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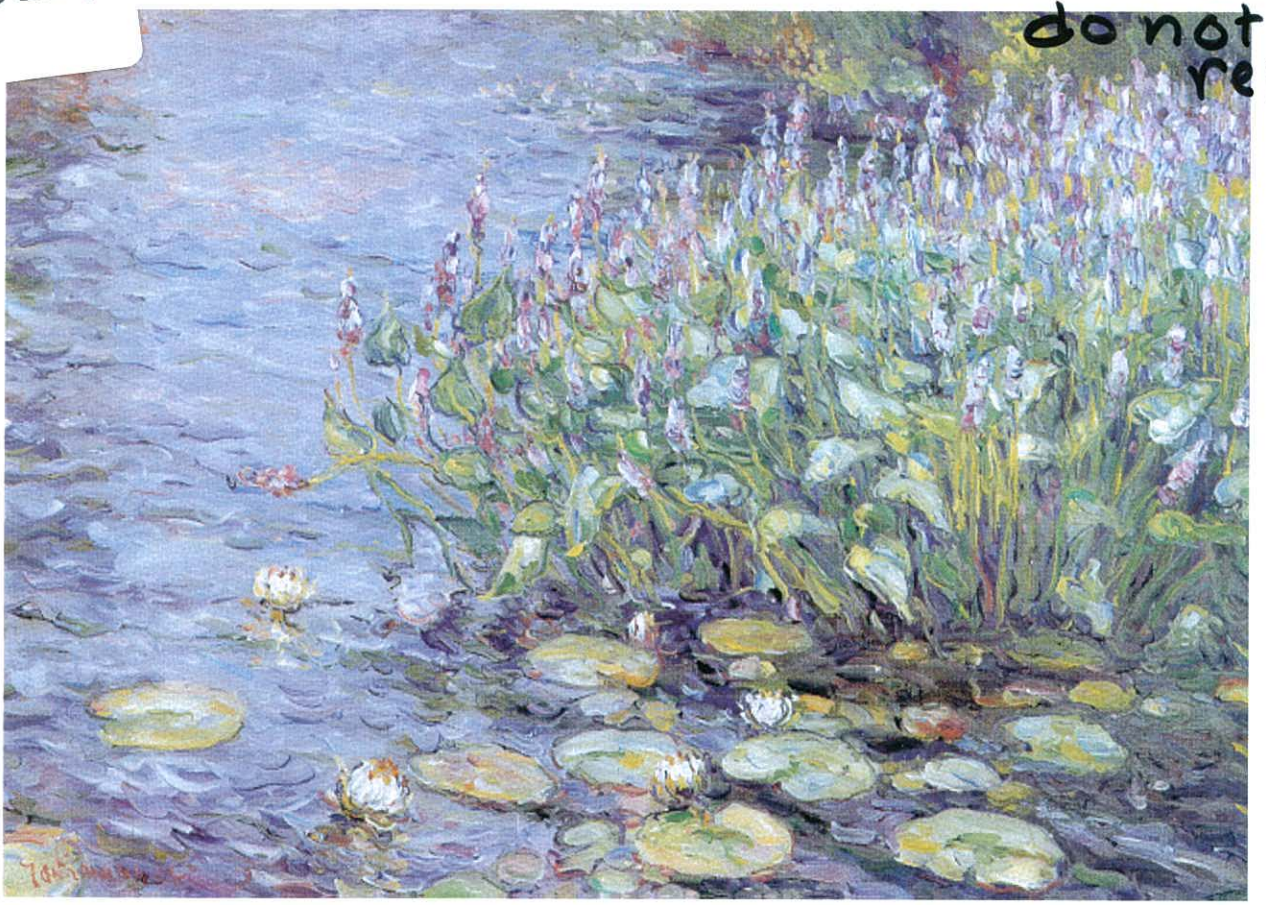

Jan Pawlowski, *At Water's Edge*

Pelican River Watershed District Aquatic Plant Harvesting Program Evaluation

December 1999

Prepared for:
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Pelican River Watershed District
Detroit Lakes, MN

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Pelican River Watershed District
Aquatic Plant Harvesting
Program Evaluation

Summary

Blue Water Science, St. Paul, Minnesota, conducted an evaluation of the aquatic plant harvesting program of the Pelican River Watershed District.

General questions addressed in the evaluation and responses are shown below.

Does the harvesting program cause any harm?

- No adverse impacts to water quality to any of the lakes in the Watershed District can be attributed to harvesting.
- No adverse impacts to fish have been reported.
- Noise impacts of the harvesting machinery have not been perceived as a problem.
- Public perception of floating weeds generated from the harvesting program are not correlated with the harvesting operation. Floating weeds are independent of the harvesting operation.
- We cannot document any adverse shift in aquatic plant distribution or species change because of harvesting activities.

Does harvesting do any good?

- Seasonal control of nuisance plant growth occurs.
- Beach clean-up and roadside plant pick-up is a convenient service well-suited and within the charter of a watershed district.
- Recreational boat use in harvested areas is facilitated.
- Harvesting removes organic material from the lakes that otherwise would decompose and release nutrients.
- Long-term plant control benefits have not been quantified.
- Potential to control curlyleaf pondweed, a nuisance exotic plant, with an earlier start in the seasonal cutting program is a possibility.

What happens if the harvesting stops?

- Nuisance weed patches will persist and may expand.
- Beaches will need more maintenance and clean-up.
- Herbicide use, both legal and illegal, will probably increase.
- The District will save money by not harvesting.

What happens if harvesting continues?

- Exotic species can be targeted and controlled.
- Reduce need for herbicide use.
- Provides a service well suited for a Watershed District.
- Aquatic plant harvesting is cost effective for lake residents compared to other plant control options.
- No adverse impacts have been noted and there may be some water quality benefits.
- Harvesting program provides a valuable service.
- Annual residential assessments will continue.

Recommendations

- Harvesting is preferred over the use of herbicides and should not be abandoned.
- The harvesting range of 3 to 8 feet of water depth, set by the MnDNR, is an appropriate range to operate within.
- Harvesting should continue to target the exotic species — curlyleaf pondweed early in the summer, and switching over to flowering rush. The next target area is nuisance growth of submerged native plants in monocultures.
- If harvesting can start in the last part of May in Big Detroit Lake, curlyleaf pondweed is vulnerable to long term reductions in density with early cutting. Plant maps of curlyleaf pondweed distribution are needed.
- Aquatic plant maps for the major lakes in the Watershed District are needed. GIS technology should be incorporated into the map making effort.
- More information and education material on aquatic plants and harvesting should be provided. Examples include information kiosks in public areas, occassional newspaper articles and even a weekly aquatic plant report. In addition yearly summaries and brochures could be mailed to lake residents.

Introduction

Plant harvesting has been a common site on Detroit Lake as well as Sallie and Melissa Lakes since the late 1960s. An initial investigation from 1969 through 1973 evaluated weed harvesting as a nutrient removal technique (Neel 1973). It was concluded that harvesting did not remove enough phosphorus to have a significant impact by itself on reducing phosphorus loading compared to other sources.

However, aquatic harvesting has continued to serve an important function by reducing the nuisance growth aquatic vegetation resulting in improvement of recreational use of the lakes.

The objective of this report was to evaluate existing plant harvesting program conditions and report to the managers of the Pelican River Watershed District. The summary in the first two pages capsulized the pertinent questions and answers. The remainder of this report reviews the 1999 harvesting season and then reviews the program results from the last ten years.

Review of the 1999 Harvesting Season

There were 115 harvesting days in the 1999 harvesting season with 70% of the days spent on Detroit Lake (Table 1). The areas harvested in Detroit Lake are shown in Figure 1 and roadside pickup areas are shown in Figure 2. The north end of the lake has a lot of action due to part to prevailing southerly winds that blow plants that way. This aids in reestablishing plants as well as accounting for considerable roadside pickup levels also.

Areas harvested in Lakes Sallie, Melissa, and Muskrat are shown in Figure 3. Roadside pickup was significant around both lakes in 1999 (Figure 4).

Table 1. Aquatic plant harvesting results for 1999.

	Detroit	Detroit - Deadshot Bay	Sallie	Melissa	Muskrat	TOTALS
Harvesting Days						
H1	6		6	12	3	27
H2	24	9	5			38
H3	50					50
TOTAL	80	9	11	12	3	115
Harvester Loads						
H1	50		32	50	15	147
H2	165	111	23			299
H3	283					283
TOTAL	498	111	55	50	15	729
Plant Harvest						
Tons (wet weight)	1040		98	75	23	1,236
Roadside Pickup						
Loads	24		10	22	--	--
Tons (wet weight)	262		102	238	--	602
Shoreline Pickup						
Loads	4	--	3	23	--	--
Tons (wet weight)	5	--	4	49	--	58
Harvesting Tons Total						
Tons (wet weight)	1,307	--	204	362	23	1,896

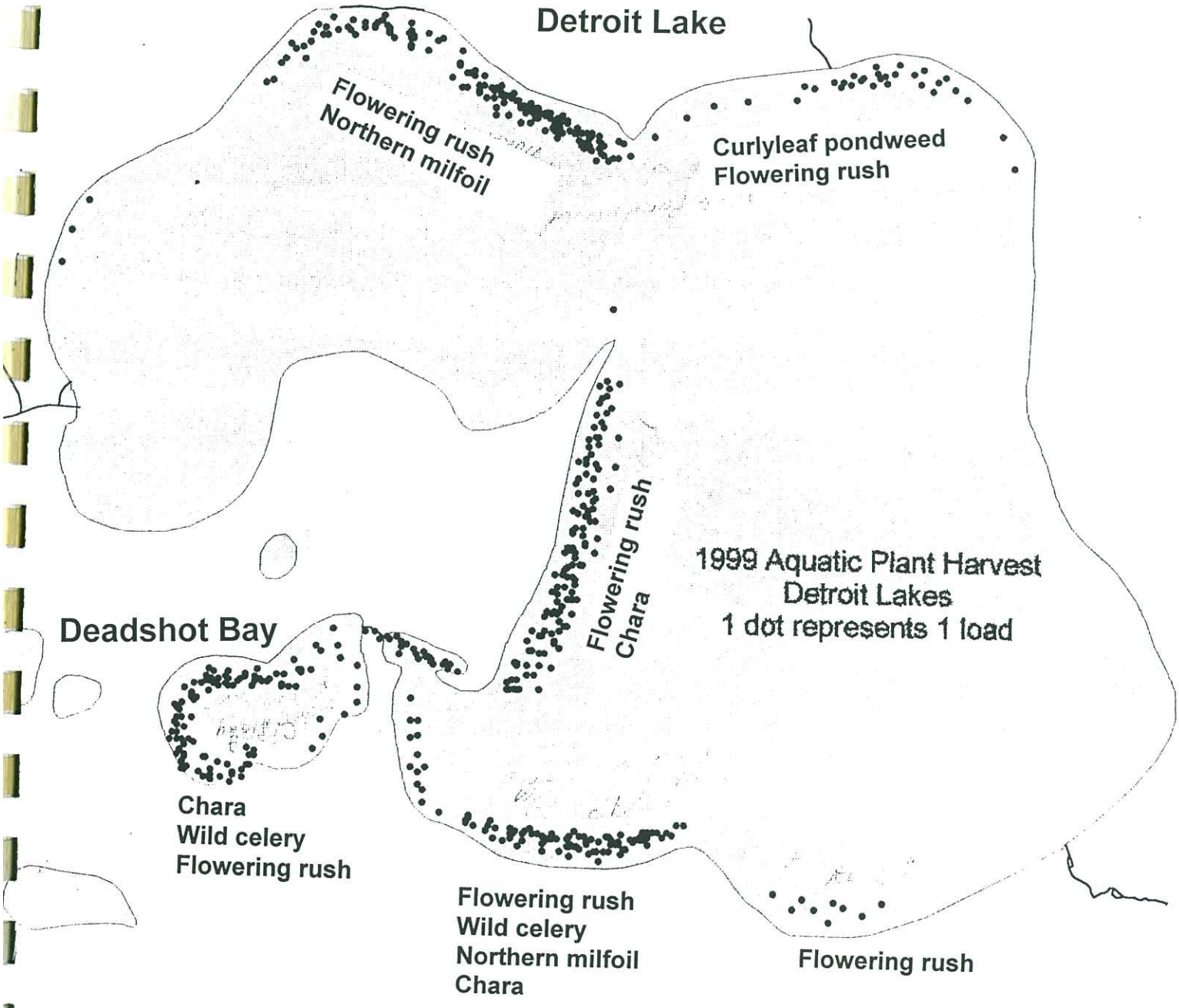

Figure 1. Aquatic plant harvest for Detroit Lakes in 1999. One dot represents one harvester load.

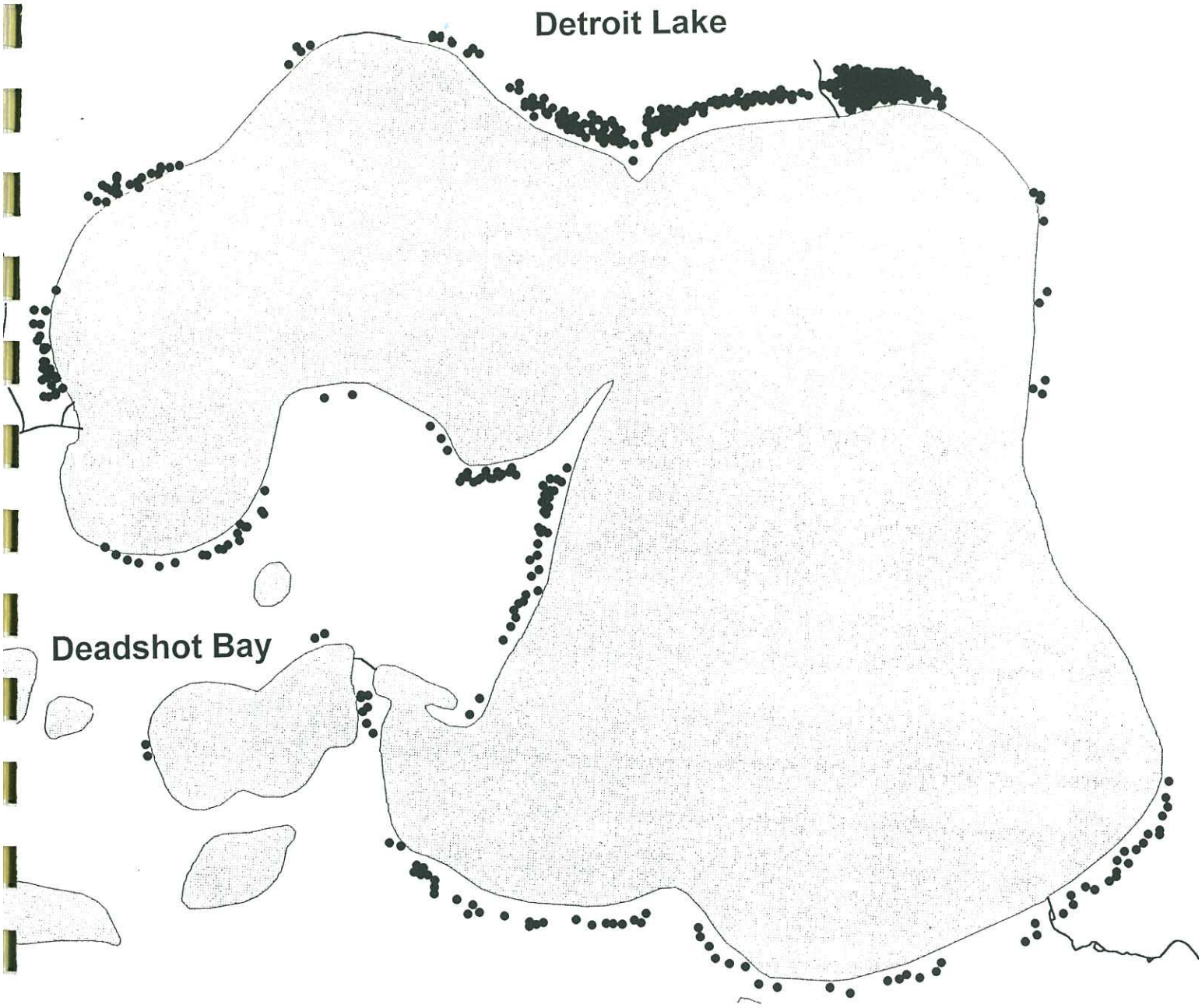

Figure 2. Aquatic plant roadside pick-up for 1999. One dot represents one bucket load from a small frontend loader.

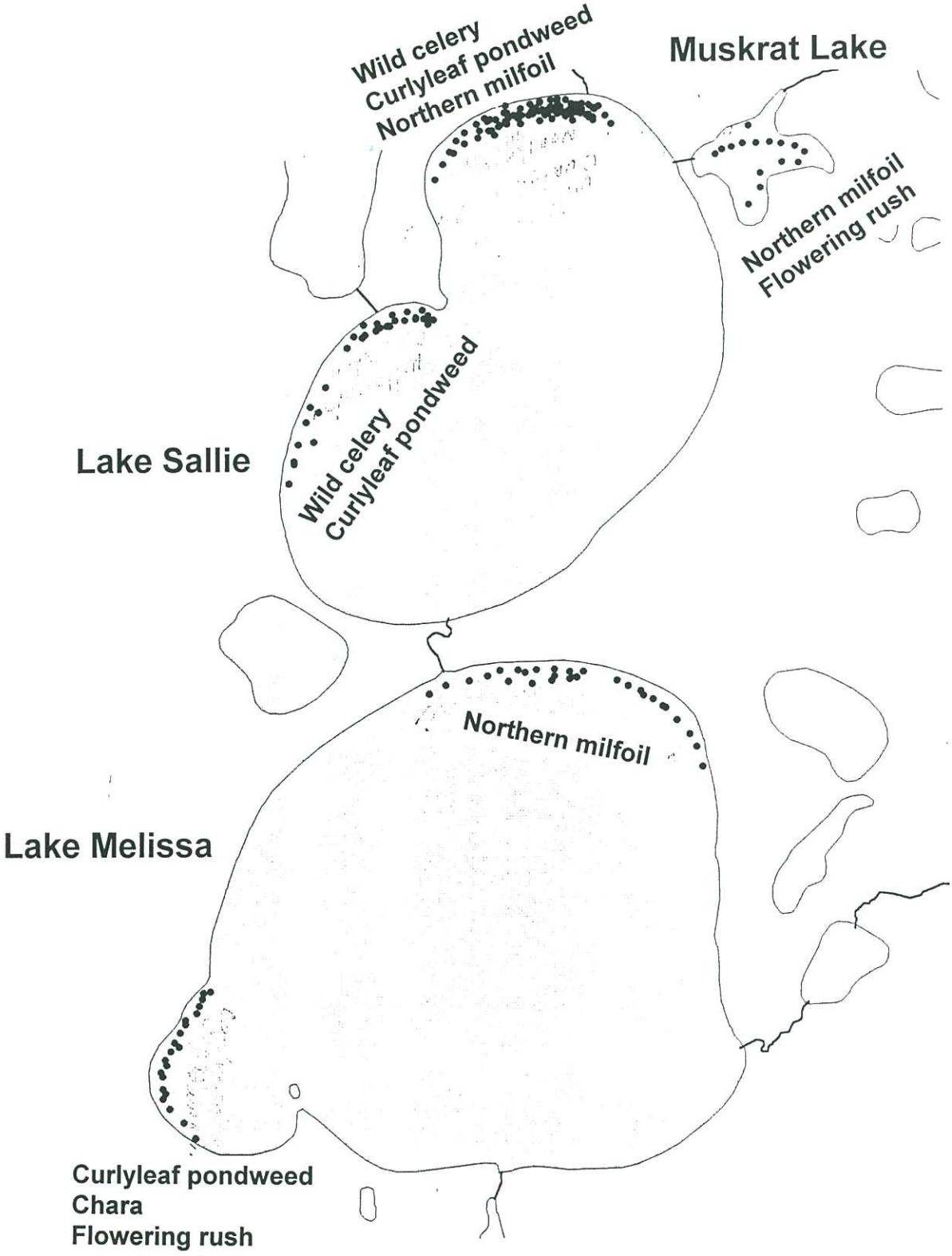

Figure 3. Aquatic plant harvest for Lake Sallie, Lake Melissa, and Muskrat Lake in 1999. One dot represents one load.

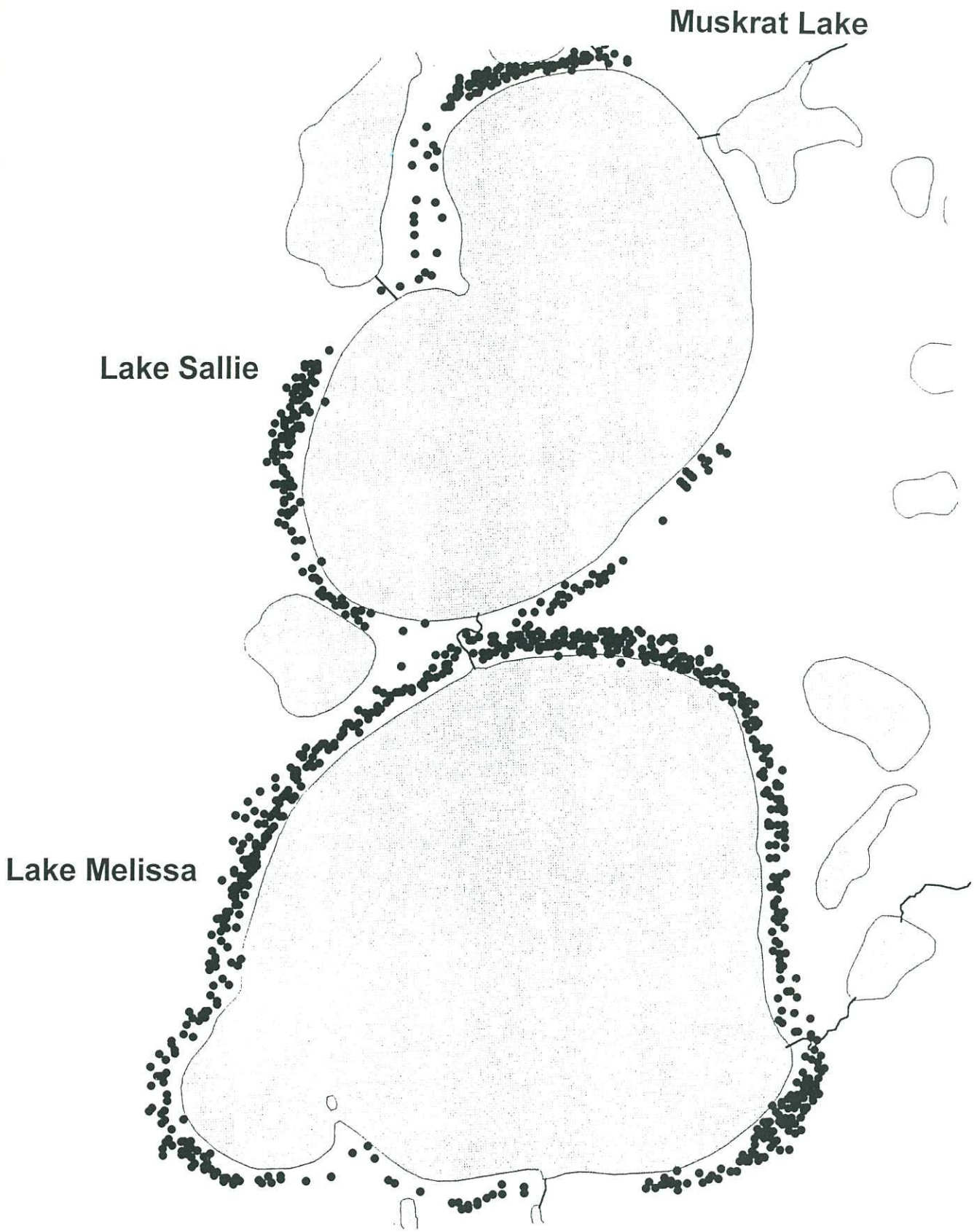

Figure 4. Aquatic plant roadside pick-up for 1999. One dot represents one bucket load.

Roadside Pickup: Plants that blow into shore are picked up at the roadside as part of the plant management program sponsored by the Watershed District. Originating from Detroit Lake, curlyleaf pondweed is a big contributor in early summer to the roadside plant biomass (Figure 5). Later in the summer the roadside biomass from Detroit, Sallie, and Melissa Lakes is dominated by chara, milfoil, and stringy pondweed.

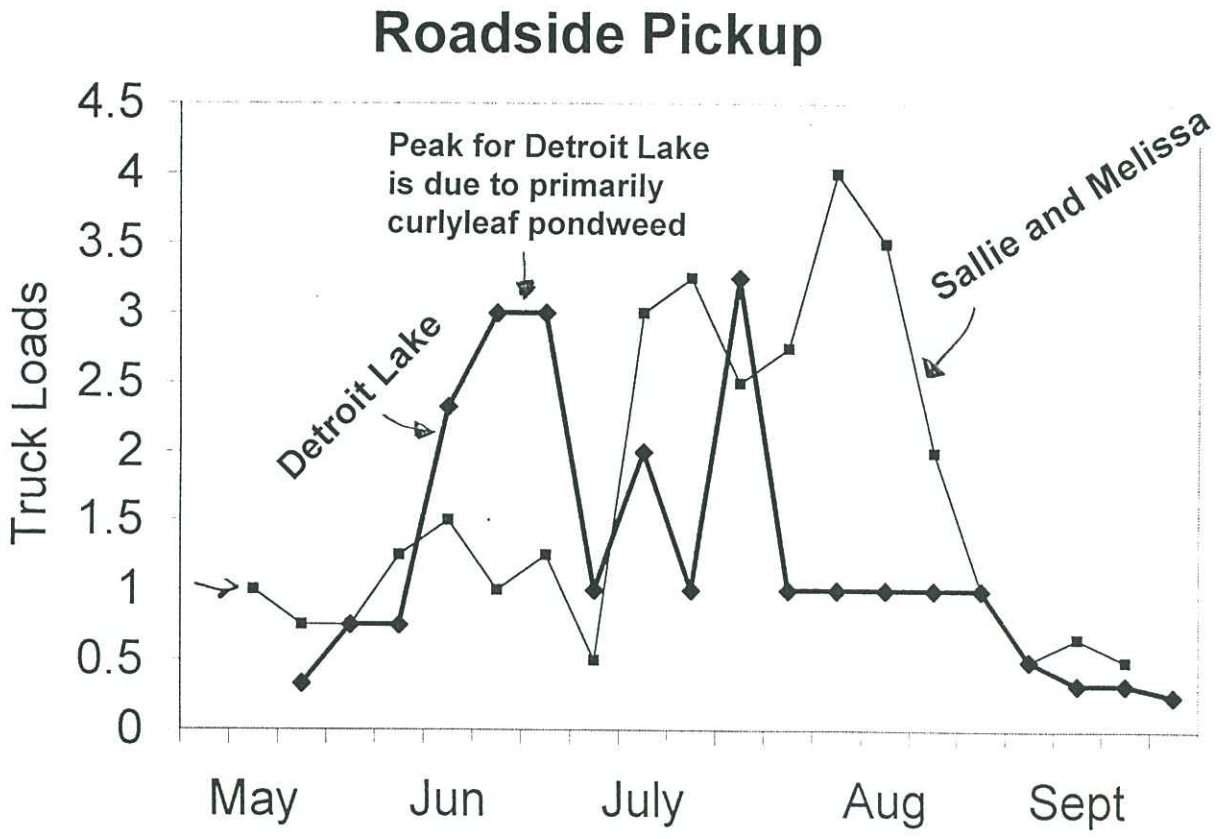

Figure 5. Roadside pickups for Detroit and Sallie and Melissa Lakes.

Source of Floating Plants: Plants that find their way to shore are primarily from natural mechanisms and not from harvester operation. Shoreline reports and fishermen observations of floating weeds are independent of harvesting operations (Figure 6).

Detroit Lakes: 1999 aquatic plant harvesting activity vs. reported "incidents" of floating "weeds"

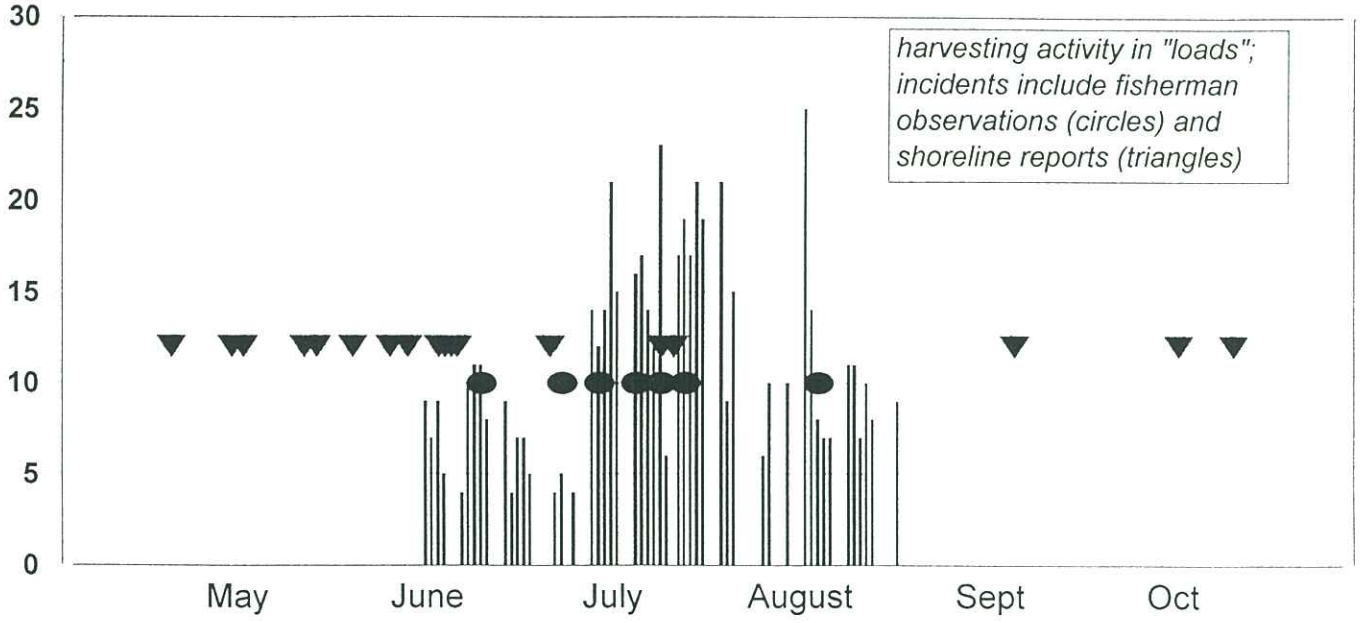

Figure 6. Aquatic plant harvesting activity verses report "incidents of floating weeds" for 1999.

Reporting Format for 1999

The approach and format used by the District summarizing harvesting activities in 1999 is mostly adequate. Table 1 coupled with Figures 1 through 5 summarize harvesting results. In the future, better maps of aquatic plant distribution and the types of plant species being harvested and picked up would be helpful.

Long Term Harvesting Review (Up to 1999)

Tons of aquatic plants (as wet weight) for 1987 through 1999 are shown in Figure 7. Plant harvesting activities from Detroit, Melissa, and Sallie has removed over 1,000 tons per year since 1991. A breakdown of aquatic plants harvested by lake is shown in Table 2.

Because of weather conditions, down time of machines, and other factors, it is difficult to discern aquatic plant trends from the data.

However, the level of effort used by Watershed District appears to address lake user needs at a reasonable cost.

A list of equipment used by the District is shown in the Appendix.

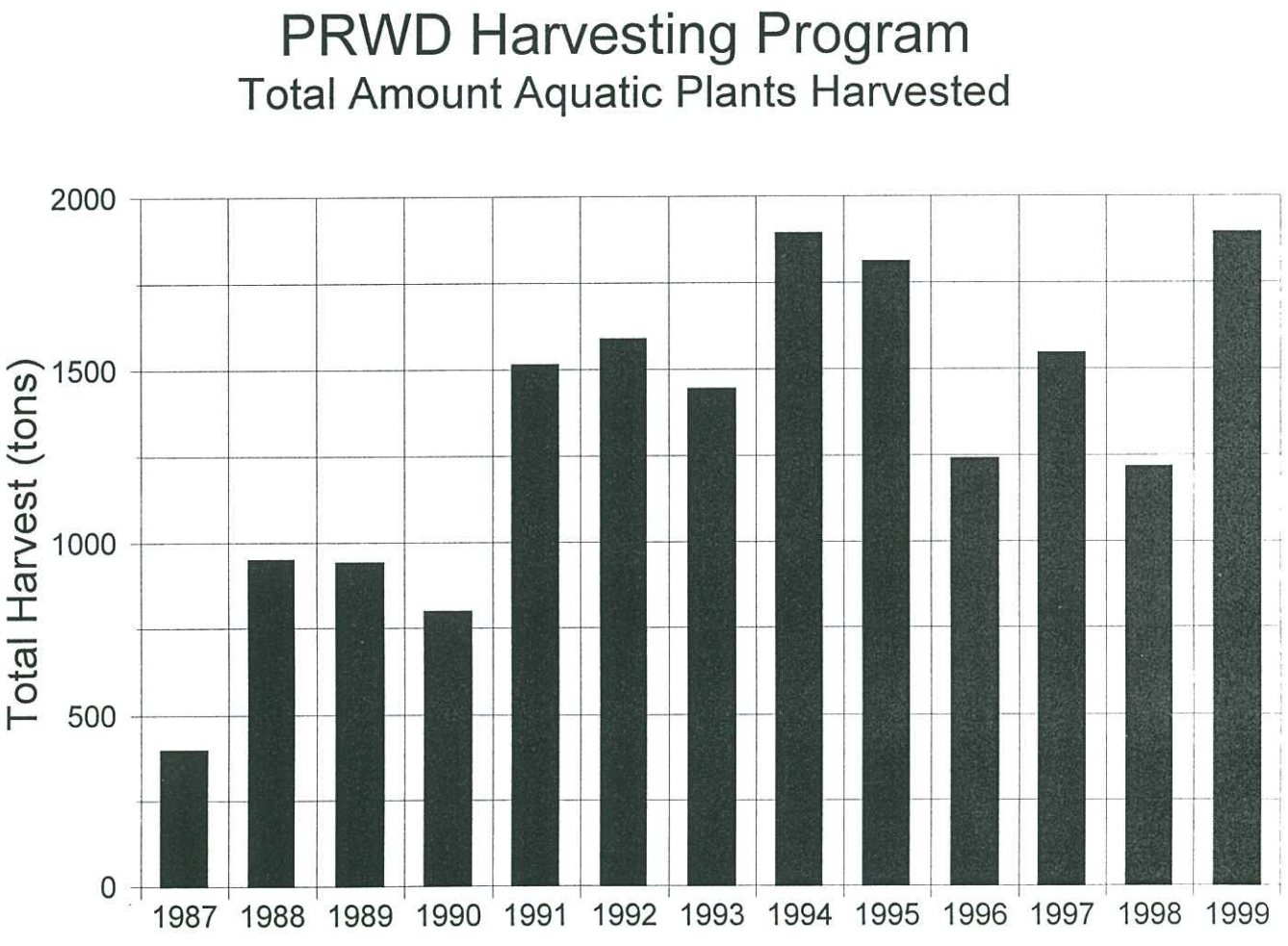

Figure 7. Tons of plants harvested in the lake and removed from roadside from 1987 through 1999.

Exotic plants: Flowering rush and curlyleaf pondweed are two exotic plants found in District lakes. The distribution of flowering rush has been tracked since 1976 (Figure 8). The spread of flowering rush has been slow. Curlyleaf pondweed has been documented in District lakes since 1970 (Neel 1973), however distribution maps and it's spread are not available.

There is no evidence that harvesting operations have caused colonization of either curlyleaf or flowering rush in areas that it wouldn't have colonized without harvesting.

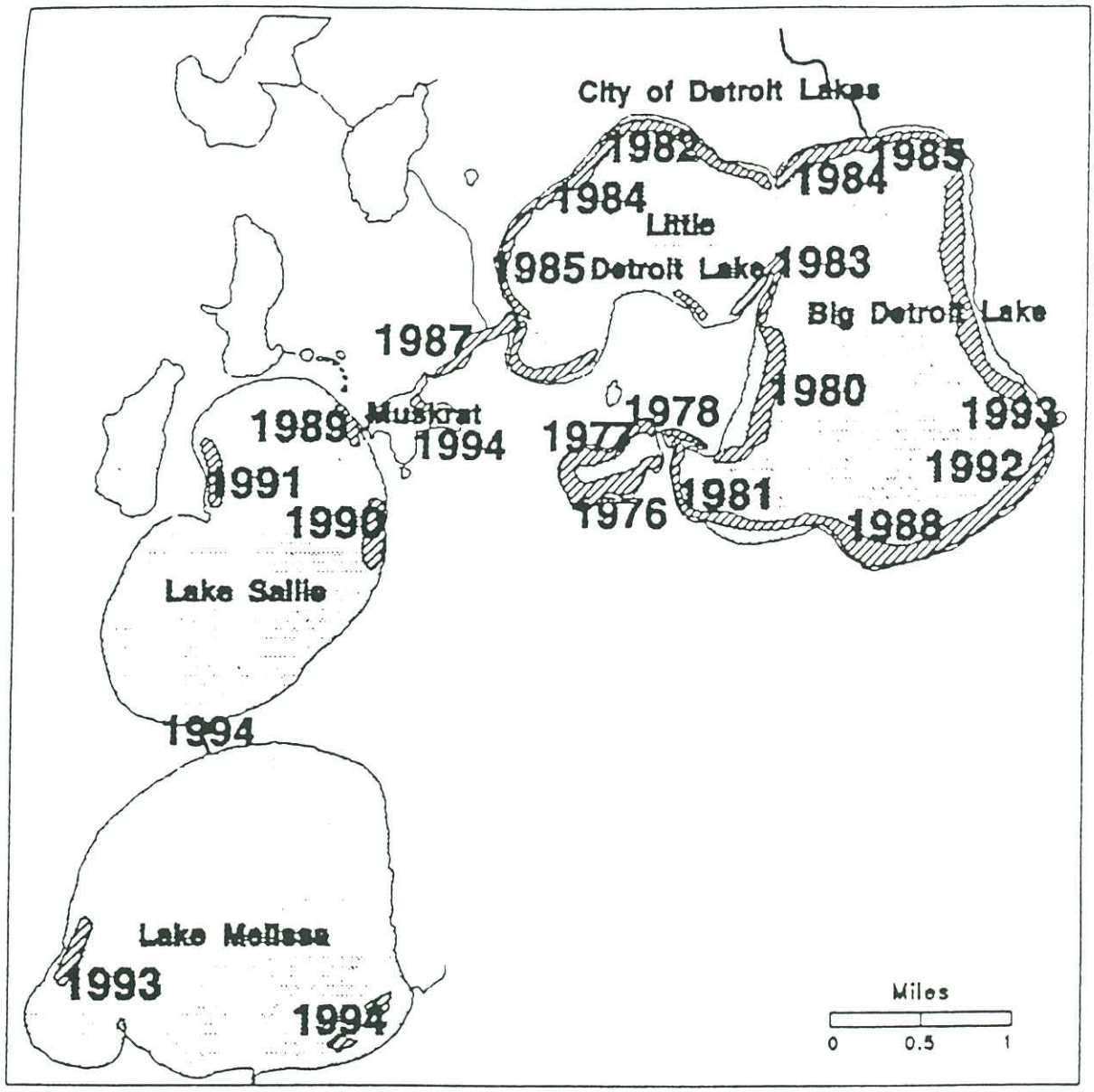

Figure 8. Distribution of *Butomus umbellatus* in the Pelican River Watershed as of 1994. Hashed areas indicate emergent plants of the species; the first year of identification is listed. Source: Pelican River Watershed District, from Johnson, K.A. 1996. MS Thesis, Bemidji State University.

Nutrient Removed by Harvesting: Tons of plants removed (Table 2) coupled with an average phosphorus tissue concentration of 0.3% (Table 3) was used to estimate the amount of phosphorus removed from the lakes due to harvesting and plant pick up.

Up to a 1,000 pounds of phosphorus per year have been removed from the lake ecosystem by harvesting efforts.

Table 3. Concentration of certain elements in various aquatic plants from Lake Sallie, Minnesota, September 16, 1968 (Neel 1973).

Plant Description	Plant Part			Phosphorus (%)	Nitrogen (%)	Carbon (%)	P:N:C Ratio
	Upper	Middle	Lower				
Scirpus validus							
	X			0.19	2.6	39.8	1:15:210
		X		0.20	2.6	42.6	1:16:213
			X	0.20	2.1	44.1	1:21:221
Myriophyllum exalbescens							
	X			0.34	3.6	34.9	1:10:103
		X		0.31	3.4	37.0	1:11:119
			X	0.29	2.8	31.9	1:11:110
Lemna trisulca							
	X	X	X	0.64	4.2	38.5	1:9:60
Ceratophyllum demersum							
	X	X	X	0.48	3.4	37.4	1:11:78
Nymphaea tuberosa							
		X		0.23	1.6	38.7	1:24:168
	X			0.32	4.6	43.9	1:10:137
Vallisneria americana							
	X	X		0.43	3.6	31.3	1:9:73
			X	0.28	3.2	29.1	1:9:104
Elodea canadensis							
	X	X	X	0.37	3.2	27.1	1:8:73
Potamogeton pectinatus							
	X			0.30	2.5	35.7	1:14:119
		X		0.27	2.3	39.5	1:17:146
			X	0.25	2.3	38.9	1:17:156
Potamogeton richardsonii							
	X			0.33	2.8	27.9	1:10:85
		X		0.31	2.8	27.3	1:10:88
			X	0.34	2.5	25.7	1:10:76
Microcystis scum							
	NA	NA	NA	0.72	8.1	43.0	1:5:60
Periphyton removed from *Vallisneria*							
	NA	NA	NA	0.46	2.7	22.9	1:8:50

Table 4. Pounds of phosphorus removed based on tons of aquatic plants removed. Tons of plants (wet weight) was from Table 2, plant wet weight was converted to dry by multiplying by 9% (Neel, 1973; p 35). Phosphorus concentration of 0.3% was an average from Table 3.

	Detroit (lbs-P)	Sallie (lbs-P)	Melissa (lbs-P)	Muskrat (lbs-P)	Roadside (lbs-P)	Shoreline (lbs-P)	TOTAL (lbs-P)
1987	73	--	--	--	143	--	216
1988	78	89	103	--	162	81	513
1989	100	66	77	--	176	89	508
1990	--	--	--	--	--	--	432
1991	340	60	74	--	183	162	819
1992	356	50	61	--	203	189	859
1993	302	35	64	--	218	162	781
1994	265	316	32	--	259	151	1,023
1995	281	166	57	--	284	208	996
1996	217	17	18	--	297	122	671
1997	433	3	38	100	232	30	836
1998	486	28	21	79	214	24	852
1999	562	53	41	12	325	31	1,024

Figure 9. Harvesting activities in 1999. (Top) Piles of harvested flowering rush on the shore of Detroit Lake. (Bottom) The modified fork on the bobcat picks up piles of aquatic plants.

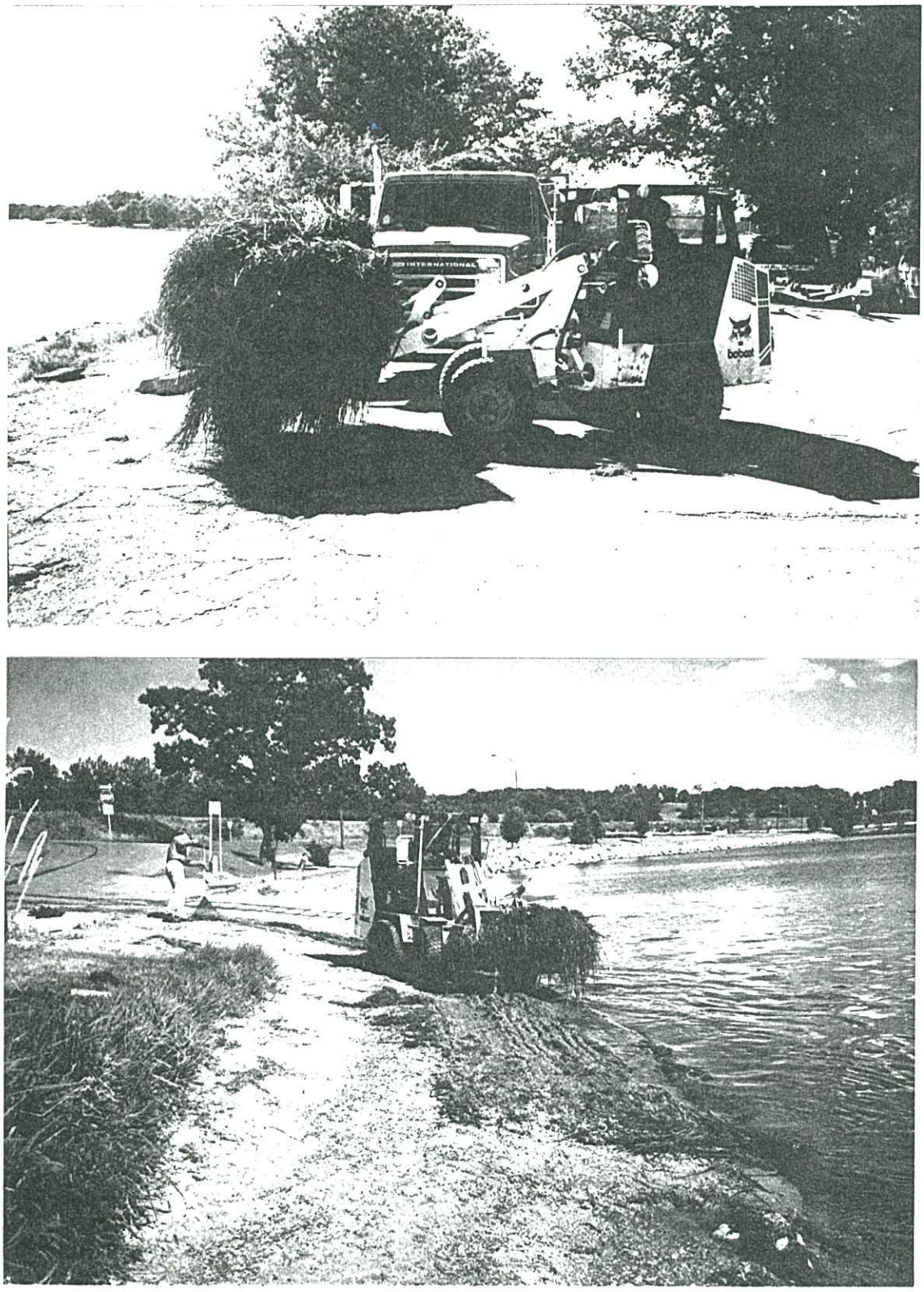

Figure 10. (Top) Plants are transferred to a dump truck. (Bottom) When pick up is finished, the shoreline is clean.

Reference

Neel, J.K. 1973. Weed harvest and lake nutrient dynamics. US EPA Proj. No. 16010 DFL. (Copy of report is on file at the Pelican River Watershed District, Detroit Lakes, MN.)

Appendix

Harvester Loads - 1999

Date	Big and Little Detroit Lakes				Lake Sallie			Melissa	Muskrat
	H1	H2	H3	Total	H1	H2	Total	H1	H1
6.15	9			*9*		9	*9*		
6.16	7			*7*		10	*10*		
6.17	9			*9*		6	*6*		
6.18	5			*5*		4	*4*		
6.19									
6.20									
6.21	4			*4*	5	4	*9*		
6.22	10			*10*					
6.23	11			*11*					
6.24	11			*11*	4/9		*4/9*		
6.25	6			*6*					
6.26									
6.27									
6.28	4			*4*	4		*4*		
6.29	3			*3*	5	5	*10*		
6.30	7	4		*11*	5/4		*5/4*		
7.1	7			*7*	4/8		*4/8*		
7.2	5			*5*					
7.3									
7.4									
7.5									
7.6	4			*4*				6	
7.7	5			*5*		10	*10*	9	
7.8									
7.9	4			*4*				6	
7.10									
7.11									
7.12	4			*4*				2	
7.13	12			*12*				5	
7.14	14			*14*				5	
7.15	9	12		*21*				3	
7.16	4	11		*15*				2	
7.17								9	
7.18									
7.19	6	10		*16*					
7.20	6	11		*17*					
7.21	5	9		*14*					
7.22	5			*5*					
7.23	9			*9*				3	
7.24		6		*6*					
7.25									
7.26		12	5	*17*					
7.27		14	5	*19*					
7.28		14	3	*17*					
7.29		18	3	*21*					
7.30		16	3	*19*					
7.31									

Date	Big and Little Detroit Lakes				Lake Sallie			Melissa	Muskrat
	H1	H2	H3	Total	H1	H2	Total	H1	H1
8.1									
8.2		16	5	*21*					
8.3		6	3	*9*					
8.4		9	6	*15*					
8.5									
8.6									
8.7									
8.8									
8.9		6		*6*					
8.10			6	*6*					11
8.11									
8.12									
8.13		4	3	*7*					3
8.14									
8.15									
8.16		9	5	*14*					
8.17		9	5	*14*					1
8.18		5	3	*8*					
8.19		4	3	*7*					
8.20		4	3	*7*					
8.21									
8.22									
8.23	6	6	5	*17*					
8.24	6	6	5	*17*					
8.25	8	7	6	*21*					
8.26	8	5	5	*18*					
8.27	6	6	2	*14*					
8.28									
8.29									
8.30									
8.31	6	5	4	*15*					
TOTAL	225	244	88	*557*	48	48	*96*	50	15

SCHEDULE OF VEHICLES - PELICAN RIVER WATERSHED DISTRICT

COVENANT NUMBER - CMC 19666
COVENANT PERIOD: 06/01/99 - 06/01/00

LMC
League of Minnesota Cities
Cities promoting excellence

VEH NO.	DESCRIPTION		VEH ID	ACV COMP.	COMP. DED.	[ ] COMP. [ ] SP. PERILS STATED AMOUNT	COLL.	COLL DED.
Autos owned at inception of this covenant and shown								
on this schedule have coverage as indicated by "X".								
Coverage is subject to the deductible indicated.								
001)	1981 FORD F150	PICKUP	4706	X	250			
002)	1977 FORD F250	PICKUP	2483	X	250			
003)	1973 GMC 1 1/2TON	TRUCK	8927	X	250			
004)	1987 FECHTNER	TRAILER	TBD	X	250			
005)	1963 VIKING	EQUIP TLR	3130					
006)	1976 RAY-MAC	EQUIP TLR	6092					
007)	1991 FRIESEN	EQUIP TLR	TBD					
008)	1987 AQUAMARINE	TRAILER	C200					
009)	1988 AQUAMARINE	EQUIP TLR	8009					
010)	1982 INT'L	3.5T W/HST	1491	X	250		X	250
011)	1997 BOAT	TRAILER	J222	X	250		X	250

ME021 (01-95)

PRWD EQUIPMENT INVENTORY

1-B is off by $.09

category	acquisition date	description	cost	depreciated value amount	date	
1-B	6/1/87	Sallie Harvester	$42,519.00	$39,694.00	12/31/97	AQUAMARINE
1-B	6/1/87	1/2 pickup	$2,300.00	$2,300.00	12/31/97	
1-B	6/1/88	Melissa harvester	$33,322.00	$27,770.00	12/31/97	AQUAMARINE
1-B	6/1/89	1/2 conveyor	$5,202.00	$5,202.00	12/31/97	
1-B	6/1/89	1/2 truck	$4,760.00	$4,760.00	12/31/97	
1-B	6/1/90	1/2 truck	$2,385.00	$2,385.00	12/31/97	
1-B	6/1/90	Bobcat	$9,900.00	$7,095.00	12/31/97	
1-B	6/1/91	power washer	$300.00	$300.00	12/31/97	
1-B	6/1/93	axle assembly	$399.00	$0.00	12/31/97	
1-B	12/16/94	Elders - radios	$1,426.00	$855.00	12/31/97	
1-B	5/15/95	82 IH Truck and Box	$18,759.56	$9,027.00	12/31/97	
1-B	7/15/96	1/2 Trailer	$1,663.00	$499.00	12/31/97	
1-B	7/31/98	Elders - radios	$515.00		12/31/98	
1-C	6/1/87	1/2 pickup	$700.00		12/31/97	
1-C	6/1/89	1/2 conveyor	$4,298.00		12/31/97	
1-C	6/1/89	1/2 truck	$3,640.00		12/31/97	
1-C	6/1/90	1/2 truck	$2,385.00		12/31/97	
1-C	6/1/90	harvester	$52,980.00		12/31/97	FRIESEN (COAL)
1-C	6/1/91	1/2 power washer	$300.00		12/31/97	
1-C	6/1/91	Bobcat	$18,153.00		12/31/97	
1-C	12/16/94	Elders - radios	$1,426.00		12/31/97	
1-C	5/15/95	82 IH truck and box	$7,676.44		12/31/97	
1-C	7/15/96	1/2 trailer	$1,663.00		12/31/97	
1-C	7/31/98	Elders - radios	$514.20		12/31/98	
1-C	6/30/99	Friesens (motors for harvestor	$1,024.24		12/31/99	
land	6/1/87	pole shed	$6,974.00			
land	6/1/91	PR near Hwy 34	$9,524.00			