

Queen's University Biological Station Annual Report and Newsletter – 2002



*Celebration of the Creation of
The Baillie Family Chair in Conservation Biology
15 June 2002*

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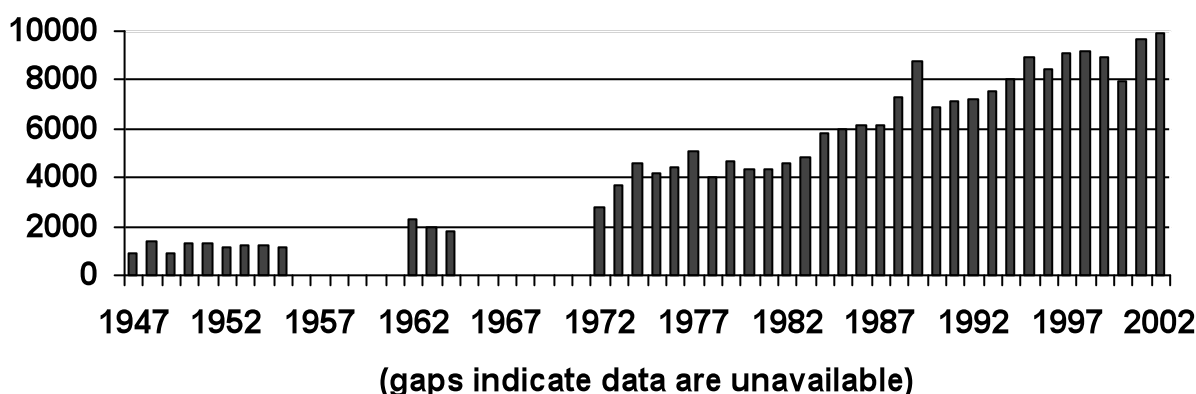
Cover: Field trip to Lindsay Lake Road (Pangman Reserve, QUBS) as part of the celebration of the creation of the Baillie Family Chair in Conservation Biology. Left to Right; Lili Harriss, Raleigh Robertson, Charles Baillie, Marilyn Baillie, Anne Godlewska, and Floyd Connor. Photo © Bernard Clark 2002.

Photo Credits: Except where otherwise noted, photographs are courtesy of Raleigh J. Robertson.

Introduction

2002 was the busiest year on record at Queen's University Biological Station. We steadily approach the elusive 10,000 user-day level, but have again fallen just short of it. Some 9,885 user-days were logged in 2002 (user-day data are displayed in tabular form on pp. 66 & 67). Use was up by 2.4% over 2001. On average, 49 researchers (professors, graduate students, honours students and assistants) were in residence through the summer. Abstracts of 2002 research projects and the personnel involved are contained in the following pages (pp. 33 - 60).

User-Days at QUBS



In teaching activities, QUBS hosted 8 modules (10 weeks worth of modules) in the Ontario Universities Program in Field Biology (OUPFB). Five of these modules were presented by Queen's instructors and three by instructors from other institutions. Titles and enrolments for the OUPFB programme are found in Tables 1 and 2 (pp. 31 & 32). In addition to the OUPFB modules, Dr. Ed Kott (Wilfrid Laurier University) brought his field course for senior undergraduates to QUBS for two weeks in late summer.

In 2002, there was a large increase in use for conferences, meetings and field trips. It seems that the improved facilities and enabling the hosting of larger groups, several groups at a once and groups during winter and spring. This year, many diverse groups made use of the facilities. A summary of conference, meeting and field trip use of QUBS in 2002 appears later in this report (pp. 61 - 63).

The mandate of QUBS is to provide opportunities for hands-on teaching and research. The experience gained at QUBS whether as a research assistant or during field trips associated with curriculum courses is invaluable to the next generation of educators, scientists, fish and wildlife managers and environmental consultants. Exposure to field work has been key to sparking life-long interest in biology for many QUBS users. Alumni cite their experiences at QUBS as being among the most memorable of their university experience. Continuing improvements to facilities and programs allow QUBS to provide increased opportunities in teaching and research to a greater number and diversity of users.



In Memoriam - George and Beatrice Hughson

As we prepared this annual report for 2002, two of our beloved neighbours and friends of the Queen's University Biological Station passed away, George Hughson on Saturday, 4 January 2003 and his wife Beatrice very soon after on Monday, 3 February 2003. George and Bea were instrumental in initiating the acquisition of land by the field station for teaching, research and conservation purposes. Their interest in preserving for perpetuity some of the lands originally accumulated by George's father, Melvin Hughson, led to the acquisition of the "New Land" by QUBS from the Hughsons in 1976. This initial acquisition set the stage for further property acquisitions which collectively form a significant landscape for the biological and environmental sciences and conservation in the area. Fittingly, some of the properties subsequently acquired were also once owned by the Hughson family.

George and Beatrice were always supportive of activities by QUBS users of the Hughson Tract. With the close association to the land that farmers have and many travels across it and diverse uses of the natural resources contained within it, George especially was a great source of historical information about the property, its features and past uses. Any contact with the Hughsons could easily lead to fascinating reminiscences of times past, sprinkled with names and dates from their collective memories. George always impressed everyone with his recollection of site-specific details especially with respect to boundaries, unique features, including mine sites, homesteads, sugar bushes etc. He was a natural storyteller, blending his special knowledge of the land and local history with humour and stories of colourful characters from the locality.

George and Beatrice were well-respected members of the local community. Both worked on a long list of volunteer projects. Even in poor health, Beatrice especially contributed valuable time and effort to numerous local initiatives, particularly those of the Chaffey's Lock Community Hall and the Chaffey's Lock and Area Historical Society.

George and Beatrice were, above all, consummate believers in the family. Regular visitors were soon adopted and welcomed as part of the family. George and Beatrice leave behind several generations of family members, among these their children Connie Banks (husband Charles), Wayne and wife Elaine, Donnie and wife Liz, Linda Reid (husband Mike)

and David. They also leave behind nine grandchildren and one great-grandchild. It must be incredibly difficult to lose both parents or grandparents in quick succession and heartfelt condolences, on behalf of the entire Queen's University community, the Biological Station and its users and those of us who considered them as friends and neighbours, are extended to the remaining Hughson family.

The "New Land" acquired from George and Bea has, until now, been known as the Hughson Tract. However, it is now proposed that this name be changed to the "Hughson Farm" to more clearly reflect the history of the property. It will long serve as a reminder of their lives and efforts. As a further reminder of their contributions, a fitting memorial monument with a plaque will be erected in their memory in consultation with the Hughson family.

MAJOR GIFTS

Baillie Family Chair in Conservation Biology

On Saturday, June 15, 2002, we were honoured to have Mr. and Mrs. Charles Baillie visit QUBS for an event to recognize their gift of an endowed Chair to Queen's. The name of the chair will be **The Baillie Family Chair in Conservation Biology** and it will be linked permanently with the Queen's University Biological Station (QUBS). The purpose of the Baillie family's generous gift is to strengthen research in conservation and biodiversity and to augment and reinforce teaching programs at the graduate and undergraduate levels in the Department of Biology. The gift reflects the Baillie family's keen interest in the natural world, the conservation of biodiversity, and their special passion for birds.

The day began with a walk on the Lindsay Lake Road, accompanied by Kathy Wynne-Edwards, Anne Godlewska, Lili Harriss, Jason Jones, Rachel Fraser, Matt Timpf, Floyd Connor and Raleigh Robertson. The Baillie's enthusiasm for birding and nature was hardly dampened by the steady rain on a very cool, wet morning. Sightings of a Black-billed Cuckoo in a frozen upright posture near the nest, a Golden-winged Warbler, and a male Cerulean Warbler, plus a female at the nest, helped to make the trip a memorable success. Frank then joined the group for a tour of the facilities at QUBS, assisted by a number of grad students explaining their research projects.

Bob Silverman, Dean, Faculty of Arts & Science, hosted a luncheon at QUBS, where we were joined by Mrs. Silverman, Peter Boag, Head of Biology, Laurene Ratcliffe, Lois Robertson, and a number of other biology faculty and students, as well as the QUBS "regulars". Dean Silverman spoke of the importance of this donation to Queen's, thanked the Baillies for this very generous gift, and presented them with a commemorative plaque. Raleigh Robertson also thanked the Baillies on behalf of the students and others who use QUBS (see text below). Charles Baillie then spoke and in explaining why the Chair was such a good "fit" for their family, he mentioned each of his children, their links to Queen's and their interest in Conservation Biology. He also mentioned Marilyn's involvement as an award-winning author of children's books. Finally, Peter Boag presented Raleigh with a plaque to commemorate his being named as the first holder of the Chair. Following lunch, we held a round-table discussion in which the grad students working at QUBS provided a synopsis of their research while the Baillies engaged them with very perceptive questions and observations.

With Mr. Charles Baillie having recently been named Chancellor of Queen's University, we at QUBS felt especially pleased to have Mr. and Mrs. Baillie visit the Station and to experience their strong interest in conservation and natural history. We look forward to future visits.



Charles and Marilyn Baillie address the celebration.



The Silvermans, Charles Baillie, and Chris Eckert



Peter Boag congratulates Raleigh.



Raleigh with his personal Baillie Chair plaque.

(All Baillie Chair Celebration photos © Bernard Clark, 2002.)

(Following is the text of remarks by Raleigh Robertson, in recognition of the Baillies' gift to Queen's.)

I want to thank the Baillie Family for the generous donation to endow the Baillie Family Chair in Conservation Biology. This represents an interest in Queen's and a commitment to Conservation biology that we all sincerely appreciate. As Dean Silverman has indicated, this endowed chair is extremely important to Queen's. But let me tell you, its proportional impact will be especially great for the Biology Station.

I also want to thank those people in the Faculty of Arts & Science, in Biology, and in the Advancement Office, for making the Chair in Conservation Biology a priority in the Campaign for Queen's. It's going to be a tremendously important asset for the Station, and I appreciate the confidence you've placed in our program by supporting this Chair.

I want to explain why this Chair is important to Queen's, to the Biology Department, to the Field Station, and to Conservation Biology.

The Chair is important to Queen's, to the Department and to QUBS for many reasons: (1) It will raise the profile of Conservation Biology in our programs and ensure that Queen's is a recognized leader in this field. (2) It will ensure that a Queen's professor will have a strong link to QUBS for both teaching and research - a professor who will develop programs at the Station - programs that will help realize the potential of our facilities and our land base. (3) It will help attract outstanding visitors to QUBS, as already demonstrated by our visiting Field Scientist, Dr.

David Jacobs. David, who is from the University of Cape Town in South Africa, gave a very stimulating and thought-provoking seminar on Conservation Biology on Wednesday evening. (4) But most importantly, I believe that the greatest significance of the Chair is that it will create opportunities for students.

Queen's is fortunate as a university in that we attract very high quality students - and much of what we, as a faculty and as a university, accomplish is through these students. We faculty provide some direction, some foundation, and for our research students some funding - but it is the energy, enthusiasm, tremendous motivation and intellect of the students that carries the work forward.

For its part, the Biological Station provides an excellent resource for teaching and conducting research in the diversity of disciplines in and related to Conservation Biology. The logistical support provided by our labs, by our equipment, by our knowledgeable staff, and by our diverse array of habitats on land owned by Queen's and hence controlled by the researcher, plus the interchange of ideas and support from fellow students and researchers, all contribute to the success of our programs.

What the Chair will accomplish is to draw on Queen's potential to attract high quality students, and to draw on the facilities and logistical support of the Field Station. By having a chair-holder who is committed to research and teaching through the Field Station, it will create opportunities for students to get involved, to learn, and to contribute in Conservation Biology. In turn, those students will go on to 'make a difference' in some aspect of Conservation Biology along whatever path their future takes.

The Chair is important for Conservation Biology because it will contribute to the knowledge base and the understanding of this important discipline. Conservation Biology, defined simply as the study and protection of biological diversity, is a very broad discipline - in fact it involves aspects of many disciplines - ecology, behaviour, population biology, evolutionary genetics, as well as economics, sociology and environmental policy, among others. In the broad sense it requires an interdisciplinary approach - a synthesis spanning the sciences and the humanities. In biological research, there are many valid approaches that contribute to Conservation Biology - at the single species level, the community level, and the landscape level. All of these are represented by work done here at Lake Opinicon. This is the science involved in developing the knowledge base needed to guide policy to protect biological diversity.

In environmental policy, our graduates become involved in the political & legislative process, in working on programs to achieve sustainable development, and in land-use programs for the preservation of habitats. On Friday morning, I heard an interview on CBC radio with Helen Howes. Helen is the Vice President for Sustainable Development at Ontario Power Generation. Helen took field courses at the Station while at Queen's as an undergraduate. Earlier this week I phoned Karen Brown, the Assistant Deputy Minister of the Environment, in charge of Environmental Conservation - Karen did graduate work on fish behaviour here at the Station with Dr. Keast back in the 1970's. Jennifer Harker, another of Dr. Keast's graduate students, is now a senior partner at Dillon Consulting. She is also on the National Board of Directors of the Canada Water Resource Association, the board that formulates national policy for water and ground water protection. Deb Turnbull, still another of Dr. Keast's students, is currently Vice President of the Canadian Manufacturers and Exporters Association. She is responsible for international aid and development, currently focusing on aid to Africa and the sponsorship of African interns and business partners. My point is, students who work at Opinicon go on into a great diversity of careers, not necessarily in biology, but many with the potential to make a large impact in Conservation Biology.

In the broadest sense, much of what we do is to help develop an attitude - a kind of attitude that has its origins in Aldo Leopold's "land ethic". In this sense, Conservation Biology is not just an 'academic exercise', but a way of living, and of relating to the natural world. Students, whether continuing in professional biology, or embarking on any of the broad array of careers or life's work that our students follow, need to understand, and develop an 'attitude' that reflects that understanding of Conservation Biology.

Endowing the Baillie Family Chair in Conservation Biology is a very far-sighted gift that will make an important difference in all of these areas, both now and continuing through the long-term future. It's hard to imagine what QUBS, or Queen's, or Canada will be like in 25 or 50 years, not to mention 100 or 500 years. Whatever they are like, it's equally hard to imagine that Conservation Biology in some form will not be an integral part of the learning, the social and the political environment. Citizens of today, and in the future, need to understand the concepts of conservation biology. The Baillie Family Chair will help Queen's, through QUBS, contribute to that understanding and through our students, to put that understanding into practice.

The Alexander and Cora Munn Summer Research Award

Thanks to a generous gift from Alexander and Cora Munn, an endowed fund was established in 2001 to provide awards to third-or fourth-year undergraduate students of Conservation Biology in full-time summer positions in a research environment at QUBS. The award is for students who aspire to pursue studies in conservation biology and environmental preservation. Preference will be given to students with an interest in woodlot management and wildlife conservation. Applications will be made to the Head of the Department of Biology. It is anticipated that the first award will be made in 2003.

We extend our gratitude to Mr. and Mrs. Munn for this very far-sighted gift. It will help provide valuable experience for future conservation biologists for the very long-term future.

Massassaugua Property

In December of 2002, a second parcel of property along the Massassaugua Road became the property of Queen's. To date, some 193 hectares (478 acres) in total has been gifted to the university and the field station through the generosity of an anonymous donor. In December of 2001, a first parcel comprising some 29 hectares (72 acres) was donated (part A on the map, p 9). In 2002, a second parcel, some 164 hectares (406 acres) in extent (Part B on the map p. 9), was donated.

Together, the property represents a mixture of habitat, ranging from farm fields surrounding a house (which burned beyond repair in late 2001 and was razed) and barns in the north, to shoreline surrounding Connells Lake in the southeastern section, to mixed forest and wetland in the south. The Massassaugua Road and Taggart's Lane cross the northern section of the property.

The southern part of the property falls within the Hamilton Lake Area of Natural and Scientific Interest (ANSI) (cf. D.J. White. 1993. Life Science Areas of Natural and Scientific Interest in Site District 6-10. Ontario Ministry of Natural Resources, Kemptville, Ontario 122 pp. [OFER SR9401]). The southern edge of the property lies very near the northern edge of the Bonwill Tract, and immediately above it.



Exploration and GPS mapping of Connells Lake.



Old Bedford Mills Road through Massassaigua tract.

These interesting and diverse habitats, which border the old Bedford Mills Road that passes through the Bonwill tract to the south, promise to contribute new opportunities for field studies in the future. An application to have the land certified as ecologically sensitive has been submitted to Environment Canada, to enable this donation to proceed in the Eco-gifts program.

Queen's Land Trust

This land trust was established in 2001. The intention is to ensure that lands owned by QUBS can be adequately managed, and that additional lands can be acquired for conservation purposes and research and teaching.

The land trust is to be an endowed fund, with income from the fund used for operational costs related to land management, or for purchase of properties of strategic importance to QUBS and its endeavours. Recognizing that there is strong interest among supporters of Queen's to assist with both education and conservation, the Queen's Land Trust provides a mechanism whereby these goals may be achieved.

The goal is to have an endowed fund of at least \$1,000,000 generating an annual income of \$50,000 or more. Mrs. Hilda Pangman was the first contributor to the trust, kick-starting the fundraising with gifts totaling \$75,000. Currently, the fund stands at \$110,000. The fund is off to a good start. The endowment will help to ensure the integrity of the substantial landholdings of QUBS, the landbase that provides such an important resource for field studies and conservation biology. Over time, QUBS landholdings will become increasingly important for these purposes as development continues apace in the Toronto-Montreal Corridor in southern Canada.

Dr. Allen Keast

Through some 40 years of association with QUBS, Dr. Allen Keast has become widely known for his community studies of fish and birds. Still active in the QUBS community and in compilation of his years of research, he regularly contributes to the field station through annual donations. This support is very welcome and has assisted QUBS through times of fiscal restraint in university budgets. Among his gifts to QUBS in 2002 is a 21" computer monitor, which will enter service with the GPS/GIS projects in 2003. For all these generous contributions we extend a heartfelt "thank you" to Allen!

The William C. Brown Research Endowment Fund

This fund was established in February 2003 through a bequest from the estate of William C. Brown, B.A.(Queen's) 1930. Annual investment income from the fund is to be used by the Queen's University Biological Station for research in the environment. This gift will allow the QUBS to build on existing strength by supporting research in ecology and conservation biology. Funds may be used for research programs, facilities or equipment at QUBS, for QUBS-based research activities of the Director of QUBS, and for teaching purposes at QUBS that have a research component.

We at QUBS are very grateful to Bill Brown for having included the Station in his will and for his commitment to studies in environmental biology and conservation. We are also grateful to Dale Canfield, the executor of Mr. Brown's estate, for his assistance in establishing this endowed fund. We have enjoyed several visits to Queen's and to QUBS by Dale and Nan Canfield; they often bring a tin of ginger cookies made by Nan following the recipe of Mary Brown. The Canfields also gave to QUBS several interesting books that had belonged to Bill and Mary Brown, as well as an old Queen's pennant from Bill's days as an undergrad in the late 20's.

While we did not have the pleasure of knowing Bill and Mary Brown, it gives us great pleasure to see their legacy continue through the income of their generous bequest, and the stewardship of the Canfields.

Michael Runtz Donations

Mike Runtz is a renowned naturalist, photographer and educator. Many have seen his photographs or participated in his owl hoots of wolf howls. His natural history course at Carleton University is well-attended and raved about by students.

Over the past few years, QUBS staff have worked with Mike to have him offer guest lectures and seminars and to obtain from him some of his remarkable photographs. At present, five of his photographs adorn the walls of the dining hall in the Operations Centre.

In 2002, Mike participated as a guest lecturer and field trip leader during the winter ecology course at QUBS. Mike took his honorarium and purchased some reference books for use at QUBS. These will be of great interest and much used by QUBS regulars. Thank you, Mike.



Michael Runtz (centre) with winter ecology class.



Michael makes a point to the winter ecology class.

Jessie Deslauriers Donation

Jessie is one of our longtime and venerable supporters of the field station. She is well-known for her interest in all things dealing with natural history and conveys this at any opportunity especially to readers through her columns in the local newspapers. In 2002, Jessie donated a number of reference books on natural history to QUBS. These are a valuable contribution to the QUBS library. Thank you, Jessie.

Estate Planning

It is very gratifying to know that some of our alumni have included QUBS in their will to create an endowment for a named bursary to provide board and room for students conducting field research at the Opinicon. Such a program will benefit numerous students over the very long-term future. It will also benefit the Station in general by allowing it to host research students that might not otherwise have opportunities to work there. Once the award is established, it will raise the profile of both QUBS and field biology by having a named award (bursary) that will be announced to students. Finally, it will be meaningful and lasting tribute to the donor. The continuing support of our friends and alumni is very important for our programs. Including QUBS in estate planning is a good way to ensure that the quality of experiences we cherish from our own QUBS involvement will be available for future generations of field biologists.

The Campaign for Queen's

In working with Lili Harriss, Ed Pearce and others in the Development Office on the Campaign for Queen's we have been very successful in funding the Queen's University Biological Station. We hope to move forward on reaching our goal for our other priority project, the Queen's Land Trust. This trust offers an ideal way to support Conservation Biology, education, Queen's and QUBS. Anyone wanting more information, or to make a donation, is encouraged to call the Development Office in the Faculty of Arts and Science at (613) 533-6000, extension 77901 and speak to Faculty Project Assistant Myrna Horton.

NSERC & Other Support

NSERC MFA Grant

In September of 2002, QUBS applied for a Major Facilities Access Grant (MFA) from NSERC (Natural Sciences and Engineering Research Council). In April 2003, it was announced that our application was successful. The new three-year grant comes with a 28% increase over the previous grant - a very good showing in the face of stiff competition for grant dollars.

The grant pays the salary and benefits of QUBS Assistant Manager (Floyd Connor) and half of the Maintenance Assistant (Roger Green) salary and benefits. Under the new grant, Roger's contract was extended to nine months from six months. The grant also contributes to the costs of shared services (primarily electricity) at QUBS.

2002 was the 19th year that QUBS has received this grant (or its precursor, the Infrastructure Grant) from NSERC. This success is an acknowledgement of the productivity and

excellence of the facility and its multi-university approach to research and training. The presence of users from many universities is enabled by this grant. The atmosphere thereby created leads to vigorous interaction among users which ultimately benefits all users and challenges them in terms of innovation of approach, quality of research and application of competing theories to their work.

Summer Work Experience Program (SWEP)

In 2002, one project consisting of two student positions was made available to QUBS under this program. SWEP is designed to create “on-campus summer jobs for Queen’s undergraduate students that will provide them with valuable career-related and/or academic experience”. It is available to students that will be returning to Queen’s for a full academic year of studies after holding the SWEP position.

The 2002 project was “SWEP 104: GPS and GIS for Biological Field Studies and Land Surveying”, under the supervision of Floyd Connor. The Biological Station provided in-kind support for the project (room and board for the two recipients). The positions were awarded to John Cunningham, in his third year of a B.Sc. honours program in Biology, and Julia Nicholson, just finishing her B.Sc. honours and preparing to begin her B.Ed. at Queen’s in September of 2002. Both students worked enthusiastically, capably, and very productively at a great variety of tasks for QUBS and for many of our resident researchers. They brought a wide variety of skills and experience to the positions. Their activities are summarized under the “GPS/GIS” section of this report.

Thanks to both Julia and John for jobs well done!



John Cunningham and Julia Nicholson with backpack GPS (MC-V) at QUBS.

The SWEP program also supported a number of other students working at QUBS on various research projects, providing valuable experience to the students and essential help to researchers.

CFI Grant to Smol and Cumming

Drs. John Smol and Brian Cumming of Queen's University have obtained funding from the Canada Foundation for Innovation (CFI) for the construction of an equipment storage building at QUBS. Others have expressed an interest in using a portion of this to store their own equipment, and as this report goes to press Drs. Peter Hodson (Environmental Studies) and Peter Boag (Biology) have agreed to contribute funds which will enable the construction of a larger and more versatile building. QUBS is contributing in-kind to the building by using staff time and some Biological Station tools and machinery in the process.

In November and December of 2002, a portion of a pine plantation behind the QUBS main workshop was cleared by QUBS staff. The trees in this area were almost all dead, having been badly damaged by "Ice Storm '98". After most of the wood was removed, Bob Smith of Lyndhurst pulled the stumps and French's Trucking of Crosby leveled the site and prepared a crushed-limestone pad to support a concrete slab. Terry French also prepared short access roads in to the site from the workshop and parking lot.

In February of 2003, a contract was signed with Lawson Building Services Ltd. of Elgin, to pour a concrete slab and build on this site a 32' x 60' frame building with steel siding and roofing, four vehicle doors, and additional storage space in the attic. Construction is slated to begin "on or before spring 2003" and to be completed by mid-summer 2003.



Cutting the spars and deadfall.



Terry French leveling the site with his "high hoe".

Scholarships and Bursaries

Wes and Dorletta Curran Scholarship

The Curran Scholarship was established in memory of the founding director of QUBS, Dr. Wes Curran and his wife, Dorletta. The award is given to an undergraduate at Queen's who

is working at the Biological Station. Projects on aquatic habitats and species are given priority in the selection process.

In 2002, this scholarship was awarded to Sally Ahn, who worked under Dr. Bob Montgomerie (Queen's – Biology) and with Dr. Albrecht Schulte-Hostedde on sperm competition in Northern Water Snakes, Walleye, and sunfish.



Sally treats a Black-capped Chickadee on Amherst Island, and feeds a Southern Flying Squirrel at Stirling and Elva Danby's house during Raleigh Robertson's winter ecology course, February 2002.

Pearl E. Williams and Llewellyn Hillis Fund

This fund, established in 1991 by Llewellyn Hillis (Arts '52) to honour her parents, is to promote the careers and scholarship of women scientists, especially biologists, at all stages of their professional development, and secondly to promote performances by artists who are women. Having studied at QUBS as an undergrad, Llewellyn also hoped this fund would promote involvement by women in programs - both scientific and artistic – at QUBS. Recipients of this award in 2002 are listed below along with brief descriptions of their programs to which the award funds were applied.

Fiona A. Reid – Visiting biologist, visual artist, and author

Fiona Reid obtained a Master of Arts degree from the State University of New York at Stony Brook for her study on "Aspects of Variation in the Song of Redwinged Blackbirds", then a second M.A. degree from King's College, Cambridge University, England. She also studied Natural History Illustration at the Parsons College of Arts and Design in New York. In 1988 she taught a Scientific Illustration Class as an adjunct professor at St. Lawrence University in New York. In 1989 and 1990, she was at the Universidad Nacional Autonoma in Heredia, Costa Rica, doing small-mammal surveys as an assistant professor for field studies.

In recent years, she has continued to develop a strong interest in and focus on mammals in general and bats in particular. She has done research and writing on, and illustrating of, bats of North, Central, and South America, as well as those of Papua-New Guinea. She has illustrated a field guide to the bats of the world. More generally, she has written and illustrated an excellent and widely-used "Field Guide to the Mammals of Central America and Southeast Mexico" (Oxford University Press, 1997), illustrated a key to trees in Villa Mills, Costa Rica and co-authored a book on giant sea creatures. Her web page, illustrated with some of her original art, is at <http://www.hopscotch.ca/fionareid/>.

Fiona is a Departmental Associate, Centre for Biodiversity and Conservation Biology, at the Royal Ontario Museum in Toronto and since 1988 has been a staff naturalist and natural history tour director with Questers Tours and Travel. In the summer of 2002, she was in the latter stages of writing and illustrating the new edition of the Field Guide to the Mammals of North America, in the Peterson Field Guide Series. In late May and early June, she was in Arizona giving a Bat Conservation International workshop and then presented a bat talk in Arkansas before returning home to Ontario. In late July and early August she taught another bat workshop, this time in Belize, and returned to Ontario on 6 August.

It was “fresh” from this workshop that she took up her Williams and Hillis scholarship at QUBS on 11 August 2002, arriving with her daughter Holly (7 years) and son Ian (5 years) and a young family friend from France as baby-sitter (Aline, 14 years). Almost immediately, Fiona was presented with the object of one her artistic quests, a live Eastern Small-footed Bat captured by John Ratcliffe, a student of Dr. M. Brock Fenton. Fiona sketched the bat in remarkably short order, and then released it alive and healthy at its cave of origin. As the week progressed, she was able to proceed with the intermediate and final stages of her colour illustration of this species. In addition to interacting with QUBS residents on a daily basis, on Monday evening (12 August) she also gave a superbly-illustrated slide show and talk (open to QUBS residents, “Friends of Opinicon”, and others) on “Mammals of Central America”. On Wednesday (14 August) she presented a workshop entitled “The Making of a Field Guide: How color plates take shape, issues with publication and production of a field guide”. Participants gathered for lunch, and were then treated to a show of Fiona’s art in various stages of completion prepared for two of her books, “A Field Guide to the Mammals of Central America and Southeast Mexico”(Oxford University Press, 1997) and the Peterson Guide to the Mammals of North America (in prep.). She also discussed various aspects of the development of a field guide, using her art to illustrate the points she made. After dinner that evening, she presented a talk entitled “Bats of Costa Rica: Diversity and conservation” and illustrated it with slides of remarkable content, beauty, and quality. Art work and family activities, combined with interactions with other QUBS residents, occupied the rest of the week. Fiona and crew were picked up by her husband (Mark Engstrom of the Royal Ontario Museum) on the weekend and they proceeded from QUBS to watch whales (which are one of Mark’s specialties) in Quebec.

In January of 2003, the art legacy which Fiona had agreed to contribute as part of her Williams and Hillis Fund program arrived (carefully wrapped) in the mail. QUBS management and staff are totally delighted and excited with the beauty of the four 9” x 12” colour prints illustrating many of the small mammals to be found at the Biological Station. All of them are copies of Fiona Reid originals, and the Eastern Small-Footed Bat was painted here at the Biological Station. They have now been very tastefully matted, mounted behind UV-filtering glass, framed and hung in the dining room of the QUBS Operations Centre. They do look good!



Eastern Small-footed Bat (*Myotis leibii*). (©Fiona A. Reid. Original painted at QUBS, August 2002)

Rachel Fraser – “Examining the genetic architecture of a newly formed hybrid zone between Blue-winged and Golden-winged Warblers.” – Ph.D. thesis

My award from the Pearl E. Williams and Llewellyn Hillis Fund was used to pay for field assistance associated with my research at QUBS. Specifically, funds were used to pay a portion of Kevin Fraser’s salary during May 2002. Kevin is a proficient nest finder and his skills were much appreciated during the height of nest building. Finding nests enabled me to increase my sample size of tissue samples collected from Golden-winged Warbler families. All samples are currently being used in paternity analyses and form an integral part of my thesis that is addressing mate-choice decisions in this species. These data will ultimately be used to examine the effect of hybridization between Blue-winged and Golden-winged Warblers. I was able effectively to gather data from over ten sites on various properties owned by QUBS, and this would not have been possible without Kevin’s assistance. I am very grateful for having received support from the Pearl E. Williams and Llewellyn Hillis Fund.

Tammy Steeves – “Mechanisms of population differentiation and speciation in a pantropical seabird species complex: the masked boobies.” – Ph.D. thesis

I used the monetary award that I received in 2002 from the Pearl E. Williams and Llewellyn Hillis Fund to help defray the cost of my research field trip to San Benedicto Island, Mexico. The primary purpose of the trip was to collect DNA samples from masked boobies for my research on mechanisms of population differentiation and speciation in pantropical seabirds. The secondary purpose was to explore a collaborative post-doctoral research project on wedge-tailed shearwater conservation genetics with the Island Conservation Ecology Group.

I am happy to report that my trip was a great success. In addition to collecting the masked booby samples necessary for my thesis, I was also able to collect wedge-tailed shearwater samples. And I made a number of important international contacts for future research.

In my application letter, I stated that “it is my understanding that the Williams/Hillis Fund was established “to promote the careers and scholarship of woman scientists, especially biologists, at all stage of professional development...” And it is my belief that I could use the funds available to further my own career as a conservation biologist.”

I am pleased to say that I still believe every word: I feel the funds I received did that.



Golden-winged Warbler, QUBS 2000.
Photo © Raleigh J. Robertson



Masked Booby, Johnston Atoll, Pacific Ocean.
Photo © Lindsey Hayes

QUBS Outreach Programs

Visiting Scientist

Dr. David Jacobs (Department of Zoology, University of Cape Town, South Africa) came to QUBS as our Visiting Scientist in 2002.

David received his B.Sc. from University of Capetown and his Ph.D. from University of Hawaii, his Doctoral research focussing on character release in the endangered Hawaiian Hoary Bat, *Lasiurus cinereus semotus*. David is currently a senior lecturer at the University of Cape Town, and is well-known to Dr. M. Brock Fenton and Dr. James Fullard through his collaborative work on bats and their interaction with prey species (moths). During his time at QUBS, David had the opportunity to engage in some of this collaborative work on Canadian bat species.

During his visit to QUBS, David interacted with QUBS users and engaged in discussions of research activities and approaches on a wide variety of topics. David also presented a seminar on his current research work. A second seminar on issues in African Conservation work was thought-provoking and sparked considerable discussion among QUBS regulars.

Support for the Visiting Scientist Program in 2002 was provided through the Principal's Development Fund at Queen's (Category 4 - International Visitor's Program). This program provided \$2,000.00 toward Dr. Jacob's visit and stay at QUBS. Further funds were provided by Dr. James Fullard to assist with the collaborative work described above.

Seminars

The seminar series was, as always, interesting and enjoyable. The full list of speakers and topics for 2002 appears later in this report (pp. 64 & 65).

Early on in the program, seminars were largely focussed on the research activities of QUBS regulars. As the summer progressed, topics shifted to include a wider audience and neighbours, visitors and the Friends of Opinicon were encouraged to attend. The seminar room was always full, sometimes standing room only, a testament to the quality and appeal of the program. Judging by the intensity of discussion after seminars, the program stimulates interaction and exchange of ideas among various user groups of QUBS.

Suggestions for speakers and topics are always welcome.

Open House

The annual Open House was held June 30 in 2002. Approximately 450 visitors attended to get a glimpse of the field station and current research projects. Another successful day, thanks in large part to QUBS regulars who become ambassadors of the field station and work hard to present interesting displays and answer questions from the public. Meaningful contact with the public at large is an important part of a field station and increasingly a significant role of biologists, managers, scientists and conservationists. This annual venue works both from the perspective of the interested member of the public in being able to ask questions and gain pertinent information on biological topics as well as from the perspective of our developing researchers and educators in presenting information in an interesting, informative manner without all the jargon often associated with the sciences. The Open House is a vital part of QUBS outreach efforts. Thank you to all who attended and to the regulars who make the day possible.

The 2002 version of the QUBS Community Newsletter was distributed to some 1,050 households and cottages in the Chaffey's Lock, Elgin and Perth Road area. This annual circular serves the same purpose at the Open House, maintaining contact with activities at QUBS and providing outreach to those unable to attend the Open House itself.

Both of these initiatives are very important to the continuing success of the field station. Close and friendly contact with neighbours enables many projects, especially when research activities extend beyond QUBS landholdings. Without the support of the local community, opportunities at QUBS would become much more restricted.

Friends of Opinicon

Activities for this group of interested neighbours was limited in 2002. A couple of casual natural history walks were arranged, though fewer than in previous years. This is not due to lack of interest on the part of the group, rather the incredibly full schedule of QUBS staff. Many Friends attended the seminar series in late summer. Thank you to those who helped plan the topics and speakers and to those who helped spread the word through the local community.

QUBS Logistical Support

GPS/GIS

The Global Positioning System (GPS) rover units and Geographical Information System (GIS) software and computers at QUBS remained essentially unchanged from 2001, throughout the 2002 season. They continue to be widely used in individual research projects, and in mapping and displaying spatial data in the accumulating QUBS database.

In early summer, the rechargeable and the backup batteries of the MC-V were again found to be dead. Some of the wires from the batteries were found to have melted their insulation and to have nearly melted through the plastic back of the rover unit. Because commercial repair of this unit was predicted to take two weeks or more, Floyd bought replacement batteries from "National Battery" in Kingston and soldered them into an old back that had been removed about 6 years before. It worked! Similarly, a faulty terminal on the 9-pin rover end of the incredibly expensive three-way cable that connects the MC-V, the ProXL, and the ProBeacon components of the two-antenna backpack GPS was quickly and cheaply repaired by Linden AudioTronics in Kingston. It was also discovered that the terminal of the co-axial cable running to the GPS antenna was broken off; this was quickly repaired by CANSEL.

Other minor GPS expenses included a letter stamp set for marking aluminum survey markers, and some ring binders for print-outs of various GPS and GIS files.

One potentially significant piece of hardware was added to the TSC1 rover in early autumn. A newly-available cable adapter (TSC1 DB9 Conversion Kit #910-2000) was purchased from CANSEL and attached to the rover, allowing the very expensive and fault-prone original data cable to be replaced by a simple DB9 computer cable. The expectation is that if and when the TSC1 once again develops "cable problems", simply replacing this inexpensive cable with a new one readily available from any computer store should solve the problem.

From May through August, much of the GPS/GIS program was conducted by SWEP students Julia Nicholson and John Cunningham (see "Summer Work Experience Program" elsewhere in this report). John and Julia kept track of GPS equipment, did field work and trained

others to do it, prepared a display for the annual Open House, and worked with data files in the GIS. Their combined report, wherever possible in their own words, is summarized below.

“During the summer of 2002, we undertook mapping of Queen’s Properties to locate and identify survey markers and property tract boundaries. Our team was able to find all existing property boundary markers from the original survey records of the Bonwill Tract and Watson property, and many from the Hughson Tract. A new identification system was developed to mark the property corners, using letter-punched codes on newly-placed aluminum Queen’s stakes. The UTM co-ordinates of these stakes were recorded using the GPS equipment, and added to the QUBS GIS to assist future users in navigating to the original markers using the “Navigate” function of the GPS rovers. We also began searching for original survey markers on the Krahll property; this project is ongoing. Another major project involved consultation and co-operation with Skycroft management to build a detailed GPS/GIS record of the landscape within the Skycroft and Rideau Trail network. The Skycroft campgrounds, both those already in use and those facilities under development, were also mapped for use by QUBS researchers. We mapped several feature categories of these and other QUBS properties, including swamps, ponds, button bush swamps, creeks, beaver dams, fields, plantations, roads and trails. Combined with the existing QUBS GIS data base, much of this information was used in ArcView 3.2 to create a “Quick Map” system for easy production of access maps for selected areas. Over the course of the summer, we completed a detailed GIS map of the immediate Queen’s Point grounds, including forest and lawn, building footprints, buried water lines and hydro lines, sewage lines, and trails. We vetted and reorganized the GIS computer files to make them more accessible, and wrote GIS/GPS “User Help Files”.

In addition to the general QUBS support outlined above, we provided assistance in several research projects. We helped individual researchers use GPS and GIS technology to study Black Capped Chickadees, Black and White Warblers, Cerulean Warblers, Eastern Kingbirds, American Redstarts, Golden-winged Warblers and Tree Swallows. We also mapped the shorelines of Huffman and Hughson Islands at the request of the Bass research crew.”

QUBS Properties

QUBS properties serve many functions beyond simply providing a site for field studies. The conservation value of these properties is significant, especially in the ever-developing landscape along the Montreal-Toronto corridor. The special nature of the locality has been recognized by UNESCO. In 2002, the Thousand Islands - Frontenac Arch Biosphere Reserve was approved by the United Nations Educational, Scientific and Cultural Organization. This reserve covers an area of some 150,000 hectares, forming a rough triangle between Brockville, Gananoque and Westport (see map on p. 20). QUBS properties fall within the northern apex of the triangle. The reserve will focus efforts for mutually supportive conservation and sustainable economic development. Congratulations to the team who put forward the nomination and designation documents, notably David Warner and Carol Clemenhagen.

QUBS properties now encompass some 2,263 hectares (5,590 acres), a substantial landholding by any measure. A map of QUBS landholdings is included in this report, for reference (p. 8). The boundaries shown on the map are approximate and subject to verification, a process that is underway as we develop our Geographic Information Systems database (see “GIS Mapping”, p. 21 and “GPS/GIS” p.18).

For records-keeping purposes, this section of the Annual Report will list uses of properties, management activities and changes pertinent to specific areas. Entries will be made corresponding to particular tracts of land.

GIS Mapping

Work continues on the development of a Geographic Information System for QUBS.

Data collected using Global Positioning System equipment are continually being added to the database. Mapping of physical features of QUBS properties (trails, roads, shorelines, habitat margins and conspicuous features) continues.

Although it is a time-intensive, iterative process, we are beginning to reconcile survey and metes and bounds descriptions of properties with on-site GPS data. Over time, a fully functional GIS will develop. This database will enable an overall management plan for QUBS properties.

Hughson Tract

The Hughson Tract was used for studies of Tree Swallows, Eastern Bluebirds, Golden-winged Warblers, American Redstarts, Eastern Kingbirds, damselflies, dragonflies, water mites, moths, Black Rat Snakes, Columbine, architecture of the forest understory and the possible effects of bismuth on vegetation in 2002.

The various bird box grids were used intensively by Dr. Raleigh Robertson and his students in work on cavity-nesting birds (Tree Swallows and Eastern Bluebirds).

Rotation plots in the Lane Sargent Field used by Dr. Aarssen and his students for plant work were roto-tilled on 15 October. The western-most 25m x 100 m plot in the Lane Sargent Field and the unfenced plot in the New Barn Field received two passes of the equipment, while the fenced plot in the New Barn Field received three passes.

Haying of the open fields was done by Bob Butterill in 2002. In late summer, field edges were bush-hogged and fallen branches removed using our own equipment. The regenerating edge plots established originally by Tim Demmons were restaked (Rachel and Kevin Fraser) using pressure-treated stakes and were left unmowed once again.

In fall, metal posts were installed at the field openings. The intent was to distinctively mark entrances to Queen's property and at the same time indicate that general access is restricted. A piece of galvanized chain was welded to one post at each gate and looped over a welded bracket of the opposite post. Red octagons with reflective markers were attached to the middle of each chain as a safety warning. In mid-November, four of these chains were stolen; these will have to be replaced.

In fall, George Bracken was engaged to re-establish the southwestern corner of the Watson property. For whatever reason, the original survey marker had gone missing. Now, we will be able to clearly establish the sections of the Chapman Field which belong to the Watson property and the section which forms part of the Queen's holdings.

Bonwill Tract

In 2002, The Bonwill Tract was used for studies of Cerulean Warblers, Golden-winged Warblers, American Redstarts, Eastern Kingbirds, damselflies, water mites, moths, Black Rat Snakes, Columbine and architecture of the forest understory. The Ontario Ministry of Natural Resources (Eric Boysen - Kemptville) maintains several Growth and Yield Plots flanking the

Bedford Road. Forest Bird Inventory plots are located within the Bonwill Tract, north and east of the Wire Fence Field.

Haying of the open fields was done by Bob Butterill. In late summer, field edges were bush-hogged and fallen branches removed using our own equipment. The regenerating edge plots established originally by Tim Demmons were re-staked (Rachel and Kevin Fraser) using pressure-treated stakes and were left unmowed once again.

Metal gate posts and chains were installed, as for the Hughson Tract.

The Bonwill Tract (and the Forsyth property exclusion) was the focus of intensive mapping of property boundaries during 2002 (SWEP students John Cunningham and Julia Nicholson).

John M. Cape-Charles Sauriol Environmental Studies Area

The Cape-Sauriol Tract was used for studies of damselflies, water mites, Largemouth Bass, sunfish, bats and Black Rat Snakes in 2002.

The mine sites and the associated roadways and settlements were the focus of fall trips by QUBS users, Chaffey's Lock and Area Heritage Society members and by a family reunion of the Davidson clan. Bryce Davidson was one of the original settlers of the area. His descendants gathered at Chaffey's for the reunion organized by neighbours Brad and Mary Johnson. A field trip to Lake Opinicon village and across the lake (via the QUBS "Rappinicon" pontoon boat) to the mine sites was a highlight of the gathering.



Raleigh with John M. Cape's grandsons, Tim and Mike Usher-Jones, on a winter outing to the Cape-Sauriol Tract of QUBS.

Hilda and John B. Pangman Conservation Reserve

In 2002, the Pangman Reserve was used for studies of Cerulean Warblers, Golden-winged Warblers, Eastern Bluebirds, Black-capped Chickadees, American Redstarts, Tree Swallows, Eastern Kingbirds, Black Rat Snakes, damselflies, water mites, moths, Wild Columbine, Largemouth Bass, Northern Pike, and sunfish.

Warner Lake and Long Lake are used for study on Largemouth Bass populations. Frank Phelan, Dr. David Philipp and students have individually PIT-tagged most of the male bass in the lakes and are conducting a multi-year study of bass populations. The lakes have been posted as research lakes and closed to fishing. In Lindsay Lake, a similar study has been started on Northern Pike.

The outpost cabin on Long Lake greatly facilitates lake work.

The Lindsay Lake Road continues to be a popular place for nature walks with various groups.

Bracken Tract

The Bracken Tract was used for studies of Tree Swallows, Eastern Bluebirds, American Goldfinch and light intensity in forests which might affect the spatial organization of plant communities in 2002.

In fall, the property was intensively used by students in Geology 221 (Geological Field Methods). Doug Archibald had the students lay out baselines and pickets and, working in groups, paced and compassed on perpendicular lines. The purpose of the field work was to determine the stratigraphy of the surficial sediments (lacustrine clay and/or sand over till in most places) on the property by sampling at 50m intervals using soil augers. In addition, a magnetometer survey was done on the two baselines to determine the location of the buried contact between the gneiss and the very magnetic gabbro that hosts the magnetite. This work is of interest since the area used to be home to a very successful iron (magnetite) mine.

In early summer, Maurice and Wayne Hutchings helped us erect a barbed wire fence around the Arsenault property, both to keep cattle out and to delineate the boundary between this property and Queen's holdings.

Maurice Hutchings is permitted to graze cattle on this tract. In exchange, Maurice keeps an eye on the property. In fall, some of the field margins were bushhogged to redefine the field edges.

Moores Tract

In 2002, the Moores Tract was used in studies of Black-capped Chickadees, Black and White Warblers, Black Rat Snakes and water mites.

Crabbe Property

During 2002, forays were made to the "Bird Box" and property to keep the grass cut and to check on security.

Massassaugua Property

During 2002, some initial forays were made into the property to become familiar with the potential of this newest parcel.

Animal Care, Safety and Training

Animal Care

Since November of 2001, QUBS has had in place a specific policy on animal care which meshes activities at the field station with University Animal Care Committee (UACC) protocols and approvals. All QUBS users must adhere to the QUBS policy guidelines (cf.

<http://biology.queensu.ca/~qubs/AnimalCare.pdf>).

As ethical field researchers and educators, animal care issues should be of paramount importance and concern for the animals which are the subject of field and lab activities should be foremost in any study.

Dr. Peter Autenreid (University Veterinarian and Director of University Animal Care) came to QUBS on May 22, 2002 to tour the station facilities and to present an information and training session on animal care to QUBS regulars. The session enabled discussion on policies and procedures, ethics and practical matters surrounding field study of animals. The session was attended by 30 QUBS regulars.

Dr. Bonnie Beresford has recently replaced Dr. Autenreid as Director of University Animal Care. We look forward to working with her. Contact information (address, telephone and Fax numbers) is the same as outlined for Dr. Autenreid in the policy guidelines. She can be reached by e-mail at beresfor@post.queensu.ca. UACC info can also be accessed/delivered at UACC@post.queensu.ca.

Principal Investigators should be aware that the Canadian Council on Animal Care is proposing the adoption of a new set of guidelines governing the Care and Use of Wildlife. This document is far-reaching in its implications. PI's should acquaint themselves with the content and implications of this document.

Field Safety Policy

Queen's University has developed a comprehensive field safety policy as well as guidelines for safety in field research. QUBS users are expected to fully adhere to the principles and guidelines established. The policy document is available at <http://www.safety.queensu.ca/safety/policy/fieldpol.htm>.

During his visit on May 22, 2002, Dr. Autenreid introduced the topic of field safety and Frank Phelan, Manager of QUBS led a discussion of field safety considerations during research activities at the field station. The need for careful planning, anticipation of hazards and effective response to emergencies was discussed. Each lab group was encouraged to develop a tailored strategy whereby specific risks were assessed, procedures developed to minimize identified risks and procedures for dealing with worst-case scenarios established. Basic considerations should include information transfer between members of a team (whereabouts and expected times of return) and use of a buddy system whenever possible. Most labs started a frank discussion of risks and discussed positive approaches to dealing with recognized risks. Principal investigators could use the field research safety planning record as a guide to developing a group-specific awareness and approach to field safety (cf. <http://www.safety.queensu.ca/safety/policy/field/app2.pdf>).

Watercraft Safety

With legislation mandating training and proof of operator competency coming into effect in September of 2002, there was great interest among motorboat users of QUBS and biologists in general about local courses leading to certification. Accordingly, Frank arranged two courses. The first was held March 9, 2002 at Queen's. The second was held at QUBS June 25, 2002. The Instructor was George Hiles (Tel 613-453-5253) of Lakeland Safe Boating (lakeland@safeboating.ca). During these two sessions, 50 biologists obtained proof of competency and their Pleasure Craft Operator Card.

As of September, 2002, QUBS is requiring proof of competency before permitting station motorboats to be used. Thus, QUBS users should plan ahead and obtain proof of competency before the research season. A good place to start looking for information is the Canadian Coast Guard (<http://www.ccg-gcc.gc.ca/>) for information. If there was sufficient interest shown, we could again arrange an on-site training course which would provide certification upon successful completion.

ATV Safety

All-terrain vehicles are seeing much more use as research tools at QUBS. Recognizing that these are expensive and potentially dangerous tools, we have instituted an awareness and training program for ATV users. The QUBS program uses the training manual developed by the 4-H Club. All users of ATV's at QUBS must take the training course and pass a competency test. With most QUBS users receiving the training in 2001, only a few field assistants were tested in 2002.

Drinking Water Safety

In the aftermath of Walkerton, new regulations concerning the operation of drinking water systems have been put into place. At QUBS, since we have a common source of water for multiple users and since the station is a university facility, stringent new regulations and procedures have come into effect. This is, of course, a fundamental safety issue. Considerable time, effort and money has been invested in bringing QUBS into compliance with the new legislation.

QUBS is considered a small water works and a designated facility under Regulation 505/01 (Gazetted January 5, 2002). As such, a series of safeguards have been mandated and we have worked hard to comply with all of the provisions of the Act.

A consultant's report on the current state of drinking water protection and plans for compliance was due on March 18, 2002. Accordingly, John Bishop of McIntosh Perry Consulting Engineers (Carp, Ontario) was engaged to file the mandated report. Mr. Bishop made site visits, reviewed the situation at QUBS and filed his report on time. The Ultraviolet units which treat QUBS water were found to be sufficient to the task and to the requirements of the current legislation.

A number of new requirements and procedures were established to comply with the legislation:

- 1) Frank and Floyd had to become "trained persons" under the Act. Both Frank and Floyd took and passed the Operation of Small Drinking Water Systems correspondence course offered by the Ontario Ministry of the Environment.

- 2) Inspection of the water treatment system must be done and logged at least once a week by a "trained person".
- 3) Replacement parts must be kept nearby (extra quartz sleeves and UV bulbs) and water treatment equipment must be in use whenever water is being obtained or supplied.
- 4) Samples of treated water must be submitted to an accredited lab once a week for Total Coliform and E. coli sampling and a heterotrophic bacteria plate count.
- 5) Samples of untreated water must be submitted to an accredited lab once a month for Total Coliform, E. coli sampling and a background bacteria count.
- 6) At least once every 60 months, a sample of water must be submitted to an accredited lab for analysis of multiple parameters as set out in Schedule 2 of the legislation. The list of parameters includes elements, metals, radionuclides, a range of hydrocarbons, pesticides and PCB's etc. This was done in June of 2002. Results indicate that QUBS water falls within guidelines under the Act. All parameters tested were well under guidelines and most under the minimum detectable limits of the testing procedures.
- 7) Lab results and testing must be kept available for inspection at any time. There is a complex set of reporting requirements mandated in the event of an adverse test result.
- 8) An annual report must be filed outlining the water system itself, the procedures for providing safe water and the results of all tests done on water.

This is indeed, a formidable list of tasks and requirements, many of which cost significant dollars. It is estimated that QUBS incurs a cost of \$4,000.00 per year in testing costs. In addition, a great deal of time is spent by QUBS in inspecting, monitoring, reporting and taking samples to the lab.

Dr. Raleigh Robertson (Director, QUBS) and Frank Phelan (Manager, QUBS) met with Queen's officials (June 6, 2002) to keep all apprised of requirements under the legislation, including:

Tom Morrow, Associate Vice-Principal (Operations)
 Anne Godlewska, Associate Dean (Arts and Science)
 Dan Langham, Director, Environmental Health and Safety
 Peter Boag, Chair, Department of Biology
 John Topping, Departmental Manager, Department of Biology.

At this meeting, Tom Morrow agreed to reimburse QUBS for the initial consultant's report. This was a welcome gesture.

As a potential risk to drinking water at QUBS, there was discussion of replacement of the septic field at the station. In light of its age (26 years), proximity to the well, and a recommendation from the consulting engineer's report, it was argued that we should address replacement of the tile field very soon. It was agreed that an application to the Renovations and Alterations fund would be made for 2003.

Overall, we are supplying safe drinking water at QUBS and are making every effort to ensure that this continues into the future.

Renovations and Additions

This section documents a range of projects completed during 2002, and serves as a record of the maintenance and upgrading of facilities at QUBS. Since the Operations Centre is still relatively new and continues to require some finishing and "fine tuning", we divide this section

into two parts. The first details work done on the Operations Centre and the second deals with other projects and improvements to other facilities at QUBS.

Operations Centre

- 1) **Servery Counter Tops** – Some parts of the formica surfaces on counter tops in the servery had begun to lift free and bulge upward. This was especially true near the coffee and tea water dispensers. These areas were flattened down and reglued.
- 2) **Kitchen Roof Leak** – During heavy rains, water came into the kitchen around the stove hood. The problem was in the roof mount of the stove hood fan. Leveling the fan mount (Brunet Heating and Air-Conditioning, Kingston) stopped the leaks.
- 3) **Exterior Stain** – Repainting was done where some of the exterior blue-gray stain, especially around the main entryway, had been thinly and rather irregularly applied.
- 4) **Mouse-proofing** – Since very early in its young life, the Operations Centre had been frequently invaded by White-footed Mice. This was particularly vexing to Marg and the rest of the kitchen staff, as it raised health concerns necessitating frequent cleaning and sterilization and also resulted in the loss of significant amounts of foodstuffs. In late summer a final search revealed large potential entryways from outside, most notably under the screen porches. Rod then blocked these off and gave them a final seal with caulking. Since then, the Operations Centre appears to be mouse-free.
- 5) **Hardwood Floors** – In December, the hardwood floors in the dining room and servery and the area at the head of the entryway stairs were scarified with plastic rotary cleaning pads, then thoroughly cleaned and recoated with 2 coats of “Wood Pride” #1880 Clear Satin Interior Polyurethane Varnish. The choice of finish was based on consultation with the original installer and finisher of the floors and advice from two paint sales companies.
- 6) **Tiled Floors** – Tiled floors in the halls, bathrooms, laundry room, and lower entryway were stripped of finish, thoroughly cleaned, resealed with “Dynasty” Acrylic Sealer, and given a double coat of “Secretariat” Floor Finish.
- 7) **“Runner” Mats** – The rubber finishing strips on the ends of most of these mats were cleaned and re-glued with a better grade of contact cement. Before the tiled floors under these mats were refinished, they were wet and stained from condensation; it seems that some form of porous material allowing aeration under the mats will be necessary, especially in the lower entryway.

Other Renovations and Alterations

White House

- 1) **Upstairs Bedrooms** – In spring, Rooms 1, 2, and 3 were totally refinished. Minor holes in walls were repaired, walls and ceilings were repainted, and floors were stripped, resealed, and given two coats of finish. Some repairs were done to beds and bureaus. Even the windows were thoroughly cleaned!
- 2) **Basement Apartment Room 2** – Totally remodeled to include the part of the basement hall where the refrigerator had sat. That refrigerator went to the upstairs kitchen, and was replaced in the basement suite by a new “bar-sized” fridge. The walls, ceiling, and carpeting of Room 2 were redone with new materials.
- 3) **Upstairs Freezer** – A new, small freezer was installed in the upstairs dining room.

- 4) Concrete Step – The concrete step facing the Operations Centre was beginning to rock excessively. It was temporarily removed, and new very solid footings were made.
- 5) Lakeside Walkway – The footpath on the lake side of the White House was uneven and had serious problems with drainage and erosion. In mid-summer, patio slabs were installed outside the basement entryway, steps were made leading up to the existing steps for the upper entryway, and a patio-slab walkway was completed to the edge of the White House closest to the Manager's house. Within minutes of its completion, Marg had flowers planted along its edge. It works well, and is a great improvement.
- 6) Tiled Floors – In spring, and again in November, the tiled floors in the upstairs hallway and in the dining room were stripped, washed, sealed, and given two coats of finish.
- 7) Carpets – In December, upstairs living room carpets and those recently installed in the basement small bedroom were steam cleaned as was the upholstered furniture in the upstairs living room.

Earl Cottage

- 8) Wall Repair – Wall repairs which were begun in autumn of 2001 were completed by adding plywood interior panelling. Green staining of the new exterior siding remains to be done.
- 9) Ceiling repair – Fibreboard panelling on the ceiling was badly stained, sagged, and mouse-chewed. Ceiling joists were found to be badly misshapen, making the ceiling very irregular. Ceiling joists were twinned with new ones in the attic. The ceiling was then panelled with drywall, and joints were covered with thin wooden battens. The crown moulding was repaired. The result is a notably flat and attractive ceiling with a vintage look.
- 10) Interior Painting – Walls and ceiling of the entire living room were painted an off-white, and the floor was sanded, some cracks filled, and then painted a gloss brown. The whole room looks remarkably clean, bright, and airy.
- 11) Interior Trim – New baseboards and window trim were stained a maple colour and put in place. Some staining of window casements remains to be done.
- 12) Exterior Trim – Damaged fascia were replaced, and new boards were shaped and put in place to cover the joist headers in the rebuilt area.

Curran Cottage

- 13) Room 5 – The 4-bed room had grown rather dingy, with some drywall damage and a badly worn carpet. Walls were repaired and painted, and new carpet laid down. The oversized roller drawer under one pair of bunks was cut down so that it fits properly under the bed.

Sumac Cottage

- 14) Deck and Steps – The L-shaped deck on Sumac Cottage had suffered extensive rot, and the built-in bench seating and rails along the edge were rotted to the point of being deemed unsafe. The deck was completely removed except for the support posts and the beam bridging them, and replaced by a new smaller cedar deck and rail on the lake side of the cottage only. On the Curran Cottage side, a new set of concrete steps leads to the entrance, and the access path has been re-landscaped and some new patio slabs laid down.
- 15) Carpets – In December, carpets in the living room and dining room area were steam cleaned, as were those in the middle bedroom.

Other Cabin Work

- 16) Lake-water Intakes – A continuing frustration with the tedium of rebuilding lake-water plumbing intakes for cottages each year led Rod to design and build new plumbing intake housings for several of the cottages. The most sophisticated ones are at Sumac and Curran cottages, with simpler ones at Earl Cottage, Cabin 12, and the lake-water intake for the big Aquarium House.
- 17) Cabin 12 (“The Condo”) – A new water pump and pressure tank were installed.
- 18) Cabin 7 – An excited report by a distressed resident of extensive roof leaking led to stripping and repairing the roof, and re-shingling.
- 19) Cabin 13 – The single bed near the desk was removed and stored elsewhere as a spare, and an upper-bunk frame was built in its place. This allows for a closet rod and hangers, and storage space under the bunk.

Queen’s Point Landscaping

- 20) Traffic Circle – Marg Phelan and Frank’s father Don did a lot of tilling and planting here. Rather extensive pruning of dead and broken limbs was done on the central crab-apple tree in spring.
- 21) Curran Path Upgrade – The path from Cabin 8 down to Keast Beach was steep and badly eroded due to years of ever-increasing foot traffic. In late autumn, it was notably improved by terracing using pressure-treated lumber frames and crushed limestone in a design similar to the path from the Operations Centre to the Tank House. A rail and footlights should be added in 2003.
- 22) Picnic Tables – In early summer, the old picnic tables were completely disassembled, the boards were planed and sanded and their corners rounded with a router, and reassembled. Significant cracks and holes were filled with epoxy, and they were then given 2 coats of Defthane UV-block polyurethane finish. They look really good now, but we will monitor them to see how long this lasts.
- 23) Old Aviaries – The old aviary behind the main workshop, built for Red-winged Blackbird research in the mid-1980’s, was not up to modern standards, was no longer needed, and was in the way of access to the new Storage Building and so was disassembled. Much of the pressure-treated lumber was salvaged for stakes and for rough outdoor construction projects. A second, older and smaller aviary near the Septic Leach Field was also removed and was discarded.
- 24) QUBS Road Sign – The “Queen’s University Biological Station” sign at the “station gate” was badly weathered and discoloured. It was replaced by a new sign made by Jim Janeway.
- 25) Original QUBS Sign – The original, antique QUBS sign that had been renovated and installed on the Biological Station road at our property boundary in preparation for the 50th Anniversary celebration was heavily damaged by a falling tree during a wind storm in March. The broken bits of the wooden sign were found and reassembled, the paint on the lettering was touched up, and the sign was mounted on a new and sturdier steel bracket. Once again, it stands tall and looks good.

Miscellaneous

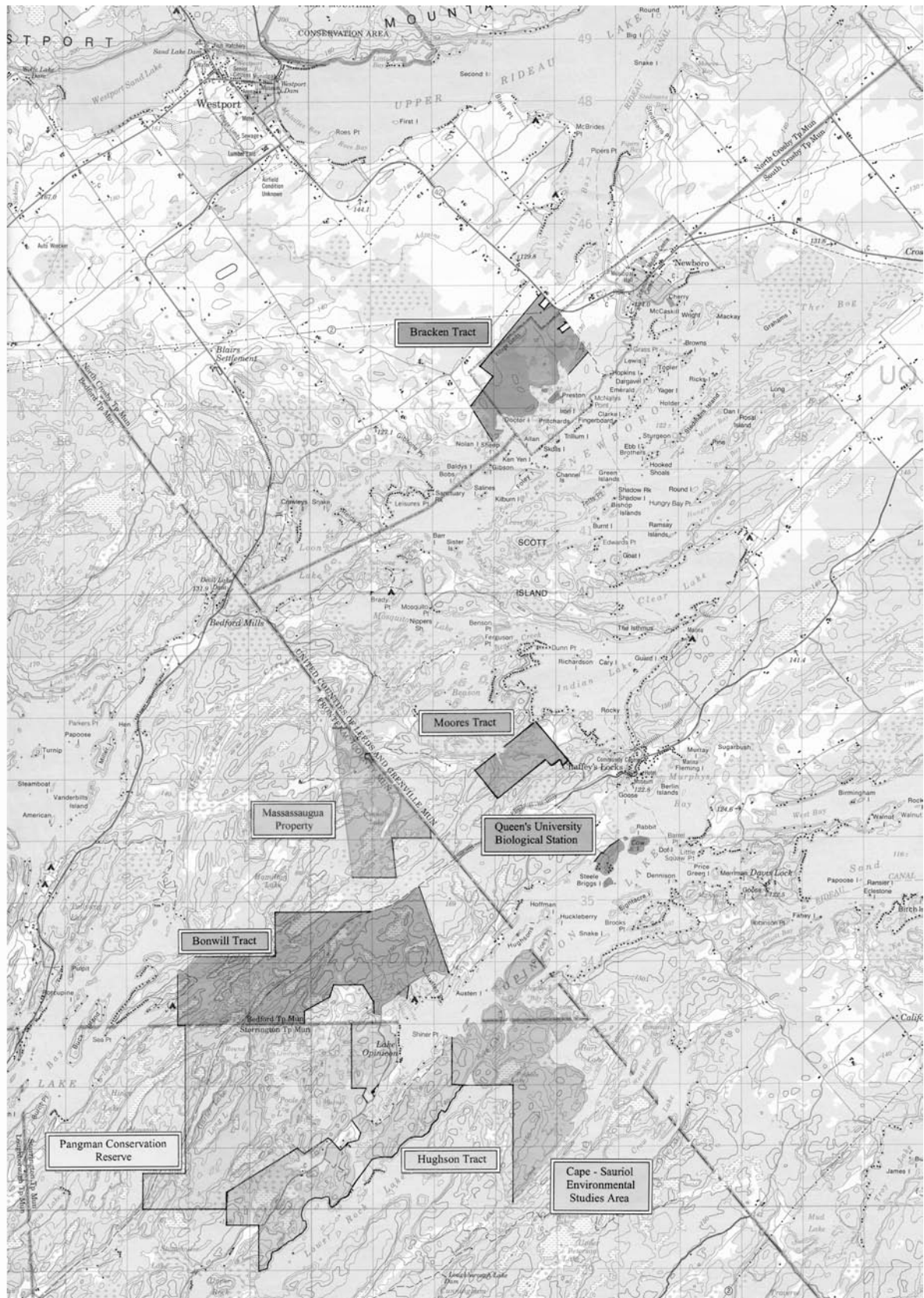
- 26) Library and Offices – Several new LAN connections were added in May. Some of the wiring needs to be made tidier and less conspicuous.

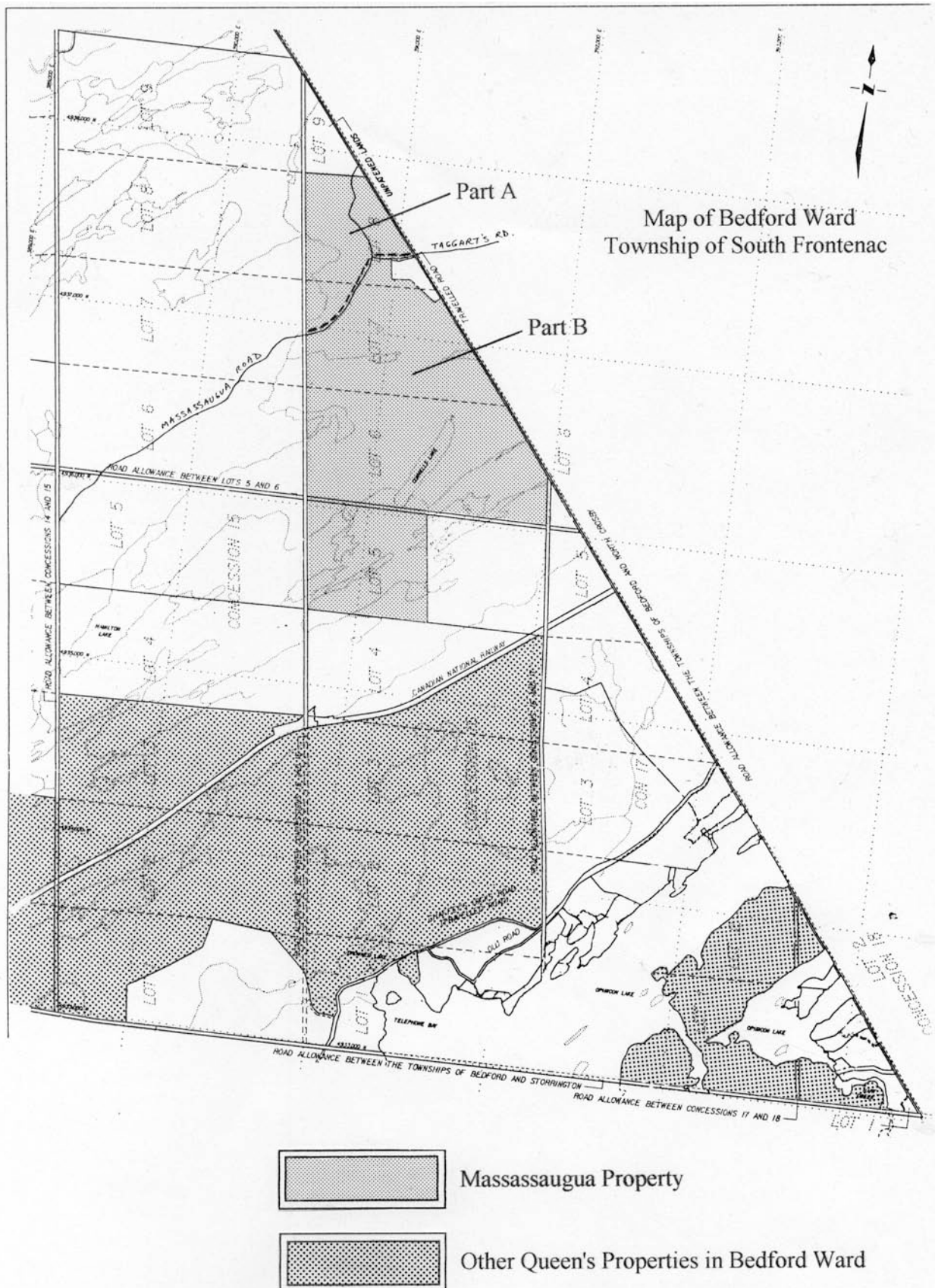
- 27) Brown Lab – In mid-summer, a high-amperage 110V circuit was installed in the Lower Brown Lab to the right of the blackboards, in preparation for installing a lab incubator. In November, all floors on both levels were stripped, cleaned, sealed, and given a double coat of floor finish.
- 28) Tri-Lab – Twice in 2002, attempts were made to seal leaks in the low-pitch roof over Room 4, using the tar-like “plastic cement”. This approach turns out to be temporary at best. We will need to undertake a wholesale effort, such as reroofing, in 2003 to effect a proper fix.
- 29) Welding Table – An old motor repair trolley used often with the former inboard motor of the “Rappinicon” barge was converted to a heavy-duty welding equipment trolley and welding table. This promises to be a very welcome and important addition to the shop equipment.
- 30) Aquarium House Drain – The drain from the flow-through fish tanks in the Aquarium House began leaking near the boathouse, and pouring water down over the walkways and docks there. It had become clogged with roots. A section of the drain was replaced.
- 31) “Rappinicon” – After years of frequent repairs of the inboard motor of the blue barge, we removed it and the outdrive assembly once and for all in spring. The aluminum motor well covering was replaced by plywood covered with rubber matting, allowing for more workspace on the afterdeck. A second outboard motor bracket was installed, on the rear of the starboard pontoon. The deck canopy was also extensively restitched, as earlier seams and strap attachments were mostly failing.
- 32) “Dinah Moe” – A new stern light was installed on the small orange pontoon boat.
- 33) Carleton Boats – This summer three sturdy, high-quality jon boats that Dr. Mark Forbes had brought to QUBS from Carleton University were purchased for use at QUBS.
- 34) Lake Temperature Probes – In spring, the float on the 0.2m and 1.2m probes was found to have become perforated and to have sunk. The probes were raised and a new float installed. One probe was malfunctioning at the time and was repaired, but by year’s end both the 0.2m probe and the 1.2m probe required repairs which will be done in spring of 2003.
- 35) Ford 3400 Tractor – Cracked welds on the front-end loader arms were repaired in a better-than-new fashion with a bridging plate. The steering arm was also repaired. Late in summer, while removing fallen limbs from field edges, a limb perforated the radiator; the “tanks” on the radiator were saved, but the core was replaced.
- 36) Ford 150 Truck – In autumn, a brakeline burst and had to be replaced. At the same time, an ongoing coolant loss problem was traced to a faulty radiator and a new one was installed, and 2 new universal joints were installed on the front axles.
- 37) Blue Dump Trailer – The hydraulic pump ceased to function in autumn and was needed immediately for stump hauling and in the long term for many tasks. It was commercially reconditioned by Kingston Truck & Trailer, and seems to work well. A “rubbermaid” tub was inverted over the pump and lashed down with bungee cords, in an attempt to reduce corrosion by rain, and road salt from tire spray.

Acknowledgements

A large vote of thanks is due our QUBS staff. Without the efforts of all our staff, no matter in how small a capacity, the field station would be unable to function. Thanks to Roger (Rod) Green (Maintenance Assistant) and our Food Service Staff - Marg Phelan, Cheryl MacDonald, Lucinda (Cindy) Chrissley and Theresa Perrin - for your efforts on behalf of all QUBS users.

QUEEN'S UNIVERSITY BIOLOGICAL STATION PROPERTIES 2003

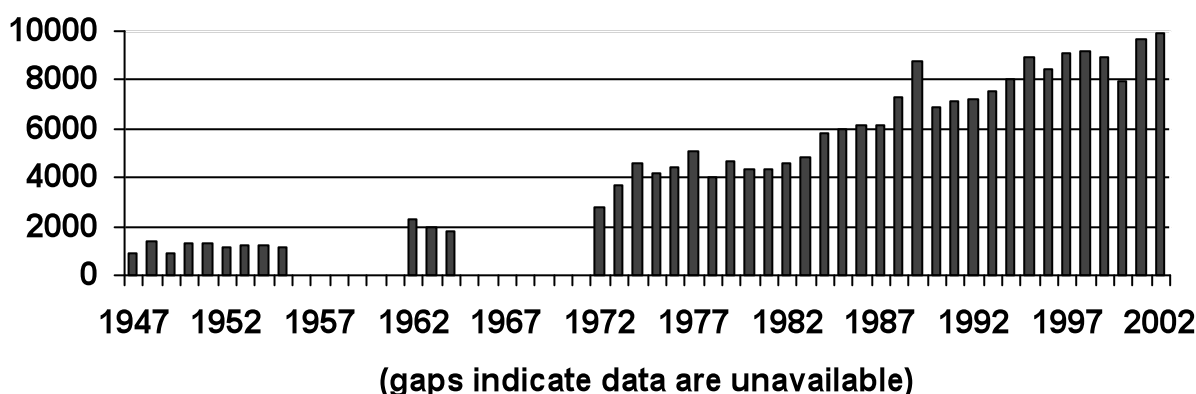




Introduction

2002 was the busiest year on record at Queen's University Biological Station. We steadily approach the elusive 10,000 user-day level, but have again fallen just short of it. Some 9,885 user-days were logged in 2002 (user-day data are displayed in tabular form on pp. 66 & 67). Use was up by 2.4% over 2001. On average, 49 researchers (professors, graduate students, honours students and assistants) were in residence through the summer. Abstracts of 2002 research projects and the personnel involved are contained in the following pages (pp. 33 - 60).

User-Days at QUBS



In teaching activities, QUBS hosted 8 modules (10 weeks worth of modules) in the Ontario Universities Program in Field Biology (OUPFB). Five of these modules were presented by Queen's instructors and three by instructors from other institutions. Titles and enrolments for the OUPFB programme are found in Tables 1 and 2 (pp. 31 & 32). In addition to the OUPFB modules, Dr. Ed Kott (Wilfrid Laurier University) brought his field course for senior undergraduates to QUBS for two weeks in late summer.

In 2002, there was a large increase in use for conferences, meetings and field trips. It seems that the improved facilities and enabling the hosting of larger groups, several groups at a once and groups during winter and spring. This year, many diverse groups made use of the facilities. A summary of conference, meeting and field trip use of QUBS in 2002 appears later in this report (pp. 61 - 63).

The mandate of QUBS is to provide opportunities for hands-on teaching and research. The experience gained at QUBS whether as a research assistant or during field trips associated with curriculum courses is invaluable to the next generation of educators, scientists, fish and wildlife managers and environmental consultants. Exposure to field work has been key to sparking life-long interest in biology for many QUBS users. Alumni cite their experiences at QUBS as being among the most memorable of their university experience. Continuing improvements to facilities and programs allow QUBS to provide increased opportunities in teaching and research to a greater number and diversity of users.



In Memoriam - George and Beatrice Hughson

As we prepared this annual report for 2002, two of our beloved neighbours and friends of the Queen's University Biological Station passed away, George Hughson on Saturday, 4 January 2003 and his wife Beatrice very soon after on Monday, 3 February 2003. George and Bea were instrumental in initiating the acquisition of land by the field station for teaching, research and conservation purposes. Their interest in preserving for perpetuity some of the lands originally accumulated by George's father, Melvin Hughson, led to the acquisition of the "New Land" by QUBS from the Hughsons in 1976. This initial acquisition set the stage for further property acquisitions which collectively form a significant landscape for the biological and environmental sciences and conservation in the area. Fittingly, some of the properties subsequently acquired were also once owned by the Hughson family.

George and Beatrice were always supportive of activities by QUBS users of the Hughson Tract. With the close association to the land that farmers have and many travels across it and diverse uses of the natural resources contained within it, George especially was a great source of historical information about the property, its features and past uses. Any contact with the Hughsons could easily lead to fascinating reminiscences of times past, sprinkled with names and dates from their collective memories. George always impressed everyone with his recollection of site-specific details especially with respect to boundaries, unique features, including mine sites, homesteads, sugar bushes etc. He was a natural storyteller, blending his special knowledge of the land and local history with humour and stories of colourful characters from the locality.

George and Beatrice were well-respected members of the local community. Both worked on a long list of volunteer projects. Even in poor health, Beatrice especially contributed valuable time and effort to numerous local initiatives, particularly those of the Chaffey's Lock Community Hall and the Chaffey's Lock and Area Historical Society.

George and Beatrice were, above all, consummate believers in the family. Regular visitors were soon adopted and welcomed as part of the family. George and Beatrice leave behind several generations of family members, among these their children Connie Banks (husband Charles), Wayne and wife Elaine, Donnie and wife Liz, Linda Reid (husband Mike)

and David. They also leave behind nine grandchildren and one great-grandchild. It must be incredibly difficult to lose both parents or grandparents in quick succession and heartfelt condolences, on behalf of the entire Queen's University community, the Biological Station and its users and those of us who considered them as friends and neighbours, are extended to the remaining Hughson family.

The "New Land" acquired from George and Bea has, until now, been known as the Hughson Tract. However, it is now proposed that this name be changed to the "Hughson Farm" to more clearly reflect the history of the property. It will long serve as a reminder of their lives and efforts. As a further reminder of their contributions, a fitting memorial monument with a plaque will be erected in their memory in consultation with the Hughson family.

MAJOR GIFTS

Baillie Family Chair in Conservation Biology

On Saturday, June 15, 2002, we were honoured to have Mr. and Mrs. Charles Baillie visit QUBS for an event to recognize their gift of an endowed Chair to Queen's. The name of the chair will be **The Baillie Family Chair in Conservation Biology** and it will be linked permanently with the Queen's University Biological Station (QUBS). The purpose of the Baillie family's generous gift is to strengthen research in conservation and biodiversity and to augment and reinforce teaching programs at the graduate and undergraduate levels in the Department of Biology. The gift reflects the Baillie family's keen interest in the natural world, the conservation of biodiversity, and their special passion for birds.

The day began with a walk on the Lindsay Lake Road, accompanied by Kathy Wynne-Edwards, Anne Godlewska, Lili Harriss, Jason Jones, Rachel Fraser, Matt Timpf, Floyd Connor and Raleigh Robertson. The Baillie's enthusiasm for birding and nature was hardly dampened by the steady rain on a very cool, wet morning. Sightings of a Black-billed Cuckoo in a frozen upright posture near the nest, a Golden-winged Warbler, and a male Cerulean Warbler, plus a female at the nest, helped to make the trip a memorable success. Frank then joined the group for a tour of the facilities at QUBS, assisted by a number of grad students explaining their research projects.

Bob Silverman, Dean, Faculty of Arts & Science, hosted a luncheon at QUBS, where we were joined by Mrs. Silverman, Peter Boag, Head of Biology, Laurene Ratcliffe, Lois Robertson, and a number of other biology faculty and students, as well as the QUBS "regulars". Dean Silverman spoke of the importance of this donation to Queen's, thanked the Baillies for this very generous gift, and presented them with a commemorative plaque. Raleigh Robertson also thanked the Baillies on behalf of the students and others who use QUBS (see text below). Charles Baillie then spoke and in explaining why the Chair was such a good "fit" for their family, he mentioned each of his children, their links to Queen's and their interest in Conservation Biology. He also mentioned Marilyn's involvement as an award-winning author of children's books. Finally, Peter Boag presented Raleigh with a plaque to commemorate his being named as the first holder of the Chair. Following lunch, we held a round-table discussion in which the grad students working at QUBS provided a synopsis of their research while the Baillies engaged them with very perceptive questions and observations.

With Mr. Charles Baillie having recently been named Chancellor of Queen's University, we at QUBS felt especially pleased to have Mr. and Mrs. Baillie visit the Station and to experience their strong interest in conservation and natural history. We look forward to future visits.



Charles and Marilyn Baillie address the celebration.



The Silvermans, Charles Baillie, and Chris Eckert



Peter Boag congratulates Raleigh.



Raleigh with his personal Baillie Chair plaque.

(All Baillie Chair Celebration photos © Bernard Clark, 2002.)

(Following is the text of remarks by Raleigh Robertson, in recognition of the Baillies' gift to Queen's.)

I want to thank the Baillie Family for the generous donation to endow the Baillie Family Chair in Conservation Biology. This represents an interest in Queen's and a commitment to Conservation biology that we all sincerely appreciate. As Dean Silverman has indicated, this endowed chair is extremely important to Queen's. But let me tell you, its proportional impact will be especially great for the Biology Station.

I also want to thank those people in the Faculty of Arts & Science, in Biology, and in the Advancement Office, for making the Chair in Conservation Biology a priority in the Campaign for Queen's. It's going to be a tremendously important asset for the Station, and I appreciate the confidence you've placed in our program by supporting this Chair.

I want to explain why this Chair is important to Queen's, to the Biology Department, to the Field Station, and to Conservation Biology.

The Chair is important to Queen's, to the Department and to QUBS for many reasons: (1) It will raise the profile of Conservation Biology in our programs and ensure that Queen's is a recognized leader in this field. (2) It will ensure that a Queen's professor will have a strong link to QUBS for both teaching and research - a professor who will develop programs at the Station - programs that will help realize the potential of our facilities and our land base. (3) It will help attract outstanding visitors to QUBS, as already demonstrated by our visiting Field Scientist, Dr.

David Jacobs. David, who is from the University of Cape Town in South Africa, gave a very stimulating and thought-provoking seminar on Conservation Biology on Wednesday evening. (4) But most importantly, I believe that the greatest significance of the Chair is that it will create opportunities for students.

Queen's is fortunate as a university in that we attract very high quality students - and much of what we, as a faculty and as a university, accomplish is through these students. We faculty provide some direction, some foundation, and for our research students some funding - but it is the energy, enthusiasm, tremendous motivation and intellect of the students that carries the work forward.

For its part, the Biological Station provides an excellent resource for teaching and conducting research in the diversity of disciplines in and related to Conservation Biology. The logistical support provided by our labs, by our equipment, by our knowledgeable staff, and by our diverse array of habitats on land owned by Queen's and hence controlled by the researcher, plus the interchange of ideas and support from fellow students and researchers, all contribute to the success of our programs.

What the Chair will accomplish is to draw on Queen's potential to attract high quality students, and to draw on the facilities and logistical support of the Field Station. By having a chair-holder who is committed to research and teaching through the Field Station, it will create opportunities for students to get involved, to learn, and to contribute in Conservation Biology. In turn, those students will go on to 'make a difference' in some aspect of Conservation Biology along whatever path their future takes.

The Chair is important for Conservation Biology because it will contribute to the knowledge base and the understanding of this important discipline. Conservation Biology, defined simply as the study and protection of biological diversity, is a very broad discipline - in fact it involves aspects of many disciplines - ecology, behaviour, population biology, evolutionary genetics, as well as economics, sociology and environmental policy, among others. In the broad sense it requires an interdisciplinary approach - a synthesis spanning the sciences and the humanities. In biological research, there are many valid approaches that contribute to Conservation Biology - at the single species level, the community level, and the landscape level. All of these are represented by work done here at Lake Opinicon. This is the science involved in developing the knowledge base needed to guide policy to protect biological diversity.

In environmental policy, our graduates become involved in the political & legislative process, in working on programs to achieve sustainable development, and in land-use programs for the preservation of habitats. On Friday morning, I heard an interview on CBC radio with Helen Howes. Helen is the Vice President for Sustainable Development at Ontario Power Generation. Helen took field courses at the Station while at Queen's as an undergraduate. Earlier this week I phoned Karen Brown, the Assistant Deputy Minister of the Environment, in charge of Environmental Conservation - Karen did graduate work on fish behaviour here at the Station with Dr. Keast back in the 1970's. Jennifer Harker, another of Dr. Keast's graduate students, is now a senior partner at Dillon Consulting. She is also on the National Board of Directors of the Canada Water Resource Association, the board that formulates national policy for water and ground water protection. Deb Turnbull, still another of Dr. Keast's students, is currently Vice President of the Canadian Manufacturers and Exporters Association. She is responsible for international aid and development, currently focusing on aid to Africa and the sponsorship of African interns and business partners. My point is, students who work at Opinicon go on into a great diversity of careers, not necessarily in biology, but many with the potential to make a large impact in Conservation Biology.

In the broadest sense, much of what we do is to help develop an attitude - a kind of attitude that has its origins in Aldo Leopold's "land ethic". In this sense, Conservation Biology is not just an 'academic exercise', but a way of living, and of relating to the natural world. Students, whether continuing in professional biology, or embarking on any of the broad array of careers or life's work that our students follow, need to understand, and develop an 'attitude' that reflects that understanding of Conservation Biology.

Endowing the Baillie Family Chair in Conservation Biology is a very far-sighted gift that will make an important difference in all of these areas, both now and continuing through the long-term future. It's hard to imagine what QUBS, or Queen's, or Canada will be like in 25 or 50 years, not to mention 100 or 500 years. Whatever they are like, it's equally hard to imagine that Conservation Biology in some form will not be an integral part of the learning, the social and the political environment. Citizens of today, and in the future, need to understand the concepts of conservation biology. The Baillie Family Chair will help Queen's, through QUBS, contribute to that understanding and through our students, to put that understanding into practice.

The Alexander and Cora Munn Summer Research Award

Thanks to a generous gift from Alexander and Cora Munn, an endowed fund was established in 2001 to provide awards to third-or fourth-year undergraduate students of Conservation Biology in full-time summer positions in a research environment at QUBS. The award is for students who aspire to pursue studies in conservation biology and environmental preservation. Preference will be given to students with an interest in woodlot management and wildlife conservation. Applications will be made to the Head of the Department of Biology. It is anticipated that the first award will be made in 2003.

We extend our gratitude to Mr. and Mrs. Munn for this very far-sighted gift. It will help provide valuable experience for future conservation biologists for the very long-term future.

Massassaugua Property

In December of 2002, a second parcel of property along the Massassaugua Road became the property of Queen's. To date, some 193 hectares (478 acres) in total has been gifted to the university and the field station through the generosity of an anonymous donor. In December of 2001, a first parcel comprising some 29 hectares (72 acres) was donated (part A on the map, p 9). In 2002, a second parcel, some 164 hectares (406 acres) in extent (Part B on the map p. 9), was donated.

Together, the property represents a mixture of habitat, ranging from farm fields surrounding a house (which burned beyond repair in late 2001 and was razed) and barns in the north, to shoreline surrounding Connells Lake in the southeastern section, to mixed forest and wetland in the south. The Massassaugua Road and Taggart's Lane cross the northern section of the property.

The southern part of the property falls within the Hamilton Lake Area of Natural and Scientific Interest (ANSI) (cf. D.J. White. 1993. Life Science Areas of Natural and Scientific Interest in Site District 6-10. Ontario Ministry of Natural Resources, Kemptville, Ontario 122 pp. [OFER SR9401]). The southern edge of the property lies very near the northern edge of the Bonwill Tract, and immediately above it.



Exploration and GPS mapping of Connells Lake.



Old Bedford Mills Road through Massassaigua tract.

These interesting and diverse habitats, which border the old Bedford Mills Road that passes through the Bonwill tract to the south, promise to contribute new opportunities for field studies in the future. An application to have the land certified as ecologically sensitive has been submitted to Environment Canada, to enable this donation to proceed in the Eco-gifts program.

Queen's Land Trust

This land trust was established in 2001. The intention is to ensure that lands owned by QUBS can be adequately managed, and that additional lands can be acquired for conservation purposes and research and teaching.

The land trust is to be an endowed fund, with income from the fund used for operational costs related to land management, or for purchase of properties of strategic importance to QUBS and its endeavours. Recognizing that there is strong interest among supporters of Queen's to assist with both education and conservation, the Queen's Land Trust provides a mechanism whereby these goals may be achieved.

The goal is to have an endowed fund of at least \$1,000,000 generating an annual income of \$50,000 or more. Mrs. Hilda Pangman was the first contributor to the trust, kick-starting the fundraising with gifts totaling \$75,000. Currently, the fund stands at \$110,000. The fund is off to a good start. The endowment will help to ensure the integrity of the substantial landholdings of QUBS, the landbase that provides such an important resource for field studies and conservation biology. Over time, QUBS landholdings will become increasingly important for these purposes as development continues apace in the Toronto-Montreal Corridor in southern Canada.

Dr. Allen Keast

Through some 40 years of association with QUBS, Dr. Allen Keast has become widely known for his community studies of fish and birds. Still active in the QUBS community and in compilation of his years of research, he regularly contributes to the field station through annual donations. This support is very welcome and has assisted QUBS through times of fiscal restraint in university budgets. Among his gifts to QUBS in 2002 is a 21" computer monitor, which will enter service with the GPS/GIS projects in 2003. For all these generous contributions we extend a heartfelt "thank you" to Allen!

The William C. Brown Research Endowment Fund

This fund was established in February 2003 through a bequest from the estate of William C. Brown, B.A.(Queen's) 1930. Annual investment income from the fund is to be used by the Queen's University Biological Station for research in the environment. This gift will allow the QUBS to build on existing strength by supporting research in ecology and conservation biology. Funds may be used for research programs, facilities or equipment at QUBS, for QUBS-based research activities of the Director of QUBS, and for teaching purposes at QUBS that have a research component.

We at QUBS are very grateful to Bill Brown for having included the Station in his will and for his commitment to studies in environmental biology and conservation. We are also grateful to Dale Canfield, the executor of Mr. Brown's estate, for his assistance in establishing this endowed fund. We have enjoyed several visits to Queen's and to QUBS by Dale and Nan Canfield; they often bring a tin of ginger cookies made by Nan following the recipe of Mary Brown. The Canfields also gave to QUBS several interesting books that had belonged to Bill and Mary Brown, as well as an old Queen's pennant from Bill's days as an undergrad in the late 20's.

While we did not have the pleasure of knowing Bill and Mary Brown, it gives us great pleasure to see their legacy continue through the income of their generous bequest, and the stewardship of the Canfields.

Michael Runtz Donations

Mike Runtz is a renowned naturalist, photographer and educator. Many have seen his photographs or participated in his owl hoots of wolf howls. His natural history course at Carleton University is well-attended and raved about by students.

Over the past few years, QUBS staff have worked with Mike to have him offer guest lectures and seminars and to obtain from him some of his remarkable photographs. At present, five of his photographs adorn the walls of the dining hall in the Operations Centre.

In 2002, Mike participated as a guest lecturer and field trip leader during the winter ecology course at QUBS. Mike took his honorarium and purchased some reference books for use at QUBS. These will be of great interest and much used by QUBS regulars. Thank you, Mike.



Michael Runtz (centre) with winter ecology class.



Michael makes a point to the winter ecology class.

Jessie Deslauriers Donation

Jessie is one of our longtime and venerable supporters of the field station. She is well-known for her interest in all things dealing with natural history and conveys this at any opportunity especially to readers through her columns in the local newspapers. In 2002, Jessie donated a number of reference books on natural history to QUBS. These are a valuable contribution to the QUBS library. Thank you, Jessie.

Estate Planning

It is very gratifying to know that some of our alumni have included QUBS in their will to create an endowment for a named bursary to provide board and room for students conducting field research at the Opinicon. Such a program will benefit numerous students over the very long-term future. It will also benefit the Station in general by allowing it to host research students that might not otherwise have opportunities to work there. Once the award is established, it will raise the profile of both QUBS and field biology by having a named award (bursary) that will be announced to students. Finally, it will be meaningful and lasting tribute to the donor. The continuing support of our friends and alumni is very important for our programs. Including QUBS in estate planning is a good way to ensure that the quality of experiences we cherish from our own QUBS involvement will be available for future generations of field biologists.

The Campaign for Queen's

In working with Lili Harriss, Ed Pearce and others in the Development Office on the Campaign for Queen's we have been very successful in funding the Queen's University Biological Station. We hope to move forward on reaching our goal for our other priority project, the Queen's Land Trust. This trust offers an ideal way to support Conservation Biology, education, Queen's and QUBS. Anyone wanting more information, or to make a donation, is encouraged to call the Development Office in the Faculty of Arts and Science at (613) 533-6000, extension 77901 and speak to Faculty Project Assistant Myrna Horton.

NSERC & Other Support

NSERC MFA Grant

In September of 2002, QUBS applied for a Major Facilities Access Grant (MFA) from NSERC (Natural Sciences and Engineering Research Council). In April 2003, it was announced that our application was successful. The new three-year grant comes with a 28% increase over the previous grant - a very good showing in the face of stiff competition for grant dollars.

The grant pays the salary and benefits of QUBS Assistant Manager (Floyd Connor) and half of the Maintenance Assistant (Roger Green) salary and benefits. Under the new grant, Roger's contract was extended to nine months from six months. The grant also contributes to the costs of shared services (primarily electricity) at QUBS.

2002 was the 19th year that QUBS has received this grant (or its precursor, the Infrastructure Grant) from NSERC. This success is an acknowledgement of the productivity and

excellence of the facility and its multi-university approach to research and training. The presence of users from many universities is enabled by this grant. The atmosphere thereby created leads to vigorous interaction among users which ultimately benefits all users and challenges them in terms of innovation of approach, quality of research and application of competing theories to their work.

Summer Work Experience Program (SWEP)

In 2002, one project consisting of two student positions was made available to QUBS under this program. SWEP is designed to create “on-campus summer jobs for Queen’s undergraduate students that will provide them with valuable career-related and/or academic experience”. It is available to students that will be returning to Queen’s for a full academic year of studies after holding the SWEP position.

The 2002 project was “SWEP 104: GPS and GIS for Biological Field Studies and Land Surveying”, under the supervision of Floyd Connor. The Biological Station provided in-kind support for the project (room and board for the two recipients). The positions were awarded to John Cunningham, in his third year of a B.Sc. honours program in Biology, and Julia Nicholson, just finishing her B.Sc. honours and preparing to begin her B.Ed. at Queen’s in September of 2002. Both students worked enthusiastically, capably, and very productively at a great variety of tasks for QUBS and for many of our resident researchers. They brought a wide variety of skills and experience to the positions. Their activities are summarized under the “GPS/GIS” section of this report.

Thanks to both Julia and John for jobs well done!



John Cunningham and Julia Nicholson with backpack GPS (MC-V) at QUBS.

The SWEP program also supported a number of other students working at QUBS on various research projects, providing valuable experience to the students and essential help to researchers.

CFI Grant to Smol and Cumming

Drs. John Smol and Brian Cumming of Queen's University have obtained funding from the Canada Foundation for Innovation (CFI) for the construction of an equipment storage building at QUBS. Others have expressed an interest in using a portion of this to store their own equipment, and as this report goes to press Drs. Peter Hodson (Environmental Studies) and Peter Boag (Biology) have agreed to contribute funds which will enable the construction of a larger and more versatile building. QUBS is contributing in-kind to the building by using staff time and some Biological Station tools and machinery in the process.

In November and December of 2002, a portion of a pine plantation behind the QUBS main workshop was cleared by QUBS staff. The trees in this area were almost all dead, having been badly damaged by "Ice Storm '98". After most of the wood was removed, Bob Smith of Lyndhurst pulled the stumps and French's Trucking of Crosby leveled the site and prepared a crushed-limestone pad to support a concrete slab. Terry French also prepared short access roads in to the site from the workshop and parking lot.

In February of 2003, a contract was signed with Lawson Building Services Ltd. of Elgin, to pour a concrete slab and build on this site a 32' x 60' frame building with steel siding and roofing, four vehicle doors, and additional storage space in the attic. Construction is slated to begin "on or before spring 2003" and to be completed by mid-summer 2003.



Cutting the spars and deadfall.



Terry French leveling the site with his "high hoe".

Scholarships and Bursaries

Wes and Dorletta Curran Scholarship

The Curran Scholarship was established in memory of the founding director of QUBS, Dr. Wes Curran and his wife, Dorletta. The award is given to an undergraduate at Queen's who

is working at the Biological Station. Projects on aquatic habitats and species are given priority in the selection process.

In 2002, this scholarship was awarded to Sally Ahn, who worked under Dr. Bob Montgomerie (Queen's – Biology) and with Dr. Albrecht Schulte-Hostedde on sperm competition in Northern Water Snakes, Walleye, and sunfish.



Sally treats a Black-capped Chickadee on Amherst Island, and feeds a Southern Flying Squirrel at Stirling and Elva Danby's house during Raleigh Robertson's winter ecology course, February 2002.

Pearl E. Williams and Llewellyn Hillis Fund

This fund, established in 1991 by Llewellyn Hillis (Arts '52) to honour her parents, is to promote the careers and scholarship of women scientists, especially biologists, at all stages of their professional development, and secondly to promote performances by artists who are women. Having studied at QUBS as an undergrad, Llewellyn also hoped this fund would promote involvement by women in programs - both scientific and artistic – at QUBS. Recipients of this award in 2002 are listed below along with brief descriptions of their programs to which the award funds were applied.

Fiona A. Reid – Visiting biologist, visual artist, and author

Fiona Reid obtained a Master of Arts degree from the State University of New York at Stony Brook for her study on "Aspects of Variation in the Song of Redwinged Blackbirds", then a second M.A. degree from King's College, Cambridge University, England. She also studied Natural History Illustration at the Parsons College of Arts and Design in New York. In 1988 she taught a Scientific Illustration Class as an adjunct professor at St. Lawrence University in New York. In 1989 and 1990, she was at the Universidad Nacional Autonoma in Heredia, Costa Rica, doing small-mammal surveys as an assistant professor for field studies.

In recent years, she has continued to develop a strong interest in and focus on mammals in general and bats in particular. She has done research and writing on, and illustrating of, bats of North, Central, and South America, as well as those of Papua-New Guinea. She has illustrated a field guide to the bats of the world. More generally, she has written and illustrated an excellent and widely-used "Field Guide to the Mammals of Central America and Southeast Mexico" (Oxford University Press, 1997), illustrated a key to trees in Villa Mills, Costa Rica and co-authored a book on giant sea creatures. Her web page, illustrated with some of her original art, is at <http://www.hopscotch.ca/fionareid/>.

Fiona is a Departmental Associate, Centre for Biodiversity and Conservation Biology, at the Royal Ontario Museum in Toronto and since 1988 has been a staff naturalist and natural history tour director with Questers Tours and Travel. In the summer of 2002, she was in the latter stages of writing and illustrating the new edition of the Field Guide to the Mammals of North America, in the Peterson Field Guide Series. In late May and early June, she was in Arizona giving a Bat Conservation International workshop and then presented a bat talk in Arkansas before returning home to Ontario. In late July and early August she taught another bat workshop, this time in Belize, and returned to Ontario on 6 August.

It was “fresh” from this workshop that she took up her Williams and Hillis scholarship at QUBS on 11 August 2002, arriving with her daughter Holly (7 years) and son Ian (5 years) and a young family friend from France as baby-sitter (Aline, 14 years). Almost immediately, Fiona was presented with the object of one her artistic quests, a live Eastern Small-footed Bat captured by John Ratcliffe, a student of Dr. M. Brock Fenton. Fiona sketched the bat in remarkably short order, and then released it alive and healthy at its cave of origin. As the week progressed, she was able to proceed with the intermediate and final stages of her colour illustration of this species. In addition to interacting with QUBS residents on a daily basis, on Monday evening (12 August) she also gave a superbly-illustrated slide show and talk (open to QUBS residents, “Friends of Opinicon”, and others) on “Mammals of Central America”. On Wednesday (14 August) she presented a workshop entitled “The Making of a Field Guide: How color plates take shape, issues with publication and production of a field guide”. Participants gathered for lunch, and were then treated to a show of Fiona’s art in various stages of completion prepared for two of her books, “A Field Guide to the Mammals of Central America and Southeast Mexico”(Oxford University Press, 1997) and the Peterson Guide to the Mammals of North America (in prep.). She also discussed various aspects of the development of a field guide, using her art to illustrate the points she made. After dinner that evening, she presented a talk entitled “Bats of Costa Rica: Diversity and conservation” and illustrated it with slides of remarkable content, beauty, and quality. Art work and family activities, combined with interactions with other QUBS residents, occupied the rest of the week. Fiona and crew were picked up by her husband (Mark Engstrom of the Royal Ontario Museum) on the weekend and they proceeded from QUBS to watch whales (which are one of Mark’s specialties) in Quebec.

In January of 2003, the art legacy which Fiona had agreed to contribute as part of her Williams and Hillis Fund program arrived (carefully wrapped) in the mail. QUBS management and staff are totally delighted and excited with the beauty of the four 9” x 12” colour prints illustrating many of the small mammals to be found at the Biological Station. All of them are copies of Fiona Reid originals, and the Eastern Small-Footed Bat was painted here at the Biological Station. They have now been very tastefully matted, mounted behind UV-filtering glass, framed and hung in the dining room of the QUBS Operations Centre. They do look good!



Eastern Small-footed Bat (*Myotis leibii*). (©Fiona A. Reid. Original painted at QUBS, August 2002)

Rachel Fraser – “Examining the genetic architecture of a newly formed hybrid zone between Blue-winged and Golden-winged Warblers.” – Ph.D. thesis

My award from the Pearl E. Williams and Llewellyn Hillis Fund was used to pay for field assistance associated with my research at QUBS. Specifically, funds were used to pay a portion of Kevin Fraser’s salary during May 2002. Kevin is a proficient nest finder and his skills were much appreciated during the height of nest building. Finding nests enabled me to increase my sample size of tissue samples collected from Golden-winged Warbler families. All samples are currently being used in paternity analyses and form an integral part of my thesis that is addressing mate-choice decisions in this species. These data will ultimately be used to examine the effect of hybridization between Blue-winged and Golden-winged Warblers. I was able effectively to gather data from over ten sites on various properties owned by QUBS, and this would not have been possible without Kevin’s assistance. I am very grateful for having received support from the Pearl E. Williams and Llewellyn Hillis Fund.

Tammy Steeves – “Mechanisms of population differentiation and speciation in a pantropical seabird species complex: the masked boobies.” – Ph.D. thesis

I used the monetary award that I received in 2002 from the Pearl E. Williams and Llewellyn Hillis Fund to help defray the cost of my research field trip to San Benedicto Island, Mexico. The primary purpose of the trip was to collect DNA samples from masked boobies for my research on mechanisms of population differentiation and speciation in pantropical seabirds. The secondary purpose was to explore a collaborative post-doctoral research project on wedge-tailed shearwater conservation genetics with the Island Conservation Ecology Group.

I am happy to report that my trip was a great success. In addition to collecting the masked booby samples necessary for my thesis, I was also able to collect wedge-tailed shearwater samples. And I made a number of important international contacts for future research.

In my application letter, I stated that “it is my understanding that the Williams/Hillis Fund was established “to promote the careers and scholarship of woman scientists, especially biologists, at all stage of professional development...” And it is my belief that I could use the funds available to further my own career as a conservation biologist.”

I am pleased to say that I still believe every word: I feel the funds I received did that.



Golden-winged Warbler, QUBS 2000.
Photo © Raleigh J. Robertson



Masked Booby, Johnston Atoll, Pacific Ocean.
Photo © Lindsey Hayes

QUBS Outreach Programs

Visiting Scientist

Dr. David Jacobs (Department of Zoology, University of Cape Town, South Africa) came to QUBS as our Visiting Scientist in 2002.

David received his B.Sc. from University of Capetown and his Ph.D. from University of Hawaii, his Doctoral research focussing on character release in the endangered Hawaiian Hoary Bat, *Lasiurus cinereus semotus*. David is currently a senior lecturer at the University of Cape Town, and is well-known to Dr. M. Brock Fenton and Dr. James Fullard through his collaborative work on bats and their interaction with prey species (moths). During his time at QUBS, David had the opportunity to engage in some of this collaborative work on Canadian bat species.

During his visit to QUBS, David interacted with QUBS users and engaged in discussions of research activities and approaches on a wide variety of topics. David also presented a seminar on his current research work. A second seminar on issues in African Conservation work was thought-provoking and sparked considerable discussion among QUBS regulars.

Support for the Visiting Scientist Program in 2002 was provided through the Principal's Development Fund at Queen's (Category 4 - International Visitor's Program). This program provided \$2,000.00 toward Dr. Jacob's visit and stay at QUBS. Further funds were provided by Dr. James Fullard to assist with the collaborative work described above.

Seminars

The seminar series was, as always, interesting and enjoyable. The full list of speakers and topics for 2002 appears later in this report (pp. 64 & 65).

Early on in the program, seminars were largely focussed on the research activities of QUBS regulars. As the summer progressed, topics shifted to include a wider audience and neighbours, visitors and the Friends of Opinicon were encouraged to attend. The seminar room was always full, sometimes standing room only, a testament to the quality and appeal of the program. Judging by the intensity of discussion after seminars, the program stimulates interaction and exchange of ideas among various user groups of QUBS.

Suggestions for speakers and topics are always welcome.

Open House

The annual Open House was held June 30 in 2002. Approximately 450 visitors attended to get a glimpse of the field station and current research projects. Another successful day, thanks in large part to QUBS regulars who become ambassadors of the field station and work hard to present interesting displays and answer questions from the public. Meaningful contact with the public at large is an important part of a field station and increasingly a significant role of biologists, managers, scientists and conservationists. This annual venue works both from the perspective of the interested member of the public in being able to ask questions and gain pertinent information on biological topics as well as from the perspective of our developing researchers and educators in presenting information in an interesting, informative manner without all the jargon often associated with the sciences. The Open House is a vital part of QUBS outreach efforts. Thank you to all who attended and to the regulars who make the day possible.

The 2002 version of the QUBS Community Newsletter was distributed to some 1,050 households and cottages in the Chaffey's Lock, Elgin and Perth Road area. This annual circular serves the same purpose at the Open House, maintaining contact with activities at QUBS and providing outreach to those unable to attend the Open House itself.

Both of these initiatives are very important to the continuing success of the field station. Close and friendly contact with neighbours enables many projects, especially when research activities extend beyond QUBS landholdings. Without the support of the local community, opportunities at QUBS would become much more restricted.

Friends of Opinicon

Activities for this group of interested neighbours was limited in 2002. A couple of casual natural history walks were arranged, though fewer than in previous years. This is not due to lack of interest on the part of the group, rather the incredibly full schedule of QUBS staff. Many Friends attended the seminar series in late summer. Thank you to those who helped plan the topics and speakers and to those who helped spread the word through the local community.

QUBS Logistical Support

GPS/GIS

The Global Positioning System (GPS) rover units and Geographical Information System (GIS) software and computers at QUBS remained essentially unchanged from 2001, throughout the 2002 season. They continue to be widely used in individual research projects, and in mapping and displaying spatial data in the accumulating QUBS database.

In early summer, the rechargeable and the backup batteries of the MC-V were again found to be dead. Some of the wires from the batteries were found to have melted their insulation and to have nearly melted through the plastic back of the rover unit. Because commercial repair of this unit was predicted to take two weeks or more, Floyd bought replacement batteries from "National Battery" in Kingston and soldered them into an old back that had been removed about 6 years before. It worked! Similarly, a faulty terminal on the 9-pin rover end of the incredibly expensive three-way cable that connects the MC-V, the ProXL, and the ProBeacon components of the two-antenna backpack GPS was quickly and cheaply repaired by Linden AudioTronics in Kingston. It was also discovered that the terminal of the co-axial cable running to the GPS antenna was broken off; this was quickly repaired by CANSEL.

Other minor GPS expenses included a letter stamp set for marking aluminum survey markers, and some ring binders for print-outs of various GPS and GIS files.

One potentially significant piece of hardware was added to the TSC1 rover in early autumn. A newly-available cable adapter (TSC1 DB9 Conversion Kit #910-2000) was purchased from CANSEL and attached to the rover, allowing the very expensive and fault-prone original data cable to be replaced by a simple DB9 computer cable. The expectation is that if and when the TSC1 once again develops "cable problems", simply replacing this inexpensive cable with a new one readily available from any computer store should solve the problem.

From May through August, much of the GPS/GIS program was conducted by SWEP students Julia Nicholson and John Cunningham (see "Summer Work Experience Program" elsewhere in this report). John and Julia kept track of GPS equipment, did field work and trained

others to do it, prepared a display for the annual Open House, and worked with data files in the GIS. Their combined report, wherever possible in their own words, is summarized below.

“During the summer of 2002, we undertook mapping of Queen’s Properties to locate and identify survey markers and property tract boundaries. Our team was able to find all existing property boundary markers from the original survey records of the Bonwill Tract and Watson property, and many from the Hughson Tract. A new identification system was developed to mark the property corners, using letter-punched codes on newly-placed aluminum Queen’s stakes. The UTM co-ordinates of these stakes were recorded using the GPS equipment, and added to the QUBS GIS to assist future users in navigating to the original markers using the “Navigate” function of the GPS rovers. We also began searching for original survey markers on the Krahll property; this project is ongoing. Another major project involved consultation and co-operation with Skycroft management to build a detailed GPS/GIS record of the landscape within the Skycroft and Rideau Trail network. The Skycroft campgrounds, both those already in use and those facilities under development, were also mapped for use by QUBS researchers. We mapped several feature categories of these and other QUBS properties, including swamps, ponds, button bush swamps, creeks, beaver dams, fields, plantations, roads and trails. Combined with the existing QUBS GIS data base, much of this information was used in ArcView 3.2 to create a “Quick Map” system for easy production of access maps for selected areas. Over the course of the summer, we completed a detailed GIS map of the immediate Queen’s Point grounds, including forest and lawn, building footprints, buried water lines and hydro lines, sewage lines, and trails. We vetted and reorganized the GIS computer files to make them more accessible, and wrote GIS/GPS “User Help Files”.

In addition to the general QUBS support outlined above, we provided assistance in several research projects. We helped individual researchers use GPS and GIS technology to study Black Capped Chickadees, Black and White Warblers, Cerulean Warblers, Eastern Kingbirds, American Redstarts, Golden-winged Warblers and Tree Swallows. We also mapped the shorelines of Huffman and Hughson Islands at the request of the Bass research crew.”

QUBS Properties

QUBS properties serve many functions beyond simply providing a site for field studies. The conservation value of these properties is significant, especially in the ever-developing landscape along the Montreal-Toronto corridor. The special nature of the locality has been recognized by UNESCO. In 2002, the Thousand Islands - Frontenac Arch Biosphere Reserve was approved by the United Nations Educational, Scientific and Cultural Organization. This reserve covers an area of some 150,000 hectares, forming a rough triangle between Brockville, Gananoque and Westport (see map on p. 20). QUBS properties fall within the northern apex of the triangle. The reserve will focus efforts for mutually supportive conservation and sustainable economic development. Congratulations to the team who put forward the nomination and designation documents, notably David Warner and Carol Clemenhagen.

QUBS properties now encompass some 2,263 hectares (5,590 acres), a substantial landholding by any measure. A map of QUBS landholdings is included in this report, for reference (p. 8). The boundaries shown on the map are approximate and subject to verification, a process that is underway as we develop our Geographic Information Systems database (see “GIS Mapping”, p. 21 and “GPS/GIS” p.18).

For records-keeping purposes, this section of the Annual Report will list uses of properties, management activities and changes pertinent to specific areas. Entries will be made corresponding to particular tracts of land.

GIS Mapping

Work continues on the development of a Geographic Information System for QUBS.

Data collected using Global Positioning System equipment are continually being added to the database. Mapping of physical features of QUBS properties (trails, roads, shorelines, habitat margins and conspicuous features) continues.

Although it is a time-intensive, iterative process, we are beginning to reconcile survey and metes and bounds descriptions of properties with on-site GPS data. Over time, a fully functional GIS will develop. This database will enable an overall management plan for QUBS properties.

Hughson Tract

The Hughson Tract was used for studies of Tree Swallows, Eastern Bluebirds, Golden-winged Warblers, American Redstarts, Eastern Kingbirds, damselflies, dragonflies, water mites, moths, Black Rat Snakes, Columbine, architecture of the forest understory and the possible effects of bismuth on vegetation in 2002.

The various bird box grids were used intensively by Dr. Raleigh Robertson and his students in work on cavity-nesting birds (Tree Swallows and Eastern Bluebirds).

Rotation plots in the Lane Sargent Field used by Dr. Aarssen and his students for plant work were roto-tilled on 15 October. The western-most 25m x 100 m plot in the Lane Sargent Field and the unfenced plot in the New Barn Field received two passes of the equipment, while the fenced plot in the New Barn Field received three passes.

Haying of the open fields was done by Bob Butterill in 2002. In late summer, field edges were bush-hogged and fallen branches removed using our own equipment. The regenerating edge plots established originally by Tim Demmons were restaked (Rachel and Kevin Fraser) using pressure-treated stakes and were left unmowed once again.

In fall, metal posts were installed at the field openings. The intent was to distinctively mark entrances to Queen's property and at the same time indicate that general access is restricted. A piece of galvanized chain was welded to one post at each gate and looped over a welded bracket of the opposite post. Red octagons with reflective markers were attached to the middle of each chain as a safety warning. In mid-November, four of these chains were stolen; these will have to be replaced.

In fall, George Bracken was engaged to re-establish the southwestern corner of the Watson property. For whatever reason, the original survey marker had gone missing. Now, we will be able to clearly establish the sections of the Chapman Field which belong to the Watson property and the section which forms part of the Queen's holdings.

Bonwill Tract

In 2002, The Bonwill Tract was used for studies of Cerulean Warblers, Golden-winged Warblers, American Redstarts, Eastern Kingbirds, damselflies, water mites, moths, Black Rat Snakes, Columbine and architecture of the forest understory. The Ontario Ministry of Natural Resources (Eric Boysen - Kemptville) maintains several Growth and Yield Plots flanking the

Bedford Road. Forest Bird Inventory plots are located within the Bonwill Tract, north and east of the Wire Fence Field.

Haying of the open fields was done by Bob Butterill. In late summer, field edges were bush-hogged and fallen branches removed using our own equipment. The regenerating edge plots established originally by Tim Demmons were re-staked (Rachel and Kevin Fraser) using pressure-treated stakes and were left unmowed once again.

Metal gate posts and chains were installed, as for the Hughson Tract.

The Bonwill Tract (and the Forsyth property exclusion) was the focus of intensive mapping of property boundaries during 2002 (SWEP students John Cunningham and Julia Nicholson).

John M. Cape-Charles Sauriol Environmental Studies Area

The Cape-Sauriol Tract was used for studies of damselflies, water mites, Largemouth Bass, sunfish, bats and Black Rat Snakes in 2002.

The mine sites and the associated roadways and settlements were the focus of fall trips by QUBS users, Chaffey's Lock and Area Heritage Society members and by a family reunion of the Davidson clan. Bryce Davidson was one of the original settlers of the area. His descendants gathered at Chaffey's for the reunion organized by neighbours Brad and Mary Johnson. A field trip to Lake Opinicon village and across the lake (via the QUBS "Rappinicon" pontoon boat) to the mine sites was a highlight of the gathering.



Raleigh with John M. Cape's grandsons, Tim and Mike Usher-Jones, on a winter outing to the Cape-Sauriol Tract of QUBS.

Hilda and John B. Pangman Conservation Reserve

In 2002, the Pangman Reserve was used for studies of Cerulean Warblers, Golden-winged Warblers, Eastern Bluebirds, Black-capped Chickadees, American Redstarts, Tree Swallows, Eastern Kingbirds, Black Rat Snakes, damselflies, water mites, moths, Wild Columbine, Largemouth Bass, Northern Pike, and sunfish.

Warner Lake and Long Lake are used for study on Largemouth Bass populations. Frank Phelan, Dr. David Philipp and students have individually PIT-tagged most of the male bass in the lakes and are conducting a multi-year study of bass populations. The lakes have been posted as research lakes and closed to fishing. In Lindsay Lake, a similar study has been started on Northern Pike.

The outpost cabin on Long Lake greatly facilitates lake work.

The Lindsay Lake Road continues to be a popular place for nature walks with various groups.

Bracken Tract

The Bracken Tract was used for studies of Tree Swallows, Eastern Bluebirds, American Goldfinch and light intensity in forests which might affect the spatial organization of plant communities in 2002.

In fall, the property was intensively used by students in Geology 221 (Geological Field Methods). Doug Archibald had the students lay out baselines and pickets and, working in groups, paced and compassed on perpendicular lines. The purpose of the field work was to determine the stratigraphy of the surficial sediments (lacustrine clay and/or sand over till in most places) on the property by sampling at 50m intervals using soil augers. In addition, a magnetometer survey was done on the two baselines to determine the location of the buried contact between the gneiss and the very magnetic gabbro that hosts the magnetite. This work is of interest since the area used to be home to a very successful iron (magnetite) mine.

In early summer, Maurice and Wayne Hutchings helped us erect a barbed wire fence around the Arsenault property, both to keep cattle out and to delineate the boundary between this property and Queen's holdings.

Maurice Hutchings is permitted to graze cattle on this tract. In exchange, Maurice keeps an eye on the property. In fall, some of the field margins were bushhogged to redefine the field edges.

Moores Tract

In 2002, the Moores Tract was used in studies of Black-capped Chickadees, Black and White Warblers, Black Rat Snakes and water mites.

Crabbe Property

During 2002, forays were made to the "Bird Box" and property to keep the grass cut and to check on security.

Massassaugua Property

During 2002, some initial forays were made into the property to become familiar with the potential of this newest parcel.

Animal Care, Safety and Training

Animal Care

Since November of 2001, QUBS has had in place a specific policy on animal care which meshes activities at the field station with University Animal Care Committee (UACC) protocols and approvals. All QUBS users must adhere to the QUBS policy guidelines (cf.

<http://biology.queensu.ca/~qubs/AnimalCare.pdf>).

As ethical field researchers and educators, animal care issues should be of paramount importance and concern for the animals which are the subject of field and lab activities should be foremost in any study.

Dr. Peter Autenreid (University Veterinarian and Director of University Animal Care) came to QUBS on May 22, 2002 to tour the station facilities and to present an information and training session on animal care to QUBS regulars. The session enabled discussion on policies and procedures, ethics and practical matters surrounding field study of animals. The session was attended by 30 QUBS regulars.

Dr. Bonnie Beresford has recently replaced Dr. Autenreid as Director of University Animal Care. We look forward to working with her. Contact information (address, telephone and Fax numbers) is the same as outlined for Dr. Autenreid in the policy guidelines. She can be reached by e-mail at beresfor@post.queensu.ca. UACC info can also be accessed/delivered at UACC@post.queensu.ca.

Principal Investigators should be aware that the Canadian Council on Animal Care is proposing the adoption of a new set of guidelines governing the Care and Use of Wildlife. This document is far-reaching in its implications. PI's should acquaint themselves with the content and implications of this document.

Field Safety Policy

Queen's University has developed a comprehensive field safety policy as well as guidelines for safety in field research. QUBS users are expected to fully adhere to the principles and guidelines established. The policy document is available at

<http://www.safety.queensu.ca/safety/policy/fieldpol.htm>.

During his visit on May 22, 2002, Dr. Autenreid introduced the topic of field safety and Frank Phelan, Manager of QUBS led a discussion of field safety considerations during research activities at the field station. The need for careful planning, anticipation of hazards and effective response to emergencies was discussed. Each lab group was encouraged to develop a tailored strategy whereby specific risks were assessed, procedures developed to minimize identified risks and procedures for dealing with worst-case scenarios established. Basic considerations should include information transfer between members of a team (whereabouts and expected times of return) and use of a buddy system whenever possible. Most labs started a frank discussion of risks and discussed positive approaches to dealing with recognized risks. Principal investigators could use the field research safety planning record as a guide to developing a group-specific awareness and approach to field safety

(cf. <http://www.safety.queensu.ca/safety/policy/field/app2.pdf>).

Watercraft Safety

With legislation mandating training and proof of operator competency coming into effect in September of 2002, there was great interest among motorboat users of QUBS and biologists in general about local courses leading to certification. Accordingly, Frank arranged two courses. The first was held March 9, 2002 at Queen's. The second was held at QUBS June 25, 2002. The Instructor was George Hiles (Tel 613-453-5253) of Lakeland Safe Boating (lakeland@safeboating.ca). During these two sessions, 50 biologists obtained proof of competency and their Pleasure Craft Operator Card.

As of September, 2002, QUBS is requiring proof of competency before permitting station motorboats to be used. Thus, QUBS users should plan ahead and obtain proof of competency before the research season. A good place to start looking for information is the Canadian Coast Guard (<http://www.ccg-gcc.gc.ca/>) for information. If there was sufficient interest shown, we could again arrange an on-site training course which would provide certification upon successful completion.

ATV Safety

All-terrain vehicles are seeing much more use as research tools at QUBS. Recognizing that these are expensive and potentially dangerous tools, we have instituted an awareness and training program for ATV users. The QUBS program uses the training manual developed by the 4-H Club. All users of ATV's at QUBS must take the training course and pass a competency test. With most QUBS users receiving the training in 2001, only a few field assistants were tested in 2002.

Drinking Water Safety

In the aftermath of Walkerton, new regulations concerning the operation of drinking water systems have been put into place. At QUBS, since we have a common source of water for multiple users and since the station is a university facility, stringent new regulations and procedures have come into effect. This is, of course, a fundamental safety issue. Considerable time, effort and money has been invested in bringing QUBS into compliance with the new legislation.

QUBS is considered a small water works and a designated facility under Regulation 505/01 (Gazetted January 5, 2002). As such, a series of safeguards have been mandated and we have worked hard to comply with all of the provisions of the Act.

A consultant's report on the current state of drinking water protection and plans for compliance was due on March 18, 2002. Accordingly, John Bishop of McIntosh Perry Consulting Engineers (Carp, Ontario) was engaged to file the mandated report. Mr. Bishop made site visits, reviewed the situation at QUBS and filed his report on time. The Ultraviolet units which treat QUBS water were found to be sufficient to the task and to the requirements of the current legislation.

A number of new requirements and procedures were established to comply with the legislation:

- 1) Frank and Floyd had to become "trained persons" under the Act. Both Frank and Floyd took and passed the Operation of Small Drinking Water Systems correspondence course offered by the Ontario Ministry of the Environment.

- 2) Inspection of the water treatment system must be done and logged at least once a week by a "trained person".
- 3) Replacement parts must be kept nearby (extra quartz sleeves and UV bulbs) and water treatment equipment must be in use whenever water is being obtained or supplied.
- 4) Samples of treated water must be submitted to an accredited lab once a week for Total Coliform and E. coli sampling and a heterotrophic bacteria plate count.
- 5) Samples of untreated water must be submitted to an accredited lab once a month for Total Coliform, E. coli sampling and a background bacteria count.
- 6) At least once every 60 months, a sample of water must be submitted to an accredited lab for analysis of multiple parameters as set out in Schedule 2 of the legislation. The list of parameters includes elements, metals, radionuclides, a range of hydrocarbons, pesticides and PCB's etc. This was done in June of 2002. Results indicate that QUBS water falls within guidelines under the Act. All parameters tested were well under guidelines and most under the minimum detectable limits of the testing procedures.
- 7) Lab results and testing must be kept available for inspection at any time. There is a complex set of reporting requirements mandated in the event of an adverse test result.
- 8) An annual report must be filed outlining the water system itself, the procedures for providing safe water and the results of all tests done on water.

This is indeed, a formidable list of tasks and requirements, many of which cost significant dollars. It is estimated that QUBS incurs a cost of \$4,000.00 per year in testing costs. In addition, a great deal of time is spent by QUBS in inspecting, monitoring, reporting and taking samples to the lab.

Dr. Raleigh Robertson (Director, QUBS) and Frank Phelan (Manager, QUBS) met with Queen's officials (June 6, 2002) to keep all apprised of requirements under the legislation, including:

Tom Morrow, Associate Vice-Principal (Operations)
 Anne Godlewska, Associate Dean (Arts and Science)
 Dan Langham, Director, Environmental Health and Safety
 Peter Boag, Chair, Department of Biology
 John Topping, Departmental Manager, Department of Biology.

At this meeting, Tom Morrow agreed to reimburse QUBS for the initial consultant's report. This was a welcome gesture.

As a potential risk to drinking water at QUBS, there was discussion of replacement of the septic field at the station. In light of its age (26 years), proximity to the well, and a recommendation from the consulting engineer's report, it was argued that we should address replacement of the tile field very soon. It was agreed that an application to the Renovations and Alterations fund would be made for 2003.

Overall, we are supplying safe drinking water at QUBS and are making every effort to ensure that this continues into the future.

Renovations and Additions

This section documents a range of projects completed during 2002, and serves as a record of the maintenance and upgrading of facilities at QUBS. Since the Operations Centre is still relatively new and continues to require some finishing and "fine tuning", we divide this section

into two parts. The first details work done on the Operations Centre and the second deals with other projects and improvements to other facilities at QUBS.

Operations Centre

- 1) **Servery Counter Tops** – Some parts of the formica surfaces on counter tops in the servery had begun to lift free and bulge upward. This was especially true near the coffee and tea water dispensers. These areas were flattened down and reglued.
- 2) **Kitchen Roof Leak** – During heavy rains, water came into the kitchen around the stove hood. The problem was in the roof mount of the stove hood fan. Leveling the fan mount (Brunet Heating and Air-Conditioning, Kingston) stopped the leaks.
- 3) **Exterior Stain** – Repainting was done where some of the exterior blue-gray stain, especially around the main entryway, had been thinly and rather irregularly applied.
- 4) **Mouse-proofing** – Since very early in its young life, the Operations Centre had been frequently invaded by White-footed Mice. This was particularly vexing to Marg and the rest of the kitchen staff, as it raised health concerns necessitating frequent cleaning and sterilization and also resulted in the loss of significant amounts of foodstuffs. In late summer a final search revealed large potential entryways from outside, most notably under the screen porches. Rod then blocked these off and gave them a final seal with caulking. Since then, the Operations Centre appears to be mouse-free.
- 5) **Hardwood Floors** – In December, the hardwood floors in the dining room and servery and the area at the head of the entryway stairs were scarified with plastic rotary cleaning pads, then thoroughly cleaned and recoated with 2 coats of “Wood Pride” #1880 Clear Satin Interior Polyurethane Varnish. The choice of finish was based on consultation with the original installer and finisher of the floors and advice from two paint sales companies.
- 6) **Tiled Floors** – Tiled floors in the halls, bathrooms, laundry room, and lower entryway were stripped of finish, thoroughly cleaned, resealed with “Dynasty” Acrylic Sealer, and given a double coat of “Secretariat” Floor Finish.
- 7) **“Runner” Mats** – The rubber finishing strips on the ends of most of these mats were cleaned and re-glued with a better grade of contact cement. Before the tiled floors under these mats were refinished, they were wet and stained from condensation; it seems that some form of porous material allowing aeration under the mats will be necessary, especially in the lower entryway.

Other Renovations and Alterations

White House

- 1) **Upstairs Bedrooms** – In spring, Rooms 1, 2, and 3 were totally refinished. Minor holes in walls were repaired, walls and ceilings were repainted, and floors were stripped, resealed, and given two coats of finish. Some repairs were done to beds and bureaus. Even the windows were thoroughly cleaned!
- 2) **Basement Apartment Room 2** – Totally remodeled to include the part of the basement hall where the refrigerator had sat. That refrigerator went to the upstairs kitchen, and was replaced in the basement suite by a new “bar-sized” fridge. The walls, ceiling, and carpeting of Room 2 were redone with new materials.
- 3) **Upstairs Freezer** – A new, small freezer was installed in the upstairs dining room.

- 4) Concrete Step – The concrete step facing the Operations Centre was beginning to rock excessively. It was temporarily removed, and new very solid footings were made.
- 5) Lakeside Walkway – The footpath on the lake side of the White House was uneven and had serious problems with drainage and erosion. In mid-summer, patio slabs were installed outside the basement entryway, steps were made leading up to the existing steps for the upper entryway, and a patio-slab walkway was completed to the edge of the White House closest to the Manager's house. Within minutes of its completion, Marg had flowers planted along its edge. It works well, and is a great improvement.
- 6) Tiled Floors – In spring, and again in November, the tiled floors in the upstairs hallway and in the dining room were stripped, washed, sealed, and given two coats of finish.
- 7) Carpets – In December, upstairs living room carpets and those recently installed in the basement small bedroom were steam cleaned as was the upholstered furniture in the upstairs living room.

Earl Cottage

- 8) Wall Repair – Wall repairs which were begun in autumn of 2001 were completed by adding plywood interior panelling. Green staining of the new exterior siding remains to be done.
- 9) Ceiling repair – Fibreboard panelling on the ceiling was badly stained, sagged, and mouse-chewed. Ceiling joists were found to be badly misshapen, making the ceiling very irregular. Ceiling joists were twinned with new ones in the attic. The ceiling was then panelled with drywall, and joints were covered with thin wooden battens. The crown moulding was repaired. The result is a notably flat and attractive ceiling with a vintage look.
- 10) Interior Painting – Walls and ceiling of the entire living room were painted an off-white, and the floor was sanded, some cracks filled, and then painted a gloss brown. The whole room looks remarkably clean, bright, and airy.
- 11) Interior Trim – New baseboards and window trim were stained a maple colour and put in place. Some staining of window casements remains to be done.
- 12) Exterior Trim – Damaged fascia were replaced, and new boards were shaped and put in place to cover the joist headers in the rebuilt area.

Curran Cottage

- 13) Room 5 – The 4-bed room had grown rather dingy, with some drywall damage and a badly worn carpet. Walls were repaired and painted, and new carpet laid down. The oversized roller drawer under one pair of bunks was cut down so that it fits properly under the bed.

Sumac Cottage

- 14) Deck and Steps – The L-shaped deck on Sumac Cottage had suffered extensive rot, and the built-in bench seating and rails along the edge were rotted to the point of being deemed unsafe. The deck was completely removed except for the support posts and the beam bridging them, and replaced by a new smaller cedar deck and rail on the lake side of the cottage only. On the Curran Cottage side, a new set of concrete steps leads to the entrance, and the access path has been re-landscaped and some new patio slabs laid down.
- 15) Carpets – In December, carpets in the living room and dining room area were steam cleaned, as were those in the middle bedroom.

Other Cabin Work

- 16) Lake-water Intakes – A continuing frustration with the tedium of rebuilding lake-water plumbing intakes for cottages each year led Rod to design and build new plumbing intake housings for several of the cottages. The most sophisticated ones are at Sumac and Curran cottages, with simpler ones at Earl Cottage, Cabin 12, and the lake-water intake for the big Aquarium House.
- 17) Cabin 12 (“The Condo”) – A new water pump and pressure tank were installed.
- 18) Cabin 7 – An excited report by a distressed resident of extensive roof leaking led to stripping and repairing the roof, and re-shingling.
- 19) Cabin 13 – The single bed near the desk was removed and stored elsewhere as a spare, and an upper-bunk frame was built in its place. This allows for a closet rod and hangers, and storage space under the bunk.

Queen’s Point Landscaping

- 20) Traffic Circle – Marg Phelan and Frank’s father Don did a lot of tilling and planting here. Rather extensive pruning of dead and broken limbs was done on the central crab-apple tree in spring.
- 21) Curran Path Upgrade – The path from Cabin 8 down to Keast Beach was steep and badly eroded due to years of ever-increasing foot traffic. In late autumn, it was notably improved by terracing using pressure-treated lumber frames and crushed limestone in a design similar to the path from the Operations Centre to the Tank House. A rail and footlights should be added in 2003.
- 22) Picnic Tables – In early summer, the old picnic tables were completely disassembled, the boards were planed and sanded and their corners rounded with a router, and reassembled. Significant cracks and holes were filled with epoxy, and they were then given 2 coats of Defthane UV-block polyurethane finish. They look really good now, but we will monitor them to see how long this lasts.
- 23) Old Aviaries – The old aviary behind the main workshop, built for Red-winged Blackbird research in the mid-1980’s, was not up to modern standards, was no longer needed, and was in the way of access to the new Storage Building and so was disassembled. Much of the pressure-treated lumber was salvaged for stakes and for rough outdoor construction projects. A second, older and smaller aviary near the Septic Leach Field was also removed and was discarded.
- 24) QUBS Road Sign – The “Queen’s University Biological Station” sign at the “station gate” was badly weathered and discoloured. It was replaced by a new sign made by Jim Janeway.
- 25) Original QUBS Sign – The original, antique QUBS sign that had been renovated and installed on the Biological Station road at our property boundary in preparation for the 50th Anniversary celebration was heavily damaged by a falling tree during a wind storm in March. The broken bits of the wooden sign were found and reassembled, the paint on the lettering was touched up, and the sign was mounted on a new and sturdier steel bracket. Once again, it stands tall and looks good.

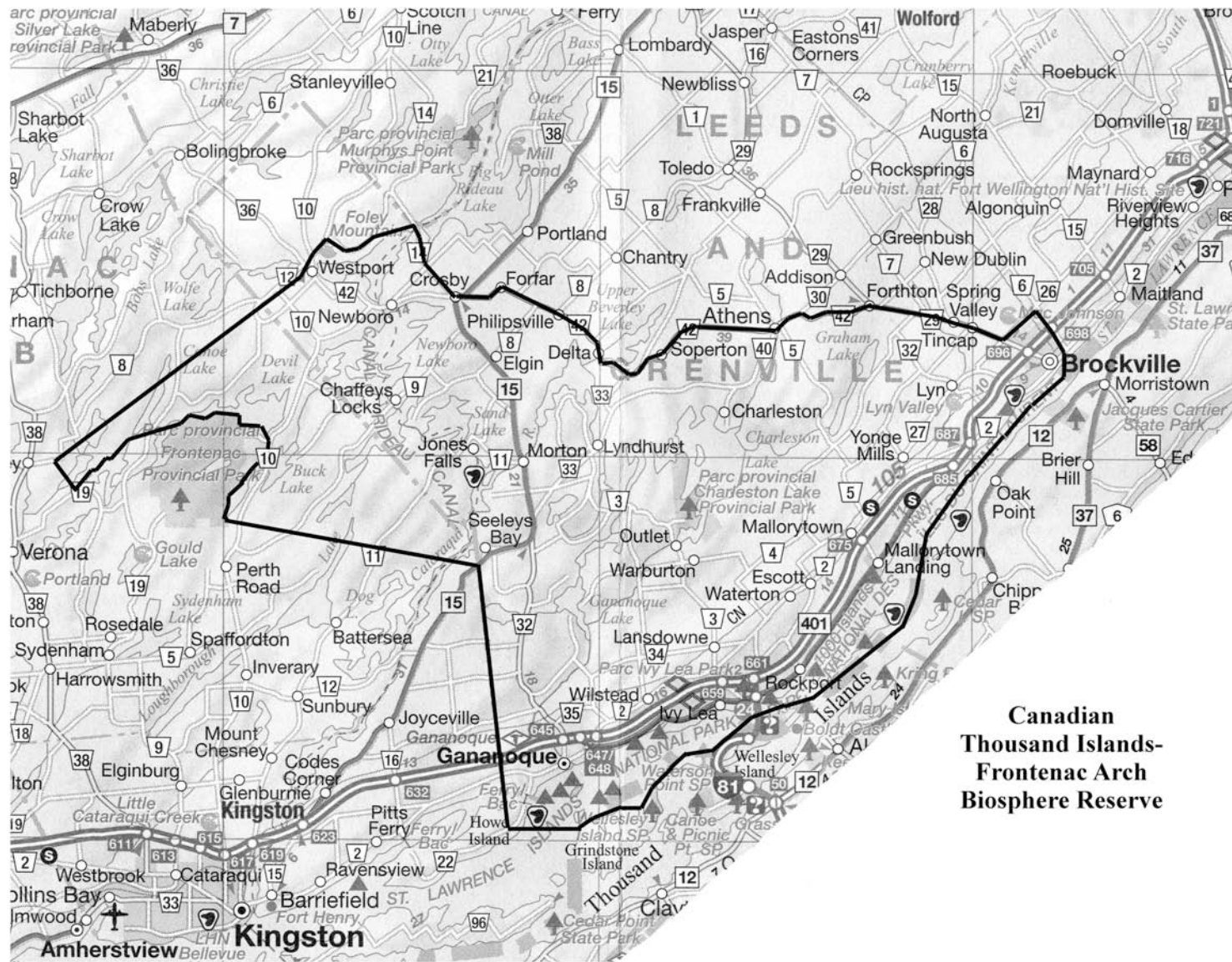
Miscellaneous

- 26) Library and Offices – Several new LAN connections were added in May. Some of the wiring needs to be made tidier and less conspicuous.

- 27) Brown Lab – In mid-summer, a high-amperage 110V circuit was installed in the Lower Brown Lab to the right of the blackboards, in preparation for installing a lab incubator. In November, all floors on both levels were stripped, cleaned, sealed, and given a double coat of floor finish.
- 28) Tri-Lab – Twice in 2002, attempts were made to seal leaks in the low-pitch roof over Room 4, using the tar-like “plastic cement”. This approach turns out to be temporary at best. We will need to undertake a wholesale effort, such as reroofing, in 2003 to effect a proper fix.
- 29) Welding Table – An old motor repair trolley used often with the former inboard motor of the “Rappinicon” barge was converted to a heavy-duty welding equipment trolley and welding table. This promises to be a very welcome and important addition to the shop equipment.
- 30) Aquarium House Drain – The drain from the flow-through fish tanks in the Aquarium House began leaking near the boathouse, and pouring water down over the walkways and docks there. It had become clogged with roots. A section of the drain was replaced.
- 31) “Rappinicon” – After years of frequent repairs of the inboard motor of the blue barge, we removed it and the outdrive assembly once and for all in spring. The aluminum motor well covering was replaced by plywood covered with rubber matting, allowing for more workspace on the afterdeck. A second outboard motor bracket was installed, on the rear of the starboard pontoon. The deck canopy was also extensively restitched, as earlier seams and strap attachments were mostly failing.
- 32) “Dinah Moe” – A new stern light was installed on the small orange pontoon boat.
- 33) Carleton Boats – This summer three sturdy, high-quality jon boats that Dr. Mark Forbes had brought to QUBS from Carleton University were purchased for use at QUBS.
- 34) Lake Temperature Probes – In spring, the float on the 0.2m and 1.2m probes was found to have become perforated and to have sunk. The probes were raised and a new float installed. One probe was malfunctioning at the time and was repaired, but by year’s end both the 0.2m probe and the 1.2m probe required repairs which will be done in spring of 2003.
- 35) Ford 3400 Tractor – Cracked welds on the front-end loader arms were repaired in a better-than-new fashion with a bridging plate. The steering arm was also repaired. Late in summer, while removing fallen limbs from field edges, a limb perforated the radiator; the “tanks” on the radiator were saved, but the core was replaced.
- 36) Ford 150 Truck – In autumn, a brakeline burst and had to be replaced. At the same time, an ongoing coolant loss problem was traced to a faulty radiator and a new one was installed, and 2 new universal joints were installed on the front axles.
- 37) Blue Dump Trailer – The hydraulic pump ceased to function in autumn and was needed immediately for stump hauling and in the long term for many tasks. It was commercially reconditioned by Kingston Truck & Trailer, and seems to work well. A “rubbermaid” tub was inverted over the pump and lashed down with bungee cords, in an attempt to reduce corrosion by rain, and road salt from tire spray.

Acknowledgements

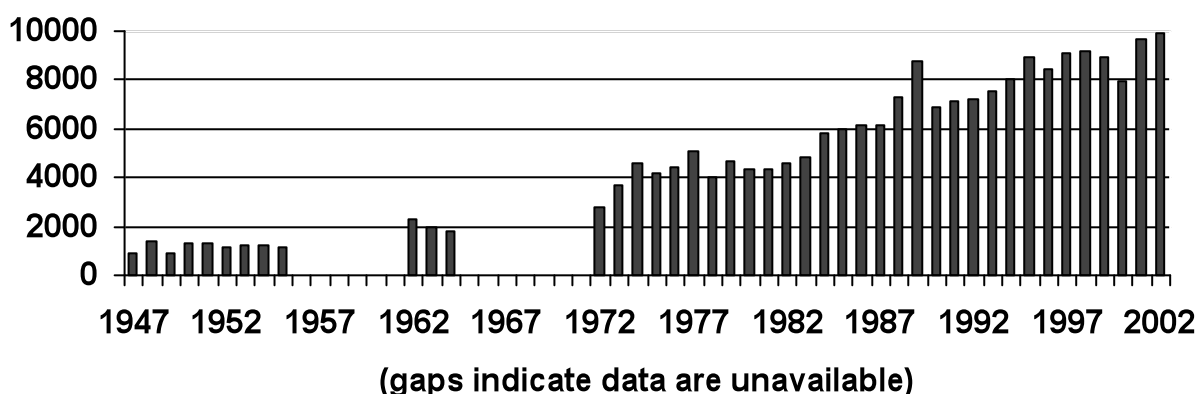
A large vote of thanks is due our QUBS staff. Without the efforts of all our staff, no matter in how small a capacity, the field station would be unable to function. Thanks to Roger (Rod) Green (Maintenance Assistant) and our Food Service Staff - Marg Phelan, Cheryl MacDonald, Lucinda (Cindy) Chrissley and Theresa Perrin - for your efforts on behalf of all QUBS users.



Introduction

2002 was the busiest year on record at Queen's University Biological Station. We steadily approach the elusive 10,000 user-day level, but have again fallen just short of it. Some 9,885 user-days were logged in 2002 (user-day data are displayed in tabular form on pp. 66 & 67). Use was up by 2.4% over 2001. On average, 49 researchers (professors, graduate students, honours students and assistants) were in residence through the summer. Abstracts of 2002 research projects and the personnel involved are contained in the following pages (pp. 33 - 60).

User-Days at QUBS



In teaching activities, QUBS hosted 8 modules (10 weeks worth of modules) in the Ontario Universities Program in Field Biology (OUPFB). Five of these modules were presented by Queen's instructors and three by instructors from other institutions. Titles and enrolments for the OUPFB programme are found in Tables 1 and 2 (pp. 31 & 32). In addition to the OUPFB modules, Dr. Ed Kott (Wilfrid Laurier University) brought his field course for senior undergraduates to QUBS for two weeks in late summer.

In 2002, there was a large increase in use for conferences, meetings and field trips. It seems that the improved facilities and enabling the hosting of larger groups, several groups at a once and groups during winter and spring. This year, many diverse groups made use of the facilities. A summary of conference, meeting and field trip use of QUBS in 2002 appears later in this report (pp. 61 - 63).

The mandate of QUBS is to provide opportunities for hands-on teaching and research. The experience gained at QUBS whether as a research assistant or during field trips associated with curriculum courses is invaluable to the next generation of educators, scientists, fish and wildlife managers and environmental consultants. Exposure to field work has been key to sparking life-long interest in biology for many QUBS users. Alumni cite their experiences at QUBS as being among the most memorable of their university experience. Continuing improvements to facilities and programs allow QUBS to provide increased opportunities in teaching and research to a greater number and diversity of users.



In Memoriam - George and Beatrice Hughson

As we prepared this annual report for 2002, two of our beloved neighbours and friends of the Queen's University Biological Station passed away, George Hughson on Saturday, 4 January 2003 and his wife Beatrice very soon after on Monday, 3 February 2003. George and Bea were instrumental in initiating the acquisition of land by the field station for teaching, research and conservation purposes. Their interest in preserving for perpetuity some of the lands originally accumulated by George's father, Melvin Hughson, led to the acquisition of the "New Land" by QUBS from the Hughsons in 1976. This initial acquisition set the stage for further property acquisitions which collectively form a significant landscape for the biological and environmental sciences and conservation in the area. Fittingly, some of the properties subsequently acquired were also once owned by the Hughson family.

George and Beatrice were always supportive of activities by QUBS users of the Hughson Tract. With the close association to the land that farmers have and many travels across it and diverse uses of the natural resources contained within it, George especially was a great source of historical information about the property, its features and past uses. Any contact with the Hughsons could easily lead to fascinating reminiscences of times past, sprinkled with names and dates from their collective memories. George always impressed everyone with his recollection of site-specific details especially with respect to boundaries, unique features, including mine sites, homesteads, sugar bushes etc. He was a natural storyteller, blending his special knowledge of the land and local history with humour and stories of colourful characters from the locality.

George and Beatrice were well-respected members of the local community. Both worked on a long list of volunteer projects. Even in poor health, Beatrice especially contributed valuable time and effort to numerous local initiatives, particularly those of the Chaffey's Lock Community Hall and the Chaffey's Lock and Area Historical Society.

George and Beatrice were, above all, consummate believers in the family. Regular visitors were soon adopted and welcomed as part of the family. George and Beatrice leave behind several generations of family members, among these their children Connie Banks (husband Charles), Wayne and wife Elaine, Donnie and wife Liz, Linda Reid (husband Mike)

and David. They also leave behind nine grandchildren and one great-grandchild. It must be incredibly difficult to lose both parents or grandparents in quick succession and heartfelt condolences, on behalf of the entire Queen's University community, the Biological Station and its users and those of us who considered them as friends and neighbours, are extended to the remaining Hughson family.

The "New Land" acquired from George and Bea has, until now, been known as the Hughson Tract. However, it is now proposed that this name be changed to the "Hughson Farm" to more clearly reflect the history of the property. It will long serve as a reminder of their lives and efforts. As a further reminder of their contributions, a fitting memorial monument with a plaque will be erected in their memory in consultation with the Hughson family.

MAJOR GIFTS

Baillie Family Chair in Conservation Biology

On Saturday, June 15, 2002, we were honoured to have Mr. and Mrs. Charles Baillie visit QUBS for an event to recognize their gift of an endowed Chair to Queen's. The name of the chair will be **The Baillie Family Chair in Conservation Biology** and it will be linked permanently with the Queen's University Biological Station (QUBS). The purpose of the Baillie family's generous gift is to strengthen research in conservation and biodiversity and to augment and reinforce teaching programs at the graduate and undergraduate levels in the Department of Biology. The gift reflects the Baillie family's keen interest in the natural world, the conservation of biodiversity, and their special passion for birds.

The day began with a walk on the Lindsay Lake Road, accompanied by Kathy Wynne-Edwards, Anne Godlewska, Lili Harriss, Jason Jones, Rachel Fraser, Matt Timpf, Floyd Connor and Raleigh Robertson. The Baillie's enthusiasm for birding and nature was hardly dampened by the steady rain on a very cool, wet morning. Sightings of a Black-billed Cuckoo in a frozen upright posture near the nest, a Golden-winged Warbler, and a male Cerulean Warbler, plus a female at the nest, helped to make the trip a memorable success. Frank then joined the group for a tour of the facilities at QUBS, assisted by a number of grad students explaining their research projects.

Bob Silverman, Dean, Faculty of Arts & Science, hosted a luncheon at QUBS, where we were joined by Mrs. Silverman, Peter Boag, Head of Biology, Laurene Ratcliffe, Lois Robertson, and a number of other biology faculty and students, as well as the QUBS "regulars". Dean Silverman spoke of the importance of this donation to Queen's, thanked the Baillies for this very generous gift, and presented them with a commemorative plaque. Raleigh Robertson also thanked the Baillies on behalf of the students and others who use QUBS (see text below). Charles Baillie then spoke and in explaining why the Chair was such a good "fit" for their family, he mentioned each of his children, their links to Queen's and their interest in Conservation Biology. He also mentioned Marilyn's involvement as an award-winning author of children's books. Finally, Peter Boag presented Raleigh with a plaque to commemorate his being named as the first holder of the Chair. Following lunch, we held a round-table discussion in which the grad students working at QUBS provided a synopsis of their research while the Baillies engaged them with very perceptive questions and observations.

With Mr. Charles Baillie having recently been named Chancellor of Queen's University, we at QUBS felt especially pleased to have Mr. and Mrs. Baillie visit the Station and to experience their strong interest in conservation and natural history. We look forward to future visits.



Charles and Marilyn Baillie address the celebration.



The Silvermans, Charles Baillie, and Chris Eckert



Peter Boag congratulates Raleigh.



Raleigh with his personal Baillie Chair plaque.

(All Baillie Chair Celebration photos © Bernard Clark, 2002.)

(Following is the text of remarks by Raleigh Robertson, in recognition of the Baillies' gift to Queen's.)

I want to thank the Baillie Family for the generous donation to endow the Baillie Family Chair in Conservation Biology. This represents an interest in Queen's and a commitment to Conservation biology that we all sincerely appreciate. As Dean Silverman has indicated, this endowed chair is extremely important to Queen's. But let me tell you, its proportional impact will be especially great for the Biology Station.

I also want to thank those people in the Faculty of Arts & Science, in Biology, and in the Advancement Office, for making the Chair in Conservation Biology a priority in the Campaign for Queen's. It's going to be a tremendously important asset for the Station, and I appreciate the confidence you've placed in our program by supporting this Chair.

I want to explain why this Chair is important to Queen's, to the Biology Department, to the Field Station, and to Conservation Biology.

The Chair is important to Queen's, to the Department and to QUBS for many reasons: (1) It will raise the profile of Conservation Biology in our programs and ensure that Queen's is a recognized leader in this field. (2) It will ensure that a Queen's professor will have a strong link to QUBS for both teaching and research - a professor who will develop programs at the Station - programs that will help realize the potential of our facilities and our land base. (3) It will help attract outstanding visitors to QUBS, as already demonstrated by our visiting Field Scientist, Dr.

David Jacobs. David, who is from the University of Cape Town in South Africa, gave a very stimulating and thought-provoking seminar on Conservation Biology on Wednesday evening. (4) But most importantly, I believe that the greatest significance of the Chair is that it will create opportunities for students.

Queen's is fortunate as a university in that we attract very high quality students - and much of what we, as a faculty and as a university, accomplish is through these students. We faculty provide some direction, some foundation, and for our research students some funding - but it is the energy, enthusiasm, tremendous motivation and intellect of the students that carries the work forward.

For its part, the Biological Station provides an excellent resource for teaching and conducting research in the diversity of disciplines in and related to Conservation Biology. The logistical support provided by our labs, by our equipment, by our knowledgeable staff, and by our diverse array of habitats on land owned by Queen's and hence controlled by the researcher, plus the interchange of ideas and support from fellow students and researchers, all contribute to the success of our programs.

What the Chair will accomplish is to draw on Queen's potential to attract high quality students, and to draw on the facilities and logistical support of the Field Station. By having a chair-holder who is committed to research and teaching through the Field Station, it will create opportunities for students to get involved, to learn, and to contribute in Conservation Biology. In turn, those students will go on to 'make a difference' in some aspect of Conservation Biology along whatever path their future takes.

The Chair is important for Conservation Biology because it will contribute to the knowledge base and the understanding of this important discipline. Conservation Biology, defined simply as the study and protection of biological diversity, is a very broad discipline - in fact it involves aspects of many disciplines - ecology, behaviour, population biology, evolutionary genetics, as well as economics, sociology and environmental policy, among others. In the broad sense it requires an interdisciplinary approach - a synthesis spanning the sciences and the humanities. In biological research, there are many valid approaches that contribute to Conservation Biology - at the single species level, the community level, and the landscape level. All of these are represented by work done here at Lake Opinicon. This is the science involved in developing the knowledge base needed to guide policy to protect biological diversity.

In environmental policy, our graduates become involved in the political & legislative process, in working on programs to achieve sustainable development, and in land-use programs for the preservation of habitats. On Friday morning, I heard an interview on CBC radio with Helen Howes. Helen is the Vice President for Sustainable Development at Ontario Power Generation. Helen took field courses at the Station while at Queen's as an undergraduate. Earlier this week I phoned Karen Brown, the Assistant Deputy Minister of the Environment, in charge of Environmental Conservation - Karen did graduate work on fish behaviour here at the Station with Dr. Keast back in the 1970's. Jennifer Harker, another of Dr. Keast's graduate students, is now a senior partner at Dillon Consulting. She is also on the National Board of Directors of the Canada Water Resource Association, the board that formulates national policy for water and ground water protection. Deb Turnbull, still another of Dr. Keast's students, is currently Vice President of the Canadian Manufacturers and Exporters Association. She is responsible for international aid and development, currently focusing on aid to Africa and the sponsorship of African interns and business partners. My point is, students who work at Opinicon go on into a great diversity of careers, not necessarily in biology, but many with the potential to make a large impact in Conservation Biology.

In the broadest sense, much of what we do is to help develop an attitude - a kind of attitude that has its origins in Aldo Leopold's "land ethic". In this sense, Conservation Biology is not just an 'academic exercise', but a way of living, and of relating to the natural world. Students, whether continuing in professional biology, or embarking on any of the broad array of careers or life's work that our students follow, need to understand, and develop an 'attitude' that reflects that understanding of Conservation Biology.

Endowing the Baillie Family Chair in Conservation Biology is a very far-sighted gift that will make an important difference in all of these areas, both now and continuing through the long-term future. It's hard to imagine what QUBS, or Queen's, or Canada will be like in 25 or 50 years, not to mention 100 or 500 years. Whatever they are like, it's equally hard to imagine that Conservation Biology in some form will not be an integral part of the learning, the social and the political environment. Citizens of today, and in the future, need to understand the concepts of conservation biology. The Baillie Family Chair will help Queen's, through QUBS, contribute to that understanding and through our students, to put that understanding into practice.

The Alexander and Cora Munn Summer Research Award

Thanks to a generous gift from Alexander and Cora Munn, an endowed fund was established in 2001 to provide awards to third-or fourth-year undergraduate students of Conservation Biology in full-time summer positions in a research environment at QUBS. The award is for students who aspire to pursue studies in conservation biology and environmental preservation. Preference will be given to students with an interest in woodlot management and wildlife conservation. Applications will be made to the Head of the Department of Biology. It is anticipated that the first award will be made in 2003.

We extend our gratitude to Mr. and Mrs. Munn for this very far-sighted gift. It will help provide valuable experience for future conservation biologists for the very long-term future.

Massassaugua Property

In December of 2002, a second parcel of property along the Massassaugua Road became the property of Queen's. To date, some 193 hectares (478 acres) in total has been gifted to the university and the field station through the generosity of an anonymous donor. In December of 2001, a first parcel comprising some 29 hectares (72 acres) was donated (part A on the map, p 9). In 2002, a second parcel, some 164 hectares (406 acres) in extent (Part B on the map p. 9), was donated.

Together, the property represents a mixture of habitat, ranging from farm fields surrounding a house (which burned beyond repair in late 2001 and was razed) and barns in the north, to shoreline surrounding Connells Lake in the southeastern section, to mixed forest and wetland in the south. The Massassaugua Road and Taggart's Lane cross the northern section of the property.

The southern part of the property falls within the Hamilton Lake Area of Natural and Scientific Interest (ANSI) (cf. D.J. White. 1993. Life Science Areas of Natural and Scientific Interest in Site District 6-10. Ontario Ministry of Natural Resources, Kemptville, Ontario 122 pp. [OFER SR9401]). The southern edge of the property lies very near the northern edge of the Bonwill Tract, and immediately above it.



Exploration and GPS mapping of Connells Lake.



Old Bedford Mills Road through Massassaigua tract.

These interesting and diverse habitats, which border the old Bedford Mills Road that passes through the Bonwill tract to the south, promise to contribute new opportunities for field studies in the future. An application to have the land certified as ecologically sensitive has been submitted to Environment Canada, to enable this donation to proceed in the Eco-gifts program.

Queen's Land Trust

This land trust was established in 2001. The intention is to ensure that lands owned by QUBS can be adequately managed, and that additional lands can be acquired for conservation purposes and research and teaching.

The land trust is to be an endowed fund, with income from the fund used for operational costs related to land management, or for purchase of properties of strategic importance to QUBS and its endeavours. Recognizing that there is strong interest among supporters of Queen's to assist with both education and conservation, the Queen's Land Trust provides a mechanism whereby these goals may be achieved.

The goal is to have an endowed fund of at least \$1,000,000 generating an annual income of \$50,000 or more. Mrs. Hilda Pangman was the first contributor to the trust, kick-starting the fundraising with gifts totaling \$75,000. Currently, the fund stands at \$110,000. The fund is off to a good start. The endowment will help to ensure the integrity of the substantial landholdings of QUBS, the landbase that provides such an important resource for field studies and conservation biology. Over time, QUBS landholdings will become increasingly important for these purposes as development continues apace in the Toronto-Montreal Corridor in southern Canada.

Dr. Allen Keast

Through some 40 years of association with QUBS, Dr. Allen Keast has become widely known for his community studies of fish and birds. Still active in the QUBS community and in compilation of his years of research, he regularly contributes to the field station through annual donations. This support is very welcome and has assisted QUBS through times of fiscal restraint in university budgets. Among his gifts to QUBS in 2002 is a 21" computer monitor, which will enter service with the GPS/GIS projects in 2003. For all these generous contributions we extend a heartfelt "thank you" to Allen!

The William C. Brown Research Endowment Fund

This fund was established in February 2003 through a bequest from the estate of William C. Brown, B.A.(Queen's) 1930. Annual investment income from the fund is to be used by the Queen's University Biological Station for research in the environment. This gift will allow the QUBS to build on existing strength by supporting research in ecology and conservation biology. Funds may be used for research programs, facilities or equipment at QUBS, for QUBS-based research activities of the Director of QUBS, and for teaching purposes at QUBS that have a research component.

We at QUBS are very grateful to Bill Brown for having included the Station in his will and for his commitment to studies in environmental biology and conservation. We are also grateful to Dale Canfield, the executor of Mr. Brown's estate, for his assistance in establishing this endowed fund. We have enjoyed several visits to Queen's and to QUBS by Dale and Nan Canfield; they often bring a tin of ginger cookies made by Nan following the recipe of Mary Brown. The Canfields also gave to QUBS several interesting books that had belonged to Bill and Mary Brown, as well as an old Queen's pennant from Bill's days as an undergrad in the late 20's.

While we did not have the pleasure of knowing Bill and Mary Brown, it gives us great pleasure to see their legacy continue through the income of their generous bequest, and the stewardship of the Canfields.

Michael Runtz Donations

Mike Runtz is a renowned naturalist, photographer and educator. Many have seen his photographs or participated in his owl hoots of wolf howls. His natural history course at Carleton University is well-attended and raved about by students.

Over the past few years, QUBS staff have worked with Mike to have him offer guest lectures and seminars and to obtain from him some of his remarkable photographs. At present, five of his photographs adorn the walls of the dining hall in the Operations Centre.

In 2002, Mike participated as a guest lecturer and field trip leader during the winter ecology course at QUBS. Mike took his honorarium and purchased some reference books for use at QUBS. These will be of great interest and much used by QUBS regulars. Thank you, Mike.



Michael Runtz (centre) with winter ecology class.



Michael makes a point to the winter ecology class.

Jessie Deslauriers Donation

Jessie is one of our longtime and venerable supporters of the field station. She is well-known for her interest in all things dealing with natural history and conveys this at any opportunity especially to readers through her columns in the local newspapers. In 2002, Jessie donated a number of reference books on natural history to QUBS. These are a valuable contribution to the QUBS library. Thank you, Jessie.

Estate Planning

It is very gratifying to know that some of our alumni have included QUBS in their will to create an endowment for a named bursary to provide board and room for students conducting field research at the Opinicon. Such a program will benefit numerous students over the very long-term future. It will also benefit the Station in general by allowing it to host research students that might not otherwise have opportunities to work there. Once the award is established, it will raise the profile of both QUBS and field biology by having a named award (bursary) that will be announced to students. Finally, it will be meaningful and lasting tribute to the donor. The continuing support of our friends and alumni is very important for our programs. Including QUBS in estate planning is a good way to ensure that the quality of experiences we cherish from our own QUBS involvement will be available for future generations of field biologists.

The Campaign for Queen's

In working with Lili Harriss, Ed Pearce and others in the Development Office on the Campaign for Queen's we have been very successful in funding the Queen's University Biological Station. We hope to move forward on reaching our goal for our other priority project, the Queen's Land Trust. This trust offers an ideal way to support Conservation Biology, education, Queen's and QUBS. Anyone wanting more information, or to make a donation, is encouraged to call the Development Office in the Faculty of Arts and Science at (613) 533-6000, extension 77901 and speak to Faculty Project Assistant Myrna Horton.

NSERC & Other Support

NSERC MFA Grant

In September of 2002, QUBS applied for a Major Facilities Access Grant (MFA) from NSERC (Natural Sciences and Engineering Research Council). In April 2003, it was announced that our application was successful. The new three-year grant comes with a 28% increase over the previous grant - a very good showing in the face of stiff competition for grant dollars.

The grant pays the salary and benefits of QUBS Assistant Manager (Floyd Connor) and half of the Maintenance Assistant (Roger Green) salary and benefits. Under the new grant, Roger's contract was extended to nine months from six months. The grant also contributes to the costs of shared services (primarily electricity) at QUBS.

2002 was the 19th year that QUBS has received this grant (or its precursor, the Infrastructure Grant) from NSERC. This success is an acknowledgement of the productivity and

excellence of the facility and its multi-university approach to research and training. The presence of users from many universities is enabled by this grant. The atmosphere thereby created leads to vigorous interaction among users which ultimately benefits all users and challenges them in terms of innovation of approach, quality of research and application of competing theories to their work.

Summer Work Experience Program (SWEP)

In 2002, one project consisting of two student positions was made available to QUBS under this program. SWEP is designed to create “on-campus summer jobs for Queen’s undergraduate students that will provide them with valuable career-related and/or academic experience”. It is available to students that will be returning to Queen’s for a full academic year of studies after holding the SWEP position.

The 2002 project was “SWEP 104: GPS and GIS for Biological Field Studies and Land Surveying”, under the supervision of Floyd Connor. The Biological Station provided in-kind support for the project (room and board for the two recipients). The positions were awarded to John Cunningham, in his third year of a B.Sc. honours program in Biology, and Julia Nicholson, just finishing her B.Sc. honours and preparing to begin her B.Ed. at Queen’s in September of 2002. Both students worked enthusiastically, capably, and very productively at a great variety of tasks for QUBS and for many of our resident researchers. They brought a wide variety of skills and experience to the positions. Their activities are summarized under the “GPS/GIS” section of this report.

Thanks to both Julia and John for jobs well done!



John Cunningham and Julia Nicholson with backpack GPS (MC-V) at QUBS.

The SWEP program also supported a number of other students working at QUBS on various research projects, providing valuable experience to the students and essential help to researchers.

CFI Grant to Smol and Cumming

Drs. John Smol and Brian Cumming of Queen's University have obtained funding from the Canada Foundation for Innovation (CFI) for the construction of an equipment storage building at QUBS. Others have expressed an interest in using a portion of this to store their own equipment, and as this report goes to press Drs. Peter Hodson (Environmental Studies) and Peter Boag (Biology) have agreed to contribute funds which will enable the construction of a larger and more versatile building. QUBS is contributing in-kind to the building by using staff time and some Biological Station tools and machinery in the process.

In November and December of 2002, a portion of a pine plantation behind the QUBS main workshop was cleared by QUBS staff. The trees in this area were almost all dead, having been badly damaged by "Ice Storm '98". After most of the wood was removed, Bob Smith of Lyndhurst pulled the stumps and French's Trucking of Crosby leveled the site and prepared a crushed-limestone pad to support a concrete slab. Terry French also prepared short access roads in to the site from the workshop and parking lot.

In February of 2003, a contract was signed with Lawson Building Services Ltd. of Elgin, to pour a concrete slab and build on this site a 32' x 60' frame building with steel siding and roofing, four vehicle doors, and additional storage space in the attic. Construction is slated to begin "on or before spring 2003" and to be completed by mid-summer 2003.



Cutting the spars and deadfall.



Terry French leveling the site with his "high hoe".

Scholarships and Bursaries

Wes and Dorletta Curran Scholarship

The Curran Scholarship was established in memory of the founding director of QUBS, Dr. Wes Curran and his wife, Dorletta. The award is given to an undergraduate at Queen's who

is working at the Biological Station. Projects on aquatic habitats and species are given priority in the selection process.

In 2002, this scholarship was awarded to Sally Ahn, who worked under Dr. Bob Montgomerie (Queen's – Biology) and with Dr. Albrecht Schulte-Hostedde on sperm competition in Northern Water Snakes, Walleye, and sunfish.



Sally treats a Black-capped Chickadee on Amherst Island, and feeds a Southern Flying Squirrel at Stirling and Elva Danby's house during Raleigh Robertson's winter ecology course, February 2002.

Pearl E. Williams and Llewellyn Hillis Fund

This fund, established in 1991 by Llewellyn Hillis (Arts '52) to honour her parents, is to promote the careers and scholarship of women scientists, especially biologists, at all stages of their professional development, and secondly to promote performances by artists who are women. Having studied at QUBS as an undergrad, Llewellyn also hoped this fund would promote involvement by women in programs - both scientific and artistic – at QUBS. Recipients of this award in 2002 are listed below along with brief descriptions of their programs to which the award funds were applied.

Fiona A. Reid – Visiting biologist, visual artist, and author

Fiona Reid obtained a Master of Arts degree from the State University of New York at Stony Brook for her study on "Aspects of Variation in the Song of Redwinged Blackbirds", then a second M.A. degree from King's College, Cambridge University, England. She also studied Natural History Illustration at the Parsons College of Arts and Design in New York. In 1988 she taught a Scientific Illustration Class as an adjunct professor at St. Lawrence University in New York. In 1989 and 1990, she was at the Universidad Nacional Autonoma in Heredia, Costa Rica, doing small-mammal surveys as an assistant professor for field studies.

In recent years, she has continued to develop a strong interest in and focus on mammals in general and bats in particular. She has done research and writing on, and illustrating of, bats of North, Central, and South America, as well as those of Papua-New Guinea. She has illustrated a field guide to the bats of the world. More generally, she has written and illustrated an excellent and widely-used "Field Guide to the Mammals of Central America and Southeast Mexico" (Oxford University Press, 1997), illustrated a key to trees in Villa Mills, Costa Rica and co-authored a book on giant sea creatures. Her web page, illustrated with some of her original art, is at <http://www.hopscotch.ca/fionareid/>.

Fiona is a Departmental Associate, Centre for Biodiversity and Conservation Biology, at the Royal Ontario Museum in Toronto and since 1988 has been a staff naturalist and natural history tour director with Questers Tours and Travel. In the summer of 2002, she was in the latter stages of writing and illustrating the new edition of the Field Guide to the Mammals of North America, in the Peterson Field Guide Series. In late May and early June, she was in Arizona giving a Bat Conservation International workshop and then presented a bat talk in Arkansas before returning home to Ontario. In late July and early August she taught another bat workshop, this time in Belize, and returned to Ontario on 6 August.

It was “fresh” from this workshop that she took up her Williams and Hillis scholarship at QUBS on 11 August 2002, arriving with her daughter Holly (7 years) and son Ian (5 years) and a young family friend from France as baby-sitter (Aline, 14 years). Almost immediately, Fiona was presented with the object of one her artistic quests, a live Eastern Small-footed Bat captured by John Ratcliffe, a student of Dr. M. Brock Fenton. Fiona sketched the bat in remarkably short order, and then released it alive and healthy at its cave of origin. As the week progressed, she was able to proceed with the intermediate and final stages of her colour illustration of this species. In addition to interacting with QUBS residents on a daily basis, on Monday evening (12 August) she also gave a superbly-illustrated slide show and talk (open to QUBS residents, “Friends of Opinicon”, and others) on “Mammals of Central America”. On Wednesday (14 August) she presented a workshop entitled “The Making of a Field Guide: How color plates take shape, issues with publication and production of a field guide”. Participants gathered for lunch, and were then treated to a show of Fiona’s art in various stages of completion prepared for two of her books, “A Field Guide to the Mammals of Central America and Southeast Mexico”(Oxford University Press, 1997) and the Peterson Guide to the Mammals of North America (in prep.). She also discussed various aspects of the development of a field guide, using her art to illustrate the points she made. After dinner that evening, she presented a talk entitled “Bats of Costa Rica: Diversity and conservation” and illustrated it with slides of remarkable content, beauty, and quality. Art work and family activities, combined with interactions with other QUBS residents, occupied the rest of the week. Fiona and crew were picked up by her husband (Mark Engstrom of the Royal Ontario Museum) on the weekend and they proceeded from QUBS to watch whales (which are one of Mark’s specialties) in Quebec.

In January of 2003, the art legacy which Fiona had agreed to contribute as part of her Williams and Hillis Fund program arrived (carefully wrapped) in the mail. QUBS management and staff are totally delighted and excited with the beauty of the four 9” x 12” colour prints illustrating many of the small mammals to be found at the Biological Station. All of them are copies of Fiona Reid originals, and the Eastern Small-Footed Bat was painted here at the Biological Station. They have now been very tastefully matted, mounted behind UV-filtering glass, framed and hung in the dining room of the QUBS Operations Centre. They do look good!



Eastern Small-footed Bat (*Myotis leibii*). (©Fiona A. Reid. Original painted at QUBS, August 2002)

Rachel Fraser – “Examining the genetic architecture of a newly formed hybrid zone between Blue-winged and Golden-winged Warblers.” – Ph.D. thesis

My award from the Pearl E. Williams and Llewellyn Hillis Fund was used to pay for field assistance associated with my research at QUBS. Specifically, funds were used to pay a portion of Kevin Fraser’s salary during May 2002. Kevin is a proficient nest finder and his skills were much appreciated during the height of nest building. Finding nests enabled me to increase my sample size of tissue samples collected from Golden-winged Warbler families. All samples are currently being used in paternity analyses and form an integral part of my thesis that is addressing mate-choice decisions in this species. These data will ultimately be used to examine the effect of hybridization between Blue-winged and Golden-winged Warblers. I was able effectively to gather data from over ten sites on various properties owned by QUBS, and this would not have been possible without Kevin’s assistance. I am very grateful for having received support from the Pearl E. Williams and Llewellyn Hillis Fund.

Tammy Steeves – “Mechanisms of population differentiation and speciation in a pantropical seabird species complex: the masked boobies.” – Ph.D. thesis

I used the monetary award that I received in 2002 from the Pearl E. Williams and Llewellyn Hillis Fund to help defray the cost of my research field trip to San Benedicto Island, Mexico. The primary purpose of the trip was to collect DNA samples from masked boobies for my research on mechanisms of population differentiation and speciation in pantropical seabirds. The secondary purpose was to explore a collaborative post-doctoral research project on wedge-tailed shearwater conservation genetics with the Island Conservation Ecology Group.

I am happy to report that my trip was a great success. In addition to collecting the masked booby samples necessary for my thesis, I was also able to collect wedge-tailed shearwater samples. And I made a number of important international contacts for future research.

In my application letter, I stated that “it is my understanding that the Williams/Hillis Fund was established “to promote the careers and scholarship of woman scientists, especially biologists, at all stage of professional development...” And it is my belief that I could use the funds available to further my own career as a conservation biologist.”

I am pleased to say that I still believe every word: I feel the funds I received did that.



Golden-winged Warbler, QUBS 2000.
Photo © Raleigh J. Robertson



Masked Booby, Johnston Atoll, Pacific Ocean.
Photo © Lindsey Hayes

QUBS Outreach Programs

Visiting Scientist

Dr. David Jacobs (Department of Zoology, University of Cape Town, South Africa) came to QUBS as our Visiting Scientist in 2002.

David received his B.Sc. from University of Capetown and his Ph.D. from University of Hawaii, his Doctoral research focussing on character release in the endangered Hawaiian Hoary Bat, *Lasiurus cinereus semotus*. David is currently a senior lecturer at the University of Cape Town, and is well-known to Dr. M. Brock Fenton and Dr. James Fullard through his collaborative work on bats and their interaction with prey species (moths). During his time at QUBS, David had the opportunity to engage in some of this collaborative work on Canadian bat species.

During his visit to QUBS, David interacted with QUBS users and engaged in discussions of research activities and approaches on a wide variety of topics. David also presented a seminar on his current research work. A second seminar on issues in African Conservation work was thought-provoking and sparked considerable discussion among QUBS regulars.

Support for the Visiting Scientist Program in 2002 was provided through the Principal's Development Fund at Queen's (Category 4 - International Visitor's Program). This program provided \$2,000.00 toward Dr. Jacob's visit and stay at QUBS. Further funds were provided by Dr. James Fullard to assist with the collaborative work described above.

Seminars

The seminar series was, as always, interesting and enjoyable. The full list of speakers and topics for 2002 appears later in this report (pp. 64 & 65).

Early on in the program, seminars were largely focussed on the research activities of QUBS regulars. As the summer progressed, topics shifted to include a wider audience and neighbours, visitors and the Friends of Opinicon were encouraged to attend. The seminar room was always full, sometimes standing room only, a testament to the quality and appeal of the program. Judging by the intensity of discussion after seminars, the program stimulates interaction and exchange of ideas among various user groups of QUBS.

Suggestions for speakers and topics are always welcome.

Open House

The annual Open House was held June 30 in 2002. Approximately 450 visitors attended to get a glimpse of the field station and current research projects. Another successful day, thanks in large part to QUBS regulars who become ambassadors of the field station and work hard to present interesting displays and answer questions from the public. Meaningful contact with the public at large is an important part of a field station and increasingly a significant role of biologists, managers, scientists and conservationists. This annual venue works both from the perspective of the interested member of the public in being able to ask questions and gain pertinent information on biological topics as well as from the perspective of our developing researchers and educators in presenting information in an interesting, informative manner without all the jargon often associated with the sciences. The Open House is a vital part of QUBS outreach efforts. Thank you to all who attended and to the regulars who make the day possible.

The 2002 version of the QUBS Community Newsletter was distributed to some 1,050 households and cottages in the Chaffey's Lock, Elgin and Perth Road area. This annual circular serves the same purpose at the Open House, maintaining contact with activities at QUBS and providing outreach to those unable to attend the Open House itself.

Both of these initiatives are very important to the continuing success of the field station. Close and friendly contact with neighbours enables many projects, especially when research activities extend beyond QUBS landholdings. Without the support of the local community, opportunities at QUBS would become much more restricted.

Friends of Opinicon

Activities for this group of interested neighbours was limited in 2002. A couple of casual natural history walks were arranged, though fewer than in previous years. This is not due to lack of interest on the part of the group, rather the incredibly full schedule of QUBS staff. Many Friends attended the seminar series in late summer. Thank you to those who helped plan the topics and speakers and to those who helped spread the word through the local community.

QUBS Logistical Support

GPS/GIS

The Global Positioning System (GPS) rover units and Geographical Information System (GIS) software and computers at QUBS remained essentially unchanged from 2001, throughout the 2002 season. They continue to be widely used in individual research projects, and in mapping and displaying spatial data in the accumulating QUBS database.

In early summer, the rechargeable and the backup batteries of the MC-V were again found to be dead. Some of the wires from the batteries were found to have melted their insulation and to have nearly melted through the plastic back of the rover unit. Because commercial repair of this unit was predicted to take two weeks or more, Floyd bought replacement batteries from "National Battery" in Kingston and soldered them into an old back that had been removed about 6 years before. It worked! Similarly, a faulty terminal on the 9-pin rover end of the incredibly expensive three-way cable that connects the MC-V, the ProXL, and the ProBeacon components of the two-antenna backpack GPS was quickly and cheaply repaired by Linden AudioTronics in Kingston. It was also discovered that the terminal of the co-axial cable running to the GPS antenna was broken off; this was quickly repaired by CANSEL.

Other minor GPS expenses included a letter stamp set for marking aluminum survey markers, and some ring binders for print-outs of various GPS and GIS files.

One potentially significant piece of hardware was added to the TSC1 rover in early autumn. A newly-available cable adapter (TSC1 DB9 Conversion Kit #910-2000) was purchased from CANSEL and attached to the rover, allowing the very expensive and fault-prone original data cable to be replaced by a simple DB9 computer cable. The expectation is that if and when the TSC1 once again develops "cable problems", simply replacing this inexpensive cable with a new one readily available from any computer store should solve the problem.

From May through August, much of the GPS/GIS program was conducted by SWEP students Julia Nicholson and John Cunningham (see "Summer Work Experience Program" elsewhere in this report). John and Julia kept track of GPS equipment, did field work and trained

others to do it, prepared a display for the annual Open House, and worked with data files in the GIS. Their combined report, wherever possible in their own words, is summarized below.

“During the summer of 2002, we undertook mapping of Queen’s Properties to locate and identify survey markers and property tract boundaries. Our team was able to find all existing property boundary markers from the original survey records of the Bonwill Tract and Watson property, and many from the Hughson Tract. A new identification system was developed to mark the property corners, using letter-punched codes on newly-placed aluminum Queen’s stakes. The UTM co-ordinates of these stakes were recorded using the GPS equipment, and added to the QUBS GIS to assist future users in navigating to the original markers using the “Navigate” function of the GPS rovers. We also began searching for original survey markers on the Krahll property; this project is ongoing. Another major project involved consultation and co-operation with Skycroft management to build a detailed GPS/GIS record of the landscape within the Skycroft and Rideau Trail network. The Skycroft campgrounds, both those already in use and those facilities under development, were also mapped for use by QUBS researchers. We mapped several feature categories of these and other QUBS properties, including swamps, ponds, button bush swamps, creeks, beaver dams, fields, plantations, roads and trails. Combined with the existing QUBS GIS data base, much of this information was used in ArcView 3.2 to create a “Quick Map” system for easy production of access maps for selected areas. Over the course of the summer, we completed a detailed GIS map of the immediate Queen’s Point grounds, including forest and lawn, building footprints, buried water lines and hydro lines, sewage lines, and trails. We vetted and reorganized the GIS computer files to make them more accessible, and wrote GIS/GPS “User Help Files”.

In addition to the general QUBS support outlined above, we provided assistance in several research projects. We helped individual researchers use GPS and GIS technology to study Black Capped Chickadees, Black and White Warblers, Cerulean Warblers, Eastern Kingbirds, American Redstarts, Golden-winged Warblers and Tree Swallows. We also mapped the shorelines of Huffman and Hughson Islands at the request of the Bass research crew.”

QUBS Properties

QUBS properties serve many functions beyond simply providing a site for field studies. The conservation value of these properties is significant, especially in the ever-developing landscape along the Montreal-Toronto corridor. The special nature of the locality has been recognized by UNESCO. In 2002, the Thousand Islands - Frontenac Arch Biosphere Reserve was approved by the United Nations Educational, Scientific and Cultural Organization. This reserve covers an area of some 150,000 hectares, forming a rough triangle between Brockville, Gananoque and Westport (see map on p. 20). QUBS properties fall within the northern apex of the triangle. The reserve will focus efforts for mutually supportive conservation and sustainable economic development. Congratulations to the team who put forward the nomination and designation documents, notably David Warner and Carol Clemenhagen.

QUBS properties now encompass some 2,263 hectares (5,590 acres), a substantial landholding by any measure. A map of QUBS landholdings is included in this report, for reference (p. 8). The boundaries shown on the map are approximate and subject to verification, a process that is underway as we develop our Geographic Information Systems database (see “GIS Mapping”, p. 21 and “GPS/GIS” p.18).

For records-keeping purposes, this section of the Annual Report will list uses of properties, management activities and changes pertinent to specific areas. Entries will be made corresponding to particular tracts of land.

GIS Mapping

Work continues on the development of a Geographic Information System for QUBS.

Data collected using Global Positioning System equipment are continually being added to the database. Mapping of physical features of QUBS properties (trails, roads, shorelines, habitat margins and conspicuous features) continues.

Although it is a time-intensive, iterative process, we are beginning to reconcile survey and metes and bounds descriptions of properties with on-site GPS data. Over time, a fully functional GIS will develop. This database will enable an overall management plan for QUBS properties.

Hughson Tract

The Hughson Tract was used for studies of Tree Swallows, Eastern Bluebirds, Golden-winged Warblers, American Redstarts, Eastern Kingbirds, damselflies, dragonflies, water mites, moths, Black Rat Snakes, Columbine, architecture of the forest understory and the possible effects of bismuth on vegetation in 2002.

The various bird box grids were used intensively by Dr. Raleigh Robertson and his students in work on cavity-nesting birds (Tree Swallows and Eastern Bluebirds).

Rotation plots in the Lane Sargent Field used by Dr. Aarssen and his students for plant work were roto-tilled on 15 October. The western-most 25m x 100 m plot in the Lane Sargent Field and the unfenced plot in the New Barn Field received two passes of the equipment, while the fenced plot in the New Barn Field received three passes.

Haying of the open fields was done by Bob Butterill in 2002. In late summer, field edges were bush-hogged and fallen branches removed using our own equipment. The regenerating edge plots established originally by Tim Demmons were restaked (Rachel and Kevin Fraser) using pressure-treated stakes and were left unmowed once again.

In fall, metal posts were installed at the field openings. The intent was to distinctively mark entrances to Queen's property and at the same time indicate that general access is restricted. A piece of galvanized chain was welded to one post at each gate and looped over a welded bracket of the opposite post. Red octagons with reflective markers were attached to the middle of each chain as a safety warning. In mid-November, four of these chains were stolen; these will have to be replaced.

In fall, George Bracken was engaged to re-establish the southwestern corner of the Watson property. For whatever reason, the original survey marker had gone missing. Now, we will be able to clearly establish the sections of the Chapman Field which belong to the Watson property and the section which forms part of the Queen's holdings.

Bonwill Tract

In 2002, The Bonwill Tract was used for studies of Cerulean Warblers, Golden-winged Warblers, American Redstarts, Eastern Kingbirds, damselflies, water mites, moths, Black Rat Snakes, Columbine and architecture of the forest understory. The Ontario Ministry of Natural Resources (Eric Boysen - Kemptville) maintains several Growth and Yield Plots flanking the

Bedford Road. Forest Bird Inventory plots are located within the Bonwill Tract, north and east of the Wire Fence Field.

Haying of the open fields was done by Bob Butterill. In late summer, field edges were bush-hogged and fallen branches removed using our own equipment. The regenerating edge plots established originally by Tim Demmons were re-staked (Rachel and Kevin Fraser) using pressure-treated stakes and were left unmowed once again.

Metal gate posts and chains were installed, as for the Hughson Tract.

The Bonwill Tract (and the Forsyth property exclusion) was the focus of intensive mapping of property boundaries during 2002 (SWEP students John Cunningham and Julia Nicholson).

John M. Cape-Charles Sauriol Environmental Studies Area

The Cape-Sauriol Tract was used for studies of damselflies, water mites, Largemouth Bass, sunfish, bats and Black Rat Snakes in 2002.

The mine sites and the associated roadways and settlements were the focus of fall trips by QUBS users, Chaffey's Lock and Area Heritage Society members and by a family reunion of the Davidson clan. Bryce Davidson was one of the original settlers of the area. His descendants gathered at Chaffey's for the reunion organized by neighbours Brad and Mary Johnson. A field trip to Lake Opinicon village and across the lake (via the QUBS "Rappinicon" pontoon boat) to the mine sites was a highlight of the gathering.



Raleigh with John M. Cape's grandsons, Tim and Mike Usher-Jones, on a winter outing to the Cape-Sauriol Tract of QUBS.

Hilda and John B. Pangman Conservation Reserve

In 2002, the Pangman Reserve was used for studies of Cerulean Warblers, Golden-winged Warblers, Eastern Bluebirds, Black-capped Chickadees, American Redstarts, Tree Swallows, Eastern Kingbirds, Black Rat Snakes, damselflies, water mites, moths, Wild Columbine, Largemouth Bass, Northern Pike, and sunfish.

Warner Lake and Long Lake are used for study on Largemouth Bass populations. Frank Phelan, Dr. David Philipp and students have individually PIT-tagged most of the male bass in the lakes and are conducting a multi-year study of bass populations. The lakes have been posted as research lakes and closed to fishing. In Lindsay Lake, a similar study has been started on Northern Pike.

The outpost cabin on Long Lake greatly facilitates lake work.

The Lindsay Lake Road continues to be a popular place for nature walks with various groups.

Bracken Tract

The Bracken Tract was used for studies of Tree Swallows, Eastern Bluebirds, American Goldfinch and light intensity in forests which might affect the spatial organization of plant communities in 2002.

In fall, the property was intensively used by students in Geology 221 (Geological Field Methods). Doug Archibald had the students lay out baselines and pickets and, working in groups, paced and compassed on perpendicular lines. The purpose of the field work was to determine the stratigraphy of the surficial sediments (lacustrine clay and/or sand over till in most places) on the property by sampling at 50m intervals using soil augers. In addition, a magnetometer survey was done on the two baselines to determine the location of the buried contact between the gneiss and the very magnetic gabbro that hosts the magnetite. This work is of interest since the area used to be home to a very successful iron (magnetite) mine.

In early summer, Maurice and Wayne Hutchings helped us erect a barbed wire fence around the Arsenault property, both to keep cattle out and to delineate the boundary between this property and Queen's holdings.

Maurice Hutchings is permitted to graze cattle on this tract. In exchange, Maurice keeps an eye on the property. In fall, some of the field margins were bushhogged to redefine the field edges.

Moores Tract

In 2002, the Moores Tract was used in studies of Black-capped Chickadees, Black and White Warblers, Black Rat Snakes and water mites.

Crabbe Property

During 2002, forays were made to the "Bird Box" and property to keep the grass cut and to check on security.

Massassaugua Property

During 2002, some initial forays were made into the property to become familiar with the potential of this newest parcel.

Animal Care, Safety and Training

Animal Care

Since November of 2001, QUBS has had in place a specific policy on animal care which meshes activities at the field station with University Animal Care Committee (UACC) protocols and approvals. All QUBS users must adhere to the QUBS policy guidelines (cf.

<http://biology.queensu.ca/~qubs/AnimalCare.pdf>).

As ethical field researchers and educators, animal care issues should be of paramount importance and concern for the animals which are the subject of field and lab activities should be foremost in any study.

Dr. Peter Autenreid (University Veterinarian and Director of University Animal Care) came to QUBS on May 22, 2002 to tour the station facilities and to present an information and training session on animal care to QUBS regulars. The session enabled discussion on policies and procedures, ethics and practical matters surrounding field study of animals. The session was attended by 30 QUBS regulars.

Dr. Bonnie Beresford has recently replaced Dr. Autenreid as Director of University Animal Care. We look forward to working with her. Contact information (address, telephone and Fax numbers) is the same as outlined for Dr. Autenreid in the policy guidelines. She can be reached by e-mail at beresfor@post.queensu.ca. UACC info can also be accessed/delivered at UACC@post.queensu.ca.

Principal Investigators should be aware that the Canadian Council on Animal Care is proposing the adoption of a new set of guidelines governing the Care and Use of Wildlife. This document is far-reaching in its implications. PI's should acquaint themselves with the content and implications of this document.

Field Safety Policy

Queen's University has developed a comprehensive field safety policy as well as guidelines for safety in field research. QUBS users are expected to fully adhere to the principles and guidelines established. The policy document is available at

<http://www.safety.queensu.ca/safety/policy/fieldpol.htm>.

During his visit on May 22, 2002, Dr. Autenreid introduced the topic of field safety and Frank Phelan, Manager of QUBS led a discussion of field safety considerations during research activities at the field station. The need for careful planning, anticipation of hazards and effective response to emergencies was discussed. Each lab group was encouraged to develop a tailored strategy whereby specific risks were assessed, procedures developed to minimize identified risks and procedures for dealing with worst-case scenarios established. Basic considerations should include information transfer between members of a team (whereabouts and expected times of return) and use of a buddy system whenever possible. Most labs started a frank discussion of risks and discussed positive approaches to dealing with recognized risks. Principal investigators could use the field research safety planning record as a guide to developing a group-specific awareness and approach to field safety

(cf. <http://www.safety.queensu.ca/safety/policy/field/app2.pdf>).

Watercraft Safety

With legislation mandating training and proof of operator competency coming into effect in September of 2002, there was great interest among motorboat users of QUBS and biologists in general about local courses leading to certification. Accordingly, Frank arranged two courses. The first was held March 9, 2002 at Queen's. The second was held at QUBS June 25, 2002. The Instructor was George Hiles (Tel 613-453-5253) of Lakeland Safe Boating (lakeland@safeboating.ca). During these two sessions, 50 biologists obtained proof of competency and their Pleasure Craft Operator Card.

As of September, 2002, QUBS is requiring proof of competency before permitting station motorboats to be used. Thus, QUBS users should plan ahead and obtain proof of competency before the research season. A good place to start looking for information is the Canadian Coast Guard (<http://www.ccg-gcc.gc.ca/>) for information. If there was sufficient interest shown, we could again arrange an on-site training course which would provide certification upon successful completion.

ATV Safety

All-terrain vehicles are seeing much more use as research tools at QUBS. Recognizing that these are expensive and potentially dangerous tools, we have instituted an awareness and training program for ATV users. The QUBS program uses the training manual developed by the 4-H Club. All users of ATV's at QUBS must take the training course and pass a competency test. With most QUBS users receiving the training in 2001, only a few field assistants were tested in 2002.

Drinking Water Safety

In the aftermath of Walkerton, new regulations concerning the operation of drinking water systems have been put into place. At QUBS, since we have a common source of water for multiple users and since the station is a university facility, stringent new regulations and procedures have come into effect. This is, of course, a fundamental safety issue. Considerable time, effort and money has been invested in bringing QUBS into compliance with the new legislation.

QUBS is considered a small water works and a designated facility under Regulation 505/01 (Gazetted January 5, 2002). As such, a series of safeguards have been mandated and we have worked hard to comply with all of the provisions of the Act.

A consultant's report on the current state of drinking water protection and plans for compliance was due on March 18, 2002. Accordingly, John Bishop of McIntosh Perry Consulting Engineers (Carp, Ontario) was engaged to file the mandated report. Mr. Bishop made site visits, reviewed the situation at QUBS and filed his report on time. The Ultraviolet units which treat QUBS water were found to be sufficient to the task and to the requirements of the current legislation.

A number of new requirements and procedures were established to comply with the legislation:

- 1) Frank and Floyd had to become "trained persons" under the Act. Both Frank and Floyd took and passed the Operation of Small Drinking Water Systems correspondence course offered by the Ontario Ministry of the Environment.

- 2) Inspection of the water treatment system must be done and logged at least once a week by a "trained person".
- 3) Replacement parts must be kept nearby (extra quartz sleeves and UV bulbs) and water treatment equipment must be in use whenever water is being obtained or supplied.
- 4) Samples of treated water must be submitted to an accredited lab once a week for Total Coliform and E. coli sampling and a heterotrophic bacteria plate count.
- 5) Samples of untreated water must be submitted to an accredited lab once a month for Total Coliform, E. coli sampling and a background bacteria count.
- 6) At least once every 60 months, a sample of water must be submitted to an accredited lab for analysis of multiple parameters as set out in Schedule 2 of the legislation. The list of parameters includes elements, metals, radionuclides, a range of hydrocarbons, pesticides and PCB's etc. This was done in June of 2002. Results indicate that QUBS water falls within guidelines under the Act. All parameters tested were well under guidelines and most under the minimum detectable limits of the testing procedures.
- 7) Lab results and testing must be kept available for inspection at any time. There is a complex set of reporting requirements mandated in the event of an adverse test result.
- 8) An annual report must be filed outlining the water system itself, the procedures for providing safe water and the results of all tests done on water.

This is indeed, a formidable list of tasks and requirements, many of which cost significant dollars. It is estimated that QUBS incurs a cost of \$4,000.00 per year in testing costs. In addition, a great deal of time is spent by QUBS in inspecting, monitoring, reporting and taking samples to the lab.

Dr. Raleigh Robertson (Director, QUBS) and Frank Phelan (Manager, QUBS) met with Queen's officials (June 6, 2002) to keep all apprised of requirements under the legislation, including:

Tom Morrow, Associate Vice-Principal (Operations)
 Anne Godlewska, Associate Dean (Arts and Science)
 Dan Langham, Director, Environmental Health and Safety
 Peter Boag, Chair, Department of Biology
 John Topping, Departmental Manager, Department of Biology.

At this meeting, Tom Morrow agreed to reimburse QUBS for the initial consultant's report. This was a welcome gesture.

As a potential risk to drinking water at QUBS, there was discussion of replacement of the septic field at the station. In light of its age (26 years), proximity to the well, and a recommendation from the consulting engineer's report, it was argued that we should address replacement of the tile field very soon. It was agreed that an application to the Renovations and Alterations fund would be made for 2003.

Overall, we are supplying safe drinking water at QUBS and are making every effort to ensure that this continues into the future.

Renovations and Additions

This section documents a range of projects completed during 2002, and serves as a record of the maintenance and upgrading of facilities at QUBS. Since the Operations Centre is still relatively new and continues to require some finishing and "fine tuning", we divide this section

into two parts. The first details work done on the Operations Centre and the second deals with other projects and improvements to other facilities at QUBS.

Operations Centre

- 1) **Servery Counter Tops** – Some parts of the formica surfaces on counter tops in the servery had begun to lift free and bulge upward. This was especially true near the coffee and tea water dispensers. These areas were flattened down and reglued.
- 2) **Kitchen Roof Leak** – During heavy rains, water came into the kitchen around the stove hood. The problem was in the roof mount of the stove hood fan. Leveling the fan mount (Brunet Heating and Air-Conditioning, Kingston) stopped the leaks.
- 3) **Exterior Stain** – Repainting was done where some of the exterior blue-gray stain, especially around the main entryway, had been thinly and rather irregularly applied.
- 4) **Mouse-proofing** – Since very early in its young life, the Operations Centre had been frequently invaded by White-footed Mice. This was particularly vexing to Marg and the rest of the kitchen staff, as it raised health concerns necessitating frequent cleaning and sterilization and also resulted in the loss of significant amounts of foodstuffs. In late summer a final search revealed large potential entryways from outside, most notably under the screen porches. Rod then blocked these off and gave them a final seal with caulking. Since then, the Operations Centre appears to be mouse-free.
- 5) **Hardwood Floors** – In December, the hardwood floors in the dining room and servery and the area at the head of the entryway stairs were scarified with plastic rotary cleaning pads, then thoroughly cleaned and recoated with 2 coats of “Wood Pride” #1880 Clear Satin Interior Polyurethane Varnish. The choice of finish was based on consultation with the original installer and finisher of the floors and advice from two paint sales companies.
- 6) **Tiled Floors** – Tiled floors in the halls, bathrooms, laundry room, and lower entryway were stripped of finish, thoroughly cleaned, resealed with “Dynasty” Acrylic Sealer, and given a double coat of “Secretariat” Floor Finish.
- 7) **“Runner” Mats** – The rubber finishing strips on the ends of most of these mats were cleaned and re-glued with a better grade of contact cement. Before the tiled floors under these mats were refinished, they were wet and stained from condensation; it seems that some form of porous material allowing aeration under the mats will be necessary, especially in the lower entryway.

Other Renovations and Alterations

White House

- 1) **Upstairs Bedrooms** – In spring, Rooms 1, 2, and 3 were totally refinished. Minor holes in walls were repaired, walls and ceilings were repainted, and floors were stripped, resealed, and given two coats of finish. Some repairs were done to beds and bureaus. Even the windows were thoroughly cleaned!
- 2) **Basement Apartment Room 2** – Totally remodeled to include the part of the basement hall where the refrigerator had sat. That refrigerator went to the upstairs kitchen, and was replaced in the basement suite by a new “bar-sized” fridge. The walls, ceiling, and carpeting of Room 2 were redone with new materials.
- 3) **Upstairs Freezer** – A new, small freezer was installed in the upstairs dining room.

- 4) Concrete Step – The concrete step facing the Operations Centre was beginning to rock excessively. It was temporarily removed, and new very solid footings were made.
- 5) Lakeside Walkway – The footpath on the lake side of the White House was uneven and had serious problems with drainage and erosion. In mid-summer, patio slabs were installed outside the basement entryway, steps were made leading up to the existing steps for the upper entryway, and a patio-slab walkway was completed to the edge of the White House closest to the Manager's house. Within minutes of its completion, Marg had flowers planted along its edge. It works well, and is a great improvement.
- 6) Tiled Floors – In spring, and again in November, the tiled floors in the upstairs hallway and in the dining room were stripped, washed, sealed, and given two coats of finish.
- 7) Carpets – In December, upstairs living room carpets and those recently installed in the basement small bedroom were steam cleaned as was the upholstered furniture in the upstairs living room.

Earl Cottage

- 8) Wall Repair – Wall repairs which were begun in autumn of 2001 were completed by adding plywood interior panelling. Green staining of the new exterior siding remains to be done.
- 9) Ceiling repair – Fibreboard panelling on the ceiling was badly stained, sagged, and mouse-chewed. Ceiling joists were found to be badly misshapen, making the ceiling very irregular. Ceiling joists were twinned with new ones in the attic. The ceiling was then panelled with drywall, and joints were covered with thin wooden battens. The crown moulding was repaired. The result is a notably flat and attractive ceiling with a vintage look.
- 10) Interior Painting – Walls and ceiling of the entire living room were painted an off-white, and the floor was sanded, some cracks filled, and then painted a gloss brown. The whole room looks remarkably clean, bright, and airy.
- 11) Interior Trim – New baseboards and window trim were stained a maple colour and put in place. Some staining of window casements remains to be done.
- 12) Exterior Trim – Damaged fascia were replaced, and new boards were shaped and put in place to cover the joist headers in the rebuilt area.

Curran Cottage

- 13) Room 5 – The 4-bed room had grown rather dingy, with some drywall damage and a badly worn carpet. Walls were repaired and painted, and new carpet laid down. The oversized roller drawer under one pair of bunks was cut down so that it fits properly under the bed.

Sumac Cottage

- 14) Deck and Steps – The L-shaped deck on Sumac Cottage had suffered extensive rot, and the built-in bench seating and rails along the edge were rotted to the point of being deemed unsafe. The deck was completely removed except for the support posts and the beam bridging them, and replaced by a new smaller cedar deck and rail on the lake side of the cottage only. On the Curran Cottage side, a new set of concrete steps leads to the entrance, and the access path has been re-landscaped and some new patio slabs laid down.
- 15) Carpets – In December, carpets in the living room and dining room area were steam cleaned, as were those in the middle bedroom.

Other Cabin Work

- 16) Lake-water Intakes – A continuing frustration with the tedium of rebuilding lake-water plumbing intakes for cottages each year led Rod to design and build new plumbing intake housings for several of the cottages. The most sophisticated ones are at Sumac and Curran cottages, with simpler ones at Earl Cottage, Cabin 12, and the lake-water intake for the big Aquarium House.
- 17) Cabin 12 (“The Condo”) – A new water pump and pressure tank were installed.
- 18) Cabin 7 – An excited report by a distressed resident of extensive roof leaking led to stripping and repairing the roof, and re-shingling.
- 19) Cabin 13 – The single bed near the desk was removed and stored elsewhere as a spare, and an upper-bunk frame was built in its place. This allows for a closet rod and hangers, and storage space under the bunk.

Queen’s Point Landscaping

- 20) Traffic Circle – Marg Phelan and Frank’s father Don did a lot of tilling and planting here. Rather extensive pruning of dead and broken limbs was done on the central crab-apple tree in spring.
- 21) Curran Path Upgrade – The path from Cabin 8 down to Keast Beach was steep and badly eroded due to years of ever-increasing foot traffic. In late autumn, it was notably improved by terracing using pressure-treated lumber frames and crushed limestone in a design similar to the path from the Operations Centre to the Tank House. A rail and footlights should be added in 2003.
- 22) Picnic Tables – In early summer, the old picnic tables were completely disassembled, the boards were planed and sanded and their corners rounded with a router, and reassembled. Significant cracks and holes were filled with epoxy, and they were then given 2 coats of Defthane UV-block polyurethane finish. They look really good now, but we will monitor them to see how long this lasts.
- 23) Old Aviaries – The old aviary behind the main workshop, built for Red-winged Blackbird research in the mid-1980’s, was not up to modern standards, was no longer needed, and was in the way of access to the new Storage Building and so was disassembled. Much of the pressure-treated lumber was salvaged for stakes and for rough outdoor construction projects. A second, older and smaller aviary near the Septic Leach Field was also removed and was discarded.
- 24) QUBS Road Sign – The “Queen’s University Biological Station” sign at the “station gate” was badly weathered and discoloured. It was replaced by a new sign made by Jim Janeway.
- 25) Original QUBS Sign – The original, antique QUBS sign that had been renovated and installed on the Biological Station road at our property boundary in preparation for the 50th Anniversary celebration was heavily damaged by a falling tree during a wind storm in March. The broken bits of the wooden sign were found and reassembled, the paint on the lettering was touched up, and the sign was mounted on a new and sturdier steel bracket. Once again, it stands tall and looks good.

Miscellaneous

- 26) Library and Offices – Several new LAN connections were added in May. Some of the wiring needs to be made tidier and less conspicuous.

- 27) Brown Lab – In mid-summer, a high-amperage 110V circuit was installed in the Lower Brown Lab to the right of the blackboards, in preparation for installing a lab incubator. In November, all floors on both levels were stripped, cleaned, sealed, and given a double coat of floor finish.
- 28) Tri-Lab – Twice in 2002, attempts were made to seal leaks in the low-pitch roof over Room 4, using the tar-like “plastic cement”. This approach turns out to be temporary at best. We will need to undertake a wholesale effort, such as reroofing, in 2003 to effect a proper fix.
- 29) Welding Table – An old motor repair trolley used often with the former inboard motor of the “Rappinicon” barge was converted to a heavy-duty welding equipment trolley and welding table. This promises to be a very welcome and important addition to the shop equipment.
- 30) Aquarium House Drain – The drain from the flow-through fish tanks in the Aquarium House began leaking near the boathouse, and pouring water down over the walkways and docks there. It had become clogged with roots. A section of the drain was replaced.
- 31) “Rappinicon” – After years of frequent repairs of the inboard motor of the blue barge, we removed it and the outdrive assembly once and for all in spring. The aluminum motor well covering was replaced by plywood covered with rubber matting, allowing for more workspace on the afterdeck. A second outboard motor bracket was installed, on the rear of the starboard pontoon. The deck canopy was also extensively restitched, as earlier seams and strap attachments were mostly failing.
- 32) “Dinah Moe” – A new stern light was installed on the small orange pontoon boat.
- 33) Carleton Boats – This summer three sturdy, high-quality jon boats that Dr. Mark Forbes had brought to QUBS from Carleton University were purchased for use at QUBS.
- 34) Lake Temperature Probes – In spring, the float on the 0.2m and 1.2m probes was found to have become perforated and to have sunk. The probes were raised and a new float installed. One probe was malfunctioning at the time and was repaired, but by year’s end both the 0.2m probe and the 1.2m probe required repairs which will be done in spring of 2003.
- 35) Ford 3400 Tractor – Cracked welds on the front-end loader arms were repaired in a better-than-new fashion with a bridging plate. The steering arm was also repaired. Late in summer, while removing fallen limbs from field edges, a limb perforated the radiator; the “tanks” on the radiator were saved, but the core was replaced.
- 36) Ford 150 Truck – In autumn, a brakeline burst and had to be replaced. At the same time, an ongoing coolant loss problem was traced to a faulty radiator and a new one was installed, and 2 new universal joints were installed on the front axles.
- 37) Blue Dump Trailer – The hydraulic pump ceased to function in autumn and was needed immediately for stump hauling and in the long term for many tasks. It was commercially reconditioned by Kingston Truck & Trailer, and seems to work well. A “rubbermaid” tub was inverted over the pump and lashed down with bungee cords, in an attempt to reduce corrosion by rain, and road salt from tire spray.

Acknowledgements

A large vote of thanks is due our QUBS staff. Without the efforts of all our staff, no matter in how small a capacity, the field station would be unable to function. Thanks to Roger (Rod) Green (Maintenance Assistant) and our Food Service Staff - Marg Phelan, Cheryl MacDonald, Lucinda (Cindy) Chrissley and Theresa Perrin - for your efforts on behalf of all QUBS users.

Table 1: Summary of enrolments in the Ontario Universities Program in Field Biology in 2002 (QUBS courses highlighted)

Location	B	C	G	M	O	Q	To	Tr	Wa	We	Wi	Y	Other	TOTAL
QUBS	0	0	0	0	0	16	0	0	0	0	0	0		16
Australia	0	0	18	1	0	0	0	0	0	1	0	0		20
Costa Rica	0	1	3	0	2	2	0	2	5	0	0	0		15
QUBS	0	0	3	0	0	3	0	0	1	3	0	2		12
QUBS	0	0	1	0	2	5	0	0	2	1	0	0		11
HMSC	0	1	1	0	0	5	13	2	1	2	0	0		25
HMSC	0	1	1	1	0	4	12	0	0	0	0	1		20
Pigeon Lake	0	1	1	0	2	0	3	3	1	2	0	0		13
Windsor	0	0	0	0	0	1	0	1	0	3	4	3		12
Belize	0	1	2	1	0	3	0	0	0	3	1	0		11
HMSC	0	0	1	0	3	2	2	0	1	2	0	0	5	16
Vietnam	0	0	0	0	0	2	6	0	0	0	0	0		8
Queen Charlotte Is.	0	0	0	0	0	1	2	1	1	0	0	0		5
Dorset	0	4	2	0	0	0	0	0	0	3	0	1		10
HMSC	0	0	4	0	0	5	0	0	4	0	0	0	2	15
Churchill, Man	0	0	20	0	0	0	0	0	0	0	0	0		20
QUBS	0	0	0	0	0	4	1	0	0	0	0	1		6
QUBS	0	0	3	0	0	1	0	0	0	1	0	2		7
Algonquin Park	0	0	24	0	0	0	0	0	1	0	0	1		26
Central Siberia	0	0	0	1	0	5	0	0	1	0	1	0		8
Kananaskis	0	1	0	0	0	4	2	0	1	2	0	1		11
Churchill, Man	1	1	0	1	1	3	14	0	1	0	0	0		22
QUBS	0	0	0	0	0	1	1	1	0	0	0	2		5
QUBS	0	0	1	0	0	3	1	0	0	2	0	1		8
Cornwall	0	0	0	1	0	2	1	1	0	1	0	0		6
Algonquin Park	0	1	1	0	0	0	1	0	0	8	0	0		11
HMSC	0	0	1	0	0	1	1	1	0	3	0	0		7
HMSC	0	0	0	0	0	3	0	0	1	0	0	0		4
Deep River	1	0	1	0	0	0	8	0	0	0	0	0		10
Algonquin Park	0	0	1	2	0	3	1	0	7	0	0	1	1	16
QUBS	0	0	1	1	2	2	1	0	1	1	0	1	1	11
Sudbury	0	0	0	0	0	1	0	0	2	0	0	4	3	10
Pigeon Lake	0	0	0	1	1	2	1	5	1	0	1	0		12
Jamaica	0	0	6	4	0	2	0	1	0	2	0	1		16
Barbados	1	0	2	0	0	1	9	0	0	0	0	1		14
# of students	3	12	98	14	13	87	80	18	32	40	7	23	12	439
# student-weeks	4	24	184	23	24	145	136	33	60	75	14	33	20	775

B=Brock C=Carleton G=Guelph M=McMaster O=Ottawa Q=Queen's To=Toronto Tr=Trent Wa=Waterloo We=Western Wi=Windsor Y=York

Table 2: Summary of credits earned in the Ontario Universities Program in Field Biology in 2002

	Brock	Carleton	Guelph	McMaster	Ottawa	Queen's	Toronto	Trent	Waterloo	Western	Windsor	York	Other	Total Student-Weeks	Half-Course Credits	Total
Total Student-Weeks																
Not at QUBS	4	24	179	22	18	86	131	31	54	64	14	23	20	670		335
Total Student-Weeks																
at QUBS	0	0	5	1	6	59	5	2	6	11	0	10	0	105		52.5
Total Student-Weeks																
in Field Modules	4	24	184	23	24	145	136	33	60	75	14	33	20	775		
Total Half-Course																
Equivalents in Field Modules	2	12	92	11.5	12	72.5	68	16.5	30	37.5	7	16.5	10			387.5

13.5% of credits in entire program earned at QUBS in 2002 (14% in 2001; 24% in 2000; 13% in 1999; 22% in 1998)

41% of Queen's credits earned at QUBS in 2002 (30% in 2001; 47 % in 2000; 26% in 1999; 40% in 1998)

Research conducted by Queen's University Personnel in 2002

Dr. Lonnie W. Aarssen

“Plant ecology and evolution”

Jason Pither - “Measuring the relative intensity of incident light at many locations, across fine spatial scales, simultaneously” - Ph.D. thesis

This project explores the possibility of using photo-sensitive paper to measure fine-scale variation in cumulative light intensity incident at points throughout the forest floor. A nested grid of over 200 sample points was set up within a grazed forest at Bracken Tract. The “ozalid” paper, as it is referred to, successfully measured variation in the cumulative amounts of incident light received (relative to outside forest), and the nested grid sampling design enabled the characterization of spatial variation in light intensity at scales from 15cm to 10m. This method can therefore be used when fine-scale variation in cumulative light intensity needs to be characterized in forest plots.

Assistants: Michelle Cook, Jen Evans, Cam MacLeod and Jen Waugh

Maayke Schurer – “Why some understory trees don’t stand up straight: testing alternative hypotheses for the architectural response of understory saplings to light gradient” - B.Sc. thesis

Spatial patterns of variation in incident light intensity and canopy openness from analysis of hemispherical photo images are being related to variation in understory seedling and sapling architecture in Sugar Maple, Basswood, White Ash, and American Elm. Analysis will attempt to assess the role of four potential hypotheses for explaining why the stems of understory trees commonly depart from a straight and vertical upright orientation:

- (1) Ice loading hypothesis - Some trees may have incurred greater damage from physical forces such as the ice storm effect of 1998 (e.g. because the accumulation of ice load was heavier in some local sites than in others).
- (2) Biomechanical constraints hypothesis - Some trees may have experienced more shaded conditions during their life and hence have invested disproportionately more growth in vertical (stem length) growth at the expense of lateral (stem diameter) growth. Hence, whereas this may assist in the ‘race to the canopy’ under light competition, the resulting biomechanical constraints dictate that these trees are more susceptible to stem buckling (which may be precipitated by loads such as ice storm effects).
- (3) Phototropic response hypothesis - Trees that are more bent-over may experience greater spatial variation in shade and may be directing growth towards higher light conditions (e.g. toward the forest edge or a forest gap). Stem bending then is considered adaptive here because it presumably maximizes the chances of placing leaves in locations where they can intercept more sunlight.
- (4) Light harvesting hypothesis - Trees that are more bent-over may be growing in deeper shade and hence, by bending during growth can display leaves more laterally, thus minimizing leaf overlap while harvesting as much of the limited light as possible. Stem bending then may also be considered adaptive here, especially for shade-tolerant species.

Assistants: Brandon Schamp, Floyd Connor

Theses:

Jennifer Evans. 2002. What determines tree shape? Interpretation of stem diameter-height allometry in young sugar maple (*Acer saccharum* Marsh.). B.Sc. honours thesis, Queen's University.

Dr. Chris Eckert

“Plant evolution and population genetics”

Publication:

Herlihy, C.R. and C.G. Eckert. 2002. Genetic cost of reproductive assurance in a self-fertilizing plant. *Nature* 416:320-323.

Dr. Barrie J. Frost (Queen's Department of Psychology) and **Dr. Henrik Mouritsen** (Queen's Department of Psychology, and Fachbereich Biologie, University of Oldenburg, Oldenburg, Germany)

“Mechanisms of Monarch Butterfly migration”

Henrik Mouritsen and Barrie Frost's paper on mechanisms of Monarch Butterfly migration, which appeared recently in *Proceedings of the National Academy of Sciences (PNAS)* (<http://www.pnas.org/misc/archive071202.shtml#HL3>), reports on experiments and observations performed at QUBS at Lake Opinicon in late summer of 2001. It has been widely publicized in the TV, Radio and news media around the world. This research used a novel flight simulator to fly tethered migratory monarchs while an optical encoder continuously recorded their directions. This enabled the researchers to reconstruct long sections of their virtual migratory paths. By carefully controlling the butterflies' circadian clocks and modifying magnetic fields, Mouritsen and Frost were able to show that Monarchs use a time-compensated sun compass, and not magnetic information, to steer their course to Mexico. Subsequent studies have shown that the butterflies' direction can be guided by the orientation of polarized light. This accounts for their correctly-directed flight paths on overcast days, because residual polarized light penetrates cloud.

Publication:

Mouritsen, H. and B.J. Frost. 2002. Virtual migration in tethered flying monarch butterflies reveals their orientation mechanisms. *PNAS* 99(15): 10162-10166.

Dr. Rudolf Harmsen (Queen's Biology) and **Dr. Suzanne Blatt** (Honorary Research Associate, Department of Biology, Acadia University, Wolfville, N.S.)

“Secondary succession and carbon fixation in abandoned agricultural fields”

This project was in its 27th year, which was a ‘sleeper year’, i.e. no field data were collected. However, laboratory research was conducted on previously-collected data and specimens. The field component of the project will be re-activated in 2003.

Publication:

Blatt, S.E., J.A. Janmaat, and R. Harmsen. 2001. Modeling succession to include an herbivore effect. *Ecological Modeling* 139:123-136.

Jim D. Karagatzides (Queen's Geography) and **Dr. Len J.S. Tsuji** (Environmental Science, University of Waterloo)

“Potential effects of bismuth shotgun pellets on southern Ontario Sugar Maple forests and wetlands”

With concern over the impact of lead on the health of our environment and people, lead has been removed from many products yet lead pellets remain the major constituent of shotshell. Bismuth is proposed as a non-toxic alternative to replace lead shot pellets yet there is a paucity of data on the potential impact of bismuth on the environment. This is of further importance in our region where persistent acidic deposition may lead to mobilization of bismuth and other metals found in bismuth pellets. To examine the potential effects of bismuth pellets on terrestrial and aquatic ecosystems in southern Ontario, we established long-term monitoring plots in a sugar maple forest and sedge marsh at QUBS in 1999. In each environment, 6 plots received one of four treatments: bismuth, acidifying agent (ammonium sulphate pellets applied once annually), bismuth plus acidifying agent, or control (no bismuth or acidifying agent). Bismuth pellets were applied in November 1999 at average published rates of lead pellets in the environment: 50 pellets m⁻² for upland forests and 200 pellets m⁻² for wetlands. At the end of the study, we will examine pre- *versus* post-treatment comparisons of soil chemistry (pH, bismuth and other elements found in shotshell), vegetation biomass, chemical status of wetland and forest herbaceous plants and tree foliage, and tree ring increment growth and chemistry. The results will provide much-needed information on the effects of bismuth shotshell pellets on plant growth and chemistry in forests and wetlands.

Dr. Robert Montgomerie

“Reproductive strategies: Sperm traits and sperm competition.”

In 2002 we continued our research on sperm competition at QUBS, with three different projects described below. Our ongoing studies of sperm competition in bluegills, started by Brenda Leach and I in 1996, continue to reveal some interesting patterns that are helping us to understand what influences the evolution of sperm morphology and behaviour. With the assistance of postdoctoral fellows Albrecht Schulte-Hostedde and Gary Burness, we are now

getting a handle on some of the physiological influences on sperm behaviour and how females influence the fertilization success of different males by inhibiting or promoting sperm motility.

Stephen Casselman, Gary Burness, Albrecht Schulte-Hostedde – “Sperm traits of parental and sneaker bluegill”

During June of 2002, we collected data on the sperm characteristics of bluegills (*Lepomis macrochirus*). Male bluegill have alternative mating strategies; small sexually- mature males use cuckold reproductive tactics to obtain fertilizations from larger mature males which build and defend nests. Due to the intense sperm competition faced by sneaker males we expected that sneakers might compensate by producing a superior ejaculate. We conducted two studies. First we compared the amount of ATP (the energy for sperm movement) in the sperm of sneaker and parental males at fixed intervals throughout the duration of sperm motility to see if we could find differences between the two reproductive strategies. We found that cuckold and parental males differed in the ATP levels, velocity and longevity of their sperm. Second, we measured various indices of immune response to determine the effect of immune suppression on sperm production in both sneaker and parental males. Although no differences have been found between the two tactics, within tactics there is a relationship between immune suppression and sperm traits.

Tristan A.F. Long – "Sexual conflict and sperm competition in the waterstrider *Aquarius remigis*" – Ph.D. thesis

In May and June I began a preliminary study of the waterstrider *Aquarius remigis* as part of my PhD research on sexual conflict. In many species, males and females do not share the same interests on matters relating to reproduction, be it the frequency, the number, the duration or the investment in mating events. The divergence of interests sets the stage for an evolutionary tug-of-war between the sexes. Any new adaptation that results in greater reproductive success of one sex, even if it comes at the expense of the other sex, should be selected for, just as counter-adaptations should evolve in the other sex. A recent comparative inter-specific study (Arnqvist and Rowe 2002, *Nature* 415:787–789) of waterstriders (Insecta: Heteroptera) has suggested that the changes in morphology and behaviour that are a consequence of this “arms race” is an important means by which new species form. We set out to determine whether this pattern is also manifested at the population level. We collected males and females from geographically (i.e. genetically) isolated populations, which are theoretically following independent coevolutionary trajectories in order to look for divergences that are consistent with those observed at the species level. The consequences of these divergences can also be experimentally tested by comparing the interactions of copulating males and females that come from the same population (and have had the opportunity to coevolve) with experimental situations in which males and females come from different populations (and whose genomes have not had the opportunity to coevolve). This research should further our understanding of the mechanisms by which speciation proceeds.

Assistant: Sally Ahn

Albrecht Schulte-Hostedde — “Ejaculate traits and sperm competition of Northern Water Snakes (*Nerodia sipedon*)” – Post-Doctoral Fellow

Northern Water Snakes have high levels of multiple paternity within litters and high variance in male reproductive success. Sperm competition has been implicated as a mechanism

for these patterns, yet little is known about how male snakes vary with respect to ejaculate investment or sperm traits. A study of sperm traits was conducted on water snakes from mid-April to late May to examine three issues. First, we tested whether sperm traits were size or condition dependent. Then we tested, by examining the effects of immunological activity on ejaculate traits, the hypothesis that males which invest heavily in ejaculates should have suppressed immune systems. Finally, we examined the effects of sperm traits on fertilization success in the context of sperm competition by conducting mating trials between pairs of males and single females. Analysis is ongoing. However, the mating trials resulted in only 3 of 12 females producing offspring.

Assistant: Sally Ahn

Dr. Laurene Ratcliffe

"Acoustic communication and mate choice"

Kristin Schubert - "The ontogeny of social rank in Black-capped Chickadees (*Poecile atricapilla*) and its fitness implications" - M.Sc. thesis

Group living is a widespread adaptive life history trait. In order for a social group to form, it is hypothesized that all members must derive some benefit; however, not all members benefit equally. The Black-capped Chickadee (*Poecile atricapilla*), a passerine species residing year-round at QUBS, is a model species for studying the ecological and evolutionary significance of group living. Wintering chickadees form dominance-structured flocks, and high-ranking individuals have preferential access to winter food resources. These same high-ranking birds also have the greatest success during the spring breeding season. My current research investigates the causes and consequences of this rank-structured social system for individual birds. I am addressing this question by assessing the relative contributions of intrinsic and extrinsic characteristics to the acquisition of social rank, as well as determining the individual fitness consequences of rank acquisition.

In the winter of 2002, I banded 50 new birds and caught 90 surviving adults, a small population compared to those of recent years (i.e. 180 in 2001). After catching the birds, my assistant and I conducted behavioural observations at feeding stations to construct dominance hierarchies for each of 24 flocks. In the spring, we monitored ~50 breeding pairs, locating nests and sampling nestlings for genetic paternity analysis. The current study builds on a 10-year dataset on the chickadee population at QUBS. In addition to my own observations from 2002, I am utilizing data collected by Daniel Mennill, Scott Ramsay and Kenneth Otter for their respective doctoral theses.

Assistants: Adi Boon, Erik Coleman, and Josiane Vachon

Daniel Mennill - "The song system and mating system of the Black-capped Chickadee: Communication networks and female choice" - Ph.D. thesis

2002 was the final year of my dissertation research on the song system and mating system of Black-capped Chickadees. I conducted a short field season in 2002, having completed most of the field work for my dissertation in 2001. I designed a multi-speaker playback

experiment to test whether male black-capped chickadees eavesdrop on the countersinging interactions of other males. Using the left and right channels of stereo sound files to simulate two countersinging males, I tested how territorial male Chickadees respond to opponents who differ only their relative contribution to song contests. Male Chickadees discriminated between loudspeakers broadcasting overlapping and overlapped songs, responding more aggressively to overlapping opponents. Further, males of high and low dominance status showed rank-related differences in their responses to intruders.

Following the publication of my research on female eavesdropping on male song contests in May 2002, many news agencies reported on our Chickadee research at QUBS including Nature, U.S.A. Today, The National Post, The Ottawa Citizen, The Kingston Whig-Standard, Birder's World magazine, New Scientist magazine, Season's magazine, The Discovery Channel, CNN, CBC's Quirks & Quarks, BBC radio, and National Public Radio. You can read more about chickadee research at QUBS on the internet (<http://www.biology.queensu.ca/~mennilld>).

Assistant: Stephanie Doucet

Ryan Norris - "Linking events of the annual cycle in a long-distance migratory bird using stable-carbon isotopes" - Ph.D. thesis; co-supervised by Dr. Peter Marra (Smithsonian Environmental Research Centre)

We are using stable isotopes to link summer and winter events in a long-distance migratory bird, the American Redstart (*Setophaga ruticilla*). Stable-carbon isotopes indicate the quality of habitat occupied by individuals during the tropical, non-breeding season. Because isotopic signatures do not turn over immediately in tissues, individuals can be non-destructively sampled the following season on the breeding grounds to determine the quality of habitat used the previous winter, thousands of kilometers away. In 2001 and 2002, we banded and sampled 204 adults (152 males and 52 females), 159 nestlings, and monitored 224 nests in 5 forest plots (60 ha total) located in Bedford Tract (in the Bonwill Tract of QUBS). Preliminary results show that arrival date and reproductive success are strongly correlated with tropical winter habitat quality in adult males. Importantly, female Redstarts originating from high quality winter habitat, such as coastal mangroves and lowland forests, fledge up to 2 additional young per season compared to females originating from poor quality habitat, such as dry scrub forest. In 2002, we also began an egg removal experiment to investigate the effect of re-nesting on the acquisition of winter habitat quality. This is a 2-year experiment that involves sampling manipulated and control birds the following breeding season. We are also continuing to sample individuals throughout their wintering range (Caribbean, Central America, northern South America) to develop an isotopic basemap for the tropics. This will allow us to determine the geographic wintering location of individual Redstarts breeding at QUBS.

Assistants: Dev Aiama, Adi Boon, Laura Tourangeau, Matthew French, Derek White

Publications:

Kasumovic, M.M., RATCLIFFE, L.M. and P. T. Boag. Female song in least flycatchers (*Empidonax minimus*). Wilson Bulletin (accepted with minor revisions 10 March 2003)

Mennill, D.J. and L.M. RATCLIFFE. Overlapping and matching in the song contests of black-capped chickadees. Animal Behaviour (accepted 11 Feb 2003)

- Mennill, D.J., Doucet, S.M., Montgomerie, R. and L.M. RATCLIFFE. 2003. Achromatic color variation in black-capped chickadees, *Poecile atricapilla*: black and white signals of sex and rank. Behavioral Ecology and Sociobiology (in press; online publication 8.3.03 at <http://dx.doi.org/10.1007/s00265-003-0581-8>)
- Mennill, D.J., RATCLIFFE, L.M. and P.T. Boag. 2002. Female eavesdropping on male song contests in songbirds. Science 296: 873
- Ramsay, S.M. and L. M. RATCLIFFE. 2003. Determinants of social rank in female black-capped chickadees (*Poecile atricapilla*). Canadian Journal of Zoology 81: 117-121
- Ramsay, S.M., Mennill, D.J., Otter, K.A., RATCLIFFE, L. M. and P. T. Boag. 2003. Sex allocation in black-capped chickadees *Poecile atricapilla*. Journal of Avian Biology 34: (in press)
- Tarof, S.A., RATCLIFFE, L.M. and P.T. Boag. 2001. Polymorphic microsatellite loci for assigning parentage in least flycatchers (*Empidonax minimus*). Molecular Ecology Notes 1: 146-148.

Theses:

- Kasumovic, M. M. 2002. Male and female reproductive tactics in Least (*Empidonax minimus*) clusters. M.Sc. thesis, Queen's University, pp xi + 108
- Christie, P. J. 2002. Song fine structure as a cue to male quality in black-capped chickadees (*Poecile atricapilla*). M.Sc. thesis, Queen's University, pp vii +113
- Mennill, D.J. 2003. The song system and mating system of the black-capped chickadee: communication networks and female choice. Ph.D. thesis, Queen's University.

Dr. Raleigh J. Robertson

"Behavioural ecology and conservation biology of birds"

With a very energetic team of grad students and under-grad assistants, work in my lab continued with on-going studies of Tree Swallows, Cerulean Warblers, Golden-winged Warblers, Black-and-white Warblers and Eastern Kingbirds. Our Eastern Bluebird studies were discontinued, although we monitored Bluebirds nesting in the Tree Swallow grids.

In addition to the studies described below, we explored with Jan and Mary-Ann Lifjeld, during a week-long visit in June, the location of Barn Swallow nests on Lake Opinicon, Indian and Newboro Lakes, as well as at Loughborough Lake Bridge and several sand-sheds in the area, in preparation for studies that Jan plans with graduate students beginning in 2003.

Cerulean Warbler Studies:

Kate Girvan - “Examining migratory connectivity and dispersal patterns in the Cerulean Warbler (*Dendroica cerulea*) using stable isotope analysis” - M.Sc. thesis

During the summer of 2002, Kate, Jason, and Chris continued collecting long-term demographic data on the Cerulean Warbler population at the Bedford plot at QUBS. Behavioural observations were done to record return rates, pairing success, nesting success, and fledgling movements. We color-banded most of the male Ceruleans on the plot and collected blood and feather samples from each bird. Blood samples will be used for Chris Gibb’s thesis examining the prevalence of blood parasites in Ceruleans. Feather samples will be used for Kate’s M.Sc. thesis examining migratory connectivity and dispersal through stable isotope analysis of feathers.

In addition, Kate and Chris spent six weeks in the eastern United States collecting blood and feather samples from six additional Cerulean Warbler populations. Kate is in the second year of her master’s degree and will be defending during the fall of 2003.

Field Assistant: Chris Gibb

Chris Gibb - “Aspects of Cerulean Warblers (*Dendroica cerulea*): Post-fledging care and blood parasites” - B.Sc. thesis

Chris Gibb and Kate Girvan sampled five Cerulean Warbler populations in the USA in the spring to collect blood and feather samples. In June and July, they continued to collect blood and feather samples and monitored the Cerulean population on the Bedford and Skycroft grids at QUBS. In addition, for her fourth year undergraduate thesis, Chris tracked Cerulean fledglings to study fledgling behaviour, parental and sibling interaction, dispersal and habitat use. Chris is currently comparing the differences in blood parasite prevalence and intensity among the six different populations

Eastern Kingbird Studies:

Bill McLeish - “Population dynamics and habitat choice in Eastern Kingbirds at Lake Opinicon” - M.Sc. thesis

This investigation has two main components. First, it is a comparative study of the breeding biology and success of Eastern Kingbirds at Lake Opinicon in relation to previous studies at QUBS by Dr. Peter J. Blancher and others (from 1977 to 1985). Secondly, it is an investigation into habitat choice and the habitat requirements of breeding Eastern Kingbirds at multiple spatial scales (nest placement and concealment at scales ranging from within 1m radius of the nest, to >100m radius from the nest). The goals of this study are twofold: 1) to determine what factors are involved in potential breeding site consistency for Kingbirds at Lake Opinicon, and 2) to determine the extent to which Eastern Kingbirds hold habitat requirements (i.e. are they true 'open area/edge' generalists, or do they make certain habitat choices within the landscape that lead to higher likelihood of nesting success?). As a continuation of fieldwork in 2001, settlement patterns were monitored, in addition to territory occupancy, and nesting success, along with other behavioural information relating to nest defense (via. aggression

scores). Factors monitored in relation to their effects on nesting success include clutch initiation date, clutch size, hatching success, and fledging success. Data collection was expanded in 2002 to include information on nesting Kingbirds in the 'back lakes' of QUBS property (e.g. Lindsay Lake, Long Lake etc.), in addition to the small ephemeral beaver ponds (e.g. Horseshoe Pond, Allen's Pond, Jack's Marsh etc.) in order to provide a gradient of 'open area' habitat availability. In conjunction with data collected on habitat characteristics around nest sites (vegetation data from 1m radius to 100m radius), a random sub-sample of 'available' nest locations (~200m from nest sites) was conducted for a direct comparison of nest-site use versus nest-site availability.

Field Assistant: Kate Neville

Tree Swallow Studies:

Mary Stapleton - "Why do female Tree Swallows (*Tachycineta bicolor*) mate multiply? Testing the genetic compatibility hypothesis" - Ph.D. thesis

During the summer of 2002, Mary and her field assistant Catherine, monitored the reproductive efforts of Tree Swallows breeding in nest boxes located on QUBS property. During the beginning of the breeding season, Mary and Catherine spent much of their time radio-tracking female Tree Swallows in order to learn more about female movement during the fertile period. In addition, all pairs of Tree Swallows nesting in boxes were monitored to determine clutch size, hatching success, and fledging success. Blood samples were taken from adults and nestlings to be used in a genetic study examining the role of the genetic compatibility and relatedness in mate choice in this species. Mary is currently in her third year of the Ph.D. program at Queen's University.

Field Assistant: Catherine Dale

Catherine Dale - "Factors affecting the infestation of tree swallow nests by parasitic blowflies" - B.Sc. thesis

While acting as a field assistant for Mary Stapleton, Catherine also conducted research on the factors that affect the prevalence and severity of parasitic blowfly (*Protocalliphora sialia*) infestations in tree swallow nests. She examined nests collected in 1995, 1996, 1997 (by Dr. Wally Rendell) and 2002, and collected and measured the pupal cases deposited in the nests by the blowflies. She also noted various aspects of nest construction such as nest composition and number of feathers in the lining. Preliminary results suggest that some of the factors that affect the infestation of nests include the volume of nest material, nest microclimate, the quality of feather lining, nest composition and overall weather patterns. Catherine was supported by NSERC funding.

Golden-winged Warbler Studies:

Rachel Fraser - "Implications of hybridization for the conservation of Golden-winged Warblers (*Vermivora chrysoptera*)" - Ph.D. thesis

During the summer of 2002, Rachel and Matt completed their second field season studying Golden-winged Warblers at QUBS. Field work involved finding, capturing and banding adult birds, locating nests, as well as collecting blood samples from adult birds and nestlings, and mapping nests sites using the GPS. Blood samples collected are currently being used in paternity analyses to determine if female Golden-winged Warblers 1) engage in extra-pair copulations (EPC), and 2) whether EPC's are ever sought from heterospecific males (i.e. Blue-winged Warblers and hybrids). Once complete, these data will be useful in characterizing mate-choice in a population of Golden-winged Warblers. This information will be added to other molecular genetic data (currently in progress) and will ultimately help explain the effects of widespread hybridization between Golden-winged and Blue-winged Warblers on Golden-winged Warblers breeding throughout Canada and the north-eastern United States.

Rachel and Matt also spent two weeks in Kentucky and Tennessee, USA collecting blood samples from Blue-winged Warblers for inclusion into the molecular genetics study on hybridization between Blue-winged and Golden-winged Warblers.

Field Assistant: Matthew Timpf

Black-and-White Warbler Studies:

Melinda Collins - "Breeding biology and habitat use of Black-and-White Warblers (*Mniotilta varia*)" - M.Sc. thesis

During the summer of 2002, Melinda carried out her field season studying the breeding biology and habitat use of Black-and-White Warblers with the help of field assistant Julia Panczuk. Melinda and Julia captured and colour-banded males and mapped out their breeding territories using the GeoExplorer II GPS unit. Map generation and GIS analyses were made possible by the help of Julia Nicholson and John Cunningham.

Melinda and Julia Panczuk also spent much time searching for nests and documenting breeding behaviour. With considerable effort they were able to characterize habitat features preferred by female BAWW's for nest-site selection and gain much insight into the unusual breeding behaviour of this elusive species. Melinda hopes to complete her Master's program during the summer of 2003.

Field Assistant: Julia Panczuk

Julia Panczuk - "Patterns in the size and blackness of throat and auricular patches among male Black and White Warblers (*Mniotilta varia*)" - B.Sc. thesis

While working as field assistant for Melinda Collins (M.Sc. candidate), Julia collected her own data for analysis of plumage variation among male Black-and-White Warblers (*Mniotilta varia*). The males in this species vary greatly in the size and blackness of their black

throat and ear patches, and in her undergraduate thesis project, Julia will attempt to quantify and look for patterns in this variation among males of different sizes and ages. This involved banding and performing measurements on birds at QUBS during the summer of 2002, and then tracking the birds to determine whether they successfully paired with a female. Julia also made a trip to the Royal Ontario Museum in the fall of 2002 to collect additional morphological data on the Black and White Warblers in the ROM archive. Julia will be completing her undergraduate Biology degree and her Honours thesis under the supervision of Dr. Raleigh Robertson in April 2003.

Publications:

Kempenaers, B., K. Peer, E.L.M. Vermeirssen and R.J. ROBERTSON. 2002. Testis size and asymmetry in the Tree Swallow *Tachycineta bicolor*: a test of the compensation hypothesis. *Avian Science* 2: 115-122.

Theses:

Aiama, Deviah. 2002. The influence of leaf-out on song post selection by male Cerulean Warblers (*Dendroica cerulea*). B. Sc. Honours thesis. 35pp.

Barg, Jennifer J. 2002. Small-scale biological phenomena in a male neotropical migrant songbird: Space use, habitat use, and behaviour within territories of male Cerulean Warblers. M.Sc. thesis. 93pp.

Male, Sean. 2002. Effects of nestbox density on the behaviour of Tree Swallows (*Tachycineta bicolor*) throughout the nest-building stage of the breeding season. B.Sc. Honours thesis. 40pp.

Dr. Raleigh J. Robertson (Queen's University) and **Dr. Jason Jones** (Croasdale Fellow, Dept. Biological Sciences, Dartmouth College)

“Long-term studies of Cerulean Warbler demography and population dynamics”

During the summer of 2002, Jason continued the demographic monitoring of the Cerulean Warbler study population at the Bedford site, which straddles the boundary of the Bonwill Tract and Turid Forsyth's property. This population has been monitored since 1994 and represents the longest continuous monitoring of a population of this species north of Mississippi. Reproductive success was low this year, with only 7 of the 25 breeding pairs successfully fledging young. From a conservation standpoint, two very important results have come from this long-term study: (1) the implication of adult mortality (probably during spring and fall migration) as the dominant variable in determining population growth rates; (2) stochastic nature of variation in fecundity among years.

Collaborators: Jennifer Barg, Kate Girvan, Christine Gibb

Publications:

Barg, J. J., J. Jones, and R. J. Robertson. 2002. Interim Status Update for the Cerulean Warbler. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON.

Jones, J., C. M. Francis, M. Drew, S. Fuller, and M. W. S. Ng. 2002. Age-related differences in body mass and rates of mass gain of passerines during autumn migratory stopover. *Condor* 104:49-58. (based on student research project from a Ontario Universities Program in Field Biology course)

Dr. John P. Smol, Paleoecological Environmental Assessment and Research Lab (PEARL)

“Establishing development guidelines for lake watershed management in Southeastern Ontario using a multi-proxy paleolimnological approach”

Our lab uses paleolimnological techniques to study a variety of water quality issues, including those associated with lake eutrophication in the QUBS region.

Publications:

Forrest, F., Reavie, E.D., and Smol, J.P. 2002. Comparing limnological changes associated with 19th century canal construction and other catchment disturbances in four lakes within the Rideau Canal system, Ontario, Canada.. *J. Limnol.* 61(2): 183-197.

Dr. Bruce Tufts, (Queen's University) **and Dr. Jim Kieffer** (University of New Brunswick)

“Evaluating the potential to minimize physiological disturbance associated with live-release angling tournaments for Largemouth Bass, Smallmouth Bass and Walleye”

The practice of releasing fish following angling (catch-and-release) has increased dramatically in the past few decades. The rise in popularity of catch-and-release has been partially due to the increasing popularity of live-release angling tournaments. While releasing fish following angling does not typically result in mortality, studies have documented that mortality of fish following tournaments can occur. Our lab is interested in both the physiological responses of Largemouth Bass, Smallmouth Bass and Walleye to the challenges associated with catch-and-release angling, as well as the physiological disturbances that arise in these species during live-release angling events. The goal of our research is to find ways of minimizing the physiological disturbance associated with angling and with angling tournaments, and to maximize the survival of fish caught during these events.

Cory Suski - “Quantification and alleviation of physiological disturbances in Largemouth Bass (*Micropterus salmoides*) and Smallmouth Bass (*M. dolomieu*) during competitive angling events” – Ph.D. thesis

Live-release angling events present fish with a number of different challenges, and my research in the summer of 2002 focused on two specific challenges associated with livewell confinement. First, we examined the impact of water conditions within the livewell on the

ability of Largemouth Bass to recover from exercise. Second, we simulated a number of different situations commonly experienced by Largemouth Bass during livewell confinement and examined how these conditions affected both ion loss and waste production. Results from these studies can be used to help minimize the physiological disturbance experienced by fish during angling tournaments, and can also help facilitate recovery of fish following exercise.

Assistants: Michael Morrissey, Shaun Killen.

Publications:

Suski, C. D., S. S. Killen, M. Morrissey, S. G. Lund and B.L. Tufts. 2003. Physiological status of Largemouth Bass, *Micropterus salmoides*, following live-release angling tournaments. North American Journal of Fisheries Management (in press).



Raleigh Robertson and his Winter Ecology field module, in front of the much-appreciated new Operations Centre at QUBS. February 2002.

Research conducted by Non-Queen's Personnel in 2002

Stefania Biscardi (La Sapienza, Rome, Italy), **John M. Ratcliffe** and **M. Brock. Fenton** (Department of Biology, York University)

"Variability in echolocation calls of *Myotis lucifugus* (Vespertilionidae, Chiroptera) in different habitats."

The aim of this study was to investigate the effects of different habitats on echolocation calls of *Myotis lucifugus*.

During the summer 2002 (August- September) we recorded the echolocation calls of *M. lucifugus* in different habitats: over the water (lake), open field and forest. Our goal was to determine if the echolocation calls (and therefore behaviour) differed between situations. We captured bats in a harp trap and compared echolocation calls from released bats with echolocation calls from free flying bats. For the statistical analyses we used calls from released bats, selecting only search phase calls recorded when one individual flew in the recording area. To record calls we used a Pettersson D980 bat detector using the high-frequency output connected via an F 2000 Control filter via an Ines DAQ i508 high speed card to a laptop. We found significant differences in duration and frequencies in echolocation calls between the different recording situations, suggesting inter-habitat flexibility in the echolocation behaviour of *M. lucifugus*.

Dr. Gabriel Blouin-Demers (Department of Biology, University of Ottawa) and **Dr. Patrick J. Weatherhead** (Program in Ecology and Evolutionary Biology, University of Illinois)

"Factors affecting gene flow between hibernacula populations of black rat snakes"

Habitat fragmentation is thought to be a major factor responsible for population declines in threatened species and yet the mechanisms by which fragmentation causes such declines are poorly understood. This is particularly true for inconspicuous species such as snakes, where factors that potentially link sub-populations (e.g., dispersal, mating) are difficult to observe. However, genetic tools in the form of hypervariable DNA-based genetic markers provide a novel and powerful indirect method for assessing such behaviours. In this project, we take advantage of some previously-developed microsatellite DNA loci for black rat snakes, a data bank of almost 2000 blood samples from adults and neonates, and the substantial ecological data available on black rat snakes, to determine (1) the levels of gene flow between local rat snake hibernacula populations and (2) the ecological and behavioural factors that determine such patterns. We will then use the information derived from this novel integration of genetic and ecological data for rat snakes to (1) determine the scale of demographically-independent management units in this species and to (2) develop an empirical model to predict the consequences of fragmentation on other snakes for which little ecological or genetic data are available. The fieldwork we conducted at QUBS in 2002 had several objectives relevant to the above goals. (1) Continue the long-term demographic study of the black rat snake population. (2) Continue the collection of blood samples necessary for the genetic analyses. (3) Radio-track juvenile (3 to 6 year old) black rat snake to determine their dispersal patterns during the 5 to 7 years before they join communal

hibernacula. (4) Recapture some of the 1200 neonates marked and released since 1996 to quantify their dispersal. (5) Build and deploy artificial nesting sites to increase our ability to collect eggs, and thus mark neonates to monitor their dispersal.

Assistants: Dawn Weber, Jeffrey Row, and Catherine Verreault (volunteer)

Publications:

Blouin-Demers, G, KA Prior & PJ Weatherhead. 2002. Comparative demography of black rat snakes (*Elaphe obsoleta*) in Ontario and Maryland. *Journal of Zoology* 256: 1-10.

Blouin-Demers, G & PJ Weatherhead. 2002. Habitat-specific behavioural thermoregulation by black rat snakes (*Elaphe o. obsoleta*). *Oikos* 97: 59-68.

Blouin-Demers, G & PJ Weatherhead. 2002. Implications of spatial and movement patterns for gene flow in black rat snakes (*Elaphe obsoleta*). *Canadian Journal of Zoology* 80: 1162-1172.

Weatherhead, PJ, G Blouin-Demers & KA Prior. 2002. Synchronous variation and long-term trends in two black rat snake (*Elaphe o. obsoleta*) populations. *Conservation Biology* 16: 1602-1608.

Blouin-Demers, G. In press. Precision and accuracy of body size measurements in a constricting, large-bodied snake (*Elaphe obsoleta*). *Herpetological Review*.

Blouin-Demers, G, PJ Weatherhead & HA McCracken. In press. A test of the thermal coadaptation hypothesis with black rat snakes and northern water snakes. *Journal of Thermal Biology*.

Blouin-Demers, G. & HL Gibbs. In press. Isolation and characterisation of microsatellite markers in black rat snakes (*Elaphe obsoleta*). *Molecular Ecology Notes*.

Dr. Mark R. Forbes (Department of Biology, Carleton University)

"Ecological entomology: damselfly and dragonfly studies"

QUBS became the temporary summer home of Dr. Maria Servia (Visiting Postdoc, Universidad de Santiago de Compostela, Spain), Tonia Robb (Ph.D. Student, Carleton), & Marc Lajeunesse (M.Sc. student, Carleton). A number of projects were initiated, whereas others were partially or wholly completed. All projects this year dealt with the ecology of damselflies and dragonflies, particularly in relation to season, weather-related temperature variation, and parasitism by mites. The work on parasitism by mites includes ongoing collaborations with Drs. Bruce P. Smith (Ithaca College) and Robert Baker (Erindale College, University of Toronto).

Maria Servia - “Phenodeviants and fluctuating asymmetry of *Sympetrum vicinum*” - Visiting Post-Doctoral Fellow

Many tests of whether fluctuating asymmetry (FA) relates to fitness variation of organisms are based on natural variation in both fitness correlates and FA. One reason that there has been such controversy in FA-fitness studies is that the range of FA variation observed in some studies is small (and unrelated to supposed fitness correlates). Maria’s Ph.D. research was an investigation of whether abnormalities in aquatic insects co-varied with FA. She extended this research during her short stay at QUBS to investigate whether phenodeviants (based on several morphological characters in multivariate space) were more likely to have high FA values for the dragonfly, *Sympetrum vicinum*. Other questions to be addressed include: whether or not FA values increase seasonally in dragonflies, as both size and condition at emergence are known to decline seasonally for temperate odonates. Maria’s stay was only one month in duration; its purpose was to develop techniques for the accurate and precise measurement of FA. She also gathered basic natural history on *S. vicinum*, a species in a group of closely-related species which we are studying in relation to ecology of mite parasitism.

Tonia Robb - “Weather-related tolerance/immunity in damselflies” - Ph.D. thesis

Tonia’s research at QUBS in 2002 was multifaceted. She returned from a busy field season in New Zealand examining immunity in relation to cuticular melanism and population density in the New Zealand Alpine Weta, only to prepare for her field season at QUBS. Once there, she completed collection of data on *Enallagma boreale* damselflies for a project on weather-dependent temperature variation and immune expression. Those data indicate that bouts of cool weather are associated with reduced immune expression in males, but not in females of this species. Such findings are important as the success of parasites on their hosts may well depend on the weather experienced by both. For example, reduced immunity with poor weather could result in parasites having greater effects on damselfly fitness. Alternatively, insect immunity can be costly and result in reduced survival if immune expression is followed by inclement weather, as recently shown for bumblebees. Often, the efficacy of biocontrols of pest species is weather- dependent. In a separate study, Tonia investigated whether newly-emerged *Lestes disjunctus* damselflies were more or less able to resist *Arrenurus pollictus* mites if reared under low versus high temperatures. This species of host, curiously like several other damselfly species, does not appear to mount a melanotic encapsulation response to mite feeding tubes. Tonia is testing whether mites engorge more slowly under cool temperatures, which might preclude the need of an aggressive response.

Assistant: Marc Lajeunesse

Marc Lajeunesse - “Local adaptation studies: mites and dragonflies” - M.Sc. thesis

In addition to assisting with other studies, Marc managed to finish writing up his M.Sc. thesis and to prepare papers for publication while at QUBS. His main research interest was whether generalist versus specialist parasites differ in their likelihood of showing local adaptation (i.e. a parasite does better on local versus non-local population of hosts). He tested some of the suppositions of both verbal and mathematical models of local adaptation using *Limnochares americana* mites and two of their host dragonflies. Marc first used a meta-analysis to show that generalist parasites are often not well adapted to local populations of given host

species; he then demonstrated that mites on a less abundant host were less likely to engorge than were mites on a more abundant host. This research suggested local tracking of abundant host species by mites, similar to research from other study systems.

Publications:

- Forbes MR, Muma KE, and Smith BP. 2002. Diffuse coevolution: constraints on a generalist parasite favor use of a dead-end host. *Ecography* 25:345-351.
- Hecker KR, Forbes MR, and Leonard NJ. 2002. Parasitism of *Enallagma boreale* damselflies by gregarines: sex biases and relations to adult survivorship. *Can. J. Zool.* 80:162-168.
- Lajeunesse MJ and Forbes MR. 2002. Host range and local parasite adaptation. *Proc. Roy. Soc. Lond. Series B* 269: 703-710.
- Lajeunesse MJ and Forbes MR. In press. A comparison of structural size and condition in two female morphs of the damselfly, *Nehalennia irene* (Hagen). *Odonatologica*.
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- McCurdy DG, Boates JS, and Forbes MR. 2001. An empirical model of the optimal timing of reproduction for female amphipods infected by trematodes. *J. Parasitol.* 87:24-30.
- Schalk G, Forbes MR, and Weatherhead PJ. 2002. Phenotypic plasticity in green frog (*Rana clamitans*) embryos and hatchlings: effects of a leech (*Macrobdella decora*) predator. *Copeia*. 2:445-449.
- Sherratt TMN and Forbes MR. 2001. Sexual differences in coloration of Coenagrionid damselflies (Odonata): case of intraspecific aposematism? *Anim. Behav.* 62:653-660.
- Yourth CP, Forbes MR, and RL Baker. 2002. Sex differences in melanotic encapsulation responses (immunocompetence) in the damselfly, *Lestes forcipatus* Rambur. *Can. J. Zool.* 80: 1578-1583.
- Yourth CP, Forbes MR, and Smith BP. 2002. Immune expression in a damselfly is related to time of season and not to fluctuating asymmetry or host size. *Ecol. Entomol.* 27:123-128.

Theses:

- Lajeunesse, M.J. 2002. Local adaptation and evolutionary potential of multi-host parasites. M.Sc. thesis, Carleton University. 80 pp.

Dr. James H. Fullard (Department of Biology, Erindale College, University of Toronto)

"Insect sensory ecology"

2002 was another busy summer with the second year of the "bat-cage" in operation. This screened enclosure allows us to fly small bats while videotaping them in near infra-red (invisible) light as well as digitally recording their echolocation calls. These echolocation sequences are used to examine the foraging flexibility of certain bats (Ratcliffe; Jacobs, Ratcliffe and Fullard) and how sympatric moths are able to detect these calls (Fullard, Ratcliffe and Jacobs). Some moths have adopted exclusively diurnal flight habits and this should enable them to be released from bat predation. We continue to examine two species of day-flying moths to test whether this release has changed their defensive armament (Muma and Fullard). We examined the alternative anti-bat strategies of earless moths and how this sensory condition has resulted in lifestyle adaptations (Soutar). After many years of watching the fish people have so much fun, we've finally ventured into the murky waters of moth/fish interactions and are looking at what problems moths face when they dive out of the night sky onto the surface of a lake (Guignion).

Dr. David S. Jacobs (2002 QUBS Visiting Scientist) (Department of Zoology, University of Cape Town, Cape Town, South Africa)

I was invited to Queens Biological Station by Profs James Fullard (University of Toronto) and Raleigh Robertson (Queens University) and served as the QUBS visiting scientist for 2002. My main research interest is bat echolocation in the context of its co-evolution with moth hearing. I usually approach bat/moth co-evolution through studies on bat echolocation and diet i.e. studies on what prey the echolocation of a species allows it to capture as manifested in its diet. My visit to the laboratory of Prof Fullard, who specializes on the neuroethology of moths, allowed me to study moth hearing and its response to bat echolocation calls directly. In 2002 I worked on a manuscript reporting a study I undertook with Profs Fullard and Fenton (York University) and John Ratcliffe, a doctoral student of Prof. Fenton, at QUBS in 2001. The foraging habitat of insectivorous bats has traditionally been characterized on the basis of the number of obstacles the bat has to detect and avoid i.e. by the amount of clutter. However, clutter is an ill-defined term and there is little data on the relative ability of bats to deal with it. In our manuscript we develop a clutter index based upon the time components of the bat's echolocation calls, its flight speed and the distance to clutter scaled to body size.

As visiting scientist I delivered two lectures, one on my research and one on conservation biology. I was most impressed with the calibre of students and staff assembled at QUBS during the summer and found my interaction with both extremely beneficial to my own research. The facilities at QUBS are second to none and is something that Queens University can rightly be proud. Every research university should have such a facility. Well done to Raleigh and his team of dedicated staff who make the QUBS experience such an enriching one.

James Fullard, John Ratcliffe and David Jacobs - “Reduced audibility in the terminal phase calls of the Northern Long-eared Bat (*Myotis septentrionalis*)”

As a bat closes onto its flying prey, it changes its echolocation calls from relatively long, intense and slowly repeated “search” pulses to a shorter, fainter and more rapidly repeated train of pulses called the terminal “buzz”. An earlier study in our lab demonstrated that the ears of moths do not hear the terminal buzz pulses as well as they do the search calls and that this decrease in audibility could be exploited by the bat to reduce its acoustic conspicuousness to the erratically flying moth. The Northern Long-eared Bat, *Myotis septentrionalis* is unusual in the large proportion of moths that it includes in its diet and previous studies have explained this as a result of its ability to glean moths from vegetation. A recent study by Ratcliffe and Dawson, however, showed that *M. septentrionalis* also feeds while on the wing, although its search calls do not differ much from those of non-moth-feeding bats such as the Little Brown Bat, *Myotis lucifugus*. We played the echolocation attack sequence of *M. septentrionalis* into the ears of two sympatric species of notodontid moths while we monitored the auditory nerve responses to see if this bat also reduces its conspicuousness at terminal phase of its attack. Whereas the previous study suggested that an attacking bat effectively “disappears” 100 - 200 msec before it contacts the moth, the exposure trials of the calls of *M. septentrionalis* shows that this bat expands this period of cloaking to almost 1 second before contact. We believe that this time will give the bat enough of an advantage to overcome the moth’s ear-based defence and allow it to increase the number of moths in its diet.

Assistants: Kit Muma, Amanda Soutar, Cassie Guignion

Kit Muma (Ithaca College)-"Persistence of hearing in the exclusively diurnal moths, *Trichodezia albobittata* (Geometridae) and *Lycomorpha pholus* (Arctiidae). "

During the summer of 2002, we completed a two-year study of hearing in diurnal moths. We tested the prediction that the total isolation from the predatory effects of echolocating bats would result in degeneration in auditory structures and behavioural responses in these species. We found that *Trichodezia albobittata* (a silent geometrid moth) had large ears with auditory thresholds similar to nocturnal geometrids and a strong behavioural response to ultrasound. In contrast, *Lycomorpha pholus* (a sound-producing arctiid moth) had small ears with low auditory sensitivities and low response to ultrasound. We examined the four conditions that must be met for the phenotypic effects of the release from the selective pressures of bats as outlined in Fullard (2000): 1. complete isolation from bats, 2. absence of alternative uses for ears, 3. genetic isolation from bat-exposed conspecifics and 4. sufficient evolutionary time in bat-released condition.

John M. Ratcliffe (York University) - “The use of sensory cues for the discrimination of palatable from unpalatable prey in the Northern Long eared Bat, *Myotis septentrionalis*.” - Ph. D. thesis (supervisor Dr. M. Brock Fenton)

This past summer we investigated the use of visual and acoustic cues in the northern long eared bat for discriminating arctiid moths, a noxious group of insects, from moths of similar size readily consumed by this bat species. The Northern Long-eared Bat was chosen because the

literature indicates that for this species, uniquely amongst the eight found in southern Ontario, moths are the predominant prey item eaten. Further, this species is specialized for gleaning prey (i.e. hovering before and then taking stationary prey). This foraging strategy should give the bat a better opportunity to size up a prey item than should capturing moving prey on the wing. We found that neither visual cues (e.g. warning colouration) nor acoustic cues (e.g. high frequency sounds made by some arctiid moths in response to echolocation calls and tactile stimulation) alone were effective in deterring the bats from capturing arctiid moths. These results suggest a number of possibilities: (1) that visual cues are not used by this bat species and that acoustic warning by the moth is only of use during aerial attacks when the high frequency clicks disturb the bat's ability to echolocate (bats have typically stopped echolocating prior to commencing a gleaning attack); (2) that the costs associated with capturing unpalatable prey (e.g. wasted time and energy) do not outweigh the benefits of making quick and decisive attacks on all possible prey items; (3) that a multi-modal suite of acoustic and visual cues together are necessary to prevent the bat from completing a gleaning attack. None of these possibilities is mutually exclusive. We have designed future experiments to help determine which of these cues, if any, influence Northern Long eared Bat's decision making processes in the capture of stationary prey.

Assistant: Cassie Guignion

Amanda Soutar - "Lifestyles of the tasty and earless: Anti-bat defences of earless moths" - M. Sc. thesis

As moths are short-lived organisms that rely on flight to find mates, the need to remain undetected by bats and the need to find a mate creates a conflict. Most moths have resolved this in part through the evolution of ultrasound-sensitive ears; however, little is known about the anti-bat defences of a small number of earless moths. Last summer I continued a project which was started during the summer of 2001, in which I hypothesized that earless moths reduce activity to decrease detection by bats. Fullard and Napoleone (2001) examined the timing of flight in moths and found that eared moths restrict their flight to short time periods of the night. However, no studies to date measure total amount of flight of moths in a phylogenetically controlled study. Moths were captured at mercury vapour and UV collecting lights at locations around the Biological Station. They were then filmed overnight in large outdoor cages (0.6m x 0.9m x 1.2m) using near-infrared-sensitive cameras and the resulting videos were later used to measure total flight time. Statistical analysis performed in the fall of 2002 found that earless moths had significantly reduced flight compared to eared moths, supporting my hypothesis though leaving the question of how the mate-searching strategies of earless moths have compensated for reduced flight. Flight time was also not found to be correlated with size of moth, despite hypotheses that larger moths are protected from bat predation. A significant positive relationship was also found between the number of auditory receptors in a moth's ear, and flight time. More research is needed to determine if greater number of receptors increases auditory quality.

Assistant: Cassie Guignion

Cassie Guignon - "Effect of flight over water on the anti-bat response behaviour of moths" - B.Sc. thesis

Many moths have evolved ears specifically tuned to the frequencies emitted by bats during echolocation. These moths register high-intensity sounds as indicative of the close proximity of the bat. At these intensities, the moth then enters into an erratic flight pattern as an evasive behaviour. Typically, this flight includes descent toward the ground surface in the form of 'power dives' and 'downward spirals'. While this method may be effective over a solid surface such as land, I wish to examine the effectiveness of this technique over a body of water, Lake Opinicon. Flight over water introduces new predation threats, namely that of water surface predation by fish. This summer, I wished to quantify the risk of landing on the water surface. I compared the risk between moths of various sizes and between scaled and de-scaled moths. These experiments were performed off the docks of both the boat house and Earl Cottage. During this upcoming year, I will observe the reaction of moths to high-intensity sounds over various ground surfaces in a lab situation.

Publications:

Fullard, J.H., Dawson, J.W. Jacobs, D.S. 2003. Auditory encoding during the last moment of a moth's life. *Journal of Experimental Biology* 206: 281-294.

Ratcliffe, J. M. and Dawson, J. W. 2003. Behavioural flexibility: the little brown bat and the northern long-eared bat both glean and hawk prey. *Animal Behaviour* (in press).

Dr. Jim Kieffer (Department of Biology and Centre for Coastal Studies and Aquaculture, University of New Brunswick, Saint John, N.B.)

“Physiological and behavioural aspects of “catch and release angling” on Largemouth Bass”

In collaboration with Dr. Bruce Tufts and his students (Cory Suski and Shaun Killen), the focus of this research project was to examine the impacts of tournament angling on the physiology, behaviour and survival of largemouth bass. QUBS served as the research hub for most of our experiments.

Dr. Scott A. MacDougall-Shackleton (Department of Psychology, University of Western Ontario)

“Integrative studies of birdsong”

My research addresses the mechanistic bases of birdsong production and perception, as well as the reproductive and population-level effects of variation in singing behaviour.

**Jeremy Pfaff - "Song repertoire size and male quality in the Song Sparrow
(*Melospiza melodia*)" - B.Sc. thesis**

Female song sparrows prefer males who sing large song repertoires over males who sing smaller song repertoires. In 2002 we initiated a long-term study of song repertoires and male quality in a population of song sparrows breeding on the Bracken Tract. This involved i) recording the entire song repertoires of the local males, ii) locating nests and collecting DNA samples from males, females and nestlings, iii) collecting blood samples for parasite analyses, and iv) taking morphological measures to evaluate physical measures of quality. Our first field season was very successful and Jeremy plans to continue this research into his M.Sc.

Dr. Bryan D. Neff (Department of Zoology, University of Western Ontario)

"Origins and dynamics of alternative mating tactics in Bluegill Sunfish"

My laboratory conducted two studies at the QUBS this summer. First, we investigated kin recognition systems of nest-tending parental male Bluegill. Parentals are regularly cuckolded during spawning by specialized parasitic males. We were interested in testing whether parentals could differentiate their offspring from non-offspring within their nest. Parentals and females were collected from natural colonies in Lake Opinicon just prior to spawning and used to produce offspring of known parentage using *in vitro* fertilization techniques. After the eggs hatched, each parental was given two odour samples in a two-choice experimental set-up conducted in the aquatic facility at the Biological Station. One sample was scented with the male's own offspring and the other with a foreign male's. We found that parentals spent significantly more time associated with the scent of their own offspring. Because the parentals had never come into contact with the offspring prior to the experiment, the results strongly suggest that they were able to use their own odour as a referent template in kin recognition. This mechanism of recognition is receiving increasing support in the animal kingdom, and may be particularly important in systems where no other reliable cues of kinship exist. It has been termed "self-referencing" by Paul Sherman and euphemistically termed the "arm-pit effect" by Richard Dawkins.

Second, we examined the risk sensitivity during foraging of offspring produced by parental males versus the parasitic cuckolder males. We again used *in vitro* fertilization to produce offspring of known parentage. Once the eggs hatched we placed the young into large semi-natural ponds using the experiment pool facility at the station. Some pools had no predators present, while others had a predator. The offspring were allowed to feed and grow for about 1 month and then all surviving young were collected. Microsatellite paternity analysis will be conducted in my molecular ecology facility at Western to determine the parentage of the survivors. These individuals will also be digitally photographed and measured to determine their growth rate. Any differences in growth or survivorship between the offspring of parentals versus cuckolders can be attributed to differences in genetic quality. These data will help to understand the origins of the alternative parental and cuckolder life histories.

Collaborators: Dr. Mart R. Gross (Toronto), Dr. Paul W. Sherman (Cornell)

Students: Joanna Lister, M.Sc. thesis

Assistants: Beth Clare (University of Western Ontario, summer NSERC), Michael Richards (University of Toronto)

Publications:

- Neff, BD, P Fu and MR Gross. 2003. Alternative male mating tactics and sperm investment in bluegill sunfish. *Behavioural Ecology*, in press.
- Neff, BD and MR Gross. 2001. Dynamic adjustment of parental care in response to perceived paternity, *Proceedings for the Royal Society of London (B)*, 268:1559-1565.
- Neff, BD. 2001. Genetic paternity analysis and breeding success in bluegill sunfish (*Lepomis macrochirus*). *Journal of Heredity*, 92:111-119.
- Fu, P, BD Neff and MR Gross. 2001. Tactic-specific success in sperm competition, *Proceedings for the Royal Society of London (B)*, 268:1105-1112.

Dr. David Philipp (Illinois Natural History Survey and University of Illinois at Champaign-Urbana)

Research interests: Natural resource conservation genetics; factors controlling reproductive success in fishes; evolution of reproductive behaviors in fishes; impacts of catch-and-release angling; evolution of gene regulatory mechanisms; developmental and biochemical genetics of fishes.

“Long-Term monitoring of Largemouth Bass and Smallmouth Bass reproductive success”

The impact of early variation in mating and reproductive success is not well understood for many species of fish, especially in species with long-term parental care. To address this issue in Largemouth and Smallmouth bass, we have been monitoring the reproductive activities at several sites within Lake Opinicon, including 4 islands and 2 km of shoreline. These habitats have been surveyed annually during the spawning season by visual swims using a mask and snorkel. Data collected included the date of each individual spawn, location and depth of the nest, assessment of mating success (number of eggs laid), size of parental male, and duration of parental care for each male, as well as the occurrence of hookwounds from angling. Visual swims to determine number of one- and two-year-old Largemouth and Smallmouth bass are also done to assess year class strength. By determining the degree of success or failure of each male in raising a brood, we can then calculate total fry production for each site each year. These data can then be correlated with year class strength one and two years later.

Project Team Members: David Philipp, Julie Claussen, Brandon Barthel, Steve Cooke, Jack Degner, Anne Readell, Jim Ludden, Jana Svec, Deanna Iwaniec, Magdalena Bartkowska.

“Conservation sanctuaries as management tools”

The use of sanctuaries or conservation zones to protect spawning areas of certain fish is a concept that is being explored by many conservation agencies. Current regulations in Ontario prohibit angling for nesting bass while they are spawning and providing parental care for their young. Existing regulations do allow angling for other game fish such as Black Crappie and

Northern Pike. As a result, it is possible inadvertently to hook a nesting bass while legally angling for another game fish. Our research has demonstrated that catching and releasing a male bass can lead to an increase in their nest abandonment and can affect reproductive success within a water body. One alternative management strategy that may prove effective at preventing angling male bass out of season is a peer-enforced, voluntary bass conservation zone. When properly enforced, these conservation zones can reduce the harmful effects of angling and can lead to an increase in nesting success. Current research is being conducted to assess the efficacy of conservation zones, as well as designing protocols to predict areas preferred by nesting bass. Once developed, this protocol would allow lake associations and local residents to establish conservation zones using recognizable cues such as littoral zone character, shoreline features, and topographical maps.

Project Team Members: David Philipp, Brandon Barthel, Anne Readell, Jana Svec, Steven Cooke, Jim Ludden, Deanna Iwaniec, Julie Claussen, and Frank Phelan

“Reproductive ecology and seasonal movement of Smallmouth Bass in the Mississippi River Watershed”

For more than ten years, the INHS research team has been studying the reproductive ecology of Smallmouth Bass in the Mississippi River and Millers Lake (both in Eastern Ontario). These studies have focused on monitoring the reproductive success of individual nesting male Smallmouth Bass. The data gained from these ongoing projects continue to provide insight into recruitment mechanisms and nest-site fidelity, improving our ability to manage and conserve Smallmouth Bass populations. A three-year telemetry project concluded in the summer of 2002. Over 40 adult bass of both genders were located throughout each year, most frequently during the reproductive period. The study has resulted in detailed assessments of pre- and post-spawn movements and provided insight into habitat use and seasonal movements. It has also led to the hypothesis that multiple life history strategies may be present among the fish of the system. This comprehensive project will continue to improve the understanding of the ecology of Smallmouth Bass.

Project Team Members: David Philipp, Brandon Barthel, Jana Svec, Steven Cooke, Anne Readell, Jim Ludden, Jack Degner, Deanna Iwaniec, Julie Claussen, Magdalena Bartkowska, and Frank Phelan

Steven J. Cooke – “The physiological ecology of parental care in centrarchid fishes” (Department of Natural Resources and Environmental Sciences, University of Illinois)

Using coupled field and laboratory assessments, we studied the energetics and cardiovascular performance of six species of paternal-care-providing centrarchid fishes that occur syntopically in Lake Opinicon, Ontario. The duration of parental care, activity patterns and energetic costs varied widely among species. Overall, the duration of care increased with increasing parental size. When energetics were adjusted for the species-specific differences in the duration of parental care, the cost of parental care increased with the size of the fish. Fish with extended parental care exhibited stage-specific patterns of activity and energy expenditure

consistent with parental investment theory, whereas fish with short duration parental care tended to maintain high levels of activity throughout the entire parental care duration. Resting cardiovascular values were consistently higher for nesting fish when adjusted for variation in temperature. When exposed to exhaustive exercise, nesting fish took longer to exhaust and recovered more rapidly than non-nesting individuals. The maximal cardiac variables were usually slightly higher in nesting fish than non-nesting fish such that cardiac scope was maintained during the parental care period. Several cardiovascular variables were correlated with parental care metrics. Collectively, these data suggest that parental-care-providing fish possess adaptations that enhance their ability to provide protracted care at high intensities and reveal the important link between physiological performance and fitness. These data also reveal the extreme energetic consequences of parental care.

Project Team Members: Steven Cooke, David Philipp, and Patrick Weatherhead

Steven J. Cooke – “Physiological diversity of centrarchid fishes” – Ph. D. thesis
(Department of Natural Resources and Environmental Sciences, University of Illinois)

The focus of my dissertation research was assessing the inter- and intra-specific physiological diversity of centrarchid fishes (freshwater sunfish), and examining how this variation shapes their conservation needs. To evaluate inter-specific physiological diversity, an integrated field and laboratory study was used to quantify the energetic costs (intensity and duration) and physiological correlates (cardiovascular performance) of parental care in six syntopic centrarchids. Parental care energetics varied substantially among the six species, with smaller species providing more intense care than larger ones. Males that were engaged in providing parental care had higher resting cardiovascular parameters and recovered more rapidly from exercise than did conspecific males that were not engaged in parental care. Species that modulated cardiac output principally by changing heart rate were also the species that invested the most total energy in parental care. To evaluate intra-specific physiological diversity, a series of genetically distinct stocks of Largemouth Bass collected from different regions of the upper midwestern United States were used to assess the physiological and energetic bases of adaptation to different climatic conditions. Locally adapted fish had superior (i.e., more efficient) physiological performance than non-local stocks or the resulting interstock hybrids, indicating that physiological differences can exist even at small spatial scales, and/or among groups with apparently close genetic relatedness. A second assessment of intra-specific variation evaluated the evolutionary consequences of selection through angling. Comparing two distinct lines of Largemouth Bass differentially selected for high and low vulnerability to angling over several generations, the more vulnerable line had higher metabolic rates and was more aggressive in defending broods. These aggressive individuals required greater food intake to compensate for the higher metabolic rates, likely leading to more time foraging and their increased angling vulnerability. Collectively, the findings of these individual studies provide strong evidence for biologically meaningful physiological diversity at the individual, stock, and species levels that needs to be considered in the development of conservation and management strategies.

Publications:

Cooke, S.J., C.M. Bunt, J.F. Schreer, and D.P. Philipp. 2002. Attachment, validation, and preliminary deployments of ultrasonic heart rate transmitters on largemouth bass, *Micropterus salmoides*. *Aquatic Living Resources*. 15: 155-162.

- Cooke, S.J., D.P. Philipp and P.J. Weatherhead. 2002. Parental care patterns and energetics of smallmouth bass, *Micropterus dolomieu*, and largemouth bass, *M. salmoides*, monitored with activity transmitters. *Canadian Journal of Zoology*. 80:756-770.
- Barthel, B.L., S.J. Cooke, C.D. Suski, and D.P. Philipp. In Press. Effects of recreational angling landing net mesh on injury and mortality of bluegill. *Fisheries Research*.
- Bunt, C.M., S.J. Cooke, and D.P. Philipp. In Press. A simple technique for obtaining radio signals from deep water. *North American Journal of Fisheries Management*.
- Cooke, S.J. In Press. Parental care behaviour and reproductive success of a small centrarchid fish is not affected by externally attached radio transmitters. *Journal of Fish Biology*.
- Cooke, S.J., B.L. Barthel, and C.D. Suski. In Press. Effects of hook type on injury and capture efficiency of rock bass, *Ambloplites rupestris*, angled in southeastern Ontario. *Fisheries Management and Ecology*.
- Cooke, S.J., J.F. Schreer, D.P. Philipp, and D.H. Wahl. In Press. Catch-and-release studies of *Micropterus* species and their implications for management. *Black Bass 2000: ecology, conservation and management*. American Fisheries Society Symposium 31.
- Cooke, S.J., C.D. Suski, B.L. Barthel, B.L. Tufts, D.P. Philipp, and K.G. Ostrand. In Press. Injury and mortality induced by four hook types on bluegill and pumpkinseed. *North American Journal of Fisheries Management*.

Dr. Bruce P. Smith (Biology Dept., Ithaca College, Ithaca, NY)

"Water mite parasitism of aquatic insects"

Much of my time in summer 2002 was spent writing papers. However, I also continued my work on stylostomes, the feeding tube secreted by parasitic larval water mites into their host insects. Larvae of different species of *Arrenurus* mites parasitic on dragonflies and damselflies have distinctively different stylostomes: through dissection of cleared hosts, it is possible to determine the intensity of parasitism and what species of mites were involved, even after the mites have detached. Moreover, larval mites of *Arrenurus* spp. are extremely difficult to identify, so that stylostomes are also proving to be a useful diagnostic tools for confirming identifications. I continued work of previous summers in collecting, clearing, and dissecting parasitized hosts, documenting stylostome morphology, and correlating stylostomes with their associated mites. This identification method should be especially valuable for future guild-level research on mite/insect interactions conducted through my lab and Mark Forbes' lab.

Publications:

- Smith, I.M., Cook, D.R., Smith, B.P. 2001. Water mites (Hydrachnida) and other arachnids. *in Ecology and Classification of North American Freshwater Invertebrates*, Chapter 16, pp 551-659. 2nd edition, edited by J.H. Thorp and A.P. Covich. Academic Press, 1056 pp.

- Yourth, C.P., Forbes, M.R., Smith, B.P. 2001. On understanding variation in immune expression of *Lestes* spp. damselflies. *Canadian Journal of Zoology*. 79: 815-821.
- Forbes, M.R., Muma, K.E., Smith, B.P. 2002. Diffuse coevolution: constraints on a generalist parasite favor use of a dead-end host. *Ecography* 25: 345- 351.
- Yourth, C.P., Forbes, M.R., Smith, B.P. 2002. Immune expression in a damselfly is related to time of season, not to fluctuating asymmetry or host size. *Ecological Entomology* 27: 123-128.
- Smith, B.P., Hagman, J. 2003. Experimental evidence for a female sex pheromone in *Arrenurus manbriator* (Acari: Hydrachnida; Arrenuridae). *Experimental and Applied Acarology*. ACCEPTED.
- Smith, B.P. 2003. Diversity of stylostome structure among parasitic larval water mites (Acari: Hydrachnida). *In* From Yankee Springs to Wheeny Creek: An Acarological Tribute to David R. Cook, edited by I.M. Smith. Indira Publishing House. INVITED PAPER.

Dr. David Wahl (Illinois Natural History Survey and University of Illinois at Champaign/Urbana)

“Fisheries research”

Michael Siepker - "Consequences of angling during the reproductive period of Largemouth Bass and Smallmouth Bass" – M.Sc. thesis

Recreational and competitive angling of Black Bass has experienced growth in its popularity. For example, 80% of nearly 30,000 competitive angling events held annually in North America are spent seeking Largemouth Bass. In response, researchers at Queens University Biological Station assessed impacts of catch and release and competitive angling practices on the nesting success of Largemouth Bass guarding eggs, Smallmouth Bass guarding eggs, and Smallmouth Bass guarding fry. Competitive angling treatments were developed using reproductively-disruptive aspects of competitive angling (i.e. confinement, displacement, air exposure, etc.). These treatments involved angling males off their nest, holding them for various time periods, releasing them various distances from the nest while protecting some nests from nest predators. Abandonment rates of nesting males were documented to determine the influence of these treatments on Largemouth and Smallmouth bass reproductive success. Time fish are held from the nest appears to be an important determinant of nest success. These findings support further consideration of practices that limit angling of Largemouth and Smallmouth Bass during their vulnerable parental care phase.

Collaborators: Steven J. Cooke (Dept Forest Science, UBC), David H. Wahl, and David P. Philipp

Dr. Patrick J. Weatherhead (Program in Ecology and Evolutionary Biology, University of Illinois)

"Long-term studies of snakes and birds"

Field work at QUBS in 2001 was focussed primarily on the long-term black rat snake study conducted in collaboration with Dr. Gabriel Blouin-Demers (see joint entry above). New research on Northern Water Snakes was initiated by Dr. Albrecht Shulte-Hostedde, a post-doctoral fellow working with me and Dr. Bob Montgomerie. Analysis and writing of papers from previous research at QUBS continues.

Publications (exclusive of those published with Gabriel Blouin-Demers):

Cooke, SJ, DP Philipp & PJ Weatherhead. 2002. Parental care patterns and energetics of smallmouth bass (*Micropterus dolomieu*) and largemouth bass (*M. salmoides*) monitored with activity transmitters. *Canadian Journal of Zoology* 80: 756-770.

Prosser, ML, PJ Weatherhead, HL Gibbs & GP Brown. 2002. Genetic analysis of the mating system and opportunity for sexual selection in northern water snakes (*Nerodia sipedon*). *Behavioral Ecology* 13: 800-807.

Schalk, G, MR Forbes, & PJ Weatherhead. 2002. Developmental plasticity and growth rates of green frog (*Rana clamitans*) embryos and tadpoles in relation to a leech (*Macrobdella decora*) predator. *Copeia* 2002: 445-449.

Weatherhead, PJ, ML Prosser, HL Gibbs & GP Brown. 2002. Male reproductive success and sexual selection in northern water snakes determined by microsatellite DNA analysis. *Behavioral Ecology* 13: 808-815.

Theses:

Kissner, KJ. 2002. Maternal influences on offspring quality in northern water snakes, *Nerodia sipedon*. Ph.D. thesis, Department of Biology, Carleton University, Ottawa, Ontario.

Summary of Conference, Meeting and Field Trip Use of QUBS in 2002

Organizer	Function	Numbers	Duration
June Leach (Queen's - Env'tl Science)	Environmental Science Departmental Retreat	27	January 12
Katherine Smith (Queen's)	Queen's Program in International Development Training	16	January 25-26
Claudia Kraft (Queen's)	Queen's Medical Outreach Retreat and Training	20	February 2-3
Tracy Hardiman (Queen's)	Science Quest Retreat and Planning Session	7	February 9-10
Katherine Smith (Queen's)	Queen's Program in International Development Training	19	March 2-3
Rachel Fraser/Mary Stapleton (Queen's - Biology)	Ontario Ethology and Ecology Colloquium Field Trip	25	April 20-21
Dan Selbie (Queen's - Biology)	Environmental Mini-Enrichment Course in Limnology	25	May 8
Dan Selbie (Queen's - Biology)	Environmental Mini-Enrichment Course in Limnology	25	May 15
Dr. Peter Autenreid (Queen's - Animal Care)	Workshop on Animal Care, Ethics and Field Safety	45	May 22
Ken Kingdon (RVFN)	Rideau Valley Field Naturalists Field Trip	28	May 25
Paul McKenzie (KFN)	Kingston Field Naturalists Field Trip	30	May 26
Mark Millan (Glenburnie Public School)	Canoe Trip and Station Tour	28	June 4
Mark Millan (Calvin Park Public School)	Calvin Park Public School Challenge Program	30	June 6
Neil Patterson (CLAHS)	Chaffey's Lock and Area Heritage Society Board Meeting	10	June 8
Jill Daugherty/Jennifer Rogers (Royal Military College)	Field Work Training Session for DEW Line Environmental Work	34	June 24
Jill Daugherty/Jennifer Rogers (Royal Military College)	Field Work Training Session for DEW Line Environmental Work	38	June 25

Summary of Conference, Meeting and Field Trip Use of QUBS in 2002

Organizer	Function	Numbers	Duration
George Hiles (Lakeland Safe Boating)	Boat Operator Safety Training Course and Operator Certification	30	June 25
Dr. Robert Shipley (U of Waterloo - Planning)	Oxford-Brookes University Exchange Program Field Trip	15	June 29-July 4
Shaun Thompson (Ont Min of Natural Resources)	Black Rat Snake Recovery Plan Meeting	15	July 5
Sue Bedell/Alan Grant (Queen's)	Joint Health and Safety Committee Site Visit	2	July 11
Dr. Raleigh Robertson (Queen's - Biology)	Major Facilities Access Grant Planning Meeting	8	July 15
Nava Aslani (Queen's)	Science Discovery Field Trip	20	July 24
Dee Padfield (Queen's)	Queen's University Retirees Association Field Trip and Picnic	66	August 7
Tim Lewis/Mary Anne Koot (MFN)	McNamara Field Naturalists Field Trip	4	August 10
Nava Aslani (Queen's)	Science Discovery Field Trip	11	August 14
Fiona Reid (QUBS Visiting Artist)	Art Show and Workshop "The Making of a Field Guide"	23	August 14
Barbara Leadbeater	Lindsay Family Field Trip to Lindsay Lake	12	August 24
Dr. Ed Kott (Wilfrid Laurier U - Biology)	Senior Undergraduate Field Course in Biology	16	August 25 - September 7
Dr. Peter Hodson (Queen's - Env'tl Studies)	Canadian Network of Toxicology Centres Meeting	23	September 3-5
Diane Lawrence (Queen's - Education)	Environmental Education Workshop	40	September 7-8
Peter Hannah (RWLT)	Rideau Waterway Land Trust Annual General Meeting	64	September 13
Faye Thompson/Sarah Cosh (Queen's - Biology)	Bio 200 (Organization for Life- The Organism) Field Trip	144	September 14

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Organizer	Function	Numbers	Duration
Faye Thompson/Sarah Cosh (Queen's - Biology)	Bio 200 (Organization for Life-The Organism) Field Trip	97	September 15
Doug Archibald (Queen's - Geology)	Geology 221 (Geological Field Methods) Field Trip	40	Sept 18 - 19
Brenda Schamehorn (Queen's - Biology)	Bio 302 (General Ecology) Field Trip	76	Sept 21-22
Brenda Schamehorn (Queen's - Biology)	Bio 302 (General Ecology) Field Trip	51	Sept 28-29
Dr. Brian Cumming (Queen's - Biology)	Bio 335 (Limnology) Field Trip	33	September 28
Dr. Brian Cumming (Queen's - Biology)	Bio 335 (Limnology) Field Trip	32	September 29
Brad and Mary Johnson	Davidson Family Reunion and Field Trip to Mine Sites	18	October 5
Peter Chenaux (Queen's - Biology)	Graduate Student Orientation Weekend and Field Trip	62	October 5-6
Dr. Ed Kott (Wilfrid Laurier U - Biology)	Fish Ecology Course	14	Oct 11 - 14
Howard Martin (Chaffey's Lock Seniors)	Chaffey's Lock Seniors Meeting and Luncheon	45	October 17
Drs. Remenda and Jamieson (Queen's Geol Sci/Env Sci)	Geol 433/485 Field Trip	26	October 20
Steve Pitt (Ont Min of Natural Resources)	Lennox and Addington Stewardship Council Conference Field Trip	60	October 26

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Seminars 2002

Seminars marked with an asterisk (*) were part of the QUBS outreach program in conjunction with Friends of Opinicon

Tuesday, May 7 - **Dan Mennill** (Dept of Biology, Queen's U) -
"Eavesdropping in chickadees"

Thursday, May 9 - **Dr. Scott MacDougall-Shackleton** (Dept of Psychology, U of Western Ontario) -
"Bird song and bird brains"

Wednesday, May 15 - **Dr. Steve Loughheed** (Dept of Biology, Queen's U) -
"Studies in Africa: Cultural and Biological Diversity"

Wednesday, May 22 - **Dr. Peter Autenried** (Queen's U) -
"Animal Care, Ethics and Field Safety"

Wednesday, June 5 - **Steve Cooke** (Illinois Natural History Survey/U of Illinois) -
"Ichthyophysiology: Things that "beat" in the fish lab"

Wednesday, June 12 - **Dr. David Jacobs** (U of Capetown, South Africa - **QUBS Visiting Scientist 2002**)-
"African Conservation: Protectionism vs Community-Based Conservation"

Tuesday, June 18 - **Dr. Jan Lifjeld** (Zoological Museum, U of Oslo, Norway) -
"Choosing the right one - A study of female mate choice in the bluethroat"

Wednesday, June 26 - **Dr. David Jacobs** (U of Capetown, South Africa - **QUBS Visiting Scientist 2002**)-
"Echolocating bats vs hearing moths: The allotonic frequency hypothesis"

Wednesday, July 10 - **Dr. Jim Kieffer** (Dept of Biology, U of New Brunswick, St. John) -
"Limits to Exercise in Fish"

Wednesday, July 17 - **Dr. Allen Keast** (Professor Emeritus, Dept of Biology, Queen's U) -
"Ecological Biogeography"

Wednesday, July 31 - **Dr. James Fullard, Amanda Soutar** - (Erindale College of U of Toronto) and **Kit Muma** (Ithaca College) -
"Bat-moth interaction: Ecology, behaviour and physiology of a high-stakes predator-prey contest"*

Wednesday, August 7 - **Bill McLeish** - (Queen's U, Dept of Biology) -
"Focus on local bird research: Kingbirds"*

Seminars 2002 (continued)

Monday, August 12 - **Fiona Reid** - (Biologist, artist, tourguide - **Hillis Fund Visitor**) -
"Mammals of Central America: A slide show on the diversity of mammals in the area
and how I went about finding them to study for my field guide"*

Wednesday, August 14 - **Fiona Reid** - (Biologist, artist, tourguide - **Hillis Fund Visitor**) -
"Bats of Costa Rica: Diversity and conservation"*

Wednesday, August 21 - **John McKenzie** - (Ontario Ministry of Natural Resources) -
"Local reintroductions?: Wild turkeys and fishers"*

Wednesday, August 28 - **Dr. Gabriel Blouin-Demers** - (University of Ottawa) -
"Local snakes: Focus on black rat snakes: ecology and conservation"*



Abandoned farm machinery from an earlier era at the Massassaigua Property.
Photo © Raleigh J. Robertson, January 2003.

Documentation of Research Use of QUBS in 2002 - User-Days

User	Affiliation	Principal Investigator	Post-Doc	Graduate Student	Assistant	Total
Aarssen	Queen's - Biology	5	-	10	30	45
Cumming	Queen's - Biology	1	-	1	3	5
Eckert	Queen's - Biology	1	-	32	2	35
Friesen	Queen's - Biology	-	-	6	-	6
Frost	Queen's - Psychology	-	-	-	18	18
Harmesen	Queen's - Biology	1	1	-	-	2
Jelinski	Queen's - Env'tl Science	-	-	-	14	14
Karagatzides	Queen's - Geography	-	-	2	-	2
Keast	Queen's - Biology	78	-	-	-	78
Montgomerie	Queen's - Biology	4	67	55	49	175
Ratcliffe	Queen's - Biology	10	-	207	265	482
Robertson	Queen's - Biology	75	-	345	381	801
Tufts	Queen's - Biology	2	-	42	20	64
Queen's Subtotal						1727

Blouin-Demers	Ottawa U - Biology	125	-	199	113	437
Fenton	York U - Biology	-	-	76	-	76
Forbes	Carleton - Biology	5	35	86	6	132
Fullard	U of T (Erindale) - Zoology	101	-	161	164	426
Jacobs	U of Capetown - Biology	42	-	-	-	42
Jones	Dartmouth College - Biology	50	-	-	-	50
Kempnaers	Max Planck Institute	11	-	-	-	11
Kieffer	U New Brunswick - Biology	23	-	-	-	23
Lifjeld	Natl Museum - U of Oslo	9	-	-	9	18
Marra	Smithsonian Env'tl Res Ctr	-	-	28	107	135
Neff	U of W Ontario - Zoology	40	-	50	133	223
Philipp	Illinois Natural Hist Survey	49	-	135	367	551
Shackleton	U of W Ont - Psychology	20	-	-	105	125
Sherry	Tulane U - Ecol & Evol Biol	-	-	27	105	132
Smith, B	Ithaca College - Biology	70	-	-	-	70
Wade	Indiana U - Biology	-	-	29	-	29
Wahl	Illinois Natural Hist Survey	2	-	31	2	35
Weatherhead	U Illinois - Nat Res/Env'tl Sci	60	-	-	-	60
Non-Queen's Subtotal						2575

RESEARCH TOTAL	4302
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Documentation of Use of QUBS in 2002 - User-Days

	Principal Investigator	Post-Doc	Graduate Student	Assistant	Total
Total Research User-Days	784	103	1522	1893	4302
% Queen's	23	66	46	41	40
% Non - Queen's	77	34	54	59	60
User - Days in Teaching Activities					2042
Conference and Field Trip Use					1126
Other*					2415
Grand Total User - Days**					9885

(* QUBS staff, family and their visitors are not included)

(** up2.4% from 2001)

Fee Schedule for 2003

University Research and Teaching Rates

Board Charges - Meals only

\$535/month/person	-no obligation for chores
\$378/month/person	-includes obligation for chores on a rotating schedule

Accommodation Charges - Housing only - no linen service

\$39/month/person	-dormitory (White House or Curran Cottage)
\$78/month	-small cabin (Cabins 1, 4, 5, 6, 7, 11)
\$156/ month	-medium cabin (Cabins 2, 3, 8, 9, 10, 13, 14)
\$206/month	-large cabin (Cabins 12, 15 and White House Apartment)
\$300/month	-Cottage (Keast, Earl, Sumac or Maplewood)

Room and Board Rates for Field Courses - no linen service

\$270/person	-weekly R&B for OUPFB field courses
\$300/person	-weekly R&B for other field courses - incl. facilities use fee

Room and Board Rates for Short-Term Users and Guests- no linen service

\$33/day/person	-24 hr. room and board
\$5.40	-breakfast or lunch only
\$10.75	-dinner only
\$16.10	-overnight accommodation

Bench Fees

Basic* 1 (MFA co-applicants)

\$1.07/day	principal investigator/graduate student/lab coordinator
\$0.54/day	assistant

Special Requirements** 1 (MFA co-applicants)

\$2.68/day	principal investigator/graduate student/lab coordinator
\$1.07/day	assistant

Basic* 2 (non-MFA Queen's researchers)

\$2.68/day	principal investigator/graduate student/lab coordinator
\$1.07/day	assistant

Special Requirements** 2 (non-MFA Queen's researchers)

\$5.36/day	principal investigator/graduate student/lab coordinator
\$2.68/day	assistant

Basic* 3 (non-MFA non-Queen's researchers)

\$5.36/day	principal investigator/graduate student/lab coordinator
\$2.68/day	assistant

Special Requirements** 3 (non-MFA non-Queen's researchers)

\$10.71/day	principal investigator/graduate student/lab coordinator
\$5.36/day	assistant

*Basic - desk/lab bench space only - electricity and/or water

**Special Requirements - tanks, pumps, heating, cooling, air, disposables, extra space

NOTE - If sufficient funds are not available, bench fees may be waived or reduced upon written application to the Director.

Fee Schedule for 2003 (continued)

Electronic Equipment Charges

Local Area Network Connection

Research Use: \$21/mo for each computer connected to the network

Internet Access

Individual Users: \$10.50/mo

GPS/GIS Equipment

Charges for maintenance of equipment and systems will be charged back to users based on intensity of use

Boat Rental

\$300/month, \$135/week - includes maintenance from normal use - gas and oil not included
\$65/day - includes gas and oil for one day rental

All QUBS boat users will require Operator Proficiency cards to rent a boat

NOTE - Fees for use of pontoon boats are negotiated directly with the Manager or Director

Conference and Group Rates

\$5.25/person/day	facility day use fee - no meals
\$48.30/person/day	24 hr R&B and day use - summer season (April 30 - September 10)
\$10.50/person/day	linen service

Rates for groups outside of summer season and for special requirements are negotiated directly with the Manager or Director

Rates are based on provision of basic services (dining hall meals, conference room use, dormitory style accommodation) - additional requirements will increase rates

50% booking deposit required (non-refundable if cancellation made less than two weeks prior to event)

Provincial Sales Tax

P.S.T. is applicable to non-Queen's users for oil used in boats, photocopies and Fax .

Goods and Services Tax

G.S.T. is applicable non-Queen's users for charges for boat rental, photocopies, direct sales (e.g. equipment) and all charges for room and board from casual users.

QUBS Management reserves the right to allocate space to maximize accessibility to all users of the facility. This may mean sharing space at times of intense use.