Summary Report on Vegetation and Soil Analyses for the 1999 Pilot Study
Revelstoke Reach-Upper Arrow Reservoir

May 2000

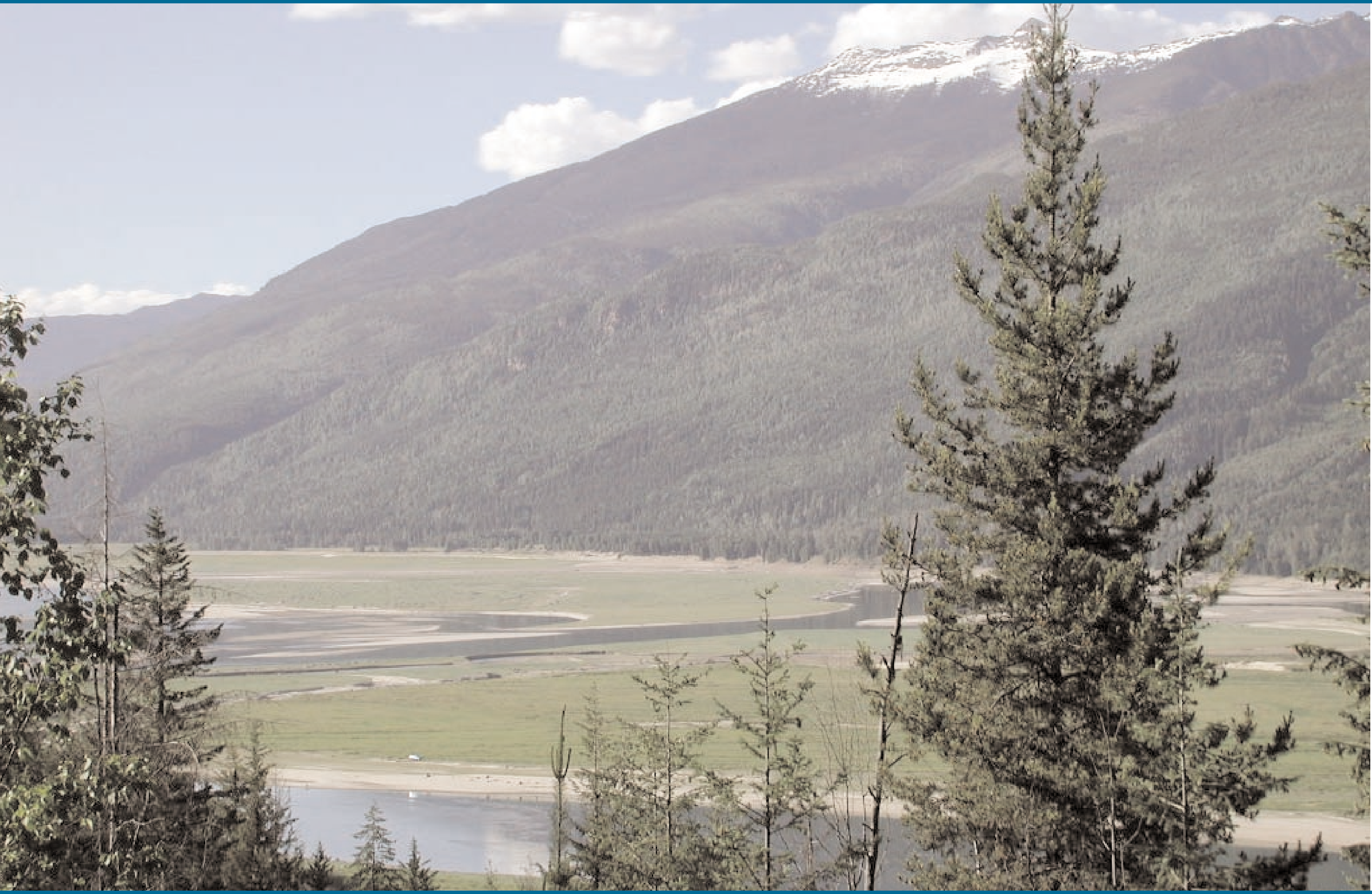

Photo courtesy of Wendy Beauchamp

Prepared by: AIM Ecological Consultants Ltd. and CARR Environmental Consultants

Prepared for: BC Hydro Strategic Environmental Initiatives Program
Evaluation of the Ancillary Benefits of Upper Arrow Reservoir Drawdown Zone Revegetation Project

BC Hydro

Strategic Environmental Initiatives Program
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Executive Summary

Since the late 1980's, significant portions of the Revelstoke Reach of Arrow Reservoir have been repeatedly seeded by BC Hydro as part of the Upper Arrow Dust Control Program. In addition to effective wind erosion control and dust abatement, the seeding program has also resulted in the development of new, permanent wetland communities on some of the higher elevation, former dust control areas. Over the later half of the 1990's, there have been anecdotal reports of numerous ecological and social benefits associated with this new wetland area (also referred to as the Revelstoke Wetlands), including increased wildlife usage, improved trout fishing and an increased level of recreational use.

In 1999, BC Hydro initiated an evaluation of the potential benefits associated with the new wetland area under the Strategic Environmental Initiatives Program: Evaluation of Ancillary Benefits of Reservoir Revegetation. One of the key objectives of this program is quantification of the potential contribution of these new wetlands to aquatic and terrestrial resource values in Revelstoke Reach. A key step in understanding the magnitude and importance of these ecosystem inputs and potential linkages to aquatic and terrestrial productivity is quantifying the inherent quality of the new wetland community that has developed over the past decade. As there had been little quantitative study of the area since 1994, the first year of this program (1999) was deemed a pilot study to provide an initial evaluation of the plant communities and develop appropriate sampling methods for subsequent studies planned for 2000 and 2001.

The sampling program employed in 1999 sought to identify biomass of the major vegetation communities in the Upper Arrow Reservoir, and supplemental species specific information on biomass, nutrient levels and carbon content. To help refine the data and prepare for future studies, the pilot study focused on potential differences in biomass and nutrient levels associated with plant species, reservoir elevation and site (location). Vegetation and soil samples were collected across the elevation gradient 434 – 428+ m in three of the major dust control areas (K, M, and P). Vegetation was sampled over the growing season starting in late May until inundation at the end of June. Additional species specific analyses were also undertaken on vegetation samples collected as part of a companion study investigating the linkage between benthic invertebrates and submerged vegetation.

Reservoir elevation, which defines the available growing season and level of inundation, was consistently a key factor in the vegetation analyses. Average biomass demonstrated a constant increase in standing crop across the elevation gradient, reaching a maximum at 437m. At the lower elevations, the species contribution to biomass was dominated by reed canarygrass (~80% of the total biomass at 435m) with lenticulate sedge contribution increasing from ~10% to over 35% BY 437m, and Columbia sedge making a contribution beginning at 437m.

Although this pattern was consistent for the three sampling areas (K, M, and P), values at area K were significantly different from those on areas M and P, indicating a need to address soil substrates and location effects in the future. Plant nutrient levels were also found to be quite variable between site and species, and a change in sampling from composite area samples to species specific sampling is recommended.

The submerged vegetation study provided an opportunity to investigate the response of individual species to extended flooding. Fall rye was the least tolerant of inundation, with little residual biomass after 3 months submergence, with an accompanying loss of plant nitrogen and potassium. Both the reed canarygrass and lenticulate sedge tolerated six weeks of inundation before showing an impact due to inundation with a slight decrease in aboveground biomass. However both species initiated new growth while inundated and the overall net loss of biomass was minimal. Nitrogen and phosphorus levels in the submerged sedge and reed canarygrass were fairly constant throughout the period of inundation, indicating fairly tight internal cycling of these two nutrients. However, potassium content declined markedly during inundation and appears to be flushed into the aquatic environment fairly quickly.

The research initiated in 1999 provided a greater understanding of the behavior of vegetation in reservoirs and the impacts of inundation. However much of this work was preliminary in nature and requires further refinement before it can be utilized to make management decisions. Detailed vegetation mapping is paramount to future studies, especially given the sensitivity of the various species to reservoir elevation, which determines the depth and duration of inundation. Species specific sampling is also required in the broader vegetation sampling program. The area based sampling used in 1999 yielded composite samples that were highly variable in proportion contribution of the three main species, and thus a high degree of variability in biomass and nutrient analyses.

1.0 INTRODUCTION

Since the late 1980's, significant portions of the Revelstoke Reach of Arrow Reservoir (often referred to as Upper Arrow Reservoir) have been repeatedly seeded with fall rye for wind erosion control and dust abatement. Initially, only 200-350 ha of identified dust source area were seeded with fall rye. However, the dust control seeding program was expanded to over 1000 ha in 1991.The annual fall rye seeding program has continued for dust control, with the program modified each year based on projected water levels, shifts in dust source locations, and the encroachment/establishment of native vegetation on previously seeded areas. The shift in treatment areas as a result of native vegetation colonization has allowed the annual seeding program to address other identified dust source areas while leaving dust control to the re-established native vegetation on large portions of the drawdown zone.

Past, informal monitoring of vegetation establishment within Upper Arrow has indicated that in addition to the annually seeded fall rye, which dominates below 434m in reservoir elevation, three perennial vegetation communities have evolved within treated (formerly seeded) portions of the reservoir. As the reservoir elevation rises from 434m to 436m+, the lower elevation sedge dominated community gradually transitions into a reed canarygrass dominated community. Both of these plant communities include an understory of both annual and perennial wetland species. Across this elevation range, there are also localized patches of a horsetail dominated plant community that is associated with either very coarse, sandy soils or wet depressions where the other plant communities cannot thrive.

Over the latter half of the 1990's, there have been anecdotal reports of ecological and social benefits from the permanent plant communities that have established on the Upper Arrow drawdown zone. This includes observations of increased wildlife usage, improved trout fishing, and a high level of associated recreational use. In 1999, BC Hydro initiated an evaluation of the potential benefits associated of the potential benefits associated with the new wetland area under the Strategic Environmental Initiatives Program (SEIP). The initial focus is quantification of the vegetation benefits to the local fishery, and possibility to overall fish habitat within Arrow Reservoir. Additional studies addressing bird usage and recreational activities have also been proposed for 2001.

One of the objectives of the BC Hydro Strategic Initiatives Program: Evaluation of Ancillary Benefits of Reservoir Revegetation is quantification of the potential contribution to aquatic and terrestrial resource values of the vegetation communities that have established as a result of the Arrow Dust Control Program. The development of extensive areas of vegetation within the reservoir has the potential to affect both the aquatic and terrestrial phases of the drawdown zone ecosystem by providing structural habitat (shelter and cover) and organic (food web) inputs that can be utilized by a variety of organisms. A key step in understanding the magnitude and importance of these ecosystem inputs and potential linkages to both aquatic and terrestrial productivity is quantifying the inherent quality of the new wetland community that has developed over the past decade. The distribution and development of wetland communities as influenced by reservoir elevation (an indication of the effect of annual inundation) and performance of individual plant species (including biomass production and nutrient content) are important metrics in assessing the ecosystem value of the new wetlands, and the primary task of the Vegetation and Soils Studies.

1.1 Objectives

The objectives of the three-year Vegetation and Soil Studies are as follows:

- Quantify the distribution of vegetation and evaluate the colonization rates of native species within the revegetated areas within Upper Arrow Reservoir
- Quantify biomass and nutrient (N, P, and K) levels of the plant communities to determine the potential contribution of vegetation to the surrounding ecosystems
- Develop a system for long term monitoring that examines relative abundance, species composition, and biomass within the study area.

As there had been little quantitative study of the area since 1994, the first year of this program was deemed a pilot study to provide an initial evaluation of the plant communities and develop appropriate sampling methods for subsequent studies planned for 2000 and 2001. The pilot program was a cooperative effort between AIM Ecological Consultants Ltd., CARR Environmental Consultants, and Pacific Soil Analysis Ltd. (PSAI). Components of companion studies investigating benthic invertebrate and periphyton development on submerged vegetation (Limnotek Ltd. and EcoLogic Ltd., respectively) also contributed to the vegetation and soils pilot study.

1.2 Approach

At the inception of this project, an intensive field program was proposed for May through June 1999 to accomplish the program design layout and vegetation/soil sampling prior to inundation of the drawdown zone in Upper Arrow. The following is a description of the tasks and proposed order of implementation.

Preliminary mapping of vegetation communities from aerial photos

- analysis of both recent and historical air photos for Revelstoke Arm
- conducted by AIM prior to May 17th field tour, with subsequent field verification

Biomass sampling from the three plant communities (fall rye, sedge, and reed canary grass on dust control areas G, K, M and P

- development of long-term monitoring plots/transects
- sampling of aboveground (live and detritus) and below
- ground (root) and soil contributions of N, P, and C
- sampling design based on results from initial field trip in mid-May, with subsequent sampling numbers to be modified based on variability
- initial sampling conducted by AIM, CARR, and PSAI
- replicate sampling on a bi-weekly basis, conducted under the direction of AIM and/CARR, with local field support
- analysis of samples at PSAI labs in Richmond
- data analysis and report development, conducted by AIM and CARR, with input from PSAI

Preliminary characterization biomass conversion pathways to be conducted by Eco-Logic, with supplemental samples provided by AIM

- in-field identification of microbial populations associated with the biomass as it is inundated
- collection of samples for more detailed assessment
- sampling to be undertaken in early June coinciding with inundation of the three plant communities
- supplemental samples of biomass and water to be collected in conjunction with the repeated biomass sampling

1.3 Modifications to proposed program based on preliminary field assessments.

Based on preliminary field inspection in May 1999, the following adjustments were made to the proposed program:

- Although historical aerial photos were mapped; recommendations were made for current aerial photography to be obtained since the most recent photography (1996) was inappropriate (taken too early in growing season) for mapping of vegetation distributions.
- Biomass sampling of vegetation communities was initiated at Area “P”, with subsequent expansion to Areas “K” and “M”. Plots were stratified according to elevation and marked for long-term reference. Repeated sampling of above

ground biomass was undertaken in the reference plots for evaluation of temporal changes in vegetation values.

- Companion studies launched for benthic invertebrate and periphyton development on submerged vegetation presented the opportunity to include vegetation analyses. Preliminary discussions between team members allowed for a design that would allow segregation of samples for analyses of the various components (periphyton, invertebrates, vegetation) and also provide eventual feedback from the vegetation components (biomass and nutrient levels) to the benthic study.

2.0 METHODS

The sampling methods employed in 1999 sought to identify:

- biomass of the major groups of vegetation in Upper Arrow Reservoir
- biomass, carbon and nutrient levels in the plant species and substrates of Upper Arrow Reservoir

To further refine these questions, investigations targeted:

- species effects
- elevation effects
- site effects
- plant component (shoot/root) effects with respect to nutrients (N, P, K)
- seasonality to the nutrient levels

2.1 Biomass Sampling

Preliminary vegetation sampling was undertaken in May 1999 to provide an indication of variability across elevations and sites. Three sampling sessions were undertaken for biomass clippings: May 20-22 (referred to as T-1); June 10-11 (T-2) and June 22-23 (T-3). Sampling locations were stratified within areas according to elevations derived from B.C.Hydro 1:5,000 orthophotos (Project No 86800). Some variability in locating precise elevations occurred due to interpolation of sites from the 1 m elevation interval of the orthophotos. Areas were identified alphabetically according to the B.C. Hydro Dust Control Study nomenclature, and were chosen, based on previous field experience, for relatively consistent substrates, vegetation assemblages and a full cross section of elevational ranges.

The first sampling session (T-1) was conducted across a full range of elevations at site ”P”. Further partial sampling was undertaken at area “K” to ascertain between site variability. Subsequently, the sampling for T-2 and T3 was expanded to include three areas (“K”, “M” and “P”) (Figure 1). By the final sampling date, water levels were rising approximately 30 cm per day. Although sampling sites were for the most part exposed, access to the sites was impossible by vehicle (roads flooded) or by boat (too shallow), therefore the final sampling was accomplished by helicopter.

Sampling locations at each elevation were identified with a central marker for future reference. Five circular plots ($0.5 m^2$) (Figure 2) were randomly chosen at each location at each date. Vegetation cover within the plot was visually estimated and a photo was taken to record the plot appearance. All vegetation within the plot was clipped at ground level and bagged for shipment to the lab. During the first sampling session, all of the standing and surface litter were also harvested to provide an indication of plant fractions remaining from the previous year’s growth. Subsequent biomass harvests did not include the litter fractions. Replicate (10cm in diameter by 10 cm deep) soil and root cores were obtained from within the plot after the harvesting of the aboveground components. Upon completion of sampling, labeled plastic tent pegs were inserted into the centre of the plot to mark the site and prevent re-sampling of the plot during subsequent sessions. Harvested plant material was stored in plastic bags and kept refrigerated until the samples had been processed and air-dried for shipment to the lab. Preliminary processing included washing of the plants in fine mesh bags, spin-drying by centrifuge and subsequent assessment to determine species composition, stem lengths and heights. Minor losses of nutrients and biomass may have occurred during the washing process.

2.2 Submergence Study

The studies launched for benthic invertebrate and periphyton development on submerged vegetation presented the opportunity to obtain vegetation samples to determine plant responses to inundation. Complete details of experimental design of the benthic invertebrate “outplanting” study (referred to from the vegetation perspective as the “submergence” study) are presented in Limnotek et. al. (2000)[1]. A brief summary is provided here as it relates to the plant analyses.

Replicated samples (18.5 x 18.5 x 15 cm – length x width x depth) of three major plant species (reed canarygrass, lenticulate sedge, and fall rye) were excavated and transferred to fiberglass mesh bags which would allow continued transfer of water and nutrients across the bag barrier. Bagged plants were placed into excavated spaces matching the size of the bagged plant. Sides were infilled with soil and tamped so no surrounding air space remained. The principal objective of this study was to evaluate benthic assemblages and periphyton developing on the

[1] Limnotek et. al. 2000. Biofilm, Invertebrate And Fish Communities Associated With Vegetation Strata In The Drawdown Zone Of The Arrow Lake Reservoir – 1999 Data Report

plants. However, at the time of bag retrieval, vegetation samples were split in two, with half of the material designated for the benthos / periphyton study and the remainder of the sample designated for plant analyses. After the preliminary division of the sample, the portion destined for plant analysis was segregated into shoot and root portions that were bagged separately but labeled for identification as portions of the same plant. Subsequently the samples were handled in the same way as the standing crop samples; washed to remove sediment, spun dry and air dried in paper bags prior to shipment to the laboratory.

Figure 1: Sampling Areas for Vegetation, Root and Soil Analyses, 1999.

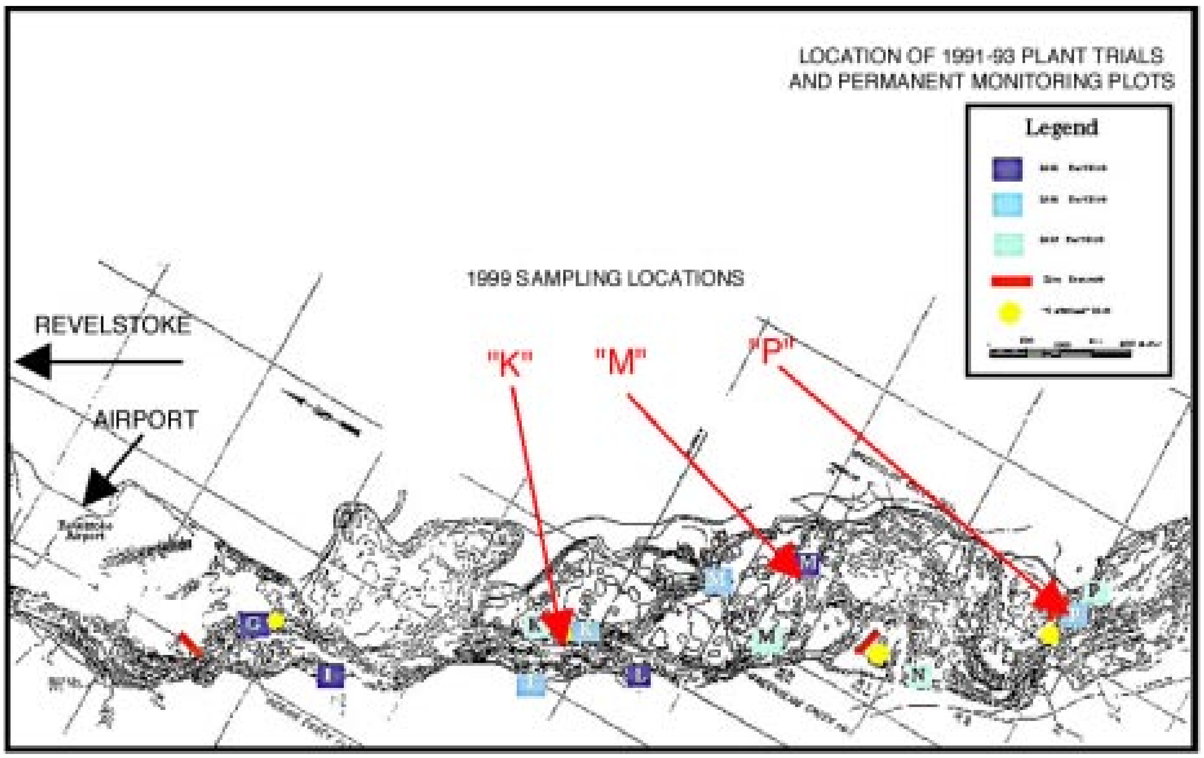


Figure 2: Example of Circular Sample Plot (0.5 m^2)

2.3 Laboratory Analyses

Laboratory analyses were conducted at Pacific Soil Analysis Incorporated, Richmond, B.C. Biomass samples were initially oven dried to 70°C, ground and subsampled for analysis. Later, the biomass samples were re-dried to 105 °C, and all nutrient data were corrected to that weight.

Laboratory analysis were completed for the following:

- Aboveground biomass – T1, T2 and T3
- Aboveground nutrients (N, P, K), ash – T3
- Below ground biomass and nutrients (N, P, K, and C) –T1and T3
- Soil bulk density, nutrients and carbon –T1 and T3
- Biomass, nutrient, and ash– all submergent samples

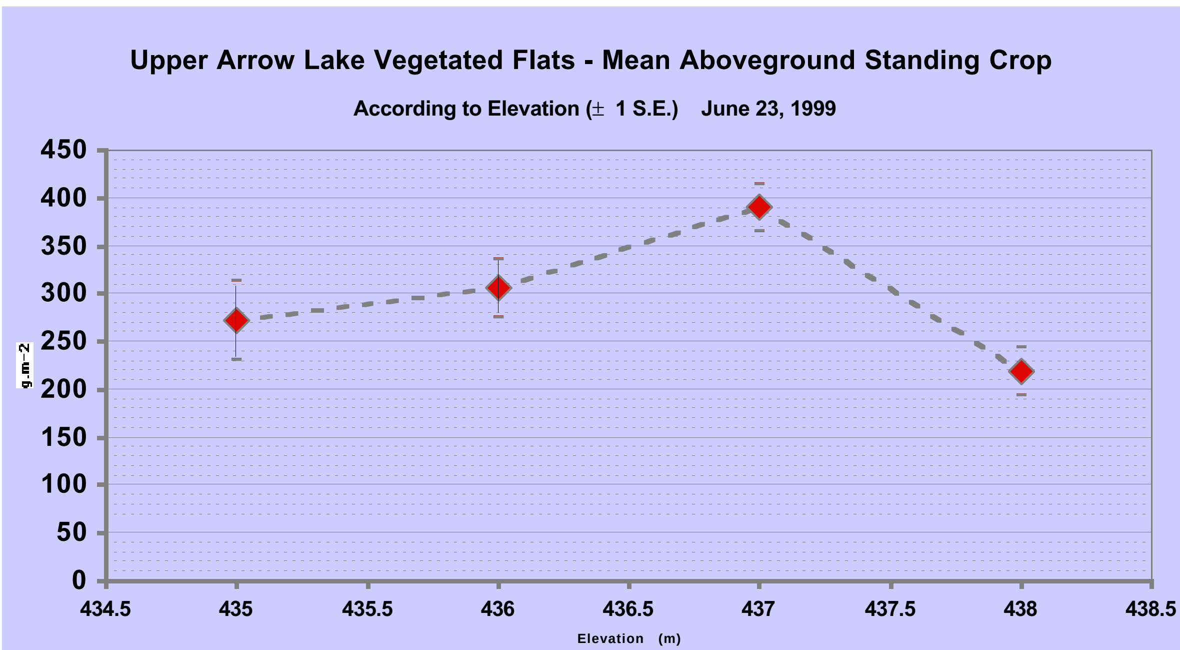
All data is presented in the Appendices. All of the remaining sample material has been stored at the lab for potential additional analysis in the future if warranted.

3.0 RESULTS

3.1 Standing Crop – Composite Samples

Aboveground plant standing crop in the vegetated draw down zone averaged approximately 300 $g\,m^{-2}$ immediately prior to inundation on June 23, 1999 with a low of 219 $g\,m^{-2}$ at 438m to a high of 390 $g\,m^{-2}$ at 437m (Figure 3). The average below ground biomass was 840 $g\,m^{-2}$ with an overall root to shoot ratio of 2.8.

Figure 3



Average plant standing crops showed increases over time and with elevation (Table 1). Maximum standing crop values were consistently encountered at elevation 437m, with lesser values occurring at both lower and higher elevations.

Table 1: Average Aboveground Standing Crop $g\,m^{-2}$ (Composite Samples)

Elevation	20-May	11-Jun	23-Jun
434	72	169	Under water
435	115	153	272
436	140	223	306
437	161	297	390
438	90	Not sampled	219

The patchy distribution of vegetation resulted in high variability among plots and consequently an individual sample with the greatest biomass sampled during was harvested during the second sampling session (maximum value = 756 g m^{-2}) rather than at the final date. Small clumps of plants, either sedge or reed canary grass showed much higher standing crop values over their area of growth, but the bare areas between clusters of vegetation resulted in a lower overall mass and a large variability in plot results.

Overall growth rates were calculated based on the differences in growth between dates, divided by the number of days between sampling dates. The greatest growth rate occurred at elevation 437 m with an overall average of almost 7 g m^{-2} per day, or the equivalent of 68 kg per hectare per day (Table 2).

Table 2: Average Growth Rates between Sampling Periods ODW g m^{-2} per day

Elevation	May 20 to June 11	June 11 to June 23	Overall Average May 20 to June 23
434m	4.4		
435m	1.7	4.0	2.5
436m	3.8	6.9	4.9
437m	6.2	7.8	6.8
434-437m			**3.8**

3.1.1 Elevation effects

Average biomass values revealed a constant increase in standing crop with increase in elevation to a maximum value at elevation 437m. A dramatic decrease was noted between elevation 437m and 438m standing crops for both the first and last sampling sessions (438m was not sampled in the June 11 session). Although site differences were distinct, the pattern of increasing standing crop with elevation followed by a subsequent decline held true for most sites. Analysis of variance of the T3 data revealed significant differences in standing crop according to elevation.

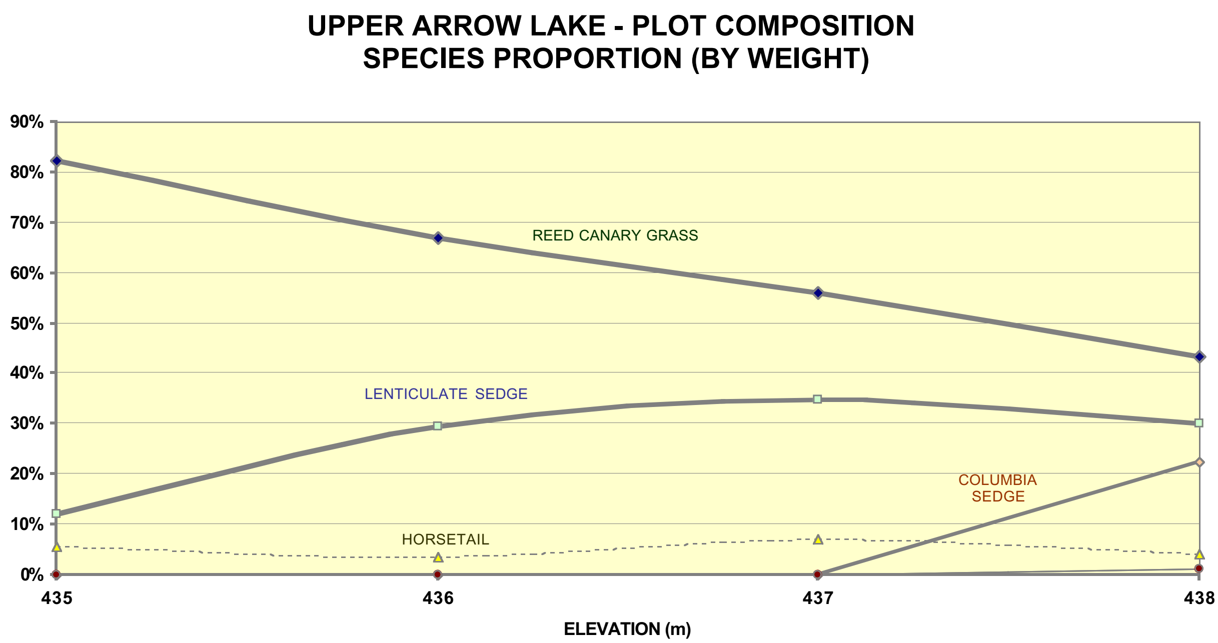
Water levels rose very quickly in the latter part of June, and the lowest elevations (434m) were flooded at the time of the final sampling. Each 1 m higher elevation band had approximately one week of exposure more than the preceding lower elevation. Plant growth had not reached maximum standing crop at the time of inundation (based on previous years observations) and could be expected to continue to accumulate biomass if flooding was delayed.

On June 23rd, data from Fauquier indicated water levels of 435.5m, approximately 1m higher than elevations for the sample sites identified on the orthophotos. Refinement of elevation data is recommended for future analyses of vegetation growth in relation to water levels.

3.1.2 Species Effects

Although species composition within plots was visually estimated for the first two sampling sessions, actual segregation by species was undertaken for the final sampling session. Overall proportions of species by weight were plotted by elevation to provide an indication of the relative contribution to the biomass by species. At elevation 435m, reed canarygrass made up over 80% of the mass of the plots, lenticulate sedge slightly over 10 % with the remaining proportion being comprised of horsetail (Figure 4). The proportion of reed canary grass declined consistently with increasing elevation whereas the proportion of lenticulate sedge increased to a maximum of approximately 35% at elevation 437m. Columbia sedge only became prevalent at elevation 438m.

Figure 4



3.1.3 Site Effects

Area “K” standing crops was determined to be significantly different from those at areas “M” and “P”. However, no significant differences were detected between areas “M” and “P”.

3.1.4 Litter fraction

The amount of standing dead and surface litter was determined for the first sampling period in May. Both components generally increased with increasing elevation. However, large site differences were noted between the two areas sampled (P and K) with much more standing litter at P, possibly due to current effects.

3.2 Nutrient Content

Nutrient values were found to be quite variable between sites and between species. Reed canarygrass showed a high degree of variability, ranging from 0.69 to 1.38% N. The sedge showed generally higher values, from 1.1 to 1.68% N, with highest nutrient levels found in horsetail (1.21 to 1.94% N). Fall rye showed the most limited range of N content, 0.79-1.02% N. Phosphorus (P) values were generally the highest in the sedge and horsetail (around 0.21%), with a value of 0.15% P for reed canarygrass and a range of 0.11% to 0.23% P for fall rye. The composite biomass sample values (a mixture of all species) tended to be around 1% N and 0.1% P. The highest plant nutrient levels tended to coincide with the highest biomass values.

3.2.1 Seasonality in nutrient levels (N,P,K)

Nutrient analyses would need to be completed on a subset of T=1 and T=2 samples to provide an indication of changes in nutrient levels between May and June. Pre-flooding standing crop analyses for the submergence study indicated slight declines in nutrient proportions (% of dry weight of N, P, K) for the sedge and fall rye values over a 3 week period, and a substantial decline for reed canary grass.

3.2.2 Species and plant component effect In nutrients

Component effects within species could only be determined where complete plants were analyzed. This occurred for the T=0 samples (June 7 and June 29) of the submergence study (all three species), and for a replicate set of sedge samples collected on June 23. The root to shoot ratios indicate seasonal change in proportions as the aboveground standing crop increased. Nitrogen proportions in below ground components increased over time for the perennial species (sedge and reed canary grass) but remained relatively constant for the annual fall rye (Table 3). Phosphorus levels showed no major trends.

Table 3: Root to Shoot Ratios of biomass and major nutrients according to plant species.

	Carex lenticularis			**Reed Canary grass**		**Fall Rye**	
	June 7	**June 23**	**June 29**	**June 7**	**June 29**	**June 7**	**June 29**
AFDW	3.8	2.8	3.0	2.6	1.9	0.7	0.6
N	0.6	0.4	0.9	0.6	1.2	0.7	0.6
P	0.8	0.7	0.9	0.8	1.0	0.9	0.6
Ca	1.1	0.8	0.9	1.8	1.6	1.2	1.4
Mg	1.8	1.8	1.5	2.1	1.4	2.1	1.7
K	0.5	0.4	0.4	0.6	0.6	0.5	0.4

3.2.3 Potential nutrient contribution to the aquatic system

Although the nutrient content of the aboveground vegetation appears relatively minor, when extrapolated over a broader area, it is apparent that significant nutrient contributions are possible from the degrading vegetation. For example, sedge phosphorus content averaged 0.12% for aboveground components. If this is lost from the leaves by the end of the season, at an average weight of 300 g m^{-2}, the net contribution could be 3.6 kg of P per ha (Table 4).

Table 4: Nutrient values averaged per hectare for Carex lenticularis.

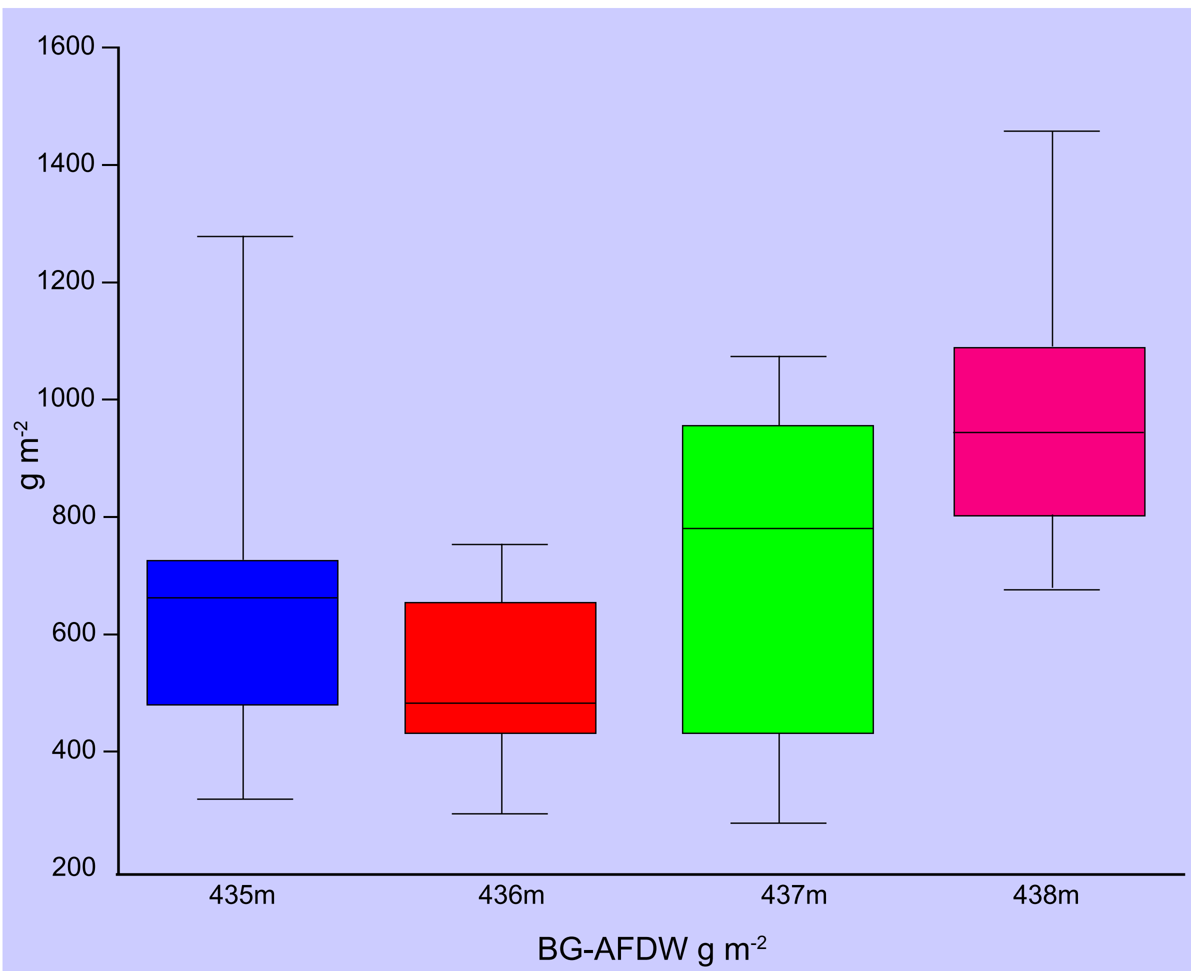
	Average nutrient content	**Weight of nutrient g·m^{-2}**	**Weight of nutrient kg per hectare**
N	1.27%	3.81	38.1
P	0.12%	0.36	3.6
Ca	0.35%	1.05	10.5
Mg	0.14%	0.42	4.2
K	2.22%	6.66	66.6

3.2.4 Root and substrate effects

Root analyses revealed a trend toward increased biomass with increased elevation (Figure 5). The lack of a drop in biomass at the highest elevations distinguished the root biomass from the shoot biomass. The root samples represent composite values, not segregated according to plant species. Although roots, in general, may reflect several years of growth, the samples collected for the below ground biomass targeted the upper 10cm of root, thereby focussing on the active growth zone.

Aboveground biomass averaged 2.84 t/ha while the below ground production averaged 6.99 t/ha. Analysis indicated that both components were 45% C, for a total of 4.42 tC/ha. However more importantly, the soil carbon pool had increased from 4.5 t/ha (0.13% C) to 56.4 t/ha (1.61%) in 9 years, carbon that is sequestered in the soil. Based on preliminary statistical analyses, no significant correlations were detected between plant biomass and soil nutrient levels.

Figure 5: Box Plot Showing Belowground Biomass According to Elevation (displaying 10th, 25th, 50th and 90th percentiles)



3.3 Submergence Studies

The “outplanting” (submergence) studies revealed, for the first time, individual species responses to extended flooding. Reed canary grass and sedge both degraded slowly (Figure 6). Reed canary grass tolerated inundation for approximately 6 weeks prior to initiating new leaf and root growth underwater. The sedge leaves degenerated slowly but produced new shoots to replace the dying leaves. Fall rye degenerated fairly rapidly in contrast to the two perennial species and showed only the toughest structural material remaining by the end of the experiment. Plant biomass values were difficult to interpret due to the variability among sample sizes. However, visual observations revealed a steady decrease in aboveground biomass over time for all species, with much smaller changes apparent in the belowground components. Phosphorus levels showed no clear trend, maintaining consistent levels within the plant component and species during the course of the experiment (Figures 7, 8 and 9). Nitrogen levels were fairly variable. Levels appeared to decline over the first 3 weeks of inundation followed by an increase, presumably due to periphyton colonization, and another decline (Figures 7, 8 and 9).

Figure 6: Reed Canary Grass, Sedge and Fall Rye Mean AFDW (g^{-2}) of Aboveground(A) and Below Ground (B) Component in Submergence Trials.

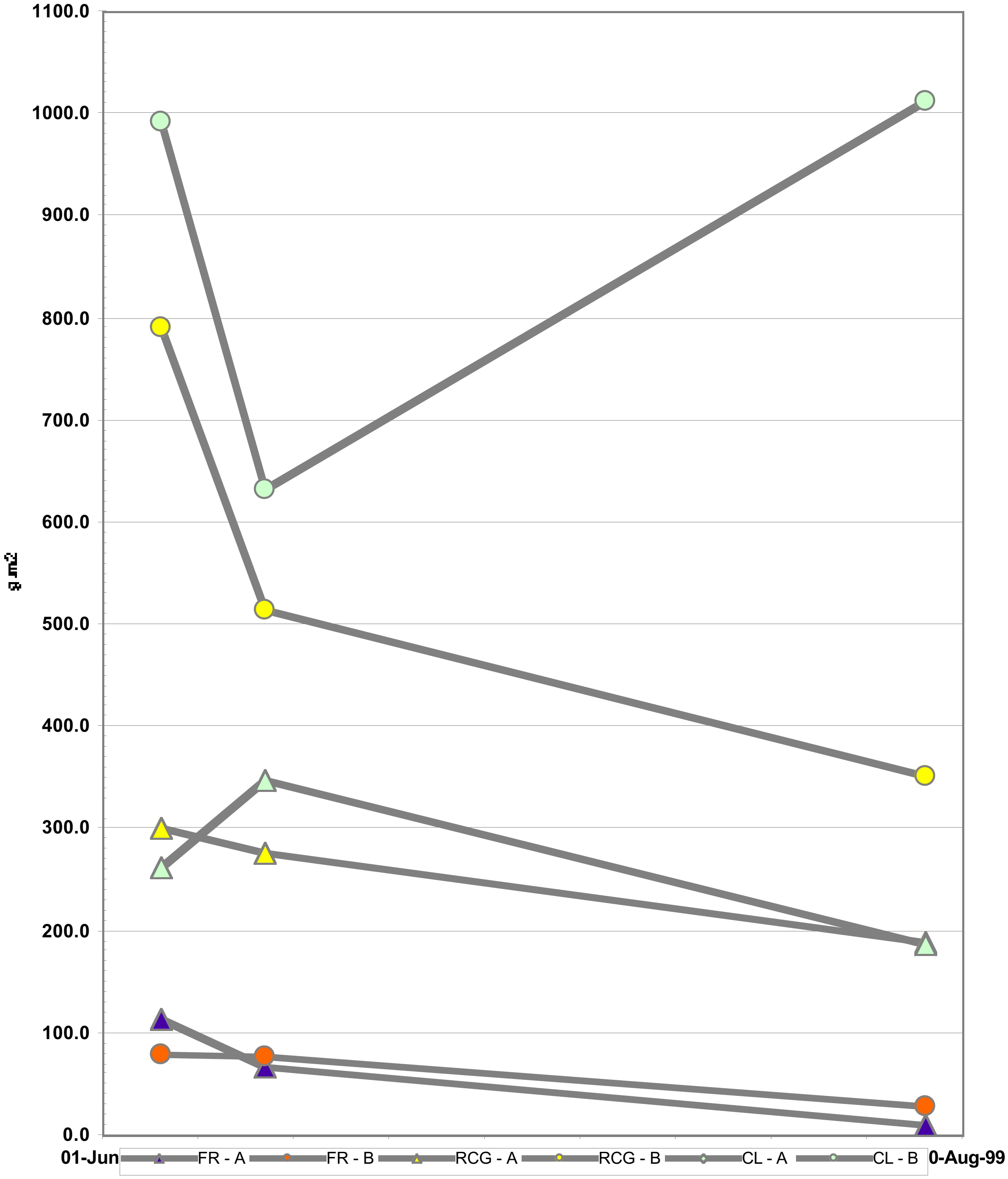


Figure 7: Changes in Sedge Nutrient Levels During Submergence

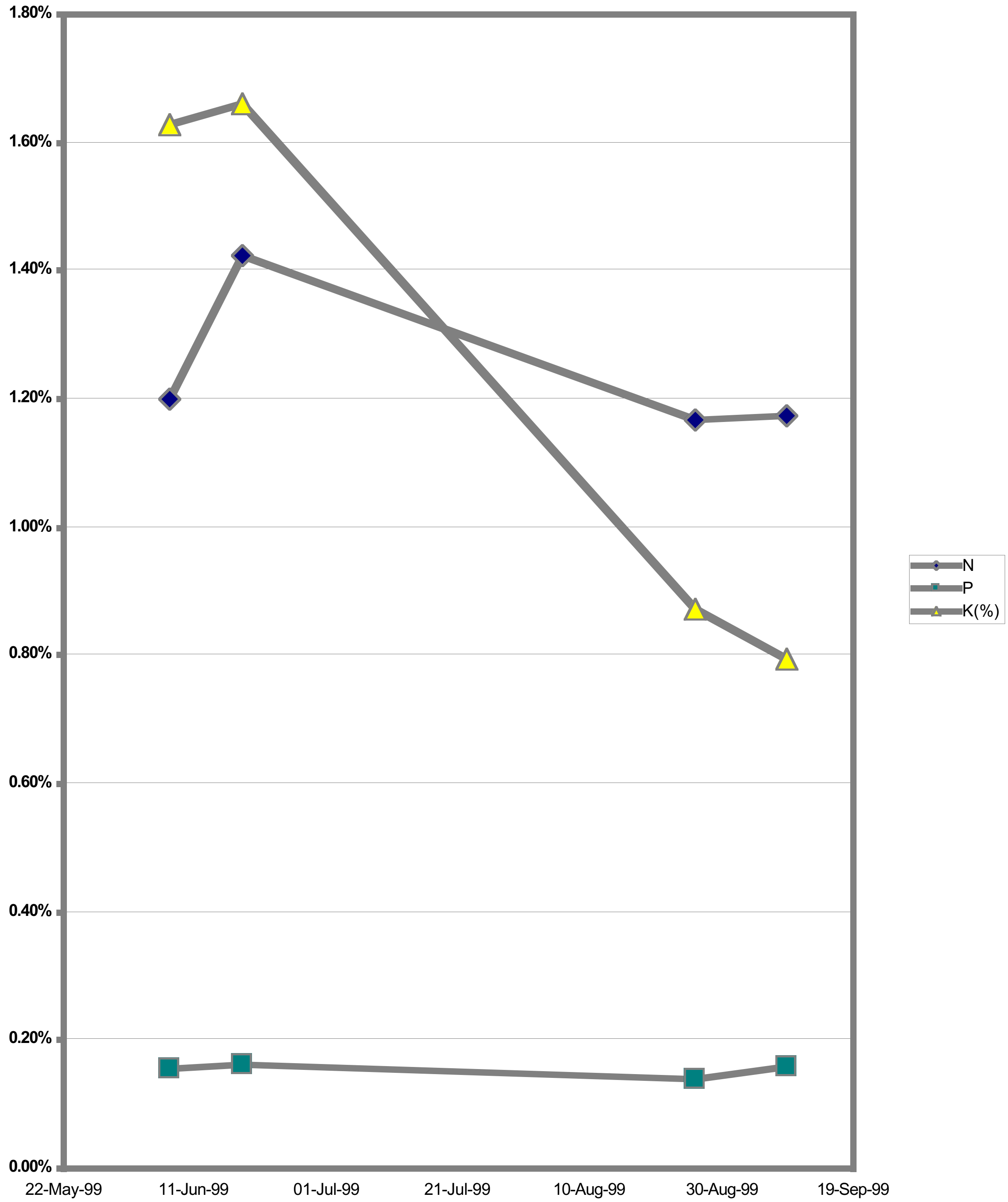


Figure 8: Changes in Reed Canary Grass Nutrient Levels during Submergence

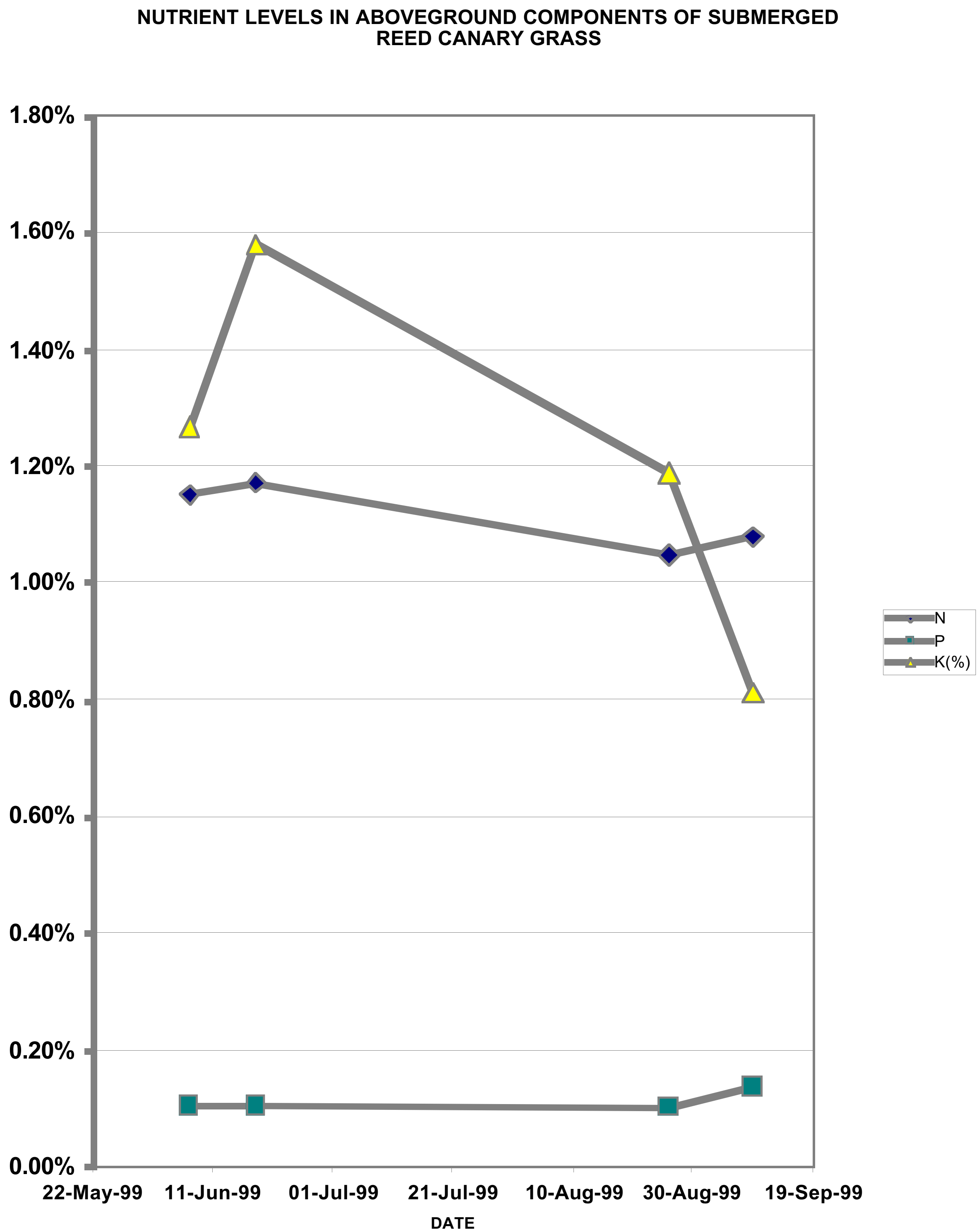
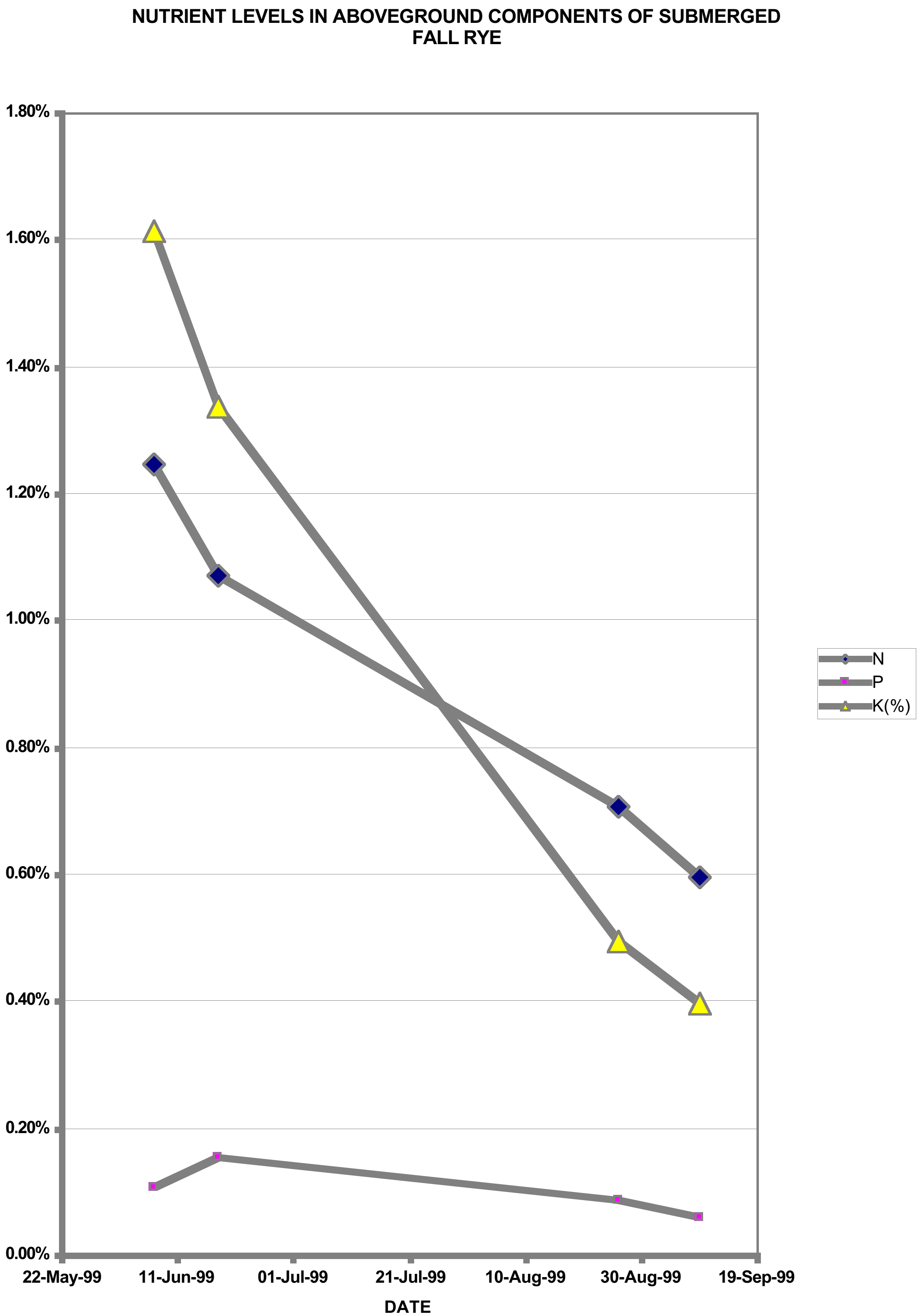


Figure 9: Changes in Fall Rye Nutrient Levels during Submergence



4.0 RECOMMENDATIONS

4.1 Unfinished work from 1999

Although most laboratory analyses planned for 1999 have been completed, limited additional analyses would provide further data on which to draw conclusions regarding seasonal changes in both aboveground and belowground biomass and nutrients. Full analysis of remaining (i.e. stored) T1 and T2 samples is proposed for 2000 to complete the data set, at which time, complete statistical analysis for T1 and T2 will be possible.

4.2 Further work based on existing soil and vegetation samples

Heavy metals are known to be bound in sediments and roots of wetland vegetation, and sedges have been documented as bioaccumulators of mercury. In light of a concern put forth regarding the potential contamination of fish and wildlife using the Revelstoke flats, it is recommended that analyses be conducted of a sub-set of the stored vegetation and soils to determine the potential for upper food chain contamination. Given that this material is already available for analysis (i.e. harvested, cleaned, dried and ground), it would be very cost effective to utilize this available material for contaminant analyses, if desired.

4.3 Recommendations for further field studies

The research initiated in 1999 addressed and quantified many data gaps in our knowledge of reservoir ecosystems. However, much of the work initiated in 1999 was preliminary in nature and requires further refinement before it can be utilized with confidence. Therefore, continuation of the preliminary work initiated in 1999 within the vegetation and soils program is highly recommended. The following are some specific steps that should be considered in 2000 and 2001:

- define the present extent (mapping and area calculations) of vegetation communities and plant densities, refine the elevation relationships using airphotos from 2000
- field verify mapping of aerial photos and broader field mapping of vegetation and soils
- refine analysis of aboveground standing crop, with a shift to species specific sampling as opposed to the area based approach used in 1999
- assess potential impacts of fertilizer on vegetation growth and nutrient levels

- refine analysis of carbon and nutrient pools including analysis of soil and roots to greater depths
- assess changes in the nutrient pools between year 9 and 10 to get carbon and nutrient rates and flux through system
- refine and extend submergence ("outplanting") trials
- assess vegetation contribution to the terrestrial food web
- refine ecosystem model parameters

5.0 APPENDICES

Definitions

O.D.	oven dry weight	
AFDW	ash free dry weight	
FR	*Secale cereale*	fall rye
RCG	*Phalaris arundinacea*	reed canarygrass
EQ	*Equisetum fluviatile*	water horsetail
CL	*Carex lenticularis*	lenticulate sedge
CA	*Carex aperta*	Columbia sedge
SC	*Scirpus* microcarpus	small-fruited bulrush.
JB	Jun*cus balticus*	arctic rush

5.1 Appendix 1: Vegetation Aboveground Standing Crop, T=1

DATE	SITE	ELEV	REP	SPP	Veg-O.D. $g \cdot m^{-2}$	% OF TOTAL BY WEIGHT
20-May-99	K	436	1	COMPOSITE	194.0	73.3%
20-May-99	K	436	1	STANDING DEAD	46.8	17.7%
20-May-99	K	436	1	SURFACE LITTER	24.0	9.1%
20-May-99	K	436	TOTAL		264.8	
20-May-99	K	436	2	COMPOSITE	161.2	77.1%
20-May-99	K	436	2	STANDING DEAD	33.2	15.9%
20-May-99	K	436	2	SURFACE LITTER	14.6	7.0%
20-May-99	K	436	TOTAL		209.0	
20-May-99	K	436	3	COMPOSITE	60.6	81.2%
20-May-99	K	436	3	STANDING DEAD	14.0	18.8%
20-May-99	K	436	3	SURFACE LITTER	0.0	0.0%
20-May-99	K	436	TOTAL		74.6	
20-May-99	K	436	4	COMPOSITE	151.8	89.3%
20-May-99	K	436	4	STANDING DEAD	18.2	10.7%
20-May-99	K	436	4	SURFACE LITTER	0.0	0.0%
20-May-99	K	436	TOTAL		170.0	
20-May-99	K	436	5	COMPOSITE	162.2	82.8%
20-May-99	K	436	5	STANDING DEAD	33.6	17.2%
20-May-99	K	436	5	SURFACE LITTER	0.0	0.0%
20-May-99	K	436	TOTAL		195.8	
20-May-99	K	437	1	COMPOSITE	253.2	46.0%
20-May-99	K	437	1	STANDING DEAD	111.0	20.2%
20-May-99	K	437	1	SURFACE LITTER	186.0	33.8%
20-May-99	K	437	TOTAL		550.2	
20-May-99	K	437	2	COMPOSITE	282.8	72.8%

20-May-99	K	437	2	STANDING DEAD	68.0	17.5%
20-May-99	K	437	2	SURFACE LITTER	37.6	9.7%
20-May-99	K	437	TOTAL		388.4	
20-May-99	K	437	3	COMPOSITE	253.0	51.2%
20-May-99	K	437	3	STANDING DEAD	192.4	38.9%
20-May-99	K	437	3	SURFACE LITTER	48.8	9.9%
20-May-99	K	437	TOTAL		494.2	
20-May-99	K	437	4	COMPOSITE	273.2	60.6%
20-May-99	K	437	4	STANDING DEAD	114.2	25.3%
20-May-99	K	437	4	SURFACE LITTER	63.4	14.1%
20-May-99	K	437	TOTAL		450.8	
20-May-99	K	437	5	COMPOSITE	279.2	55.4%
20-May-99	K	437	5	STANDING DEAD	177.4	35.2%
20-May-99	K	437	5	SURFACE LITTER	47.6	9.4%
20-May-99	K	437	TOTAL		504.2	
20-May-99	P	434	1	COMPOSITE	62.0	51.2%
20-May-99	P	434	1	STANDING DEAD	34.0	28.1%
20-May-99	P	434	1	SURFACE LITTER	25.2	20.8%
21-May-99	P	434	TOTAL		121.2	
20-May-99	P	434	2	COMPOSITE	116.0	41.5%
20-May-99	P	434	2	STANDING DEAD	96.0	34.4%
20-May-99	P	434	2	SURFACE LITTER	67.4	24.1%
21-May-99	P	434	TOTAL		279.4	
20-May-99	P	434	3	COMPOSITE	60.4	52.9%
20-May-99	P	434	3	STANDING DEAD	38.4	33.6%
20-May-99	P	434	3	SURFACE LITTER	15.4	13.5%
21-May-99	P	434	TOTAL		114.2	

20-May-99	P	434	4	COMPOSITE	59.0	39.4%
20-May-99	P	434	4	STANDING DEAD	55.4	37.0%
20-May-99	P	434	4	SURFACE LITTER	35.4	23.6%
21-May-99	P	434	TOTAL		149.8	
20-May-99	P	434	5	COMPOSITE	63.2	40.4%
20-May-99	P	434	5	STANDING DEAD	57.4	36.7%
20-May-99	P	434	5	SURFACE LITTER	35.8	22.9%
21-May-99	P	434	TOTAL		156.4	
20-May-99	P	435	1	COMPOSITE	132.2	56.6%
20-May-99	P	435	1	STANDING DEAD	82.4	35.3%
20-May-99	P	435	1	SURFACE LITTER	19.0	8.1%
20-May-99	P	435	TOTAL		233.6	
20-May-99	P	435	2	COMPOSITE	73.8	31.6%
20-May-99	P	435	2	STANDING DEAD	101.8	43.6%
20-May-99	P	435	2	SURFACE LITTER	59.4	25.4%
20-May-99	P	435	TOTAL		235.0	
20-May-99	P	435	3	COMPOSITE	127.0	54.4%
20-May-99	P	435	3	STANDING DEAD	172.2	73.7%
20-May-99	P	435	3	SURFACE LITTER	185.2	79.3%
20-May-99	P	435	TOTAL		484.4	
20-May-99	P	435	4	COMPOSITE	86.4	30.4%
20-May-99	P	435	4	STANDING DEAD	125.4	44.1%
20-May-99	P	435	4	SURFACE LITTER	72.8	25.6%
20-May-99	P	435	TOTAL		284.6	
20-May-99	P	435	5	FR	89.4	44.4%
20-May-99	P	435	5	STANDING DEAD	71.4	35.5%
20-May-99	P	435	5	SURFACE LITTER	40.6	20.2%

20-May-99	P	435	TOTAL		201.4	
20-May-99	P	435	6	COMPOSITE	157.8	67.9%
20-May-99	P	435	6	STANDING DEAD	58.8	25.3%
20-May-99	P	435	6	SURFACE LITTER	15.8	6.8%
20-May-99	P	435	TOTAL		232.4	
20-May-99	P	435	7	FR	11.0	100.0%
20-May-99	P	435	7	STANDING DEAD	0.0	0.0%
20-May-99	P	435	7	SURFACE LITTER	0.0	0.0%
20-May-99	P	435	TOTAL		11.0	
20-May-99	P	435	8	FR	22.4	100.0%
20-May-99	P	435	8	STANDING DEAD	0.0	0.0%
20-May-99	P	435	8	SURFACE LITTER	0.0	0.0%
20-May-99	P	435	TOTAL		22.4	
20-May-99	P	435	9	FR	20.6	100.0%
20-May-99	P	435	9	STANDING DEAD	0.0	0.0%
20-May-99	P	435	9	SURFACE LITTER	0.0	0.0%
20-May-99	P	435	TOTAL		20.6	
20-May-99	P	435	10	FR	42.0	100.0%
20-May-99	P	435	10	STANDING DEAD	0.0	0.0%
20-May-99	P	435	10	SURFACE LITTER	0.0	0.0%
20-May-99	P	435	TOTAL		42.0	
20-May-99	P	435	11	FR	35.0	100.0%
20-May-99	P	435	11	STANDING DEAD	0.0	0.0%
20-May-99	P	435	11	SURFACE LITTER	0.0	0.0%
20-May-99	P	435	TOTAL		35.0	
20-May-99	P	436	1	COMPOSITE	176.4	44.2%
20-May-99	P	436	1	STANDING DEAD	100.6	25.2%

20-May-99	P	436	1	SURFACE LITTER	122.4	30.6%
20-May-99	P	436	TOTAL		399.4	
20-May-99	P	436	2	COMPOSITE	93.6	33.3%
20-May-99	P	436	2	STANDING DEAD	94.6	33.7%
20-May-99	P	436	2	SURFACE LITTER	92.6	33.0%
20-May-99	P	436	TOTAL		280.8	
20-May-99	P	436	3	COMPOSITE	72.0	18.1%
20-May-99	P	436	3	STANDING DEAD	156.6	39.3%
20-May-99	P	436	3	SURFACE LITTER	170.2	42.7%
20-May-99	P	436	TOTAL		398.8	
20-May-99	P	436	4	COMPOSITE	113.2	33.4%
20-May-99	P	436	4	STANDING DEAD	118.6	34.9%
20-May-99	P	436	4	SURFACE LITTER	107.6	31.7%
20-May-99	P	436	TOTAL		339.4	
20-May-99	P	436	5	COMPOSITE	213.0	46.2%
20-May-99	P	436	5	STANDING DEAD	141.0	30.6%
20-May-99	P	436	5	SURFACE LITTER	107.0	23.2%
20-May-99	P	436	TOTAL		461.0	
20-May-99	P	437	1	COMPOSITE	74.6	11.4%
20-May-99	P	437	1	STANDING DEAD	259.8	39.6%
20-May-99	P	437	1	SURFACE LITTER	321.4	49.0%
20-May-99	P	437	TOTAL		655.8	
20-May-99	P	437	2	COMPOSITE	54.2	15.7%
20-May-99	P	437	2	STANDING DEAD	124.4	35.9%
20-May-99	P	437	2	SURFACE LITTER	167.6	48.4%
20-May-99	P	437	TOTAL		346.2	
20-May-99	P	437	3	COMPOSITE	33.0	7.7%

20-May-99	P	437	3	STANDING DEAD	150.4	34.9%
20-May-99	P	437	3	SURFACE LITTER	247.2	57.4%
20-May-99	P	437	TOTAL		430.6	
20-May-99	P	437	4	COMPOSITE	39.4	3.0%
20-May-99	P	437	4	STANDING DEAD	1101.6	82.7%
20-May-99	P	437	4	SURFACE LITTER	191.6	14.4%
20-May-99	P	437	TOTAL		1332.6	
20-May-99	P	437	5	COMPOSITE	64.2	10.2%
20-May-99	P	437	5	STANDING DEAD	275.8	43.7%
20-May-99	P	437	5	SURFACE LITTER	291.8	46.2%
20-May-99	P	437	TOTAL		631.8	
20-May-99	P	438	1	COMPOSITE	60.0	12.9%
20-May-99	P	438	1	STANDING DEAD	254.8	54.7%
20-May-99	P	438	1	SURFACE LITTER	150.8	32.4%
20-May-99	P	438	TOTAL		465.6	
20-May-99	P	438	2	COMPOSITE	90.4	22.9%
20-May-99	P	438	2	STANDING DEAD	236.4	59.8%
20-May-99	P	438	2	SURFACE LITTER	68.4	17.3%
20-May-99	P	438	TOTAL		395.2	
20-May-99	P	438	3	COMPOSITE	106.4	24.4%
20-May-99	P	438	3	STANDING DEAD	218.4	50.1%
20-May-99	P	438	3	SURFACE LITTER	111.0	25.5%
20-May-99	P	438	TOTAL		435.8	
20-May-99	P	438	4	COMPOSITE	142.6	28.3%
20-May-99	P	438	4	STANDING DEAD	259.2	51.4%
20-May-99	P	438	4	SURFACE LITTER	102.2	20.3%
20-May-99	P	438	TOTAL		504.0	

20-May-99	P	438	5	COMPOSITE	52.6	22.1%
20-May-99	P	438	5	STANDING DEAD	124.6	52.4%
20-May-99	P	438	5	SURFACE LITTER	60.4	25.4%
20-May-99	P	438	TOTAL		237.6	
20-May-99	P	439	1	COMPOSITE	79.2	12.4%
20-May-99	P	439	1	STANDING DEAD	313.2	48.9%
20-May-99	P	439	1	SURFACE LITTER	247.6	38.7%
20-May-99	P	439	TOTAL		640.0	
20-May-99	P	439	2	COMPOSITE	64.6	10.3%
20-May-99	P	439	2	STANDING DEAD	523.8	83.9%
20-May-99	P	439	2	SURFACE LITTER	35.8	5.7%
20-May-99	P	439	TOTAL		624.2	
20-May-99	P	439	3	COMPOSITE	53.2	12.8%
20-May-99	P	439	3	STANDING DEAD	363.0	87.2%
20-May-99	P	439	3	SURFACE LITTER	0.0	0.0%
20-May-99	P	439	TOTAL		416.2	
20-May-99	P	439	4	COMPOSITE	22.2	4.1%
20-May-99	P	439	4	STANDING DEAD	516.2	95.9%
20-May-99	P	439	4	SURFACE LITTER	0.0	0.0%
20-May-99	P	439	TOTAL		538.4	
20-May-99	P	439	5	COMPOSITE	38.0	15.1%
20-May-99	P	439	5	STANDING DEAD	213.8	84.9%
20-May-99	P	439	5	SURFACE LITTER	0.0	0.0%
20-May-99	P	439	TOTAL		251.8	

5.2 Appendix 2: Vegetation Aboveground Standing Crop, T=2

DATE	SITE	ELEV	REP	SPP	Veg-O.D. g•m^{-2}	% OF TOTAL BY WEIGHT
11-Jun-99	K	435	1	COMPOSITE	74.6	78.0%
11-Jun-99	K	435	1	FR	21.0	22.0%
11-Jun-99	K	435	TOTAL		95.6	
11-Jun-99	K	435	2	COMPOSITE	55.6	56.0%
11-Jun-99	K	435	2	FR	43.6	44.0%
11-Jun-99	K	435	TOTAL		99.2	
11-Jun-99	K	435	3	COMPOSITE	45.2	58.5%
11-Jun-99	K	435	3	FR	32.0	41.5%
11-Jun-99	K	435	TOTAL		77.2	
11-Jun-99	K	435	4	COMPOSITE	28.6	32.6%
11-Jun-99	K	435	4	FR	59.0	67.4%
11-Jun-99	K	435	TOTAL		87.6	
11-Jun-99	K	435	5	COMPOSITE	90.0	84.5%
11-Jun-99	K	435	5	FR	16.4	15.5%
11-Jun-99	K	435	TOTAL		106.4	
11-Jun-99	K	436	1	COMPOSITE	330.6	100.0%
11-Jun-99	K	436	TOTAL		330.6	
11-Jun-99	K	436	2	COMPOSITE	248.4	100.0%
11-Jun-99	K	436	TOTAL		248.4	
11-Jun-99	K	436	3	COMPOSITE	274.2	100.0%
11-Jun-99	K	436	TOTAL		274.2	
11-Jun-99	K	436	4	COMPOSITE	292.6	100.0%
11-Jun-99	K	436	TOTAL		292.6	
11-Jun-99	K	436	5	COMPOSITE	201.2	100.0%
11-Jun-99	K	436	TOTAL		201.2	

11-Jun-99	K	437	1	COMPOSITE	292.8	100.0%
11-Jun-99	K	437	TOTAL		292.8	
11-Jun-99	K	437	2	COMPOSITE	326.0	100.0%
11-Jun-99	K	437	TOTAL		326.0	
11-Jun-99	K	437	3	COMPOSITE	293.0	100.0%
11-Jun-99	K	437	TOTAL		293.0	
11-Jun-99	K	437	4	COMPOSITE	193.6	100.0%
11-Jun-99	K	437	TOTAL		193.6	
11-Jun-99	K	437	5	COMPOSITE	184.2	100.0%
11-Jun-99	K	437	TOTAL		184.2	
11-Jun-99	M	434	1	COMPOSITE	103.6	67.7%
11-Jun-99	M	434	1	FR	49.4	32.3%
11-Jun-99	M	434	TOTAL		153.0	
11-Jun-99	M	434	2	COMPOSITE	63.8	58.2%
11-Jun-99	M	434	2	FR	45.8	41.8%
11-Jun-99	M	434	TOTAL		109.6	
11-Jun-99	M	434	3	COMPOSITE	72.8	47.9%
11-Jun-99	M	434	3	FR	79.2	52.1%
11-Jun-99	M	434	TOTAL		152.0	
11-Jun-99	M	434	4	COMPOSITE	171.4	80.0%
11-Jun-99	M	434	4	FR	42.8	20.0%
11-Jun-99	M	434	TOTAL		214.2	
11-Jun-99	M	434	5	COMPOSITE	0.9	0.7%
11-Jun-99	M	434	5	FR	122.4	99.3%
11-Jun-99	M	434	TOTAL		123.3	
11-Jun-99	M	435	1	COMPOSITE	344.4	100.0%
11-Jun-99	M	435	TOTAL		344.4	
11-Jun-99	M	435	2	COMPOSITE	169.6	100.0%

11-Jun-99	M	435	TOTAL		169.6	
11-Jun-99	M	435	3	COMPOSITE	118.4	100.0%
11-Jun-99	M	435	TOTAL		118.4	
11-Jun-99	M	435	4	COMPOSITE	514.2	100.0%
11-Jun-99	M	435	TOTAL		514.2	
11-Jun-99	M	435	5	COMPOSITE	292.8	100.0%
11-Jun-99	M	435	TOTAL		292.8	
11-Jun-99	M	436	1	COMPOSITE	157.8	98.5%
11-Jun-99	M	436	1	FR	2.4	1.5%
11-Jun-99	M	436	TOTAL		160.2	
11-Jun-99	M	436	2	COMPOSITE	124.2	73.4%
11-Jun-99	M	436	2	FR	45.0	26.6%
11-Jun-99	M	436	TOTAL		169.2	
11-Jun-99	M	436	3	COMPOSITE	379.2	100.0%
11-Jun-99	M	436	TOTAL		379.2	
11-Jun-99	M	436	4	COMPOSITE	29.8	68.7%
11-Jun-99	M	436	4	FR	13.6	31.3%
11-Jun-99	M	436	TOTAL		43.4	
11-Jun-99	M	436	5	COMPOSITE	299.2	100.0%
11-Jun-99	M	436	TOTAL		299.2	
11-Jun-99	M	437	1	COMPOSITE	282.4	100.0%
11-Jun-99	M	437	TOTAL		282.4	
11-Jun-99	M	437	2	COMPOSITE	302.2	100.0%
11-Jun-99	M	437	TOTAL		302.2	
11-Jun-99	M	437	3	COMPOSITE	397.0	100.0%
11-Jun-99	M	437	TOTAL		397.0	
11-Jun-99	M	437	4	COMPOSITE	390.0	100.0%

11-Jun-99	M	437	TOTAL		390.0	
11-Jun-99	M	437	5	COMPOSITE	417.6	100.0%
11-Jun-99	M	437	TOTAL		417.6	
11-Jun-99	P	434	1	COMPOSITE	252.4	100.0%
11-Jun-99	P	434	TOTAL		252.4	
11-Jun-99	P	434	2	COMPOSITE	173.0	100.0%
11-Jun-99	P	434	TOTAL		173.0	
11-Jun-99	P	434	3	COMPOSITE	219.6	100.0%
11-Jun-99	P	434	TOTAL		219.6	
11-Jun-99	P	434	4	COMPOSITE	192.6	100.0%
11-Jun-99	P	434	TOTAL		192.6	
11-Jun-99	P	434	5	COMPOSITE	97.4	100.0%
11-Jun-99	P	434	TOTAL		97.4	
11-Jun-99	P	435	1	COMPOSITE	105.4	100.0%
11-Jun-99	P	435	TOTAL		105.4	
11-Jun-99	P	435	2	COMPOSITE	153.2	100.0%
11-Jun-99	P	435	TOTAL		153.2	
11-Jun-99	P	435	3	COMPOSITE	153.0	100.0%
11-Jun-99	P	435	TOTAL		153.0	
11-Jun-99	P	435	4	COMPOSITE	131.2	100.0%
11-Jun-99	P	435	TOTAL		131.2	
11-Jun-99	P	435	5	COMPOSITE	122.4	100.0%
11-Jun-99	P	435	TOTAL		122.4	
11-Jun-99	P	435	6	FR	59.4	100.0%
11-Jun-99	P	435	TOTAL		59.4	
11-Jun-99	P	435	7	FR	75.4	100.0%
11-Jun-99	P	435	TOTAL		75.4	

11-Jun-99	P	435	8	FR	113.8	100.0%
11-Jun-99	P	435	TOTAL		113.8	
11-Jun-99	P	435	9	FR	152.8	100.0%
11-Jun-99	P	435	TOTAL		152.8	
11-Jun-99	P	435	10	FR	77.8	100.0%
11-Jun-99	P	435	TOTAL		77.8	
11-Jun-99	P	436	1	COMPOSITE	257.2	100.0%
11-Jun-99	P	436	TOTAL		257.2	
11-Jun-99	P	436	2	COMPOSITE	196.0	100.0%
11-Jun-99	P	436	TOTAL		196.0	
11-Jun-99	P	436	3	COMPOSITE	309.2	100.0%
11-Jun-99	P	436	TOTAL		309.2	
11-Jun-99	P	436	4	COMPOSITE	21.8	100.0%
11-Jun-99	P	436	TOTAL		21.8	
11-Jun-99	P	436	5	COMPOSITE	158.4	100.0%
11-Jun-99	P	436	TOTAL		158.4	
11-Jun-99	P	437	1	COMPOSITE	200.4	100.0%
11-Jun-99	P	437	TOTAL		200.4	
11-Jun-99	P	437	2	COMPOSITE	136.2	100.0%
11-Jun-99	P	437	TOTAL		136.2	
11-Jun-99	P	437	3	COMPOSITE	151.4	100.0%
11-Jun-99	P	437	TOTAL		151.4	
11-Jun-99	P	437	4	COMPOSITE	756.4	100.0%
11-Jun-99	P	437	TOTAL		756.4	
11-Jun-99	P	437	5	COMPOSITE	132.4	100.0%
11-Jun-99	P	437	TOTAL		132.4	

5.3 Appendix 3: Vegetation Aboveground Standing Crop, T=3

DATE	SITE	ELEV	REP	SPP	Veg-O.D. g•m^{-2}	% OF TOTAL BY WEIGHT
23-Jun-99	K	436	1	RCG	408.7	97.3%
23-Jun-99	K	436	1	EQ	11.3	2.7%
23-Jun-99	K	436	TOTAL		419.9	
23-Jun-99	K	436	2	COMPOSITE	243.7	100.0%
23-Jun-99	K	436	TOTAL		243.7	
23-Jun-99	K	436	3	RCG	448.1	92.4%
23-Jun-99	K	436	3	CL	32.1	6.6%
23-Jun-99	K	436	3	EQ	4.7	1.0%
23-Jun-99	K	436	TOTAL		484.8	
23-Jun-99	K	436	4	RCG	327.7	91.3%
23-Jun-99	K	436	4	CL	7.4	2.1%
23-Jun-99	K	436	4	EQ	24.0	6.7%
23-Jun-99	K	436	TOTAL		359.1	
23-Jun-99	K	436	5	COMPOSITE	549.1	100.0%
23-Jun-99	K	436	TOTAL		549.1	
23-Jun-99	K	437	1	RCG	276.8	62.4%
23-Jun-99	K	437	1	CL	19.0	4.3%
23-Jun-99	K	437	1	EQ	147.6	33.3%
23-Jun-99	K	437	TOTAL		443.4	
23-Jun-99	K	437	2	COMPOSITE	555.0	237.6%
23-Jun-99	K	437	TOTAL		555.0	
23-Jun-99	K	437	3	RCG	86.5	17.2%
23-Jun-99	K	437	3	CL	334.1	66.3%
23-Jun-99	K	437	3	EQ	83.5	16.6%
23-Jun-99	K	437	TOTAL		504.1	

23-Jun-99	K	437	4	COMPOSITE	445.1	100.0%
23-Jun-99	K	437	TOTAL		445.1	
23-Jun-99	K	437	5	RCG	283.7	91.3%
23-Jun-99	K	437	5	CL	2.3	0.7%
23-Jun-99	K	437	5	EQ	24.7	8.0%
23-Jun-99	K	437	TOTAL		310.7	
23-Jun-99	K	438	1	RCG	110.1	51.5%
23-Jun-99	K	438	1	CL	103.8	48.5%
23-Jun-99	K	438	TOTAL		213.9	
23-Jun-99	K	438	2	RCG	174.8	53.6%
23-Jun-99	K	438	2	CL	151.3	46.4%
23-Jun-99	K	438	TOTAL		326.1	
23-Jun-99	K	438	3	RCG	223.6	64.5%
23-Jun-99	K	438	3	CL	110.2	31.8%
23-Jun-99	K	438	3	EQ	13.0	3.8%
23-Jun-99	K	438	TOTAL		346.8	
23-Jun-99	K	438	4	COMPOSITE	361.1	100.0%
23-Jun-99	K	438	TOTAL		361.1	
23-Jun-99	K	438	5	COMPOSITE	239.7	100.0%
23-Jun-99	K	438	TOTAL		239.7	
23-Jun-99	M	435	1	RCG	37.5	54.6%
23-Jun-99	M	435	1	CL	14.1	20.6%
23-Jun-99	M	435	1	EQ	17.0	24.8%
23-Jun-99	M	435	TOTAL		68.6	
23-Jun-99	M	435	2	RCG	243.5	81.3%
23-Jun-99	M	435	2	CL	39.8	13.3%
23-Jun-99	M	435	2	EQ	16.3	5.5%

23-Jun-99	M	435	TOTAL		299.7	
23-Jun-99	M	435	3	RCG	91.0	43.9%
23-Jun-99	M	435	3	CL	85.0	41.0%
23-Jun-99	M	435	3	EQ	31.5	15.2%
23-Jun-99	M	435	TOTAL		207.5	
23-Jun-99	M	435	4	COMPOSITE	203.2	100.0%
23-Jun-99	M	435	TOTAL		203.2	
23-Jun-99	M	435	5	COMPOSITE	454.5	100.0%
23-Jun-99	M	435	TOTAL		454.5	
23-Jun-99	M	436	1	RCG	12.9	7.6%
23-Jun-99	M	436	1	CL	135.4	80.2%
23-Jun-99	M	436	1	EQ	11.9	7.0%
23-Jun-99	M	436	1	FR	8.7	5.2%
23-Jun-99	M	436	TOTAL		168.9	
23-Jun-99	M	436	2	RCG	28.8	21.1%
23-Jun-99	M	436	2	CL	103.4	75.7%
23-Jun-99	M	436	2	EQ	4.0	2.9%
23-Jun-99	M	436	2	FR	0.4	0.3%
23-Jun-99	M	436	TOTAL		136.6	
23-Jun-99	M	436	3	FR	6.5	1.7%
23-Jun-99	M	436	3	COMPOSITE	365.6	98.3%
23-Jun-99	M	436	TOTAL		372.1	
23-Jun-99	M	436	4	RCG	163.9	88.5%
23-Jun-99	M	436	4	CL	12.6	6.8%
23-Jun-99	M	436	4	CA	2.1	1.1%
23-Jun-99	M	436	4	EQ	6.5	3.5%
23-Jun-99	M	436	TOTAL		185.2	

23-Jun-99	M	436	5	FR	1.2	0.5%
23-Jun-99	M	436	5	COMPOSITE	237.3	99.5%
23-Jun-99	M	436	TOTAL		238.6	
23-Jun-99	M	437	1	RCG	189.4	47.0%
23-Jun-99	M	437	1	CL	208.2	51.7%
23-Jun-99	M	437	1	EQ	5.1	1.3%
23-Jun-99	M	437	TOTAL		402.7	
23-Jun-99	M	437	2	RCG	259.0	54.2%
23-Jun-99	M	437	2	CL	132.9	27.8%
23-Jun-99	M	437	2	CA	84.5	17.7%
23-Jun-99	M	437	2	EQ	1.4	0.3%
23-Jun-99	M	437	TOTAL		477.9	
23-Jun-99	M	437	3	RCG	222.2	48.2%
23-Jun-99	M	437	3	CL	234.2	50.8%
23-Jun-99	M	437	3	EQ	4.3	0.9%
23-Jun-99	M	437	TOTAL		460.8	
23-Jun-99	M	437	4	COMPOSITE	332.9	100.0%
23-Jun-99	M	437	TOTAL		332.9	
23-Jun-99	M	437	5	COMPOSITE	364.5	100.0%
23-Jun-99	M	437	TOTAL		364.5	
23-Jun-99	M	438	1	CA	248.3	100.0%
23-Jun-99	M	438	TOTAL		248.3	
23-Jun-99	M	438	2	COMPOSITE	84.7	100.0%
23-Jun-99	M	438	TOTAL		84.7	
23-Jun-99	M	438	3	COMPOSITE	111.4	100.0%
23-Jun-99	M	438	TOTAL		111.4	
23-Jun-99	M	438	4	RCG	20.4	26.8%

23-Jun-99	M	438	4	CL	36.4	48.0%
23-Jun-99	M	438	4	Jun	19.2	25.2%
23-Jun-99	M	438	TOTAL		75.9	
23-Jun-99	M	438	5	RCG	126.8	78.6%
23-Jun-99	M	438	5	CL	34.6	21.4%
23-Jun-99	M	438	TOTAL		161.3	
23-Jun-99	P	435	1	RCG	148.5	100.0%
23-Jun-99	P	435	TOTAL		148.5	
23-Jun-99	P	435	2	RCG	421.5	100.0%
23-Jun-99	P	435	TOTAL		421.5	
23-Jun-99	P	435	3	RCG	292.4	100.0%
23-Jun-99	P	435	TOTAL		292.4	
23-Jun-99	P	435	4	COMPOSITE	432.1	100.0%
23-Jun-99	P	435	TOTAL		432.1	
23-Jun-99	P	435	5	COMPOSITE	193.7	100.0%
23-Jun-99	P	435	TOTAL		193.7	
23-Jun-99	P	435	6	FR	48.5	100.0%
23-Jun-99	P	435	TOTAL		48.5	
23-Jun-99	P	435	7	FR	46.3	100.0%
23-Jun-99	P	435	TOTAL		46.3	
23-Jun-99	P	435	8	FR	45.2	100.0%
23-Jun-99	P	435	TOTAL		45.2	
23-Jun-99	P	435	9	FR	89.2	100.0%
23-Jun-99	P	435	TOTAL		89.2	
23-Jun-99	P	435	10	FR	56.0	100.0%
23-Jun-99	P	435	TOTAL		56.0	
23-Jun-99	P	436	1	CL	208.9	82.7%

23-Jun-99	P	436	1	EQ	0.4	0.1%
23-Jun-99	P	436	1	RCG	43.4	17.2%
23-Jun-99	P	436	TOTAL		252.7	
23-Jun-99	P	436	2	RCG	169.6	77.9%
23-Jun-99	P	436	2	CL	28.6	13.1%
23-Jun-99	P	436	2	EQ	19.7	9.0%
23-Jun-99	P	436	TOTAL		217.8	
23-Jun-99	P	436	3	RCG	322.9	94.9%
23-Jun-99	P	436	3	CL	17.2	5.1%
23-Jun-99	P	436	3	EQ	0.3	0.1%
23-Jun-99	P	436	TOTAL		340.4	
23-Jun-99	P	436	4	COMPOSITE	299.0	100.0%
23-Jun-99	P	436	TOTAL		299.0	
23-Jun-99	P	436	5	COMPOSITE	322.8	100.0%
23-Jun-99	P	436	TOTAL		322.8	
23-Jun-99	P	437	1	RCG	418.1	100.0%
23-Jun-99	P	437	TOTAL		418.1	
23-Jun-99	P	437	2	CL	245.3	100.0%
23-Jun-99	P	437	TOTAL		245.3	
23-Jun-99	P	437	3	COMPOSITE	253.0	100.0%
23-Jun-99	P	437	TOTAL		253.0	
23-Jun-99	P	437	4	COMPOSITE	337.3	100.0%
23-Jun-99	P	437	TOTAL		337.3	
23-Jun-99	P	437	5	RCG	174.8	57.8%
23-Jun-99	P	437	5	CL	54.4	18.0%
23-Jun-99	P	437	5	CA	73.2	24.2%
23-Jun-99	P	437	TOTAL		302.4	

23-Jun-99	P	438	1	RCG	87.0	53.5%
23-Jun-99	P	438	1	CL	59.1	36.3%
23-Jun-99	P	438	1	EQ	16.6	10.2%
23-Jun-99	P	438	TOTAL		162.6	
23-Jun-99	P	438	2	SCCY	18.4	10.9%
23-Jun-99	P	438	2	RCG	48.3	28.7%
23-Jun-99	P	438	2	CL	70.0	41.6%
23-Jun-99	P	438	2	EQ	31.6	18.8%
23-Jun-99	P	438	TOTAL		168.3	
23-Jun-99	P	438	3	RCG	86.0	57.0%
23-Jun-99	P	438	3	CL	53.6	35.5%
23-Jun-99	P	438	3	EQ	11.4	7.5%
23-Jun-99	P	438	TOTAL		151.0	
23-Jun-99	P	438	4	COMPOSITE	358.9	100.0%
23-Jun-99	P	438	TOTAL		358.9	
23-Jun-99	P	438	5	COMPOSITE	276.7	100.0%
		438	TOTAL		276.7	

5.4 Appendix 4: Plot composition, Species percentage by weight

			Average values M435	**RCG**	**64.6%**	**Average values P435**	**RCG**	**100.0%**
				CL	**24.1%**			
				EQ	**11.3%**			
Average values K436	**RCG**	**92.3%**	**Average values M436**	**RCG**	**42.7%**	**Average values P436**	**RCG**	**66.1%**
	CL	**4.6%**		**CL**	**52.2%**		**CL**	**31.4%**
	EQ	**3.1%**		**CA**	**0.4%**		**EQ**	**2.5%**
				EQ	**4.6%**			**0.0%**
Average values K437	**RCG**	**51.4%**	**Average values M437**	**RCG**	**50.0%**	**Average values P437**	**RCG**	**66.4%**
	CL	**28.2%**		**CL**	**42.9%**		**CL**	**33.6%**
	EQ	**20.3%**		**CA**	**6.3%**		**EQ**	**0.0%**
				EQ	**0.8%**			
Average values K438	**RCG**	***57.3%***	***Average values M438***	**RCG**	***31.5%***	Average values P438	RCG	41.2%
	CL	*41.2%*		*CL*	*15.2%*		CL	34.0%
	EQ	*1.5%*		*CA*	*53.2%*		EQ	11.1%
				EQ	*0.0%*		CA	13.6%
				Juncus	*4.0%*		SCCY	3.4%

5.5 Appendix 5: Aboveground Nutrient Analyses, T=3

June 23						Calculated Values				Lab Results						
LAB #	DATE	SITE	ELEV	REP	SPP	Shoot AFDW g/m^2	Shoot N-g/m^2	Shoot P-g/m^2	Shoot K-g/m^2	N%	P%	Ca%	Mg%	K%	ASH%	OVEN DRY WT. g/0.5m^2
865	June 23/99	K	435	1	RCG	408.68	2.92	0.26	5.79	0.72	0.06	0.16	0.07	1.42	8.40	204.34
866	June 23/99	K	435	1	EQ	11.26	0.15	0.01	0.40	1.32	0.12	1.25	0.20	3.55	22.40	5.63
867	June 23/99	K	435	2	COMPOSITE	243.75	2.59	0.23	4.34	1.06	0.09	0.31	0.12	1.78	11.40	121.87
868	June 23/99	K	435	3	RCG	448.06	3.41	0.29	5.15	0.76	0.07	0.18	0.08	1.15	5.60	224.03
869	June 23/99	K	435	3	CL	32.07	0.40	0.04	0.65	1.24	0.14	0.31	0.17	2.04	7.90	16.03
870	June 23/99	K	435	3	EQ	4.70	0.07	0.01	0.19	1.40	0.13	1.33	0.23	4.10	18.50	2.35
871	June 23/99	K	435	4	RCG	327.74	2.36	0.21	4.09	0.72	0.06	0.17	0.06	1.25	7.60	163.87
872	June 23/99	K	435	4	CL	7.41	0.08	0.01	0.15	1.13	0.11	0.32	0.13	1.96	9.20	3.70
873	June 23/99	K	435	4	EQ	23.99	0.29	0.02	0.66	1.21	0.09	1.04	0.20	2.73	22.90	12.00
874	June 23/99	K	435	5	COMPOSITE	549.14	5.01	0.32	8.06	0.91	0.06	0.29	0.07	1.47	7.90	274.57
814	June 23/99	K	436	1	RCG	276.76	3.09	0.35	4.03	1.12	0.13	0.22	0.12	1.46	11.60	138.38
815	June 23/99	K	436	1	CL	19.04	0.26	0.03	0.43	1.34	0.14	0.38	0.19	2.24	10.10	9.52
816	June 23/99	K	436	1	EQ	147.62	2.87	0.29	4.69	1.94	0.20	1.38	0.34	3.18	21.90	73.81
817	June 23/99	K	436	2	COMPOSITE	555.04	5.36	0.51	8.49	0.97	0.09	0.30	0.12	1.53	11.10	277.52
818	June 23/99	K	436	3	RCG	86.48	0.73	0.06	1.14	0.84	0.07	0.14	0.09	1.32	7.50	43.24
819	June 23/99	K	436	3	CL	334.13	4.09	0.29	7.51	1.22	0.09	0.38	0.22	2.25	10.30	167.06
820	June 23/99	K	436	3	EQ	83.47	1.56	0.14	3.22	1.87	0.17	1.35	0.32	3.86	22.80	41.73
821	June 23/99	K	436	4	COMPOSITE	445.13	4.55	0.39	6.07	1.02	0.09	0.32	0.13	1.36	10.90	222.57
822	June 23/99	K	436	5	RCG	283.73	1.98	0.20	3.06	0.70	0.07	0.18	0.08	1.08	7.90	141.86
823	June 23/99	K	436	5	CL	2.25	0.03	0.00	0.05	1.19	0.10	0.40	0.23	2.30	11.60	1.13
824	June 23/99	K	436	5	EQ	24.74	0.45	0.05	0.90	1.80	0.19	1.48	0.29	3.63	21.90	12.37
875	June 23/99	K	438	1	RCG	110.12	1.01	0.12	1.44	0.91	0.11	0.18	0.11	1.31	6.70	55.06
876	June 23/99	K	438	1	CL	103.83	1.15	0.17	1.90	1.10	0.17	0.28	0.14	1.83	6.30	51.91
877	June 23/99	K	438	2	RCG	174.82	1.20	0.15	1.75	0.69	0.09	0.11	0.07	1.00	4.50	87.41
878	June 23/99	K	438	2	CL	151.28	1.67	0.21	3.34	1.10	0.14	0.37	0.18	2.21	7.20	75.64
879	June 23/99	K	438	3	RCG	223.61	2.89	0.34	4.42	1.29	0.15	0.27	0.15	1.98	5.60	111.81
880	June 23/99	K	438	3	CL	110.20	0.96	0.10	2.26	0.87	0.09	0.29	0.15	2.05	7.00	55.10
881	June 23/99	K	438	3	EQ	13.03	0.18	0.02	0.38	1.37	0.12	0.79	0.24	2.89	15.60	6.52
882	June 23/99	K	438	4	COMPOSITE	361.14	3.56	0.34	5.29	0.99	0.09	0.21	0.09	1.46	6.60	180.57
883	June 23/99	K	438	5	COMPOSITE	239.70	2.72	0.30	3.60	1.14	0.12	0.25	0.14	1.50	6.40	119.85
825	June 23/99	M	435	1	RCG	37.48	0.52	0.07	0.52	1.38	0.19	0.52	0.12	1.38	11.30	18.74
826	June 23/99	M	435	1	CL	14.13	0.21	0.04	0.22	1.48	0.25	0.46	0.15	1.58	10.00	7.06
827	June 23/99	M	435	1	EQ	17.04	0.25	0.04	0.35	1.45	0.26	1.61	0.24	2.06	20.60	8.52
828	June 23/99	M	435	2	RCG	243.49	1.79	0.24	2.95	0.73	0.10	0.22	0.11	1.21	9.10	121.74
829	June 23/99	M	435	2	CL	39.83	0.52	0.08	0.63	1.31	0.19	0.46	0.19	1.57	12.60	19.91
830	June 23/99	M	435	2	EQ	16.34	0.22	0.03	0.34	1.36	0.18	1.66	0.30	2.08	22.60	8.17
831	June 23/99	M	435	3	RCG	91.02	0.84	0.13	1.17	0.92	0.15	0.36	0.11	1.28	9.80	45.51
832	June 23/99	M	435	3	CL	85.03	1.13	0.18	1.50	1.32	0.22	0.48	0.15	1.77	10.20	42.52
833	June 23/99	M	435	3	EQ	31.47	0.49	0.06	0.81	1.56	0.21	2.11	0.25	2.59	22.40	15.74
834	June 23/99	M	435	4	COMPOSITE	203.16	2.49	0.38	3.35	1.23	0.19	0.99	0.19	1.65	14.30	101.58
835	June 23/99	M	435	5	COMPOSITE	454.50	3.46	0.49	5.55	0.76	0.11	0.22	0.12	1.22	8.10	227.25
884	June 23/99	M	436	1	RCG	12.90	0.10	0.01	0.15	0.76	0.07	0.20	0.07	1.20	6.10	6.45
885	June 23/99	M	436	1	CL	135.40	2.27	0.21	2.99	1.68	0.16	0.58	0.18	2.21	9.60	67.70
886	June 23/99	M	436	1	EQ	11.85	0.18	0.02	0.42	1.48	0.13	1.41	0.34	3.58	19.50	5.93
887	June 23/99	M	436	1	FR	8.74	0.09	0.01	0.13	0.99	0.12	0.41	0.11	1.54	7.40	4.37
888	June 23/99	M	436	2	RCG	28.81	0.20	0.02	0.30	0.68	0.05	0.18	0.06	1.04	6.10	14.41

June 23						Calculated Values				Lab Results						
LAB #	DATE	SITE	ELEV	REP	SPP	Shoot AFDW g/m2	Shoot N-g/m2	Shoot P-g/m2	Shoot K-g/m2	N%	P%	Ca%	Mg%	K%	ASH%	OVEN DRY WT. g/0.5m2
889	June 23/99	M	436	2	CL	103.35	1.10	0.13	2.44	1.06	0.12	0.35	0.11	2.36	8.10	51.68
890	June 23/99	M	436	2	EQ	4.00	0.05	0.00	0.16	1.29	0.11	1.35	0.31	4.03	19.60	2.00
891	June 23/99	M	436	2	FR	0.42	0.01	0.00	0.01	1.31	0.16	0.45	0.19	2.12	9.00	0.21
892	June 23/99	M	436	3	FR	6.48	0.09	0.01	0.18	1.41	0.20	0.57	0.22	2.75	12.50	3.24
893	June 23/99	M	436	3	COMPOSITE	365.60	4.46	0.51	8.08	1.22	0.14	0.43	0.16	2.21	8.00	182.80
894	June 23/99	M	436	4	RCG	163.91	1.18	0.11	1.98	0.72	0.07	0.25	0.09	1.21	6.30	81.96
895	June 23/99	M	436	4	CL	12.63	0.18	0.02	0.31	1.41	0.18	0.42	0.16	2.43	9.20	6.32
896	June 23/99	M	436	4	CA	2.10	0.03	0.00	0.05	1.57	0.13	0.56	0.24	2.50	9.10	1.05
897	June 23/99	M	436	4	EQ	6.53	0.10	0.01	0.22	1.49	0.12	1.60	0.43	3.36	19.10	3.26
898	June 23/99	M	436	5	FR	1.25	0.03	0.00	0.04	2.05	0.31	0.67	0.23	3.20	14.10	0.62
899	June 23/99	M	436	5	COMPOSITE	237.31	2.71	0.43	5.96	1.14	0.18	0.40	0.16	2.51	9.30	118.65
900	June 23/99	M	437	1	RCG	189.37	1.30	0.13	1.97	0.69	0.07	0.21	0.08	1.04	5.40	94.69
901	June 23/99	M	437	1	CL	208.15	2.32	0.29	4.30	1.11	0.14	0.35	0.17	2.07	9.00	104.08
902	June 23/99	M	437	1	EQ	5.13	0.07	0.01	0.22	1.45	0.18	1.33	0.39	4.35	22.40	2.56
903	June 23/99	M	437	2	RCG	259.01	2.08	0.20	3.53	0.80	0.08	0.19	0.10	1.36	7.30	129.51
904	June 23/99	M	437	2	CL	132.93	1.53	0.20	3.06	1.15	0.15	0.35	0.17	2.30	9.30	66.47
905	June 23/99	M	437	2	CA	84.54	1.25	0.14	1.89	1.48	0.17	0.34	0.13	2.23	8.40	42.27
906	June 23/99	M	437	2	EQ	1.45	0.02	0.00	0.07	1.61	0.21	1.60	0.43	4.95	21.70	0.72
907	June 23/99	M	437	3	RCG	222.24	2.52	0.27	4.23	1.14	0.12	0.38	0.17	1.91	8.90	111.12
908	June 23/99	M	437	3	CL	234.24	3.19	0.40	5.82	1.36	0.17	0.39	0.22	2.49	9.50	117.12
909	June 23/99	M	437	3	EQ	4.34	0.07	0.01	0.17	1.56	0.18	1.16	0.34	3.85	19.00	2.17
910	June 23/99	M	437	4	COMPOSITE	332.87	3.45	0.33	5.66	1.04	0.10	0.33	0.15	1.70	8.40	166.44
911	June 23/99	M	437	5	COMPOSITE	364.50	3.24	0.28	4.86	0.89	0.08	0.21	0.10	1.33	7.80	182.25
912	June 23/99	M	438	1	CA	248.33	4.79	0.52	4.71	1.93	0.21	0.31	0.15	1.90	8.70	124.17
913	June 23/99	M	438	2	COMPOSITE	84.67	1.57	0.20	1.85	1.86	0.23	0.31	0.19	2.18	13.70	42.33
914	June 23/99	M	438	3	COMPOSITE	111.42	1.74	0.20	2.00	1.56	0.18	0.35	0.15	1.79	10.10	55.71
915	June 23/99	M	438	4	RCG	20.36	0.31	0.04	0.51	1.53	0.21	0.29	0.13	2.50	11.70	10.18
916	June 23/99	M	438	4	CL	36.41	0.82	0.09	0.73	2.24	0.25	0.42	0.18	2.00	8.40	18.21
917	June 23/99	M	438	4	JB	19.15	0.40	0.04	0.34	2.08	0.23	0.33	0.15	1.79	7.30	9.58
918	June 23/99	M	438	5	RCG	126.76	1.99	0.23	2.55	1.57	0.18	0.31	0.20	2.01	10.30	63.38
919	June 23/99	M	438	5	CL	34.58	0.57	0.07	0.71	1.64	0.21	0.36	0.19	2.05	9.00	17.29
836	June 23/99	P	435	1	RCG	148.45	0.99	0.15	1.37	0.67	0.10	0.16	0.06	0.92	6.60	74.23
837	June 23/99	P	435	2	RCG	421.45	1.92	0.41	3.04	0.46	0.10	0.07	0.05	0.72	5.50	210.73
838	June 23/99	P	435	3	RCG	292.44	1.77	0.27	2.52	0.60	0.09	0.11	0.05	0.86	5.20	146.22
839	June 23/99	P	435	4	COMPOSITE	432.09	3.26	0.51	5.19	0.76	0.12	0.18	0.12	1.20	7.70	216.05
840	June 23/99	P	435	5	COMPOSITE	193.70	1.24	0.22	2.18	0.64	0.11	0.24	0.08	1.13	6.90	96.85
841	June 23/99	P	435	1fr	FR	48.47	0.48	0.10	0.70	0.98	0.20	0.31	0.12	1.45	9.20	24.23
842	June 23/99	P	435	2fr	FR	46.34	0.47	0.11	0.72	1.02	0.23	0.31	0.14	1.56	8.50	23.17
843	June 23/99	P	435	3fr	FR	45.22	0.39	0.08	0.58	0.87	0.18	0.39	0.15	1.28	12.50	22.61
844	June 23/99	P	435	4fr	FR	89.16	0.71	0.14	1.09	0.79	0.16	0.33	0.13	1.22	16.40	44.58
845	June 23/99	P	435	5fr	FR	55.98	0.55	0.08	0.85	0.99	0.14	0.32	0.12	1.52	6.80	27.99
846	June 23/99	P	436	1	RCG	43.41	0.44	0.05	0.62	1.02	0.11	0.17	0.11	1.44	7.80	21.70
847	June 23/99	P	436	1	CL	208.93	2.76	0.29	3.91	1.32	0.14	0.40	0.17	1.87	7.70	104.46
848	June 23/99	P	436	1	EQ	0.35	0.01	0.00	0.01	1.77	0.17	1.30	0.36	3.39	17.90	0.18
849	June 23/99	P	436	2	RCG	169.60	1.66	0.19	2.52	0.98	0.11	0.19	0.12	1.48	7.10	84.80
850	June 23/99	P	436	2	CL	28.58	0.47	0.06	0.56	1.63	0.21	0.26	0.17	1.95	7.40	14.29
851	June 23/99	P	436	2	EQ	19.66	0.42	0.05	0.74	2.14	0.25	1.14	0.38	3.76	17.30	9.83
852	June 23/99	P	436	3	RCG	322.91	3.78	0.37	5.07	1.17	0.11	0.24	0.14	1.57	7.50	161.46

June 23						Calculated Values				Lab Results						
LAB #	DATE	SITE	ELEV	REP	SPP	Shoot AFDW g/m2	Shoot N-g/m2	Shoot P-g/m2	Shoot K-g/m2	N%	P%	Ca%	Mg%	K%	ASH%	OVEN DRY WT. g/0.5m2
853	June 23/99	P	436	3	CL	17.20	0.28	0.03	0.36	1.63	0.20	0.26	0.15	2.12	7.60	8.60
854	June 23/99	P	436	3	EQ	0.33	0.01	0.00	0.01	1.96	0.22	1.25	0.42	3.37		0.16
855	June 23/99	P	436	4	COMPOSITE	299.02	4.17	0.37	4.94	1.40	0.12	0.32	0.18	1.65	7.40	149.51
856	June 23/99	P	436	5	COMPOSITE	322.83	4.64	0.43	4.72	1.44	0.13	0.32	0.17	1.46	7.80	161.41
857	June 23/99	P	437	1	RCG	418.10	4.26	0.65	6.78	1.02	0.16	0.17	0.14	1.62	7.00	209.05
858	June 23/99	P	437	2	CL	245.33	3.50	0.57	4.27	1.43	0.23	0.36	0.14	1.74	8.40	122.67
859	June 23/99	P	437	3	COMPOSITE	253.00	2.96	0.39	4.19	1.17	0.15	0.19	0.14	1.66	8.60	126.50
860	June 23/99	P	437	4	COMPOSITE	337.31	3.45	0.47	5.62	1.02	0.14	0.15	0.13	1.67	6.90	168.66
861	June 23/99	P	437	5	RCG	174.83	2.10	0.23	3.08	1.20	0.13	0.23	0.17	1.76	8.60	87.41
862	June 23/99	P	437	5	CL	54.43	0.90	0.11	1.11	1.66	0.20	0.29	0.16	2.04	8.40	27.21
863	June 23/99	P	437	5	CA	73.15	1.27	0.16	1.49	1.73	0.22	0.29	0.12	2.04	7.40	36.58
864	June 23/99	P	438	2	SC	18.43	0.19	0.03	0.27	1.06	0.15	0.17	0.09	1.45	6.10	9.21
803	June 23/99	P	438	1	RCG	86.96	1.43	0.24	1.83	1.65	0.27	0.22	0.22	2.11	12.20	43.48
804	June 23/99	P	438	1	CL	59.06	1.14	0.17	1.30	1.93	0.28	0.40	0.20	2.20	9.10	29.53
805	June 23/99	P	438	1	EQ	16.58	0.35	0.05	0.55	2.11	0.30	1.70	0.39	3.33	18.10	8.29
806	June 23/99	P	438	2	RCG	48.27	0.71	0.13	0.94	1.47	0.26	0.26	0.22	1.95	12.30	24.13
807	June 23/99	P	438	2	CL	69.99	1.14	0.17	1.37	1.63	0.25	0.38	0.20	1.95	9.20	35.00
808	June 23/99	P	438	2	EQ	31.64	0.58	0.08	0.83	1.84	0.27	1.62	0.34	2.63	18.60	15.82
809	June 23/99	P	438	3	RCG	86.01	1.48	0.22	1.60	1.72	0.26	0.32	0.23	1.86	10.90	43.00
810	June 23/99	P	438	3	CL	53.60	1.14	0.16	1.04	2.12	0.30	0.40	0.22	1.94	9.00	26.80
811	June 23/99	P	438	3	EQ	11.40	0.25	0.04	0.35	2.22	0.33	1.48	0.38	3.05	17.60	5.70
812	June 23/99	P	438	4	COMPOSITE	358.94	5.93	0.85	6.59	1.65	0.24	0.42	0.22	1.83	9.40	179.47
813	June 23/99	P	438	5	COMPOSITE	276.74	4.10	0.66	4.60	1.48	0.24	0.45	0.19	1.66	10.20	138.37

SPECIES KEY

CL *Carex lenticularis*
CA *Carex aperta*
RCG *Reed Canary Grass*
EQ *Equisetum*
JB *Juncus balticus*
FR *Fall Rye*
SC *Scirpus*

5.6 Appendix 6: Belowground (Root Soil) Nutrient Analyses, T=3

June 23				Calculated Values				Lab Results									
DATE	SITE	ELEV	REP	ROOT AFDW (g/m^2)	ROOT N (g/m^2)	ROOT P (g/m^2)	ROOT C (g/m^2)	TOTAL SOIL C %	TOTAL SOIL N %	AVAIL SOIL P ppm	AVAIL SOIL K ppm	AVAIL SOIL Ca ppm	AVAIL SOIL Mg ppm	BULK DENSITY (kg/m^3)	ROOT %N	ROOT %P	ROOT %C
23-Jun-99	K	436	1	787.8	6.14	0.71	349.0	1.52	0.09	3	51	1500	170	1133.1	0.78	0.09	44.3
23-Jun-99	K	436	2	673.6	8.49	0.74	295.0	1.30	0.10	5	52	1500	160	1162.9	1.26	0.11	43.8
23-Jun-99	K	436	3	298.1	3.58	0.33	130.3	1.62	0.10	1	51	2250	145	1103.6	1.20	0.11	43.7
23-Jun-99	K	436	4	752.0	7.52	0.60	327.1	1.75	0.10	3	49	2150	150	1145.7	1.00	0.08	43.5
23-Jun-99	K	436	5	430.7	4.35	0.43	185.2	2.00	0.10	1	60	2475	140	1182.5	1.01	0.10	43.0
23-Jun-99	K	437	1	286.8	2.93	0.32	122.8	1.40	0.08	2	55	2150	105	1143.0	1.02	0.11	42.8
23-Jun-99	K	437	2	219.3	2.28	0.24	91.9	1.80	0.11	2	53	1800	125	1070.4	1.04	0.11	41.9
23-Jun-99	K	437	3	863.7	6.65	0.86	371.4	1.54	0.09	4	49	2000	95	1158.4	0.77	0.10	43.0
23-Jun-99	K	437	4	283.6	2.69	0.28	115.4	1.48	0.10	4	50	2050	80	1100.5	0.95	0.10	40.7
23-Jun-99	K	437	5	305.1	3.78	0.31	135.2	1.44	0.09	2	52	1800	110	1151.3	1.24	0.10	44.3
23-Jun-99	K	438	1	575.4	4.66	0.63	267.6	0.50	0.05	6	37	800	80	1479.0	0.81	0.11	46.5
23-Jun-99	K	438	2	979.5	8.03	1.18	450.6	0.90	0.06	8	38	650	70	1271.8	0.82	0.12	46.0
23-Jun-99	K	438	3	905.4	7.61	1.00	390.2	1.26	0.06	6	39	750	75	1436.1	0.84	0.11	43.1
23-Jun-99	K	438	4	772.7	7.73	0.85	347.7	1.20	0.10	10	54	450	40	1541.9	1.00	0.11	45.0
23-Jun-99	K	438	5	992.1	9.13	1.19	432.5	0.56	0.04	13	45	500	55	1429.2	0.92	0.12	43.6
23-Jun-99	M	435	1	483.6	4.06	0.58	237.0	2.71	0.18	26	35	1100	70	1228.2	0.84	0.12	49.0
23-Jun-99	M	435	2	656.2	7.15	0.85	301.9	1.54	0.11	10	41	1000	100	1301.3	1.09	0.13	46.0
23-Jun-99	M	435	3	586.5	5.98	0.76	255.7	1.89	0.16	24	36	900	70	1217.2	1.02	0.13	43.6
23-Jun-99	M	435	4	664.8	6.65	0.73	299.2	1.07	0.11	24	35	700	70	1271.5	1.00	0.11	45.0
23-Jun-99	M	435	5	655.2	6.36	0.72	305.3	1.38	0.11	21	38	850	90	1232.6	0.97	0.11	46.6
23-Jun-99	M	436	1	268.8	2.72	0.32	121.5	0.72	0.08	6	20	600	40	1555.8	1.01	0.12	45.2
23-Jun-99	M	436	2	414.6	3.77	0.46	168.7	1.00	0.08	7	41	550	45	1464.9	0.91	0.11	40.7
23-Jun-99	M	436	3	582.7	4.37	0.70	249.4	0.66	0.06	5	37	550	60	1484.6	0.75	0.12	42.8
23-Jun-99	M	436	4	340.4	3.81	0.41	139.2	0.58	0.04	7	24	500	35	1588.6	1.12	0.12	40.9
23-Jun-99	M	436	5	470.0	5.17	0.66	195.5	0.68	0.06	10	28	600	40	1533.9	1.10	0.14	41.6
23-Jun-99	M	437	1	781.3	6.72	0.86	314.9	1.18	0.08	7	53	850	100	1197.5	0.86	0.11	40.3
23-Jun-99	M	437	2	830.0	8.13	1.00	356.9	0.98	0.09	5	60	750	110	1036.4	0.98	0.12	43.0
23-Jun-99	M	437	3	968.6	12.30	1.26	384.5	1.30	0.10	7	63	750	110	1092.5	1.27	0.13	39.7
23-Jun-99	M	437	4	734.7	8.45	0.73	325.5	1.03	0.09	5	47	850	120	1118.0	1.15	0.10	44.3
23-Jun-99	M	437	5	753.3	6.25	0.75	320.9	1.41	0.09	4	53	1150	118	1170.6	0.83	0.10	42.6
23-Jun-99	M	438	1	2515.9	18.87	3.77	1202.6	3.02	0.23	8	107	600	55	639.9	0.75	0.15	47.8

June 23				Calculated Values				Lab Results									
DATE	SITE	ELEV	REP	ROOT AFDW (g/m^2)	ROOT N (g/m^2)	ROOT P (g/m^2)	ROOT C (g/m^2)	TOTAL SOIL C %	TOTAL SOIL N %	AVAIL SOIL P ppm	AVAIL SOIL K ppm	AVAIL SOIL Ca ppm	AVAIL SOIL Mg ppm	BULK DENSITY (kg/m^3)	ROOT %N	ROOT %P	ROOT %C
23-Jun-99	M	438	2	1200.5	12.24	1.44	543.8	2.69	0.18	14	92	600	50	915.8	1.02	0.12	45.3
23-Jun-99	M	438	3	747.0	9.04	1.05	320.5	2.26	0.16	13	84	550	45	1022.1	1.21	0.14	42.9
23-Jun-99	M	438	4	678.9	8.69	1.22	294.6	2.02	0.19	24	58	500	45	1029.8	1.28	0.18	43.4
23-Jun-99	M	438	5	1012.7	15.39	1.42	521.5	2.76	0.20	12	93	550	50	868.1	1.52	0.14	51.5
23-Jun-99	P	435	1	276.3	2.46	0.30	135.1	0.88	0.06	15	37	900	95	1481.5	0.89	0.11	48.9
23-Jun-99	P	435	2	766.2	4.83	0.77	370.8	0.82	0.04	22	33	450	65	1487.8	0.63	0.10	48.4
23-Jun-99	P	435	3	721.1	4.25	0.72	345.4	0.74	0.06	36	37	400	30	1486.5	0.59	0.10	47.9
23-Jun-99	P	435	4	1794.7	15.97	1.79	881.2	1.24	0.06	20	47	550	60	1266.0	0.89	0.10	49.1
23-Jun-99	P	435	5	333.4	2.77	0.33	162.7	0.77	0.05	11	40	800	90	1510.6	0.83	0.10	48.8
23-Jun-99	P	436	1	627.4	6.84	0.75	258.5	1.81	0.13	10	74	500	55	995.6	1.09	0.12	41.2
23-Jun-99	P	436	2	418.3	4.39	0.50	178.2	2.15	0.15	15	62	450	45	1060.1	1.05	0.12	42.6
23-Jun-99	P	436	3	434.0	4.73	0.48	194.5	2.16	0.16	12	70	550	45	977.2	1.09	0.11	44.8
23-Jun-99	P	436	4	629.7	6.93	0.69	294.7	2.04	0.14	14	52	550	50	1170.6	1.10	0.11	46.8
23-Jun-99	P	436	5	647.4	6.15	0.71	293.9	1.65	0.13	13	54	450	40	1110.4	0.95	0.11	45.4
23-Jun-99	P	437	1	1096.4	10.31	1.32	514.2	2.33	0.20	52	110	550	55	1055.6	0.94	0.12	46.9
23-Jun-99	P	437	2	963.2	10.59	2.12	393.9	2.07	0.15		85	550	50	1104.7	1.10	0.22	40.9
23-Jun-99	P	437	3	733.7	9.68	1.03	326.5	3.04	0.26	31	118	650	75	619.4	1.32	0.14	44.5
23-Jun-99	P	437	4	1359.1	15.63	1.63	656.4	2.56	0.20	29	128	600	60	930.0	1.15	0.12	48.3
23-Jun-99	P	437	5	766.6	6.52	0.77	337.3	2.36	0.16	29	90	525	58	1016.2	0.85	0.10	44.0
23-Jun-99	P	438	1	1083.1	10.94	1.41	501.5	4.51	0.20	21	143	1050	100	820.9	1.01	0.13	46.3
23-Jun-99	P	438	2	814.3	7.00	1.06	405.5	1.86	0.12	24	75	650	65	1060.5	0.86	0.13	49.8
23-Jun-99	P	438	3	913.9	12.34	1.46	415.8	2.99	0.17	26	115	800	80	936.9	1.35	0.16	45.5
23-Jun-99	P	438	4	1404.8	14.33	2.25	635.0	1.88	0.12	24	92	600	50	1009.6	1.02	0.16	45.2
23-Jun-99	P	438	5	906.5	8.88	1.36	414.3	2.48	0.15	13	91	750	60	1052.7	0.98	0.15	45.7

5.7 Appendix 7: Sedge (*Carex lenticularis*) clumps of 3 sizes Shoot and Root nutrient analyses

Lab#	Sample	Plant Diam.	Plant Area cm^2	Comp.	N %	P %	Ca %	Mg %	K %	Weight /plant (g)	ASH %	AFDW /plant (g)	Ratio R:S	AFDW g/cm^2
385	M1	15	176.63	A	1.46	0.11	0.35	0.15	2.14	51.15	9.7	46.19	2.84	0.26
386	M2	15	176.63	A	1.52	0.13	0.31	0.15	2.07	41.18	9.4	37.31	2.26	0.21
387	M3	15	176.63	A	1.35	0.10	0.47	0.15	2.33	47.28	9.4	42.83	2.97	0.24
388	M4	10	78.50	A	0.94	0.10	0.24	0.10	2.62	21.01	10.2	18.87	2.32	0.24
389	M5	10	78.50	A	1.09	0.14	0.27	0.14	2.13	15.37	8.5	14.07	2.35	0.18
390	M6	10	78.50	A	1.21	0.13	0.35	0.16	2.51	20.77	9.6	18.78	2.67	0.24
391	M7	5	19.60	A	1.13	0.13	0.46	0.12	2.16	2.52	8.9	2.30	3.13	0.12
392	M8	5	19.60	A	1.13	0.12	0.41	0.18	2.25	2.47	10.3	2.22	3.03	0.11
393	M9	5	19.60	A	1.55	0.10	0.30	0.11	1.76	4.52	8.5	4.14	4.05	0.21
394	M1	15	176.63	B	0.49	0.06	0.23	0.18	0.58	176.76	25.9	130.98		0.74
395	M2	15	176.63	B	0.51	0.08	0.29	0.36	0.69	160.76	47.6	84.24		0.48
396	M3	15	176.63	B	0.51	0.07	0.24	0.22	0.82	182.74	30.5	127.00		0.72
397	M4	10	78.50	B	0.54	0.09	0.46	0.30	0.91	67.42	35.1	43.75		0.56
398	M5	10	78.50	B	0.57	0.10	0.30	0.35	0.78	52.48	37	33.06		0.42
399	M6	10	78.50	B	0.53	0.10	0.26	0.27	0.94	73.86	32	50.22		0.64
400	M7	5	19.60	B	0.49	0.09	0.20	0.18	0.85	8.25	12.8	7.19		0.37
401	M8	5	19.60	B	0.61	0.09	0.25	0.27	0.89	8.65	22.4	6.71		0.34
402	M9	5	19.60	B	0.47	0.06	0.17	0.15	0.78	19.35	13.4	16.76		0.86

	Aboveground		Belowground		R:S Ratio
	Mean	StdDev	Mean	StdDev	
N %	1.27	0.21	0.53	0.04	0.42
P %	0.12	0.02	0.08	0.02	0.70
Ca %	0.35	0.08	0.27	0.08	0.75
Mg %	0.14	0.02	0.25	0.08	1.83
K %	2.22	0.25	0.80	0.11	0.36
ASH %	9.39	0.66	28.52	11.27	3.04
AFDW g/cm^2	0.20	0.05	0.57	0.18	2.85
AFDW g/m^2*	2017.20	545.70	5689.30	1808.80	2.82

Notes:

Carex lenticularis Sampled June 23/99 Area “M”

* weight per m^2 is not a realistic measure in this species due to its caespitose nature. In reality sedge clumps cover 10- 25% of ground area.

Therefore true weight per m^2 may range from 200-500 g/m^2 depending on density of plants.

5.8 Appendix 8: Submergence Study - Summary Table for June 7, 1999

	R.C.G.					C.L.					F.R.				
JUNE 7/99	Aboveground		Belowground			Aboveground		Belowground			Aboveground		Belowground		
(g/0.1m^2)	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO
AFDW	301.25	105.47	791.63	189.23	2.6	262.34	73.28	993.25	391.74	3.8	113.05	45.74	80.25	22.32	
N	2.19	0.87	1.37	0.33	0.6	2.29	0.45	1.36	0.14	0.6	2.37	0.25	1.62	0.13	0.7
P	0.20	0.03	0.16	0.04	0.8	0.29	0.06	0.23	0.02	0.8	0.21	0.02	0.18	0.01	0.7
Ca	0.49	0.11	0.86	0.39	1.7	0.64	0.11	0.70	0.06	1.1	0.67	0.05	0.81	0.09	0.9
Mg	0.23	0.04	0.49	0.31	2.1	0.29	0.03	0.52	0.08	1.8	0.24	0.01	0.51	0.13	1.2
K	2.41	0.53	1.50	0.52	0.6	3.10	0.40	1.52	0.24	0.5	3.07	0.23	1.64	0.21	2.1
C	86.08	1.46	77.03	13.34	0.9	87.90	1.09	74.49	7.02	0.8	86.01	5.28	73.68	4.66	0.5
ASH	18.83	4.75	45.71	27.56	2.4	18.77	1.24	48.19	15.99	2.6	20.29	1.24	37.66	7.18	0.9
%															1.9
N	1.15%		0.72%			1.20%		0.71%			1.25%		0.85%		
P	0.11%		0.09%			0.15%		0.12%			0.11%		0.09%		
Ca	0.26%		0.45%			0.34%		0.37%			0.35%		0.43%		
Mg	0.12%		0.26%			0.15%		0.27%			0.12%		0.27%		
K	1.27%		0.79%			1.63%		0.80%			1.62%		0.86%		
C	45.25%		40.50%			46.21%		39.16%			45.22%		38.73%		
ASH	9.90%		24.03%			9.87%		25.33%			10.67%		19.80%		
AFDW/sample	27.11g		71.25g			23.61g		89.39g			10.17g		7.22g		

* note - weight per m2 is not a realistic measure in this species due to its caespitose nature. In reality sedge clumps cover 10- 25% of ground area.
numbers provided here are for 0.1m-2, which represents the low end of the natural density and cooincides with other biomass findings.

5.9 Appendix 9: Submergence Study - Summary Table for June 29, 1999

	R.C.G.					C.L.					F.R.				
JUNE 29/99	Aboveground		Belowground			Aboveground		Belowground			Aboveground		Belowground		
(g/0.1m^2)	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO
AFDW	230.31	23.12	440.44	41.91	1.9	274.37	86.78	829.14	207.82	3.0	176.05	38.10	111.94	26.11	0.6
N	1.28	0.16	1.47	0.09	1.1	2.16	0.20	1.49	0.21	0.7	1.87	0.06	1.07	0.11	0.6
P	0.14	0.01	0.14	0.02	1.0	0.25	0.05	0.22	0.05	0.9	0.33	0.05	0.19	0.05	0.6
Ca	0.37	0.08	0.58	0.08	1.6	0.76	0.00	0.65	0.05	0.9	0.49	0.03	0.68	0.03	1.4
Mg	0.16	0.01	0.22	0.06	1.4	0.31	0.04	0.47	0.06	1.5	0.28	0.05	0.46	0.07	1.7
K	1.77	0.01	1.12	0.13	0.6	2.86	0.12	1.27	0.16	0.4	3.04	0.16	1.22	0.04	0.4
C	84.77	0.76	87.65	7.59	1.0	82.31	4.86	74.43	4.38	0.9	78.60	5.07	68.06	2.37	0.9
ASH	16.23	3.07	20.10	6.12	1.2	23.02	4.03	48.50	6.31	2.1	26.12	3.45	49.71	10.13	1.9
%															
N	0.67%		0.77%			1.13%		0.78%			0.98%		0.56%		
P	0.07%		0.08%			0.13%		0.12%			0.17%		0.10%		
Ca	0.19%		0.30%			0.40%		0.34%			0.26%		0.36%		
Mg	0.08%		0.12%			0.16%		0.25%			0.15%		0.24%		
K	0.93%		0.59%			1.51%		0.67%			1.60%		0.64%		
C	44.57%		46.08%			43.27%		39.13%			41.33%		35.78%		
ASH	8.53%		10.57%			12.10%		25.50%			13.73%		26.13%		
AFDW/sample	20.73g		39.64g			24.69g		74.62g			15.84g		10.07g		
Wt./sample	22.64g		44.26g			28.05g		100.64g			18.43g		13.58g		

* note - weight per m2 is not a realistic measure in this species due to its caespitose nature. In reality sedge clumps cover 10- 25% of ground area. numbers provided here are for 0.1m-2, which represents the low end of the natural density and cooincides with other biomass findings.

5.10 Appendix 10: Submergence Study - Summary Table for August 25, 1999: Site “Fall Rye”

Site Fall Rye	R.C.G.					C.L.					F.R.				
August 25/99	Aboveground		Belowground			Aboveground		Belowground			Aboveground		Belowground		
($g/0.1m^2$)	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO
AFDW	127.42	35.76	372.86	292.48	2.93	172.73	74.63	501.34	170.73	2.90	13.71	4.35	27.89	7.94	2.03
N	2.25	0.26	1.45	0.11	0.65	2.10	0.21	1.11	0.18	0.53	1.83	0.15	1.16	0.27	0.64
P	0.19	0.04	0.12	0.03	0.62	0.23	0.05	0.19	0.01	0.82	0.20	0.02	0.15	0.02	0.74
Ca	0.53	0.13	0.74	0.06	1.40	0.89	0.07	0.73	0.10	0.83	1.50	0.17	1.20	0.05	0.80
Mg	0.34	0.09	0.37	0.16	1.08	0.49	0.02	0.54	0.16	1.09	0.75	0.10	0.48	0.04	0.64
K	1.95	0.70	1.20	0.54	0.62	1.20	0.32	1.62	0.26	1.36	1.16	0.15	0.67	0.09	0.58
C	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
ASH	25.81	19.53	32.46	12.04	1.26	28.59	6.65	64.73	29.03	2.26	56.68	5.54	34.24	10.21	0.60
%															
N	1.18%		0.76%			1.10%		0.58%			0.96%		0.61%		
P	0.10%		0.06%			0.12%		0.10%			0.10%		0.08%		
Ca	0.28%		0.39%			0.47%		0.39%			0.79%		0.63%		
Mg	0.18%		0.20%			0.26%		0.28%			0.40%		0.25%		
K	1.02%		0.63%			0.63%		0.85%			0.61%		0.35%		
C	0.00%		0.00%			0.00%		0.00%			0.00%		0.00%		
ASH	13.57%		17.07%			15.03%		34.03%			29.80%		18.00%		
AFDW	11.47g		33.56g			15.55g		45.12g			1.23g		2.51g		
Wt. (g)	13.14g		39.14g			18.20g		74.94g			1.75g		3.03g		

* note - weight per m2 is not a realistic measure in this species due to its caespitose nature. In reality sedge clumps cover 10- 25% of ground area. numbers provided here are for 0.1m-2, which represents the low end of the natural density and cooincides with other biomass findings.

Appendix 10 (cont): Submergence Study - Summary Table for August 26, 1999: Site "Barren"

Site "Barren"	R.C.G.					C.L.					F.R.				
August 26/99	Aboveground		Belowground			Aboveground		Belowground			Aboveground		Belowground		
(g/0.1m^2)	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO
AFDW	188.15	50.78	351.75	25.72	1.87	187.87	17.78	1011.85	260.68	5.39	11.11	1.20	62.17	7.03	5.59
N	1.99	0.05	1.60	0.12	0.80	2.22	0.19	1.39	0.08	0.63	1.35	0.33	1.47	0.09	1.09
P	0.20	0.05	0.13	0.02	0.68	0.26	0.02	0.20	0.02	0.76	0.16	0.04	0.15	0.01	0.90
Ca	0.59	0.14	0.61	0.06	1.02	0.99	0.08	0.67	0.02	0.68	0.79	0.12	0.85	0.13	1.08
Mg	0.32	0.03	0.36	0.06	1.10	0.51	0.06	0.56	0.01	1.10	0.56	0.06	0.50	0.07	0.88
K	2.26	0.70	1.43	0.37	0.63	1.66	0.14	1.66	0.22	1.00	0.94	0.13	0.73	0.08	0.78
C	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
ASH	21.43	7.05	24.22	3.45	1.13	35.32	9.68	56.18	3.69	1.59	67.33	28.32	38.42	11.57	0.57
%															
N	1.05%		0.84%			1.17%		0.73%			0.71%		0.77%		
P	0.10%		0.07%			0.14%		0.11%			0.09%		0.08%		
Ca	0.31%		0.32%			0.52%		0.35%			0.41%		0.45%		
Mg	0.17%		0.19%			0.27%		0.29%			0.29%		0.26%		
K	1.19%		0.75%			0.87%		0.87%			0.49%		0.39%		
C	0.00%		0.00%			0.00%		0.00%			0.00%		0.00%		
ASH	11.27%		12.73%			18.57%		29.53%			35.40%		20.20%		
AFDW	16.93g		31.66g			16.91g		91.07g			1.00g		5.60g		
Wt. (g)	19.24g		36.25g			20.78g		129.04g			1.60g		7.06g		

* note - weight per m2 is not a realistic measure in this species due to its caespitose nature. In reality sedge clumps cover 10- 25% of ground area. numbers provided here are for 0.1m-2, which represents the low end of the natural density and cooincides with other biomass findings.

5.11 Appendix 11: Submergence Study - Summary Table for September 9, 1999

	R.C.G.					C.L.					F.R.				
Sept. 9/99	Aboveground		Belowground			Aboveground		Belowground			Aboveground		Belowground		
($g/0.1m^2$)	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO	Mean	St.Dev.	Mean	St.Dev.	R:S RATIO
AFDW	201.26	18.91	599.63	225.38	3.0	242.05	81.26	1000.92	248.79	4.1	54.83	12.31	61.76	10.67	1.1
N	2.06	0.25	1.73	0.27	0.8	2.23	0.27	1.43	0.10	0.6	1.14	0.37	0.89	0.01	0.8
P	0.26	0.02	0.15	0.01	0.6	0.30	0.08	0.25	0.02	0.8	0.12	0.04	0.11	0.03	0.9
Ca	0.44	0.10	0.60	0.07	1.4	0.97	0.15	0.69	0.05	0.7	0.57	0.26	0.51	0.08	0.9
Mg	0.27	0.06	0.40	0.11	1.5	0.46	0.06	0.51	0.06	1.1	0.38	0.20	0.37	0.07	1.0
K	1.55	0.46	1.12	0.21	0.7	1.51	0.14	1.28	0.04	0.8	0.76	0.36	0.73	0.10	1.0
C	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
ASH	22.76	2.62	25.04	10.37	1.1	36.71	2.31	49.52	13.23	1.3	26.31	5.22	40.01	10.50	1.5
%															
N	1.08%		0.91%			1.17%		0.75%			0.60%		0.47%		
P	0.14%		0.08%			0.16%		0.13%			0.06%		0.06%		
Ca	0.23%		0.32%			0.51%		0.36%			0.30%		0.27%		
Mg	0.14%		0.21%			0.24%		0.27%			0.20%		0.19%		
K	0.81%		0.59%			0.80%		0.67%			0.40%		0.38%		
C	0.00%		0.00%			0.00%		0.00%			0.00%		0.00%		
ASH	11.97%		13.17%			19.30%		26.03%			13.83%		21.03%		
AFDW	18.11g		53.97g			21.78g		90.08g			4.94g		5.56g		
Wt. (g)	20.59g		62.35g			26.99g		124.02g			5.70g		7.11g		

* note - weight per m2 is not a realistic measure in this species due to its caespitose nature. In reality sedge clumps cover 10- 25% of ground area. numbers provided here are for 0.1m-2, which represents the low end of the natural density and cooincides with other biomass findings.

5.12 Appendix 12: Submergence Study Data

							LAB RESULTS							
LAB	SAMPLING DATE	SITE	SPP	PART	REP	T	N (%)	P (%)	Ca (%)	Mg (%)	K (%)	C (%)	ASH (%)	TOTAL Dry Wt(g)
701	07-Jun-99	Vegetated	RCG	A	1	T=0	1.02%	0.13%	0.32%	0.14%	1.18%	45.00%	12.7%	19.61
702	07-Jun-99	Vegetated	RCG	A	2	T=0	1.66%	0.10%	0.24%	0.12%	1.58%	46.11%	9.1%	31.03
703	07-Jun-99	Vegetated	RCG	A	3	T=0	0.78%	0.09%	0.21%	0.10%	1.04%	44.65%	7.9%	39.10
704	07-Jun-99	Vegetated	RCG	B	1	T=0	0.69%	0.09%	0.59%	0.35%	0.88%	36.12%	30.8%	92.99
705	07-Jun-99	Vegetated	RCG	B	2	T=0	0.90%	0.10%	0.56%	0.36%	1.01%	36.79%	33.9%	88.87
706	07-Jun-99	Vegetated	RCG	B	3	T=0	0.56%	0.06%	0.21%	0.07%	0.48%	48.58%	7.4%	97.89
707	07-Jun-99	Vegetated	C.L.	A	1	T=0	0.96%	0.11%	0.32%	0.15%	1.41%	46.87%	9.2%	18.92
708	07-Jun-99	Vegetated	C.L.	A	2	T=0	1.43%	0.17%	0.29%	0.13%	1.83%	45.97%	10.5%	33.92
709	07-Jun-99	Vegetated	C.L.	A	3	T=0	1.21%	0.17%	0.40%	0.17%	1.64%	45.81%	9.9%	25.86
710	07-Jun-99	Vegetated	C.L.	B	1	T=0	0.77%	0.11%	0.40%	0.23%	0.67%	43.31%	17.8%	73.53
711	07-Jun-99	Vegetated	C.L.	B	2	T=0	0.73%	0.13%	0.34%	0.31%	0.92%	36.24%	34.4%	196.12
712	07-Jun-99	Vegetated	C.L.	B	3	T=0	0.63%	0.11%	0.37%	0.27%	0.82%	37.93%	23.8%	103.77
713	07-Jun-99	Vegetated	F.R.	A	1	T=0	1.35%	0.12%	0.35%	0.12%	1.75%	45.73%	10.0%	9.75
714	07-Jun-99	Vegetated	F.R.	A	2	T=0	1.30%	0.11%	0.38%	0.13%	1.51%	47.70%	10.7%	7.77
715	07-Jun-99	Vegetated	F.R.	A	3	T=0	1.10%	0.10%	0.32%	0.12%	1.58%	42.22%	11.3%	16.70
716	07-Jun-99	Vegetated	F.R.	B	1	T=0	0.90%	0.10%	0.45%	0.27%	0.77%	36.55%	20.3%	10.90
717	07-Jun-99	Vegetated	F.R.	B	2	T=0	0.88%	0.09%	0.37%	0.19%	0.83%	41.38%	15.8%	5.86
718	07-Jun-99	Vegetated	F.R.	B	3	T=0	0.77%	0.09%	0.45%	0.33%	0.98%	38.27%	23.3%	10.49
767	18-Jun-99	Fall Rye	RCG	A	1	T=1	1.11%	0.08%	0.19%	0.10%	1.33%	43.95%	8.6%	28.15
768	18-Jun-99	Fall Rye	RCG	A	2	T=1	1.09%	0.12%	0.19%	0.10%	1.69%	42.84%	9.7%	16.92
769	18-Jun-99	Fall Rye	RCG	A	3	T=1	1.32%	0.12%	0.26%	0.21%	1.72%	41.13%	15.8%	40.27
770	18-Jun-99	Fall Rye	RCG	B	1	T=1	0.73%	0.06%	0.21%	0.10%	0.97%	44.22%	10.7%	48.08
771	18-Jun-99	Fall Rye	RCG	B	2	T=1	0.63%	0.07%	0.29%	0.15%	0.92%	41.13%	14.6%	39.45
772	18-Jun-99	Fall Rye	RCG	B	3	T=1	0.84%	0.07%	0.37%	0.18%	0.66%	43.78%	16.9%	75.13
773	18-Jun-99	Fall Rye	C.L.	A	1	T=1	1.70%	0.16%	0.50%	0.29%	1.65%	40.53%	15.2%	30.58
774	18-Jun-99	Fall Rye	C.L.	A	2	T=1	1.26%	0.20%	0.50%	0.29%	1.74%	41.72%	15.0%	45.18
775	18-Jun-99	Fall Rye	C.L.	A	3	T=1	1.31%	0.13%	0.45%	0.22%	1.60%	36.75%	14.4%	34.42
776	18-Jun-99	Fall Rye	C.L.	B	1	T=1	0.92%	0.11%	0.45%	0.22%	0.82%	41.69%	20.1%	69.54
777	18-Jun-99	Fall Rye	C.L.	B	2	T=1	0.52%	0.12%	0.34%	0.22%	0.73%	35.66%	27.2%	111.66
778	18-Jun-99	Fall Rye	C.L.	B	3	T=1	0.65%	0.11%	0.26%	0.15%	0.71%	46.76%	7.1%	36.37
779	18-Jun-99	Fall Rye	F.R.	A	1	T=1	0.99%	0.15%	0.61%	0.53%	1.66%	23.03%	53.3%	13.30
780	18-Jun-99	Fall Rye	F.R.	A	2	T=1	1.08%	0.15%	0.64%	0.48%	1.11%	21.38%	53.4%	11.35
781	18-Jun-99	Fall Rye	F.R.	A	3	T=1	1.14%	0.17%	0.62%	0.38%	1.25%	25.41%	35.9%	10.54
782	18-Jun-99	Fall Rye	F.R.	B	1	T=1	1.10%	0.13%	0.63%	0.27%	0.89%	40.95%	19.6%	2.55
783	18-Jun-99	Fall Rye	F.R.	B	2	T=1	0.82%	0.13%	1.29%	0.49%	0.87%	29.85%	45.1%	15.04
784	18-Jun-99	Fall Rye	F.R.	B	3	T=1	0.72%	0.13%	1.06%	0.46%	0.96%	29.57%	44.5%	18.75
785	18-Jun-99	Barren	RCG	A	1	T=1	1.30%	0.14%	0.29%	0.12%	1.53%	43.01%	11.9%	22.00
786	18-Jun-99	Barren	RCG	A	2	T=1	0.84%	0.10%	0.18%	0.08%	1.26%	43.10%	10.9%	33.82
787	18-Jun-99	Barren	RCG	A	3	T=1	0.78%	0.11%	0.21%	0.12%	1.20%	43.26%	13.6%	21.43
788	18-Jun-99	Barren	RCG	B	1	T=1	0.84%	0.09%	0.29%	0.15%	0.84%	41.91%	15.2%	53.33
789	18-Jun-99	Barren	RCG	B	2	T=1	0.83%	0.10%	0.34%	0.20%	0.76%	43.38%	23.5%	48.05
790	18-Jun-99	Barren	RCG	B	3	T=1	0.64%	0.08%	0.21%	0.13%	0.72%	43.45%	13.6%	82.79
791	18-Jun-99	Barren	C.L.	A	1	t=1	1.10%	0.17%	0.39%	0.22%	1.52%	41.61%	15.3%	40.98
792	18-Jun-99	Barren	C.L.	A	2	t=1	1.26%	0.20%	0.42%	0.21%	1.73%	43.92%	12.9%	19.38
793	18-Jun-99	Barren	C.L.	A	3	t=1	1.37%	0.18%	0.39%	0.23%	1.65%	42.85%	13.6%	28.17
794	18-Jun-99	Barren	C.L.	B	1	t=1	0.57%	0.10%	0.31%	0.26%	0.75%	33.24%	29.8%	96.47
795	18-Jun-99	Barren	C.L.	B	2	t=1	0.49%	0.10%	0.34%	0.27%	0.78%	33.98%	25.4%	117.07
796	18-Jun-99	Barren	C.L.	B	3	t=1	0.68%	0.11%	0.44%	0.33%	0.78%	33.73%	31.7%	136.63

LAB	SAMPLING DATE	SITE	SPP	PART	REP	T	N (%)	P (%)	Ca (%)	Mg (%)	K (%)	C (%)	ASH (%)	TOTAL Dry Wt(g)
							LAB RESULTS							
797	18-Jun-99	Barren	F.R.	A	1	t=1	0.95%	0.17%	0.39%	0.22%	1.00%	34.25%	12.0%	6.61
798	18-Jun-99	Barren	F.R.	A	2	t=1	0.73%	0.17%	0.60%	0.34%	0.91%	40.28%	19.9%	9.08
799	18-Jun-99	Barren	F.R.	A	3	t=1	0.88%	0.16%	0.49%	0.30%	0.88%	36.81%	30.6%	3.75
800	18-Jun-99	Barren	F.R.	B	1	t=1	0.83%	0.14%	0.55%	0.26%	0.63%	40.39%	22.2%	10.37
801	18-Jun-99	Barren	F.R.	B	2	t=1	0.62%	0.13%	0.88%	0.42%	0.67%	33.43%	46.5%	28.76
802	18-Jun-99	Barren	F.R.	B	3	t=1	0.84%	0.12%	0.68%	0.19%	0.53%	41.63%	15.3%	9.21
761	23-Jun-99	Vegetated	C.L.	A	1	Bio 1	1.12%	0.16%	0.40%	0.21%	1.87%	44.29%	10.5%	51.60
762	23-Jun-99	Vegetated	C.L.	A	2	Bio 2	1.19%	0.19%	0.40%	0.17%	1.64%	47.53%	9.4%	31.91
763	23-Jun-99	Vegetated	C.L.	A	3	Bio 3	1.00%	0.17%	0.29%	0.16%	1.69%	45.11%	9.4%	38.06
764	23-Jun-99	Vegetated	C.L.	B	1	Bio 1	0.55%	0.10%	0.34%	0.29%	0.79%	35.64%	32.3%	147.77
765	23-Jun-99	Vegetated	C.L.	B	2	Bio 2	0.42%	0.11%	0.31%	0.26%	0.76%	32.47%	30.7%	137.35
766	23-Jun-99	Vegetated	C.L.	B	3	Bio 3	0.53%	0.10%	0.29%	0.18%	0.58%	43.24%	13.4%	137.40
755	23-Jun-99	Vegetated	RCG	A	1	Bio 1	1.05%	0.08%	0.21%	0.10%	1.26%	46.02%	8.0%	52.31
756	23-Jun-99	Vegetated	RCG	A	2	Bio 2	1.62%	0.09%	0.24%	0.13%	1.67%	44.85%	8.9%	50.51
757	23-Jun-99	Vegetated	RCG	A	3	Bio 3	1.38%	0.08%	0.21%	0.13%	1.57%	43.35%	8.1%	62.15
758	23-Jun-99	Vegetated	RCG	B	1	Bio 1	0.74%	0.08%	0.32%	0.13%	0.66%	45.85%	7.6%	34.11
759	23-Jun-99	Vegetated	RCG	B	2	Bio 2	0.82%	0.10%	0.50%	0.26%	0.82%	40.22%	22.1%	43.44
760	23-Jun-99	Vegetated	RCG	B	3	Bio 3	0.91%	0.07%	0.56%	0.18%	0.56%	45.92%	12.3%	59.38
725	29-Jun-99	Vegetated	C.L.	A	1	T=1	1.17%	0.13%	0.40%	0.14%	1.43%	43.08%	9.7%	32.98
726	29-Jun-99	Vegetated	C.L.	A	2	T=1	1.01%	0.11%	0.40%	0.18%	1.55%	45.92%	13.7%	33.13
727	29-Jun-99	Vegetated	C.L.	A	3	T=1	1.22%	0.16%	0.40%	0.18%	1.54%	40.81%	12.9%	18.03
728	29-Jun-99	Vegetated	C.L.	B	1	T=1	0.82%	0.12%	0.34%	0.28%	0.68%	36.62%	29.2%	112.08
729	29-Jun-99	Vegetated	C.L.	B	2	T=1	0.66%	0.09%	0.32%	0.22%	0.58%	39.65%	24.5%	119.88
730	29-Jun-99	Vegetated	C.L.	B	3	T=1	0.87%	0.14%	0.37%	0.24%	0.74%	41.13%	22.8%	69.96
731	29-Jun-99	Vegetated	F.R.	A	1	T=1	1.00%	0.20%	0.26%	0.12%	1.50%	39.26%	12.4%	15.81
732	29-Jun-99	Vegetated	F.R.	A	2	T=1	0.95%	0.17%	0.24%	0.15%	1.66%	44.33%	13.0%	15.95
733	29-Jun-99	Vegetated	F.R.	A	3	T=1	1.00%	0.15%	0.26%	0.17%	1.64%	40.38%	15.8%	23.52
734	29-Jun-99	Vegetated	F.R.	B	1	T=1	0.58%	0.13%	0.34%	0.23%	0.63%	35.91%	21.6%	12.65
735	29-Jun-99	Vegetated	F.R.	B	2	T=1	0.50%	0.08%	0.37%	0.21%	0.63%	36.96%	32.0%	11.48
736	29-Jun-99	Vegetated	F.R.	B	3	T=1	0.61%	0.09%	0.37%	0.29%	0.66%	34.47%	24.8%	16.62
719	29-Jun-99	Vegetated	RCG	A	1	T=1	0.77%	0.08%	0.19%	0.09%	0.93%	44.28%	10.4%	20.97
720	29-Jun-99	Vegetated	RCG	A	2	T=1	0.61%	0.07%	0.16%	0.08%	0.93%	45.02%	7.6%	24.81
721	29-Jun-99	Vegetated	RCG	A	3	T=1	0.63%	0.07%	0.24%	0.08%	0.92%	44.41%	7.6%	22.15
722	29-Jun-99	Vegetated	RCG	B	1	T=1	0.83%	0.09%	0.29%	0.15%	0.67%	41.52%	14.1%	41.35
723	29-Jun-99	Vegetated	RCG	B	2	T=1	0.75%	0.07%	0.35%	0.10%	0.56%	47.78%	9.8%	44.89
724	29-Jun-99	Vegetated	RCG	B	3	T=1	0.75%	0.07%	0.27%	0.10%	0.53%	48.94%	7.8%	46.55
737	08-Jul-99	Vegetated	RCG	A		T=1+1	0.63%	0.06%	0.21%	0.10%	0.63%	45.49%	9.0%	22.00
740	08-Jul-99	Vegetated	RCG	B		T=1+1	0.66%	0.07%	0.21%	0.08%	0.53%	46.82%	7.1%	45.18
743	08-Jul-99	Vegetated	C.L.	A		T=1+1	1.01%	0.13%	0.37%	0.13%	1.19%	44.64%	9.2%	21.33
746	08-Jul-99	Vegetated	C.L.	B		T=1+1	0.63%	0.11%	0.31%	0.28%	0.52%	38.60%	25.1%	104.07
749	08-Jul-99	Vegetated	F.R.	A		T=1+1	0.89%	0.14%	0.34%	0.23%	0.94%	37.74%	27.9%	10.23
752	08-Jul-99	Vegetated	F.R.	B		T=1+1	0.58%	0.10%	0.45%	0.26%	0.50%	36.77%	23.7%	10.35
744	14-Jul-99	Vegetated	C.L.	A		T=1+2	0.95%	0.13%	0.40%	0.15%	0.58%	44.59%	11.6%	41.26
747	14-Jul-99	Vegetated	C.L.	B		T=1+2	0.63%	0.11%	0.32%	0.18%	0.50%	40.90%	13.1%	145.13
750	14-Jul-99	Vegetated	F.R.	A		T=1+2	0.68%	0.12%	0.37%	0.20%	0.60%	40.68%	17.2%	13.80
753	14-Jul-99	Vegetated	F.R.	B		T=1+2	0.52%	0.12%	0.60%	0.25%	0.31%	40.86%	16.1%	6.88
738	14-Jul-99	Vegetated	RCG	A		T=1+2	0.61%	0.09%	0.21%	0.10%	0.69%	44.65%	8.6%	19.26
741	14-Jul-99	Vegetated	RCG	B		T=1+2	0.80%	0.09%	0.35%	0.11%	0.67%	46.26%	9.0%	20.20
745	20-Jul-99	Vegetated	C.L.	A		T=1+3	0.95%	0.01%	0.42%	0.18%	1.21%	43.20%	14.3%	41.31
748	20-Jul-99	Vegetated	C.L.	B		T=1+3	0.48%	0.08%	0.29%	0.16%	0.48%	39.69%	11.2%	155.36

LAB	SAMPLING DATE	SITE	SPP	PART	REP	T	LAB RESULTS N (%)	P (%)	Ca (%)	Mg (%)	K (%)	C (%)	ASH (%)	TOTAL Dry Wt(g)
751	20-Jul-99	Vegetated	F.R.	A		T=1+3	0.59%	0.09%	0.52%	0.30%	0.77%	33.13%	42.0%	14.55
754	20-Jul-99	Vegetated	F.R.	B		T=1+3	0.50%	0.06%	0.34%	0.13%	0.13%	36.06%	20.8%	4.90
739	20-Jul-99	Vegetated	RCG	A		T=1+3	0.82%	0.08%	0.19%	0.10%	0.80%	45.84%	8.3%	36.53
742	20-Jul-99	Vegetated	RCG	B		T=1+3	0.68%	0.07%	0.13%	0.06%	0.47%	45.95%	7.4%	54.31
303	28-Jul-99	Vegetated	RCG	A		T=1+4	1.00%	0.14%	0.50%	0.23%	0.88%		20.6%	12.42
304	28-Jul-99	Vegetated	RCG	B		T=1+4	0.91%	0.13%	0.38%	0.20%	0.74%		16.1%	27.71
301	28-Jul-99	Vegetated	C.L.	A		T=1+4	1.10%	0.18%	0.47%	0.22%	0.88%		15.9%	23.56
302	28-Jul-99	Vegetated	C.L.	B		T=1+4	0.90%	0.15%	0.48%	0.24%	0.77%		24.0%	87.54
305	28-Jul-99	Vegetated	F.R.	A		T=1+4	0.74%	0.12%	0.69%	0.40%	0.96%		46.5%	13.27
306	28-Jul-99	Vegetated	F.R.	B		T=1+4	0.44%	0.09%	0.72%	0.32%	0.66%		42.9%	11.67
309	05-Aug-99	Vegetated	RCG	A		T=1+5	0.76%	0.13%	0.40%	0.26%	0.93%		29.0%	21.65
310	05-Aug-99	Vegetated	RCG	B		T=1+5	0.74%	0.11%	0.39%	0.17%	0.74%		16.1%	27.44
307	05-Aug-99	Vegetated	C.L.	A		T=1+5	1.58%	0.26%	0.57%	0.32%	1.07%		28.9%	27.65
308	05-Aug-99	Vegetated	C.L.	B		T=1+5	1.01%	0.19%	0.46%	0.29%	0.93%		22.7%	68.76
311	05-Aug-99	Vegetated	F.R.	A		T=1+5	0.71%	0.11%	0.44%	0.27%	0.63%		23.7%	12.89
312	05-Aug-99	Vegetated	F.R.	B		T=1+5	0.42%	0.12%	0.63%	0.40%	0.91%		49.2%	10.77
315	10-Aug-99	Vegetated	RCG	A		T=1+6	1.11%	0.13%	0.23%	0.15%	0.86%		11.9%	31.90
316	10-Aug-99	Vegetated	RCG	B		T=1+6	0.91%	0.10%	0.41%	0.15%	0.50%		13.7%	43.71
313	10-Aug-99	Vegetated	C.L.	A		T=1+6	1.03%	0.15%	0.51%	0.25%	0.90%		16.8%	19.16
314	10-Aug-99	Vegetated	C.L.	B		T=1+6	0.61%	0.15%	0.46%	0.30%	0.91%		39.1%	97.78
317	10-Aug-99	Vegetated	F.R.	A		T=1+6	0.67%	0.10%	0.46%	0.27%	0.65%		27.5%	7.38
318	10-Aug-99	Vegetated	F.R.	B		T=1+6	0.54%	0.09%	0.53%	0.32%	0.72%		33.4%	10.78
321	24-Aug-99	Vegetated	RCG	A		T=1+8	1.26%	0.15%	0.35%	0.20%	1.02%		19.0%	17.34
322	24-Aug-99	Vegetated	RCG	B		T=1+8	1.00%	0.12%	0.27%	0.15%	0.50%		12.8%	40.78
319	24-Aug-99	Vegetated	C.L.	A		T=1+8	1.08%	0.16%	0.46%	0.22%	0.84%		26.6%	24.91
320	24-Aug-99	Vegetated	C.L.	B		T=1+8	0.72%	0.15%	0.37%	0.34%	0.89%		35.7%	82.65
323	24-Aug-99	Vegetated	F.R.	A		T=1+8	0.47%	0.09%	0.22%	0.12%	0.35%		11.5%	3.59
324	24-Aug-99	Vegetated	F.R.	B		T=1+8	0.61%	0.10%	0.43%	0.29%	0.40%		21.7%	7.24
355	25-Aug-99	Fall Rye	RCG	A	1	T=2	1.12%	0.08%	0.35%	0.23%	0.74%		25.4%	11.40
356	25-Aug-99	Fall Rye	RCG	A	2	T=2	1.34%	0.12%	0.26%	0.18%	1.44%		8.3%	12.01
357	25-Aug-99	Fall Rye	RCG	A	3	T=2	1.09%	0.11%	0.22%	0.14%	0.89%		7.0%	16.01
358	25-Aug-99	Fall Rye	RCG	B	1	T=2	0.72%	0.05%	0.36%	0.12%	0.42%		11.6%	70.87
359	25-Aug-99	Fall Rye	RCG	B	2	T=2	0.74%	0.08%	0.40%	0.28%	0.95%		24.0%	14.97
360	25-Aug-99	Fall Rye	RCG	B	3	T=2	0.83%	0.06%	0.42%	0.19%	0.53%		15.6%	31.57
349	25-Aug-99	Fall Rye	C.L.	A	1	T=2	0.98%	0.09%	0.46%	0.25%	0.47%		13.7%	12.52
350	25-Aug-99	Fall Rye	C.L.	A	2	T=2	1.14%	0.14%	0.51%	0.27%	0.61%		19.0%	15.56
351	25-Aug-99	Fall Rye	C.L.	A	3	T=2	1.19%	0.13%	0.43%	0.25%	0.81%		12.4%	26.52
352	25-Aug-99	Fall Rye	C.L.	B	1	T=2	0.47%	0.09%	0.43%	0.38%	1.01%		51.1%	120.92
353	25-Aug-99	Fall Rye	C.L.	B	2	T=2	0.63%	0.10%	0.40%	0.26%	0.81%		29.3%	67.25
354	25-Aug-99	Fall Rye	C.L.	B	3	T=2	0.65%	0.10%	0.32%	0.21%	0.74%		21.7%	36.64
361	25-Aug-99	Fall Rye	F.R.	A	1	T=2	1.03%	0.10%	0.90%	0.37%	0.55%		26.5%	2.06
362	25-Aug-99	Fall Rye	F.R.	A	2	T=2	0.98%	0.10%	0.75%	0.36%	0.58%		30.9%	2.03
363	25-Aug-99	Fall Rye	F.R.	A	3	T=2	0.88%	0.11%	0.73%	0.46%	0.70%		32.0%	1.16
364	25-Aug-99	Fall Rye	F.R.	B	1	T=2	0.71%	0.07%	0.66%	0.27%	0.30%		14.0%	3.79
365	25-Aug-99	Fall Rye	F.R.	B	2	T=2	0.67%	0.09%	0.61%	0.25%	0.40%		15.9%	2.90
366	25-Aug-99	Fall Rye	F.R.	B	3	T=2	0.45%	0.07%	0.63%	0.23%	0.35%		24.1%	2.42
337	26-Aug-99	Barren	RCG	A	1	T=2	1.06%	0.13%	0.27%	0.19%	1.32%		15.5%	25.96
338	26-Aug-99	Barren	RCG	A	2	T=2	1.02%	0.10%	0.27%	0.16%	1.48%		9.7%	14.37
339	26-Aug-99	Barren	RCG	A	3	T=2	1.07%	0.08%	0.40%	0.17%	0.77%		8.6%	17.38
340	26-Aug-99	Barren	RCG	B	1	T=2	0.91%	0.08%	0.35%	0.22%	0.94%		13.0%	36.36

LAB	SAMPLING DATE	SITE	SPP	PART	REP	T	LAB RESULTS N (%)	P (%)	Ca (%)	Mg (%)	K (%)	C (%)	ASH (%)	TOTAL Dry Wt(g)
341	26-Aug-99	Barren	RCG	B	2	T=2	0.80%	0.07%	0.29%	0.16%	0.76%		10.8%	38.10
342	26-Aug-99	Barren	RCG	B	3	T=2	0.80%	0.06%	0.31%	0.19%	0.55%		14.4%	34.29
331	26-Aug-99	Barren	C.L.	A	1	T=2	1.25%	0.15%	0.49%	0.26%	0.90%		14.3%	21.78
332	26-Aug-99	Barren	C.L.	A	2	T=2	1.06%	0.13%	0.57%	0.30%	0.79%		24.2%	21.82
333	26-Aug-99	Barren	C.L.	A	3	T=2	1.19%	0.14%	0.51%	0.24%	0.92%		17.2%	18.75
334	26-Aug-99	Barren	C.L.	B	1	T=2	0.70%	0.10%	0.36%	0.29%	0.74%		27.4%	151.34
335	26-Aug-99	Barren	C.L.	B	2	T=2	0.78%	0.12%	0.34%	0.30%	0.94%		31.2%	143.24
336	26-Aug-99	Barren	C.L.	B	3	T=2	0.71%	0.10%	0.36%	0.29%	0.94%		30.0%	92.54
343	26-Aug-99	Barren	F.R.	A	1	T=2	0.51%	0.06%	0.34%	0.27%	0.42%		18.3%	1.17
344	26-Aug-99	Barren	F.R.	A	2	T=2	0.80%	0.10%	0.45%	0.33%	0.51%		42.4%	1.95
345	26-Aug-99	Barren	F.R.	A	3	T=2	0.81%	0.10%	0.45%	0.29%	0.55%		45.5%	1.69
346	26-Aug-99	Barren	F.R.	B	1	T=2	0.72%	0.07%	0.45%	0.25%	0.41%		25.9%	7.58
347	26-Aug-99	Barren	F.R.	B	2	T=2	0.81%	0.08%	0.52%	0.30%	0.41%		20.9%	7.86
348	26-Aug-99	Barren	F.R.	B	3	T=2	0.78%	0.08%	0.38%	0.23%	0.33%		13.8%	5.74
327	02-Sep-99	Vegetated	RCG	A	1	T=1+9	0.93%	0.12%	0.14%	0.09%	1.03%		7.1%	21.14
328	02-Sep-99	Vegetated	RCG	B	1	T=1+9	1.06%	0.09%	0.39%	0.16%	0.49%		13.1%	46.03
325	02-Sep-99	Vegetated	C.L.	A	1	T=1+9	1.35%	0.16%	0.52%	0.32%	0.69%		18.5%	14.47
326	02-Sep-99	Vegetated	C.L.	B	1	T=1+9	0.73%	0.11%	0.27%	0.30%	0.80%		29.3%	88.27
329	02-Sep-99	Vegetated	F.R.	A	1	T=1+9	0.82%	0.07%	0.26%	0.19%	0.40%		13.4%	6.50
330	02-Sep-99	Vegetated	F.R.	B	1	T=1+9	0.63%	0.06%	0.36%	0.17%	0.34%		12.5%	5.55
373	09-Sep-99	Vegetated	RCG	A	1	T=2	1.07%	0.13%	0.19%	0.12%	0.68%		12.5%	19.17
374	09-Sep-99	Vegetated	RCG	A	2	T=2	0.95%	0.14%	0.22%	0.13%	0.66%		10.4%	19.58
375	09-Sep-99	Vegetated	RCG	A	3	T=2	1.21%	0.15%	0.29%	0.18%	1.09%		13.0%	23.02
376	09-Sep-99	Vegetated	RCG	B	1	T=2	0.83%	0.08%	0.33%	0.26%	0.66%		19.4%	64.38
377	09-Sep-99	Vegetated	RCG	B	2	T=2	1.07%	0.09%	0.35%	0.22%	0.46%		10.8%	84.31
378	09-Sep-99	Vegetated	RCG	B	3	T=2	0.83%	0.07%	0.27%	0.15%	0.65%		9.3%	38.37
367	09-Sep-99	Vegetated	C.L.	A	1	T=2	1.07%	0.13%	0.60%	0.27%	0.74%		18.2%	20.86
368	09-Sep-99	Vegetated	C.L.	A	2	T=2	1.11%	0.14%	0.48%	0.25%	0.76%		20.6%	22.77
369	09-Sep-99	Vegetated	C.L.	A	3	T=2	1.33%	0.21%	0.45%	0.21%	0.88%		19.1%	37.34
370	09-Sep-99	Vegetated	C.L.	B	1	T=2	0.79%	0.14%	0.38%	0.23%	0.69%		18.0%	83.11
371	09-Sep-99	Vegetated	C.L.	B	2	T=2	0.69%	0.12%	0.33%	0.28%	0.65%		30.1%	161.53
372	09-Sep-99	Vegetated	C.L.	B	3	T=2	0.77%	0.13%	0.38%	0.29%	0.67%		30.0%	127.41
379	09-Sep-99	Vegetated	F.R.	A	1	T=2	0.81%	0.08%	0.43%	0.31%	0.60%		12.2%	6.29
380	09-Sep-99	Vegetated	F.R.	A	2	T=2	0.56%	0.06%	0.29%	0.19%	0.36%		12.3%	6.41
381	09-Sep-99	Vegetated	F.R.	A	3	T=2	0.43%	0.04%	0.17%	0.10%	0.23%		17.0%	4.41
382	09-Sep-99	Vegetated	F.R.	B	1	T=2	0.46%	0.05%	0.23%	0.17%	0.37%		16.3%	6.39
383	09-Sep-99	Vegetated	F.R.	B	2	T=2	0.47%	0.05%	0.27%	0.18%	0.34%		19.7%	5.88
384	09-Sep-99	Vegetated	F.R.	B	3	T=2	0.46%	0.07%	0.31%	0.24%	0.44%		27.1%	9.06

Species

RCG **Reed Canary Grass**
C.L. **Carex lenticularis**
F.R. **Fall rye**

Part
A **Aboveground**
B **Belowground**

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