James McLean Oliver Ecological Centre
2003 Annual Report

In memory of Miss Marjorie Oliver
October 8th 1909 – November 28, 2003

Marjorie and Ring - 1912

Marjorie and sister Margaret at the beach - 1912

Marjorie at the opening of the James McLean Oliver Ecological Centre - 1998

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2003 Annual Report

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Cover The picture on the cover of the annual report is Marjorie Oliver's father James McLean Oliver. He and his dog Ring are watering the horses. Photo courtesy of Marjorie Oliver.

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Director's Report for the Oliver Centre 2003 - Tom Hutchinson

The Oliver Centre showed a lot of progress in 2003, both in the level and sophistication of the research being carried out, and in the range of undergraduate courses being offered. The major users of the Centre are from the departments of Biology, Environmental and Resource Studies, Native Studies, and Geography, while graduates and researchers are from two of Trent's graduate programmes, Watershed Ecosystem Graduate Studies and the Environmental Modelling programme. Details of the undergraduate courses offered in 2003 as well as research reports follow in this Annual Report.

We have now settled into an annual Common Loon survey, done on a weekly basis on Pigeon Lake, as well as the annual monitoring of amphibians, snakes, butterflies, birds, and timing of flowering for a number of plant species! All data are intended to contribute to long-term monitoring of the biota and to provide the basis for assessing change over time. We have carried out similar surveys for base-line data on adjacent properties especially at the 960 acre hardwood forest owned by Mr. Rod Parker.

Air pollution monitoring together with detailed meteorological monitoring is providing us with a clear picture of the stress the Kawarthas are now subjected to and the potential sources of the air pollution episodes. Much work has been done on the impacts of ozone on crops, vegetables and the hardwood forests. A new air pollution research garden was set up in 2003 and this will be a basis for ongoing studies. The Canopy Access System, which allows researchers to work 70 feet above the forest floor is now attracting a lot of research interest and media attention. The research opportunities at the Oliver Centre are unique in Canada and three graduate students and several honours thesis students are utilizing it.

In 2003 we presented our site plan and land use plans for the Oliver Centre to the Municipality, and these have been accepted. Education, research, and conservation are the basis of the long-term plans, with a limited number of buildings to be added for accommodation, service facilities, and research. Robert Ballarin of Trent's Physical Resources has been a great help with all these endeavours. The first of three attractive wooden cabins was completed in 2003, with a second to go in, in 2004. The first cabin, which sleeps up to eight persons was funded by a most generous gift from Mrs. Audrey Hanbidge.

Sadly, Miss Oliver passed away in November 2003. She had a remarkable life and has been a most generous and far-seeing benefactor to Trent. She has taken a close personal interest in how the Trent Oliver Centre has been developed after her gift of the estate and was a frequent visitor until her deteriorating health stopped her in the last 18 months. The Centre is her legacy and the house is largely restored with her furniture

Sheena Symington, the Centre Manager, and her husband Eric Sager and son Kalin kept close touch with Marjorie and their visits brought her much pleasure. The Oliver Centre has been able to make such a good start in large measure because of the excellent Manager we have and the Sheena-Eric-Kal team have worked with skill and commitment to help all users achieve their goals. They have also kept the place in good order and connected with the local community, as well as Trent in a creative way. I thank them for this dedicated and invaluable effort.

Trent's Acquisition of the Oliver Centre from Miss Marjorie Oliver

On October 8th, 1998, Miss Marjorie Oliver donated her 270-acre estate on the shores of Pigeon Lake, near Bobcaygeon, Ontario, to Trent University. Miss Oliver donated this property on her 90th birthday, with the intention that it be developed as a long-term ecological and environmental research centre. The property contains a wide range of natural ecosystems - 94 acres of woodlands, 3.7 acres of wetlands, 2000 feet of shoreline, and a unique range of historical agricultural fields representing old field successions from forty, twenty and ten years of abandonment. Altogether this represents a wide range of habitats suitable for the teaching and research of both aquatic and terrestrial ecosystems. The 1903 majestic house and 1912 rustic cottage provide accommodation for professors and students.

The property, named the James McLean Oliver Ecological Research Centre (in honour of Marjorie Oliver's father), provides a unique opportunity for researchers to conduct undisturbed short and long-term

environmental and ecological research. The Centre provides a forum for multi-disciplinary research to take place amongst collaborating experts in ecology, biology, limnology, toxicology, entomology, ornithology, environmental modelling, geography, hydrology, climatology, atmospheric physics, and chemistry. It also is the base for three annual residential undergraduate field courses.

It is with sadness that we report that Miss Marjorie Oliver passed away on November 28, 2003. She died peacefully at Princess Gardens where she had lived for the last four years. Miss Oliver was born at the Oliver farmstead in 1909 and was 94 years old at the time of her death. The funeral was held at Knox Presbyterian Church in Bobcaygeon where she was a devoted member for many years. A reception, in her memory, was hosted by the Oliver Centre following the funeral service. Paul bearers at the funeral service were Tom Hutchinson, Bob van Dompseler, Sheena Symington, Neil Emery, Shaun Watmough, and Alison Clark, all of Trent University.

Marjorie's Memories

The Oliver History - Sheena Symington
We have worked with Miss Oliver to develop an archival history of the property and of the Oliver family. We have some stories from Miss Oliver which provide a wonderful insight into life at the Oliver farm as it used to be. We are including some of these in the Annual Reports to provide a perspective on how it was then and how it is today.

#3 Memories by Marjorie Oliver: Miss Marjorie Oliver has written a number to stories about aspects of her life growing up on Lakeview Farm, located on Pigeon Lake. The following is number three of Marjorie's stories.

"Chores" by Miss Marjorie Oliver

Our house and barns stood on a hill overlooking a lake. And right now I am remembering the winters of my childhood - their tasks as well as their joys around our stables. Each night Father would put on his heavy rubbers, extra sweater, sturdy smock, woolen and leather mitts; light his lantern, and stand for a minute while I made up my mind whether to accompany him or not - usually I would bundle up and go with him to "bed down the animals". As we made our way to the stable, I walked behind Father who carried the lantern. The shadows of our feet stepped high, our breath rose steadily in two puffy spirals, and the crunch of the snow sounded frostily under our boots. We entered the stable first. It was warm with the contented breathing of the cattle and horses. We began the chores by bedding the horses. Father always told me to hold the lantern so that I could see, and then he, too, would be able to see what he was doing. Soiled straw was forked from the floors of each stall, and fresh straw which was to form a bedding, was scattered in its place. Hay from the passageway was forked into the mangers. The cows, the young cattle, and the calves were similarly attended to, and as we left the stable there was the pleasant sound of steady chomping.

We next looked after the sheep. My father's ancestors had been shepherds in Scotland and he had a special love for his sheep and lambs. As we opened the door of the pen, their eyes blinked as they looked toward Father who would raise his lantern to see that all was well with his flock. They welcomed the feed we gave them and munched daintily as we left them and proceed on to the pig pen. Here we were greeted by inquiring grunts which soon changed to heart-warming slurps of great satisfaction as they hastily finished the chop and slops. The door was carefully shut and we made our way out through the sheep pen where the sheep sleepily watched us depart into the cold of the night air. The windows of the kitchen shone out their welcoming warmth as we made our way back, and our mouths watered at the thoughts of toasted buns and hot tea that Mother had waiting for us. Father would say, "It's going to be a cold one, but the animals are all warn and fed." And with that remark he threw his mitts under the stove to dry out for the morning. He sat down beside the wood box, picked up a piece of cedar and with his draw blade made shavings which would help to start the fire in the stove next morning. He then settled himself in his arm chair beside the lamp at the end of the kitchen table to sip his tea and read his "Globe" while Mother made the rolled-oat porridge which would be heated for our breakfast in the morning. The kitchen at night was a warm and happy place full of comfort and serenity.

Winter mornings were a different matter. Milking was done and the warm milk was carried steaming to the kitchen where it was separated into cream for us and skim for the pigs. Washing the separator was a tedious chore and I was always glad when I could escape. Bowls, spouts and dishes had to be washed, rinsed and re-assembled. Huge bowls of hot porridge, thick slices of home-made bread toasted over the hot coals of a wood fire, eggs and home-cured pork prepared us well for the work of the day. If for some reason I did not go to school, or it were a weekend morning, I had my role to play and usually the barns, stables, and pens made up the scene in which I had my part.

Water holes had to be cut before the animals were let out of the stables. Every morning Father dressed for the outdoors with the ear lugs of his cap pulled well down and his mackinaw coat collar turned well up, picked up his axe and followed the path to the lake. There he chopped the water holes clear of ice. Back up the hill he would go, replace the axe and head for the stable to be welcomed by the rattling of the chains against the stanchions, and we knew the cattle were anxious to get at that cold lake water. One by one they were let out, but usually they trailed one another slowly and ploddingly. Next came the calves that in their childish way kicked up their heels and even slipped in their hurry to get out. The young cattle - the year olds - followed eagerly but more surely. As they all got out, they sniffed the air, filled their lungs, and filed their way to the lake. The horses left the stable last and they were the most frisky of the lot; they galloped around the yard, and often before going to the lake would lie on the snow and roll from side to side, get up, snort, and streak for the water holes. Sometimes I went to the sheep pen, opened the door and hid behind it until the sheep and especially the ram had left. The sheep did not seem to be drawn to the lake as did the other animals. In the meantime, on a fair day, Father would scatter hay in the barn yard, and when all the animals came back from the lake feed was ready for them. The hens picked their way gingerly over the snow to pick up the few grain that had shaken from the feed put out for the animals. On such days the roosters appeared less cocky than usual as their attention was absorbed by avoiding icy patches and by snapping up especially large morsels. It was usually Mother who cooked some sort of mash as a warm treat for the grateful hens and chickens on a particularly cold day. The cackling discussion of the goodies found in the mash was a rewarding sound that reflected complete satisfaction of the hen house.

Once in a while the whole barnyard would be in an uproar. After a heavy snowstorm, the roof of the barn would become loaded with snow, but when a sunny day came along and the roof warmed up a bit, the whole mass of snow would slide off with the thunderous upheaval of a small avalanche, and all the animals would gallop away and then turn and stare at what had scared them.

The cleaning of the stables came next. Shovels cleaned the floor of the stalls into the gutters down which ran the liquid to some underground passage outside. Father then came and shoveled the solid mess into the wheelbarrow which he wheeled outside to the manure pile. Back-breaking trips had to be made to get the smelly but rich and pungent stuff outside where it froze solid during the winter. In the spring when it thawed out, there came the disgusting work of “drawing out manure” to the fields where it was used as fertilizer.

By this time the stable was well aired and we went up to the barn to “throw down” hay and straw from their lofts. A slide door was pulled open, hay was forked onto the floor, then it was pushed along in one grand pile to the door and shoved through to the stable beneath. Straw was forked from another loft and through another door to be used later for bedding. We next went into the old barn that Grandfather had built, and we forked hay down the chute into the sheep pen. Back to the stable we would go to do what I liked best. A turnip bin had been filled in the fall with hundreds of turnips which were great for pitching. I pierced one with a pitch fork and hurled it down the length of the cows’ mangers. Thirteen cows- thirteen turnips. They were then picked up one by one and tossed into a manger as a treat for each cow. Calves and year-olds could not manage whole ones, so turnips were thrown into the pulper and chopped into slices and carried by a shovel to these young animals. The thing I liked about this task was the tasty nibble of the crisp centre of the turnip; the thing I did not like about the task was lifting the roots in my mittened hands and seeing the red wool become grey and damp. While I did this Father stood on a box, reached up and pulled back a little paddle-like wooden slide at the end of a chute along the ceiling, and down would come a stream of golden oats from the granary in the barn above and into a bucket held up high by Father. The oats were special and were divided among the boxes beside the horses’ mangers.

Late in the afternoon came the task of carrying boxes of corn ensilage from the basement of the silo to the mangers of the cows. The stuff smelled of fermented corn and my nose wrinkled in an effort to avoid the stench. The ensilage was also very heavy. I could fill the boxes, but I could not lift nor carry them; this work was left to Father or Mother who often helped him with the chores. The cows always seemed to find the feed most acceptable.

If the weather were good, the stock stayed out in the sunshine and good air-being very serious and staid for the most part, but getting on with the business of eating or just standing there thinking, no doubt of the treats awaiting them in the stables. At times they became skittish and playful and kicked up their heels; but in a matter of seconds the older animals settled down as if aghast at their unseemly conduct. If the weather were cold and stormy, the cattle made for the open doors, and unerringly took the same stalls day after day, and with great relish gulped down the cool crisp turnips. The horses, on the other hand, nosed in their oat boxes and mangers for carrots, oats and hay.

At least once in a winter on a very cold night, Ginny, the good and faithful horse that pulled us in buggy or cutter over miles of roads and miles of ice on the lake, would become possessed with an idea of staying outside for the night and would kick in defiance of being coaxed in. At regular intervals Father would put on all of his outer winter clothes, light his lantern, go to the stable, shake a pan of oats, and call to the mare that would toss her head and go galloping around the barns. Father worried about her being out in the bitter cold and would go out in the middle of the night to try to tempt her again and finally she would give in, and we would all settle down for the rest of the night knowing that Ginny had a last found her senses and had gone into the warmth of the stable.

The comradeship between Father and me was sweet indeed. He realized there was " a time to keep silence and a time to speak" In his Scottish blood it was not natural to reveal the soul too nakedly, and although he said little, I knew him well enough to sense his pride and pleasure when I accompanied him to do his many chores - especially those done at night. The cold quiet of a bright moon-lit winter night, when the sky was heavy with stars, seemed to tighten the bond between us and our souls felt at peace. We understood each other.

Plate 2: Vacationing children enjoy a ride on a load of hay during their stay at Lakeview Farm, Pigeon Lake in the 1940's. Charles Kraeger drives the team. Photographer – William Law of Toronto, an habitual visitor with his family. (Photo courtesy of Marjorie Oliver).

Richard Ivey Foundation Scholarships

In 1999 the Richard Ivey Foundation awarded $125,000.00 to graduate students undertaking theses research at the Oliver Ecological Centre in the area of biodiversity. This award will support graduate students at the Oliver Centre for five years. The recipients for the academic year 2003-2004 were:

1. Rebecca Grant (M.Sc candidate with Professor Tom Hutchinson).

2. Michelle Charbonneau (MSc candidate with Professor Michael Berrill).

3. Alison Clark (MSc candidate with Professor Tom Hutchinson).

Organizational Structure of the Oliver Ecological Centre

The management committee, appointed by President Patterson, governs the Oliver Ecological Centre. The Director of the Centre is Dr. Tom Hutchinson. The Centre has a Manager, Sheena Symington, living on site in the main house where visiting researchers are also welcomed. The cottage on the property provides accommodation for field courses as well as graduate and undergraduate students conducting research at the Oliver Centre.

2003 Oliver Ecological Centre Management Committee

Professor Tom Hutchinson (Chair/Director) Environmental and Resource Studies and Biology
Professor Chris Metcalfe, Dean of Research and Graduate Studies
Professor Jim Schaefer, Biology, Alternate: Professor Erica Nol, Biology
Professor Tom Whillans, Environmental and Resource Studies
Professor Colin Taylor, Dean of Arts and Science
Professor Peter Lafleur, Geography
Ms. Susan Mackle, Development Office Vice-President
Ms. Sheena Symington, Oliver Ecological Centre Manager
Mr. Robert van Dompseler, Physical Resources Manager
Mr. Mark Ridgway, MNR

2003 Receipts

User fees	$11,519.00 - this money is used for day-to-day upkeep of the Oliver Centre
Grants:	
CFWIP grant (MNR) - Annual loon survey	$1,300.00
Donations:	
Community group donations	$900.00
Individual donation	$25,300.00
Individual donation towards annual loon survey	$200.00
In-kind donations*:*	
Individual donation	16 ft Boat and 75 hp Evinrude motor

User Fees

Overnight accommodation is $10/person
Note: Fees for groups and conferences are negotiated directly with the Manager or Director

2003 Equipment purchase

Air pollution monitoring equipment to be placed within the sugar maple canopy.

Community Involvement

An Open House organized by Sheena Symington and Katie Brown (Development Office at Trent) on June 20, 2003 provided a great opportunity for local residents and cottagers to visit the centre and meet the Oliver Ecological Centre researchers. The 2003 Oliver Ecological Centre Open House was very successful with greater than 130 in attendance, including members of both the local community and as well as the Trent community. The Trent Foundation held their annual meeting prior the public open house and in this sense hosted the event. Greater than 200 open house invitations were mailed and the invitation itself included research titles of work done at the Oliver Centre over the past 5 field seasons, which provided those people unable to attend the open house, with an update of Oliver Centre activities.

This year (2003) we celebrated our fifth field-season of research at the Centre and the hundredth birthday for the Oliver Farmhouse. Tom Hutchinson, Director of the Oliver Centre provided an update on current research taking place at the Centre. A number of graduate students spoke of their Oliver Centre research. As well, a series of displays allowed an informal setting for graduate and undergraduate students to present their research projects. Informal tours of the property were also provided.

Outreach

The James McLean Oliver Ecological Centre Web-page can be located at:
http://www.trentu.ca/olivercentre

Regular updates and announcements are published in local newspapers in both Bobcaygeon and Peterborough.

Summary of Conference, Meeting and Field Trip Use of Oliver Centre in 2003

Organizer	Function	Number of Participants	Duration
Sheena Symington (Oliver Centre Manager)	Canopy Access Inspection/Training	10	April 23
Mark Dockstator (Trent University)	Native Studies Teaching Retreat	20	April 26 – May 6
Tom Hutchinson (Trent ERS/Biology)	Summer Students –Cedar Welsh, Simon Yiuman and Raheman Dhalla – effects of ozone on agriculture crops	4	May - August
Erin Crowe (Trent University) and Robert Sarginson	Loon Survey of Pigeon Lake	2	May – August 71 days in total
Eric Sager (Oliver Centre)	United Church Men's Breakfast (host and tour of property)	20	May 10
Chris Risely – MNR	Natural Heritage Information Centre - field day	6	June 2
E. Sager and D. Woodfine, and T. Hutchinson (Trent University)	Ecology of the Kawarthas, 2-week residential ON field course	12	May 18 –May 30
Sheena Symington (Oliver Centre Manager) with Katie Brown (Trent's Development Office)	Oliver Ecological Centre Open House	110+	June 20
Lisa Bridges, (with Jeff Bowman, MNR)	Trapping of Flying Squirrels	3	July 2-4 and July 21-August 1
Tom Hutchinson (ERS and Biology, Trent)	Graduate Student Exchange with Jagiellonion University, Krakow, Poland. Student – Lukasz Kutrzeba and Dorota Zyla	2	July 6 – September 1
Sheena Symington (Oliver Centre Manager)	Fenelon Falls Bike Club visit and property tour	10	July 23
Brenda Koenig (Trent University)	ERSC/NAST 215H Native Studies 2-week residential field course	15	August 11-August 21
Eric Sager (Trent University) and Alex Smith (University of McGill)	Wetland Ecology: Life on the Edge, 2-week residential field course	10	August 24-Sept 5
Neil Emery (Trent University Biology)	Bio 328H one day field trip lab at Oliver Canopy Access System	13	September 19
Eric Sager (Trent University ERS)	Wetland Ecology one day field trip	45	September 26
Peterborough Field Naturalists (with E. Nol, Biology, Trent University)	Banding of Saw whet owls	20	Fall – five weeks

Teaching at the Oliver Ecological Centre

The variety of habitats (wetlands, old abandoned fields, forests, shoreline and lake) in addition to proximity of the Oliver Centre to Trent University makes it an excellent site for one-day field trips. To date, field trips to the Oliver Centre include wetland ecology, limnology, herpetology and plant ecology courses. During 2003, three residential field courses were offered at the Oliver Ecological Centre.

Ecology of the Kawarthas Field Course
Twelve students attended the 2003 Field Course at the Oliver Centre, offered May 18 – May 30. Taught by Eric Sager of Trent University, the focus was terrestrial plant ecology, aquatic ecology (limnology) and ornithology. The course description is the following: This course introduces students to a wide range of ecosystems at the Oliver property and in the surrounding area. These included hardwood forest, old field successions, wetlands, lake shorelines and lakes themselves. Some emphasis is on the ecology of target groups, i.e. amphibians, reptiles, fish and zooplankton, as well as birds, flowering plants and lichens. Ecological sampling and methods of investigation and analysis were a theme. Students designed a small research project that incorporates different components of one ecosystem and emphasises the interdependence of abiotic and biotic factors. A number of lectures were given in the first week. During much of the second week, students designed and carried out their own research projects.

Plate 3: 2003 Participants of Ecology of the Kawarthas (BIOL-ERSC 386H), a two-week residential field course. This picture was taken upon completing the Walk in the Clouds, with staff from the Haliburton Forest and Wildlife Reserve.

Environmental assessment techniques for aboriginal communities: Residential Course
This course taught by Brenda Koenig was offered Aug 10 – Aug 20, 2003. The course description is the following: The primary objective of this course is to provide students in the Indigenous Environmental Studies program with appropriate western scientific theory and basic scientific skills to address environmental and natural resource issues that are frequently encountered on Indigenous lands. It is intended for students with little or no background in science.

Plate 4: 2003 Participants in the Environmental assessment techniques for aboriginal communities (ERSC/NAST 215H) residential field course.

Wetland Ecology: Life on the Edge Field Course

Twelve students attended the Life on the Edge field course offered Aug 24- September 5, 2003. This course taught by Eric Sager of Trent University and Alex Smith of the University of McGill, focused on the littoral zones of lakes and wetlands. The course description is the following: This course will examine the role of littoral and wetland communities in the functioning of the Kawartha Highlands ecosystem. This will include a combination of field and laboratory work examining both flora and fauna of these eco-zones. Students will learn the role that these systems play in greater hydrological cycle. In addition to identification of key species, field topics include bogs succession, effect of shoreline development on littoral communities and provincial wetland evaluation.

Plate 5: 2003 Participants of Life on the Edge: Wetland Ecology (BIOL-ERSC 387H), a two-week residential field course.

Teaching Camp for Traditional Aboriginal Knowledge and Spirituality
Mark Dockstator of Trent University.
This field school was the second annual gathering of this sort at the Oliver Centre. It included a fasting component where fasting took place in the Oliver Centre forest for four days. This camp is held each year in order to teach aspects of Aboriginal spirituality/indigenous knowledge, utilizing a traditional camp setting and natural learning environment. This gathering with the invited Elder Michael Thrasher from Victoria, B.C. was again very successful.

Collection of Baseline Data at Field Station

The Banding of Saw-Whet Owls at the Oliver Centre – 2003 as printed in the Peterborough Field Naturalists Journal the *Orchid* Vol 50, Number 1 January/February 2004.

by Anna Hargreaves and Chris Risley

"We've started hearing owl calls in our sleep!" – as noted in the log book.

The call of the Northern Saw-whet Owl (which sounds much like the repetitive beeping of a reversing truck) could be heard from the north shore of Pigeon Lake all month-long this past October, as banders played recorded versions to lure in the small owls. Saw-whet Owls breed across the boreal forests of central Canada and migrate south in the fall, passing through the Peterborough area around October. Not much bigger than robins, Saw-whets are eastern North America's smallest owl, and fit easily into a juice can when being weighed! Tiny as they are, these owls are full of personality, with enough charisma and spunk to coax over 70 people, (ages 6 to 60), out on dark October nights to check mist nets with the banders for the tiny feathered "furballs".

This marked the fifth year of the Northern Saw-whet Owl banding program at the Trent University's James McLean Oliver Ecological Centre, a few kilometers east (as the owl flies) from Bobcaygeon. And a great year it was! Despite a few nights when hopeful banders were rained out, we had nets up on 29 nights from October 1st to November 6th, for a total of over 800 net-hours (number of hours each net was kept open). The effort rewarded us with 104 owls banded, a few escapees, and one foreign banded owl; the best we've done in a few years! For comparison, we banded 56 last year, 34 in 2001, and 72 in 2000. The biggest owl year however, was still our first in 1999 with 132 owls banded. Good ol' beginner's luck!

Captures of owls on any given night are weather-dependent and seasonal. The peak in the Kawarthas is mid-October after which our catch gradually declines as they head further south. The Saw-whets seem to prefer good weather for migration, with the highest catches occurring in clear conditions. Young owls migrate earlier than older owls and most of the owls we captured were sexed as females (based on wing chord and weight). The nets were open on 29 nights and we caught owls on 24 of the nights; a good return for our effort! Our biggest nights were the 17th and 19th, where lucky (and busy!) folks banded 13 and 14 owls respectively, although we caught 10 owls on both Oct 2 & 10. The catch of 14 was the most we've banded in a single night in the past four years (the record catch was in 1999, with 16 owls banded on October 11th). Maybe next year…

Our banding is part of a larger effort in both Canada and the United States to learn more about the migration and ecology of these secretive raptors. A decade ago very little was known about their movements, and at one point it was believed that they didn't migrate at all. Thanks to recent banding and radio-collaring efforts however, we now know that they are far-flying migrants, and rarely return to the same place to breed. Owls from Ontario go as far south as the central Atlantic states where they over-winter. Much remains to be discovered about these little owls, including better estimates of their life span, how far individual owls travel, and their habitat needs.

The real jewels of all banding programs are recaptures – birds that have previously been banded, either by another station or from a different year. These birds provide rare and wonderful insights into bird lifespan and individual movements. Two owls that we banded at Pigeon Lake in 2002 travelled south to central Virginia and Pennsylvania respectively, covering the distances in about 30 days. Our most interesting recovery was an owl which we banded on October 21, 2000 which was recaptured 2.5 hours later the same night 71 km south in Candlewick Woods at Port Hope. Assuming a straight-line flight, this owl would have been flying at a speed of 28 km/h! This year we captured a Saw-whet Owl originally banded on October 19, 1999 in Maryland and caught by us on October 6, 2003. Also, an owl banded in 2002 by Erica Nol was caught this fall at Prince Edward Point, Ontario.

Owl photos courtesy of Todd Sherstone

We thank the many volunteers who helped with the project this year from Trent University, the Peterborough and Kawartha Field Naturalists, Sir Sandford Fleming College and Ministry of Natural Resources. We would especially like to thank Todd Sherstone, a Fleming College co-op student who got to stay at the cottage for two weeks (a great experience!) helping, Erica Nol (banding permit holder), and Sheena Symington (Trent University) for permission to band at the James McLean Oliver Ecological Centre.

Table 1. Number of Owls Banded (1999-2003)

	1999	%	**2000**	%	**2001**	%	**2002**	%	**2003**	%	**Total**	Overall %
Age												
HY	**67**	51	**14**	19	**13**	35	**27**	48	**58**	55	**179**	44
AHY	**65**	49	**60**	81	**22**	60	**24**	43	**41**	40	**213**	56
U	**0**	0	**0**	0	**2**	5	**5**	9	**5**	5	**12**	3
Total	**132**	100	**74**	100	**37**	100	**56**	100	**104**	100	**404**	100
Sex												
M	**27**	20	**9**	12	**1**	3	**1**	2	**72**	68	**110**	27
F	**92**	70	**63**	85	**25**	67	**35**	62	**6**	7	**222**	55
U	**13**	10	**2**	3	**11**	30	**20**	36	**26**	25	**72**	18
Total	**132**	100	**74**	100	**37**	100	**56**	100	**104**	100	**404**	100

	1999	%	2000	%	2001	%	2002	%	2003	%	Total	Overall %
HYM	**23**	17	**3**	4	**0**	0	**1**	2	**5**	5	**32**	8
HYF	**38**	30	**9**	12	**10**	27	**14**	25	**35**	33	**106**	26
HYU	**6**	5	**2**	3	**3**	8	**12**	21	**18**	17	**41**	10
AHYM	**4**	3	**6**	8	**1**	3	**0**	0	**2**	2	**13**	3
AHYF	**54**	40	**54**	73	**15**	41	**15**	27	**32**	31	**171**	43
AHYU	**7**	5	**0**	0	**6**	16	**9**	16	**7**	7	**29**	7
UF	**0**	0	**0**	0	**0**	0	**0**	0	**4**	4	**4**	1
UU	**0**	0	**0**	0	**2**	5	**5**	9	**1**	1	**8**	2
Total	**132**	100	**74**	100	**37**	100	**56**	100	**104**	100	**403**	100
Banding days	**22**		**29**				**27**		**29**			
Total net Hours	**621**		**730**				**522.2**		**807.5**			
Foreign Recap	**1**		**2**		**2**		**0**		**1**			

Age: HY and AHY hatch-year and after hatch-year individuals, U is of unknown age
Sex: M indicates male, F indicates female, and U is of unknown sex.

The Canadian Lakes Loon Survey of Pigeon Lake 2003 – Erin Crowe
The Common Loon, *Gavia immer,* with its large size, distinct black and white plumage and haunting calls has become a symbol of Ontario's wilderness lakes. The site and sound of the loon enhances the vacationing experience for many on the Tri-lakes, which include Pigeon, Chemong and Bald lakes. To the Indigenous Peoples of this area the loon is a sacred animal highly respected and revered.

The Common Loon breeds almost exclusively in North America except for small numbers found in Northwestern Europe. In Ontario the loon generally breeds on lakes of the Canadian Shield and northward, thus contributing to its identity as a true Canadian northerner. These birds are also migratory and head south into the United States for the coasts of the Atlantic, Gulf or Pacific during the winter freeze up of Ontario inland lakes. They will return again in the spring, sometimes the day after the ice goes out and the open water is spotted by one of the scouts sent out by the groups of loons gathering in the Great Lakes.

If a loon has mated upon return to a lake, the breeding cycle will commence and nests will be built, often on small islands, on old muskrat houses, or floating islands in marshes, all very close to the waters edge. When Common Loons mate it is a partnership for life. Robert Sarginson the local Naturalist who initiated the loon survey on Pigeon Lake in 1989 has observed this and Vallinatos (2001) has discovered this through DNA fingerprinting studies that show Common Loons are indeed monogamous. The care of nests and loon young is very labour intensive and young are more likely to survive if both parents are heavily invested in the relationship. Thus it is speculated that one reason for loons to maintain monogamy is that they just don't have time to pursue extra-pair copulations.

The objective of this study is to collect another season of data on the Common Loon population of Pigeon Lake. The data collected through observational study of the loons every week throughout the spring and summer of 2003 will then be compiled with the data of the last 14 years for analysis (Table 2). The data can be used to monitor the success of the population at rearing young, determine patterns in site preferences for selecting nesting sites, and to discuss the general health of the Tri-Lakes ecosystem since the Common

Loon can be viewed as a keystone species.

Methods

The summer of 2003 saw the completion of another successful Loon survey on Pigeon Lake carried out in partnership with the James McLean Oliver Centre and Robert Sarginson, an avid local naturalist. The survey itself took 1 ½ to 2 days a week to fulfill with a 14 ft aluminium boat and 9.5 horsepower motor. The first day of the weekly survey was spent on the north end of the lake, an area with the southern boundary distinguished as the south tip of Boyd Island. The second day was spent travelling down the east shore to Emily Park at the south end of the lake and back up the west shore.

The survey began on the 16th of June and finished on the 11th of September. During the initial weeks of observation much time was spent just spotting the loons and associating a pair with a landmark. As the summer went on the and the location of loon pairs could be anticipated. They do not stray far from their nursery area, roughly a 1km radius from a nest site.

Three stages of growth were differentiated based upon Canadian Lakes Loon Survey descriptions. These descriptions are outlined here to provide reference for the reader. When the chicks are first hatched they are in the downy young stage, which refers to the chicks that are less than 1/3 adult length, have dark grey down, and may ride on the parents' back. These chicks are less than three weeks old. The small young stage refer to chicks that are 1/3 to 2/3 adult length, have lighter brown/grey down, or mottled light and dark grey feathers, and do not ride on the parents' backs. These chicks would be between three and six weeks old. The large young stage refers to chicks that are 2/3 adult length or longer and have a full coat of light and dark grey feathers forming a "scalloped" pattern along the back. These chicks are still attended and fed by the parents, and do not fly. Large young are at least six weeks old. Observations and summaries of loon populations in this report are derived from this season's 13-week period of surveying.

Results and Discussion

The ice on Pigeon lake went out the 20th of April this year and the next day the loons where back on the lake, thus commencing the 2003 loon study. At the start of the summer (June 16-22), 38 adult loons were observed on the lake (Figure 1). The population rose to its peak of 47 adults, observed in the middle of the summer (July 21-27). This number decreased to 25 adults by the end of the study (Sept. 8-14). Out of this population, the lake supported a total of 22 mated pairs, 12 of which raised young successfully.

When the peak count of 47 was recorded, many adults had gathered into groups of 4-6 in areas where young had been lost. According to a theory developed by Sarginson of the "Mentor" loon, this gathering is a normal part of loon society and is likened to a mourning ceremony for the parents. This gathering of adult loons was observed in the three areas on the lake, the week following the disappearance of loon young.

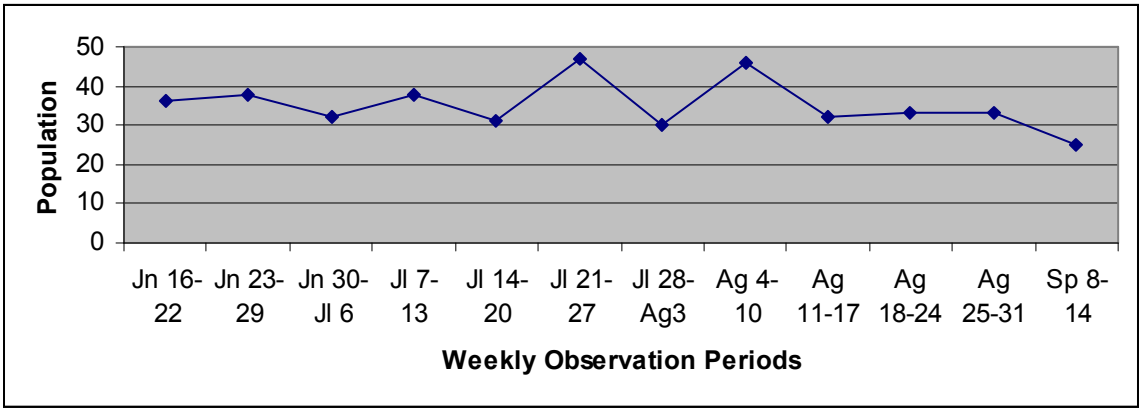

Figure 1. The population of adult loons on Pigeon Lake throughout the observational weeks (June to Sept.) in 2003.

After a period of breeding, the first downy young hatched on the 9th of June. A total of 23 downy were hatched on the lake, 17 of which survived to the large young stage. Thus the rate of loss for downy young was 26.1%. This summers' success rate of downy young survival, expressed as young per nest, decreased slightly from its steady increase of the last three years Table 2. The last downy young hatched approximately July 14th or 15th.

The first of the three downy young, disappeared during the first week of summer vacation on the Tri Lakes, the week of June 30th to July 6th. While surveying during this week a drastic increase in recreational boat traffic was noticed on all parts of Pigeon Lake. One area that underwent constant water skiing and jet ski traffic was Blind Channel, on the north side of Jacob's Island in Gannon's Narrows. It was in this channel that one pair lost both of their loon young and another pair with one young quickly migrated to a less trafficked area.

The disappearance to the next set of two young occurred after the weekend of July 13th when there had been a bass tournament on the lake. The loon pair nested near a cattail bed and fishermen tend to drive up along side the bed jigging for the bass that are underneath the cattails. This fishing practice can drive the parents from the young or sometimes even drown young or flood a nest. If the parents do not return in time, the loon young can die of hypothermia or starvation. From his 14 years of observation on the lake, Sarginson believes this activity to be most detrimental to survival success of downy young. In years with no bass tournaments on the lake he has observed the highest percentage of loon young per nest, suggesting a correlation between the two. This year on the Tri-lakes there were 12 days of fishing tournaments.

Although humans' activities in the form of recreational boating contribute to the majority of loon young mortality on Pigeon Lake, environmental factors also influence rates of survival for loon young. For instance, there was a known nest with two eggs in it that was washed out with a heavy windstorm. The wind caused a transient cattail bed to crash into a smaller bed being used as a nesting site. Factors of weather, predation and competition are very real reasons for the loss of loon young on even heavily developed waterways.

Currently, however, the majority of loon losses can be attributed to some form of human activity. These detrimental effects caused by human activity are recognized by local user groups and governing agencies like the Ministry of Natural Resources, the Kawartha Fisheries Association, Bird Studies Canada and local lakeshore citizens. In order to live a lifestyle more harmonized with loons, these groups have come up with advice for boaters on conservation efforts.

The advice includes four simple steps such as avoiding loon nests, nesting areas and staying away from loons and their chicks by at least 30 m. From observations on the water this summer the exact opposite seems to have happened. Boaters are intrigued by the loon young and want to take the family for a closer look. I witnessed an adult pair being run over by a speedboat, luckily they were able to dive in time to avoid the motor. If there were young with this pair, they would not have had a chance! Unfortunately, like most conservation regulations and advice, there is a serious lack of enforcement and even education. Out of a combined surveying total of over 200 hrs for two people on the lake this summer, only once did Sarginson see a Conservation Officer.

While the loons on Pigeon Lake are accustomed to some sort of human disturbance whether, on the water or lakeshore, the majority of successful nesting sites and nursery areas are either protected by an island or along a lengthy expanse of cattails. Some loon pairs where quite "shy", attempting to stay as far away from boats as possible, especially when their offspring where in the downy young stage. This is true of the six pair nesting on the west side of the lake and the one pair in the southern most channel. Three successful nesting pairs where found on the east side of the lake and only two in the north end where most of the shore line is an broken patchwork of house and cottage lots, much of which has been altered. Along the west side of the lake however, close to 40 percent of the lakeshore is cattail beds and abandoned farmland, thus allowing more of a sanctuary and seemingly safer habitat for downy survival.

Conclusions
The data collected on the Common Loon on Pigeon Lake this summer will be used to continue monitoring of the populations' health and loon survival success. Loons have the ability to co-habit with humans, if we as humans can maintain a non-obtrusive relationship with them. The adult loon population fluctuated slightly this year in a normal pattern for migratory birds. The success of downy young survival decreased this year because of both natural and anthropogenic pressures. It is the latter that is most concerning in the Tri-lakes. Without doubt, the Tri-lakes will become increasingly populated as a vacationing destination. From observations this year it was clear that loons will have more success at raising young in areas with reduced shoreline disturbance and boat traffic.

Table 2. Young Loons per nest: Pigeon Lake Loon Survey (1989-2003)

Year	% Pigeon Lake	# Loon Nests	Young Per Nest	Bass Tournament
1989	20% of lake	5 pairs, 4 DY, 3 LY	0.6	July 1
1990	30% of lake	6 pairs, 5 DY, 3 LY	0.5	late June or early July
1991	50% of lake	12 pairs, 8 DY, 6 LY	0.5	June 29-30
1992	100% of lake and Pigeon River	22 pairs, 23 DY, 19 LY	0.863	July 25/26 1st tournament
1993	100% of lake/river	21 pairs, 25 DY, 19 LY	0.904	No tournaments June/July
1994	100% of lake/river	22 pairs, 23 DY, 11 LY	0.5	July 3
1995	100% of lake/river	18 pairs, 11 DY, 7 LY	0.388	July 1, 2, 9, 15, 30
1996	100% of lake/river	15 pairs, 20 DY, 18 LY	1.2	No tournaments June/July
1997	100% of lake/river	19 pairs, 19 DY, 11 LY	0.58	June 29, July 12, 13
1998	100% of lake/river	20 pairs, 21 DY, 13 LY	0.65	July 4, 5, 11, 12, 18, 19, 25, 26
1999	100% of lake/river	21 pairs, 23 DY, 16 LY	0.762	July 10, 17, 18, 24, 25, 31
2000	100% of lake/river	23 pairs, 27 DY, 21 LY	0.913	July 23-29
2001	100% of lake/river	21 pairs, 19 DY, 17 LY	0.809	June 30, July 14, 15, 21
2002	100% of lake/river	20 pairs, 30 DY, 25 LY	1.25	July 13,14,21,27
2003	100% of lake/river	22 pairs, 23 DY, 17 Ly	0.772	

Documentation of Ecological Information

Nutrient cycling experiments- Professor Tom Hutchinson
Nutrient cycling experiments have been set-up in the mature sugar maple forest to assess the impact of litter fall and on soil nutrient cycling and plant growth. During the fall of 1999 leaf litter was collected from the Sugar Maple area of the forest to be sorted, identified, dried and archived for future use/analyses. Litter was moved from one set of plots and added to other to provide a range of treatments ie, -1, 0, and +1 litter addition.

Climate records - A Campbell MET station was established in June 2000 in the open field near the house. It is fenced off to avoid problems from deer and bears. The software at this station records a reading every half-hour for average air/soil temperature and relative humidity, total rain fall and snow depth, wind direction and speed and solar irradiance and UVb. It is intended to establish the Oliver Centre as a regional climatological and air pollution centre.

Long-term Salamander Survey – Professor Joe Cebek

Two species of salamander, the red-backed and blue-spotted salamanders, are regularly found at the Oliver Centre. Salamanders have moist, sensitive skins that make them especially vulnerable to disturbances in their habitat. Ecologists have started using the abundance of salamanders to help them identify healthy forests; i.e. salamander densities can be high in mature, diverse forest stands. Since 2000, we have been monitoring salamander abundance at the Oliver Ecological Centre with a long term goal of tracking population trends at the site. On July 19th, 2001 cover boards were set out along the south side of an ephemeral pond. These boards will provide long term cover for salamanders. The data collected from this study will give an estimate of density and species composition of the local salamander population.

Location: Three 55 m transacts along the south side of the Wood Pond.
Cover boards: 36 - 100cm^2 cedar boards. Placed 5 m apart. 12 boards/ transact.
Total area covered: 550 m^2
The four corners of the survey plot were flagged and GPS readings were taken.
Sampling frequency: 6 times each summer
Potential species: Northern Redback, Blue spotted, Four-toed, Spotted salamander, Red-spotted newt.

Amphibian research at the Oliver Centre -Professor Michael Berrill and associates

Species diversity and population monitoring:

We assessed the occurrence and relative abundance of frogs in ephemeral wetlands on the Oliver Centre property and in adjacent ponds and inlets, including Nogies Creek. We documented breeding populations of a species ie. Spring peepers (*Hyla crucifer*), Chorus frogs (*Pseudacris triseriata*), Leopard frogs (*Rana pipiens*), Wood frogs (*Rana sylvatica*), American toads (*Bufo americanus*), Tree frogs (*Hyla versicolor*), Green frogs (*Rana clamitans*) and Bullfrogs (*Rana catesbeiana*). Of these, only the Leopard frog occurred in unexpectedly low numbers.

Unexpected developments:

1) Wood frog tadpole die-off

Wood frogs breed in early spring in the two of the major ponds that we monitored. Both ponds dried up by the end of the summer of 2000, 2001, 2003 (but not 2002) and must be considered ephemeral. They are about 300 meters apart, and are about the same size and appearance. In one of the ponds, Wood frog tadpoles grew successfully to metamorphosis and dispersed away from the pond before it dried up. However, in the second pond in 2000 and 2001, the tadpoles died in the late stages prior to metamorphosis. Such a catastrophic die-off is very unusual and concerning. Preliminary analysis indicates it is due to a virus known to occur elsewhere in North America but never reported in Ontario before. Because of the potential significance of this event, we are launching a detailed enquiry into tadpole deaths across the province.

2) Bullfrog populations in decline

Bullfrogs breed in suitable habitats in permanent water in the area. In particular, they breed along most of the length of Nogies Creek. Data from previous studies in the 1970s and then again in the early 1990s suggested that there may have been some decline in population sizes. For two seasons, we monitored the Bullfrogs in populations scattered along a 6 km stretch of Nogies Creek, including the sites included in the previous studies. We marked 300 adults each season by inserting a small chip into the abdomen of each - when recaptured, we could identify each of these using a wand-like chip reader. We are able now to identify the marked frogs until they die or disperse out of the area. Preliminary results indicate that the populations of Bullfrogs have declined precipitously since the 1970s, and we are exploring the potential causes.

Websites*:*

We have constructed a website linked to the main Oliver Centre website which provides an introduction to the amphibians of the Oliver Centre and adjacent wetlands. As well, we have constructed an interactive website for anyone who has noticed a tadpole die-off anywhere in Ontario and wishes to send us information about it.

Personnel involved:
Neil Osborne, Tina Howe, Dave Ireland, Amy Greer, Michelle Charbonneau, Chris Reaume and Sue Chow have been involved in various parts of the project. Neil did much of the initial work on the Wood frogs. Dave spent most of two months living at the Oliver Centre in both 2001 and 2002, monitoring and marking Bullfrogs each night (with the assistance of Neil and then Chris). Amy has worked on the question of the tadpole die-offs and their causes, and developed the tadpole die-off website. Michelle will explore the immunosuppressive potential of pesticides, and hypothesize that low-level pesticide exposure adversely affects the tadpoles ability to mount an immune response to this ranavirus. Sue did most of the work on the website on amphibians of the Oliver Centre, including the art. Tina has worked at times on all parts of the project.

Table 3. Oliver Centre Bird List – up to December 2003 (**bolded item is a 2003 addition**)

1. Common Loon
2. Canada Goose
3. Mallard
4. Hooded Merganser
5. Red-breasted Merganser
6. Common Merganser
7. Common Flicker
8. Pileated Woodpecker
9. Downy Woodpecker
10. Yellow-bellied Sapsucker
11. Great-blue Heron
12. Green Heron
13. Ruffed Grouse
14. Osprey
15. Red-tailed Hawk
16. Turkey Vulture
17. Merlin
18. Kestrel
19. Ring-billed Gull
20. Spotted Sandpiper
21. Ruddy Turnstone
22. Mourning Dove
23. Whip-poor will
24. Belted Kingfisher
25. Ruby-throated Hummingbird
26. Black-capped Chickadee
27. Rose-breasted Grosbeak
28. Cedar Waxwing
29. Eastern Kingbird
30. Least Flycatcher
31. Eastern Phoebe
32. Eastern Wood Pewee
33. Philadelphia Vireo
34. Warbling Vireo
35. Red-eyed Vireo
36. Chestnut-sided Warbler
37. Black-throated Green Warbler
38. Ovenbird
39. Yellow Warbler
40. Common Yellowthroat
41. American Redstart
42. Golden-winged Warbler
43. Black-and-white Warbler
44. Clay-coloured Sparrow
45. Field Sparrow
46. Song Sparrow
47. Chipping Sparrow
48. Savannah Sparrow
49 Bobolink
50. Baltimore Oriole
51. Purple Martin
52. Barn Swallow
53. Tree Swallow
54. Grey Catbird
55. Brown Thrasher
56. Eastern Bluebird
57. American Robin
58. Wood Thrush
59. Veery
60. House Wren
61. Black-billed Cuckoo
62. Red-winged Blackbird
63. Eastern Meadowlark
64. Common Grackle
65. Common Crow
66. Blue Jay
67. Northern Cardinal
68. American Goldfinch
69. Brown-headed Cowbird
70. European Starling
71. Ruby-crowned Kinglet
72. Hermit Thrush
73. Yellow-rumped warbler
74. Hairy woodpecker
75. White-breasted nuthatch
76. Olive-sided flycatcher
77. Great crested flycatcher
78. Nashville warbler
79. Myrtle warbler
80. Blackburnian warbler
81. Northern waterthrush
82. White-throated sparrow
83. White-crowned sparrow
84. Eastern towee
85. **Sandhill Crane**

Table 4. Oliver Centre Reptile and Amphibian Spring Checklist

Frogs/Toads:
Spring peepers (*Pseudacris crucifer*)
Chorus frogs (*Pseudacris triseriata*)
Leopard frogs (*Rana pipiens*)
Wood frogs (*Rana sylfatica*)
American toads (*Bufo americanus*)
Grey treefrogs (*Hyla versicolor*)
Green frogs (*Rana clamitans*)
Bullfrogs (*Rana catesbeiana*)

Salamanders:
Blue spotted salamanders (*Ambystoma laterale*)
Spotted salamanders (*Ambystoma maculatum*)
Red-backed salamanders (forest breeders; *Plethodon cinereus*)
Four-toed Salamander *(Hemidactylium scutatum*)

Reptiles:
Painted turtles (*Chrysemys picta*)
Snapping turtles (*Chelydra serpentina*)
Water snakes (*Nerodia sipedon*)
Eastern Garter snakes (*Thamnophis sirtalis sirtalis*)

Table 5. Oliver Centre Butterfly Checklist – bolded entries are 2003 additions (54 to date)

Papilionidae (swallowtails)
Canadian Tiger Swallowtail *Papilio canadenis*
Black Swallowtail *Papilio polyxenes*

Pieridae (whites & yellows)
Cabbage White *Pieris rapae*
West Virginia White *Pieris virginiensis*
Mustard White *Pieris napi*
Orange Sulphur *Colias eurytheme*
Clouded Sulphur *Colias philodice*

Lycaenidae (gossamer-wings)
Harvester *Feniseca tarquinius*
Spring Azure *Celastrina ladon*
Summer Azure *Celastina landon violacea*
Silvery Blue *Glaucopsyche lygdamus*
Eastern Tailed-Blue *Everes comnytas*
Banded Hairstreak *Satyrium calanus*
Coral Hairstreak *Satyrium titus*
Acadian Hairstreak *Satyrium acadia*
Bronze Copper *Lycaena hyllus*

Nymphalidae (brushfoots)
Tawny Crescent *Phyciodes batesii*
Northern Crescent *Phyciodes cocyta*
Pearl Crescent *Phyciodes tharos*
Eastern Comma *Polygonia comma*
Gray Comma *Poygonia progne*
Question Mark *Polygonia interrogationis*

Mourning Cloak *Nymphalis antiopa*
American Lady *Vanessa virginiensis*
Painted Lady *Vanessa cardui*
Red Admiral *Vanessa atalanta*
White Admiral *Limenitis arthemis arthemis*
Viceroy *Limenitis archippus*
Eyed Brown *Satyrodes eurydice*
Appalachian Brown *Satyrodes appalachia*
Northern Pearly-eye *Enodia anthedon*
Little Wood-Satyr *Megisto cymela*
Common Ringlet *Coenonympha tullia*
Monarch *Danaus plexippus*
Great Spangled Fritillary *Speyeria cybele*
Atlantis Fritillary *Speyeria atlantis*
Meadow Fritillary *Boloria bellona*
Aphrodite Fritillary *Speyeria aphrodite*
Common Wood Nymph *Cerecyonis pegala*

Hesperiidae (skippers)

Northern Cloudywing *Thorybes pylades*
Juvenal's Duskywing *Erynnis juvenalis*
Dreamy Duskywing *Erynnis icelus*
Columbine Duskywing *Erynnis lucilius*
Little Glassywing *Pompeius verna*
European Skipper *Thymelicus lineola*
Least Skipper *Ancyloxpha numitor*
Peck's Skipper *Polites peckius*
Tawny-edged Skipper *Polites themistocles*
Northern Broken-Dash *Wallengrenia egeremet*
Hobomok Skipper *Poanes hobomok*
Dun Skipper *Euphyes bimacula*
Crossline skipper *Polites origenes*
Silvery spotted skipper *Epargyreus clarus*
Leonard's Skipper *Hesperia Leonardus*

Research 2003

Oliver ozone garden research summary – Tom Hutchinson and Cedar Welsh

The vegetable garden located at the James McLean Oliver Centre was one of four gardens included in a geographical analysis to investigate the sensitivity of various agricultural species to increasing ambient ozone concentrations during the summer of 2003. Ozone is an oxidant that is formed in the troposphere from a complex series of sunlight-driven reactions involving nitrogen oxides, carbon monoxide and hydrocarbons. This mechanism, often referred to as the "photochemical smog", can be generated in both polluted and unpolluted regions of the troposphere. In polluted regions, there is little doubt that ozone production causes the majority of summertime air pollution. This is due to the continuous production of ozone through a range of human activities such as fossil-fuel combustion. In the remote troposphere, far removed from any major anthropogenic influences, ozone can be locally significant. For instance, the Ministry of Environment and Energy data shows that the Peterborough area consistently receives among the highest levels of ozone in the province. Transport processes (air currents or wind) act to disperse precursors from areas of high concentrated emissions (for example Toronto) to areas of low concentration emissions (for example Peterborough). As a result, rural areas, with relatively low automobile densities and emission rates can experience ozone episodes as intense or greater than those encountered in cities.

Tropospheric ozone is a major component of smog. A scientific review by the US Environmental Protection Agency (EPA) on the effects of ozone found that exposure to ambient ozone levels is linked to respiratory ailments such as asthma, inflammation and premature aging of the lung, and to chronic respiratory illnesses such as emphysema and bronchitis. Exposure to epidosed corretlates, well with an increase in heart attacks and stoke (EPA 2002). Detrimental effects on vegetation include reduction in agricultural and commercial forest yields, reduced growth and increased plant susceptibility to disease, and potential long-term effects on forests and natural ecosystems. Once thought to be primarily an urban problem, elevated ozone concentrations are now recognized as extending far beyond city limits.

This study provided an extensive qualitative assessment of the effect of summer concentrations of ozone at different garden sites in the Peterborough-Kawartha region. The four garden sites tested were located at Trent University on the roof of the Environmental Science Building, the Hutchinson farm near Norwood, a farm at Cannington in the township of Brock, and the Oliver Ecological Centre. Visible symptoms arising from ozone are generally recognized as either acute or chronic responses. Acute injury normally involves the death of cells and develops within a few hours or days following exposure. It often takes the form of bifacial flecking on the leaves with light tan to darker brown-coloured spots. Acute injury is associated with exposure to very high ozone concentrations. Chronic types of foliar injury develop more slowly, within days or weeks following exposure. This response often results in mild chlorosis, purple pigmentation (various coloured stippling), and premature leaf senescence. Chronic injury usually appears in response to long-term, low concentration exposures. Closer examination with a hand lens will reveal that affected areas are restricted to certain areas of the leaf, or appear as discrete, dot-like areas of increased pigmentation. Veins and veinlets are usually not involved, and veinlets consistently border the injured areas, producing angular sections of affected cells and tissues. Symptoms are also often restricted to sun-exposed portions of the leaves; overlapping leaves tend to be absent of injury.

Throughout the summer of 2003, between May 1 and August 31, the Peterborough-Kawartha region experienced five smog advisories. This covered a total of 12 days in which ozone levels were above 80ppb. In particular, the ozone levels monitored at the Oliver Centre were consistently above 50ppb, the concentration considered to be the safe threshold for plants. Crop species showing visible damage associated with ozone exposure at the Oliver Centre included Seneca Tomahawk corn, Yukon Gold potatoes, the four cultivars of beans, and Gypsy peppers. Beans are known to be particularly vulnerable to ozone exposure, and were often those that showed the highest degree of damage at all garden sites. Sugar maple, white ash and milkweed also showed ozone damager in 2003.

Distribution and genetics of flying squirrel populations in Ontario - *Jeff Bowman, Project Leader*
This research project will investigate the distributions in Ontario of two species, the northern (*Glaucomys sabrinus*) and the southern (*G. volans*) flying squirrel. A primary objective of the study is to use flying squirrel populations as a case study for the development of landscape genetics techniques. Landscape genetics is the application of population genetics to landscape ecology.

Both of Ontario's flying squirrel species are associated with mature forests and we will use a landscape genetics approach to test whether squirrel populations in Ontario are isolated due to forest loss and fragmentation. Isolation increases extinction risk. In our study, we will use genetic techniques to measure whether squirrel populations are connected to one another by dispersal.

Another objective of this study is to improve our understanding of the relative distributions of the two flying squirrel species in Ontario. Our preliminary field studies have suggested that the southern flying squirrel is more widely distributed in Ontario than previously believed. This squirrel is listed nationally by COSEWIC as a species of special concern due to its restricted distribution; in Ontario, it is considered only to occur south of 45 degrees latitude.

However, our investigations at the Oliver Centre suggest that this is not the case. The broader than expected range of southern flying squirrels may be a result of their being previously overlooked, or it may be a result of recent range expansion, possibly associated with global warming. In any case, we seek to clarify these uncertainties.

Methods

Field sampling of squirrel populations

Both squirrel species will be live-trapped during 2002-2004 at several sites across Ontario (one site is the Oliver Ecological Centre), from the most northern, near Temagami, to the most southern, near Rondeau Provincial Park. At each site, 60-80 squirrel traps will be placed in trees and checked daily for at least 1 week. Captured squirrels will be identified for age and sex, weighted, examined for body condition, and marked with a numbered ear-tag. A minimum of twenty individuals per site (of each species that occurs at a site) will be sampled for DNA by pulling 10-20 tail hairs. (*This research is being conducted under an animal care protocol approved by the Ontario Ministry of Natural Resources. We are trapping more widely in the in the Kawartha Highlands Area, so the 20 traps at the Oliver Centre would be a sub-section; the remainder of our traps will be up HWY 509*).

Conclusions

The genetic data will be analyzed to examine questions of landscape fragmentation and range expansion. The linking of high-resolution genetic data to GIS databases allows specific hypotheses to be tested on the genetic structure and movements of organisms relating to ecological and environmental variables (such as climate change) through spatial statistical analyses.

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Graduate Student Research

PhD Candidate: 2003
Air-surface exchange of PBDEs and PCBs: Evidence for an "early spring pulse" and long-range transport – 2002

Todd Gouin, (PhD Candidate) with Don Mackay (Supervisor) Canadian Environmental Modelling Centre, Trent University, Peterborough, ON, Canada.

Polybrominated diphenyl ethers (PBDEs) are a class of fire retardants that are emerging as a "new" persistent organic pollutant. Due to their suspected toxicity, potential for bioaccumulation in aquatic food chains and detection in environmental samples of air, water, sediment and fish, PBDEs may pose a growing environmental threat. In a collaborative study conducted at the James McLean Oliver Ecological Centre during the spring of 2000, which involved researchers from the Canadian Environmental Modelling Centre at Trent University and Lancaster University in England, 36 air samples and 12 leaf-litter samples were collected over a three-day period, prior to bud burst, in order to measure the simultaneous diurnal variations in PCBs and PBDEs. Compared to PCBs, relatively little information exists on environmental levels of PBDEs, especially pertaining to atmospheric and temperature dependent data. Thus by comparing the diurnal data obtained for PCBs, which have been well studied, to data obtained for PBDEs for the same samples, we hoped to provide valuable insights about the air-surface exchange of these compounds, and determine if PCBs and PBDEs behave similarly.

Total PBDE concentrations in the air ranged between 90 and 1250 pg/m^3, and were dominated by the lighter congeners (PBDE-17, 28 and 47), while concentrations of total PCBs ranged between 100 and 950 pg/m^3, and were dominated by the lower chlorinated (tri- to tetra-) congeners, namely PCB-18, 22, 28, 31, 49 and 52. It is hypothesised that the high PBDE concentrations are the result of an "early spring pulse" in which PBDEs deposited in the snowpack over the winter are released with snow melt, resulting in elevated

concentrations in the surface and air. As a result of evaporation and partitioning into foliage following bud burst, PBDE concentrations in air were observed to return to low values of 10 to 20 pg/m^3. A paper discussing the results of this study has been published in *Environmental Science and Technology* (2002, *36*, 1426-1434).

Currently the research group at the Canadian Environmental Modelling Centre, led by Professor Don Mackay and Todd Gouin, is focused on better understanding the mechanisms influencing this "early spring pulse" effect. This is a collaborative effort which involves researchers from Lancaster University, Environment Canada and the James McLean Oliver Ecological Centre, and began in the winter of 2002 with a comprehensive investigation of the "spring pulse hypothesis" at the James McLean Oliver Ecological Centre. A number of high volume air samples, litterfall and surface organic material were collected over the course of several months (winter to late spring). Samples will be analysed for PCBs and PBDEs. In addition to the intensive sampling campaign at the Oliver Centre, a number of passive air samplers (PUF disc samplers), which have been previously tested (Shoeib and Harner, *Environmental Science and Technology*, 36, 4142-4151) have been deployed at ten locations representing a variety of rural and urban sites. Thus, it is hoped that by combining data collected from both the passive air samplers and the high volume air samples that we will provide a better sense of the spatial and seasonal distribution of PBDEs.

MSc Candidates: 2003

Phenolic effects of ground level ozone on soybean (Glycine max) and white bean (Phaseolus vulgaris) crops grown in the Kawartha Lakes area.

Krista Campbell, (MSc candidate) with Tom Hutchinson (supervisor) ERS/Biology, Trent University, Peterborough, ON, Canada.

Ground-level ozone is the main chemical constituent in smog, an increasingly common weather phenomenon affecting southern and central Ontario during the summer. Ozone is formed under warm, sunny conditions by a reaction between nitrous oxides (largely caused by vehicle exhaust and industrial emissions) and volatile hydrocarbons also from automobiles. Each summer, the Peterborough Kawartha Lakes area receives among the highest ozone levels in Ontario due to its location downwind (northeast) of Toronto.

High ozone concentrations have been shown to be detrimental to plant growth in various field and controlled environment experiments. The purpose of this study is to determine how ozone specifically effects the production of certain stress-induced phenolic compounds in soybean and white bean varieties adapted to grow in the Peterborough Kawartha Lakes area. This will be accomplished through the determination of concentrations of specific phenolic compounds present in soybean and white bean crops grown under unmodified field conditions. Follow-up lab experiments will expose the same crop varieties to ideal growing conditions, some major environmental stresses (including ozone) both in isolation and in combination with each other. Determining the phenolic concentrations of the crops grown under these simulated stress conditions and comparing them with the phenolic concentrations of the crops grown under natural conditions in the field may lead to a better understanding of both the conditions causing ozone stress responses and the actual effects of natural stresses on soybeans and white beans. These phenolics are being determined to see whether their production relates to high ozone exposures.

Plate 6: 2003 Air Pollution Research Garden at the Oliver Centre. Various Bean Varieties were grown to Study Ozone Impacts. Photo, courtesy of Krista Campbell.

Ranavirus and Amphibians: virology, pathology and pesticide induced immunosuppression - 2003

Michelle Charbonneau, (MSc Candidate) with Michael Berrill (Supervisor) Biology, Trent University, Peterborough, ON, Canada.

Iridovirus (Ranavirus), an emerging wildlife pathogen, has been implicated in several frog population kills in Central Ontario. Ranavirus involvement in three wood frog tadpole die-off events has been documented at the James McLean Oliver Centre Pond, north of Buckhorn Ontario, in the mid-summer of 1999, 2000, and 2001. Conversely, the Oliver Centre Pond wood frog tadpoles appeared healthy in 2002 and 2003. Recently, wood frog die-off events were recorded in 2003 at two historically unaffected wetlands in the area: Poplar Pond and the Parker Property Wetland, both of which are also located in the same area north of Buckhorn, Ontario. Ranavirus involvement in the 2003 events will be confirmed using PCR amplification of a region in the viral major capsid protein. The mechanism of ranavirus transmission remains unknown and little is known about the etiology of ranavirus disease, which acts rapidly to terminate the tadpole population. Ranavirus disease is a unique emerging infection in that it affects otherwise pristine areas, which have received little detrimental anthropogenic impact. Given the known immunosuppressive potential of pesticides, we hypothesize that low-level pesticide exposure adversely affects the tadpoles ability to mount an immune response to ranavirus.
Future research objectives include: 1. Map amphibian die-off events throughout Ontario; 2. Assess samples retrieved from die-off events and from healthy populations for the presences of ranavirus and confirm that ranavirus is the pathogen responsible for local frog kill events; 3. Isolate the ranavirus from the Oliver, Poplar and Parker sites and compare it with ranavirus isolated from other geographic locations; 4. Test the pesticide immunosuppression hypothesis, which requires isolation and culturing of our ranavirus in order to be able to challenge tadpoles in vivo, in conjunction with low-level pesticide exposure.

The effects of ozone stress in the upper canopy of Acer saccharum Marsh

Rebecca Grant, (MSc Candidate) with Tom Hutchinson (Supervisor) ERS/Biology, Trent University, Peterborough, ON, Canada.

During the summer months of 2003 (June- August) field data was collected while using the canopy access system in the tops of a sugar maple stand at the Oliver Centre research station. During this time, I with the help of others collected data which characterized several environmental, morphological and physiological parameters which affect and distinguish the leaves of the upper canopy. These parameters include, light intensity, UV-B intensity, relative humidity, leaf temperature, leaf conductance, leaf respiration, leaf area and leaf thickness. Sampling was done beneath the tree canopy and at the tops of the trees.

At present lab experiments are being conducted to determine the stomatal makeup of the leaves as well as the biochemical defense mechanisms present in the leaves. Once laboratory data is complete I am hoping to relate the areas of environmental variables (light intensity and UV-B), leaf morpholgy (leaf area, leaf thickness and number of stomata), biochemical defense (activity of specific defensive enzymes) and leaf position (upper vs. lower and inner vs. outer leaves), to ozone exposure and stress. In doing so, a more complete picture of the ecological and chemical functioning of the upper canopy of a sugar maple stand, in response to ozone, will be characterized.

Plate 7: Rebecca Grant using the Oliver Centre canopy access system. She is measuring individual leaves of mature sugar maple trees, 70ft above the ground.

The role of Cytokinins (CK) and Abscisic Acid (ABA) in regulation of stomata within a mature Sugar Maple (Acer saccharum) forest canopy - 2003

Ian Reeves, (MSc Candidate) with Neil Emery (Supervisor) Biology, Trent University, Peterborough, ON, Canada.

There is relatively little known about the signaling pathways responsible for the regulations of stomatal exchange within plants and most especially within forest canopies. This study is an investigation into the role that the phytohormones CK and ABA play in the regulation of stomata within the canopy. Stomata play a strong role in the overall carbon and water cycles of mature forests and this study will give a greater understanding of gas exchange processes within the canopy. The canopy walkway at the Oliver Property provides a unique opportunity to carry out many physiological measurements *in situ*. Overall, this study will be the first to address the roles that CK and ABA play in the regulation of stomata within mature temperate forest canopies. As such, it will expand knowledge of whole plant physiology in large mature tree species and potentially provide critical component needed by forestry modelers to assess the impacts of ground level smog uptake on temperate forest canopies.

Plate 8: Ian Reeves, Rebecca Grant and Krista Campbell (background) are utilizing the Olive Centre Canopy Access system to conduct their Masters research. This system allows measurements and sampling to take place 70 ft above the ground at the leaf surface of mature sugar maple trees.

PhD Theses Completed

Sager, Eric: The Interactive Effects of Three Global Stressors on the Growth Morphology and Chemistry of *Acer Saccharum* and *Pinus Strobes* Seedlings. PhD 2003. Supervisor: Tom Hutchinson, Environmental and Resource Studies Program, Trent University.

Master Theses Completed

Bell-Allen, Rhonda: An Examination of the Milfoil Weevil (*Euhrychiopsis lecontei*) Within Eurasian Watermilfoil Beds in Pigeon Lake, Canada. M.Sc. 2002. Supervisor: Michael Fox, Environmental and Resource Studies Program, Trent University.

Bridges, Lisa: Spatial Scale and Environmental Structure: Habitat Selection of the Eastern Grey Squirrel (Sciurus carolinensis) in Central Ontario. M.Sc. 2002. Supervisor: Jim Schaefer, Biology, Trent University.

Gouin, Todd: Long-range Transport of Organic Contaminants: The role of air-surface exchange. M.Sc. 2002. Supervisor: Don Mackay, Canadian Centre for Environmental Modelling, Trent University.

Greer, Amy: The Epizootiology of Six Amphibian Mortality Events in South Central Ontario, Canada, 1999-2003. M.Sc. 2004. Supervisor: Michael Berrill, Biology, Trent University.

Ireland, David: Demographic Connectivity and Sex-biased Dispersal in Bullfrogs (*Rana catesbeiana*). M.Sc. 2003. Supervisor: Michael Berrill, Biology, Trent University.

Phillips, Judith: Matrix Land-Use and the Nesting Density and Breeding Success of Three Species of Forest-Nesting Birds. M.Sc. 2002. Supervisor: Erica Nol, Biology, Trent University.

Taillon, Dan: Walleye (*Stizostedion vitreum*) Egg and Larval Production and Survival on Rehabilitated Spawning Sites in Pigeon Lake, Ontario. M.Sc. 2003. Supervisor: Mike Fox, Environmental and Resource Studies Program, Trent University.

Undergraduate Theses Completed

Bell, Rhonda. April, 2000. *Spatial and Temporal movement of the Aquatic Weevil* (Euhrychiopsis lecontei) *within the Kawartha Lakes: A potential Biological Control for Eurasian watermilfoil.* Environmental Resource Studies with M. Fox and T. Whillans.

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Newman, Daniel, April, 2000. *Island microhabitats in a riverine wetland near Nogies Creek, Ontario: the role of logs for species and community diversity.* Biology with Michael Berrill.

Taillon, Dan. April 2001. *The Effects of Residential Development on Littoral Zone Fish Communities.* Environmental and Resource Studies Program with Michael Fox.

Publications

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Watmough, S.A. 2002. A Dendrochemical Survey of Sugar Maple (*Acer Saccharum Marsh*) in South-Central ON, Canada. Water, Air and Soil Pollution. 136: 165-187.

Watmough, S.A., Hutchinson, T.C. 2003. Uptake of ^{207}Pb and ^{111}Cd through bark in mature Sugar Maple, White Ash and White Pine: A field experiment**.** *Environmental Pollution*, 121: 39-48.

Watmough, S. A., Hutchinson, T.C. 2004. The quantification and distribution of pollution Pb at a woodland in rural south central Ontario, Canada. *Environmental Pollution*, 128: 419-428.

Watmough, S.A., Hutchinson, T.C. and Dillon, P. 2004. Lead dynamics in the forest floor and mineral soil in south-central Ontario. Biogeochemistry.