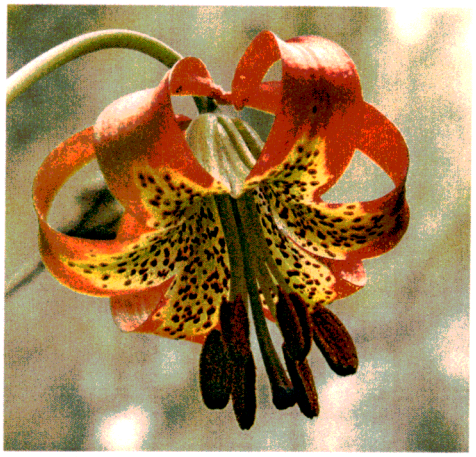

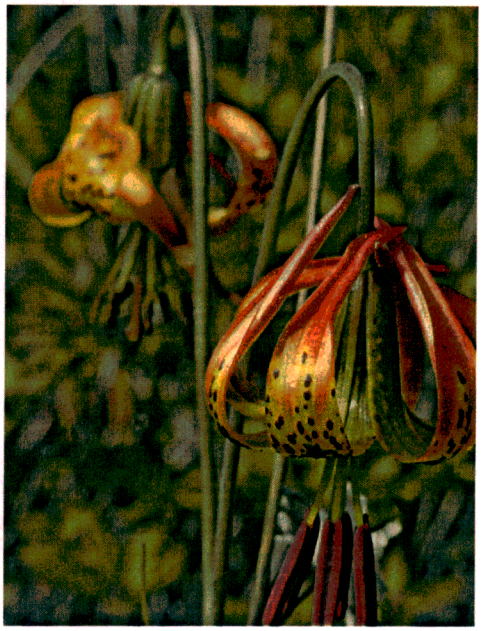

CRESCENT CITY MARSH WILDLIFE AREA

DEL NORTE COUNTY, AND

TABLE BLUFF ECOLOGICAL RESERVE

HUMBOLDT COUNTY, CALIFORNIA

CALIFORNIA DEPARTMENT OF FISH AND GAME

2002 STATUS REPORT
WESTERN LILY VEGETATION STRATEGY

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Prepared Under Interagency Agreement
California State University/Dept. of Fish and Game

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Clockwise from left: Western Lily at CCMWA,
Western Lily at TBER,
Western Lily at CCMWA

1.0 INTRODUCTION

This report summarizes the results for monitoring and other tasks conducted for the Western Lily (*Lilium occidentale*) Vegetation Strategy Project, implemented in June 1998 at the Table Bluff Ecological Reserve (TBER) and Crescent City Marsh Wildlife Area (CCMWA). Tasks completed over the past five years include data collection from previously established vegetation transects and sampling of life history plots intended to further our understanding of the ecology of the western lily, and assess the efficacy of manual treatment and cattle grazing for maintaining its habitat. Since many elements of the study involve long term processes (e.g., western lily recruitment, gradual modification of habitat), extended monitoring is necessary in order to gain meaningful information, and thus, this study was designed to continue beyond the current schedule, perhaps for a decade or more.

Included in this report is a summary of the data from the annual monitorings conducted from1998-2002, as well as, conclusions obtained from 5 years of observations and experimental manipulations. This year concludes the final season funded through Section 6 of the Endangered Species Act. Although this funding was discontinued, limited additional funds provided by U.S. Fish & Wildlife Service will allow for the continued monitoring of the life history plots at both TBER and CCMWA, as well as, the census at CCMWA for the 2003 season. Future funds needed to accomplish the long-term goals of this study are being requested for 2004-2007.

2.0 BACKGROUND AND STUDY OBJECTIVES

2.1 TABLE BLUFF ECOLOGICAL RESERVE

Formal monitoring of the western lily population at TBER began in 1987 (Map 1). Annual monitoring at this and other sites on Table Bluff documented often severe browsing by deer or small mammals, resulting in loss of 50% or more of the reproductive effort in some years (Imper and Sawyer, 2001b). With the exception of the limited monitoring at the Christensen and Barry sites on Table Bluff in the early 1990's, and monitoring conducted by The Nature Conservancy at their Bastendorf Reserve near Coos Bay, Oregon, there has been no intensive effort previously to determine the actual annual loss to deer and small mammals, or to investigate methods for discouraging mammal depredation. The ability of this plant to remain dormant for one or more years complicates investigation of browsing impacts. As a result, investigation intended to model the population demographics and various external factors affecting survival must necessarily track the life history of a large number of seedlings throughout the growing season, and over multiple years.

The monitoring at TBER since 1987 also documented an increasing threat to the lily as a result of plant growth following removal of cattle. In addition, removal of approximately 50% of the spruce forest further encouraged plant growth on the forest floor, exacerbating the need for vegetation management. Although the removal of spruce allowed many juvenile lily plants to mature, the release caused by tree canopy removal also appeared to eliminate many preexisting lily plants (seedlings, juveniles, and adults).

Whether lily recruitment at TBER is adequate to maintain or expand the existing population was also unclear. Seed plots established in fall 1993 as part of the Experimental Habitat Manipulation Project exhibited virtually no survival of seedlings in the *Coastal prairie*, and relatively low survival in the *Spruce forest* (Imper & Sawyer, 1994). In contrast, abundant seedlings have been documented growing in pedestrian cattle trails at the reserve, and in old cattle trails at another site on Table Bluff. We do not know if these seedlings eventually will mature. There is evidence, however, that

exclusion of cattle from the lily habitat between 1987 and 1996 negatively impacted both lily seedling recruitment and the longevity of mature plants. Consequently, passive cattle grazing has been introduced into the entire lily habitat at TBER for the past 7 years. Other than vegetation transect data collected prior to reintroduction of grazing, and data collected in this study, there has been no past quantitative study of the impacts of cattle grazing on vegetation, soil compaction, or lily recruitment.

The investigation at TBER is generally aimed at quantifying both the beneficial and negative impacts of cattle grazing applied at varying intensities and duration, as a method for maintenance of vegetation in western lily habitat. That information is critical to development of a formal grazing plan for TBER, and should be applicable to many other western lily sites throughout the range.

The principal study objectives at TBER are to:

- assess the impacts of cattle grazing applied at different intensities and durations upon vegetation composition and structure, soil compaction, and recruitment by the lily, and
- determine quantitative impacts of natural browsing on the western lily, and the effect of deer and small mammal fencing and chemical inhibitors in reducing natural browsing.
- Secondary objectives include further definition of the life history of the lily, and determination of whether cattle ingestion of the lily seed, under controlled conditions, is a successful mode of recruitment.

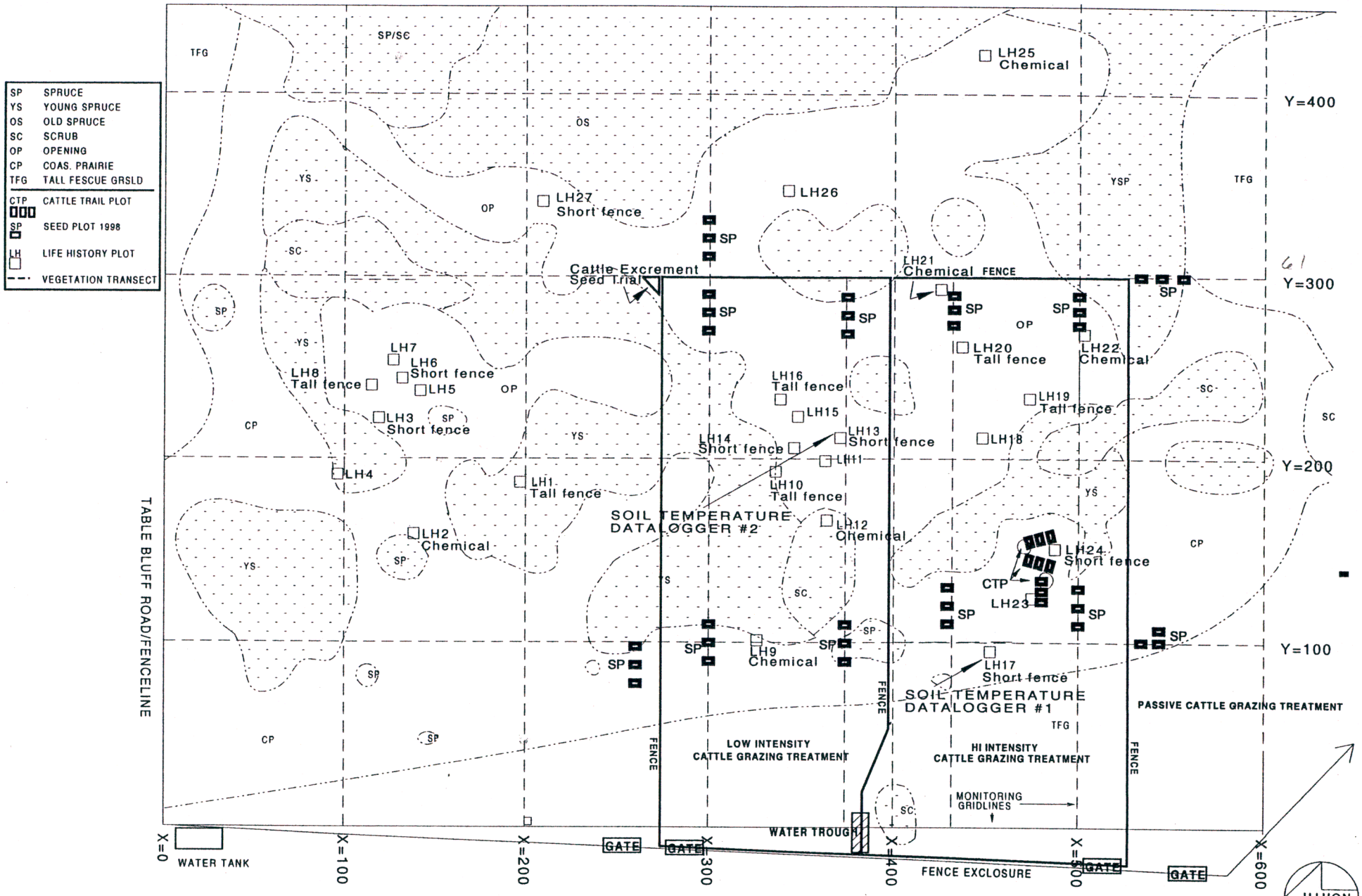
2.2 CRESCENT CITY MARSH WILDLIFE AREA

Formal monitoring of the western lily population in the north part of the CCMWA ("North" and "South" Marshes) was implemented in 1997 (Map 2; Imper and Sawyer, 1992, 1997). The CCMWA population is the largest population known, yet has been one of the least studied. Until this study, there had been no detailed investigation of the life history, recruitment and population demographics, and browsing impacts for the western lily at any of the populations near Crescent City. The critical importance of the CCMWA population to the species (50% or more of all known flowering plants) warrants a greater understanding of natural browsing impacts, as well as, the general life history of this population.

Past monitoring at sites on Table Bluff and in southern Oregon indicate the principal threat to the western lily is encroachment by trees and shrubs (USFWS, 1998). At the CCMWA, even a slow growth rate may be cause for alarm, due to the exponential relationship between lateral growth and aerial cover, particularly in light of the expanding "islands" of shrubs and trees (seedlings and saplings) now scattered throughout the marsh.

The principal objectives of this investigation at CCMWA are therefore to:

- characterize the current state of the western lily population and its habitat,
- monitor the rate of vegetation encroachment and its impact on the lily,
- determine the efficacy of manual vegetation removal for maintaining the habitat in a suitable condition for the lily,
- assess the historical impact of cattle grazing in western lily habitat on the reserve, and
- determine the relative impacts of natural browsing and the effect of deer and small mammal fencing in reducing natural browsing.
- Secondary objectives are to increase our knowledge of the life history of the largest known population of western lily and to develop a quantitative estimate of current recruitment.



MAP 1. CURRENT VEGETATION, LIFE HISTORY PLOTS (LH1-27), CATTLE TRAIL PLOTS, SOIL TEMPERATURE LOGGERS, SEED PLOTS, SEASONAL GRAZING TREATMENTS, LH PLOT TREATMENTS, AND VEGETATION TRANSECTS, TBER 2001

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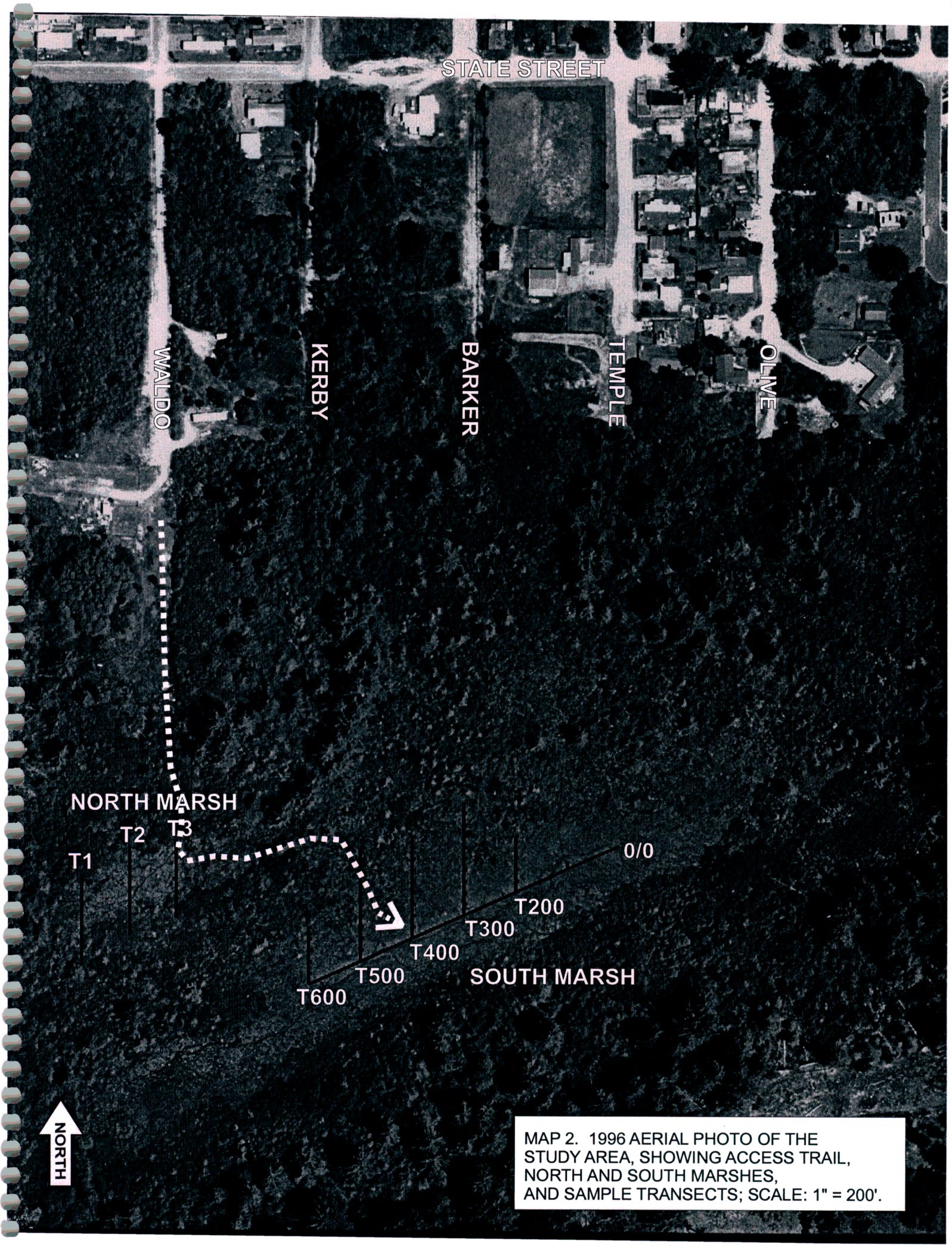


MAP 2. 1996 AERIAL PHOTO OF THE STUDY AREA, SHOWING ACCESS TRAIL, NORTH AND SOUTH MARSHES, AND SAMPLE TRANSECTS; SCALE: 1" = 200'.

TABLE 1. LOCATIONAL COORDINATES OF LIFE HISTORY PLOTS (LH), CATTLE TRAIL PLOTS, SEED PLOTS AND VEGETATION TRANSECT (MAP 1) AND PHOTOPOINTS, TBER.

Location	Plot ID	Cattle grazing treatment	LH Plot treatment	X/Y Coordinates		
Life	1	passive	Tall fence	200/184		
History	2	passive	Chemical	141/156		
Plots	3	passive	Short fence	122/219		
(SW corner)	4	passive	Tall fence	99/188		
	5	passive		145/234		
	6	passive	Short fence	135/241		
	7	passive		130/251		
	8	passive	Tall fence	118/237		
	9	no. enclosure	Chemical	329/98		
	10	no. enclosure	Tall fence	339/190		
	11	no. enclosure		366/196		
	12	no. enclosure	Chemical	367/163.5		
	13	no. enclosure	Short fence	374/208.5		
	14	no. enclosure	Short fence	349/203		
	15	no. enclosure		351/220		
	16	no. enclosure	Tall fence	341.5/229.5		
	17	so. enclosure	Short fence	455/92		
	18	so. enclosure		450.5/208.5		
	19	so. enclosure	Tall fence	476/230		
	20	so. enclosure	Tall fence	439.5/258.5		
	21	so. enclosure	Chemical	428/290		
	22	so. enclosure	Chemical	505.5/265.5		
	23	so. enclosure		477.5/121		
	24	so. enclosure	Short fence	490/148		
	25	passive	Chemical	451/418.5		
	26	passive		345.5/344		
	27	passive	Short fence	212/338		
Location	Plot ID	Cattle Grazing Treatment		X/Y Coordinates		
Seed Plots						
(NW corner)		so. enclosure		430/110	430/120	430/130
		so. enclosure		430/280	430/285	430/290
		so. enclosure		500/110	500/120	500/130
		so. enclosure		500/274	500/280	500/288
		no. enclosure		300/90	300/100	300/110
		no. enclosure		300/270	300/279	300/290
		no. enclosure		375/90	375/100	375/110
		no. enclosure		375/270	375/282	375/290
		passive		260/80	260/90	260/100
		passive		300/310	300/320	300/330
		passive		535/300	540/300	550/300
		passive		535/100	540/100	540/105
Cattle Trail	#1	so. enclosure		479/130		
Plots	#2	so. enclosure		477/142		
(SW corner)	#3	so. enclosure		478/155		

Notes: Coordinates fo Life History Plots = SW corner (rebar @ diag. corners); for Cattle Trail Plots = SW corner (rebar @ diag. corners) of center 3' x 3' plot; lateral 3' x 3' plots are oriented relative to center plot as follows:#1-90d;#2-20d;#3-356d.

Coordinates for Seed Plots = NW corner (rebar stake) of 12" x 12" plot, 50 seed planted ea. plot 10/6/98.

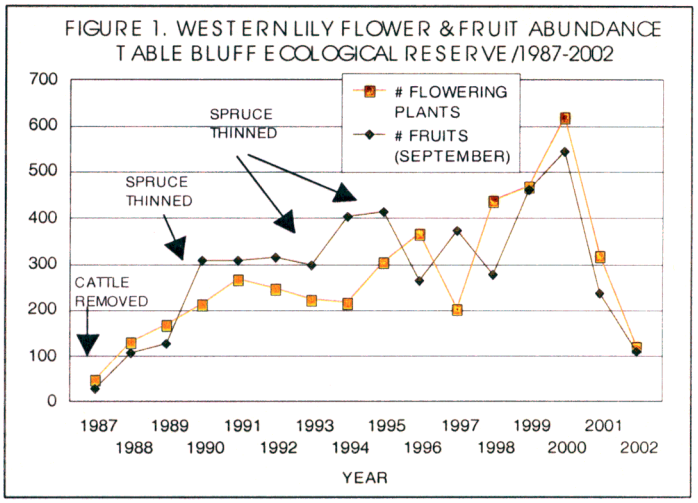
TABLE 1. CONTINUED

Vegetation Transects	Cattle Grazing Treatment		X/Y Coordinates
(General habitat	passive		Y=100; X=0-270, 530-600
and grazing trtmt	passive		Y=200; X=0-270, 530-600
characterization)	passive		Y=300; X=0-600
	passive		Y=400; X=0-600
	passive		X=100; Y=0-450
	passive		X=200; Y=0-450
	passive		X=300; Y=300-450
	passive		X=400; Y=300-450
	passive		X=500; Y=300-450
	no. enclosure		Y=100; X=270-400
	no. enclosure		Y=200; X=270-400
	no. enclosure		X=300; Y=0-300
	no. enclosure		X=375; Y=0-300
	so. enclosure		Y=100; X=400-530
	so. enclosure		Y=200; X=400-530
	so. enclosure		X=500; Y=0-300
	so. enclosure		X=430; Y=0-300

Photopoints	Cattle Grazing Treatment	Orientation	X/Y Coordinates	
General habitat		S	00/00	
(historical photopts)		S	00/50	
		E,S	200/100	
		S,W	400/100	
		E,N	470/100	
		E	125/200	(north glade)
		E,S,N	200/200	
		E,S	200/300	
		S,W	400/200	
		S,W	400/300	
		S,W	200/400	
		S,W,N	400/400	
		E,W	350/200	(south glade)
		E	170/35	(1994 mow trtmt)
		E	235/30	(1994 grzg trtmt)
		E	305/40	4 burn trtmt-unburned)
Grazing treatments	no. enclosure	S	270/100	
(added 10/8/98)	no. enclosure	S	270/200	
	no. enclosure	W	300/300	
	no. enclosure	W	360/300	
	no./so. enclos.	N,S	400/200	
	no./so. enclos.	N,S	400/100	
	no. enclosure	E	330/0	
	so. enclosure	E	460/0	
	so. enclosure	N	530/100	
	so. enclosure	N	530/200	
	so. enclosure	W	470/300	

3.0 TABLE BLUFF ECOLOGICAL RESERVE

3.1 Western Lily Population Status



A census of the entire population at TBER was conducted between 1987 and 1992, after which the annual census has generally been limited to flowering plants (Bencie and Imper, 2003). The number of flowering plants at the reserve has increased from 49 in 1987 to a peak of 620 in 2000 (Figure 1). However in 2001, the number of flowering plants decreased by nearly half. In 2002, only 120 flowering plants were recorded, a decline of 62% from 2001 (Imper and Sawyer, 2002). The severe drop in number of flowering plants appears primarily due to deer browsing. This season, at least 369 additional mature plants were present at census that likely would have flowered, but instead had been grazed. Our estimate of a ~75% browsing rate (369/489) is conservative if we consider that some mature, grazed plants either died back before the census or were overlooked during the census.

Although the entire population at TBER was not censused, a total of 2,226 plants were mapped and recorded this year inside LH monitoring plots (described below), including 1,690 seedlings and 536 mature (multi-leaved) plants (Table 2A). The height distribution from LH plots indicates the dominant size class of mature plants is the juveniles less than 12" tall (Figure 2). These plots occupy 970 square feet (sf) of the 5 acres of habitat, and although the sample plots were subjectively located in areas with a high density of lily, we can assume the total population estimate to be more than 5,000 individuals. Transplant sites located elsewhere on the reserve contain an additional 139 mature plants and 136 seedlings that were out-planted using seeds and bulbs propagated in the greenhouse (Bencie and Imper, 2003).

Most adult plants (both grazed and ungrazed) were located within openings in *Spruce forest*, created previously by manual thinning and sustained via continued annual grazing and minor thinning events (Bencie and Imper, 2003). Many of the plants able to escape browsing and produce flowers were located within Tall-Fence plots, a treatment type monitored for browsing inhibitor comparisons (described below). Flowering plants located outside Tall-Fence plots generally were camouflaged or hidden from grazers by dense vegetation.

3.2 Experimental Restrictions on Natural Browsing and Seasonal Cattle Grazing

Fencing and Natural Browsing Inhibitor Treatments: In June, 1998, twenty-seven $6ft^2$ plots, referred to as "Life History (LH) Plots", were permanently marked and allocated equally among the three seasonal cattle grazing treatment areas described below (Map 1). The southwest and northeast corner of each plot was staked with rebar; plot identification, grazing treatment, and grid coordinates of the southwest corner are given in Table 1. In order to coincide with the overall grid coordinate system for the reserve, the X/Y coordinates recorded on the data sheets for each plot utilized the northwest corner as the origin (Appendix A). Within each grazing treatment, the plots were located in order to maximize the number of mature lilies (multi-leaved) and seedlings (single-leaf), and still provide representation throughout the treatment areas. In March of 1999 through 2002, prior to emergence of the lily, the 27 plots were treated as follows:

TABLE 2A. SUMMARY STATISTICS FOR WESTERN LILY IN 27 LIFE HISTORY PLOTS, 1998-2002
TABLE BLUFF ECOLOGICAL RESERVE

OVERALL LIFE HISTORY (LH) PLOTS (27-6' sq.; 972	1998	1999	2000	2001	2002
Total LIOC seedlings sampled (single leaf)	274	467	789	1008	1690
#LIOC seedlings sampled per sf*	0.3	0.5	0.8	1	1.7
Total non-seedling plants sampled	314	496	526	570	536
Mean ht non-seedling (non-grazed) plants (in)	21	17	20	18	11
% incidence mammal grazing (plts still visible at census)	3	4	4	7	8
% incidence insect/slug grazing (plts still visible at census)	4	0	0	<1	<1
% incidence disease (plts still visible at census)	0	0	0	0	0
Total %plants missing at census time		11	1	7	39
#Seedlings missing at census		91	13	77	596
%Seedlings missing at census		19	2	8	35
#Mature plants missing at census		12	5	34	272
%Mature plants missing at census		2	1	6	51

FLOWERING PLANTS ALL LH PLOTS	1998	1999	2000	2001	2002
Total LIOC flowering	106	131	171	123	65
Mean #flowers	2.3	4.0	2.7	2.7	2.1
Maximum #flwrs	13	12	18	18	7
Maximum ht (in)	66	61	66	70	76

	DATE	6/18/98	7/8/99	6/15/00	6/28/01	7/01/02
Phenology	Bud	93	53	86	58	64
(from complete population census data; %flowering plar	Flower	6	41	14	33	33
	Fruit	0	6	0	8	3

EMERGENCE	1999		2000		2001		2002
%Sdlings emerge 3/20-4/2	0	%Sdlings emerge prior 3/17	8	%Sdlings emerge prior 3/22	17	%Sdlings prior 4/01	24
%Sdlings emerge 4/2-4/16	52	%Sdlings emerge 3/17-4/15	75	%Sdlings emerge 3/22-4/19	65	%Sdlings 4/01-5/01	41
%Sdlings emerge 4/16-5/7	39	%Sdlings emerge 4/15-5/13	13	%Sdlings emerge 4/19-5/17	16	%Sdlings 5/01-5/22	24
%Sdlings emerge 5/7-6/18	9	%Sdlings emerge 5/13-6/14	3	%Sdlings emerge 5/17-6/20	2	%Sdlings 5/22-7/1	11
%mature emerge 3/20-4/2	1	%mature emerge prior 3/17	2	%mature emerge prior 3/22	7	%mature prior 4/01	17
%mature emerge 4/2-4/16	35	%mature emerge 3/17-4/15	66	%mature emerge 3/22-4/19	63	%mature 4/01-5/01	62
%mature emerge 4/16-5/7	41	%mature emerge 4/15-5/13	29	%mature emerge 4/19-5/17	28	%mature 5/01-5/22	16
%mature emerge 5/7-6/18	24	%mature emerge 5/13-6/14	3	%mature emerge 5/17-6/20	2	%mature 5/22-7/01	5

COMPARISON AMONG BROWSING INHIBITOR TREATMENTS

Treatment (LH Plots)	*Tall Fence*	*Short Fence*	*Chemical*	*Control*
1998 (pre-treatment)				
#seedling (present at census)	65	71	64	67
#mature plants (present at census)	77	102	42	91
%mature plants present at June census & mammal graze	1	10	10	3
1999				
#seedling (total emerging)	105	127	90	145
%seedling present at June census	54*	69*	97	100
#mature plants (total emerging)	113	150	50	183
%mature plants present at June census	97	99	96	97
%mature plants mammal grazed	3	11	16	10
%mature plants missing at June census or grazed	5	11	20	13
2000				
#seedling (total emerging)	173	238	140	238
%seedling present at June census	100	100	95	97
#mature plants (total emerging)	115	177	48	186
%mature plants present at June census	99	100	98	98
%mature plants mammal grazed	3	10	19	14
%mature plants missing at June census or grazed	4	10	21	16
2001				
#seedling (total emerging)	260	332	135	281
%seedling present at June census	96	95	92	87
#mature plants (total emerging)	125	189	62	194
%mature plants present at June census	91	94	95	96
%mature plants mammal grazed	4	16	34	29
%mature plants missing at June census or grazed	13	23	39	33
2002				
#seedling (total emerging)	574	545	223	347
%seedling present at June census	63	75	51	61
#mature plants (total emerging)	110	192	45	188
%mature plants present at June census	72	40	47	47
%mature plants mammal grazed	9	41	31	37
%mature plants missing at June census or grazed	28	61	53	53

*Seedling loss for tall & short fence trtmnts in 1999 due to loss of one group of seedlings in one plot within the 2 treatments, and is not representative.

TABLE 2A. CONTINUED
TABLE BLUFF ECOLOGICAL RESERVE

COMPARISON AMONG GRAZING TREATMENTS (~1 acre cells)

LH Plots by Treatment	*Passive grazing*	*Lo Intensity*	*Hi Intensity*
1998 (treatments not yet implemented)			
#seedling (present at census)	100	65	109
#mature plants (present at census)	116	122	89
#flowering plants	41	25	40
Mean ht mature plants not grazed (in)	23	18	16
1999			
#seedling (total emerging)	167	89	211
%seedling present at June census	97	99	60*
#mature plants (total emerging)	163	212	121
%mature plants present at June census	98	98	97
#flowering plants	47	40	44
Mean ht mature plants not grazed (in)	20	15	21
2000			
#seedling (total emerging)	348	174	267
%seedling present at June census	98	98	99
#mature plants (total emerging)	181	231	114
%mature plants present at June census	100	98	99
#flowering plants	70	53	48
Mean ht mature plants not grazed (in)	24	16	23
2001			
#seedling (total emerging)	514	189	305
%seedling present at June census	90	98	93
#mature plants (total emerging)	211	226	133
%mature plants present at June census	95	94	92
#flowering plants	48	54	21
Mean ht mature plants not grazed (in)	21	17	15
2002			
#seedling (total emerging)	803	387	499
%seedling present at June census	62	67	68
#mature plants (total emerging)	185	219	133
%mature plants present at June census	45	51	52
#flowering plants	23	20	21
Mean ht mature plants not grazed (in)	9	8	9

Flowering plant characteristics (based on total population) by grazing treatment:			
1997 (treatments not yet implemented)			
Mean #flowers/plant	3.2	2.1	2.5
Mean height flowering plants	47	45	48
max height flowering plants	93	90	78
Number of fruit produced	168	62	145
Mean height competition (in)	40	41	43
Mean hemispheric cover (%) at flowering plant	59	61	63
1998 (treatments not yet implemented)			
Total plants flowering	151	103	186
Mean #flowers/plant	2.2	1.9	2.3
Mean height flowering plants	35	33	34
max height flowering plants	76	62	68
Number of fruit produced	67	49	162
Mean height competition (in)	34	35	35
Mean hemispheric cover (%) at flowering plant	61	66	56
1999			
Total plants flowering	144	142	183
Mean #flowers/plant	2.4	2.1	2.8
Mean height flowering plants	42	40	41
max height flowering plants	80	70	75
Number of fruit produced	108	71	285
Mean height competition (in)	36	39	41
Mean hemispheric cover (%) at flowering plant	58	57	50
2000			
Total plants flowering	247	171	202
Mean #flowers/plant	2.6	1.9	2.4
Mean height flowering plants	41	35	38
max height flowering plants	70	74	72
Number of fruit produced	255	79	211
Mean height competition (in)	38	24	25
Mean hemispheric cover (%) at flowering plant	62	64	58
2001			
Total plants flowering	111	117	91
Mean #flowers/plant	2.4	1.8	2.3
Mean height flowering plants	43	37	38
max height flowering plants	73	70	72
Number of fruit produced	97	65	77
Mean height competition (in)	39	27	31
Mean hemispheric cover (%) at flowering plant	65	62	59
2002			
Total plants flowering	41	30	49
Mean #flowers/plant	2.2	1.9	1.7
Mean height flowering plants	41	38	36
max height flowering plants	72	65	68
Number of fruit produced	35	31	44
Mean height competition (in)	33	26	30
Mean hemispheric cover (%) at flowering plant	62	79	55

TABLE 2B. SUMMARY STATISTICS FOR VEGETATION CHARACTERIZATION OF THE 3 GRAZING TREATMENT AREAS, 1998-2002
TABLE BLUFF ECOLOGICAL RESERVE

GRAZING TREATMENT:	PASSIVE		NORTH (LO INTENSITY)					SOUTH (HI INTENSITY)				
	1998	2002	1998	1999	2000	2001	2002	1998	1999	2000	2001	2002
% OF GRID WITH SPRUCE DIRECTLY OVERHEAD												
(Based on 3230', 860' and 860' of line intercept respectively)	50	48	53	52	55	53	46	37	41	36	38	36
% HEMISPHERIC COVER AT 3' above ground:												
(based on 327, 90 and 90 pts, respectively; 10' intervals):	72	66	64	63	63	63	67	69	62	62	62	67
Standard deviation	18	21	24	24	24	24	19	28	29	28	28	24
GROUND VEGETATION HEIGHT:												
Avg. wtd. hght. ["] (per/ft basis; 3230', 860' and 860' transect respectively)	34	34	36	34	29	29	37	46	36	32	30	39
Standard deviation	21	20	16	18	15	15	16	22	17	16	17	20
GENERAL HABITAT TYPE:												
(% sample grid based on 3230 ft, 860 ft and 860 ft line transect respectively)												
Tall fescue grassland	6		16	15	14	14		13	13	13	13	
Coastal prairie	26		23	25	27	27		34	35	33	35	
Sweet vernal grassland	35		44	45	45	45		30	30	29	28	
Willow scrub	6		10	9	9	8		16	15	16	17	
Spruce/maianthemum forest												
Young spruce	7		6	6	6	5		7	8	9	8	
Old spruce	16		0	0	0	0		0	0	0	0	
Spruce/salmonberry woodland	3		0	0	0	0		0	0	0	0	
DETAILED VEGETATION COVER:												
(% sample grid based on 3230', 860' and 860' line transect respectively)												
Tall fescue grassland (typical)	4	5	2	4	4	4	4	6	5	6	6	12
Sweet vernal grassland (typical)	19	24	13	19	21	18	21	10	14	10	14	11
Coastal prairie (typical)	7	28	10	9	17	19	15	14	20	18	17	12
Willow scrub (typical)	2	0	3	4	0	0	0	1	1	1	1	0
Rubus ursinus	16	16	23	31	24	21	22	27	26	26	25	16
Rubus spectabilis	14	6	13	5	11	10	11	8	8	13	12	16
Rubus discolor (himalaya)	0	2	1	1	1	1	0	3	2	4	3	7
Gaultheria shallon	1	0	0	0	0	0	0	0	0	0	0	0
Baccharis pilularis	5	3	0	1	1	1	1	0	0	0	1	1
Polystichum munitum	5	4	1	2	2	3	5	3	2	1	2	1
Calamagrostis nutkaensis	13	7	28	13	12	11	20	22	10	10	10	15
Maianthemum dilatatum (incl. Carex obnupta/Iris Douglasiana)	5	1	2	10	7	10	0	2	4	2	2	0
Sambucus callicarpa	1	0	0	1	0	0	0	0	0	0	0	0
Erechtites minima	3	0	0	0	0	0	0	0	0	0	0	0
Barren understory	5	5	1	1	0	1	0	4	8	7	8	9

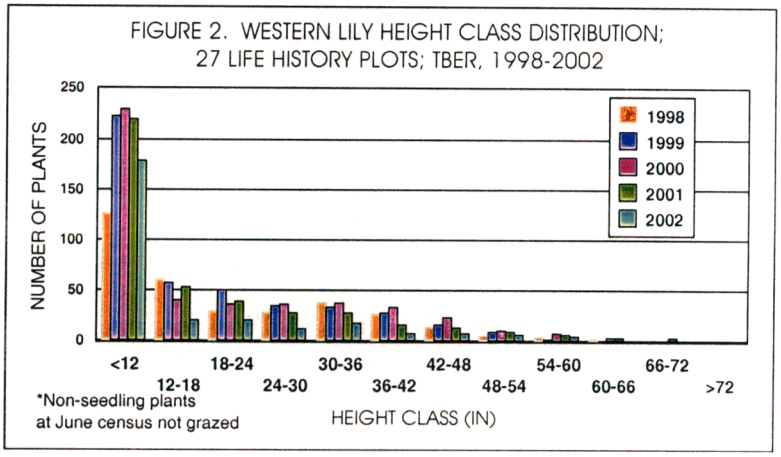
NOTE: See Table 1 for transect segments included in each grazing treatment characterization.

tbghmon99-2002.wk4

# Plots	Name	Treatment
7	Deer Exclosure:"Tall-Fence"	60 inch chicken wire, corner staked
7	Small Mammal Exclosure: "Short-Fence"	18 inch x 0.5 inch mesh fence, corner staked
6	"Chemical" Deer Inhibitor	Coyote urine vial placed at one corner, recharged at 30 day intervals
7	Control	No treatment

The fencing and chemical vials were removed in September of each year and reinstalled the following March in order to avoid interfering with the cattle grazing treatments.

The LH plots were initially monitored in June, 1998, and subsequently have been monitored on 4 dates between March and June from 1999 to 2002 (Table 2A). Single-leaf seedlings were inventoried, mapped, and characterized as to emergence date, extent of browsing or disease, and whether still present at June census. Mature lilies were also inventoried, mapped, and characterized as to emergence date, height, extent of browsing or disease, flowering status, and whether present at census. Presence at census is an indicator of "seasonal success" (or mortality), since plants that are grazed or senesce before census do not necessarily die, but may go dormant for the remainder of the season and then reappear the following year. Maps of all plants emerging in LH plots at TBER during 2002 are included as Appendix A.



Seasonal Cattle Grazing Applications: All the occupied western lily habitat (~5 acres) at the reserve was opened to passive winter grazing by cattle in 1997. Cattle were able to freely enter the ~35 acre rare plant exclosure each year generally between November and early March.

As part of this study, two 1 acre active grazing treatments were implemented in winter 1998-99, referred to as the North or "low-intensity/long duration" treatment cell, and South, or "high-intensity/short duration" treatment cell (Map 1). A 1,000 gallon water tank and a float-controlled water trough serving the 2 enclosures were installed. The grazing periods to date have been flexible, and based on the following subjective measures: maximum reduction of shrub cover and establishment of cattle trails within shrub canopies; reduction of the majority of *Calamagrostis nutkaensis* culms to between 6 and 12 inches in height; minimal disruption of soil not more than one inch deep, particularly in areas known to support the lily.

1998: Although opened to cattle on December 1, the passively grazed habitat was only utilized by cattle between about January 21 and March 7, 1999 due to scheduling problems with the former grazing lessee. Overall, the intensity of use was less than desired, but was substantial in some areas, particularly along the fences where the cattle created mud trails. Two cows were confined in the North enclosure for 20 days, beginning January 4, and 11 cows were confined in the South enclosure for 5 days, beginning January 21, 1999. Additional grazing would have been beneficial, but the cattle were removed at the request of the lessee.

1999: The new grazing lessee (Clint Victorine) confined his entire herd of 68 cows within the passively treated habitat for 3 days, beginning on February 12, 2000. The herd was then allowed to enter the habitat passively. The gates were closed on about March 1. Beginning on January 18, 2000, two cows were enclosed in the low-intensity treatment cell for 28 days (total 56 animal days), and 12 adults and 13 calves were held in the high-intensity treatment area for 6 days (72 adult days; 78 calf days).

2000: The herd of 68 cows was allowed into the entire exclosure passively beginning on February 2, 2001. The gates were closed on about March 2, when the herd was moved to another area of the wildlife area. Twelve adult cows were held in the high-intensity treatment area for 5 days (60 adult days), and 2 cows were held in the low-intensity treatment cell for approximately 21 days (42 adult days); both treatments began February 2, 2001.

2001: The herd of approximately 70 cows was allowed into the entire exclosure passively between January 7 and late March, when the herd was moved to another part of the wildlife area. Beginning on January 7, 12 adult cows were held in the high-intensity treatment area for about 8 days (96 adult days), and 2 cows were held in the low-intensity treatment cell for approximately 30 days (60 adult days).

2002: This winter, the passive exclosure was opened to the entire herd of adult and young cows for approximately 30 days during February and March. Beginning on January 25, 10 cows were placed in the high-intensity exclosure until February 2 (90 adult days), and two cows were contained within the low-intensity treatment cell until February 24 (31 adult days).

3.3 Vegetation Characterization and Results of Seasonal Grazing

Overall Habitat: Following the standard protocol, general habitat monitoring was conducted across the entire monitoring grid (a total of 4,650 ft. of transects) in October 1998 (Imper *et al.*, 1987). Results were compared to (pre-experimental grazing) habitat data collected in 1989, 1993, and 1996 (Imper & Sawyer, 2001). In general, cover by typical *Coastal prairie* increased significantly after removal of cattle in 1987, but has since stabilized. The *Sweet vernal grassland*, dominated by *Holcus lanatus* and various other "pasture" species, decreased soon after removal of grazing (i.e., converted to *Coastal prairie* or blackberry), but has increased since 1993 in response to thinning of the spruce stand. The *Young spruce forest* (i.e., the dense spruce vegetation type, as opposed to individual trees) declined from 32% cover to 7% in 1998 as a result of thinning (largely converted to *Sweet vernal grassland*). Combined cover of *Rubus ursinus* (blackberry) and *R. spectabilis* (salmonberry) increased from 13% to 31% by 1998, one of the principal reasons for implementing this study.

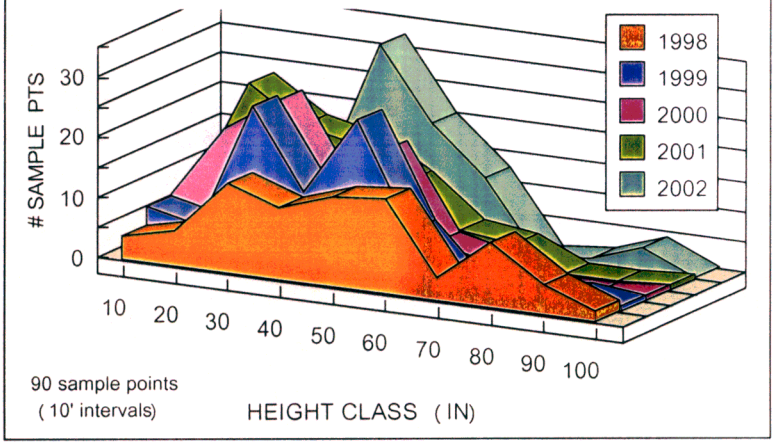
In 1998, transects were segregated according to the three grazing treatments (passive, low-intensity, and high-intensity) in order to compare the vegetation structure between grazing treatments, and to track the yearly change in vegetation within a grazing treatment (Table 2B; transect segments allocated to each treatment given in Table 1). At each sample point, transect data included %hemispheric cover and height of dominant understory species. Two additional vegetation transects were added to the existing grid network in October 1998 (X=375/Y=0-300 [North enclosure]; X=430/Y=0-300 [South enclosure]) to allow for better representation within the cattle enclosures (low- and high-intensity grazing treatments). Transects within low- and high-intensity grazing treatments were resampled in September 1999, 2000, and 2001; the entire monitoring grid was resampled in September, 2002 (Attachment 1).

Effects of Seasonal Grazing on Vegetation: Despite the differences in duration and intensity of the grazing regimes, after 5 seasons, the mean %hemispheric cover of vegetation (taken 3 ft. above the

ground) still remains nearly equal between treatments, probably within the range of sampling variation (Table 2B). The most noticeable decline in %hemispheric cover occurred within the high-intensity grazing cell after the first year of monitoring in 1998 (69% to 62%). Both the low-intensity and high-intensity grazing cells have maintained an average %hemispheric cover of 62-63% since 1998, before increasing slightly this year back to near the original 1998 level. A small decline in %hemispheric cover has also been seen in the passively grazed areas since 1998. Although the mean %hemispheric cover may remain relatively constant, the high standard deviation indicates wide variation within the habitat. Hemispheric cover is heavily influenced by tree cover, which has not materially changed since 1998. There fore, this variable does not necessarily reflect actual change in canopy cover impacting the lily.

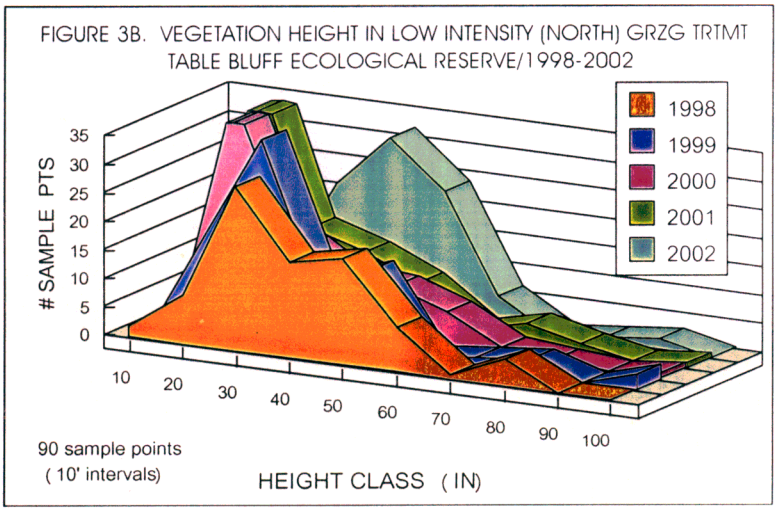
In 2002, the mean vegetation height was not substantially different between the three grazing treatments (Table 2B). Surprisingly since 1999, the high-intensity treatment cell has exhibited the tallest mean vegetation (probably reflecting higher cover by *Rubus* spp.), with the 2002 season recording the peak height since 1998 (39"). More importantly, within the high-intensity cell, the mean vegetation remains 7" below the initial 1998 level, and last year was 16" less than 1998. In contrast, within the low-intensity and passive cells, average vegetation height this year was similar to 1998. These results suggest that high-intensity grazing may be more effective in maintaining reduced vegetation height than the passive or low-intensity grazing, although, test applications of Roundup on *Rubus* spp., particularly in the South (high-intensity) enclosure, may have contributed to the reduction.

FIGURE 3A. VEGETATION HEIGHT IN HIGH INTENSITY (SOUTH) GRZG TRTMT
TABLE BLUFF ECOLOGICAL RESERVE/1998-2002



The profiles of the vegetation structure within the high- and low-intensity treatment cells indicate a noticeable shift in the dominant size classes (Figures 3A and 3B). Until 2001, the majority of sample points recorded in both cells was ≤40"; this year, most sample points were generally ≥40". These shifts are reflected in the increase in the mean vegetation height for 2002 within both the high- and low-intensity cells (+8" in the low-, and +9" in the high-intensity), and also likely due to the increased cover of *Rubus spectabilis* and *R. discolor* (Table 2B). In general, the high standard deviation for all treatments reveals a trend toward development of a mosaic pattern of taller vegetation "islands" within the habitat (i.e., spruce or *Rubus* thickets), and maximizing "edge", which is thought to benefit the lily by providing protection from deer browsing.

FIGURE 3B. VEGETATION HEIGHT IN LOW INTENSITY (NORTH) GRZG TRTMT
TABLE BLUFF ECOLOGICAL RESERVE/1998-2002

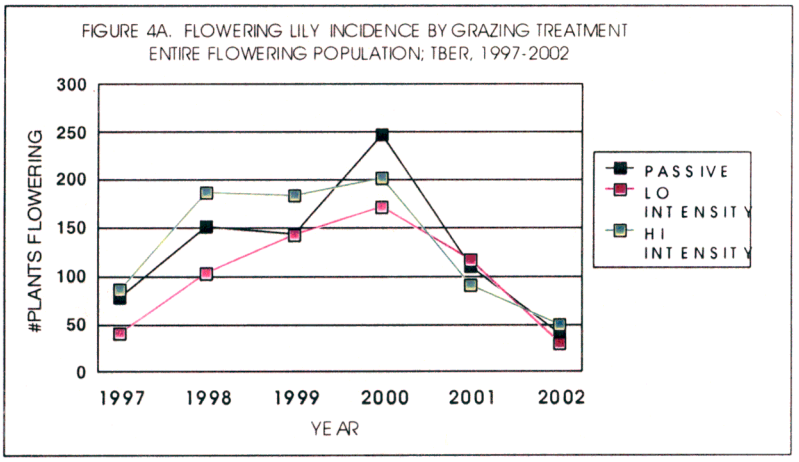


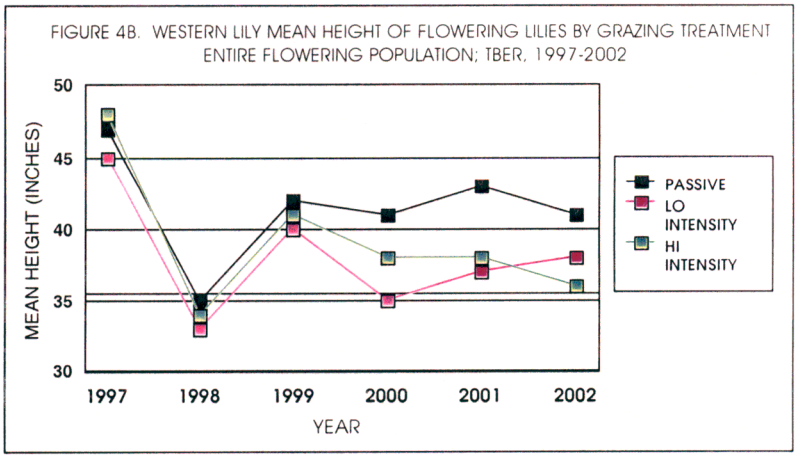
It appears that all of the grazing treatments conducted over the past 4 winters (passive throughout exclosure, and 2 confined treatments) were at least moderately successful at maintaining vegetation. Informal observations

suggest that impacts produced by a large number of cattle confined for a short period (high-intensity, short duration treatment) are more evenly distributed, and cause fewer trails and less severe soil disruption than in the low-intensity area. The two cows in the low-intensity treatment have tended to use the same pathways repeatedly, and have concentrated grazing impacts in smaller areas, resulting in greater soils disruption within the "south glade" lily habitat in the North enclosure (Map 1).

The %cover of the broad-scale, general habitat types has remained relatively stable within grazing treatments from 1998 to 2001 (Table 2B). *Sweet vernal grassland* remains the dominant habitat type within the passive and low-intensity treatment areas, while in the high-intensity cell, *Coastal prairie* is dominant. The %cover of *Willow scrub* and *Young spruce* have remained constant within treatments, suggesting this vegetation is relatively stable, or is maintained by seasonal grazing.

A more detailed sampling of the %cover of the principal species occurring in lily habitat indicates that the high-intensity grazing cell has a greater mean cover of salmonberry (*Rubus spectabilis*), himalayan berry (*R. discolor*), and barren understory than the low-intensity and passive cells (Table 2B). In contrast, %cover of trailing blackberry (*R. ursinus*) was reduced in the high-intensity grazing cell by 11% since 1998, compared to little change in the low-intensity and passive cells. These results suggest that the high-intensity, short duration grazing regime may be more effective at controlling blackberry than the woody *Rubus* spp. *Calamagrostis nutkaensis* cover (the leading indicator species for *Coastal prairie*) was the highest in both the high- and low-intensity cells since the 1998 monitoring; however, within the passively grazed area, this native grass has been reduced by nearly half.





Effects of Seasonal Grazing on Western Lily: Since 2001, the total number of flowering plants present at census in all grazing treatments has dramatically declined due to deer browsing (Figure 4A, Table 2A). In 2002, the number of flowering plants was generally evenly distributed across grazing treatments, as most plants were located within Tall-Fence plots where they were protected from grazing. Thus, the location of flowering plants during the extreme browsing years of 2001 and 2002 was primarily an indicator of the effectiveness of the Tall-Fence browsing inhibitor treatment and not a particular grazing regime. Prior to 2001, the number of flowering plants has increased steadily in all treatments.

Following a dramatic decline in the mean height of flowering lilies, from >45" in 1997 to <35" in 1998, mean heights have remained relatively constant within treatments after rebounding to ~40" in 1999 (Figure 4B, Table 2A). This decline was likely a response to the initial thinnings and re-

introduction of cattle during 1997. In 2000, the difference in mean height of flowering plants between treatments began to appear, the tallest plants being located within the passive treatment area. However, the distinction in heights during 2001 and 2002 are unreliable due to the influence of severe deer browsing. The mean number of flowers per plant has also been greatest in the passive treatment, although this variable is highly correlated with height, and thus is also influenced by deer browsing (Figure 4C). These results give some indication that the passively grazed area (with no specified duration or intensity) is more conducive to robust plant growth, however, the data is biased due to browsing.

FIGURE 4C. WESTERN LILY MEAN FLOWER NUMBER BY GRAZING TREATMENT
ENTIRE FLOWERING POPULATION; TBER, 1997-2002

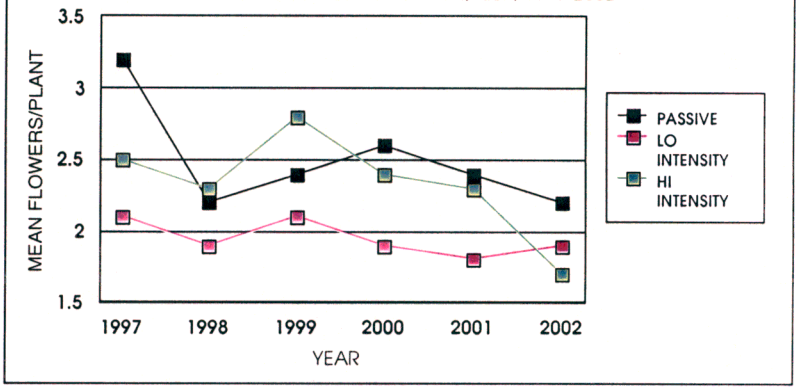
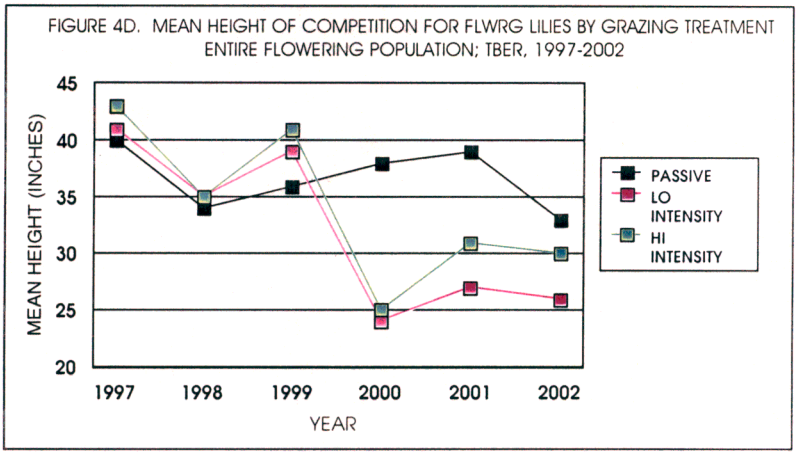


FIGURE 4D. MEAN HEIGHT OF COMPETITION FOR FLWRG LILIES BY GRAZING TREATMENT
ENTIRE FLOWERING POPULATION; TBER, 1997-2002



The mean height of flowering lilies has generally paralleled the changes in height of the competing vegetation (Figures 4B and 4D). Although severe browsing prevents making a direct correlation between the mean height of flowering lilies and the mean height of the competing vegetation, the overall reduction in flowering plant height in all treatments is consistent with the reduction in height of competing vegetation in all treatments. The passively grazed area has exhibited the tallest mean heights, while the actual treatments (low- and high-intensity) have shorter vegetation on average.

Results from the LH plots indicate that generally the greatest increase in seedlings emerging occurs within the passive treatment area (Table 2A). Since 1998, the greatest percent increase has occurred within the passive treatment (480%), followed by low-intensity (434%) and high-intensity (236%). The consistent increase in number of seedlings emerging for all treatments over the past 5 years is consistent with the increase in flowering and fruit production until 2000 (Figure 1).

This year, the percentage of seedlings still present at June census is substantially lower than in previous years. This decline in seasonal survival for seedlings does not appear associated with an increase in small mammal activity, given the decline in seasonal survival for all treatments in the browsing inhibitor plots (described below). In 2002, the percentage of seedlings present at June census was generally equal between treatments. Although the passively grazed area exhibited the lowest average seasonal survival in 2002, given the high number of seedlings initially, this area overall had the greatest number of seedlings still present at census.

Although the number of emerging mature plants declined only slightly from 2001, overall, the total number of mature plants has gradually increased since 1999 for all treatments (Table 2A). Since 1998, the overall percent increase in emerging mature plants has been greatest in the passively grazed area (13%), followed by the high-intensity treatment (10%) and the low-intensity treatment (3%).

Similar to seedlings, the percentage of mature plants still present at June census declined significantly for all treatments in 2002 (to ~50%), likely due in part to the high level of deer browsing, and perhaps weather extremes that may have also contributed to desiccation of seedlings. For 2002, the seasonal survival of mature plants was generally equal between treatments, indicating that factors other than grazing treatment are likely responsible for the apparent loss of plants.

Although we have no non-grazed treatment, in general, seasonal cattle grazing has been associated with an increase of seedlings and mature plants over time (Table 2A). Low to moderate grazing intensity (passive and low-intensity treatments) seems to have allowed a greater increase in seedling establishment than the high-intensity treatment, possibly due to a greater likelihood of trampling by cattle. However, there has been no significant difference in the increase in mature plants among grazing treatments since 1999. Therefore, while seedling establishment may be greater in the low to moderate intensity grazing regime, it is too early to determine whether that affect carries on into the mature population.

Photomonitoring: Beginning in 1987, photomonitoring was conducted during the annual flowering plant census at 25 permanent photopoints. An additional three photopoints were established in1994, which focused on the three vegetation treatment areas included in the Experimental Habitat Restoration Study (since abandoned). In 1998, 13 additional photopoints were established to monitor the impact of cattle grazing in the North and South cattle enclosures (location coordinates and declinations indicated in Table 1). The photomonitoring was most recently conducted in October 2001; no photomonitoring was conducted in 2002. The photomonitoring provides a visual record of the quantitative data recorded.

3.4 Western Lily Life History/Browsing Inhibitor Plot Results

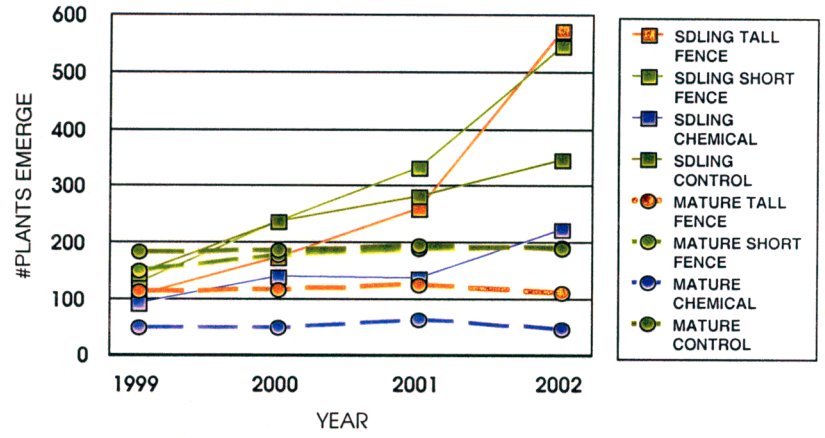
Plant Density and Growth: Various growth characteristics of the population are compared for the previous 5 years in Table 2A. In 2002, seedlings accounted for 76% of the total number of individuals in LH plots, although 35% of these were missing at the time of the June census. Mature plants were far fewer in number (24%) and suffered a higher rate of seasonal mortality (51%) than seedlings, likely due to heavy deer browsing during the growing season. The LH plots only contained 65 of the total 120 flowering plants recorded during the 2002 annual census (54%). Based on the LH plot data, about 3% of the overall lily population at TBER in 2002 were flowering individuals, and approximately 21% were non-flowering, multi-leaved individuals. Over half of the mature, ungrazed plants were 12" tall or less (Figure 2). Although the total number of mature plants in each size class varies somewhat between years, the juvenile, non-flowering, sector of the population consistently remains the dominant size class following seedlings. This demographic pattern seems to be typical for long-lived perennial plants.

Results of Browsing Inhibitor Treatments: Since 1998, the total number of seedlings emerging in all treatments has been steadily increasing (Table 2A, Figure 5A). The annual increase in total number of seedlings had been relatively constant from 1999 to 2001, but in 2002, there was a substantial increase, especially within the Tall-Fence and Short-Fence plots. The greatest percent increase in emerging seedlings since 1998 has occurred within the Tall-Fence plots (~550%), followed by Short-Fence (~430%), Chemical (~250%), and Control plots (~230%).

Until 2001, the percentage of seedlings still present in June in all treatments averaged above 90%; however, in 2002, the seasonal survival of seedlings had dropped to an average of 63% for all treatments. This decline in seedlings was generally evenly distributed across browsing inhibitor treatments. In 2002, although the total number of seedlings was greatest within the Tall-Fence plots, the highest percentage of seedlings still present at June census was found within the Short-Fence

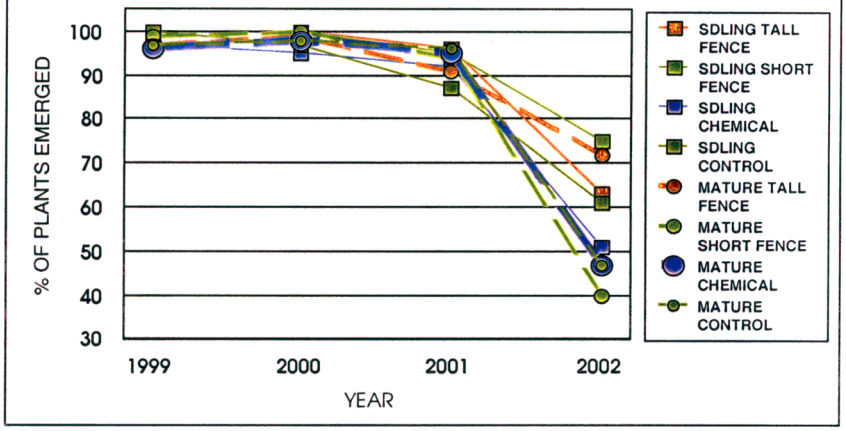
plots (Table 2A, Figure 5B). These results indicate that fencing is beneficial for seedling recruitment, shown by the Tall-Fence plots that receive no deer grazing, and the Short-Fence plots that receive deer browsing but deter predation by small mammals and slugs. The number of seedlings in Control and Chemical plots continued to increase, but at a smaller rate.

FIGURE 5A. TOTAL WESTERN LILY EMERGENCE BY BROWSING PROTECTION TREATMENT
27 LIFE HISTORY PLOTS; TBER, 1999-2002



In general, the number of mature plants emerging within each treatment has remained consistent since 1999 (Figure 5A, Table 2A). Overall, and including 2002, the Short-Fence and the Control plots have had the greatest number of emerging mature plants, unexpected given that these plots allow for the greatest deer browsing opportunities. The percent change in number of mature plants has been slight since 1998, ranging from an overall increase of 28% for Short-Fence plots to an overall decrease of 10% for Chemical plots (Table 2A). Tall-Fence plots have had only a 1% increase in the number of mature plants since 1998. An increase in the vegetation cover within Tall-Fence plots, due to complete lack of browsing during the entire growing season, could explain the lower number of emerging mature lilies found there. The number of mature plants emerging in the Short-Fence plots is more than 4 times greater than the Chemical plots, which suggests either that the coyote urine may not work at all in deterring deer browsing, or, that repelling deer is indirectly reducing browsing of competing vegetation, and thus inhibiting emergence of mature plants.

FIGURE 5B. WESTERN LILY PRESENT AT JUNE CENSUS BY BROWSING PROTECTION TREATMENT
27 LIFE HISTORY PLOTS; TBER, 1999-2002



From 1998 until 2001, the seasonal survival of mature plants has averaged above 90% for all treatments (Table 2A, Figure 5B). However in 2002, the percentage of mature plants still present at June census had significantly dropped for all treatments, most dramatically within the Short-Fence, Control, and Chemical plots (to less than 50%). For 2002, the highest seasonal survival was found within the Tall-Fence plots (72%).

The primary browser of mature plants in all years appears to be deer, which were best deterred by the Tall-Fence exclosures. Mature lilies located outside the Tall-fence plots that escaped deer browsing were generally camouflaged by dense vegetation. Most of these lilies were stunted in growth, and produced fewer flowers and fruits (Bencie and Imper, 2003). The Chemical plots had the same percent seasonal survival as Control plots for mature plants, and thus offered no additional protection against deer browsing.

3.5 Western Lily Recruitment Studies

3.51 Western Lily 1998 Seed Plots

As part of the current study, twelve 1 ft^2 seed plots were established in each of the three grazing treatment areas (Map 1). A short rebar stake was placed at the northwest corner of each plot. Location coordinates and grazing treatment for each Seed Plot are given in Table 1. On October 6, 1998, 50 visibly healthy seeds were planted in each test plot prior to introduction of cattle. A total of 600 seedlings were planted per treatment.

In July 2002, the number of seedlings and multi-leaved individuals were counted. Overall, survival after 4 years was 15.1% for all plots, with the greatest percent survival occurring within the high-intensity plots (9.8%) and the lowest within the passively grazed area (0.3%). The greatest number of seedlings occurred in plots located within the high-intensity enclosure (54 seedlings). The low-intensity plots had less than half as many seedlings (25), while the passive treatment plots contained only 2 seedlings. The number of multi-leaved individuals was equal in both the high- and low-intensity treatments (5), but no multi-leaved plants were found within the passively grazed area. Plots located in the passive area seemed disproportionately impacted by heavy cattle traffic, which may have lowered the survival rate of seedlings. Regardless of the possible bias, these data suggest that seasonal grazing is compatible with seedling recruitment.

Examining these data according to habitat type, the results are consistent with data collected from the 1993 Seed Plots (described below). *Spruce forest* plots had an overall survival rate after 4 years of 8.6%, twice the rate of the *Coastal prairie* plots (4.3%). Overall survival for the *Coastal Prairie* plots is greater here than in the 1993 Seed Plots, likely due to most of the plots being located within occupied lily habitat where a suitable moisture regime is present.

In fall 1993, a total of 48 plots in *Spruce forest* and *Coastal prairie* were planted with 100 seedlings each as part of a habitat manipulation study. In 1999, a total of 27 seedlings and 3 multi-leaved individuals were found within the *Coastal prairie* plots, giving an overall survival rate of 1.2% after 5 years; seedlings in *Coastal prairie* were not counted during 2002. Within the *Spruce forest* plots in 2002, a total of 84 seedlings and 61 multi-leaved plants (including 12 flowering) were recorded. This data gives an estimate of an overall survival rate for seedlings and mature plants in *Spruce forest* of only 6.0%, down from 8.4% in1999. These results provide the minimum estimate given the impacts of deer and cattle grazing, and indicate that survival of seedlings and mature plants is greater in *Spruce forest*.

3.52 Western Lily Seed (Cow) Ingestion Study

On January 18, 1999, 500 healthy western lily seeds were fed to a cow, provided by the grazing lessee, confined in a pen at his ranch near Loleta. The cow was initially deprived of food for 24 hours in order to encourage consumption of the grain. The seed was then added to several pounds of grain, and fed to the cow (confined by a stanchion). The excrement was collected every 12 hours thereafter for 36 hours, and transported to TBER, where it was placed in a fenced area near grid coordinates 270/300 (Map 1).

As of this year, no seedlings have emerged. These results are unexplained, but suggest either the excrement was not collected for a long enough period after the seed was fed to the cow, or complete mortality occurred, perhaps due to the altered diet of the cow prior and during the period the excrement was collected. Based on these results, this monitoring should be discontinued.

3.53 Western Lily Recruitment in Cattle Trails

In June, 1998, three 3 ft^2 plots (CTP #1-3; Map 1) were permanently marked in existing cattle trails located within the south enclosure, in order to monitor lily seedling density and fate, and soil compaction in trails created during the past 2 years of passive winter cattle grazing (and likely impacted by human traffic). Location coordinates are given in Table 1. For each plot, a rebar stake was placed at the southwest and northwest corners. In June or July of each year since 1998, all western lilies were recorded and mapped within the plot (centered on the cattle trail) and also within two 3 ft^2 plots adjoining the central plot on both sides of the trail. In 1998, 1999, and 2000, soil core samples were collected between 4 and 10 inches below the ground surface from each center plot and one of the adjacent plots. Samples were retrieved by driving a 1.37" diameter x 4 inch thinwall brass tube, sharpened on the leading edge. Each sample was immediately labeled and sealed with duct tape until weighed to the nearest gram. Samples were then extruded and dried to oven dry weight at 105 degrees Celsius, then reweighed to calculate bulk density and %moisture.

Soil Compaction: No bulk density samples were collected in 2001 or 2002 due to the potential cumulative impacts of the destructive soil sampling on the surrounding lily population. We suggest collecting the bulk density samples not more than once per 3 years for these plots. Bulk density and %moisture results for each plot from 1998 to 2000 are given in Table 3. Average soil bulk density for the 6 samples (3 trail, 3 adjacent) in 2000 was 54 pounds per cubic foot (pcf), ranging from 54-62 pcf in the trail plots, and 46-54 pcf in the adjacent plots (Table 3). Those data were similar to 1998, when average bulk density for all 6 samples was 58 pcf (ranging 50-61 in trail and 54-59 in adjacent plots). The sample sizes are too small to enable meaningful statistical comparison; however, the observed trends suggest shallow soil bulk density may be higher within the trails compared to adjacent soils, but there has been no obvious increase from year to year.

Seedling Fate: The results from monitoring seedling and mature plants within cattle trail plots are summarized in Table 3. As expected given the seasonal impacts on the trails from cattle, occurrence of seedlings, and to a lesser extent mature plants, within the plots was highly variable from year to year. The observed number of seedlings in 2002 was the lowest recorded since 1999, and the number of mature plants in 2002 was the lowest since 1998. This indicates an overall decrease of 22% in the number of seedlings since 1998, and an overall decrease of 50% for mature plants since 1998. Although subject to error due to variability in actual emergence location, difficulty in distinguishing the same plants each year, and the potential for multi-year dormancy, evidence indicates a high rate of turnover in seedlings from year to year (i.e., few seedlings survive more than 1-2 years). There is to date almost no evidence (3 questionable plants) of development of seedlings into multi-leaved plants occurring within the 5 year period.

In some cases, the trails have wandered or expanded over the years outside the initial trail center plot into the adjacent plots. Where this has happened, the number of seedlings in the adjacent plots have tended to increase, sometimes substantially (e.g., plots 1 west, 2 south). The appearance of several mole hills in several plots has confounded these results.

3.6 Soil Compaction Characterization

In October 1998, and September 1999 to 2002, between 5 and 7 soil cores were sampled at random locations within each of the three grazing treatments. Sample methodology and preparation were as described above.

Average dry bulk density for the 15 core samples in 2002 was 58 pcf, comparable to the 2001 level (57 pcf), but less than previous years ranging from 62 to 64 pcf (Table 3). The range in bulk density

TABLE 3. SOIL BULK DENSITY AND MOISTURE RESULTS, SEP 98, OCT 98, SEP 2000 - 2002.

		1998			1999			2000				2001				2002			
	Sample	Moisture	B. Dens.	Group B.D.	Sample	Moisture	B. Dens	Group B.D.	Sample	Moisture	B. Dens	Group B.D.	Sample	Moisture	B. Dens	Group B.D.	Sample	Moisture	B. Dens	Group B.D.
Location	ID	(%)	(#/cf)	Means	ID	(%)	(#/cf)	Means	ID	(%)	(#/cf)	Means	ID	(%)	(#/cf)	Means	ID	(%)	(#/cf)	Means
So. Grazing		35	54			26	64		11	23	56		1	34			1	22	47	
Trtmnt		45	49			28	61		12	22	59		2	30	54		2	21	54	
Cell		37	61			30	69		13	26	64		3	35	59		3	32	52	
		36	55			28	61		14	23	68		4	34	46		4	23	50	
		34	63	56		28	64		15	19	73	64	5	32	54	55	5	26	65	64
						39	51						6	32	60					
						30	64	62												
							2 sided t test 1998-99 P>0.1					***1998-2000 P=0.05***				*1998-2001 P>0.1*				*1998-2002 P>0.1*
No. Grazing		36	65			25	66		6	16	63		13	31	65		6	28	62	
Trtmnt		46	63			25	63		7	24	67		14	28	58		7	32	56	
Cell		26	64			33	60		8	20	65		15	43	52		8	19	63	
		42	67			51	50		9	20	65		16	30	59		9	37	56	
		33	58	63		26	52		10	24	53	63	17	33	45	56	10	29	59	69
						54	60						18	29	56					
						33	63	59												
							t statistic 1998-99 P>0.1					*1999-2000 P>0.1*				***1998-2001 P=0.04***				*1998-2002 P=0.1*
Passive		31	65			36	50		1	18	65		7	37	61		11	25	63	
Grazing		30	58			22	64		2	17	66		8	19	65		12	24	63	
Trtmnt		25	63			30	69		3	14	63		9	26	52		13	29	61	
			64			24	74		4	22	63		10	25	60		14	24	59	
		21	74	65		24	63		5	16	62	64	11	29	61	59	15	30	56	61
						27	64	64					12	26	56					
							t statistic 1998-99 P>0.1					*1999-2000 P>0.1*				*1998-2001 P=0.1*				*1998-2002 P>0.1*
Cattle Trail	1ctr	46	60			28	61		16	38	62									
Seed	1east	45	49			32	59		17	21	54			NOT				NOT		
Plots	1west																			
	2ctr	21	74			35	55		18	14	54			SAMPLED				SAMPLED		
	2north	39	58			29	57		19	14	51									
	2south																			
	3ctr	46	52			33	50		20	13	58									
	3north	44	52			30	54		21	21	46									
	3south			58				56				54								
							t statistic 1998-99 P>0.1					*1999-2000 P>0.1*								
Overall Mean		36	60			31	60			20	61			31	57			27	58	

Notes:

Soil bulk density values are dry weight; samples = 1.37" dia. x 4" or 6" brass tubes driven into soil between 4 and 10" below surface, oven-dried @ 105d C. to constant weight.

Cattle trail plots = 3' x 3', centered on cattle trails in optimum LIOC habitat.

TABLE 3 (CONTINUED). LIOC CENSUS RESULTS IN CATTLE TRAIL PLOTS, TBER, JUN/JUL 1998-2002.

WESTERN LILY IN CATTLE TRAILS

	1998		1999		2000		2001		2002		NOTES
Cattle Trail Plots	#sdlings*	#mature	#sdlings	#mat	#sdlings	#mat	#sdlings	#mat	#sdlings	#mat	
1ctr	20	0	11	0	7	0	7	0	2	0	'98-Trail thru ctr of 1CTR; '00-trail shift to w. into 1W (~30%); 01-2 molehills in CTR, 1 in 1W plot
1east	2	3	1	2	1	1	3	2	0	0	
1west	2	0	3	0	5	0	9	0	1	0	
2ctr	49	9	50	15	88	14	111	10	66	8	'98-Trail thru ctr of 2CTR; '00&'01-trail expand into 2N & 2S (~40% ea plot); '01-1 molehill in 2N and 2CTR
2north	10	6	4	8	3	7	3	1	0	1	
2south	11	9	13	11	45	10	32	11	7	2	
3ctr	19	3	14	4	16	6	20	6	10	4	'98-Trail thru ctr of 3CTR plot; '00&'01-1 molehill in CTR plot; no chge in trail since '98
3north	2	2	4	1	10	3	9	4	2	0	
3south	1	1	5	3	3	1	7	1	7	1	
Totals	116	33	105	44	178	42	201	35	95	16	

WESTERN LILY PERSISTENCE IN CATTLE TRAILS (#YEARS OBSERVED)

	1 YEAR		2 YEARS		3 YEARS		4 YEARS		5 YEARS		#SDLGS OBSERVED ADVANCING TO MATURE STAGE (ANY YEAR IN 3)
	#sdlings*	#mature	#sdlings	#mat	#sdlings	#mat	#sdlings	#mat	#sdlings	#mat	
1ctr	14	0	2	0	3	0	1	0	2	0	0
1east	3	1	2	0	0	1	0	1	0	0	0
1west	5	0	4	0	1	0	1	0	0	0	0
2ctr	86	9	0	5	58	3	6	1	5	5	3?
2north	13	4	2	1	1	4	0	0	0	1	0
2south	71	4	8	3	0	2	4	3	0	2	1?
3ctr	43	3	6	0	1	5	4	0	2	1	1?
3north	16	1	3	0	2	1	0	2	0	0	0
3south	8	1	0	0	5	1	0	0	0	0	1?
Totals	**259**	**23**	**27**	**9**	**71**	**17**	**16**	**7**	**9**	**9**	**6**
%TOTAL SDLG/ MATURE PLANTS	60	5	6	2	17	4	4	2	2	2	

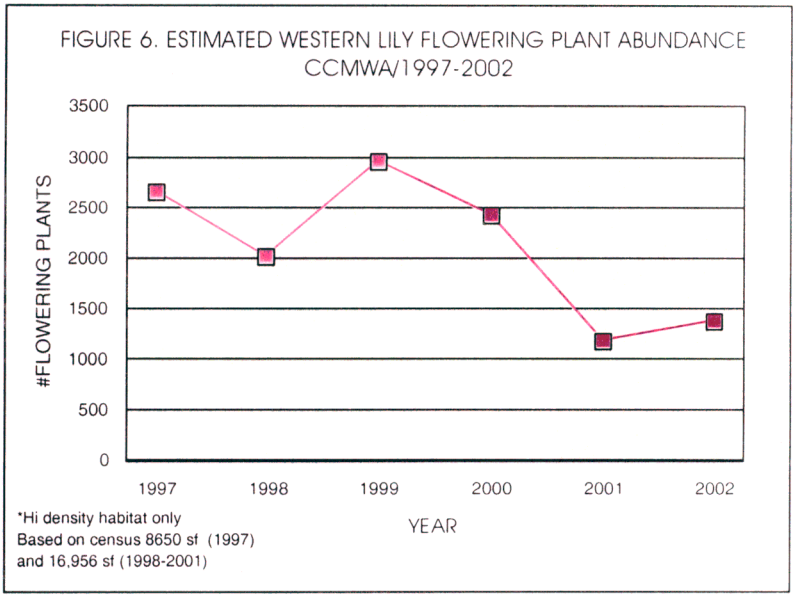
EST'D TOTAL UNIQUE PLANT 429

* Seedlings = single leaf; mature = multi-leaved.

samples this year was 47-65, compared with 45-65 in 2001, 46-73 (2000), 50-74 (1999), and 49-74 (1998). These results correlated well with the mean density for samples collected in the *Coastal prairie* in 1992 (59 pcf; n=4) and 1994 (63 pcf; n=6). For comparison, the mean bulk density measured in the nearby *Tall fescue grassland* soils (unsuitable lily habitat) was 70 pcf (n=4) in 1992 (Imper and Sawyer, 1994). In 2002, samples from the passively grazed area had the greatest average bulk density. Statistical comparison (Student's t-test) between the overall means, and the group means for bulk density for each grazing treatment between 1998 and 2002 showed no significant differences ($P \geq 0.10$). There is no indication to date that the grazing regimes are causing an increase in bulk density.

4.0 CRESCENT CITY MARSH WILDLIFE AREA

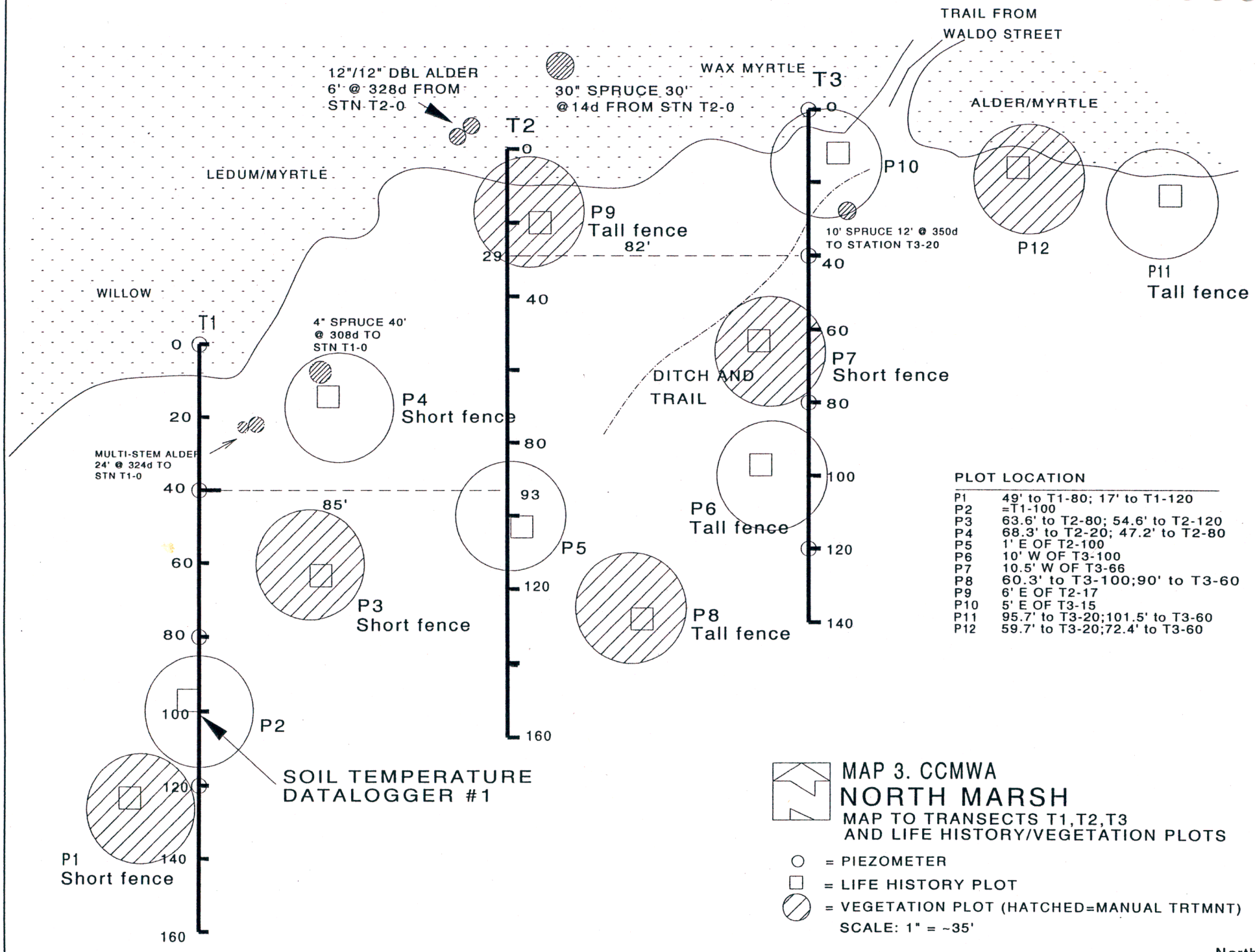
4.1 Western Lily Population Status



Due to the large and widely distributed western lily population at the CCMWA, no complete flowering census has been conducted to date. The population monitoring protocol implemented in 1997 incorporated a series of 12 foot x 20 foot belt transects in the North Marsh, and 12 foot diameter circular plots in the South Marsh, systematically located and permanently marked for reference each year (Imper and Sawyer, 1997; Maps 2, 3, and 4). All flowering plants and a portion of the vegetative plants were recorded within an area of 8,650 square feet (sf). Based on the number of flowering plants counted in the North and South Marshes (80 and 130, or 2.2 and 3.0 plants/100 sf, respectively), and the estimated square footage of equivalent high density occupied habitat in each marsh (26,400 and 69,400 sf, respectively), the entire flowering population in 1997 was estimated to be about 2,660 (not counting some 580 flowering and non-flowering plants estimated to occupy "low density" habitat that year).

The revised protocol implemented in 1998 for this study included a flowering census based on twenty-four 30 ft. diameter circular plots, for a total sample area of 16,956 sf. All flowering lilies within each plot were recorded and mapped in July from 1998-2002 (2002 maps are given in Appendix B). Assuming the 8,478 sf sampled in each marsh qualifies as "high density" habitat defined in 1997, the estimated total number of plants flowering in 2002 was 1,377 (2,016 in 1998, 2,996 in 1999, 2,430 in 2000, and 1,186 in 2001; Figure 6; Table 4). These estimates do not include a small number of plants located on private property west of the 2 marshes, or habitat considered to have plants at low density. The (non-statistical based) estimates suggest that 1997 and 1999 were peak population years, while 2001 and 2002 were poor years for flowering lilies. The sharp decline in population size in 2001 remains unexplained.

Based on the ratio of flowering to vegetative plants observed emerging in the LH plots this year at CCMWA, the total population likely exceeded the flowering population by a factor of ~9, indicating a total estimated population size of ~12,000 individuals occupying high-density habitat. In 2002, the



PLOT LOCATION

P1	49' to T1-80; 17' to T1-120
P2	=T1-100
P3	63.6' to T2-80; 54.6' to T2-120
P4	68.3' to T2-20; 47.2' to T2-80
P5	1' E OF T2-100
P6	10' W OF T3-100
P7	10.5' W OF T3-66
P8	60.3' to T3-100;90' to T3-60
P9	6' E OF T2-17
P10	5' E OF T3-15
P11	95.7' to T3-20;101.5' to T3-60
P12	59.7' to T3-20;72.4' to T3-60

MAP 3. CCMWA

NORTH MARSH

MAP TO TRANSECTS T1,T2,T3
AND LIFE HISTORY/VEGETATION PLOTS

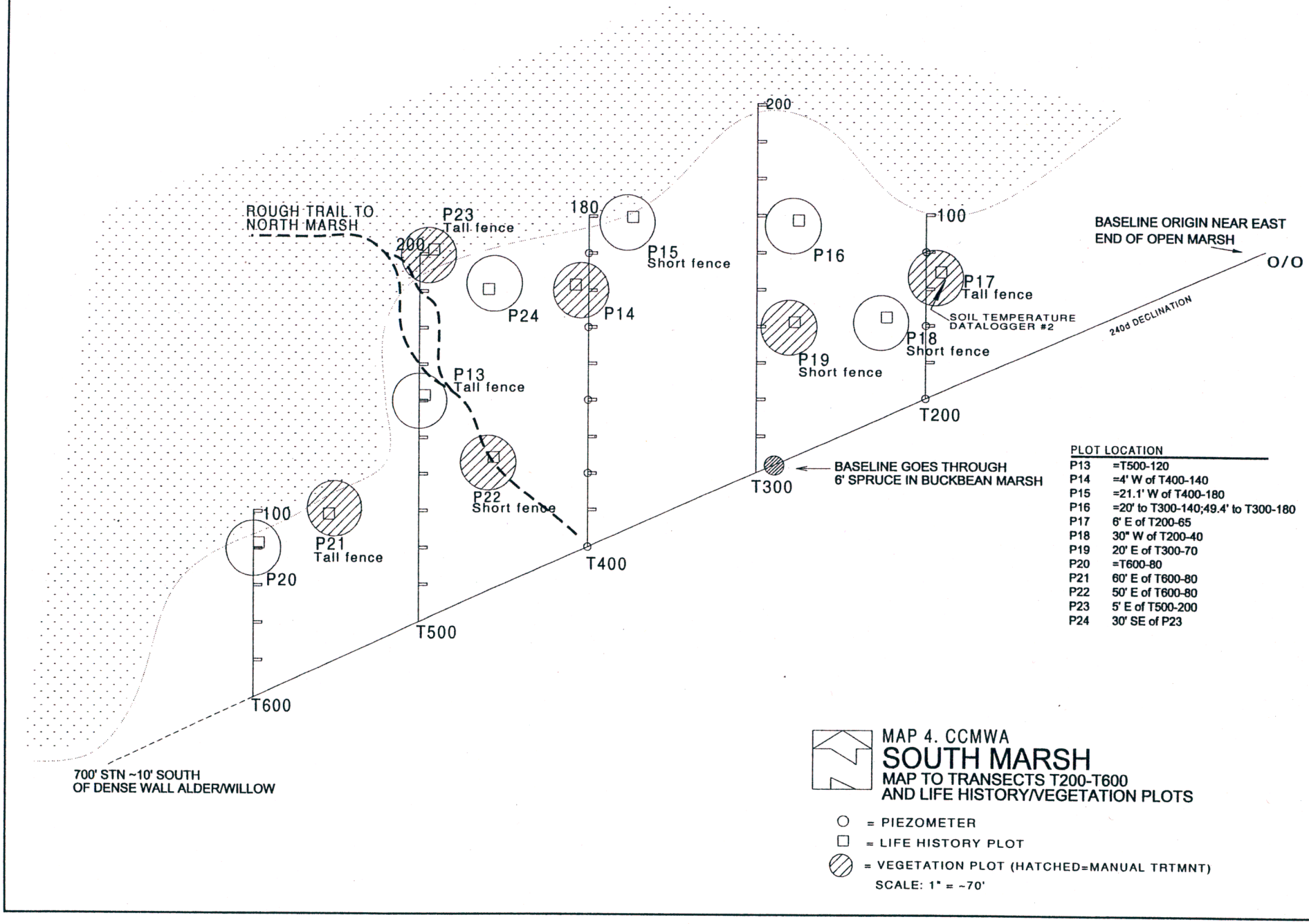
○ = PIEZOMETER

□ = LIFE HISTORY PLOT

⊘ = VEGETATION PLOT (HATCHED=MANUAL TRTMNT)

SCALE: 1" = ~35'

Northpl.dc



PLOT LOCATION	
P13	=T500-120
P14	=4' W of T400-140
P15	=21.1' W of T400-180
P16	=20' to T300-140;49.4' to T300-180
P17	6' E of T200-65
P18	30" W of T200-40
P19	20' E of T300-70
P20	=T600-80
P21	60' E of T600-80
P22	50' E of T600-80
P23	5' E of T500-200
P24	30' SE of P23

MAP 4. CCMWA

SOUTH MARSH

MAP TO TRANSECTS T200-T600
AND LIFE HISTORY/VEGETATION PLOTS

○ = PIEZOMETER

□ = LIFE HISTORY PLOT

= VEGETATION PLOT (HATCHED=MANUAL TRTMNT)

SCALE: 1" = ~70'

TABLE 4. SUMMARY STATISTICS FOR WESTERN LILY IN 24 LIFE HISTORY AND VEGETATION PLOTS, CRESCENT CITY MARSH WILDLIFE AREA SAMPLED BY R. BENCIE, K. WEAR, JULY 1998-2002

OVERALL LIFE HISTORY PLOTS (24-6 ft sq.)	NORTH MARSH					SOUTH MARSH				
BY MARSH	**1998**	**1999**	**2000**	**2001**	**2002**	**1998**	**1999**	**2000**	**2001**	**2002**
Total area sampled (sf) :	432	432	432	432	432	432	432	432	432	432
Total LIOC seedlings sampled (single leaf))	43	102	148	72	53	179	194	217	131	200
#LIOC seedlings sampled per sf	0.10	0.24	0.34	0.17	0.12	0.41	0.45	0.50	0.3	0.46
Total LIOC non-seedling sampled	81	137	139	64	67	74	79	87	30	41
Mean ht non-seedling plants (in)	33	23	19	17	18	35	29	20	19	19
% incidence mammal grazing (plts still visible at census)	3	2	0	0	9	1	0	1	1	1
% incidence insect/slug grazing (plts still visible at census)	1	0	0	0	6	0	0	0	0	0
% incidence disease (plts still visible at census)	0	0	0	0	0	0	0	0	0	0
MARSHES COMBINED										
Total %plants missing at July census; both marshes combined							15	19	24	20
#Seedlings missing at census; both marshes combined							57	77	41	47
%Seedlings missing at census; both marshes combined							19	21	20	19
#Mature plants missing at July census; both marshes combined							19	35	30	27
%Mature plants missing at census;both marshes combined							9	15	32	25

Emergence:		1999	%	2000	%	2001	%	2002	%
(both marshes combined)	%Seedlings	PRIOR TO 3/26	0	PRIOR TO 4/1	2	PRIOR TO 4/5	20	PRIOR TO 4/17	14
		3/26-4/24	62	4/1-4/29	63	4/5-5/20	72	4/17-5/11	51
		4/24-5/22	27	4/29-5/26	28	5/20-7/24	8	5-11-6/8	28
		5/22-7/21	11	5/26-7/14	7			6/8-7/13	7
	%Mature plants	PRIOR TO 3/26	0	PRIOR TO 4/1	1	PRIOR TO 4/5	1	PRIOR TO 4/17	11
		3/26-4/24	24	4/1-4/29	30	4/5-5/20	88	4/17-5/11	33
		4/24-5/22	48	4/29-5/26	56	5/20-7/24	12	5-11-6/8	35
		5/22-7/21	28	5/26-7/14	13			6/8-7/13	21

OVERALL VEGETATION PLOTS (24-30 ft dia.)		NORTH MARSH					SOUTH MARSH				
		1998	**1999**	**2000**	**2001**	**2002**	**1998**	**1999**	**2000**	**2001**	**2002**
Total area sampled (sf) :		8478	8478	8478	8478	8478	8478	8478	8478	8478	8478
Total LIOC flowering		133	268	248	135	151	199	266	204	93	113
#LIOC flowering per sf		0.016	0.032	0.029	0.016	0.018	0.023	0.031	0.024	0.011	0.013
Mean #flowers		1.6	1.7	1.4	1.5	1.7	1.5	1.6	1.7	1.4	1.3
Maximum #flwrs		5	6	6	5	5	7	8	7	4	4
Mean ht (in)		47	46	42	49	45	46	46	43	47	43
Maximum ht (in)		72	88	78	80	72	70	74	72	68	69
Phenology (%plts sampled)	Date:	07/16/1998	**********	07/14/2000	**********	07/13/2002	**********	07/21/1999	**********	07/24/2001	**********
	Bud	68	56	52	21	77	63	48	53	24	67
	Flower	29	40	42	53	23	32	47	38	44	33
	Fruit	4	4	6	26	1	4	4	9	32	0
	(Infl. Grazed)	0	0	0	0	0	1	0	0	0	0
% incidence mammal grazing (plts still visible at census)		2	0	0	0	1	1	0	1	0	0
% incidence insect/slug grazing (plts still visible at census)		2	0	0	3	5	1	1	0	0	0
% incidence disease (plts still visible at census)		0	0	0	0	0	0	0	0	0	0

COMPARISON OF CLEARED/UNCLEARED TREATMENTS	1998		1999		2000		2001		2002	
	cleared	*uncleared*	*cleared*	*uncleared*	*cleared*	*uncleared*	*cleared*	*uncleared*	*cleared*	*uncleared*
Total sdlgs (LH plots)	122	100	173	123	210	155	111	92	167	86
Total mature plts (LH plots)	83	72	132	84	134	92	52	42	58	50
#flowering plants (veg plots)	208	122	324	210	301	151	141	87	168	96

t test significance results (paired; 2 tailed)		1998-1999		1999-00 (1998-00)		2000-01 (1999-01)		2001-02 (1998-02)	
LH Plots		*cleared*	*uncleared*	*cleared*	*uncleared*	*cleared*	*uncleared*	*cleared*	*uncleared*
All seedlings: #seedlings differ	*P =*	**0.01**	0.36	**0.21 (0.02)**	(0.12)	**0.01 (0.03)**	**(0.27)**	0.16 (0.14)	(0.50)
All mature plts: #mature plts differ	*P =*	0.07	0.24	0.92 (0.13)	**(0.04)**	**0.03 (0.03)**	**(0.02)**	0.65 (08)	(0.23)
Seedlings present at census: #seedlings differ	*P =*	0.54	0.89	0.16	0.56	**0.04 (0.18)**	(0.23)		
Mature plants present at census: #mat plts differ	*P =*	0.25	0.34	0.35	0.39	**0.05 (0.02)**	**(0.01)**		
Vegetation Plots									
Flowering plts present at census: #plts differ		**0.03**	**0.003**	0.75 (0.11)	(0.43)	**0.00 (0.00)**	**(0.00)**	0.38 (0.18)	(0.50)

COMPARISON OF FENCING TREATMENTS	*Tall fence*	*Short fence*	*Control*
1998 (pre-treatment)			
#seedling (present at census)	100	70	52
#mature plants (present at census)	56	59	40
#flowering plants	30	29	22
#plants mammal grazed	2	3	2
1999			
#seedling (total emerging)	102	123	71
%seedling present at census	88	75	80
#mature plants (total emerging)	58	105	53
%mature plants present at census	95	90	89
#flowering plants	31	35	22
%mature plants mammal grazed	3	2	0
%plants missing at census time or grazed	26	39	38
2000			
#seedling (total emerging)	119	143	103
%seedling present at census	92	66	81
#mature plants (total emerging)	70	115	41
%mature plants present at census	87	83	83
#flowering plants	34	24	16
%mature plants mammal grazed	0	1	1
%mature plants missing at census time or grazed	18	68	28
2001			
#seedling (total emerging)	59	74	70
%seedling present at census	76	81	81
#mature plants (total emerging)	17	60	17
%mature plants present at census	88	58	76
#flowering plants	7	9	6
%mature plants mammal grazed	0	0	6
%mature plants missing at census time or grazed	94	65	94
2002			
#seedling (total emerging)	95	111	47
%seedling present at census	91	77	74
#mature plants (total emerging)	17	73	18
%mature plants present at census	71	68	83
#flowering plants	7	20	9
%mature plants mammal grazed	0	7	6
%mature plants missing at census time or grazed	29	32	17

estimated population size has continued to decline compared with estimated population sizes of ~15,000 in 2001 and more than 17,000 in 1999 (Imper and Sawyer, 2002). This year's results indicate a population decline of ~30% since 1999. The explanation for this decline is not evident, although apparently disease and predation from grazers (deer, slugs, and small mammals) are not important factors.

4.2 Depth to Water Table

Formal monitoring of the water table depth in the North and South marshes was begun in 1997. A portion of the PVC pipe used to mark sample plots that year were modified to serve as informal piezometers, enabling measurement of depth to the water table across the occupied lily habitat. Piezometers were installed at 40 ft. intervals along transects T1 and T3 in the North Marsh, and at 40 ft. intervals along transect T200 and T400 in the South Marsh (Maps 3 and 4). The piezometers consisted of 6 ft. sections of ¾" PVC pipe, saw cut in the lower half, capped at the bottom, and pushed at least three feet into the peat substrate. Measurements made on July 28, 1997 ranged between 9 and 36 inches below the surface in the South Marsh, and from 10 to greater than 35 inches in the North Marsh. The correlation between vegetation type and height, and depth to water was evident in the South Marsh, with an average depth of 12 inches recorded in the *Low Labrador tea marsh* (N=4), and 29 inches in the *Tall Labrador tea marsh* (N=4). In particular, measurements in that marsh taken along transect T400 exhibited a sharp drop in the water table moving north, corresponding to a sharp increase in height of the *Labrador tea marsh*. Average depth to water is less in both the *Buckbean marsh* and *Carex marsh*, located south of the transect baseline, which often contains standing water. Water table measurements taken in the North Marsh were more varied. Average depth to water table measured there in the *Calamagrostis marsh* was 20 inches (N=5), while the average measurement along the edge or outside of that habitat exceeded 28 inches (N=3).

Measurements to the water table were made again on July 15, 2002, July 24, 2001, July 13, 2000, and July 21, 1999 at the following stations (2002, 2001, 2000, 1999, and 1997 depths below surface indicated; ND = no data): **North Marsh:** T1-0' (8 inches ND, ND, ND, 8"); T1-40' (11,11,ND,ND,ND); T1-80' (8,10,9,8,27); T1-120' (8,6,8,11,10); T3-0' (ND,ND,4,ND,>35); T3-40' (10,7,7,ND,18); T3-80' (10,10,9,ND,25); T3-120' (4,9,3,ND,33); **South Marsh:** T200-0' (3,5,ND,ND,ND); T200-40' (5,9,6,6,9); T200-80' (12,14,10,ND,15); T400-0' (8,ND,2,ND,10); T400-40' (4,5,8,ND,22); T400-80' (8,5,ND,ND,ND); T400-120' (8,6,ND,8,36); T400-160' (7,7,ND,8,31). The relative measurements indicate that on nearly the same date in each year, the water table was generally within several inches. Based on the Crescent City weather station, spring rainfall (March-June) was 13.4, 12.5, 16.7, 14.1, and 16.2 inches in 2002, 2001, 2000, 1999, and 1997, respectively. It is possible the water table had not yet equilibrated inside the piezometers in 1997, which were installed only 24-48 hours prior to marking the measurements.

On October 30, 2002, two formal continuous-recording pressure transducers were installed in the vicinity of the piezometers at LH Plot #2 in the North Marsh and LH Plot #17 in the South Marsh. The transducers were installed in a 2" x 0.010 slot well screen, and set ~4-5 ft. into the marsh surface. The built-in dataloggers will record depth to the water table continuously for about 18 months, at which time the batteries should be replaced.

4.3 Manual Vegetation Removal and Fencing Treatments

Twelve 30 ft. diameter Vegetation plots, each enclosing a $6ft^2$ Life History (LH) plot, were permanently marked in both the North and South Marshes in July, 1998 (Maps 2-4). Since a comprehensive grid coordinate system has not been developed for the CCMWA population, the Vegetation and LH plots were mapped relative to the existing framework for both marshes (Maps 3

and 4). The plots were marked as follows: a 4 foot rebar stake was placed at one corner of the square plot, corresponding to the center point for the surrounding 30 ft. diameter Vegetation Plot. A 4 ft. PVC pipe marker was placed at the diagonal corner of the LH plot. The plots were subjectively located so as to provide a comparison between manual removal of vegetation and no treatment in similar vegetation, as well as, to contain at least some mature lilies, maximize the number of seedlings in the LH plots, and provide space between adjoining Vegetation plots. The manually treated plots are indicated in Maps 3 and 4.

In both the North and South Marshes, one-half of the Vegetation plots were cleared of all tree and selected shrub cover in October 1998. Trees and shrubs were removed at the base. Target species included: *Alnus rubra*, *A. viridus*, *Lonicera involucrata*, *Malus fusca*, *Myrica californica*, *Picea sitchensis*, *Rhamnus purshiana*, *Salix hookeriana*, *S. lasiolepis*, *Spiraea densiflorus*, and in some cases, *Ledum glandulosum* and *Rubus ursinus*. Past observations have indicated that in most cases the lily is able to tolerate high cover from most of the above shrub and tree species, but the lily rarely occurs in dense stands of *Spiraea*.

The LH plots at CCMWA were monitored on 4 dates between April 1 and July 13, 2002 using the same methodology as the LH plots at TBER (described in Section 3.2). Maps of all plants emerging in LH plots during 2002 are included as Appendix B. Vegetation plots were monitored in mid July; data collected included mean height and cover class for all species, %cover of the overhead canopy, and a map of the vegetation cover. Data sheets and maps of the Vegetation plots are included as Attachment 2. Browsing Inhibitor Plots were established as described for TBER, although there are no Chemical treatment plots at CCMWA.

4.4 Western Lily Characteristics and Vegetation and Life History/Browsing Inhibitor Plot Results

Lily Density and Growth: Various growth characteristics of the population are compared for the previous 5 years in Table 4. Since 1999, there has been an overall decline in the number of seedlings (15%) and mature (multi-leaved) plants (50%) within LH plots in both Marshes. In 2002, the decline in seedlings was greatest in the North Marsh (down 65% since 2000), and was greatest for mature plants in the South Marsh (down 55% since 2000). These data correspond with the overall reduction in number of flowering plants within the Vegetation plots (down 71% since 2000, and down 51% since 1999; Figure 6).

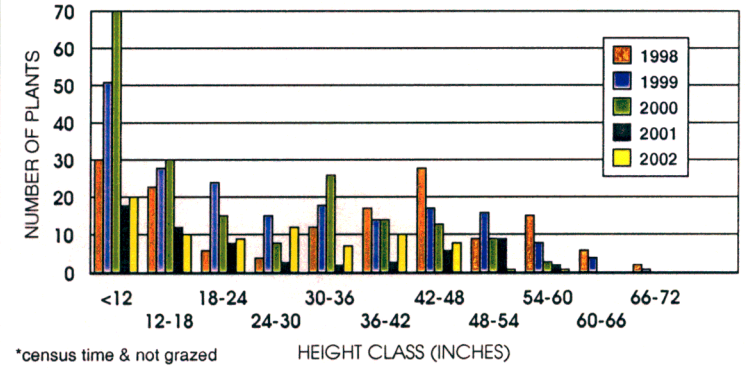
Although the number of seedlings in the South Marsh increased in 2002 to near the peak seen in 2000, the number of seedlings in the North Marsh and the total number of mature plants in both the North and South Marshes are still less than 50% of the 2000 totals. Mature and flowering plants are generally more numerous in the North Marsh, while seedlings have been consistently more abundant in the South Marsh (Table 4). Seedling density in the South Marsh is nearly 4 times that of the North Marsh; mature and flowering plant density is ~30% greater in the North marsh.

In general, the percent seedlings still present at July census in both Marshes has remained relatively consistent since 1999 (~20%), however, for mature plants, the seasonal loss has increased to 25% since 1999 (albeit the loss is slightly lower this year than in 2001) (Table 4). Incidence of disease or insect and slug predation was negligible. For the first time since monitoring was initiated, mammal grazing is an important factor impacting lilies in the North marsh (9%).

The mean height of mature plants within the LH plots has consistently declined since 1998, with the greatest reduction occurring the season following the vegetation clearing in 1998 (Table 4). Overall, plant vigor seems to have declined along with the decline in lily flowering abundance. This season,

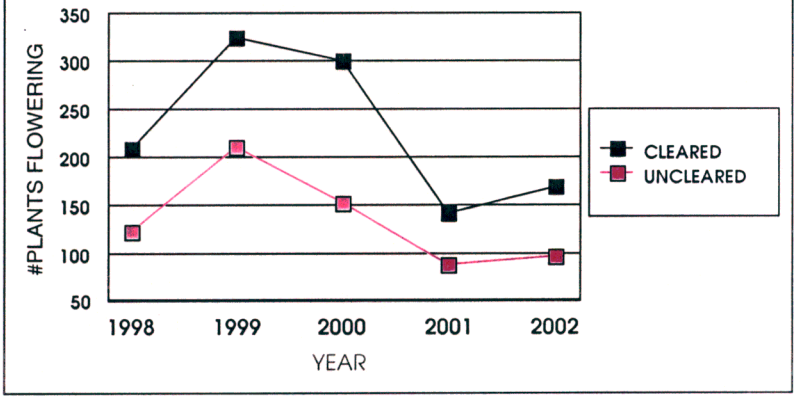
the mean height of 18.5" is approximately half the mean height recorded in 1998. In 2002, the largest size class was <12" tall, and approximately one-third of the mature plants were <24" tall (Figure 7). Since 1998, the largest size class for mature (multi-leaved) plants has remained the <12" class, however, seedlings consistently out-number mature plants, especially in the South marsh.

FIGURE 7. HEIGHT CLASS DISTRIBUTION
24 LIFE HISTORY PLOTS; CCMWA, 1998-2002



Results of Browsing Inhibitor Treatments: In all years, the greatest number of emerged seedlings have been located within Short-Fence plots, although overall since 1999, there has been a 10% decrease in seedlings within these plots (Figure 9A, Table 4). The Tall-Fence plots have also maintained a relatively high number of seedlings overall since 1999 (down only 6%). In all years, the lowest density of seedlings has consistently been found within Control plots.

FIGURE 8. FLOWERING LILY ABUNDANCE BY VEGETATION REMOVAL TREATMENT
24 VEGETATION PLOTS, CCMWA, 1998-2002



In contrast, the percentage of seedlings still present at July census is consistently lower in Short-Fence plots than in Tall-fence plots, and is comparable to the seasonal survival within Control plots (Figure 9B). These results suggest that, ironically, small mammals may actually feed preferentially inside the Short-fence plots. The 18" height of the chicken wire may not be adequate to prevent small mammals from climbing over, and once inside, the enclosure may offer some protection for the animal. Tall-fence plots prevent deer browsing and hoof damage (thus a high percentage of seedlings may escape predation and trampling), although, the total number of seedlings initially was lower, possibly due to the denser vegetation within selected plots.

Since 1999, the number of emerging mature plants has declined significantly within all browsing inhibitor treatments: Tall-Fence down 71%, Control down 66%, and Short-Fence down 30% (Table 4, Figure 9A). In all years, the greatest number of emerged mature plants was also consistently found within Short-Fence plots, and in several years, Short-Fence plots had more than twice the density of the Tall-Fence or Control plots.

Overall, the percentage of mature plants still present at July census has gradually decreased for all treatments since 1999, with the most significant seasonal loss of 42% occurring within Short-fence plots during 2001, the year that exhibited the lowest number of flowering plants (Figures 6 and 9B). Typically, Tall-Fence plots had the greatest percentage of mature plants still present at July census, but in 2002 for the first time, Tall-Fence plots had a greater seasonal loss of mature plants than Control plots.

Since 1999, there has been a decline in the number of flowering lilies in all browsing inhibitor treatments, and generally within each year, there has been no significant difference in the number of

flowering lilies between treatments (Table 4). In 2002, Short-Fence plots had the greatest number of flowering plants, but overall, this still indicates a loss of 43% over the past 4 years. Tall-Fence plots, which provide the greatest protection from browsers, have suffered a 77% decline in the number of flowering plants since 1999. These data suggest that factors other than grazing impacts are negatively affecting the flowering population.

Results of Manually Treated Vegetation Plots: In September 2002, vegetation mapping and sampling was conducted for all 30 ft. diameter Vegetation plots in order to compare vegetation patterns in control plots with plots that were manually cleared of woody vegetation (treated) (Attachment 2). Table 5 provides a summary of the changes in species' frequency, cover, and height in treated and all plots since the vegetation removal was conducted in 1998; Appendix D gives species' height and cover for treated and uncleared plots.

FIGURE 9A. WESTERN LILY EMERGENCE BY BROWSING PROTECTION TREATMENT 24 LH PLOTS, CCMWA, 1998-2002

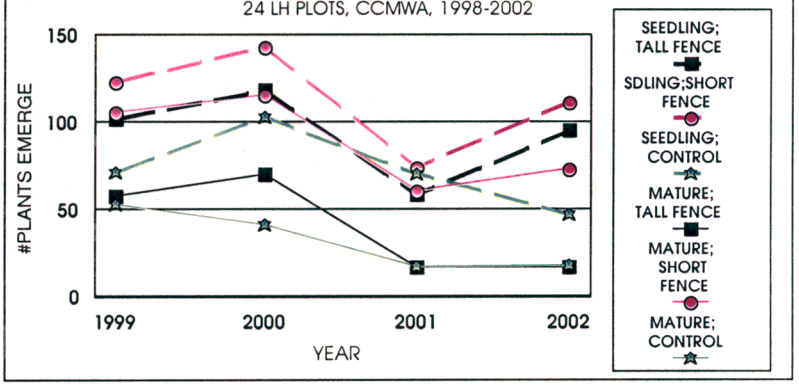
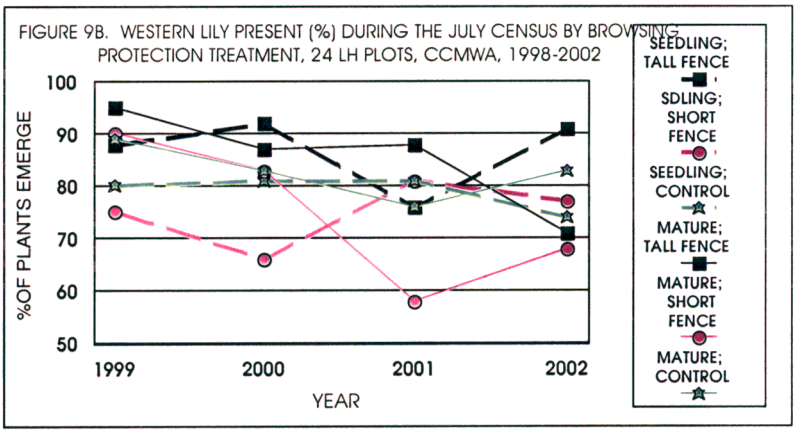


FIGURE 9B. WESTERN LILY PRESENT (%) DURING THE JULY CENSUS BY BROWSING PROTECTION TREATMENT, 24 LH PLOTS, CCMWA, 1998-2002



The most frequent species for all plots remains the same after 5 years (occurring in nearly every plot): *Calamagrostis nutkaensis*, *Ledum glandulosum* (Labrador Tea), *Lysichiton americanum* (skunk cabbage), and *Sanguisorba officinalis* (Table 5). In 2002, the %frequency of many herbaceous species in treated plots is similar to the levels for all plots, although *Potentilla palustris* has had a more noticeable increase in frequency since 1998 than others (from 75% to 92% in 2002). Other herbaceous plants that had a positive response to clearing include *Hypericum formosum*, *Veratrum californicum*, and pteridophytes *Athyrium felix-femina*, *Blechnum spicant*, and *Equisetum* sp. In manually cleared plots, the %frequency of woody shrubs and trees was deliberately reduced, and since 1998, species such as *Rubus spectabilis*, *Rhamnus purshiana*, *Picea sitchensis* have remained low in frequency. Shrubs that were not target species (i.e., *Rhododendron occidentale*) have increased in %frequency in treated plots relative to all plots.

There are few species that exhibit significant cover values in the North and South Marshes (Table 5). For all plots, the following species have remained dominant since 1998: *C. nutkaensis*, *L. glandulosum*, *S. officinalis*, *L. americanum*, and *P. palustris*; however, the native grass, *C. nutkaensis,* has experienced a significant drop since 1999 (58 to 32 %cover). Since removal of woody vegetation, the dominant species within treated plots have remained similar to all plots, but their cover is lower after 5 years. Compared to pre-treatment data from 1999, the manually cleared plots had slight declines in cover for the herbaceous species *C. nutkaensis* (-12%), *S. officinalis* (-4%), *Carex obnupta* (-5%), and *Rubus ursinus* (-5%). Cover of woody vegetation for all plots has generally remained constant since 1998, with the exception of slight decline in *Alnus viridus* (-7%). However, for cleared plots only, %cover of shrubs and trees has continued to gradually decrease since 1998, and still remains lower compared to all plots (i.e., *L. glandulosum*, *A. viridis, S. douglasii*,

TABLE 5. SUMMARY STATISTICS FOR ASSOCIATED SPECIES IN 24 VEGETATION PLOTS, CCMWA, OCT 98, JUL 99, AND SEPT 02.

	ALL PLOTS*									MANUAL TREATED PLOTS (TREATED OCT98) *								
	%FRE**			%COV**			HT (in) **			%FRE**			%COV**			HT (in) **		
ASSOCIATED SPECIES	1998	1999	2002	1998	1999	2002	1998	1999	2002	1998	1999	2002	1998	1999	2002	1998	1999	2002
Alnus rubra	17	17	21	2	2	1	199	77	154	25	25	33	1	0	0	185	22	132
Alnus viridis	83	71	88	19	10	12	83	67	73	83	58	92	10	1	4	83	43	59
Angelica genuflexa	92	96	83	5	5	2	57	51	59	92	100	92	2	2	1	52	42	54
Athyrium felix-femina	54	54	67	3	3	2	41	43	40	58	58	75	2	2	1	37	41	38
Blechnum spicant	46	54	58	4	3	3	38	40	38	42	58	67	1	1	1	34	37	36
Calamagrostis nutkaensis	100	100	100	58	58	32	43	44	45	100	100	100	26	26	14	41	42	43
Carex obnupta	88	88	79	21	20	10	45	43	42	83	83	75	10	9	5	43	39	38
Carex spp.	0	0	0	0	0	0				0	0	0	0	0	0			
Cornus sericea	0	0	0	0	0	0				0	0	0	0	0	0			
Deschampsia caespitosa	4	4	0	0	0	0	48	48		0	0	0	0	0	0			
Epipactus gigantea	8	8	4	0	0	0	18	18	12	8	8	0	0	0	0	24	24	
Equisetum spp.	17	21	38	1	1	2	27	31	25	25	33	42	1	1	2	24	30	24
Galium trifidum	0	4	0	0	0	0				0	8	0	0	0	0			
Gaultheria shallon	0	0	0	0	0	0				0	0	0	0	0	0			
Gentiana sceptrum	29	25	25	1	1	1	26	23	27	33	25	25	0	0	0	27	22	24
Holcus lanatus	0	8	0	0	0	0				0	17	0	0	0	0			
Hypericum formosum	17	21	33	0	0	1	21	20	20	8	17	25	0	0	0	24	21	20
Juncus leseurii	25	29	25	2	1	1	50	46	41	17	25	17	1	0	1	48	40	39
Ledum glandulosum	100	100	96	68	64	63	50	42	46	100	100	100	32	28	29	50	34	43
Lonicera involucrata	67	67	67	7	5	4	68	56	55	58	58	58	4	2	2	72	45	48
Lotus formosissimus	0	0	0	0	0	0				0	0	0	0	0	0			
Lysichiton americanum	96	96	100	12	13	12	35	36	35	100	100	100	8	8	7	28	31	30
Maianthemum dilatatum	4	8	0	1	1	0	48	27		0	8	0	0	0	0		6	
Malus fusca	13	8	13	1	1	1	152	87	136	17	8	17	1	0	0	162	42	138
Menyanthes trifoliata	54	58	54	3	5	5	14	14	13	42	50	42	2	3	3	12	12	11
Myrica californica	46	33	46	6	5	5	97	107	105	33	8	25	1	0	0	90	144	92
Oenanthe sarmentosa	0	0	0	0	0	0				0	0	0	0	0	0			
Picea sitchensis	50	25	25	5	2	1	134	165	152	50	0	8	3	0	0	104		48
Rhamnus purshiana	8	8	8	0	0	0	36	36	39	0	0	0	0	0	0			
Potentilla palustris	75	79	88	14	16	14	32	31	30	92	100	92	11	12	9	34	33	31
Pteridium aquilinum	4	4	0	0	0	0				0	0	0	0	0	0			
Rhododendron occidentalis	50	46	42	2	2	1	63	58	56	67	58	58	2	1	1	62	53	53
Rubus ursinus	58	58	50	18	14	8	39	35	33	58	58	42	8	4	3	38	30	30
Salix spp.	29	29	29	7	5	7	98	75	93	25	25	25	3	1	2	112	60	80
Sanguisorba officinalis	100	100	100	27	28	21	32	32	34	100	100	100	16	18	12	34	34	34
Rubus spectabilis	8	8	8	0	0	0	54	54	51	0	0	0	0	0	0			
Aster chilensis	42	42	46	1	1	1	38	33	35	42	42	58	1	0	1	41	30	34
Spiraea douglasii	42	42	42	8	7	8	60	50	53	33	33	33	3	2	3	63	39	43
Veratrum californicum	0	21	13	0	1	0				0	42	25	0	1	0			

*All plots (N=24) and Treated Plots (N=12)

**%FRE = absolute %frequency; %COV = absolute %vertical projection cover;

**HT = average weighted height (contribution to ht calculation proportional to rel. cover within plot)

Salix spp., and *M. californica*). The most distinctive difference in vegetation structure between the cleared and all plots is the significant reduction in *L. glandulosum* and *C. nutkaensis* in cleared plots. These results suggest that manual removal of shrubs and trees reduces the cover of woody vegetation for at least 5 years.

The average height of the dominant herbaceous species has remained generally similar between all plots and cleared plots. In 2002, the mean height of most trees and shrubs was still below 1998 levels, but many species are quickly approaching pre-treatment heights (especially *L. glandulosum*, *M. californica*, *L. involucrata*, *Salix* ssp., and *R. occidentale*). Although still below pre-treatment mean heights, *A. rubra* and *Malus fusca* have made tremendous growth in only 4 years (110" and 96" respectively).

In 1999, there was a significant increase in the number of flowering plants in both cleared and uncleared plots, corresponding to the peak flowering year (Figure 8). Since then, both the cleared and uncleared plots have exhibited a significant percent decrease in the total number of lily plants (Table 4). Overall since 1999, seedlings and flowering plants have had a smaller percent decline within the cleared treatment (for seedlings: -6% cleared vs. -30% uncleared; for flowering plants: -48% cleared vs. –54% uncleared), while mature plants have done better in uncleared plots (-40% uncleared and –56% cleared) (Table 4, Figure 8). Paired t-tests indicate that 2001 was a poor year for the lily, with both 2000 and 1999 having a significantly higher numbers of seedlings, mature plants, and flowering plants (Table 4). After 5 years these results show no significant benefit for the lily from clearing, although the long-term benefits of clearing are without question

Photomonitoring: In 2002, annual photomonitoring was conducted for the 24 Vegetation plots at CCMWA. For each plot, a photo was taken towards the plot center (towards the interior of the marsh), from 15 ft. outside the plot boundary. The photomonitoring provides a visual record of the quantitative data recorded. The slides are included as Attachment 3.

5.0 COMPARISONS BETWEEN TBER AND CCMWA

5.1 Plant Development

The mean height for mature, ungrazed plants in both the North and South Marshes at CCMWA (18" and 19" respectively) remains consistent with the previous 3 years, however, this average is nearly half that of the original, baseline data (33" and 35" in 1998; Table 4). Flowering and lily abundance also has declined significantly throughout the marsh, although selective browsing by deer does not appear to be a factor. Changes in hydrology (e.g., water table depth) may be a contributing factor, but our data do not indicate it has changed.

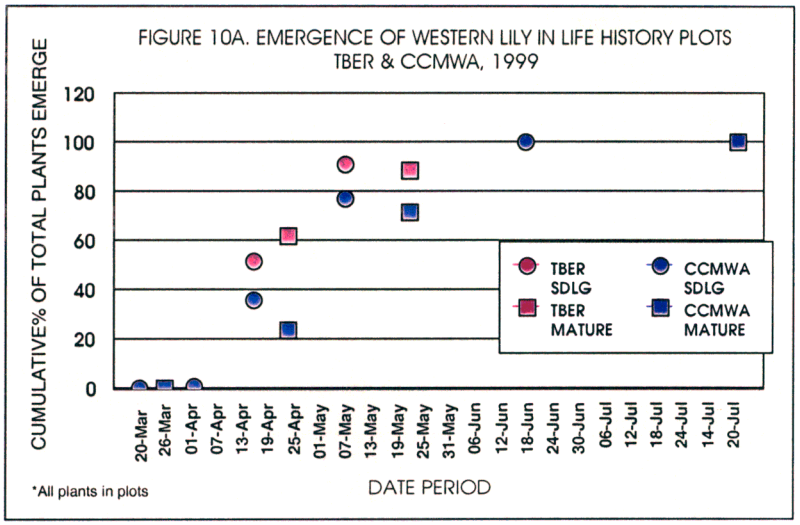
At TBER, the mean height of mature, ungrazed plants has dramatically decreased since 1998 from 21" to 11". This apparent decrease is likely an artifact caused by the greater intensity of deer browsing that has occurred at TBER in the past couple years, rather than by environmental change that imparts physiological changes. The deer preferentially browse on the taller, more readily seen lilies. In doing so, they leave behind proportionately more of the smaller, shorter, immature lilies. Thus, this data reflects the demographics of the population in that a large proportion of mature plants are juvenile, multi-leaved individuals that are not yet reproductive. There is no indication that the total population at TBER has declined as dramatically as the population at CCMWA.

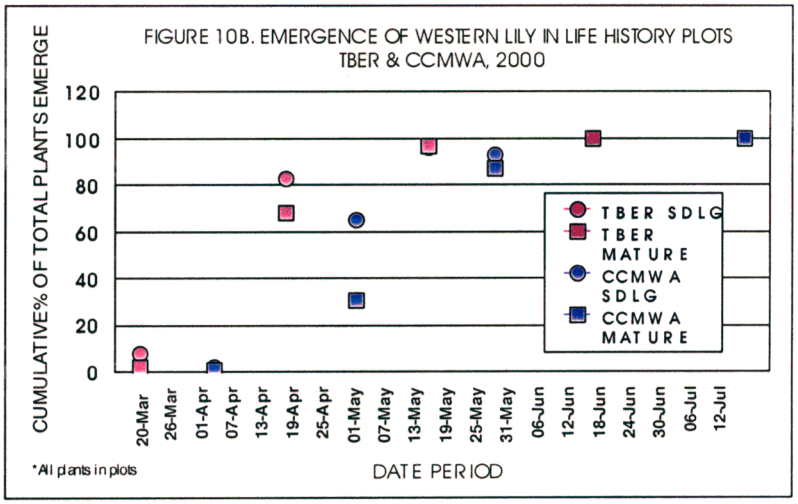
5.2 Emergence of Plants

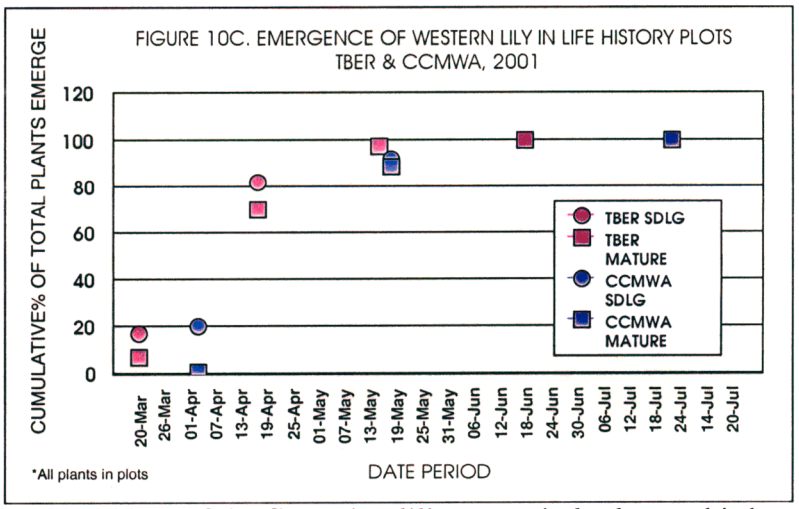
Cumulative emergence over the course of the season was plotted for seedlings and mature plants over the past four years for each site (Figures 10A-10D). The emergence curves were interpolated to

determine the data at the point where 80% of the plants have emerged. In general, the 80% emergence point for seedlings at TBER occurs during mid to late April, while the 80% emergence point for seedlings at CCMWA is delayed anywhere from 2-4 weeks later, usually in early to mid May. In 2002, the peak of seedling emergence at TBER did not occur until mid May, while peak emergence at CCMWA was delayed until early June.

The 80% emergence point for mature plants at TBER occurs consistently during late April to early May. At CCMWA, the peak for emergence of mature plants has occurred between mid May and early June. In the 4 years of monitoring at TBER and CCMWA, the 80% emergence point of mature plants at CCMWA occurred anywhere from 2-5 weeks after TBER, the largest lag occurring in 2002. The delay in emergence at CCMWA for both seedlings and mature plants is expected given the high water table and the somewhat lower soil temperatures there (described below).



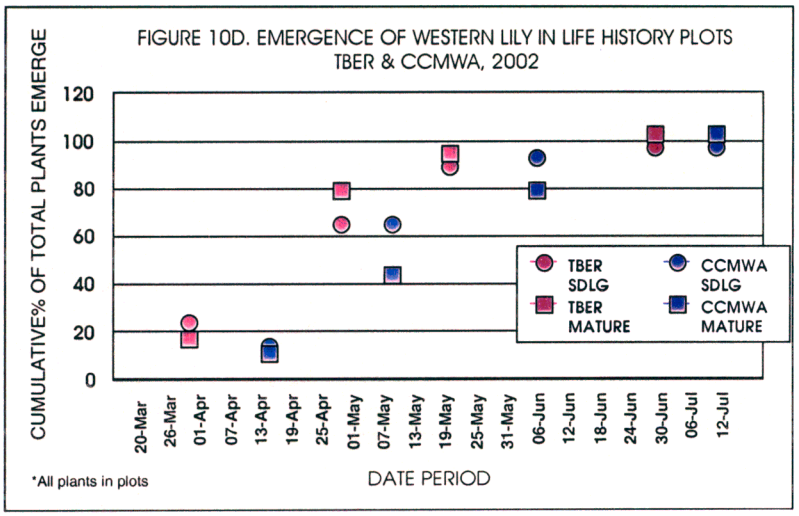




5.3 Reproductive Phenology

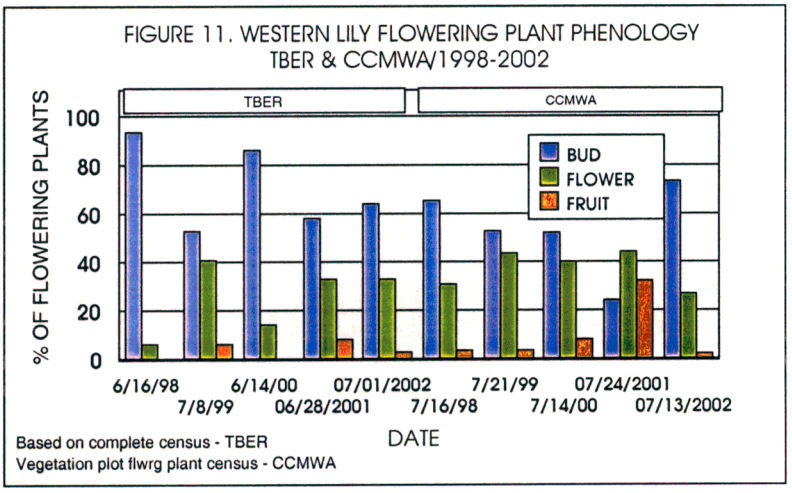
The flowering period at CCMWA, along with many of the populations in Oregon, has traditionally been thought to reach peak flower approximately one month later than the Table Bluff populations. Our data support these observations, as the population at TBER reaches peak flower generally 2-3 weeks earlier than the CCMWA population (Imper and Sawyer, 2002). Based on the annual census conducted at TBER in 2001 and 2002, by late June approximately two-thirds of the flowering lilies were in bud, one-third were in flower, and a small number were developing fruits (Table 2A, Figure 11). In most years at CCMWA, approximately two-thirds to one-half of the flowering plants are in bud at the time of census during mid July, and in all years, there has been no apparent difference in phenology between the North and South Marshes (Table 4, Figure 11). In 2001, the blooming period at CCMWA was

advanced by several weeks, so that by mid July, over half the flowering plants were already in flower, and approximately one-third were in fruit.



5.4 Soil Temperature

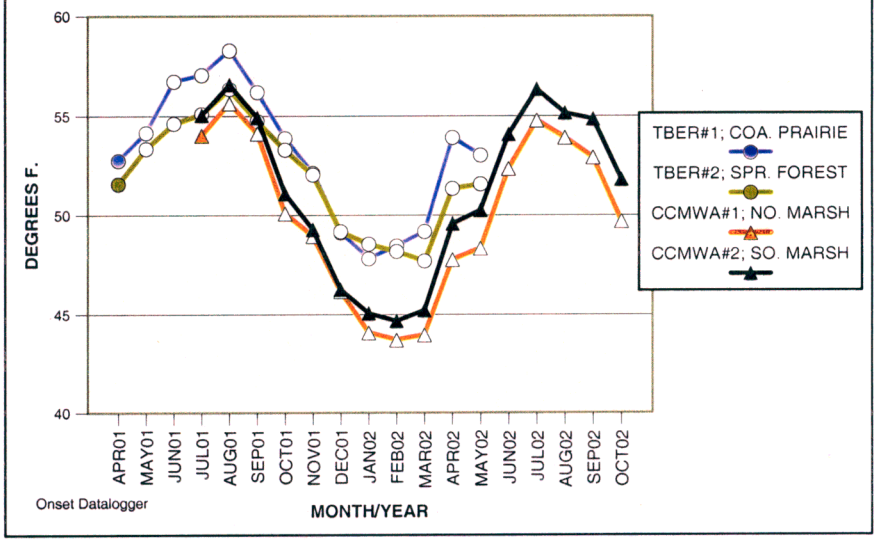
In order to better characterize soil temperature variation throughout the year, correlate soil temperatures with plant phenology, and compare temperatures between TBER and CCMWA, Onset temperature dataloggers were buried at two locations at both sites. At TBER, data was recorded at two-hour intervals at a depth of approximately 5-6 inches beneath the soil surface in both the *Coastal prairie* (NW corner of LH plot #17) and *Spruce forest* (NE corner of LH plot #13) (Map 1). At CCMWA, Onset temperature dataloggers were installed at 5-6 inches below the soil surface in the North Marsh (LH plot #2), and in the South Marsh (LH plot #17) (Maps 3 and 4). Mean monthly temperatures for each site from April 2001 until October 2002, including mean maximums and minimums, are summarized in Appendix C and shown in Figures 12A-12C.



In general, the mean temperature is greater at TBER than at CCMWA at any time of year, averaging up to 4 degrees higher from February to April. The mean maximum is also greater at TBER with nearly a 6° F difference during February to April, which also corresponds in time with the greatest difference in maximum temperature between *Coastal prairie* and *Spruce forest* at TBER (Figure 12C). Overall, the *Coastal prairie* has a higher mean temperature (by 1° F) than the adjacent *Spruce forest* for most of the year (February to November), and although cooler on average, the *Spruce forest* is always warmer than either of the North or South Marsh sites at CCMWA. At CCMWA, there is no significant difference in average temperatures between the North and South Marshes. The coolest period at TBER occurs during January and February, but still, the mean temperatures do not drop below that of CCMWA. The mean minimum temperature at TBER averaged up to 4.6° F higher than CCMWA during February, 2002.

Monitoring results for TBER over the past 15 years, (Imper and Sawyer, 2001b) have shown a strong relationship between air temperature recorded at Eureka and floral development, and have indicated a delay in flowering of approximately 4 days per degree (F) cooler air temperature. Assuming air temperatures are correlated with soil temperatures (but undoubtedly dampened to a degree), the differences in soil temperatures observed between TBER and CCMWA suggest flowering would be delayed two weeks or more at CCMWA compared to TBER, in good accordance with the phenological data described above. Both emergence and reproductive phenology is undoubtedly linked to soil temperature, though that data has not yet been analyzed.

FIGURE 12A. AVERAGE MONTHLY SOIL TEMPERATURE (F)
5-6 INCHES BELOW SURFACE; TBER & CCMWA



Onset Datalogger

FIGURE 12B. MINIMUM MONTHLY SOIL TEMPERATURE (F)
5-6 INCHES BELOW SURFACE; TBER & CCMWA

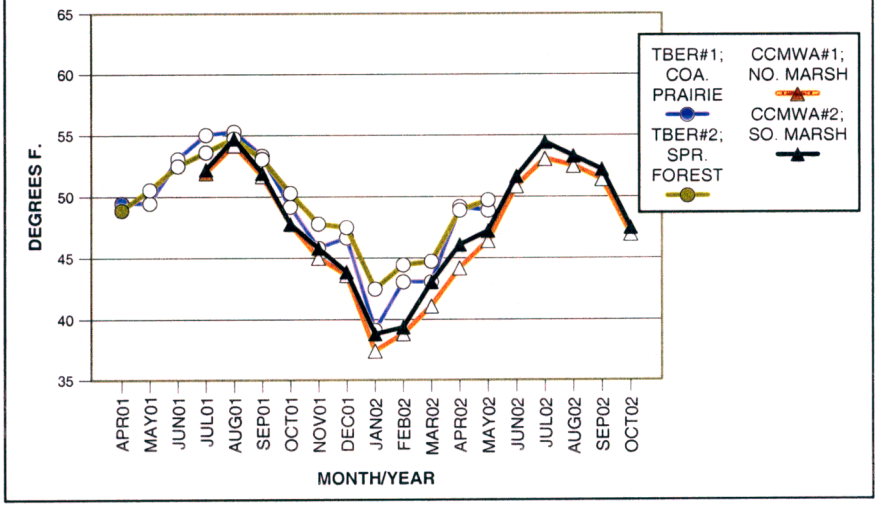
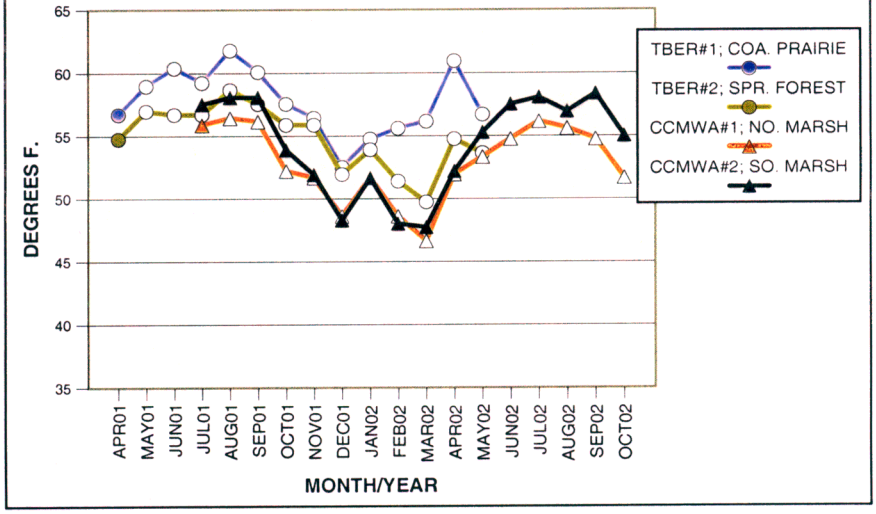


FIGURE 12C. MAXIMUM MONTHLY SOIL TEMPERATURE (F)
5-6 INCHES BELOW SURFACE; TBER & CCMWA



5.5 Browsing

The impact of natural browsing (i.e., loss of plants prior to the final census date) in the LH plots was significantly greater at TBER than at CCMWA in 2001 and 2002 due to the large population of deer that resides on Table Bluff. At TBER during 2002, deer browsing accounted for a loss of approximately 75% of the flowering plants by the time of the annual census (early July), and up to a 40% browse rate for mature plants within LH plots (Table 2A). Seedling browsing by small mammals (rodents) also appears significant at TBER, in conjunction with desiccation, as a principal cause for seedling mortality.

Overall, there has been little evidence of decline in flowering plants at CCMWA as a result of deer browsing. There is some indication of rodent or slug browsing in a small percentage of plants, which generally occurs in the Short-Fence or Control plots rather than in the Tall-Fence plots.

6.0 SUMMARY

The primary goals of this study have been to examine the life history of western lily in two large, disjunct populations occurring in very different habitat types, to evaluate the effectiveness of fencing and chemical control in reducing predation by both deer and small mammals (primarily rodents), and to assess the impacts of habitat change resulting from both manual thinnings and different grazing regimes. After 5 years, the data reveals important trends in the populations, including changes in population size and degree of predation, and provides guidelines towards enhancing management of western lily and its habitat. The interpretation of our results have been complicated by the increase in deer browsing at TBER, and the overall decline in population size at CCMWA that appears unrelated to predation, disease, changes in vegetation structure, or obvious microenvironmental factors. In addition, because western lily is a long-lived, bulbous perennial, the fate of a single individual due to direct or indirect impacts from change in habitat, predation levels, or controlled grazing, may not be quantifiable or noticeable in the population for some time given our level of examination in this study. Based on these considerations, continued annual monitoring of both populations is warranted, and a detailed examination of the life history of a single individual may be necessary in order to evaluate long-term impacts of continual high-intensity browsing on plant reproduction and longevity.

The population at TBER has exhibited a dramatic decline in the number of flowering plants and the seasonal survival rate of seedlings and mature plants (Table 2A), as well as, a corresponding increase in the proportion of flowering plants grazed, contributing to a decline in overall reproduction. These trends reflect the increase in deer density and browsing, however, historical fluctuations in deer populations have likely been experienced by western lily before, and at this point, it is too early to determine with certainty whether this level of natural browsing will be detrimental to the population in the long-term.

The results from the Browsing Inhibitor treatments at TBER indicate that for seedlings, the greatest overall increase since 1999 has occurred within Tall-Fence plots where deer are excluded (Table 2A). Control and Chemical plots exhibited a much lower percent increase in number of seedlings, while Short-Fence plots had a percent increase similar to Tall-Fence plots. Thus, Fence treatments were beneficial by nearly doubling the percent increase in number of seedlings.

Between 1999 and 2001, the seasonal survival of mature plants (% of plants still present at census) was similar between all Browsing Inhibitor treatments (>90%; Table 2A). In 2002, there was a significant decline in the seasonal survival rate for mature plants in all treatments, but the greatest proportion of mature plants still present at census was found within Tall-Fence plots. Although this result was expected, the data indicates that Tall-Fence plots since 1999 have had only a 1% overall

increase in number of emerging mature plants, and it is the Short-Fence plots that have exhibited the greatest increase overall in number of emerging mature plants (+28%). Although Short-Fence plots allow unrestrained deer browsing, this data indicates that the Short-Fence treatment may be important in protecting emerging mature plants during the critical early stages of growth by reducing predation from small mammals. The chicken wire used in the Tall-Fence treatment does not prevent small rodent access into the plot.

The controlled grazing regimes implemented at TBER indicate that the passively grazed area has had the greatest overall percent increase in seedlings and mature plants since 1999, although data from the low-intensity treatment are similar. Thus, in the short-term, low to moderate grazing intensity has been beneficial for western lily, especially for seedlings. In interpreting results from the grazing treatments, we have assumed impacts from deer browsing to be equally distributed amongst treatments, since deer have unrestricted access to all areas.

All grazing treatments appear moderately successful at maintaining a constant overhead canopy cover, as well as, reduced heights of competing vegetation (Table 2B). Overall, the passive treatment, which appears to benefit the western lily population, resulted in a significant decrease in the cover of salmonberry, and also maintained low levels of himalaya berry, blackberry, and willow scrub. The detrimental effects to the reproduction and longevity of western lily from the encroachment of these species are obvious in field observations. Again, the results from the passive treatment were generally parallel to the low-intensity treatment. The high-intensity treatment, although successful at reducing blackberry cover and maintaining low levels of willow scrub, resulted in an increase in the cover of salmonberry, himalaya berry, and barren understory. Thus, a low to moderate grazing regime composed of few cows and an extended grazing duration is overall more beneficial to western lily than a high-intensity regime where several cows are confined for a short period of time.

At CCMWA, the flowering plant population and the estimated total population size have declined significantly (Table 4, Figure 6). The LH plot results indicate that since 1999, there has been little change in the seasonal survival rate for seedlings, but there has been a 16% increase in the seasonal loss of mature plants. Browsing Inhibitor treatment results show that since 1999, the greatest decline in number of emerging seedlings occurred within Control plots (decrease of 34%), while the Fence treatments experienced a decrease averaging only 8.5%. Thus, Fenced treatments appear beneficial for seedling recruitment at CCMWA.

Surprisingly, since 1999, the greatest overall decline in number of emerging mature plants was exhibited by the Tall-Fence treatment (71%) and Control plots (66%) (Table 4). Short-Fence treatment had only a 30% decline overall since 1999 in total number of emerging mature plants. In addition, the Short-Fence treatment had the smallest overall decline in flowering plants since 1999 (decrease of 43%, vs. 59% Control and 77% Tall-Fence), and in 2002, 2001, and 1999, Short-Fence plots had the highest number of flowering plants. Thus, as at TBER, fencing is beneficial for seedlings when compared with no treatment, and perhaps the Short-Fence treatment may protect the newly emerging mature plants during a critical phase of growth. Although, the supposition of the Short-Fence treatment protecting emerging mature plants, while also making seedlings more vulnerable (higher seasonal loss) due to small mammal preferential feeding inside the Short-Fence plots is seemingly incongruous, and requires further analysis. The Tall-Fence treatment in each year has had a greater seasonal survival rate for mature plants than the Short-Fence or Control, and this is unambiguous in field observations, especially for flowering plants.

Short-term impacts to the western lily from the manual vegetation clearing treatment at CCMWA are mixed, indicating a greater overall decline in the number of seedlings in uncleared (no treatment)

plots, in contrast with a greater overall decline in number of mature plants in cleared plots. The decline in the number of flowering plants is similar for both treatments. Cleared plots have generally maintained their reduced shrub and tree cover and frequency, even though mean heights of several species increased substantially since 1999, including *Alnus rubra*, *Malus fusca*, and *Salix* spp. The long-term impacts of vegetation clearing are undoubtedly beneficial, as dense encroachment of woody species in other areas of the CCMWA has negatively impacted the smaller western lily populations that occur there.

7.0 RECOMMENDATIONS

In order to further evaluate the long-term impacts of natural deer browsing and different controlled grazing intensities on the western lily population and its habitat, we recommend the following for TBER:

1) Continue annual monitoring of the 27 LH plots on 4 sampling dates between late March and late June. On each monitoring date, all seedlings and mature lilies should be mapped and presence/absence recorded for plants located during previous monitoring dates. Mature plants should also be characterized for phenology, height, and extent of browsing or disease.
2) In accordance with the TBER Management Plan, continue general habitat monitoring of the vegetation transects within the two grazing enclosures on an annual basis, and, throughout the entire monitoring grid at approximately 3-5 year intervals (Imper et al., 1987).
3) Implement some manner of deer control for the western lily exclosure. The increase in deer on Table Bluff warrants development of a plan to monitor and control deer density in the long-term.
4) Implement monitoring that closely examines the life history of distinct individuals from seedling to reproductive adult stage in order to evaluate long-term impacts of natural browsing and habitat change.

In order to further evaluate the decline in population size for both the North and South Marshes, as well as, to aid in developing a management plan and grazing regime for the CCMWA, we recommend the following:

1) Continue annual monitoring of the 24 LH plots on 4 sampling dates between March 15 and July 15. On each monitoring date, all seedlings and mature lilies should be mapped and presence/absence recorded for plants located during previous monitoring dates. Mature plants should also be characterized for phenology, height, and extent of browsing or disease.
2) Continue the annual census for all flowering lilies within the 24 Vegetation plots during July, including mapping and recording height, phenology, and extent of browsing or disease.
3) Complete monitoring of vegetation composition structure within the 24 Vegetation plots at 3-5 year intervals, including %cover and height of all species present, as well as, mapping of vegetation in order to evaluate changes in species' cover and distribution.

8.0 LITERATURE CITED

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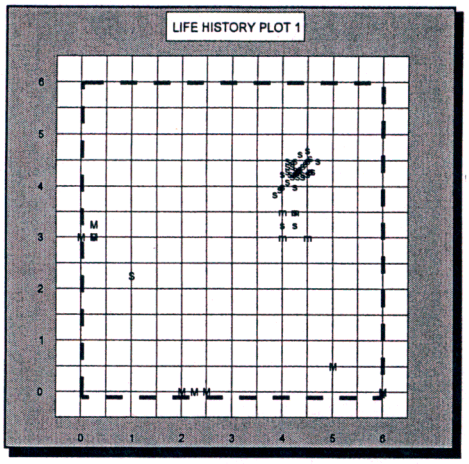
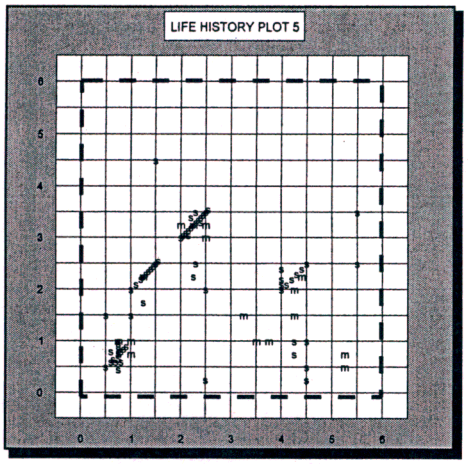
WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

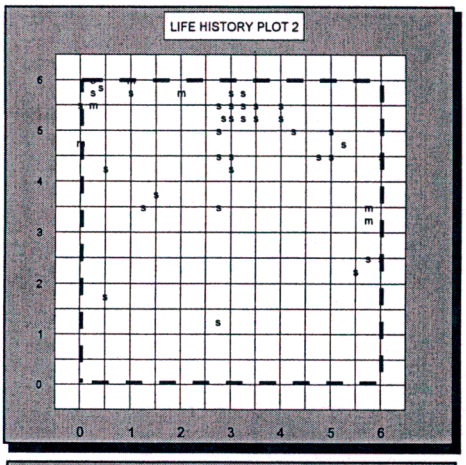
APPENDIX A

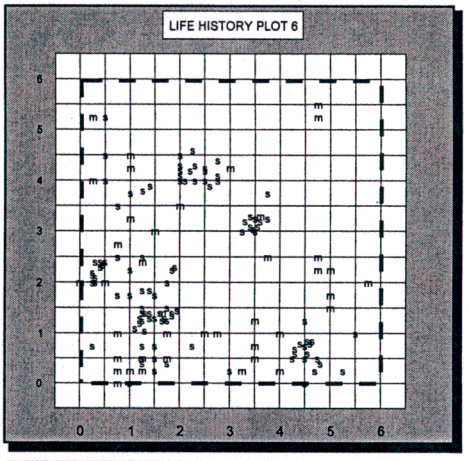
2002 MAPS OF WESTERN LILY
27 TBER LIFE HISTORY PLOTS

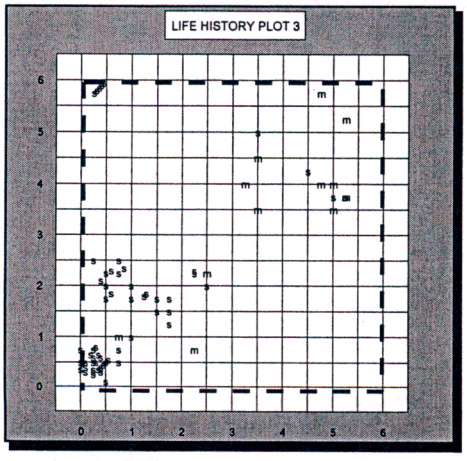
APPENDIX A
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2002

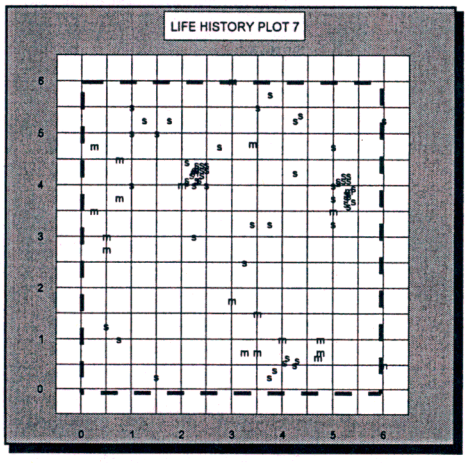


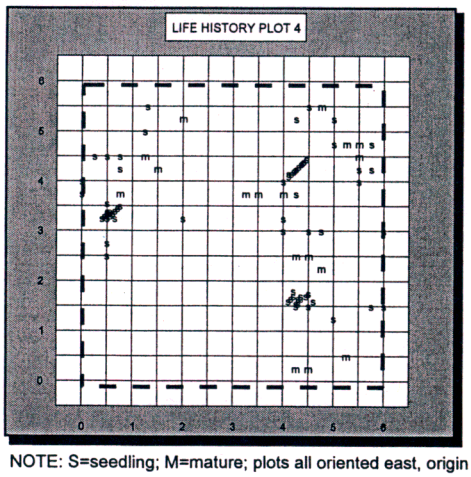


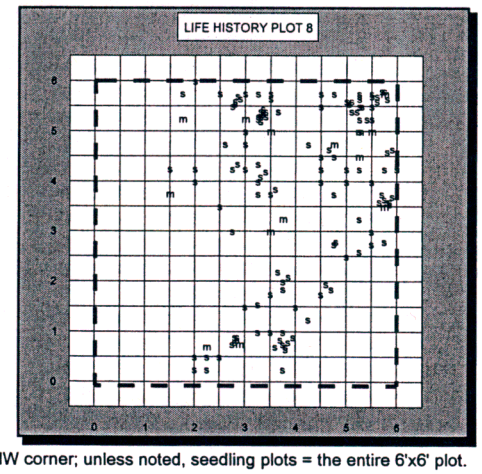






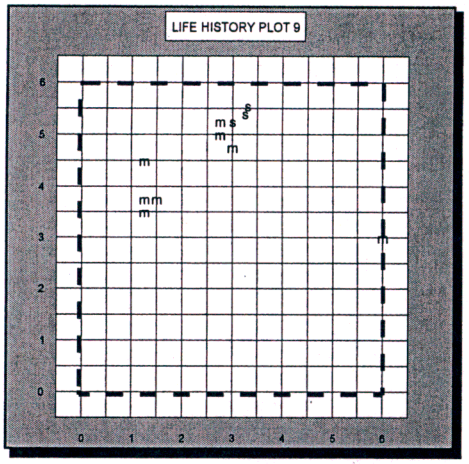


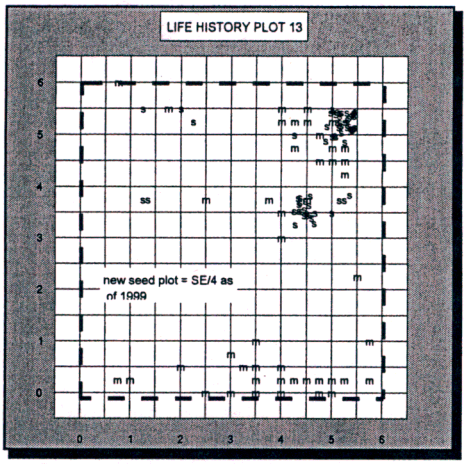


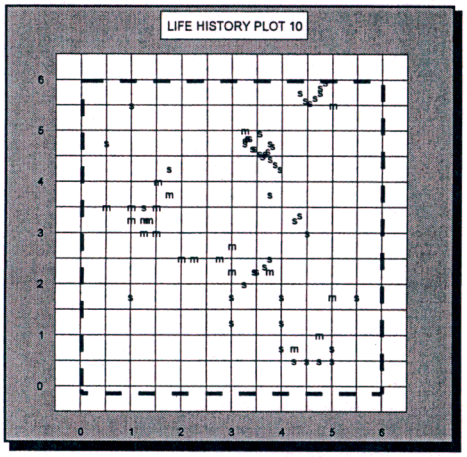


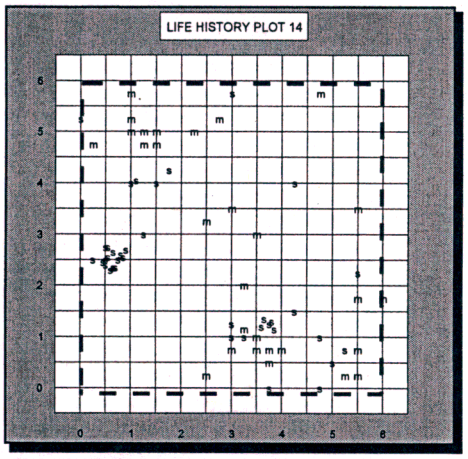
NOTE: S=seedling; M=mature; plots all oriented east, origin = NW corner; unless noted, seedling plots = the entire 6'x6' plot.

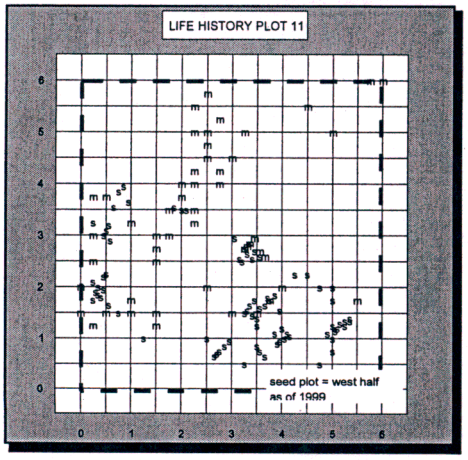
APPENDIX A (CONTINUED)
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2001

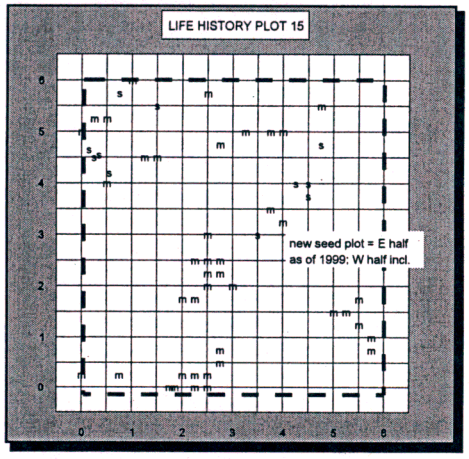


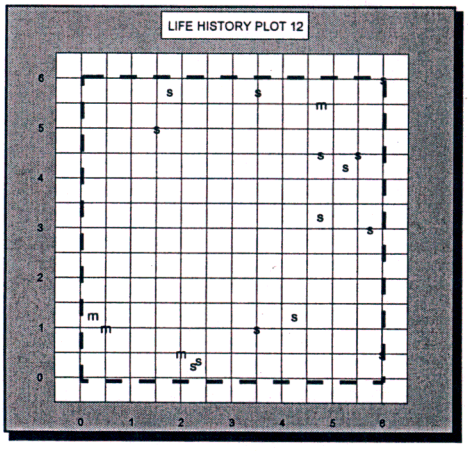


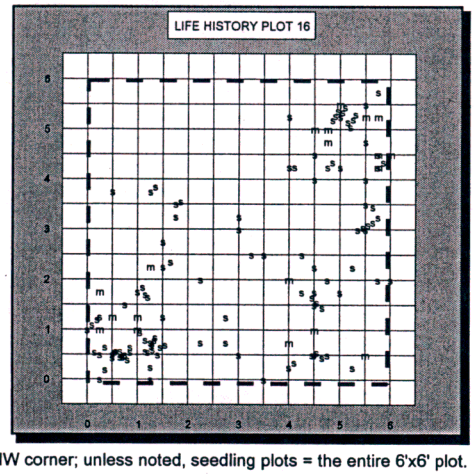






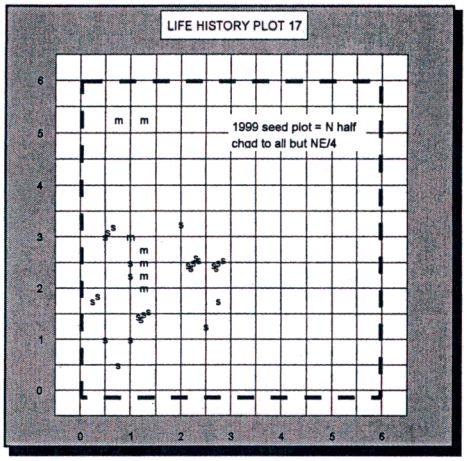


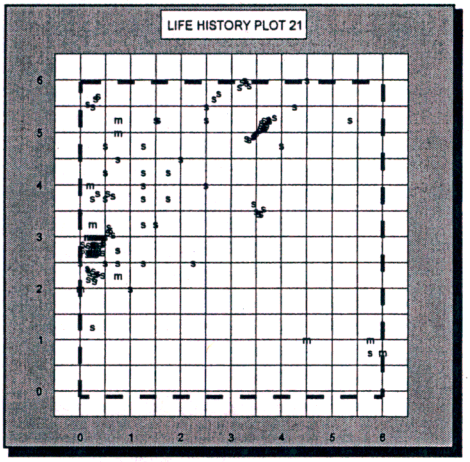


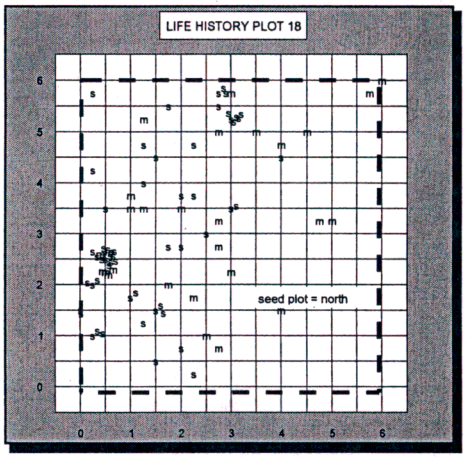


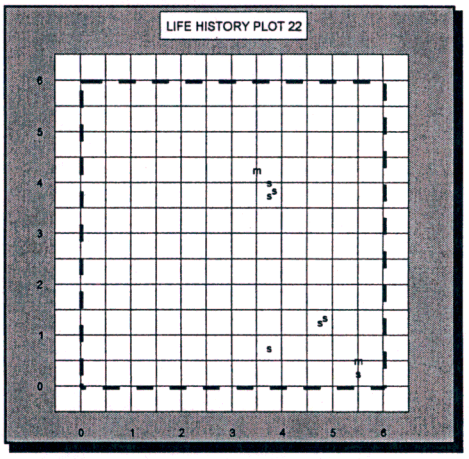
NOTE: S=seedling; M=mature; plots all oriented east, origin = NW corner; unless noted, seedling plots = the entire 6'x6' plot.

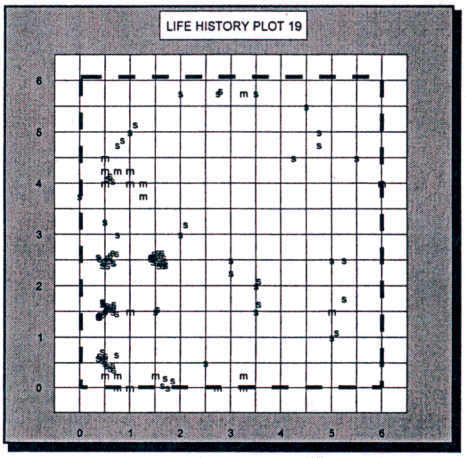
APPENDIX A (CONTINUED)
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2001

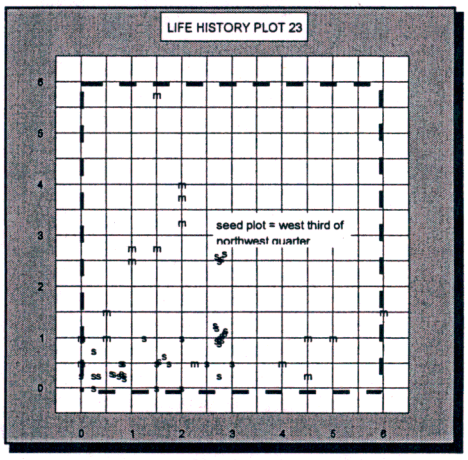


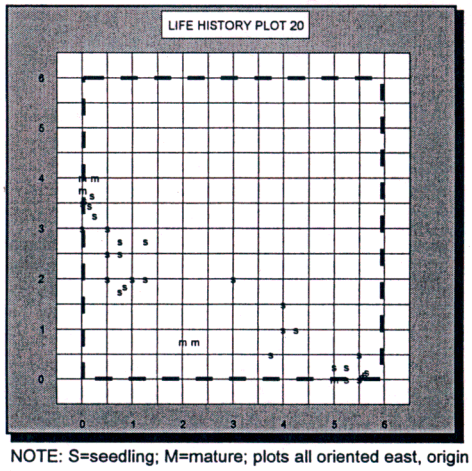


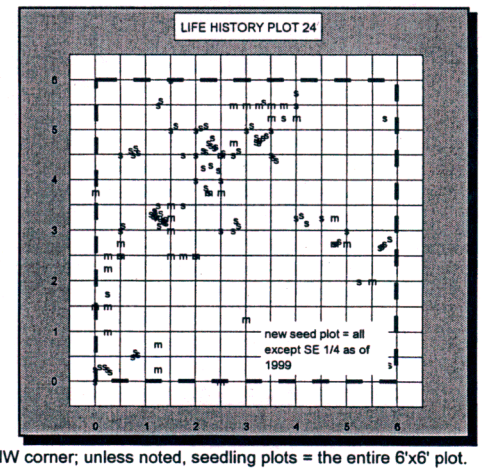






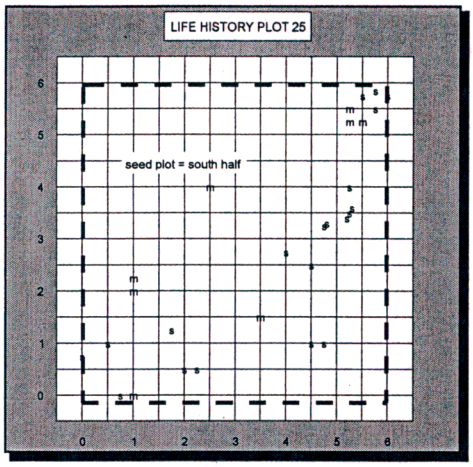


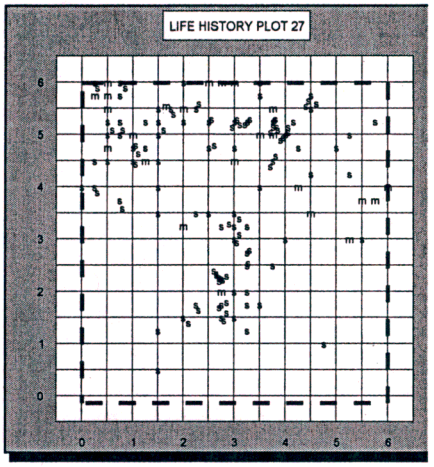


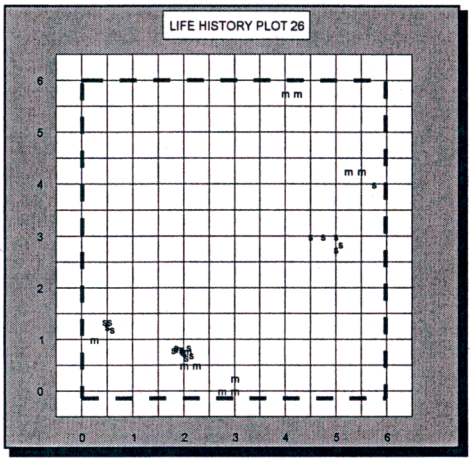


NOTE: S=seedling; M=mature; plots all oriented east, origin = NW corner; unless noted, seedling plots = the entire 6'x6' plot.

APPENDIX A (CONTINUED)
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2001







NOTE: S=seedling; M=mature; plots oriented east, origin = NW corner.
Unless indicated, seedling plots = the entire 6'x6' plot.

WESTERN LILY VEGETATION STRATEGY
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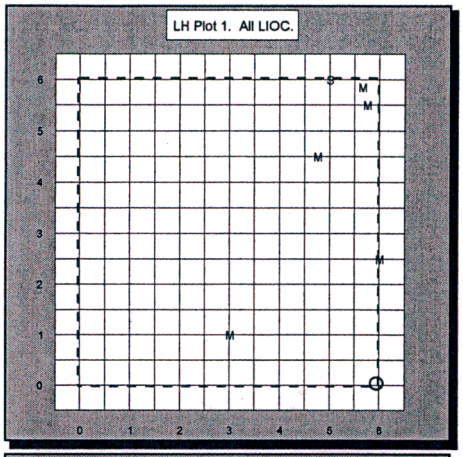
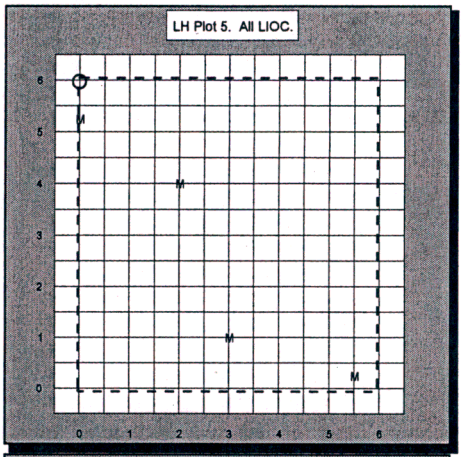
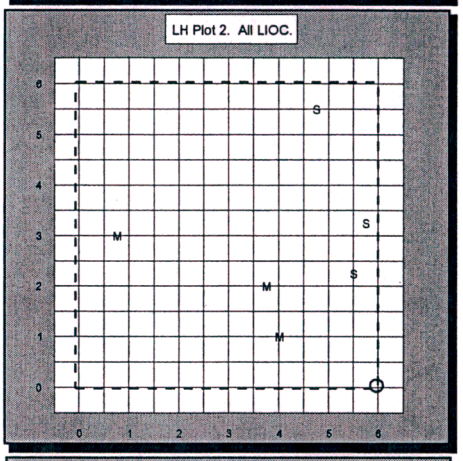
APPENDIX B

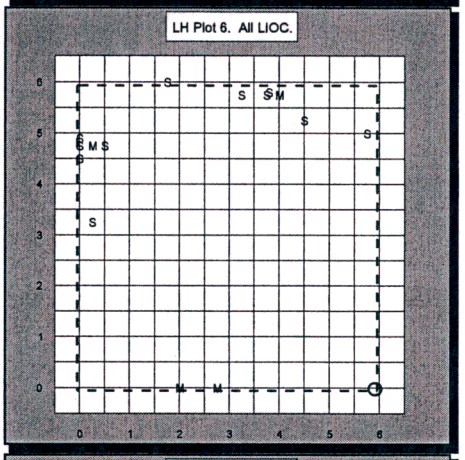
2002 MAPS OF WESTERN LILY
24 CCMWA LIFE HISTORY & VEGETATION PLOTS

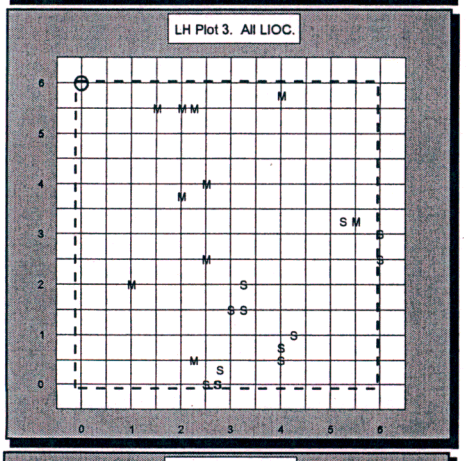
APPENDIX B
CRESCENT CITY MARSH WILDLIFE AREA LIFE HISTORY PLOTS 2002

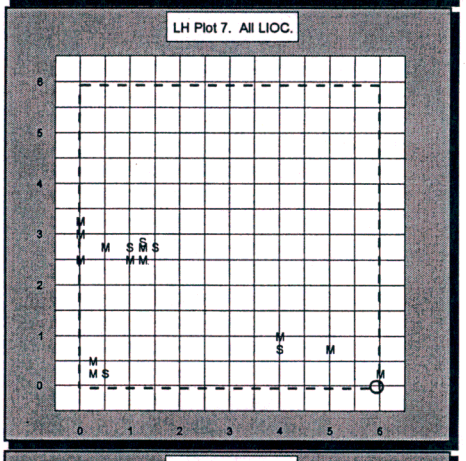


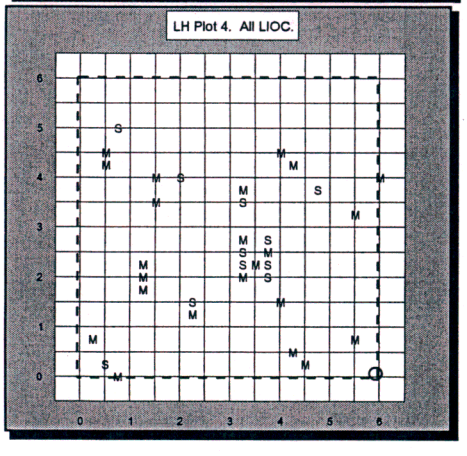


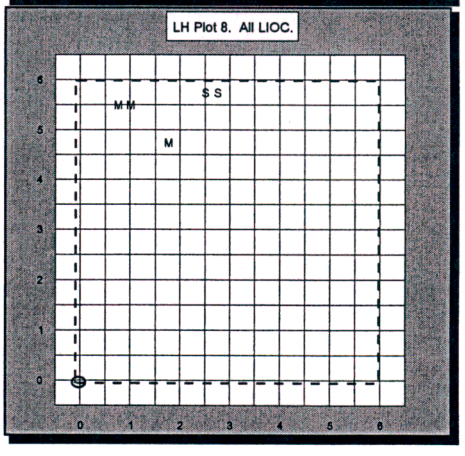






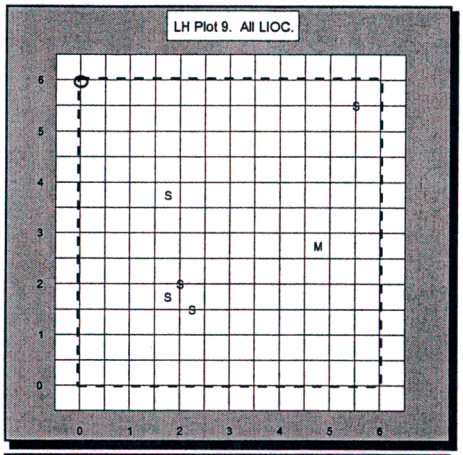


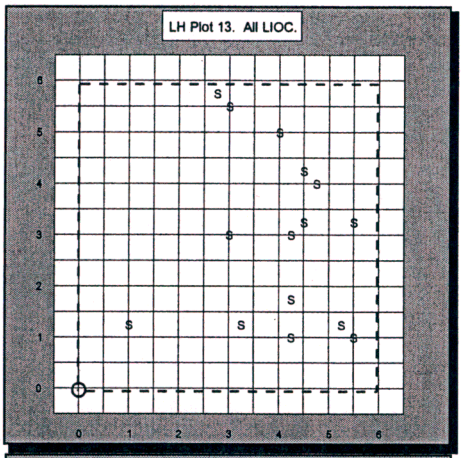


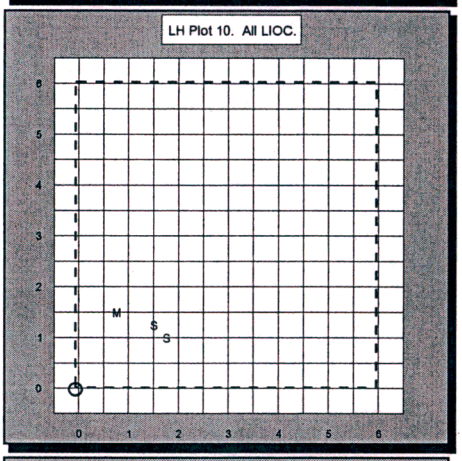


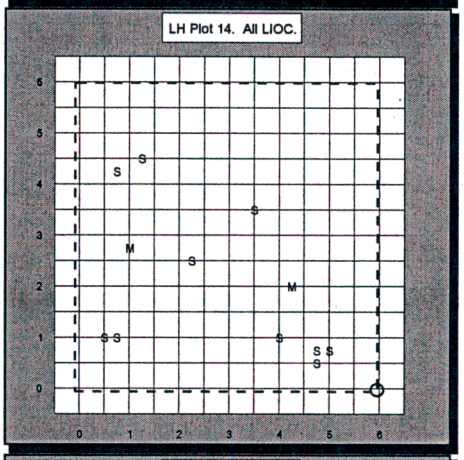
NOTE: s=seedling; m=mature; plots all oriented north; unless noted, seedling plot = entire 6x6' plot; vegetation plot center indicated.

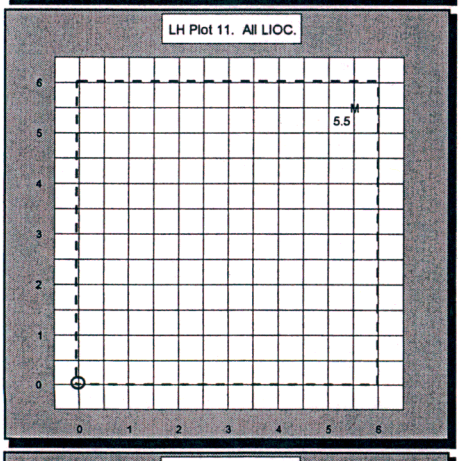
APPENDIX B: (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA LIFE HISTORY PLOTS

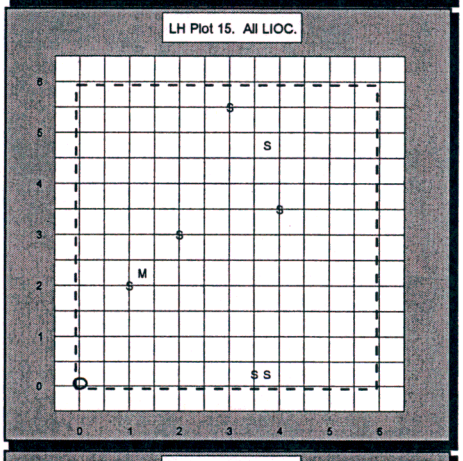


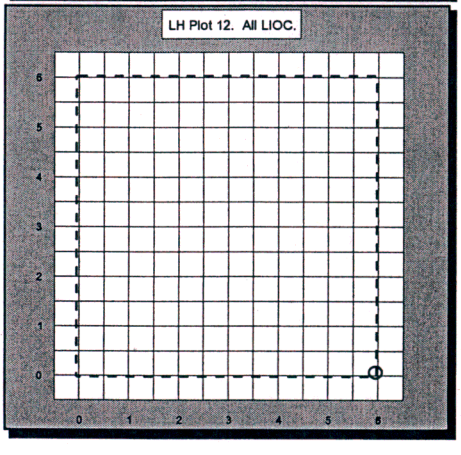


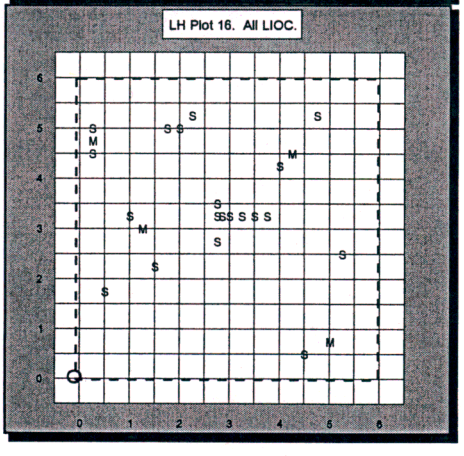






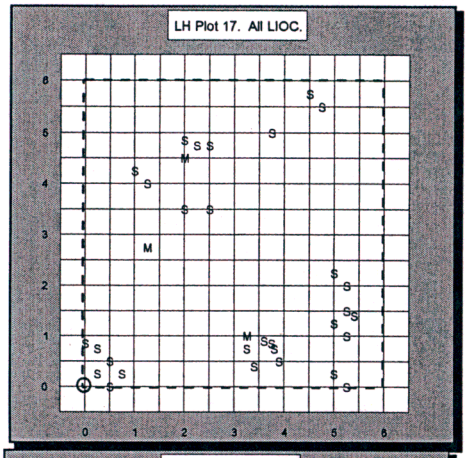


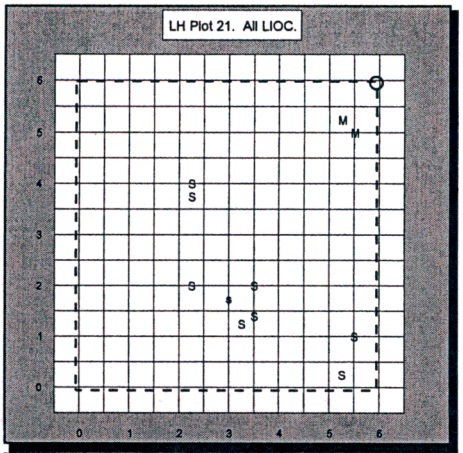


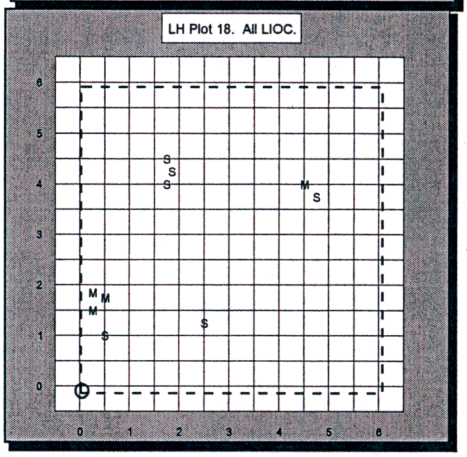


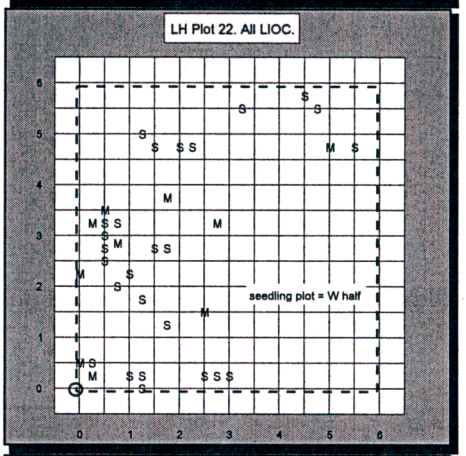
NOTE: s=seedling; m=mature; plots all oriented north; unless noted, seedling plot = entire 6x6' plot; vegetation plot center indicated.

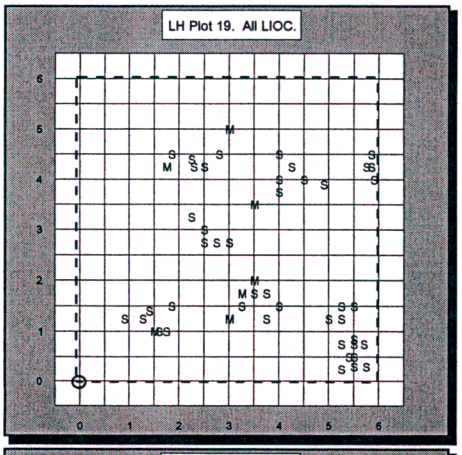
APPENDIX B. (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA LIFE HISTORY PLOTS

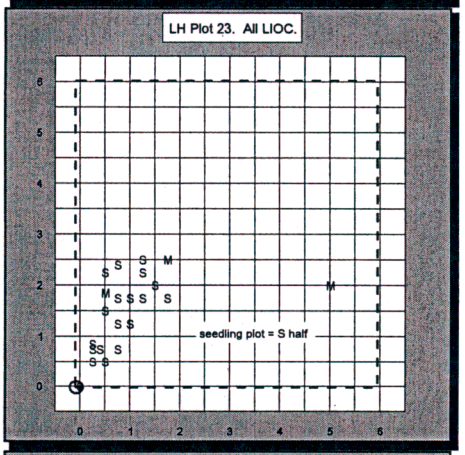


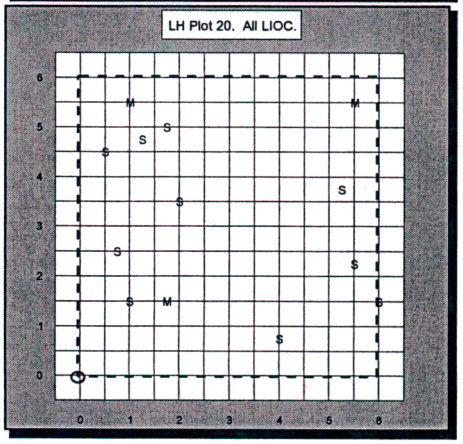


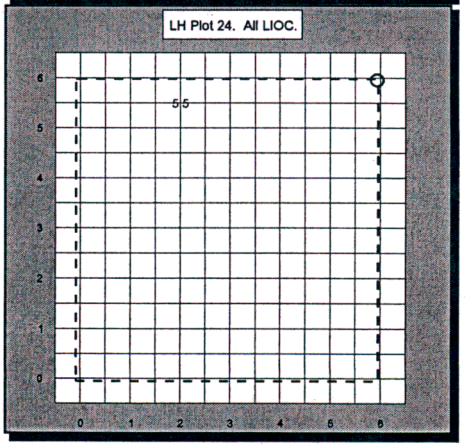






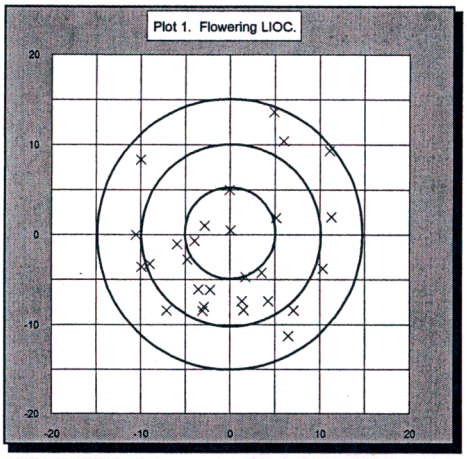


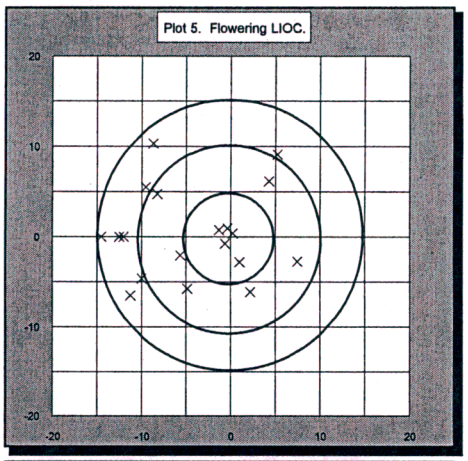


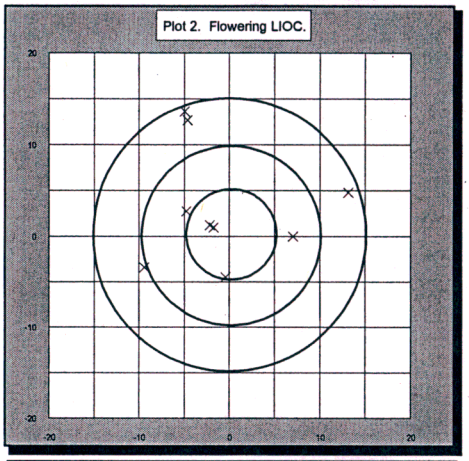


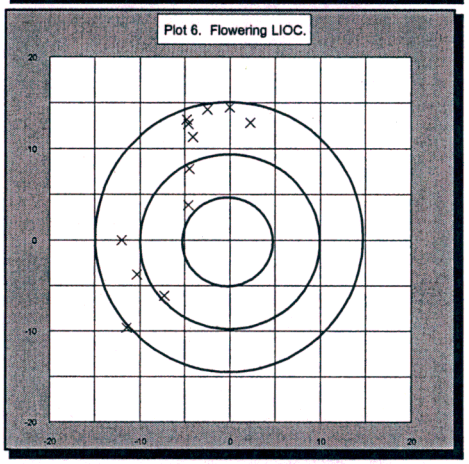
NOTE: s=seedling; m=mature; plots all oriented north; unless noted, seedling plot = entire 6x6' plot; vegetation plot center indicated. Plot 22, seedling plot = west half; Plot 23 seedling plot = south half.

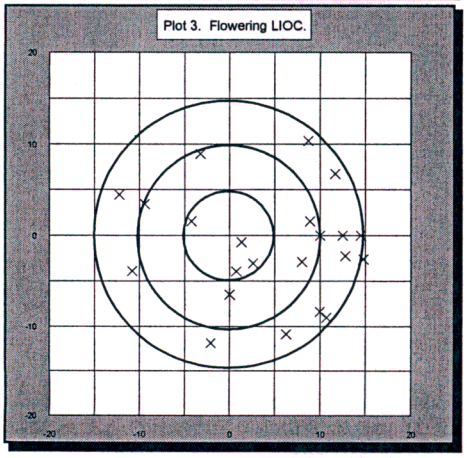
APPENDIX B
CRESCENT CITY MARSH WILDLIFE AREA VEGETATION PLOTS 2002

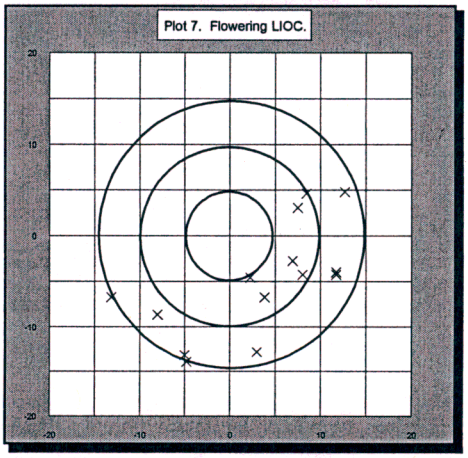


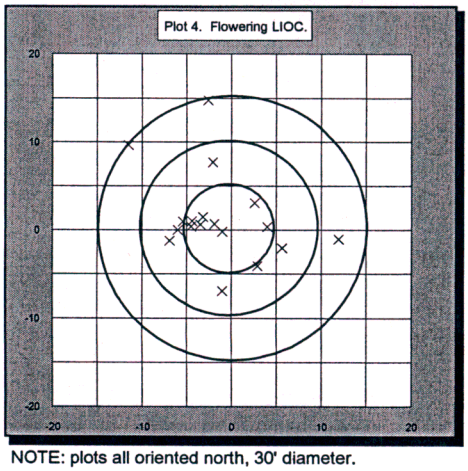


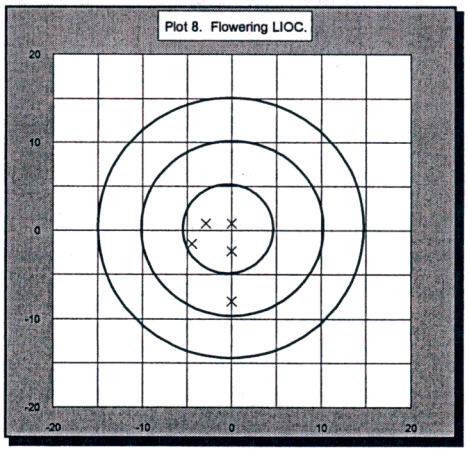






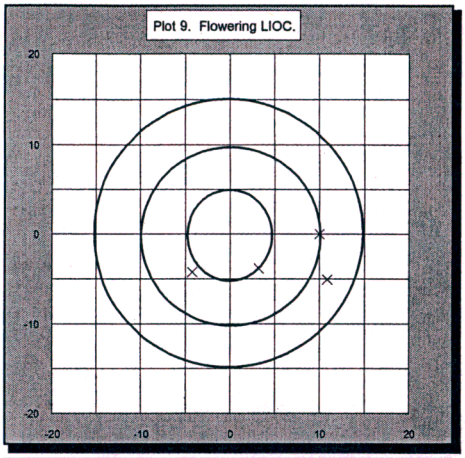


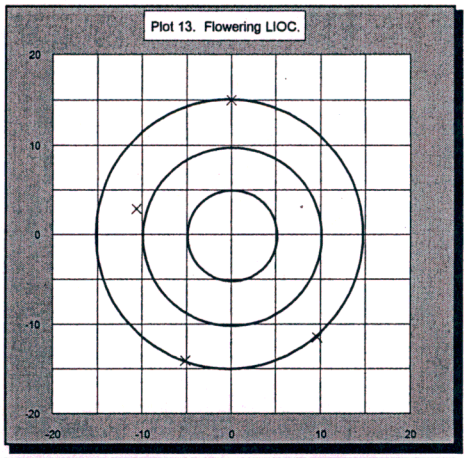


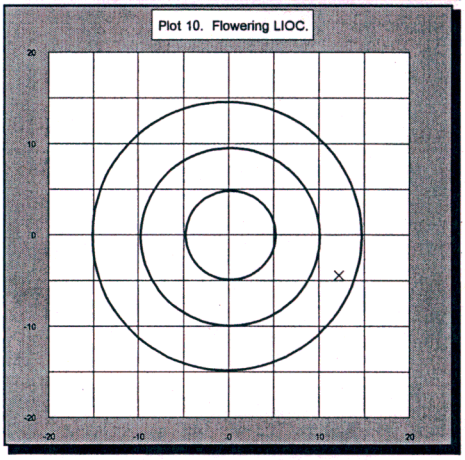


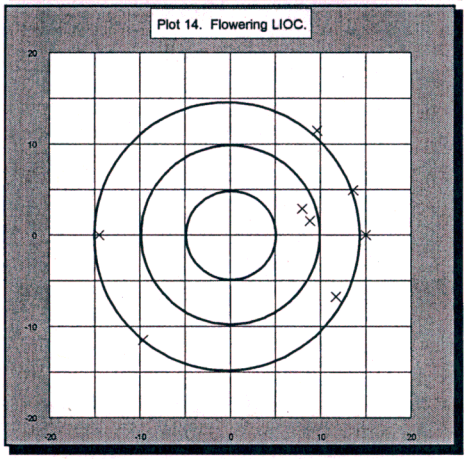
NOTE: plots all oriented north, 30' diameter.

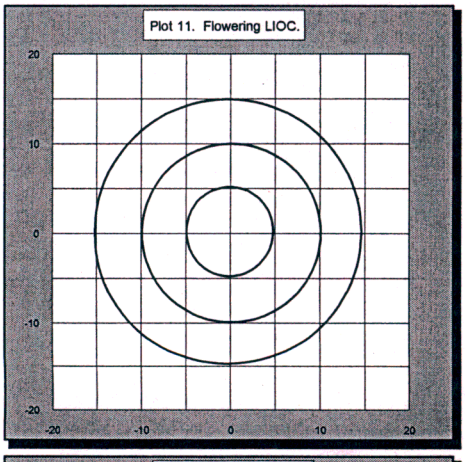
APPENDIX B (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA VEGETATION PLOTS

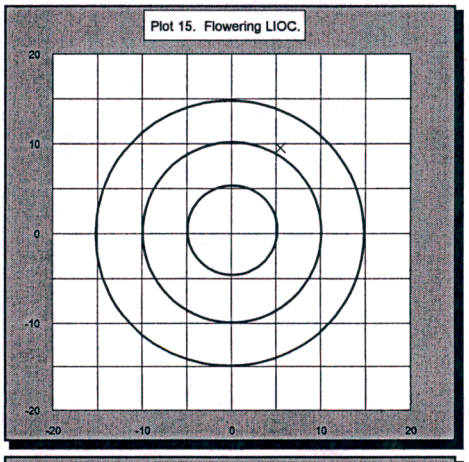


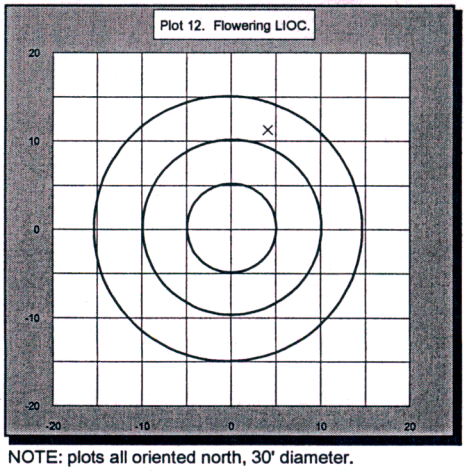


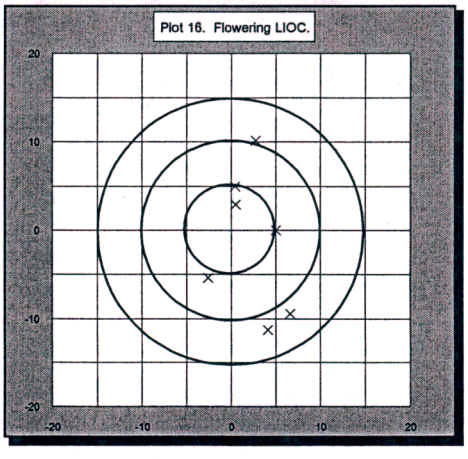






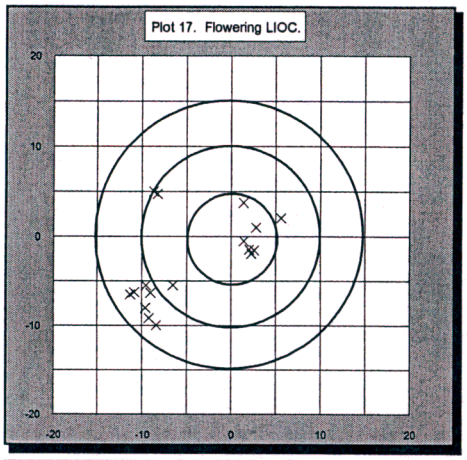


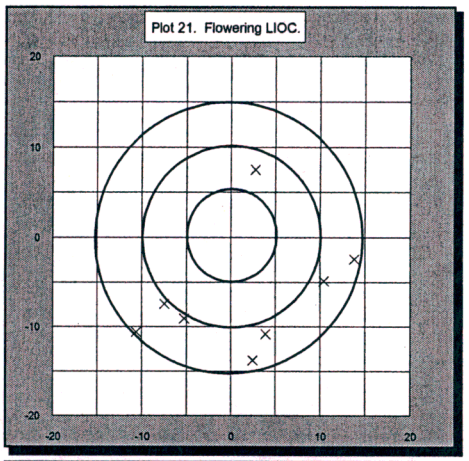


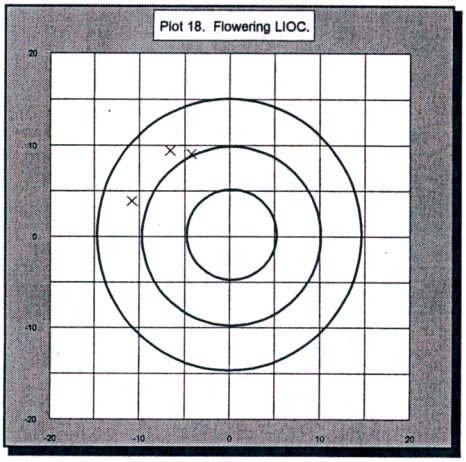


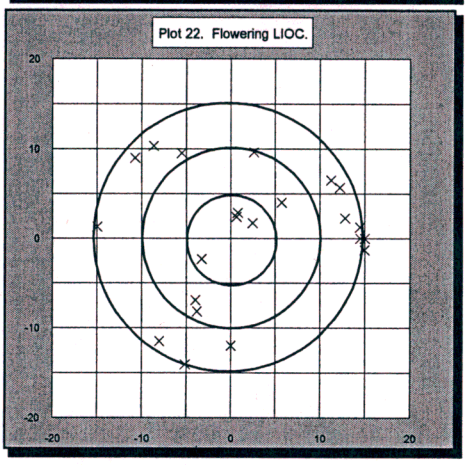
NOTE: plots all oriented north, 30' diameter.

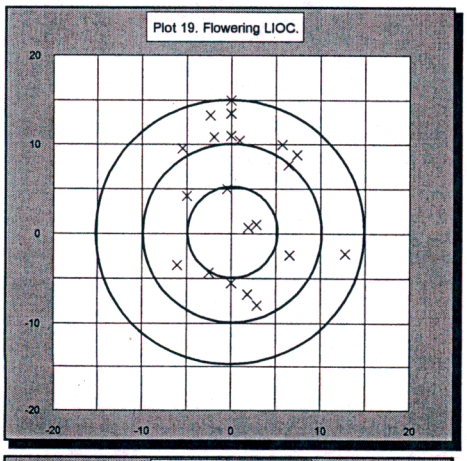
APPENDIX B (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA VEGETATION PLOTS

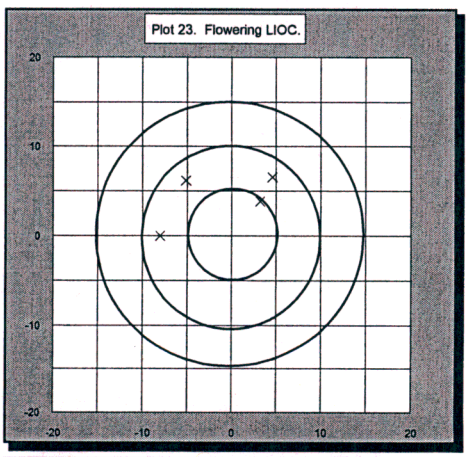


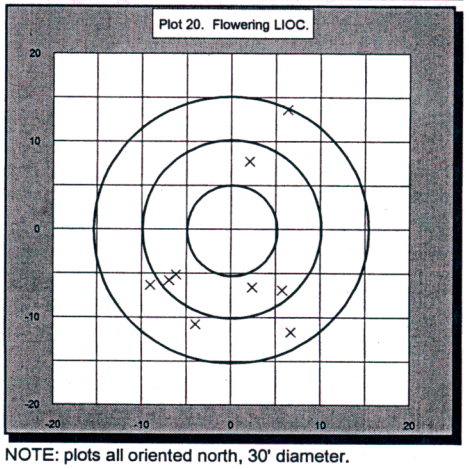


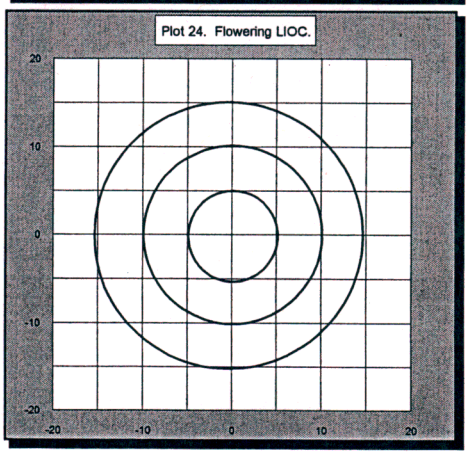












NOTE: plots all oriented north, 30' diameter.

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

APPENDIX C

SOIL TEMPERATURE DATA
TBER & CCMWA, APRIL 2001-OCTOBER 2002

APPENDIX C.

TBER & CCMWA SOIL TEMPERATURE DATA APRIL 2001-OCTOBER 2002

MEAN TEMP (F)	MONTH	TBER #1	TBER #2	CCMWA #1	CCMWA #2	DIFF. IN MEAN TBER OVER CCMWA
	APR01	52.7	51.6			
	MAY01	54.1	53.3			
	JUN01	56.7	54.6			
	JUL01	57.1	55.1	54.0	55.0	1.5
	AUG01	58.3	56.4	55.6	56.6	1.2
	SEP01	56.2	54.7	54.1	54.9	1.0
	OCT01	53.9	53.3	50.1	51.1	3.0
	NOV01	52.1	52.0	49.0	49.3	2.9
	DEC01	49.1	49.2	46.2	46.3	2.9
	JAN02	47.8	48.6	44.1	45.1	3.6
	FEB02	48.5	48.2	43.7	44.7	4.1
	MAR02	49.2	47.7	43.9	45.2	3.9
	APR02	53.9	51.3	47.8	49.6	3.9
	MAY02	53.0	51.6	48.4	50.3	
	JUN02			52.3	54.1	
	JUL02			54.8	56.4	
	AUG02			53.9	55.2	
	SEP02			52.9	54.9	
	OCT02			49.7	51.8	
	MEANS 7/01-5/02	**53**	**52**	**49**	**50**	

MINIMUM TEMP(F)	MONTH	TBER #1	TBER #2	CCMWA #1	CCMWA #2	
	APR01	49.4	48.9			
	MAY01	49.4	50.6			
	JUN01	53.1	52.5			
	JUL01	55.0	53.6	52.0	52.2	
	AUG01	55.3	54.7	54.2	54.7	0.6
	SEP01	53.3	53.1	51.7	52.0	1.4
	OCT01	49.2	50.3	47.8	47.8	2.0
	NOV01	45.8	47.8	45.0	45.8	1.4
	DEC01	46.7	47.5	43.6	43.9	3.3
	JAN02	39.1	42.5	37.4	38.8	2.7
	FEB02	43.0	44.4	38.8	39.4	4.6
	MAR02	43.0	44.7	41.1	43.0	1.8
	APR02	49.2	48.9	44.2	46.1	3.9
	MAY02	48.9	49.7	46.4	47.2	2.5
	JUN02			50.8	51.7	
	JUL02			53.1	54.5	
	AUG02			52.5	53.3	
	SEP02			51.4	52.2	
	OCT02			46.9	47.5	
	MEANS 7/01-5/02	**48**	**49**	**46**	**46**	

MAXIMUM TEMP(F)	MONTH	TBER #1	TBER #2	CCMWA #1	CCMWA #2	
	APR01	56.7	54.7			
	MAY01	58.9	57.0			
	JUN01	60.4	56.7			
	JUL01	59.2	56.7	55.9	57.5	1.3
	AUG01	61.8	58.7	56.4	58.1	3.0
	SEP01	60.1	57.5	56.1	58.1	1.7
	OCT01	57.5	55.9	52.2	53.9	3.6
	NOV01	56.4	55.9	51.7	52.0	4.3
	DEC01	52.5	52.0	48.6	48.3	3.8
	JAN02	54.7	53.9	51.7	51.7	2.7
	FEB02	55.6	51.4	48.6	48.0	5.2
	MAR02	56.1	49.7	46.7	47.8	5.7
	APR02	60.9	54.7	52.0	52.2	5.8
	MAY02	56.7	53.6	53.3	55.3	
	JUN02			54.7	57.5	
	JUL02			56.1	58.1	
	AUG02			55.6	57.0	
	SEP02			54.7	58.4	
	OCT02			51.7	55.0	
	MEANS 7/01-5/02	**57**	**55**	**52**	**53**	

Onset Temperature Dataloggers buried at 5-6" below surface

Temperature recorded at approx. 1-2 hour intervals.

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

APPENDIX D

VEGETATION PLOT COVER AND HEIGHT DATA FOR ASSOCIATED SPECIES CCMWA, JULY 2002

This file was updated to include 1999 veg values for veg plots that wee treated Oct 98.

APPENDIX D: VEGETATION PLOT FIELD DATA PRIOR TO MANUAL TREATMENT, CRESCENT CITY MARSH WILDLIFE AREA; SAMPLED JULY 2002.

NORTH MARSH																								
PLOT NUMBER	1		2		3		4		5		6		7		8		9		10		11		12	
Vegetation Treated?	Y				Y								Y		Y		Y						Y	
Photopoint orientation	180		90		180		360		180		90		90		180		360		360		360		360	
(taken 20' from plot center)																								
Vegetation type	ED		ED		ED		CM		ED		ED		CM		TLM		ED		ED		ED		ED	
SPECIES	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht
Alnus rubra																					15	240	2	300
Alnus viridis	2	120	15	132	2	48	2	60	15	120	37	96	2	48	15	84	2	42						
Angelica genuflexa	2	96	2	72	2	24	2	48	2	72	2	60	2	36	2	60	2	54	2	84			2	48
Athyrium felix-femina					2	36	2	36	2	60					2	60	2	36			2	48		
Blechnum spicant					2	24			2	48					2	48	2	36			2	42	2	36
Calamagrostis nutkaensis	37	42	37	48	37	42	62	42	37	48	37	48	37	36	15	48	62	42	37	48	2	42	15	40
Carex obnupta	15	36	15	48	15	36	15	36	15	48	15	48	15	36	15	48	2	30	15	48			37	40
Carex spp.																								
Cornus sericea																								
Deschampsia caespitosa																								
Epipactus gigantea																								
Equisetum spp.					2	24			2	24	2	36	15	24	2	24	2	24	2	24			15	24
Galium trifidum																								
Gaultheria shallon																								
Gentiana sceptrum	2	18	2	30	2	30	2	24	2	36			2	24										
Holcus lanatus																								
Hypericum formosum			2	24	2	24			2	24	2	24	2	24			2	12						
Juncus leseuri																	2	36			2	48	15	42
Ledum glandulosum	15	60			15	40	37	42	85	48	85	48	15	48	62	36	62	36	62	48	85	48	62	42
Lonicera involucrata	15	72	2	60			15	42			2	108	2	36			15	48			2	60		
Lotus formosissimus																								
Lysichiton americanum	15	36	15	30	2	24	2	24	15	48	2	48	2	24	15	36	15	36	2	24	2	36	2	24
Maianthemum dilatatum																								
Malus fusca																							2	216
Menyanthes trifoliata	15	12	15	12	15	12	2	12	2	12	15	12	15	12					2	12				
Myrica californica							15	60			2	72					2	156	37	180	2	120	2	66
Oenanthe sarmentosa																								
Picea sitchensis							2	240			2	120							2	120				
Rhamnus purshiana											2	48									2	30		
Potentilla palustris	37	30	15	24	15	24	37	24	15	36	2	24	15	24	15	24	15	36	2	24				
Pteridium aquilinum																								
Rhododendron occidentalis	2	60											2	48	2	60							2	66
Rubus ursinus							15	24							2	32	15	24	15	36	62	36	37	36
Salix spp.									2	36														
Sanguisorba officinalis	15	30	15	24	37	36	62	36	15	36	15	36	37	36	15	36	37	36	15	36	15	24	37	24
Rubus spectabilis																					2	54		
Aster chilensis	2	18	2	36	2	36			2	36	2	48			2	36							2	30
Spiraea douglasii	15	48	37	72	37	40	15	36			15	60					15	42	15	72	15	60	15	40
Veratrum californicum																								
TOTAL COVER	189		174		189		287		215		239		163		166		254		208		210		249	

NOTES: Plots = 30 ft diameter; Treatment consisted of manual removal trees and selected shrubs (see text) ; Vegetation Types: ED = edge of marsh to willow scrub; CM = Calamagrostis marsh; TLM = tall ledum marsh; LLM = low ledum marsh; WS = will

LLM = low ledum marsh; WS = willow scrub.

APPENDIX D: (CONTINUED) .

SOUTH MARSH																								
PLOT NUMBER	**13**		**14**		**15**		**16**		**17**		**18**		**19**		**20**		**21**		**22**		**23**		**24**	
Vegetation treated?			Y						Y				Y				Y		Y		Y			
Photopoint orientation	180		360		360		360		45		270		90		315		45		180		45		45	
(taken 20' from plot center)																								
Vegetation type	ED		TLM		ED		ED		LLM		ED		LLM		ED		TLM		LLM		WS		ED	
SPECIES	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht
Alnus rubra									2	72			2	96					2	60				
Alnus viridis	15	84	2	72	2	60	15	72	2	48	2	120	15	36	37	72	2	48	15	54	37	48	62	60
Angelica genuflexa	2	48	2	76	2	72	2	60	2	48	2	72	2	36			2	72	2	48				
Athyrium felix-femina	2	36	15	36	2	48	2	36	2	36			2	36			2	48	2	36	2	18	2	36
Blechnum spicant	15	36					2	36	2	36					15	36	2	42	2	36	15	30	2	48
Calamagrostis nutkaensis	62	48	37	48	37	48	62	48	15	48	37	48	37	48	15	48	2	48	37	42	2	36	2	48
Carex obnupta	15	48					2	48	2	36	15	36			15	48	2	40			15	36	2	48
Carex spp.																								
Cornus sericea																								
Deschampsia caespitosa																								
Epipactus gigantea							2	12																
Equisetum spp.					2	24																		
Galium trifidum																								
Gaultheria shallon																								
Gentiana sceptrum																								
Holcus lanatus																								
Hypericum formosum							2	12							2	12								
Juncus leseurii					2	48									2	36							2	36
Ledum glandulosum	85	42	85	48	85	60	62	48	62	48	85	48	62	36	85	60	85	36	85	42	85	42	62	60
Lonicera involucrata	2	60	2	36			2	40	2	36	2	30	2	36	2	72	15	72					2	70
Lotus formosissimus																								
Lysichiton americanum	15	36	37	36	15	36	15	48	15	36	15	48	15	24	15	48	15	24	15	24	15	36	15	48
Maianthemum dilatatum																								
Malus fusca																					2	60	15	132
Menyanthes trifoliata					15	24	2	12			15	24	15	12					2	6				
Myrica californica	15	120			15	120					2	60									2	54	15	144
Oenanthe sarmentosa																								
Picea sitchensis							2	144											2	48			15	240
Rhamnus purshiana																								
Potentilla palustris	15	36	2	36	2	36	15	36	37	36	15	36	37	36	2	24	2	30	37	36	15	24		
Pteridium aquilinum																								
Rhododendron occidentalis	2	42	2	60	2	72									2	72	2	36			2	42		
Rubus ursinus	15	30			2	36									2	48	2	36			15	24	2	36
Salix spp.					37	156	37	96	15	96	37	120	15	96			15	48						
Sanguisorba officinalis	15	36	15	36	15	36	15	24	15	36	37	36	15	36	2	36	15	36	37	30	15	36	2	36
Rubus spectabilis	2	48																						
Aster chilensis			2	48			2	24	2	36									2	36				
Spiraea douglasii							15	60																
Veratrum californicum			2	36									2	36					2	30				
TOTAL COVER	277		203		235		256		175		264		221		196		163		242		222		200	

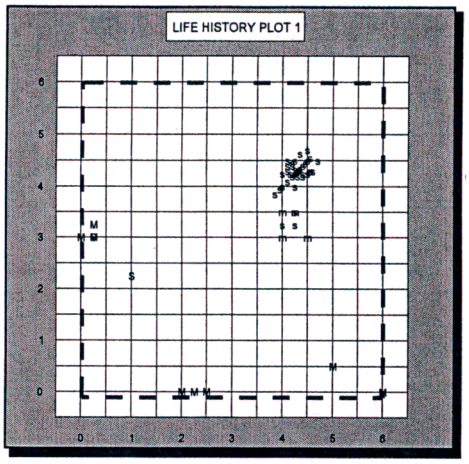
NOTES: Plots = 30 ft diameter; Treatment consisted of manual removal trees and selected shrubs (see text) ; Vegetation Types: ED = edge of marsh to willow scrub; CM = Calamagrostis marsh; TLM = tall ledum marsh, LLM = low ledum marsh; WS = willow scrub.

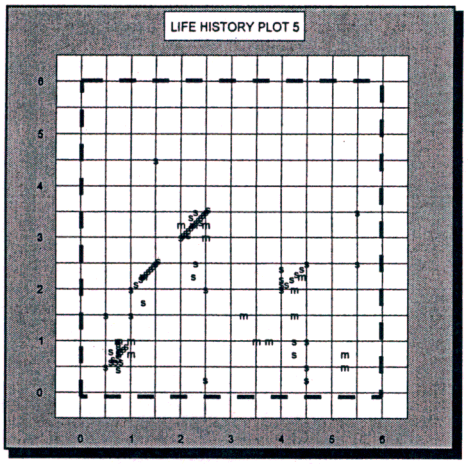
WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

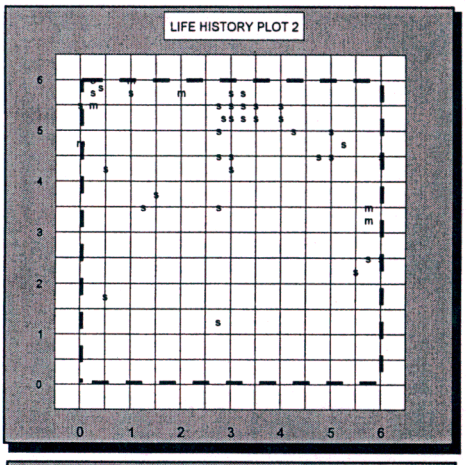
APPENDIX A

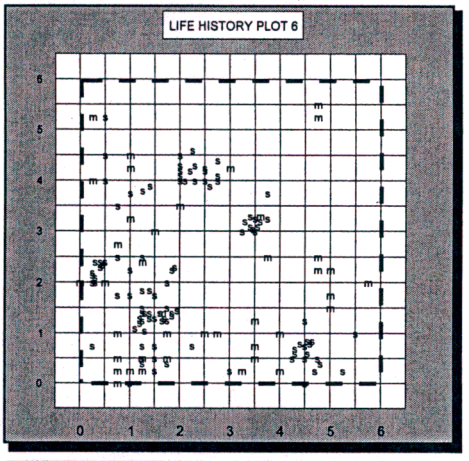
2002 MAPS OF WESTERN LILY
27 TBER LIFE HISTORY PLOTS

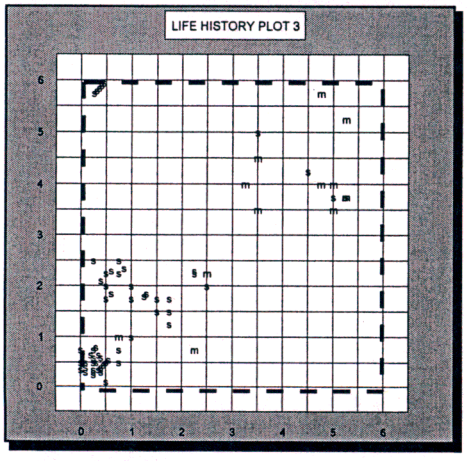
APPENDIX A
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2002

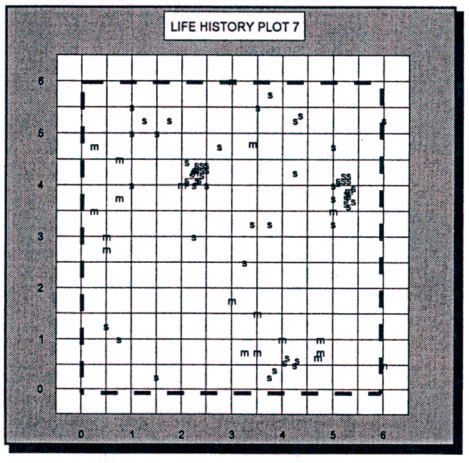


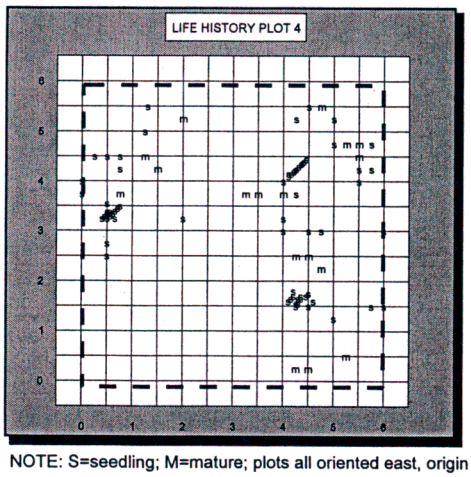


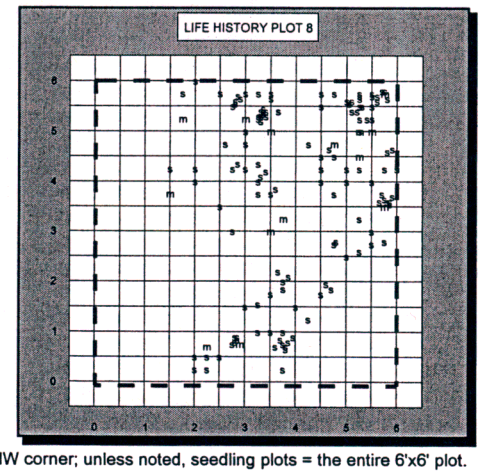






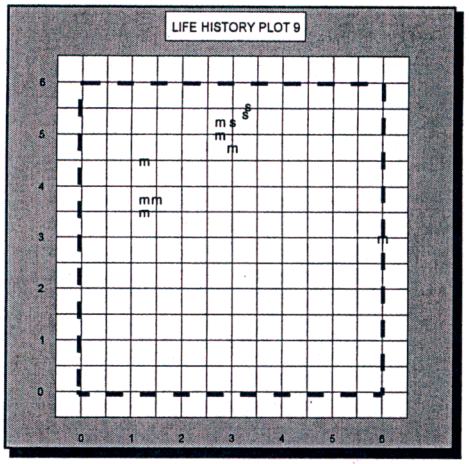


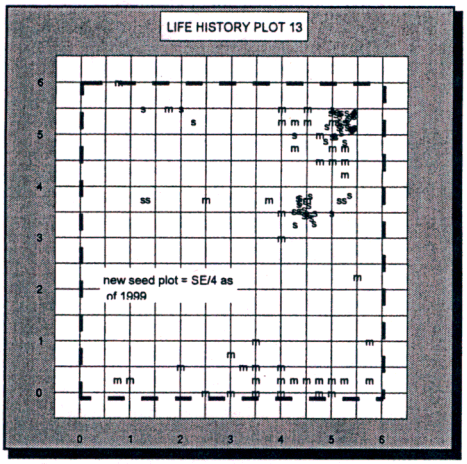


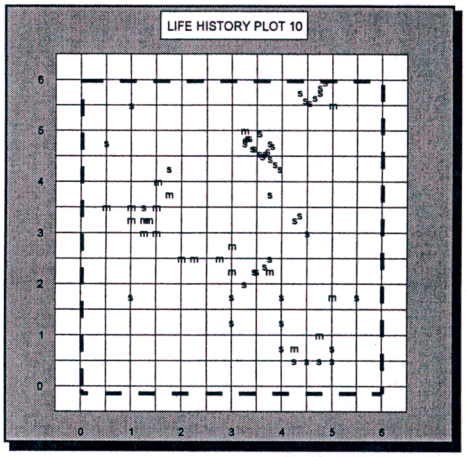


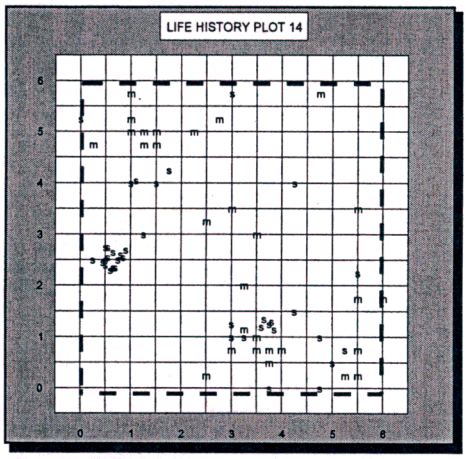
NOTE: S=seedling; M=mature; plots all oriented east, origin = NW corner; unless noted, seedling plots = the entire 6'x6' plot.

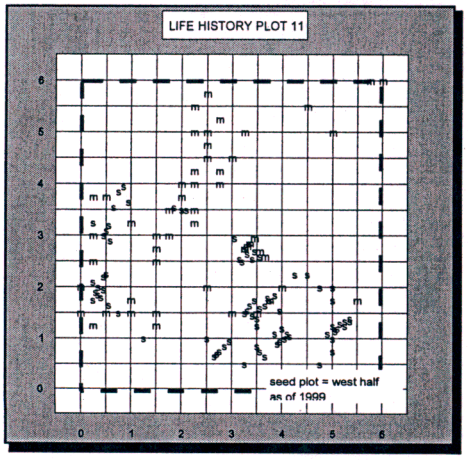
APPENDIX A (CONTINUED)
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2001

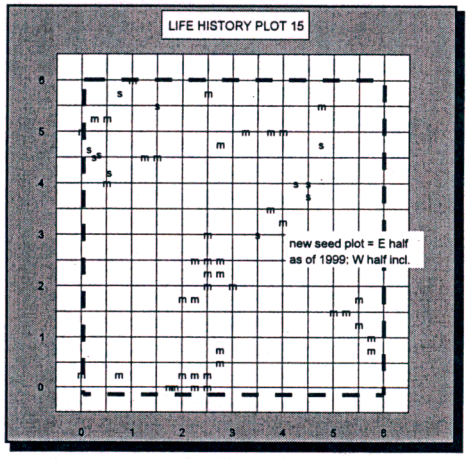


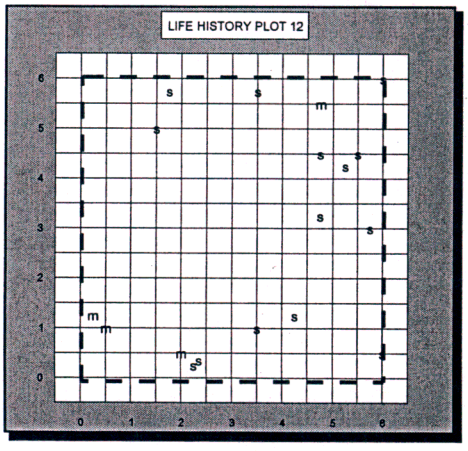


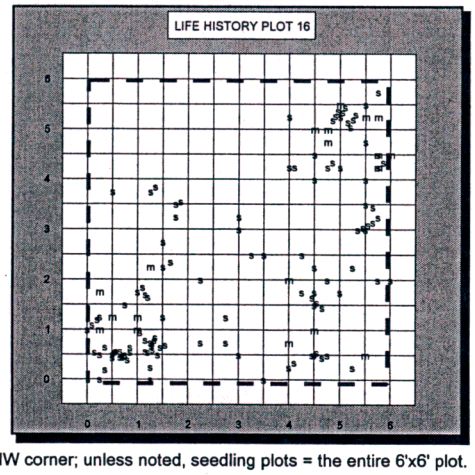






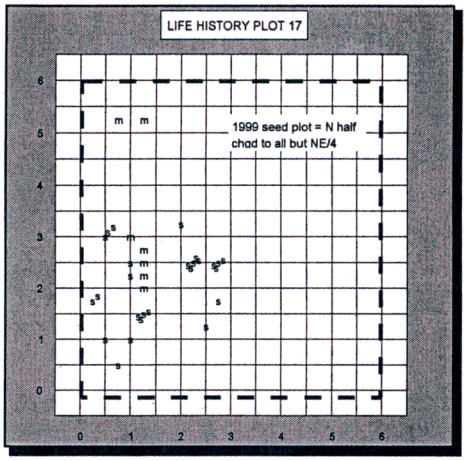


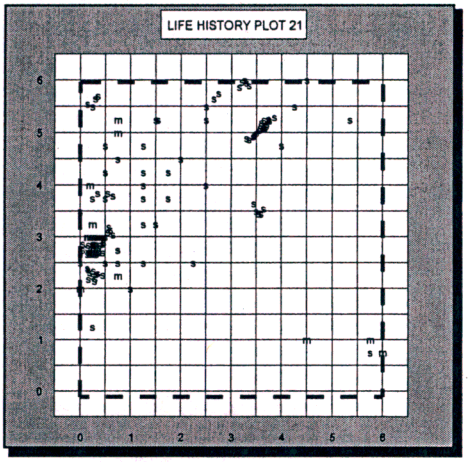


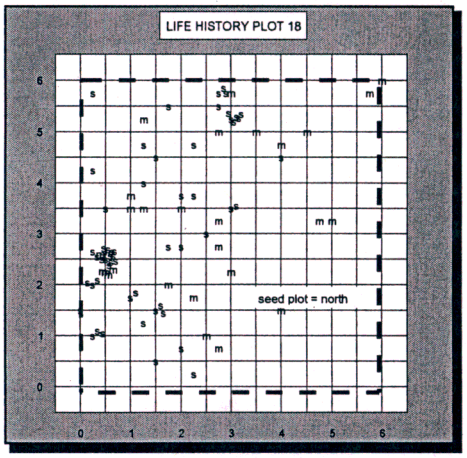


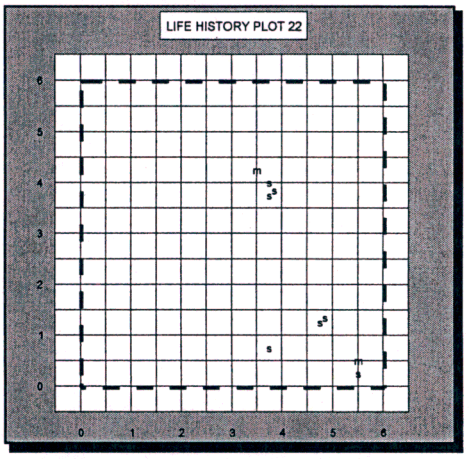
NOTE: S=seedling; M=mature; plots all oriented east, origin = NW corner; unless noted, seedling plots = the entire 6'x6' plot.

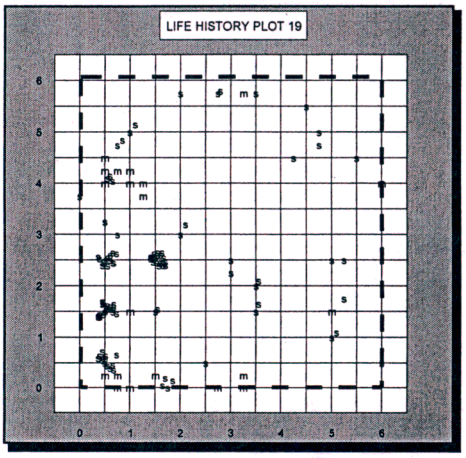
APPENDIX A (CONTINUED)
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2001

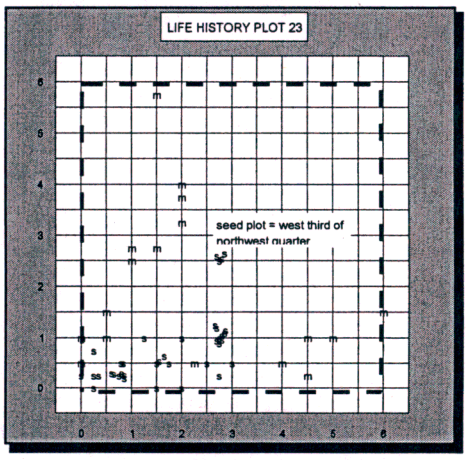


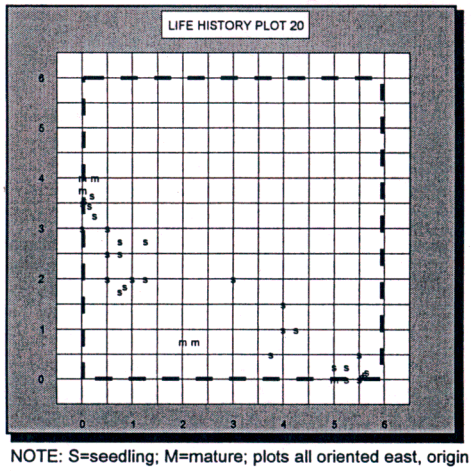


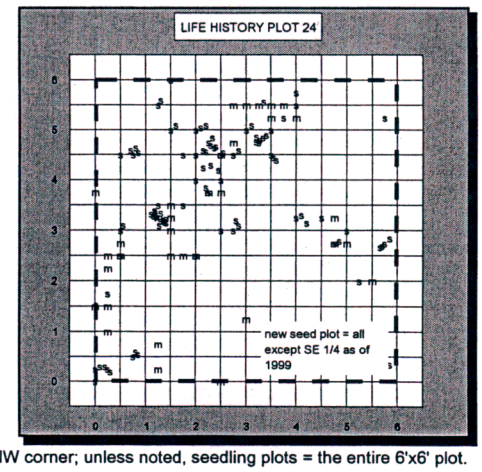






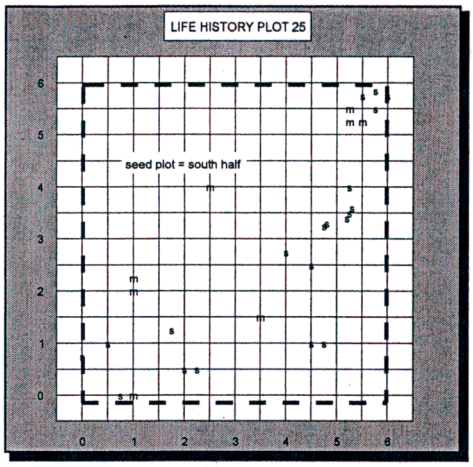


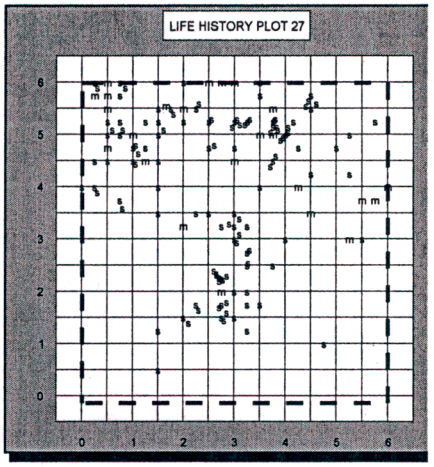


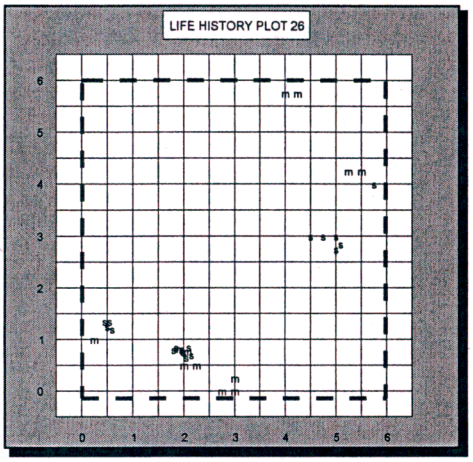


NOTE: S=seedling; M=mature; plots all oriented east, origin = NW corner; unless noted, seedling plots = the entire 6'x6' plot.

APPENDIX A (CONTINUED)
TABLE BLUFF ECOLOGICAL RESERVE LIFE HISTORY PLOTS 2001







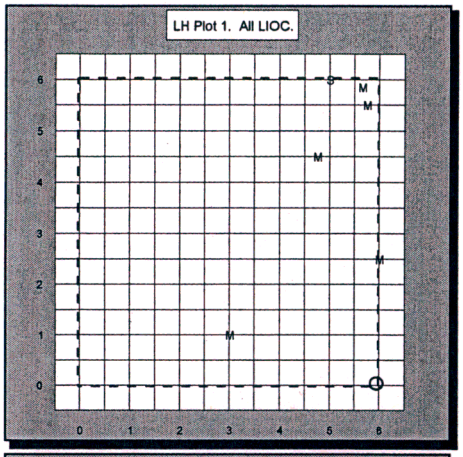
NOTE: S=seedling; M=mature; plots oriented east, origin = NW corner.
Unless indicated, seedling plots = the entire 6'x6' plot.

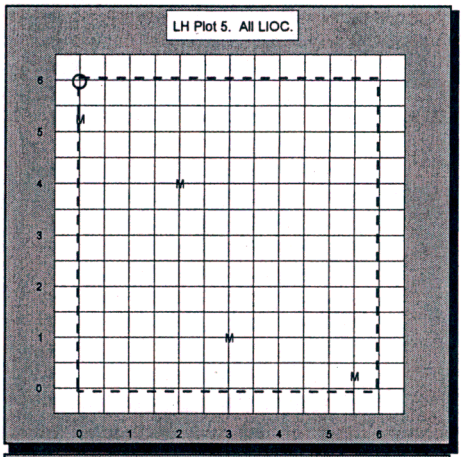
WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

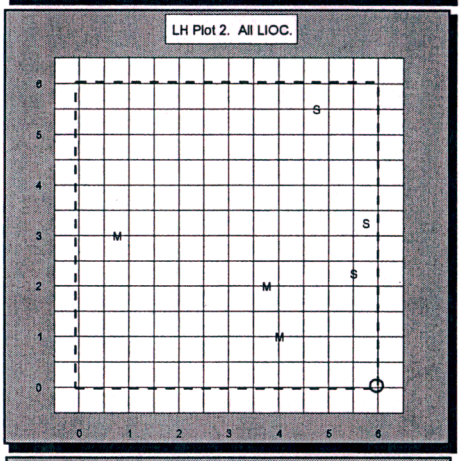
APPENDIX B

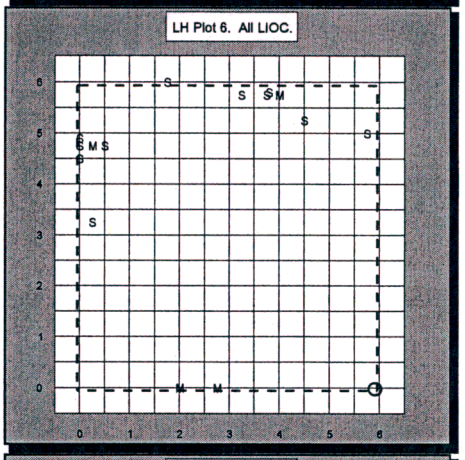
2002 MAPS OF WESTERN LILY
24 CCMWA LIFE HISTORY & VEGETATION PLOTS

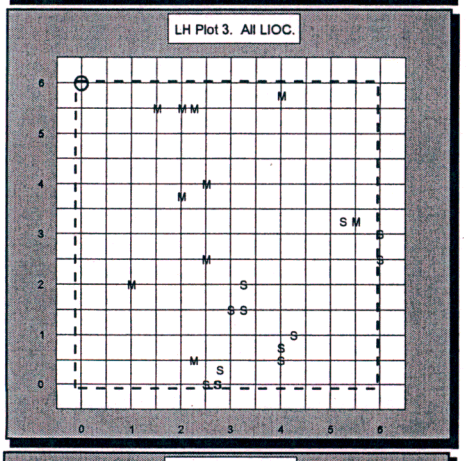
APPENDIX B
CRESCENT CITY MARSH WILDLIFE AREA LIFE HISTORY PLOTS 2002

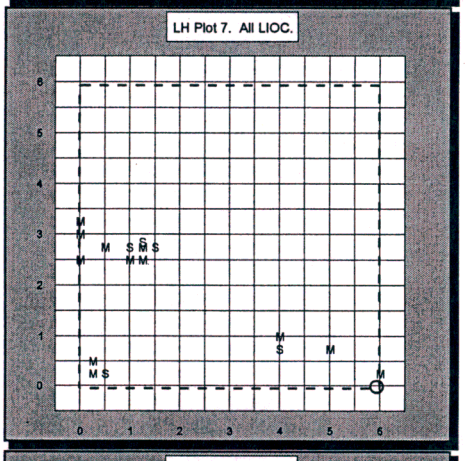


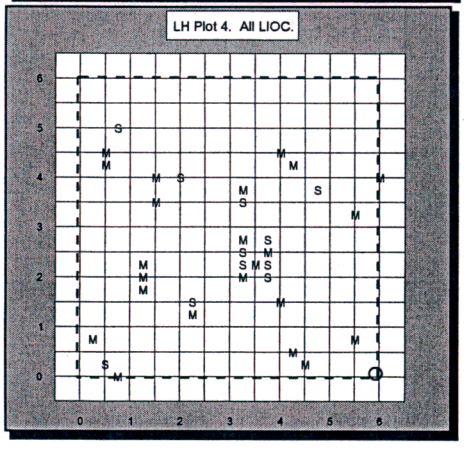


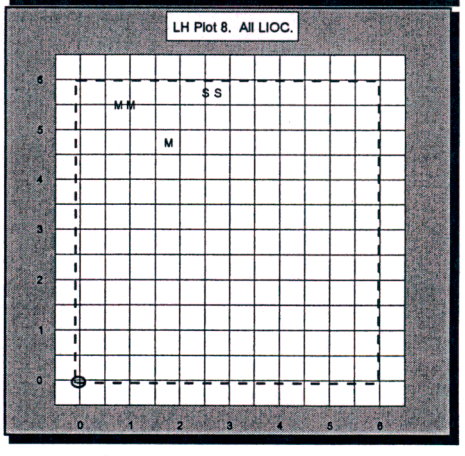






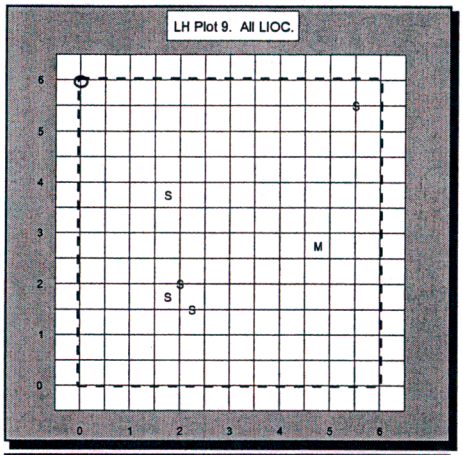


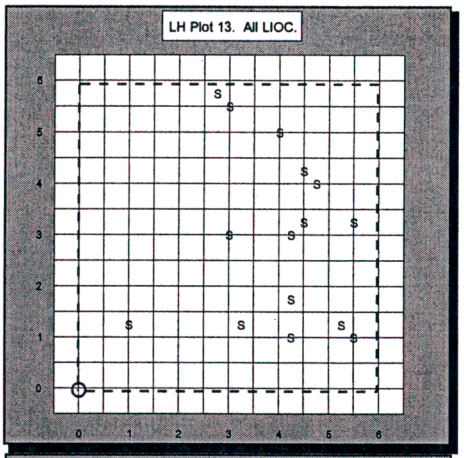


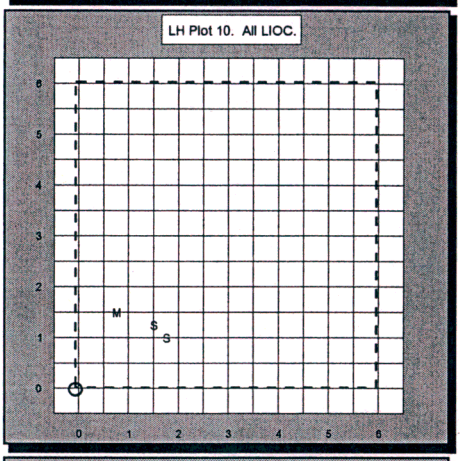


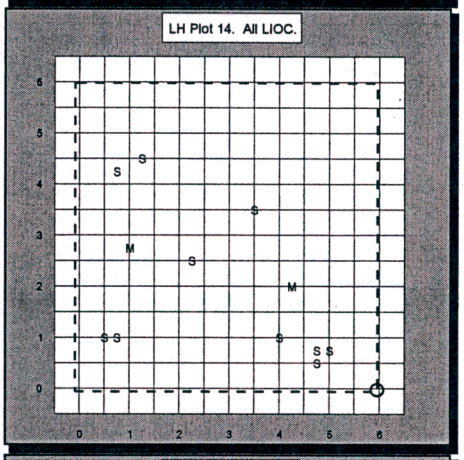
NOTE: s=seedling; m=mature; plots all oriented north; unless noted, seedling plot = entire 6x6' plot; vegetation plot center indicated.

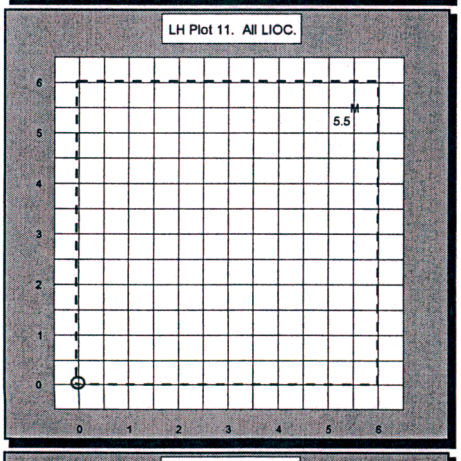
APPENDIX B: (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA LIFE HISTORY PLOTS

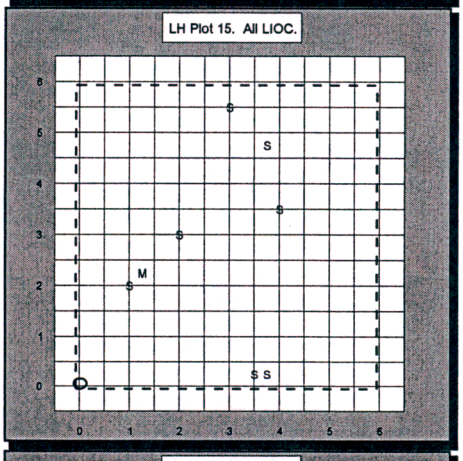


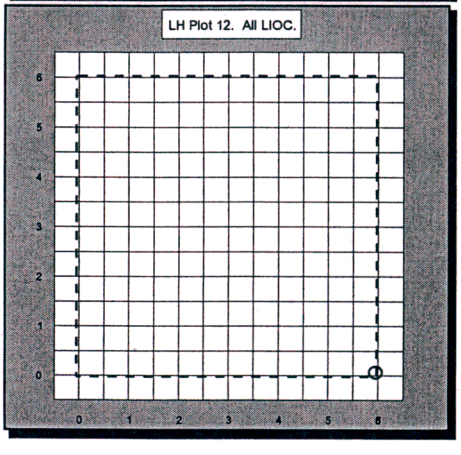


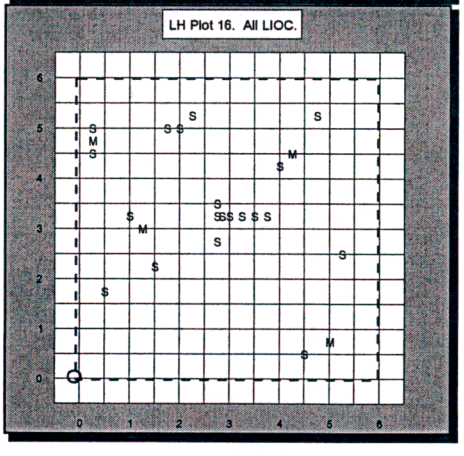






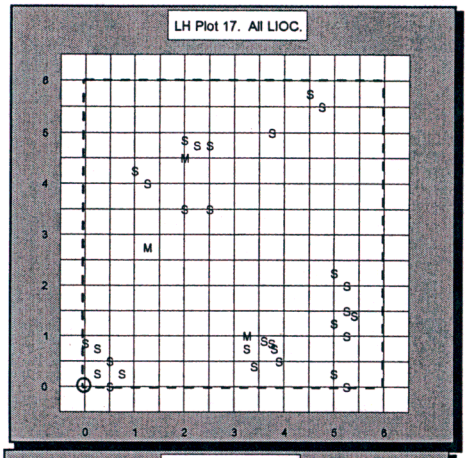


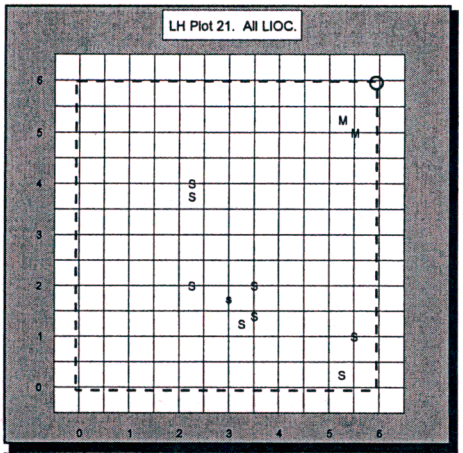


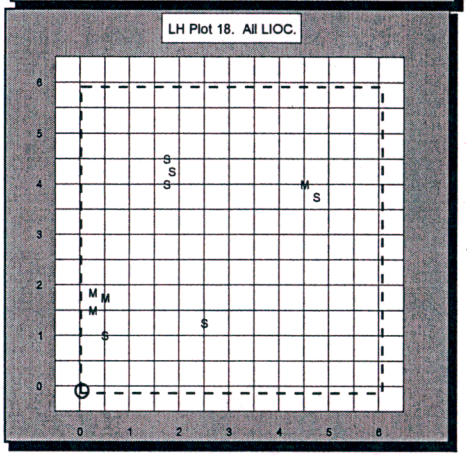


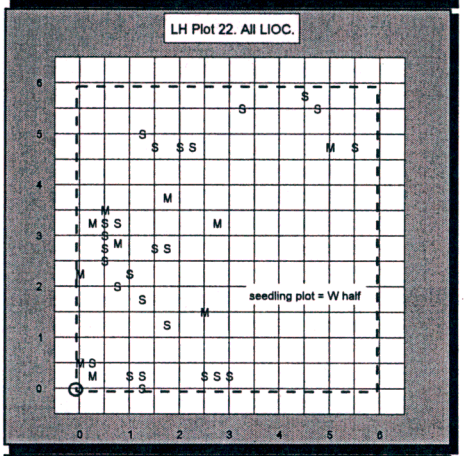
NOTE: s=seedling; m=mature; plots all oriented north; unless noted, seedling plot = entire 6x6' plot; vegetation plot center indicated.

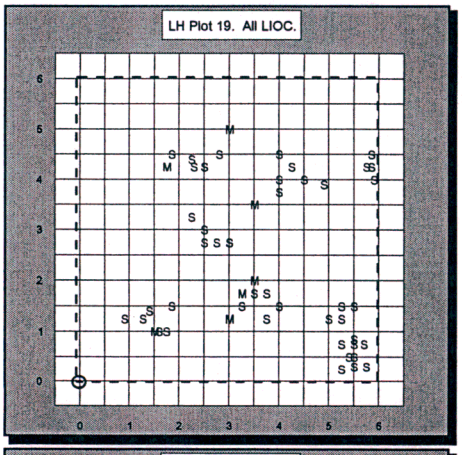
APPENDIX B. (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA LIFE HISTORY PLOTS

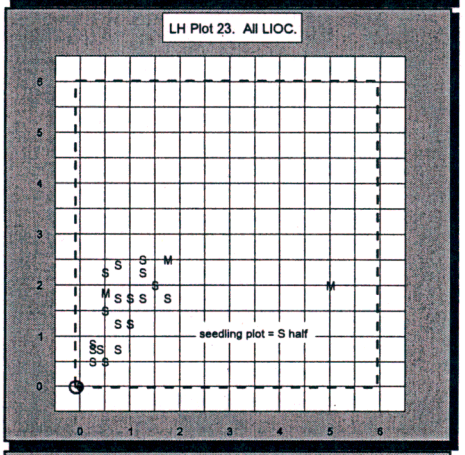


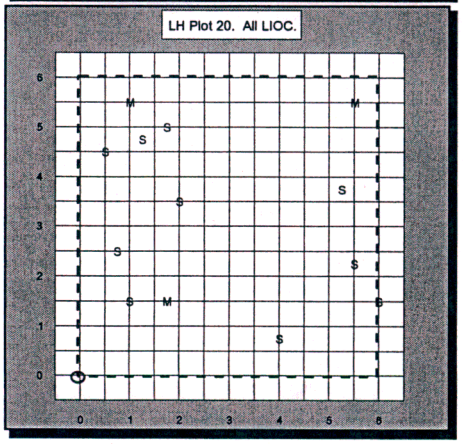


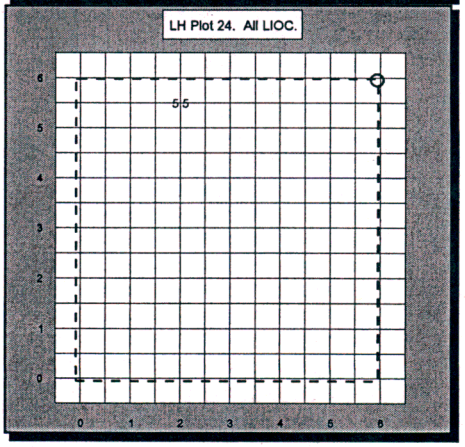






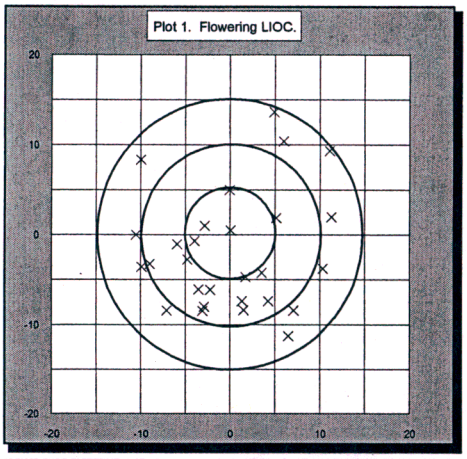


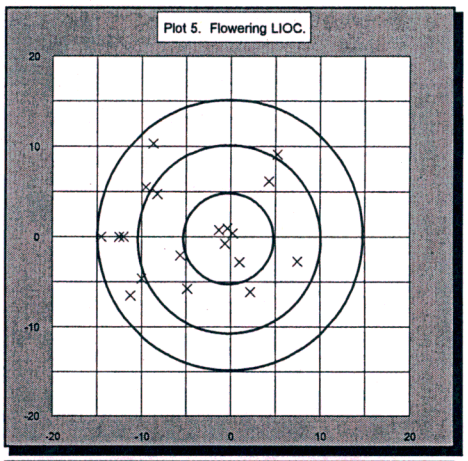


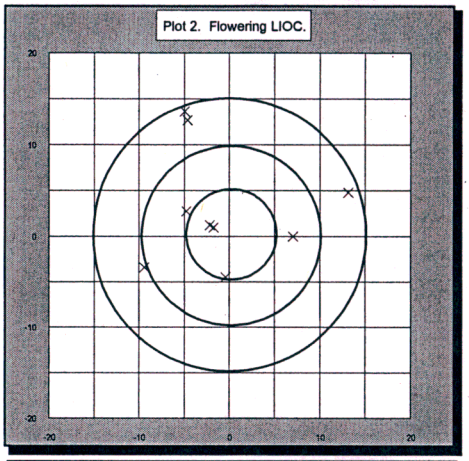


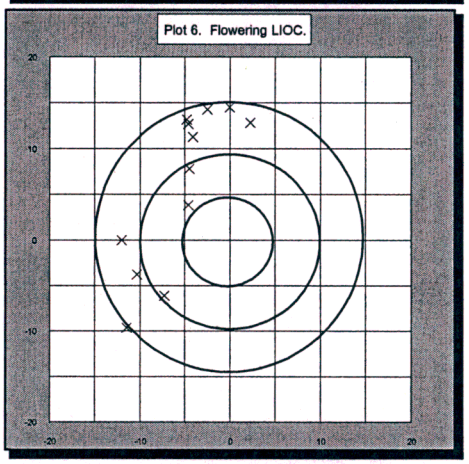
NOTE: s=seedling; m=mature; plots all oriented north; unless noted, seedling plot = entire 6x6' plot; vegetation plot center indicated. Plot 22, seedling plot = west half; Plot 23 seedling plot = south half.

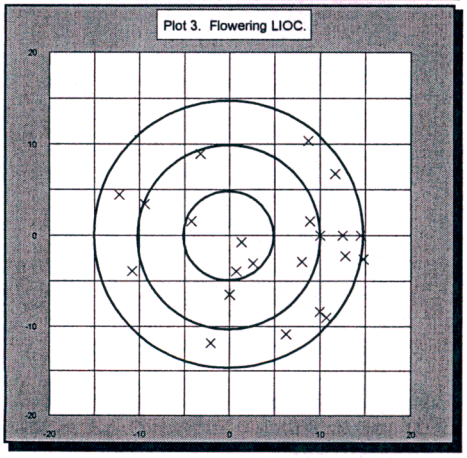
APPENDIX B
CRESCENT CITY MARSH WILDLIFE AREA VEGETATION PLOTS 2002

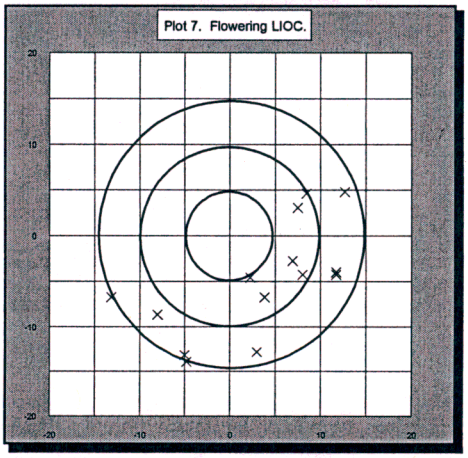


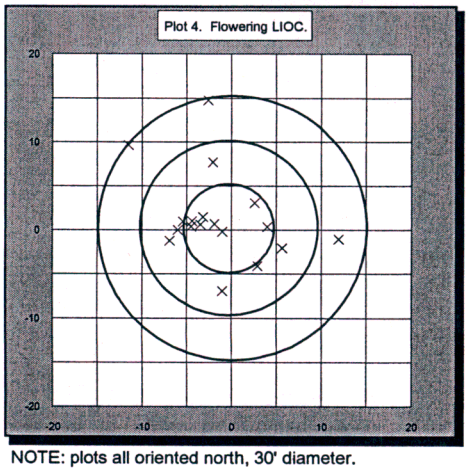


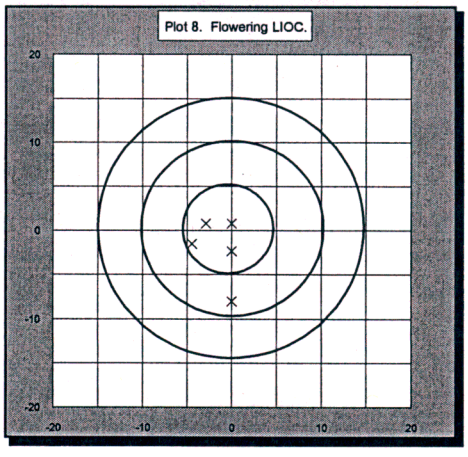






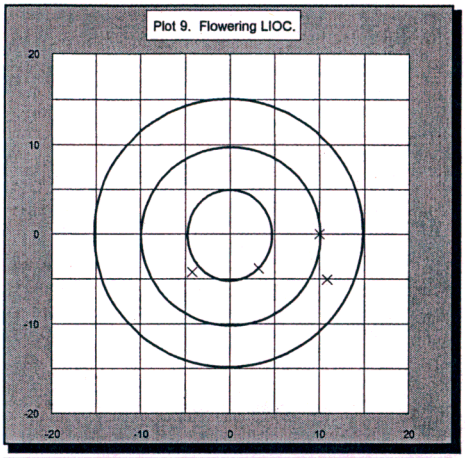


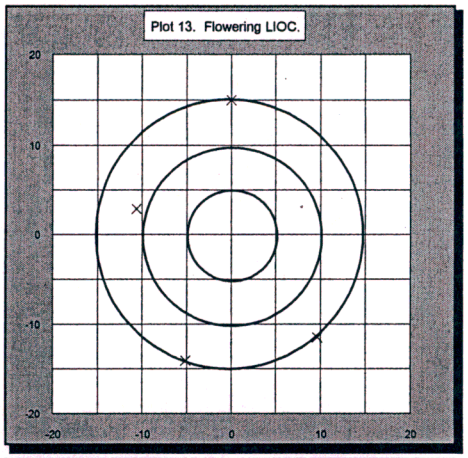


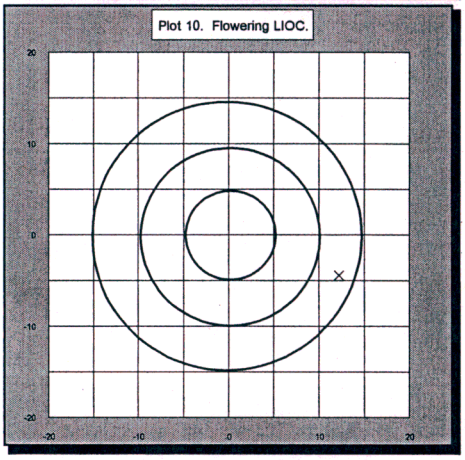


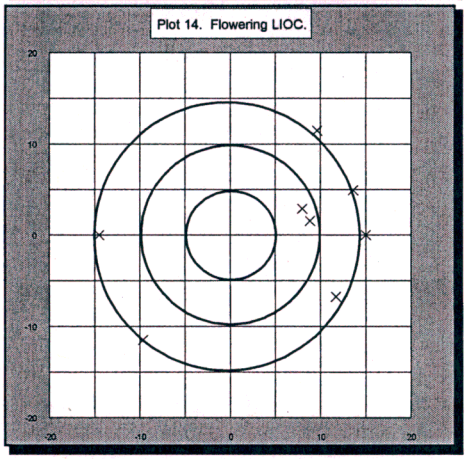
NOTE: plots all oriented north, 30' diameter.

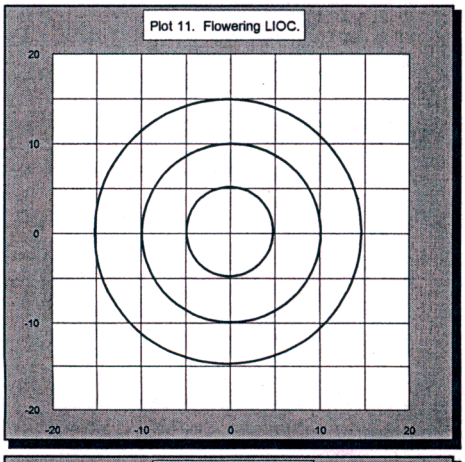
APPENDIX B (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA VEGETATION PLOTS

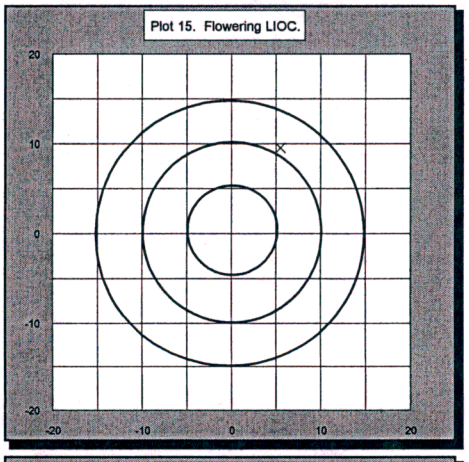


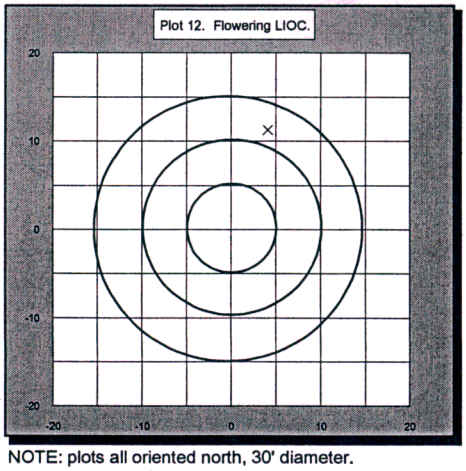


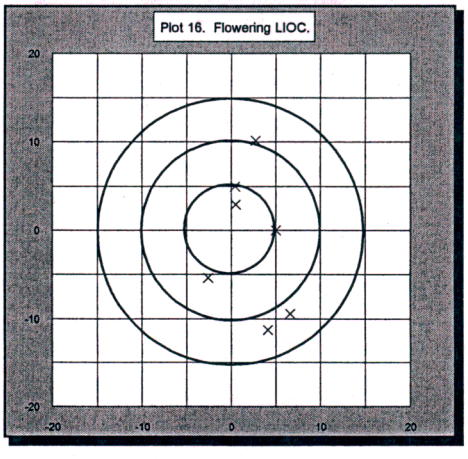






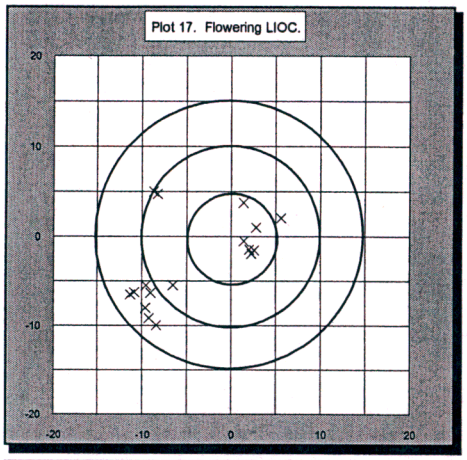


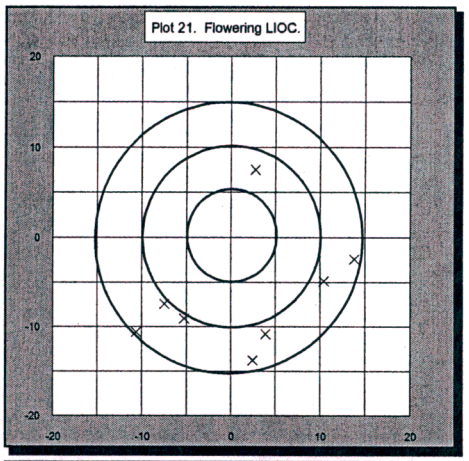


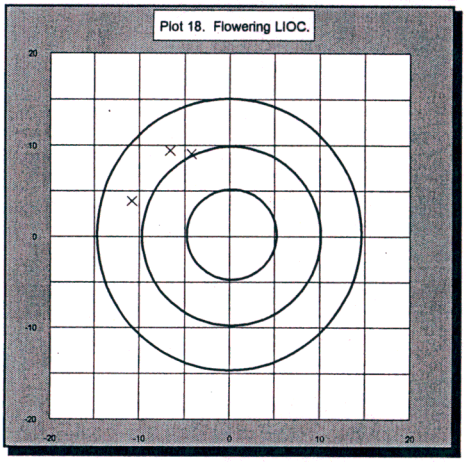


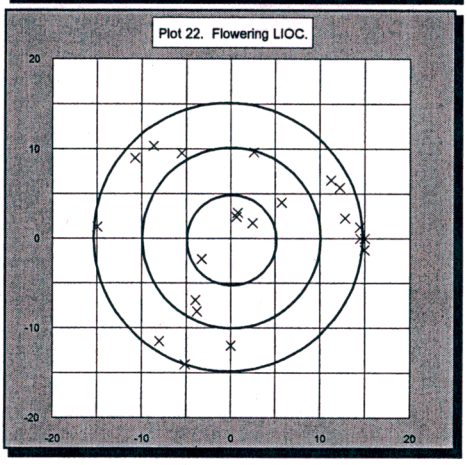
NOTE: plots all oriented north, 30' diameter.

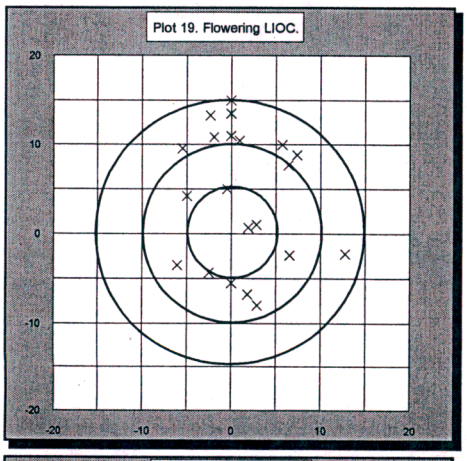
APPENDIX B (CONTINUED) .
CRESCENT CITY MARSH WILDLIFE AREA VEGETATION PLOTS

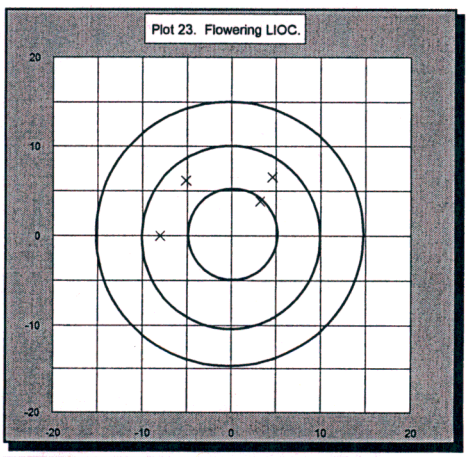


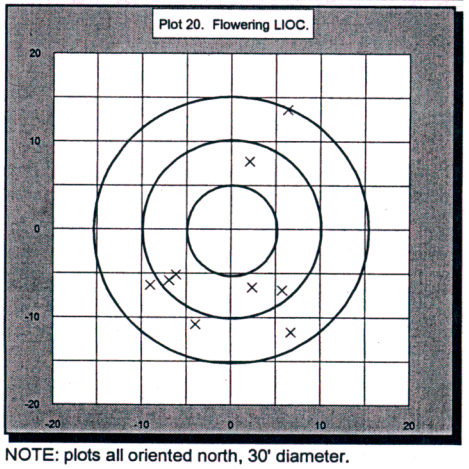


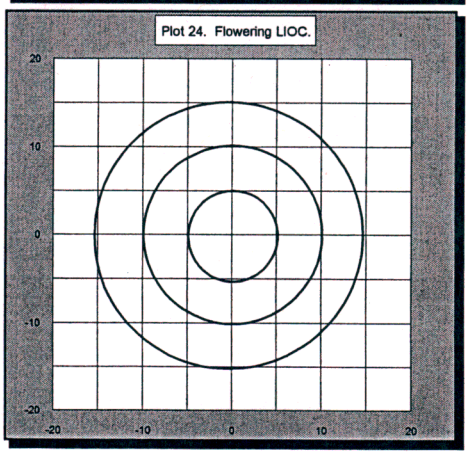












NOTE: plots all oriented north, 30' diameter.

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

APPENDIX C

SOIL TEMPERATURE DATA
TBER & CCMWA, APRIL 2001-OCTOBER 2002

APPENDIX C.

TBER & CCMWA SOIL TEMPERATURE DATA APRIL 2001-OCTOBER 2002

MEAN TEMP (F)	MONTH	TBER #1	TBER #2	CCMWA #1	CCMWA #2	DIFF. IN MEAN TBER OVER CCMWA
	APR01	52.7	51.6			
	MAY01	54.1	53.3			
	JUN01	56.7	54.6			
	JUL01	57.1	55.1	54.0	55.0	1.5
	AUG01	58.3	56.4	55.6	56.6	1.2
	SEP01	56.2	54.7	54.1	54.9	1.0
	OCT01	53.9	53.3	50.1	51.1	3.0
	NOV01	52.1	52.0	49.0	49.3	2.9
	DEC01	49.1	49.2	46.2	46.3	2.9
	JAN02	47.8	48.6	44.1	45.1	3.6
	FEB02	48.5	48.2	43.7	44.7	4.1
	MAR02	49.2	47.7	43.9	45.2	3.9
	APR02	53.9	51.3	47.8	49.6	3.9
	MAY02	53.0	51.6	48.4	50.3	
	JUN02			52.3	54.1	
	JUL02			54.8	56.4	
	AUG02			53.9	55.2	
	SEP02			52.9	54.9	
	OCT02			49.7	51.8	
	MEANS 7/01-5/02	**53**	**52**	**49**	**50**	

MINIMUM TEMP(F)	MONTH	TBER #1	TBER #2	CCMWA #1	CCMWA #2	
	APR01	49.4	48.9			
	MAY01	49.4	50.6			
	JUN01	53.1	52.5			
	JUL01	55.0	53.6	52.0	52.2	
	AUG01	55.3	54.7	54.2	54.7	0.6
	SEP01	53.3	53.1	51.7	52.0	1.4
	OCT01	49.2	50.3	47.8	47.8	2.0
	NOV01	45.8	47.8	45.0	45.8	1.4
	DEC01	46.7	47.5	43.6	43.9	3.3
	JAN02	39.1	42.5	37.4	38.8	2.7
	FEB02	43.0	44.4	38.8	39.4	4.6
	MAR02	43.0	44.7	41.1	43.0	1.8
	APR02	49.2	48.9	44.2	46.1	3.9
	MAY02	48.9	49.7	46.4	47.2	2.5
	JUN02			50.8	51.7	
	JUL02			53.1	54.5	
	AUG02			52.5	53.3	
	SEP02			51.4	52.2	
	OCT02			46.9	47.5	
	MEANS 7/01-5/02	**48**	**49**	**46**	**46**	

MAXIMUM TEMP(F)	MONTH	TBER #1	TBER #2	CCMWA #1	CCMWA #2	
	APR01	56.7	54.7			
	MAY01	58.9	57.0			
	JUN01	60.4	56.7			
	JUL01	59.2	56.7	55.9	57.5	1.3
	AUG01	61.8	58.7	56.4	58.1	3.0
	SEP01	60.1	57.5	56.1	58.1	1.7
	OCT01	57.5	55.9	52.2	53.9	3.6
	NOV01	56.4	55.9	51.7	52.0	4.3
	DEC01	52.5	52.0	48.6	48.3	3.8
	JAN02	54.7	53.9	51.7	51.7	2.7
	FEB02	55.6	51.4	48.6	48.0	5.2
	MAR02	56.1	49.7	46.7	47.8	5.7
	APR02	60.9	54.7	52.0	52.2	5.8
	MAY02	56.7	53.6	53.3	55.3	
	JUN02			54.7	57.5	
	JUL02			56.1	58.1	
	AUG02			55.6	57.0	
	SEP02			54.7	58.4	
	OCT02			51.7	55.0	
	MEANS 7/01-5/02	**57**	**55**	**52**	**53**	

Onset Temperature Dataloggers buried at 5-6" below surface

Temperature recorded at approx. 1-2 hour intervals.

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

APPENDIX D

VEGETATION PLOT COVER AND HEIGHT DATA FOR ASSOCIATED SPECIES CCMWA, JULY 2002

This file was updated to include 1999 veg values for veg plots that wee treated Oct 98.

APPENDIX D: VEGETATION PLOT FIELD DATA PRIOR TO MANUAL TREATMENT, CRESCENT CITY MARSH WILDLIFE AREA; SAMPLED JULY 2002.

NORTH MARSH																								
PLOT NUMBER	1		2		3		4		5		6		7		8		9		10		11		12	
Vegetation Treated?	Y				Y								Y		Y		Y						Y	
Photopoint orientation	180		90		180		360		180		90		90		180		360		360		360		360	
(taken 20' from plot center)																								
Vegetation type	ED		ED		ED		CM		ED		ED		CM		TLM		ED		ED		ED		ED	
SPECIES	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht
Alnus rubra																					15	240	2	300
Alnus viridis	2	120	15	132	2	48	2	60	15	120	37	96	2	48	15	84	2	42						
Angelica genuflexa	2	96	2	72	2	24	2	48	2	72	2	60	2	36	2	60	2	54	2	84			2	48
Athyrium felix-femina					2	36	2	36	2	60					2	60	2	36			2	48		
Blechnum spicant					2	24			2	48					2	48	2	36			2	42	2	36
Calamagrostis nutkaensis	37	42	37	48	37	42	62	42	37	48	37	48	37	36	15	48	62	42	37	48	2	42	15	40
Carex obnupta	15	36	15	48	15	36	15	36	15	48	15	48	15	36	15	48	2	30	15	48			37	40
Carex spp.																								
Cornus sericea																								
Deschampsia caespitosa																								
Epipactus gigantea																								
Equisetum spp.					2	24			2	24	2	36	15	24	2	24	2	24	2	24			15	24
Galium trifidum																								
Gaultheria shallon																								
Gentiana sceptrum	2	18	2	30	2	30	2	24	2	36			2	24										
Holcus lanatus																								
Hypericum formosum			2	24	2	24			2	24	2	24	2	24			2	12						
Juncus leseuri																	2	36			2	48	15	42
Ledum glandulosum	15	60			15	40	37	42	85	48	85	48	15	48	62	36	62	36	62	48	85	48	62	42
Lonicera involucrata	15	72	2	60			15	42			2	108	2	36			15	48			2	60		
Lotus formosissimus																								
Lysichiton americanum	15	36	15	30	2	24	2	24	15	48	2	48	2	24	15	36	15	36	2	24	2	36	2	24
Maianthemum dilatatum																								
Malus fusca																							2	216
Menyanthes trifoliata	15	12	15	12	15	12	2	12	2	12	15	12	15	12					2	12				
Myrica californica							15	60			2	72					2	156	37	180	2	120	2	66
Oenanthe sarmentosa																								
Picea sitchensis							2	240			2	120							2	120				
Rhamnus purshiana											2	48									2	30		
Potentilla palustris	37	30	15	24	15	24	37	24	15	36	2	24	15	24	15	24	15	36	2	24				
Pteridium aquilinum																								
Rhododendron occidentalis	2	60											2	48	2	60							2	66
Rubus ursinus							15	24							2	32	15	24	15	36	62	36	37	36
Salix spp.									2	36														
Sanguisorba officinalis	15	30	15	24	37	36	62	36	15	36	15	36	37	36	15	36	37	36	15	36	15	24	37	24
Rubus spectabilis																					2	54		
Aster chilensis	2	18	2	36	2	36			2	36	2	48			2	36							2	30
Spiraea douglasii	15	48	37	72	37	40	15	36			15	60					15	42	15	72	15	60	15	40
Veratrum californicum																								
TOTAL COVER	189		174		189		287		215		239		163		166		254		208		210		249	

NOTES: Plots = 30 ft diameter; Treatment consisted of manual removal trees and selected shrubs (see text) ; Vegetation Types: ED = edge of marsh to willow scrub; CM = Calamagrostis marsh; TLM = tall ledum marsh; LLM = low ledum marsh; WS = will

LLM = low ledum marsh; WS = willow scrub.

APPENDIX D: (CONTINUED) .

SOUTH MARSH																								
PLOT NUMBER	**13**		**14**		**15**		**16**		**17**		**18**		**19**		**20**		**21**		**22**		**23**		**24**	
Vegetation treated?			Y						Y				Y				Y		Y		Y			
Photopoint orientation	180		360		360		360		45		270		90		315		45		180		45		45	
(taken 20' from plot center)																								
Vegetation type	ED		TLM		ED		ED		LLM		ED		LLM		ED		TLM		LLM		WS		ED	
SPECIES	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht	cov	ht
Alnus rubra									2	72			2	96					2	60				
Alnus viridis	15	84	2	72	2	60	15	72	2	48	2	120	15	36	37	72	2	48	15	54	37	48	62	60
Angelica genuflexa	2	48	2	76	2	72	2	60	2	48	2	72	2	36			2	72	2	48				
Athyrium felix-femina	2	36	15	36	2	48	2	36	2	36			2	36			2	48	2	36	2	18	2	36
Blechnum spicant	15	36					2	36	2	36					15	36	2	42	2	36	15	30	2	48
Calamagrostis nutkaensis	62	48	37	48	37	48	62	48	15	48	37	48	37	48	15	48	2	48	37	42	2	36	2	48
Carex obnupta	15	48					2	48	2	36	15	36			15	48	2	40			15	36	2	48
Carex spp.																								
Cornus sericea																								
Deschampsia caespitosa																								
Epipactus gigantea							2	12																
Equisetum spp.					2	24																		
Galium trifidum																								
Gaultheria shallon																								
Gentiana sceptrum																								
Holcus lanatus																								
Hypericum formosum							2	12							2	12								
Juncus leseurii					2	48									2	36							2	36
Ledum glandulosum	85	42	85	48	85	60	62	48	62	48	85	48	62	36	85	60	85	36	85	42	85	42	62	60
Lonicera involucrata	2	60	2	36			2	40	2	36	2	30	2	36	2	72	15	72					2	70
Lotus formosissimus																								
Lysichiton americanum	15	36	37	36	15	36	15	48	15	36	15	48	15	24	15	48	15	24	15	24	15	36	15	48
Maianthemum dilatatum																								
Malus fusca																					2	60	15	132
Menyanthes trifoliata					15	24	2	12			15	24	15	12					2	6				
Myrica californica	15	120			15	120					2	60									2	54	15	144
Oenanthe sarmentosa																								
Picea sitchensis							2	144											2	48			15	240
Rhamnus purshiana																								
Potentilla palustris	15	36	2	36	2	36	15	36	37	36	15	36	37	36	2	24	2	30	37	36	15	24		
Pteridium aquilinum																								
Rhododendron occidentalis	2	42	2	60	2	72									2	72	2	36			2	42		
Rubus ursinus	15	30			2	36									2	48	2	36			15	24	2	36
Salix spp.					37	156	37	96	15	96	37	120	15	96			15	48						
Sanguisorba officinalis	15	36	15	36	15	36	15	24	15	36	37	36	15	36	2	36	15	36	37	30	15	36	2	36
Rubus spectabilis	2	48																						
Aster chilensis			2	48			2	24	2	36									2	36				
Spiraea douglasii							15	60																
Veratrum californicum			2	36									2	36					2	30				
TOTAL COVER	277		203		235		256		175		264		221		196		163		242		222		200	

NOTES: Plots = 30 ft diameter; Treatment consisted of manual removal trees and selected shrubs (see text) ; Vegetation Types: ED = edge of marsh to willow scrub; CM = Calamagrostis marsh; TLM = tall ledum marsh, LLM = low ledum marsh; WS = willow scrub.

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

ATTACHMENT 1

VEGETATION TRANSECT FIELD DATA SHEETS
LIFE HISTORY PLOT MAPS
TBER, 2002

TBER HABITAT DATASHEET

DATE: 9-13-02 PAGE____OF____

BY: KW

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
Y=-400	0	Bare	0	Y	0	95	
	9	CP	60		10	75	
	20	SVG	12		20	70	
	22	BAPI	72		30	65	
	33	SVG	24		40	55	
	45	RUVR	24		50	55	
	69	Bare	0	Y	60	90	RAPU overhead
	77	POMU	36	Y	70	90	
	84	Bare	0	Y	80	95	
	97	POMU	24	Y	90	90	
	104	BARE	0	Y	100	90	
	127	POMU	24	Y	110	95	
	130	Bare	0	Y	120	90	
	147	POMU	24	Y	130	95	
	155	RUVR	24	Y	140	95	
	159	POMU	24	Y	150	90	
	163	CP	12	Y	160	85	
	170	POMU	40	Y	170	85	
	178	CP	36	Y	180	85	
	251	SVG	24	Y	190	85	
	265	CP / Mianth.	36	Y	200	85	
	396	RUVR/RUDI	36	Y	210	60	
	413	CP/ Mianth	36	Y	220	60	
	447	RUVR	36	Y	230	60	
	451	CP	36	Y	240	60	
	469	RUVR	48	N	250	65	
	483	SVG	36	N	260	60	
	501	CANU	36	Y	270	65	
	506	SVG	24	Y	280	56	
	533	CP / Mianth.	24	Y	290	60	
	556	TFG	36	N	300	60	
					310	60	
					320	65	
					330	75	
					340	80	
					350	75	
					360	78	
					370	70	
					380	65	
					390	60	
					400	60	
					410	65	
					420	60	
					430	55	
					440	56	
					450	50	
					460	60	
					470	60	
					480	60	
					490	55	
					500	55	
					510	60	
					520	70	
					530	70	
					540	70	
					550	80	
					560	58	
					570	35	
					580	30	
					590	25	
					600	25	

entered - passive

entered - passive

entered

Y=-400 to X = 0-600 passive

TBER HABITAT DATASHEET

DATE: 9/13/02 PAGE 1 OF 1

BY: KW/AC

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
X-200	10	TAHFESCAL	24	—	0	30	
	45	CANU	48	—	10	10	
	63	CP	36	—	20	10	
	123	CANU	48	—	30	10	
	130	RUUR	36	y	40	10	
	138	Barren	—	y	50	20	
	157	CP	12	y	60	30	
	173	SVG	24	—	70	15	
	234	RUSP	60	—	80	25	
	259	SVG	24	—	90	20	
	288	RUSP	48	—	100	20	
	292	SVG	24	—	110	20	
	305	RUUR	72	—	120	30	
	328	SVG	24	—	130	95	Lowbush
	342	POMU	48	—	140	90	
	351	CANU	36	—	150	80	
	355	SVG	24	—	160	85	
	420	CANU	36	—	170	80	
	430	RUSP	72	—	180	75	
					190	65	
					200	65	
					210	65	
					220	65	
					230	60	
					240	80	
					250	75	
					260	65	
					270	70	
					280	75	
		X=200 to Y=450 = Passive			290	75	
					300	75	
					310	90	
					320	90	
					330	80	
					340	75	
					350	85	
					360	80	
					370	80	
					380	80	
					390	80	
					400	80	
					410	80	
					420	75	
					430	80	
					440	85	
					450	90	
					460		
					470		
					480		
					490		
					500		
					510		
					520		
					530		
					540		
					550		
					560		
					570		
					580		
					590		
					600		

TBER HABITAT DATASHEET

DATE: 9/13/02
BY: KW/AC

PAGE ___ OF ___

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?
X-100	0	RUUR	60	—
	8	CP	12	—
	41	RUUR	60	—
	62	CANU	48.	Y
	88	CP	12	Y
	119	barren	—	Y
	138	CP	12	Y
	148	BAPI	60	Y
	155	CP	12	—
	160	BAPI	60	—
	163	CP	24	—
	169	RUUR	36	—
	178	CP	24	—
	193	Barren	—	Y
	204	CP	12	Y
	208	RUUR	48	Y
	219	CP	12	Y
	255	SVG	12	—
	269	RUUR	36	—
	277	CP	24	Y
	300	RUUR	24	Y
	315	barren	—	Y
	351	CP	12	Y
	376	RUUR	60	—
	391	CP	12	—
	404	Barren	—	Y
	419	POMU	24	Y
	429	RUUR/RUSP	72	—

Detailed Habitat Column. P

X = 100 to Y = 450 = Passive Treatment

For Grazing Cells — take mt transects w/ cells + put in Highmm 99-2001 & (include yellow-tabbed data sheets)

TABLE 2B, Fig 3

Y %COVER

DIST	@3'	NOTES
0	20	
10	15	
20	100	
30	90	
40	45	
50	75	
60	100	
70	90	
80	75	
90	40	
100	95	
110	80	
120	95	
130	95	
140	90	
150	85	
160	80	
170	75	
180	75	
190	90	
200	85	
210	80	
220	90	
230	95	
240	60	
250	60	
260	60	
270	65	
280	70	
290	85	
300	90	
310	90	
320	95	
330	95	
340	95	
350	95	
360	85	
370	80	
380	85	
390	85	
400	90	
410	95	
420	95	
430	85	
440	75	
450	51	
460		
470		
480		
490		
500		
510		
520		
530		
540		
550		
560		
570		
580		
590		
600		

Calculate based on Veg ht — Col. I

Centered Passive

X = 0 to 400 (N)

X = 400 - 530 (S)

TBER HABITAT DATASHEET

DATE: 9/13/02 PAGE____OF____

BY: AC/KW

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
Y-300	0	BAPI	84	—	0	50	
	11	CP	36	—	10	50	
	44	RUUR	48	—	20	55	
	53	CP	24	—	30	55	
	60	RUUR	36	—	40	55	
	68	CP	12	—	50	60	
	71	RUUR	36	—	60	65	
	77	Carex	24	Y	70	70	
	80	RUUR	48	Y	80	90	
	84	Carex	36	Y	90	95	
	116	RUUR	60	Y	100	95	
	128	PISI	72	Y	110	90	
	136	SVG	24	Y	120	75	
	187	RUUR	24	—	130	75	
	202	SVG	12		140	80	
	206	RUUR/RUPI	72		150	80	
	216	SVG	24		160	80	
	220	RUSP	72		170	75	
	230	SVG	24		180	65	
	276	RUUR/RUSP	72		190	60	
	298	SVG	24		200	70	
	300	RUSP/RUUR	48		210	55	
	314	SVG	24	Y	220	55	
	396	CP	36	Y	230	55	
	410	RUUR	48		240	55	
	433	BAPI	60	Y	250	55	
	441	RUUR/RUSP	36	Y	260	55	
	452	CANU	36		270	60	
	458	RUUR	36		280	55	
	497	CP	36	Y	290	55	
	558	TFG	36		300	55	
	575	RUUR/CAOB	36		310	50	
					320	55	
					330	55	
					340	55	
					350	55	
					360	50	
					370	55	
					380	65	
					390	60	
					400	50	
					410	55	
					420	55	
					430	55	
					440	55	
					450	60	
					460	70	
					470	75	
					480	85	MUCH over
					490	90	
					500	90	
					510	60	
					520	65	
					530	70	
					540	60	
					550	60	
					560	50	
					570	40	
					580	35	
					590	30	
					600	30	

Margin notes: entered Passive; X=270; entered North; X=400; South entered; X=530; Passive entered

Notes column: Passive entered; entered North; entered South

entered Y=300 to X=0-270 = Passive

entered Y=300 to X=270-400 = ~~North~~ Passive

entered Y=300 to X=400-530 = ~~South~~ Passive

entered Y=300 to X=530-600 passive

Entire transect is passive - 5 ft east of fence line

Changed in data 4/26

TBER HABITAT DATASHEET

DATE: 9/14/02

BY: AC

PAGE 1 OF 1

~~[illegible]~~

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
X=400	0	SVG	24	Y	0	80	
	4	GASH	12	—	10	85	
	8	RUUR	24	—	20	80	
	20	POMU	24	Y	30	85	
	23	RUUR	36	Y	40	70	
	35	SVG	24	—	50	80	
	44	RUUR	48	—	60	60	
	62	ERMI	60	—	70	~~75~~ 80	
	67	RUUR	48	—	80	~~70~~ 45	
	73	SVG	24	—	90	~~80~~ 45	
	100	CANU	36	—	100	~~80~~ 65	
	110	SVG-CP	24	Y	110	70	
	158	RUSP	84	—	120	75	
	171	RUUR	36	—	130	80	
	186	RUSP	36	Y	140	85	
	189	RUUR	24	Y	150	80	
	195	SVG	24	—	160	85	
	201	RUSP	60	—	170	75	
	212	RUUR	24	—	180	70	
	222	barren	—		190	80	
	242	SVG	24	—	200	80	
	268	BAPI	60	—	210	85	
	274	RUSP	84	—	220	85	
	~~288~~	~~BAPI~~	~~60~~	—	230	90	
	288	RUUR	48	—	240	90	
	293	RUSP	60	—	250	80	
	297	CP	24	—	260	70	
	307	POMU	36	—	270	75	
	311	CP	24	—	280	85	
	322	RUSP	36	~~[illegible]~~ Y	290	80	
	332	CP	24	—	300	70	
	360	CANU	36	—	310	60	
	365	RUSP	72	—	320	60	
	37?1	BAPI	72	—	330	60	
	375	RUDI	84	—	340	50	
	399	POMU	36	—	350	50	
	403	RUUR	84	—	360	50	
	425	RUSP	60	—	370	85	
	435+	CP	24	—	380	95	
					390	95	
					400	95	
					410	95	
					420	75	
					430	75	
					440	75	
					450	75	
					460		
					470		
					480		
					490		
					500		
					510		
					520		
					530		
					540		
					550		
					560		
					570		
					580		
					590		
					600		

South entered

Y=300

entered passive

entered

South entered

entered passive

X = 400 to Y = 0-300 = SOUTH

X = 400 to Y = 300-450 = Passive

TBER HABITAT DATASHEET

DATE: 9/[illegible]/22

BY: KJ

PAGE ____ OF ____

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
Y=200	0	CP	18		0	50	
	25	RUUR	24		10	50	
	34	CP	12		20	60	
	39	BAPI	60		30	50	
	44	RUUR	24		40	75	
	55	BAPI	70		50	65	
	60	CANU	60		60	65	
	65	BAPI	60		70	65	
	68	CANV	60		80	70	
	94	PISI	60		90	70	
	100	CP	12	Y	100	80	
	112	CP	24	Y	110	95	
	139	SV6	24	Y	120	95	
	147	RUUR	48	Y	130	90	
	154	SV6	24	Y	140	80	
	214	RUUR	24	Y	150	65	
	229	CANV	36	Y	160	65	
	233	RUUR	36	Y	170	60	
	244	SV6	24	Y	180	60	
	263	RUUR	60	Y	190	55	
	267	SV6	24	Y	200	65	
	270	RUUR	48	Y	210	60	
	279	CP	36	Y	220	60	
	324	SV6	24	Y	230	60	
	333	CP	24	Y	240	55	
	360	RUUR	48	Y	250	55	
	390	RUSP	72	NO	260	60	
	405	BAPI	60	Y	270	70	
	408	SV6 / CP	36	Y	280	65	
	449	RUSP	60	N	290	75	
	456	CP / Mianth	24	Y	300	65	
	484	Bare		Y	310	65	
	510	CP	12	Y	320	75	
	517	POMU	36	Y	330	80	
	521	SV6	24	Y	340	80	
	541	RUUR	36	Y	350	80	
	547	BAPI	60	Y	360	85	
	552	SV6/CANV	24	Y	370	75	
					380	68	
					390	75	
					400	80	
					410	70	
					420	70	
					430	65	
					440	65	
					450	65	
					460	65	
					470	70	
					480	75	
					490	85	
					500	90	
					510	90	
					520	90	
					530	80	
					540	90	
					550	80	
					560	80	
					570	70	
					580	65	
					590	63	
					600	50	

Y=200 + X=0-270 = passive

Y=200 to X=270-400 = NORTH

Y=200 to X=400-530 = SOUTH

Y=200 to X=530-600 = passive

375, 430 only 300 ft

TBER HABITAT DATASHEET

DATE: 9-14-02
BY: KW

PAGE ____ OF ____

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
X = 500	0	RUUR	48	N	0	10	
	34	TF6	36		10	20	
	98	CANU	36		20	20	
	109	TF6	36		30	20	
	121	CANU	36		40	20	
	122	TF6	36		50	20	
	134	RUUR	48	Y	60	20	
	168	RUSP	60	Y	70	25	
	171	CP - Mouth	12	Y	80	25	
	192	POMU	12	Y	90	30	
	195	Bare	0	Y	100	40	
	220	CP - Mouth	12	Y	110	55	
	229	CP	36	N	120	55	
	235	RUUR	48	N	130	95	
	263	CP - Mouth/RUSP	24	Y	140	95	
	306	SU6	24	Y	150	80	
	330	CANU	36	Y	160	80	
	342	SU6	24	Y	170	85	
	354	RUSP	72	Y	180	90	
	364	SU6	24	Y	190	95	
	368	RUUR	24	Y	200	95	
	376	SU6	36	Y	210	95	
	400	CANU	36	Y	220	95	
	409	RUUR / RUSP	60		230	80	
	418	POMU	36		240	55	
	428	SU6	24		250	55	
	441	POMU	36		260	55	
	445	SU6	24		270	60	
					280	60	
					290	60	
					300	90	
					310	85	
					320	80	
					330	50	
					340	55	
					350	55	
					360	55	
					370	55	
					380	55	
					390	55	
					400	55	
					410	55	
					420	55	
					430	55	
					440	50	
					450	50	
					460		
					470		
					480		
					490		
					500		
					510		
					520		
					530		
					540		
					550		
					560		
					570		
					580		
					590		
					600		

MUST BE X = 500

↑ South entered

↓ passive entered

interfered

X = 500 to Y = 0 - 300, South

X = 500 to Y = 300 - 450 = passive

SOUTH entered

passive entered

TBER HABITAT DATASHEET

DATE: 11/13/02 PAGE ___ OF ___

BY: AC

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
	0	CANU	36		0	40	
	14	BAPI	72		10	[illegible]	
	22	RUUR	60		20	60	
	30	CP	24		30	85	
	99	BAPI	72		40	70	
	122	CP	36		50	80	
	126	BAPI	60		60	80	
	142	CANU	48		70	80	Spruce
	188	RUUR	36		80	90	overstory
	232	CANU	48		90	85	not accounted for
	309	RUUR	36		100	85	
	320	CANU	36	Y	110	95	Maybe redo
	336	SVG	24	Y	120	50	line as shown
	353	RUUR	84	Y	130	50	and collect spruce
	371	SVG	24	Y	140	45	% cover
	406	CANU	36	—	150	35	
	435	RUUR	36	—	160	35	
	465	CANW	48	—	170	40	
	515	TFG	36	—	180	45	
	552	RUUR	24		190	55	
	556	TFG	36		200	55	
	573	RUUR	24		210	40	
	579	TFG	36		220	50	
	583	RUUR	48		230	55	
					240	65	
					250	65	
					260	65	
					270	55	entered passive
					280	55	
					290	50	
					300	50	
					310	55	
					320	60	
					330	65	
					340	65	
					350	75	
					360	95	
					370	80	
					380	75	
					390	70	
					400	70	entered north
					410	65	
					420	75	
					430	65	
					440	65	
					450	75	
					460	75	
					470	60	
					480	65	
					490	75	
					500	80	
					510	20	
					520	20	
					530	20	entered south
					540	15	
					550	15	
					560	15	
					570	15	
					580	15	
					590	15	
					600	15	entered passive

Left margin: entered passive; 270 BREAK; X=400 entered; X=530 entered; entered passive

entered Y=100 to X=0-270 Passive

entered Y=100 to X=270-400=NORTH

entered Y=100 to X=400-530=SOUTH

Y=100 to X=530-600 Passive

TBER HABITAT DATASHEET

DATE: 9/14/02
BY: AC

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
Y=300	0	RUUR	36	—	0	50	
	5	fescue	24	—	10	50	
	10	RUUR	48	—	20	95	
	30	fescue	24	—	30	25	
	60	CANU	36	—	40	15	
	123	SVG	24	Y	50	15	
	137	CANU	36	Y	60	20	
	151	CP	24	Y	70	30	
	165	POMU	36	Y	80	40	
	188	RUSP	60	—	90	50	
	195	CANU	36	—	100	55	
	212	POMU	24	—	110	65	
	219	RUSP	60	—	120	75	
	246	CANU	36	Y	130	70	
	251	SVG	24	Y	140	70	
	270	RUSP	48	—	150	75	
	277	CANU	48	—	160	75	
X=300	288	RUSP	48	—	170	80	
	305	SVG	36	—	180	75	
	308	RUSP	60	—	190	80	
	318	SVG	36	Y	200	75	
	343	RUSP	72	—	210	75	
	348	RUDI	72	—	220	80	
	370	POMU	48	—	230	80	
	387	SVG	24	Y	240	85	
	399	POMU	48	Y	250	80	
	407	SVG	24	Y	260	75	
	420	POMU	48	Y	270	75	
	429	SVG	24	Y	280	70	
	440+	RUUR	60	—	290	70	
					300	70	
					310	75	
					320	80	
					330	80	
					340	75	
					350	95	
					360	95	
					370	90	
					380	75	
					390	75	
					400	80	
					410	85	
					420	85	
					430	85	
					440	85	
					450	85	
					460		
					470		
					480		
					490		
					500		
					510		
					520		
					530		
					540		
					550		
					560		
					570		
					580		
					590		
					600		

Active entered

Passive entered

entered

Passive entered

entered 4/10

X=300 to Y=0-300 = North

X=300 to Y=300-450 Passive

DATE: 9/14/02

BY: AC

TBER HABITAT DATASHEET

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?	DIST	%COVER @3'	NOTES
X=375	0	SVG	24	—	0	20	
	37	RUUR	48	—	10	20	
	63	SVG	24	—	20	20	
	89	CANU	36	Y	30	25	
	97	SVG	24	Y	40	75	
	109	RUSP	36	Y	50	50	
	121	POMU	24	Y	60	70	
	124	RUUR	36	Y	70	50	
	161	BAPI	84	Y	80	50	
	169	RUSP	60	Y	90	65	
	187	RUUR	72	Y	100	75	
	200	POMU	48	Y	110	70	
	210	RUSP	36	Y	120	70	
	216	SVG	24	Y	130	80	
	220	RUUR	48	—	140	95	
	228	CP - MIMI	12	Y	150	95	
	273	SVG	24	Y	160	95	
	286	PISI	48	N	170	75	
	289	RUSP	48	Y	180	70	
	298	CP	48	Y	190	80	
					200	75	
					210	85	
					220	80	
					230	90	
					240	95	
					250	85	
					260	80	
					270	75	
					280	65	
					290	60	
					300	65	
					310		
					320		
					330		
					340		
					350		
					360		
					370		
					380		
					390		
					400		
					410		
					420		
					430		
					440		
					450		
					460		
					470		
					480		
					490		
					500		
					510		
					520		
					530		
					540		
					550		
					560		
					570		
					580		
					590		
					600		

transect - X=375 to Y=300 = NORTH

DATE: 9/14/02
BY: AC

TBER HABITAT DATASHEET

REF TRANS	DIST	DOMINANT SPECIES UNDERSTORY	AVG HGT UNDSTY	SPRUCE OVERSTORY?
Y:430	0	RUUR/AUDI	60	—
	60	SVG [redacted]	36	—
	80	CANU	48	—
	110	RUUR	36	—
	125	BAPI	48	—
	127	SVG	36	Y
	139	Barren	—	Y
	164	RUSP	60	[redacted]
	191	RUUR	36	—
	200	SVG	24	—
	205	RUSP	48	Y
	220	CANU	48	Y
	225	RUSP	84	—
	260	CANU	60	—
	265	RUSP	84	—
275	[redacted]	BAPI	72 [redacted]	—
	280	RUUR	36	—
	292	RUSP	48	—
	296+	RUUR	36	—

DIST	%COVER @3'
0	95
10	95
20	95
30	95
40	95
50	95
60	95
70	25
80	25
90	75
100	75
110	[redacted] 75
120	60
130	75
140	80
150	90
160	90
170	85
180	70
190	85
200	70
210	80
220	80
230	95
240	80
250	70
260	60
270	60
280	70
290	70
300	60
310	
320	
330	
340	
350	
360	
370	
380	
390	
400	
410	
420	
430	
440	
450	
460	
470	
480	
490	
500	
510	
520	
530	
540	
550	
560	
570	
580	
590	
600	

NOTES

430, 100
, 110
120
130
} rebar

leveled

entered 4/20

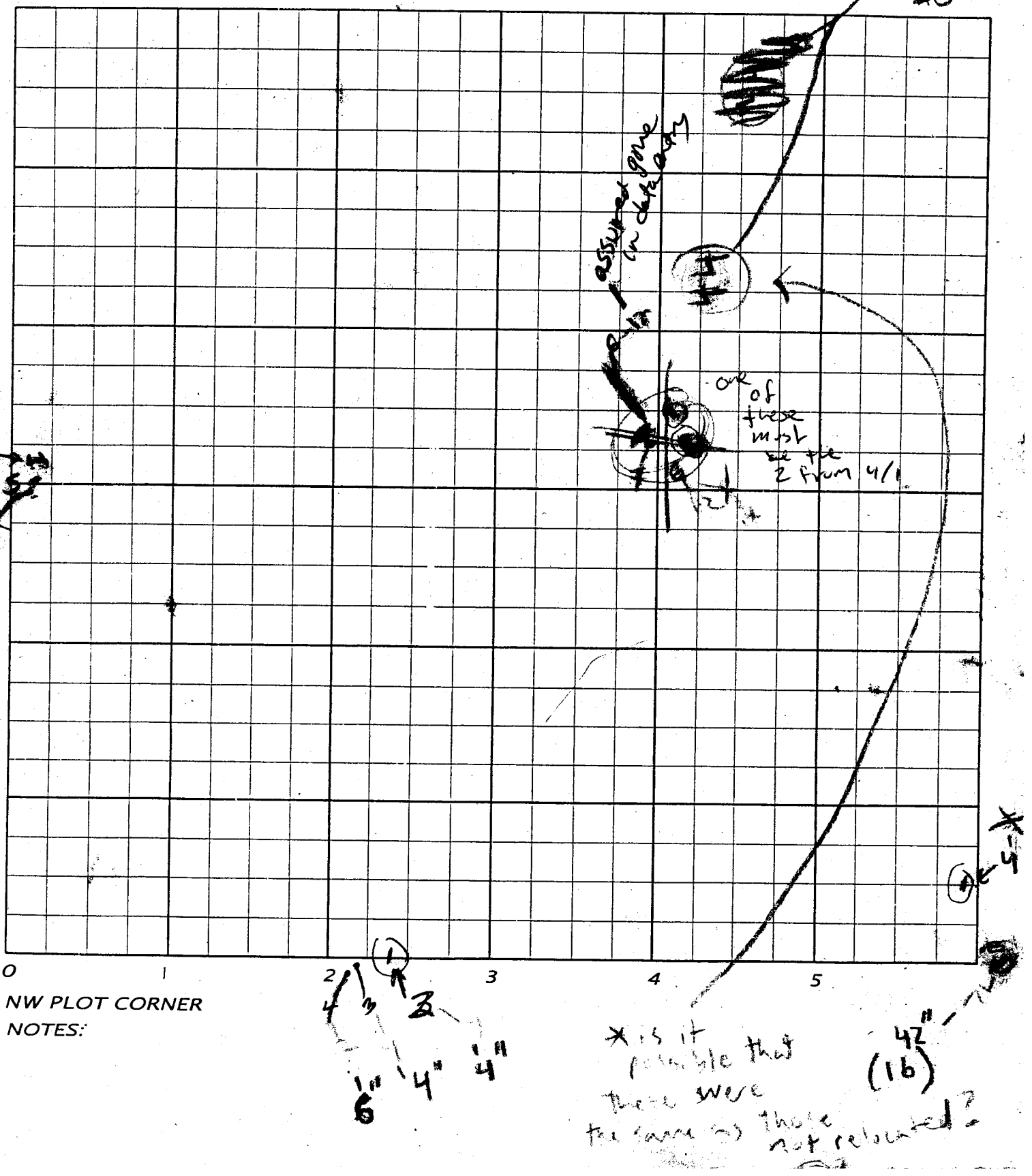
X=430 to Y=300 = SOUTH

TBER LIFE HISTORY PLOT

SAMPLER KW

DATE AND KEY: 4/1/02 | 5/1 4/24 | 7/2 MB

PLOT# LH 1

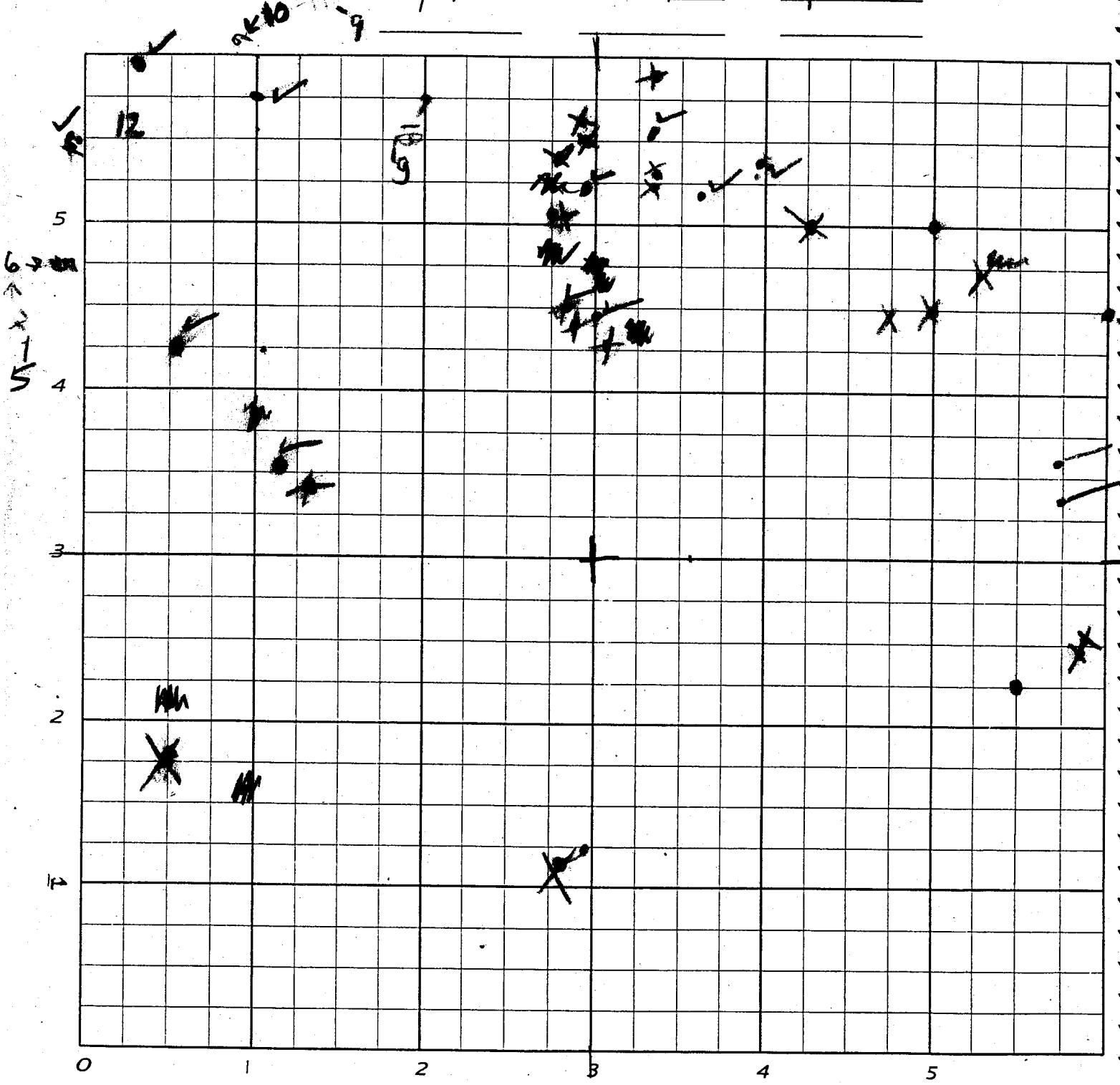


TBER LIFE HISTORY PLOT

PLOT# LH2

SAMPLER Whole Gang

DATE AND KEY: 4/1/02 5/1/02 4/24/02 7/2 MB



NW PLOT CORNER

NOTES:

g = grazed

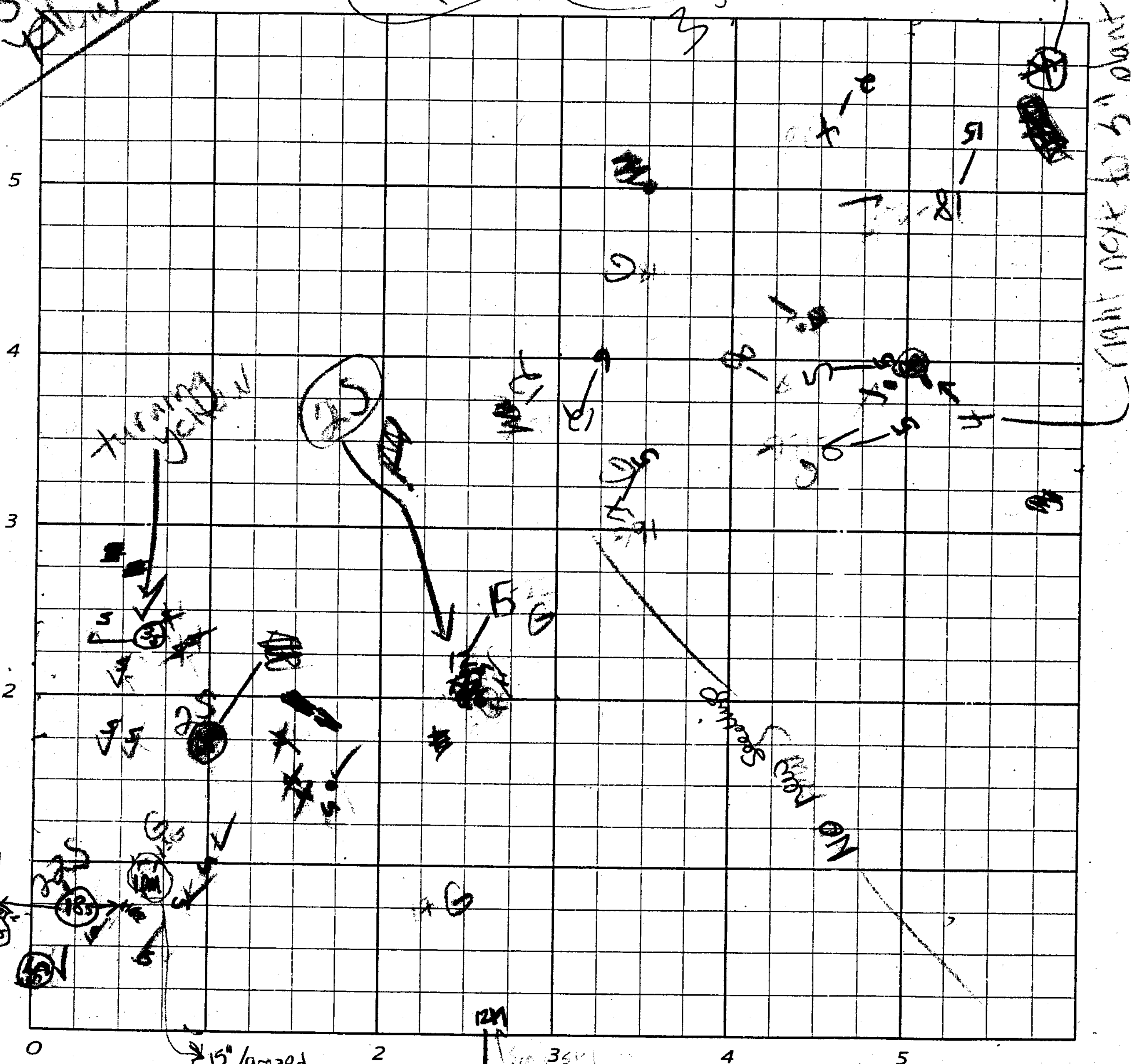
...BER LIFE HISTORY PLOT

PLOT# 443

SAMPLER Bencie

DATE AND KEY:

~~4-01-02~~ ~~4-24-02~~ ⑤ 5-1 Jen 7-2-02 JK



NW PLOT CORNER

NOTES:

* At (2.5, 2) there are 2 plants: 1 mature, 1 seedling
1 mature, 2.5

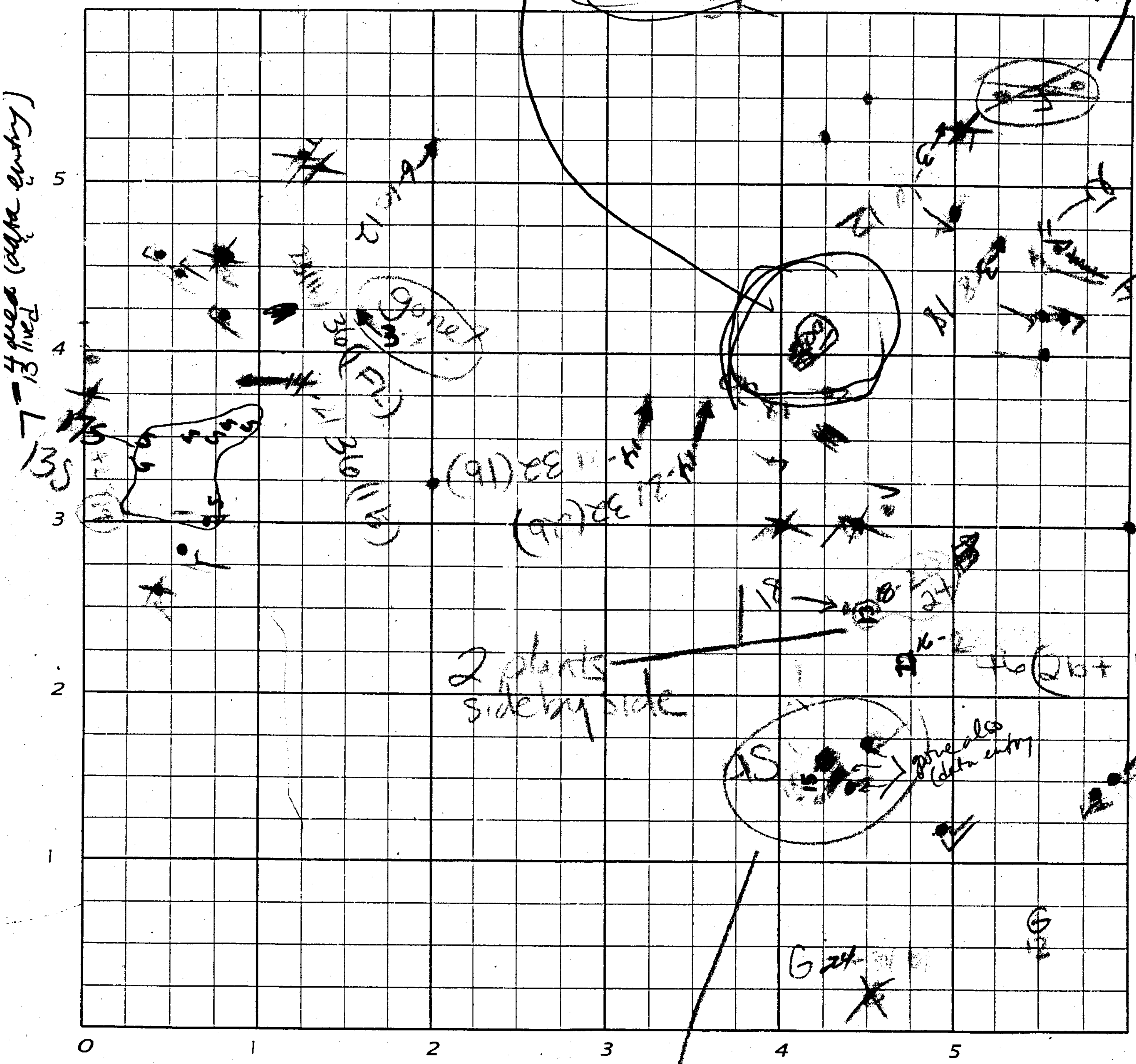
Unsure what this means — did not enter to data RB 10/25/02 — later decided to enter as 18S

TBER LIFE HISTORY PLOT

SAMPLER Bences

PLOT# LH4

DATE AND KEY: 1 4-1-02 | 2 4/24 5-1-02 | 3 5-2-02 | 4 4-2-02



NW PLOT CORNER

NOTES:

corners are way off

TBER LIFE HISTORY PLOT

SAMPLER Bruce

DATE AND KEY:

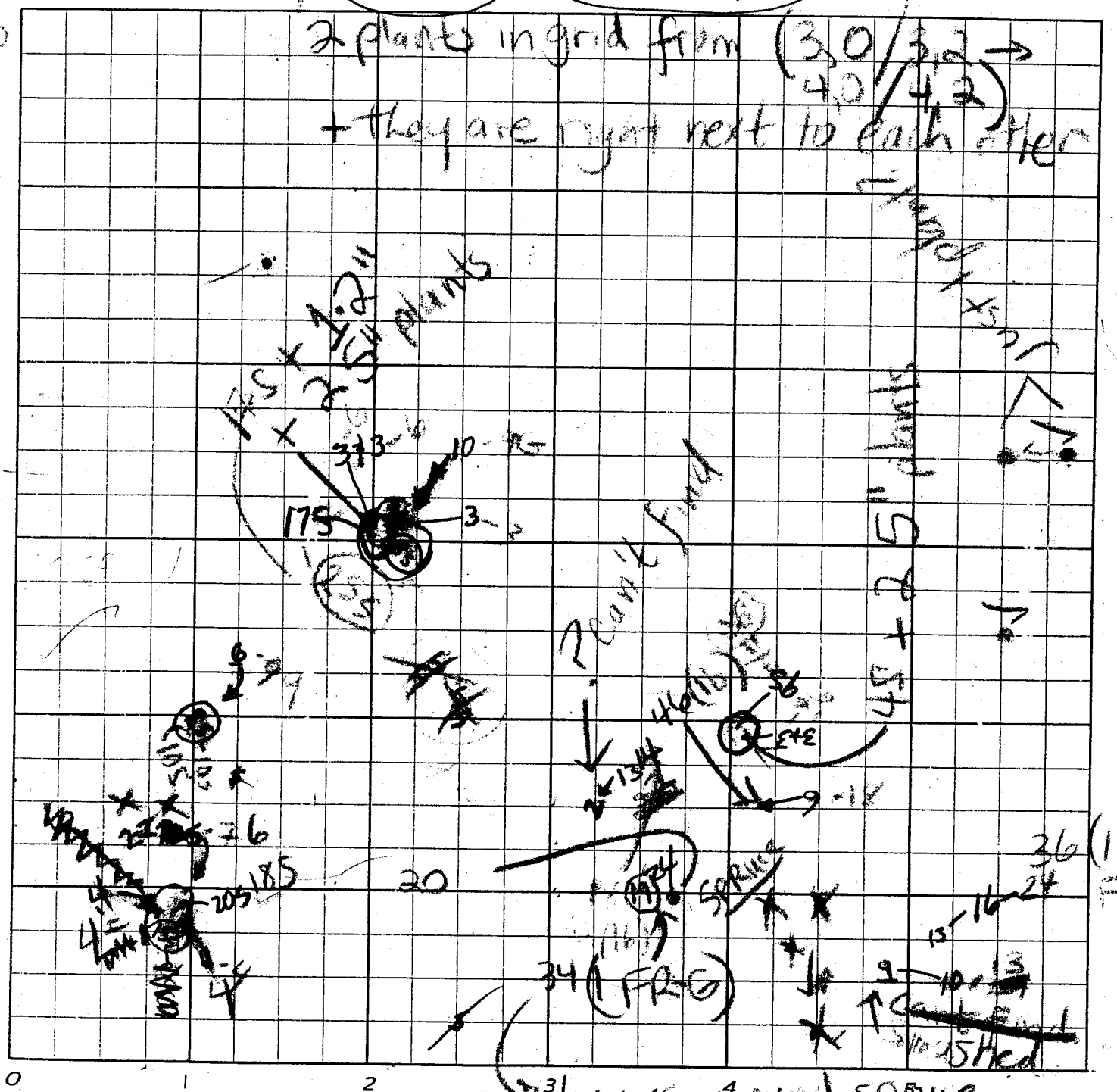
1 4-01-02

2 milk on 4/24 5/-02 (Heavy)

3 4-02

4 5/-02 JK

PLOT# LH5



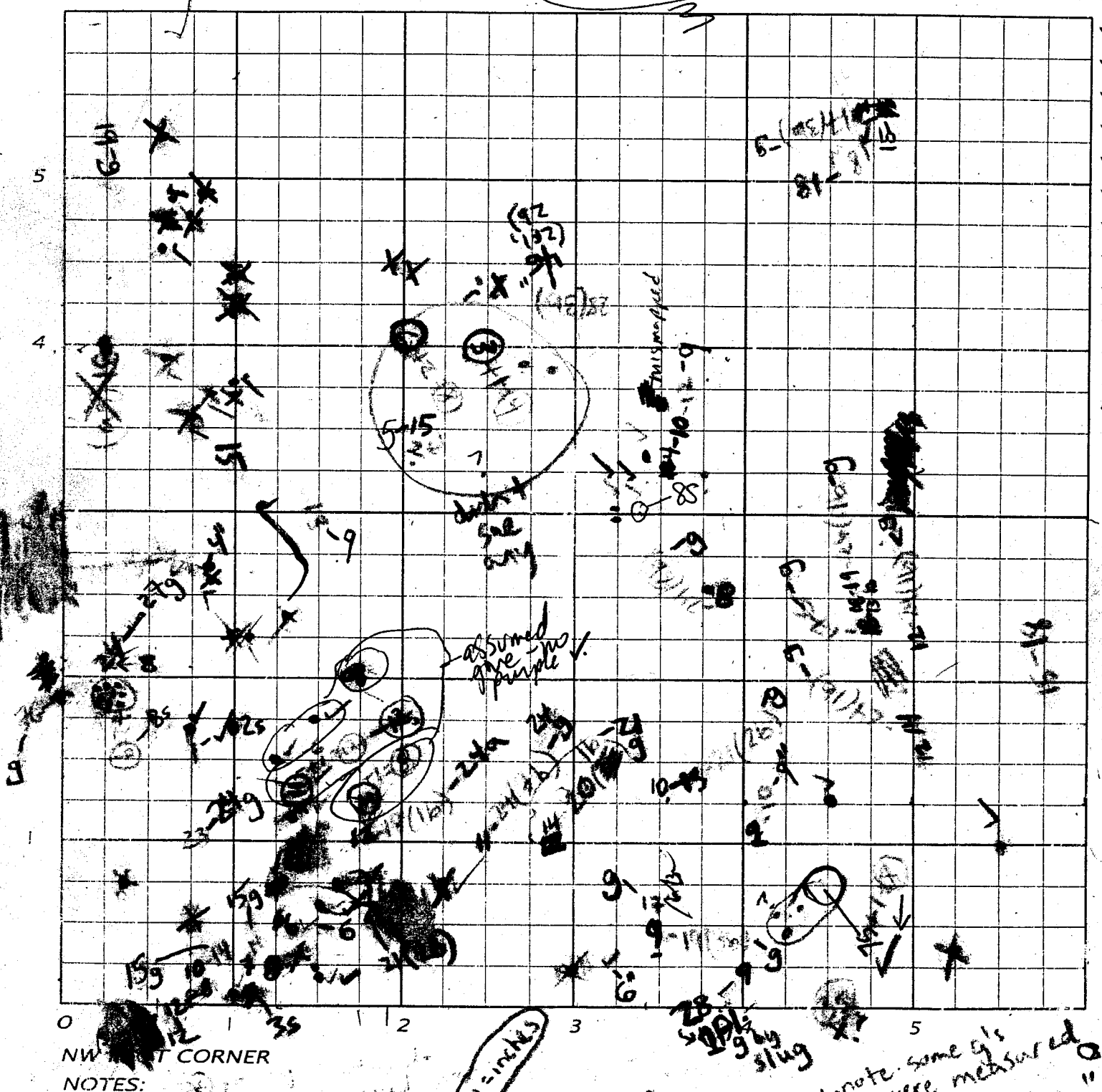
NOTES:

↔ indicates height + wee to wee too huh?

TBER LIFE HISTORY PLOT 1 2 4 PLOT# LH6

SAMPLER Jen

DATE AND KEY: 4-1-02 5-1-02 7/2/02 MB



NW CORNER

NOTES:

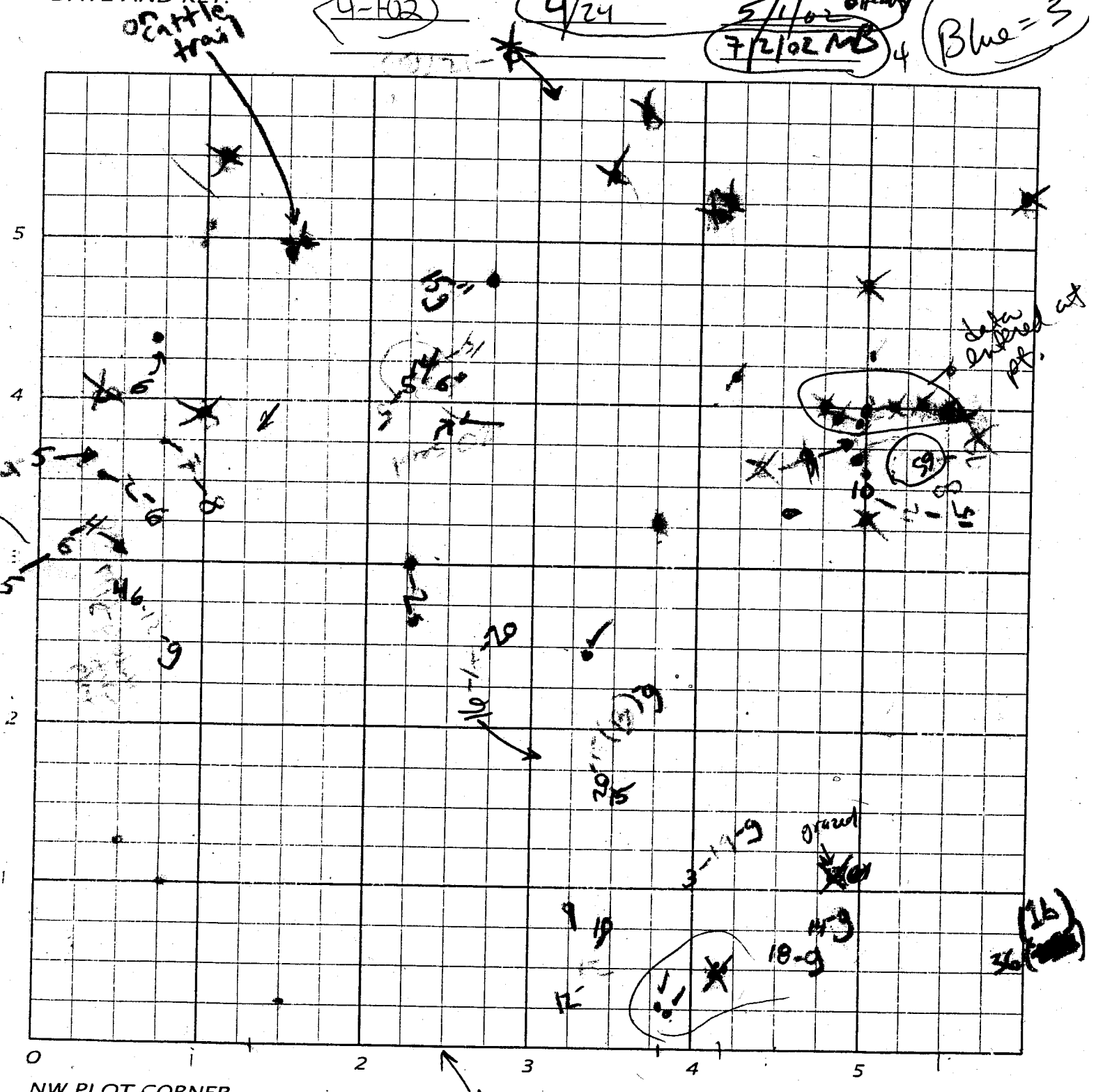
TBER LIFE HISTORY PLOT

SAMPLER Jen

DATE AND KEY: 4-402 4/24 5/1/02 OHEARN 7/2/02 MB

PLOT# 117

Blue = 3



NW PLOT CORNER

NOTES:

* If no purple ✓, assumed plant missing - coded "G".

g = grazed (no measurement taken)

TBER LIFE HISTORY PLOT

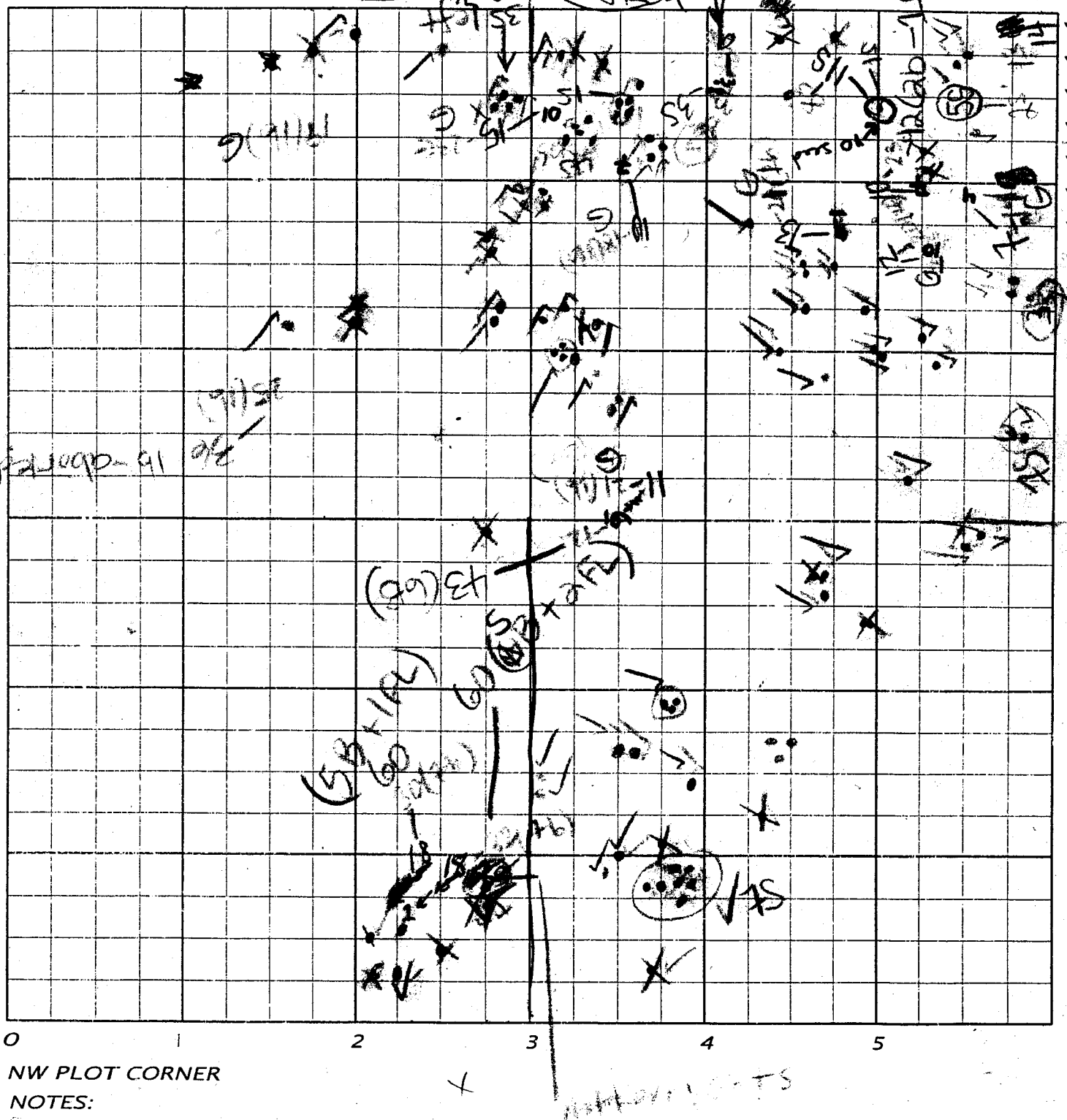
PLOT# LA8

SAMPLER KW

DATE AND KEY:

4/1/02 4/24/02 5-1-02 JK

7-2-02 JK



NW PLOT CORNER

NOTES:

seeds is starting to turn brown

TBER LIFE HISTORY PLOT

SAMPLER KW + JK

PLOT# LH9

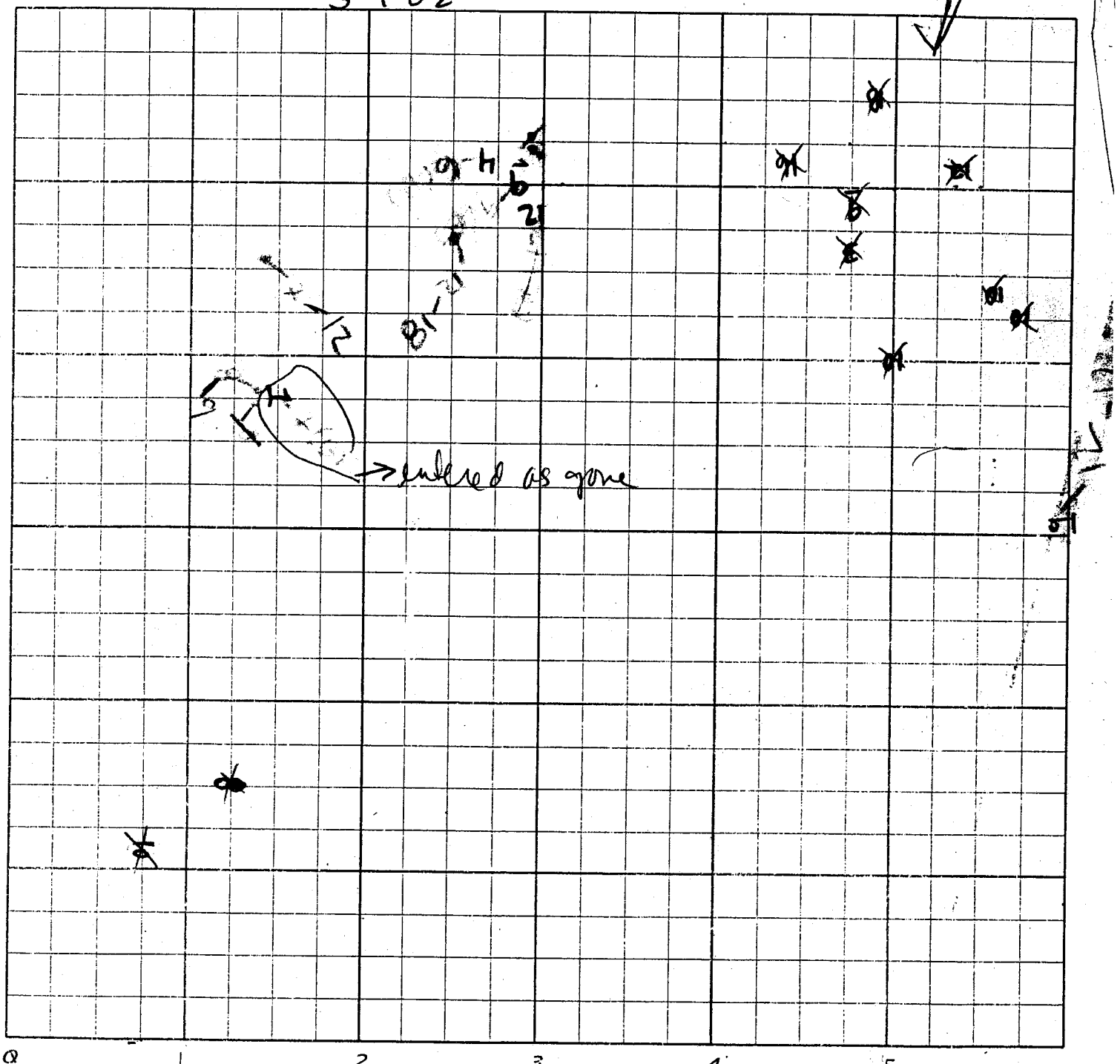
DATE AND KEY:

4/1/02 5-2 KJ

4/24/02 7-3 KJ

5-1-02

these are all mistakes



NW PLOT CORNER

* If no green mark - assumed gone for data entry

NOTES:

no plants on 4/1

most have used wrong data sheet on 4/24 (first attempt)

TBER LIFE HISTORY PLOT

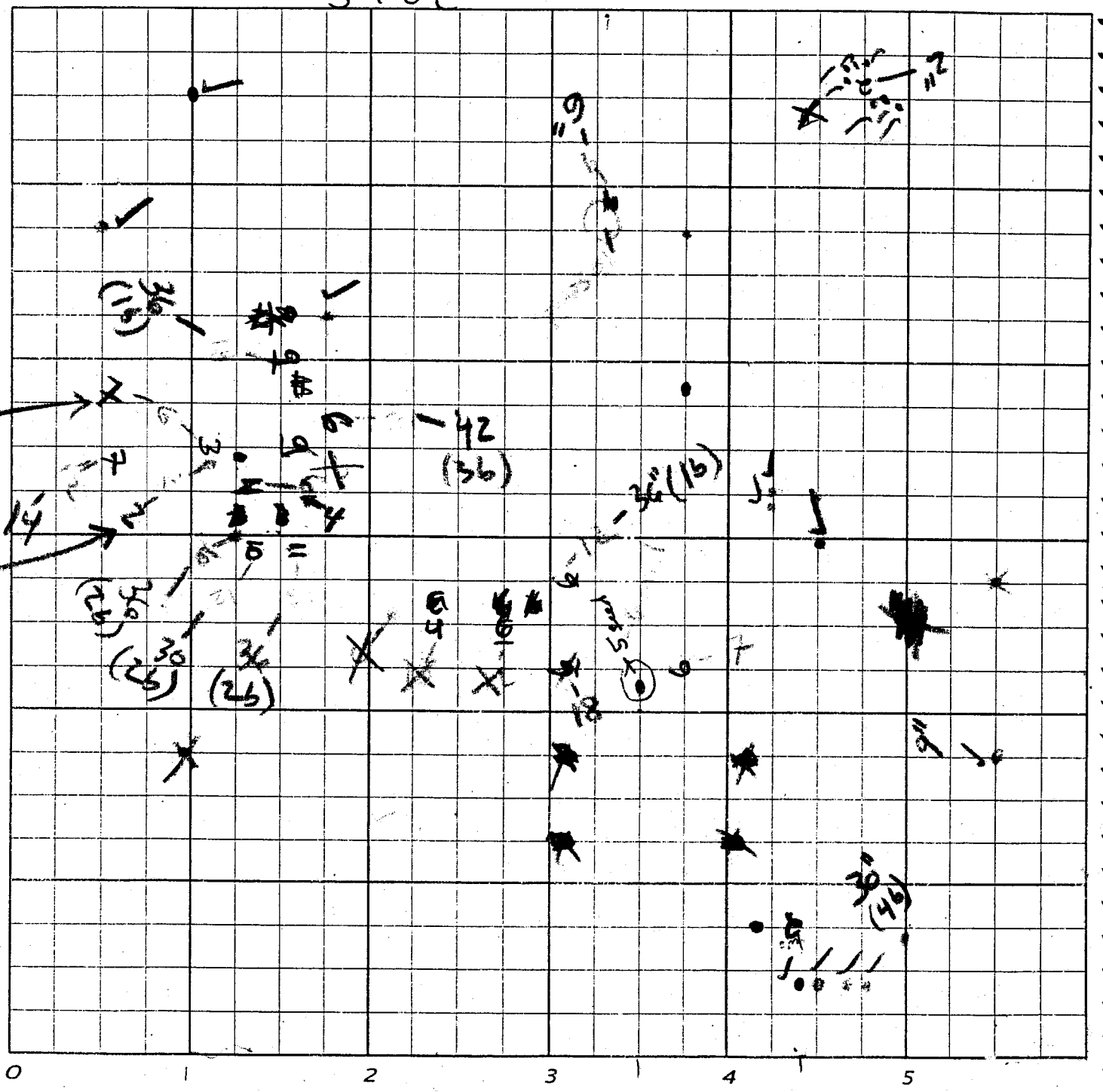
PLOT# LH10

SAMPLER Jen

DATE AND KEY: 4-1-02 7/2/02 MB

4-24-02

5-1-07



NW PLOT CORNER

NOTES:

TBER LIFE HISTORY PLOT

SAMPLER JCM

DATE AND KEY:

4-1-02

4-24-02

5-1-02

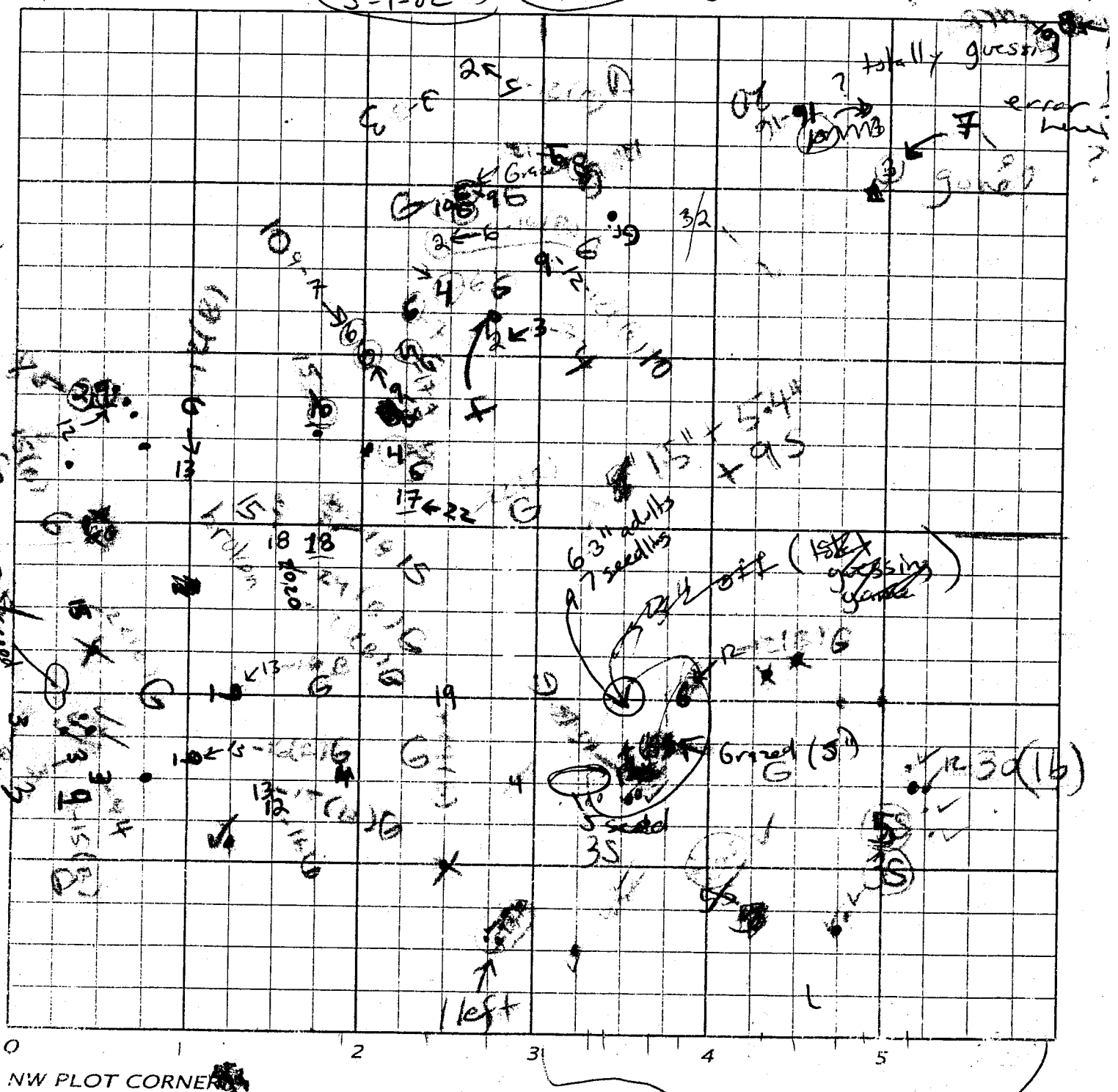
3

4

7-2 JK

PLOT# LH11

old about 4-5 inches not these plants are off



NW PLOT CORNER

NOTES: Deer scat in plot

this quad 37 seedlings

TBER LIFE HISTORY PLOT

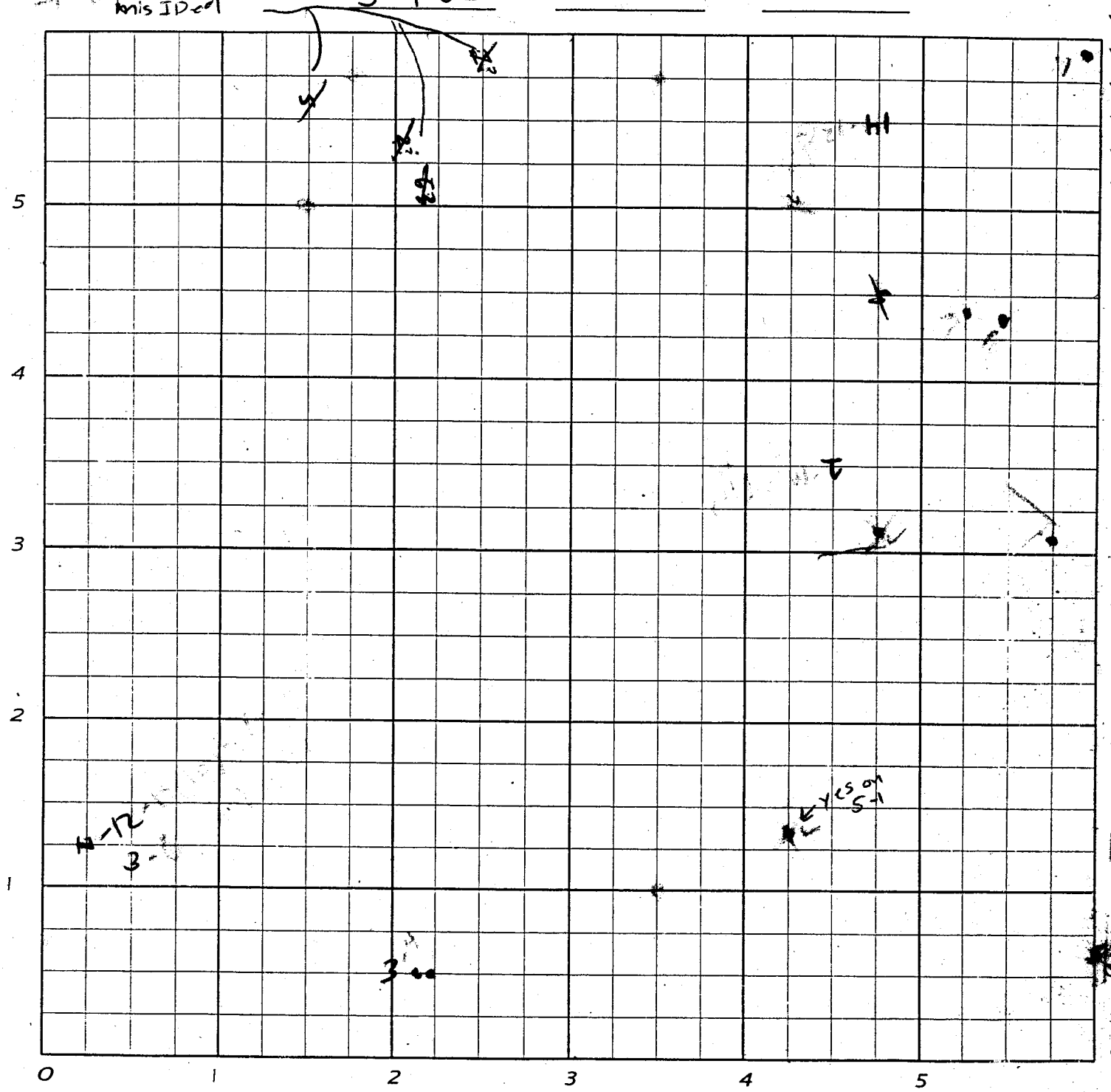
PLOT# LH12

SAMPLER Beverly

DATE AND KEY:

4-01-02

5-1-02



NW PLOT CORNER

NOTES: Note first monit day letter S used for seedling now its dots. Possibly several wrong IDs on day 1

TBER LIFE HISTORY PLOT

PLOT# LH13

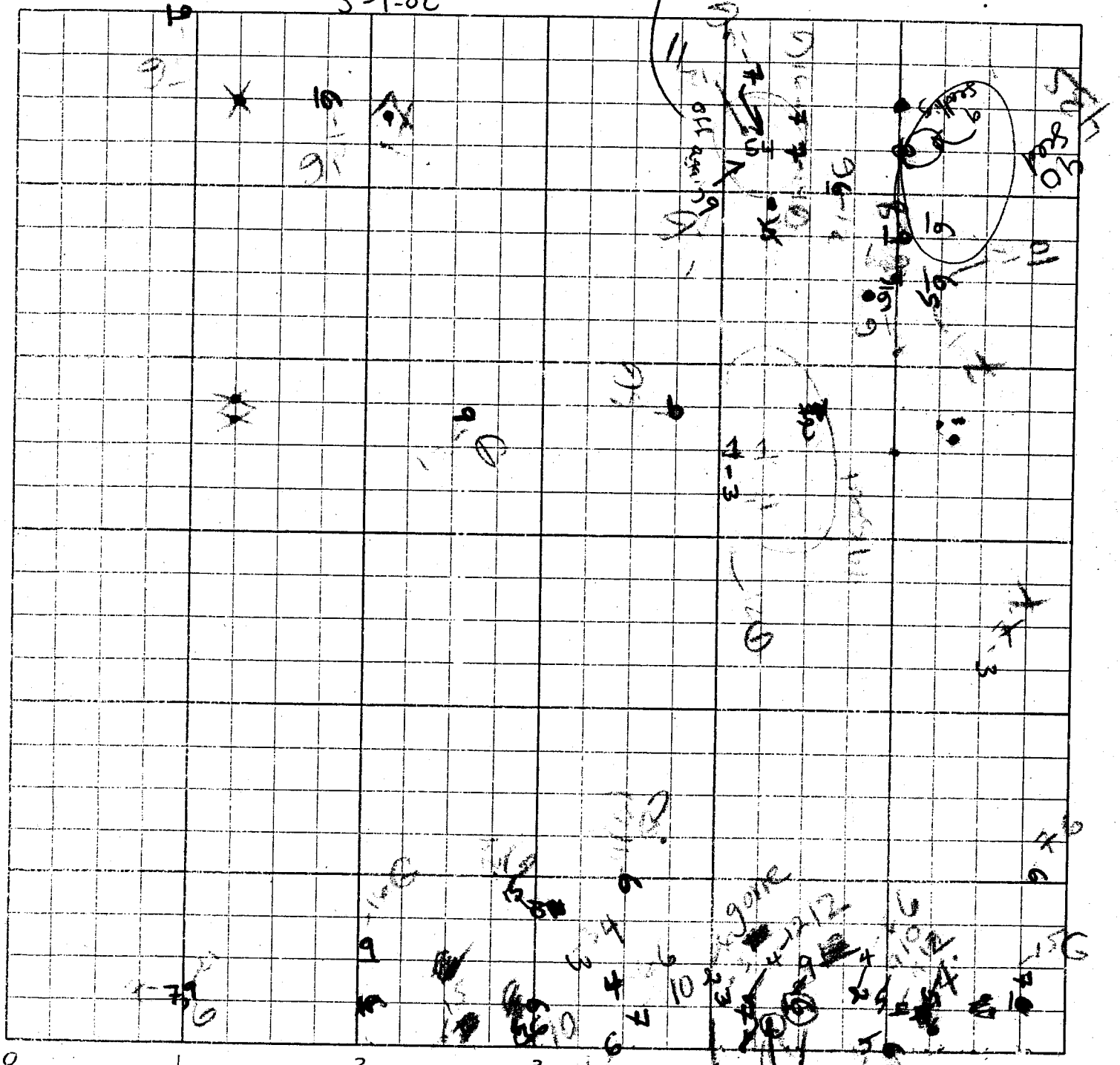
SAMPLER_____

DATE AND KEY: 4/1/02 2-2JK

4/24-02

5-1-02

cards don't match 3-4 11 error



NW PLOT CORNER

NOTES: GOOD PLOT = E 1/2

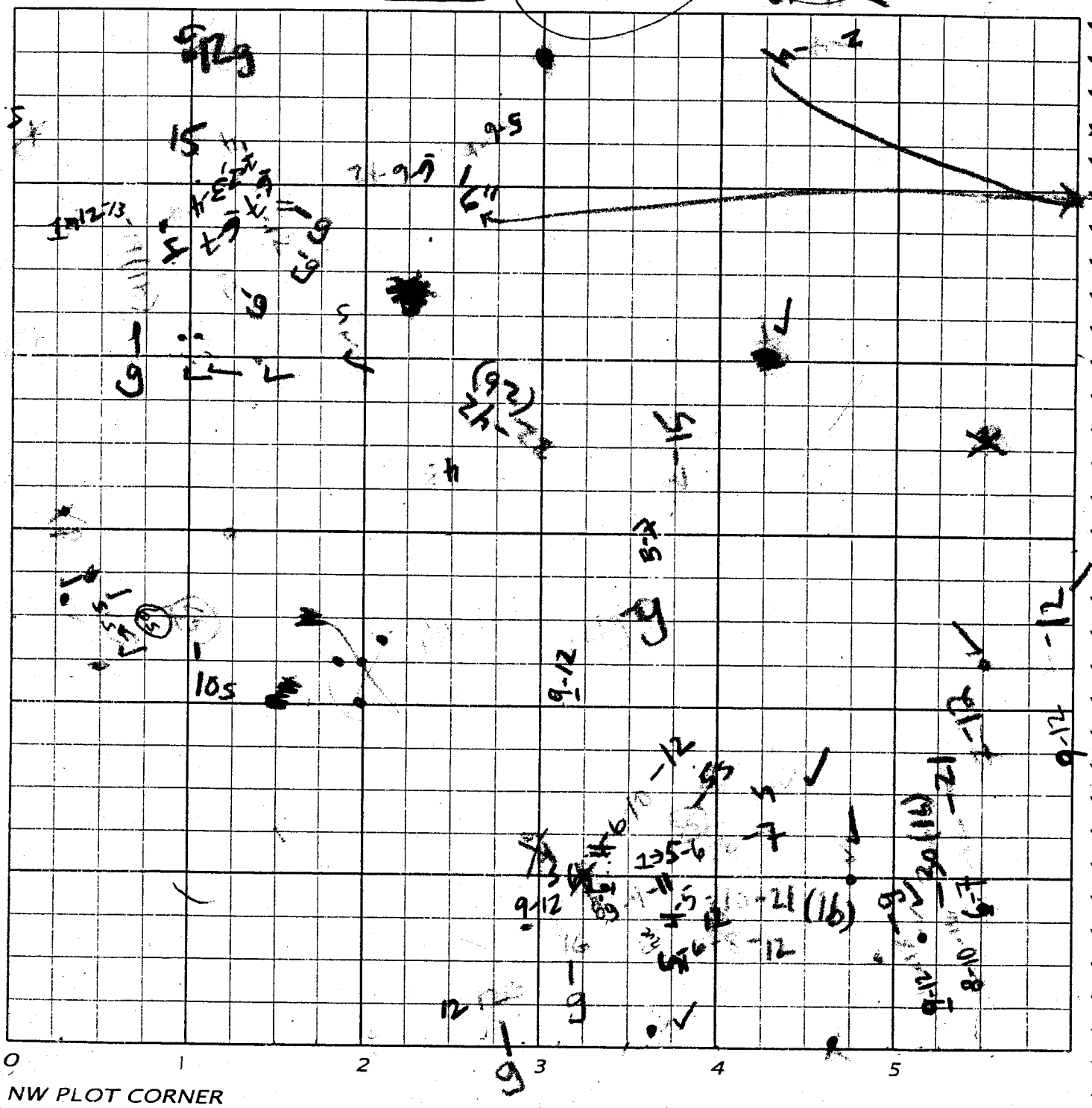
TBER LIFE HISTORY PLOT

SAMPLER JK + KW

DATE AND KEY: 4/1/02 5-01-02 7/2 MB

~~4-29-02~~ ~~5-01-02~~ ~~7-21-02~~

PLOT# LH1L



NW PLOT CORNER

NOTES:

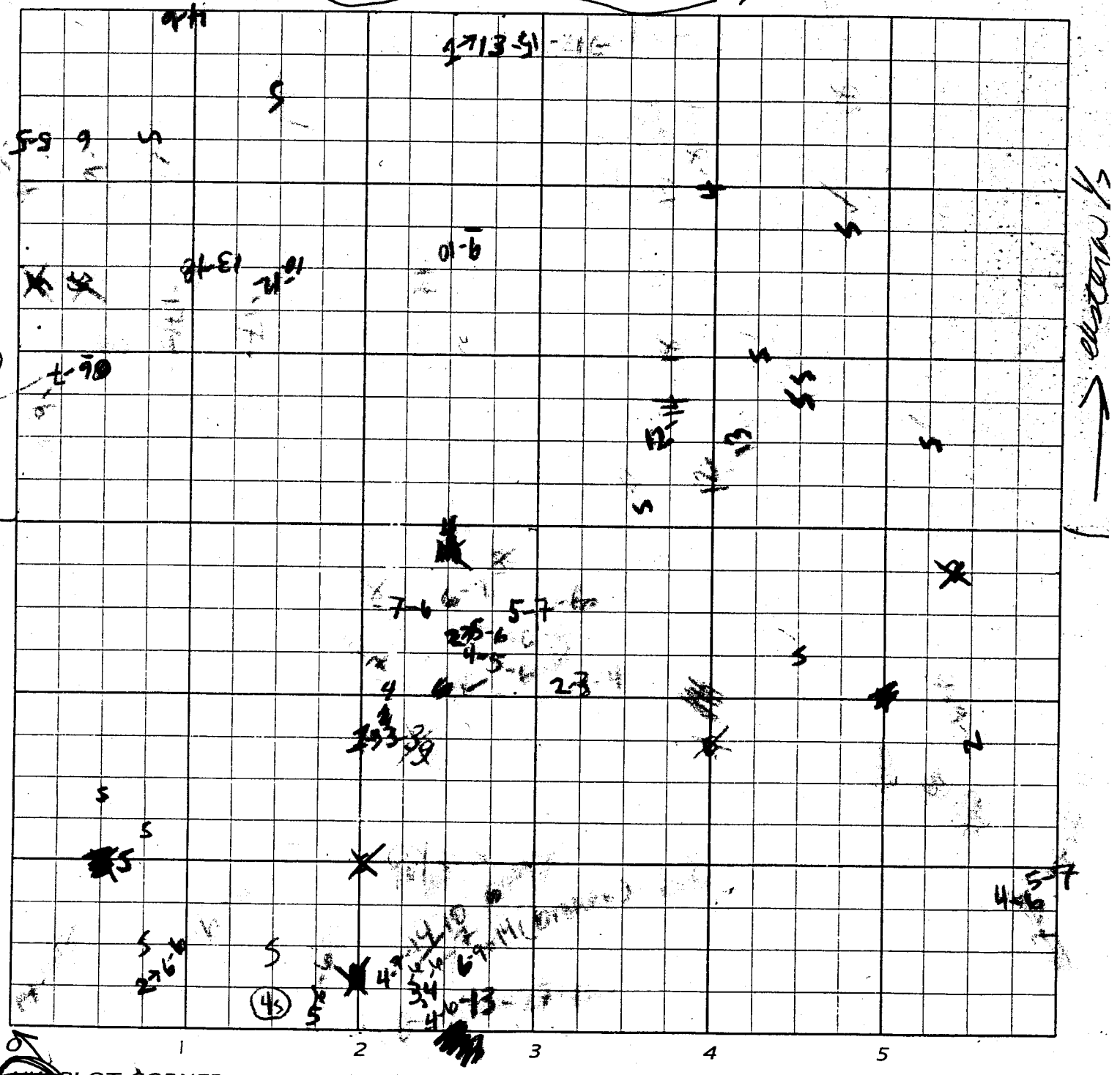
g=grazed

TREE LIFE HISTORY PLOT
SAMPLER Bruce
DATE AND KEY:

1 2 4

4-01-02
4-24-02
5-01-02
3

PLOT# LH15



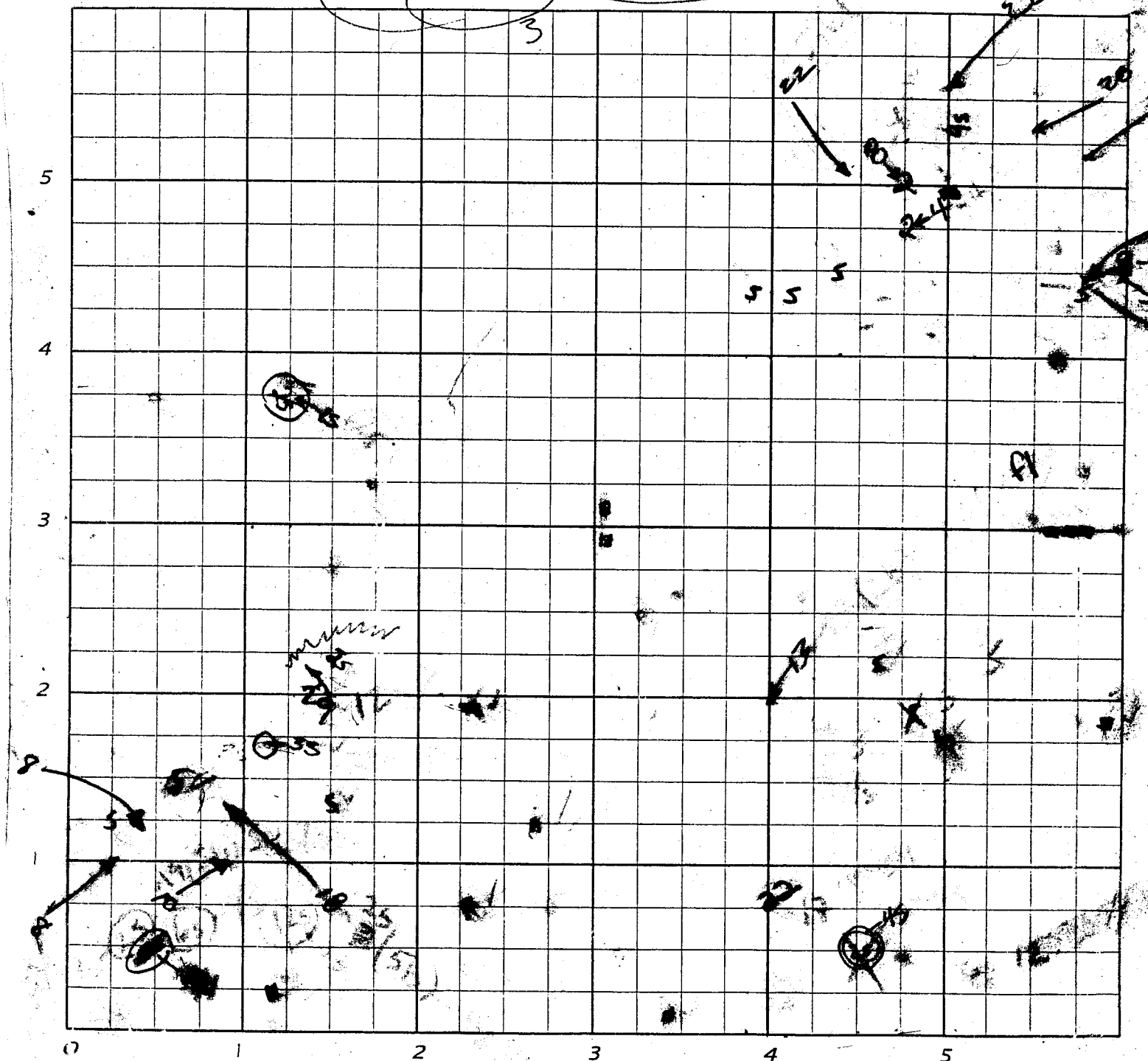
NOTES:

Note → not sure which repro, one was original

See [illegible] half only

TBER LIFE HISTORY PLOT
SAMPLER Bernie
DATE AND KEY: 4-01-02 5-1-03 (Henry)

PLOT# LH16



NW PLOT CORNER
NOTES:

TBER LIFE HISTORY PLOT

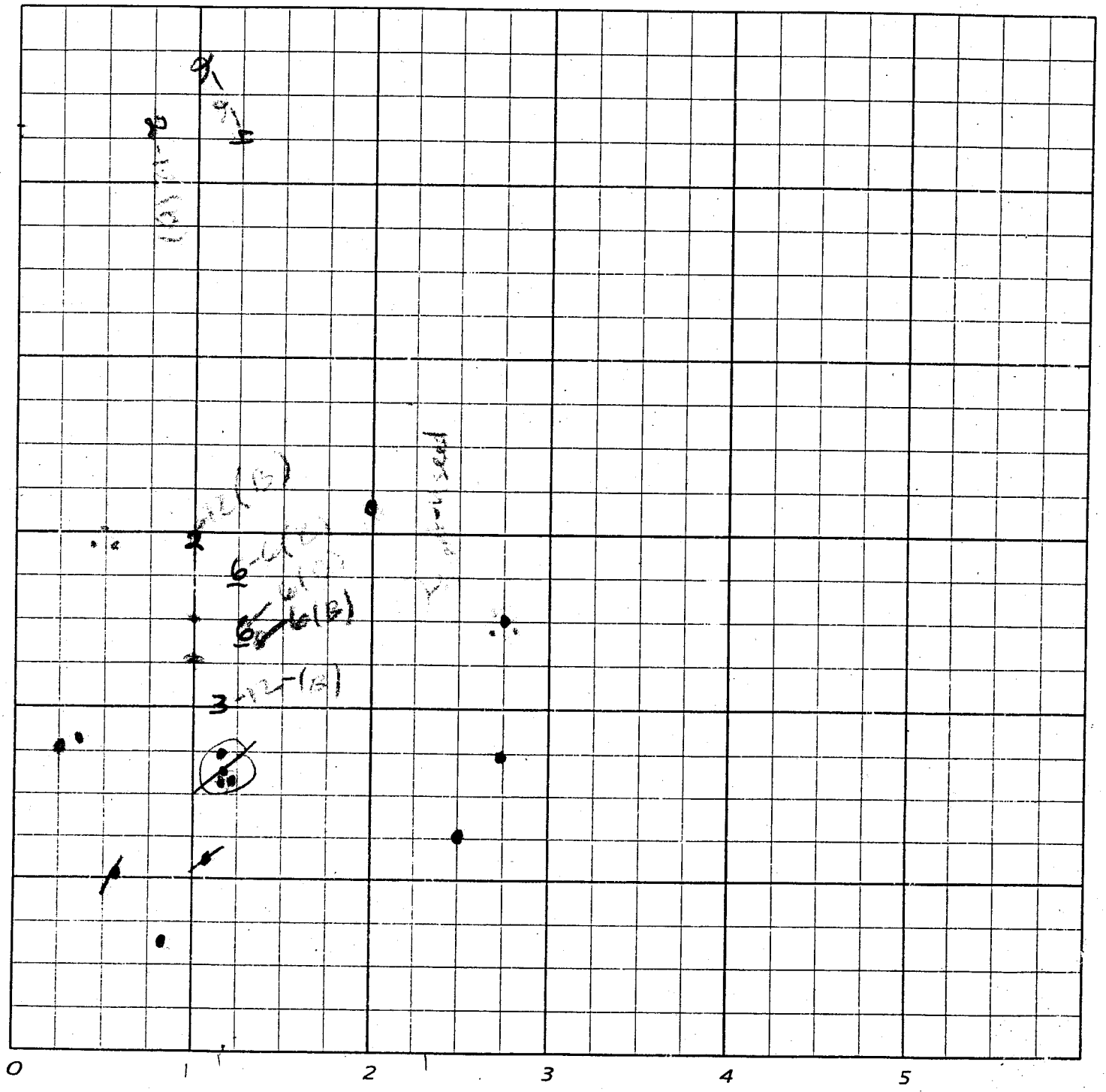
PLOT# 17

SAMPLER JK

DATE AND KEY:

1 4-1-02 3 5-1-02 KW

2 5-1-02 4 7-3 KW



NW PLOT CORNER

NOTES:

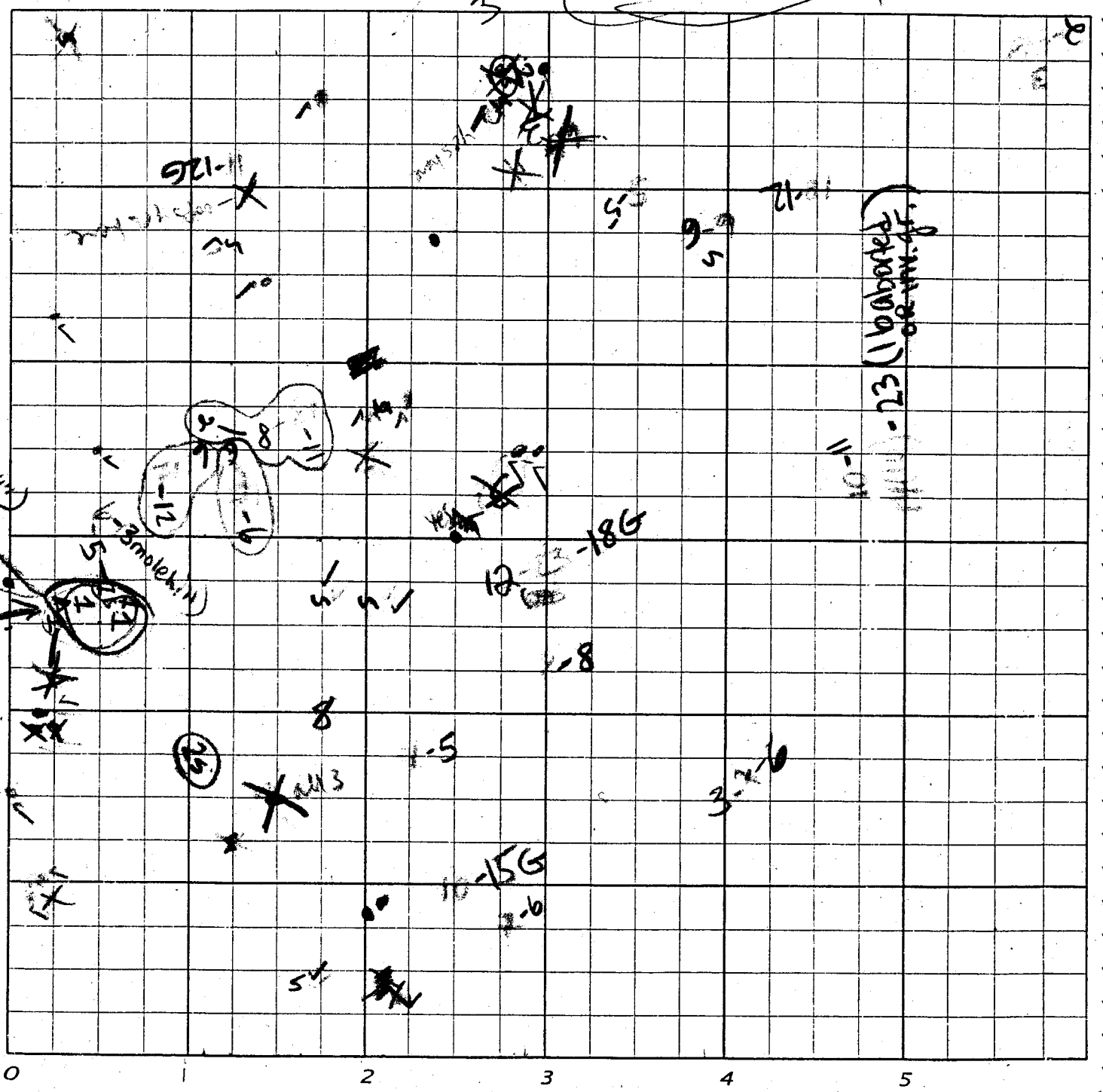
B = ground

TBER LIFE HISTORY PLOT

SAMPLER Bruce

DATE AND KEY: 4-01-02 S-1 JK 37-05-02RB

PLOT# LH18



NOTES:

~4 mayfly nymphs in plot

TBER LIFE HISTORY PLOT

SAMPLER JK + KW

DATE AND KEY:

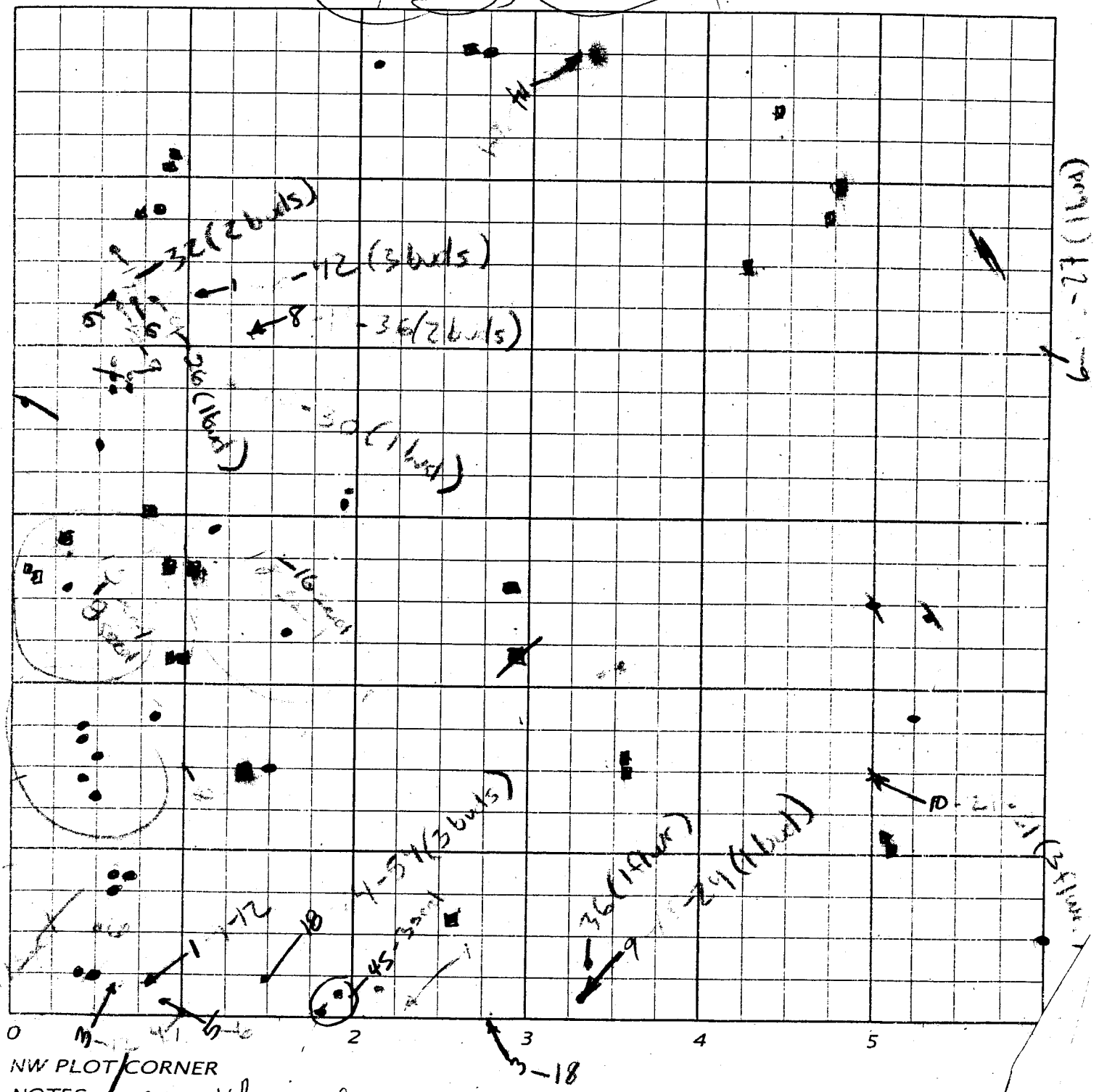
1 4-1-02

2 5-1-02 (team)

3 5

4 7-3 KW

PLOT# CH_19



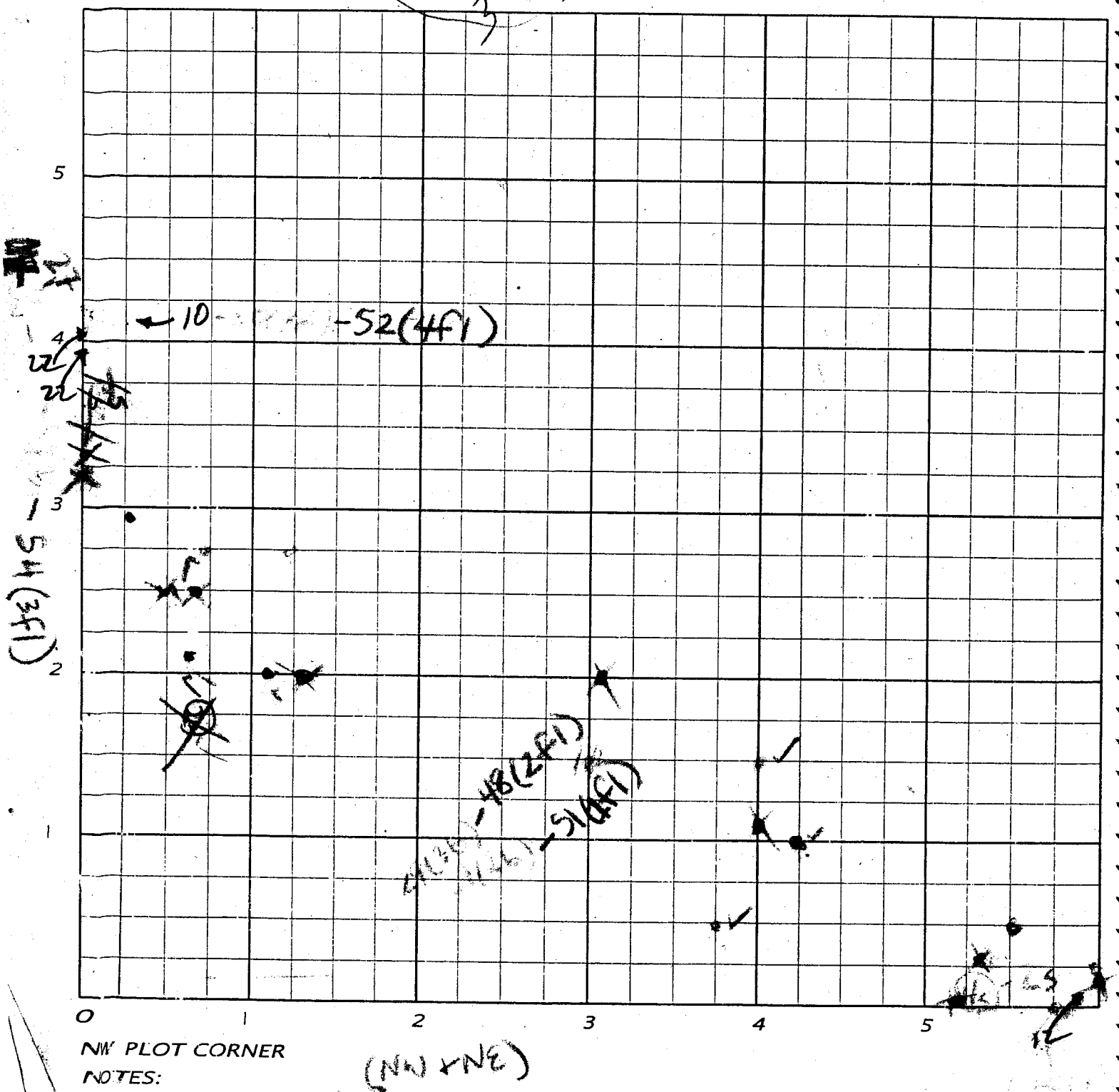
NOTES: Aster chilensis - Rainy margins

TBER LIFE HISTORY PLOT

SAMPLER Brewer

DATE AND KEY: 1 4-01-02 2 5/1 02 (Heavy) 7-05-02 RB 4 3

PLOT# LH20



TBER LIFE HISTORY-PLOT

PLOT# LH21

SAMPLER Bruce

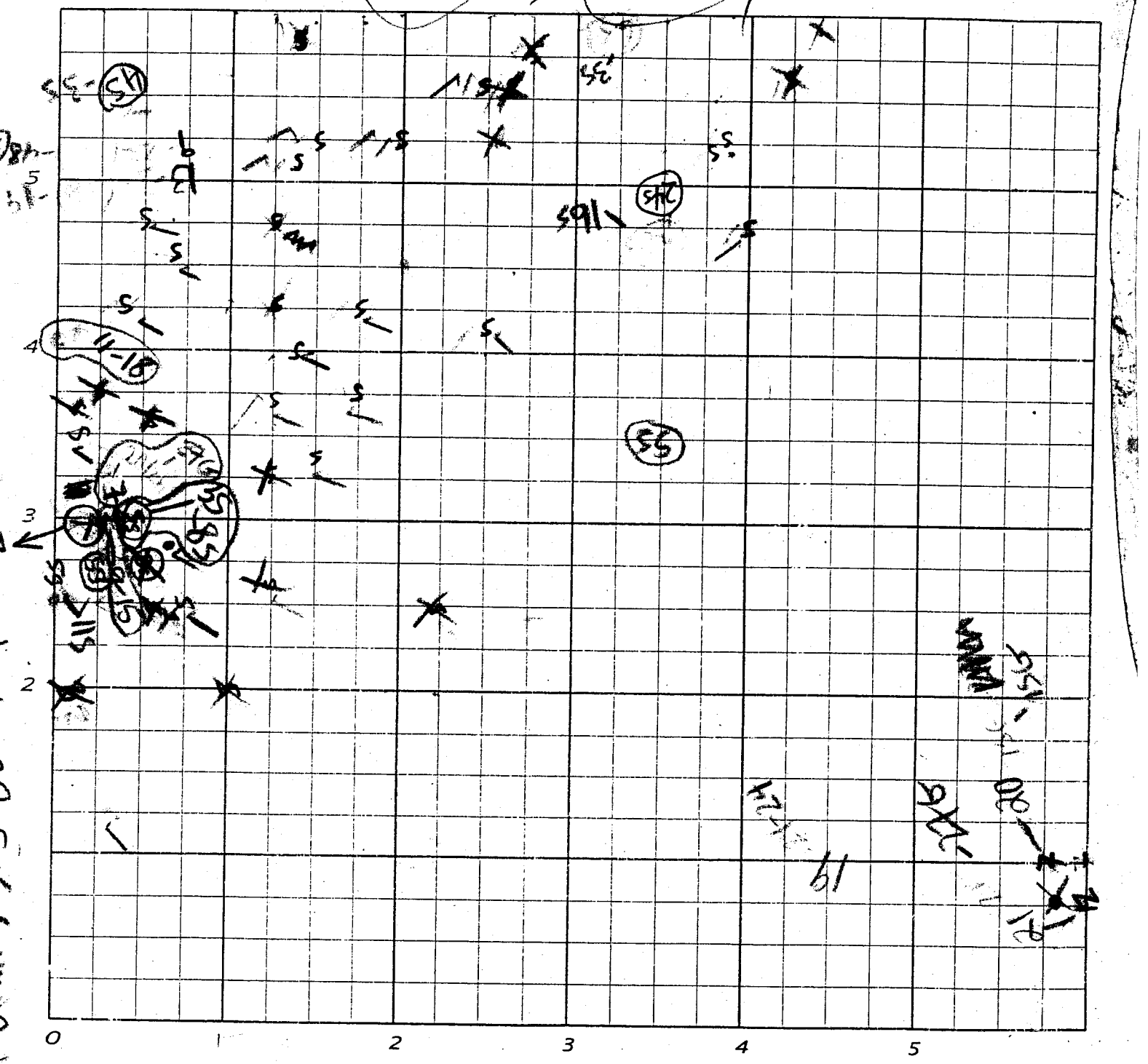
DATE AND KEY:

1 04-01-02

2 5-1-02

3

4



NW PLOT CORNER

NOTES: Frame Stuger NE corner

TBER LIFE HISTORY PLOT

SAMPLER JK

DATE AND KEY:

1 4-1-02

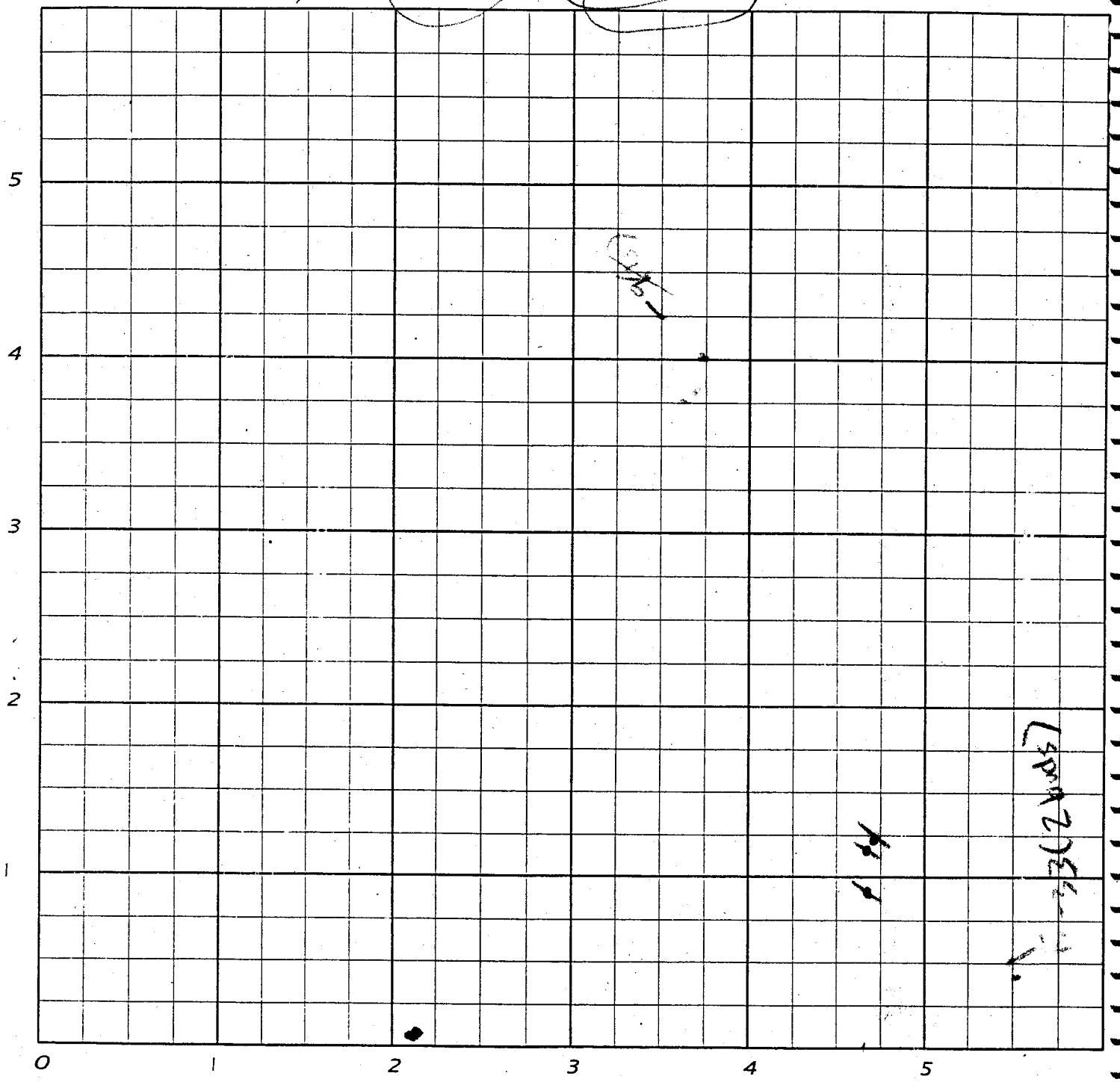
2 5-1 JK

3 3-12-01

4 7-3-02 KW

NW change

PLOT# 22



NW PLOT CORNER

NOTES:

TBER LIFE HISTORY PLOT

SAMPLER Beau

DATE AND KEY:

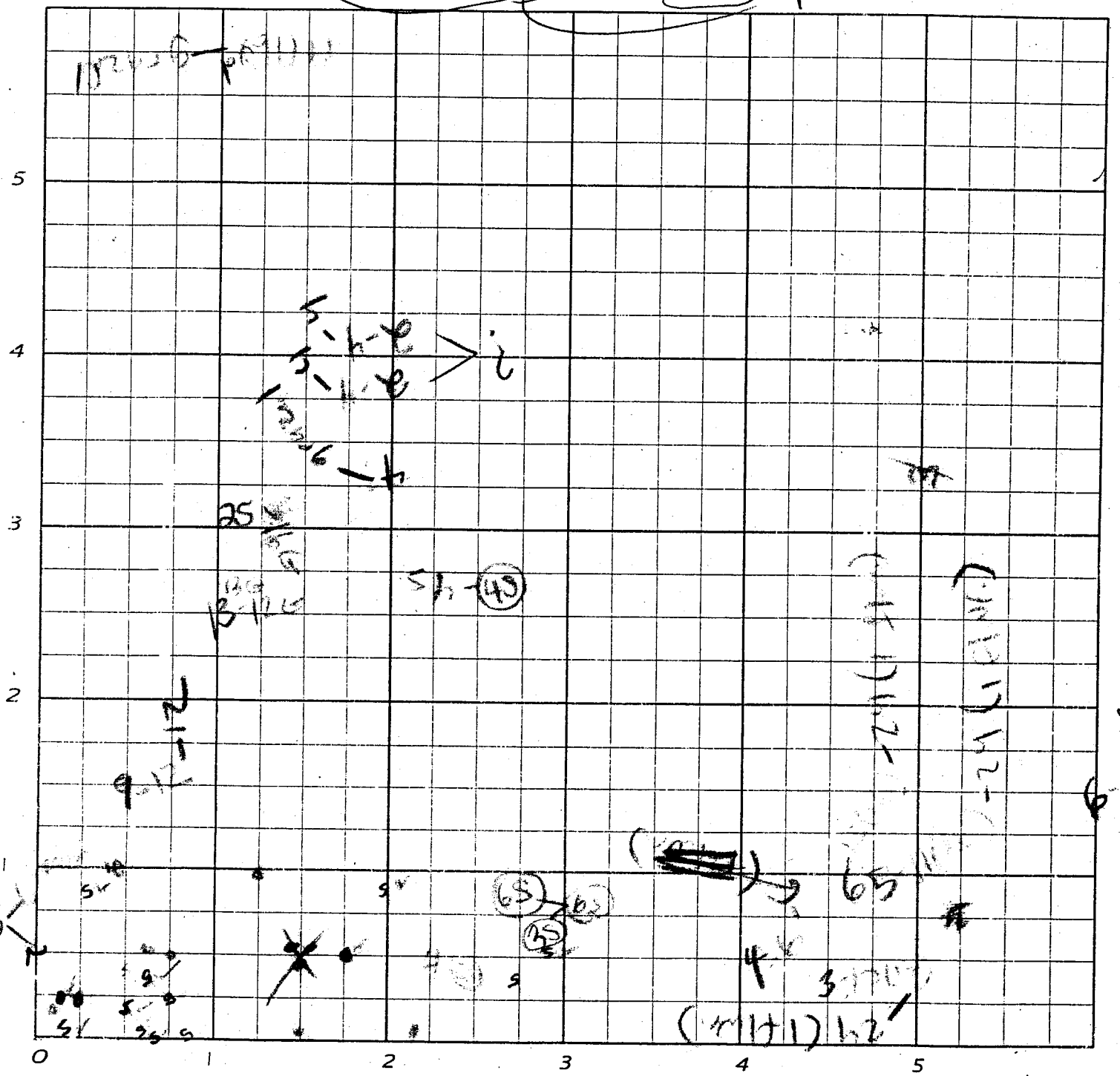
1 4-07-02

2 5-1 JK 7-3 KJ

3

4

PLOT#



NW PLOT CORNER

NOTES:

count seedlings in W ½ of NW ¼

TBER LIFE HISTORY PLOT

PLOT#LH2

SAMPLER KW & JK

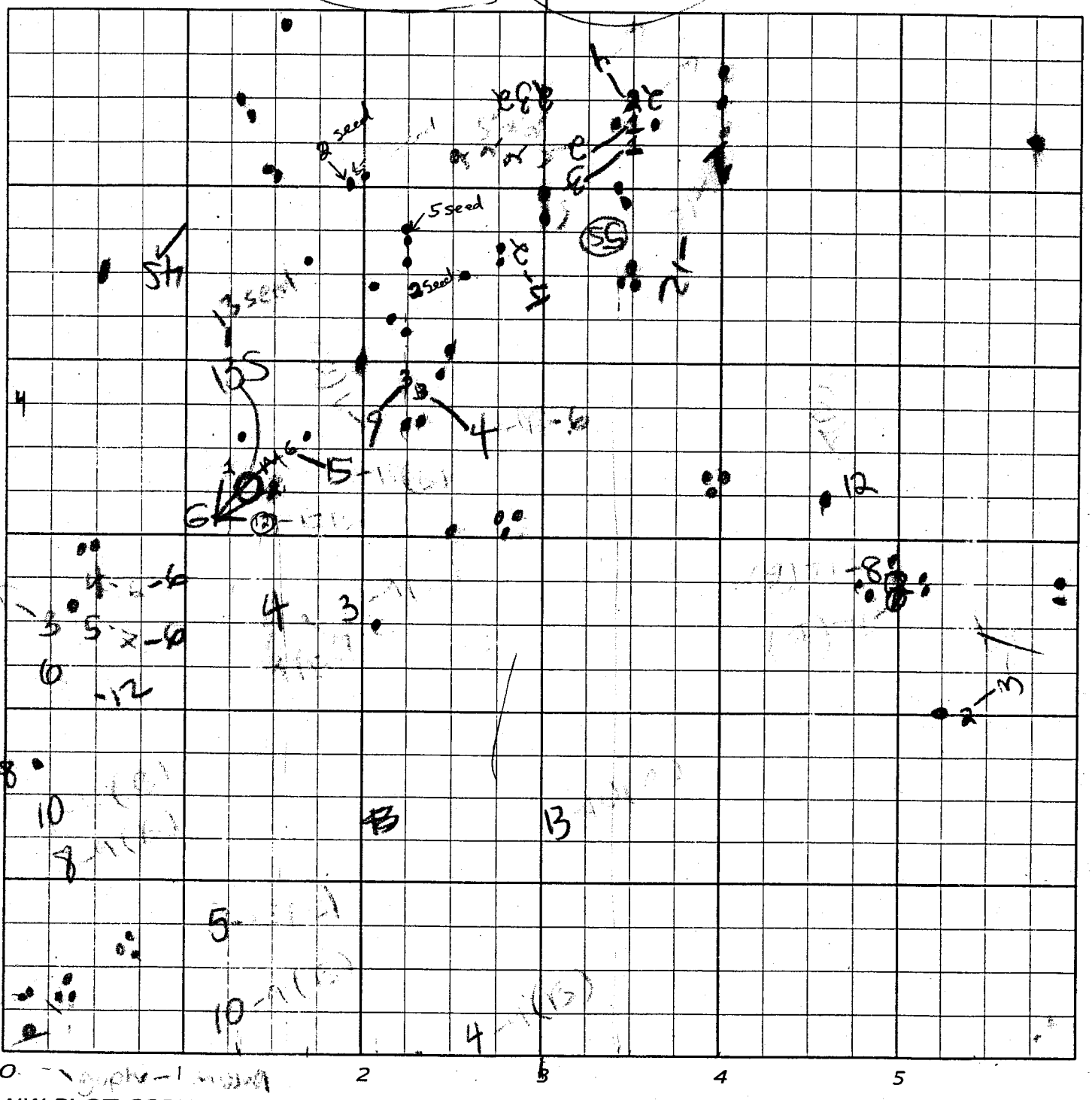
DATE AND KEY:

1 4/4/02 S-H, KW

2 5-1 JK 7-5 KW

3

4



NW PLOT CORNER

NOTES:

B from 5/22 = grazed

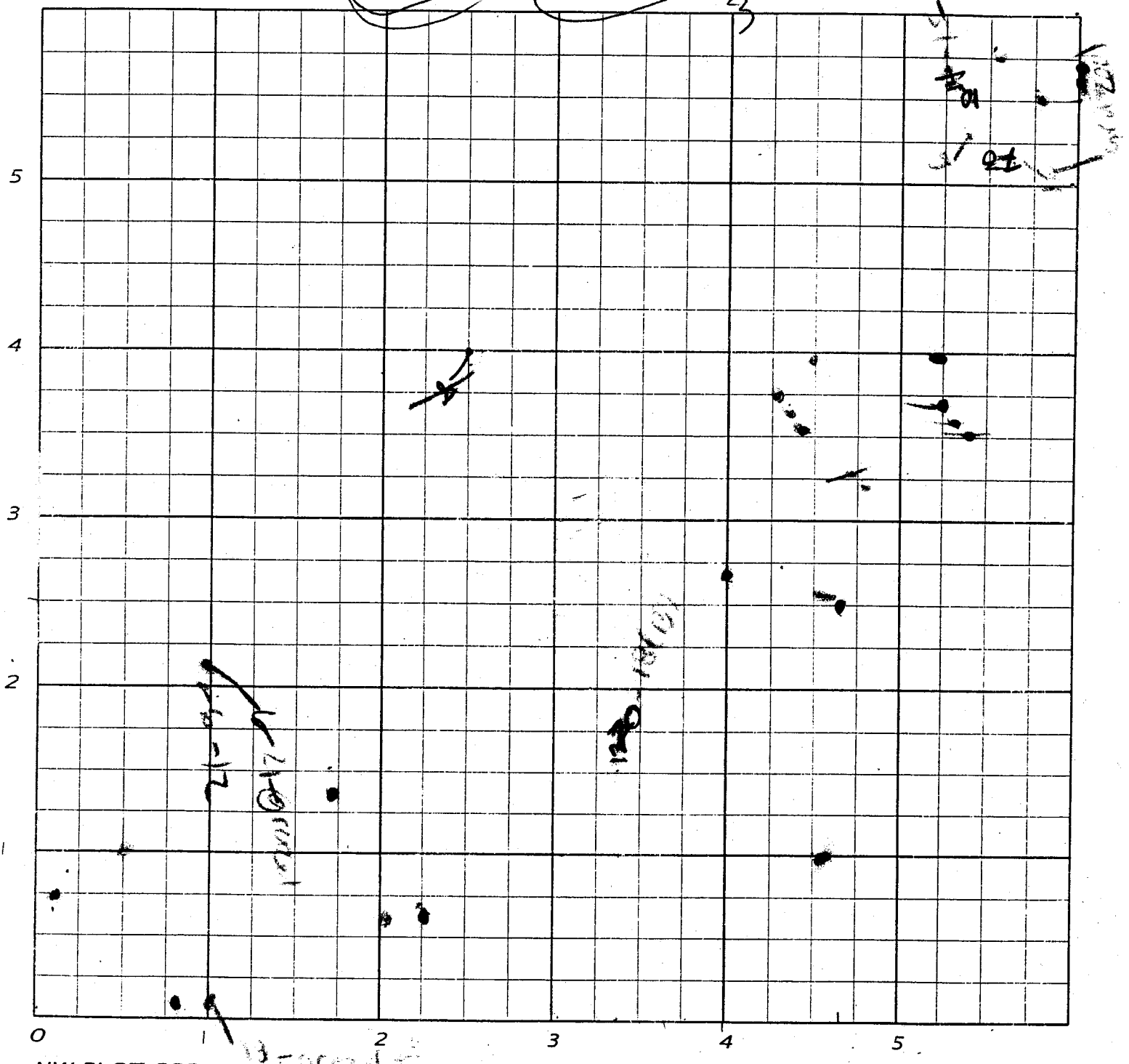
Seedlings look really healthy compared to other plots

TBER LIFE HISTORY PLOT

SAMPLER Jen

DATE AND KEY:

PLOT# 4425



NW PLOT CORNER

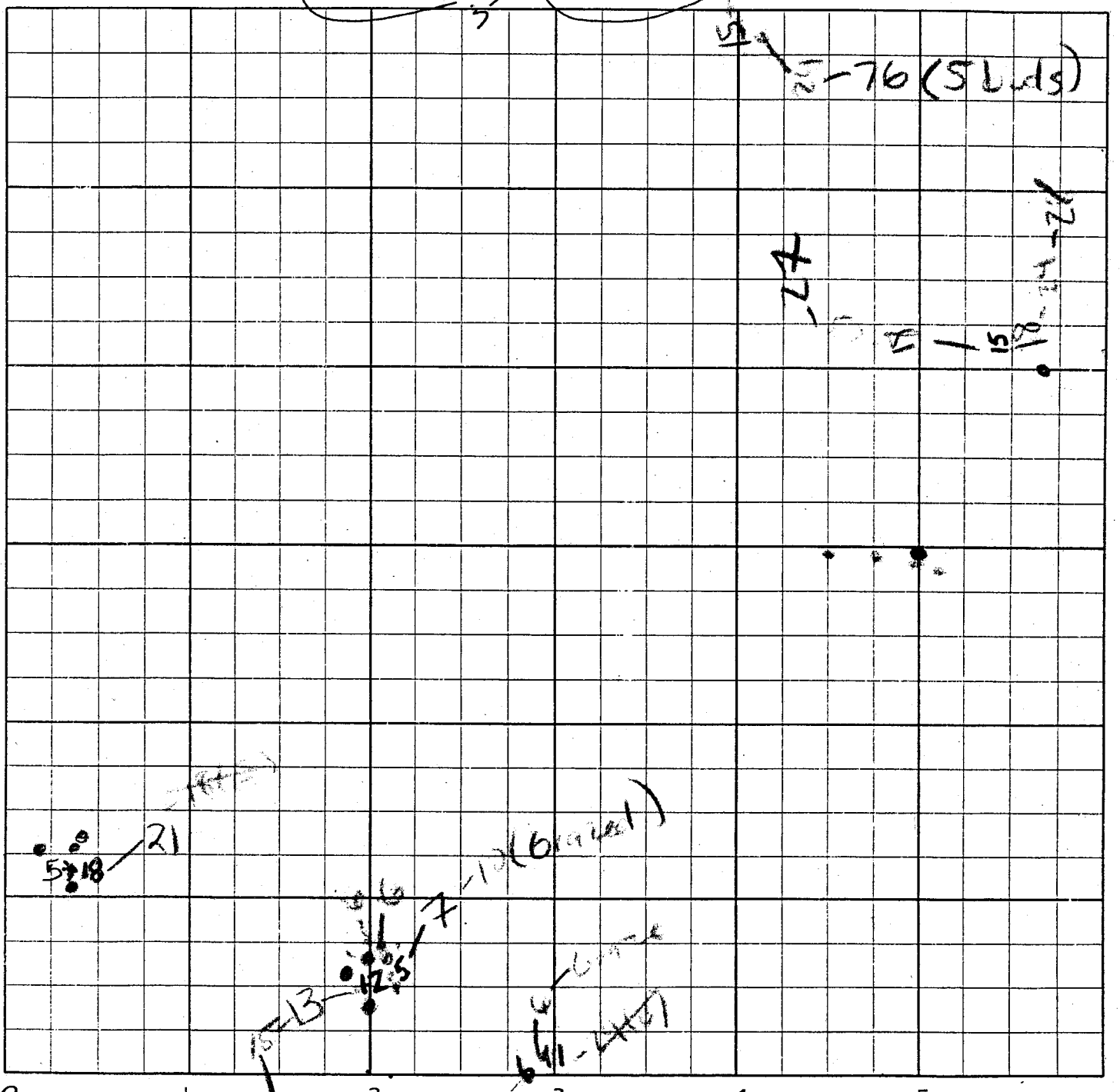
NOTES:

TBER LIFE HISTORY PLOT

SAMPLER Jen

DATE AND KEY:

PLOT# LH26



NW PLOT CORNER

NOTES:

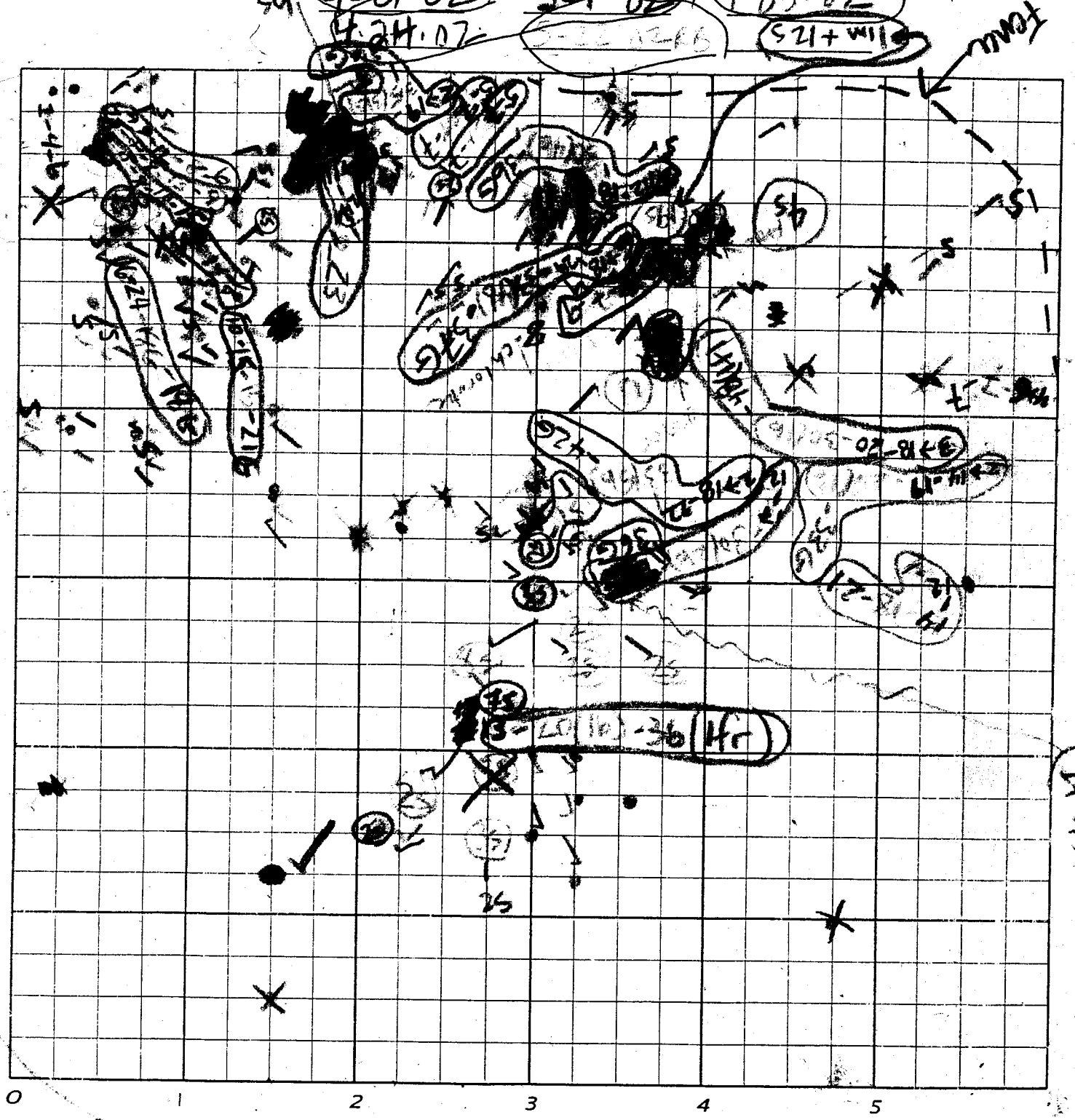
many grazed to near ground level

TBER LIFE HISTORY PLOT

SAMPLER Bernie

DATE AND KEY: 4-01-02 5-1-02 7-05-02 4-24-07

PLOT# ~~LH6~~ LH27



NW PLOT CORNER

NOTES:

Smug SW NE

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

ATTACHMENT 2

VEGETATION PLOT MAPS AND DATA SHEETS
LIFE HISTORY PLOT MAPS
CCMWA, 2002

CCMWA VEGETATION PLOT DATASHEET

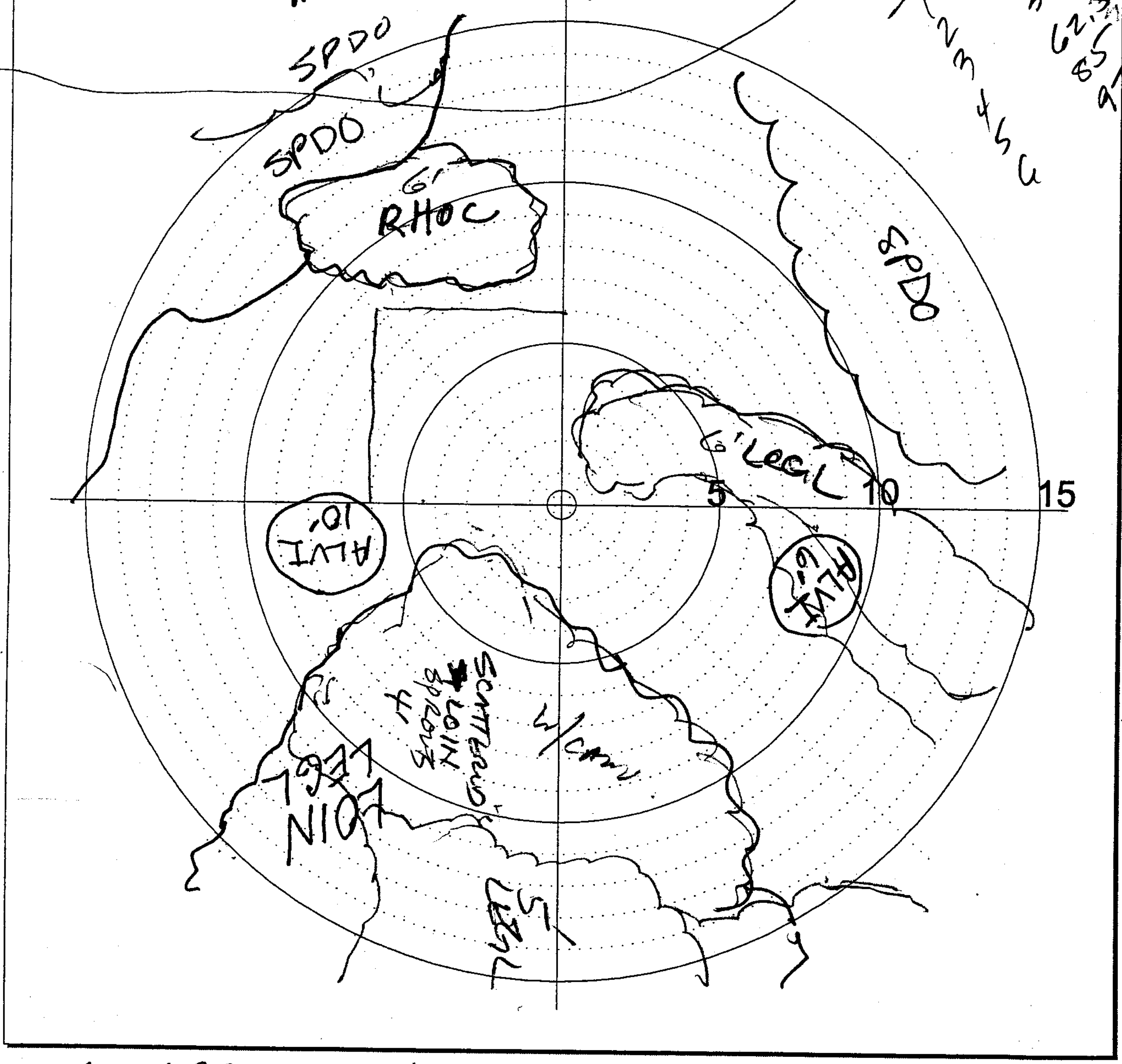
DATE: 7-21-99 BY: DKI PLOT# 1

AC 9/4/02

VEG TYPE	OVERHD CAN%	SPECIES		COV CLASS(1-6	AVG HT	NOTES
E	5	LEGL	✓2-60	2	48	
	25%	LOIN	✓2-72	2	48	
		ALVI	✓1-120	1	96	
		RHOC	✓1-60	2	60	
		SPDO	✓2-48	1	36	
		CAMU	✓3-42	5	42	
		CAOB	✓2-36	2	36	
		~~SAOB~~ OFF	✓2-30	3	30	
		LYAM	✓2-36	2	30	
		PO PAL	✓3-30	3	30	
		MEWY	✓2-12	2	12	
	Angelica?	AUG	✓1-96	1	36	
		ASTER	✓1-18	1	18	
		GENT	✓1-18	1	18	
	??	CORN veratrum		1	36	
		Hypericum	1-24			

Cov class: 1 2 3 4 5 6 — 1, 2.5, 15, 37.5, 62.5, 85, 97.5

* use mid point of cover class value to ... value



CCM99 Veg → Save as Appendix + DZ VegStr .32

CCMWA VEGETATION PLOT DATASHEET

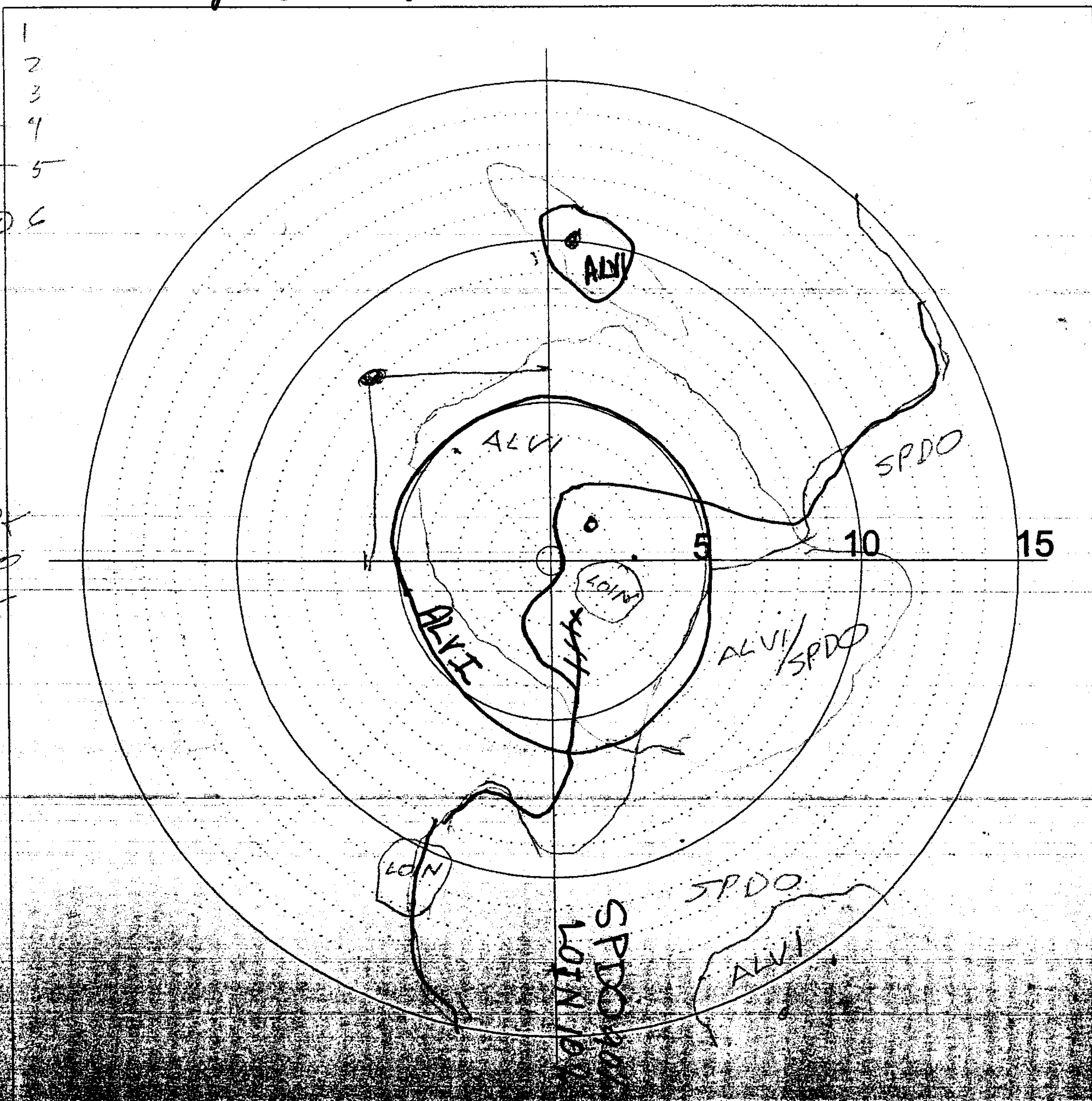
DATE: 10/29/98 BY: McRae PLOT# P-2

AC 9/6/02

VEG TYPE	OVERHD CAN%	SPECIES		COV CLASS(1-6	AVG HT	NOTES
Edge	25	ALVI	√2-132	2	108	
		SPDO	√3-72	3	72	
		LOIN	√1-60	2	60	
		CANU	√3-48	4	48	
		CAOB	√2-48	3	48	
		LEGL	√ NA	2	48	
		SAOF	√2-24	2	24	
		POPA	√2-24	2	24	
		ANGE	√1-72	1	60	
		HYFO	√1-24	1	24	
		ASteu	√1-36	1	36	
		METR	√2-12	1	12	
		LYAM	√2-30	2	48	
		gentia	√1-30			

0-5 1
5-25 2
25-50 3
50-75 4
50-75 5
75-100 6

Photo Pt wcnto East

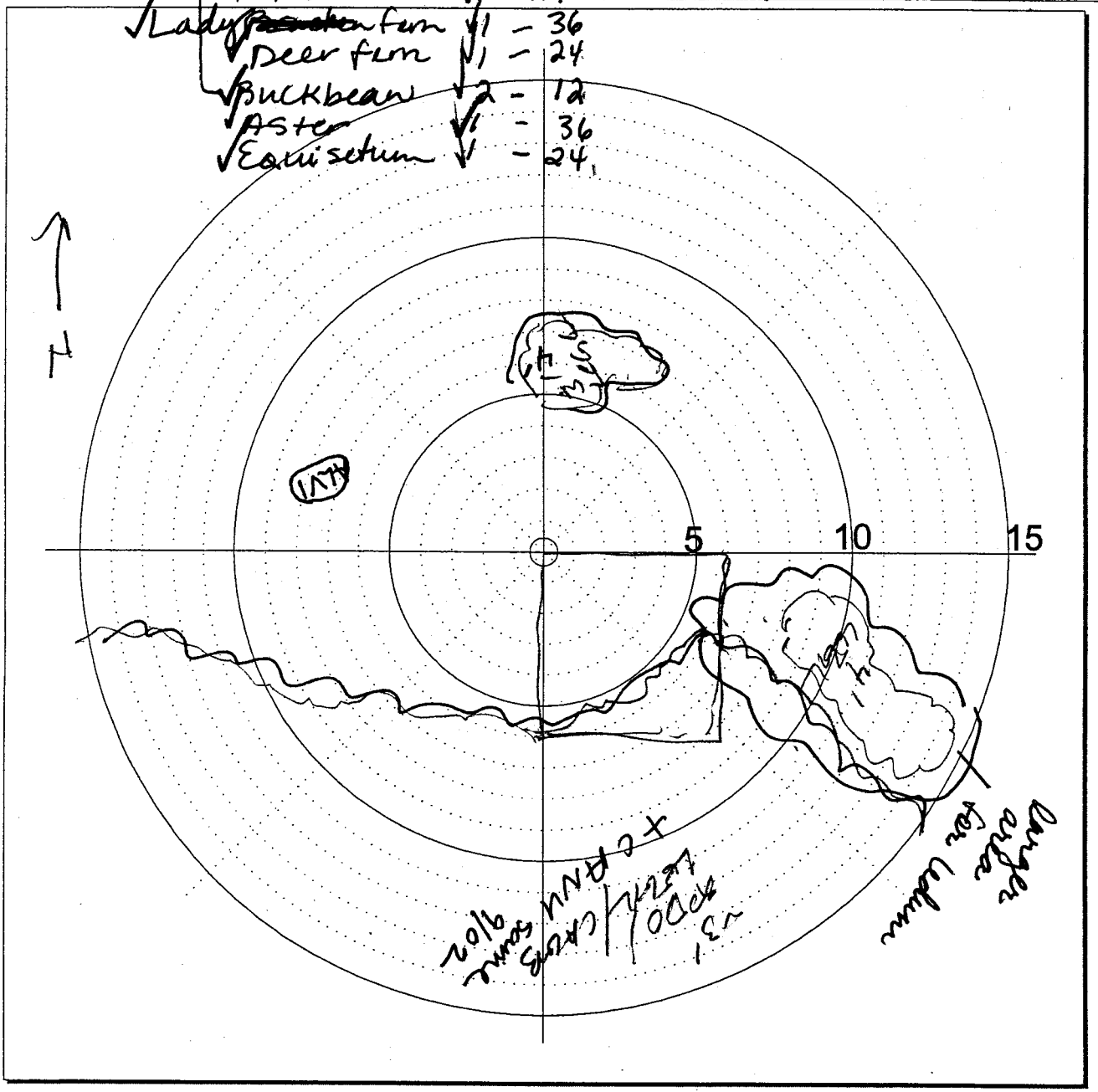


CCMWA VEGETATION ~~PLOT DATASHEET~~

DATE: 7/21/99 BY: tkl PLOT# 3

AC 9/6/02

VEG TYPE	OVERHD CAN%	SPECIES		COV CLASS(1-6	AVG HT	NOTES
ED	5	ALVI	✓1-48	—		
	10%	LEGL	✓2-40	3	30	
		LOIN	✓N/A	—		
		SPDO	✓3-40	3	36	RESPROUTS - AREA THAT INCS SPDO NOW TOUCH CAOB, LEGL, SPDO resp
		CANU	✓3-42	4	42	
		CAOB	✓2-36	3	30	
	question	GLSS	✓1-30	1	24	
		LYAM	✓1-24	2	24	
		SAOF	✓3-36	3	36	
		ANGER	✓1-24	1	24	JUST GROW-
		POT PAL.	✓2-24	2/3	36	
		ASTER	✓1-24	1	24	
		MENTHAN.		2	12	
		HYPER	✓1-24	1	18	
		✓Lady ~~Fern~~ fern	✓1-36			
		✓Deer fern	✓1-24			
		✓Buckbean	✓2-12			
		✓Aster	✓1-36			
		✓Equisetum	✓1-24			



CCMWA VEGETATION PLOT DATASHEET

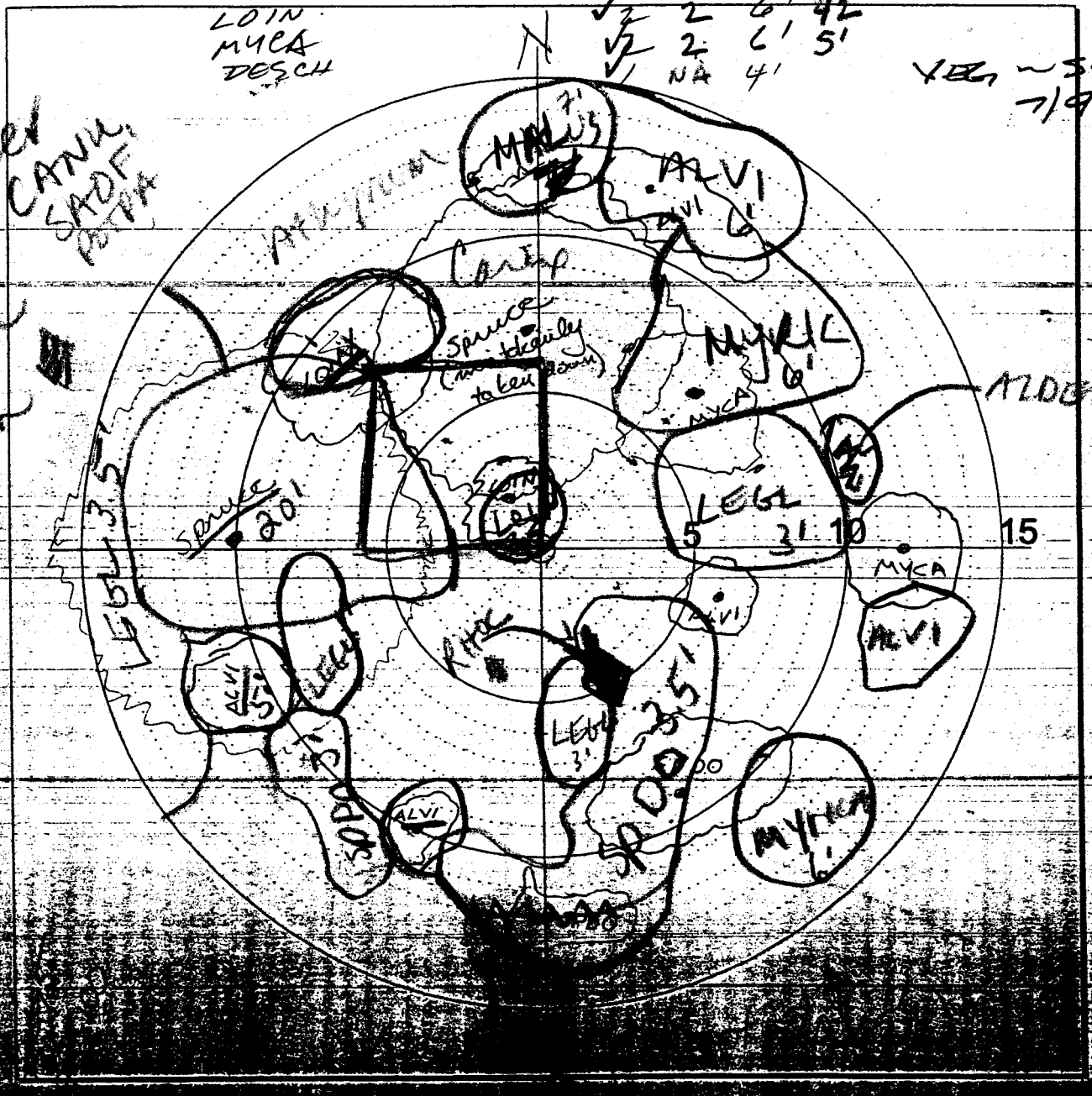
DATE: 10/28/98 BY: McRae PLOT# P4

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6		HT	AVG	NOTES
CP		CANU	✓5	4	42	42	✓ Aerial photo
		LEGL	✓3	3	48	42	
		ALVI	✓2	1	60	60	
		CAOB	✓2	2	36	36	
		SAOF	✓4	4	30	36	
	✓	SPDO	✓2	2	36	36	
		ZYAM	✓1	1	36	24	
		METR	✓1	2	12	12	
		ANGE	✓1	1	36	48	
		GESE	✓1	1	24	24	
		RUUR	✓2	2	24	24	
		Aspen	✓1	NA	36		
		Spruce	✓2	1	17	20'	approx 20 yrs based on intervals
		POT PRL.	✓3	3	2,	24	
		LOIN	✓2	2	6'	4'	
		MYCA	✓2	2	6'	5'	
		DESCH	✓1	NA	4'		

Filed CANU, SAOF, POTR

RUSP 12

VEG ~ same 7/99.



CCMWA VEGETATION PLOT DATASHEET

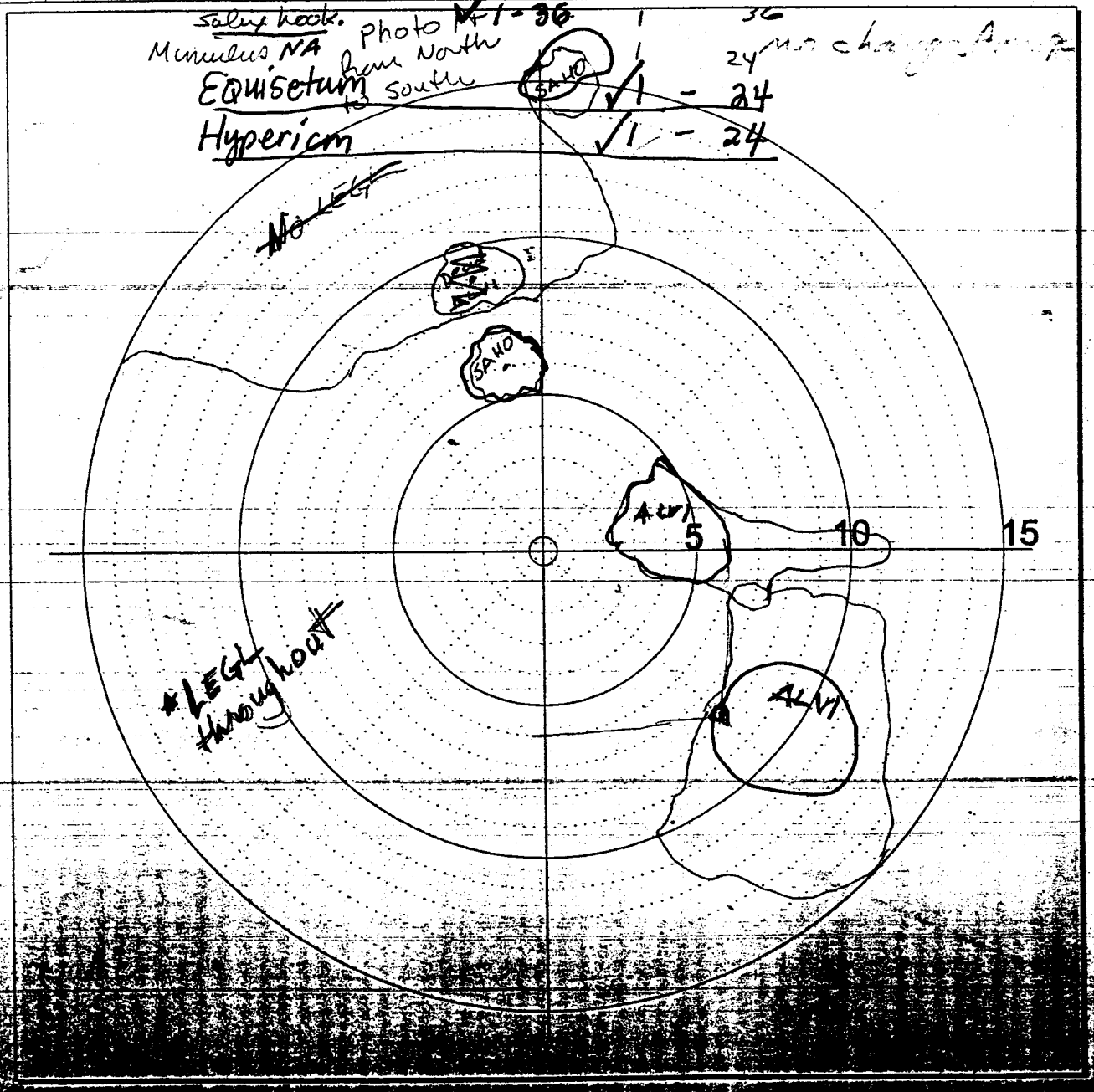
DATE: 10/29/98 BY: McRae PLOT# P-5

AG 9/4/02

VEG TYPE	OVERHD CAN%	SPECIES		COV CLASS(1-6	AVG HT	NOTES
Edge	25	LEGL	√5 - 48	5	48	
		ALVI	√2 - 120	2	96	
		SAHO	√1 - 36	1	48	
		CANU	√3 - 48	4	48	
		CAOB	√2 - 48	3	40	
		LYAM	√2 - 48	2	36	
		SAOF	√2 - 36	2	36	
		POPA	√2 - 36	2	36	
Lady		Blechnum	√1 - 48	1	48	
~~Bracken~~fern		Dryopteris	√1 - 60	1	48	
		ANGE	√1 - 72	2	72	
gentia?		GESE	√1 - 36	1	24	
		Aster	√1 - 36	1	48	
		METR	√1 - 12	1	12	
		Salix hook.	√1 - 36	1	36	
		Mimulus NA	√1 - 24	1	24	no change A-2
		Equisetum	√1 - 24			
		Hypericum	√1 - 24			

Photo from North to South

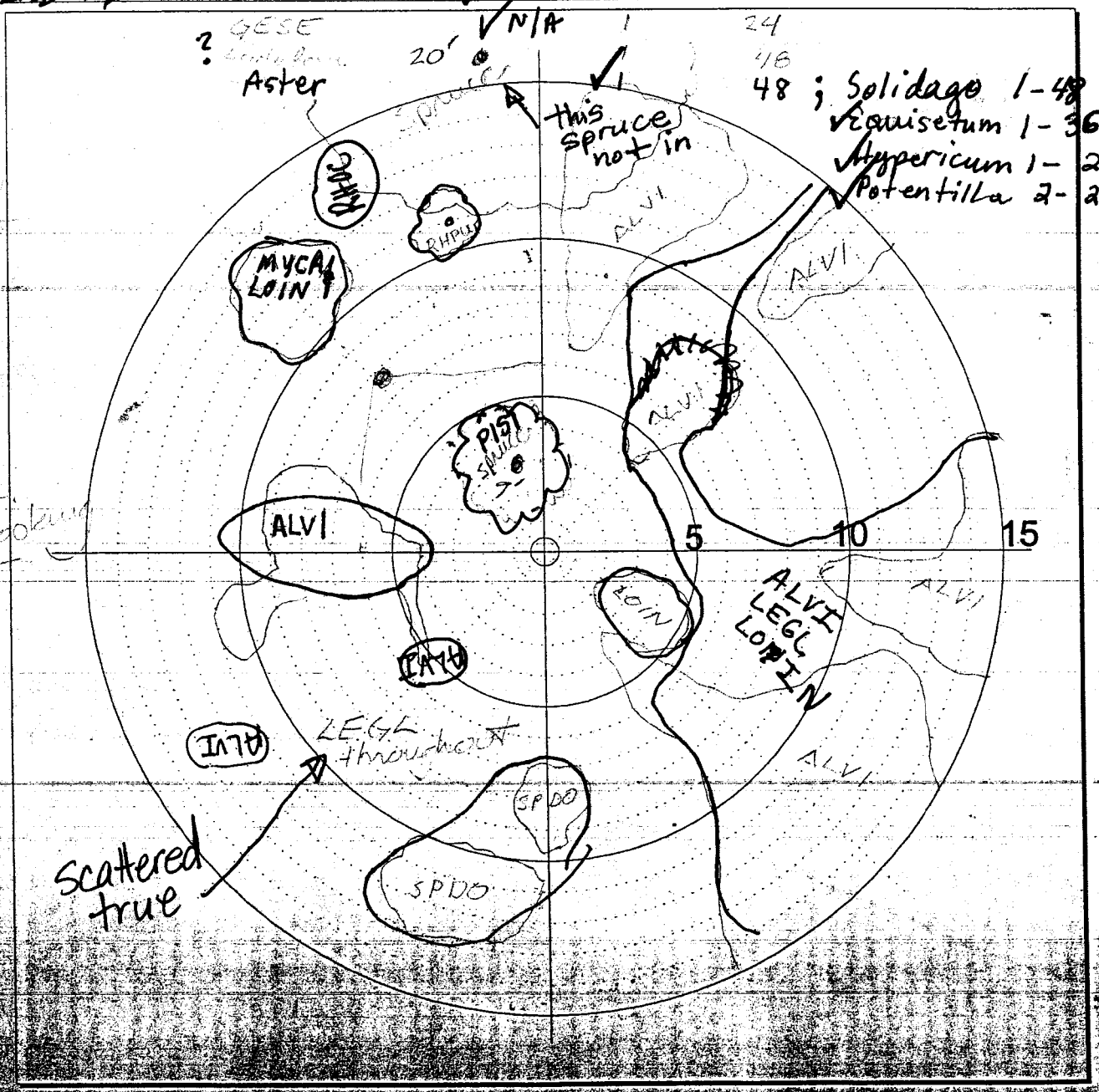
0-5
5-25
25-50
50-75
75-95
95-100



CCMWA VEGETATION PLOT DATASHEET

DATE: 9/9/02 BY: McPar PLOT# P6 AC 9/6/02

VEG TYPE	OVERHD CAN%	SPECIES		COV CLASS(1-6)	AVG HT	NOTES
Spruce	15%	SPRUCE	✓ 1-120	2	15'	
		ALVI	✓ 3-96	3	96'	
		MYCA	✓ 1-72	1	96	
		RHPU	✓ 1-48	1	36	
		LOIN	✓ 1-108	1	48	
		LEGL	✓ 5-48	6	36	
		SPDO	✓ 2-60	2	48	
		CANU	✓ 3-48	5	48	
		CAOR	✓ 2-48	2	48	
		LYAM	✓ 1-36	2	48	
		ANGE	✓ 1-60	1	72	
		TAOF	✓ 2-36	3	24	
Shadows	3	RUUR	✓ NA	3	48	
		METR	✓ 2-12	2	12	
		GESE	✓ N/A	1	24	
		?			48	

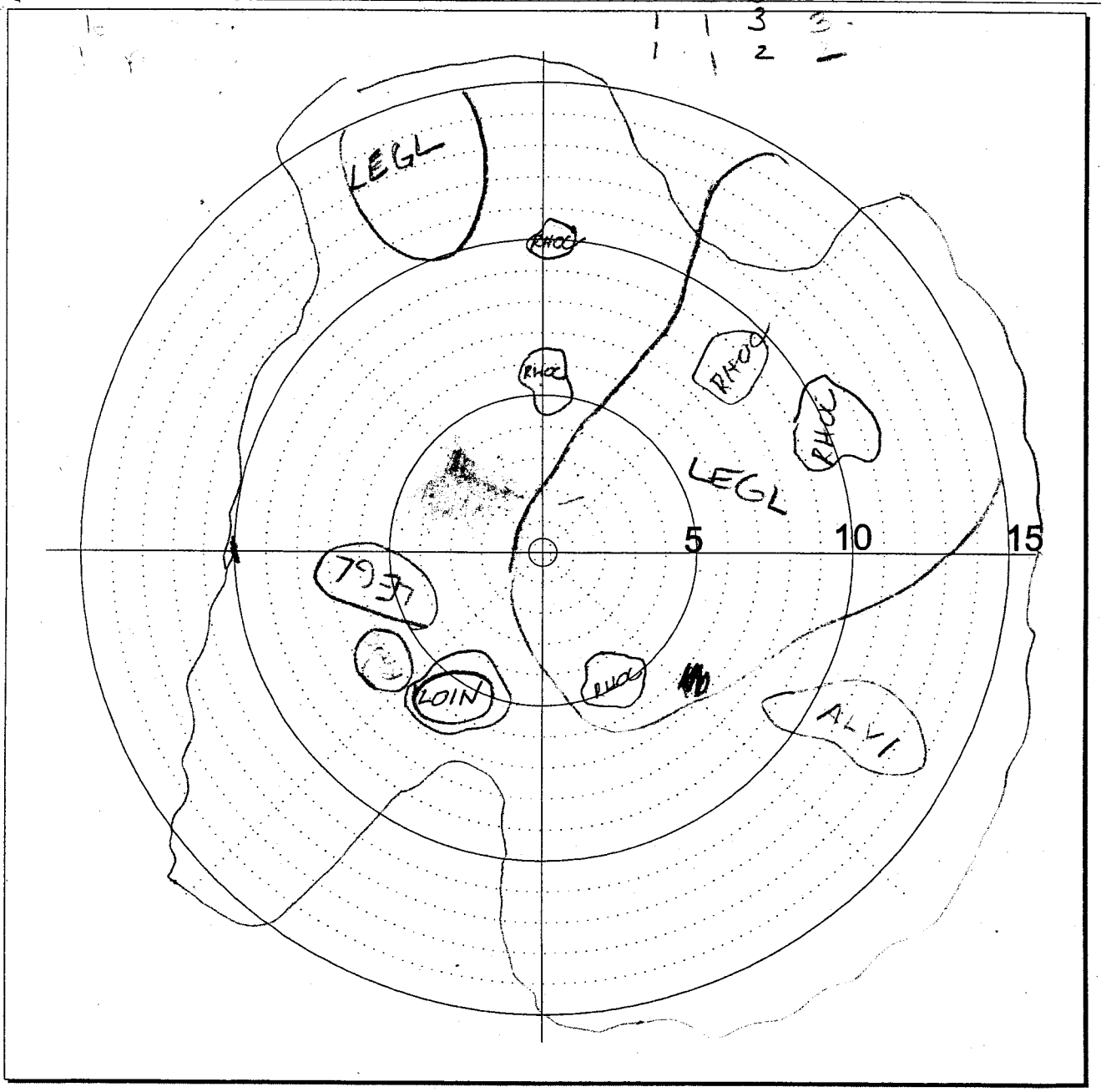


48 ; Solidago 1-48
✓Equisetum 1-36
✓Hypericum 1-24
✓Potentilla 2-24

CCMWA VEGETATION PLOT DATASHEET

DATE: 7-21-99 9-6-02 BY: MPac NC PLOT# 7

VEG TYPE	OVERHD CAN% 10% SPECIES	COV CLASS(1-6		AVG HT		NOTES
CANU		4	3	3		
CAOB		2		3		
LYAM		2	1	3	2	
LEGL		3	2	3	4	
AOF		3		3		
POPA		3	2	3		
PISI		0		0	0	
entrain		0	1	0	2	
ALVI		0	1	0	4	
ANGE		1	1	3	3	
RHOC		1	1	2	4	
METR		2		1	1	
juiseburn		2		2		
RUUR		NF	1	3	NA	
LOIN		1	1	3	3	
THYFO		1	1	2		

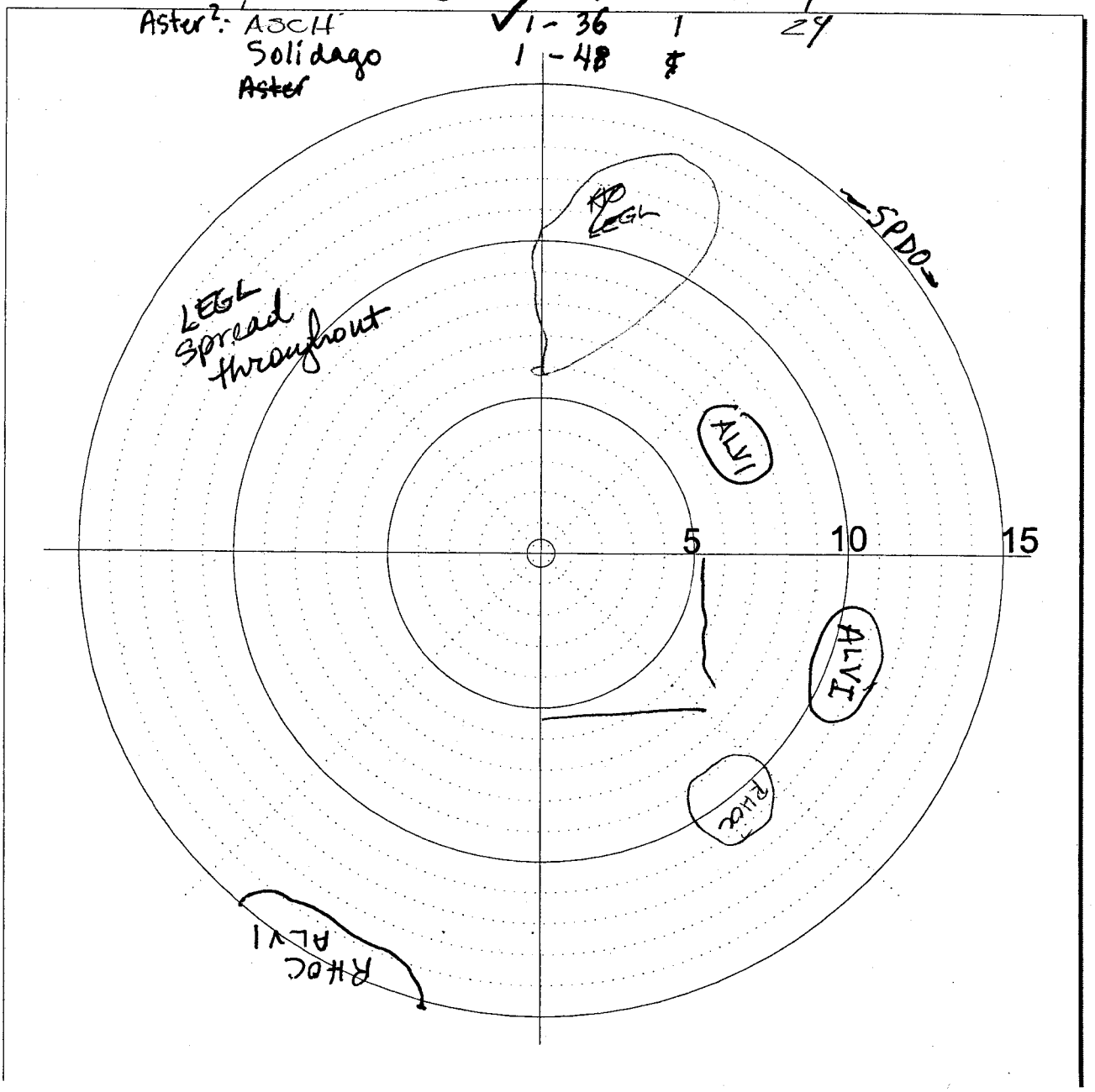


CCMWA VEGETATION PLOT DATASHEET

DATE: 7-21-99 BY: Mahar, PLOT# 8

AC 9/6/02

VEG TYPE	OVERHD CAN%	SPECIES		COV CLASS(1-6	AVG HT	NOTES
TLM	~~10~~	CANU	✓2 - 48	3	42	
		CAOB	✓2 - 48	2	42	
	15%	ALVI	✓2 - 84	6	0	Maybe Solidago was hidden not blooming yet in the previous yr.
		LEGL	✓4 - 36	4	36	
		LYAM	✓2 - 36	2	24	
		RHOC	✓ 1 - 60	1	48	
		BLSP	✓1 - 48	1	48	
		SAOF	✓2 - 36	4	3	
		POPA	✓3 - 24	3	3	
		RUVR	✓1 - 32	2	24	~~Horseweedish~~ plant 1-48
		ANGE	✓1 - 60	1	60	
		GESC	✓ NA	1	24	
lady fern ~~bracken~~		Athyrium	✓1 - 60	1	48	Erechtites?
		Equisetum	✓1 - 24	1	24	
		Aster? ASCH	✓1 - 36	1	24	
		Solidago	1 - 48	8		
		~~Aster~~				



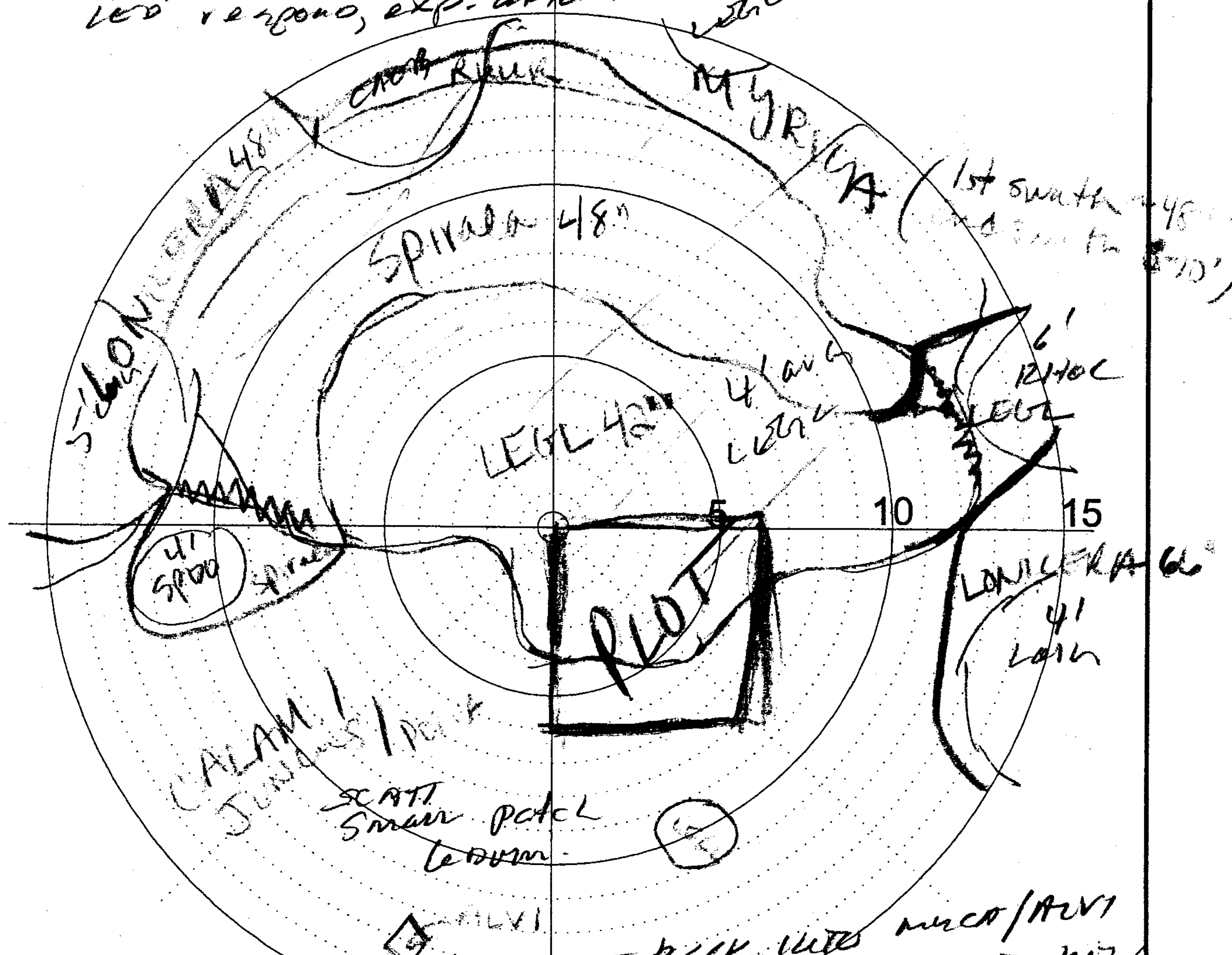
CCMWA VEGETATION PLOT DATASHEET

DATE: 7-21-99 BY: DK1 PLOT# 9

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	NOTES
Hemlk	15 15%	CANU	✓ 4 4	42 42	
		LYAM	✓ 2 2	36 36	
		CAOB	✓ 1 1	4, 30	
		✓ ANGL	1	3'	✓SPDO 1 2 3'
		POT PAL	✓ 2 2	3' 3	✓RHOC 1 6'
		RUVR	✓ 3 2	3' 2	TSCA 1 -3'
		MYCA	✓ 1 1	12' 13'	ALVI 0
		LEGL	✓ 4 4	3' 3'	Sambu 1 1 3' 3'
		JUN EFF	✓ 1 1	4' 3	
		SANG	✓ 3 3	3' 3'	✓GOLS 2 2'
		BLECH	✓ 1 1	3' 3'	✓ANGE 1 5'
		ATHY	✓ 1 1	3 3'	✓Hyperic 1 12"
		LOIN	✓ 1 2	4' 4	✓ALVI 1 3.5'

DID NOT MAP LEGL LAST OCT.

LOIN resprout rapidly, LOIN RESPR immed from cut trunks
ANG just sprout now
LEG respond, exp. after removal MYCA ALVI



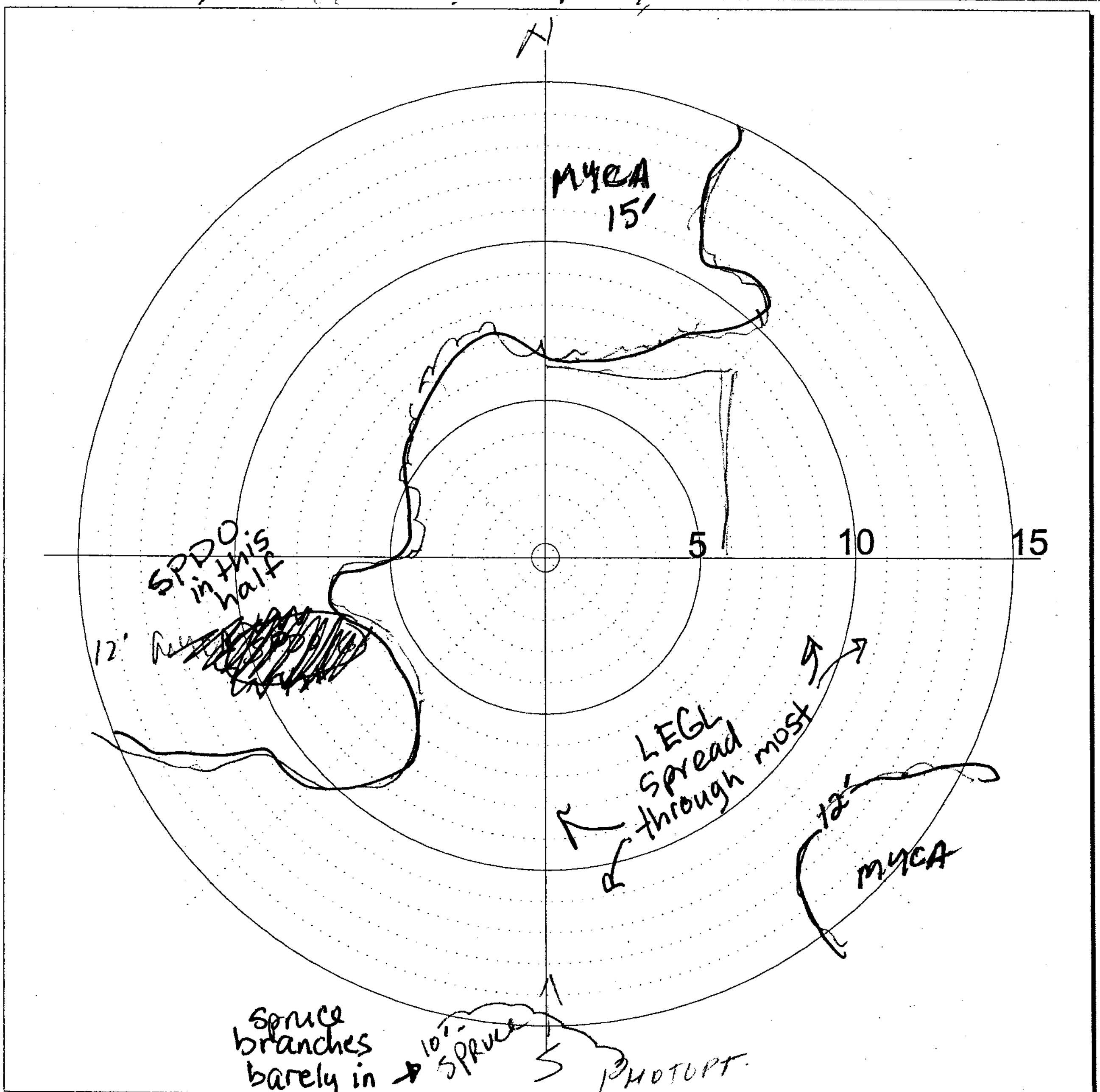
LEGL Horiz stems were back into MYCA/ALVI
Before — rapidly sprout Dominant now
in area. Thinned. O.S.
Some canu released.

CCMWA VEGETATION PLOT DATASHEET

DATE: 10-28-98 BY: DK1 PLOT# P10

AC 9/6/02

VEG TYPE	HEMIS OVERHD CAN%	SPECIES		COV CLASS(1-6	AVG HT	NOTES
ED		MYCA	√3 - 15'	3	12'	
		PIST	√1 - 10'	1	10'	
		CANV	√3 - 48	4	3'	
		RVUR	√2 - 36	4	3'	
		SANG	√2 - 36	3	3'	VEG SAME AS EXC AS NOTED 7/99
		LED.	√4 - 48	4	4'	
	??	ERET.		1	3'	
		SPIR DO.	√2 - 72	2	6'	
		CAOB	√2 - 48	3	4'	
		EQ1	√1 - 24	1	3'	
	35%	LYSICH.	√1 - 24	1	2'	
		POT. pal.	√1 - 24	2	2'	
		MENY.	√1 - 12	1	1'	
		ANG. Lrh.	√1 - 84	1	6'	

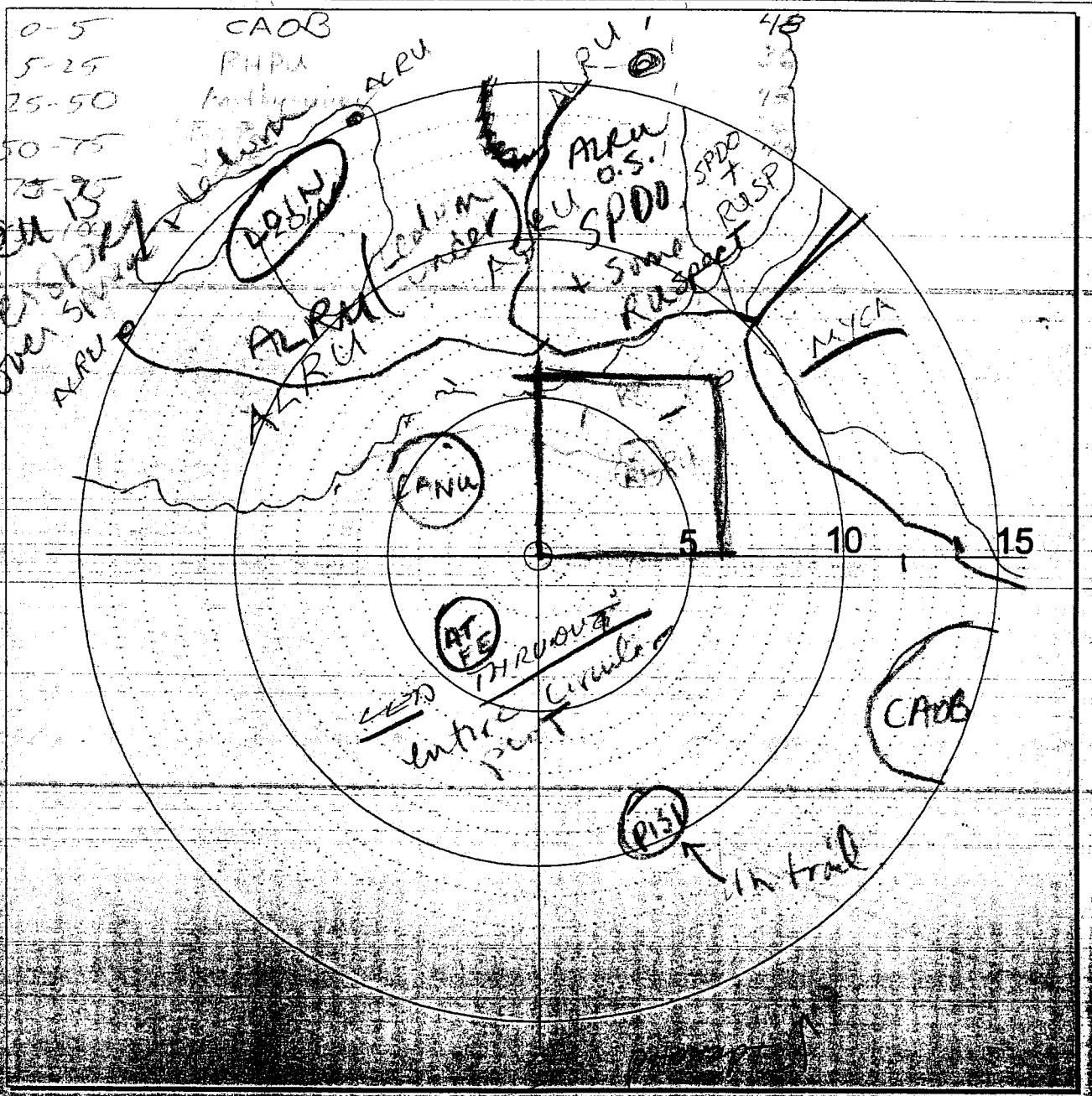


CCMWA VEGETATION PLOT DATASHEET

DATE: 10/28/98 7-21-99 BY: MRae PLOT# P11. NO TRT.

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	NOTES
BT		CANU	✓2 1	36	42
		LEGL	✓5 5	48	48
		RUUR	✓5 4	48	36
		RUSP	✓1 1	72	54
		MYCA	✓2 1	96	90
		SPDO	✓2 2	72	60
✓RHAR	1 30"	LOIN	✓2 1	84	60
		ALRU	✓3 2	+20	+20'
		Lacky Lettuce	✓1 1	48	48
		Brachyum. sp	✓2 2/3	48	42
		SAOF	✓2 2	24	24
		VUMYUA VULE	✓1 1	60	48
		LYAM	✓1 1	36	36
		RHOC	✓NA 1	72	

1	0-5	CAOB	48
2	5-25	PHPA	
3	25-50		
4	50-75		
5	75-?		
6			

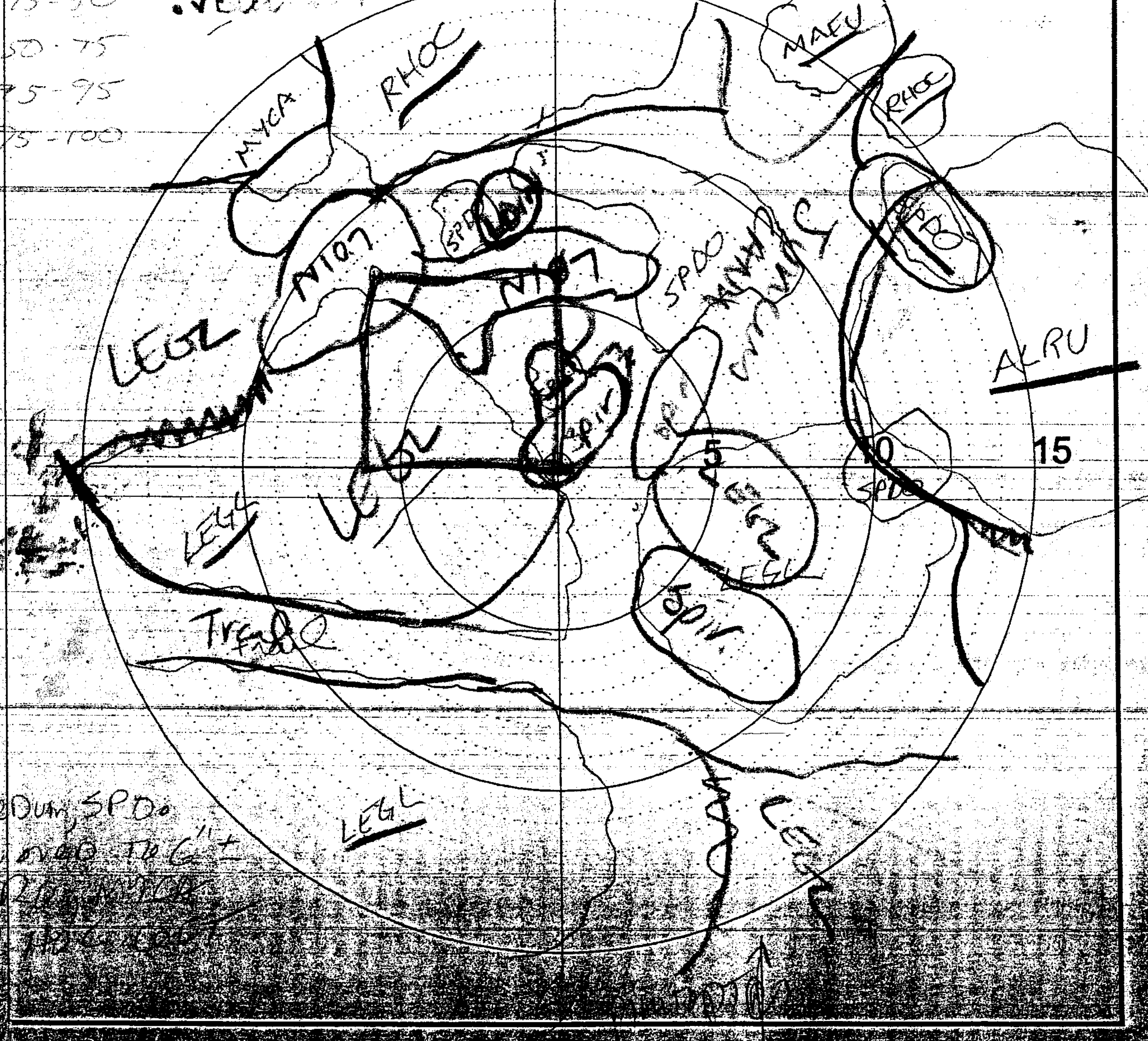


CCMWA VEGETATION PLOT DATASHEET

DATE: 10/28/98 BY: McRoo PLOT# P12

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	NOTES
Edge	30	MYCA	✓ 1 1	72 60	
		CANU	✓ 4 2	40 40	
		CAOB	✓ 4 3	48 40	
		JULE	✓ 2 2	48 42	
		LEGL	✓ 4 4	48 42	
		POPA	✓ 2 NA	24	
		LYAM	✓ 2 1	36 24	
		SPDO	✓ 2 2	48 40	
		RUUR	✓ 4 3	36 30	
		EQUISETUM	✓ 1 2	24 24	
		MAFU	✓ 1 1	15 18	
		ALRU	✓ 1 1	+20 25	
		SAOF	✓ 2 3	24 24	
		ANGE	✓ 1 1	60 48	
		RHOC	✓ 2 1	96 60	
		ASCH ASTER	✓ 1 1	36 30	
		✓ [illegible]	1	[illegible]	

0-5
5-25
25-50
50-75
75-95
95-100



An LEDum, SPDo
[illegible]

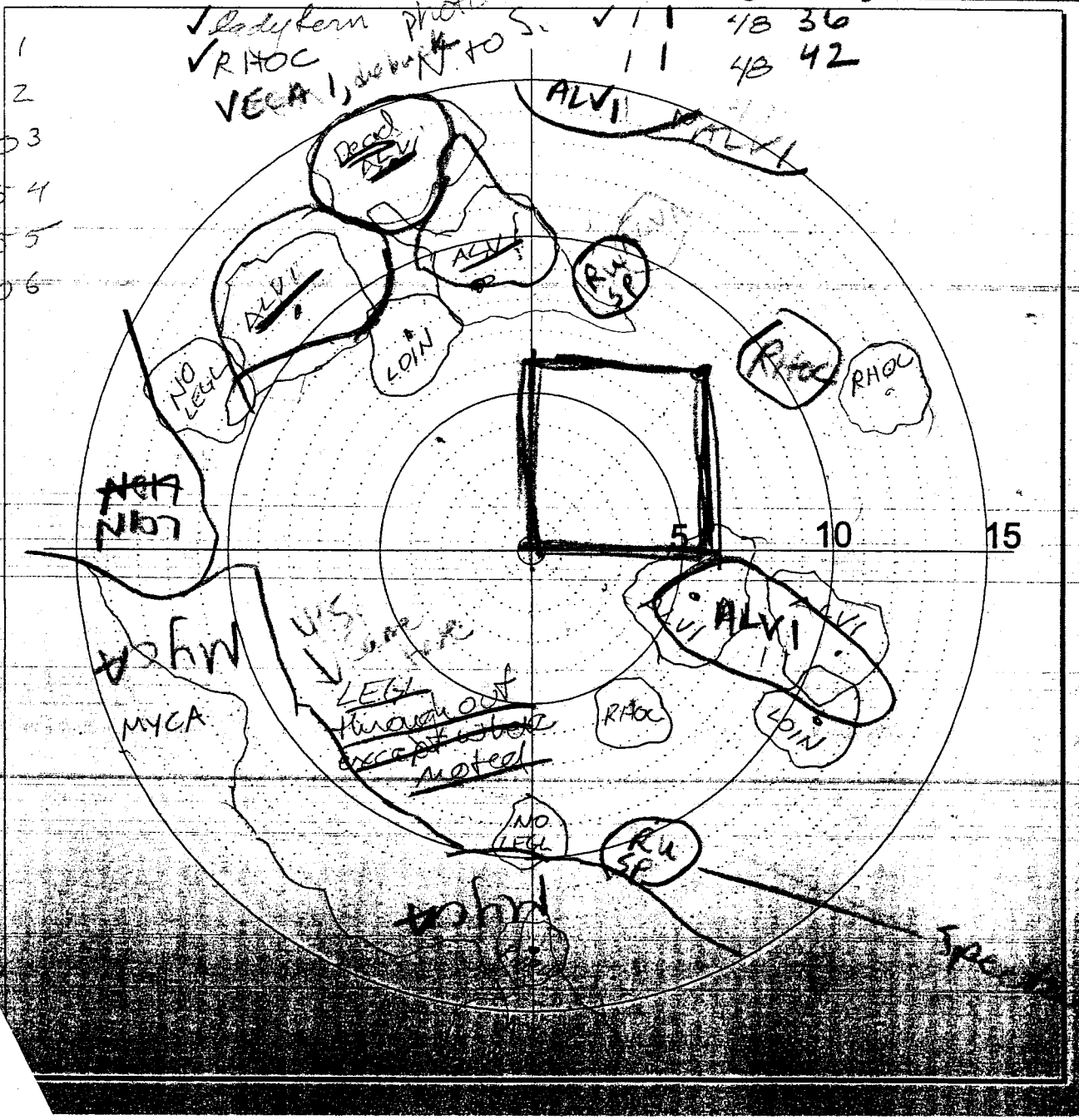
CCMWA VEGETATION PLOT DATASHEET

DATE: 10-29-98 7-22-99 BY: McRae PLOT# P-13

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6		HT	NOTES
Edge	60	✓ ALVI	✓ 2	2	96	7'
		✓ LOIN	2	1	60	60
		✓ MYCA	✓ 2	2	96	10'+
		✓ RIPU (viscosum)	1	NA	36	
		✓ LEGL	5	5	48	42
		✓ CANU	✓ 5	4	48	48
		✓ CAOB	3	2	48	48
		✓ LYAM	2	2	48	36
		✓ BLSP Blechnum	✓ 2	2	36	36
		✓ ANGE	✓ 1	1	60	48
		✓ SAOF	2	2	24	36
		✓ POPA	1	2	24	36
		✓ RUSP	1	1	36	48
		✓ RUUR	2	2	36	30
		✓ Lady fern photo pt	✓ 1	1	48	36
		✓ RHOC	1	1	48	42

0-5 1
5-25 2
25-50 3
50-75 4
75-95 5
95-100 6

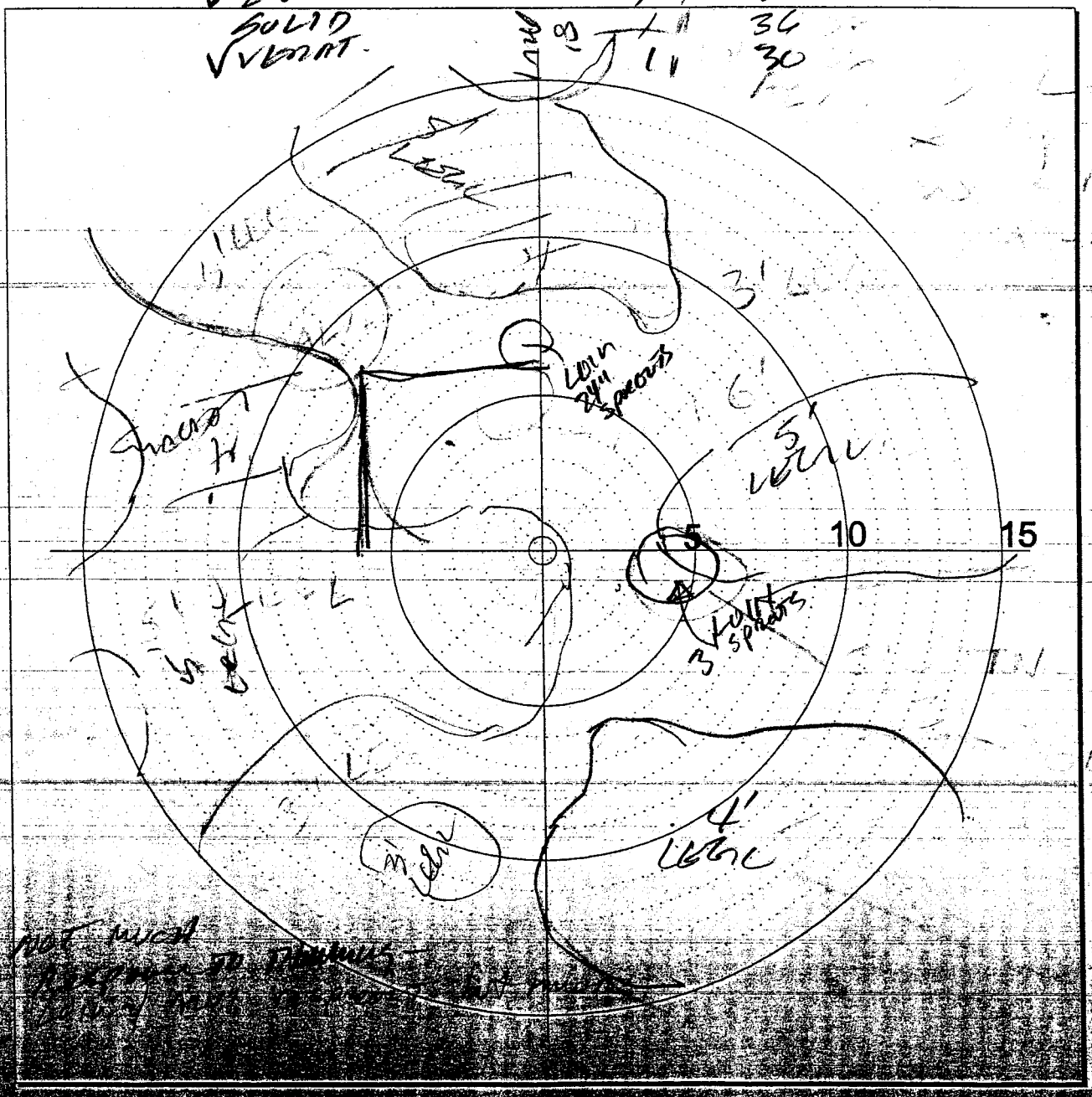
VEGA 1, decker N to S.



CCMWA VEGETATION PLOT DATASHEET

DATE: 7-22-99 BY: DIG PLOT# 14

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	NOTES
		PIPO			
		✓ LEGL	4 5	4'	
		✓ ANGE.	2 1	4' #21"	7/6
		MYCA			
		✓ CAMU	4 3	4'	
		✓ ALNU	1 1	5'	
		✓ LYAM	3 3	36"	
		✓ ARTH.	2	36"	
		✓ SAMB	3 2	30	
		✓ POT.	2 1	30	
		RHOL			
		✓ RUUR none	1 1	36"	
		✓ ASTER	1 1	48"	
		✓ LOIN.	1 1	3'	
		SOLID	1 1	36	
		✓ VEMAT.	1 1	30	



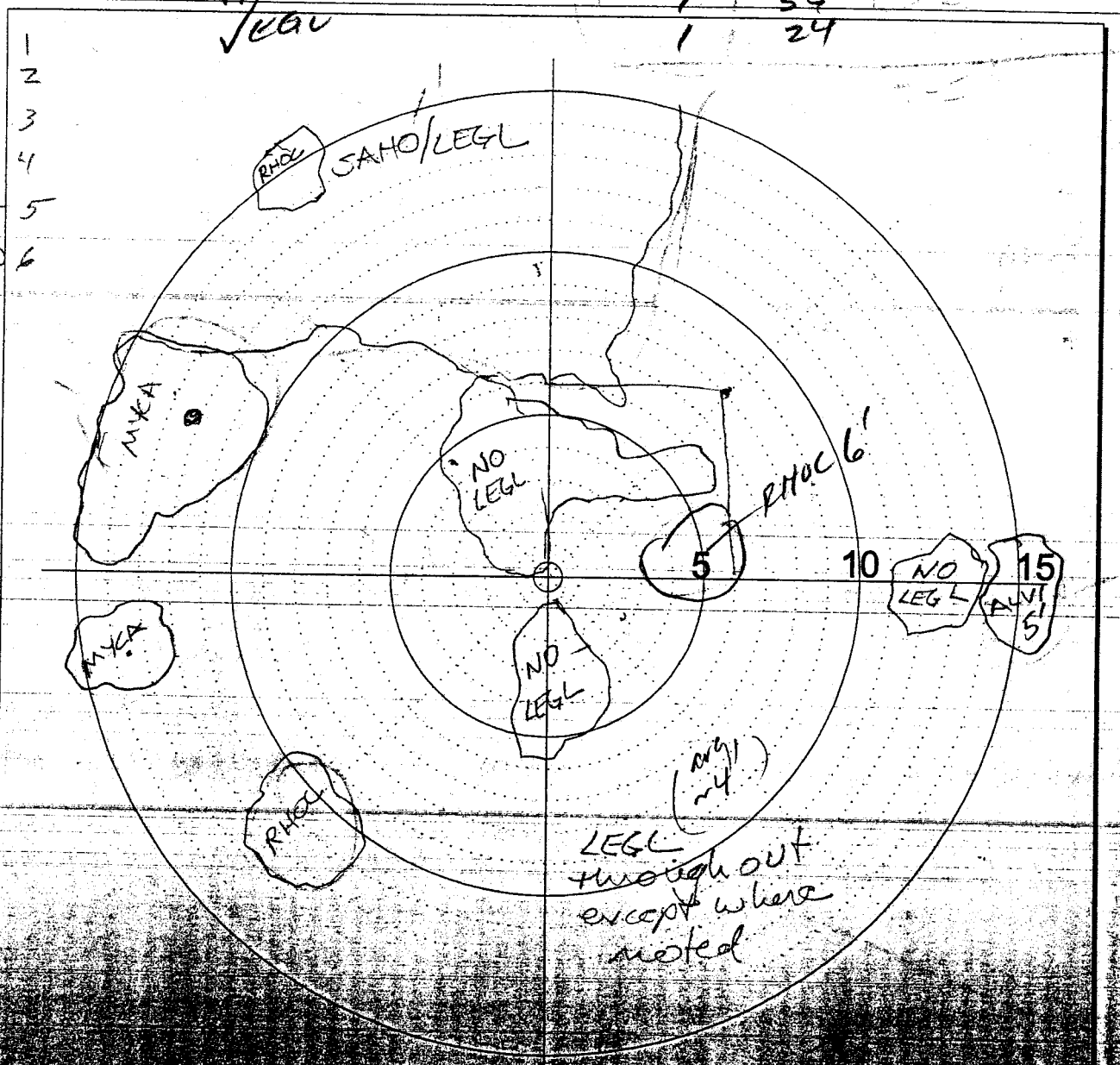
NOT MUCH

CCMWA VEGETATION PLOT DATASHEET

DATE: 10/29/98 BY: MCLaa PLOT# P-15

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	NOTES
Edge		✓SAHO	3 ~~3~~ 2	120	
		✓LEGL	5	60	
		✓AUVI	1	60	
		✓MYCA	2	108	
		✓RHOC	1	72	
		✓CANU	4	48	
		✓JULE	2	48	
		✓METR	2	24	
		✓SAOF	~~3~~ 3	24 36	
		✓ANGE	2	72	
		✓Gadi Penn	2	48	
		✓LYAM	2	48 36	
		✓POPA	2	36	
		✓JUVU	1	36	
		✓LEGU	1	24	

0-5 1
5-25 2
25-50 3
50-75 4
75-95 5
95-100 6

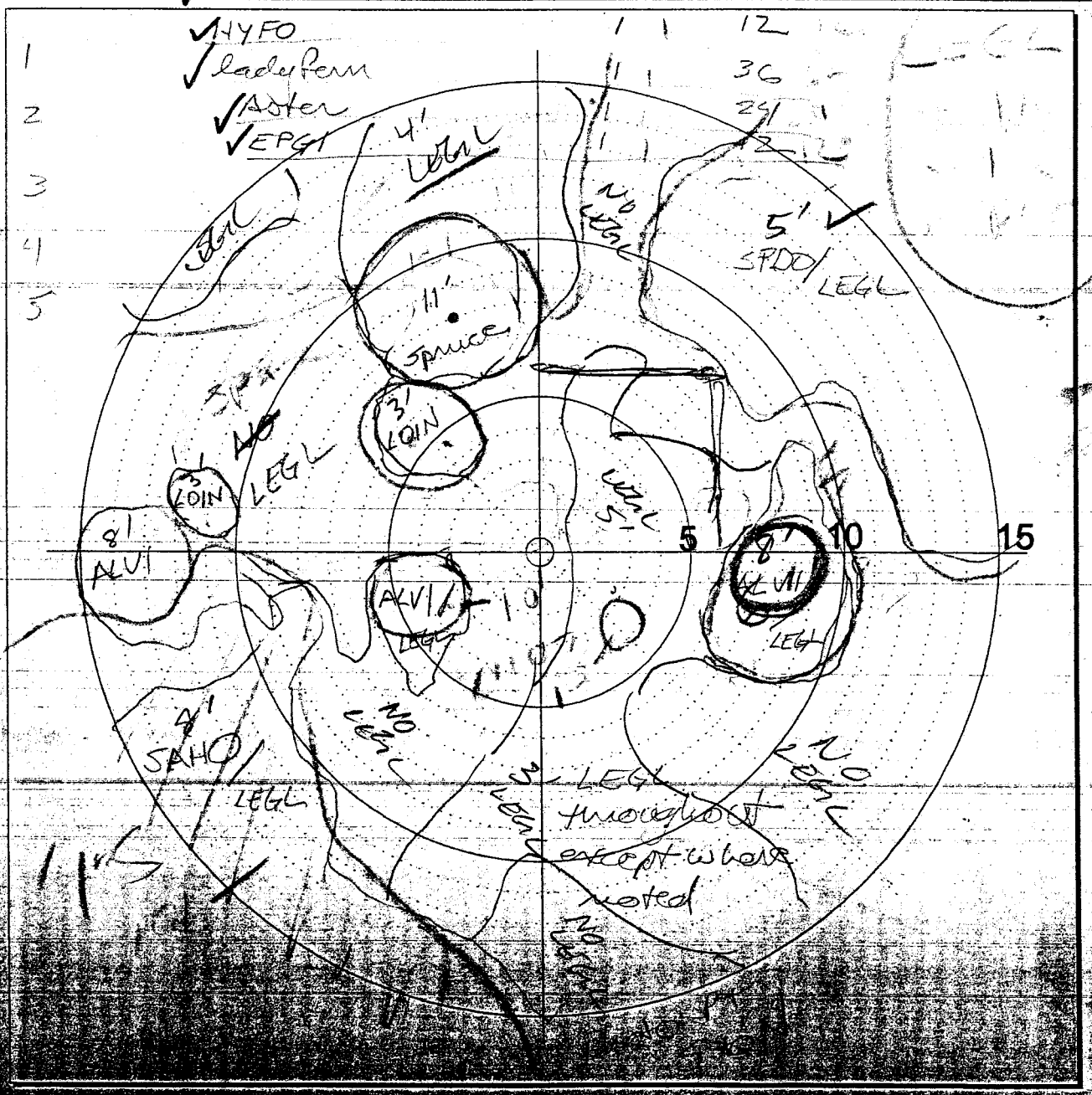


CCMWA VEGETATION PLOT DATASHEET

DATE: 10-29-98 BY: DKJ PLOT# P-16

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	HT	NOTES
Edge		✓SPRUCE	1	120	
		✓LEGL	4	48	
		✓ALVI	2	72	
		✓SAHO	2	84	
		✓LOIN	1	48	
		✓CANU	5	48	
		✓CAOB	2	48	
		✓ANGE	1	60	
		✓METR	1	12	
		✓SAOF	1	24	
		✓POPA	1	36	
		✓LYAM	2	48	
		✓BLSP Blechnum	1	36	
		✓SPDO	2	48	
		✓HYFO	1	12	
		✓ladyfern	1	36	
		✓Aster	1	24	
		✓EPGL	1	12	

0-5 1
5-25 2
25-50 3
50-75 4
75-95 5

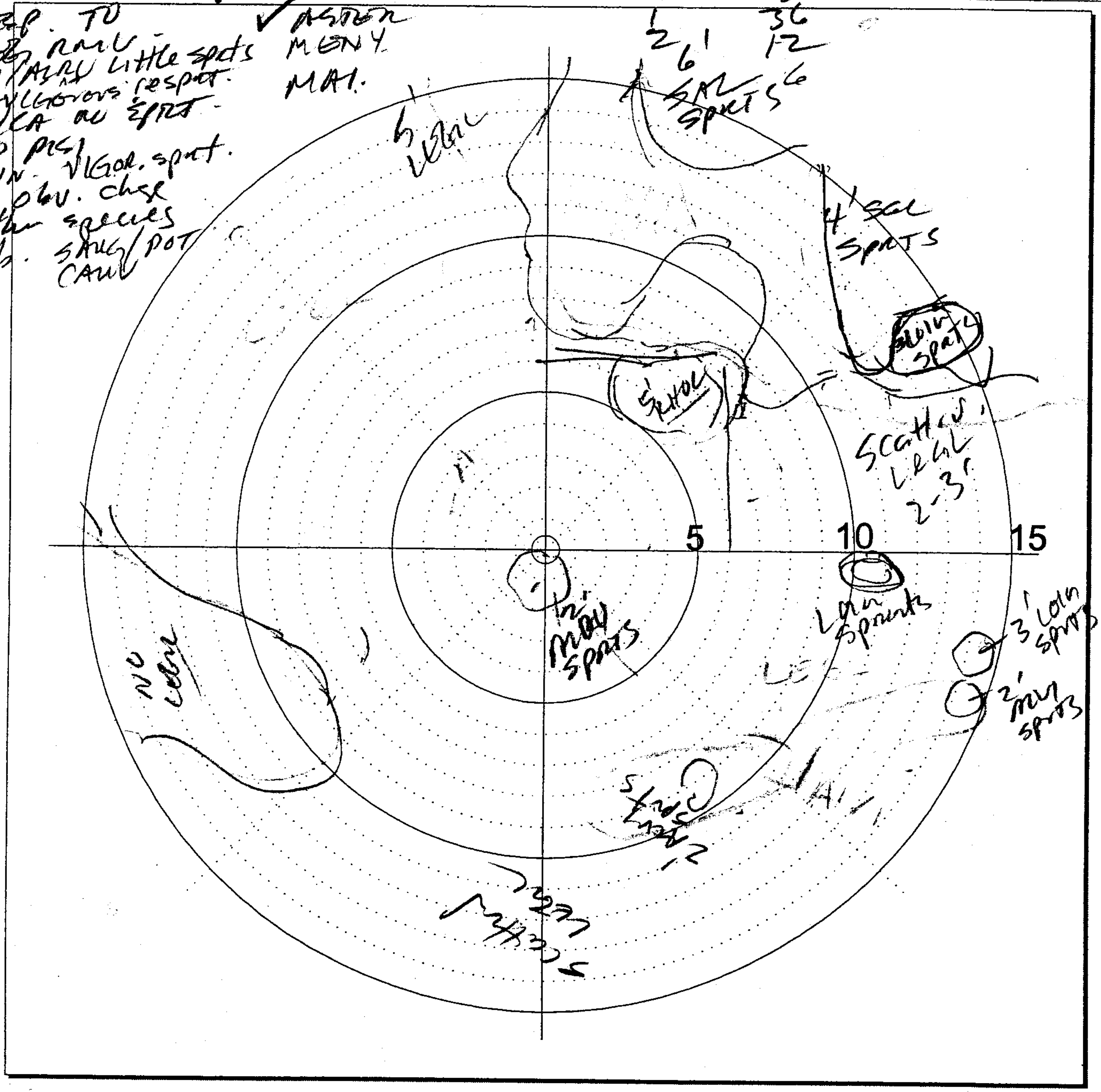


CCMWA VEGETATION PLOT DATASHEET

DATE: 7-22-99 BY: DKI PLOT# 17

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	VEG TRTD NOTES
LLM. (former edge)	5	✓ CANU	3	42	
		✓ LEGL	4	42	
		✓ SAL	1 2	5'	
		✓ ALVI	1	2'	
		✓ ALRU	1	2'	
		PISI	—		
		✓ DNG	1 1	4'	
		✓ BLECH	1 1	3'	
		✓ LYAM	2	3'	
		✓ POT PAL	3	36	
		✓ SANG	3	36	
		✓ CAR CADN	2 1	42	
		✓ ATHY	1 1	36	
		✓ LOIN.	1 1	3'	
		✓ ASTER	1	36	
		MENY	2 6'	12	
		MAI.			

* RESP. TO VEG RMV
ALVI/ALRU little sprts
ALRU vigorous respt.
MECA no sprt.
no PISI
LOIN. VIGOR. sprt.
NO obv. chge other species
prob. SANG/POT/CANU

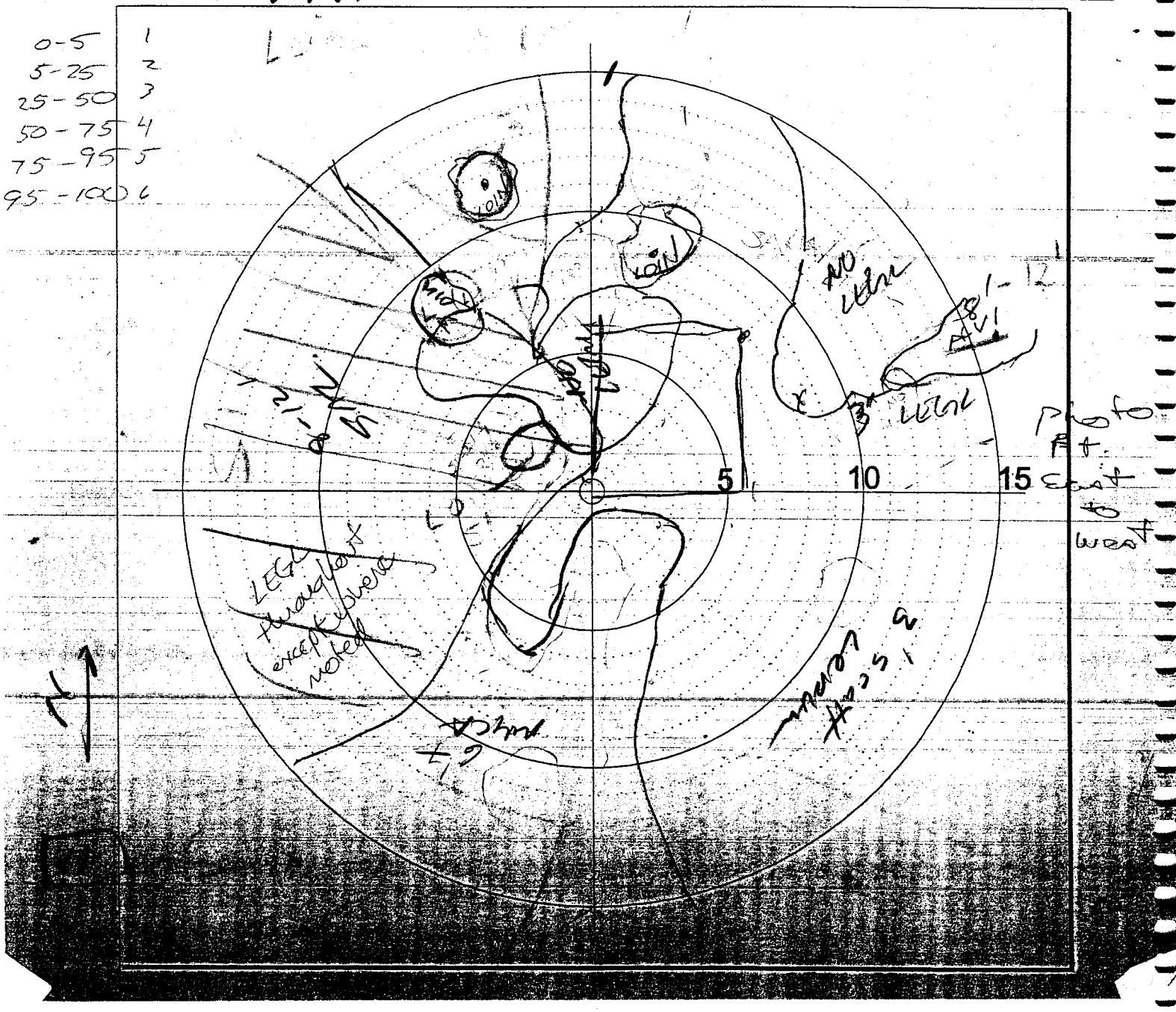


CCMWA VEGETATION PLOT DATASHEET

DATE: 10/29/98 BY: M. Race PLOT# 18

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	HT	NOTES
edge		✓ LOIN	1	60	
		✓ SALA Salix lasiolepis	3	96	
		✓ LEGL	5	48	
		✓ SPMA CO	4	84	
		✓ ALVI	1	108	
		✓ CANU	5	48	
		✓ CAOB	2	48	
		✓ ANGE	2	72	
		✓ SAOF	3	36	
		✓ POPA	3	36	
		✓ Rotten	1	36	
		✓ METR	3	24	
		✓ LYAM	2	48	
		✓ MYCA	2	96	(6)

0-5	1
5-25	2
25-50	3
50-75	4
75-95	5
95-100	6

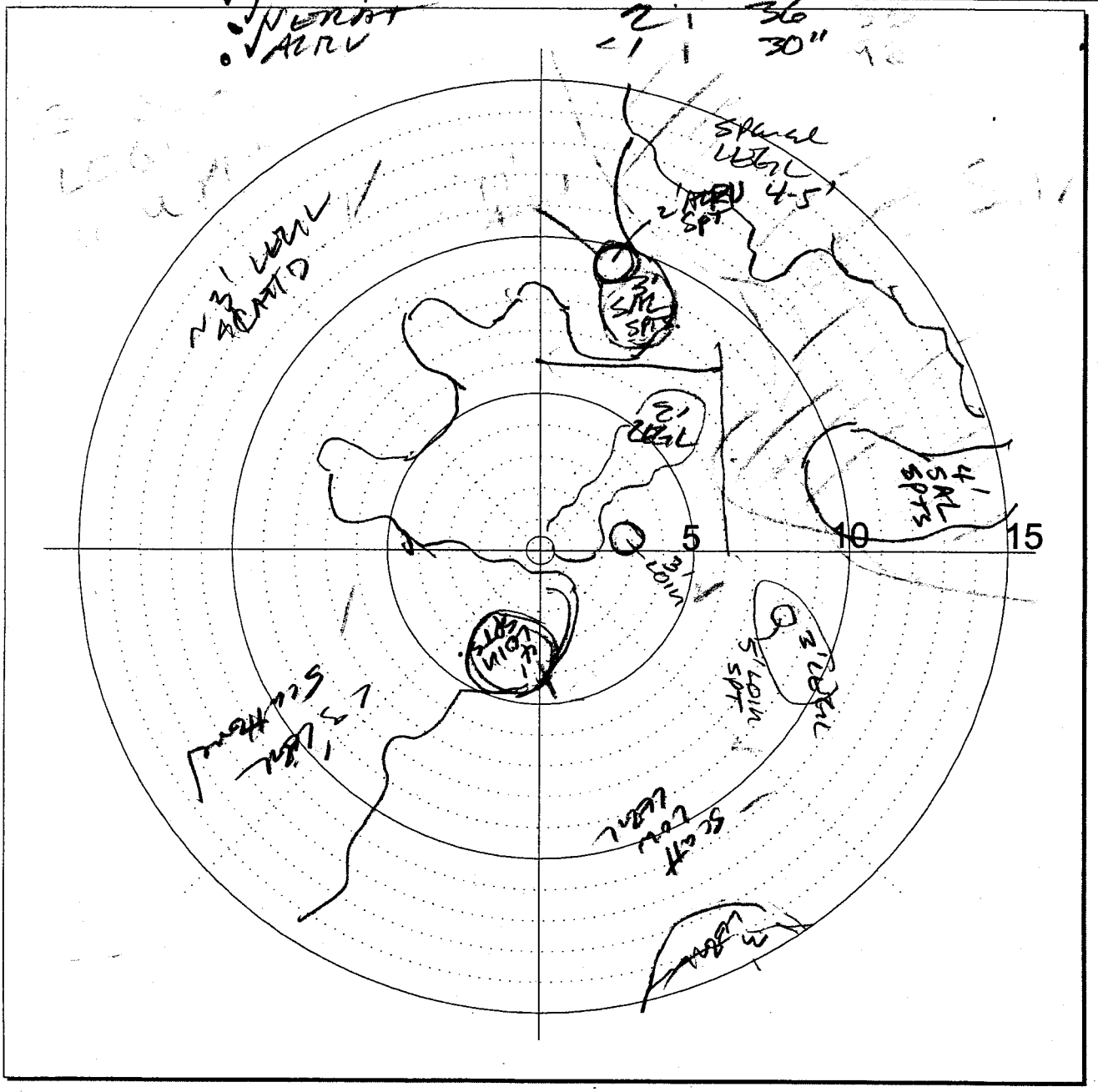


CCMWA VEGETATION PLOT DATASHEET

DATE: 7-22-99 BY: DKJ PLOT# 19

Many clearings.

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	NOTES
EDGE	10	✓ ARVI	1	24	SPOTS
LLM		✓ SAL	1	48	SPROUTS
		✓ PISI	1	36	
		✓ RUBU	4	36	
		✓ LEGL	4	48	
		✓ CANU	3	36	
		✓ POT PRA	3	36	
		✓ SAMB	1	2'	
		✓ EPIP.	1	3'	SPOTS
		✓ LOIN	1	3'	
		✓ CAGR (CAU)	2	2'	
		✓ LYAM	2	12"	
		✓ MENY	1	3'	
		✓ ATFI	2	36"	
		✓ NEMO	1	30"	
		✓ ARRU			

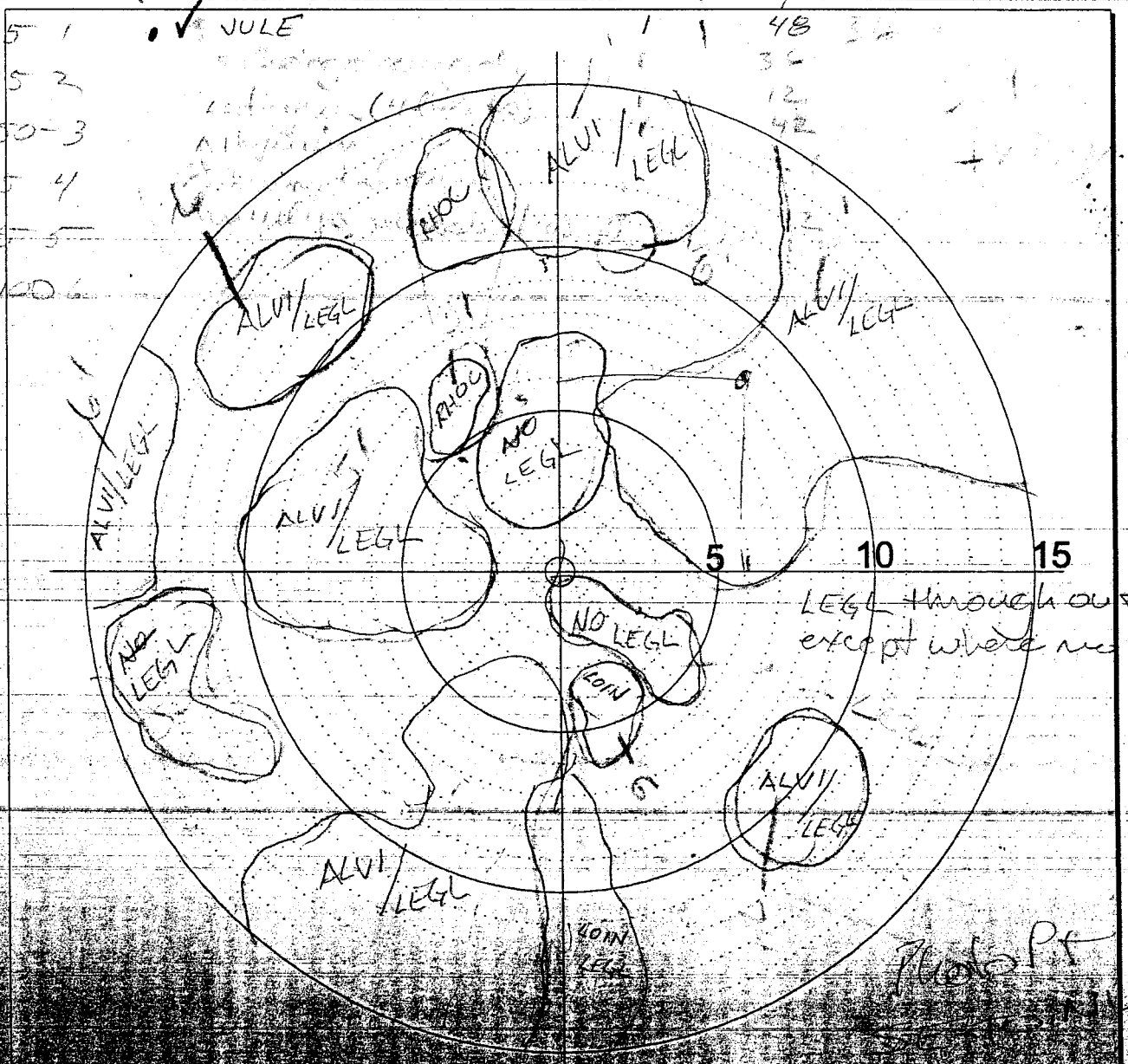


CCMWA VEGETATION PLOT DATASHEET

DATE: 10/3/08 BY: McRae PLOT# P-20

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6		AVG HT	NOTES
Edge	50	LEGL	5	5	60	
		ALVI	3		72	72
		LOIN	2	1	72	72
		RHOC	1		72	
		CANU	4	4	48	48
		CAOB	3	3	48	
		ANGE	2		72	
		RUUR	2	1	48	
		LYAM	2	2	48	
		JAOE	2	1	36	
		BLSP	2	2	36	
		SOCA	1		48	
		HYFO	1		24	
		POPA	1		24	
		JULE	1	1	48	

0-5 1
5-25 2
25-50 3
50-75 4
75-95 5
95-100 6



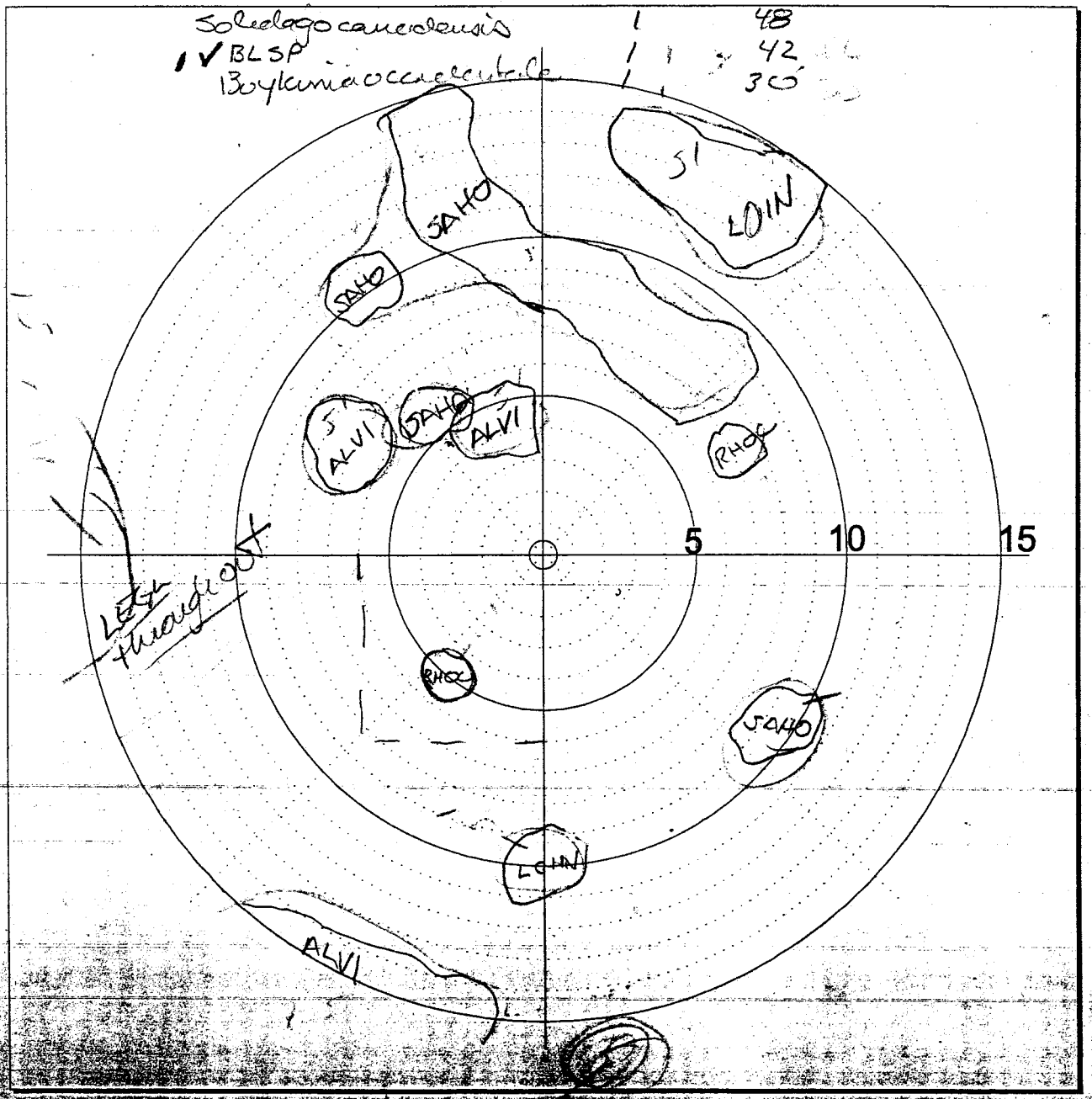
LEGL throughout except where noted

Photo Pt

CCMWA VEGETATION PLOT DATASHEET

DATE: 7-22-99 BY: McRae PLOT# 21

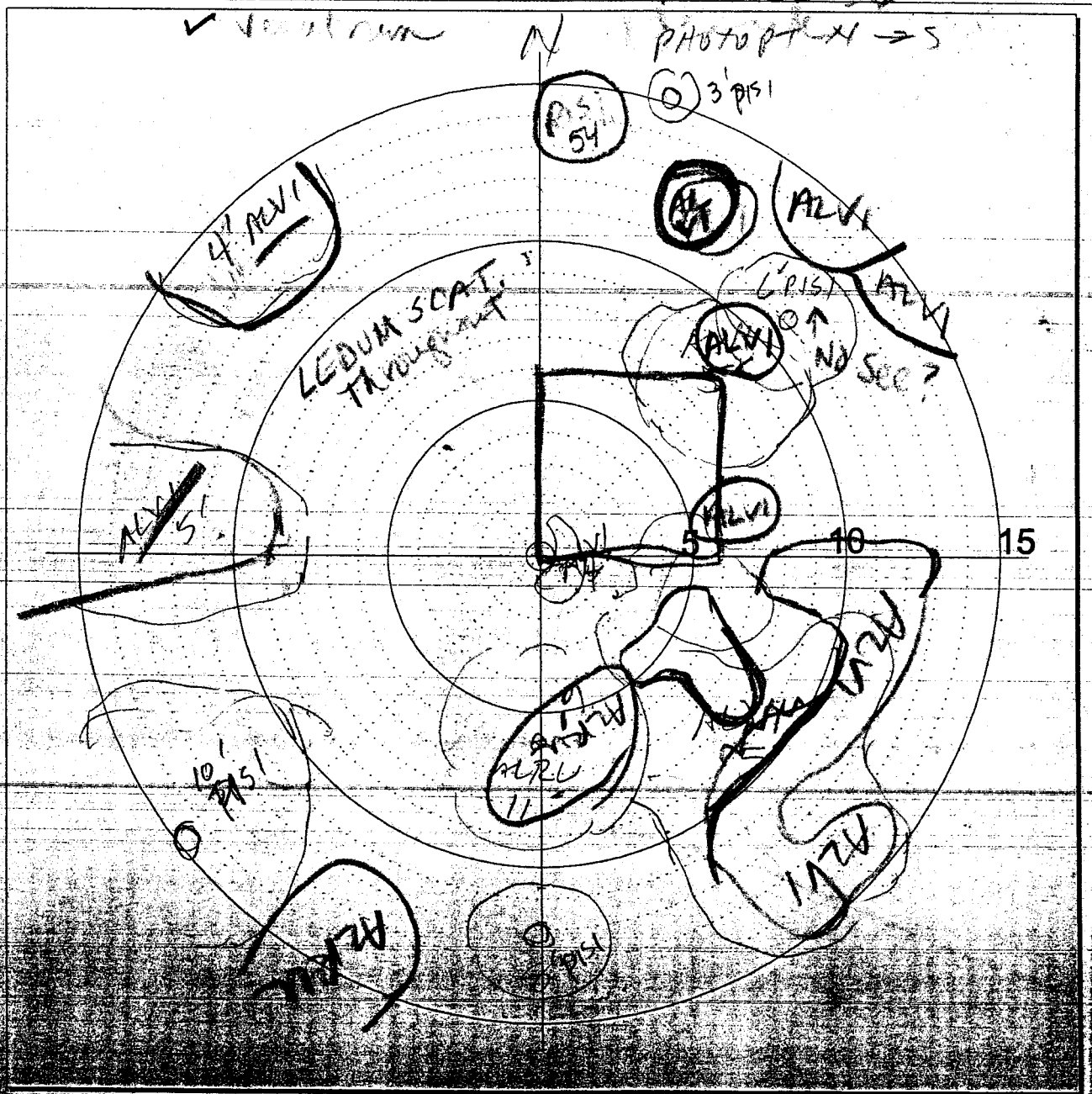
VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	AVG HT	NOTES
CP	30	SAHO	2	48	48" growth unaffected
		✓ LOIN	2	72	72" growth unaffected
		✓ LEGL	5	36	12" cut 48" uncut
		✓ LYAM	2	24	
		✓ CANU	2	48	
		✓ CAOB	3	36	
		✓ ALVI	1	30	30" growth unaffected cut
		✓ RUUR	2	36	
		✓ ANGE	1	48	
		✓ RHOC	1	36	
		✓ SAOF	3	36	
		✓ POPA	2	36	
		✓ Adlyrium	2	48	
		ASCH	1	30	
		Soledago canadensis	1	48	
		✓ BLSP	1	42	
		Botrychium occidentale	1	30	



CCMWA VEGETATION PLOT DATASHEET

DATE: 10-30-98 BY: DKJ PLOT# P22

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6	HT	NOTES
LLM	15	✓ ALVI	3	5'	54
	5	✓ ALRU	4	11'	54
		✓ LED.	4	42	42
		✓ CANE	4	42	42
		✓ SALG	3	81	30
		✓ AUG	1	3'	48
		✓ AD PAL	2	3'	36
		✓ LYAN	2	2'	24
		✓ ATFIL	1	2'	36
		✓ ISLECH.	1	3'	36
		✓ PIS I	2	8'	48
		✓ MEN.	1	12"	6
		✓ ASTR2	1	3'	36
		SO. SPECIES	1	36	36
		✓ [illegible]			



CCMWA VEGETATION PLOT DATASHEET

DATE: 7-22-99 BY: Mellao PLOT# 23

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6		AVG HT		NOTES
willow scrub	30	✓ ALVI	2	3	40"	48	40" growth since treated
		✓ MYCA	0	1	0		not resprouting
		✓ LEGL	5	5	12"	42	42" growth since treated
		✓ RUUR	1	2	12"	24	
		✓ CAOB	2	2	36	36	
		✓ BLSP	1	2	24	30	
		✓ CANU	2	1	36	36	
		✓ SAOF	2	2	36	36	
		✓ RHOC	1	1	48	42	
		✓ MAFU	1	1	42	60	42" growth since treated
		Boykinia	1	2	12	12	
		✓ LYAM	2	2	36	36	
		✓ POPA	1	2	24	24	
		✓ VECA	1	0	48	NA	
		✓ Athyrium	1		18		

9/6/00

CCMWA VEGETATION PLOT DATASHEET

DATE: 10-29-98 BY: McRae PLOT# P-24

VEG TYPE	OVERHD CAN%	SPECIES	COV CLASS(1-6		AVG HT	NOTES
Edge	10%	✓LEGL	5		60	
		✓ALVI	4	4	72	70'
		✓MYCA	2	2	96	12'
		✓MAFU	2	2	132"	11' 132"
		✓Spruce	2	2	20'	
		✓LOIN	1	1	84	70
		✓Blackberry sp	2	1	48	48
		✓ANGE	1		24	
		✓LYAM	2	2	48	48
		✓CANU	2	1	48	48
		✓CAOB	2		48	
		✓JULE	1		48	
		✓SAOF	2	1	36	36
		✓RUUR	2	1	36	
		✓Lady fern	1	1	36	36

0-5 1
5-25 2
25-50 3
50-75 4
75-95 5
95-100 6

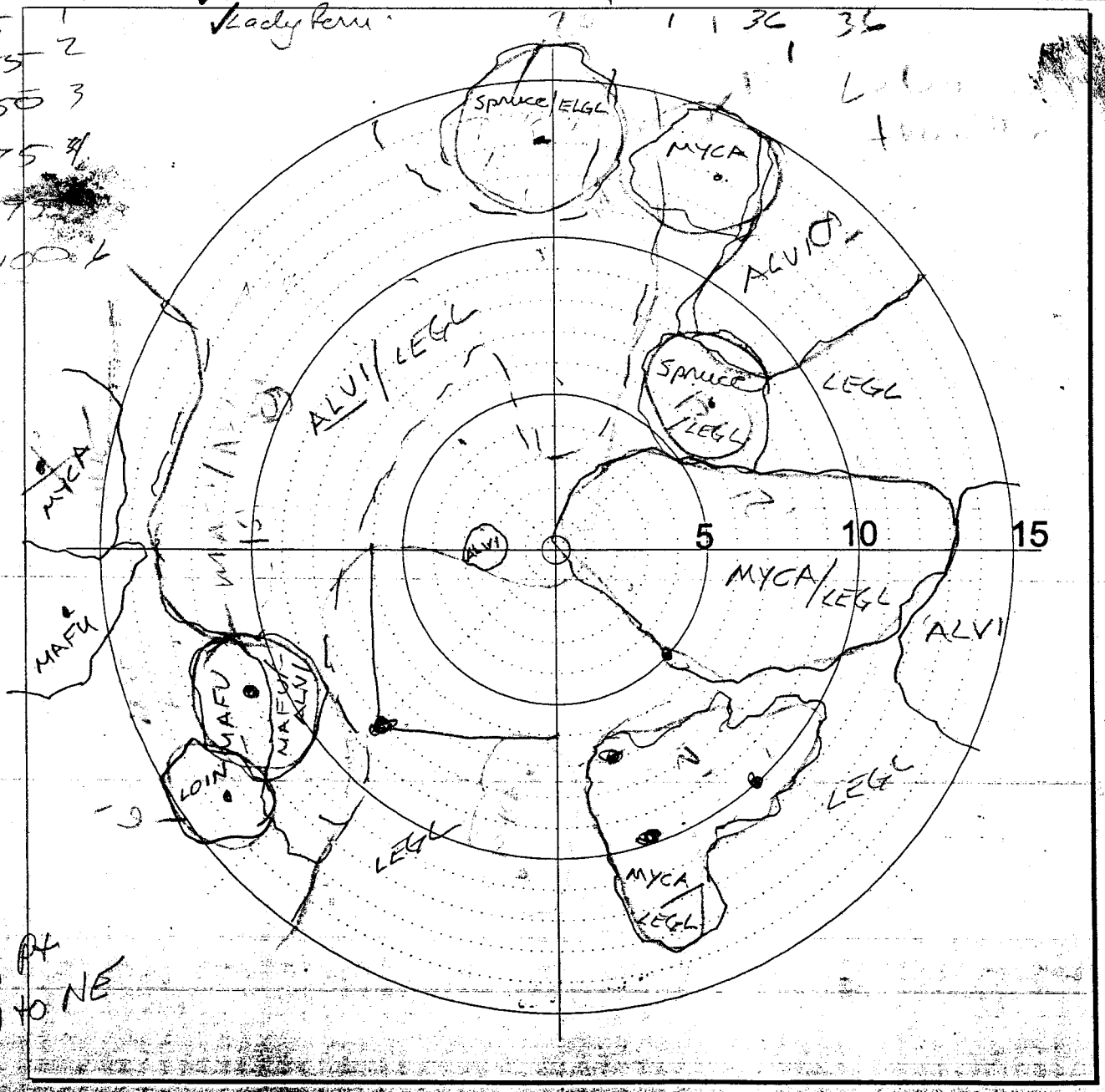


Photo @ SW to NE

SITE: CC Marsh DATE: 7/13/02 BY: KW / AC PLOT #: 1

PLOT LOCATION: COORDS- X Y CORNER LASER: DIST AZ (TO) PT DIST AZ (TO) PT

VEG TRTMENT CATEGORY

LILY INVENTORY

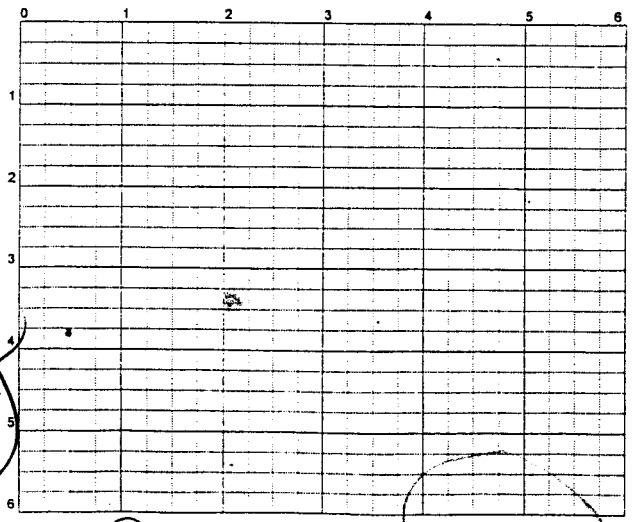
QUADRANT OF 6X6 PLOT	FT FROM X( )	PLT CRN Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	0.5	190	48		1B	
	3.0	110	33		1B	
	6	80	39		1F	
	4	80	42		1F	
	11	40	60		2F	
	7	30	48		5B	
	8.5	20	48		2B	
	9.0	20	48		1B	
	7.5	350	48		1B	
	8.5	350	48		1B	
	8.5	330	54		2B	
	13.0	330	42		2B	
	11	320	48		4B	
	11	290	60		2B	
	11.5	260	48		2B	
	14.5	230	48		2B	
	14.5	230	48		2B	
	14.5	200	48		1B	
	12	210	46		1B	
	5.5	250	49		1B	
	5.5	250	47		I	
	5.0	340	33		2B	
	5.5	320	44		1B	
	5.5	320	50		1B	
	5.5	320	52		5B	
	5.5	320	51		1B	
	10.5	90	50		4B	
	9.5	70	58		2B	
	10.5	70	54		2B	
	6.5	20	48		2B	
	5.5	60	51		1B	
	13	130	54		3B	
	5	180	42		1B	

VEGETATION * → overvalue for entire plot!

VEG TYPE	OVRHD CAN%	SPECIES	Comp. ht.	COV	AVG HT	NOTES
	20		40			
	20					
	20					
	20					
	30					
	20					
	30					
	30					
	30					
	30					
	40		60			
	40		60			
	45		60			
	45		60			
	45		60			
	45		60			
	40		40			
	30		40			
	30		50			2nd bud grazed
	30		50			bud-5 insect grzd
	35		35			
	35		40			
	35		40			
	35		40			
	35		40			
	20		40			
	30		40			
	30		40			
	30		40			
	30		40			
	40		50			
	25		30			

Notes:

Total Flowering Plants Counted at CC Marsh (N & S. Marsh areas)



→ Sampling = 264

Total # plants = 33

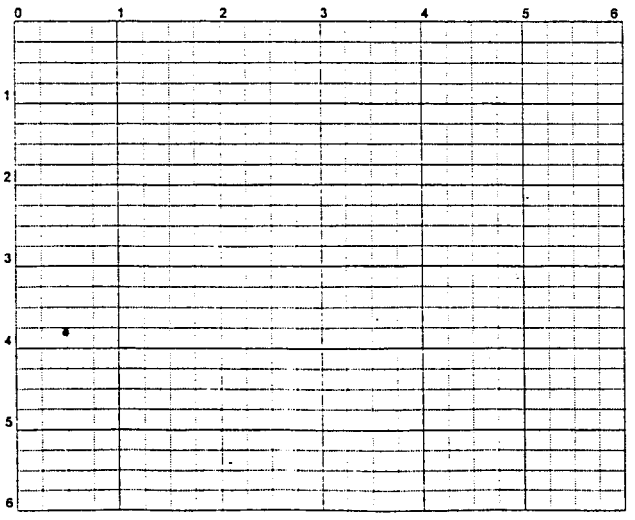
SITE: CC Marsh DATE: 7/13/02 BY: KW/AC PLOT # 2

PLOT LOCATION: COORDS- X Y CORNER LASER DIST AZ (TO) PT DIST AZ (TO) PT VEG TRTMENT CATEGORY

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( ) Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	5.5 120	57		5B	
	2.0 120	48		4B	
	10.0 70	42		4B	
	4.5 5	42		2B	
	7.0 270	60		1B	
	2.5 120	39		1B	
	14 250	42		1B	
	13.5 160	36		1B	
	14.5 160	39		1B	

VEGETATION VEG TYPE	OVRHD CAN%	SPECIES	comp. ht.	COV	AVG HT	NOTES
	30		36			
	30					
	30					
	20					
	30					
	30					
	20					
	20					
	20					

Notes:



Total plants = 9

LIOC LIFE HISTORY PLOT DATASHEET

SITE: CC Marsh DATE: 7/13 BY: KW/AC PLOT # 3

PLOT LOCATION: COORDS- X ____ Y ____ CORNER ____ LASER: DIST ____ AZ ____ (TO) PT ____ DIST ____ AZ ____ (TO) PT ____ VEG TRTMENT CATEGORY ____

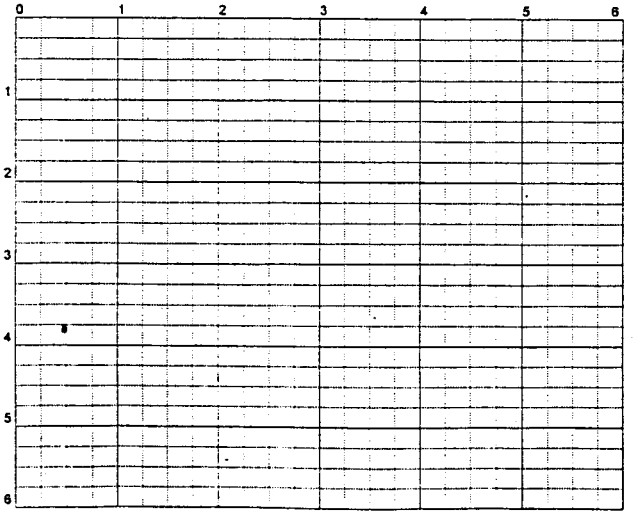
LILY INVENTORY

QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	1.5	300	36		1B	
	4.0	350	39		1F	
	4.0	320	42		2F	
	6.5	360	36		1F	
	12.0	10	47		1B	
	12.5	330	57		1B	
	13	310	42		1F	
	14	310	43		1F	
	8.5	290	33		1F	
	9	260	48		2F	
	9	260	48		2F	
	10	270	50		2B	
	12.5	270	48		1F	
	14.5	270	50		1F	
	15	280	50		2B	
	13	280	48		1F	
	13.5	240	36		1F	
	13.5	220	36		1F	
	4.5	110	42		2B	
	10	110	39		2B	
	13	110	39		1F	
	11.5	70	48		1B	
	9.5	160	36		3B	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	comp height	COV	AVG HT	NOTES
	10		316			broken - insect
	10					
	10					
	10					
	20					
	20					
	20					
	20					
	10					
	15					
	15					
	15					
	15					
	15					
	15					broken - insect
	15					
	15					
	10					
	15					
	15					
	20					
	10					

Notes:



total plants = 23

LIOC LIFE HISTORY PLOT DATASHEET

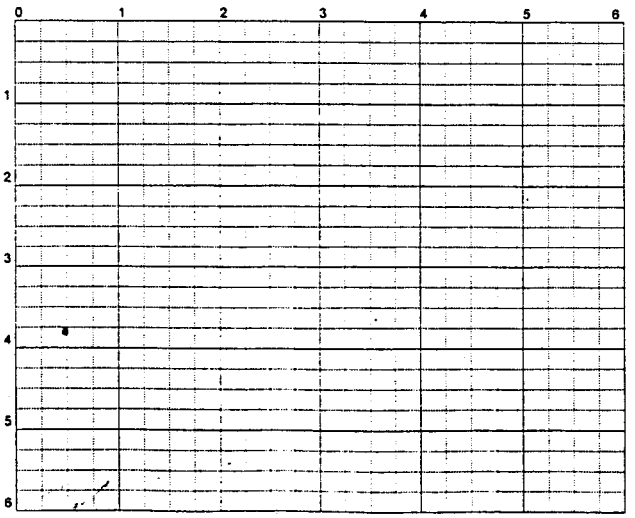
SITE: N Marsh CC DATE: 7-13-07 BY: Bev PLOT #: 4

PLOT LOCATION: COORDS- X Y CORNER LASER: DIST AZ (TO) PT DIST AZ (TO) PT

VEG TRTMENT CATEGORY

LILY INVENTORY							VEGETATION				
QUADRANT OF 6X6 PLOT	FT FROM X (DIS)	Y (AZ)	PLT CRN HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS	VEG TYPE	OVRHD CAN%	Comp. height SPECIES	AVG COV	AVG HT	NOTES
	1'	80	48		2B			0	21"			
	1'	80	30		1B			0	21			
	2'	110	27		1B			0	"			
	2.5	115	37		1B			0	"			
	3.5	100	30		1B			0	"			
	4.5	103	30		1B			"	"			
	4.5	95	30		1B			"	"			
	5.5	100	39		1B			"	"			
	6.0	90	36		1FI			20%	24"			
	7.0	80	42		2B			"	"			
	6.0	90	42		1FI				"			
	7.0	80	32		1B				"			
	6.0	290	39		1B				"			
	6.0	290	39		1FI			10%	24"			
	4.0	265	44		2FI			5%	"			
	4.0	226	38		1B			25%	24"			
	8.0	165	39		1B			40%	39"			
	15.1	30	60		3FI			25%	42"			
	15.0	170	48		1FI			5%	36"			
	15.0	170	51		1FI			5%	36"			
	15.0	170	42		2B				"			
	12.0	275	40		2B			3%	27"			
	5.0	325	42		1B			3%	40"			

Notes:



total plants = 23

SITE: cl marsh DATE: 7/12/02 BY: KW & AC PLOT # 5

PLOT LOCATION: COORDS- X Y CORNER LASER: DIST AZ (TO) PT DIST AZ (TO) PT VEG TRTMENT CATEGORY

LILY INVENTORY

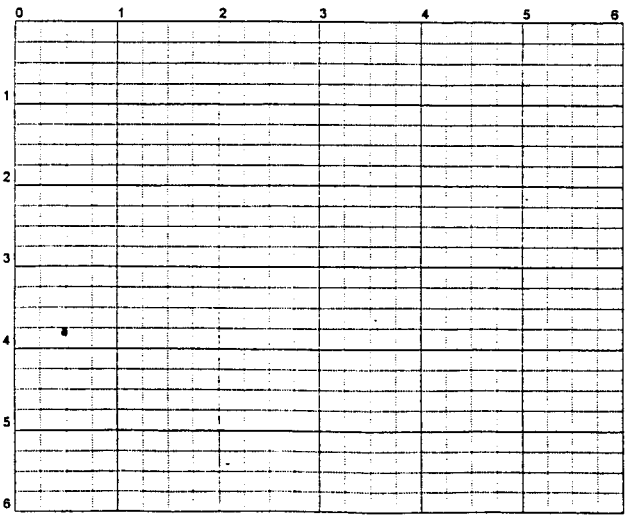
QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	3.0	340	40		3B	
	6.5	340	46		2B	
	1.0	40	36		1B	
	1.0	160	45		5B	
	1.5	120	45		1B	
	7.5	40	50		3F	
	6	70	48		2B	
	6	70	48		2B	
	9.5	120	48		3B	
	11	120	48		2B	
	12.5	90	48		2B	
	12.5	90	48		1B	
	12	90	48		1B	
	14.5	90	50		1B	
	13.5	140	30		2F	
	11	65	52		1B	
	13	60	42		1B	
	8	290	42		2B	
	7.5	215	42		4B	
	0.5	215	36		2B	
	10.5	210	33		1B	
	10.5	210	33		1B	
	10.5	210	48		1B	
	10.5	210	48		1B	
	10.5	210	48		1B	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	comp. height	COV	AVG HT	NOTES
	5		36			
	20					
	10					
	10					
	10					
	5					
	5					
	5					
	5					
	5					
	5					
	5					
	5					
	10					
	10					
	10					
	15					
	10					
	15					
	10					
	10					
	10					
	10					
	10					

Notes:

- Several plants blooming/budding and barely not in ⊙.
- There could easily be more plants hidden in this veg.



total plants = 25

LIOC LIFE HISTORY PLOT DATASHEET

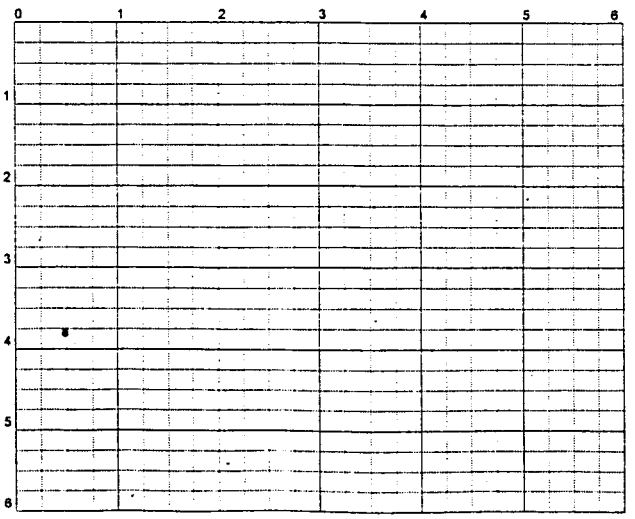
SITE: CC Marsh DATE: 7/13/02 BY: KW / AC PLOT # 6

PLOT LOCATION: COORDS- X Y CORNER LASER DIST AZ (TO) PT DIST AZ (TO) PT VEG TRTMENT CATEGORY

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	6	130	30		1B	
	15	50	72		2F	
	9.5	50	48		1B	
	12	90	39		1B	
	11	70	42		3B	
	9	150	42		1F	
	12	160	48		2B	
	13.5	160	48		1B	
	14	160	48		1F	
	14.5	170	48		1B	
	14.5	180	66		3B	
	13	190	52		3B	

VEGETATION VEG TYPE	OVRHD CAN%	SPECIES	comp. wt.	AVG COV	AVG HT	NOTES
	5		48			
	15		36			
	10		48			
	10		36			
	10		36			
	15		42			
	15		40			
	15		40			
	15		40			
	20		48			
	20		60			
	20		60			

Notes:



Total plants = 12

LILY LIFE HISTORY PLOT DATASHEET

SITE: CC Marsh DATE: 7/13/02 BY: KW/AC PLOT # 7

PLOT LOCATION: COORDS- X Y CORNER LASER DIST AZ (TO) PT DIST AZ (TO) PT VEG TRTMENT CATEGORY

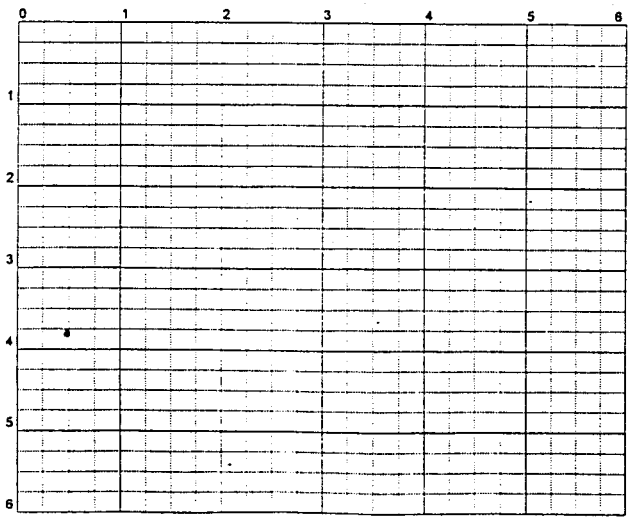
LILY INVENTORY

QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	6	330	42		2B	
	13	350	44		2B	
	6	320	53		1B	
	10.5	310	42		2B	
	12.5	290	42		1B	
	12.5	290	39		2B	
	8 ~~13~~	300	56		1B	
	8 ~~12.5~~	290	56		1B	
	9 ~~10~~	250	~~50~~		3B	
	13.5	250	48		2B	
	14	110	39		1B	
	10.5	50	39		1B	
	~~57~~ 10	30	57		3B	
	14	20	42		2B	
	14	5	30		1B	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	comp ht.	COV	AVG HT	NOTES
	10		44			
	10		44			
	10					
	10					
	10					
			50			
	10		44			
	10		36			
	15		42			
	15		44			
	10		40			
	15		30			

Notes:



total # plants = 15

LIOC LIFE HISTORY PLOT DATASHEET

SITE: cc marsh DATE: 7/13/02 BY: Kw & AC PLOT # 8

PLOT LOCATION: 4W/8

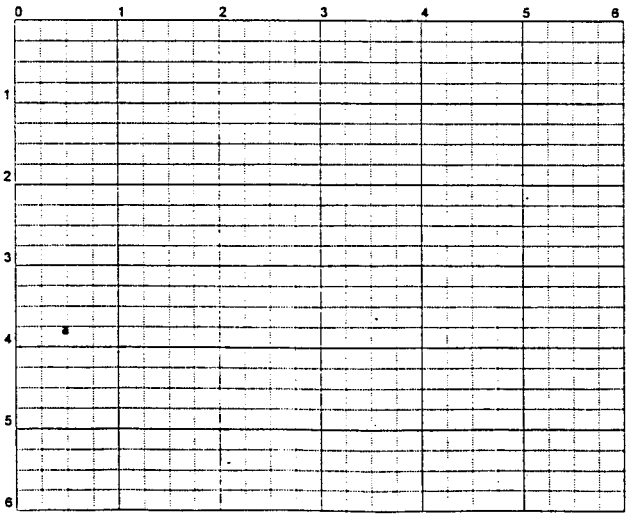
COORDS-	X	Y	CORNER DIST	AZ	(TO) PT	LASER DIST	AZ	(TO) PT

VEG TRTMENT CATEGORY

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM X( )	PLT CRN Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	13.5	280	55		3B	
	3	300	48		2B	
	4.5	100	48		1F	
	4.5	100	48		1B	
	8.5	20	48		1P	

VEGETATION VEG TYPE	OVRHD CAN%	SPECIES	COV	AVG HT	NOTES

Notes:



total plants = 5

LIOC LIFE HISTORY PLOT DATASHEET

SITE: North Marsh CC DATE: 7-13-0? BY: [illegible] PLOT # 9

PLOT LOCATION:

COORDS-____CORNER X	Y	LASER DIST	AZ	(TO) PT	DIST	AZ	(TO) PT

VEG TRTMENT CATEGORY______

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM____PLT CRN X ( ) dist from center	~~Y ( )~~ Azimuth	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS	VEGETATION VEG TYPE	OVRHD CAN%	~~SPECIES~~ Competing veg ht	COV	AVG HT	NOTES
	5'	220	46"		3B	✓		5%	27"			
	12'	295	50"		3fl			10%	~~36~~ 42"			
	10'	270	52"		3B			10%	28"			
	6'	457	44"		1fl + 1 fr			3%	36"			

Notes:

B = Buds
fl = Flower
Az, muth - plant to center
fr = fruit

total plants = 4

LIOC LIFE HISTORY PLOT DATASHEET

SITE: CC Marsh DATE: 7/13/02 BY: KW/AC PLOT # 10

PLOT LOCATION: COORDS- X Y CORNER LASER DIST AZ (TO) PT DIST AZ (TO) PT VEG TRTMENT CATEGORY

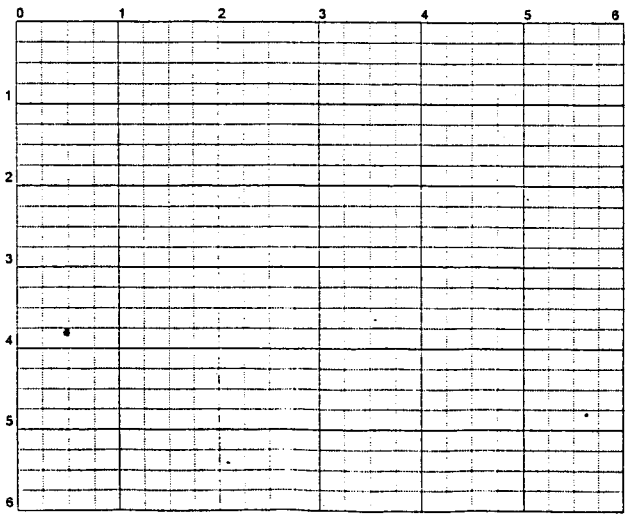
LILY INVENTORY

QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( ) Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	13 290	39		1F	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	Comp ht.	COV	AVG HT	NOTES
	25		39			

Notes:



total plants = 1

LIOC LIFE HISTORY PLOT DATASHEET

SITE: N Marsh CC DATE: 7-13-02 BY: Bencie PLOT # 11

PLOT LOCATION: COORDS- X Y CORNER LASER: DIST AZ (TO) PT DIST AZ (TO) PT

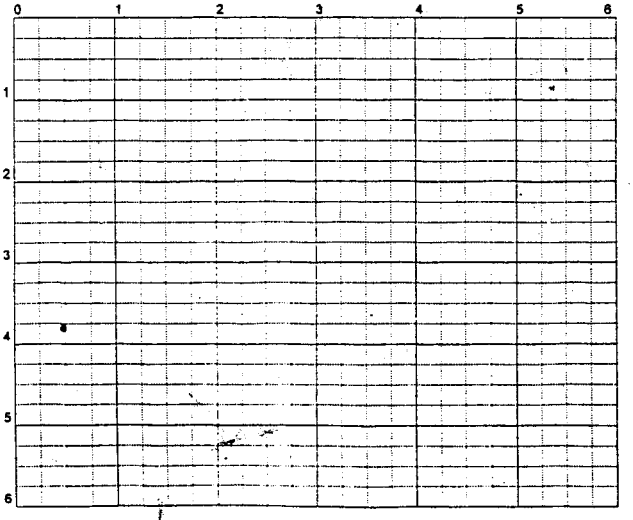
VEG TRTMENT CATEGORY

LILY INVENTORY						VEGETATION				
QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( ) Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS	VEG TYPE	OVRHD CAN%	SPECIES	AVG COV	AVG HT NOTES

No plants in circle plot

A Ledum / Pedicularis purple

Notes:



Total plants = 0

LIOC LIFE HISTORY PLOT DATASHEET

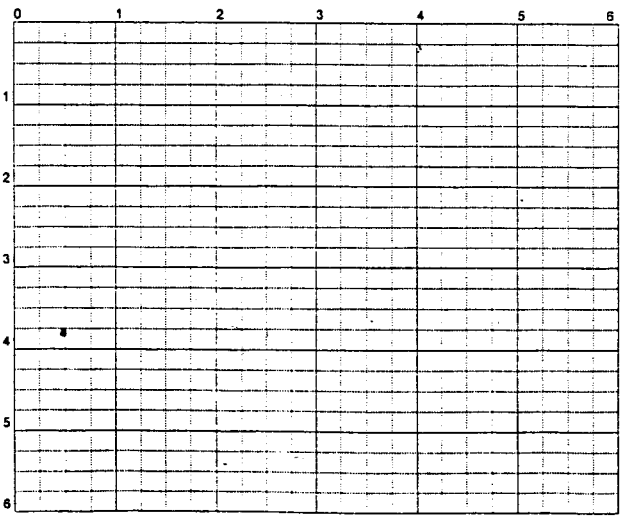
SITE: N Mesa CC DATE: 7-13-22 BY: B. Rucker PLOT #: 12

PLOT LOCATION: COORDS- X Y CORNER LASER: DIST AZ (TO) PT DIST AZ (TO) PT

VEG TRTMENT CATEGORY

LILY INVENTORY								VEGETATION						
QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X (DIST)	Y (AZ)	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS		VEG TYPE	OVRHD CAN%	SPECIES	Comp Avg Ht	COV	AVG HT	NOTES
	12.0	200	34		1	F1			30%		34			

Notes:



total plants = 1

LIOC LIFE HISTORY PLOT DATASHEET

SITE: S Marsh CC DATE: 7-13-02 BY: Bennett PLOT # 13

PLOT LOCATION: COORDS- C CORNER LASER

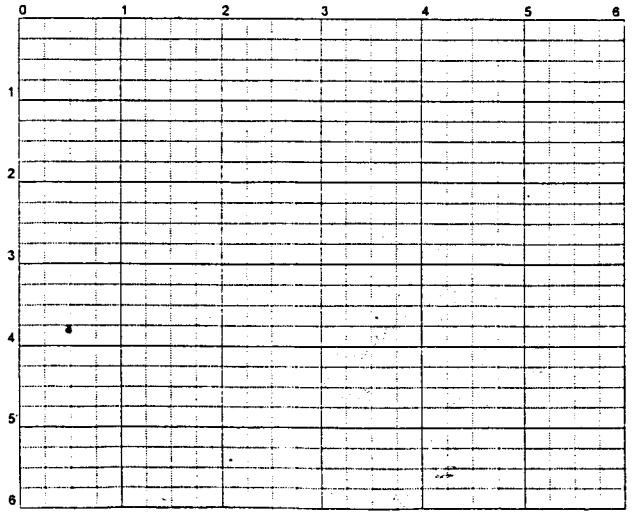
X	Y	DIST	AZ	(TO) PT	DIST	AZ	(TO) PT

VEG TRTMENT CATEGORY

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM X (DIST)	FT FROM Y (AZ)	PLT CRN HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	15	180	33		1F	
	11	105	14		2B	
	15	280	42		1F	
	15	320	60		1F	

VEGETATION VEG TYPE	OVRHD CAN%	Ht Comp. Sp SPECIES	AVG COV	AVG HT	NOTES
	10%	27			
	~~3%~~ <1%	36			Shorter than comp
	5%	30			
	5%	57			

Notes:



total plants = 4

SITE: CC Marsh DATE: 7/15/02 BY: KW/AC PLOT # 14

PLOT LOCATION: COORDS- X Y CORNER DIST AZ (TO) PT LASER DIST AZ (TO) PT VEG TRTMENT CATEGORY

LILY INVENTORY

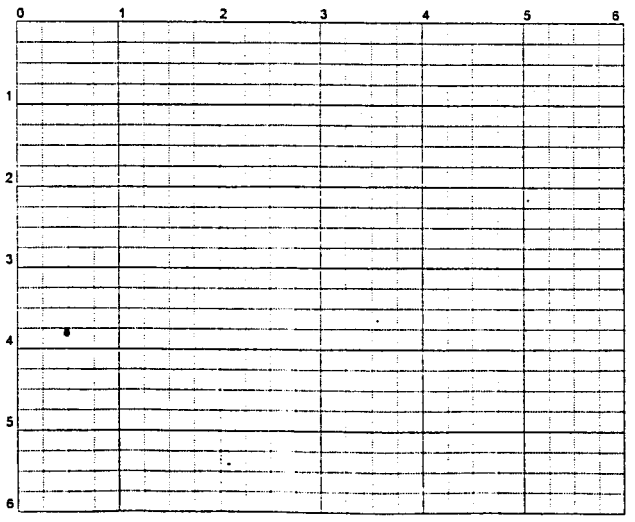
QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	13.5	300	48		1F	
	15	270	55		1F	
	9	260	69		4F	
	9	260	57		1B	
	14.5	250	42		1B	
	8.5	250	48		2B	
	15	220	48		2B	
	14.5	90	58		3B	
	15	40	44		1B	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	Comp ht.	AVG COV	AVG HT	NOTES
	15		48			
	15		48			
	5		52			
	20		52			
	20		42			
	15		52			
	20		40			
	25		58			
	20		44			

Notes:

Some lilies have defined leaf whorls & others lack whorling completely. (All plots in CC)



total plants = 9

LIOC LIFE HISTORY PLOT DATASHEET

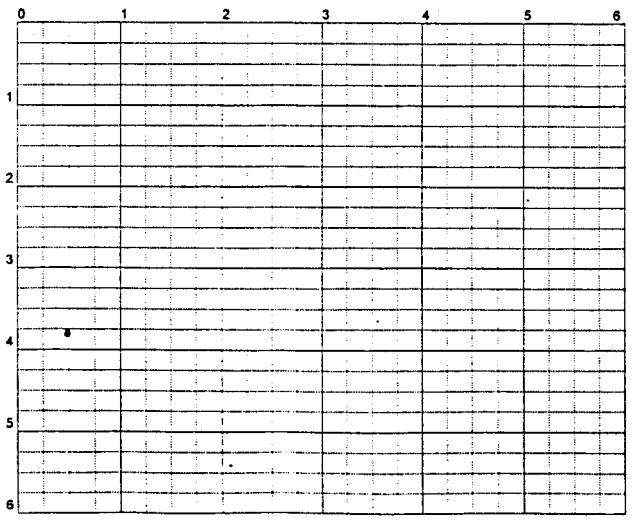
SITE: CC Marsh DATE: 7/15/02 BY: KW/AC PLOT # 15

PLOT LOCATION: COORDS- X Y CORNER LASER: DIST AZ (TO) PT DIST AZ (TO) PT

VEG TRTMENT CATEGORY

LILY INVENTORY							VEGETATION					
QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( ) Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS	VEG TYPE	OVRHD CAN%	SPECIES	Comp ht.	COV	AVG HT	NOTES
11	210	59		2F			50		>84			

Notes:



total plants = 1

SITE: Cc Marsh

LIOC LIFE HISTORY PLOT DATASHEET

DATE: 7/13/02 BY: KW/AC

PLOT #: 16

PLOT LOCATION: COORDS-____CORNER ——————LASER——————

X	Y	DIST	AZ	(TO) PT	DIST	AZ	(TO) PT

VEG TRTMENT CATEGORY: _____

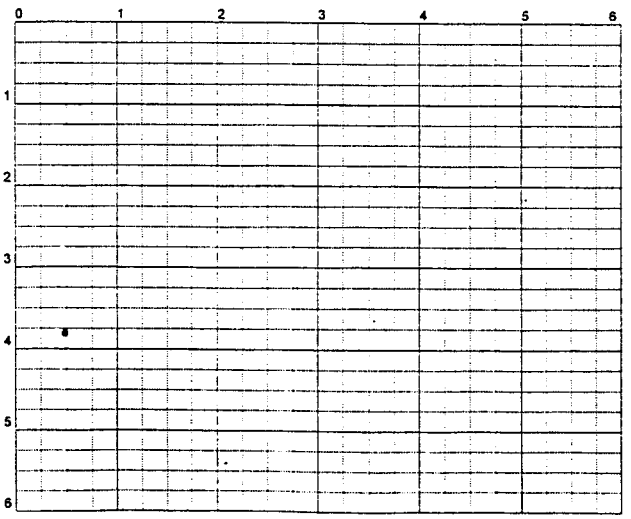
LILY INVENTORY

QUADRANT OF 6X6 PLOT	FT FROM X( )	FT FROM Y( )	PLT CRN HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	5	185	42		1B	
	6	26	42		1B	
	5	270	48		0B	
	12	340	45		1B	
	11.5	325	48		1B	
	3	190	42		1F	
	10.5	195	50		1F	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	comp. ht.	AVG COV	AVG HT	NOTES
	15		45			
	↓		45			
			45			
			45			
			45			
			↓			

Notes:



total plants = (7)

LIOC LIFE HISTORY PLOT DATASHEET

SITE: CC Marsh DATE: 7/13/02 BY: KW/AC PLOT #: 17

PLOT LOCATION: COORDS- ____ CORNER ——— LASER ———

X	Y	DIST	AZ	(TO) PT	DIST	AZ	(TO) PT

VEG TRTMENT CATEGORY: ____

LILY INVENTORY

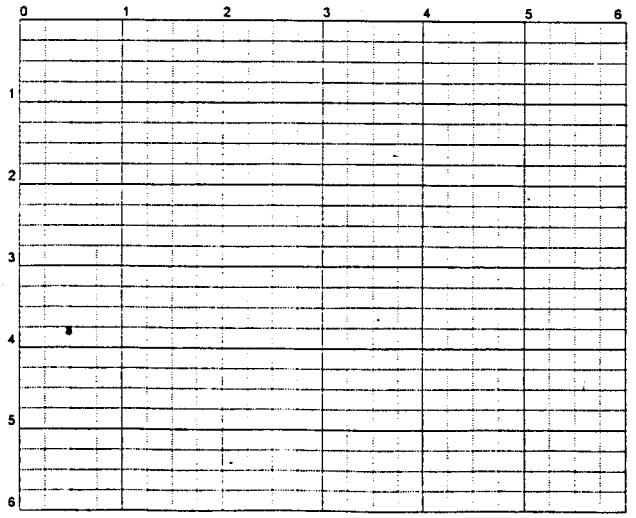
QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	4	200	48		1B	
	3	310	36		1F	
	6	256	48		1B	
	3	250	52		3B	
	3	300	30		1B	
	2.5	305	42		1B	
	1.5	290	48		1B	
	9.5	120	52		1B	
	~~9.5~~ 10	120	30		1F	
	12.5	60	53		1B	
	13	60	56		2B	
	11	60	48		1B	
	11	55 ~~60~~	60		3F	
	12.5	50	39		1F	
	8.5	50	48		1B	
	13 ~~0~~	40	39		1F	
	13.0 ~~0~~	45	33		1F	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	comp. ht.	COV	AVG HT	NOTES
	10		48			
	20					
	20					
	20					
	20					

Notes:

This plot needs to be re-shaped.



total # plants = 17

SITE: CC Marsh

LIOC LIFE HISTORY PLOT DATASHEET

DATE: 7/13 BY: KW/AC

PLOT #: 18

PLOT LOCATION:

COORDS- CORNER LASER

X	Y	DIST	AZ	(TO) PT	DIST	AZ	(TO) PT

VEG TRTMENT CATEGORY

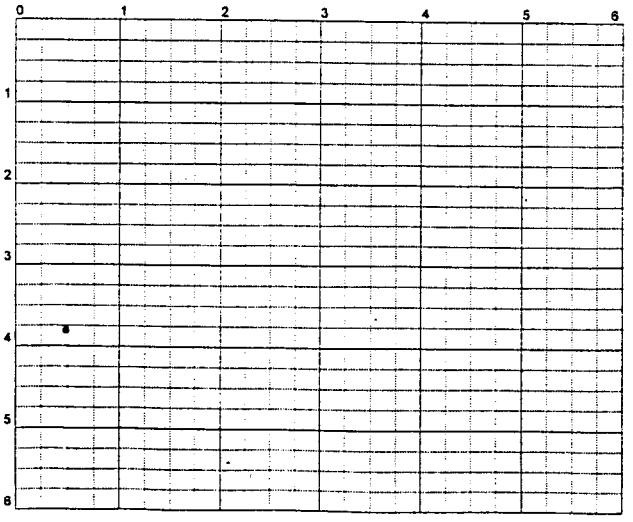
LILY INVENTORY

QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	11.5	110	51		1F	
	11.5	145	53		1F	
	10	155	51		2B	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	comp weight	COV	AVG HT	NOTES
	50		60			
	40		60			
	40		40			

Notes:



total plants = 3

LIOC LIFE HISTORY PLOT DATASHEET

SITE: CC Marsh DATE: 7/13 BY: KW/AC PLOT # 19

PLOT LOCATION: COORDS- X ____ Y ____ CORNER ____ LASER: DIST ____ AZ ____ (TO) PT ____ | DIST ____ AZ ____ (TO) PT ____

VEG TRTMENT CATEGORY ____

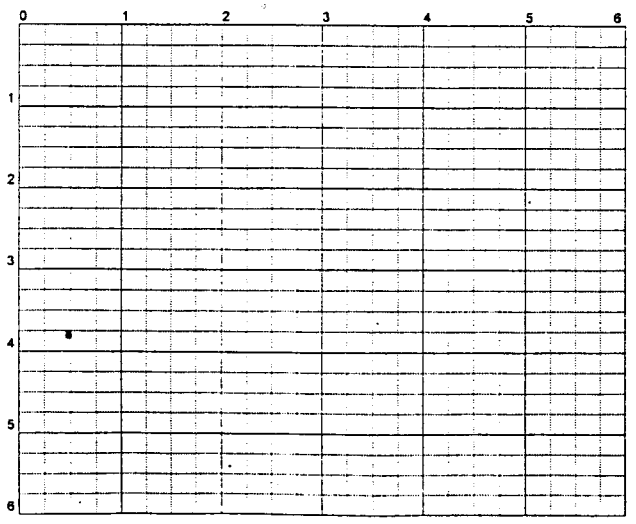
LILY INVENTORY

QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	2	250	36		1B	
	3	250	36		1B	
	7	60	36		1B	
	5	30	54		2F	
	8.5	340	42		1B	
	7	345	42		2B	
	5.5	360	36		1B	
	7	290	42		2B	
	13	280	54		1B	
	11	150	36		1B	
	11	150	42		1F	
	11	170	36		1B	
	11	180	37		1B	
	10.5	185	42		1B	
	5	175	36		1B	
	15	180	43		1B	
	13.5	180	48		2B	
	13.5	170	39		1B	
	6.5	130	42		2B	
	11.5	210	33		2B	
	11.5	220	50		2B	
	10	220	42		2B	

VEGETATION

VEG TYPE	OVRHD CAN%	SPECIES	comp. ht	COV	AVG HT	NOTES
	5		40			
			40			
	30					
	10					
	10					
	25					
	25					
	25					
	10					
	25					
	25					
	25					
	25					
	25					
	25					

Notes:



total plants = 22

LIOC LIFE HISTORY PLOT DATASHEET

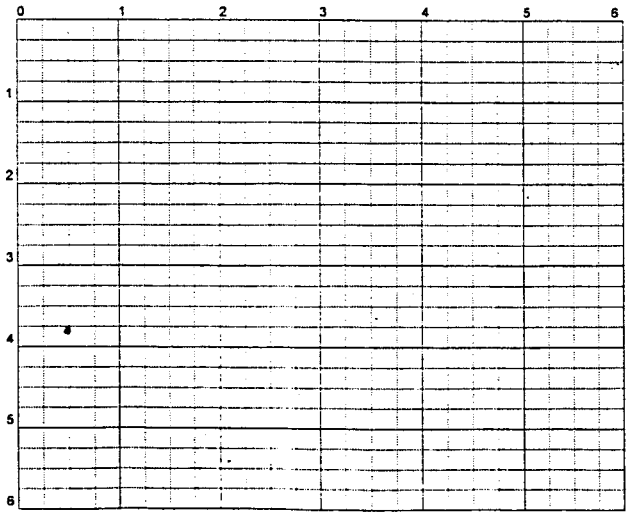
SITE: CC Marsh DATE: 7/15/02 BY: KW/AC PLOT # 20

PLOT LOCATION: COORDS- X Y CORNER LASER DIST AZ (TO) PT DIST AZ (TO) PT VEG TRTMENT CATEGORY

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	7	340	55		F	
	13.5	330	44		IF	
	13.5	330	48		IB	
	9	320	50		2B	
	15	205	47		IB	
	8	195	42		IB	
	8	50	42		IB	
	9	50	42		IB	
	11	55	49		2B	
	11.5	20	49		IB	
	11.5	20	47		IB	

VEGETATION VEG TYPE	OVRHD CAN%	SPECIES	Comp. ht.	AVG COV	AVG HT	NOTES
	40		72			
	30		60			
	30		60			
	40		50			
	30		60			
	30		42			
	30		42			
	30		42			
	30		42			
	40		72			
	40		72			

Notes:



total plants = 11

LIOC LIFE HISTORY PLOT DATASHEET

SITE: CL Marsh DATE: 7/15 BY: KW/AC PLOT # 21

PLOT LOCATION: COORDS- X Y CORNER LASER: DIST AZ (TO) PT DIST AZ (TO) PT

VEG TRTMENT CATEGORY

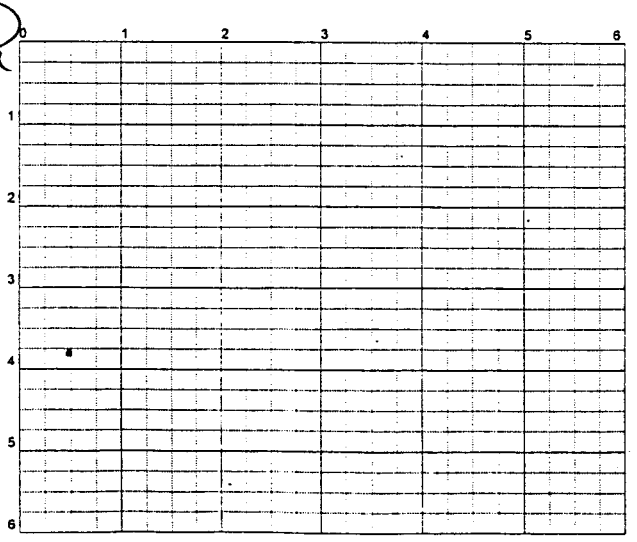
LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM PLT CRN X( )	Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	8	200	42		1F	
	14	280	42		1F	
	11.5	295	42		1B	
	11.5	340	39		1B	
	11.5	340	48		2B	
	14	350	48		1B	
	10.5	30	40		1F	
	15	45	30		1B	
	10.5	45	36		1B	

VEGETATION VEG TYPE	OVRHD CAN%	SPECIES	Comp-ht.	COV	AVG HT	NOTES
	20		42			
	15		42			
	20		48			
	25		40			
	25		40			
	30		60			sickly - also has one deformed flower
	20		40			
	25		40			
	10		40			

Boykinia

Notes:

Possible Heuchera (?) ~10 ft N of Plot ctr.



total plants = 9

LIOC LIFE HISTORY PLOT DATASHEET

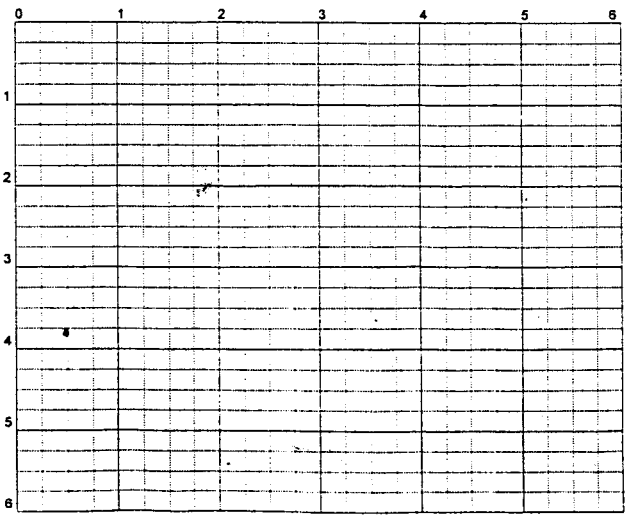
SITE: S Marble CC DATE: 7-13-02 BY: Rentz PLOT # 22

PLOT LOCATION: COORDS- X ____ Y ____ CORNER ____ LASER: DIST ____ AZ ____ (TO) PT ____ DIST ____ AZ ____ (TO) PT ____ VEG TRTMENT CATEGORY ____

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM X (Dist)	FT FROM Y (Az)	PLT CRN HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
	2.5	195	37		3B	
	3.0	195	29		1B	
	3.0	235	36		2B	
	7.0	235	30		1F1	
	4.0	55	42		1F1	
	8.0	30	40		1F1	
	9.0	25	42		1B	
	14.0	35	43		1F1	
	14.0	25	43		1B	
	15.0	20	19		1L1	
	15.0	0	36		1F1	
	15	230	3		1F1	
	15	215	41		1B	
	15	200	30		1B	
	14.5	265	30		1F1	
	13	260	39		1B	
	13	260	39		1B	
	13	240	43		1F1	
	13.5	245	36		2B	
	13	240	40		1B	
	10	195	33		1B	
	10	195	24		1B	
	11	150	54		1F1	
	13.5	140	37		1B	
	14	130	40		1F1	
	15	95	39		1B	

VEGETATION VEG TYPE	OVRHD CAN%	~~SPECIES~~ Competing Veg Ht"	AVG COV	AVG HT	NOTES
	0	24			
	"	"			
	"	"			
	"	"			
	0	36			
	0	30			
	0	30			
	3	36			
	3	36			
		36			
	5	24			
	3	24			
	3	36			
	3	36			
		30			
		30			
		30			
		30			
		27			
	"	21			
	"	18			
	"	42			
	"	30			
	25	46			
	15	30			

Notes:



total # plants = 26

SITE: CC Marsh

LIOC LIFE HISTORY PLOT DATASHEET

DATE: 7/15/02 BY: RW/AC

PLOT #: 23

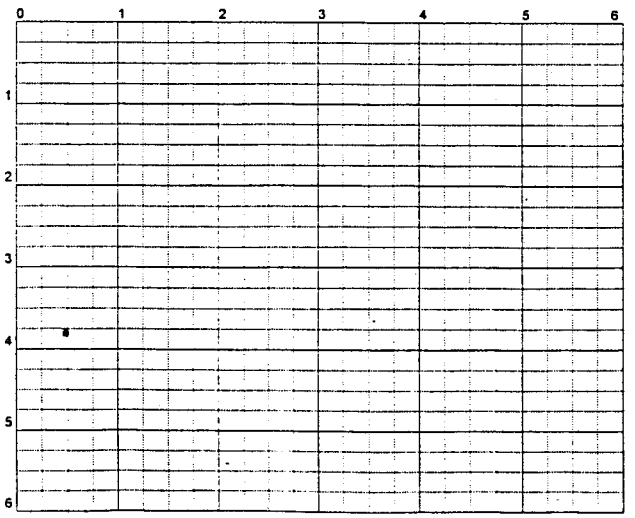
PLOT LOCATION:

COORDS- X Y ____ CORNER ____ LASER DIST AZ (TO) PT DIST AZ (TO) PT

VEG TRTMENT CATEGORY ____

LILY INVENTORY							VEGETATION					
QUADRANT OF 6X6 PLOT	FT FROM X( )	PLT CRN Y( )	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS	VEG TYPE	OVRHD CAN%	SPECIES	Comp. ht.	COV	AVG HT NOTES
1	5	220	48		1B			20		48		
2	8	140	52		2B			20		40		
3	8	90	48		2F			30		50		
4	8	215	30		1F			40		48		

Notes:



total # plants = 4

SITE: CC Marsh

LIOC LIFE HISTORY PLOT DATASHEET

DATE: 7/15/02 BY: KW/AC

PLOT # 24

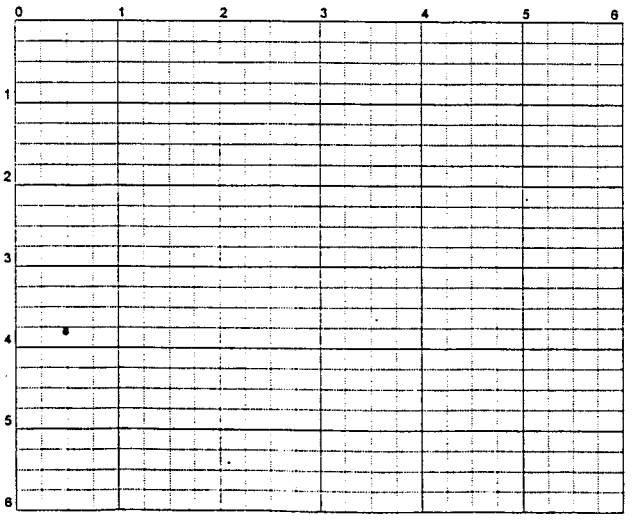
PLOT LOCATION: COORDS- X Y CORNER LASER DIST AZ (TO) PT DIST AZ (TO) PT

VEG TRTMENT CATEGORY

LILY INVENTORY QUADRANT OF 6X6 PLOT	FT FROM X( ) Y( ) PLT CRN	HGT (")	SDLG #LVES	FLR #/PH	GRZD/ DISEAS
No flowering plants					

VEGETATION VEG TYPE	OVRHD CAN%	SPECIES	AVG COV	AVG HT	NOTES

Notes:



plants = 0

CCMWA LIFE HISTORY PLOT

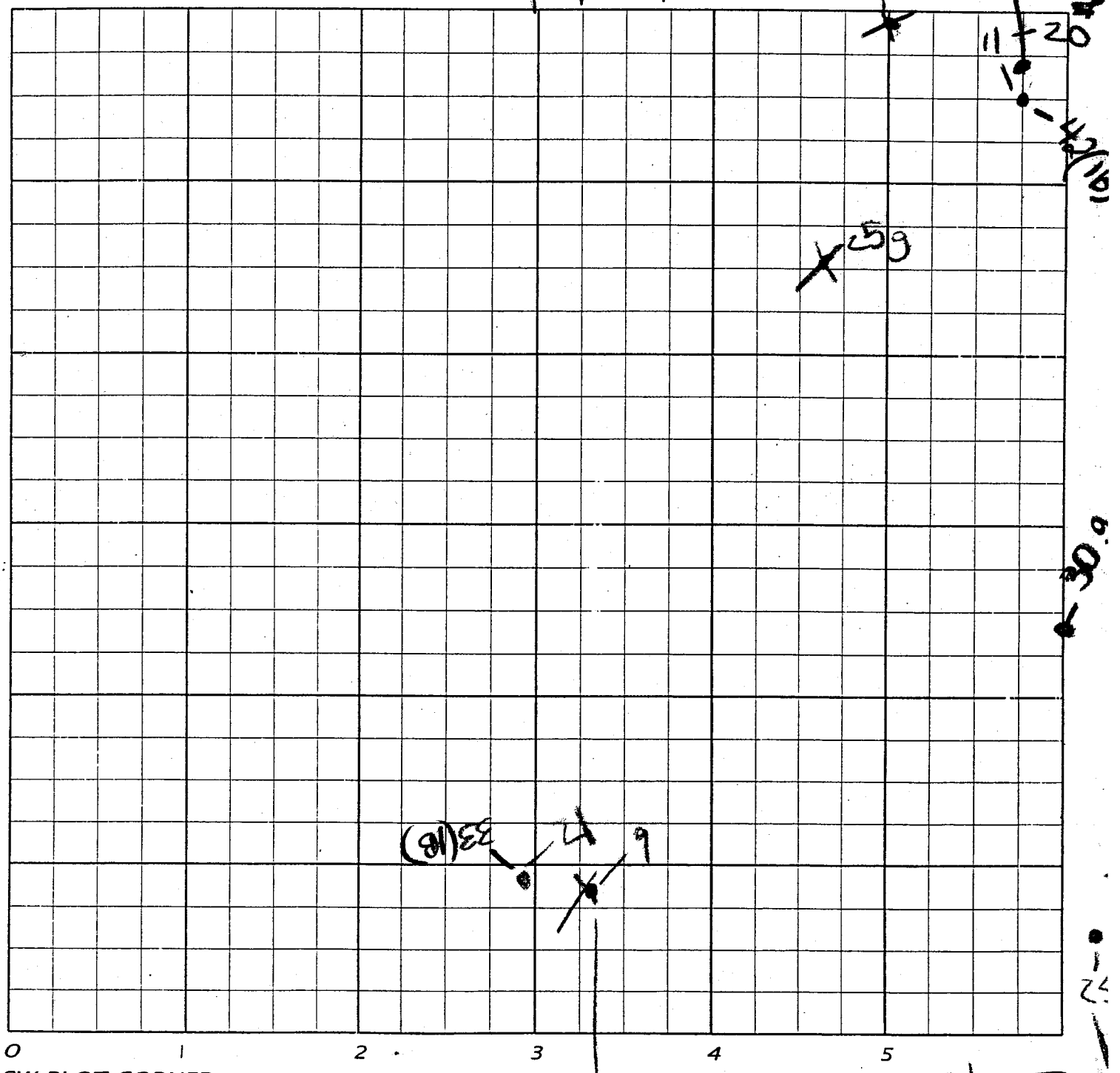
PLOT# 1

SAMPLER Ku

DATE AND KEY:

4-17 — 6/8/02 MS

JK 5-11 — purple = 7/13



SW PLOT CORNER

NOTES:

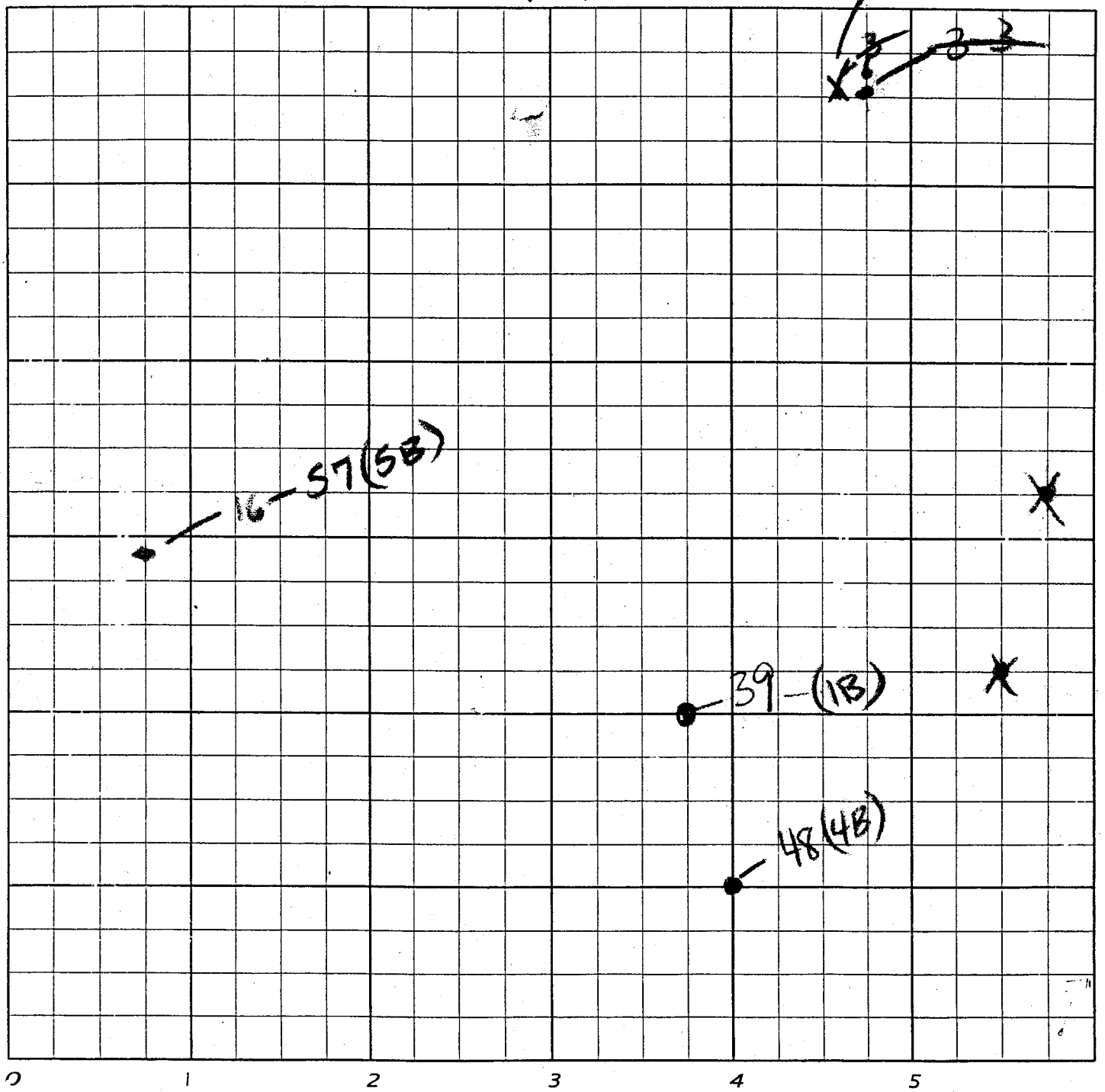
CCMWA LIFE HISTORY PLOT

PLOT# 2

SAMPLER Jen

DATE AND KEY: 4-17-02 6/clot MB _____ ignore

JK 5-11 purple = 7/13 _____



SW PLOT CORNER

NOTES:

PLOTP

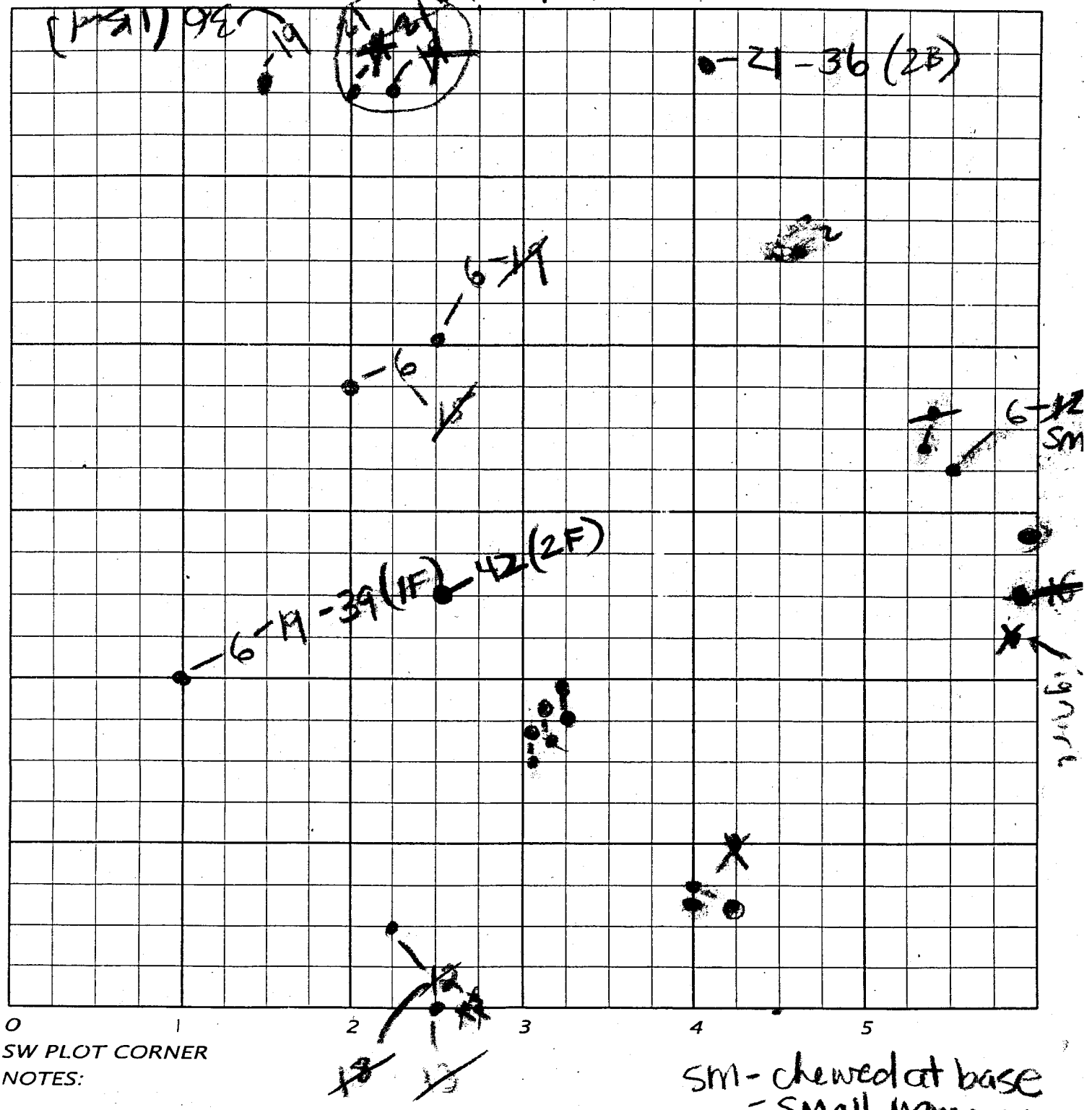
CCMWA LIFE HISTORY PLOT

PLOT# 3

SAMPLER KW

DATE AND KEY: 4/17 Ø 6/8/02 MB

JK 5-11 7/13/02 MB AC



SW PLOT CORNER

NOTES:

SM - chewed at base - small mammal

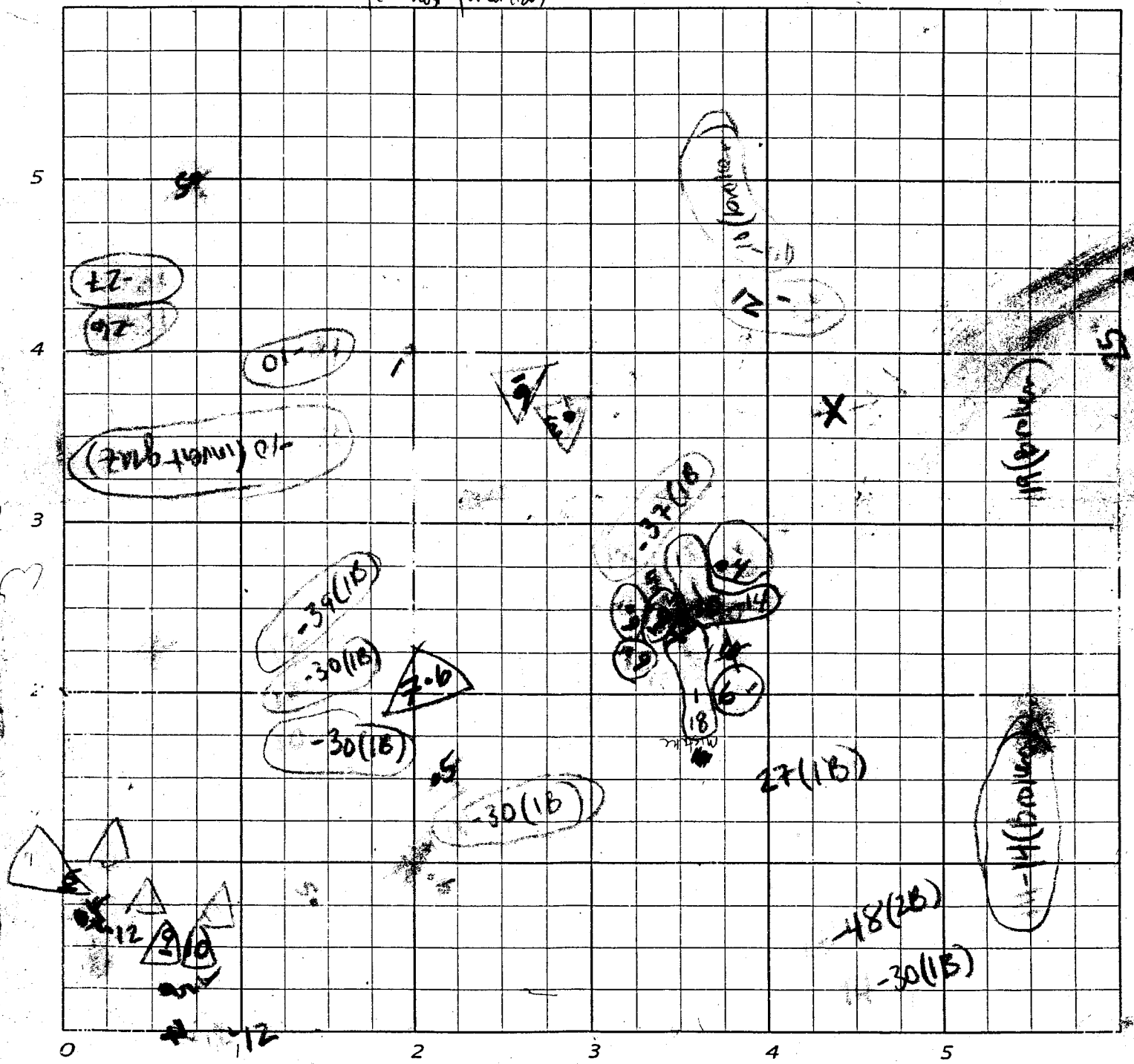
CCMWA LIFE HISTORY PLOT

SAMPLER Bevell

PLOT# 4

DATE AND KEY:

4-17-02	5-11-02	7-13-02
(# plants OR seedlings seen) plot mostly under H2O		



SW PLOT CORNER

NOTES:

• = seedlings w/ height

YES MISED A

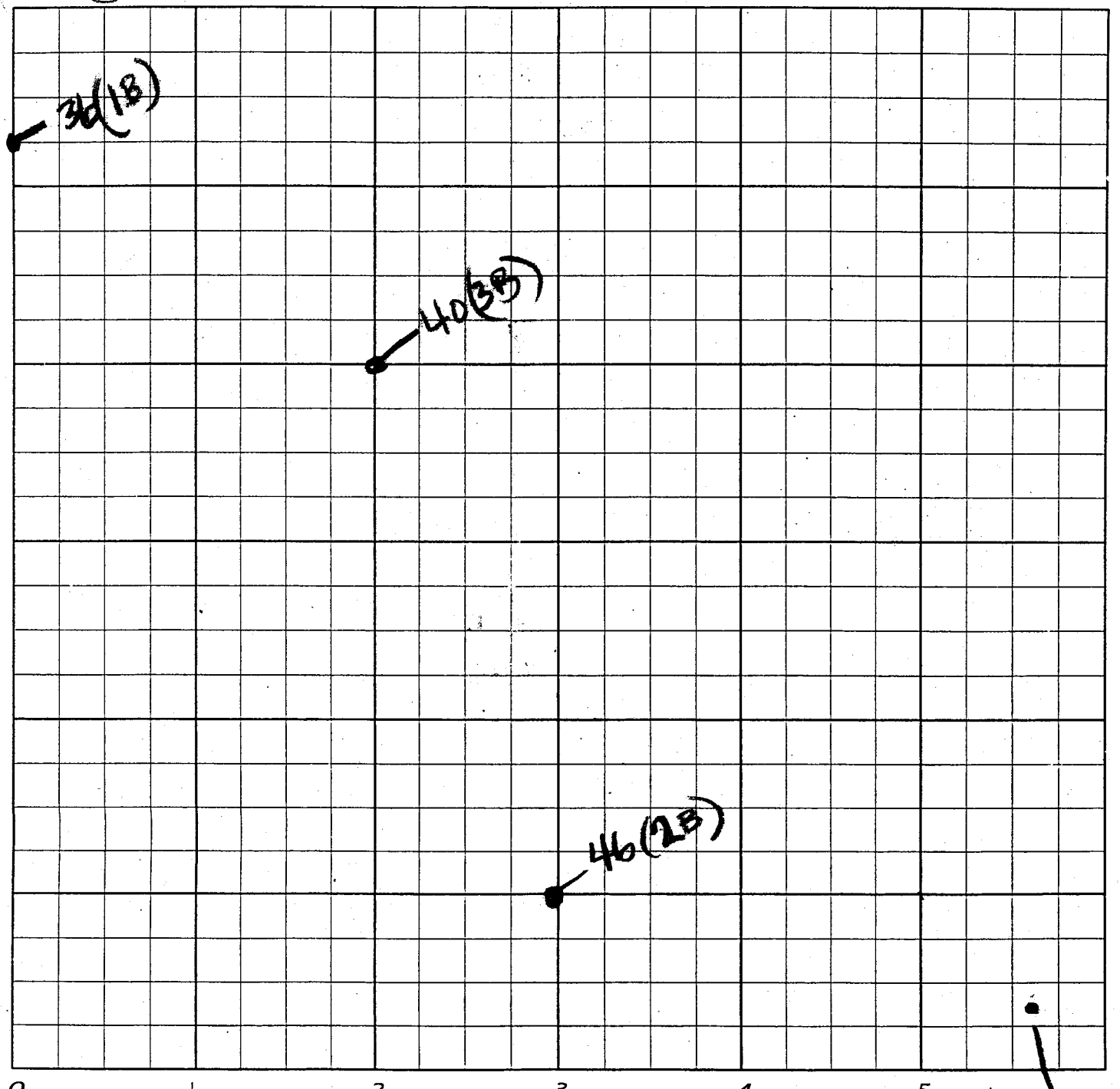
CCMWA LIFE HISTORY PLOT

PLOT# 5

SAMPLER KW

DATE AND KEY:

	4/17	6/1/02 MB	
(2B) JK	5-11	7/12/02	



SW PLOT CORNER

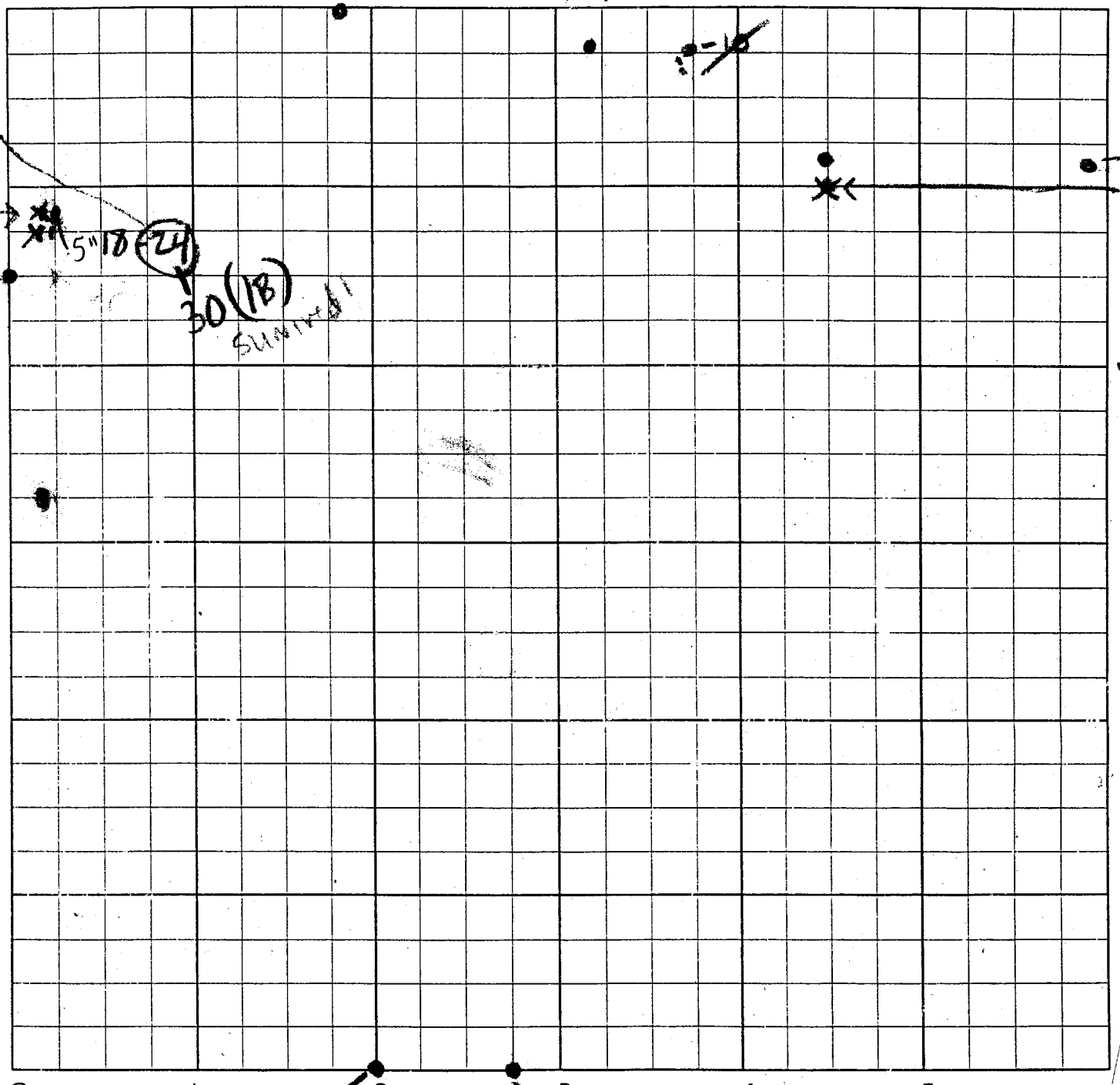
NOTES:

CCMWA LIFE HISTORY PLOT

PLOT# 6

SAMPLER JK

DATE AND KEY: 4-17-02 JK S 11 — 6/8/02 MB — 7/-/02 AC KW



continue brook off during survey

SW PLOT CORNER

NOTES:

reading present - still just single leaf

2 Lothyrus w/ 2 leaflets thus 1/4

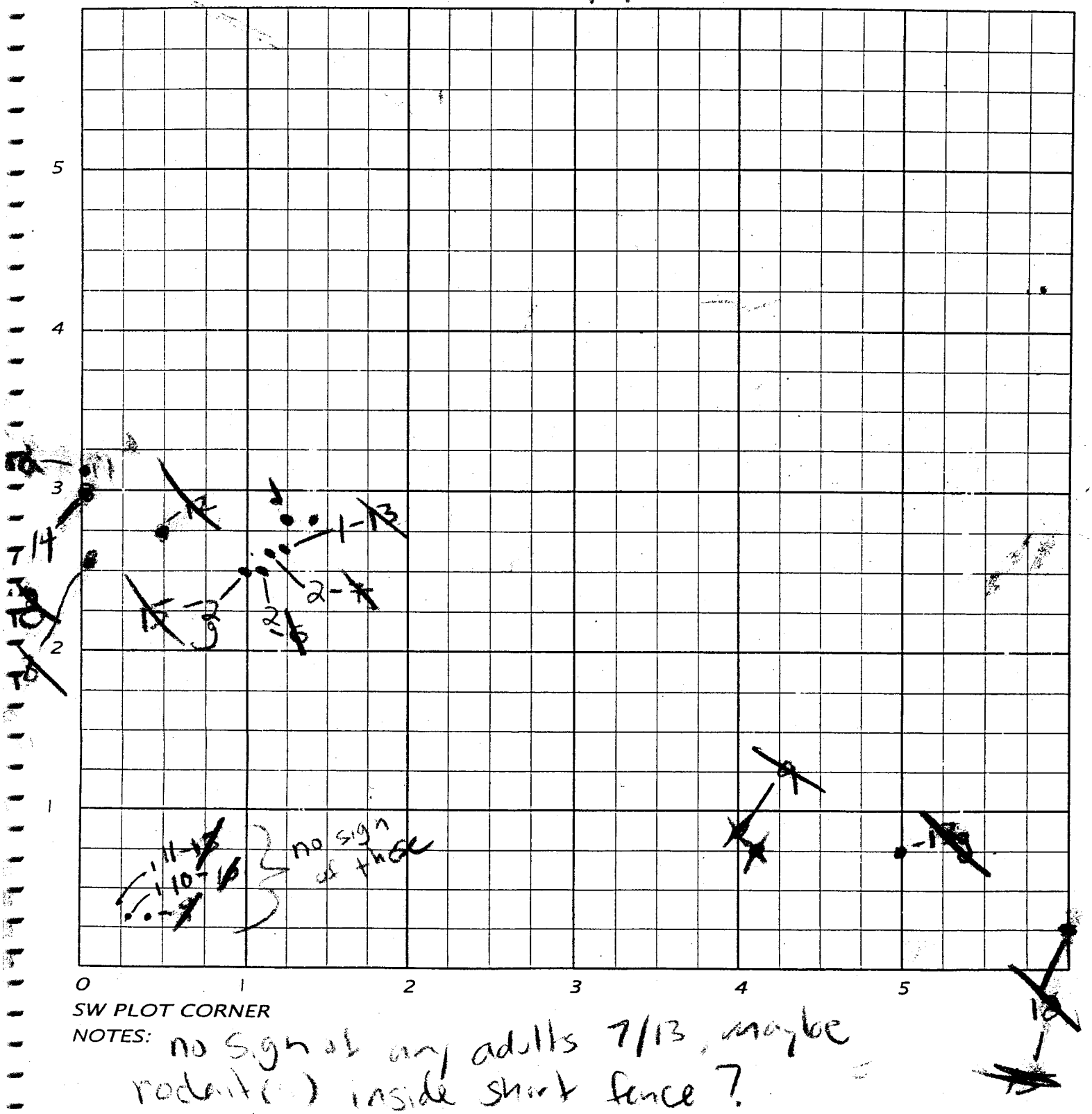
CCMWA LIFE HISTORY PLOT

PLOT# 7

SAMPLER DRI

DATE AND KEY:

	4-17-02	[illegible] MB	
JK	5-11	7/1-/02	



SW PLOT CORNER

NOTES: no sign of any adults 7/13, maybe rodent(s) inside short fence?

CCMWA LIFE HISTORY PLOT PLOT#_8_

SAMPLER_KW_

DATE AND KEY: 4/17 Ø 6-8-02 MB

JK 5-11 7/12/02

planted shrub seedling + rag 2

gone

23-30-1A

12-45(RB)

5

4

3

2

1

0 1 2 3 4 5

SW PLOT CORNER

NOTES:

Fence!

1A = aborted bud

CCMWA LIFE HISTORY PLOT

SAMPLER Bernie

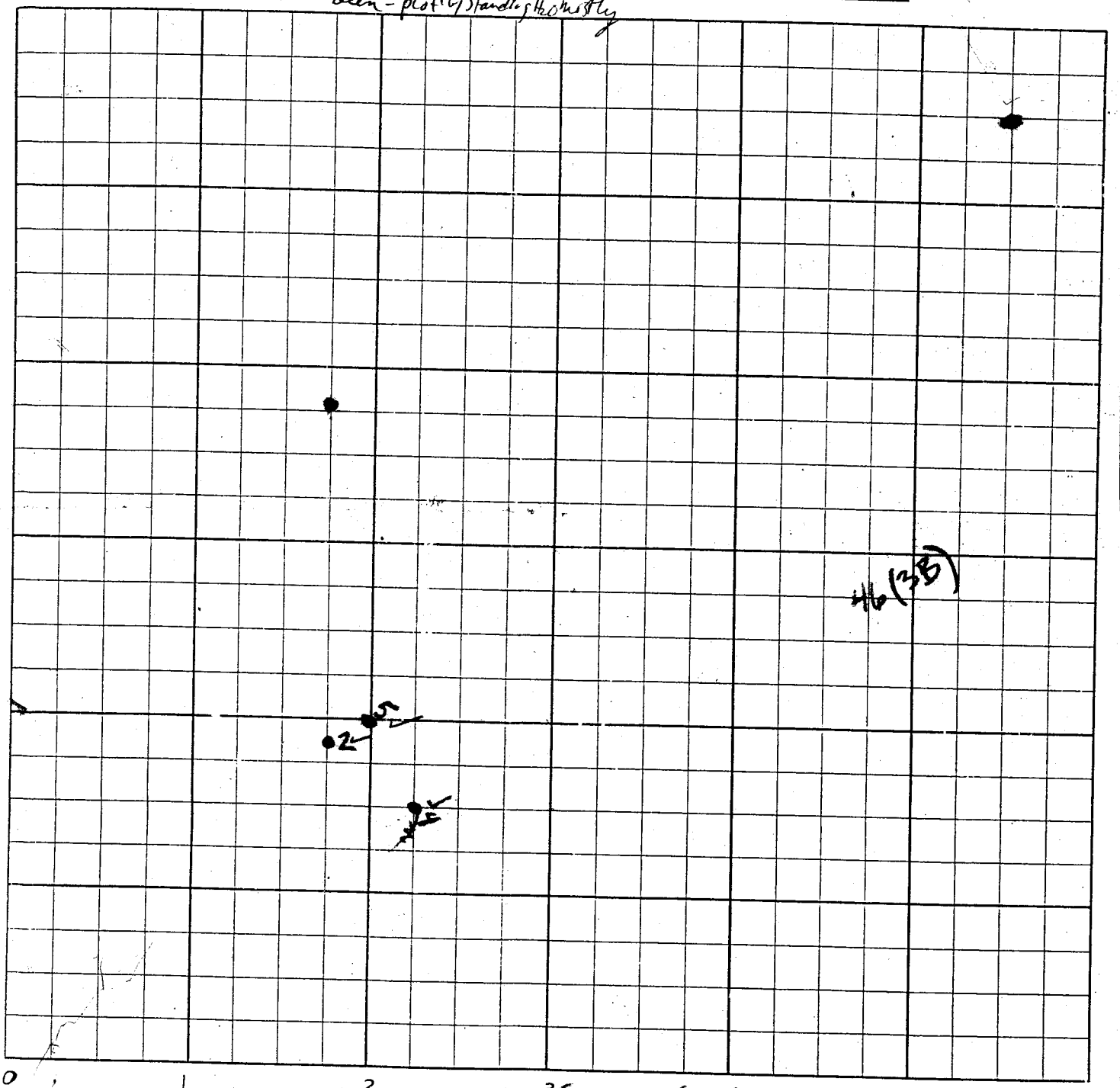
PLOT# 9

DATE AND KEY:

~~KEY~~

4-17-02 5-11-02 7-13-02

↳ No plants/seedlings seen - plot w/ standing shrubs



SW PLOT CORNER

NOTES:

B = Bud, FL = Flower

• = seedling

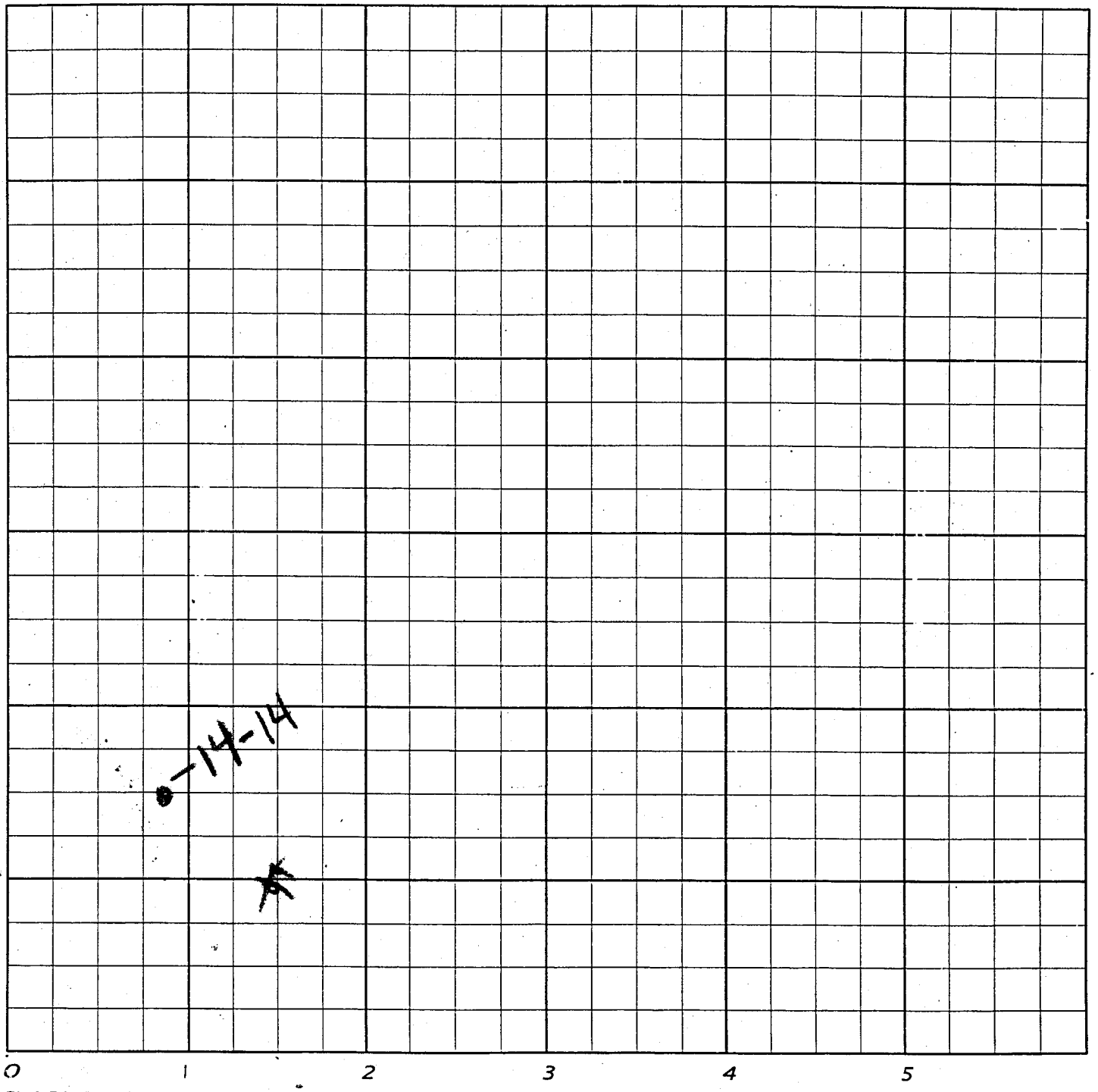
- Dots for seedlings
- Dots w/ measurement for adults

CCMWA LIFE HISTORY PLOT PLOT# 10

SAMPLER KW

DATE AND KEY:

	4/17 ← no plants	6/8/02 MB	
JK	5-11	7/13	



SW PLOT CORNER

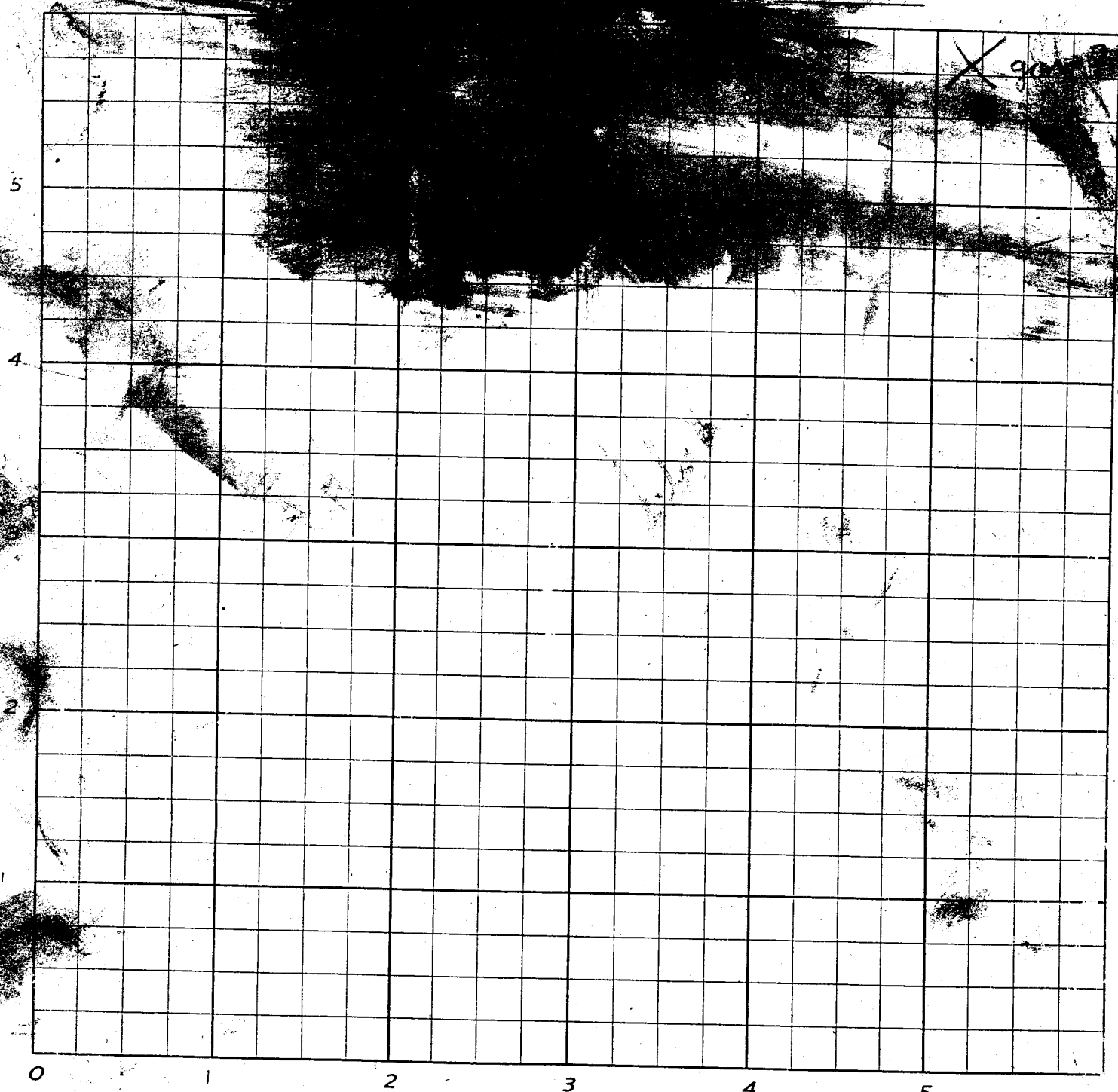
NOTES:

CCMWA LIFE HISTORY PLOT

SAMPLER KW

PLOT# 11

DATE AND KEY



SW PLOT CORNER

NOTES:

Good light on Northern ridge + slopes

CCMWA LIFE HISTORY PLOT

PLOT# 12

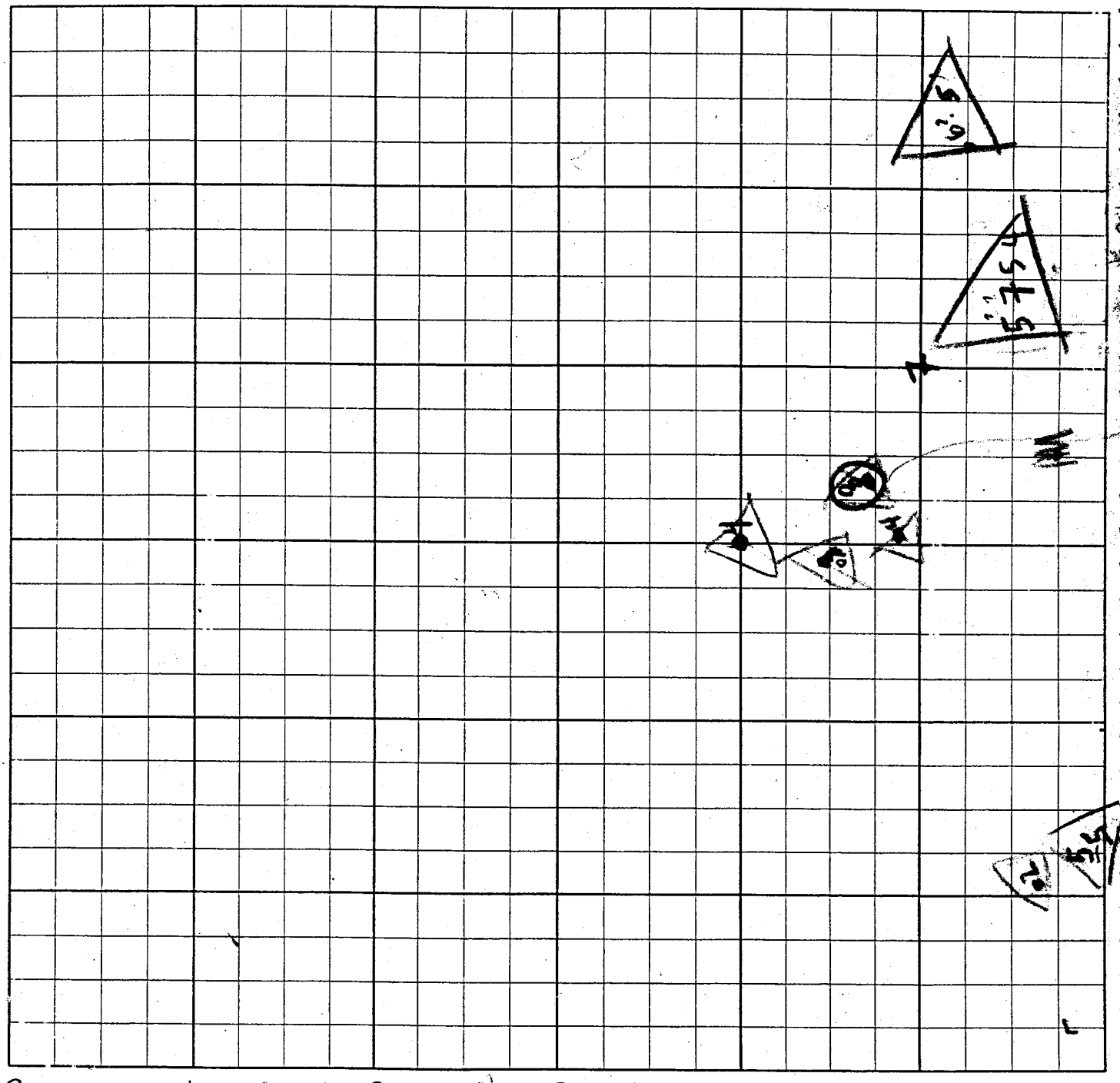
SAMPLER RB + DH

DATE AND KEY:

4-19-02

5-11-02

7-13-02



SW PLOT CORNER

NOTES: No Lilies in Plot Today
• : Seedlings
△ MISSED

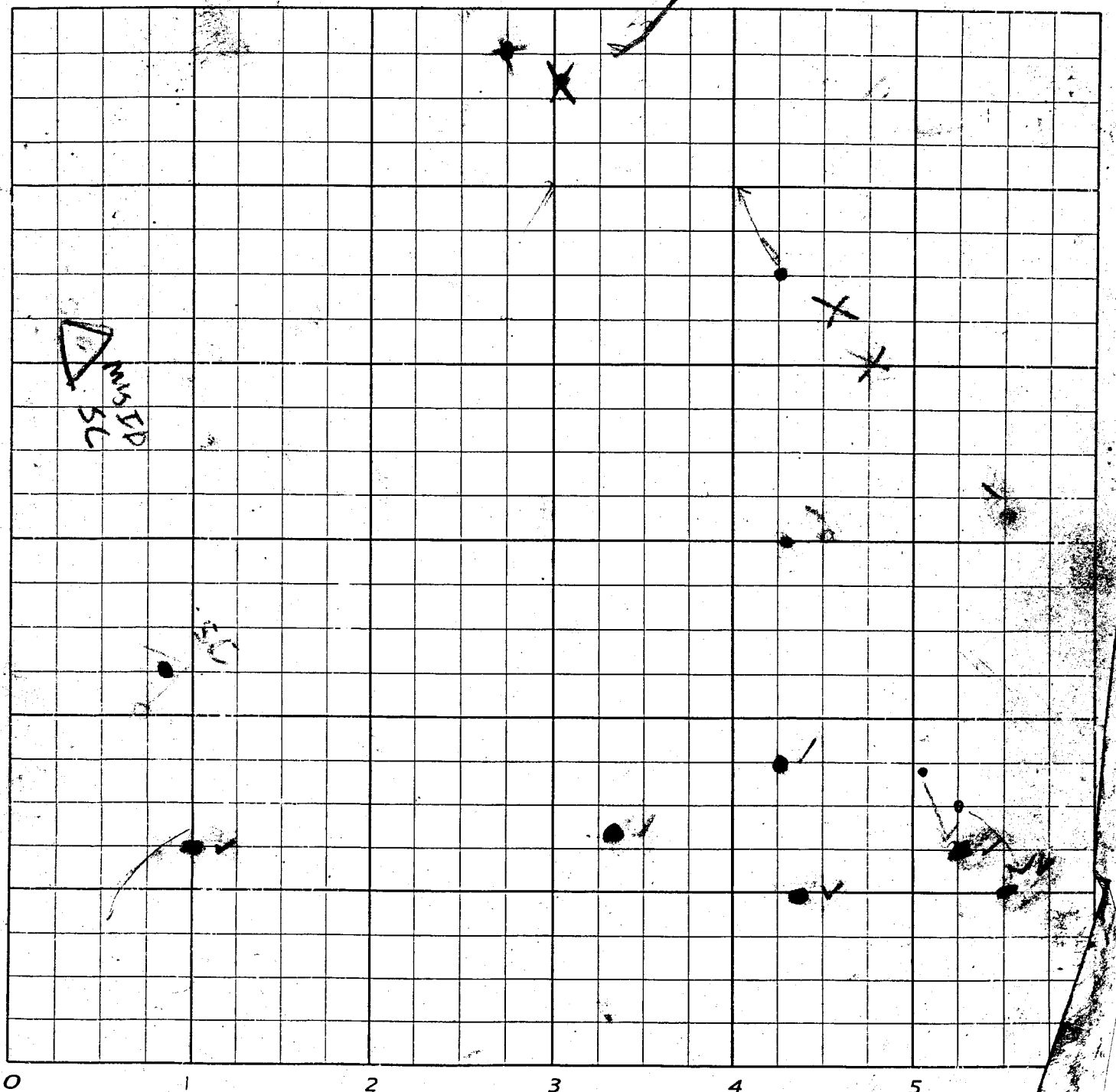
CCMWA LIFE HISTORY PLOT

PLOT # 13

SAMPLER DKI / KW

DATE AND KEY: 4-17-02

5-11-02 7-13-07



SW PLOT CORNER

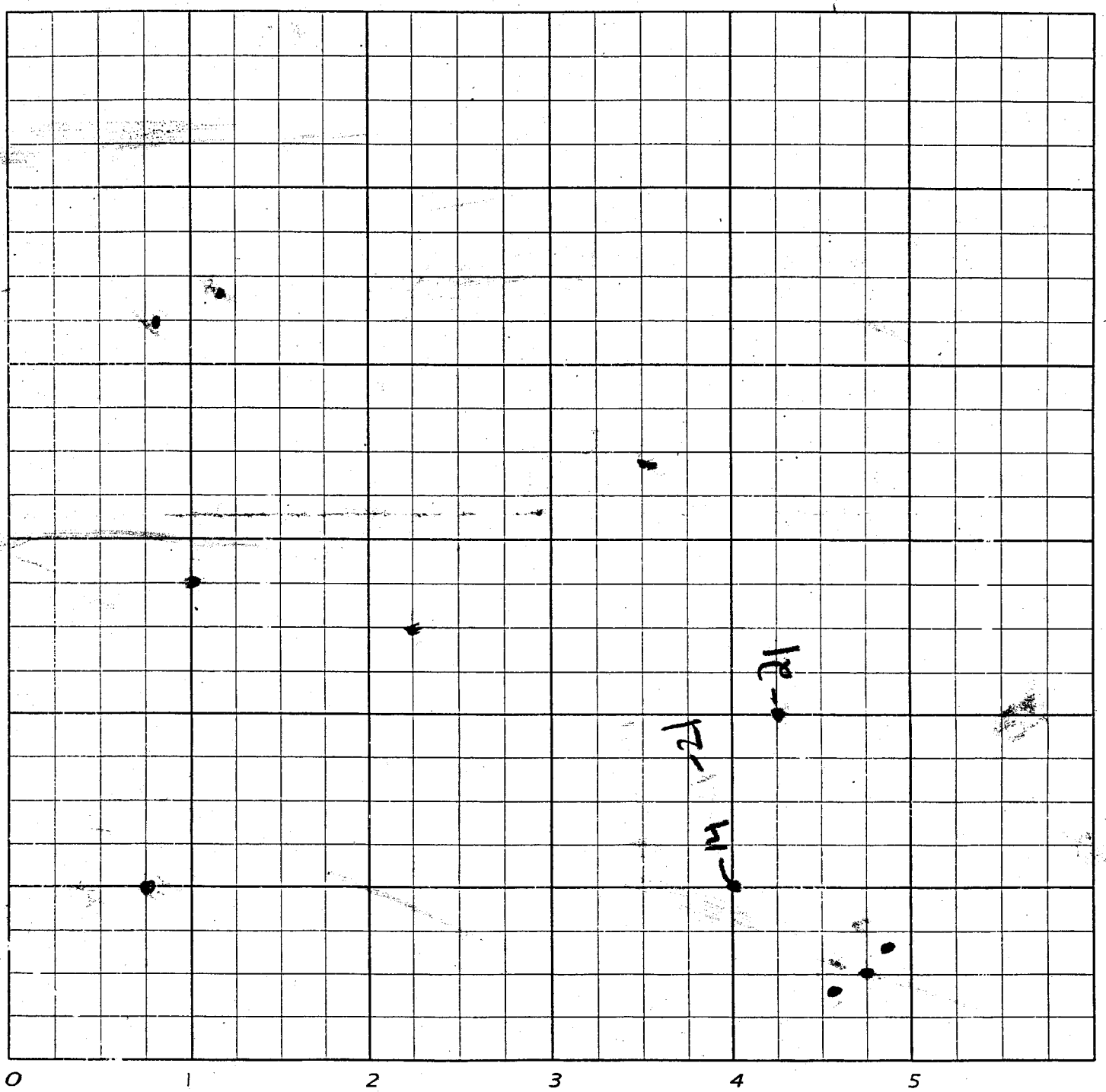
NOTES: good tight @ SW corner

CCMWA LIFE HISTORY PLOT

PLOT# 14

SAMPLER Jen + Ruben KW

DATE AND KEY: 4-17-02 | 5-11-02 | 7-15 | _____ | _____



SW PLOT CORNER

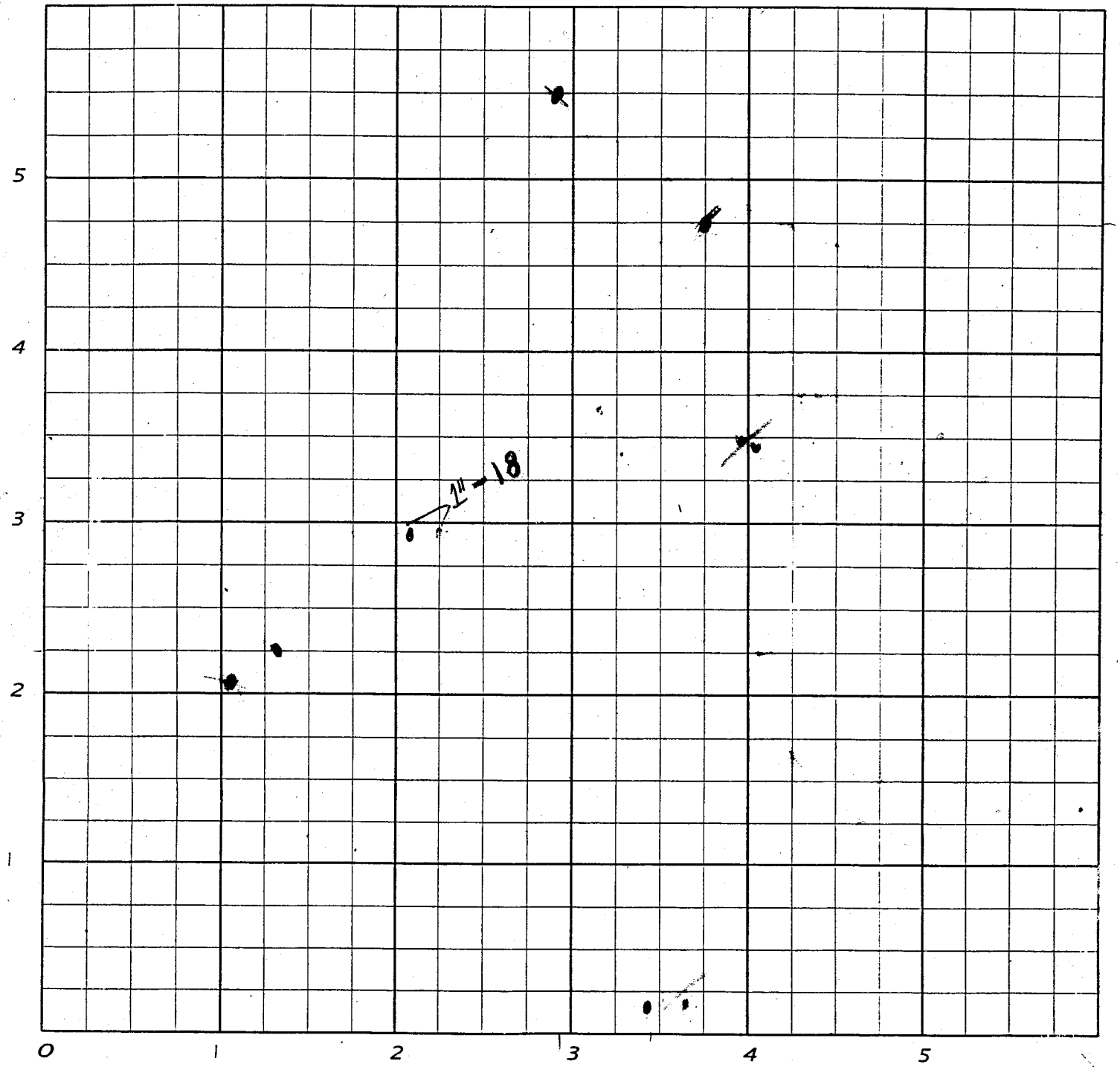
NOTES:

CCMWA LIFE HISTORY PLOT PLOT# 15

SAMPLER Jenx Robin KW

DATE AND KEY: 4-17-02 7-15

5-11-02



SW PLOT CORNER

NOTES:

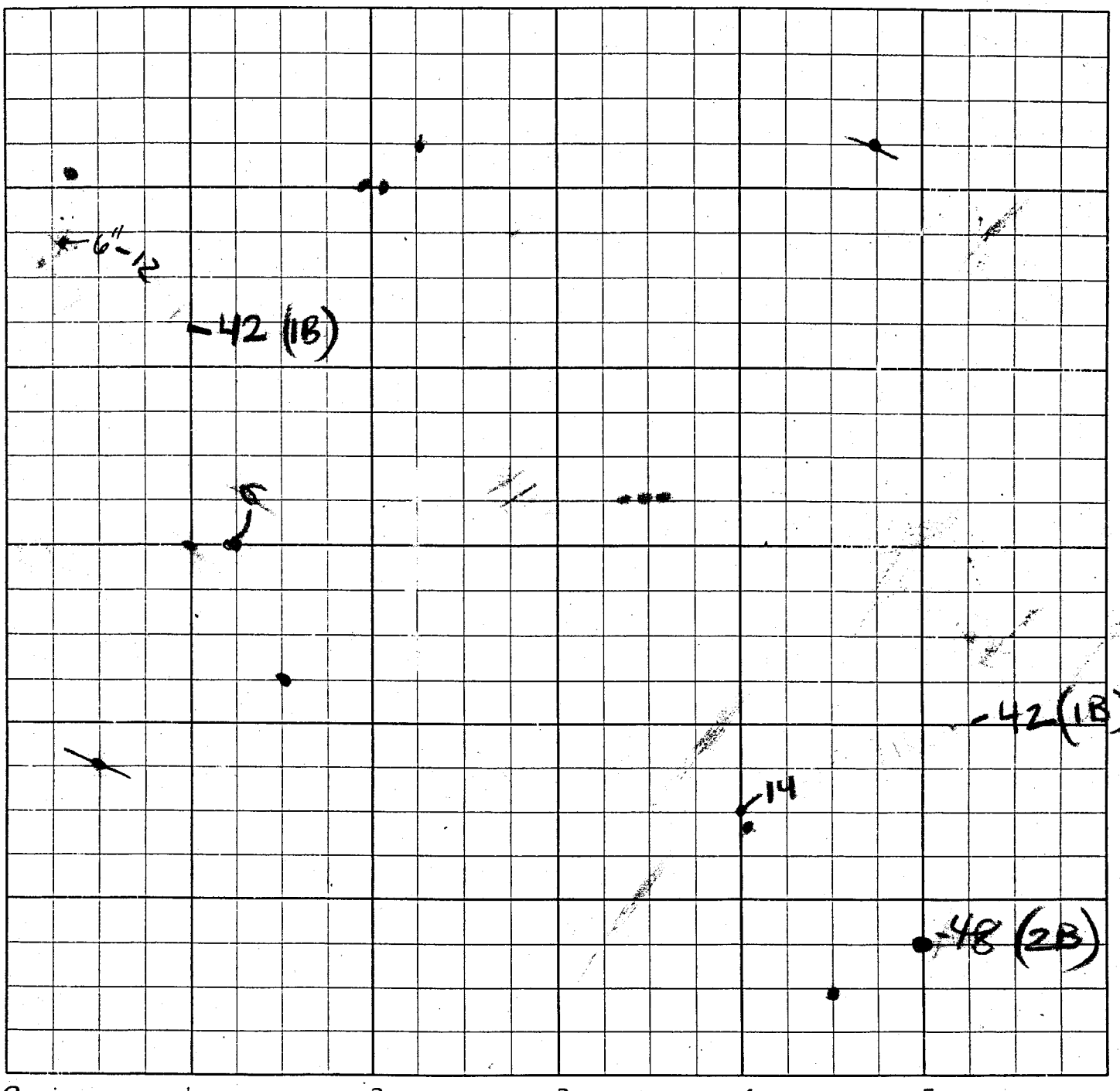
CCMWA LIFE HISTORY PLOT

PLOT# 16

SAMPLER KW/DKI

DATE AND KEY: 4-17-02

5-11-02 7-13



SW PLOT CORNER

coming out here

NOTES: 12" er has very skinny bones

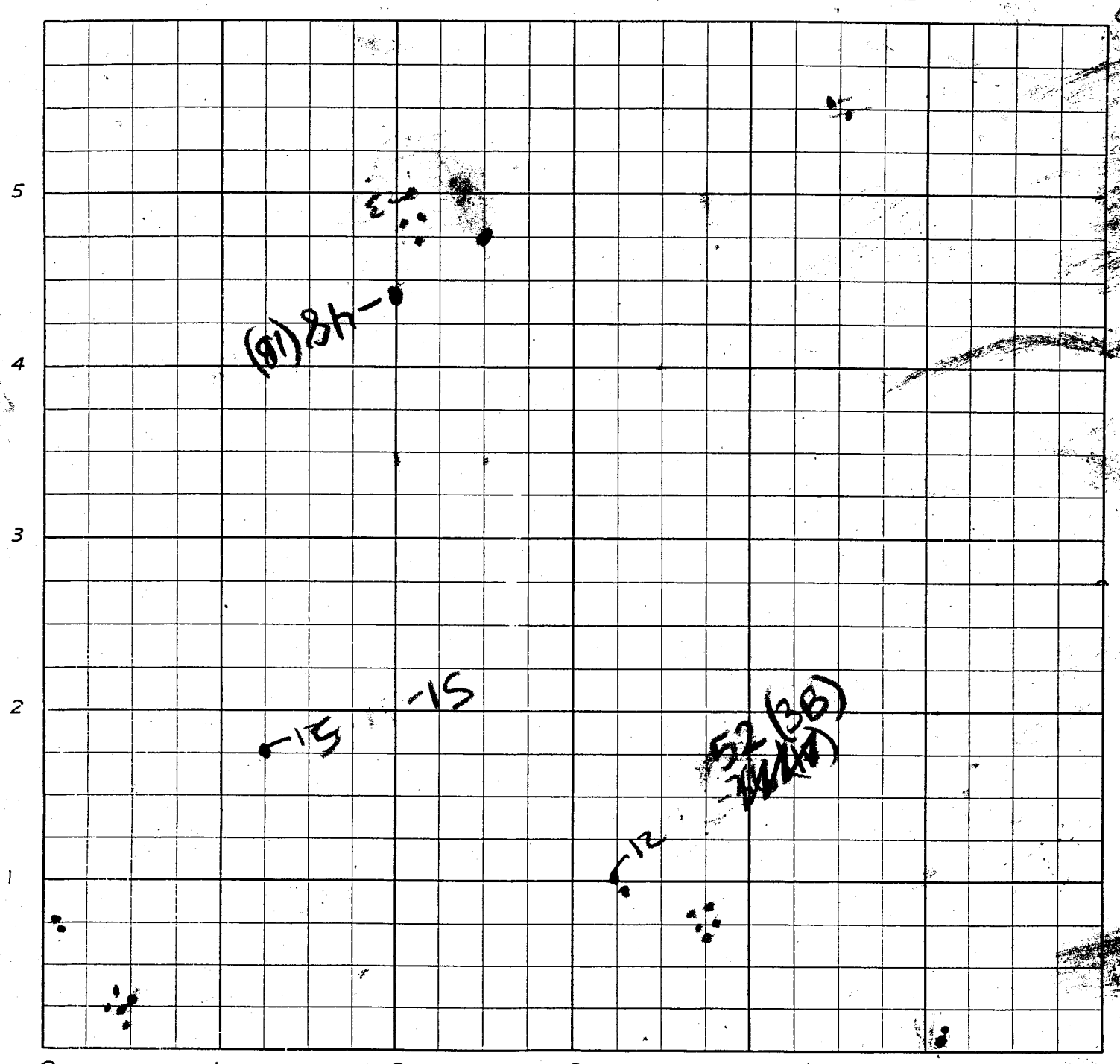
CCMWA LIFE HISTORY PLOT

PLOT# 17

SAMPLER KW DK

DATE AND KEY: 4-17-02

5-11-02 7-13-02



SW PLOT CORNER

NOTES: This plot is abt off in size

← (13) → several budscaling line

CCMWA LIFE HISTORY PLOT

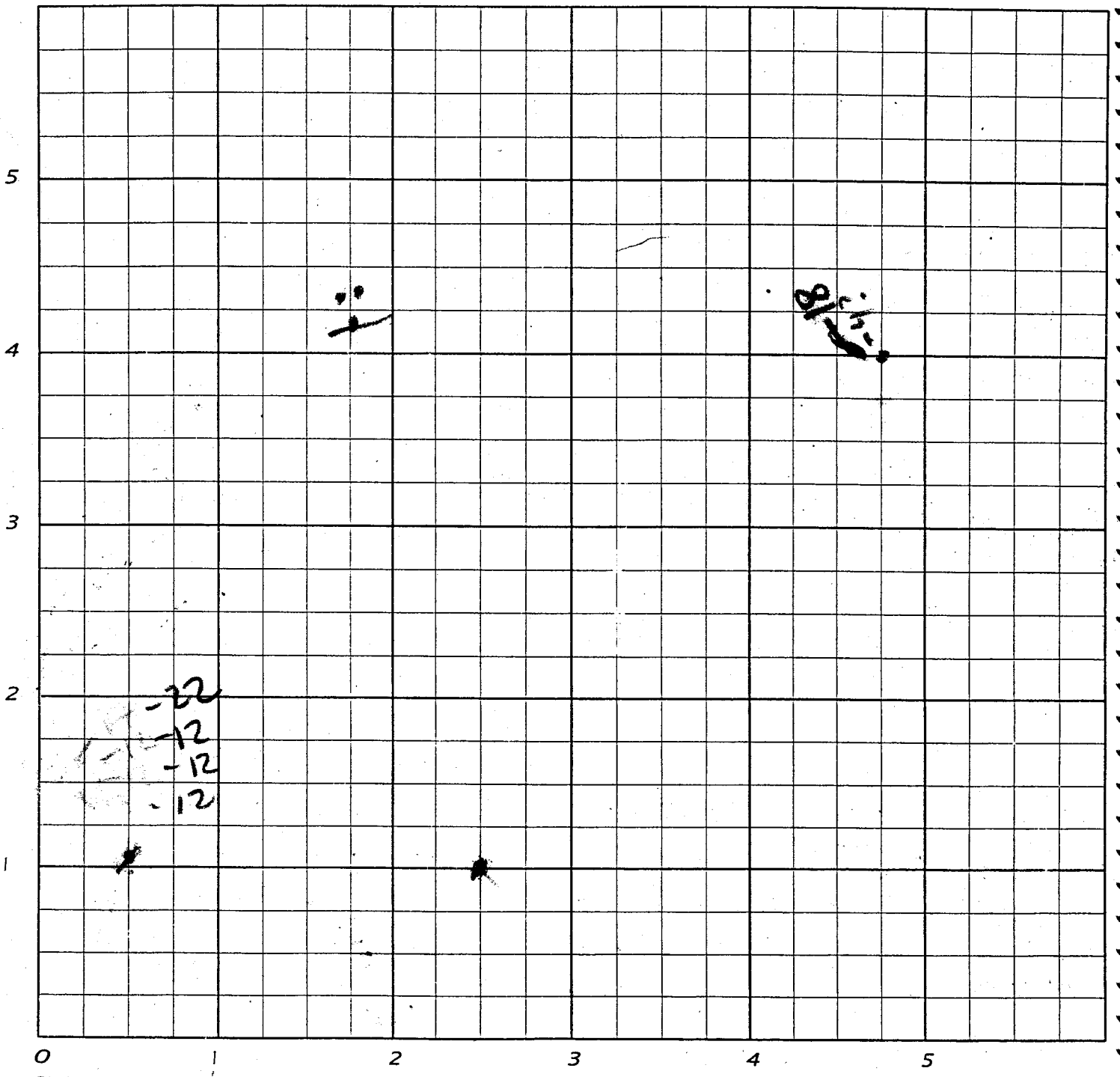
PLOT# 18

SAMPLER KWDK1

DATE AND KEY:

4-17-02 | | |

5-11-02 | 7-13 | |



SW PLOT CORNER

NOTES:

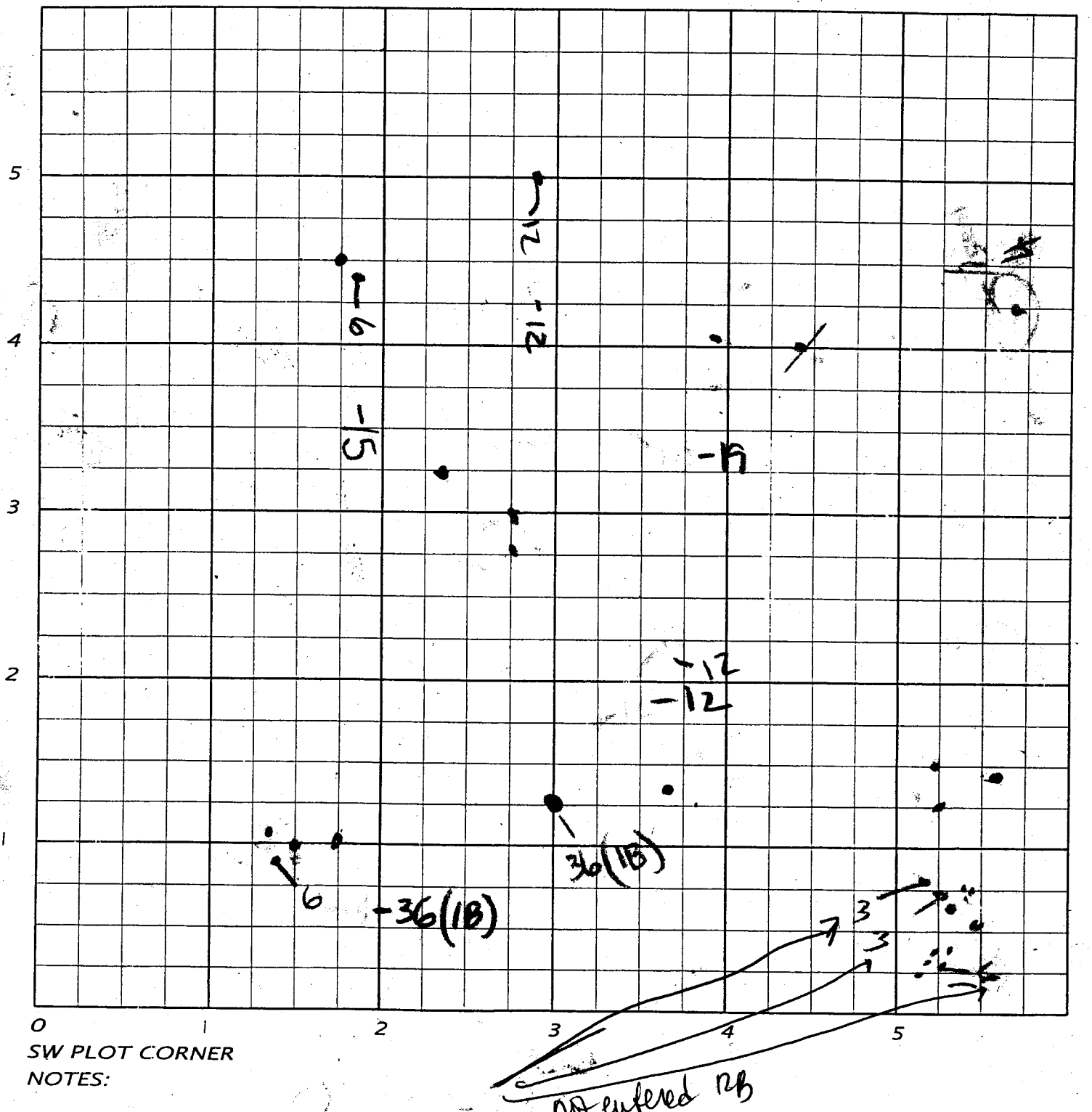
CCMWA LIFE HISTORY PLOT

PLOT# 19

SAMPLER KW DKL

DATE AND KEY: 1. 4-17-02

5-11-02 7-18



SW PLOT CORNER

NOTES:

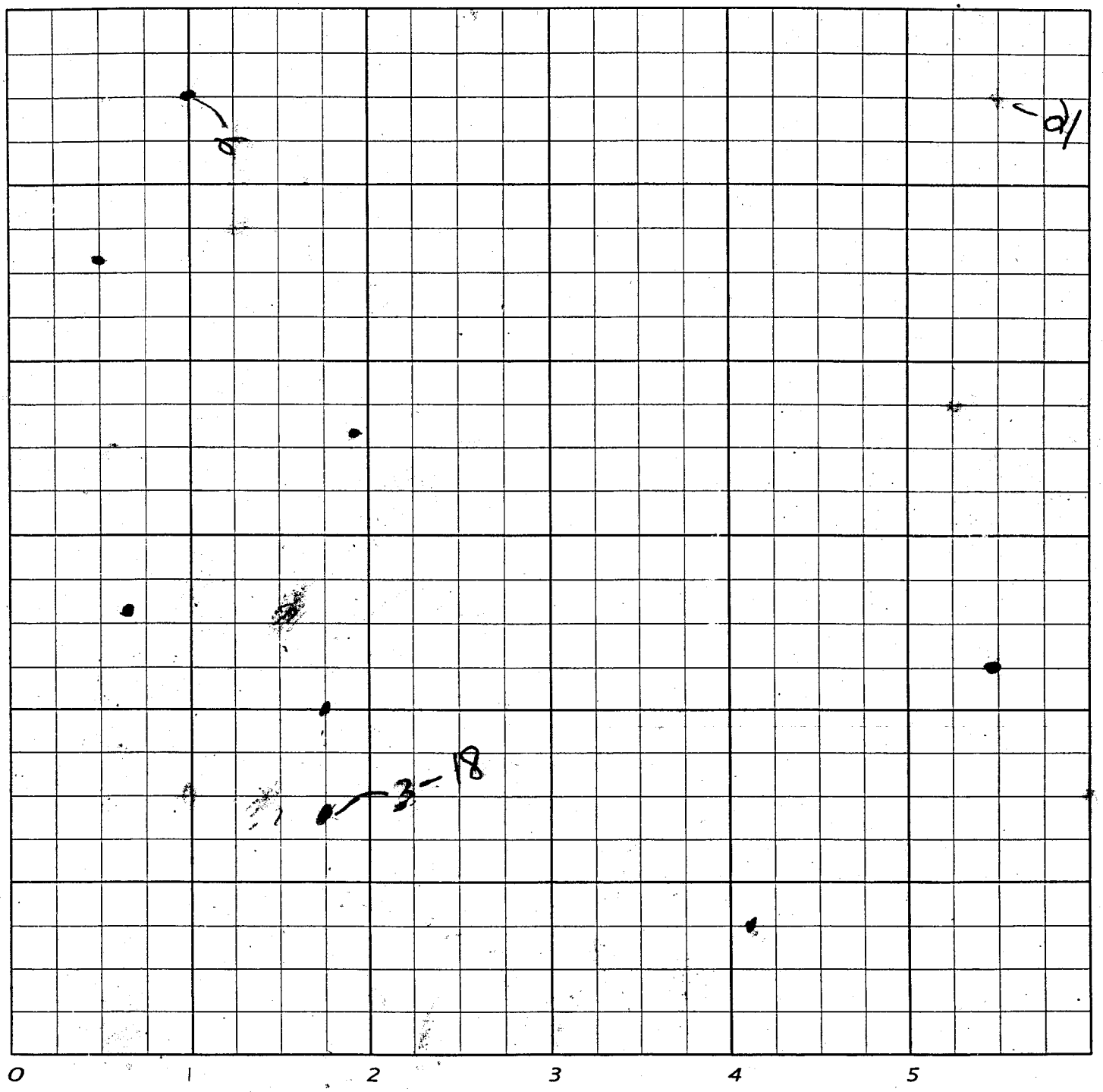
CCMWA LIFE HISTORY PLOT

PLOT# 20

SAMPLER KW DK

DATE AND KEY: 4-17-02 | | |

5-11-02 | 7-15 | |



SW PLOT CORNER

NOTES:

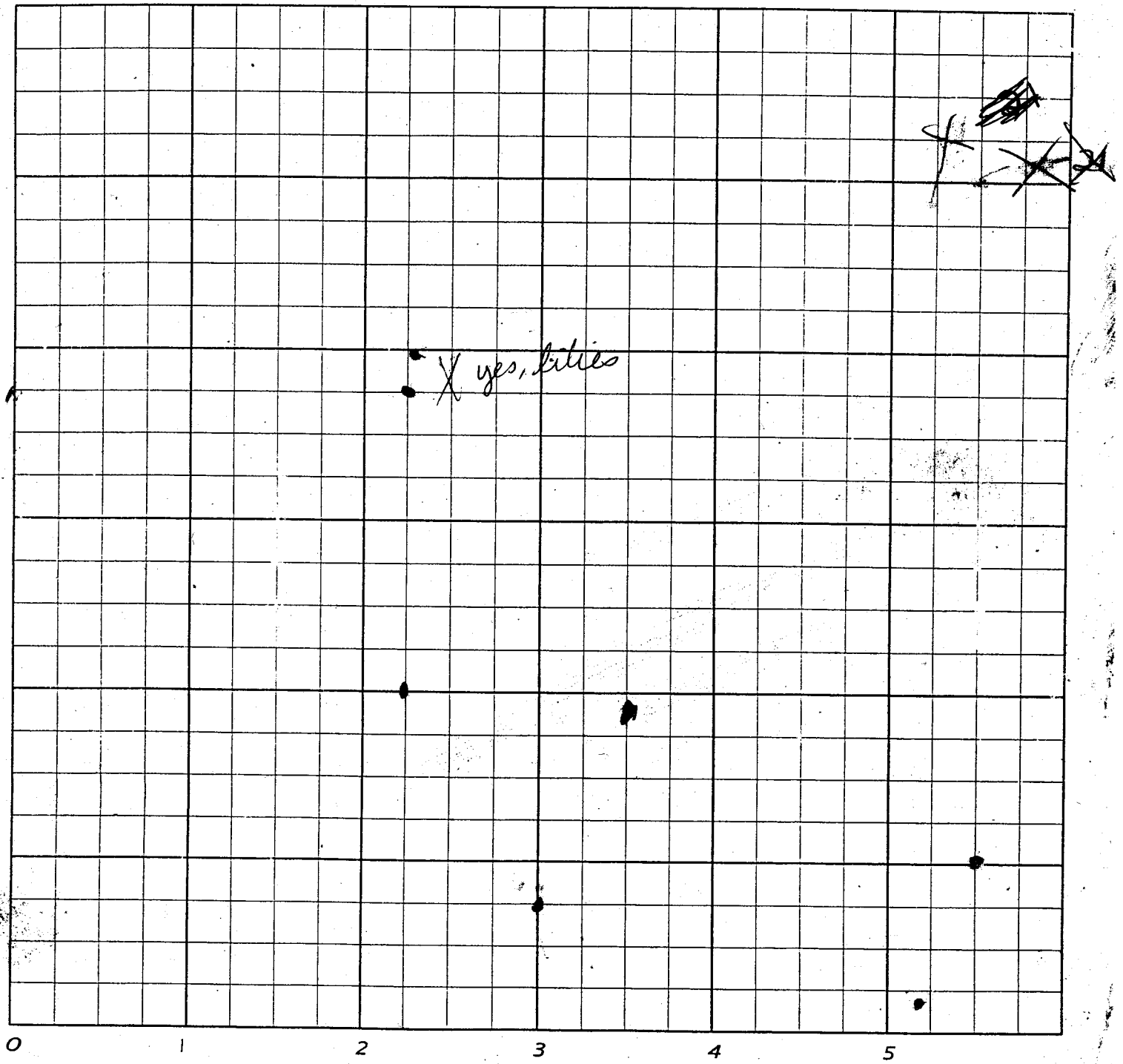
CCMWA LIFE HISTORY PLOT

PLOT# 21

SAMPLER DKL / KW

DATE AND KEY: 4-17-02

5-11-02 7-15



SW PLOT CORNER

NOTES:

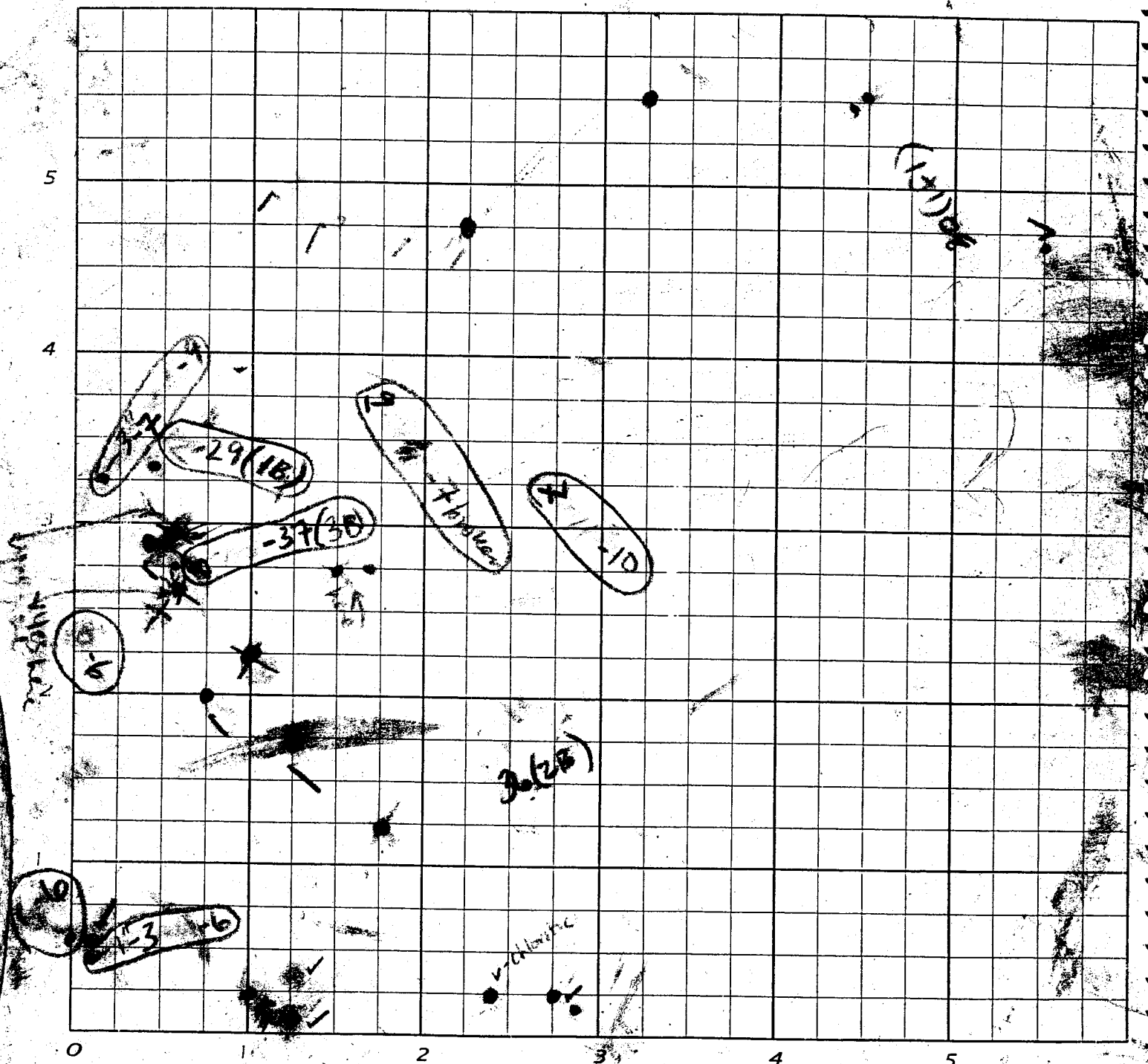
IWA LIFE HISTORY PLOT

SAMPLER DH / KW

PLOT# 22

DATE AND KEY: 4-17-02

7-13-02



SW PLOT CORNER

NOTES:

* Seedlings only on west half
* Quad entered - tight in SE corner

CCMWA LIFE HISTORY PLOT

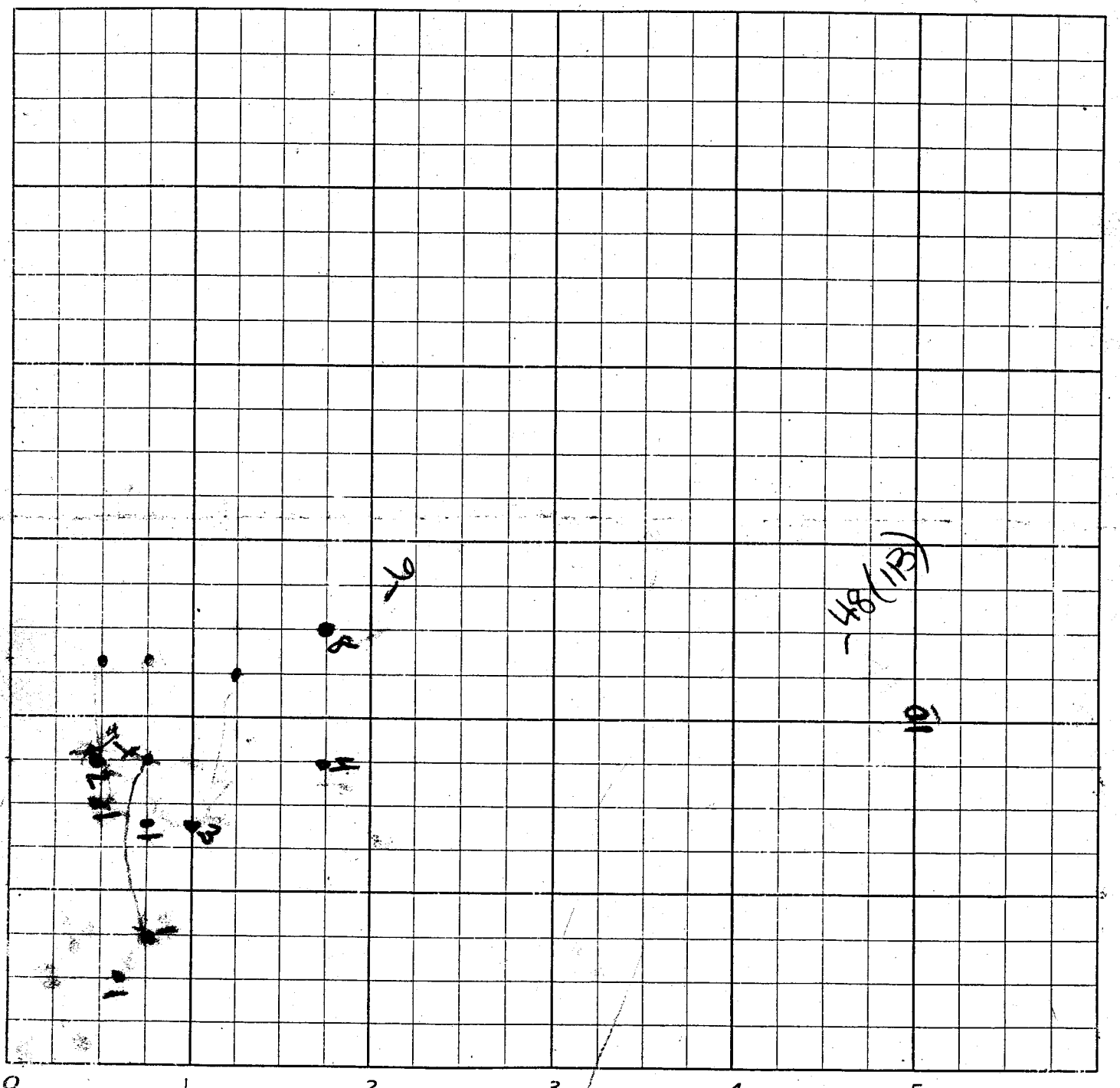
PLOT# 23

SAMPLER Bercie

DATE AND KEY: 4-17-02 | | | |

5-11-02 | 7-15-02 | | |

24 - no plants



SW PLOT CORNER

NOTES:

• = seedling w/ height

* seedlings only on S. half

Grid tight on all corners exc orientation corner

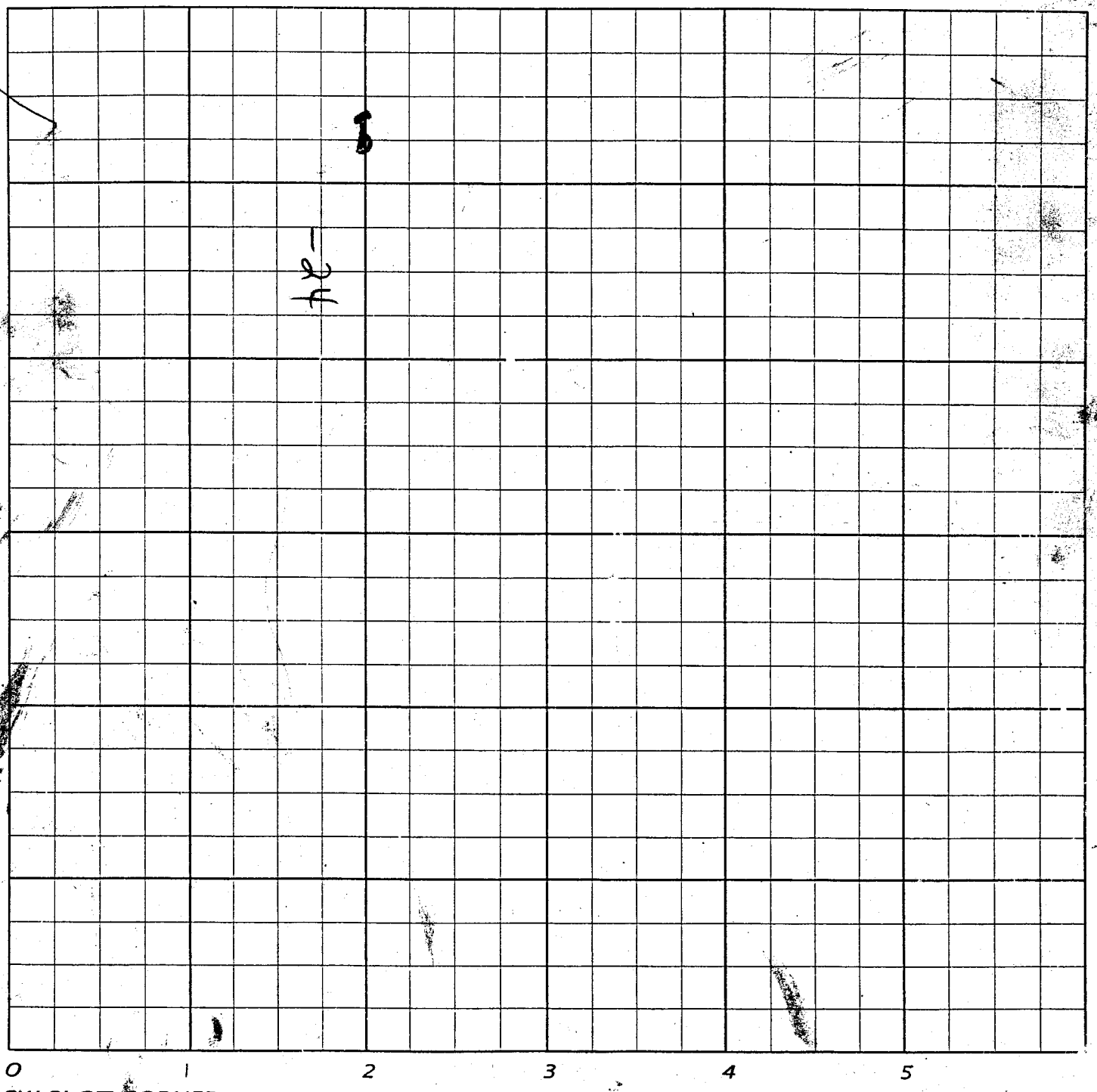
no plants

CCMWA LIFE HISTORY PLOT PLOT# 24

SAMPLER Jen + Robin

DATE AND KEY: 4-17 7-15

5-11-02



SW PLOT CORNER

NOTES: Veg so thick!

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

ATTACHMENT 3

PHOTODOCUMENTATION, 24 VEGETATION PLOTS
CCMWA
JULY 2002

Plot 1 35 deg
Marsh edge 9/19/03

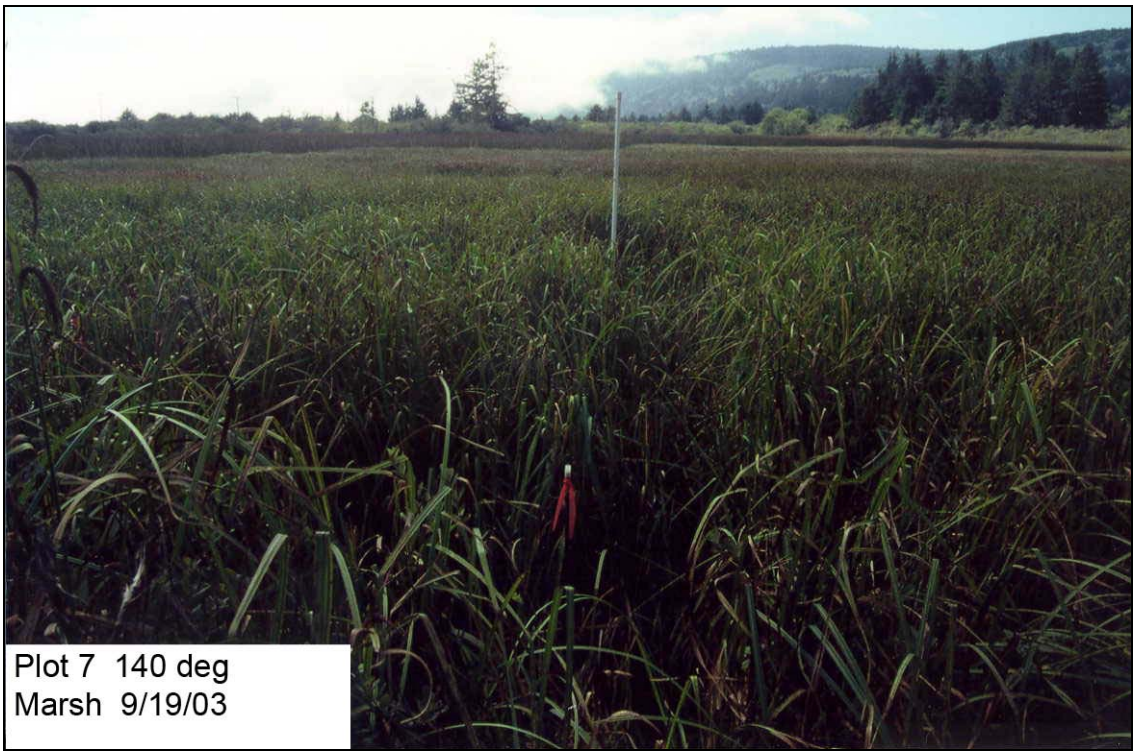
Plot 2 200 deg
Marsh edge 9/19/03

Plot 3 35 deg
Scrub 9/19/03

Plot 4 20 deg
Marsh 9/19/03

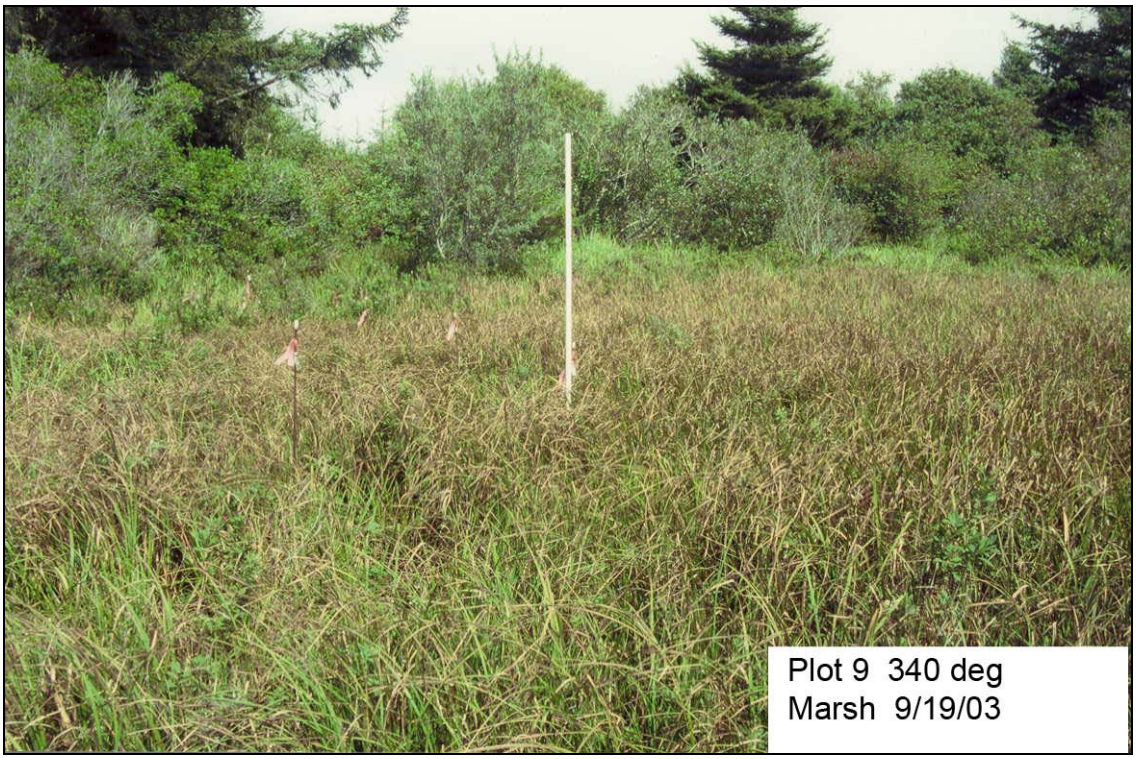
Plot 5 350 deg
Scrub 9/19/03

Plot 6 325 deg
Marsh edge 9/19/03



Plot 7 140 deg
Marsh 9/19/03

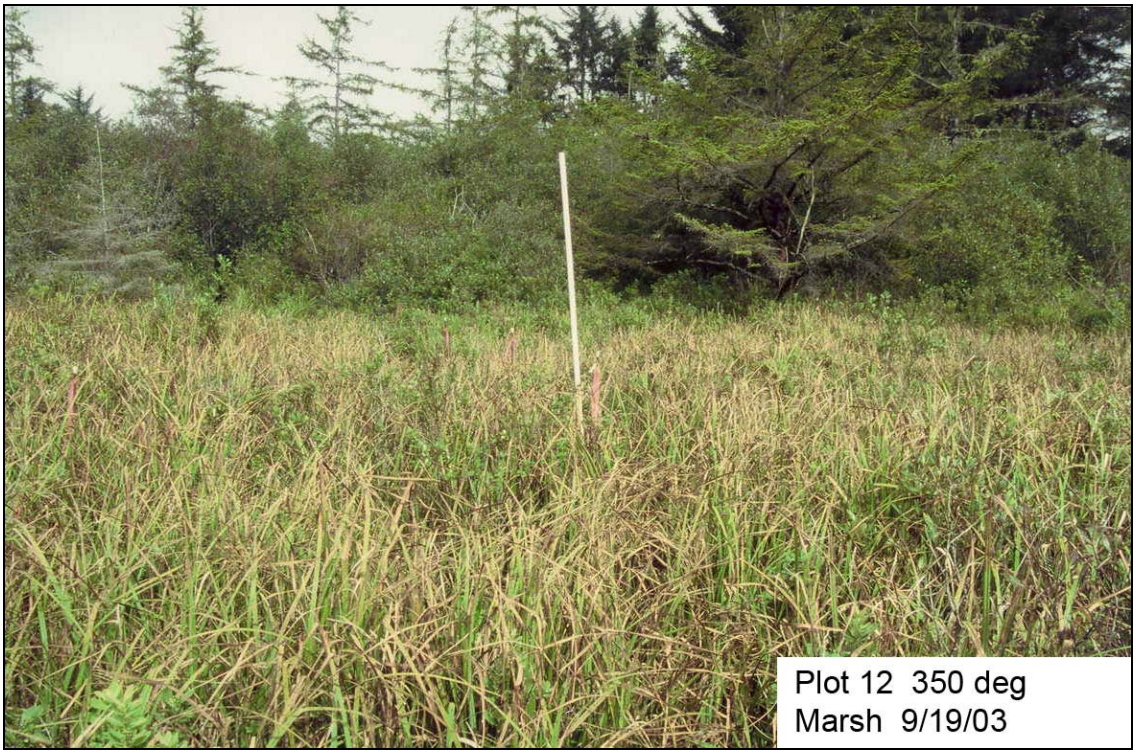
Plot 8 50 deg
Marsh edge 9/19/03



Plot 9 340 deg
Marsh 9/19/03

Plot 10 335 deg
Scrub 9/19/03

Plot 11 40 deg
Marsh edge 9/19/03



Plot 12 350 deg
Marsh 9/19/03

Plot 13 180 deg
Scrub 7/15/02

Plot 14 360 deg
Marsh edge 7/15/02

Plot 15 360 deg
Marsh 7/15/02

Plot 16 360 deg
Scrub 7/15/02

Plot 17 45 deg
Scrub 7/15/02

Plot 18 270 deg
Scrub 7/15/02

Plot 19 90 deg
Opening 7/15/02

Plot 20 315 deg
Marsh edge 7/15/02

Plot 21 45 deg
Marsh 7/15/02

Plot 22 180 deg
Marsh 7/15/02

WESTERN LILY VEGETATION STRATEGY
2002 STATUS REPORT

ATTACHMENT 4

2002 DATA SPREADSHEET
AND
LIFE HISTORY PLOT MAP FILES
TBER AND CCMWA

TABLE 2A
TABLE 2B
TABLE 4
TABLE 5
APPENDIX A. LIFE HISTORY PLOTS – TBER
APPENDIX B. LIFE HISTORY AND VEGETATION PLOTS - CCMWA
APPENDIX D. VEGETATION PLOT COVER AND HEIGHT DATA FOR ASSOCIATED SPECIES - CCMWA
JULY 2002

NOTE; THESE FILES WERE PROVIDED ON FLOPPY DISKS AND ARE INCLUDED IN THE BODY OF THE REPORT.