295	316			1	
1.19	06-04-98	SITE 2	MNWF	268	235			1	
1.2	06-04-98	SITE 2	MNWF	300	342			1	
1.21	06-04-98	SITE 2	MNWF	316	337			1	
1.22	06-04-98	SITE 2	MNWF	268	234			1	
1.23	06-04-98	SITE 2	MNWF	300				1	
1.24	06-04-98	SITE 2	MNWF	246	200			1	
1.25	06-04-98	SITE 2	MNWF	252	187			1	
1.26	06-04-98	SITE 2	MNWF	258	206			1	
1.27	06-04-98	SITE 2	MNWF	260	208			1	
1.28	06-04-98	SITE 2	MNWF	235	160			1	
1.29	06-04-98	SITE 2	MNWF	253	193			1	
1.3	06-04-98	SITE 2	MNWF	260				1	
1.31	06-04-98	SITE 2	MNWF	300	293			1	
1.32	06-04-98	SITE 2	MNWF	295	358			1	
1.33	06-04-98	SITE 2	MNWF	201	138			1	
1.34	06-04-98	SITE 2	MNWF	290	222			1	
1.35	06-04-98	SITE 2	MNWF	300	363			1	
1.36	06-04-98	SITE 2	MNWF	245	203			1	effort 1806
1.37	06-04-98	SITE 2	MNWF	270	246			1	
1.38	06-04-98	SITE 2	MNWF	125	35			1	
1.39	06-04-98	SITE 2	MNWF	174	67			1	
1.4	06-04-98	SITE 2	MNWF	240				1	
1.41	06-04-98	SITE 2	MNWF	334	395			1	
1.42	06-04-98	SITE 2	MNWF	282	267			1	
1.43	06-04-98	SITE 2	MNWF	290	250			1	
1.44	06-04-98	SITE 2	MNWF	252	191			1	
1.45	06-04-98	SITE 2	BNTR	365				1	
1.46	06-04-98	SITE 2	BNTR	373	467			1	
1.47	06-04-98	SITE 2	BNTR	441	652			1	
1.48	06-04-98	SITE 2	BNTR	366	426			1	
1.49	06-04-98	SITE 2	BNTR	428	529			1	
1.5	06-04-98	SITE 2	BNTR	187				1	
1.51	06-04-98	SITE 2	BNTR	333	396			1	
1.52	06-04-98	SITE 2	BNTR	299	275			1	
1.53	06-04-98	SITE 2	BNTR	143	40			1	
2.01	06-04-98	SITE 2	MNWF	390	612			1	
2.02	06-04-98	SITE 2	MNWF	252	225			1	
2.03	06-04-98	SITE 2	MNWF	300	355			1	
2.04	06-04-98	SITE 2	MNWF	300	350			1	
2.05	06-04-98	SITE 2	MNWF	285	299			1	
2.06	06-04-98	SITE 2	MNWF	300	358			1	
2.07	06-04-98	SITE 2	MNWF	290	285			1	
2.08	06-04-98	SITE 2	MNWF	322	387			1	
2.09	06-04-98	SITE 2	MNWF	259	273			1	
2.1	06-04-98	SITE 2	MNWF	334	427			1	
2.11	06-04-98	SITE 2	MNWF	222	218			1	
2.12	06-04-98	SITE 2	MNWF	236	197			1	
2.13	06-04-98	SITE 2	MNWF	284	223			1	
2.14	06-04-98	SITE 2	MNWF	255	214			1	
2.15	06-04-98	SITE 2	MNWF	262	227			1	
2.16	06-04-98	SITE 2	MNWF	155	60			1	
2.17	06-04-98	SITE 2	MNWF	320	352			1	
2.18	06-04-98	SITE 2	MNWF	335	426			1	
2.19	06-04-98	SITE 2	BNTR	495	1153			1	
2.2	06-04-98	SITE 2	BNTR	423	639			1	
2.21	06-04-98	SITE 2	BNTR	393	579			1	
2.22	06-04-98	SITE 2	BNTR	311	335			1	
2.23	06-04-98	SITE 2	BNTR	300	295			1	
2.24	06-04-98	SITE 2	BNTR	335	355			1	
2.25	06-04-98	SITE 2	BNTR	384	557			1	
2.26	06-04-98	SITE 2	BNTR	352	398			1	
2.27	06-04-98	SITE 2	BNTR	265	201			1	
2.28	06-04-98	SITE 2	BNTR	354	379			1	
2.29	06-04-98	SITE 2	BNTR	290	234			1	
2.3	06-04-98	SITE 2	BNTR	278	204			1	
2.31	06-04-98	SITE 2	BNTR	296	276			1	
2.32	06-04-98	SITE 2	BNTR	231	115			1	
2.33	06-04-98	SITE 2	BNTR	225	125			1	
2.34	06-04-98	SITE 2	BNTR	400	463			1	
2.35	06-04-98	SITE 2	BNTR	354	347			1	
2.36	06-04-98	SITE 2	BNTR	272	168			1	
2.37	06-04-98	SITE 2	BNTR	190	68			1	
2.38	06-04-98	SITE 2	BNTR	92	16			1	
2.39	06-04-98	SITE 2	BNTR	186	74			1	
2.41	06-04-98	SITE 2	BNTR	375	535			1	
2.42	06-04-98	SITE 2	BNTR	375	577			1	
2.43	06-04-98	SITE 2	BNTR	335	452			1	
2.44	06-04-98	SITE 2	BNTR	175	71			1	
2.45	06-04-98	SITE 2	BNTR	345	434			1	
2.46	06-04-98	SITE 2	BNTR	205	99			1	
2.47	06-04-98	SITE 2	BNTR	435	669			1	
2.48	06-04-98	SITE 2	BNTR	361	475			1	effort 1998
2.49	06-04-98	SITE 2	BNTR	234	160			1	12 C
2.5	06-04-98	SITE 2	BNTR	200	74			1	
2.51	06-04-98	SITE 2	MNWF	316				1	
2.52	06-04-98	SITE 2	MNWF	300				1	
2.53	06-04-98	SITE 2	MNWF	285				1	
2.54	06-04-98	SITE 2	MNWF	343				1	
2.55	06-04-98	SITE 2	MNWF	263				1	
2.56	06-04-98	SITE 2	MNWF	348				1	
2.57	06-04-98	SITE 2	MNWF	261				1	
2.58	06-04-98	SITE 2	MNWF	220				1	
2.59	06-04-98	SITE 2	MNWF	225				1	
2.6	06-04-98	SITE 2	MNWF	302				1	
2.61	06-04-98	SITE 2	MNWF	250				1	
2.62	06-04-98	SITE 2	MNWF	226				1	
2.63	06-04-98	SITE 2	MNWF	220				1	
2.64	06-04-98	SITE 2	BNTR	263	205			1	
2.65	06-04-98	SITE 2	MNWF	318				1	

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
2.66	06-04-98	SITE 2	MNWF	358				1	
2.67	06-04-98	SITE 2	MNWF	338				1	
2.68	06-04-98	SITE 2	MNWF	265				1	
2.69	06-04-98	SITE 2	MNWF	265				1	
2.7	06-04-98	SITE 2	MNWF	258				1	
2.71	06-04-98	SITE 2	MNWF	301				1	
2.72	06-04-98	SITE 2	MNWF	285				1	
2.73	06-04-98	SITE 2	MNWF	293				1	
2.74	06-04-98	SITE 2	MNWF	260				1	
2.75	06-04-98	SITE 2	MNWF	316				1	
2.76	06-04-98	SITE 2	MNWF	275				1	
2.77	06-04-98	SITE 2	MNWF	267				1	
2.78	06-04-98	SITE 2	MNWF	250				1	
2.79	06-04-98	SITE 2	MNWF	263				1	
2.8	06-04-98	SITE 2	MNWF	263				1	
3.01	06-04-98	SITE 2	MNWF	252				1	
3.02	06-04-98	SITE 2	MNWF	246				1	
3.03	06-04-98	SITE 2	BNTR	180	36			1	
3.04	06-04-98	SITE 2	MNWF	170				1	
3.05	06-04-98	SITE 2	BNTR	175	65			1	
3.06	06-04-98	SITE 2	BNTR	407	645			1	
3.07	06-04-98	SITE 2	BNTR	376	544			1	
3.08	06-04-98	SITE 2	BNTR	356	510			1	
3.09	06-04-98	SITE 2	BNTR	325	358			1	
3.1	06-04-98	SITE 2	BNTR	285	235			1	
3.11	06-04-98	SITE 2	BNTR	195	99			1	
3.12	06-04-98	SITE 2	MNWF	275				1	
3.13	06-04-98	SITE 2	MNWF	255				1	
3.14	06-04-98	SITE 2	MNWF	335				1	
3.15	06-04-98	SITE 2	MNWF	185			M	1	
3.16	06-04-98	SITE 2	MNWF	75			M	1	
3.17	06-04-98	SITE 2	MNWF	125			M	1	
3.18	06-04-98	SITE 2	MNWF	125			M	1	
3.19	06-04-98	SITE 2	MNWF	120			M	1	
3.2	06-04-98	SITE 2	MNWF	255				1	
3.21	06-04-98	SITE 2	MNWF	315				1	
3.22	06-04-98	SITE 2	MNWF	330				1	
3.23	06-04-98	SITE 2	BURB	361				1	
3.24	06-04-98	SITE 2	MNWF	255				1	
3.25	06-04-98	SITE 2	MNWF	234				1	
3.26	06-04-98	SITE 2	MNWF	266				1	
3.27	06-04-98	SITE 2	MNWF	249				1	
3.28	06-04-98	SITE 2	BNTR	99	35			1	
3.29	06-04-98	SITE 2	BNTR	402	634			1	
3.3	06-04-98	SITE 2	BNTR	483	1033			1	
3.31	06-04-98	SITE 2	BNTR	350	411			1	
3.32	06-04-98	SITE 2	BNTR	300	312			1	
3.33	06-04-98	SITE 2	BNTR	260	194			1	
3.34	06-04-98	SITE 2	BNTR	267	222			1	
3.35	06-04-98	SITE 2	BNTR	227	125			1	
3.36	06-04-98	SITE 2	BNTR	253	178			1	
3.37	06-04-98	SITE 2	MNWF	320				1	
3.38	06-04-98	SITE 2	MNWF	253				1	
3.39	06-04-98	SITE 2	MNWF	279				1	
3.4	06-04-98	SITE 2	MNWF	300				1	
3.41	06-04-98	SITE 2	MNWF	252				1	
3.42	06-04-98	SITE 2	MNWF	293				1	
3.43	06-04-98	SITE 2	MNWF	225			M	1	
3.44	06-04-98	SITE 2	MNWF	171			M	1	
3.45	06-04-98	SITE 2	MNWF	223			M	1	

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
3.46	06-04-98	SITE 2	MNWF	125			M	1	
3.47	06-04-98	SITE 2	MNWF	115			M	1	effort 2728
3.48	06-04-98	SITE 2	MNWF	126			M	1	12 C
3.49	06-04-98	SITE 2	BNTR	419	670			1	
3.5	06-04-98	SITE 2	BNTR	128	26			1	
3.51	06-04-98	SITE 2	BNTR	282	259			1	
3.52	06-04-98	SITE 2	BNTR	214	96			1	
3.53	06-04-98	SITE 2	MNWF	241				1	
3.54	06-04-98	SITE 2	MNWF	192				1	
3.55	06-04-98	SITE 2	MNWF	129				1	
3.56	06-04-98	SITE 2	MNWF	206			M	1	
3.57	06-04-98	SITE 2	MNWF	128			M	1	
3.58	06-04-98	SITE 2	MNWF	140			M	1	
3.59	06-04-98	SITE 2	MNWF	120			M	1	
3.6	06-04-98	SITE 2	MNWF	315				1	
3.61	06-04-98	SITE 2	MNWF	270				1	
3.62	06-04-98	SITE 2	MNWF	183				1	
3.63	06-04-98	SITE 2	MNWF	312				1	
3.64	06-04-98	SITE 2	MNWF	300				1	
3.65	06-04-98	SITE 2	MNWF	262				1	
3.66	06-04-98	SITE 2	MNWF	265				1	
3.67	06-04-98	SITE 2	MNWF	186				1	
3.68	06-04-98	SITE 2	MNWF	270			M	1	
3.69	06-04-98	SITE 2	MNWF	294			M	1	
3.7	06-04-98	SITE 2	MNWF	305			M	1	
3.71	06-04-98	SITE 2	MNWF	250			M	1	
3.72	06-04-98	SITE 2	MNWF	260			M	1	
3.73	06-04-98	SITE 2	MNWF	205			M	1	
3.74	06-04-98	SITE 2	MNWF	125			M	1	
3.74A	06-04-98	SITE 2	MNWF	125			M	1	
3.74B	06-04-98	SITE 2	MNWF	125			M	1	
4.01	06-04-98	SITE 2	BURB	688				1	
4.02	06-04-98	SITE 2	BNTR	385	570			1	
4.03	06-04-98	SITE 2	BNTR	533	1602			1	
4.04	06-04-98	SITE 2	BNTR	404	698			1	
4.05	06-04-98	SITE 2	BNTR	353	522			1	
4.06	06-04-98	SITE 2	BNTR	388	656			1	
4.07	06-04-98	SITE 2	MNWF	271				1	
4.08	06-04-98	SITE 2	MNWF	307				1	
4.09	06-04-98	SITE 2	MNWF	309				1	
4.1	06-04-98	SITE 2	MNWF	235				1	
4.11	06-04-98	SITE 2	MNWF	319				1	
4.12	06-04-98	SITE 2	MNWF	312				1	
4.13	06-04-98	SITE 2	MNWF	276				1	
4.14	06-04-98	SITE 2	MNWF	288				1	
4.15	06-04-98	SITE 2	MNWF	239				1	
4.16	06-04-98	SITE 2	MNWF	218				1	
4.17	06-04-98	SITE 2	MNWF	268				1	
4.18	06-04-98	SITE 2	MNWF	278				1	
4.19	06-04-98	SITE 2	MNWF	238				1	
4.2	06-04-98	SITE 2	MNWF	291				1	
4.21	06-04-98	SITE 2	MNWF	270				1	
4.22	06-04-98	SITE 2	MNWF	242				1	
4.23	06-04-98	SITE 2	MNWF	120			M	1	
4.24	06-04-98	SITE 2	MNWF	340				1	
4.25	06-04-98	SITE 2	MNWF	298				1	
4.26	06-04-98	SITE 2	MNWF	248				1	
4.27	06-04-98	SITE 2	MNWF	245				1	
4.28	06-04-98	SITE 2	MNWF	262				1	
4.29	06-04-98	SITE 2	MNWF	252				1	

Data	Date	Location	Species	Forklength	Weight	Head	Mark		
4.3	06-04-98	SITE 2	MNWF	383				1	
4.31	06-04-98	SITE 2	MNWF	282				1	
4.33	06-04-98	SITE 2	MNWF	262				1	
4.34	06-04-98	SITE 2	MNWF	265				1	
4.35	06-04-98	SITE 2	MNWF	290				1	
4.36	06-04-98	SITE 2	MNWF	280				1	
4.37	06-04-98	SITE 2	MNWF	245				1	
4.38	06-04-98	SITE 2	MNWF	235				1	
4.39	06-04-98	SITE 2	MNWF	280				1	
4.4	06-04-98	SITE 2	MNWF	308				1	
4.41	06-04-98	SITE 2	MNWF	291				1	
4.42	06-04-98	SITE 2	MNWF	318				1	
4.43	06-04-98	SITE 2	BNTR	338	456			1	
4.44	06-04-98	SITE 2	BNTR	350				1	
4.45	06-04-98	SITE 2	BNTR	371	554			1	
4.46	06-04-98	SITE 2	BNTR	350				1	
4.47	06-04-98	SITE 2	BNTR	290	298			1	
4.48	06-04-98	SITE 2	BNTR	350				1	
4.49	06-04-98	SITE 2	BNTR	223	134			1	
4.5	06-04-98	SITE 2	MNWF	350				1	
4.53	06-04-98	SITE 2	MNWF	123			M	1	
4.54	06-04-98	SITE 2	MNWF	350				1	
4.55	06-04-98	SITE 2	MNWF	390				1	
4.56	06-04-98	SITE 2	MNWF	350				1	
4.57	06-04-98	SITE 2	MNWF	273				1	
4.58	06-04-98	SITE 2	MNWF	350				1	
4.59	06-04-98	SITE 2	MNWF	175			M	1	
4.6	06-04-98	SITE 2	MNWF	350				1	
4.61	06-04-98	SITE 2	MNWF	255				1	
4.62	06-04-98	SITE 2	MNWF	350				1	
4.63	06-04-98	SITE 2	MNWF	300				1	
4.64	06-04-98	SITE 2	MNWF	350				1	
4.65	06-04-98	SITE 2	MNWF	254				1	
4.66	06-04-98	SITE 2	MNWF	215				1	
4.67	06-04-98	SITE 2	MNWF	276				1	
4.68	06-04-98	SITE 2	MNWF	226				1	
4.69	06-04-98	SITE 2	MNWF	291				1	
4.7	06-04-98	SITE 2	MNWF	221				1	Elliott 2637
4.71	06-04-98	SITE 2	MNWF	350				1	
4.72	06-04-98	SITE 2	MNWF	325				1	
4.73	06-04-98	SITE 2	MNWF	350				1	
4.74	06-04-98	SITE 2	MNWF	236				1	
4.75	06-04-98	SITE 2	MNWF	350				1	
4.76	06-04-98	SITE 2	MNWF	248				1	
4.77	06-04-98	SITE 2	MNWF	350				1	
4.78	06-04-98	SITE 2	MNWF	257				1	
4.79	06-04-98	SITE 2	MNWF	350				1	
4.8	06-04-98	SITE 2	MNWF	311				1	
4.81	06-04-98	SITE 2	MNWF	350				1	
5.02	06-04-98	SITE 2	MNWF	249				1	
5.03	06-04-98	SITE 2	MNWF	350				1	
5.04	06-04-98	SITE 2	MNWF	295				1	
5.05	06-04-98	SITE 2	MNWF	350				1	
5.06	06-04-98	SITE 2	MNWF	301				1	
5.07	06-04-98	SITE 2	MNWF	350				1	
5.09	06-04-98	SITE 2	MNWF	270				1	
5.09	06-04-98	SITE 2	MNWF	291				1	
5.1	06-04-98	SITE 2	MNWF	279				1	
5.11	06-04-98	SITE 2	MNWF	351				1	
5.12	06-04-98	SITE 2	MNWF	306				1	
5.13	06-04-98	SITE 2	MNWF	350				1	
5.14	06-04-98	SITE 2	MNWF	295				1	
5.15	06-04-98	SITE 2	MNWF	350				1	
5.16	06-04-98	SITE 2	MNWF	303				1	
5.17	06-04-98	SITE 2	MNWF	350				1	
5.18	06-04-98	SITE 2	MNWF	265				1	
5.19	06-04-98	SITE 2	MNWF	350				1	
5.2	06-04-98	SITE 2	MNWF	363				1	
5.21	06-04-98	SITE 2	MNWF	350				1	
5.22	06-04-98	SITE 2	MNWF	125				1	
5.23	06-04-98	SITE 2	MNWF	350				1	
5.24	06-04-98	SITE 2	MNWF	166				1	
5.25	06-04-98	SITE 2	MNWF	350				1	
5.26	06-04-98	SITE 2	MNWF	265				1	
5.27	06-04-98	SITE 2	MNWF	177				1	
5.28	06-04-98	SITE 2	MNWF	295				1	
5.29	06-04-98	SITE 2	MNWF	240				1	
5.3	06-04-98	SITE 2	MNWF	223				1	
5.31	06-04-98	SITE 2	MNWF	124				1	
5.32	06-04-98	SITE 2	MNWF	350				1	
5.33	06-04-98	SITE 2	MNWF	184				1	
5.34	06-04-98	SITE 2	MNWF	350				1	
5.35	06-04-98	SITE 2	MNWF	255				1	
5.36	06-04-98	SITE 2	MNWF	350				1	
5.37	06-04-98	SITE 2	BNTR	245	163			1	
5.38	06-04-98	SITE 2	BNTR	350				1	
5.39	06-04-98	SITE 2	BNTR	312	344			1	
5.4	06-04-98	SITE 2	BNTR	350				1	
5.41	06-04-98	SITE 2	BNTR	452	874			1	
5.42	06-04-98	SITE 2	BNTR	350				1	
5.43	06-04-98	SITE 2	BNTR	410	664			1	
5.44	06-04-98	SITE 2	BNTR	350				1	
5.45	06-04-98	SITE 2	MNWF	266				1	
5.46	06-04-98	SITE 2	BURB	350				1	
5.47	06-04-98	SITE 2	BURB	545				1	
5.48	06-04-98	SITE 2	BNTR	350				1	
5.49	06-04-98	SITE 2	MNWF	202				1	
5.5	06-04-98	SITE 2	MNWF	350				1	
5.51	06-04-98	SITE 2	MNWF	223				1	
5.52	06-04-98	SITE 2	BNTR	350				1	
5.53	06-04-98	SITE 2	BNTR	362	460			1	
5.54	06-04-98	SITE 2	BNTR	350				1	
5.55	06-04-98	SITE 2	BNTR	453	810			1	
5.56	06-04-98	SITE 2	BNTR	310	622			1	
5.57	06-04-98	SITE 2	BNTR	285	574			1	
5.58	06-04-98	SITE 2	BNTR	346	566			1	
5.59	06-04-98	SITE 2	BNTR	350				1	
5.6	06-04-98	SITE 2	BNTR	212	104			1	
5.61	06-04-98	SITE 2	BNTR	350				1	
5.62	06-04-98	SITE 2	BNTR	301	315			1	
5.63	06-04-98	SITE 2	MNWF	350				1	
5.64	06-04-98	SITE 2	MNWF	258				1	
5.65	06-04-98	SITE 2	MNWF	350				1	
5.66	06-04-98	SITE 2	MNWF	262				1	
5.67	06-04-98	SITE 2	MNWF	350				1	
5.68	06-04-98	SITE 2	MNWF	414				1	
5.69	06-04-98	SITE 2	MNWF	350				1	
5.7	06-04-98	SITE 2	MNWF	248				1	

5.72	06-04-98	SITE 2	MNWF	272		1	
5.74	06-04-98	SITE 2	MNWF	193		1	
5.76	06-04-98	SITE 2	MNWF	250		1	8 C
5.78	06-04-98	SITE 2	MNWF	272		1	
6.01	06-04-98	SITE 2	MNWF	217		1	
6.03	06-04-98	SITE 2	MNWF	255		1	
6.05	06-04-98	SITE 2	MNWF	178		1	
6.07	06-04-98	SITE 2	MNWF	280		1	
6.09	06-04-98	SITE 2	MNWF	231		1	
6.11	06-04-98	SITE 2	BNTR	382	568	1	
6.13	06-04-98	SITE 2	BNTR	388	641	1	
6.15	06-04-98	SITE 2	BNTR	298	295	1	
6.17	06-04-98	SITE 2	BNTR	274	224	1	
6.19	06-04-98	SITE 2	BNTR	465	941	1	
6.21	06-04-98	SITE 2	BNTR	419	714	1	
6.23	06-04-98	SITE 2	BNTR	355	496	1	
6.25	06-04-98	SITE 2	BNTR	451	861	1	
6.27	06-04-98	SITE 2	BNTR	294	299	1	
6.29	06-04-98	SITE 2	BNTR	370	562	1	
6.3	06-04-98	SITE 2	MNWF	190		1	
6.32	06-04-98	SITE 2	MNWF	226		1	
6.34	06-04-98	SITE 2	MNWF	267		1	
6.36	06-04-98	SITE 2	MNWF	183		1	
6.38	06-04-98	SITE 2	MNWF	234		1	
6.4	06-04-98	SITE 2	MNWF	292		1	
6.42	06-04-98	SITE 2	MNWF	290		1	
6.44	06-04-98	SITE 2	MNWF	261		1	
6.46	06-04-98	SITE 2	MNWF	259		1	
6.48	06-04-98	SITE 2	BNTR	349	466	1	effort 1649
6.5	06-04-98	SITE 2	BNTR	342	392	1	
6.52	06-04-98	SITE 2	BNTR	272	240	1	
6.54	06-04-98	SITE 2	BNTR	338	420	1	
6.56	06-04-98	SITE 2	BNTR	161	51	1	
6.58	06-04-98	SITE 2	BNTR	178	66	1	
1.02	06-10-98	SITE 1	MNWF	304	331	1	
1.04	06-10-98	SITE 1	MNWF	205	102	1	
1.06	06-10-98	SITE 1	MNWF	332	413	1	
1.08	06-10-98	SITE 1	MNWF	254	235	1	
1.1	06-10-98	SITE 1	MNWF	288	297	1	
1.12	06-10-98	SITE 1	MNWF	250	190	1	
1.14	06-10-98	SITE 1	MNWF	204	207	1	
1.16	06-10-98	SITE 1	MNWF	242	190	1	
1.17	06-10-98	SITE 1	MNWF	166	59	1	
1.19	06-10-98	SITE 1	MNWF	210	119	1	
1.21	06-10-98	SITE 1	MNWF	112	22	1	
1.23	06-10-98	SITE 1	MNWF	240	173	1	
1.25	06-10-98	SITE 1	BNTR	337	449	1	
1.27	06-10-98	SITE 1	BNTR	345	432	1	
1.29	06-10-98	SITE 1	BNTR	240	151	1	
1.31	06-10-98	SITE 1	BNTR	351	489	1	
1.33	06-10-98	SITE 1	BNTR	250	166	1	
1.35	06-10-98	SITE 1	MNWF	112	14	1	
2.01	06-10-98	SITE 1	MNWF	314	355	1	
2.03	06-10-98	SITE 1	MNWF	280	254	1	effort 3600
2.05	06-10-98	SITE 1	MNWF	240	176	1	
2.07	06-10-98	SITE 1	MNWF	250	169	1	
2.09	06-10-98	SITE 1	MNWF	217	121	1	
2.11	06-10-98	SITE 1	MNWF	278	259	1	
2.13	06-10-98	SITE 1	MNWF	209	116	1	
2.15	06-10-98	SITE 1	MNWF	196	89	1	
2.17	06-10-98	SITE 1	MNWF	290	828	1	

Data	Date	Location	Species	Forklength	Weight		
2.19	06-10-98	SITE 1	MNWF	234	240		1
2.2	06-10-98	SITE 1	MNWF	240	338		1
2.22	06-10-98	SITE 1	MNWF	240	198		1
2.24	06-10-98	SITE 1	MNWF	255	174		1
2.26	06-10-98	SITE 1	MNWF	294	296		1
2.28	06-10-98	SITE 1	MNWF	279	246		1
2.3	06-10-98	SITE 1	MNWF	376	520		1
2.32	06-10-98	SITE 1	MNWF	106	12		1
2.34	06-10-98	SITE 1	BNTR	252	191		1
2.36	06-10-98	SITE 1	BNTR	330	367		1
2.38	06-10-98	SITE 1	BNTR	211	105		1
2.4	06-10-98	SITE 1	BNTR	221	119		1
2.42	06-10-98	SITE 1	BNTR	332	411		1
2.44	06-10-98	SITE 1	BNTR	348	417		1
2.46	06-10-98	SITE 1	BNTR	232	130		1
2.47	06-10-98	SITE 1	BNTR	270	195		1
2.49	06-10-98	SITE 1	BNTR	177	61		1
2.51	06-10-98	SITE 1	BNTR	187	76		1
2.53	06-10-98	SITE 1	BNTR	172	54		1
2.55	06-10-98	SITE 1	BNTR	216	110		1
2.57	06-10-98	SITE 1	BNTR	198	83		1
2.59	06-10-98	SITE 1	BNTR	146	33		1
2.61	06-10-98	SITE 1	BNTR	150	34		1
2.64	06-10-98	SITE 1	MNWF	120	18		1
3.01	06-10-98	SITE 1	MNWF	120	125		1
3.03	06-10-98	SITE 1	MNWF	337	432		1
3.05	06-10-98	SITE 1	MNWF	107	334		1
3.07	06-10-98	SITE 1	MNWF	234	155		1
3.09	06-10-98	SITE 1	MNWF	218	121		1
3.11	06-10-98	SITE 1	MNWF	297	328		1
3.13	06-10-98	SITE 1	MNWF	238			1
3.14	06-10-98	SITE 1	MNWF	270			

3.15	06-10-98	SITE 1	MNWF	319			1
3.17	06-10-98	SITE 1	MNWF	242			1
3.19	06-10-98	SITE 1	MNWF	303			1
3.21	06-10-98	SITE 1	MNWF	283			1
3.23	06-10-98	SITE 1	MNWF	283			1
3.25	06-10-98	SITE 1	MNWF	275			1
3.27	06-10-98	SITE 1	MNWF	293			1
3.29	06-10-98	SITE 1	MNWF	215			1
3.3	06-10-98	SITE 1	MNWF	207			1
3.32	06-10-98	SITE 1	MNWF	220			1
3.34	06-10-98	SITE 1	MNWF	210			1
3.36	06-10-98	SITE 1	MNWF	257			1
3.38	06-10-98	SITE 1	MNWF	222			1
3.4	06-10-98	SITE 1	MNWF	198			1
3.42	06-10-98	SITE 1	MNWF	245			1
3.44	06-10-98	SITE 1	MNWF	218			1
3.46	06-10-98	SITE 1	MNWF	118			1 effort 1830
3.48	06-10-98	SITE 1	MNWF	120			1
3.5	06-10-98	SITE 1	MNWF	233			1
3.52	06-10-98	SITE 1	MNWF	112			1
3.54	06-10-98	SITE 1	MNWF	109			1
3.56	06-10-98	SITE 1	MNWF	112			1
3.57	06-10-98	SITE 1	MNWF	114			1
3.59	06-10-98	SITE 1	MNWF	109			1
3.61	06-10-98	SITE 1	MNWF	100			1
3.64	06-10-98	SITE 1	BNTR	245	197		1
3.66	06-10-98	SITE 1	BNTR	238	154		1
3.68	06-10-98	SITE 1	BNTR	180	67		1
3.7	06-10-98	SITE 1	BNTR	330	358		1
3.72	06-10-98	SITE 1	BNTR	283	257		1
3.74	06-10-98	SITE 1	BNTR	420	687		1

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
3.76	06-10-98	SITE 1	BNTR	101	9			1	
3.77	06-10-98	SITE 1	BNTR	236	151			1	
3.78	06-10-98	SITE 1	BNTR	88	7			1	
3.79	06-10-98	SITE 1	BNTR	86	7			1	
3.8	06-10-98	SITE 1	BURB	346				1	
4.01	06-10-98	SITE 1	MNWF	233				1	
4.02	06-10-98	SITE 1	MNWF	243				1	
4.03	06-10-98	SITE 1	MNWF	289				1	
4.04	06-10-98	SITE 1	MNWF	240				1	
4.05	06-10-98	SITE 1	MNWF	369				1	
4.06	06-10-98	SITE 1	MNWF	332				1	
4.07	06-10-98	SITE 1	MNWF	248				1	
4.08	06-10-98	SITE 1	MNWF	243				1	
4.09	06-10-98	SITE 1	MNWF	352				1	
4.1	06-10-98	SITE 1	MNWF	234				1	
4.11	06-10-98	SITE 1	MNWF	253				1	
4.12	06-10-98	SITE 1	MNWF	281				1	
4.13	06-10-98	SITE 1	MNWF	292				1	
4.14	06-10-98	SITE 1	MNWF	325				1	
4.15	06-10-98	SITE 1	MNWF	241				1	
4.16	06-10-98	SITE 1	MNWF	207				1	
4.17	06-10-98	SITE 1	MNWF	238				1	
4.18	06-10-98	SITE 1	MNWF	305				1	
4.19	06-10-98	SITE 1	MNWF	333				1	
4.2	06-10-98	SITE 1	MNWF	252				1	
4.21	06-10-98	SITE 1	MNWF	163				1	
4.22	06-10-98	SITE 1	MNWF	210				1	
4.23	06-10-98	SITE 1	MNWF	117				1	
4.24	06-10-98	SITE 1	MNWF	114				1	
4.25	06-10-98	SITE 1	MNWF	115				1	
4.26	06-10-98	SITE 1	MNWF	328				1	
4.27	06-10-98	SITE 1	MNWF	216				1	
4.28	06-10-98	SITE 1	MNWF	110				1	
4.29	06-10-98	SITE 1	MNWF	243				1	
4.3	06-10-98	SITE 1	MNWF	117				1	
4.31	06-10-98	SITE 1	BNTR	162	48			1	
4.32	06-10-98	SITE 1	BNTR	177	64			1	
4.33	06-10-98	SITE 1	BNTR	194	79			1	
4.34	06-10-98	SITE 1	BNTR	222	111			1	
4.35	06-10-98	SITE 1	BNTR	318	354			1	
4.36	06-10-98	SITE 1	BNTR	236	134			1	
4.37	06-10-98	SITE 1	MNWF	333	448			1	
4.38	06-10-98	SITE 1	MNWF	312				1	
4.39	06-10-98	SITE 1	MNWF	354				1	
4.4	06-10-98	SITE 1	MNWF	258				1	
4.41	06-10-98	SITE 1	MNWF	295				1	
4.42	06-10-98	SITE 1	MNWF	258				1	
4.43	06-10-98	SITE 1	MNWF	286				1	
4.44	06-10-98	SITE 1	MNWF	291				1	
4.45	06-10-98	SITE 1	MNWF	210				1	
4.46	06-10-98	SITE 1	MNWF	290				1	
4.47	06-10-98	SITE 1	MNWF	284				1	
4.48	06-10-98	SITE 1	MNWF	273				1	
4.49	06-10-98	SITE 1	MNWF	205				1	
4.5	06-10-98	SITE 1	MNWF	262				1	
4.51	06-10-98	SITE 1	MNWF	259				1	
4.52	06-10-98	SITE 1	MNWF	246				1	
4.53	06-10-98	SITE 1	MNWF	216				1	
4.54	06-10-98	SITE 1	MNWF	285				1	
4.55	06-10-98	SITE 1	MNWF	283				1	

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
4.56	06-10-98	SITE 1	MNWF	181				1	
4.57	06-10-98	SITE 1	MNWF	312				1	
4.58	06-10-98	SITE 1	MNWF	105				1	
4.59	06-10-98	SITE 1	MNWF	246				1	
4.6	06-10-98	SITE 1	MNWF	118				1	
4.61	06-10-98	SITE 1	MNWF	113				1	
4.62	06-10-98	SITE 1	MNWF	109				1	
4.63	06-10-98	SITE 1	MNWF	111				1	
4.64	06-10-98	SITE 1	MNWF	112				1	
4.65	06-10-98	SITE 1	MNWF	113				1	
4.66	06-10-98	SITE 1	MNWF	114				1	
4.67	06-10-98	SITE 1	MNWF	121				1	
4.68	06-10-98	SITE 1	MNWF	111				1	
4.69	06-10-98	SITE 1	MNWF	110				1	
4.7	06-10-98	SITE 1	MNWF	117				1	
4.71	06-10-98	SITE 1	MNWF	219				1	
4.72	06-10-98	SITE 1	MNWF	112				1	
4.73	06-10-98	SITE 1	MNWF	111				1	
4.74	06-10-98	SITE 1	MNWF	115				1	
4.75	06-10-98	SITE 1	MNWF	112				1	
4.76	06-10-98	SITE 1	MNWF	115				1	
4.77	06-10-98	SITE 1	MNWF	115				1	
4.78	06-10-98	SITE 1	MNWF	221				1	
4.79	06-10-98	SITE 1	MNWF	253				1	
4.8	06-10-98	SITE 1	BNTR	200	81			1	
5.01	06-10-98	SITE 1	BNTR	221	121			1	
5.02	06-10-98	SITE 1	BNTR	322	374			1	
5.03	06-10-98	SITE 1	BNTR	105	11			1	
5.04	06-10-98	SITE 1	BNTR	220	120			1	
5.05	06-10-98	SITE 1	BNTR	267	220			1	
5.06	06-10-98	SITE 1	BNTR	228	122			1	
5.07	06-10-98	SITE 1	BNTR	91	7			1	
5.08	06-10-98	SITE 1	BNTR	167	46			1	
5.09	06-10-98	SITE 1	BNTR	216	109			1	
5.1	06-10-98	SITE 1	BNTR	198	74			1	
5.11	06-10-98	SITE 1	BNTR	174	50			1	
5.12	06-10-98	SITE 1	BNTR	436	791			1	
5.13	06-10-98	SITE 1	BNTR	260	205			1	
5.14	06-10-98	SITE 1	BNTR	147	35			1	
5.15	06-10-98	SITE 1	BNTR	145	33			1	
5.16	06-10-98	SITE 1	BNTR	111	15			1	
5.17	06-10-98	SITE 1	BNTR	354	485			1	
6.01	06-10-98	SITE 1	MNWF	305				1	
6.02	06-10-98	SITE 1	MNWF	116				1	
6.03	06-10-98	SITE 1	MNWF	253				1	
6.04	06-10-98	SITE 1	MNWF	302				1	
6.05	06-10-98	SITE 1	MNWF	248				1	
6.06	06-10-98	SITE 1	MNWF	316				1	
6.07	06-10-98	SITE 1	MNWF	270				1	
6.08	06-10-98	SITE 1	MNWF	281				1	
6.09	06-10-98	SITE 1	MNWF	280				1	
6.1	06-10-98	SITE 1	MNWF	281				1	
6.11	06-10-98	SITE 1	MNWF	246				1	effort 2810
6.12	06-10-98	SITE 1	MNWF	268				1	
6.13	06-10-98	SITE 1	MNWF	221				1	
6.14	06-10-98	SITE 1	MNWF	298				1	
6.15	06-10-98	SITE 1	MNWF	293				1	
6.16	06-10-98	SITE 1	MNWF	232				1	
6.17	06-10-98	SITE 1	MNWF	125				1	
6.18	06-10-98	SITE 1	BNTR	164	51			1	

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
6.19	06-10-98	SITE 1	BNTR	146	35			1	
6.2	06-10-98	SITE 1	BNTR	213	103			1	
6.21	06-10-98	SITE 1	MNWF	313				1	
6.22	06-10-98	SITE 1	MNWF	284				1	
6.23	06-10-98	SITE 1	MNWF	371				1	
6.24	06-10-98	SITE 1	MNWF	273				1	
6.25	06-10-98	SITE 1	MNWF	246				1	
6.26	06-10-98	SITE 1	MNWF	321				1	
6.27	06-10-98	SITE 1	MNWF	248				1	
6.28	06-10-98	SITE 1	MNWF	170				1	
6.29	06-10-98	SITE 1	MNWF	266				1	
6.3	06-10-98	SITE 1	MNWF	115				1	
6.31	06-10-98	SITE 1	MNWF	115				1	
6.32	06-10-98	SITE 1	MNWF	347				1	
6.33	06-10-98	SITE 1	MNWF	300				1	
6.34	06-10-98	SITE 1	MNWF	110				1	
6.35	06-10-98	SITE 1	MNWF	242				1	
6.36	06-10-98	SITE 1	BNTR	170	51			1	
6.37	06-10-98	SITE 1	BNTR	164	48			1	
6.38	06-10-98	SITE 1	BNTR	110	15			1	
6.39	06-10-98	SITE 1	BNTR	106	69			1	
6.4	06-10-98	SITE 1	BNTR	443	751			1	
6.41	06-10-98	SITE 1	BNTR	331	360			1	
6.42	06-10-98	SITE 1	BNTR	91	9			1	
6.43	06-10-98	SITE 1	MNWF	265				1	
6.44	06-10-98	SITE 1	MNWF	310				1	
6.45	06-10-98	SITE 1	MNWF	110				1	
6.46	06-10-98	SITE 1	MNWF	218				1	
6.47	06-10-98	SITE 1	MNWF	179				1	
6.48	06-10-98	SITE 1	BNTR	206	98			1	
6.49	06-10-98	SITE 1	BNTR	219	107			1	
6.5	06-10-98	SITE 1	BNTR	186	75			1	
6.51	06-10-98	SITE 1	MNWF	267				1	
6.52	06-10-98	SITE 1	MNWF	113				1	
6.53	06-10-98	SITE 1	MNWF	113				1	
6.54	06-10-98	SITE 1	MNWF	105				1	
6.55	06-10-98	SITE 1	MNWF	257				1	
6.56	06-10-98	SITE 1	MNWF	178				1	
6.57	06-10-98	SITE 1	MNWF	111				1	
6.58	06-10-98	SITE 1	MNWF	111				1	
6.59	06-10-98	SITE 1	MNWF	116				1	
6.6	06-10-98	SITE 1	MNWF	117				1	effort 1519
6.61	06-10-98	SITE 1	BNTR	341	398			1	
6.62	06-10-98	SITE 1	BNTR	355	513			1	
6.63	06-10-98	SITE 1	BNTR	205	89			1	
6.64	06-10-98	SITE 1	BNTR	282	237			1	
6.65	06-10-98	SITE 1	BNTR	109	14			1	
6.66	06-10-98	SITE 1	BNTR	165	46			1	
6.67	06-10-98	SITE 1	BNTR	188	66			1	
6.68	06-10-98	SITE 1	BNTR	313	310			1	
6.69	06-10-98	SITE 1	BNTR	152	35			1	
6.7	06-10-98	SITE 1	BNTR	271	210			1	
6.71	06-10-98	SITE 1	BNTR	151	38			1	
6.72	06-10-98	SITE 1	BNTR	149	36			1	
6.73	06-10-98	SITE 1	BNTR	167	46			1	
6.74	06-10-98	SITE 1	MNWF	122				1	
6.75	06-10-98	SITE 1	MNWF	253				1	
6.76	06-10-98	SITE 1	MNWF	340				1	
6.77	06-10-98	SITE 1	MNWF	323				1	
6.78	06-10-98	SITE 1	MNWF	105				1	

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
6.79	06-10-98	SITE 1	MNWF	121				1	
6.8	06-10-98	SITE 1	MNWF	196				1	
7.01	06-10-98	SITE 1	MNWF	121				1	
7.02	06-10-98	SITE 1	BNTR	223	130			1	
7.03	06-10-98	SITE 1	BNTR	149	37			1	
7.04	06-10-98	SITE 1	BNTR	288	248			1	
7.05	06-10-98	SITE 1	BNTR	148	36			1	
1.01	06-11-98	SITE 2	MNWF	293				2	13 C, 1332 SEC
1.02	06-11-98	SITE 2	BNTR	392	609			2	
1.03	06-11-98	SITE 2	MNWF	279				2	
1.04	06-11-98	SITE 2	MNWF	321				2	
1.05	06-11-98	SITE 2	MNWF	282		R		2	
1.06	06-11-98	SITE 2	MNWF	278				2	
1.07	06-11-98	SITE 2	MNWF	186				2	
1.08	06-11-98	SITE 2	MNWF	128				2	
1.09	06-11-98	SITE 2	MNWF	273				2	
1.1	06-11-98	SITE 2	MNWF	274				2	
1.11	06-11-98	SITE 2	MNWF	251				2	
1.12	06-11-98	SITE 2	MNWF	302		R		2	
1.13	06-11-98	SITE 2	MNWF	252				2	
1.14	06-11-98	SITE 2	MNWF	303				2	
1.15	06-11-98	SITE 2	MNWF	262				2	
1.16	06-11-98	SITE 2	MNWF	310		R		2	
1.17	06-11-98	SITE 2	MNWF	316				2	
1.18	06-11-98	SITE 2	MNWF	286				2	
1.19	06-11-98	SITE 2	BNTR	465	874			2	
1.2	06-11-98	SITE 2	BNTR	361		R		2	
1.21	06-11-98	SITE 2	BNTR	361	478			2	
1.22	06-11-98	SITE 2	BNTR	262	221			2	
1.23	06-11-98	SITE 2	BNTR	338	429			2	
1.24	06-11-98	SITE 2	BNTR	183	80			2	
1.25	06-11-98	SITE 2	MNWF	232				2	
1.26	06-11-98	SITE 2	MNWF	270		R		2	
1.27	06-11-98	SITE 2	MNWF	276		R		2	
1.28	06-11-98	SITE 2	MNWF	273				2	
1.29	06-11-98	SITE 2	MNWF	292		R		2	
1.3	06-11-98	SITE 2	MNWF	263				2	
1.31	06-11-98	SITE 2	MNWF	264				2	
1.32	06-11-98	SITE 2	MNWF	257				2	
1.33	06-11-98	SITE 2	MNWF	274				2	
1.34	06-11-98	SITE 2	BNTR	214	113			2	
1.35	06-11-98	SITE 2	MNWF	300		R		2	
1.36	06-11-98	SITE 2	MNWF	301				2	
1.37	06-11-98	SITE 2	MNWF	350				2	
1.38	06-11-98	SITE 2	MNWF	278				2	
1.39	06-11-98	SITE 2	BNTR	442		R		2	
1.4	06-11-98	SITE 2	BNTR	303		R		2	
1.41	06-11-98	SITE 2	BNTR	272	219			2	
1.42	06-11-98	SITE 2	BNTR	372	523			2	
1.43	06-11-98	SITE 2	BNTR	376	670			2	
1.44	06-11-98	SITE 2	MNWF	266				2	
1.45	06-11-98	SITE 2	MNWF	236		R		2	
1.46	06-11-98	SITE 2	MNWF	276		R		2	
1.47	06-11-98	SITE 2	MNWF	280		R		2	
1.48	06-11-98	SITE 2	MNWF	190				2	
1.49	06-11-98	SITE 2	BNTR	220	138			2	
1.5	06-11-98	SITE 2	MNWF	306		R		2	
1.51	06-11-98	SITE 2	MNWF	126				2	
1.52	06-11-98	SITE 2	MNWF	299				2	
1.53	06-11-98	SITE 2	MNWF	343				2	

1.54	06-11-98	SITE 2	MNWF	265		R	2	
1.56	06-11-98	SITE 2	BNTR	332	444		2	
1.58	06-11-98	SITE 2	MNWF	276			2	
1.6	06-11-98	SITE 2	MNWF	263			2	
1.63	06-11-98	SITE 2	BNTR	291		R	2	effort 1283
1.65	06-11-98	SITE 2	MNWF	276			2	
1.67	06-11-98	SITE 2	MNWF	333		R	2	
1.69	06-11-98	SITE 2	MNWF	284		R	2	
1.7	06-11-98	SITE 2	MNWF	326			2	
1.72	06-11-98	SITE 2	MNWF	310			2	
1.74	06-11-98	SITE 2	MNWF	320			2	
1.76	06-11-98	SITE 2	MNWF	304			2	
1.78	06-11-98	SITE 2	MNWF	315			2	
1.8	06-11-98	SITE 2	BNTR	390		R	2	
2.02	06-11-98	SITE 2	BNTR	378	551		2	
2.04	06-11-98	SITE 2	MNWF	236			2	
2.06	06-11-98	SITE 2	BNTR	111	23		2	
2.08	06-11-98	SITE 2	MNWF	355			2	
2.1	06-11-98	SITE 2	MNWF	120			2	
2.12	06-11-98	SITE 2	MNWF	228			2	
2.14	06-11-98	SITE 2	BNTR	330		R	2	
2.16	06-11-98	SITE 2	MNWF	261			2	
2.17	06-11-98	SITE 2	BNTR	332		R	2	
2.19	06-11-98	SITE 2	BNTR	159	30		2	
2.21	06-11-98	SITE 2	BNTR	409	20		2	
2.23	06-11-98	SITE 2	MNWF	199			2	14 C
2.25	06-11-98	SITE 2	MNWF	188		R	2	
2.27	06-11-98	SITE 2	MNWF	251			2	
2.29	06-11-98	SITE 2	MNWF	235		R	2	
2.31	06-11-98	SITE 2	MNWF	192			2	
2.33	06-11-98	SITE 2	MNWF	304		R	2	
2.35	06-11-98	SITE 2	MNWF	259			2	
2.37	06-11-98	SITE 2	BNTR	362		R	2	
2.39	06-11-98	SITE 2	BNTR	176			2	
2.41	06-11-98	SITE 2	MNWF	304			2	
2.43	06-11-98	SITE 2	MNWF	256		R	2	
2.45	06-11-98	SITE 2	MNWF	223		R	2	
2.47	06-11-98	SITE 2	BNTR	177		R	2	
2.49	06-11-98	SITE 2	MNWF	125			2	
2.51	06-11-98	SITE 2	MNWF	256			2	
2.53	06-11-98	SITE 2	BNTR	390	603		2	
2.55	06-11-98	SITE 2	BNTR	374		R	2	
2.57	06-11-98	SITE 2	BNTR	418	625	R	2	
2.58	06-11-98	SITE 2	BNTR	409	663		2	
2.6	06-11-98	SITE 2	MNWF	265			2	
2.62	06-11-98	SITE 2	MNWF	249		R	2	
2.64	06-11-98	SITE 2	MNWF	268			2	
2.66	06-11-98	SITE 2	MNWF	259			2	
2.68	06-11-98	SITE 2	BNTR	268		R	2	
2.7	06-11-98	SITE 2	MNWF	274			2	
2.72	06-11-98	SITE 2	MNWF	250			2	
2.74	06-11-98	SITE 2	BNTR	116	11		2	
2.76	06-11-98	SITE 2	BNTR	172	60		2	
2.78	06-11-98	SITE 2	MNWF	130		M	2	
2.79	06-11-98	SITE 2	MNWF	114		M	2	
3.01	06-11-98	SITE 2	BNTR	120	20		2	
3.04	06-11-98	SITE 2	MNWF	244		R	2	15 C
3.06	06-11-98	SITE 2	MNWF	263		R	2	
3.08	06-11-98	SITE 2	MNWF	251			2	
3.1	06-11-98	SITE 2	MNWF	265			2	
3.12	06-11-98	SITE 2	MNWF	336		R	2	
3.14	06-11-98	SITE 2	MNWF	306			2	

3.16	06-11-98	SITE 2	MNWF	323	R	2	
3.18	06-11-98	SITE 2	MNWF	285	R	2	
3.2	06-11-98	SITE 2	MNWF	306	R	2	
3.22	06-11-98	SITE 2	MNWF	115		2	
3.24	06-11-98	SITE 2	MNWF	310		2	
3.25	06-11-98	SITE 2	MNWF	267	R	2	
3.26	06-11-98	SITE 2	MNWF	268		2	
3.27	06-11-98	SITE 2	MNWF	314	R	2	
3.28	06-11-98	SITE 2	MNWF	140		2	
3.29	06-11-98	SITE 2	MNWF	254	R	2	
3.30	06-11-98	SITE 2	MNWF	268		2	
3.31	06-11-98	SITE 2	MNWF	245	R	2	
3.32	06-11-98	SITE 2	BNTR	241		2	
3.33	06-11-98	SITE 2	BNTR	297	R	2	
3.34	06-11-98	SITE 2	BNTR	237		2	
3.35	06-11-98	SITE 2	BNTR	274		2	
3.36	06-11-98	SITE 2	BNTR	237		2	
3.37	06-11-98	SITE 2	BNTR	405	R	2	
3.38	06-11-98	SITE 2	BNTR	284		2	
3.39	06-11-98	SITE 2	BNTR	284	R	2	
3.4	06-11-98	SITE 2	BNTR	382		2	
3.41	06-11-98	SITE 2	BNTR	382	549	2	
3.42	06-11-98	SITE 2	BNTR	441		2	
3.43	06-11-98	SITE 2	BNTR	441	934	2	
3.44	06-11-98	SITE 2	MNWF	299		2	
3.45	06-11-98	SITE 2	MNWF	299	R	2	
3.46	06-11-98	SITE 2	MNWF	241		2	
3.47	06-11-98	SITE 2	MNWF	241		2	
3.48	06-11-98	SITE 2	MNWF	246		2	
3.5	06-11-98	SITE 2	MNWF	252	R	2	
3.51	06-11-98	SITE 2	MNWF	252		2	
3.52	06-11-98	SITE 2	MNWF	240		2	
3.53	06-11-98	SITE 2	MNWF	137		2	
3.55	06-11-98	SITE 2	MNWF	360		2 effort 360	
3.56	06-11-98	SITE 2	MNWF	330		2 15 C	
3.57	06-11-98	SITE 2	MNWF	323		2	
3.58	06-11-98	SITE 2	MNWF	285		2	
3.59	06-11-98	SITE 2	MNWF	215		2	
3.6	06-11-98	SITE 2	MNWF	180		2	
3.61	06-11-98	SITE 2	MNWF	292		2	
3.62	06-11-98	SITE 2	MNWF	215		2	
3.63	06-11-98	SITE 2	MNWF	195		2	
3.64	06-11-98	SITE 2	MNWF	195		2	
3.65	06-11-98	SITE 2	MNWF	250		2	
3.66	06-11-98	SITE 2	MNWF	250		2	
3.67	06-11-98	SITE 2	MNWF	230		2	
3.68	06-11-98	SITE 2	MNWF	230		2	
3.69	06-11-98	SITE 2	BNTR	275	R	2	
3.7	06-11-98	SITE 2	BNTR	275		2	
3.71	06-11-98	SITE 2	BNTR	495	1000	2	
3.72	06-11-98	SITE 2	BNTR	495		2	
3.73	06-11-98	SITE 2	BNTR	379	565	2	
3.74	06-11-98	SITE 2	BNTR	379		2	
3.75	06-11-98	SITE 2	BNTR	345	R	2	
3.76	06-11-98	SITE 2	BNTR	345		2	
3.78	06-11-98	SITE 2	MNWF	282		2	
3.8	06-11-98	SITE 2	MNWF	280		2	
4.02	06-11-98	SITE 2	BNTR	319	349	2	
4.04	06-11-98	SITE 2	BURB	380		2	
4.06	06-11-98	SITE 2	MNWF	418		2	
4.08	06-11-98	SITE 2	MNWF	320		2	
4.1	06-11-98	SITE 2	MNWF	282	R	2 MORT	
4.12	06-11-98	SITE 2	MNWF	270		2	
4.14	06-11-98	SITE 2	BNTR	378	R	2	
4.15	06-11-98	SITE 2	MNWF	260		2	
4.17	06-11-98	SITE 2	BNTR	196	55	2	
4.19	06-11-98	SITE 2	MNWF	270		2	
4.21	06-11-98	SITE 2	MNWF	270		2	
4.23	06-11-98	SITE 2	MNWF	265		2 effort 1691	
4.25	06-11-98	SITE 2	MNWF	305		2	
4.27	06-11-98	SITE 2	MNWF	305	R	2	
4.29	06-11-98	SITE 2	MNWF	285		2	
4.31	06-11-98	SITE 2	MNWF	258		2	
4.33	06-11-98	SITE 2	MNWF	270		2	
4.35	06-11-98	SITE 2	MNWF	268		2	
4.37	06-11-98	SITE 2	MNWF	250		2	
4.39	06-11-98	SITE 2	BNTR	356		2	
4.41	06-11-98	SITE 2	MNWF	320		2	
4.42	06-11-98	SITE 2	MNWF	290		2	
4.44	06-11-98	SITE 2	MNWF	245	R	2	
4.46	06-11-98	SITE 2	MNWF	260		2	
4.48	06-11-98	SITE 2	MNWF	140		2	
4.5	06-11-98	SITE 2	MNWF	175	R	2	
4.52	06-11-98	SITE 2	MNWF	310	R	2	
4.54	06-11-98	SITE 2	BURB	370		2	
4.56	06-11-98	SITE 2	MNWF	305	R	2	
4.58	06-11-98	SITE 2	MNWF	285		2	

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
4.6	06-11-98	SITE 2	MNWF	200				2	
4.61	06-11-98	SITE 2	BNTR	244				2	
4.62	06-11-98	SITE 2	BNTR	292				2	
4.63	06-11-98	SITE 2	MNWF	260				2	
4.64	06-11-98	SITE 2	MNWF	120				2	
4.65	06-11-98	SITE 2	MNWF	245				2	
4.66	06-11-98	SITE 2	MNWF	260				2	
4.67	06-11-98	SITE 2	BNTR	120				2	
4.68	06-11-98	SITE 2	BURB	580				2	
4.69	06-11-98	SITE 2	MNWF	175		R		2	
4.7	06-11-98	SITE 2	MNWF	258				2	
4.71	06-11-98	SITE 2	MNWF	140				2	
4.72	06-11-98	SITE 2	MNWF	130				2	
4.73	06-11-98	SITE 2	MNWF	131				2	
4.74	06-11-98	SITE 2	BNTR	350				2	
4.75	06-11-98	SITE 2	BNTR	360				2	
4.76	06-11-98	SITE 2	BNTR	308		R		2	
4.77	06-11-98	SITE 2	BNTR	185		R		2	
4.78	06-11-98	SITE 2	BNTR	145				2	
4.79	06-11-98	SITE 2	BNTR	155				2	
4.8	06-11-98	SITE 2	MNWF	210				2	effort 1433
5.01	06-11-98	SITE 2	MNWF	223				2	
5.02	06-11-98	SITE 2	MNWF	273				2	
5.03	06-11-98	SITE 2	MNWF	283				2	
5.04	06-11-98	SITE 2	MNWF	223		R		2	
5.05	06-11-98	SITE 2	MNWF	250				2	
5.06	06-11-98	SITE 2	MNWF	238				2	
5.07	06-11-98	SITE 2	MNWF	268				2	
5.08	06-11-98	SITE 2	MNWF	249				2	
5.09	06-11-98	SITE 2	MNWF	100				2	
5.1	06-11-98	SITE 2	MNWF	276				2	
5.11	06-11-98	SITE 2	BNTR	264				2	
5.12	06-11-98	SITE 2	BNTR	448		R		2	
5.13	06-11-98	SITE 2	BNTR	380		R		2	
5.14	06-11-98	SITE 2	BNTR	394				2	
5.15	06-11-98	SITE 2	MNWF	305				2	
5.16	06-11-98	SITE 2	MNWF	343				2	
5.17	06-11-98	SITE 2	MNWF	273				2	
5.18	06-11-98	SITE 2	MNWF	346				2	
5.19	06-11-98	SITE 2	MNWF	283				2	
5.2	06-11-98	SITE 2	MNWF	254				2	
5.21	06-11-98	SITE 2	MNWF	270				2	
5.22	06-11-98	SITE 2	MNWF	265		R		2	
5.23	06-11-98	SITE 2	MNWF	256				2	
5.24	06-11-98	SITE 2	MNWF	193		R		2	
5.25	06-11-98	SITE 2	MNWF	303				2	
5.26	06-11-98	SITE 2	MNWF	133				2	
5.27	06-11-98	SITE 2	BNTR	353		R		2	
5.28	06-11-98	SITE 2	BNTR	389		R		2	
5.29	06-11-98	SITE 2	BNTR	192				2	
5.3	06-11-98	SITE 2	MNWF	260				2	
5.31	06-11-98	SITE 2	MNWF	260		R		2	
5.32	06-11-98	SITE 2	MNWF	190		R	M	2	
5.33	06-11-98	SITE 2	MNWF	278		R		2	
5.34	06-11-98	SITE 2	MNWF	306				2	
5.35	06-11-98	SITE 2	MNWF	275				2	
5.36	06-11-98	SITE 2	MNWF	128			M	2	
5.37	06-11-98	SITE 2	MNWF	248				2	
5.38	06-11-98	SITE 2	MNWF	220				2	
5.39	06-11-98	SITE 2	MNWF	208				2	

Data	Date	Location	Species	Forklength	Weight	Reca	Mort	Run	other
5.4	06-11-98	SITE 2	MNWF	266		R		2	
5.41	06-11-98	SITE 2	MNWF	250				2	
5.42	06-11-98	SITE 2	MNWF	196		R		2	
5.43	06-11-98	SITE 2	MNWF	231				2	
5.44	06-11-98	SITE 2	MNWF	133			M	2	
5.45	06-11-98	SITE 2	MNWF	127			M	2	
5.46	06-11-98	SITE 2	MNWF	231				2	
5.47	06-11-98	SITE 2	MNWF	128				2	
5.48	06-11-98	SITE 2	BNTR	400				2	
5.49	06-11-98	SITE 2	BNTR	318				2	
5.5	06-11-98	SITE 2	BNTR	371				2	
5.51	06-11-98	SITE 2	BNTR	326		R		2	
5.52	06-11-98	SITE 2	BNTR	389		R		2	
5.53	06-11-98	SITE 2	BNTR	183		R		2	
5.54	06-11-98	SITE 2	BNTR	368				2	
5.55	06-11-98	SITE 2	BNTR	206				2	
5.56	06-11-98	SITE 2	BNTR	193				2	
5.57	06-11-98	SITE 2	MNWF	176				2	effort 1000
5.58	06-11-98	SITE 2	MNWF	240				2	
5.59	06-11-98	SITE 2	MNWF	124				2	
5.6	06-11-98	SITE 2	MNWF	288		R		2	
5.61	06-11-98	SITE 2	MNWF	311		R		2	
5.62	06-11-98	SITE 2	MNWF	123				2	
5.63	06-11-98	SITE 2	MNWF	133				2	
5.64	06-11-98	SITE 2	MNWF	117				2	
5.65	06-11-98	SITE 2	BNTR	350		R		2	
5.66	06-11-98	SITE 2	BNTR	270				2	
5.67	06-11-98	SITE 2	BNTR	253				2	
5.68	06-11-98	SITE 2	BNTR	343		R		2	
5.69	06-11-98	SITE 2	BNTR	500				2	
5.7	06-11-98	SITE 2	BNTR	214		R		2	
5.71	06-11-98	SITE 2	BNTR	142				2	
5.72	06-11-98	SITE 2	BNTR	200				2	
5.73	06-11-98	SITE 2	MNWF	293		R		2	
5.74	06-11-98	SITE 2	MNWF	256				2	
5.75	06-11-98	SITE 2	MNWF	238				2	
5.76	06-11-98	SITE 2	MNWF	277				2	
5.77	06-11-98	SITE 2	MNWF	289		R		2	
5.78	06-11-98	SITE 2	BNTR	339		R		2	