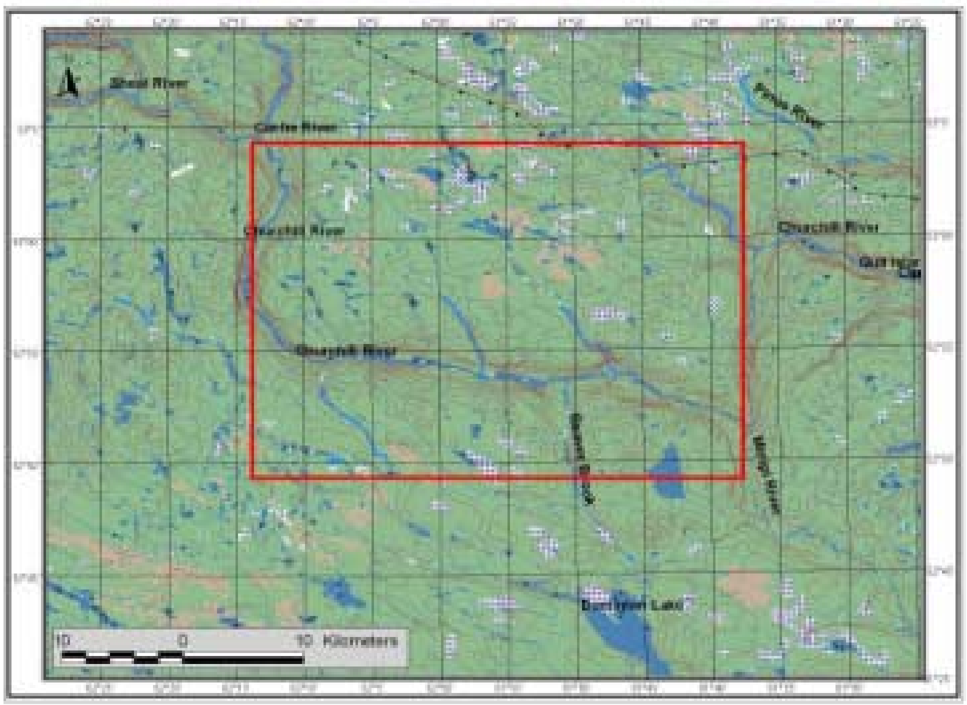
River Valley Ecosystems Project

2002 – Lower Churchill River Interim Report



Institute for Environmental Monitoring and Research

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Acknowledgements

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Introduction

This field study was based on the 2001 River Valley Ecosystem work by Jung and Jones, the experiences gained from the 2001 fieldwork at the Little Mecatina and St. Augustin Rivers and comments by members of the IEMR River Valley Advisory Committee. The goal of the 2001 field program was to obtain general information on the fauna and habitat types within 2 river valleys of the Quebec – Labrador Peninsula. The 2002 reconnaissance fieldwork was in anticipation of university-led studies of cause-and-effect relationships between the abundance, diversity, behaviour and/or reproductive success of selected wildlife species and low-level over flights.

As a result of the relatively low abundance and diversity of wildlife populations observed during the 2001 fieldwork at the Little Mecatina and St. Augustin Rivers, the Churchill River valley ecosystem will be the focus of study during 2002. Expanding the scope of the River Valley Ecosystem Project to include an additional pair of Control/Treatment sites was originally proposed at an advisory committee meeting in 2000. The incorporation of an additional river valley may serve as a replicate for the 2001 fieldwork, but more importantly will provide the opportunity to locate Before – After, Control – Impact (BACI) study sites with relatively more accessible wildlife populations. In 2002, as in 2001, the field studies were a reconnaissance and baseline study. Data obtained from 2001 and 2002 will be instrumental in defining selected taxa to examine specific cause and effect studies in subsequent years.

Goal and Objectives

The goal of the 2002-field program of the River Valley Ecosystem Project is to obtain general information on the fauna and habitat types within a river valley that could be used as a Before-After Control-Impact study. The reconnaissance program of 2002 is in anticipation of university-lead studies of cause-and-effect relationships between the abundance, diversity, behaviour, and/or reproductive success of selected wildlife species and low-level over flights. Specific objectives of the 2002 program include:

1. Determine the relative distribution, abundance, and diversity of forest songbirds and small mammals within the Churchill River (treatment site and control site) between Moonie Rapids and Minipi Rapids.
2. Describe the structure and composition of the main habitat types within the river valley.
3. Relate songbird and small mammal abundance (or presence and absence) and diversity to habitat types and structures.
4. Provide a reconnaissance of other wildlife species within the river valley.

5. Assess the viability of future intensive red squirrel, northern flying squirrel, marten or bat studies.
6. Provide a measure of the baseline noise dosage in the river valley.
7. Provide an archive of selected plants and animals from the river valley for future contaminant analyses.
8. Provide baseline information for use in the combined ecosystem study of the Red Wine caribou and River Valley.

Methodology

Study Site and Plot Selection

Plot selection was based on the 2002 reconnaissance survey, Landsat TM imagery and forest cover data along the slack water section of the Churchill River. Ninety (90) Interior and Riparian plots were sampled in the Control Area and 130 Interior and Riparian plots were sampled in the treatment area. All sampling for birds and small mammals occurred within these plots. Field staff and responsibilities are identified in Appendix A and B.

A BACI study design provides the best opportunity to address cause and effect research in the coming years. 2002 would constitute the before and control sampling and the subsequent 3-5 years would allow for the Control and After/Impact component of sampling. The use of a section of the lower Churchill River as a study area had a number of advantages: habitat is relatively consistent along the river corridor and animal movements and environmental factors better controlled / measured for the study; there is a significant opportunity to link the River Valley research in this site to other projects including the Red Wine Caribou ecosystem research and baseline data for potential future Hydro related studies; the closures to low level flights in recent years provides an experimental basis for observing changes due to low level flight activity if treatment areas are opened to over flights in subsequent years; and access and field logistics are significantly better than small river systems and therefore more cost effective.

It is recognized that consultation with users of the river must be completed before any low level over flight restrictions are lifted in future years for portions or at times of the study.

The dominant habitat types were closed conifer forest and open conifer-lichen woodlands. The two segments of the river will serve as a study areas and control area, with a buffer area between (Figure 1). Ground verification of the broad forest types in the initial days of camp setup will assisted in the final selection of plots. An overview of sampling dates and locations for vegetation plots and bird survey stations, and locations of small mammal live trapping and snap – trapping are found in Appendix C. The Field Schedule is in Appendix D.

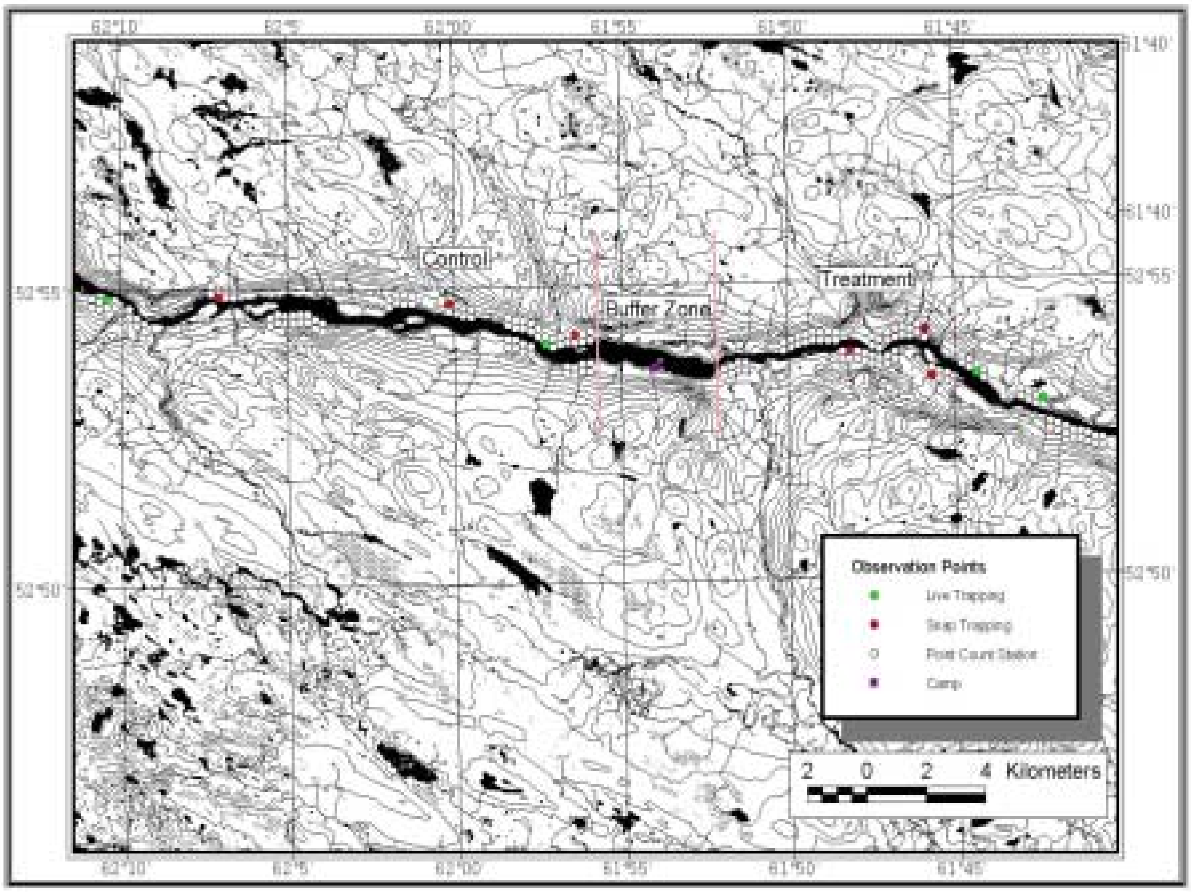

Figure 1. Churchill River 2002 Study Area showing placement of bird and small mammal sites. The proposed treatment area lay to the east of the buffer zone and the control area is located west and upstream of the buffer zone.

The study was conducted on the southerly section of the Churchill River, Labrador between the Cache River Rapids (53 05’N, 62 13’W) and the Minipi Rapids (52 52’N, 61 37’W). This section of river was divided into 2 segments to serve as future treatment and control areas with a 4 km buffer between. The treatment area is a 13-kilometer segment of the river located east of the buffer zone and the control area is a 17-kilometer long segment located west of the buffer zone. In each of the study segments, we randomly selected six 1-kilometer sections on the north side of the river and six 1-kilometer sections on the south side of the river. A paired sampling design was used to sample in the riparian (50 m from the river) and interior (300 m from the river) zones. Point count stations were at least 250 m apart, resulting in four paired sampling stations for each 1-kilometer section. A total of 96 paired point count stations were established along the river, 48 in each study segment. All stations were assigned a unique alphanumeric code and geo-referenced with a GPS unit. All small mammal-trapping grids were set up on a randomly selected sample of point count stations

Sampling stations were spaced at least 250 m apart and at least 125 m from the nearest forest edge, in keeping with sampling protocols for songbirds (Ralph *et al*. 1995). Stations were established with the assistance of the GPS and compass to ensure a linear grid arrangement and to reduce travel distances between stations. Each point count station was marked with flagging tape, florescent paint and/or permanent metal tags. Trails between sampling stations and river entrance/exits points were also flagged. Vegetation sampling stations were located at 250 m spacing.

Forest Songbirds

Forest songbirds were enumerated on circular plots using a point count method (Savard and Hooper 1995, Welsh 1995, Thompson *et al*. 1999). In 2002, as in 2001, breeding bird data provided information on species occurrence, abundance and diversity among sites sampled in the treatment and control site. A total of 90-120 breeding bird census point stations per control / treatment site were monitored.

All point count stations were visited at least twice during the breeding season (15 June - 25 July) (see: Appendix C for a schedule of surveys). During all aspects of fieldwork, teams of 2 persons worked together during data collection.

Prior to the start of morning field activities weather conditions (*e.g*. temperature, humidity, wind speed, direction, etc.) were recorded and updated at 12:00 and 18:00. Sampling duration at each point count station was 5 minutes, occurring between the hours of 05:00 and 10:30. Surveys conducted during periods of heavy rain or with winds that exceeded 20 km/h were not used in analysis. Each team of observers waited 2-5 minutes after arriving at point count stations to allow birds to resume normal activity.

Detections of birds during a point count were made in a 50 m radius and in an unlimited distance category. Data were recorded on pre-printed waterproof data sheets (see Appendix F) and field notebooks, and each crew was equipped with a tape recorder to record any unidentified species songs encountered in each plot. Bird species were recorded using the standard 4-letter codes adopted by the American Ornithological Union (AOU).

In order to reduce observer bias, sampling was arranged to ensure that both observers should sample each survey point only once (*i.e*. switch observers during the second visits). This was to ensure that all points receive a standard sampling effort, regardless of potential different detection abilities among observers. Observers spent 2-3 days in the field near Goose Bay training and assessing their detection abilities and calibrating their abilities to estimate a 50 m radius, prior to the actual fieldwork. Birds were confirmed by observation whenever possible.

Small Mammals – Live Trapping

Small mammals were sampled in a sub-set of stations sampled for forest songbirds. Small mammal communities in each of the present habitat types were captured and marked via live trapping. Trapping occurred on the same plots where habitat characteristics are described and quantified. Live trapping was conducted between July and October at four sites, 2 in the treatment and 2 in the control area. We established a 7x7 trapping grid, containing 49 trapping stations spaced 12 meters apart. The grid was orientated parallel with the river and was placed in the best available habitat adjacent to the point count station. One Longworth trap was placed within 1 m of each grid station marker and baited with a mixture of quick oats and sunflower seeds. Each trap session lasted 2-4 days, with each grid being trapped at least once per week. Information recorded at the time of capture included species, sex, age class, weight and reproductive condition. Individual animals were marked by toe clipping and with Monel™ ear tags.

Traps were baited with a mixture of rolled oats, peanut butter and sunflower seeds and cotton batting was provided for thermal protection. Trapping grids were established and run 2 days per week for a minimum of 6 weeks, with traps locked open or removed for non-trapping nights to minimize trap stress and avoidance. Traps were checked each morning. During trap monitoring, field staff recorded (see Appendix H): Date, traps set off without captured animals, species, sex, reproductive status and weight, as well as other comments. Captured animals were put in clear plastic bags for identification, assessment of reproductive status and weighing.

Preliminary species determination was made with the aid of Banfield (1974) and Burt and Grossenheider (1975). Mass was measured with a 50-gram Pesola™ scale. Age, sex and reproductive status are to follow methods outlined in Parker (1989) and Simon *et al*. (1998).

Small Mammals – Kill Trapping

Small mammals were sampled in a sub-set of vegetation plots sampled for forest songbirds. Small mammal communities in each of 6 plots were collected via removal trapping. Snap trapping was conducted in early August at six sites along the river valley, 3 in the treatment area and 3 in the control area. We established a 10x10 trapping grid, containing 100 trapping stations spaced 12 meters apart, similar to Parker (1989) and Simon *et al*. (2001).. The grid was orientated parallel with the river and was usually centered on the point count station. Each trapping station contained 2 Victor mouse traps placed within 1 meter of the station marker. Traps, baited daily with a mixture of peanut butter and rolled oats, were operated for 3 consecutive trap nights. Traps were checked between 9:00 am and 4:00pm. Species were identified by pelage and dentition. Sex, weight, and reproductive status were recorded. During trap checking, field staff noted (see Appendix F): Date, which the grid was checked; traps set off without a captured animal; and captured animals.

Captured animals were kept in individually labeled sample bags identifying the date, site, trapping grid and trapping station on the outside with permanent marker and on the inside with a piece of paper and brought back to the field camp. Each day, captured animals were processed at the camp and the following data recorded: Date, Site, Plot (Trapping Grid), Trapping Station, Species, Sex, Mass, and Age.

Species determination was made with the aid of Banfield (1974) and Burt and Grossenheider (1975). Mass was measured with a Pesola™ scale. Age, sex and reproductive status was determined following methods outlined in Parker (1989) and Simon *et al*. (1998). In the case of Soricidae, C. Jones and S. Sharpe identified captured animals to the species level in Goose Bay. Sex, age and reproductive status of Soricidae was not reliably determinable in the field. All captured animals were retained and delivered to Goose Bay weekly. Samples were stored at the camp in refrigerated coolers.

Habitat Data

Habitat data from a sub-sample of bird sampling stations was collected for describing both small mammal communities and habitat characteristics. Habitat characteristics were sampled in 0.1 ha circular plots centered on the sampling station. Forest structure and ground cover composition were evaluated. Structural components measured included estimated percentage cover of trees and snags, shrubs and herbs by species. In future work, snags will be counted rather than estimated. Ground cover composition was visually estimated as a percentage of each species. To reduce observer bias in estimating percentages of species cover composition observers used cover diagrams and cross-referenced observations with one another. Samples were collected for keying species composition not known on site.

Coarse woody debris (CWD) was quantified using 2 transects of 50 m within vegetation sampling plots and small mammal grids to record the number of downed logs greater than 5 cm dbh that intersect each transect line (similar to Ringvall *et al*. 2001). Species, estimated dbh, length and decomposition state were recorded.

Other Species

Limited efforts were made by the field crew to note bats and owls, which may be of particular interest for future directed studies. Portable ultrasonic detectors were used to sample bats at night in close proximity to existing trails near the main campsites at both riparian and interior habitats. Bat activity was monitored using ultrasonic bat detectors for 90 minutes immediately after sunset similar to Grindal *et al*. (1999) when weather conditions permitted and bat activity was present.

Results

Habitat Vegetation Cover

Mean cover +/- SE are presented in Appendix J. In the canopy layers (A1, A2) black spruce and balsam fir dominated throughout the study area, with significantly greater black spruce percentage cover in the treatment sites ($p<0.0002$) but no significant difference among riparian and interior sites ($p>0.15$). Balsam fir relative abundance was not significantly different among control and treatment areas ($p>0.5$), but was significantly higher in riparian sites ($p<0.006$). Paper birch had significantly greater percentage cover in the treatment areas ($p<0.00005$) and in riparian sites ($p<0.005$).

Tall Shrub layers (B-1) were dominated by black spruce, balsam fir and alder and short shrubs layers (B-2) were dominated by black spruce, balsam fir, alder, Labrador tea and blueberry. In the tall shrub layer (B-1), Balsam fir had significantly greater percent cover in riparian sites ($p<0.003$) and in control sites ($p<0.005$). Black spruce had greater percent cover in interior sites ($p<0.009$) and tamarack had greater cover in riparian sites ($p<0.02$). The short shrub layer (B-2) showed similar patterns with balsam fir having greater cover in the riparian ($p<0.0007$) and in the control ($p<0.02$). Alder had greater coverage in riparian areas ($p<0.007$) and black spruce seedlings were significantly more common in control sites ($p<0.002$). Labrador tea and *Vaccinium* species were considerably more prevalent in the interior sites ($p<0.000001$) than in the riparian sites.

The herb (C) and ground cover (D) layer were predominantly composed of *Pleurozium* and Gaultheria spp. *Pleurozium* spp. and *Mnium* spp. were significantly greater in the control sites ($p<0.05$). Riparian sites had greater cover by *Hylocomium* spp. ($p<0.0003$) and *Mnium* spp. ($p<0.007$) than Interior sites and Interior sites had greater cover by *Cladina* spp. ($p<<0.000001$), Rabbit lettuce ($p<0.002$), *Gaultheria* ($p<0.04$) and *Peltigera* spp. ($p<0.02$).

The single factor ANOVA results for each plant species compared between Riparian / Interior Sites and between Control / Treatment sites are summarized in Appendix K.

Forest Songbirds

Most bird species were limited in abundance, occurring at only a small percentage of stations (Table 1). Species that occurred in both treatment and control sites at a minimum of 10% of sample stations included Grey Jays, Myrtle/Yellow-rump warblers, Swainson's thrush, dark eyed junco, ruby crowned kinglet and boreal chickadee. Yellow warblers and American redstarts were common at riparian areas. Tennessee warblers and Northern water thrush were somewhat more common in downstream treatment sites. Weather was a significant factor affecting point count success as the breeding season was dominated by rainy conditions.

Table 1. Percent Occurrence of Songbird Species by Site in 2002 along Churchill River				
Species	% Control Interior Sites	% Riparian Interior Sites	% Treatment Interior Sites	% Treatment Riparian Sites
ALFL	0.7	0.7	2.9	2.9
AMCR	0.0	1.5	1.0	0
AMRE	1.5	7.4	1.9	11.5
AMRO	0.0	1.5	0	1.0
BASW	0.0	0.7	0	0
BBWA	0.0	0.7	0	0
BBWO	0.0	2.2	1.0	1.0
BOCH	11.8	11.8	15.4	15.4
BOWA	0.0	0.0	1.0	0
BTNW	8.8	3.7	8.7	6.7
CEDW	0.0	0.7	0	0
COGO	0.0	0.7	0	0
COLO	0.0	0.0	1.0	1.0
CORA	0.7	4.4	2.9	2.9
COSN	0.0	0.7	0	
DEJU	36.8	34.6	30.8	38.5
FOSP	16.2	21.3	3.8	6.7
GCFL	0.0	0.0	0.0	1.0
GCKI	2.2	2.2	3.8	3.8
GCTH	0.0	0.7	0	0
GRAJ	17.6	16.9	18.3	17.3
GULL	0.7	0.7	0	0
HERG	0.0	0.7	0	0
HAWO	0.7	0	1.0	0
HETH	0.0	0	2.9	4.8
MAWA	0.7	4.4	0	1.0
MYWA	22.8	26.5	16.3	29.8
NOSH	0.0	0.7	0	0
NOWA	5.1	0.7	1.9	14.4
OCWA	0.0	1.5	1.9	1.0
PAWA	0.7	2.2	1.0	1.0
PHVI	2.9	0	0	1.9
PISI	5.1	2.9	2.9	0
RCKI	21.3	25.7	13.5	19.2
RTHA	0.7	0	0	0
SPSA	0.7	9.6	0	3.8
squirrel	19.1	16.9	7.7	16.3
SWTH	34.6	42.6	35.6	69.2
TEWA	2.9	4.4	9.6	15.4
TTWO	2.2	0	0	0
WCSP	0.0	0	0	2.9
WIWR	4.4	4.4	0	1.9
WOOD	3.7	4.4	1.0	1.9
WTSP	6.6	2.2	2.9	1.9
YBFL	5.1	7.4	4.8	7.7
YWAR	0.7	14.7	1.0	15.4

Small Mammals

Snap Trapping

For all grids, a total of 3435 trap night were recorded, 1700 in the control and 1735 in the treatment [Table 2]. Traps that were set off or were missing bait were assigned a value of 0.5 trap night. Grid C13N3A had a high amount of traps that were missing bait; this may have been due to the heavy rains that occurred during the trapping session.

Table 2. Distribution of trap nights among snap trapping grids.

	Control			Treatment		
	C01N3B	C05N4B	C13N3A	T05S2A	T07N4B	T08S1B
Potential Trap Nights	600	600	600	600	600	600
Traps Set Off	12	13	25	18	21	20
Traps with Bait Missing	18	37	96	34	5	31
Total No. of Trap Nights	585	575	540	574	587	574

A total of 140 small mammals were captured, 96 in the control and 44 in the treatment [Table 2]. Species captured included the Boreal Red back Vole *Clethrionomys gapperi* and the Masked Shrew *Sorex cinereus*. Four *Sorex* specimens could not be positively identified by dentition. Grid C13N3A had the greatest number of Red back Voles (40), followed by grids C01N3B (27), T08S1B (24), C05N1B (21), T05S2A (13) and T07N4B (3) [Table2]. Grid C01N3B had the greatest number of *Sorex* sp. (5), followed by C13N3A (3), T05S2A (2), T07N4B (1), T08S1B (1) and C05N4B (0) [Table 3].

Table 3. Numbers of small mammals captured by grid (Totals).

	Control			Treatment		
	C01N3B	C05N4B	C13N3A	T05S2A	T07N4B	T08S1B
C. gapperi	27	21	40	13	3	24
Breeding Females	2	7	10	4	1	4
Breeding Males	11	5	9	1	2	10
S. cinerues	3	0	2	2	0	1
Sorex sp.	2	0	1	0	1	0
Total Captures	32	21	43	15	4	25

Live Trapping

For all grids, a total of 3788 trap night were recorded, 1754 in the control and 2034 in the treatment [Table 4]. Traps that were set off but empty, were subtracted from the total. Grid C02N3A had an unusually high amount of setoffs; these were likely attributed to the activities of Northern Flying Squirrels *Glaucomys sabrinus*.

Table 4. Distribution of trap nights among lives trapping grids.

	Control		Treatment	
	C02N3A	C17S2A	T09N3A[1]	T11N4B
Potential Trap Nights	931	931	1127	931
No. of Traps Set Off	91	17	13	11
Total No. of Trap Nights	840	914	1114	920

[1] Grid had an additional 4-day trapping session at the beginning of the season. After achieving poor trapping success, the grid was reoriented to better suit the terrain and available habitat.

A total of 284 small mammals were captured 1549 times during the trapping period [Tables 5 and 6]. Species captured included, the Boreal Red back Vole, Masked Shrew and Northern Flying Squirrel. The Red back Vole was the most frequently captured species throughout the river valley. Grids C17S4A and C02N3A in the control area had a higher number of Red back Vole captures (484 and 404 captures, respectively) than grids T11N4B and T09N3A in the treatment area (338 and 262 captures, respectively) [Table 5]. The Masked Shrew was captured at all grids, with the highest number captured in the control area [Table 5]. Due to their high metabolic requirements and susceptibility to stress, all shrews were found dead at the time of trap check. Northern Flying Squirrels were only captured at grid C02N3A [Table 5].

Table 5. Number of small mammals captured by grid (Totals).

	Control		Treatment	
Species	C02N3A	C17S2A	T09N3A	T11N4B
C. gapperi	404	484	262	338
S. cinereus	16	14	12	10
G. sabrinus	8	0	0	0
Total	428	498	275	348

Table 6. Number of individual Red back Voles captured by grid (Totals).

	Control		Treatment	
	C02N3A	C17S2A	T09N3A	T11N4B
No. of individuals	70	85	56	73
Breeding Females	10	9	5	11
Breeding Males	9	17	13	25
Total Mortalities	7	27	12	17

The number of individual Red back Voles captured was highest in grid C17S2A (85 individuals), followed by T11N4B (73 individuals), C02N3A (70 individuals) and T09N3A (56 individuals) [Table 6]. The number of breeding females was highest in grid T11N4B (11), followed by C02N3A (10), C17S2A (9) and T09N3A (5) [Table 6]. The number of breeding males was highest at grid T11N4B (25), followed by C17S4A (17), T09N3A (13) and C02N3A (9) [Table 6]. Grid C17S2A had the highest number of mortalities (27), followed by T11N4B (17), T09N3A (12) and C02N3A (7) [Table6].

Discussion and Recommendations

Preliminary assessment indicates that the River Valley study area has overall comparable habitat sites and would be suitable for a BACI study. With respect to species suitable for directed studies within an ecosystem approach, red back voles and squirrels were ubiquitous. Similarly, studies involving songbird species such as Grey Jays, Boreal chickadees, Swainsons thrush, myrtle warbler, ruby crowned kinglet and gray jay would be possible based on occurrence throughout the study area. The Churchill River Valley also offered an excellent logistic choice with regard to access among sample sites and in terms of proximity to Happy Valley – Goose Bay.

Bird work was greatly dependent on the weather during the breeding season. Despite the cool rainy weather that dominated the field season, point checks were conducted successfully 2 times at each site. In future songbird survey work, I would recommend doing 3 checks at each sample location rather than 2.

Live trapping was highly successful in terms of trap ability of small mammals, but mortality was sometimes high due to time constraints on field staff precluding the opportunity to check traps twice per day. Live trapping will allow an assessment of life history changes such as number of litters, growth rates, survival rates and other demographic variables. Pitfall trapping should be implemented for more complete assessment of shrew species. If live trapping is to be continued, it should be expanded and a field crew needs to be dedicated to trap checking. This summer, logistics were complicated due to limited availability of boats and fuel.

Several species present in the 2001-2002 pilot studies are suitable for directed effects research. Although very good habitat and monitoring work can be achieved in this study area, I do not recommend a continued monitoring project related to noise effects. I highly recommend the selection of 1or 2 resident bird species, including grey jays to conduct directed research. In addition, I recommend that we conduct directed studies complimentary to those proposed with the province of Quebec looking at Boreal Owls, bats and possibly flying squirrels, if they use nest boxes. Small mammal trapping should be conducted in support of the boreal owl nestbox study.

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Appendix A: RVE Project Team

Management

Team Member: Sean Sharpe
Role: *Project Leader* (IEMR staff)
Duration: Full extent of the project

Team Member: Colin Jones
Role: *Field Logistics* (IEMR staff)
Duration: Full extent of the project

Senior Field Staff (rotational duties at the camps)

Team Member: Song birder #1 – Shauna Baillie
Role: *Crew Leader / Field Biologist* (Seasonal)
Duration: Full extent of field sampling

Team Member: Colin Jones
Role: *Crew Leader / Field Biologist* (IEMR staff)
Duration: Various, particularly initial set-up, plot selection and small mammal trapping

Team Member: Song birder #2 – Kathy Hogan
Role: *Field Biologist* (Seasonal)
Duration: Songbird, small mammal, habitat

Team Member: Corinne Wilkerson
Role: *Field Biologist* (IEMR staff)
Duration: Small mammal, songbird, habitat

Team Member: Tony Parr
Role: *Database Manager / Field Technician* (IEMR staff)
Duration: Initial setup of camps and songbird plots

Seasonal Field Staff (field sampling – rotational duties)

Team Member: Ted Pardy
Role: *Camp Manager / Field Technician*
Certificates: Standard and Wilderness First-Aid; Firearms; Boating Safety; Helicopter Safety; Hunting and Trapping; WHMIS; Wilderness Survival

Team Member: Louis Rich
Role: *Field Technician*
Certificates: Standard First-Aid

Team Member: Joseph Townley
Role: *Field Technician / Alternate Camp Manager*
Certificates: Standard First-Aid; Firearms; Boating Safety; Hunting and Trapping; WHMIS

Team Member: Greg Penashue
Role: *Field Technician*
Certificates: Standard First-Aid

Team Member: Kirk Rowe
Role: *Field Technician*
Certificates: Standard First-Aid; Firearms; Boating Safety; Hunting and Trapping

Team Member: Edward Blake
Role: *Field Technician*
Certificates: Standard First-Aid; Firearms; Boating Safety; Hunting and Trapping

Appendix B: Seasonal Job Descriptions

Field Biologists (4)

Qualifications:

- Post-secondary education in biology or a related field
- Experience in wildlife research. Preference will be given to candidates with previous experience in:
  - assessing songbird populations via point count surveys and/or territory mapping
  - forest mensuration techniques
  - small mammal capture and study
  - owl and bat surveys
- Knowledge of boreal ecosystems (flora and fauna)
- Willingness to camp for extended periods in remote wilderness environments
- Willingness to work irregular hours and long days
- Ability to travel by helicopter, float plane and boat
- Ability to tolerate biting insects (mosquitoes and black flies)
- Ability to be both a team player and an effective leader
- Valid First Aid/CPR certification (additional outdoor certification is a definite asset, e.g. Firearms, Boating Safety, etc)

Primary Duties:

- Assist in remote field camp establishment and maintenance
- Enumerate songbirds in 2 northern river valleys through point count surveys
- Sample small mammal communities (live and removal trapping) at both sites
- Conduct numerous surveys to document wildlife populations at both sites with the emphasis on determining presence/absence and relative abundance
- Management of collected field data
- 1 position will be compensated at a crew leader level owing to increased responsibilities

Field Technicians (6)

Qualifications:

- Post-secondary education in biology or a related field
- Experience in wildlife research
- Knowledge of boreal ecosystems (flora and fauna)
- Willingness to camp for extended periods in remote wilderness environments
- Willingness to work irregular hours and long days
- Ability to travel by helicopter, float plane and boat
- Ability to tolerate biting insects (mosquitoes and black flies)
- Ability to be a team player
- Valid First Aid/CPR certification (additional outdoor certification is a definite asset, e.g. Firearms, Boating Safety, etc)

Primary Duties:

- Assist in remote field camp establishment and maintenance
- Assist in all aspects of data collection (wildlife surveys and habitat sampling)
- Data recording and data entry

APPENDIX C: Site locations, bird point sampling and vegetation sampling dates

Station	Easting	Northing	Vegetation	Check	CWD	Check	Mammal Plot
C01N1A	571750	5861643	20-Aug-02	V1	20-Aug	V1,AP	
C01N1B	571750	5861893	10-Aug-02	V1	10-Aug	V1	
C01N2A	571500	5861564	10-Aug-02	V1	10-Aug	V1	
C01N2B	571500	5861814	10-Aug-02	V1	10-Aug	V1	
C01N3A	571250	5861541	8-Aug-02	V1	8-Aug	V1	
C01N3B	571250	5861791	7-Aug-02	V1	7-Aug	V1	**Snap**
C01N4A	571000	5861553	8-Aug-02	V1	8-Aug	V1	
C01N4B	571000	5861803	8-Aug-02	V1	8-Aug	V1	
C01S1A	571750	5860905	17-Aug-02	V2	17-Aug-02	V2,LR	
C01S1B	571750	5860655	17-Aug-02	V2	17-Aug-02	V2	
C01S2A	571500	5860881	17-Aug-02	V2	17-Aug-02	V2	
C01S2B	571500	5860631	17-Aug-02	V2	17-Aug-02	V2	
C01S3A	571245	5860776	17-Aug-02	V2	17-Aug-02	V2	
C01S3B	571250	5860526	17-Aug-02	V2	17-Aug-02	V2	
C01S4A	571000	5860809	17-Aug-02	V2	17-Aug-02	V2	
C01S4B	571000	5860559	17-Aug-02	V2	17-Aug-02	V2	
C02N1A	570753	5861479	12-Aug-02	V2	12-Aug-02	V1	
C02N1B	570750	5861729	12-Aug-02	V2	12-Aug-02	V1	
C02N2A	570500	5861421	12-Aug-02	V1	N/A: Delta		
C02N2B	570500	5861671	12-Aug-02	V2	12-Aug-02	V1	
C02N3A	570250	5861502	10-Aug-02	V1	10-Aug	V1	**Live**
C02N3B	570250	5861752	11-Aug-02	V1	11-Aug	V2	
C02N4A	570000	5861737	11-Aug-02	V1	11-Aug	V2	
C02N4B	570000	5861987	11-Aug-02	V2	11-Aug	V1	
C03N1A	569750	5861906	14-Aug-02	V2	14-Aug-02	V2, CJ	
C03N1B	569750	5862156	14-Aug-02	V2	14-Aug-02	AP	
C03N2A	569500	5861975	14-Aug-02	V2	14-Aug-02	AP	
C03N2B	569500	5862225	14-Aug-02	V2	14-Aug-02	AP	
C03N3A	569250	5862013	14-Aug-02	V1	14-Aug-02	V1	
C03N3B	569250	5862263	14-Aug-02	V1	14-Aug-02	V1	
C03N4A	569000	5862085	20-Aug-02	V1	20-Aug-02	V2	
C03N4B	569000	5862335	14-Aug-02	CJ	14-Aug-02	CJ	
C03S1A	569750	5861431	19-Aug-02	V2	19-Aug-02	V2	
C03S1B	569750	5861181	19-Aug-02	V2	19-Aug-02	V2	
C03S2A	569500	5861522	19-Aug-02	V2	19-Aug-02	V2	
C03S2B	569500	5861272	19-Aug-02	V2	19-Aug-02	V2	
C03S3A	569250	5861626	19-Aug-02	V1	19-Aug-02	AP	
C03S3B	569250	5861376	19-Aug-02	AP	19-Aug-02	V1	
C03S4A	569001	5861661	19-Aug-02	AP	19-Aug-02	V1	
C03S4B	569001	5861411	19-Aug-02	V1	19-Aug-02	AP	
C05N1A	567750	5862339	15-Aug-02	V2	15-Aug-02	EB, V2	
C05N1B	567750	5862589	15-Aug-02	V1	15-Aug-02	LR	
C05N2A	567500	5862357	15-Aug-02	V2	15-Aug-02	EB	
C05N2B	567500	5862607	15-Aug-02	V1	15-Aug-02	LR	
C05N3A	567250	5862456	15-Aug-02	V2	15-Aug-02	EB	
C05N3B	567250	5862706	15-Aug-02	V1	15-Aug-02	LR	
C05N4A	567000	5862510	15-Aug-02	V2	15-Aug-02	EB	
C05N4B	567000	5862760	15-Aug-02	V1	15-Aug-02	LR, V1	**Snap**
C07N1A	565750	5862739	23-Aug-02	AP	23-Aug-02	AP	
C07N1B	565750	5862989	23-Aug-02	AP	23-Aug-02	AP	

C07N2A	565500	5862764	23-Aug-02	KH	23-Aug-02	V2	
C07N2B	565500	5863014	23-Aug-02	AP	23-Aug-02	AP	
C07N3A	565250	5862773	23-Aug-02	KH	23-Aug-02	V2	
C07N3B	565250	5863023	23-Aug-02	V2	23-Aug-02	KH	
C07N4A	565000	5862635	23-Aug-02	V2	23-Aug-02	KH	
C07N4B	565000	5862885	23-Aug-02	KH	23-Aug-02	V2	
C10S1A	562750	5862142	29-Aug-02	V3	29-Aug	TP	
C10S1B	562750	5861892	29-Aug-02	V3	29-Aug	TP	**Snap**
C10S2A	562500	5862248	30-Aug-02	V3	30-Aug-02	AP	
C10S2B	562500	5861998	29-Aug-02	V3	29-Aug-02	TP	
C10S3A	562250	5862422	30-Aug-02	V3	30-Aug-02	AP	
C10S3B	562250	5862172	29-Aug-02	V3	29-Aug-02	TP	
C10S4A	562000	5862426	29-Aug-02	AP	20-Aug-02	KR	
C10S4B	562000	5862176	29-Aug-02	V3	29-Aug-02	TP	
C11S1A	561750	5862390	30-Aug-02	V3	30-Aug-02	AP	
C11S1B	561750	5862140	29-Aug-02	V3	29-Aug-02	TP	
C11S2A	561500	5862374	29-Aug-02	V3	29-Aug-02	TP	
C11S2B	561500	5862124	29-Aug-02	V3	29-Aug-02	TP	
C11S3A	561250	5862427	29-Aug-02	V3	29-Aug-02	TP	
C11S3B	561250	5862177	29-Aug-02	V3	29-Aug-02	TP	
C11S4A	561000	5862315	29-Aug-02	V3	29-Aug-02	TP	
C11S4B	561000	5862065	29-Aug-02	V3	29-Aug-02	TP	
C13N1A	559750	5862936	15-Oct-02		15-Oct-02		
C13N1B	559750	5863186	15-Oct-02		15-Oct-02		
C13N2A	559500	5862931	15-Oct-02		15-Oct-02		
C13N2B	559500	5863181	15-Oct-02		15-Oct-02		
C13N3A	559250	5862934	15-Oct-02		15-Oct-02		**Snap**
C13N3B	559250	5863184	15-Oct-02		15-Oct-02		
C13N4A	559000	5863049	15-Oct-02		15-Oct-02		
C13N4B	559000	5863299	15-Oct-02		15-Oct-02		
C16S1A	556762	5862130	22-Aug-02	AP	22-Aug-02	AP	
C16S1B	556750	5861880	22-Aug-02	AP	22-Aug-02	AP	
C16S2A	556500	5862284	22-Aug-02	AP	22-Aug-02	AP	
C16S2B	556500	5862034	22-Aug-02	AP	22-Aug-02	AP, KH	
C16S3A	556250	5862579	22-Aug-02	KH	22-Aug-02	V2	
C16S3B	556250	5862329	22-Aug-02	KH	22-Aug-02	V2	
C16S4A	556001	5862520	22-Aug-02	KH	22-Aug-02	V2	
C16S4B	556010	5862423	22-Aug-02	KH	22-Aug-02	V2	
C17S1A	555750	5862875	21-Aug-02	V2	21-Aug-02	V2	
C17S1B	555750	5862625	21-Aug-02	V2	21-Aug-02	V2	
C17S2A	555500	5862890	finished		finished		**Live**
C17S2B	555500	5862640	21-Aug-02	V2	21-Aug-02	V2	
C17S3A	555250	5862829	21-Aug-02	AP	21-Aug-02	V2,KH	
C17S3B	555250	5862579	21-Aug-02	AP	21-Aug-02	AP	
C17S4A	555000	5862906	21-Aug-02	AP	21-Aug-02	AP	
C17S4B	555000	5862656	21-Aug-02	AP	21-Aug-02	AP	
T01S1A	576250	5860747	16-Aug-02	V1	16-Aug-02	V1	
T01S1B	576250	5860497	16-Aug-02	EB	16-Aug-02	EB	
T01S2A	576500	5860832	16-Aug-02	V1	16-Aug-02	V1	
T01S2B	576500	5860582	16-Aug-02	EB	16-Aug-02	EB	
T01S3A	576750	5860946	16-Aug-02	V1	16-Aug-02	V1	
T01S3B	576750	5860696	16-Aug-02	EB	16-Aug-02	EB	
T01S4A	577000	5860945	16-Aug-02	V1	16-Aug-02	V1	

T01S4B	577000	5860689	16-Aug-02	EB	16-Aug-02	EB	
T03N1A	578250	5861322	15-Aug-02	V1	15-Aug	LR	
T03N1B	578250	5861572	15-Aug-02	V2	15-Aug	EB	
T03N2A	578500	5861419	15-Aug-02	V1	15-Aug	LR	
T03N2B	578500	5861669	15-Aug-02	V2	15-Aug	EB	
T03N3A	578750	5861510	15-Aug-02	V1	15-Aug	LR	
T03N3B	578750	5861760	15-Aug-02	V2	15-Aug	ER	
T03N4A	579005	5861570	15-Aug-02	V1	15-Aug	LR, V1	
T03N4B	579000	5861820	15-Aug-02	V2	15-Aug	ER, V2	
T04N1A	579250	5861633	24-Aug-02	V3	24-Aug-02	V3	
T04N1B	579250	5861885	24-Aug-02	V3	24-Aug-02	V3	
T04N2A	579500	5861633	24-Aug-02	V3	24-Aug-02	V3	
T04N2B	579500	5861883	24-Aug-02	V3	24-Aug-02	V3	
T04N3A	579750	5861643	24-Aug-02	AP	24-Aug-02	KH	
T04N3B	579750	5861893	24-Aug-02	AP	24-Aug-02	KH	
T04N4A	580000	5861633	24-Aug-02	AP	24-Aug-02	KH	
T04N4B	580000	5861883	24-Aug-02	AP	24-Aug-02	KH	
T05S1A	580250	5861304	24-Aug-02	KH	24-Aug-02	AP	
T05S1B	580250	5861054	24-Aug-02	KH	24-Aug-02	AP	
T05S2A	580500	5861333	6-Aug-02	V1	7-Aug-02	V1	**Snap**
T05S2B	580500	5861083	8-Aug-02	V1	8-Aug	V1	
T05S3A	580750	5861294	24-Aug-02	V3	24-Aug-02	V3	
T05S3B	580750	5861044	24-Aug-02	KH	24-Aug-02	KH	
T05S4A	581000	5861253	24-Aug-02	V3	24-Aug-02	V3	
T05S4B	581000	5861003	24-Aug-02	V3	24-Aug-02	V3	
T06N1A	581250	5861477	25-Aug-02	KH	25-Aug-02	KH	
T06N1B	581250	5861727	25-Aug-02	KH	25-Aug-02	KH	
T06N2A	581500	5861396	25-Aug-02	KH	25-Aug-02	KH	
T06N2B	581500	5861646	25-Aug-02	KH	25-Aug-02	KH	
T06N3A	581750	5861626	25-Aug-02	TP	25-Aug-02	KR	
T06N3B	581750	5861876	25-Aug-02	TP	25-Aug-02	KR	
T06N4A	582000	5861750	25-Aug-02	TP	25-Aug-02	KR	
T06N4B	582000	5862000	25-Aug-02	TP	25-Aug-02	KR	
T06S1A	581250	5861161	15-Oct-02		15-Oct-02		
T06S1B	581250	5860911	15-Oct-02		15-Oct-02		
T06S2A	581500	5861113	15-Oct-02		15-Oct-02		
T06S2B	581500	5860863	15-Oct-02		15-Oct-02		
T06S3A	581750	5861168	15-Oct-02		15-Oct-02		
T06S3B	581750	5860918	15-Oct-02		15-Oct-02		
T06S4A	582000	5861292	15-Oct-02		15-Oct-02		
T06S4B	582000	5861042	15-Oct-02		15-Oct-02		
T07N1A	582250	5861792	26-Aug-02	V3	26-Aug-02	TP	
T07N1B	582250	5862042	26-Aug-02	V3	26-Aug-02	AP, KH	
T07N2A	582500	5861782	26-Aug-02	V3	26-Aug-02	V3	
T07N2B	582500	5862012	26-Aug-02	AP	26-Aug-02	KH	
T07N3A	582750	5861871	26-Aug-02	V3	26-Aug-02	V3	
T07N3B	582750	5862121	26-Aug-02	AP	26-Aug-02	KH	
T07N4A	583000	5861751	26-Aug-02	V3	26-Aug-02	V3	
T07N4B	583000	5862001	26-Aug-02	AP	26-Aug-02	KH	**Snap**
T08S1A	583250	5860800	7-Aug-02	SB, EB	7-Aug	EB	
T08S1B	583250	5860550	6-Aug-02	V1	6-Aug	V1	**Snap**
T08S2A	583500	5860689	30-Aug-02	V3	30-Aug-02	AP	
T08S2B	583500	5860439	30-Aug-02	V3	30_Aug-02	AP	

T08S3A	583750	5860637	30-Aug-02	V3	30-Aug-02	AP	
T08S3B	583750	5860387	30-Aug-02	V3	30-Aug-02	AP	
T08S4A	584000	5860537	30-Aug-02	V3	30-Aug-02	AP	
T08S4B	584000	5860287	30-Aug-02	V3	30-Aug-02	AP	
T09N1A	584250	5860946	23-Aug-02	AP	23-Aug-02	V2	
T09N1B	584250	5861196	23-Aug-02	V2	23-Aug-02	AP	
T09N2A	584500	5860794	23-Aug-02	V2	23-Aug-02	AP	
T09N2B	584500	5861044	23-Aug-02	AP	23-Aug-02	V2	
T09N3A	584750	5860641	7-Aug-02	V1	7-Aug	V1	**Live**
T09N3B	584750	5860891	23-Aug-02	KH	23-Aug-02	KH	
T09N4A	585000	5860477	23-Aug-02	KH	23-Aug-02	KH	
T09N4B	585000	5860727	23-Aug-02	KH	23-Aug-02	KH	
T11N1A	586250	5859911	19-Aug-02	V2	19-Aug-02	V2	
T11N1B	586250	5860161	19-Aug-02	AP	19-Aug-02	V1	
T11N2A	586500	5859788	19-Aug-02	V2	19-Aug-02	V2	
T11N2B	586500	5860038	19-Aug-02	V1	19-Aug-02	AP	
T11N3A	586750	5859683	19-Aug-02	V2	19-Aug-02	V2	
T11N3B	586750	5859933	19-Aug-02	AP	19-Aug-02	V1	
T11N4A	587000	5859625	19-Aug-02	V2	19-Aug-02	V2	
T11N4B	587000	5859875	19-Aug-02	AP	19-Aug-02	SM	**Live**
T12S1A	587250	5859164	28-Aug-02	V3	28-Aug-02	V3	
T12S1B	587250	5858914	28-Aug-02	V3	28-Aug-02	TP	
T12S2A	587500	5859092	28-Aug-02	V3	28-Aug-02	KR	
T12S2B	587500	5858842	28-Aug-02	V3	28-Aug-02	TP	
T12S3A	587750	5858977	28-Aug-02	V3	28-Aug-02	TP	
T12S3B	587750	5858727	28-Aug-02	V3	28-Aug-02	TP	
T12S4A	588000	5858868	28-Aug-02	V3	28-Aug-02	TP	
T12S4B	588000	5858618	28-Aug-02	V3	28-Aug-02	TP	
T13S1A	588250	5858829	20-Aug-02	V2	20-Aug	V2	
T13S1B	588250	5858579	20-Aug-02	V2	20-Aug	V2	
T13S2A	588500	5858769	20-Aug-02	V2	20-Aug	V2	
T13S2B	588500	5858519	20-Aug-02	V2	20-Aug	V2	
T13S3A	588750	5858672	20-Aug-02	V1	20-Aug	AP	
T13S3B	588750	5858422	20-Aug-02	V1	20-Aug	AP	
T13S4A	589000	5858651	20-Aug-02	V1	20-Aug	AP	**Snap**
T13S4B	589000	5858401	20-Aug-02	V1	20-Aug	AP	

Appendix D: TENTATIVE June to August Schedule

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
June 3	**June 4**	**June 5**	**June 6**	**June 7**	**June 8**	**June 9**
Prep in Goose Bay	Prep in Goose Bay	Prep in Goose Bay	Prep in Goose Bay	Prep in Goose Bay		
June 10	**June 11**	**June 12**	**June 13**	**June 14**	**June 15**	**June 16**
Prep in Goose Bay	Prep in Goose Bay	Prep in Goose Bay	Prep in Goose Bay	Prep in Goose Bay		
June 17	**June 18**	**June 19**	**June 20**	**June 21**	**June 22**	**June 23**
Prep in Goose Bay Field Staff Orientation and Training	Prep in Goose Bay Field Staff Orientation and Training	Prep in Goose Bay Field Staff Orientation and Training	Prep in Goose Bay Field Staff Orientation and Training	Prep in Goose Bay Field Staff Orientation and Training	Prep in Goose Bay Field Staff Orientation and Training	**Treatment R.** Setup Camp Establish Point Count Stations
June 24	**June 25**	**June 26**	**June 27**	**June 28**	**June 29**	**June 30**
Treatment R. Setup Camp Establish Point Count Stations Point Counts	**Treatment R.** Setup Camp Establish Point Count Stations Point Counts	**Treatment R.** Setup Camp Establish Point Count Stations Point Counts	**Treatment R.** Setup Camp Establish Point Count Stations Point Counts	**Treatment R.** Setup Camp Establish Point Count Stations Point Counts	**Treatment R.** Establish Point Count Stations Point Counts	**Treatment R.** Establish Point Count Stations Point Counts
July 1	**July 2**	**July 3**	**July 4**	**July 5**	**July 6**	**July 7**
Treatment R. Point Counts	**Treatment R.** Point Counts **Treatment R. to Control R.** Setup Camp Establish Point Count Stations	**Control R.** Setup Camp Establish Point Count Stations Point Counts	**Control R.** Setup Camp Establish Point Count Stations Point Counts	**Control R.** Setup Camp Establish Point Count Stations Point Counts	**Control R.** Setup Camp Establish Point Count Stations Point Counts	**Control R.** Setup Camp Establish Point Count Stations Point Counts
July 8	**July 9**	**July 10**	**July 11**	**July 12**	**July 13**	**July 14**
Control R. Establish Point Count Stations Point Counts	**Control. R.** Establish Point Count Stations Point Counts	**Control R.** Point Counts	**Control R.** Point Counts **Control R. to Treatment R.** Setup Camp	**Treatment R.** Point Counts Habitat Data	**Treatment R.** Point Counts Habitat Data	**Treatment R.** Point Counts Habitat Data

July 15	July 16	July 17	July 18	July 19	July 20	July 21
Treatment R. Point Counts Habitat Data	**Treatment R.** Point Counts Habitat Data	**Treatment R.** Point Counts Habitat Data	**Treatment R.** Point Counts Habitat Data	**Treatment R.** Point Counts Habitat Data	**Treatment R.** Point Counts **Treatment R. to Control R.** Setup Camp	**Control R.** Point Counts Habitat Data
July 22	**July 23**	**July 24**	**July 25**	**July 26**	**July 27**	**July 28**
Control R. Point Counts Habitat Data	**Control R.** Point Counts Habitat Data	**Control R.** Point Counts Habitat Data	**Control R.** Point Counts Habitat Data	**Control R.** Point Counts Habitat Data	**Control R.** Point Counts Habitat Data	**Control R.** Point Counts Habitat Data
July 29	**July 30**	**July 31**	**August 1**	**August 2**	**August 3**	**August 4**
Control R. Point Counts **Control R. to Goose Bay**	Time off – Goose Bay	Time off – Goose Bay	Time off – Goose Bay	Time off – Goose Bay	Time off – Goose Bay	Time off – Goose Bay
August 5	**August 6**	**August 7**	**August 8**	**August 9**	**August 10**	**August 11**
Goose Bay to Treatment R. Setup Camp Establish Trap Grids / Stations	**Treatment R.** Establish Trap Grids / Stations	**Treatment R.** Small Mammal Trapping Habitat Data	**Treatment R.** Small Mammal Trapping Habitat Data	**Treatment R.** Small Mammal Trapping Habitat Data	**Treatment R.** Establish Trap Grids / Stations	**Treatment R.** Small Mammal Trapping Habitat Data
August 12	**August 13**	**August 14**	**August 15**	**August 16**	**August 17**	**August 18**
Treatment R. Small Mammal Trapping Habitat Data	**Treatment R.** Small Mammal Trapping Habitat Data	**Treatment R.** Establish Trap Grids / Stations	**Treatment R.** Small Mammal Trapping Distance Sampling	**Treatment R.** Small Mammal Trapping Distance Sampling	**Treatment R.** Small Mammal Trapping Distance Sampling	**Treatment R.** Open
August 19	**August 20**	**August 21**	**August 22**	**August 23**	**August 24**	**August 25**
Treatment R. to Control R. Setup Camp Establish Trap Grids / Stations	**Control R.** Establish Trap Grids / Stations	**Control R.** Small Mammal Trapping Distance Sampling	**Control R.** Small Mammal Trapping Distance Sampling	**Control R.** Small Mammal Trapping Distance Sampling	**Control R.** Establish Trap Grids / Stations	**Control R.** Small Mammal Trapping Habitat Data
August 26	**August 27**	**August 28**	**August 29**	**August 30**	**August 31**	**Sept 1**
Control R. Small Mammal Trapping Habitat Data	**Control R.** Small Mammal Trapping Habitat Data	**Control R.** Establish Trap Grids / Stations	**Control R.** Small Mammal Trapping Habitat Data	**Control R.** Small Mammal Trapping Habitat Data	**Control R.** Small Mammal Trapping Habitat Data	**Control R. to Goose Bay**

Appendix E: DRAFT RVE Project Budget and Equipment List

Staff			
Field Crew Leader/Song birder (2 @ 2.5 months @ $2500/month)	$ 12,500		
Camp Manager (1 @ 2.5 months @ $2000/month)	$ 5,000		
Field Assistants (4 @ 2.5 months @ $1,750/month)	$ 17,500		
Innu Field Assistant (2 @ 2.5 months @ $1,750/month)	$ 8,750		
Data Analyst (Contract: 4 months @ $2,500/month)	$ 10,000		**$ 53,750**
Holiday pay / other benefits (15%)			**$ 8,100**
Food and Accommodations			
Food (2.5 months @ ca. $2000/month)	$ 5,000		**$ 5,000**
Camp Equipment and Supplies			
Generator (Honda 1000 Watt)	$ -		
Surge Protector and Electrical Peripherals	$ -		
Wall Tents and Stoves: 12' X 14' (2)	$ -		
Sleeping Tents (Eureka Timberline (4)	$ -		
Sleeping Cots (7)	$ -		
Sleeping Bags (8)	$ -		
Plywood and Lumber (for tent platforms & tables)	$ 800		
Tarps, Rope and Nails	$ 300		
Axes, Buck Saws, and Shovels	$ -		
Chainsaw and safety gear	$ -		
Assorted Hand Tools	$ 200		
Coleman Stove & Propane Tanks (2)	$ -		
Coleman Camp Lanterns (2 @ $75 each)	$ 150		
Camp Cook and Dining Set (2)	$ -		
Assorted Replacement Cookware	$ 300		
Assorted Coolers/Storage Containers	$ 500		
Kool-a-Tron Cooler	$ 200		
Battery Charger	$ -		
Photovoltaic Cells (Solar Panels; 2 @ $250 each)	$ 500		
12 Volt Heavy Duty Batteries (2 @ $125 each)	$ 250		
Camp Equipment and Supplies (con't)			
Short-wave Radio	$ 200		
Camp Fuel (Gasoline, Propane, Motor Oils, etc.)	$ 3,000		
River Boat (NFLW Science Division)	-		
River Boat and 15 hp Motor (Rental)	$ 3000		
9.9 hp Boat Motor and Freighter Canoe – Sean	-		
Early Detection/Bear Warning Fence	$ 500		
Miscellaneous Disposables (matches, candles, etc., etc.)	$ 750		**$ 10,650**
Personal Equipment			
Rain Gear (6 @ ca. $100 each)	$ 600		
Rubber Boots (ca. $50 each)	$ 100		
Bug Jackets (10 @ ca. $70 each)	$ 700		
Bug Spray and Sun Block	$ 400		**$ 1,800**
Safety Equipment			
Large Camp First-Aid Kit	$ 100		
Small Field First-Aid Kits (2)	$ -		
Life Jackets (4 @ ca. $75 each)	$ 300		
Satellite Telephone	$ 1,750		
Satellite Telephone Fees	$ 3,000		
Mobile Radios (5 @ ca. $100 each)	-		
River Throw Bags	$ 85		
Bear Bangers (6 @ ca. $70 each)	$ 420		
Bear Deterrent Spray (8 @ ca. $75 each)	$ 600		

Shotgun (Winchester Defender)	-	
Misc. Disposables (e.g. whistles, ammunition, etc.)	$ 500	**$ 6,755**
Research Equipment		
Programmable Sound Level Meter (1, * possibly 2)	$ -	
Refurbishment of Sound Meter (i.e. Calibration, etc.)	$ 1,000	
Solar Powered, Portable Weather Station	$ 1,250	
Notebook Computer (rental)	$ 500	
Zip-Drive (Data Back-up; 1)	$ -	
Digital Camera (1)	$ -	
Digital Video Recorder (Zoom/Still camera capabilities)	$ 1,000	
Research Equipment (con't)		
Trimble GPS (1)	$ -	
Garmin 12XL GPS (2)	$ -	
Topographic Maps	$ 300	
Compasses (Silva Ranger: 4 @ ca. $55 each)	$ 220	
Spotting Scope (1)	$ -	
Binoculars (4)	$ -	
Bat Detectors (2 @ $250)	$ 500	
Daypacks (4 @ $50 each)	$ 200	
Field Guides (e.g. trees, shrubs, etc.)	$ 300	
Field Notebooks, Pencils, Clipboards, Recording Supplies, etc.	$ 500	
Daypacks (4 @ $50 each)	$ 250	
Taping/Recording Equipment (2)	$ -	
Small Mammal Trapping Equipment (traps, bags, bait, Pesola, etc.)	$ 8,500	
Minnow Traps (2 @ $125 each)	$ 250	
Misc. Disposables (flagging tape, forestry flags, batteries, etc.)	$ 1,200	**$ 15,970**
Chartered Air Services (includes 2 recon flights for river selection)		
Fixed-Wing (est. 500 miles @ $7.50/mile)	$ 3,750	
Helicopter (est. 10 hours @ $1150/hour)	$ 11,500	
River Charters (crew changes and supplies) 20 @ 750 per day	$ 15,000	**$ 30,250**
Contingency	$ 8,000	**$ 8,000**
Estimated Expenditures		**$ 140,275**

Appendix F: List of Potential Species of Birds

Species	RVE 2001 Fieldwork Study 1		Western Labrador		Laurentian Mountains, Quebec
	Augustin	Mecatina	Study 2	Study 3	Study 4
Alder Flycatcher	1	0	1	0	1
American Redstart	1	0	0	0	1
American Robin	1	1	1	1	1
Bay-breasted Warbler	1	1	0	0	1
Belted Kingfisher	1	1	0	0	1
Bicknell's Thrush	0	0	0	0	1
Black and White Warbler	0	1	0	0	1
Black-backed Woodpecker	1	0	0	0	1
Blackburnian Warbler	1	1	0	0	1
Black-capped Chickadee	0	0	0	0	1
Blackpoll Warbler	1	1	1	0	1
Black-throated Green Warbler	1	1	0	0	1
Blue-headed Vireo	1	1	0	0	0
Blue Jay	1	0	0	0	0
Bohemian Waxwing	1	1	0	0	0
Boreal Chickadee	1	1	1	1	1
Brown Creeper	0	0	0	0	1
Canada Warbler	0	0	0	0	1
Cape May Warbler	0	0	0	0	1
Cedar Waxwing	1	1	0	0	1
Chipping Sparrow	1	1	0	0	1
Dark-eyed Junco	1	1	1	1	1
Fox Sparrow	1	1	1	1	1
Golden-crowned Kinglet	1	1	0	0	1
Gray Jay	1	1	1	1	1
Hairy Woodpecker	0	1	0	0	0
Species	RVE 2001 Fieldwork Study 1		Western Labrador		Laurentian Mountains, Quebec
	Augustin	Mecatina	Study 2	Study 3	Study 4
Hermit Thrush	1	1	1	1	0
Lincoln's Sparrow	0	1	1	0	1
Magnolia Warbler	1	1	1	0	1
Mourning Warbler	0	0	0	0	1
Nashville Warbler	0	0	0	0	1
Northern Flicker	1	1	1	1	1
Northern Waterthrush	1	1	1	0	1
Olive-sided Flycatcher	0	1	0	0	0
Orange-crowned Warbler	0	0	1	0	0
Ovenbird	1	0	0	0	0
Palm Warbler	1	1	0	0	0
Philadelphia Vireo	1	0	0	0	1
Pine Grosbeak	1	0	1	0	1
Pine Sisken	1	1	1	0	1
Purple Finch	1	0	0	0	1
Red-breasted Nuthatch	1	1	0	0	1
Ruby-crowned Kinglet	1	1	1	1	1
Ruffed Grouse	0	1	0	0	1
Rusty Blackbird	0	1	0	0	1
Solitary Vireo	0	0	0	0	1
Spotted Sandpiper	1	1	0	0	1
Spruce Grouse	1	1	0	0	1
Swainson's Thrush	1	1	1	1	1
Tennessee Warbler	1	1	1	1	1

Species	RVE 2001 Fieldwork Study 1		Western Labrador		Laurentian Mountains, Quebec
	Augustin	Mecatina	Study 2	Study 3	Study 4
Three-toed Woodpecker	1	0	1	0	0
Tree Swallow	0	1	0	0	1
White-crowned Sparrow	**1**	**1**	**1**	**1**	**0**
White-throated Sparrow	**1**	**1**	**1**	**1**	**1**
White-winged Crossbill	**1**	**1**	**1**	**0**	**1**
Wilson's Warbler	**1**	**1**	**1**	**1**	**1**
Winter Wren	**1**	**1**	**0**	**0**	**1**
Yellow Warbler	**1**	**1**	**0**	**0**	**0**
Yellow-bellied Flycatcher	**1**	**1**	**1**	**1**	**1**
Yellow-rumped Warbler	**1**	**1**	**1**	**1**	**1**
Total Number of Species	**44**	**42**	**25**	**15**	**48**

Notes:

- 0 = not recorded, 1 = recorded
- Bolded species are most likely to be present at the selected river valleys
- Study 1 = Jung and Jones 2001
- Study 2 = Simon et al. 1998
- Study 3 = Schwab et al. 2001
- Study 4 = Darveau et al. 1995

Appendix G: Breeding Bird Point Count Data Sheet

SITE: Control **PLOT:** 48 **HABITAT:** Open Conifer **DATE:** 26 June 2005

OBSERVOR(S): F. Flintstone **LAT.:** 51.4563° **LONG.:** 61.9831° **VISIT:** 2

Point	Time	Species	≤ 50 m		> 50 m		Fly-Overs	
			0-3 min	3-5 min	0-3 min	3-5 min	0-3 min	3-5 min
1	05:08	AMRO	IIII 4		I 1			
		TTWO				II 2		
		OSFL		III 3				
2	05:22	AMRO	II 2					
		RTHA						I 1
		GRAJ	II 2		III 3			
		CORA					I 1	
3	05:38	RUBL	I 1					
		PIGR	I 1					
		AMRO			III 3			
		WWCR						IIII 4
		BBAW		II 2				

Sample

Modified from: Ralph et al. (1995).

Appendix H: List of Potential Species of Small Mammals

Common Name	Scientific Name
Masked Shrew	*Sorex cinereus*
Water Shrew	*Sorex palustris*
Pygmy Shrew	*Microsorex hoyi*
Star-nosed Mole	*Condylura cristata*
Deer Mouse	*Peromyscus maniculatus*
Red-Backed Vole	*Clethrionomys gapperi*
Northern Bog Lemming	*Synaptomys borealis*
Heather Vole	*Phenacomys intermedius*
Meadow Vole	*Microtus pennsylvanicus*
Rock Vole	*Microtus chrotorrhinus*
Meadow Jumping Mouse	*Zapus hudsonius*
Woodland Jumping Mouse	*Napaeozapus insignis*

From: Banfield (1974).

Appendix I: Small Mammal Trapping Data Sheet

SITE: Control **TRAPPING GRID:** 1-44-A **HABITAT:** Open Conifer

OBSERVOR(S): F. Flintstone, B. Rubble **TRAP DAY:** 3 **DATE:** 6 May 2005

Trapping Station	Trap [A]	Species	Sex	Age	Mass	Notes
1-03-01	1	Meadow Vole	M	J	15.2	
	2	0	0	0	0	
1-03-02	1	Deer Mouse	F	A	21.4	
	2	0				Trap set off
1-03-03	1	0				
	2	0				
1-03-04	1	Bog Lemming	M	A	32.2	
	2	0				
1-03-05	1	RB Vole				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1-03[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1-03[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2	0				
1-03-08	1	Meadow Vole	F	J	14.3	
	2	0				
1-03-09	1	0				
	2	Deer Mouse	F	A	13.4	Partially eaten
1-03-10	1	0				
	2	0				Trap set off
1-03-11	1	0				
	2	Shrew	0	0	7.2	Species unknown

Sample

[A] Trap Model: 1 = Victor, 2 = Museum Special

APPENDIX J: Mean vegetation cover+/- standard error

Vegetation Cover Layer - Canopy		A1	A1	A1	A2	A2	A2	A2
Species Class Code		**bF**	**wB**	**bS**	**bF**	**wB**	**bS**	**tA**
Control Site	Mean Percent Cover	1.05	0.35	3.94	7.33	0.73	18.20	0.15
Interior sample	SE	0.47	0.34	0.73	1.73	0.29	2.10	0.12
Control Site	Mean Percent Cover	0.49	0.50	5.03	12.85	2.57	22.91	0.11
Riparian sample	SE	0.26	0.34	0.85	2.44	0.80	2.41	0.11
Treatment Site	Mean Percent Cover	0.14	0.03	2.33	6.39	3.69	36.17	0.67
Interior sample	SE	0.09	0.02	0.43	1.88	0.64	2.55	0.41
Treatment Site	Mean Percent Cover	1.13	1.44	2.77	11.40	7.95	25.81	0.16
Riparian sample	SE	0.57	1.12	0.54	1.75	1.74	2.86	0.16
Vegetation Cover Layer -Shrubs		**B1**	**B1**	**B1**	**B1**	**B2**	**B2**	**B2**
Species Class Code		**bF**	**wB**	**bS**	**Alnus sp**	**bF**	**Alnus sp.**	**wB**
Control Site	Mean Percent Cover	8.17	1.80	12.61	5.97	8.06	6.09	1.25
Interior sample	SE	1.64	0.57	1.32	2.43	1.69	1.69	0.53
Control Site	Mean Percent Cover	9.80	2.25	13.37	4.96	8.60	9.10	1.89
Riparian sample	SE	1.32	0.60	1.64	1.72	1.21	2.21	0.58
Treatment Site	Mean Percent Cover	3.07	0.87	14.90	0.99	2.03	2.22	0.86
Interior sample	SE	0.69	0.29	1.89	0.44	0.50	1.39	0.24
Treatment Site	Mean Percent Cover	7.99	1.77	7.30	10.31	8.66	9.67	0.83
Riparian sample	SE	1.20	0.54	1.11	2.86	1.27	2.55	0.23
		B2	**B2**	**B2**	**B2**	**B2**	**B2**	
		bS	**Cornus stolonifera**	**Ledum groenlandicun**	**Salix sp.**	**Vaccinium sp.**	**Kalmia sp.**	
Control Site	Mean Percent Cover	10.90	0.14	21.24	0.82	6.50	0.32	
Interior sample	SE	1.11	0.10	3.63	0.29	1.41	0.20	
Control Site	Mean Percent Cover	11.96	1.20	15.47	0.60	2.67	0.00	

Riparian sample	SE	2.11	1.21	3.41	0.35	0.64	0.00			
Treatment Site	Mean Percent Cover	7.43	0.00	27.28	1.33	5.61	1.13			
Interior sample	SE	0.85	0.00	3.23	0.28	0.96	0.70			
Treatment Site	Mean Percent Cover	6.58	0.04	10.45	0.35	1.05	0.00			
Riparian sample	SE	1.09	0.03	2.45	0.13	0.30	0.00			
Vegetation Cover Layer - Herbs / cover		**C**	**C**	**C**	**C**	**C**	**D**			
Species Class Code		**Poaceae/ Carex**	**Cornus Canadensis**	**Linnaea borealis**	**Mitchella repens**	**Gaultheria sp.**	**Cladina sp.**			
Control Site	Mean Percent Cover	0.27	3.41	1.38	0.65	9.25	14.44			
Interior sample	SE	0.14	0.67	0.50	0.17	1.45	3.30			
Control Site	Mean Percent Cover	0.00	3.48	1.57	1.29	7.46	2.89			
Riparian sample	SE	0.00	1.06	0.90	0.42	1.79	1.14			
Treatment Site	Mean Percent Cover	1.59	3.91	1.19	1.15	11.46	24.13			
Interior sample	SE	1.35	0.80	0.62	0.36	1.68	3.83			
Treatment Site	Mean Percent Cover	0.13	3.47	2.42	0.55	6.75	2.83			
Riparian sample	SE	0.07	0.89	1.15	0.13	1.63	1.08			
		D	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**
		Dicranum sp.	**Hylocomium splendens**	**Ptilium crista-castrensis**	**Sphagnum sp.**	**Pleurozium**	**Rabbit lettuce**	**Peltigera sp.**	**Bare**	**Unk**
Control Site	Mean Percent Cover	0.67	8.57	3.89	2.59	52.02	2.09	0.77	0.00	0.67
Interior sample	SE	0.34	2.00	2.33	0.93	4.88	0.46	0.31	0.00	0.57
Control Site	Mean Percent Cover	0.72	13.95	3.85	1.82	56.37	1.27	0.57	0.09	0.01
Riparian sample	SE	0.21	3.04	2.62	0.69	4.27	0.25	0.22	0.06	0.01
Treatment Site	Mean Percent Cover	0.55	5.77	6.17	5.43	50.20	1.67	0.98	0.60	0.01
Interior sample	SE	0.21	1.49	2.27	2.55	4.08	0.36	0.27	0.59	0.01
Treatment Site	Mean Percent Cover	1.95	16.21	5.66	1.05	41.81	0.55	0.25	0.55	0.55
Riparian sample	SE	0.98	2.53	1.80	0.52	3.93	0.16	0.10	0.42	0.55

Appendix K: Summary of results of Anova analysis

		P-values		P-values	
Layer	**Species**	**Riparian vs. Interior**	**Significant**	**Control vs. Treatment**	**Significant**
A - 1	*Abies balsamea*	0.407	N	0.778	N
A - 1	*Betula papyrifera*	0.209	N	0.636	N
A - 1	*Picea mariana*	0.252	N	0.001876	**Y - Control higher**
A - 1	*Larix laricina*	0.307	N	0.397	N
A - 1	*Populus tremuloides*	0.273	N	0.528	N
A - 2	*Abies balsamea*	0.00662	**Y - Riparian higher**	0.53	N
A - 2	*Betula papyrifera*	0.005886	**Y - Riparian higher**	0.000051	**Y - Treatment higher**
A - 2	*Picea mariana*	0.152	N	0.000189	**Y - Treatment higher**
A - 2	*Picea glauca*	0.307	N	0.397	N
A - 2	*Larix laricina*	0.052	N	0.109	N
A - 2	*Populus tremuloides*	0.226	N	0.289	N
A - 2	*Populus balsamifera*	0.329	N	0.397	N
B - 1	*Abies balsamea*	0.0035	**Y - Riparian higher**	0.00556	**Y - Control higher**
B - 1	*Betula papyrifera*	0.148	N	0.161	N
B - 1	*Picea mariana*	0.0091	**Y - Interior higher**	0.2004	N
B - 1	*Larix laricina*	0.051	N	0.105	N
B - 1	*Alnus sp.*	0.019	**Y - Riparian higher**	0.889	N
B - 1	*Prunus sp.*	0.307	N	0.239	N
B - 1	*Salix sp.*	0.2205	N	0.191	N
B - 2	*Abies balsamea*	0.000761	**Y - Riparian higher**	0.0186	**Y - Control higher**
B - 2	*Alnus sp.*	0.0067	**Y - Riparian higher**	0.446	N
B - 2	*Betula papyrifera*	0.497	N	0.053	N
B - 2	*Larix laricina*	0.514	N	0.378	N
B - 2	*Picea mariana*	0.789	N	0.00185	**Y - Control higher**
B - 2	*Populus tremuloides*	0.364	N	0.477	N
B - 2	*Ferns*	0.259	N	0.349	N
B - 2	*Fraxinus nigra*	0.36	N	0.34	N
B - 2	*Cornus stolonifera*	0.466	N	0.267	N
B - 2	*Ledum groenilicum*	0.00009	**Y - Interior higher**	0.865	N
B - 2	*Prunus sp.*	0.307	N	0.239	N
B - 2	*Ribes sp.*	0.362	N	0.213	N
B - 2	*Rubus idaeus*	0.152	N	0.828	N
B - 2	*Rubus sp.*	0.307	N	0.397	N
B - 2	*Salix sp.*	0.0125	**Y - Interior higher**	0.657	N
B - 2	*Vaccinium sp.*	0.0000009	**Y - Interior higher**	0.174	N
B - 2	*Viburnum sp.*	0.459	N	0.483	N
B - 2	*Kalmia sp.*	0.051	N	0.341	N
B - 2	*Amelanchier sp.*	0.356	N	0.471	N
		P-values		**P-values**	
Layer	**Species**	**Riparian vs. Interior**	**Significant**	**Control vs. Treatment**	**Significant**
C	*Ferns*	0.067	N	0.775	N
C	*Clintonia sp.*	0.113	N	0.395	N

C	*Poacea sp.*	0.209	N	0.361	N
C	*Goodyera repens*	0.687	N	0.486	N
C	*Equisetum sp.*	0.157	N	0.219	N
C	*Maianthemum sp.*	0.228	N	0.315	N
C	*Smilicina sp.*	0.449	N	0.318	N
C	*Trillium sp.*	0.591	N	0.382	N
C	*Coptis triflora*	0.229	N	0.209	N
C	*Cornus canadense*	0.826	N	0.813	N
C	*Epilobium sp.*	0.171	N	0.636	N
C	*Galium sp.*	0.189	N	0.225	N
C	*Linnaea borealis*	0.356	N	0.706	N
C	*Mitchella repens*	0.796	N	0.646	N
C	*Pyrola sp.*	0.376	N	0.424	N
C	*Sarracenia sp.*	0.307	N	0.397	N
C	*Trientalis borealis*	0.59	N	0.535	N
C	*Viola sp.*	0.087	N	0.41	N
C	*Gaultheria sp.*	0.036	**Y - Interior higher**	0.677	N
C	*Monotropa uniflora*	0.973	N	0.815	N
D	*Cladina sp.*	5.03E-10	**Y - Interior higher**	0.0954	N
D	*Dicranum sp.*	0.175	N	0.36	N
D	*Hylocomium splendens*	0.000307	**Y - Riparian higher**	0.917	N
D	*Mnium sp.*	0.00655	**Y - Riparian higher**	0.007	**Y - Control higher**
D	*Ptilium crista-castrensis*	0.908	N	0.371	N
D	*Sphagnum sp.*	0.065	N	0.542	N
D	*Cladonia sp.*	0.225	N	0.177	N
D	*Pleurozium*	0.499	N	0.0486	**Y - Control higher**
D	*Polytrichum commune*	0.044	**Y - Riparian higher**	0.138	N
D	*Lycopodium*	0.0367	**Y - Riparian higher**	0.79	N
D	*Rabbit lettuce*	0.0018	**Y - Interior higher**	0.0658	N
D	*Peltigera sp.*	0.016	**Y - Interior higher**	0.896	N
D	*bare ground/ leaf litter*	0.977	N	0.208	N