AN EVALUATION MEMORANDUM

DIVER HAND HARVESTING RESULTS

OVER A DECADE

REGARDING THE AQUATIC INVASIVE WEED

EURASIAN WATER MILFOIL (EWM)

ON

SCHROON LAKE, NEW YORK

EASTERN BORDER OF THE ADIRONDACK PARK

BY

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ESSLA

October 12, 2015

PREFACE

The invasive aquatic weed, Eurasian Water Milfoil (EWM) was first discovered in Schroon Lake in the summer of 1995 by Adirondack Ecologists (AE). It is believed that EWM has been present in the lake at least since the 1980's and possibly earlier than that. Without getting into much detail about the plants characteristics, how it first got into the lake and its harmful effects on native plants, recreation, business and property values, suffice it to say that it is a 'bad plant'----- it multiplies rapidly, spreads easily by fragmentation and left unchecked, will have a major negative impact on the overall health of the water body it is in, and consequentially, serious problems with homeowners and businesses alike. That is why removal activities (hand harvesting by divers) commenced in 2006, by AE, with 3 year grant monies, and continued with the same firm through 2012. In 2012, another firm, Adirondack Invasive Management (AIM), was contracted for limited harvesting in specific locations on the lake and following that was awarded a three year contract for EWM removal on the entire lake, in years 2013, 2014, and 2015. Both AE and AIM have produced annual reports of their harvesting results tied to specific locations on the lake. The reader should understand that all these locations are generally in the littoral region of the lake, known as the region where the sunlight penetrates the water column depth to the bottom. The Minnesota Department of Natural Resources define littoral as the portion of the lake that is less than 15 feet. Hence, one can see that all the hand harvesting activities take place in a relatively narrow band around the inner circumference of the lake's shoreline and around the shoreline of the two islands, Brill and Clark.

Using the 10 year recorded history of EWM plant removal quantities, by the two contracted harvesting firms, the writer evaluated the information to see if the data disclosed important information regarding the success of removal and trends that might be helpful for future efforts. A summary table and graphs are contained herein and discussed in this Memo.

A foot note: No attempt is made to discuss the significant assistance rendered by early groups of volunteers and the organized Scout Program in locating EWM and communicating those findings to the subcontractors. Also, the outlet river is omitted from this memo. Its full length is monitored by the Scout program, annually and no EWM has been discovered to date.

METHODOLOGY

Using the annual reports of the two harvesting firms (AE and AIM) the attached chart, covering 10 years, was constructed. It does not cover the entire lake but rather 12 specific zones, labeled 'A' through 'L'. Eleven of the zones (see "Invasive Species Diagram") are in Essex County and one is in Warren County. These zones were conceived by the writer to act as control zones. They encompass the major portion of the points reported by AE in each of their annual reports. For example, AE reports harvesting results for points 14 through 20 and 32, 35. These points are near and around Clark Island. The writer drew a rectangle to encompass all these points and labeled the rectangle zone 'H'. The same approach was used to generate all the other zones. Hence, seven years-worth of recording by AE, using numbered points on the lake, were, by in large, captured and contained within 12 control zones, A through L. In 2013, AIM's first year, they were requested to include in their reports which zone the harvesting results applied to. They complied in 2013 but not in 2014 and 2015. They cited workload as a factor. Nevertheless, through the efforts of Gretchen Marcell, ESSLA's Scout Program leader, we were was able to follow the written descriptions by AIM in their annual reports and with reasonable certainty were able to assign harvesting quantities to the appropriate lettered zone.

AE and AIM report all their harvesting results in number of plants and/or in number of bags (26"x36" mesh construction). To simplify the construction of the chart and also the resulting graphs, data was reduced to the lowest common denominator, namely, number of plants. To do this the writer used an AIM approximation of 1 bag=117 plants. There are ranges to this number but using it as a constant will not affect the trend (or curvature) of the graphs from which final conclusions will be drawn. In summary, all the plant quantifications from the AE and AIM were reduced to number of plants and entered on the chart for each year of harvesting. The chart lists zone number in the first column, followed by zone name that ties to the map, followed by the reported AE points within each zone and then quantity tallies for each year for the seven AE years and the three AIM years.

RESULTS

The 12 graphs of the lettered zones were divided into two groups. Group 1 consists of the eight zones A,E,G,H,I,J,K,L and Group11 consisting of four zones B,D,F,C. Group 1 exhibits plant removal results with decreasing trends over the 10 year period or exhibits zero to low quantities of plant removal (less than 128 in any year). Group11 consists of four zones, all located on the west shoreline of the lake, all exhibiting widely fluctuating results.

GROUP 1 (please refer to graphs at end of report)

ZONE A (Lockwood Bay)---a relatively low yield zone with yields below 91 plants for 5 of the 10 years and 0 to 1 plants for the other 5 years.

ZONE E (Schroon lake Marina)---A saw tooth pattern of removal but with a downward trend line as shown by dotted line.

ZONE G (WOL ranch, Brill Is.,Sand Pt.)---Three years of large quantities of plant removal (4,622, 2,141, 1,521) followed by steady decreasing trend over 8 years.

ZONE H (WOL Clark Island)--- following 2 years of high harvest (3,042 and 1,638) the next three years drop to the 500-700 range and are followed by a rise in the next 3 years after which there is a drop to the two lowest values on the graph. Overall the zone exhibits a downward trend with time.

ZONE I (East shore south of Talachita pt.)---high numbers above 2,200 the first 3 years with a dramatic reduction in 2009 to 263, followed by seven years of low yield in range of 1/10 the starting 2006 yield. Two trend lines summarizes the yields in this zone.

ZONE J (Steep Bay)---A low yielding zone with a steady downward trend.

ZONE K (west shore opposite Steep Bay)---Practically a EWM free zone with a spike in 2012 that tells you why you must be vigilant.

ZONE L (Meadow Cove)---This zone was not harvested the first 5 years on the graph and Scout discovery in 2011 was followed by significant work by AE and then AIM follow up to keep the levels down. Another message sent by EWM---leave me, and I will grow----teamwork will keep me low!

RESULTS (continued)

GROUP11 (please refer to graphs at end of this report)

The four zones in this group (B,C,D,F) all exhibit unusual harvesting results. The low 2015 yields on 3 of the 4 zones (B,C,D) at values of 428, 136, and 176, provides some comfort, but not much.

ZONE B (Grove pt. Landing)---A five year period of relatively low yields followed by a dramatic spike in 2011 which gets harvested aggressively to reduce the 2012 yield to a much lower number, only to be followed by a second spike of an even higher value, and knocked down again. Zone bears watching!

ZONE C (Terra Alta)---Graph equally troubling as Zone B. Bears watching!

ZONE D (West shore between WOL launch and Town Beach)---Trouble continues! Watch it!

ZONE F (Sandy Point, west shore)---Now isn't this a beaut? Seven years of relatively quiet activity and then a 20+ factor rise followed by the year 2014 where there was no indication that the zone was harvested. In 2015 still a substantial harvest! This zone surely deserves a critical follow up in 2016.

What do the four zones described above, have in common? I think we can all agree they have unusual harvesting results. Also, strangely enough, they all are located on the upper west shoreline of the lake. The writer cannot explain the results but data suggests close scrutiny is in order for coming years.

CONCLUSIONS

Schroon Lake is fortunate to have had continual EWM surveillance and diver harvesting for such an extended period. Almost 67,000 plants were removed weighing a little over 7 tons. Had this not been the case the lake would have easily been overrun by this invasive weed and the consequences dire. The downward trend and/or the low harvest numbers in eight of the twelve control zones (Group 1) are comforting. Six of these eight zones experienced harvesting reductions between 88% and 100%.

The four zones in Group 11 pose a challenge. Two of the zones had harvesting values in 2015 lower than the 2006 values while the other two had increased values. Also, some of the yearly harvesting swings were significant and not completely understood.

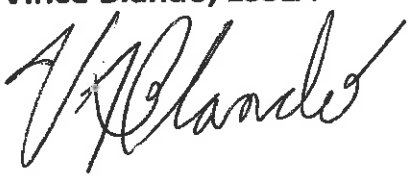
From this evaluation the writer considers the overall condition of the lake to be in good control, regarding the spread and growth of EWM. Third party, independent surveillance reports by Warren County Soil and water conservation District's (WCSWCD) Bob Bombard supports this notion. Nevertheless, The 3 year contract for AIM harvesting expired the end of 2015. At this writing a subcontractor to continue the work in 2016 and beyond has not been selected. The writer strongly recommends that the hand harvesting sub contract work continue and urges the Water Shed Steering Committee to assign a high priority to this action and in conjunction with WCSWCD and the three Townships begin the bid cycle ASAP so there is no lapse in the overall management control of EWM. One can easily see, by examining the graphs contained herein, and the characteristic surges in many of the zones, that EWM, left to its own devices, will multiply to out of control levels, unless there is continuous management team combating its spread. This has been done in the past with the team consisting of the three Towns, the WCSWCD and the Scout Program, which are all in place. All we need is the 4th leg of the stool, the diver subcontractor, to keep the lake healthy.

Final notes:

1. When the contract is put together it should include a copy of this report, for information, and a requirement for reporting harvesting results as they relate to the zones discussed in this report. This is fairly easy to accomplish. At the end of this report, Table 1 shows GPS readings for each numbered AE point. We should not be put in a position, like the last two years, of trying to guess what harvest amount belongs to what control zone. Also, emphasizing the Group 11 zones for special attention will contribute to bringing these zones to more manageable levels by the subcontractor.
2. The inland harbor at the Adirondack Lodges, on East Shore Drive, has not been included in this report. Reasons: recorded history has only been for recent years; this private harbor has only recently permitted access to outside firms: harvesting in this harbor has been accomplished by the residents, by AE under special contract, and by AIM the last few of years. Hard data for all these activities was not available to the writer. Nevertheless, this location is critical to the health of the lake. In this small area there has been an abundance of EWM growth, coupled with a large number of boats in relatively close quarters.

Boats exiting the harbor travel under a low and narrow bridge to gain access to the lake. The narrow passageway between boats leading to the bridge has had lapping EWM on the surface, which is easily chopped up, with fragments hitch hiking the boat and inevitably being discharged into the lake. This is a high priority area and hand harvesting requires close coordination with the resident boat owners. Similar circumstances prevail at the Schroon Lake Marina. It is imperative, that this area and the marina are specifically addressed for harvesting action in any bid proposals for future work.

Vince Blando, ESSLA



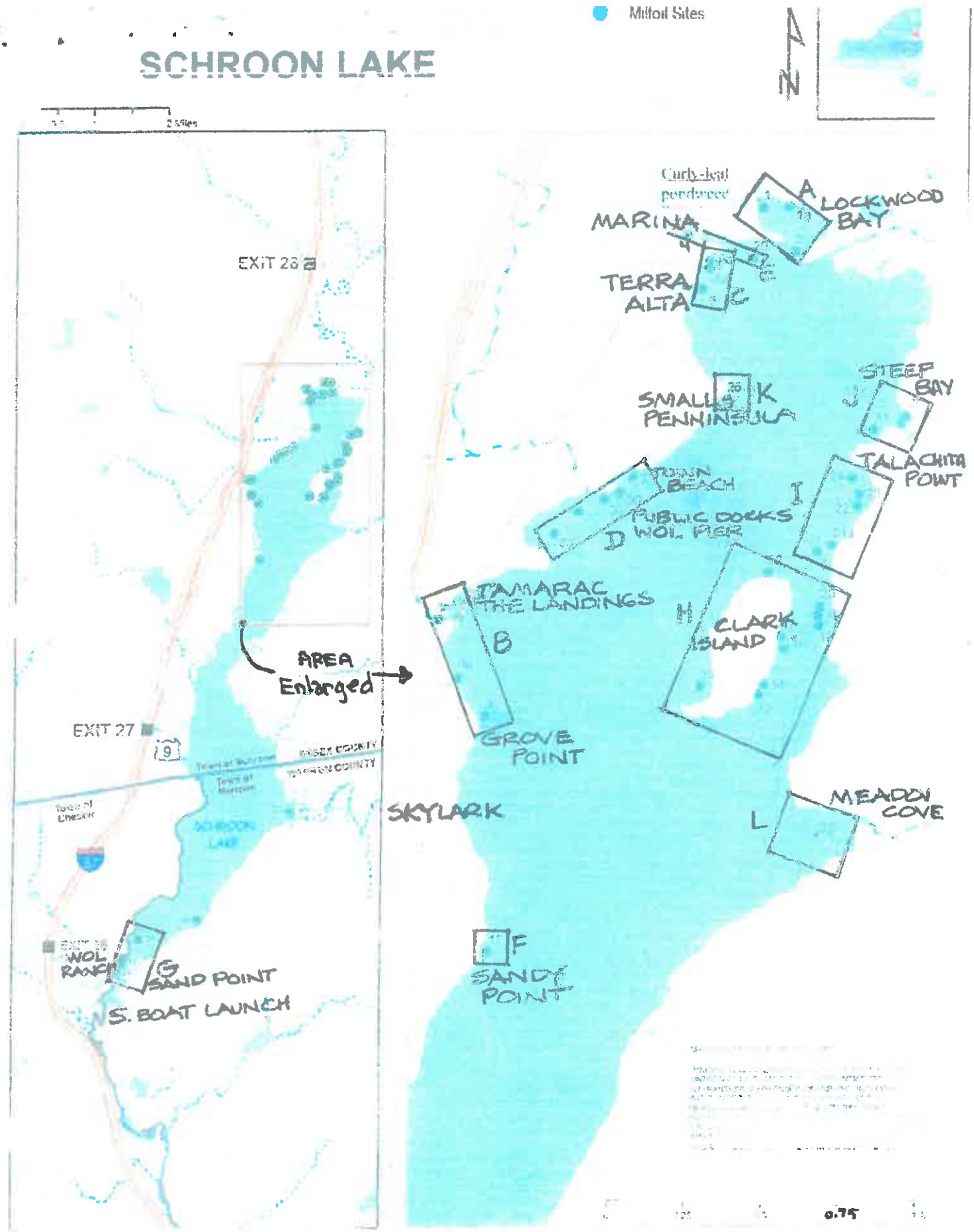
Milfoil Harvesting on Schroon Lake in 12 Zones (A thru L) as function of number of plants versus year (data from AE & AIM annual reports)

I bag=117 plants=25#		AE	Harvester>	AE	AE	AE	AE	AE	AE	AE+AIM	AIM	AIM	AIM	Total	plant	
Zone	Zone NAME	POINT	YR. 2000>	6	7	8	9	10	11	12	13	14	15	Plants	rank *	Area Name
			area index													
A	LOCKWOOD BAY	1,1a,2	3.8	1	0	91	0	0	0	59	45	84	62	342	11	Lockwood Bay
B	GROVE PT. LANDING & Tamarac Village-?	3,3a,8, 8a	7.0	448	293	319	211	565	3,481	510	4,482	821	428	11,558	3	Grove Pt. Landing
C	TERRA ALTA	5a,5b,6	1.6	468	782	731	154	198	208	763	117	365	136	3,922	7	Terra Alta
D	West Shore between WOL launch & Town Beach	7,9,30, 33,37	3.9	77	30	33	527	0	176	551	770	167	176	2,507	8	West shore between WOL launch & Town Beach
E	Schroon Lk. Marina	4,29	1.5	644	779	1,211	664	467	648	211	205	497	79	5,405	5	Schroon Lake Marina
F	Sandy Pt. North East shore	10,	** 1.0	0	293	117	117	234	117	88	1,972	0	1,170	4,108	6	Sandy point north
G	WOL ranch, Brill Is., Sand Pt.	11,12, 13,34	7.3	4,622	2,141	1,521	936	1,296	1,053	1,287	97	354	235	13,542	1	WOL ranch, Brill, & Sand Pt.
H	WOL CLARK ISLAND	14-20, 32,35	20.6	3,042	1,638	695	556	784	1,465	2,150	1,945	407	352	13,034	2	WOL Clark Island
I	East Shore south of Talachita point	21,21a, 22,23,24	3.0	3,373	2574	2,232	263	351	98	104	176	50	6	9,227	4	east shore south of Talachita Pt.
J	STEEP BAY	26,27,31	2.5	293	176	253	93	23	5	90	38	0	0	971	10	Steep Bay
K	West Shore opposite Steep Bay	25	1.7	0	0	2	0	0	0	128	2	0	0	132	12	west shore south steep bay
L	MEADOW COVE	38	5.6	0	0	0	0	0	1,614	240	18	94	179	2,145	9	Meadow cove
	Total Number of Plants			12968	8706	7205	3521	3918	8865	6181	9867	2839	2823	66,893		
	Total Number of bags			111	74	62	30	33	76	53	84	24	24	572		
	Total weight in pounds			2771	1860	1540	752	837	1894	1321	2108	607	603	14293		
			YR. 2000>	6	7	8	9	10	11	12	13	14	15			

Notes:

* The largest number of plants under column "Total Plants" is 13,542 and is assigned a rank of 1. All others are ranked accordingly.

** The smallest zone area(F) is assigned the number 1. Numbers for all the other zones signify how much bigger, in area they are relative to zone F



Map showing NE numbered points (EWM) and lettered zones around points.

GRAPHS OF

GROUP 1

ZONE

A

E

G

H

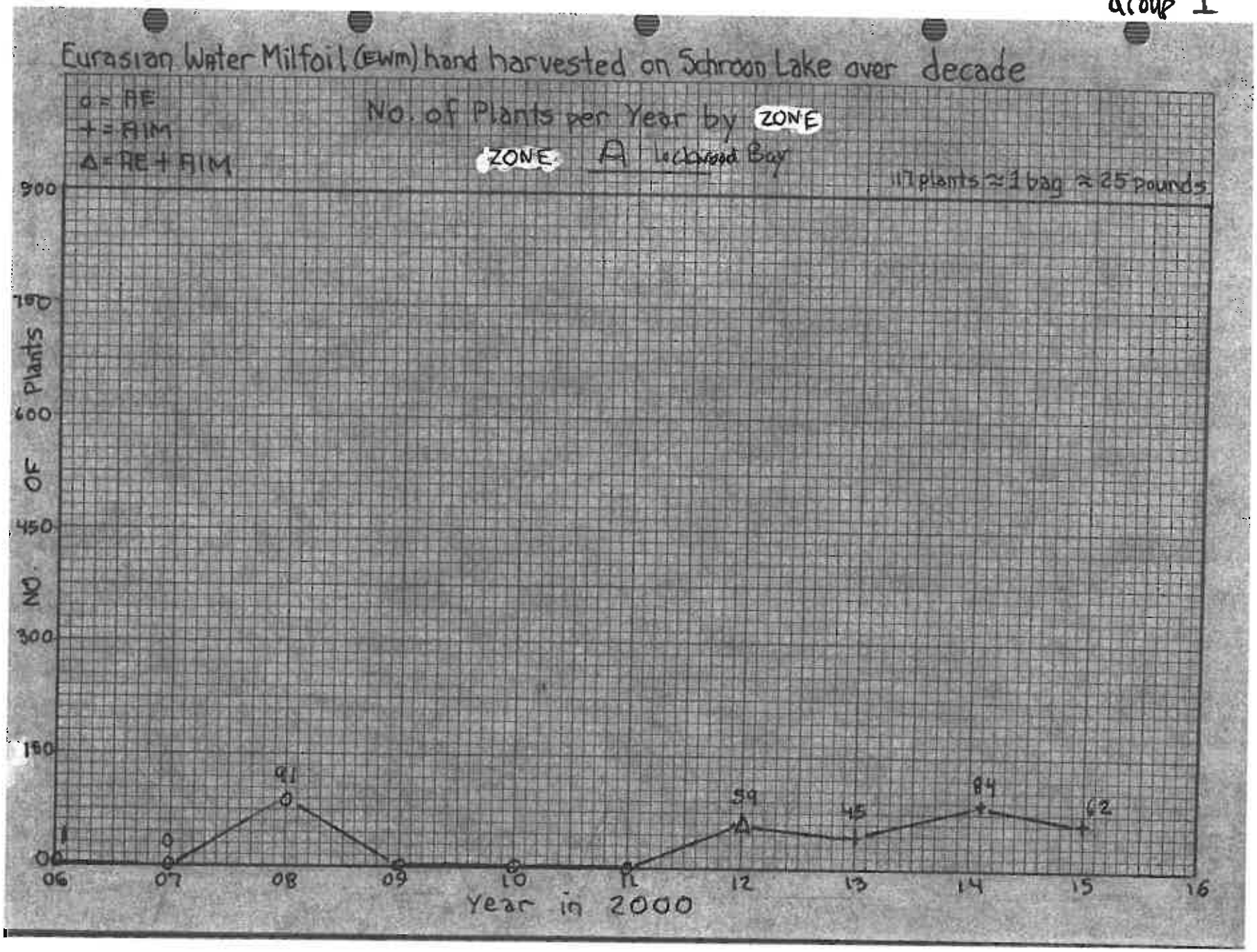
I

J

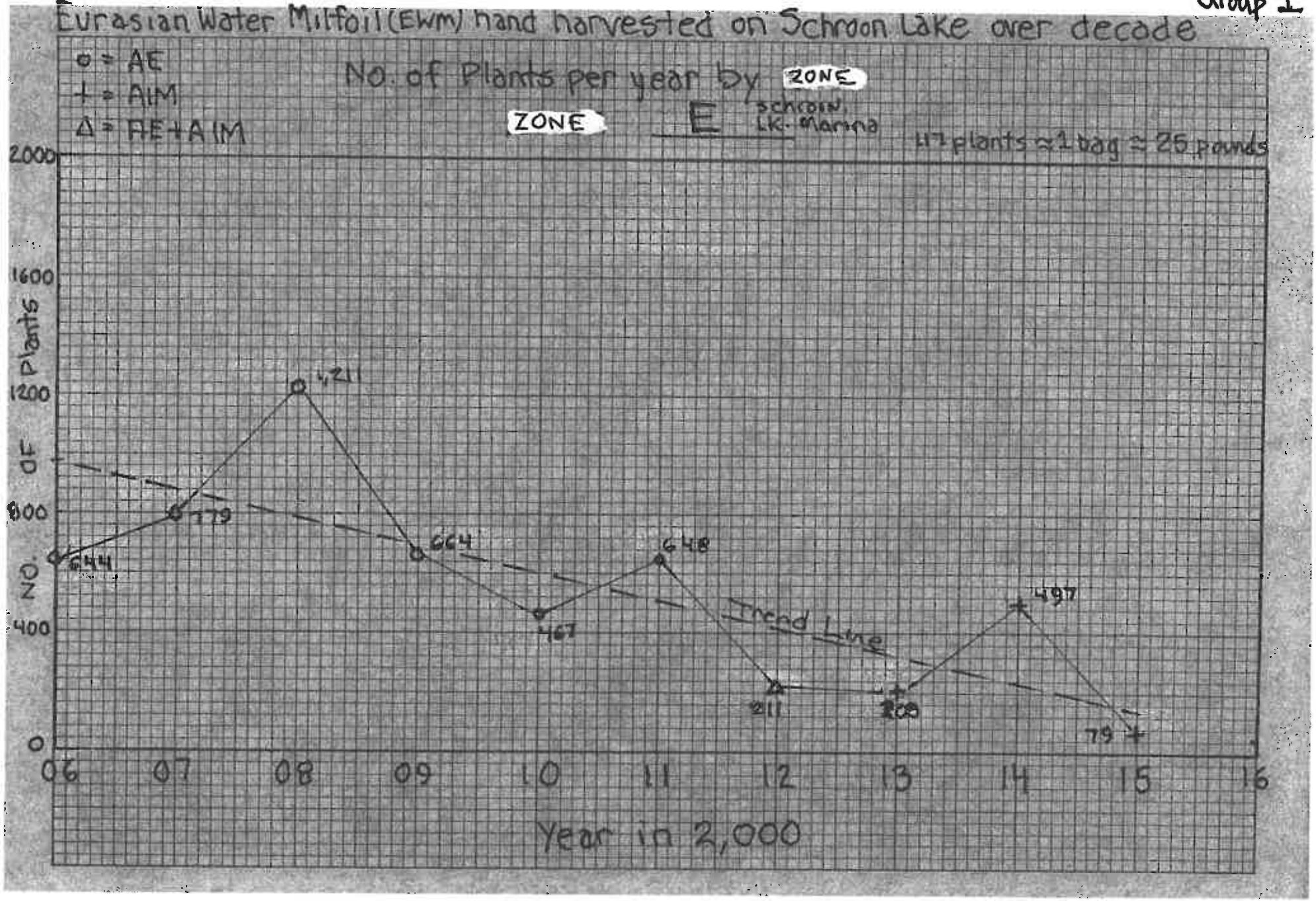
K

L

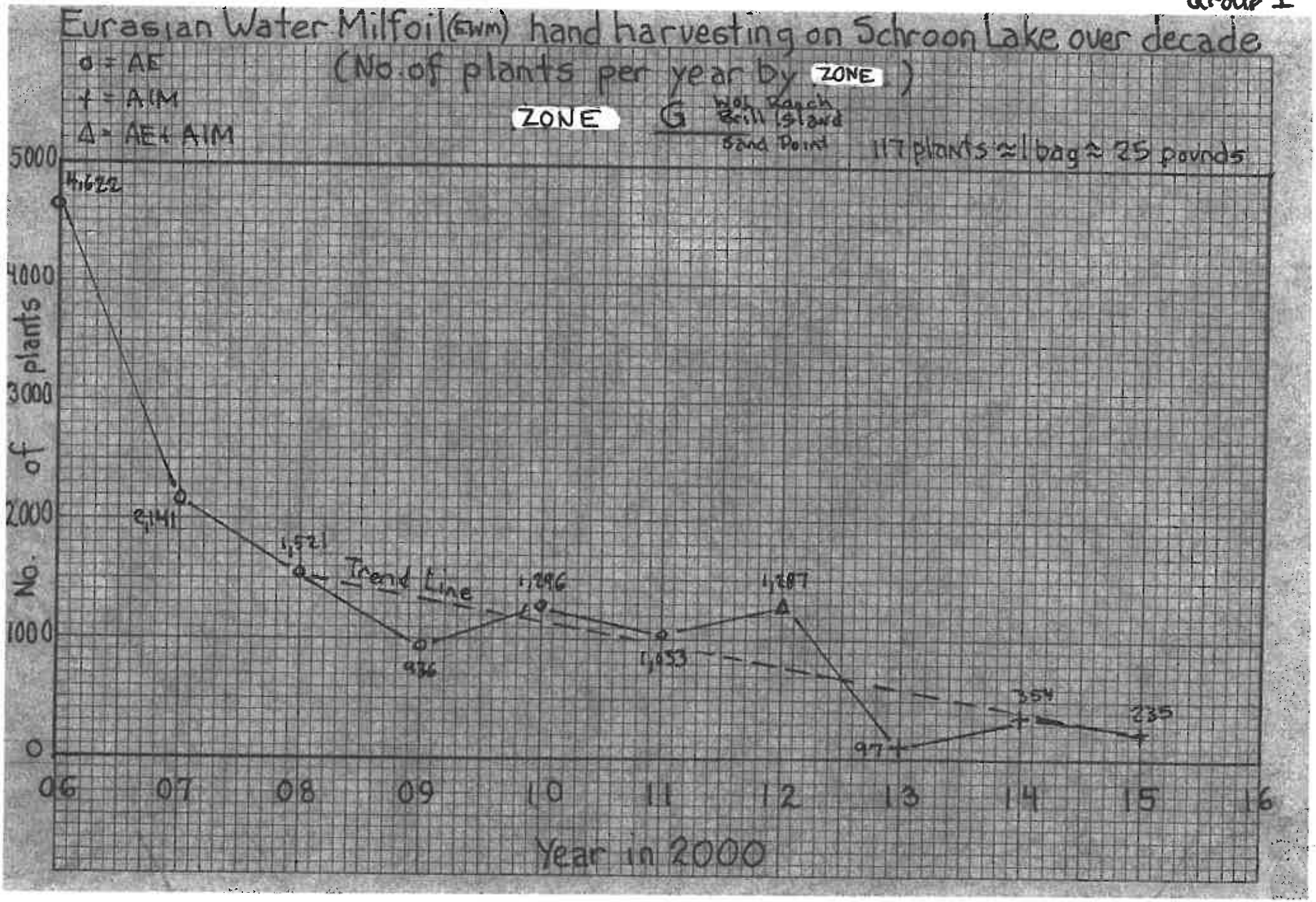
Group I


Eurasian Water Milfoil (EWM) hand harvested on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE + AIM
No. of Plants per Year by ZONE
ZONE A Lockwood Bay
117 plants ≈ 1 bag ≈ 25 pounds
NO. OF Plants
900
750
600
450
300
150
0
0
0
91
59
45
84
62
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

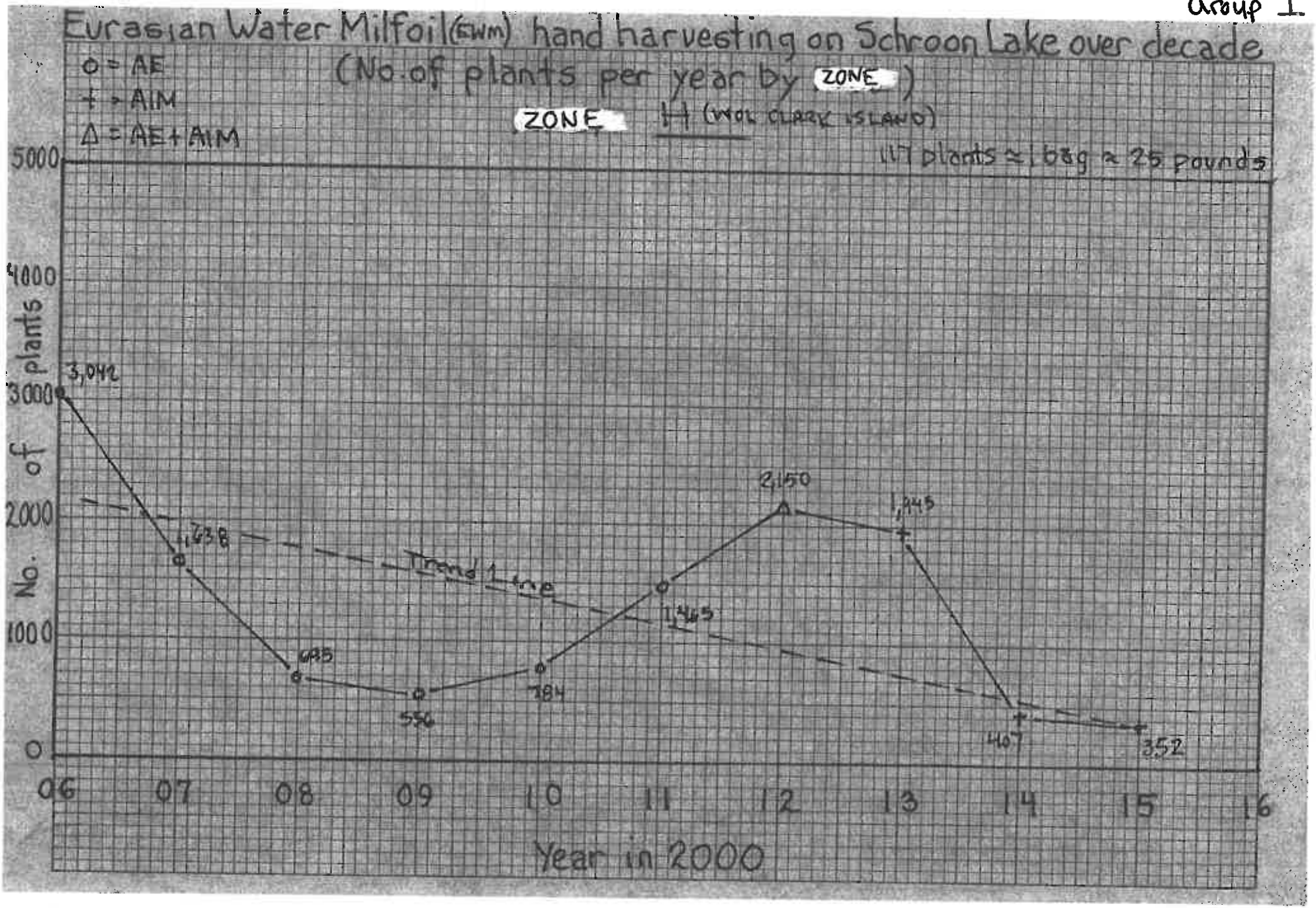
Group I


Eurasian Water Milfoil (EWM) hand harvested on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE+AIM
No. of Plants per year by ZONE
ZONE E Schroon Lk. Manna
47 plants ≈ 1 bag ≈ 25 pounds
2000
1600
1200
800
400
0
No. of Plants
644
779
1,211
664
467
648
211
200
497
79
Trend Line
06
07
08
09
10
11
12
13
14
15
16
Year in 2,000

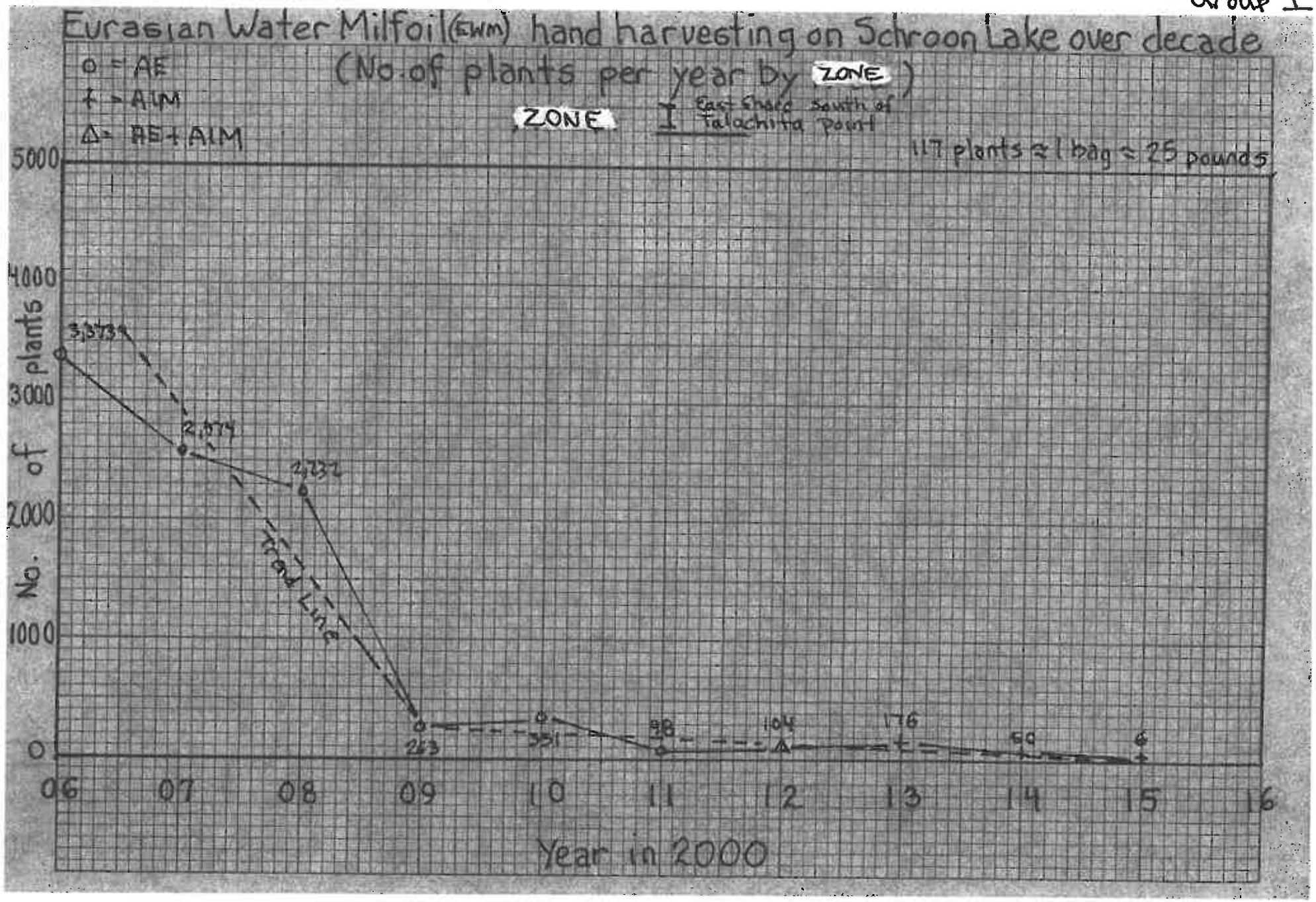
Group I


Eurasian Water Milfoil (EWM) hand harvesting on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE + AIM
(No. of plants per year by ZONE)
ZONE G Hot Ranch Bell Island Sand Point
117 plants ≈ 1 bag ≈ 25 pounds
5000
4000
3000
2000
1000
0
No. of plants
4,622
2,141
1,521
936
1,296
1,053
1,487
97
354
235
Trend Line
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

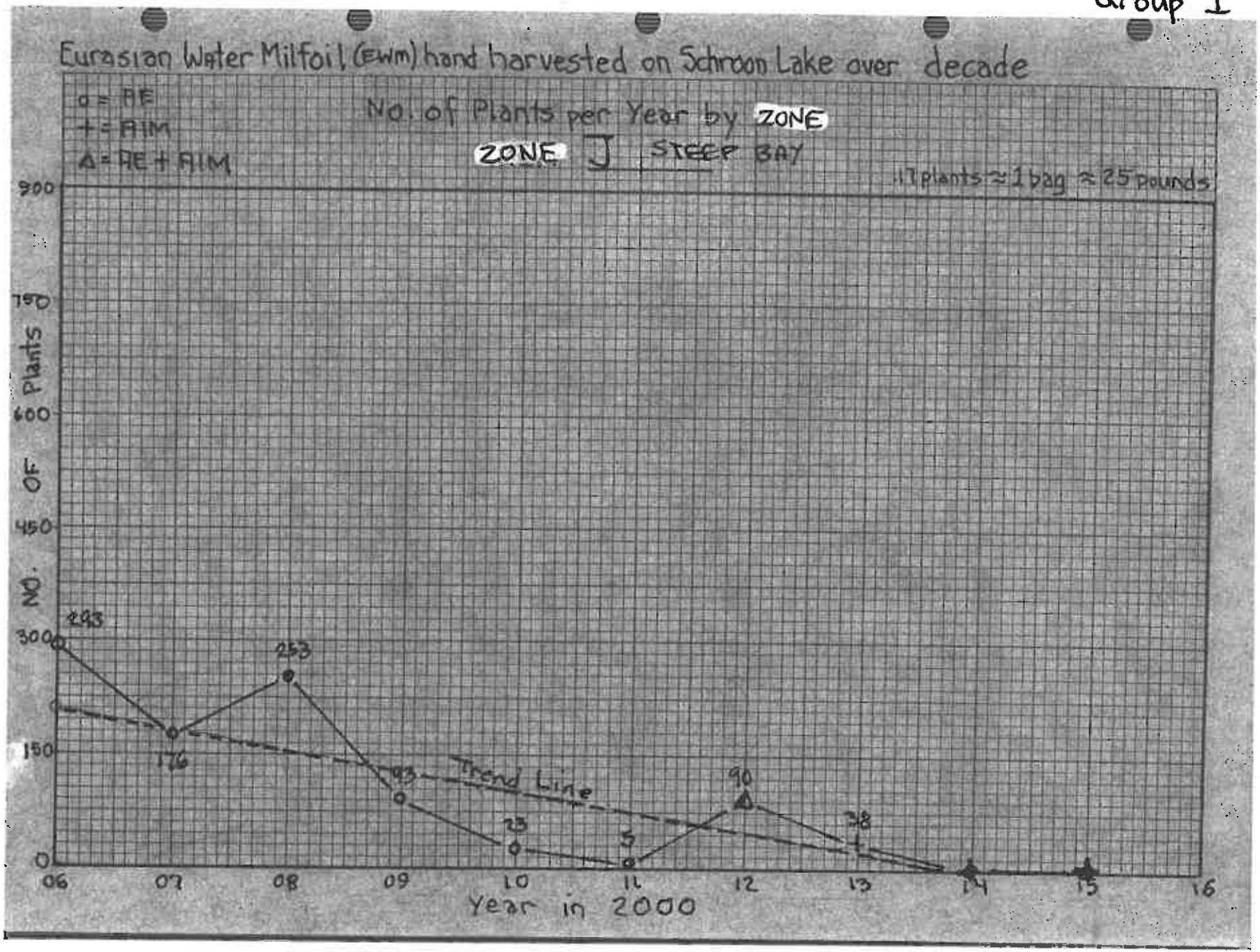
Group I


Eurasian Water Milfoil (EWM) hand harvesting on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE + AIM
(No. of plants per year by ZONE)
ZONE 11 (NOT CLARK ISLAND)
117 plants ≈ 1 bag ≈ 25 pounds
No. of plants
5000
4000
3000
2000
1000
0
3,042
1,638
685
556
784
2,150
1,745
1,345
407
352
Trend line
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

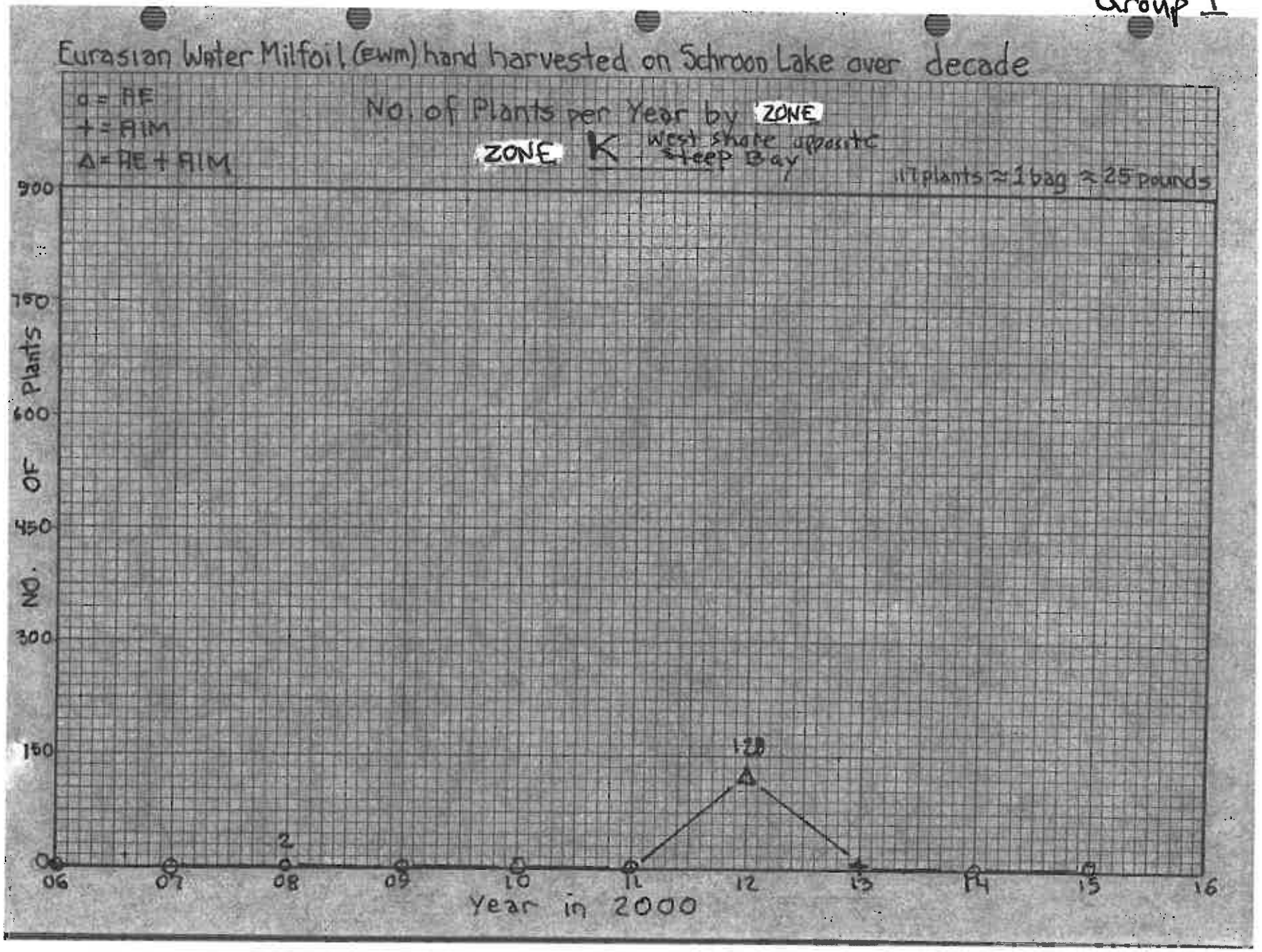
Group I


Eurasian Water Milfoil (EWM) hand harvesting on Schroon Lake over decade
(No. of plants per year by ZONE)
o = AE
+ = AIM
Δ = AE + AIM
ZONE I East Shore South of Talachita Point
117 plants ≈ 1 bag ≈ 25 pounds
No. of plants
5000
4000
3000
2000
1000
0
3,373
2,374
2,232
253
351
98
104
176
60
6
Trend Line
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

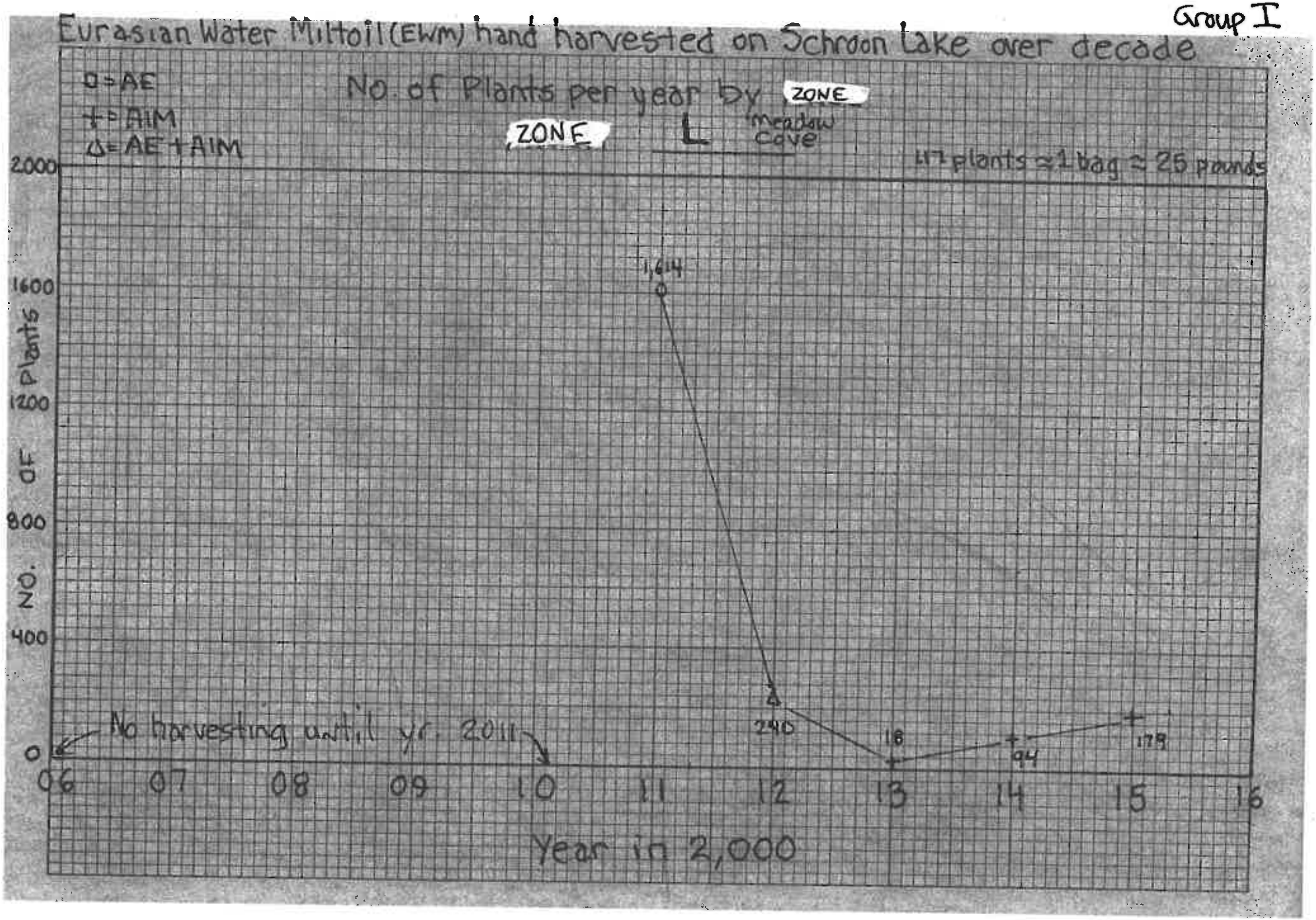
Group I


Eurasian Water Milfoil (EWM) hand harvested on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE + AIM
No. of Plants per Year by ZONE
ZONE J STEEP BAY
17 plants ≈ 1 bag ≈ 25 pounds
NO. OF Plants
900
750
600
450
300
150
0
293
253
176
93
23
3
90
28
Trend Line
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

Group I


Eurasian Water Milfoil (ewm) hand harvested on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE + AIM
No. of Plants per Year by ZONE
ZONE K west shore opposite Steep Bay
1 plants ≈ 1 bag ≈ 25 pounds
900
750
600
450
300
150
0
NO. OF Plants
2
128
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

Group I


Eurasian Water Miltoil (EWM) hand harvested on Schroon Lake over decade
□ = AE
+ = AIM
◇ = AE + AIM
No. of Plants per year by ZONE
ZONE L Meadow Cove
117 plants ≈ 1 bag ≈ 25 pounds
2000
1600
1200
800
400
0
NO. Plants
AE
1,614
290
16
94
179
No harvesting until yr. 2011
06
07
08
09
10
11
12
13
14
15
16
Year in 2,000

GRAPHS OF

GROUP 11

ZONES

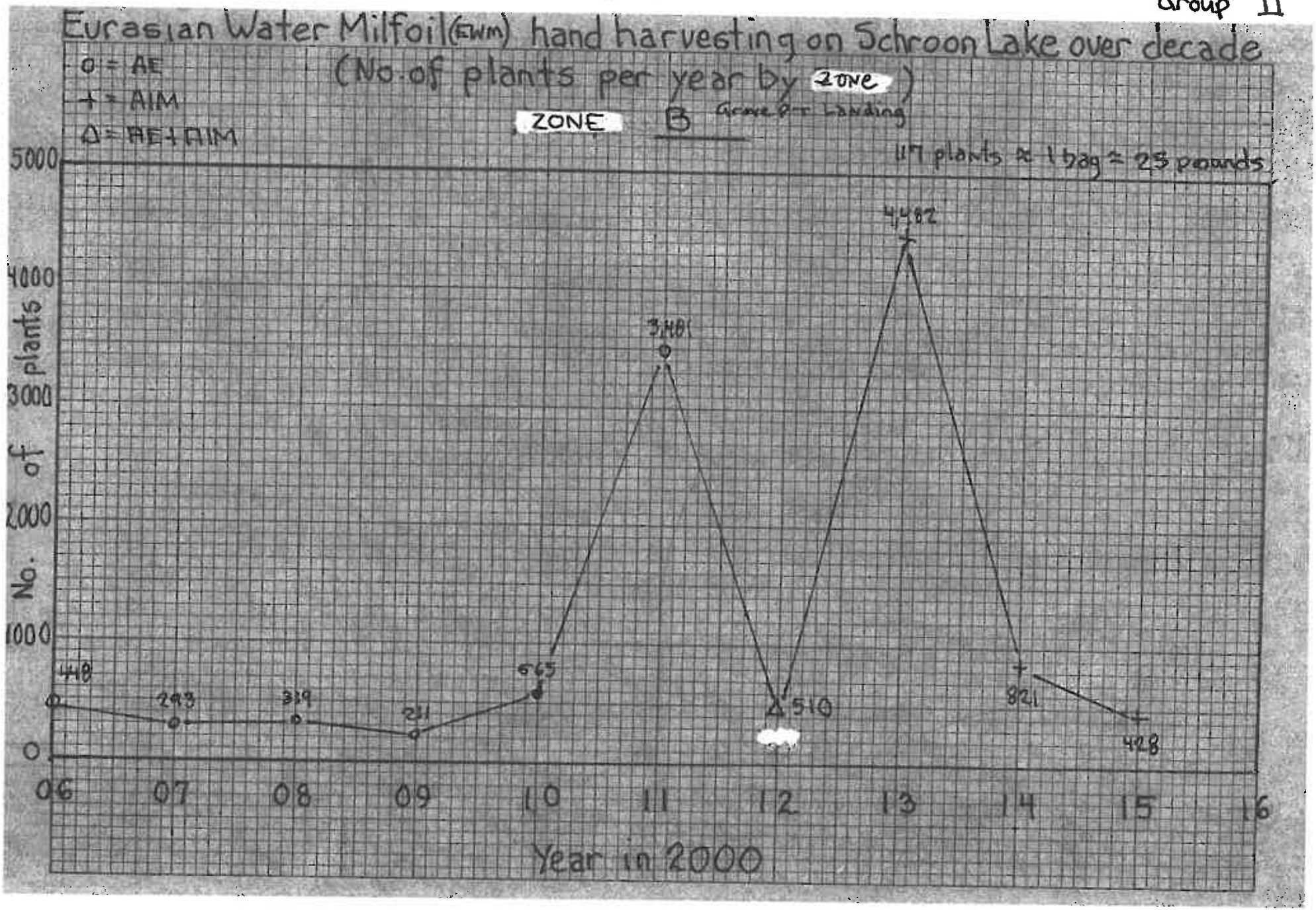
B

C

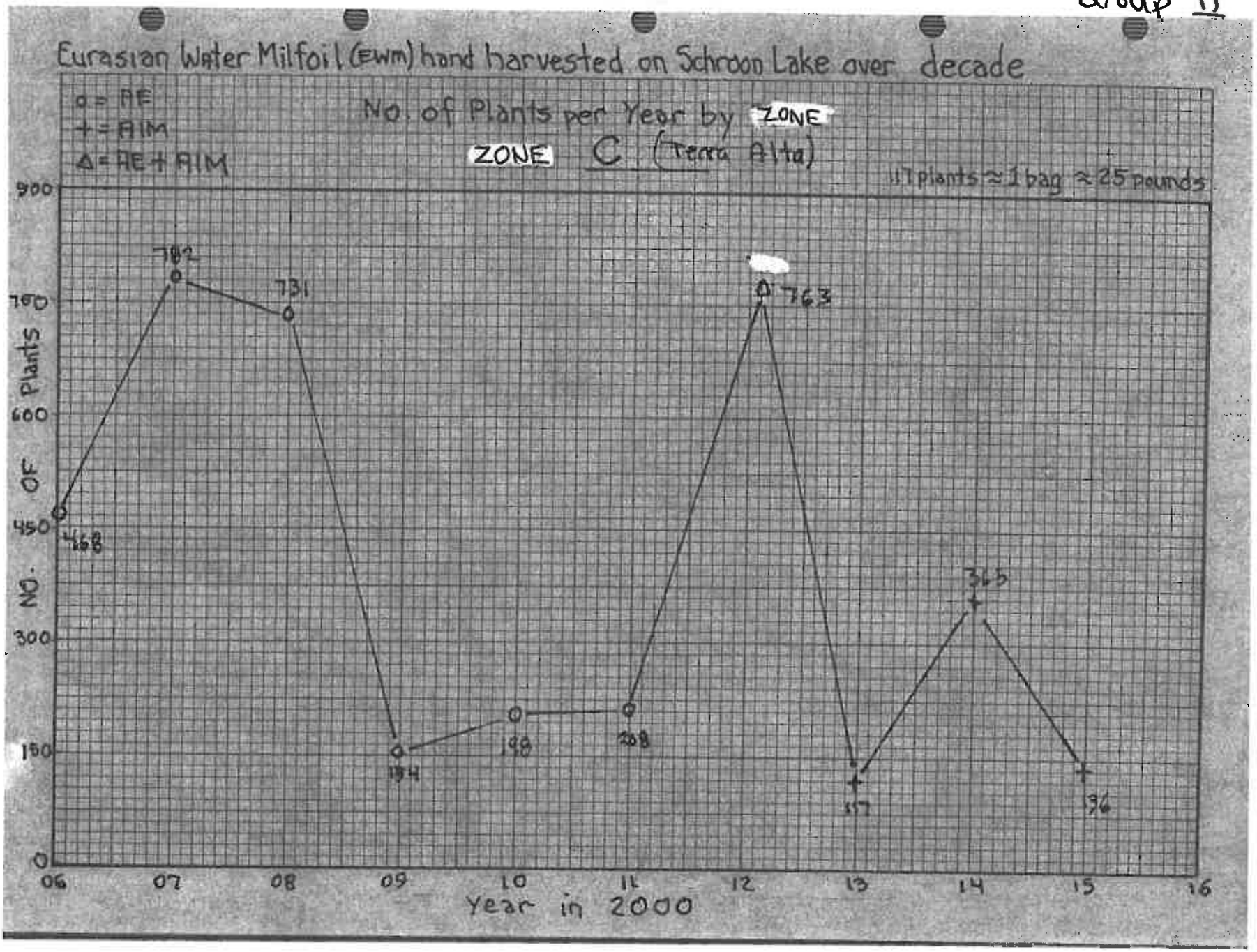
D

F

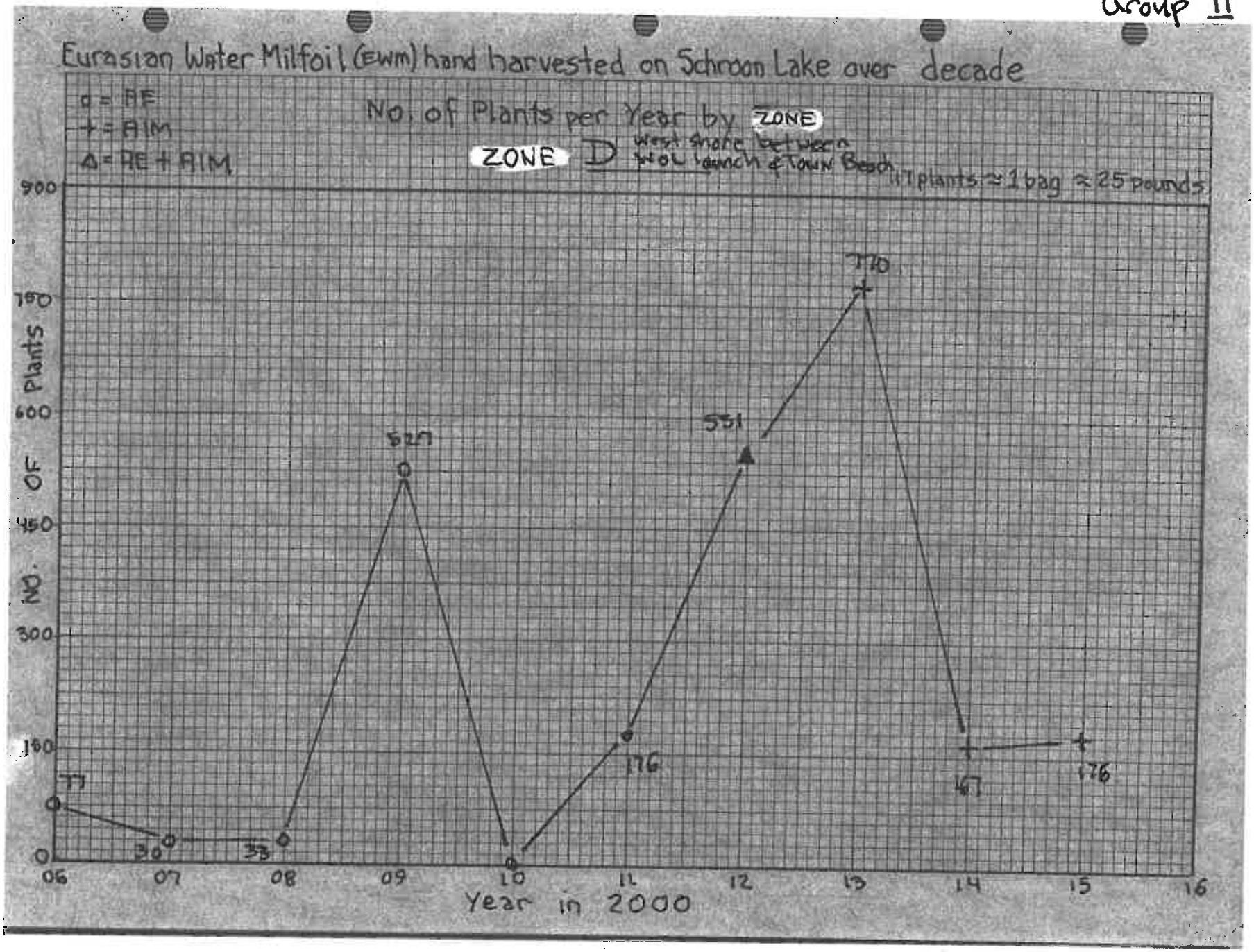
Group II


Eurasian Water Milfoil (EWM) hand harvesting on Schroon Lake over decade
(No. of plants per year by ZONE)
o = AE
+ = AIM
Δ = AE + AIM
ZONE B
Grove Pt Landing
117 plants ≈ 1 bag ≈ 25 pounds
No. of plants
5000
4000
3000
2000
1000
0
448
293
339
231
645
3,481
510
4,482
821
428
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

Group II


Eurasian Water Milfoil (Ewm) hand harvested on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE + AIM
No. of Plants per Year by ZONE
ZONE C (Terra Alta)
17 plants ≈ 1 bag ≈ 25 pounds
NO. OF Plants
900
750
600
450
300
150
0
782
731
468
134
198
208
763
365
157
196
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

Group II


Eurasian Water Milfoil (EWM) hand harvested on Schroon Lake over decade
o = RE
+ = RIM
Δ = RE + RIM
No. of Plants per Year by ZONE
ZONE D West shore between Pilot Knob Launch & Town Beach
1 plants ≈ 1 bag ≈ 25 pounds
No. of Plants
900
750
600
450
300
150
0
77
30
33
527
0
176
551
770
467
176
06
07
08
09
10
11
12
13
14
15
16
Year in 2000

Group II

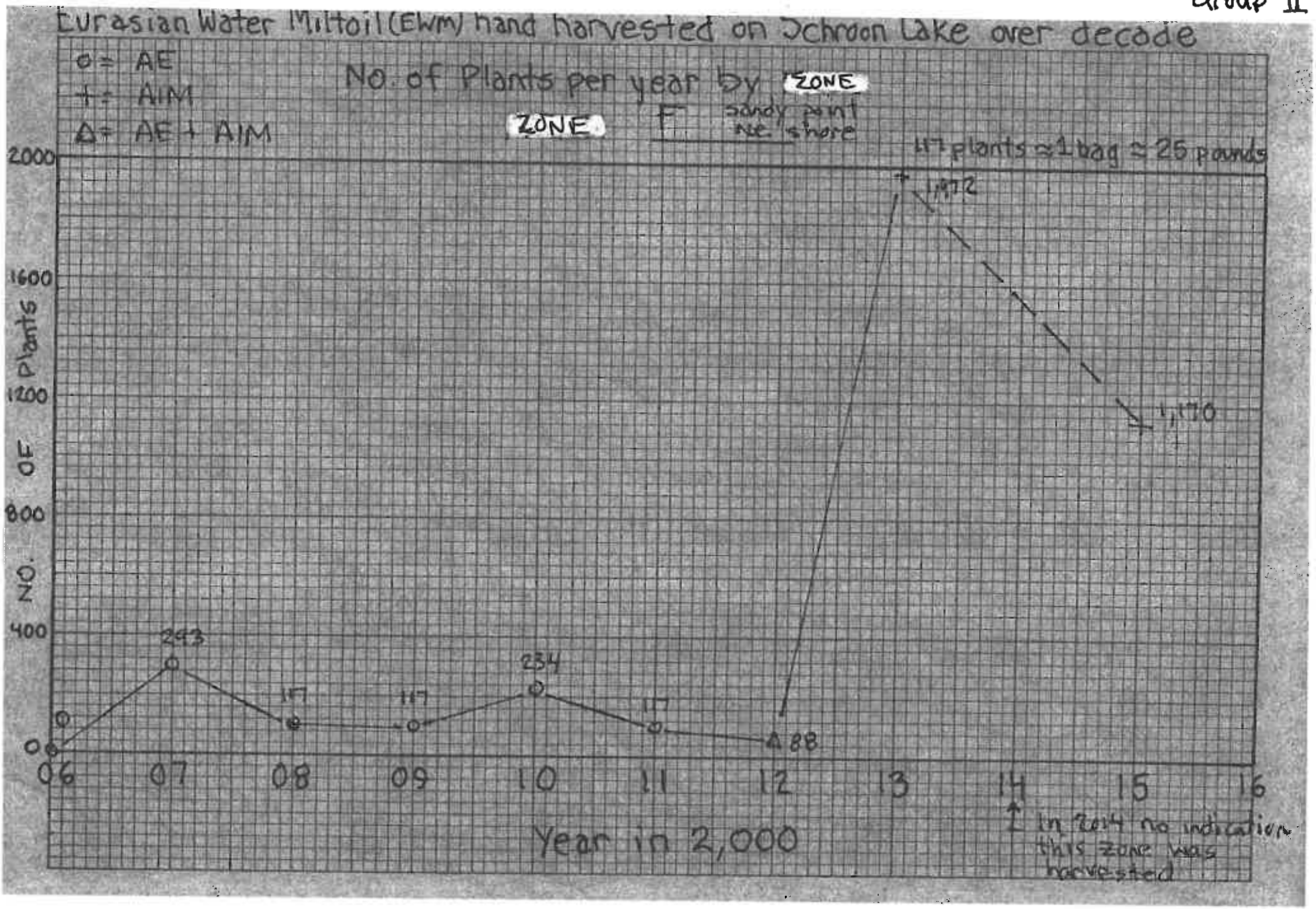

Eurasian Water Miltoil (EWM) hand harvested on Schroon Lake over decade
o = AE
+ = AIM
Δ = AE + AIM
No. of Plants per year by ZONE
ZONE F sandy point NE. shore
117 plants ≈ 1 bag ≈ 25 pounds
1,972
1,170
NO. Plants OF
2000
1600
1200
800
400
0
293
117
117
234
117
88
06
07
08
09
10
11
12
13
14
15
16
Year in 2,000
In 2014 no indication this zone was harvested

TABLE #1	GPS READINGS FOR AE NUMBERED SITES			
			GPS READINGS(min.)	
Site Name	#		N43degrees	W73degrees
Lockwood Bay	1	,1a	50.857(1) 50.854(1a)	45.066(1) 44.914(1a)
Mouth of Lockwood	2		50.743	44.89
Grove Point	3	,3a	49.484(3) 46.553(3a)	46.110(3) 46.168(3a)
Schroon Marina Nav. Canal	4		50.789	45.328
Terra Alta	5a	,5b	50.716(5a) 50.690(5b)	45.161(5a) 45.220(5b)
Terra Alta	6	,6a	50.664	45.224
Rogers Brook	7		50.009	45.736
Mouth of Landings	8		49.774	46.155
Landings navigation canal	8a		49.7	46.3
South of Town Launch	9		50.034	45.648
Sandy Point	10		48.791	46.075
WOL Ranch	11	,12,13	44.096	48.333
Clark Island Launch	14	,15	49.518(14) 49.495(15)	45.05(14) 45.020(15)
Clark Island Shoreline	16		49.673	44.918
Clark Is. Downed Tree	17		49.666	44.939
East Shore	18	,19,20	49.704(18) 49.733(19) 49.755(20)	44.819(18) 44.809(19) 44.805(20)
Eastern Shore	21		49.922	44.806
Eastern Shore		21a	49.906	44.782
Bay south of Talachita Pt.	22	,23,24	50.042(22) 50.071(23) 50.098(24)	44.671(22) 44.658(23) 44.661(24)
Offshore of small penisula	25		52.346	45.123
Steep Head Bay	26	,27	50.253(26) 50.269(27)	44.480(26) 44.466(27)
ADK Lodges	28		45.833	45.575
North Shore	29		50.736	45.01
Town Boat Launch	30		50.079	45.559
Shore south of Steep Bay	31		50.229	44.598
Northern tip of Clark Island	32		49.859	44.997
WOL Launch	33		49.967	45.822
Brill Island	34		44.3	48.15
WOL Island Bay	35		49.546	45.275
Blue Sky Estates boat dock	36		44.524	47.103
Off Town Beach	37		50.078	45.51
Meadow Cove	38	(new)	49.156	44.771