Saw-whet Owl photo courtesy of Martha Allen, 1999

1st Annual Report
James McLean Oliver Ecological Centre
1999-2000

On October 8th, 1998, a 270-acre estate on the shores of Pigeon Lake, near Bobcaygeon, Ontario, was donated to Trent University by Miss Marjorie Oliver. 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 immediate accommodation for professors and students.

This 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, geography, hydrology, climatology, atmospheric physics, and chemistry.

Short History of the Property

The first of Marjorie Oliver's family to come to Canada was her great-grandfather, William Oliver, who emigrated from Scotland in the 1850's. What is now the James McLean Oliver Ecological Centre has been in the Oliver family since 1868. This land was acquired by William Oliver's eldest son, George Oliver (Marjorie Oliver's Grandfather). This property was used for mixed farming: hay, grains, vegetables, cattle, sheep, pigs, horses, chickens, and turkeys. An apple orchard was also planted. James McLean Oliver, his wife Margaret and two children Margaret and Marjorie operated a tourist summer establishment, which started in 1906 and continued until 1986. The brick house was built in 1903, and as the tourist operation expanded more buildings were added, including two annexes, two sleeping cabins, and two house-keeping cottages. A sand beach and a cement slip for boats were also added to accommodate visiting tourists. Farming and tourism continued for some years until farming gave way to simple pasturing of cattle on both parcels, east and west of Mill Line Road, this lasting until 1989.

Miss Marjorie Oliver has very fond memories of growing up on the shores of Pigeon Lake, particularly of helping her father with the evening chores, tapping trees to make maple syrup, and swimming in Pigeon Lake. Many of Marjorie Oliver's memories of the property have been recorded by Sheena Symington who has spent many hours cataloguing Miss Oliver=s memoirs, including having access to a large photographic collection. One of the early mandates of the centre has been to record the history of the property and its remaining belongings.

Marjorie Oliver was schooled at Nogies Creek Public School before attending High School in Lindsay, ON. She obtained her teaching degree at Queens University in Kingston and later taught for the majority of her career in Peterborough at Prince of Wales Public School. With this gift to Trent, teaching and learning continue to be a part of the Oliver=s legacy.

Marjorie Oliver at Oliver Centre entrance, 1998

Natural History Documentation 1999-2000

The oral and written history both of the land use of the Oliver=s property and the Oliver=s ancestry has been documented (1999-2000). Oral interviews have been conducted with Miss Marjorie Oliver and these tapes are available to researchers.

A pictorial record has been digitally scanned for easy access of historical photographs (1906 to present) and archived on disk at the Oliver Centre (1999-2000).

The Rationale for Long-term Ecological and Climatological Studies

The value of long-term monitoring of atmospheric chemistry and physics and of the biota, and the insights that such monitoring provides as to the changing state of our environment and the biological effects of climate change, have been strikingly demonstrated over the past 40 years. Global monitoring of atmospheric CO_2 levels and the initiation of European rain chemistry network in 1957 was begun as part of the International Geophysical Year. Both led to profound insights into atmospheric changes, with major significance in their effects on biological communities. Hubbard Brook in the USA initiated watershed studies in 1963 and this led to recognition of a regional acid rain problem in eastern North America, while the 30-year record of ecological and limnological work at the watershed site has led to many insights as to ecosystem functioning.

Centres for integrated ecological field research combining detailed multi-disciplinary experimental studies with careful ongoing monitoring of the environment are very rare. The comparative plant

ecology studies in the vicinity of Sheffield University in the UK, led by Philip Grime since 1958 are one example, the Hubbard Brook studies in New Hampshire, USA led by Gene Likens and Herb Bormann are a second example. Other notable examples are the studies on small mammals at Kluane in the Yukon; the snow goose studies at La Perouse Bay at Churchill, Manitoba; the Rothamsted fertilizer plot experiments from the UK with 160 years of observation; the Experimental Lakes eutrophication and acidification studies near Kenora in Ontario led by David Schindler; the Solling experimental forest studies in Germany and the Dorset long-term lake studies in central Ontario led by Peter Dillon. The importance, in each case, has been enhanced by well-thought-out, long-term monitoring with insightful experiments, and a first-rate team of scientists and graduate students working together. Data are not simply collected; they are broadly interpreted and analysed.

Rarely do we have the possibilities and advantages of combining ecological monitoring and field experiments with physical-chemical monitoring, and of measuring changes in climate, air, soil, sediment and water quality over time with ecological-biological measurements and observations at the same site. The Oliver Ecological Centre provides a unique opportunity to do this, combining a main building with research facilities, on-site field instrumentation, accommodation for researchers and computing facilities connected directly to Trent's main campus.

Canadian Foundation for Innovation Infrastructure Support

Building on the strengths of the James McLean Oliver Ecological Research Centre, a proposal was made to Canadian Foundation for Innovation (CFI) for equipment - infrastructure support for the facility. Twelve professors from biology, environmental sciences, geography, physics and the graduate programs of Watershed Ecosystem students and Modelling, proposed close cooperation in planning and executing research, together with graduate and post-doctoral training. The successful application to Canadian Foundation for Innovation (CFI) has provided the infrastructure to facilitate both short-term and long-term experiments and monitoring. Partial matching funds from the Province of Ontario added to this substantial award.

Richard Ivey Foundation Scholarships

In 1999 the Richard Ivey Foundation awarded $125,000.00 to graduate students undertaking thesis 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 first scholarships were awarded for the academic year 2000 - 2001. Three scholarships were given these were to:

Lisa Bridges (MSc candidate) who was studying the ecology and reproductive success of squirrels on the property, her thesis title is *The Ecology of Southern Flying squirrels* (Glaucomys volans*) and Eastern Grey squirrels (*Sciurus carolinenis*) at the James McLean Oliver Ecological Research Centre, in Central Ontario.* Her supervisor is Professor Jim Schaefer (Biology).

Jude Phillips (MSc candidate), who is studying *The Effects of Land-use on Breeding Success in Woodland-nesting Birds* using the Oliver centre as part of a larger study. Her supervisor is

Professor Erica Nol (Biology).

Eric Sager (PhD candidate) who is looking at *Interactive effects of increased UV-B and nitrogen on seedlings of Acer saccharum in temperate deciduous forests* at the Oliver Ecological Centre with supervisor Professor Tom Hutchinson (Environmental and Resource Studies).

The Richard Ivey Foundation is located in London, Ontario and has made charitable contributions for more than 50 years especially in the areas that are not well supported by government and other foundation. More recently, the foundation has started to focus on environmental matters. For the period 1995 - 2000 it's focus was on forest biodiversity and has supported many university researchers as well as many non-governmental organizations like the Federation of Ontario Naturalists, World Wildlife Fund and the Sierra Club.

Organizational Structure of the Oliver Ecological Centre

A management committee has been appointed by President Patterson to govern 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 is used as the accommodation for field courses and graduate students conducting research at the Oliver Centre.

1999 Oliver Ecological Centre Management Committee

Professor Tom Hutchinson (Chair/Director) Environmental and Resource Studies, and Biology
Professor Paul Healy, Dean of Research and Graduate Studies
Professor Jim Schaefer, 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 Ridgeway, MNR

1999 Receipts

CFI grant	$364,500.00
ON Challenge Fund	$77,550.00
User Fees	$9,020.00
Individual donations	$10,000.00

In kind donations	1 microwave and 1 clothes dryer

2000 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
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 Ridgeway, MNR

2000 Receipts

Ivey Foundation scholarships	$125,000.00
Individual donations	$25,000.00
User Fees	$7,800.00
In kind donations – T.J. Cavanagh, Peterborough ON	1 washing machine, 2 small chest freezers, 1 full fridge, 1 fridge with freezer, 1 dehumidifier.
In kind Boat Loan- Canadian Centre for Inland Waters, Dept. of Fisheries and Oceans, Burlington, ON.	18 ft Boston Whaler

User Fees
$10/person Overnight accommodation – academic purposes
Note: Fees for groups and conferences are negotiated directly with the Manager or Director.

1999/2000 Equipment purchase
Significant equipment purchases for research at the Oliver Ecological Centre include:
-*Field station vehicle*: 1998 Ford Truck (5.4L V8) -maximum towing capacity of 8700 pounds.
-*Field station boat*: 14' 24" deep 62" Beam boat with a 1985 OMC motor (9.9 horse power).
-*T-800 Boat Trailer*
-*Aquatic sampling equipment*:
Seine net, 4x4 framenet with 2 45’ wings, 32K Stowaway tidbit Temp (-5 to +37 C),

12 L Schindler trap, 3 stacking bentic wash frame, Ekman and messenger, 1200 ml Van Dorn sampler (ventical), 4 D- Frame nets and poles, Secchi disk with 100' rope, and a Wisconsin net (153 mm mesh).

-PD-2CT Radio transmitters with temperature sensors for flying squirrels and grey squirrels.
-Portable Leaf Area Meter to measure leaf area in the field.

-UVB monitoring equipment, light meter to measure photosynthetically active radiation, and computers.
-*Air pollution monitoring equipment* for SO_2, NO_2, NO, O_3 are to be located at the Oliver Centre, including some located in the forest research area.
-*MET station* equipped to measure air and soil temperature, liquid precipitation, snow depth, wind speed and direction, relative humidity and solar irradiance. Data collection began June 2000.

Community Involvement

An Open House organized by Friends of Trent University in June 1999, provided a great opportunity for the local residents and cottagers to visit the centre and meet the Trent Community who are planning to do research and teach. This was the first of what is intended to be an annual open house at the Oliver Centre for local people and those interested in the research and teaching. Tom Whillans of Trent University presented a beautiful old photograph of James McLean Oliver to both the Oliver Centre and to Miss Marjorie Oliver.

Open House 1999, T.Whillans presenting photos to both Miss Oliver, and T.Hutchinson for the Oliver Centre

Outreach
A web page has been established on-line at Trent University web site:
http://www.trentu.ca/olivercentre Readers are encouraged to look at it.

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

The Bobcaygeon Library hosts the James McLean Oliver Ecological Centre Lecture series on a monthly basis.

Lecture Series Titles

February 29, 2000	*Will Frogs Survive the 21st Century?* Michael Berrill, Biology, Trent University
March 30, 2000	*Birds and our Hardwood Forests.* Erica Nol, Biology, Trent University.
April 26, 2000	*Agriculture and Forests in Climate Change*. Tom Hutchinson, Environmental and Resource Studies and Biology, Trent University.
May 31, 2000	*Out for Blood – Biting Fly Behaviour*. Jim Sutcliffe, Biology, Trent University.
June 21, 2000	*Wetlands: Metaphors for Change*. Tom Whillans, Environmental and Resource Studies, Trent University.
October 5, 2000	*A Peek at the Past, Early 19C Development in Harvey Township.* Alan Brunger, Geography, Trent University.

Property development
A shoreline restoration project and planting took place in October 1999 with more than 1000 plants by Tom Whillans and Friends of Trent Severn Waterway. This will be followed over the years as a demonstration restoration project.

Together with John Marsh of the Geography Department, the Centre is in the process of planning locations for nature trails at the Oliver Centre. In May 2000, Lakefield high school students helped clear a trail through the Cedar forest on the west side of the Oliver Centre property. The intent is to have self-guided interpretive trails accessible to the public.

Tours highlighting research at the centre have been frequently given to interested community

members and researchers since the opening of the Centre.

Cover

The cover is a picture of a Saw whet owl taken by Martha Allen, October 1999.

Summary of Conference, Meeting and Field Trip Use of Oliver Centre in 1999/2000

Organizer	Function	Number of Participants	Duration
E. Nol, T. Hutchinson, M. Fox (Trent Biology, ERS)	Ecology of the Kawarthas, ON Field Course	12	May 23 – June 4, 1999
Friends of Trent (Trent Foundation)	Oliver Open House	50+	June 25, 1999
Trent Centre for Community Based Education	Board Meeting	12	July 12, 1999
E. Nol (Trent Biology)	Saw whet Owl banding	5	October/November 1999 - 5 weeks duration
T. Whillans (Trent ERS) and the Friends of Trent	Shoreline Restoration	35+	Oct 1999 – 1 day
T. Whillans (Trent ERS)	ES 351a Wetland Ecology Field Trip	50	Nov 1999 – 1day field trip
E. Sager (Trent ERS)	Bio 305 Limnology Field Trip	25	Feb 2000 – 1 day field trip
G. Mastersmith (High School – Ottawa)	Blue bird box donation	1	Feb 2000 – 1 day
S. Symington (JMOEC Manager)	Learning for a Sustainable Future – working group meeting	11	April 4, 2000
D. Mackay – (Trent and Lancaster UK cooperation)	Air sampling in young forest	2	April 24 – June 8, 2000
D. Mackay – (Trent and Lancaster UK cooperation)	24 hour intensive air sampling	2	April 25 – April 27, 2000
Tom Hutchinson (Trent ERS)	NSERC summer students- Forested ecosystem: Kristy Hogsden – butterfly diversity and numbers; Anna Hargreaves – lichen diversity; Robin Kartright – plant flowering phenologies	3	May – August, 2000
Karen Gowanlock (Lakefield High School)	Students – camping, canoeing and trial clearing in cedar forest	20	May 8-10, 2000
Jennifer Bowe Trent Centre for Community Based Education	Retreat	12	May 9, 2000
Organizer	**Function**	**Number of Participants**	**Duration**
Dave Woodfine and Joe Cebeck (Trent Biology)	Ecology of the Kawarthas, ON Field Course	12	May 21-June 2, 2000

Jennifer Bowe Trent Centre for Community Based Education	Meeting	6	June 22, 2000
John Marsh and Sheena Symington (Trent Geography)	Flagged potential public trail	2	July 18, 2000
Ted Hill (Northern Pigeon Lake Rate Payers Assocation)	Annual Meeting, BBQ and tour of the Oliver Centre	70+	July 29, 2000
Karen Gowanlock and Sheena Symington	Mushroom identification in Maple forest	2	August 21, 2000
Tom Hutchinson (ERS and Biology, Trent)	Graduate Student Exchange with Jagiellonion University, Krakow, Poland. Student - Dobroslawa Bialonska	1	September and October, 2000
Chris Risley (MNR) and Erica Nol (Trent)	Peterborough Field Naturalists Field Day and Tour of the Oliver Centre	50+	September 10, 2000
Don Mackay (Trent ERS)	Photochemist visit Don Crosby, U.C. Davis, California	4	September 27, 2000
Jim Schaefer (Trent Biology)	Ecology 202 field trip - radiotelemetry	20	September 30, 2000
Erica Nol (Trent Biology)	Saw whet owl banding started	8	September, 30 – five weeks duration
Tom Hutchinson (Trent ERS)	North American Forestry Commission Study Group on Atmospheric Change and Forests – Site Visit	30+	October 4, 2000
Tom Whillans (Trent ERS)	ES 351H Wetland Ecology and Management field trip	20	October 4, 2000
Erica Nol, Chris Risley and Andrew Jobes	Peterborough Field Naturalists visit to help band Saw Whet owls	50+	October 20, 2000
Jim Schaefer (Trent Biology)	Radiotelemetry demonstration for Girl Guides of Peterborough	12	October 21, 2000

Teaching at the Oliver Ecological Centre

Ecology of the Kawarthas, 1999

One of the highlights of this year was the first field course offered at the Centre to study the Ecology of the Kawarthas. The two-week field course (May 23-June 4, 1999) was taught by Erica Nol, Tom Hutchinson, and Michael Fox. The course focused on ornithology, terrestrial plant ecology and limnology (fish). Twelve students from eight Ontario universities and one from the UK were in attendance. A bird list was compiled as of July 5th with 71 different bird species, including the rare clay-coloured sparrow, found breeding in the old field successional area (see Table 1). A bluebird pair raised young in an old tree nearby.

First field course students and professors with Miss Marjorie Oliver, 1999.

Ecology of the Kawartha's, 2000

Twelve students attended the 2000 Field Course at the Oliver Centre, offered May 21 - June 2, 2000. Taught by David Woodfine and Joe Cebek, the focus was terrestrial plant ecology, aquatic ecology (limnology) and herpetology (reptiles and amphibians) (see Table 2). A reptile and amphibian list was compiled which included a relatively rare sighting of a four-toed salamander by one of the field course students.

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 the Centre has been used for field trips for wetland ecology, limnology and herpetology courses.

Table 1. 1999 Oliver Centre Bird List

Birds Seen at the James McLean Oliver Ecological Centre (**May 23 to July 5, 1999**) 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. American Goldfinch 50. Bobolink 51. Baltimore Oriole 52. Purple Martin 53. Barn Swallow 54. Tree Swallow 55. Grey Catbird 56. Brown Thrasher 57. Eastern Bluebird 58. American Robin 59. Wood Thrush 60. Veery 61. House Wren 62. Black-billed Cuckoo 63. Red-winged Blackbird 64. Eastern Meadowlark 65. Common Grackle 66. Common Crow 67. Blue Jay 68. Northern Cardinal 69. American Goldfinch 70. Brown-headed Cowbird 71. European Starling

Table 2. Oliver Centre Reptile and Amphibian Checklist (spring 1999-2000)

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*)

Field Station Baseline Data Collection

The Banding of Saw-whet Owls

The fall of 1999 marked the first and very successful Saw-whet Owl banding at the Oliver Centre. The objective of the project was to track inland migration of Saw-whet Owls through banding, in order to document age ratios of birds during their fall migration, using the Oliver Centre as a location of possible value. These results will be compared with those from other banding locations such as Thunder Bay Cape Bird Observatory and the Long Point Bird Observatory. At the Oliver Centre, volunteers banded 132 owls in 22 band nights, using only 3-7 nets per night, indicating substantial migration through the Bobcaygeon and Peterborough area. One re-captured owl had already been banded at Long Point (LPBO, banded in fall 1997) and it is hoped that with additional such re-traps, the timing of migration for individual birds may be determined. Andrew Jobes (Masters student with Erica Nol) carried out the majority of the banding for this project in 1999. This programme was so successful that it will be repeated in subsequent years, courtesy of Erica Nol, Chris Risley and the Peterborough Field Naturalists.

During the fall of 2000, volunteers banded 74 Saw-whet Owls in 29 band nights. The total number of owls was significantly lower when compared to 1999. A rare recapture occurred during this study. An individual released at 20:50 on 21 October 2000 from the Oliver Centre was recaptured at 22:20 on the same evening at a Port Hope banding site. This translated to 71.3 km traveled in 2.5 hours, and equated to a minimum constant straight-line flight speed of 28.5 km/h. Based on this recapture, hourly capture rates at each site were correlated with local (Trent) weather conditions at time of capture, and with northern (Dorset) weather conditions the appropriate number of hours prior to capture, based on assumed flight speeds of 24-32 km/h.

Ecological Information Documentation

It is critical to have an intensive baseline ecological inventory, as well as information about baseline chemistry of the soil, litter, trees and other vegetation, air pollution (ozone levels etc.) in order to explore and document changes over time with respect to climate change.

Baseline research at the property included the establishment of permanent long term 600 m vegetational transects in two abandoned pastures to record successional changes of fields to forest over time. Plant communities have been identified and mapped along the 600m transect, which ends in the mature forest.

Nutrient cycling experiments have been set-up in the mature sugar maple forest to assess the impact of litter 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.

Tree basal area of the 94-acre forest was determined and spring/summer ground flora percent coverage recorded (with S. Watmough, N. Klenavic and E. Sager). More than 2000 trees were

measured. Initial soil collections for archival purposes were collected from the pasture that was last grazed 30 years ago.

Climate records - A MET station was established in June 2000. 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. It is intended to establish the Oliver Centre as a regional climatological and air pollution centre.

Aerial photos (dating 1928 to 1995) have been obtained from the air photo library in Ottawa. Ontario base maps have also been obtained. Baseline information of typography, vegetation type, soil chemistry etc. will then be digitally added to this map using GIS and made available to Oliver Centre researchers.

Phenological studies commenced on the flowering dates of plant species along the permanent long-term 600 m vegetational transect. This transect follows a "vegetational" gradient from abandoned agricultural field to a sugar maple dominated forest. The flowering times of these plants will be recorded each year in order to gather data on the response of these plants to climate. For example, some plants in Canada are flowering a month earlier than they were a century ago.

A survey of butterflies at the property at 8 different habitat locations recorded 43 species at the Centre from June-Sept 2000. Butterflies were identified by Kristy Hogsden and Sheena Symington (see Table 3).

The fall of 2000 was an excellent year for fungi. Greater than 48 species of mushrooms were identified in the Mature Sugar Maple forest at the Oliver Centre by Karen Gowanlock and Sheena Symington.

Table 3. Oliver Centre Butterfly Checklist (June - September, 2000)

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*

Table 3. (con't)

Lycaenidae (gossamer-wings)

Harvester *Feniseca tarquinius*
Spring Azure *Celastrina ladon*
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*
Eastern Comma *Polygonia comma*
Question Mark *Polygonia interrogationis*
Mourning Cloak *Nymphalis antiopa*
American Lady *Vanessa virginiensis*
Red Admiral *Vanessa atalanta*
White Admiral *Limenitis arthemis arthemis*
Viceroy *Limenitis archippus*
Eyed Brown *Satyrodes eurydice*
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*
Common Wood Nymph *Cerecyonis pegala*

Hesperiidae (skippers)

Northern Cloudywing *Thorybes pylades*
Juvenal's Duskywing *Erynnis juvenalis*
Dreamy Duskywing *Erynnis icelus*
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*

Research 1999-2000

This first two years of research activity at the Oliver Centre were very successful in establishing the property as a research facility.

Air-surface exchange of PBDEs and PCBs: Evidence for an "early spring pulse" and long-range transport. D. Mackay, Environmental and Resource Studies Program Trent University, Peterborough, ON, Canada (705)748-1101 Ext 1489. email: **dmackay@trentu.ca**

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 submitted for review to *Environmental Science and Technology*.

Uptake of ^{207}Pb and ^{111}Cd through bark in mature Sugar Maple, White Ash and White Pine: A field experiment. Shaun Watmough and Tom Hutchinson, Environmental and Resource Studies Program Trent University, Peterborough, ON, Canada (705)748-1101 Ext 1647. email: swatmough@trentu.ca

A field study was undertaken to determine whether ^{207}Pb and ^{111}Cd, applied to the exterior bark of sugar maple (*Acer saccharum* Marsh.), white ash (*Fraxinus Americana* L.) and white pine (*Pinus strobes* L.), could enter xylem tissue. Stable isotope tracers (3 *u*g Pb ml^{-1}; 2 *u*g Cd ml^{-1})

were applied separately to bark in simulated rainfall, acidified to pH 4.5, in multiple doses over a four- month (July-October) period. Tree cores were extracted from the region of application in the following March, and Pb and Cd isotopes were measured in bark and the outer tree rings using inductively coupled plasma mass spectrometry. The majority of the applied stable isotope tracer recovered (over 94%) was present in bark tissue, although a small amount of each metal tracer entered the outer (1-3) tree rings in all trees. Despite high concentrations of excess ^{207}Pb in bark (up to 50 *u*g g^{-1}), the maximum concentration of excess ^{207}Pb measured in tree rings was only around 50 ng g^{-1}, which represents less than 30% of the background Pb concentration in wood at the study site. High excess ^{111}Cd concentrations in bark (up to 35 *u*g g^{-1}) also resulted in small increases in ^{111}Cd in wood (up to 50 ng g^{-1}), but due to lower background Cd concentrations in wood, such increases more than double the amount of Cd in wood compared with background levels. However, at sites where such high bark Cd concentrations are found, uptake from Cd-contaminated soil would probably be much greater than found at our study site. It appears that Cd and Pb applied to bark can enter woody tissue, but that this route of uptake is likely to be a minor contributor to the metal burden in wood.

The residence time of lead and cadmium in the forest floor. Shaun Watmough and Tom Hutchinson, Environmental and Resource Studies Program Trent University, Peterborough, ON, Canada (705)748-1101 Ext 1647. email: swatmough@trentu.ca

Lead and cadmium are highly toxic trace elements that historically have been released into the environment through a number of anthropogenic activities including metal smelting, coal burning, and gasoline. Although the highest contamination levels in soils and vegetation generally occur close to emission sources, extremely high levels have been measured in the forest floor at remote high elevation sites in the United States due to the long-range transport in the atmosphere. In eastern North America, emissions of these potentially toxic elements have decreased substantially in recent years, although many workers have suggested that these toxic metals will remain in the forest floor and potentially available to biota and humans for many decades. In this study, small amounts of stable isotopes of lead (^{207}Pb) and cadmium (^{111}Cd) were applied to plots beneath a sugar maple (*Acer Saccharum* Marsh) or white pine (*Pinus strobus* L.) canopy at the James McLean Oliver Research Centre (JMOEC) in July 2000. After 1 year, 77 % (maple) and 30 % (pine) of the lead tracer and 92 % (maple) and 82 % (pine) of the cadmium tracer had been lost from the forest floor. The rapid loss of metals from the forest floor appears to be due to the rapid turnover of the forest floor at the JMOEC. The metal tracer accumulated in the upper mineral soil and lead isotope data indicate that the majority of anthropogenic lead that has been deposited during the 20th century has accumulated in the upper 0-10 cm of mineral soil. Less than 5 % of the anthropogenic lead measured at the JMOEC had accumulated in forest biomass. This is the first example were stable metal isotopes have been used to determine the residence time of trace metals in the forest floor. When combined with data from a regional survey, results from this work will be used to develop models that accurately predict the residence time of trace metals in the forest floor in Canada and level of reduction that may be

expected at current or predicted levels of deposition.

Graduate Student Research

PhD Candidate: 1999

The interactive effects of increased UV-B and nitrogen on seedlings of Acer saccharum *in temperate deciduous forests 1999-*

Sager, Eric (PhD Candidate) with Tom Hutchinson (Supervisor) Environmental and Resource Studies Program Trent University, Peterborough, ON, Canada.

A field experiment has been established to assess the impact of increased exposure to UV-B, due to stratospheric ozone thinning, and nitrogen fertilization on foliar characteristics and flavonoids on sugar maple seedlings. In the spring of 1993, surface UV-B reached levels that were 40% above normal and this was directly related to a reduction in total stratospheric ozone with the primary causal agent being the eruption of Mt. Pinatubo. While 1993 may be anomalous with respect to the high levels of UV-B experienced at more temperate latitudes, the continued loading of ozone depleting chemicals into the atmosphere could result in the annual occurrence of those conditions experienced in 1993. The fact that these large increases in UV-B are occurring in spring at a time when new plant foliar growth is occurring may present a risk to the long term health of forests. The continued deposition of nitrogenous compounds, largely originating from automobile exhaust and industrial emissions, represents another potential stress to forests. The long term deposition of nitrogen to forest systems can lead to eutrophication, which leads to increases in plant growth and productivity, and eventual acidification of soils. Previous studies have demonstrated that prior land-use history and the buffering potential of the soil parent material plays a significant role in preconditioning the response of the forest of nitrogen fertilization and possible saturation. Therefore, experimental plots have been set up at two sites, the James McLean Oliver Ecological Centre, where the soils are highly alkaline, and the Haliburton Forest and Wildlife Reserve where the soils are much more acid sensitive. Native sugar maple seedlings are being exposed to ambient and sub-ambient levels f biologically effective UV-B radiation. Nitrogen fertilizer (NH_4NO_3) gas also been applied at levels equivalent to an additional 50 kg $N \cdot ha^{-1} \cdot yr^{-1}$ over the last two growing seasons.

For additional information please contact Eric Sager at (705)748-1101 extension 1647 esager@trentu.ca or Tom Hutchinson at (705)748-1634 thutchinson@trentu.ca

MSc Candidates: 2000

*Ecology of Southern Flying squirrels (*Glaucomys volans*) and Eastern Grey squirrels* (Sciurus carolinenis) *at the James McLean Oliver Ecological Research Centre, in Central Ontario, 2000-*

Bridges, Lisa (MSc Candidate) with Jim Schaefer (Supervisor) Biology Department, Trent University, Peterborough, ON, Canada.

Black bears, white-tailed deer, raccoons, porcupines, skunks, chipmunks and red squirrels have all been seen on the property. Research has primarily focused on populations of black-phase grey squirrels (*Sciurus carolinenis*) and southern flying squirrels (*Glaucomys volans*).

The research on populations of *S. carolinensis* and *G. volans* has two phases. The methodology includes a trapping survey to ascertain through mark-recapture the general sizes of the squirrel populations. The other section is to try and ascertain through radio collaring and radiotelemetry, behaviour and habitat distribution of individuals within the two squirrel populations.

Currently, there are 5 grey squirrels and 6 flying squirrels radio collared in the populations at the Oliver Ecological Research Centre. This research is being conducted by Lisa Bridges, a master's candidate at Trent, under the supervision of Dr. Jim Schaefer, Assistant Professor of Biology at Trent. It will continue through winter 2000 and through spring, summer and fall 2001.

If there are any questions regarding this research, please contact Dr. Jim Schaefer at (705) 748-1011, extension 1378 or via email at jschaefer@trentu.ca or Lisa Bridges via email at lbridges@trentu.ca.

The Effects of Land-use on Breeding Success in Woodland-nesting Birds, 2000-

Phillips, Judith (Msc Candidate) with Erica Nol (Supervisor), Biology Department, Trent University, and Dawn Burke (Supervisor), Ministry of Natural Resources, 659 Exeter Road, London ON, Watershed Ecosystems Graduate Program, Trent University, Peterborough ON.

As towns and cities increase in area, more and more houses are being built in the countryside along the edges of lakes, rivers, wetlands and woodlots. However, little is known about whether or not, and by what mechanisms this change affects wildlife inhabiting these relatively natural areas. This two-year study compares the effects of land-use immediately surrounding small, mature deciduous woodlots on the breeding success of birds nesting in the woodlots. Land-use is classified as ex-urban (5 or more houses within 100m of the edge of the woodlot) intensive agriculture, or less intensive agriculture. Nest searching and monitoring of Ovenbirds (*Seiurus aurocapillus*), Wood Thrush *(Hylocichla mustelina*) and American Robins (*Turdus migratorius*)

will take place throughout the summer, along with invertebrate surveys, predator surveys, point counts and vegetation surveys.

In 2000, 5 Ovenbird nests were found at the Oliver Ecological Center, more than at any other site studied in the Peterborough region. By continuing field-work next summer (2001), we hope to establish why the woodlot at the center is particularly favored by Ovenbirds.

For more information, please contact Judith Phillips at juphillips@trentu.ca or Erica Nol at (705) 748-1011 extension 1640, enol@trentu.ca

A Native Predator for Eurasian watermilfoil, Euhrychiopsis lecontei*, 2000-*

Bell, Rhonda (MSc Candidate) with Michael Fox (Supervisor) Environmental and Resource Studies Program Trent University, Peterborough, ON, Canada.

Eurasian watermilfoil is an invasive perennial aquatic herb that entered the Kawartha Lakes system in the late 1960's. Since the invasion, various measures have been applied to control the spread of the species. Mechanical harvesting, dredging, herbicide treatments and smothering with aggregate materials have been among some of the control methods implemented. These procedures have not eradicated Eurasian watermilfoil and repeat treatments are required to render efforts beneficial.

A native biological control agent known as the milfoil weevil, *Euhrychiopsis lecontei*, has (within the northern United States) shown promise to suppress Eurasian watermilfoil populations. The milfoil weevil has a preference for using Eurasian watermilfoil for several stages of its life cycle in a manner, which harms the milfoil. During the summer months, milfoil weevils live underwater on watermilfoil, either attached to the plant or inside the stem. Adult weevils lay 2 to 3 eggs a day on the top of the plant. Four to 7 days after they hatch the larval insects emerge and begin to feed for the next 14 days upon the tissue of the plant by borrowing into the main stem. By borrowing into the stem, this little weevil disrupts the flow of nutrients, affecting the health of the plant and also making it less buoyant. The pupal stage of the weevil lasts up to 17 days and also takes place inside the stem. When this stage is complete, adult weevils 3 mm in length emerge. Once the main stem of a Eurasian watermilfoil plant has been damaged by the presence of feeding milfoil weevils, the loss of buoyancy causes them to sink toward the bottom where light is insufficient for survival of the weakened plant. As autumn approaches, the milfoil weevil ceases egg production and begins preparation for the migration towards the shoreline where they over-winter in the soil and under vegetative litter.

The Kawartha Fisheries Association and Parks Canada in conjunction with Trent University sponsored a study on the weevil and milfoil in the Kawartha Lakes that began in the summer of 1999. Milfoil beds in Stony Lake and Pigeon Lake were mapped and classified by density and

health and sites were picked out for a study of the terrestrial phase of the weevils life cycle. Adult weevils were found within the leaf litter and soil along shoreline areas adjacent to Eurasian watermilfoil beds up to 3 m. Although the weevil has been studied extensively in the United States, little is known about the over-wintering phase of the weevil. Specifically, it is not known what shoreline habitat is required for the weevil to successfully over-winter. It was suspected that undisturbed, natural areas are preferred. The two areas where weevils were studied extensively last fall on Pigeon Lake and Emily Creek were undisturbed shoreline sites.

The research will continue in 2001 with a thorough search of the lakes to determine if weevils are able to exist in areas, which have been developed. By conducting this research it is hoped that a habitat index can be constructed which will allow cottage owners, Lake Stewards and scientists to address the potential to use the milfoil weevil as a biological control for Eurasian water-milfoil. For more information please contact Rhonda Bell at rhbell@trentu.ca or Michael Fox at mfox@trentu.ca

Computer modelling of ecosystem function in the Sugar Maple forest at the Oliver Ecological Centre, 2000-

McDougall, George (MSc Candidate) with T. Hutchinson and D. Mackay (Supervisors) Environmental and Resource Studies Program Trent University, Peterborough, ON, Canada.

Undergraduate Student Research - 4th Year Honours Theses Abstracts (1999/2000)

The influence of temperature on growth and behaviour of the adult green frog (Rana clamitans) *and the pre-metamorph wood frog* (Rana sylvatica) *in ephemeral ponds.*

McLeod, Brenna Annie, April 2000. 4th Year Undergraduate Honour Thesis in Biology with Micheal Berrill, Trent University, Peterborough, ON, Canada.

It has been long acknowledged that temperature is an integral factor in the growth of anurans, influencing developmental rates, maturation, and other physiological processes. This study aims to assess the degree to which behavioural thermoregulation and specific temperatures influence individual growth (of the adult green frog, *Rana clamitans*) and general growth (of the larval wood frog *Rana sylvatica*). Growth of the adult *R. clamitans* was measured in the form of snout-vent length and weight while that of *R. sylvatica* was measured by snout-tail length and developmental stage. These ranids were studied within separate ephemeral Ontario ponds over a five-week period. Behavioural observations were carried out to assess thermoregulation. The *R. clamitans* population consisted primarily of juvenile animals, suggesting a growth strategy. Results indicate

that both species carry out behavioural thermoregulation and that for *R. clamitans* growth rate is correlated with temperature increase.

Island microhabitats in a riverine wetland near Nogies Creek, Ontario: the role of logs for species and community diversity.

Newman, Daniel, April, 2000. 4th Year Undergraduate Honour Thesis in Biology with Michael Berrill, Trent University, Peterborough, ON, Canada.

Macrophyte species diversity and community composition on insular log islands is hypothesized to be determined by several physical and environmental factors in accordance with the theory of Island Biogeography and the Intermediate Disturbance Hypothesis. In 1999, I listed all macrophyte species on 47 logs isolated from shore in a large heterogeneous wetland; the same process was repeated at the closest point on shore (in plots corresponding to each log=s area). Light intensity at various distances from shore was also measured, and vegetation mapping of the wetland and immediate shoreline forest was conducted. Life history features of each species, with emphasis on shade tolerance, vagility, and successional status were compiled from ecological and horticultural literatures. Species richness was strongly correlated with site area, but no relationship was found with distance from shore. Analysis of community composition revealed that isolation from shore decreased species diversity, and acted as a slight successional gradient. Communities on shore, as well as on near-shore logs, comprised a more important proportion of mid- to late successional species (eg. Viola spp.) Relative to more insular logs. As distance from shore grew, logs became increasingly dominated by early hydrarch species, especially Carex spp. And facultative annuals (eg Lycpus spp. and Bidens connata). These results suggest that log islands may play a role as refugia for certain early successional species, with potential implication for wetland restoration projects aiming to maximize species diversity.

Spatial and Temporal movement of the Aquatic Weevil (Euhrychiopsis lecontei) *within the Kawartha Lakes: A potential Biological Control for Eurasian watermilfoil.*

Bell, Rhonda. April, 2000. 4th Year Undergraduate Honour Thesis in Environmental Resource Studies with M. Fox, T. Whillans, Trent University, Peterborough, ON, Canada.

Search for the native aquatic weevil, Euhrychiopsis lecontei, which could serve as the agent for biological control for Eurasian watermilfoil, began in September 1999. This preliminary study was focussed on the Kawartha Lakes watershed specifically including Pigeon Lake, Stony Lake and Emily Creek, a tributary of Sturgeon Lake. The objectives of the study were to document the location of Eurasian water-milfoil within the selected lakes, to determine relative weevil abundance within the leaf litter in the fall along undisturbed shoreline adjacent to selected plant communities, and to characterize the temporal and spatial pattern of weevil abundance in the autumn months.

Eurasian water-milfoil beds were documented by driving in boats along the shoreline of each lake and then through the use of a geographic positioning system coordinates of each bed were

transferred to a grid map. Also a density and health scale was developed to transfer general information about each bed to the map, which would be used to pinpoint areas where aquatic weevils could be preying upon Eurasian watermilfoil. After the shoreline was complete, horizontal transects were followed by boating throughout the lake to obtain the remaining bed coordinates.

Leaf litter was collected adjacent to Eurasian water-milfoil beds, which were sparse to moderate in density and health. With a D-net, 9 samples per site were collected from 15 m of shoreline. Soil samples were collected from the most productive leaf litter sites. Fifty-four soil samples (0.3 m x 0.3 m x 0.2 m) in total were collected from two sites, from October until mid-November. Weevils were found on Eurasian water-milfoil plants at Emily Creek and were subsequently found in the terrestrial leaf litter and soil samples taken from Jacob Island on Pigeon Lake and Emily Creek until mid November.

The results from this study suggest that the aquatic weevil may have site-specific preferences for over-wintering habitat. Although this study was small in scale, the results suggest that weevils react to differences in soil temperature. As the soil temperature dropped in the soil weevils were found deeper. The temporal shift seen within this study could be one component of many factors, which reflect the preference of sites for the weevil to over-winter. Future work will examine other biotic factors, which may play a role in ultimately determining the difference between high and low relative weevil densities within sites.

The Effects of Residential Development on Littoral Zone Fish Communities

Taillon, Dan 4th Year Undergraduate Honour Thesis with Michael Fox (Supervisor) Environmental and Resource Studies Program Trent University, Peterborough, ON, Canada. Field season – 2000.

This thesis examines whether residential development on Pigeon Lake has an impact on the shoreline (or littoral zone) fish communities. Development was classified as high if there were significant in-water and shoreline structures or alterations (i.e. boat lifts and rails, sea walls, beach added), moderately developed if only minor changes were made (docks, grass cutting, cottage/house), and undeveloped areas were included in the study. A total of 135 sites were assessed, primarily during the months of July and August. The fish community was assessed by snorkeling through an area of consistent habitat type and development classification. The species and lifestages were observed and recorded. Four separate five-minute intervals were used. Fish seen in the first minute were given a score of five points, those seen in the second minute received a score of four, and so on. This allows for comparisons of relative abundance and species richness (number of species) to be carried out. Much of the fieldwork was accomplished by using boats stored at the Oliver property, decreasing travel time and allowing as much time as

possible to be spent in the field. For more information please contact Dan Taillon at dtaillon@trentu.ca or Michael Fox at mfox@trentu.ca