

Reflections on a Marsh: The Delta Marsh Field Station's First 20 Years, 1966-1986

by
Jennifer M. Shay





**Delta Marsh
Field Station**
University of Manitoba
(1966–2010)

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Cover photos (top to bottom):
Ecology students sampling vegetation.
Core sampling for pollen on Cadham Bay.
Log house building course.
Jennifer Shay on the west dike.

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Foreword

The Delta Marsh is a legendary place for wetland ecologists. This is in large part because it is the site of not one, but two field stations dedicated to the study of wetlands. There are only a handful of other wetlands around the world with even one field station. This memoir tells the story of the founding and early history of the younger of these two stations, The Delta Marsh Field Station. There is no one better qualified to tell its story than Dr. Jennifer M. Shay. Establishing this station was her idea, and she was its first director. Her experience at a field station in her native England had convinced her of the importance of field experiences for biology students and the general public. Experiences that were not available in Manitoba when she arrived from England in the late 1950s.

My own interest in prairie wetlands began when I took a job at Iowa State University in 1973. Shortly after arriving in Ames, I began looking for field sites for a class on aquatic plants that I would be teaching that fall. One of my new colleagues suggested that I check out a prairie pothole just north of Ames. I visited it in mid-August and found that it was an ideal site for a class field trip because of its diverse vegetation. When I took my class there a month later, I discovered, much to my surprise and embarrassment, that almost all of the vegetation was gone. Numerous muskrat lodges were the only evidence that this marsh had once been vegetated. This was my first exposure to the dynamic nature of prairie wetlands. That fall I began to look for other studies of vegetation dynamics in prairie wetlands. My library research eventually turned up an unpublished MSc thesis and PhD dissertation by Jennifer Walker (now Jennifer Shay) at the University of Manitoba.

I obtained copies of both, and they were a revelation to me. Jennifer's work described the revegetation of the Delta Marsh after a period of high water had destroyed most of its emergent vegetation. I began to appreciate that it is normal for prairie wetlands to undergo cyclic changes in vegetation. Her work was one of the major inspirations for my subsequent studies on how wetland plant species can persist in prairie wetlands in spite of periodic destruction of existing populations. Much of my career has been spent confirming that Jennifer's early insights into the nature of prairie wetlands were correct.

Like Jennifer, I was the director of a university field station, Iowa Lakeside Laboratory. Lakeside, however, was not my idea. It had been established in 1909. Running an established field station is difficult and frustrating. Jennifer had to start a field station from scratch. All she had initially was an old hunting lodge and some outbuildings on a property that had been bought by the government of Manitoba. Her account of the twenty-year struggle to expand the Station's facilities and programs is a unique contribution to the history of field stations and also to the early history of wetland ecology. First person accounts of the early history of field stations are rare, and hers is a good one. Her constant worries about funding, staffing, fluctuating student enrollments, developing community programs, etc., as well as the endless negotiations with university and government bureaucrats, will be familiar to station directors everywhere.

I spent ten summers working at the other field station, the Delta Waterfowl and Wetlands Field Station. During this period, I regularly visited the University Field Station, as we called it, and got to meet and know Jennifer. Before meeting her for the first time, I was unsure about how she would react to my working in the Delta Marsh on a project that was largely based on her research. She was not the least bit disturbed by this and welcomed me with open arms. (In this memoir, she indicates that she was too busy to take on any more responsibilities and thus declined to become involved in the Marsh Ecology Research Program at the Delta Waterfowl Station.) Tellingly, a couple of years after becoming director of the Delta Marsh Field Station, she was offered the directorship of an established field station in England. Although her family in England wanted her to come back, she decided to stay in Manitoba. It is Jennifer's selfless devotion to the Delta Marsh and the Delta Marsh Field Station that come across most strongly in this memoir. As she herself says, she sometimes wondered if she made the right decision. I suspect that for her personally many of the decisions that she made were not in her own best interest, but they certainly were in the best interest of the Delta Marsh and the Delta Marsh Field Station.

Arnold van der Valk
Ames, Iowa

Introduction

This is the second installment of my reflections on the history of the University Field Station (Delta Marsh), now called the Delta Marsh Field Station, as one of its founders and former director (*Figure 1*).¹ The first installment, in Appendix I, covered events leading up to the Station's establishment and its first few months of operation in 1966.² Here, I add some additional pre-1966 background information, but deal mainly with the years 1966 to 1986. Material is drawn from my personal files and letters, university and Field Station archives, newspaper accounts, government reports and the Field Station Annual Reports.

These twenty years were rife with challenges but also enthusiasm and hope as we struggled, with limited finances, to turn a hunting lodge and assortment of dilapidated out-buildings into a viable biological research and teaching facility.

One might wonder, why I even thought about a university Field Station and why at Delta Marsh? Answers to these questions lie in some of my earliest experiences in Canada and before I came to this country.

In 1946, the Council for the Promotion of Field Studies in England, later called the Field Studies Council, began to offer field courses at their four newly-established centres. In the spring term of that year, my fifth form biology class spent a week at the Flatford Mill Field Centre in Suffolk. During the week, we explored the plants and animals of marshes, hedge-rows, and woodlands, peered down microscopes at tiny invertebrates and listened to dozens of bird species performing their dawn chorus. We all enjoyed the stimulating learning experience. Later, I attended many field courses as an amateur naturalist, both with my school and as a university student. In

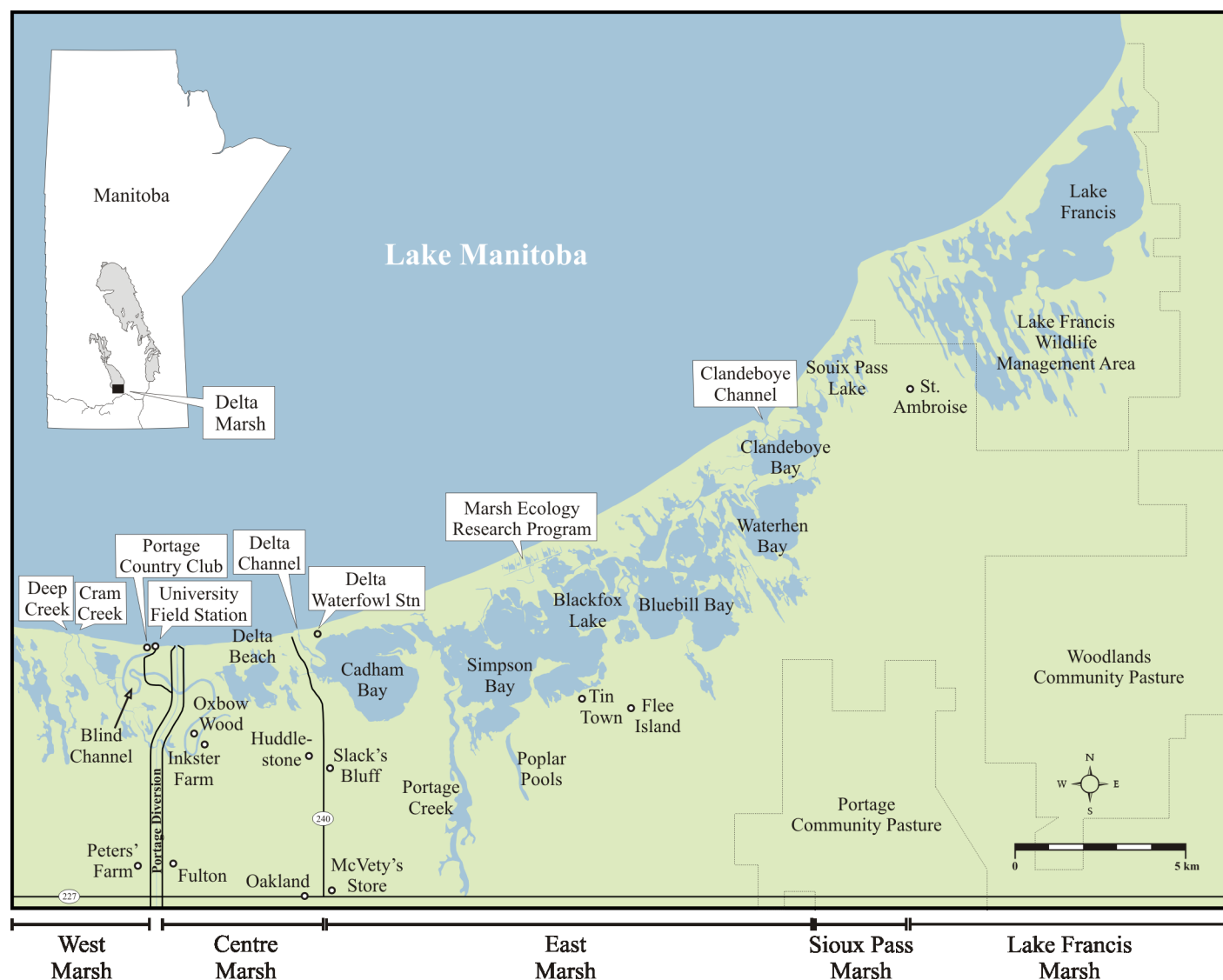


Figure 1. Map of Delta Marsh showing the locations of places mentioned in the text.



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Figure 2. Reed stubble after the recession of floodwaters, 1958. Note quadrat is 2 meters by 2 meters.

my final term at the university, I applied for a job at Flatford and was astonished to be appointed. I began work the day after completing my degree exams at the University of London.

Flatford was ideally situated for a field centre. Set along the picturesque River Stour, made famous by the paintings of John Constable, it provided residential facilities and laboratories for a variety of field programs. School pupils, university students and the public could take advantage of them. Among their many benefits, such courses offered first-hand experience in identifying plants and animals, sampling biological populations and measuring environmental variables. They also provided practical experience in observation, note-taking, record keeping, data analysis, time management and other skills. I spent six, happy and stimulating years at Flatford. While there, I gained a great deal of experience in plant and animal ecology and had the privilege of meeting, and listening to lectures by a number of renowned scientists such as Sir Arthur Tansley, Dr. (later Sir) Richard Southwood, Dr. T. T Macan, Dr. Max Walters and Dr. David Lack, all truly inspiring.

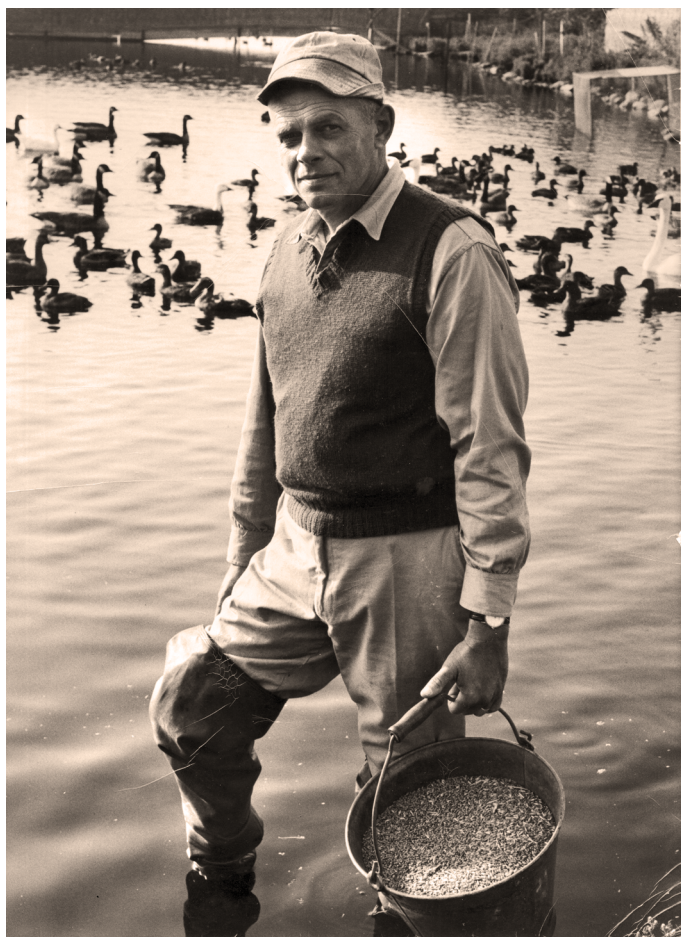
But all of this was destined to change. In the fall of 1957, I was invited to Winnipeg, to spend a year as a Research Assistant in the Department of Botany at the University of Manitoba. I felt at the time that a year in Canada would offer an interesting experience.

Once there, I enjoyed my laboratory work but yearned for the outdoors.

Something that struck me almost immediately after arriving in Manitoba was the fact that none of the biology courses taught at the university involved field work. Indeed, the faculty biologists apparently did no teaching out-of-doors. In comparison, I felt I had far more field experience before entering London University than biology graduates at the University of Manitoba. I thought that the Manitoba students had missed a great deal by having little or no practical field experience.

This lack of field courses was supposedly explained by the harsh Manitoba climate with its potential for early autumn snowfalls and late spring thaws. Another reason given was the need for students to work during the summer in order to pay their tuition fees. While I found these reasons somewhat persuasive, I was unconvinced by the arguments that field courses could not be successful in Manitoba. I pondered these and other differences between my experience and that of Manitoba students.

Meanwhile, being a keen bird watcher, it was not long before I visited the Delta Waterfowl Research Station (hereafter DWRS). (Figure 1) Set on the 15,000 hectares (35,000 acre) Delta Marsh along the southern shores of Lake Manitoba, this renowned station attracted waterfowl researchers from across the continent. After several visits, I realized that, while researchers were engrossed in the study of waterfowl, they paid little attention to the birds' natural habitats. For example, no one was studying the re-colonization of Delta Marsh after high water levels and flooding in the 1950s had killed off most of the emergent vegetation. As floodwaters receded, they left exposed almost endless expanses of dead reeds (Figure 2) and denuded mud flats where a few pioneer plants were appearing. The marsh was just beginning to recover and I thought someone should study this process. Such an excellent opportunity should not be missed. So, encouraged by



Archives of Manitoba, H. A. Hochbaum Fonds.

Figure 3. Dr. H. Albert Hochbaum (1911–1988), wildlife scientist and artist, Director of the Delta Waterfowl Research Station (1938–1970).

Dr. H. A. Hochbaum (*Figure 3*), Director of the Waterfowl Station, I applied for and was fortunate to receive a small Imperial Chemicals Industry grant to begin a re-colonization study. (*Figure 4*) I submitted the results of my first year's research "Vegetation Studies in the Delta Marsh, Delta, Manitoba" for an MSc degree.³ The project was so interesting that I forthwith enrolled in a PhD program to continue to work on it.

My MSc and PhD research was based at the Delta Waterfowl Research Station. While there, I found it curious that despite the Station's proximity to Winnipeg (112 km or 69 miles), I was among the first Manitoba graduate students to do my research at Delta.⁴

As I grew to know the marsh, I became increasingly enthusiastic about its wealth of research and teaching opportunities. The marsh could be the venue for undergraduate courses in ecology and related subjects, for graduate student and faculty research, for school programs and for public education. Delta Marsh had potential as a venue for several reasons. The marsh had long been considered one of the most

renowned marshes in western Canada.⁵ It continues to be an important stop-over on the Mississippi flyway for tens of thousands of migrating waterfowl and furthermore, had traditionally been one of the finest waterfowl breeding marshes on the Canadian prairies.⁶

Even though the marsh had long attracted hunters and naturalists, it was not until 1925 that the Provincial government of Manitoba took an active role in its management. That year they reserved an extensive area of Crown land around the marsh as Public Hunting Grounds.⁷ Six years later, in 1931, the Delta Waterfowl Research Station was established, as an outgrowth of a wild duck hatchery set up by industrialist James Ford Bell of Minneapolis, Minnesota.⁸

Delta marsh was not without its problems. It was susceptible to prairie droughts and floods. Low water in Lake Manitoba and the marsh during the 1930s drought, prompted the Manitoba Government, in the 1940s, to build a number of control structures between the lake and the marsh. Among these, they constructed a fixed-crest dam across the channel at Clandeboye, a major connection between Lake Manitoba and the marsh's eastern end. (*Figure 1*)

Low water levels were eventually followed by high water levels in Lake Manitoba from 1954–57. During these years, floodwaters inundated most of the marsh. This high water prompted the Province to build a dam at Fairford at the north end of Lake Manitoba in 1961 with the intention of regulating the lake to prevent future flooding.

The need to control flooding from the Assiniboine River to the south also was destined to affect Lake Manitoba. In 1962, government planners designed a flood-control channel, the Portage Diversion.⁷ This diversion was to be 27 km (18 miles) long and up to 0.4 km (0.25 mile) wide. The channel would carry excess spring runoff from the Assiniboine River at Portage la Prairie across the Portage Plain to Lake Manitoba. Such an ambitious project necessitated the acquisition of much private land over the next few years.

Floods and droughts were not the only concerns about Delta Marsh. Many questions kept being raised about the welfare of its wildlife, questions such as: Why did wildlife numbers fluctuate? What conditions might trigger muskrat disease or avian botulism? What could be done about waterfowl depredation on farmer's fields? How might fluctuating water levels in the marsh be managed?⁷ These concerns about the welfare of the marsh ultimately prompted government action. To deal with these and related matters, the Minister of Mines and Natural Resources, set up

a Delta Marsh Management Committee early in 1964, with a mandate to produce a long-range plan to manage and develop the marsh. To accomplish this, two sub-committees were convened: one Administrative, the other Technical. Both sub-committees drew their membership from a number of agencies and included the Department of Mines and Natural Resources (Wildlife, Fisheries, Water Control and Conservation), the Canadian Wildlife Service, Ducks Unlimited (Canada), the DWRS, and the University of Manitoba. Dr. Howard Lees, Chairman of the university's Division of Biology, was on the Administrative Committee and I was on the Technical Committee. The fact that the university had representatives on both committees implied not only an interest in the marsh but, I suspected, the expectation that research funds might become available to its faculty.

The Management Committee began an ambitious research program to obtain basic information about the marsh, funded and carried out by the Canadian Wildlife Service. Led by Dr. William Miller, work began in the summer of 1964 and continued for the next two ice-free seasons. The project was based at the DWRS where the Assistant Project leader lived. With the assistance of a summer student, the team gathered data on the physical and biological properties of the marsh. They monitored water levels, carried out waterfowl surveys, estimated deer populations and harvests and counted muskrat houses. The project also mapped vegetation using black and white and color aerial photography. Incidentally, the Delta Marsh was the first extensive freshwater marsh to be photographed in color from the air.⁷

Apart from these basic data-gathering activities, specific concerns were also addressed. Within the past decade, carp had become not only a nuisance but it was suspected that they threatened the waterfowl food supply. Carp feeding tends to disturb the underwater pondweeds, which then may fail to fruit. Lack of fruiting deprives waterfowl of an important food source. Carp also increase turbidity by their foraging. Turbidity reduces light levels and lowers the production of plankton on which invertebrates and other organisms feed.

In 1964, Ducks Unlimited Canada (DU) took steps to cope with the carp in the marsh. They set up barriers and screens to prevent carp from migrating from the lake where they over-wintered, to the marsh where they bred. DU installed barriers on Clandeboyne Dam, and on two other channels, Deep and Cram Creeks and put screens on the culverts in the Delta Channel. (Figure 1) These deterrents helped prevent carp from



Archives of Manitoba, H. A. Hochbaum Fonds.

Figure 4. Ph.D. student Jennifer M. Walker (Shay) sampling marsh vegetation for her dissertation research.

migrating into the marsh but they also proved a boon to local fishermen. The fishermen took advantage of the migration to harvest several thousand tons of fish each spring at the barriers.⁷ (Figure 5) They sold the carp to the lucrative New York market under the name of "gifeltfish."

To study the carp's impact on the marsh in more detail, Drs. Roy Waygood, Paul Ralston and myself, aided by two honors botany students, launched a research project in 1964. Its aim was to examine the effects of carp on aquatic vegetation. Based at the DWRS, the project was funded by Mines and Natural Resources.⁹ Funding continued for a second year. Many of us were pleased to have this sign of the Provincial Government's support for the university's involvement in marsh research.

Among the lands purchased by the Provincial Government in 1964, was the 932 ha (2300 acre) hunting estate of Donald H. Bain. The Bain estate covered part of the western portion of the marsh bordering the lake. Donald Bain (Figure 6), a prominent Winnipeg businessman had built Mallard Lodge in 1932, an



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Figure 5. Carp caught while moving from Lake Manitoba where they over-wintered to the Delta Marsh where they breed.

elegant hunting lodge and outbuildings. (Figure 7) After Bain's death in 1962, the estate passed through another owner, Octave Enterprises Ltd., before being sold to the Provincial Government for twice the original sale price. This situation led to allegations of government mishandling of the land acquisition. The Government subsequently justified the purchase, in part, by arguing that estate land could be used for biological research and that the lodge could become a research station.

Although there were those among university biologists who felt the Bain land was an inappropriate venue for field research, those supportive of the idea of a university field station at Delta produced a report in June, 1965 urging the university administration to consider establishing such a station.²

Subsequently, on 15 August 1965, representatives from the Provincial Government, University of Manitoba, Canadian Wildlife Service, and Delta Waterfowl Station toured the Bain estate. The university contingent included Drs. H. E. Duckworth, Vice-President of Development, R. D. Connor, Associate Dean of Arts and Science, H. Lees, Head, Biology Teaching Unit, H. E. Welch, Head, Zoology, E. R. Waygood, Head, Botany, W. G. Barker, Botany, and myself. Mr. E. F. Bossenmaier was among the Provincial representatives. By this time, the Province had informally given the university to understand that they would be sym-

pathetic to a proposal to use the Bain estate as a biological field station.¹⁰

Following the tour, we met in the evening at the Waterfowl Station with Provincial representatives, Mr. Stuart Anderson (Deputy Minister of Mines and Natural Resources) and one of the latter's staff Mr. O. S. Eagleton. We discussed the merits of a marsh field station versus an "upland" field station but favored the former, as most felt that the present university competence lay in marsh ecology and aquatic biology. Next morning, Dr. Hochbaum joined the group as discussions



University of Manitoba Archives & Special Collections, D. H. Bain Fonds.

Figure 6. Athlete and businessman Mr. Donald H. Bain (1874–1962) built Mallard Lodge that eventually became the University Field Station (Delta Marsh).

continued. The need for financial support from the government was acknowledged but left for a future meeting to decide.¹⁰

Some time later, Mr. Anderson phoned Dr. Connor (pers. com.), inviting him to a football match. Though an unusual invitation, they duly met at the sports ground for the match but neither of them saw the game. Instead, they discussed the Delta marsh and the Bain estate. Mr. Anderson explained that two other agencies had expressed an interest in the land, namely fire fighters who wanted a training center and another who thought it would be ideal as a children's home. Mr. Anderson felt the land would be best used by the university as a field station. He asked if the university would consider this. Dr. Connor thought the university would jump at the chance and later told President Saunderson about the meeting.

In October, in a memo to Dr. Duckworth, Dr. Waygood suggested a four-stage plan for Botany's potential role in a field station on the Bain estate. This covered faculty research, summer assistants, graduate students and the presentation of courses.¹¹

Finally, in November, Dr. Duckworth forwarded to the university President, Dr. Hugh Saunderson a proposal that would establish a field station in the Delta Marsh.¹² The proposal requested that the Provincial Government make the Bain estate available to the

university for a field station. Included in this would be financial support to furnish the lodge as a dormitory, annual funds to maintain the lodge and a laboratory, and money to support a portion of the research to be undertaken. However, the specific location of a field station laboratory took many months of discussion to decide.² The university Board of Governors approved the proposal in principle but deferred action until the funds were made available.

I received my PhD in 1965 and left in September for a post-doctoral year at London University, with a commitment to return to the University of Manitoba for at least a year.

1966

The extensive Bain estate (*Figure 8*) had both advantages and disadvantages as a venue for a field station. Its main advantages were its diversity of aquatic and upland habitats supporting a rich array of plant and animal life. The property encompasses marshland with open water, inter-connecting channels, ponds and sloughs; lake shore, woodland and remnants of prairie. Although these features made it ideal for field teaching and research, the physical facilities, with some exceptions, left much to be desired. We could hardly expect that a hunting lodge with a few ramshackle out-buildings could be converted into viable laboratories, teaching and living space, without a great deal of money and effort.

The majority of the buildings were aligned along the lake shore at the western limits of the former Bain estate and adjacent to the lands of a private hunting club, the Portage Country Club (PCC). The most impressive building was, and I think still is, the two-story Mallard Lodge. Mr. Bain used the lodge to host his business associates and friends. The lodge contained a large sitting room featuring a massive stone fireplace, a kitchen, six bedrooms, and a bathroom. It also had a bed-sitting room



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Figure 7. Mallard Lodge, 1964, with Manitoba Government representatives, Hon. Sterling Lyon (left) and Mr. Stuart Anderson (right) on an inspection trip.

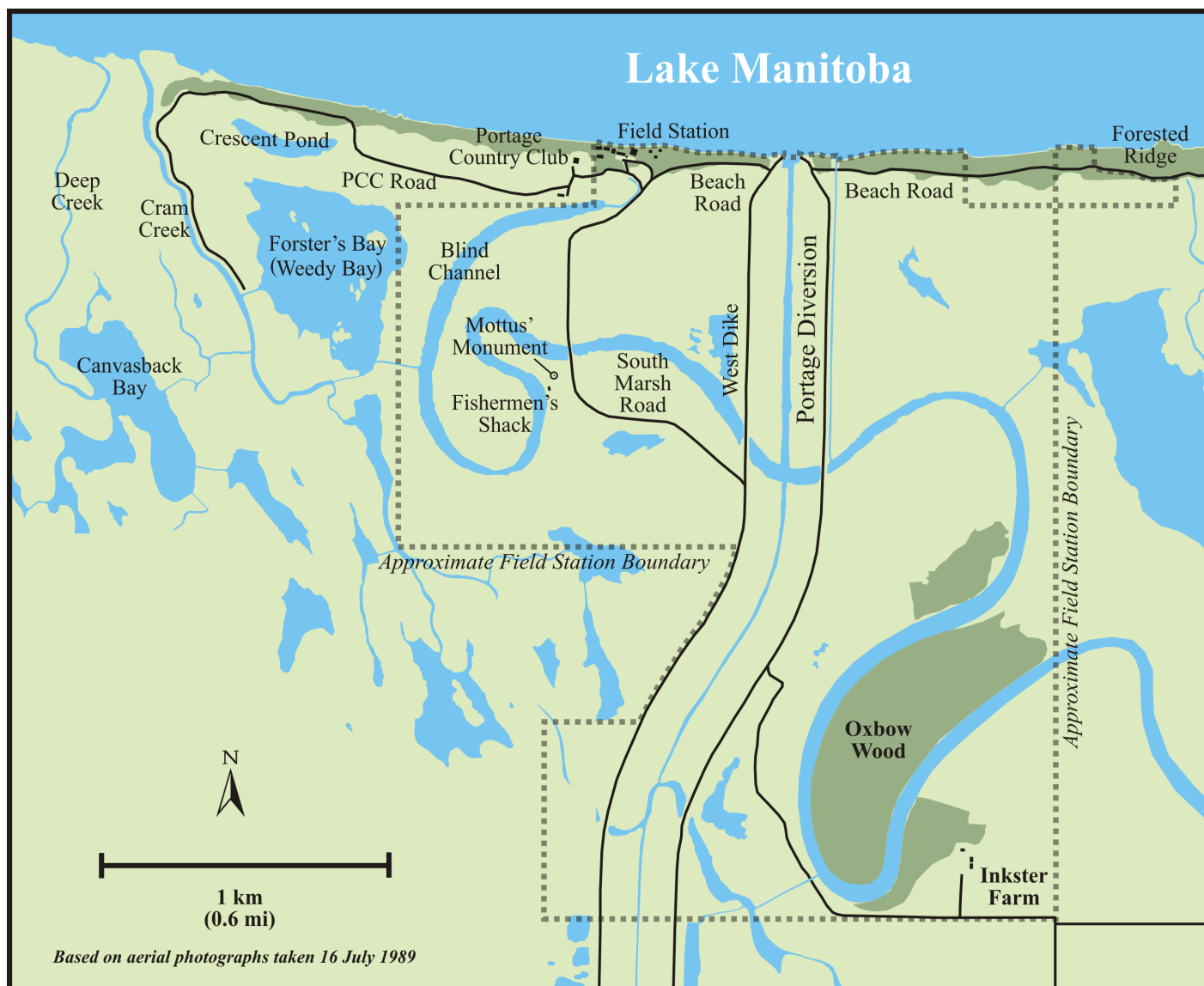


Figure 8. Location of the Bain property at Delta Marsh, most of which was leased to the University of Manitoba in 1967. The small southwest parcel in Section 5 was transferred to the Portage Country Club in partial compensation for land expropriated during construction of the Diversion. In the northeast corner of the property, a small portion of beach-front property, excluded from the lease, was substituted by another beach-front portion to the east, resulting in the unusual property lines in this area.

and bathroom for his housekeeper. Close by was Murray's Cottage, the house occupied by Mr. Bain's manservant. In between these was a large barn which had housed the Bain collection of vintage automobiles, and a generator house (later named the Bell House). Several old railroad cars and a game hanging shed completed the inventory. On the southern boundary of the property, about 6.5 km (4 miles) south, stood the somewhat decrepit Inkster farm house with a barn and small outbuildings. (*Figure 1*)

Given the run-down state of many of the buildings on the Bain estate, other venues for field station laboratories were explored. Indeed, at one time, serious

consideration was given to using Mallard lodge only as a dormitory and to build a university laboratory either elsewhere on the Bain estate or at the Waterfowl Station. Close collaboration with DWRS was deemed to be essential.¹⁰ We had all agreed that the Waterfowl Station would continue to study waterfowl and those of our students wishing to work with ducks and geese, would work there.

In February, Dr. Duckworth wrote to President Saunderson informing him that the Minister of Mines and Natural Resources, the Hon. Sterling Lyon, and his Deputy Minister, Mr. Stuart Anderson, were anxious that the university should lease the Bain estate,

but that there was no item in their budget to support a field station.¹³ Notwithstanding the lack of financial support, Mr. Anderson had offered (1) Mallard lodge for accommodation, (2) to employ Mr. Murray as caretaker until the end of the year, (3) to fund a caretaker for the following year and, (4) maintain the fabric of Mallard Lodge. He also said that the government would be sympathetic to a proposal to support an ecologist for two years, to carry out marsh research. The Provincial Government indicated that it was desirable that the university use the estate for scientific purposes as soon as possible.¹³ Consequently, a month later, President Saunderson wrote to the Hon. Sterling Lyon, requesting that the Bain estate be made available to the university.¹⁴

Soon after this, Mr. Sterling Lyon presented the university President with a cheque for \$15,000. At last, field station supporters saw the first government financial contribution towards realizing a research and teaching facility in the marsh.¹⁵ The government gave an additional grant of \$4,300 to the Department of Botany for the continuation of its research on carp and marsh vegetation.

Almost immediately, a university Field Station Committee was set up “to get the ball rolling.” Committee members included those who supported the idea of a field station, namely Drs. Lees (Chair), Duckworth, Connor, Waygood, Welch and Hochbaum, and the Deputy Minister of Mines and Natural Resources Mr. Anderson, or his designate.¹⁶ The committee deemed it important to maintain a close liaison with the government because the latter still owned the Bain estate and, hopefully, would eventually fund most of the station’s operating costs. It was felt essential, however, for the committee to secure interim funding for day-to-day expenses as there was a tacit understanding that the property should be used as soon as possible. To show their willingness to act, the university appointed Dr. Welch as the Station’s Acting Director.

In May, somewhat fortuitously, Colleen Nelson, artist and waterfowl researcher, came to see Dr. Welch. Colleen, who hoped to enroll in a PhD program in Zoology, asked Dr. Welch if she could use Mallard Lodge as the base for her study of newly-hatched downy ducklings.¹⁷ One might have expected that hers was a project that should be carried out at the DWRS. Colleen had apparently submitted her research plans, including space needs, specimens and budget to Dr. Hochbaum the previous October. To her dismay, she had just learned, nearly six months later, that her request had been rejected. It seemed

that all available space had been allocated to other researchers. Hearing her story, Dr. Welch agreed that Colleen could use the lodge. Perhaps he was relieved that someone wanted to use the place! In order to provide Colleen with the bare necessities for living, he purchased some army surplus metal bunks, a table and chairs and a refrigerator.

Even though Colleen prepared her own meals and provide her own bedding, she seemed extremely grateful for the facilities and support.

She set up a makeshift hatchery ready to receive the many shipments of duck eggs. Then she painted and meticulously documented dozens of newly-hatched ducklings representing a wide range of North American duck species. After leaving the Field Station, she continued to study ducklings for many years. Finally, in 1993, the Delta Station Press published her results in a sumptuously-illustrated *The Downy Waterfowl of North America*.¹⁸

Once in residence, Colleen sent a memo to Dr. Welch containing her comprehensive list of Station “wants.”¹⁹ She noted that, in Mallard Lodge, there seemed to be only two electrical circuits, the roof leaked in several places, the exterior needed cleaning, the woodwork oiling, the windows frames were in a poor condition and needed refinishing and the water system had an appalling smell.²⁰ Mr. Murray apparently said he had “let a tap run for a week and it still stinks—it’s not fit for any use!” It was unfortunately years before all these problems were adequately dealt with.

But before long, Dr. Welch had acquired old maple laboratory benches from the recently-renovated Science Building (later renamed the Buller Biological Laboratories) on campus. These benches were set up in the north and south porches of the lodge and in the basement, thus providing rather primitive lab facilities.

The leased portion of the Bain estate soon became known as “The University Field Station (Delta Marsh)” (Figure 8). It was named in this way because many felt that it might be the first of a series of University Field Stations. In future, University Field Stations might be set up, for example in Churchill and in The Pas.

While on leave in London, I was offered and accepted the role of Director of the embryonic University Field Station, beginning in September, 1966. I recall that I had a triple focus in wanting to develop a field station—research, teaching and community outreach. I believed, perhaps being idealistic, that it was important to expose the magic of the marsh and

the fragile balance of nature to as wide an audience as possible. Everyone could benefit from an experience in the marsh, whether they be a supermarket clerk, mechanic, lawyer or nurse. I thought that even a brief experience would persuade them to respect the natural world. I also felt that, because winter is such a dominant element in Manitoba, it was essential that a field station should operate year-round.

Thankfully, Mr. Anderson provided the money for a marsh ecologist. To take up this position, Dr. Michael Levin arrived on June 13 and was given a two-year contract.²⁰ His task was to study marsh vegetation, and to teach some botany courses. Dr. Levin's position was funded by the Department of Mines and Natural Resources who contributed \$10,000 for a salary and \$5,000 for research (i.e. the \$15,000 noted earlier). He and his family were housed at the Waterfowl Station where he was given space in a laboratory for his research.

In July, the University Field Station Committee met to consider a long list of pressing issues.²¹ They debated the siting of a laboratory as well as overall caretaking and cooking arrangements at the station. Other topics discussed covered the need to: provide safe drinking water, compile an expense budget for Mallard Lodge, install a security gate at the entrance drive to the lodge, repair the lodge's exterior and remove trees overhanging the building. They acknowledged that transport to and from the station was vital. The Portage Diversion blocked the beach road, making it impossible to drive directly from the station to the village. (*Figure 8*) Access could be provided by obtaining a boat to travel via the lake to the village of Delta, and by renting a pick-up truck. We were eventually permitted to rent a truck but some years passed before we were able to purchase a boat. The committee also considered providing summer cottages for married researchers with children.

Dr. Welch was well aware of the pressing need to employ permanent staff to look after the place. Shortly after this, upon the recommendation of Dr. Hochbaum, he wrote to Mr. Nan Mulder, who had operated the duck decoy at the DWRS for many years. He described to Mr. Mulder the positions of caretaker/handyman and cook/housekeeper that would be available the following year (*Figures 9, 10*).²² Would Mr. and Mrs. Mulder be interested in these positions? Thankfully, their response was positive.

The next UFS committee meeting was held in August at the Waterfowl Station.²³ Those present were greeted with rather depressing news from the government members. Tenders for repairs to the lodge had



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Figure 9. Mr. Nan Mulder (1913–1993), field station caretaker from 1967 to 1978.

been judged too high, and thus no repairs had been commissioned. Estimates for a lab building costing between \$45,000 to \$60,000 were not acceptable. Any lease of the Bain property would forbid sub-leasing and government permission should be sought before any buildings were either demolished or erected. The group again discussed the siting of a laboratory but no one had any notion of where the money for a lab might come from.

But amidst all this negativity, there was a bit of good news. By this time, the government had constructed a concrete sill at the mouth of the Portage Diversion. This “hard” sill provided a potential means of crossing the Diversion channel, except when strong north winds washed over it. As yet, however, it remained a potential crossing as there were no access ramps from the Diversion banks to the sill. Much to our relief, however, the construction of the sill meant that a costly bridge across the diversion might not be needed.

At the end of my leave I returned to Winnipeg in September 1966. Shortly thereafter, I visited my friends at the Delta Waterfowl Station and happened to meet the Hon. Sterling Lyon. During our conver-

sation, he expressed his disappointment that there seemed to be very little activity on the Bain estate. He even hinted that the government might repossess the property if its use did not increase. He asserted that, from the government's point of view, it was vital that the Bain property be well used, mainly because it had been a costly investment and, if not adequately used, would increasingly become an embarrassment. I assured him that we would endeavor to develop some programs as quickly as possible.

Soon thereafter, I convened my first University Field Station Committee meeting, chaired by Dr. Lees. The committee had the same members as the committee that had been meeting during the summer. The main agenda item was to consider the development of a five-year plan which would involve negotiating a formal lease and securing funds for facilities and research projects. At that time there was little support among most university biologists for the proposed field station to have a long lease. It was the general opinion that a field station would not survive for as

long as five years. I held the opposite view and urged that we attempt to negotiate a 21-year lease. I was grateful that, with support from Drs. Waygood and Welch, the committee eventually sent the government a proposal for a 21-year lease.

That fall, Mr. Murray, the caretaker retired. I did not know Mr. Murray well, but recall him as a man of short stature and a rather taciturn disposition. On occasion, he could be encouraged to reminisce about his past association with Mr. Bain to whom he seemed devoted. In the barn, he kept a collection of old license plates from Bain's vintage car collection and loved to talk about the antiques.

After Murray's retirement, I made arrangements with Doug Garnham, a resident of the village of Delta, to check Mallard Lodge on a regular basis over the winter in order to ensure that the central heating kept working. Mallard Lodge had always been heated and we were concerned that, if the heating should fail, the massive stone chimney in the common room might shift, if the ground beneath it froze.

During the fall and winter, we at the station established good relationships with our neighbors to the west, members of the Portage Country Club. Their property had the advantage of accessibility and security, having locked gates on its access road. Club members willingly allowed us access to their property for research. Although we could work on Country Club land to the west, we could not access our property to the east because of the barrier created by the Portage Diversion. To gain access to our east side, we were obliged to drive 10 km (6 miles) south to Highway 227, cross the bridge there and drive north again on the east dike, a 22 km (15-mile) trip.

1967

Management of the marsh continued to be the subject of study. In May, M. M. Dillon, Ltd. released their "Delta Marsh Development Engineering Feasibility Study." The study was prepared for the Provincial Department of Agriculture and Conservation.²⁴ Dillon proposed building many miles of earthen dikes, canals, drainage ditches and numerous water control structures across the marsh, costing about \$1,400,000. They recommended a staged development over a number of years. After reading it, I was naturally keen to know how this proposal, if adopted, would affect the marsh and especially the Field Station and our research.

But the struggling station faced more immediate concerns. At that time, we did not have our own budget. The Department of Mines and Natural Re-



Delta Marsh Field Station

Figure 10. Mrs. Gertie Mulder (1914–2007), cook and housekeeper.

sources had agreed to help finance research projects that addressed their specific concerns but declined to pay for the lodge's day-to-day operating expenses or to purchase any basic furnishings. Lacking such support and aware of the urgent need for furniture, I felt obliged to exercise resourcefulness in acquiring such necessities as cheaply as possible. In this endeavor I was grateful to be given \$6,000 from a 'special fund' for this purpose by Dr. Duckworth.²⁵

In order to locate furniture, I routinely visited the university Operations and Maintenance storage barns. These dusty warehouses became a major source of useful items. In one barn, I found tables that had originated in the Dental School but were suitable for the dining room. The dining room chairs were straight-backed oak chairs from turn-of-the century lecture rooms when the university was on Memorial Boulevard in the center of Winnipeg. Glass-fronted oak cabinets which came from recently re-modeled laboratories on campus, were perfectly suitable for bookcases. The carpet in the common room of Mallard Lodge, Bain's former living room, began life on the women's dress floor of The Hudson's Bay Company department store. I found it in a second-hand warehouse in Winnipeg's Exchange District. Chests of drawers for the bedrooms came from the now-defunct Canadian Army base at Churchill, Manitoba. We were even offered old, rather shabby and dilapidated overstuffed chairs and other items by friends, including President Saunderson. These we declined, I hope tactfully, because I resolved to uphold some minimum standards! I bought a few things new, such as our heavy woolen "Trapper Point" blankets and other bedding, crockery, tableware and kitchen equipment.

In March, Nan Mulder took up the position of caretaker/handyman and his wife Gertie that of cook/housekeeper. The couple moved into the small housekeeper's apartment in the lodge, adjacent to the kitchen. Their apartment consisted of a small bedroom and bathroom. We seemed now truly "open for business." To our great relief, the Province reaffirmed their agreement to pay Mr. Mulder's salary until March 1968.

A viable biological station needs a weather station so we were pleased that the Federal Department of Transport was willing to add us to their network of meteorological stations. The department provided us with a Stevenson screen shelter, maximum and minimum thermometers, a rain gauge, evaporation pan, and a Campbell-Stokes solarimeter. All were installed a short distance south of the Bell house at the edge of the marsh. They also built a tower at the

side of the driveway near the lodge for wind gauges whose data were fed through cables to the basement of the lodge. Pleased as I was to have the equipment, I felt that with the press of other responsibilities, station staff could commit to take readings only once a day. Thankfully, the Meteorological Office agreed that we should take readings once at 0800 hours rather than twice a day as was the usual requirement. Mr. Mulder willingly undertook the duties of weather recorder. He proved to be reliable, punctual and enthusiastic about this task, and rarely asked anyone else to take readings for him.

In order to cement our close ties with the DWRS, the university offered Dr. Hochbaum the title of Honorary Professor in Graduate Studies and Research in January. In June, the Board of the DWRS in turn appointed me a Scientific Advisor to the Waterfowl Station.²⁶

Research began in earnest in the spring. We launched, somewhat to my surprise, nine projects. (*Appendix Table 1*) These involved faculty members Drs. Welch, Lubinsky, Brinkman-Voss, Evans, Levin and myself. Projects included either graduate students or research assistants who worked at the station for varying periods of time during the field season. Dr. Welch and his students studied nematodes in marsh soils and the mermethids that parasitize midges, Dr. Lubinsky surveyed land and freshwater mollusks and Dr. Brinkman-Voss looked at the distribution of aquatic hydra. Dr. Evans investigated the breeding behavior of gulls, terns and other species. In the Botany Department, Dr. Levin examined the systematics of the reed (*Phragmites*) and sow-thistle (*Sonchus*) and I looked at photosynthesis in *Phragmites*, cat-tail (*Typha*) and spangletop grass (*Scolochloa*). Dr. Chris Watts, a Post Doctoral Fellow in Zoology, took up residence to study intra-specific competition in red-backed voles. Also, Mr. Morgan Tamplin from Anthropology supervised a crew surveying for archaeological sites on the beach ridge.

To house all these researchers, we rented two small house trailers and positioned them opposite the barn. For our makeshift labs, set up in the north and south porches of the lodge, Nan installed plumbing and old sinks from the campus. Each researcher was allocated a rather cramped working space in the labs. Not everyone benefited by this arrangement, however. During warm summer days, the botanists sweltered in their sun-drenched south porch "lab" while zoologists enjoyed cool comfort in the north porch and in the basement.

Mrs. Mulder turned out to be an accomplished cook. She prepared our meals in the lodge kitchen and served them in the common room. After each meal, we all drew playing cards to decide who would do the washing up. Indeed, washing up became quite a social occasion.

Some of the outbuildings did not survive for long. We did not discuss the fate of the old, dilapidated railroad cars and game hanging shed through official channels. They somehow mysteriously disappeared!

Having accommodation, meals and, albeit somewhat primitive, laboratory facilities, we turned to ensuring that we shared our research findings with others. On Wednesday nights we held seminars to which we invited the staff and students at the DWRS and members of the PCC. We wanted our neighbors to learn about the studies being carried out. We also held regular meetings of users so as to air any problems and hopefully, find immediate solutions.

But as the summer progressed, problems with the roads and water supply kept cropping up. During wet weather, road access to the station was particularly difficult. The only route was along the west bank of the Portage Diversion. This so-called "road" was little more than a rough, rutted track, virtually impassable after a heavy rain. Many intrepid souls on their way to the station had to abandon their cars along the muddy track and proceed on foot.

As for the water supply, the smelly tap water in the lodge could only be used for washing, so Nan Mulder made frequent trips to Portage la Prairie in our rented pick-up truck packed with milk churns, to collect potable water. Gertie Mulder frequently accompanied him to town to purchase food and other supplies. Both were surprisingly good humored about their excursions, though they sometimes became stuck in the mud.

A crew of archaeologists led by Mr. Morgan Tamplin, spent three weeks at the station in early summer. They attempted to unravel the history of early Aboriginal settlement on the lake shore ridge through collecting bones and arrow points and other artifacts from the beach and by excavating test trenches. In July, we were challenged when the university's Summer School scheduled both the Plant Kingdom and Chordate Zoology courses to be held at the station. In the fall, we also hosted the Introductory Ecology course that spent four days with us before the term started.

At this stage, I felt that the university administrators needed to see the Field Station in operation at first-hand, and learn about our activities. So, somewhat ambitiously, in early July, I hosted a luncheon and invited Drs. Saunderson and Duckworth, other university administrators, several deans, the heads of all the Biology departments, the government members of the Field Station

committee and others who supported us. At the last minute, a cabinet meeting prevented the government people from joining us, but the twelve others who came seemed interested in what they saw and heard. Hopefully, the experience of our guests would make some of our future requests for funds more relevant. For example, the fact that they had to queue to use the single upstairs toilet apparently impressed some visitors with our need for additional bathroom facilities.

Then, in order to reach out to more colleagues on campus, we



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Figure 11. Biology Division picnic arranged to introduce staff and students from the campus to the Field Station, summer, 1967.

organized a Division of Biology picnic in July. It was attended by more than 60 people, (*Figure 11*) including Dr. Waygood, (*Figure 12*) and our friends from DWRS and the PCC.

Later that month, at the UFS Committee meeting, I felt it necessary to review some of the problems and uncertainties we faced.²⁷ Among the problems were the continued difficulties to access the station along the Portage Diversion as well as the urgent need to arrange a means to cross the Diversion at the beach road. In addition, we felt obliged to address such questions as who would finance: (1) renovations to the lodge so as to provide additional bathroom facilities, (2) the improvement of the Mulder's accommodation, and (3) a potable water supply. Also, would the \$15,000 the government had previously given for research be forthcoming next year and where should the new and essential laboratory be built? On the last point, Dr. Duckworth recommended that the season be completed before discussing the siting of the lab.

There were other questions. For example, why had the government allocated haying rights on the Bain property near Inkster farm without our knowledge? Surely we should be contacted before they took any

such decisions. Cutting hay could have affected our research projects. I felt particularly strongly about this, because, several years before, and without my knowledge, 100 of my PhD study plots on the south side of the marsh had been inadvertently mown by a local farmer.

To our great relief, many of these questions were addressed by Mr. Mair the Deputy Minister of Mines and Natural Resources at the August committee meeting.²⁸ He informed us that the government would give us a grant to cover some expenses. They would also provide some funds for maintenance. Our request that the property be designated as a Wildlife Refuge had apparently been granted and Water Control had agreed to provide a ford and approach ramps at the mouth of the Portage Diversion. Mr. Mair urged that a 5-10 year plan for the Bain property be developed as soon as possible. This would make funding from his department easier. He suggested that a new \$1.00 a year long-term lease be drawn up to include a grant to cover some expenses.

Once these problems had been addressed, we turned our attention to field teaching. Somewhat ambitiously, we offered a pre-term week of fieldwork for the fall Introductory Ecology course. The week proved so popular that every bed was filled. We were obliged to put additional applicants on a waiting list.

The university Bulletin featured an informative article about the Field Station in its September issue.²⁹ In November, to make our presence felt on campus, all those who had undertaken research at the station during the season, presented progress reports at a one-day seminar. It was deemed important to inform our university colleagues about our research. Among those invited to attend were the Chancellor of the university, the Associate Dean of Arts and Science, Provincial Government and Ducks Unlimited (Canada) representatives as well as biologists from the University of Winnipeg and Brandon University. We were gratified by the turnout and the interest and enthusiasm of the audience.

Our experience over the summer of 1967, made it clear that we had to do something to increase both laboratory and living space. We were severely limited with only the meager lab facilities in the north and south porches and in the basement of Mallard Lodge. To respond to this urgent need for more space, Prof. Carl Nelson from the Faculty of Architecture kindly offered to design, in consultation with faculty members, a separate building that would house two small laboratories. The building was to be located on the ridge immediately west of the lodge. We hoped that



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Figure 12. Dr. Roy Waygood (1918–2001), Head of the Botany Department, at the Biology Division picnic, summer, 1967.

this would be the first of several labs to be erected along the ridge between Mallard Lodge and Murray's Cottage. Carpenters worked on the building over the fall and winter. (Figure 13) We also discussed plans to construct two prefab cottages on the east side of the lodge. Our intention was to separate faculty from student housing and laboratories. During the winter, the south porch in the lodge was divided into two, one half being incorporated into the Mulder's accommodation. Also, the promised modification of the large upstairs bathroom into two halves, each with a toilet, hand basin and shower, was accomplished and another toilet was installed in a former linen closet on the landing.

1968

At the April Field Station committee meeting I first presented a report that summarized the previous season's activities.³⁰ I then reminded committee members that we still had no money formally set aside by the university for the station operations and none for the salaries of any secretarial or administrative assistants. Consequently, I recommended that the Director should be allowed to submit an annual budget to the Faculty of Arts and Science. This prompted Associate Dean Connor to indicate that the University Administration had in fact set aside \$20,000 for Field Station expenses and that the Faculty of Graduate Studies another \$5,500.³¹ Mr. Mair added that his department would give the Field Station one grant of \$19,500 and \$4,500 to the university in another allocation. This was almost equivalent to the \$25,000 given last year for research and other matters, and included Dr. Levin's salary. This solid commitment of moneys was a tremendous relief. Now we could move on with our planning and budgeting. It was agreed that I should prepare a budget for the following year for Dr. Connor, so he could approach President Saunderson for ongoing financial assistance. Mr. Mair said that, in



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Figure 13. East and West labs under construction, 1967-1968. Note the base of Mallard Lodge has been infilled with logs to improve its appearance.

future, the Provincial Government would probably give one grant to the university whose administrators would then allocate portions to various projects, the University Field Station being one. He pointed out that funds would be more likely to be forthcoming from the government if they knew what were our plans for capital expenditure in the future. He emphasized that it was important that the biologist funded by the government, spent adequate time at the station.

I advised the committee that all day-to-day administrative chores were my responsibility, and that the organization, equipping and running of the Station should take more time than I had with my heavy Botany department duties. I believed that the Field Station should be expanding its program of research and graduate training, and that I should have time to be involved in such other activities as conservation (e.g., the International Biological Program) and still have time for research. In the discussion that followed, Dr. Waygood pointed out that my Botany department salary was not connected with the Field Station. My salary was solely for my duties in Botany. The possibility of a separate Director's salary was discussed but the issue was left unresolved.

According to our original draft lease, Murray's cottage was to be demolished. Nan Mulder therefore began the process by removing the porch that sur-

rounded two sides of the building. He used the logs, augmented by new ones, to fill in the spaces between the concrete columns that supported Mallard Lodge. This improved the appearance of the lodge at a minimal cost. (Figure 13)

In the meantime, with the agreement of the Field Station Committee, our plans for Murray's cottage had changed. After careful assessment by experts at the university's Operations and Maintenance department, the building was declared to be sound, and, because we desperately needed space, we decided to renovate Murray's to provide three bedrooms, a shower and toilet and a common room which could also be used for classes. During the winter, Nan brightened the interior of the lodge by painting the dark ceiling of the common room a pale beige. He also painted the kitchen, bedroom ceilings and closets and papered the bedrooms. The appearance of our surroundings was beginning to improve.

The need for more furniture prompted me to attend the auction of the contents of the about-to-be demolished Royal Alexandra Hotel in Winnipeg. Aided and abetted by my department head, Dr. Waygood, I secured a number of chest-of-drawers and other useful items. Love's Transfer in nearby Oakland, ferried these purchases as well as other goods and equipment to the Field Station, thus providing a vital link between the station and Winnipeg.



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Figure 15. A strong wind from the north during a storm on Lake Manitoba. Water is pushed towards the south, covering the beach, 1974.

Slowly, gradually, things within our control were improving. Unfortunately, we had no control over the weather and found ourselves the victims of changing winds and waves. Abrupt shifts in the lake were a source of both concern and no small measure of awe. When strong winds blew from the south, they drove the water far out into the lake and exposed sand bars offshore as well as a wide strip of shoreline where stands of hard-stem bulrush (*Schoenoplectus acutus*, formerly *Scirpus acutus*) had gained a foothold. (Figure 14) In contrast, strong winds from the north whipped up menacing white-capped waves that relentlessly pounded the beach ridge. (Figure 15)



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Figure 14. A strong wind from the south pushing water in Lake Manitoba north and exposing a zone of bulrushes and offshore sandbars, 1967.

Eventually, to our great relief, the Water Control and Conserva-

tion Branch installed approach ramps at the mouth of the Portage Diversion. It was now possible to cross the Diversion channel on the concrete sill when winds blew from the south, but hazardous when strong north winds created frightening waves that washed over and concealed the edges of the sill.

Easier access to the Station brought with it unforeseen problems. Despite large conspicuous notices at our boundaries announcing 'Private property' and 'Research in progress', the newly-built means of crossing the Diversion proved to be extremely popular with weekend tourists. Scores of picnickers swarmed onto the adjacent lake shore while others wandered along the beach, or around the Field Station. This invasion of uninvited visitors was a cause for concern because we had installed valuable research equipment on the beach and in the forested ridge. Explaining our situation to the many intruders proved tedious and time-consuming. Picnic debris and other litter became both an eyesore and nuisance. To cope with this problem which seemed to grow with each passing week, we eventually installed a gate on the beach road at the eastern boundary of our leased land, and another at our boundary on the west bank of the Diversion. Both gates were accompanied by explanatory signs. We issued keys to all the Field Station personnel, and gave keys to the PCC members and to the DWRS. We also left keys with Stan McVety at the Oakland store for anyone who had forgotten theirs. (Figure 1) This solution worked for a time but locking the gates was eventually abandoned, in part because of vandalism.

To improve our vehicle access, both roads from the Diversion to the station were graveled, i.e. the beach road and the south marsh road. (Figure 8) Unfortunately, Water Control still had jurisdiction over the, often impassable, muddy track on top of the west bank of the Diversion. Water Control officials must have become weary of my frequent phone calls requesting that something be done to improve the diversion road and make our access easier.

Though we had difficulties with unwanted visitors and sometimes impassable roads, our research and teaching continued to expand. The new laboratories proved a valuable addition to work space and encouraged us to hope that more labs could soon be built.

In the spring, Dr. John Wright, a limnologist from the UK, (Figure 16) replaced Dr. Chris Watts as the resident Post-Doctoral Fellow (PDF) for two years. John's plan was to investigate the ecology of midges, the Tendipedinae (now called Chironomidae). He also helped me in many ways with our program of school field trips (Figure 17) for which we had obtained

funds for student transportation from the Wildlife Foundation of Manitoba. A total of 192 students from Brandon, Neepawa and Winnipeg enrolled in the program. While with us, we introduced them to ongoing research and practical field work.

Several faculty from Botany and Zoology brought their research projects to the Field Station. Twelve projects were undertaken by faculty and graduate students (Appendix Table 1). Five of these continued from the previous year while seven were new. In Botany, Albert Sproule (under my supervision) (Figure 18) completed his study of the post-glacial history of the marsh. John Yeung studied the effects of an early spring fire that destroyed 1500 acres (607 ha) of marsh vegetation. He also analysed water samples from the diversion. Norma Orlido, Dr. Levin's student, analyzed the vegetation on the southern shore of Lake Manitoba to determine its floristic affinities. Dr. Levin continued his work on the systematics of reeds and sow-thistles. I expanded my study of photosynthesis in the reed and other species. (Figures 19 and 20) In Zoology, Martin McNichol, Dr. Evans' student, studied the breeding biology and ecology of Forster's terns. Leo Hlynka, supervised by Dr. Welch, began a survey of the parasitic helminth fauna of the leopard frog, the wood frog and the Canadian toad and Robert Merkel, Dr. Gee's student, studied photic responses



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Figure 16. Dr. John Wright, Post-Doctoral Fellow, using an Eckman dredge to sample bottom fauna in the marsh.



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Figure 17. A group of school students in front of Mallard Lodge after a day learning about the marsh, 1968.

in tadpoles during their first three weeks of life.

These projects demonstrated the wide range of studies that the Field Station could host, though I was the only faculty member who spent much time in residence. Two project supervisors stayed at the Station overnight from time to time, but both considered that their supporting grants were solely for research and they declined to participate in any station activities or interact with visitors.

In the early summer I was faced with a personal decision because I had been invited to become the Warden (Director) of the Slapton Ley Field

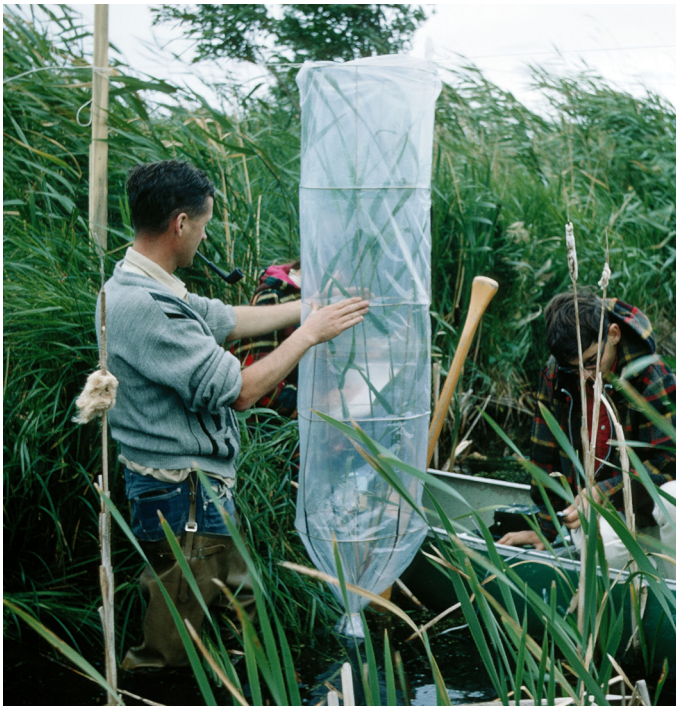
Centre in Devon, operated by the Field Studies Council. One of my aspirations had been to again work for the Field Studies Council in the UK. The offer was extremely tempting, but, after much soul searching, I thought that I could make a greater contribution to education and research if I managed to put the fledgling University Field Station on a firm footing, rather than move to a well-established and successful operation. Despite the cajoling of my family in England, I decided to say no to Slapton. Afterwards, on a number of occasions, I wondered if I had made the right decision!

We continued to attract visiting scientists and host seminars. In July, we were fortunate that Dr. George Dunnet from the University of Aberdeen, spent three days at the Field Station under the auspices of the Organization of Inland Biological Field Stations aided by a grant from the University of Manitoba Faculty Visiting Lecturer's fund. Dr. Dunnet gave three inspiring seminars to which researchers from the DWRS were invited. The latter also joined us at our weekly Wednesday night seminars, and our second Division of Biology picnic which more than 90 people attended. (Figure 21) Our continued links with the Waterfowl Station were made easier as Dr.



J. M. Shay

Figure 18. Core sampling for pollen in sediments in Cadham Bay to determine the post-glacial history of Delta Marsh, 1968, with (left to right), Nan Mulder and M.Sc. students Manfred Hoefs and Albert Sproule.



J. M. Shay

Figure 19. Dr. Barry Irvine of the Botany Department measures CO₂ uptake in photosynthesis by the reed, August 19, 1968.

Hochbaum, its Director, and I had monthly lunch meetings to “keep in touch.”

The prolonged negotiations over the lease seemed to be nearing conclusion with a caveat being included to allow PCC members to have access through our property to theirs. Over the year we continued to develop a positive relationship with the PCC President and its members. Because our property on the east side of the Diversion was still vulnerable to trespass, their more secluded land, which they were willing to let us use, provided valuable sites for research.

Apart from concerns about the lease, serious academic difficulties arose, when, at the end of the summer, Dr. Levin would not allow Norma

Orlido to use the data she had collected during the summer for her MSc thesis. Because he had financed her research, he deemed her to be a technician, and claimed the data for himself. Dr. Waygood could not resolve the problem. Regretfully, this contributed to the fact that Norma had to return to the Philippines without an MSc. It was a sad and salutary experience from which we all learned lessons.

As with the haying rights, we dealt with ongoing conflicts over the management of the marshes' resources. In October, it became obvious that deer were being hunted and trapped on our property. This caused us concern because indiscriminate deer hunting could affect our research projects. I sought legal advice from the university solicitor as to hunting and trapping rights on Crown land such as ours. Unfortunately, advice was a long time in coming.

Another conflict arose around carp fishing. Without our knowledge, a group of fishermen had erected a fish shack south of the beach road between the Field Station and the west bank of the Diversion. They had been granted a license by the Province to fish for carp at the Diversion exit and at Cram Creek. (Figure 8) Initially, they traveled to Cram Creek along the PCC road, but before long, the PCC prohibited this because their vehicles caused considerable damage to the road. To continue to have access to Cram Creek, again without our knowledge, the fishermen cut a trail



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Figure 20. Assistant John Yeung monitors temperature inside a plastic bag used in photosynthesis experiments with the reed, August 19, 1968.



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Figure 21. Biology Division picnic, summer, 1968. Note the zone of emergent marsh vegetation along the lake shore. This disappeared a few years later after lake levels continued to be regulated.

through the beach ridge on our side of the Diversion. From there they traveled in their Bombardier tracked vehicle along the beach to Cram Creek. A more serious problem associated with the carp fishing enterprise was their indiscriminate dumping of fish heads and guts and the fact that they failed to clean up the sites they used.

Notwithstanding these conflicts, other station activities continued. With the expansion of research and teaching, we felt we needed some library resources. The university agreed to provide a limited amount of money for a reference library to be housed in the common room. It was something we had requested several times. We also began to subscribe to several scientific journals—*Ecology*, *The New Scientist* and *Scientific American* for, although we had access to the DWRS library, its holdings did not cover the broad spectrum of our research projects and interests. The general opinion was that we should develop a library of our own.

During the field season, everyone including student researchers and assistants and occasionally another faculty member, contributed to Tuesday evening “work nights” by painting buildings and doing other chores. A general spirit of enthusiasm was pervasive

which bolstered my feeling that the developing Field Station had considerable potential. I still felt a nagging insecurity because the number of resident researchers seemed below the “critical mass” for a successful operation and there was still no ongoing commitment for funding from the university. I was convinced that one important hindrance to faculty involvement was a lack of accommodation for married instructors. For the UFS to fulfill its mandate, it was essential that we offer both adequate living and laboratory facilities.

With the Station on a slightly firmer footing, and in response to Mr. Mair’s request. I realized that it was time to plan for the longer term. In August, I circulated a short paper outlining a five-year plan for research and development.³² It cited two purposes of the Field Station which had been set out in 1967. The first was to provide facilities for research and training at the professional, graduate and undergraduate levels, in ecology and other fields. The second was to cooperate with the DWRS and other agencies in the promotion of ecological research with special reference to marsh ecology and waterfowl. The long range program was aimed at a greater understanding of the dynamics of marsh ecosystems. The five-year plan suggested an outline of projects to be undertaken should be produced each spring and a seminar scheduled in the



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Figure 22. Introductory Ecology course students sampling vegetation in the Borrow Pit (where soil has been removed) adjacent to the Portage Diversion, 1968. In the foreground are Drs. H. E. Welch (left) and J. Gee (right).

fall, so that researchers could present their findings. A summer seminar program should be held in conjunction with the DWRS. Publications arising from station research should be given a Field Station publication number. Although not specifically mentioned in the plan, our experience to date had led us to feel that our laboratories should be built on the Bain estate and not at the Waterfowl Station. The plan went on to say that we hoped, in 1969, to build a lab/classroom; in 1970, to build two more cottages, or renovate Inkster farm or the lodge porches for living quarters; and in 1971 to build another lab. However, it made no mention about how we would fund such ambitious building plans.

We continued pre-term ecology offerings. Indeed, a short residential course at the Field Station had now become a pre-requisite for enrollment in the fall Introductory Ecology course. (*Figures 22 and 23*) To accommodate the 28 students who had enrolled, we held two three-day sessions during Registration week. This experiment proved so successful that we planned to expand the pre-term course to a week for the following year.³³ During the fall, a weekend course for Honours Ecology students was judged a valuable experience by both faculty and students.

At the year's end, I circulated a summary report of our 1968 activities to Field Station users, committee members and other interested parties.³³

1969

During the winter and early spring, two "package" cottages were erected for faculty housing on the ridge east of Mallard Lodge. I managed to provide both with an assortment of new and second-hand furniture and to make curtains for them so they were ready for occupancy when the field season started. The Field Station committee insisted that I lived in Cottage 1. (*Figure 24*)



J. M. Shay

Figure 23. Introductory Ecology course students sampling marsh vegetation using transects, 1968.

At the UFS(DM) committee meeting in April, Mr. Mair wanted to know whether the completion of the present five-year plan (1966-71) would herald the end of expansion or be the beginning of a longer program.³⁴ I replied that our general feeling was that, when completed, the initial program was probably as much as the site could accommodate without adversely impacting the surrounding environment. Mr. Mair then asked whether we intended to eliminate the summer school offerings. He declared that he was convinced that there was a very real need for ecology courses for high school teachers, and that if we offered such courses, we might secure funds from the Department of Education. He added that it was likely that we would again receive financial support of \$25,000 for another year from two sources in the government. A summary of funding for research to be carried out at the Field Station in 1969 was attached to the minutes of the April meeting. We were surprised to find that the estimated total for board, travel, equipment and student salaries amounted to \$123,509.³⁵

Dr. Hochbaum believed that it was time that we took a long hard look at the policies and limitations of the Field Station. Dean Connor agreed, but thought it was too much to expect me to do this. He thought that an important step should be to appoint a full-time director, either someone else or me by September, 1969! He considered the matter urgent. The new director



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Figure 24. Cottage 1 (Director's Cottage) on the forested ridge east of Mallard Lodge in the snow, winter of 1969-70.

would teach one, or one and a half courses, advise graduate students and be given adequate supporting services. Near the end of the discussion, Dr. Lees offered to write a report summarizing the present state of affairs at the Field Station with the help of Drs. Waygood, Welch and myself.

We then learned that, due to confusion in the Wildlife Branch, we had been miss-informed about the current status of our leased property. We had thought that the government had finally changed our status from that of a Game Bird Refuge to that of a Wildlife Refuge. This had not happened and because it was still a Game Bird Refuge, we again urged that Wildlife Refuge status be reinstated. In the midst of all this, we finally received some advice from the university solicitor. In July, the solicitor, whom I had contacted the previous year, informed me that, "the lands leased by us are occupied lands, and the public, Indians and Métis are not entitled to hunt with gun or bow and arrow, or trap, except in respect of those authorized to hunt big game when the government authorizes the same." The solicitor even suggested we might need to employ a commissioner to enforce the university's rights.³⁶ I began to think that matters were getting out of hand!

Despite these concerns over our lease, we carried on with the development of the station facilities.

Thus, in the spring, the Bell House—whose bell summoned us to meals—was modified into a small laboratory by Dr. Gordon Robinson and his graduate student Dennis Brown. We prepared a site plan to ensure the orderly placement of new buildings in anticipation of obtaining two former military housing units from the nearby but now defunct Macdonald airfield. The Provincial Government guided us through the necessary negotiations that allowed us to obtain these Permanent Married Quarters or PMQ units. Associate Dean Connor provided the funds to move them.

The units were moved

during the winter to sites we had prepared west of Murray's cottage. (Figure 25) They promised to provide much needed laboratory and living space.

Research at the station continued to expand. Thirteen projects (nine new) were undertaken with two continuing fieldwork throughout the winter (*Appendix Table 1*). Nine graduate students from four departments were involved assisted by eleven summer students. Projects included phytoplankton succession, nitrification in marsh soils, evapotranspiration in the reed and water table fluctuations, ecological studies in benthic fauna, mollusk distribution, population dynamics in Brook sticklebacks, (Figure 26) comparative ecology of two Shiner species, internal helminths and biology of two amphibian species, reproductive biology of Forster's Terns, investigations of territory in Yellow Warblers, seasonal energy expenditure in muskrats, geological investigations on the Portage Plain and the hydrochemistry of shallow ground water around Delta.

During the summer, we held weekly seminars and considered ourselves fortunate that so many eminent researchers made presentations. They included Dr. L. Rudescu from Rumania, Dr. R. Miller (Yale), Drs. David Schindler and Gregg Brunskill (Fisheries Research Board), Dr. Robert Nero (Manitoba Museum of Man

and Nature), Dr. E. S. Burch (Anthropology), Mr. L. Gray (Water Control) plus our own faculty.

I unfortunately broke my leg in May and spent the summer hopping about on crutches.

In June, the university Board of Governors allowed me to submit a brief to the Public Hearings of the Manitoba Water Commission.³⁷ I prepared the brief because I wished to oppose the proposal to lower and stabilize water levels in Lake Manitoba. I was convinced that if the proposal was accepted, it would have long-term negative effects on the entire Delta Marsh.

Meanwhile, public use of the area around the Diversion continued to increase with the attendant litter and damage. Fires on the beach, accumulation of broken glass and other garbage, and deep ruts in the road after rain all contributed to the damage. Almost in despair, I sought help from Manitoba Water Control in hopes of controlling this problem of public access and its resultant impact.³⁸

In late July, some of us had other matters on our minds. In order not to deprive staff and students of an momentous event on July 21, we rented a television set and installed it in the Common room. As the predicted time for the moon landing drew nigh, everyone gathered around the TV. Our excitement grew as the commentary became more graphic, until, with cries of amazement, we took photographs (all turned out rather blurred) of our small TV screen where a tiny speck of light signaled Neil Armstrong's moon walk.

Also in July, a four-week Archaeological Field School led by Dr. Tom Shay, was held. The crew excavated a small camp site on the Bell Estate, east of the Delta Waterfowl Research Station where pottery and other artifacts dating between AD 1300 and 1600 were found. Six other courses spent varying amounts of time doing fieldwork. These were Comparative Chordate Zoology, The Plant Kingdom, Plant Ecology. (*Figure 27*) Advanced Taxonomy,

Marsh Ecology and Introductory Ecology. The high enrollment in the pre-term Introductory Ecology course necessitated three sessions, each of three and a half days duration, not the full week we had hoped to offer. Two sessions were in Registration week, the third the following weekend. All this activity somewhat dispelled the pessimistic notion that the Field Station would not be a success.

We had many visitors during the year. Dr. T. Prichard (Nature Conservancy, UK), Dr. D. Bellamy (University Durham, UK), Dr. J. H. Burnett (U of Glasgow, UK), Dr. Kaz Patalas (Freshwater Institute), Dr. Bilden (Macdonald College, McGill U), Dr. D. Pimlott (U of Toronto), Dr. G. Ross (Southern U), Dr. B. Kendrick (Waterloo), Dr. G. MacLachlan (McGill U), Dr. H. Dale, (U of Guelph), Miss V. Humphreys (National Museums, Ottawa), Miss. M. Dwyer (Parks Canada, Ottawa), Mr. E. Carp (International Wildlife Research Bureau) and Dr. A. Johnson (Hendrix College). Drs. Burnett and Dale "dropped in" unexpectedly, on their way to the International Botanical Congress in Seattle. When they arrived, we were fully booked with field courses and suffering from a power outage, not the best situation to have prestigious visitors. Gertie Mulder was cooking dinner on a Coleman camp stove while the rest of us huddled around candles. With no power for lights and no possibility of working in the labs, Dr. Burnett kindly agreed to give an impromptu



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Figure 25. Foundations for the Permanent Married Quarters (PMQ) Agassiz lab with Jennifer Walker (Shay) at left, late fall, 1969. Murray's Cottage on right.



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Figure 26. M.Sc. student T. O. Acere sampling sticklebacks in the Blind Channel near Mallard Lodge.

talk on being a biologist in the 1960s. He pointed out that today's society included people who did not have to work all of the time, just to survive. Thus, some of us were privileged to be able to enjoy leisure. A lively discussion followed his remarks.

The Division of Biology picnic in July attracted more than 80 people. The picnic became all the merrier after a torrential storm drove us indoors. Once crowded into the common room, Dr. Cas Lindsey, a professor in Zoology, produced an harmonica and led a rousing sing-song.

Though it had been in use for some months, I felt that an official opening for the recently-built lab building was called for. Thus, on August 14, a group of us gathered in front of the building. I made a few remarks (*Figure 28*) before Dr.

Hugh Saunderson officially opened the lab. (*Figure 29*) He seemed a little surprised at its small size, but congratulated us on our efforts. Well-wishers from the university and Provincial Government who attended the opening ceremony and luncheon, also viewed displays put on by our researchers.³⁹ Two weeks later we hosted an even larger social event, a barbecue supper for 128 participants who were attending the International Corogonid Conference of fish biologists in Winnipeg.

At the October UFS(DM) committee meeting, I presented a

report and asked the committee to answer a number of policy questions:⁴⁰ "What should the ratio of space allocation be between research and teaching? What should be the appropriate teaching class size? Should



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Figure 27. Students sampling vegetation in the Borrow Pit adjacent to the Portage Diversion, summer 1969.



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Unfortunately, owing to illness and the reorganization of the Division of Biology, Dr. Lees' report, promised for September, had not been produced. Nevertheless, both Dr. Duckworth and Mr. Mair indicated that, so far, the development of the Field Station had far outstripped their expectations.

As the demands upon me as director of a rapidly-growing Field Station increased, I became convinced that running it was much more than a sideline and deserved to be part of my job. At the time, I had a full time position in Botany and found it difficult to deal with the demands

Figure 28. Dr. Jennifer Walker (Shay) addressing the audience at the opening of the East and West labs, August 14, 1969.

we adopt the class size of a maximum of 12, as recommended by the Organization of Inland Biological Field Stations? Should individual or group research projects be given priority?" We needed answers to such questions before we could plan laboratory space and the number of support staff required.

During the meeting, I suggested that serious consideration should be given to the university owning some or all, of the land we leased, so as to insure continuity for any long-range projects. I informed the committee that the PCC had recently requested a small parcel of land on the Bain estate for their exclusive use. Mr. Mair told us that any decision about this parcel would have to involve the government because the land belonged to the Crown.

On the subject of staffing, I argued that the Field Station needed a full time administrator, plus a part-time secretary. We were receiving a growing number of requests to provide non-credit courses of varying lengths, for Girl Guides, Boy Scouts, naturalists and other groups. Dr. Hochbaum asked whether any faculty researchers assisted in administration. I replied that only Dr. Wright, the resident PDF helped with meeting and greeting visitors, and with the schools program and similar tasks.

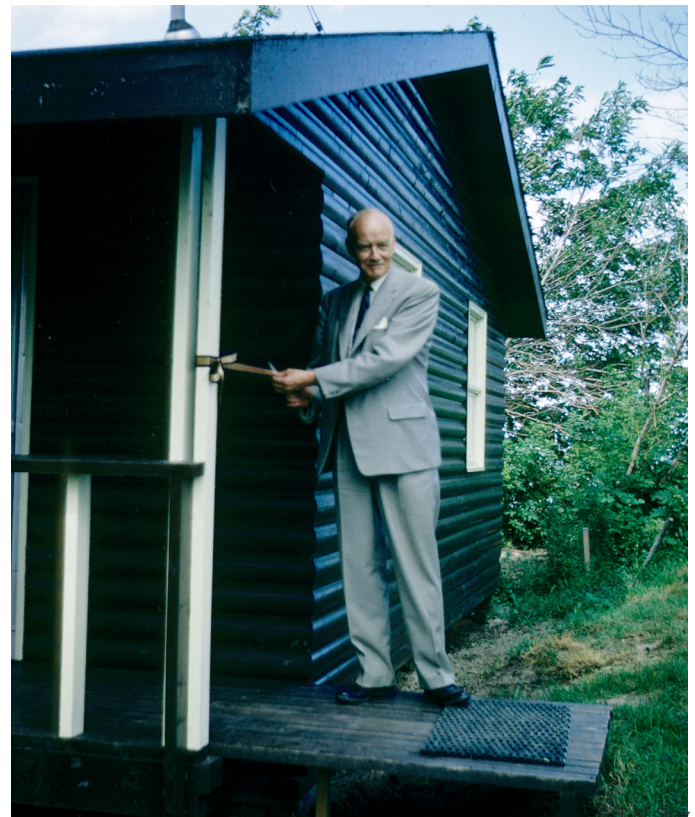


Figure 29. University President Dr. Hugh Saunderson cutting the ribbon for the opening of the East and West labs, August 14, 1969.

of my department as well as those of the station. To cope effectively with the needs of researchers as well as day-to-day tasks such as arranging for wholesale groceries and room assignments, I desperately needed a staff member on site. Unfortunately, it was months before we were able to hire someone.

Not only ours but several other field stations had emerged within the previous few years at the University of Manitoba. In October, the Research Board began to compile information about the six university stations: (1) the Department of Earth Sciences Star Lake Station in the Whiteshell Provincial Park (Dr. Wilson), (2) the Glenlea Research Station for Agriculture (Dr. Truscott), (3) The Pas for Fisheries Biology (Dr. Lindsey), (4) Wilson Creek for Hydrology (Dr. Newbury), (5) West Blue Lake for Limnology (Dr. Ward) and (6) ourselves.⁴¹ All the other facilities were used primarily for research. At Delta we also engaged in teaching and outreach.

At the end of the field season, I circulated a questionnaire to all Field Station users to get their opinions about the acceptable ratio between teaching and research, the use of space and related matters.⁴² Results of this questionnaire proved useful in subsequent discussions.

The November Seminar again attracted an audience of more than 80 people. It was acknowledged as being both a good learning experience for the

presenters and welcome publicity for the station. The Manitoba students who had worked with waterfowl at the DWRS also presented their findings.

We summarized activities at the Field Station in the first bound version of our Annual Report with a cover designed by Colleen Nelson.⁴³ After much discussion, the report was labeled “Number 4” as it contained information from the fourth season of activity. We distributed it to university administrators and users and sent copies to all major field stations across Canada.

By the end of 1969, eleven papers had been published under the Field Station banner, and two students had completed their MSc degrees.

1970

By early spring, massive snowdrifts had collected around the Field Station buildings (*Figures 30, 31, 32*) In fact, a deep blanket of snow had covered all of southern Manitoba. When the snow melted in the spring, rivers and streams, including the Assiniboine River, quickly became filled to overflowing. Consequently, engineers opened the Portage Diversion for the first time. (*Figure 33*) Unfortunately, when the diversion began flowing, the lake was still frozen so the floodwaters flushed an enormous amount of debris onto the ice and spread it along the southern shores of Lake Manitoba. (*Figure 34*)

During the winter, thanks to the efforts of the Provincial Government, we moved two PMQ housing units from the nearby Macdonald airfield, to the ridge west of Murray’s cottage where sites had been cleared and foundations prepared. (*Figure 35*) Once installed, we immediately began to renovate the western PMQ. Using as much of the existing layout as possible, each end was modified into a “motel” unit with a kitchen/living room, bedroom and bathroom. The center was converted into three bedrooms with bunk



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Figure 30. East and West Labs in the snow, winter of 1969-70.



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Figure 31. Snow drifts covering the barn on right and Murray's Cottage in the background, late winter, 1969-70.

beds for ten people plus showers and toilets. I made curtains for the clothes closets and windows.

Because we lacked funds to modify the second building, we decided to use it as a laboratory. We set up tables and stools, gleaned from a campus warehouse to be ready for such courses as Introductory Ecology's pre-term sessions, by Plant Ecology in September and Environmental Studies in October. In addition, several Environmental Studies faculty brought 75 students to Delta to investigate plant adaptations to the beach ridge and marsh environment.

At a meeting in March, Dr. Doan (Director of Research, Dept. Mines, Resources and Environmental Manage-

ment) suggested to Dr. Welch that a Wildlife Research Unit should be set up at the university, similar to the Aquatic Biology Research Unit, to provide grants for research that had relevance to provincial and federal wildlife departments. He thought that grants to the Field Station might be covered by the same arrangement.⁴⁴ It concerned me that an increase the number of applicants for government funds might dilute the chances of obtaining grants for our research projects.

Because of increased activity at the Station, and more pressure on my time, Dr. Connor, Dean of Science, at last secured

funds from the senior administration to provide us with some practical and administrative assistance. In May, Mr. David Venema was appointed for six



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Figure 32. Murray's Cottage surrounded by snow drifts, late winter, 1969-70



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Figure 33. The Portage Diversion in action for the first time. Water flowing over the Diversion outlet sill into Lake Manitoba, spring 1970.

months as my Assistant. David undertook innumerable tasks ranging from ordering day-to-day necessities, to renovating buildings. In October, we also employed a secretary who would be based on campus, but might spend some time at the Station.⁴⁵

During the summer, whenever strong winds blew from the north, hefty waves undercut the base of the sandy ridge in front of the lodge, rendering the building perilously ever-closer to the water's edge. Stabilization of lake levels had only aggravated this erosion problem. In order to retard the erosion, we planned to set up a palisade of telegraph poles at the lake edge of the ridge. The palisade would be placed in front of the World War II Bren gun carriages that Mr. Bain had buried on the lake shore many

years earlier. (Figure 36) We duly purchased telegraph poles from 4 km (3 miles) of disused line, hauled them to the station, and cut them in half. A rented backhoe dug a deep trench in the sand. We wired the telegraph poles together with cable, and installed them in the trench before back-filling it. (Figure 37) This was a group effort and, when completed we proudly surveyed our construction!

Fourteen research projects took place, a number of them continued from the previous year (Appendix Table 1).⁴⁶ Projects encompassed a wide range of topics: al-



J. M. Shay

Figure 34. Debris brought by the Diversion and spread across the ice covering a frozen Lake Manitoba, spring 1970.



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Figure 35. Newly-arrived Permanent Married Quarters (PMQs) from the Macdonald Air Base in the early spring, 1970

kitchen and dining facilities. Half the common room was already taken up with dining tables.

To enable people to work safely on the lake, we were finally able to purchase a fiberglass fishing yawl which we christened *Notropis* after a common minnow genus found in the marsh. We also established permanent plots in the Borrow pit adjacent to the Portage Diversion and elsewhere in the marsh for long term vegetation monitoring.⁴⁷

The number of visitors from other institutions continued to increase. I am not sure how they heard about us but they came from

benthic lake fauna. Dr. Steven Rothstein from Yale University, spent six weeks studying nest parasitism in birds. He considered the beach ridge an excellent site for his research. Funded by the province, Dr. Emil Kucera took up residence as a PDF for two years beginning in April, to study white-tailed deer in the marsh. To enable him to observe the deer, Emil wanted to use a horse so he could move freely through roadless areas. He brought a horse to the station and built a corral and shelter for it on the ridge next to Cottage #2 where he lived with his family.

I felt that if the numbers using the Field Station continued to increase, we would be obliged to augment the

every province, the NWT, eighteen states and thirteen universities. In May, delegates to the Canadian Audu-



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Figure 36. World War II surplus Bren Gun carriers placed by Mr. Bain along the lake shore in front of Mallard Lodge to reduce erosion.



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Figure 37. Palisade of telegraph poles being installed in a trench along the lake shore in front of Mallard Lodge to provide protection from wave action, summer, 1970.

bon Society meeting had lunch with us following their lengthy deliberations during which the society changed its name to the Canadian Nature Federation. Other visitors included 70 Girl Guides from across Canada and more than 100 delegates to the Midwest Fish and Game Commissioners meeting. The Midwest Wildlife Conference braved December's ice and snow to visit the station. Whenever possible, we gave our visitors a short talk about research projects followed by a tour of the facilities.

The Summer seminars and November seminar continued, and for the second time we participated in the Organization of Inland Biological Field Station's Foreign Visitors Program. The distinguished phycologist Dr. Frank Round from Bristol University, UK, spent three days with us in August. He presented three seminars and gave generously of his time to researchers. It was stimulating to have such an experienced field biologist among us. For this event, we provided accommodation for people from the Whiteshell Nuclear Research Establishment at Pinawa, the Fisheries Research Board and the University of Winnipeg. At times, there wasn't an empty bed in the place.

the summer at the Station in Cottage #1 but took my meals in the dining room with the students.

Because I was so busy, I requested a reduction in my teaching load. Unfortunately, because my department head and the Dean felt that I seemed to be coping, this did not happen.

In December, we said good-bye to John Wright who returned to the UK. We knew that we would miss his perennial good humor, helpfulness and interest in all the activities at the Field Station. Regrettably, because of lack of funds, he was not replaced. We also bade farewell to Dr. Hochbaum who retired as Director of the Waterfowl Station.

1971

Mr. Venema left in March, before the season started. I thought that I had made a convincing case for a replacement, but the university did not fill his position because of budget constraints.

The carp fishing operation continued to cause us problems. We frequently found fish heads and guts scattered in parts of the marsh, an unpleasant nuisance. Because of this, the local Conservation Officer had recommended to Mr. Smith, the Regional

At the Field Station meeting in September there were a number of items on the agenda including a crossing over the Diversion, trespassing by the public, budgets for various projects and staffing needs. Proposals to winterize Cottage #1 and Cottage #2 were presented in addition to a cost estimate of \$2,000 for digging a well.⁴⁸

Even with staff help, my time was fully occupied and I became somewhat weary of this heavy schedule. During the academic year from September until April, I had a full teaching load. With classes every day, I worked on campus during the week and drove out to the Field Station on Friday nights. I spent

Wildlife Director, that no licenses should be granted for fishing in 1971. But in the spring, licenses were in fact granted, apparently in response to pressure from the Manitoba Indian Brotherhood. At that time and without our knowledge, the fish shack that had been installed in 1968 was moved to a site south of the Blind Channel. The fishermen cut willows from the ridge to fill a ditch to allow their Bombardier access. They left unsightly garbage where the brush was cut. I explained to the fishermen, with whom I felt I had a good relationship, that we would like to have been informed of their plans. They said they had been granted permission by Mr. Smith. When I inquired about this, there was confusion as to who, if anyone, had actually given them permission.

The situation was of sufficient concern that, on May 10, I summarized the carp fishing problems in a memo sent to the Associate Dean of Science, Dr. Isaac.⁴⁹ I also wrote to Mr. Smith requesting that matters relating to our leased land be discussed with us before any decisions were made, especially in relation to fishing.⁵⁰ I explained that sites throughout the marsh were being used for short- and long-term research and should not be subjected to interference. In principle, we were not averse to the land being used for other purposes, especially by local people, if their activities did not conflict with our research. I believed that it would create considerable antagonism if the fishermen were asked to leave in the middle of their current fishing season. Therefore they were allowed to fish.

Apart from carp fishing, questions about the Wildlife Refuge status of the property again came to the fore. After the Bain estate passed to the government, the land was designated as a Wildlife Refuge and this was the case when the university began negotiations to lease the property. Owing to a misunderstanding, probably due to a letter from Dr. Levin, the Wildlife Branch apparently thought that the university wished

the Wildlife Refuge status removed, so that the deer population could be controlled. As a result, the area had become a Game Bird Refuge. I had requested that the property revert to full Wildlife Refuge status several times and indeed, we thought that this had occurred. Unfortunately, the Order in Council that was formulated, prohibited deer hunting but did not grant Wildlife Refuge status. Nevertheless, the Chief of Game and Fur Management thought it desirable that Wildlife Refuge status be reinstated. However, Mr. Smith felt that the antagonism towards the University Field Station by some local people was due to their being denied access to the Bain estate. I pointed out that, throughout Mr. Bain's lifetime, his estate was heavily protected, and had never been open to the public. After obtaining our solicitor's opinion I again approached the government who reaffirmed their intention to afford the property Wildlife Refuge status, once the final settlement of the PCC and Field Station boundaries had occurred. I made it clear that it was necessary to ensure that small mammals could be trapped for research purposes.

As if carp fishing and refuge status were not enough, our beach erosion problems persisted. Summer storms on Lake Manitoba continued to lash the beach ridge and in places caused substantial erosion. Sadly, after one severe storm, we awoke to find our



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Figure 38. The bank adjacent to Mallard Lodge after strong winds from the north had caused considerable erosion, summer, 1971. Note the remains of the palisade on the beach.

palisade of telegraph poles strewn like match sticks along the beach. (Figure 38) This left Mallard Lodge again perilously close to the water's edge. In view of the failure of our palisade, we sought professional advice from several hydrological engineers. Although their opinions varied, the general consensus was that the best solution would be to place large blocks of rock ("rip-rap") at the edge of the beach ridge. Thanks to an immediate response from Dr. Connor, truckloads of rock from quarries at Stonewall north of Winnipeg, were hauled in. Initially, they were placed in front of Mallard Lodge but eventually, a line of rip-rap stretched from our boundary with the Portage Country Club on the west, to the east side of the two cottages. (Figure 39)

Now that our erosion concerns had diminished, we turned our attention to meeting the ever-increasing demand for teaching space. This involved altering the central part of the second PMQ which became converted into two teaching labs with minimal alteration. The interiors of both were painted just in time for the Summer Session courses. The exteriors and roofs of both PM's were laboriously painted by summer assistants.

As additional buildings were installed, we had the agreeable task of naming them. Some years earlier, the University Field Station committee had recommended that all buildings on the site (except Mallard Lodge

and Murray's Cottage) should be named after prominent naturalists. Thus, the two former PMQ buildings were christened "Criddle," for Norman Criddle, an early Dominion Entomologist, and "Agassiz," after the 19th century geologist Louis Agassiz whose name was given to the gigantic glacial lake that covered much of Manitoba at the end of the Ice Age. The first of two motel units within Criddle was named "Seton" after Ernest Thompson Seton, popular author of animal stories as well as scientific treatises on the birds, mammals, fish, snakes and turtles of Manitoba. For a time, Seton served as official naturalist for the Government of Manitoba. We named the second motel unit "Macoun," in honor of John Macoun, the famous Dominion naturalist and author of a detailed description of the geology, climate and plant life in "Manitoba and the Great Northwest," published in 1883.⁵¹

Research and teaching use continued to grow, and by now, we were feeling more confident about our funding. We had support from the Department of Mines, Resources and Environmental Management who were willing to provide \$25,000 for projects selected from their "shopping list." Some funds came to individuals from the National Research Council, Ducks Unlimited (Canada) and Canadian Industries Ltd. as well as the university. Two summer assistants were supported by the Federal government's Opportunities for Youth program.

Nine research projects took place (Appendix Table 1). These included a study of the parasites of frogs and toads, a preliminary study of biochemical genetic variation in small mammals, food habits and winter habitat of white-tailed deer (Figure 40), mercury levels in the Diversion and southern end of Lake Manitoba, the fungal flora of Delta Marsh, a survey of vegetation along the southern shore of Lake Manitoba, effects of prescribed burning on *Phragmites*, net radiation and evapotranspiration in *Phragmites*, and the



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Figure 39. Rip-rap to be spread along the lake shore in front of Mallard Lodge, summer, 1971.



Delta Marsh Field Station

Figure 40. Dr. Emil and Iven Kucera tagging deer, Winter 1972.

ecology of bulrush (*Schoenoplectus*) species.⁵² (Figure 41)

The summer and November seminars continued to be popular. We offered two courses in the university's Summer Session: Introductory Ecology and Animal Ecology (Appendix Table 2). (Figure 42) Both were fully booked with fifteen students in each. Several other courses spent short periods at the Field Station- Chordate Zoology, Plant Ecology and pre-term Introductory Ecology whose enrollment had tripled to 98, necessitating four three-day sessions.

I once again proposed to the heads of Botany and Zoology that the number and variety of courses offered at the Station should be increased. Some courses such as Marsh Ecology seem ideally suited to being taught at the Field Station. In addition to the marsh, there are bogs and dozens of potholes nearby. I wondered why we couldn't offer such specialized courses at the Station.

The large enrollments in fall courses convinced us that our kitchen facilities must be expanded. To expect cooks to produce meals for up to fifty hungry students in a family-sized kitchen was unreasonable. Consequently, we drew up plans to convert Murray's Cottage into a dining center and adequate kitchen. We also hoped to acquire another PMQ to augment our sleeping accommodation, and to replace the bedrooms that would be lost when Murray's cottage was converted.

We again had a number of visitors. In March, 25 members of the Manitoba Naturalists Society spent a weekend studying winter ecology. (Figure 43) Dr. Gordon Robinson organized a barbecue for the more than 200 participants at the International Limnological Congress, and in August, we held an Open House for the Mayor and Council of Portage la Prairie as well as aldermen from the neighboring rural municipalities. Displays and talks on current projects stimulated much discussion. The fifth annual seminar attracted a diversified

audience and elicited a number of complimentary comments. Indeed, its value seems to grow each year for both participants and the audience.



J. M. Shay

Figure 41. Ph.D. student Sandy Macaulay (1945–2003) washing bulrush rhizomes in Lake Manitoba, 1971.



J. M. Shay

Figure 42. Students returning from a fishing project in Lake Manitoba, summer, 1971.

We welcomed Dr. Robert Jones, the new Director of the Delta Waterfowl Research Station.

No one could deny that we faced problems in launching the Field Station. Some problems kept recurring and demanded much attention, such as carp fishing and our efforts to secure Wildlife Refuge status for the property. I strongly believed that if we were to successfully carry out research, we must control the land we leased and restrict public access and the activities of carp fishermen.

In spite of these difficulties, the overwhelming feeling among us was that of progress, with a steady increase in research and teaching. Thanks to cooperation and support from the university and the Department of Mines and Natural Resources, our living accommodation and labs had greatly expanded. We had a collegial relationship with the Waterfowl Station,

and tremendous support from the Field Station committee and several of our university colleagues. And, we had dispelled the suggestion of some nay-sayers that we would not survive for five years!

1972

Early in the year, enormous snow drifts again accumulated around the Field Station. (*Figure 44*) Indeed, one could step straight onto Murray's cottage roof from the surrounding drift. To cope with the difficulty of wading through the massive drifts, the

always-ingenious Nan Mulder had constructed a covered passage that linked the west end of the barn with Murray's cottage porch. People could now walk from one to the other without going outside. Snow drifts frequently made road access to the Station very



J. M. Shay

Figure 43. Manitoba Naturalist's Society members snowshoeing on winter ecology weekend at the Field Station, February, 1970.

difficult and we often had to seek help from our farmer neighbors in order to reach Highway 227, the Oakland road.

I was on sabbatical leave for the academic year 1972-73 and handed over the running of the Station to my good friend Dr. Jack Gee in July. Nevertheless, the first six months of the year were eventful. During this time, I raised concerns about the long-term future of the marsh and the station became more financially secure. Even though we continued to have difficulties with public access and the activities of carp fishermen, thankfully our research and facilities continued to expand.

First, the future of Delta Marsh. The slow deterioration of the marsh was an ongoing concern of mine. In January, I gave a talk at the University of Winnipeg to the Manitoba Geographical Society on the "Rise and Fall of the Delta Marsh." In the talk, I explained that, in the long term, stabilization of water levels in Lake Manitoba would most likely result in the deterioration of the marsh. This was because marsh vigor is usually maintained by periodic episodes of high and low water levels. These highs and lows had been virtually eliminated by the Provincial Government's construction of the Fairford Dam in 1961. The dam had enabled water levels in Lake Manitoba to be regulated between 247.19 and 247.8 m (811 and 813 ft) above sea level. This is a range of only 0.6 m (2 ft), whereas the traditional range had been 1.5 m (5 ft.). The natural cycle of flooding followed by draw-down and re-colonization had thus disappeared. The government had argued that the dam would not affect the marsh but I strongly disagreed. I contented that this great natural resource would not survive in the long term under such a rigid regulation regime. My talk generated several comments in the *Winnipeg Free Press* but unfortunately a number of inaccurate quotes.^{53,54,55} I also talked to various organizations such as the University Women's Club in Portage la Prairie about the consequences of lake regulation. Sadly, the



J. M. Shay

Figure 44. Snow-drifts along beach ridge, winter of 1971-72.

controversy surrounding lake regulation died down after a few weeks.

In a similar vein, with permission from the university I presented a brief to the Manitoba Water Commission the following month.⁵⁶ The government had proposed to regulate Lake Winnipeg and also to divert the Churchill River in northern Manitoba for hydroelectric power. My main concerns about these proposals were the absence of any evaluation of their costs and benefits and the lack of studies of their effects on local communities, fisheries, forestry, wildlife and recreation. The implications of lake regulation for the ecology and management of natural resources was to preoccupy me over the ensuing years.

Apart from my concerns about the marsh, there were important matters regarding the Field Station's administration, finances, accommodation and research to deal with. On March 1, 1972, Associate Dean Isaac convened a meeting⁵⁷ of Dean Connor, Drs. Waygood, Lindsey (Zoology), Jones (DWRS), Van Zyll de Jong (Dept. Mines, Resources and Environmental Management) and myself. Dr. Isaac explained that, owing to protracted changes in the university's Division of Biology, the UFS(DM) committee had not met since September, 1970. In the interim, I had reported to a Division of Biology committee formed of the Heads of Botany, Microbiology and Zoology and the Director of the Biology Teaching Unit. But now a somewhat

different committee was being proposed. The new committee would have a membership similar to the old committee, except that the Deputy Minister of Mines, Resources and Environmental Management had asked to be replaced by his Department's Directors of Research, Dr. K. Doan, and Planning, Mr. A. Barr. Dr. Isaac then announced that the Field Station had now been constituted as a department with its own budget and the university was to assume the cost of maintenance of its basic facilities. This decision was a long time in coming as I had repeatedly urged that the Field Station be considered an extension of the campus. It meant that our maintenance and heating costs would now be covered by the university. Heating costs consumed a large part of our meager budget.

It was next decided that the Field Station should strive to develop sleeping accommodation for the same number of people that could be provided with meals. Considering the plan to convert Murray's Cottage from bedrooms, a classroom and a bathroom into a kitchen/dining facility that could feed up to 50 people necessitated that we provide more bedrooms elsewhere. We urgently needed such accommodation but how to get it? Another PMQ was thought to be the only practical solution.

With the need to accommodate more people, concern was raised about the adequacy of our water supply. Would pumping water from the lake in the summer, from under the ice in winter, and bringing drinking water from Portage la Prairie be adequate for the number of people now suggested as users of the Station? Despite these issues, I emphasized the importance of operating the station year-round and the committee acknowledged that graduate students were already living there throughout the winter.

Research funding was another topic discussed. Dr. Van Zyll de Jong told us that the Provincial Government would again compile a "shopping list" of research projects and provide the university with research grants to a maximum of \$25,000, although funding was not guaranteed for submitted projects. Dr. Doan, who was to evaluate the research projects, had requested a breakdown of research at the Field Station. It was decided that a UFS sub-committee, chaired by the Director should review research proposals before they were forwarded to Dr. Doan.

Concern was once more expressed about the vulnerability of station buildings that were close to the lake. It was agreed that adequate protection for the waterfront should be thoroughly investigated. Later discussions with engineers resulted in a considerable

quantity of additional rip-rap being placed at the edge of the ridge, and along the shore.

Another important topic discussed dealt with our land tenure. I still believed that we should have control over the land we leased from the Provincial Government and had discussed this again with the university solicitor.

For example, we were still concerned about public access to our land. The Delta Beach Association had requested permission to install direction signs to the Diversion on the beach road. (*Figure 8*) I had written to them urging that this not be done, because it would lead to more unwanted visitors and might well affect our research program. I reminded them that the beach road was our private road from the gate at our eastern boundary to the Diversion.

At the meeting, I also mentioned that we had ongoing problems with carp fishermen. I felt that we needed to know where and when they were operating. The committee suggested that I met with Mr. Smith of the Operations Division of the Department of Mines, Resources and Environmental Management, with whom I had previously had several conversations on this topic. This I did the following week and reported to Dr. Isaac that I was somewhat shocked to learn that the government felt that carp fishing must be allowed. Indeed, the government would like to secure 0.4-0.8 hectares (1-2 acres) of our property and move in a 12.2 x 4.3 m (40 x 14 ft) metal building for a permanent fishing station.⁵⁸ The building would have a concrete floor, running water and drains, and an ice house would also be built. The government would maintain the buildings, roads and site and be responsible for sanitary and health aspects. They would also determine fishing seasons and license specific fishermen. I felt that such a development would result in much more activity on the land we leased and would be difficult to control.

I later discussed with Mr. Smith my concerns regarding the precedent this would establish, particularly in relation to our reluctance to grant hunting and trapping privileges to anyone. I tried to make it clear that we were not against these activities in principle but considered it essential to maintain the UFS(DM) property for ecological research. I also thought that such matters should be worked out in conjunction with DWRS and with great care.⁵⁹ A month later, having discussed the matter with members of the UFS(DM) committee and despite their dismay, we reluctantly agreed that, for the current 1972 season, 0.4-0.8 hectares (1-2 acres) could be used by fishermen in the manner Mr. Smith had described, but that we

believed that such matters were part of overall marsh management and should be the purview of the Delta Marsh Management Committee. I also informed Mr. Mair the Deputy Minister of our views.⁶⁰

In spite of the carp fishing problem, research at the station continued apace. By early April, we had received eleven research proposals to submit to Dr. Doan. Not surprisingly, the sum requested greatly exceeded the potential \$25,000 from the Province. Hence, the research sub-committee met with all the researchers and deleted substantial amounts from most of their budgets. In view of the impending field season, we recommended that, in future, budget decisions should be made in December to enable faculty members to secure suitable students, assistants and funds to augment their government grants long before the summer research season began. We then decided to devise an application form to be sent to all Division of Biology faculty. Applications were to be completed by mid-November.

The availability of Provincial Government funding emphasized the need for some guidelines and policy decisions for our budget sub-committee to consider. We discussed such questions as: Should any research project have total support from government funds? Should management-type projects, which would find it difficult to secure funds from granting councils, be given priority? What should be done about lab rental charges? The present resident researcher fee of \$100 per month, which was in keeping with that charged by most field stations, was considered by some to be a deterrent. We needed to decide how much the UFS should charge for lab use.

Irrespective of lab fees, I believed that we should devise a five-year research plan with priorities as to organisms and topics. For example, we should decide whether we would rank a carp study before a study of toads, or an *Enteromorpha* algal study. But someone argued that any research plan should be coupled with a program for providing adequate labs and accommodation.

In spite of these challenging questions of planning for the next five years, it seemed clear that we now had a viable facility at Delta to support a wide range of research projects and educational endeavors.⁶¹ For my own research, I was thankful that I had applied for and received funding from the Manitoba Environmental Research Committee for two students to study infilling of the marsh.

On the administrative side, the station was at last destined to receive some help. In the spring, we were delighted to be allocated a budget for an Adminis-

trative Assistant, later called an Executive Assistant. From the 28 applicants, we selected Mr. Barry Wallis who joined us on June 15. Barry was to divide his time between the campus and the Field Station. His appointment was a great relief because there was always a lot to do. Barry's contribution grew to become invaluable. We also changed Nan Mulder's title from that of Caretaker to that of Manager, but without a change in his duties or pay packet!

In May, we moved another PMQ to the station, to be named Tyrrell, after Joseph B. Tyrrell, an early Dominion geologist. The building was to be sited south of Criddle. At the same time, Murray's Cottage began its transformation. Plans drawn up by an architect for the renovation were very expensive and Nan Mulder suggested an alternative. Nan's plan was simpler and was the one we pursued. The three bedrooms became a well-equipped kitchen complete with a commercial dish washer, refrigerators, freezers and a large storage room. The classroom became a dining room, and the original toilet was transformed into a shower room, so that swimmers could remove sand before entering the dining room. In the next few weeks, I spent quite a lot of time visiting kitchen suppliers in order to select suitable equipment.

Sonny Mowbray, a PhD student, who the previous year began his study of the effects of fire on reed-dominated communities, and who, with his wife, lived at the Station, was given the title of Senior Demonstrator when he undertook a number of duties.⁶² These included keeping an up-to-date inventory of all equipment, its whereabouts and the supplies for its effective functioning such as charts, batteries, and electrodes. He also prepared labs for courses, and was responsible for their cleanliness. Sonny also organized film evenings during the summer, maintained boats and canoes, showed visitors around, took weather records at the weekends and assisted in fall and winter courses. Hopefully, before long we would have a position for a resident biologist to undertake these and other responsibilities.

Also in May, we said good-bye to PDF Emil Kucera who had completed his study of the population ecology of white-tailed deer. His research had been funded by the Department of Mines, Resources and Environmental Management, but sadly, further funding for another researcher was not forthcoming.

However, Dr. Len Mottus, a Post Doctoral Fellow in Zoology, joined us in June to study mammals in the marsh. To enable him to observe deer movements, we built a tower with help from the Province, near the junction of the south marsh road and the Blind

Channel. Len had only just begun his project when, in October he resigned to take up a position in Vancouver. We subsequently dubbed the tower "Mottus' monument."

Six research projects occurred (*Appendix Table 1*). The four that continued from last year were joined by two new projects: biology of the leopard frog, and the dynamics of plant-snail associations.

In the fall, Dr. Jane Evans became a post-doctoral fellow, this time in Botany. Jane was funded from a variety of sources. She was to undertake both demonstrating and some research. I suggested that she might be interested in compiling a vegetation map of the Delta Marsh using air photographs, remote sensing and ground truthing. This appealed to her and it proved to be a popular project with the Province, who were very helpful with advice and equipment.

Facilities were gradually improving. That fall, we completed renovation of Murray's Cottage and drew up an extensive list of proposed renovations for 1973-74.⁶³ These included winterizing Cottages #1 and #2 by installing frost-free water lines from the cistern in Mallard Lodge, insulating their roof spaces and building porches on their north entrances. Furthermore, we hoped to re-putty all the windows in Mallard Lodge, repair its storm windows and screens, and convert the windows above the North and South porches into casement-types with associated fixed ladders so they could be used as fire escapes. We planned to paint the

barn and Bell house, install an air conditioner in Murray's cottage and build a porch at its east entrance. We also hoped to build porches at the north entrances to Agassiz, build a boat ramp for the yawl *Notropis* and install gates and signs at the entrances to our land, to control access.

The winter water supply continued to be a major consideration because we often had problems pumping water over the ice. After pumping, we had to drain the hoses quickly before any water in them froze. The whole process consumed much of Nan Mulder's time, particularly the chore of back-washing the water filters after every pumping session.

Our university teaching expanded, especially in the fall. Two courses occurred in the Summer Session: Introductory Ecology with nine students and Animal Ecology with seven students. (*Appendix Table 2, Figure 45*) This year a total of 99 students enrolled in the field portion of the fall Introductory Ecology course. To cope with such a large number, four sessions were held involving three faculty and five demonstrators.⁶⁴ I once again requested that the heads of Botany and Zoology consider allowing the Field Station to have its own course number for specialized courses offered at the Station.

The sixth Annual Seminar held in November attracted a large audience. Members of the Provincial and Federal Government staff, the DWRS and several university departments attended.

Soon after this, the University Field Station committee met in a lengthy session. The committee dealt with meal charges, weekend courses, High School visits, use of the Station, the carp fishing situation, public access and our status as a Wildlife Refuge and finally, unauthorized trapping on our property.⁶⁵

An increase in casual meal charges was proposed. The new prices to be: breakfast \$1, lunch \$2, and dinner \$2. The daily charge for both meals and accommodation for students and staff of the University of Manitoba



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Figure 45. Students on a canoe trip through the marsh, 1972.

was to increase from \$3 to \$4. All other users were to pay \$10 per day. These charges were comparable to those at the Waterfowl Station.

In the realm of public education, we designed a series of weekend courses and held a pilot weekend in May entitled "Bird Populations." The course attracted twenty enthusiastic participants. With this encouragement, we planned, together with the Extension Division, an ambitious program of weekend courses for the following year entitled the "Marshland Series." The series had a potential enrollment of twenty persons per weekend.

The station also continued to receive a number of inquiries from high schools wanting to arrange a visit. Some committee members were uncertain about such visits as they could disrupt research if not carefully managed. A difference of opinion developed among the Provincial representatives. On the one hand, Dr. Doan felt the emphasis at the Field Station should be on research, but on the other hand, Mr. Barr was convinced that high schools and many younger children could benefit from our programs. After much discussion, we agreed that a university student should be hired for late May and June to provide a series of field exercises for schools dealing with sampling and plant and animal identification. This individual could later be a demonstrator for Summer School courses. We were advised to approach the Opportunities for Youth program, the Department of Education, the Wildlife Branch of the Department of Mines, Resources and Environmental Management and the university for help in funding this position.⁶⁶

The committee discussed various uses of the Field Station and drew up a list of priorities. Heading the list was teaching and research by members of the University of Manitoba, next were courses offered by the university Extension Division, then teaching and research by other universities, and finally outside group use (conferences, retreats and seminars with an ecological focus).

The committee also discussed four perennial "problems:" (1) carp fishing, (2) public access to the west side of the diversion, (3) Wildlife Refuge status coupled with the parcel of land requested by the Portage Country Club and finally, (4) unauthorized trapping on our property.

Barry Wallis had summarized the carp fishing "saga" for discussion at the meeting. He ended with plea for action.^{67,68} Barry's summary had been sent to Dr. Doan who had forwarded it the Deputy Minister but as yet there was no decision about any government action.

A second persistent problem was the unauthorized public use of the road on the west side of the Portage Diversion. The area around the diversion outlet had become an increasingly popular weekend rendezvous for picnickers and those simply out for a drive. Mr. Barr told us that we had the right to restrict access to the land we leased, but he recommended that any restriction of access, such as installing locked gates should be a gradual process accompanied by explanatory signs.

Thirdly, it also transpired that the restoration of Wildlife Refuge status to the UFS property apparently still depended upon completion of a land settlement with the PCC.⁶⁹ We had previously discussed the access to the PCC with the government and the proposed changes to our status as a Game Bird Refuge.

In an October letter to Dr. Robert Nero, Chairman of the Delta Marsh Management Committee, Jack Gee and Barry Wallis had made it clear that we did not want a public shooting ground to be created between our land and the PCC property.⁷⁰ Dr. Gee urged that decisions about our status be concluded as soon as possible so that research projects could be realistically planned.

The forth and last issue discussed dealt with trapping. For the past two years the trapping of mink, fox and raccoon on our property by local people had increased.⁷¹ We had reported this to the Conservation Officer and explained that we wished to have trapping stopped because it affected our research projects and disturbed the ecological balance. We were told that when some local people heard about our opposition to trapping, there was deep anger, and some had even threatened to burn the Field Station down! Eventually, however, tempers cooled.

Barry Wallis had earlier attempted to summarize our policies and plans for the next five years in a position paper.⁷² He also prepared a summary of problems with our water supply, and outlined the present and proposed fire-fighting equipment situation.^{73,74}

Despite such vexing issues as carp fishing, public trespass, designation of our land and trapping, our programs continued. Environment Canada held a three day workshop at the station on "Alternative Lifestyles" in October and our first Extension weekend, Dr. Rick Riewe's "Adaptations of Mammals to Winter" was held in December. Encouragingly, it was over-booked.⁶⁴

During my sabbatical leave in England, Barry Wallis and my graduate students kept me in close touch with all the activities at the Field Station. By the end

of the year, research at the Field Station had resulted in ten theses and 18 two-refereed publications.⁶³

1973

Our education programs continued to expand. For example, the Marshland Series of weekend courses planned the previous year proved popular. Miss Judy Hay, of the Extension Division of the University of Manitoba expertly organized the series. The second weekend, entitled, "Human Survival in Winter" was held in February. (Figures 46, 47) "Spring Waterfowl Migration" followed in April, "Wildlife Photography" in May and "Marsh Ecology" in September.⁷⁵ The interest and enthusiasm of the participants was encouraging and attested to the value of such courses. We found however, that summers were not a good time to offer weekend courses as we had to cancel the summer offerings due to a lack of registrants.

Eleven summer research projects investigated some aspect of the structure and function of marsh plant and animal communities (Appendix Table 1).⁷⁵ Dr. Jane Evans began to compile the field data for a

vegetation map of the Delta Marsh. She used the most recent color aerial photography taken in August, 1972, coupled with ground truthing, as a basis for mapping the various marsh plant communities. It was most interesting to see the changes in plant cover that had taken place since 1958 when I first became familiar with the marsh. Vegetation had expanded almost everywhere, encroaching into shallow water and all the sloughs on the south side of the marsh had become completely overgrown, indicating a dramatic decline in open water. Other botanical studies included the ecology and management of goosefoot (*Chenopodium rubrum*), the effects of prescribed burning on reeds, primary productivity of epiphytic algae on aquatic macrophytes, the impact of pesticides on plankton in the marsh and lake, and plant-snail interactions. One project dealt with the bacterial uptake of amino acids in the marsh and Lake Manitoba. Zoologists studied the population biology of leopard frogs, the winter ecology of the striped skunk and the energetics of muskrats. A new member of the zoology department, Dr. Sealy made preliminary observations on song-bird behaviour and ecology. He also taught the Ornithology course in Summer Session (Appendix Table 2). Dr. Claudio Tudorancea from Budapest, Hungary, a Post Doctoral Fellow in Zoology, arrived in February to take up residence at the Field Station, and to examine benthic fauna in Lake Manitoba. Several other faculty used our facilities for short periods in connection with their research.

Jane Evans organized weekly seminars throughout the summer and the seventh Annual Seminar was held in November. More than fifty people attended, including members of the Department of Mines, Resources and Environmental Management, and Councilors from the Rural Municipality of Portage la Prairie. We appreciated their support.

Groups of senior high school students visited the station in May and June. Heather Smart, a second-year Zoology student, funded by the Student Temporary Employment Program (STEP), accepted the challenge of running the schools program. During May and June, Heather introduced each group of fifteen to twenty students to the ecology of the marsh during a nature walk, followed by field exercises involving all the students. Four hundred and fifty young people participated in the day-long activities which we hoped to integrate with the school's curriculum the following year. Another high school visited us for an extended period. As part of the Project Canada West, nineteen students and their teacher Mr. Alan Watson, from John Taylor Collegiate, spent two weeks with us in



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Figure 46. Winter Survival course participants building an igloo, February, 1973.

May. Students studied general marsh ecology and recorded their activities on film.

Various other groups used the facilities for weekend workshops. Four Summer Session half courses occurred in July and August; Introductory Ecology, Ecology, Ornithology and Plant Ecology (*Appendix Table 2*). Like last year, they were not fully booked but with a total of 38 participants, enrollments exceeded the minimum requirements to make them worthwhile. Insufficient publicity was thought to contribute to the low numbers and continuing confusion in the registration process did not help.

Little did we realize it but our fall courses were set to decline in enrollment. Much to my chagrin, the departments of Botany and Zoology decided to cancel the pre-term field portion of the fall Introductory Ecology course. Apparently they felt that the high enrollment in the field course demanded too much staff time and that it would be more appropriate to have a fieldwork component in the plant and animal ecology courses that followed Introductory Ecology. I was very sorry about this decision, being a firm believer in the value of a hands-on field approach to ecology, even for students with only a peripheral interest in the subject.

Weekend fieldwork however, did occur in the Botany and Entomology fall courses, and the Departments of Education and Architecture held study weekends at the Station. In addition, the Department of Biology at the University of Winnipeg ran two weekend courses and a group of environmentalists held a two day workshop to discuss a Canadian "Blueprint for Survival" sponsored by the Canada Council and the university's Agassiz Water Center. We were obviously becoming known as an attractive place in which to meet.

The seemingly endless task of building renovation continued. Tyrrell was modified to provide dormitory space for seventeen people, and the kitchen in Criddle



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Figure 47. Winter Survival course participants building a snow "Quinzee," January, 1974.

became a double bedroom. We could now accommodate 45 people and had five married quarters. The laboratory building Agassiz, was re-wired and had its interior slightly modified to produce three small teaching labs, one housing the herbarium.

Management of the Delta Marsh continued to preoccupy several government agencies. The Manitoba Water Commission published a report on Lake Manitoba Regulation.⁷⁶ The report pointed out that in the 1920s and early 1930s, Lake Manitoba fluctuated naturally, but because of low water levels in 1934, a control structure was built at Fairford, at the north end of the lake to prevent water levels from falling below historically-recorded lows. After studies in 1956 and 1958, a new Fairford control structure was recommended and built in 1961, as noted earlier. With water levels in the lake and consequently, the marsh, now tightly controlled, we at the Station felt that it was important that changes in the marsh environment should be carefully monitored.

The Provincial Government's most recent plans to manage the marsh were contained in Nero and Larche's "Delta Marsh Framework Plan."⁷⁷ The plan made eight recommendations: (1) that land around the marsh up to the 248.7 m (815.7 ft) contour should be acquired by the government, (2) that a Provincial-Federal scheme for joint management of the marsh should be set up, (3) that a thorough engineering

study of the East Marsh unit should be initiated (*Figure 1*) (4) that studies should occur to determine the interpretive facilities required for public education, (5) that the appointment of a marsh manager was a top priority (a recommendation that had been made in 1968), (6) that water level control and manipulation should be initiated for the Center, Sioux Pass and Lake Francis units of the marsh (*Figure 1*) as soon as possible, (7) that a committee of public representatives should be established to oversee management plans and (8) that overall, the natural aspects of the marsh should be preserved and both consumptive (i.e. hunting and trapping) and non-consumptive (tourism) uses limited by this criterion.⁷⁷

The plan suggested that the Center Marsh, between the Portage Diversion and the road to Delta village, would lend itself to early development and management through a water control structure on the Delta road, Highway 240 just south of Delta Beach village. The overall plan was to be carried out between 1974 and 1980. It was projected to cost \$3,670,000. After studying the Nero and Larche document, we at the station had a number of concerns. Some recommendations seemed to assume stabilized lake levels, but we were uncertain about the extent to which these proposals would benefit the marsh in the long term. In the meantime, structures were installed by the government in Deep and Cram Creeks (*Figure 1*) to limit the exchange of water between Lake Manitoba and the West Marsh.

Problems relating to the use of station property by unauthorized fishermen, trappers and deer hunters continued, despite our efforts to explain our desire to know of, and to limit such activities when they interfered with research. Dumping of fish offal, hunting and trapping all had potential repercussions for research projects. In view of the problems we were having with local people, we began to realize that we needed to heighten awareness of our activities. Consequently, we expanded our efforts to inform the public, particularly those people living around the marsh. Two leaflets were distributed to all the cottages and neighboring farms, about our teaching and research programs. One leaflet described our summer courses, the other outlined current research projects.

Our neighbors at the Portage Country Club generously allowed us to expand our use of their property. This was greatly appreciated because their land is far more secure than that portion of ours that lies east of the Diversion.

As mentioned earlier, I was on sabbatical at Cambridge University until September and was most

grateful to Jack Gee and Barry Wallis who successfully ran the Field Station during my absence.

1974

On January 3, I met with ten Field Station users to discuss whether we should set up a formal Users Committee.⁷⁸ It was unanimously agreed that this should be done. We then talked about Field Station equipment. Our original policy was that we should not purchase any scientific equipment because at that time we had neither funds nor staff to service and maintain such equipment. However, over the years, we had inherited several valuable items from various research projects such as hygrothermographs, telethermometers, drying ovens, binoculars and an Eckman dredge. Furthermore, \$3,500 was now available for equipment purchase. What should be on our "wish list?" Suggestions poured in! They included, in no particular order, glassware for the labs, a Cahn balance, a fume hood for Lab 2 in Agassiz, a transit and stadia rods, Endicott soil sieves, two bicycles, six aquaria, and water sampling equipment. The list went on and on. Items were eventually prioritized and prices sought. Subsequent Users meetings were held in March,⁷⁹ informally throughout the summer, and in October.⁸⁰ The meetings focused upon accommodation, visitors, vehicle use, publications, the Annual Seminar and the Annual Report.

The winter of 1973-74 had been unusually snowy with more than enough snow for the winter survival weekend. (*Figure 47*) Heavy snows were followed by a rapid spring thaw and major flows in the Assiniboine River. The Provincial Government decided to again open the Portage Diversion to funnel excess water to Lake Manitoba and thus prevent upstream flooding of farmland in the Assiniboine River valley. We could see the Diversion filling up but were astonished to be told of the vast amount of water flowing—19,000 cfs (cubic feet per second).

This massive flow proved to be too much for the west bank of the Diversion, and between April 19 and 20, about 20 m (66 ft) of the west dike was washed out. We learned much later, that a weak area had been incorporated into the dike, as a so-called "fail safe," that would give way if conditions demanded it. The conditions in 1974 clearly demanded it! Land to the west as far as Cram Creek became submerged. We managed to fill sandbags from sand on the thawed portion of the lake shore and used them to prevent flood waters from entering the basement of Mallard Lodge, but the barn was inundated, damaging stored furniture and equipment.

During the high water, Sonny Mowbray provided a vital boat service along the Diversion to the station. Researchers could leave their cars on the dike road near Tony Peter's farm and Sonny transported them by boat to the mouth of the Diversion. From there they had only a short walk to the Field Station along the beach road.

Eventually, as flood waters receded, the eroded portion of the dike was filled with clay, again permitting vehicle access to the station. But this filled-in portion remained very muddy and challenging to traverse. Throughout the summer, Water Control crews slowly raised the height of the entire west dike with the addition of more clay. This operation made access difficult at all times and virtually impossible after rain. Nevertheless, research projects started almost on time, thanks to the unqualified dedication of our support staff.

In March, I requested a meeting with Associate Dean Campbell, to whom we now reported. During the meeting I raised a number of questions such as: Should we provide accommodation for the families of research staff and instructors during the summer? The answer was yes, if space is available. Should we encourage casual visitors and should summer residents be permitted to have overnight or day visitors? Dr. Campbell felt that, in general visitors should be discouraged but when accommodation was available, the families of research faculty and graduate students could visit. However, casual visitors should be discouraged. Should residents be allowed to keep pets? No. Who should be responsible for equipment repairs? The researcher using it.⁸¹

Use of the Field Station continued to increase and the number of days of use was 18% greater than the previous year. Twelve research projects were undertaken (*Appendix Table 1*). Topics in Zoology included Ring-Billed Gulls, preliminary observations on Yellow Warblers, freshwater molluscs, benthic fauna in Lake Manitoba, overwintering in skunks, thermoregulation in muskrats, a study of Crescent Lake near Portage la Prairie, and the parasites of frogs and toads. Botanical projects looked at the effects of herbicides and insecticides on phytoplankton and epiphytic algae in Crescent Pond, fungal succession in the marsh, plant-snail associations and the influence of water levels on selected marsh plants. Phenological data for plants growing in the marsh and its surroundings was again collected by Rachael Scarth, a summer STEP student.⁸²

For the first time, we successfully ran six two-week half courses in the Summer Session, adding the Ecology of Animal Populations and the Taxonomy

of Higher Plants to the four courses offered last year (*Appendix Table 2*). In addition, the Ecology of Animal Populations and Plant Ecology both held weekend courses in the fall.

We were grateful that STEP again funded the high school day visits. It also contributed to two research projects. During the winter we had designed a selection of field exercises which we sent to schools so that they could choose the program that best fitted their curriculum. The intention was to start school visits in early May, but, because of the flooding, access to the Station was too unpredictable and hazardous. We were obliged to postpone the visits until the end of the month. Whenever the weather permitted, we welcomed a school group. Eighteen groups of Grades 11 and 12 took advantage of this marsh experience.

The effects of the stabilization of water levels in Lake Manitoba became increasingly obvious. Constant pounding of waves along a narrow zone of the lake shore redistributed the rip-rap that had been put in several years before. (*Figure 48*) Strong winds from the north, continued to erode the bank. Mallard Lodge, Agassiz and Wardle were becoming more and more exposed. The engineers we consulted had divergent opinions as to how the problem could be solved, but it was clear that something had to be done. Unfortunately, no action was taken until two years later.

In January, the Provincial Government issued the results of its public consultation in the "Marsh Study Report."⁸³ Based on fourteen meetings held the previous July and August, and attended by more than 500 people, the report made fourteen wide-ranging recommendations from development alternatives, to fisheries and refuge status. At 24 pages, the booklet was far less weighty than some of its predecessors such as the previous year's study by Nero and Larche.⁷⁷ Nevertheless, it echoed a number of earlier recommendations.

The first was that the marsh should be kept in as natural a state as possible, while acknowledging that some management may be required. Other familiar recommendations were that a resident marsh manager should be appointed and a citizens advisory committee established. The report deemed that evaluation of the effects of agricultural land use on marginal lands and wildlife needs was important, as was the acquisition of land to the 248.7 m (815.7 ft) contour, for wildlife purposes. This was the contour below which land was generally accepted to be subject to periodic flooding. The study also suggested that the Provincial Government improve existing access



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Figure 48. Rip-rap scattered along the lakeshore by wave action in front of Mallard Lodge, 1974.

routes to the marsh and prepare maps showing routes to Crown lands around the marsh. It also urged the Government to work with the Canadian Wildlife Service to design interpretive facilities to explain the importance of marshes to the public. The report closed with suggestions about how each of the main marsh areas, the West, Center, East, Sioux Pass and Lake Francis marshes should be managed. (Figure 1)

Summer was always a time for visitors and this year was no exception. Delegates from the International Limnological Congress meeting in Winnipeg spent a day with us and learned about the marsh and our research projects. We produced a simple site plan for them (Figure 49) and afterwards wondered why we had not prepared such a plan years ago.⁸⁴ Delegates toured the Station and later enjoyed a barbecue on the beach. (Figure 50) Coping with more than 100 guests involved careful planning and taxed our resources a little, but the visit was judged a great success.

During the fall, as part of a design studio, Professors Rattray and Allsopp brought a few of their Landscape graduate students to the Field Station. (Figure 51) The students selected trees along the forested ridge and, with a rented tree spade plus much hard work, moved them one by one and planted them around the Field Station buildings. As several trees ended up in exposed situations, we hoped that they would survive the winter and thankfully, they did!

Dr. Michael Bruser was a Winnipeg obstetrician and gynecologist. When he died, his widow set up a memorial bursary in his name. The bursary was intended to assist academically-promising and financially-deserving students interested in a career in botany or zoology. The bursary, initially for \$250, was open to students active in biological and ecological studies, such as those conducted at the Field Station. Hopefully, this would be the first of a series of financial supports for students taking courses or pursuing research at Delta. The establishment

of this bursary prompted me to speak to Mr. Peter Curry, the Chancellor of the university after the spring convocation ceremony. I asked Peter if he would support a bursary in his name to encourage research at the Field Station. He said "Write to me about it." This I did but had no reply, even after a second attempt. I was disappointed by his lack of response because many students desperately needed financial support to enable them to take summer courses.

Dr. Kucera's report on "The Ecology of the White Tailed Deer (*Odocoileus virginianus*) in the Delta Marsh" was published by the Field Station as an Occasional Paper.⁸⁵

1975

Lots of snow again fell over the winter. (Figure 52) Even after a light snowfall, enormous drifts tended to build-up around the station buildings and along the forested ridge. The buildings and ridge were efficient traps that captured snow that had been blown across the frozen lake.

Whomever said that there was never a dull moment at the station was absolutely correct! As a small indication of the variety of mishaps that befall a Field Station director, I recount an incident that occurred early in 1975. I was at the station cataloguing reprints with Barry Wallis when the fuel oil man arrived to fill the tank in the basement of the lodge. Unfortunately,

the delivery man misread the gauge and overfilled the tank. Fuel oil spilled out and soon covered much of the basement floor, saturating almost everything on it. The resulting stench was horrendous! We quickly realized that we not only had to move the winter woodpile that was stacked along one wall but more urgently the boxes of groceries in the store room. We carried everything that was not in a tin or plastic container through the snow to Murray's Cottage—sugar, macaroni, cocoa, cereals etc. so they would not be tainted by the nauseous odor. Next, we had to dump the woodpile outside and remove all the screen windows from their winter storage place. We then mopped up as much of the fuel oil as we could

but realized that the smell would be with us for a long time. The profuse apologies of the fuel oil driver did little to soothe our anger!

Apart from such frustrating mishaps, our first noteworthy event in 1975 was the eighth Annual Seminar held on campus on January 25. This was later than usual, so as to allow researchers more time to analyze their data. Sixteen papers were presented to an audience of more than 60, even though participants had to cope with a ferocious snowstorm to attend.

Despite a prolonged university Support Staff strike which began on March 21 and included our manager and cooks, we managed to host 12 research projects (*Appendix Table 1*).⁸⁶ New studies included

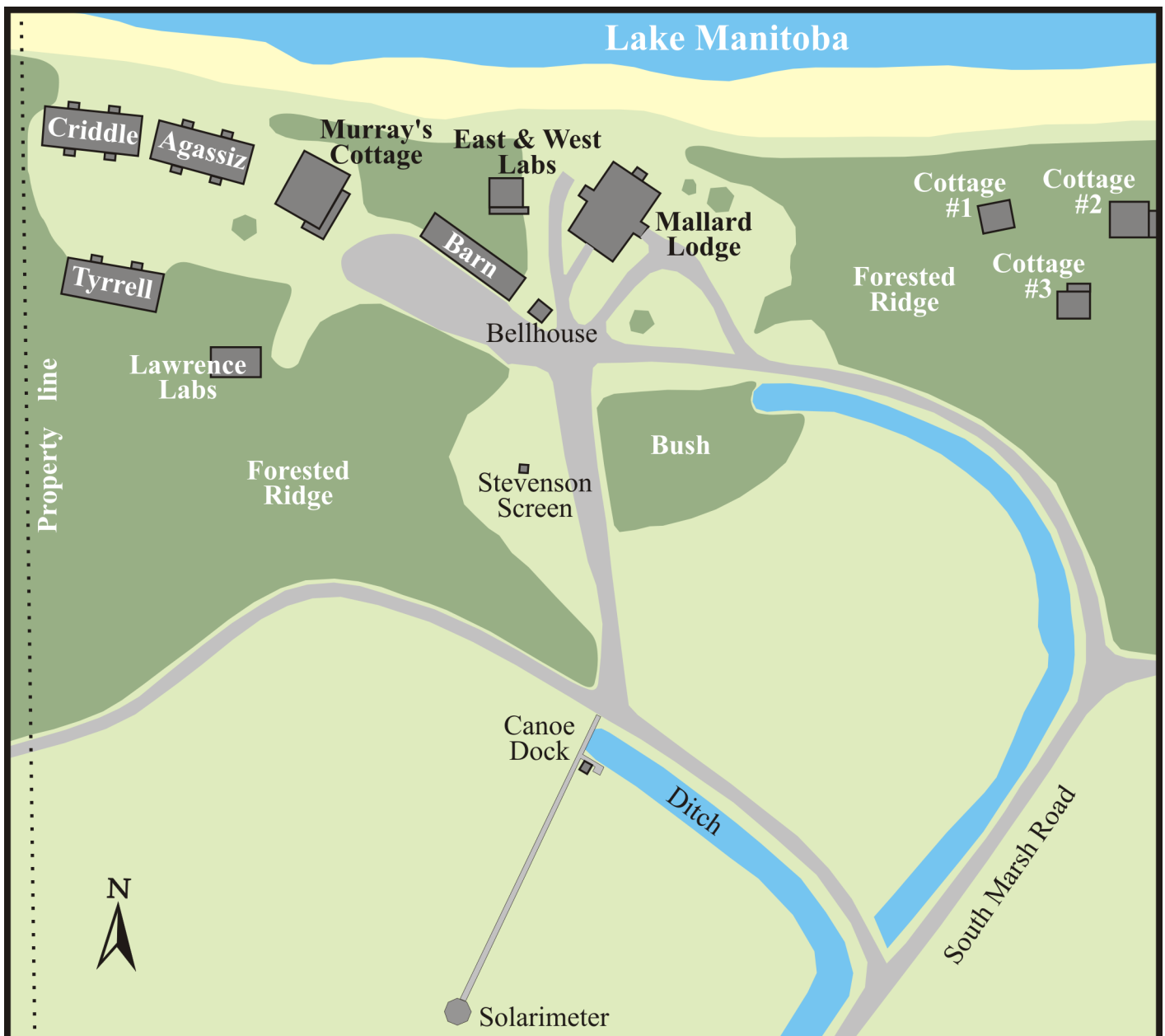


Figure 49. Field Station site plan 1986 (not to scale).



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Figure 50. Members of the Society for International Limnology enjoying a barbecue lunch at the Field Station, summer, 1974.

the breeding biology and feeding ecology of Yellow Warblers, black bullhead biology, the interaction of the endocrine system and parasites in Red-winged Blackbirds, copepod parasites of saugers and walleyes and temporal succession in beach fungi. The study of the protozoan and helminth parasites of frogs and toads continued. Some studies were not based at the Field Station, but the researchers involved visited us to collect material. One such project involved collecting pondweeds (*Potamogeton*) in order to evaluate their ability to take up nutrients from the water. (Figure 53)

Research labs were somewhat cramped, but the enlarged teaching lab was much appreciated by the four Summer Session courses, the four three-day intensive sessions run by Dr. Gee for the

with their school group. I wrote to school principals throughout the southern part of the province to explain this and to invite them to allow biology teachers to have a Friday afternoon release so they could attend

fall Animal Populations course, and the week-long pre-term Landscape Ecology course that I held (Appendix Table 2). The equipment we had gradually accumulated such as drying ovens, microscopes, pH meters and sampling gear made running such courses much easier.

Having organized the schools program for some years, we thought it needed some changes. Our experience with last year's program made us realize that many teachers would probably welcome an opportunity to attend a workshop to prepare them for a visit to the Field Station



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Figure 51. Landscape Architecture students marking places to plant trees from the forested ridge, October, 1974.

such a workshop. With Rachael Scarth's assistance, I planned to start our weekend workshops on a Friday afternoon with an introductory lecture, film and discussion. This was to be followed with field and lab exercises on Saturday and Sunday morning, finishing with a summary session after lunch. The response of almost all the school principals was positive.

We held two such workshops and were delighted with the enthusiastic response of the participants. Unfortunately, we had to cancel the third teaching workshop because of problems with road access. The west dike of the Portage Diversion, our only access route, was being built up with clay. This created appallingly muddy and unsafe conditions. Thankfully, road access gradually improved so

that in the ensuing weeks, more than 400 high school students and their teachers took part in our program. We were pleased that the program was again funded by STEP.

Community Studies in the university Extension Division again organized five Marshland weekends during the year. In January, the weekend focused upon, "Human Survival in Winter," in February and in December on "Mammals in Winter," in March on "Survival Skills," and in November, on "The Story of the Marsh." Sadly, the April and May weekends had to be canceled because of the support staff strike. With an average attendance of twenty, and waiting lists for several of the courses, we felt confident that we were filling a gap in adult education.



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Figure 52. Snow "smothering" barn and bellhouse, with Mallard Lodge in the background, April, 1975.



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Figure 53. Researcher Mike McKernan (left) and assistant (right) sampling pondweeds in the Blind Channel at Delta, 1975.

A variety of groups visited us during the year. The board of the National and Provincial Parks Association met at the Field Station in February and their executive came back in June. The Department of Landscape Architecture organized a weekend study session for their faculty and graduate students. The Hon. Harvey Bostrum, Minister of Renewable Resources, and some of his staff visited us in July. The Manitoba Association of Archaeologists held a field trip in July and the American Ornithological Union visited us in August. The reason that I mention these visits is to emphasize that there was something “going on” almost all the time. We also received a constant stream of requests for field biology programs from junior schools, high schools, teachers, youth groups and the public. Unfortunately, there was no way that, with our present complement of staff, we could meet all of these requests. Thus, the need for a Resident Naturalist/Biologist was becoming increasingly obvious. Our popular high school program was dependent upon a STEP grant, as was the collection of phenological data. If we had funding for a Resident Biologist, we could enhance many facets of our program, such as the routine monitoring of environmental conditions, and the development of a systematic scheme to record the data that emanated from undergraduate courses and graduate field studies. Among other things, such a person could introduce visitors to the Delta Marsh environment and explain its special characteristics. I was determined to make a strong case for such a position.

The graduate students organized a summer series of seminars. They also prepared a display of ongoing research for the university Campus Open House. It was accompanied by a slide show and sound effects.

A UFS(DM) committee meeting was held at the Station in July.⁸⁷ A tour of the cramped facilities made it clear that our current labs were inadequate. The possibility of obtaining a trailer from the campus to relieve congestion in the labs was to be explored. However, in the midst of this discussion, Dean Connor warned us that research requirements might have to be reduced in the future because of financial constraints placed on the university. I thought this a very discouraging comment.

During the meeting, I raised the question, which I had done so many times before about our being able to offer courses uniquely suited to the Field Station setting, with their own course number. The committee generally agreed that this should occur. This led to a discussion of the need for a Resident Naturalist/Biologist who could be responsible for the schools

program and be a demonstrator for summer and fall courses. The Dean felt that there were dangers in such a position being funded from external sources, even if we could obtain such funds.

Another concern was voiced by Dr. Welch who urged that money should be made available to adequately equip our teaching labs. He stressed that it was inadvisable to move delicate instruments such as microscopes to and from the campus.

Matters pertaining to our land were also brought up at the July meeting. We discussed the need to monitor the effects of the proposed marsh management plans on our leased lands.

During the summer, we launched a publicity campaign. We felt that there still seemed to be some local opposition to our presence so we organized several events. In July, we distributed invitations throughout the neighborhood inviting people to an Open House. At the Open House, we talked about our research and education programs. And, on October 25, we gave research presentations to the Reeve of Portage la Prairie, Councilors and other local residents.

Government reports concerning the development and management of the marsh continued to appear. A report prepared by the Resource Planning and Development Consultants Ray E. England and A. Brian Ransome entitled “A Study of Potential Interpretation Possibilities and Use at Oak Hammock and Delta Marshes” appeared in October.⁸⁸ The report concluded that Oak Hammock was best suited for day use requiring modest facilities, whilst Delta was well suited for a major interpretation center and residential facilities for students. Slack’s Bluff on the south side of the marsh was suggested as the site for the center. The authors estimated that 87,000 people annually could be introduced to the marsh and its surroundings. Much as we endorsed the need for public education about marshes and their value, we wondered who would operate such a residential facility and who would finance it.

Rachael Scarth, our STEP student produced a booklet entitled “Transect Delta—A Guide to Marsh Plants,”⁸⁹ which she submitted to Dr. Jones, the marsh manager, for his comments. In it she listed the plants found in various habitats within the marsh as one moved from the lake shore to its southern boundary. Dr. Jones liked the approach and felt that, with some revisions the Provincial Government would publish it.⁹⁰ Unfortunately, the revisions posed a problem because Rachael left to pursue her education at Cambridge University and had other commitments. We still have the manuscript!



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Figure 54. West bank of Portage Diversion (our road!) eroding, spring 1976.

Another enjoyable Annual Picnic with games, races, other activities and a dance occurred in July.

1976

If we thought that the 1974 flood experience was overwhelming, we had no idea what was to come two years later! After another cold winter with plenty of snow, there was again a rapid spring thaw. In early April, water began to rush down the Diversion over the concrete sill and onto the still-frozen lake. Shortly thereafter, as waters came dangerously close to the top of the dike, they breached the so-called “fail safe” in the west dike. A torrent of water poured out to engulf the West Marsh. From April 12 until May 18, road access to the Field Station was cut off

by flood waters. (Figure 54) We once again sand-bagged the entrance to the basement to Mallard Lodge. Water Control advised us that the flood waters would flow towards the lake through low places in the forested ridge, and should not affect us, but this did not happen. (Figure 55) Instead water levels rose rapidly around the station and threatened to breach the ridge. Waters soon reached 1.4 m (4.56 ft) above our own datum, and 248.87 m (816.5 ft) in the marsh west of the Diversion. In frantic telephone calls I pleaded for volunteers from the campus to help us fill sandbags, build dikes and empty the barn. The response was almost immediate. Twelve kind volunteers were picked up near Tony Peter’s farm and transported by



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Figure 55. Field Station buildings inundated by flood water. Note the barn (right) and Murray’s Cottage in the background, spring, 1976.



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Figure 56. Mallard Lodge in the 1976 spring flood.

boat to the north end of the Diversion. (*Figure 1*) From there they traveled by canoe to the Field Station where Mallard Lodge sat proudly above the flood waters. (*Figure 56*) There was fortunately enough unfrozen sand on the beach to fill sandbags and we soon had a defensive line of bags winding along the beach ridge to prevent the cottages being undermined. (*Figure 57*) But our supply of 2000 sandbags was soon exhausted. With still much left to do, we requested more sandbags. Our weary volunteers departed towards sunset. The next day we were surprised and relieved to hear the whir of a helicopter overhead. Within seconds, the machine had landed next to the lodge and disgorged its contents of the all-important sandbags, witnessed by an even larger group of volunteers. After a busy morning, the group gathered around

the lodge for lunch, a well-earned rest and a chance to survey their mornings handiwork. (*Figures 58, 59*) Sadly, Nan Mulder sustained a hernia while pulling in the boat and had to be hospitalized, so he was out of action.

My husband Tom and I “held the fort” more or less continuously for the next several weeks until May 2. All sump pumps had to be checked at least twice a day to ensure that they were in working order to prevent the lodge and other buildings becoming flooded. To take the weather readings, we

had to canoe to the solarimeter. With water swirling around the canoe, we struggled to change its chart and read the maximum and minimum thermometers inside the Stevenson screen that was still above water. This daily exercise proved quite a challenge.



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Figure 57. Sand bags along beach ridge near Cottage 1, April, 1976.

The peace and quiet between bouts of feverish activity was wonderful as was the opportunity to view many creatures at unusually close range as their habitat shrank ever-smaller. Mink appeared from the reeds a few steps away as we walked along the short stretch of the south marsh road that was still above water. Red fox, short- and long-tail weasels, red backed voles, meadow voles and deer mice were all seen at remarkably close range. Mallards, pintails, Buffleheads, Scaup, Blue-winged Teal and Shoveler swam around the lodge in their magnificent breeding plumage. Muskrats even sat on our cottage steps! (Figure 60)

We felt securely isolated because, while at the station, we had the only boat used for transport-



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Figure 58. Volunteers who came to fill sandbags having a rest and lunch, April, 1976.

ing people along the Diversion. If anyone wanted to visit, they had to phone ahead. But imagine our surprise when, very early one Sunday morning we were alarmed to hear loud thumping on the cottage door. Who could it be? We had the boat, so how could anyone get to us? Opening the door with great hesitation we were relieved to see the smiling face of my assistant, Barry Wallis. Barry had borrowed a truck and boat from a friend and “popped in” to see for himself how things were going!

Despite the complicated access procedure, the first researchers of the season took up residence on May 3 and full operation began on May 10. Needless to say, the station staff struggled to accommodate them. A mere flood may interfere with but does not halt nature’s routine and we



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Figure 59. Sand bags across the entrance to Mallard Lodge basement with the Bell House and Barn in the background, April, 1976.



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Figure 60. Muskrat.

did not want to jeopardize anyone's research. Thirteen projects were able to go ahead, though sadly, several projects had to be either moved or canceled (*Appendix Table 1*). Of those that took place, five involved birds (Yellow Warblers, American Coots, Vireos, Kingbirds and Orioles). Other projects focused on the parasites of blackbirds, muskrats and fish. One was a vegetation survey.

Although STEP did not fund the High School Program, the Environmental Division of the Department of Mines, Resources and Environmental Management stepped into the breach and paid the salaries of two students, Linda Girling and Kathy Sammons. These two showed considerable ingenuity in boating across the Diversion to run the program for the first two weeks from the public beach at the village of Delta. (*Figure 61*) Six hundred and twenty students and their teachers benefited from a visit to the marsh.⁹¹

The government also funded David Smith, a

botany student, who conducted fieldwork preparatory to mapping the vegetation of the Center Marsh.

The aftermath of the flood occupied us for much of the summer. Flood waters subsided in late May, leaving a blanket of silt in the West Marsh (*Figure 62*) and spectacular amounts of debris along the lakeshore (*Figure 63*) and elsewhere. At times the clean-up around the station seemed endless and the task almost insurmountable. Eventually, however, we were able to clear the accumulations of silt and mud from around the buildings, empty the piles of sandbags and replace the wooden floor in the barn with concrete. Unfortunately, in the middle of all of this activity, Nan suffered a second hernia and did not return to work full-time until October.

Flood water erosion along the edge of the forested ridge had been severe, particularly in front of the cottages and we had to bring in more rip-rap to place along the lake shore.

During the summer, my constant companion was a "To Do" book that I kept in my pocket. There were so many unexpected things that needed attention, but we tried to keep the operation running smoothly, especially with Nan out of commission. For instance, my entry for July 22 read:⁹² "paint the East and West labs, clean the entrances to all the buildings, install a rack for the fire hose in Agassiz, put wall shelves in all the bedrooms, get "shoes" for the bunk bed legs



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Figure 61. Assistants Linda Girling and Kathy Sammons having crossed the Diversion after leading a school group at the Delta campground, May, 1976.

to reduce damage to the bedroom floors, clean the lab window sills, put cleaning equipment in the labs, deepen the water lines to the cottages, prepare evaluation form for next year's courses." There was always a lot to do.

In spite of the flood, we had a large contingent of researchers. From May 3 until September 19, the average number of people in residence was nineteen. To gain publicity for the research being carried out at the Field Station we produced a small booklet outlining the on-going research projects. We gave it to all our visitors and to our neighbors.

The Summer Seminar program continued and the Users Committee decided that it could better achieve its objectives with three sub-committees:⁹³ one dealing with Space, an Editorial Committee dealing with publications and an Environment Committee dealing

with the station property. Three people were duly elected to serve on each sub-committee.

The Space sub-committee held several meetings and produced a number of suggestions for the use of existing labs and for the proposed new lab.⁹⁴ Among

these was to move the plant drying cabinet to the south lab of Mallard Lodge and install a small exhaust fan, thus making a space devoted to plant processing. The committee suggested that we provide cupboards with locks in the basement of the lodge for small items of equipment, and that we combine Lab #2 and Lab #3 in Agassiz in order to provide space for larger classes. The sub-committee also recommended that research and teaching should be separated whenever possible.

The Environment sub-committee also met



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Figure 62. Silt from the eroded part of the Portage Diversion spread across the marsh to the west, May, 1976.



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Figure 63. Woody debris from the Diversion deposited on the lakeshore.

several times. It made a number of recommendations, namely that the use of aerosol cans should be banned, that low phosphate detergents should be used for laundry, that burnable and non-burnable garbage should be separated, that smoking be banned at meal times, that all chemicals should be removed at the end of the season by researchers, that the fume hood should be re-vented, that small mammal traps should be secured in the field and all flagging tape should be removed at the end of each project.⁹⁵

The Editorial sub-committee made four main points relating to the Field Station's Annual Report. They strongly endorsed its publication which they felt brought our research to wider attention, it stimulated faculty and students to assess their progress and helped them plan for the forthcoming year, it provided students with writing experience and was a source of useful information about the marsh.⁹⁶ Detailed guidelines for authors were also produced.

Discussions at User's meetings during the summer resulted in a memo being sent to all users indicating the we wished to develop a data base of records of information collected during research projects and on courses.⁹⁷ This data base was to be maintained at the Station.

By this time, 33 papers resulting from work at the Field Station had been published. We were also pleased that some of our activities were being more widely publicized. The newsletter for the Delta Marsh Management Project entitled *Marsh Minutes* devoted most of its July edition (Vol. 2, No. 2) to our High School Ecology Program. It also contained an item on the spring flooding of the West Marsh.⁹⁸

Despite our preoccupation with the flood, we paid attention to our space needs. During the summer we cleared a site east of Tyrrell for a new building to house two labs, a small one similar to the west lab, and another twice its size. We hoped the building would be ready for the following spring. In the interim, we needed more teaching lab space. At that time there were two teaching labs in Agassiz, one large and one small. However, the large lab was much more convenient to use for teaching than the small one. At the suggestion of the Space sub-committee, we enlarged the small lab by incorporating an adjacent research lab.

Unfortunately, the spring flood affected our week-end courses and we were obliged to cancel two offerings. However, before the flood, we held a University of Winnipeg "Winter Ecology" weekend and two Continuing Education weekends, "Arctic Lifestyles"

and "Winter Survival." In October, we were able to offer a "Marsh Ecology" weekend.

Summer Session sponsored five half courses: Introductory Ecology, the Ecology of Animal Populations, Ornithology, Taxonomy of Vascular Plants and Plant Ecology. A new course, entitled Field Ecology was taught in two sessions in September. It replaced the former Introductory Ecology course which was now its pre-requisite. I again taught the first part of a Landscape Ecology course for a week in late August and two Anthropology courses, Prehistoric Human Ecology and Archaeological Field Techniques came to the Station during the fall.⁹¹

In July, I was invited to visit the University of Michigan Biological Station at Douglas Lake to talk about our on-going teaching and research programs. A visit to other biological stations was always both informative and encouraging. My short stay in Michigan, at one of the oldest biological stations in the States, was no exception.

Back in Manitoba, my efforts to secure funds for the position of a Resident Biologist continued. It always surprised me how much time I had to expend in attempting to raise funds for projects such as that of a Resident Biologist.

The Organization of Biological Field Stations chose to hold their annual meeting at Delta for three days in September. Directors from seventeen biological stations across North America assembled to consider funding, data collection, field station programs and related matters. Our discussions ranged widely and all the attendees felt the meeting had been very useful and enjoyable. They honored me by electing me to be their President for the following year.

More management plans for the marsh were in the offing. A Delta Marsh Plan by Dr. Robert Jones had gone through several drafts by November.⁹⁹ The draft plan concluded that intensive development of the Delta Marsh must permit regular fluctuations of water levels in the marsh. The plan involved the five management units in the Delta Marsh Framework Plan. Another report, entitled "Delta Marsh Project Center Unit Engineering Study" by Ray D. Bodnaruk, suggested four different options for this unit. All options involved the supply of water for each unit, its retention and its controlled release. Costs ranged from \$88,000 to \$843,000, depending upon the number of cells or compartments involved.¹⁰⁰ In December, the government set up a Delta Technical Advisory Committee to discuss Bodnaruk's Center Unit Engineering Study and related matters.

Mid-winter was a rather quiet time at the station and my husband Tom and I spent the first of many Christmases at Delta. Our stay relieved Nan and other staff of the meteorological station duties and allowed them the statutory Christmas vacation. It wasn't always quiet as my "To Do" book for December 26¹⁰¹ records—"Lodge generally grubby, I washed and polished the common room, hall and kitchen floors, put Ajax (cleanser) and sponges in the bedrooms, removed old (moldy) food from the refrigerator and much more. It's a shame that standards are difficult to maintain."

This year had been a successful albeit challenging one. Without the dedication and hard work of the support staff and our many friends it could have been a disaster.

1977

Discussions regarding the management of the Delta Marsh dominated the Delta Technical Advisory Committee meetings which were held almost every month.¹⁰² Each time we met it became more and more obvious that to effectively manage a marsh as large as the Delta Marsh would be both complex and costly. Initially, a management plan for the Center Marsh was the advisory committee's focus. The Center Marsh lies between the east dike of the Portage Diversion and Public Trunk Highway (PTH) 240. We were familiar with the area from the previous year's vegetation study we had undertaken for Dr. Jones. Our completed report had been submitted to Dr. Jones who had funded the study.¹⁰³

To promote discussion of the plans for the Center Marsh, Dr. Jones circulated the latest, his third draft of a management plan for this unit.¹⁰³ The draft expanded upon recommendations in both the Marsh Study Report⁸³ and Nero and Larche.⁷⁷

The plan indicated that the Center Marsh unit (*Figure 1*) could be rehabilitated with relative ease, now that a control structure was in place on Highway 240. This structure allowed water to flow from School Bay to Cadham Bay and vice versa. Dr. Jones felt that the Center unit could be divided into two compartments and managed mainly to: firstly, enhance annual waterfowl production and attract waterfowl on their fall migrations, and secondly, increase muskrat production and harvest. In order to manage their water levels, ways must be found to pump water in and out of these compartments. As for water supply, spring runoff could become an important source of water. This runoff could be augmented in a number of ways with the simplest being water pumped from Cadham

Bay. Another potential water source was the Portage Diversion. Diversion water could be used to augment the Center Marsh and for the future east management unit as well. Costs for diverting water from the Portage Diversion were estimated to be \$250,000.

Some of the management objectives for the East Marsh were also outlined. Dr. Jones explained that, being linked to the lake, the East Marsh, was dependent upon the level of Lake Manitoba.¹⁰⁴ It should be regulated to a maximum level of 247.80 to 247.95 m (813-813.5 ft.) and a minimum of 247.62 m (811 ft). Levels should be stable between May 15 and October 15, and be kept within 0.076 m. (3 in.) of the management objectives. These were ideal water level ranges, constrained by the maximum rate of filling through the Delta and Clandeboye channels.

In the middle of all this talk of water levels and water regimes, I suggested that an environmental impact assessment should be undertaken at least for the Center Marsh project because it was a Provincial project involving water and soil and, as such, an environmental assessment is a Provincial requirement.¹⁰⁵

During the discussion, it was pointed out that the hay in the meadows surrounding the marsh was of poor quality having only 4% protein content. It was also noted that, because of the current low water levels, farmers would probably have access to more hay land.^{99,105}

Later, Dr. Patrick Caldwell from Ducks Unlimited, Dr. Bruce Batt (DWRS) and I had informal discussions about the proposed management plans and wanted clarification of certain aspects. We were particularly concerned about the "cycles" envisaged as well as possible conflicts with other uses such as irrigation for agriculture. We communicated our concerns to Dr. Nero, Chairman of the Technical Advisory Committee.¹⁰⁶ At the station, we were deeply concerned about these management plans.

In September, Barry Wallis wrote a position paper for the Field Station Advisory Committee to consider, entitled "Center Marsh Development and Recreation Plans."¹⁰⁷ He pointed out that no changes could occur in the Center Marsh without affecting the eastern portion of our leased land. The plans outlined by Dr. Jones would require the construction of dikes and feeder channels and did not seem to acknowledge that the land upon which these structures would be built was occupied Crown land, leased to the university. Barry felt that government people who were, from time to time, seen on our land should be reminded of the need to inform us of their visits. The unilateral action of establishing a fish shack on our leased

land was deemed by the Lands Branch to have been unlawful. Construction on our leased land should only occur with the consent of the university, or by expropriation or a change in the lease. Barry went on to say that we might agree with such construction if stringent conditions applied. He suggested again that we would like Wildlife Refuge status re-established in place of the Game Bird Refuge status. This change in status still awaited an exchange of land between the Provincial government and the Portage Country Club. The Station should request protection from trespass along any new dikes that might be built. Gates should be installed on the east dike at the north and south boundaries of our property, and at Inkster farm. The government should acknowledge that the Field Station property should only be entered and works carried out with our agreement. I believed that this was another argument for the university to own the land where it operates, rather than lease it from the government.

Although the Director of the Field Station is the university representative on the Technical Committee for the Development of the Delta Marsh, we should make it clear that we do not necessarily agree with all the details of the evolving plans for marsh development. One of the requirements for water regulation in the Center Marsh unit was a source of water. Two sources had been suggested, namely the Portage Di-

version and Cadham Bay. These control structures would allow the Center Marsh to be managed as an independent unit. The question of whether funds would be available for such plans was not addressed, nor was the water quality or a time table for construction given. In sum, Barry urged that the university should emphasize its legal right over the Field Station property as laid down in the lease.

Prairie climates are notorious for their rapid shifts from flood to drought. Thus, in contrast with the floods of the previous year, we had the driest fall and winter on record. Very little snow fell during the winter which resulted in extremely dry conditions on the forested ridge and a high risk of fire.¹⁰⁸ This prompted us to ensure that all our buildings had easy access to a water supply. To this end, we installed a number of outlets for fire hoses. We also asked Water Control¹⁰⁹ to reduce public access along the east dike, and urged them to provide facilities for boat launching and picnics at the Delta campground, thereby reducing activities, such as campfires, around the Diversion outlet. We also wrote to the Assistant Deputy Minister of Renewable Resources, Mr. A. Barr, informing him of our concerns about public access.¹¹⁰

In March, we held the 10th Annual Seminar on campus when eight reports were presented. Eight graduate students had either completed their theses or were in the process of doing so. This resulted in

fewer individuals being at the Field Station during the summer. Nevertheless, eleven projects took place (*Appendix Table 1*). These included new studies on Eastern and Western Kingbirds and research on ticks. Continuing research involved ectoparasites and endoparasites in blackbirds, parasitic copepods on Lake Manitoba fish, the parasitic fauna of muskrats, the ecology and distribution of long-tailed weasels and the population biology of Northern Orioles. We turned one of the small barns at Inkster farm into a simple, satellite laboratory for the stu-



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Figure 64. Instructor J. Lazotte demonstrating during Log House Building weekend course, 1977.



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Figure 65. Demonstration mini-log house built during the Log House weekend course, 1977.

dents working on the south side of the marsh and in Oxbow wood.

Six weekend courses were organized by the Continuing Education Division. Each attracted a full complement of 20 people. The topics were varied—“Winter Involvement,” “Arctic Lifestyles,” “Outdoor Leadership,” “Log house Building” (Figures 64, 65), “Nature Photography,” and “Tree Ecology.”

Much to our dismay, STEP funds were again not forthcoming, so we were unable to offer the High School Ecology Program in May and June. However, during the spring we were at last successful in putting together sufficient funds from a variety of sources, to establish a Resident Biologist position for eleven months, the maximum permitted by the university Administration. The Resident Biologist was to keep an eye on the general running of the Station, organize the High School Ecology Program, demonstrate for courses and undertake his or her own research.¹¹¹ Two ecologists who had just completed their MSc degrees at the University of Alberta, were eager to have the job. They decided to share the position and we were delighted that Marianne See and her husband Jerry Tande became residents at the Field Station in June. Within a very short time they had clearly demonstrated the value of a Resident Biologist.

Marianne and Jerry planned to expand the High School Ecology Program, now to be also offered in

the fall and winter. They wished to put more emphasis on teacher training while continuing the school visits. Their fall field trips for grades 11 and 12 dealt with tree and shrub identification, animal tracking, the ecology of the forested ridge and snow ecology. They produced an excellent range of resource materials including a key to the identification of trees and shrubs on the forested ridge, a check-list of ridge plant species, bird identification forms and a guide to animal sign. All these resources proved to be a great asset for the schools. Their efforts were highlighted in the November issue of the Provincial Government’s publication “The Outsider.”¹¹²

They also investigated the data acquisition systems used by biological stations across Canada and the USA by circulating a detailed questionnaire to all field stations. They asked such questions as: What kind of routinely-collected information is needed by teaching and research staff? Should an effort be made to standardize information gathered from teaching programs? Further details of their thorough survey are in their Resident Biologist report.¹¹³ They also invested a great deal of thought into developing a land use map for the Field Station property and undertook two preliminary research studies. One was a dendrochronological reconstruction of water levels for Lake Manitoba, the other looked at the history of the Oxbow Wood. It really was wonderful to have their competence and enthusiasm.

Early in the year, hoping to increase enrollment in our summer courses, we distributed a leaflet to all biology students on campus, and sent leaflets to the University of Winnipeg and Brandon University, outlining our Summer Session courses to be held between July 3 to August 13. Despite this publicity, only Ornithology had sufficient enrollment to take place (Appendix Table 2). Later in the year, we designed a poster to publicize next year’s course offerings. It was modeled upon those produced by a number of universities in both Canada and the USA. We distributed it widely. Discussions continued with colleagues on campus regarding our wish to offer a selection of specialized courses during the summer. Considerable persuasion would clearly be necessary to have such programs come to fruition.

In keeping with our policy that we name buildings after famous naturalists, we assembled a list of people to be considered when we had new buildings to name. The list included John H. Ellis, a soil scientist, Ralph D. Bird, an entomologist and ecologist, W. E. Halliday, a Dominion forester and Henry Youle

Hind, John Palliser, and S. J. Dawson, all 19th century explorers.

The tenth anniversary of full operation of the Field Station coincided with the centenary of the university. We celebrated our anniversary with a luncheon at the Field Station for past and present faculty, staff and graduate students.¹¹³ After lunch, our new research laboratory was dedicated to the memory of A. G. Lawrence a well-known Manitoba naturalist. Mr. Lawrence was a founder member of the Manitoba Naturalists' Society. He also wrote a weekly column in the Winnipeg Free Press for 33 years, entitled "Chickadee Notes." He was an excellent photographer and made several fine bird films. Members of his family joined us for the ceremony which was performed by his daughter Jerdine Crawford.

Several courses used the Station for weekends during the fall and winter—Landscape Field Ecology, Principles of Quaternary Paleoclimate Reconstruction, Plant Ecology and the University of Winnipeg's Winter Ecology course.

1978

I returned from a short leave in May, grateful that Dr. Gee had again willingly assumed the role of Acting Director in my absence.

If specific years can be characterized in a few words, 1974 and 1976 would both be the years of the flood and 1978, the year of staff changes and budget constraints. In April, to our great regret, Barry Wallis resigned from his role of Administrator to take a position at St. John's High School in Winnipeg. During the six years that Barry spent with us he was a familiar and ever-helpful figure at Delta in the summer and on campus in the winter. His enthusiasm and loyalty made my job much easier. Unfortunately, because of budget constraints, Barry was not replaced. His departure meant that my day-to-day involvement with the Field Station increased dramatically.

Two months later we sadly said good-bye to Marianne See and Jerry Tande who had shared the job of Resident Biologist over the past year. When they joined us, we had funding for an eleven month position. At that time, we felt convinced that we could garner sufficient funds to keep them on our payroll after the end of the eleven months. But, try as we did, our fund-raising was unsuccessful, and, sadly, the money ran out. During their time with us Marianne and Jerry accomplished a great deal. We knew that they would be sorely missed. The lack of money for both their position and Barry's, raised doubts about the university's commitment to the Field Station. We

were not alone, for throughout Canada and indeed across much of the continent, universities were faced with shrinking budgets and falling enrollments.

We were well aware of these enrollment problems, and in order to publicize our courses, we again produced a poster which we distributed widely. Research interest thankfully increased over the previous year, with eight graduate student projects based at the station (*Appendix Table 1*). Don Thompson initiated his study of the effects of fire on *Phragmites*. Zoology projects dealt with the Northern Oriole, Warbling Vireos, Eastern and Western Kingbirds, wetland bird vocalizations, long-tailed weasels and ticks. Among them we were pleased to have PhD students from the University of Toronto and a geologist from the University of Manitoba. The latter studied the history of Lake Manitoba through collecting a number of sediment cores and analysing their chemistry.

The four, now more or less routine Summer Session courses were offered, namely Introductory Ecology, the Ecology of Animal Populations, the Taxonomy of Vascular Plants and Ornithology (*Appendix Table 2*). Thankfully, all had increased enrollments. Field Ecology and Landscape Ecology again took place before the fall term, and Prehistoric Human Ecology and Plant Ecology held weekends during the fall.

Over the years, we had hosted a variety of courses in Botany, Zoology and other departments but we were anxious to have some say in which courses were offered. At last, the Faculty of Science and the university Senate were persuaded that a series of new courses could be offered in the Summer Session, with the general heading Special Topics in Field Biology. The first would occur the following year.

Our Continuing Education courses were as popular as ever. "Building Log Houses" was especially well supported. The spring workshops for teachers were fully booked, and more than 800 students from 23 schools attended the High School Ecology Program for which we obtained funds from the Sportsman's Show.¹¹⁴

We constantly had to make small adjustments in our procedures. For example, for fire and safety reasons, we had to be more systematic with our signing in and out of individuals.

In August, after much discussion with the Dean's office, a new position of Administrative Clerk was created. Unfortunately, we lost our part-time winter secretary at the same time.

The Dean also reaffirmed the importance of the University Field Station Advisory Committee, though with a change in its composition. Now the commit-

tee members were to be the heads of the biological departments or their designates, a representative from the Faculty of Arts, two representatives from the Users, one to be a student, and the Director of the Field Station. There were no government members on this committee but we retained a close and cordial relationship with several government departments.

In August, we prepared an updated policy statement¹¹⁵ for discussion at the November meeting of the Advisory committee.¹¹⁴ The statement dealt with the purpose of the Field Station, its administrative structure, development, use priorities, courses, vehicles, boats and other equipment.

Nan Mulder retired in October. Nan had been a dedicated member of staff since 1967, living on site and keeping the day-to-day operation of the physical plant running smoothly. We were never without drinking water which he assiduously brought from Portage on a regular basis, and if we got stuck on the muddy road or in the marsh, Nan always pulled us out speedily. He had a passion for weather records and had never missed a day's recording. We thus enjoyed an enviably complete series of weather observations. Indeed, at his farewell dinner, Nan received presentations from both the Meteorological Office and from the staff and students at the Field Station.

By October, we had successfully negotiated a grant from the Sportsman's Show in support of the High School Ecology Program, and, with modest funding from a number of other sources, we were able to appoint Michael Watson as our new Resident Biologist. Mike, a graduate from Laurentian University, had studied small mammal ecology for his MSc. We believed that his experience would enhance our educational and research capabilities. In November, Joe Voll joined us as our Manager and his wife Mary became our cook.

The land use map advocated by the Users committee and developed by Marianne and Jerry was completed and put to use. It showed the separation of areas used for teaching from those used for research. All at the Field Station were urged to respect this separation.

Another Users committee suggestion had been that we should compile a Users Manual. It was thought that, with the increasing complexity of the Field Station operation, it would be helpful to have a booklet of information for residents, be they researchers, students attending courses, instructors or other visitors. As a step in developing a manual, the August preliminary policy statement was discussed in detail at the November Advisory Committee meeting.¹¹⁶

With slight modifications the statement was to be included in the Manual for Users being prepared for distribution for the next year.¹¹⁷ We wished to make the manual as comprehensive as possible and cover rules relating to many topics including accommodation, research, the Annual Seminar presentations, the research summaries for the Annual Report, publication numbers, the signing out of equipment, use of vehicles, use of land, safety, fire, personal valuables, public relations, the library, guests, casual visitors, pets, smoking, alcohol, and accommodation costs.

The Advisory Committee also discussed using Inkster farm as a residence. Manitoba Hydro was willing to hook up power, but they insisted that we provide proof of satisfactory wiring. Regrettably, we couldn't afford to hire someone to check the wiring. The idea was shelved for the time being. We installed a new sign at our entry gate near Mallard Lodge. (Figure 66)

The year saw a number of marsh management reports produced. One was authored by Frank Penner (Department of Mines Resources and Environmental Management).¹¹⁸ His report explored the possibility of diverting up to 200 cfs of water from the Portage Diversion into the Center and East units of the Delta Marsh, between the months of April and November. Another report was written by Dr. Robert Jones, entitled "A Delta Marsh Plan. Recreational Land Use".¹¹⁹ Dr. Jones' report outlined the geography of the marsh, its soils, vegetation and fauna, and discussed the



Delta Marsh Field Station

Figure 66. Field Station sign.

recreational potential of the area. Next came C. K. Smith's "Recreational Land Use of the South Shore of Lake Manitoba."¹²⁰ This report recommended, among other things, that a special designation of "Provincial Shoreline" be legislated, that the Provincial Government should purchase the Municipal campground at Delta, that the area west of the campground, (ours!) should be examined for expansion of public use, that a public education program be initiated to explain the fragility of the dune ridge, and that the importance of the existing land use at the DWRS and the UFS(DM) be given special consideration.

Such governmental concern about the marsh resulted in the re-activation of its Technical Advisory Committee of which I had been a member. The Advisory Committee produced a report and recommendations dealing with marsh management which was presented to the government in August.

I also participated in the early development of the Marsh Ecology Research Program (MERP) by the Delta Waterfowl Research Station.¹¹⁴ The program was to be initiated in 1979 and continue for a decade. I was very sorry not to have the time to be actively involved in this marsh research, but I knew that I had more than enough to do at present, with running the station, teaching in Botany and Landscape Architecture, being president of the Canadian Botanical Association and under the burden of an enormous backlog of papers to write.

1979

The Field Station buildings were surrounded by snowdrifts up to fifteen feet high when I greeted the first incoming students on May 3. The thought crossed my mind that we needed an effective snow plough! The Diversion had been flowing at capacity since mid-April and water was still running in torrents over the outlet sill. Mercifully, the Diversion did not rupture or overtop the west bank, but the provincial gravel road from Oakland (Highway 227), our only means of access, was, in several

places, in an appalling condition. To reach the Field Station along this road was now quite a challenge. It had become a single track which was firm and hard in places. But when driving along, these sections of the road, suddenly, without warning, became thickly covered with mud. More often than not, vehicles became stuck in the mud, blocking the road for others. The occasional passing pick-up truck was a godsend, but many of us had to walk up to 10 km (6 miles) to the Field Station for help. (Figure 1)

Mike Watson collected the meteorological data daily and oversaw the use of the Field Station property following the map prepared by Marianne and Gerry. The map delimited the areas to be used during courses and during the High School Ecology Program. A 100 x 100 m grid was drawn on the map to correspond with the beach ridge markers installed in 1977 by David MacKenzie. These grid references have been routinely used by Dr. Sealy, his students and others, and replaced several times over the years.

Mike also began to make study skin collections for birds and mammals. We also obtained permits for collecting certain protected mammals and salvage permits for migratory birds. Mike designed specimen data cards in order to document the approximately 30 animals that became the nucleus of our study collection.



J. M. Shay

Figure 67. Aerial view of *Phragmites* burn plots set up by M.Sc. student Don Thompson, 1979.

In addition to working with the mammal and bird collections and with an assistant, Mike capably ran the High School Ecology Program in May, June, September and October. Twenty three schools and 473 students participated.¹²¹

In comparison with last year, our summer course enrollments declined. This was despite the fact that we had produced and widely distributed a one-page leaflet outlining our Summer Session courses and Continuing Education weekends.¹²² Indeed, numbers were sufficient for only three summer courses (Introductory Ecology, Taxonomy of Vascular Plants and Marsh Ecology) to occur (*Appendix Table 2*).

However, the Continuing Education weekends ("Arctic Style Winter Camping," "Bird Behavior," "Building Log Houses," "Wildlife Photography," and "Painting and Drawing in the Marsh") were as popular as ever, attracting a total of 113 individuals.

Eight research projects were carried out, five by graduate students (*Appendix Table 1*). One project, on the effects of fire on reed regeneration was started last year by Don Thompson. This year Don laid out study plots (*Figure 67*) and carried out his first controlled burn. (*Figure 68*) Research continued on vocalizations in wetland birds, parental care in Yellow Warblers, and feeding and aggressive behaviour in Northern Orioles. Mike Watson studied small mammal ecology and set up phenology plots in order to make the

collection of phenology data more systematic, and monitored them over the season.

Physical Education kindly lent us nets and volleyballs which proved to be a popular source of recreation.

There always seemed to be a backlog of jobs awaiting attention. We did, however, construct a canoe dock in the Blind channel and relocate the fence at the north end of the Diversion in an attempt to reduce public access to the lake shore. We added insulation to the attics in Mallard Lodge, Criddle and Wardle and painted or stained all buildings. This improved their appearance plus, we hoped, helped prolong their life.

I taught a Marsh Ecology course in July, using our new course number, as well as the graduate Landscape Ecology course in September. After September, I relinquished the day-to-day running of the Station to Dr. Tom Booth as I had been awarded a sabbatical leave.

During the winter, Clandeboye dam was removed, an act we presumed, in preparation for a new management plan.

1980

We thought that finances in 1979 were tight but they were nothing compared with 1980. This was a woe-ful year of financial problems, budget cuts, increased fees and low course enrollments. In almost every as-

pect of our activities, the picture appeared bleak. Only six research projects took place (*Appendix Table 1*). Three graduate projects completed their field studies: the foraging behaviour of Northern Orioles, parental care and feeding in Yellow Warblers, and the effects of fire on *Phragmites*. Another, on vocal behaviour in wetland birds, expanded its scope. Dr. Sealy's work on ecological relationships in birds on the forested ridge increased to include more species while studies of small mammals continued. Dr. Bruce Falls (University of Toronto) was with us for two weeks



J. M. Shay

Figure 68. Experimental burn on *Phragmites* plots set up by Don Thompson, 1979.



J. M. Shay

Figure 69. Dr. Tom Shay and archaeology students collecting rhizomes.

and his assistant continued his investigations into vocalization in meadowlarks throughout the rest of the summer. Dr. Gordon Robinson guided a BSc thesis student in her study of the effects of light on epiphytic algae growing on artificial substrates.

Enrollments in Summer Session courses were so low that all of the courses we had proposed were canceled (*Appendix Table 2*). Other biological stations across North America reported similar problems. We learned that, at many stations, only courses that offered bursaries or other financial incentives actually took place. Thankfully, the pre-term and fall courses, being compulsory parts of set programs, did not suffer in the same manner. Landscape Ecology and Field Ecology both had a full complement of students¹²³ and Plant Ecology, Prehistoric Human Ecology and Archaeological Analysis spent weekends at the Field Station. (*Figure 69*) We were very pleased to welcome our first out-of-province university group with Dr. Paul Housley. Dr. Housley and his students came for five days in October from the University of Regina to study cultural geography.

Much to our dismay, Continuing Education substantially increased their workshop fees. We regretted the change but had no control over it. The increase had a seriously negative effect on course attendance. Four weekends attracted sufficient people, though three others did not. Sadly, the number of young people attending these courses dropped dramatically,

presumably because of the increased cost.

The numbers in the High School Ecology Program were also lower than in the past, mainly, we believed, because transportation costs had risen substantially. Though numbers were low, we remained convinced that we provided an excellent program taught by first-class instructors. What we sorely needed during this time of budget constraints was some benevolent agency to underwrite the cost of bringing students to Delta such as the Sportsman's Show and other agencies had done in the past.

Formal instruction may have decreased, but an ever-increasing number of organizations seemed to find our location, atmosphere and accommodation appealing. The Canadian Association of Geographers held their Western Division meeting at the Field Station, the Canadian Nature Federation had a pre-conference tour, and ten other organizations with an ecological focus did the same, as well as ten university faculties or departments.

On the maintenance side, Joe Voll replaced the rotted window frames on the north side of Agassiz, insulated Wardle and deepened the trenches for its water line, while summer students laboriously scraped and painted buildings. We also built up and graveled the south marsh road and enlarged our winter parking area.

Our staff changed again when Lori Matheson resigned to assume her new role as a mother and Mike Watson left in October. In November, I wrote to Dean Bigelow detailing the need for a twelve-month Resident Biologist position at the Field Station. I outlined the duties for such a position and the importance of continuity.¹²⁴

Tom and I again spend the Christmas season at the Field Station as the staff were given this time off. For security reasons, it seemed wise to have someone present on site during this period. While there, we took the weather observations at 8:00 AM every day.

A few days after we had comfortably settled into the lodge, a rather fishy aroma emanated from the water tap in the kitchen. By the next day the smell had grown much stronger so we decided to look into the water cistern in the basement. With a ladder from the barn, we climbed up and peered over the concrete wall of the 8,000 gallon cistern to discover the whole surface of the water covered with dead and rotting fish. A horrifying sight and smell! How did the fish get into the water tank? It didn't take us long to figure out that they must have arrived through the intake hose in the lake. The all-important wire screens must have become dislodged from the mouth of the intake hose while the cistern was being filled. The poor fish had accidentally been sucked in. But no matter how they arrived in the cistern, something had to be done!

Heroically, Tom donned chest waders and entered the stinking water with a bucket and seine net. He filled it with fish and handed it to me over the wall, all the while singing, in a loud voice "I will make you fishers of men!!" I went down the ladder, and outside to dump the fish on the snow at the edge of the lake. Several hours later we had removed the fish and were able to drain the remaining water from the cistern, using a tap on the outside of the lodge.

We then went to Portage with all the milk churns we normally used to bring drinking water, had them filled, purchased gallons of bleach and returned to begin the odious chore of scrubbing down the cistern walls. This operation was repeated until we felt that the cistern was clean. The whole process took several days. In the meantime, we used water from Portage for all our needs.

1981

We could hardly believe it but staff turnover and money problems actually increased in 1981. Indeed, we acquired new personnel in all staff positions except mine. We did, however, manage to have the Resident Biologist position expanded to become a twelve-month appointment. Since it began in 1977, the position had been for only eleven months each year.

The Field Station Advisory Committee met on March 16 to discuss funding for the Station and the urgent, (should I say desperate?) need to secure funds for the day-to-day operation of the station.¹²⁵ I had approached the Winnipeg Foundation and other funding agencies about our grave situation, but without success. Someone even suggested that we prepare a newsletter and public relations package similar to that produced by the Waterfowl Station for fund raising.

The Advisory Committee discussed other pressing issues including the need to increase accommodation fees and the importance of carefully defining the job descriptions for both the Manager and Resident Biologist. We were keen to expand the High School and Continuing Education programs as soon as the new Resident Biologist came on staff.

Another topic dealt with was a Ducks Unlimited proposal. The Ducks Unlimited Delta Marsh Development Proposal had appeared in January.¹²⁶ It recommended that the marsh be divided into five major individually-controlled units by diking and control works. Water levels in each unit could then be manipulated independently of Lake Manitoba. The plan envisaged full supply water levels' each spring. Then, water levels would assume those in Lake Manitoba and remain there most of the time, with draw-downs once in an 8-10 year cycle. It further envisaged the production of 1,400,000 ducks and 1,000,000 muskrats over fifty years, increased spawning of pike and wall-eye, benefits to farmers through flood protection and enhanced native hay production. Direct costs came to \$8.4 million and indirect costs \$6.8 million, amounting to \$15.2 million over fifty years.

These proposals caused considerable anxiety among those university faculty involved in research at the Field Station. To address their concerns, I arranged a meeting with DU biologists to allow them to explain the proposal and answer questions about it. We held the meeting on the evening of April 7, chaired by the Associate Dean, Dr. Isaac. In anticipation of the meeting, Field Station users had compiled a list of questions.^{127,128} DU's presentation raised many more questions from the attentive audience. For example, Dr. Robert (Bob) Newbury, a research scientist and hydrologist, at the Canadian government's Freshwater Institute, in Winnipeg, emphasized that the plan outlined was feasible only as a single use project.¹²⁹ He pointed out that all contemporary water-related projects in southern Canada were multiple use and that the DU plan seemed out-of-date. He hoped that the Province would consider DU as a party-at-large and develop a more comprehensive plan with the DU interest as only one component of the plan. He argued that a pilot project was essential in order to learn how to build dikes, resist erosion and plan for various uses of the marsh. During the ensuing discussion, DU agreed that historical fluctuations in Lake Manitoba had accomplished what they now wished to do with dikes and pumps. Dr. Newbury pointed out that, with suitable supervision at the Fairford River dam, a new regulation pattern, like that envisaged by DU, could

be imposed on Lake Manitoba. It could, for instance, eliminate the highest flood peaks that would affect cottages and recreation use. Compensation to farmers for the occasional flooding of their land would cost but a fraction of the proposed DU scheme. He maintained that a cost-benefit study of re-regulation of the lake, involving hay production etc. was essential and suggested that Federal-Provincial funds were available for such a study. The DU personnel clearly found it difficult to deal with these and many other comments and questions posed by the audience.

We later learned that Dr. Albert Hochbaum, former director of the Waterfowl Station, had been contacted by local farmers in February regarding the DU plan.¹³⁰ In his correspondence, Dr. Hochbaum felt that: (1) the decline in duck numbers was part of a continent-wide decline, pothole drainage being one of many factors and (2), that DU's estimate for duck production were vastly inflated. He pointed out that there was no biological support for the improvements in duck production that had been suggested by DU. He felt that DU's plan erroneously assumed that the reduction in nesting ducks at Delta was due to water level changes since the 1940s. On the contrary, Dr. Hochbaum was convinced that nesting habitat was not in short supply because there was apparently more prime waterfowl nesting habitat than the ducks returning in the spring could use. His previous discussions with DU revealed that their figure of 178 ducks/km² (460 ducks/mi²) were *potential* benefits not expected benefits,¹³¹ and the attainment of such high numbers depended upon many factors not mentioned in the plan.¹³²

In his comments, Lloyd Gamble, an MSc student, thought that the proposal was superficial and lacked much-needed quantitative and qualitative data on biological community structure and composition. Lloyd outlined what he felt would be the impact of the DU plans on Oxbow wood and its mammalian species such as coyote, badger, fox, long-tailed weasel (an endangered species), skunk, raccoon and mink which den along the Blind channel.¹³³

During the question period, the need for a pilot project was again emphasized. A pilot project had been suggested as far back as 1966.

Now that more details of the DU plan had been revealed, many faculty and others had even graver concerns. These concerns involved the intersecting dikes that would be built in the west marsh and the long dike that was to run along the forested ridge between the Field Station and Cram Creek.¹²⁶ During the meeting, several things became clear: (1) that to

re-create periodic Lake Manitoba water level fluctuations as had happened in the past was "politically" unacceptable and had not been considered, (2) that the quality of the water in the Diversion that might be used for manipulating water levels was unknown, (3) that an environmental impact study of the project had not been considered, (4) that the expected increase in ducks was only a "drop in the bucket" when considering the Mississippi flyway,¹³⁴ and (5) DU did not have data to show whether or not its other projects were producing waterfowl to capacity.

After the meeting, I had several conversations about the proposal with Dr. Sandy Macaulay, DU's Chief Biologist, and a former PhD student of mine. I pointed out that in the past I had raised many of the same concerns at the Delta Technical Advisory committee such as the need for an environmental impact assessment of the proposal, the need for a pilot project and the importance of data on water quality in the Diversion. I later wrote to Sandy¹³⁵ highlighting some of the concerns of my colleagues. His response was very critical of the university biologists and their lack of support for the entire concept, and, as he perceived it, the absence of constructive input from university personnel.¹³⁶

Aside from DU's ambitious and controversial plans for the marsh, we had other matters to cope with. Experience had taught us that unexpected problems occurred every year, and 1981 was no exception.¹³⁷ The time between a member of staff leaving and his or her replacement arriving can be particularly taxing. This year we had several such occurrences. Our previous Resident Biologist left in October 1980, but his replacement, Dr. Robert Barclay with his wife Robin, did not join us until late July 1981, nine months later. This meant that the High School Ecology Program had no instructor in the spring and early summer, so we did not publicize it. Despite this, we had a number of requests for school visits. To cope with these we were fortunate to employ Mrs. Helen Lloyd, a demonstrator in the Botany Department, for the month of June.

During the spring, I noticed that Joe Voll never traveled to Portage without his wife. Mary always drove the vehicle and I also noticed that her visits to town were unusually frequent. When questioned about this, it eventually came to light that Joe's driving license had been suspended. He was not allowed to drive on a public highway. Despite this, he was frequently away from the Station for several hours at a time. Now Joe was a skilled mechanic, and repairing farm machinery was one of his specialties. Unknown



R. M. R. Barclay

Figure 70. Dr. Robert Barclay's team collecting bats.

to me, a neighboring farmer's barn had become the focus of his machinery repair side line! I objected to this, but Joe said he was doing these repairs in his own time and complained about me to the Support Staff Union. A hearing was scheduled where we both summarized our concerns. After the hearing, it was recommended that Joe and Mary should leave our employ, which they did in July.

The replacement manager, Ken and Diane May, with their four children, joined us in September. We arranged suitable accommodation in Tyrrell for them and organized school bus pickups for their children.

Thankfully, the research scene improved over the previous year and was blessed with three botanical and five zoological projects pursued by faculty and students (*Appendix Table 1*). Dr. Sealy continued his ornithological research which included the ecological relationships of birds on the forested ridge and the migration patterns in the Least Flycatcher. Other bird studies concerned prey selection in House Wrens, and advertising behaviour in marsh and grassland birds.

A new project on the foraging strategies of insectivorous bats was launched by our resident biologist, Dr. Robert Barclay. (*Figures 70, 71*)

Two studies investigated the influence of herbicides on algal populations (*Figure 72*) and one investigated the vegetation at the north end of the Assiniboine Diversion compared with the adjacent marsh. With assistants I continued the study of fire effects on *Phragmites*.

But, once more, none of the Summer Session courses had enrollments high enough to allow them to take place (*Appendix Table 2*). I suggested that we might co-operate with Brandon University and the University of Winnipeg to avoid duplication of course offerings.¹³⁸ This would necessitate arranging for credit transfers between the three institutions but it seemed an idea worth pursuing.

In other areas our situation was not so bleak. The fall pre-term picture was brighter. Field Ecology and Landscape Field Ecology were both fully-booked. The Paleoclimate Reconstruction course spent a weekend with us, and the cultural geographers from the University of Regina visited twice. Five weekend Continuing Education courses had enthusiastic participants. The number of organizations wishing to hold seminars and workshops at the Station continued to outstrip our ability to accommodate them. Finding staff willing to work at weekends presented a special problem. Nevertheless, we hosted five university groups, one of which was the President's Think-in for Deans, and eleven special interest groups. These included the Annual meeting of the Manitoba Chapter of the Wildlife Society, the Board of the Manitoba



R. M. R. Barclay

Figure 71. Baby bat.



Delta Marsh Field Station

Figure 72. Dr. Gordon Robinson and his graduate student Gordon Goldsborough collecting algae in a duckweed-covered pond.

Naturalists Society, the DU Directors and the International Arctic Char symposium.

The maintenance situation also improved. My request to the university's Department of Physical Plant and Energy Management for advice and assistance with general maintenance culminated in Mr. Robert McDowall taking on this responsibility.¹³⁸ His involvement resulted in a staged plan for building upkeep. It began with "winterizing" Cottage #2 where the Barclays now lived, then replacing the floor in the Bell House, installing fans in several buildings to circulate heat and so on.

At the November Advisory Committee meeting, questions relating to the re-negotiating of our lease with the Province arose. Such negotiations take a long time, and because research projects are involved, two or three years lead time were thought to be necessary. Our lease required clarification regarding our rights to curtail public access along the beach, and the letting of leases for hay cutting. Public access was controlled through the Department of Renewable Resources while hay cutting leases were decided by the Province's Department of Agriculture. For instance, we felt that we should be consulted when haying leases were

allocated. The university solicitor was to look into the lease problems.¹³⁸

In September, I attended the founding meeting of the Canadian Council of University Field Stations in Kananaskis and Robert Barclay went to the annual meeting of the Organization of Biological Field Stations in Rensselaerville, New York. Our Annual Report which we sent to other field stations, was warmly praised. Indeed, others considered our Field Station a success story. I was uncertain as to how we managed to create such a positive impression, but fervently wished that we had such a good reputation at home!

1982

The Annual Seminar held this year on January 23 was as popular as ever. It included a paper by Dr. Bruce Batt outlining the Marsh Ecology Research Program (MERP) being undertaken at the Waterfowl and Wetland Research Station, (formerly the Delta Waterfowl Research Station) and now in its second year.

Despite the economic squeeze, in January we were able to appoint Lucia Flynn as an Administrative Clerk on campus. When Lucia left in August to resume her academic studies, the administration permitted us to hire Joyce Kendric in her stead.

We again prepared two leaflets: one outlined the courses to be offered,¹³⁹ while the other contained research summaries for all the ongoing projects.¹⁴⁰ We distributed both leaflets to students in biology at our university, the University of Winnipeg and Brandon University and to cottages along the beach ridge. We also organized an Open House on July 10. At the Open House, more than 200 people toured our displays and labs, and talked with researchers.

Thankfully, the number of research projects increased to sixteen (*Appendix Table 1*). Four were faculty projects, eleven were undertaken by graduate students and one by an NSERC Summer Scholar. A

particularly pleasing aspect about this year's research was the use of the Station by faculty and graduate students from two other universities, namely Lakehead and Toronto.

Bird studies topped the list.¹⁴⁰ Their topics included: graded signals in the song repertoires of Western Meadowlarks, their song matching in Western Meadowlarks, and factors influencing selection of prey by foraging House Wrens. A number of studies focussed on the ecological relationships of birds in the forested ridge, namely feeding structure of passerines, habitat and year effects on passerine feeding, fall migration and molt in warblers, and nest selection by Brown Headed Cowbirds. Other zoological projects included studies of Acuarioid nematodes of waders and rails and the foraging behavior of insectivorous bats. Botanists investigated the influence of herbicides on algal communities, diatom community development on natural and artificial substrates, the recovery of a reed-dominated community three years after spring, summer and fall burning, and the fungi associated with selected salt marsh plants.

A weekly series of informal seminars in which, one by one, all researchers outlined their investigations, enabled the entire Station community to be aware of everyone's ongoing research.

Robert Barclay, our Resident Biologist, reinstated the High School Ecology Program. He expanded it to include lower grades down to Grade Seven. Our changes in the program proved to be popular with 24 schools and 713 students taking part. We planned to introduce several new exercises for the younger students the following year. In addition, St. John's High School and St. James Collegiate organized their own three-day residential outdoor experience programs.¹⁴¹

We were pleased that summer enrollments increased enough for Introductory Ecology and the Flora of Manitoba to take place. The now traditional fall courses Field Ecology and Landscape

Field Ecology were held at the end of August and beginning of September. Ornithology students came in September and Dr. Paul Housley with his cultural geographers from Regina, again spent five days with us in October.

Two Continuing Education courses, "Winter Survival" and "Nature Photography" were the only weekends that were fully booked, and courses now had to be fully booked in order to take place. Judy Hay, who initiated the Marshland Series of the Continuing Education program, retired in September. Judy had become the mainstay of the program on campus and attended many of the weekends at Delta. Her enthusiasm and good humor were an integral part of these stimulating weekends. Considering that Continuing Education would no longer offer the Marshland Series while acknowledging the importance of providing such popular courses, Robert and I took it upon ourselves to organize our own weekend in October entitled "Marshes and Man." We also planned to offer "Winter Survival" and "Bird Migration" the following year.

I again contacted other universities in Manitoba and added the University of Saskatchewan regarding their offerings of summer courses. I suggested that, by avoiding duplicating our offerings and planning for two years ahead, we could perhaps develop a rota



J. M. Shay

Figure 73. Introductory Ecology students collecting insects.

that would garner sufficient students for key summer courses to take place at one of the institutions.

Course enrollments may have been a problem, but maintenance chores never seemed to diminish. In the interest of energy conservation, styrofoam was installed under the Agassiz, Criddle and Tyrrell buildings. A concrete floor was poured in the Bell House and a new septic field was dug for the cottages. Our largest boat, the yawl *Notropis*, was refurbished and made lake-worthy again, and we acquired a small tractor for grass cutting, snow-blowing and other chores. I was amazed that we had survived as long as this without such a useful piece of equipment!

For some years it had been impossible to gain access to the Blind Channel because the linking ditch was completely overgrown with pondweeds and reeds. Anyone who used the Blind Channel had to carry their canoe to, and launch it from, the Portage Country Club dock. This situation was inconvenient, to say the least. At last, we had enough funds to hire a back hoe and dig out the ditch that led from the Field Station to the Blind Channel. Once this was accomplished, we built a small dock along the new ditch near the Station. Canoeing to the Blind Channel after this became quite a pleasant experience.

We offered to participate in the Portage Regional Work Activity Training Program, which provided us with some free labor. A very helpful supervisor and trainees assisted us to, among other things, remove all the old paint from Tyrrell and Criddle prior to repainting them.

As a safety procedure, we instituted a sign-out scheme for vehicles, boats and canoes, and appointed one of the residents as a Fire Officer.¹⁴² Fire drills had become a periodic occurrence and now we all knew how to operate the hoses and fire escapes.

In September, the Provincial Government launched a Manitoba Marsh Heritage Program to conserve Manitoba wetlands. It was a co-operative effort involving the Department of Mines and Natural Resources, DU, the Manitoba Wildlife Federation, and the Manitoba Naturalist's Society. Its aim was to conserve marshes and educate the public about their value.¹⁴³ On the international scene, the Delta Marsh became designated as a Ramsar site, a wetland of international importance under the Ramsar Convention.¹⁴⁴

It was a pleasure to have Robert and Robin Barclay with us during the year. Robert was involved in teaching at all levels from high school to graduate students. He had successfully continued his bat research program, often aided by Robin, and had also set up a

series of permanent transects in fields north of Inkster farm. These fields were formally hay meadows, but the hay leases had recently been changed and hay was no longer cut. This allowed us to monitor the secondary plant succession that usually takes place in such "old-fields." This year the Introductory Ecology course collected data along these transects, on the floral composition, species density, and biomass, as well as data on insect and small mammal populations in the adjacent fields. Specimens gathered were added to the small mammal and bird skin collections and to the herbarium, and an insect collection was started.

At the November Advisory Committee meeting,¹⁴⁵ Dean Isaac astonished us with the news that the Field Station might close in 1984! Apparently, the Federal and Provincial governments were contemplating canceling their cost-sharing agreements with the university. The Faculty of Science had to cull \$250,000 from its budget. The Field Station was deemed to be an identifiable unit within the faculty and thus had been put on the budgetary "chopping block." However, because our current lease with the Provincial Government did not expire until 1988, the university had an obligation to keep the property until then. In the meantime, Dr. Isaac said, it was important the Field Station operate with a positive attitude! We wondered what encouragement was there to do this?

A cheering note was the news that by the end of the year, thirty students had completed their theses on research undertaken at the Field Station and 96 scientific papers had been published. Was this evidence not sufficient to convince the Administration that the Field Station fulfills a need and has been doing a good job?

1983

Much to our surprise, on January 12, a Ducks Unlimited news release announced that they had indefinitely deferred their proposal for a \$15 million habitat development program in the Delta Marsh.¹⁴⁶ We hoped that, at some stage, a pilot water manipulation project might now be forthcoming.

Although not without some problems, if the threat of station closure could be considered a problem, 1983 was a busy and productive year. The number of people using the Field Station increased by almost 30% over the previous year. We were particularly pleased with the expansion in research together with the number of universities using our facilities. Thirteen researchers from our own university were joined by graduate students and faculty from Brandon, Carleton, and Lakehead Universities and the Universities of Guelph, Ottawa, Oxford (UK) and Toronto. This

made for a fine mix of research projects. Seventeen of these had a zoological focus while six were botanical in nature (*Appendix Table 1*).¹⁴⁷ One project described the projectile points that had been found along the beach in front of the Field Station.

Researchers put a great deal of effort into their displays for the July Open House, but the event was virtually rained out by a torrential downpour. Even so, more than fifty intrepid souls braved the weather, and had one-to-one conversations with the researchers in their labs. During the summer, the students again organized the weekly informal research seminars.

We tried to emulate a series of weekend courses like those organized by Judy Hay in her Marshland series, but we had two problems: one was to find suitably-talented instructors, the other to effectively publicize the offerings. We realized, again and again, what an excellent job Judy had done. Despite our difficulties, we were able to organize a successful survival course in January. We also had full enrollment for the spring "Bird Migration" weekend, but the course had to be canceled because of dreadful weather.

For summer courses, we offered Introductory Ecology in June, earlier than during the normal Summer Session in July and August (*Appendix Table 2*). By scheduling it earlier, we had hoped to attract more students though enrollment did not increase. The Ornithology course followed it. In August, the Flora of Manitoba and Topics in Field Biology were held, but all four courses had only a combined enrollment of 27 students, just over the minimum. Summer Session rules stated that a course could only run if there were at least five participants.

Our pre-term Field Ecology and Landscape Field Ecology maintained their popularity as did the fall term weekends in Ornithology and Prehistoric Human Ecology.

We again had several staff changes. Ken and Diane May left in March. Ken was replaced by Terry Ostrowski and, for the next four months, we survived meals prepared by a rather eccentric cook who went home one weekend in July and never came back! In some ways this was a blessing though we did not find a suitable replacement until September. The cheerful co-operation of our other staff and friends carried us through August.

University finances were still uncomfortably tight. Rumors that the Field Station might close in order to enable the Faculty of Science to balance its budget kept resurfacing. Clearly, we had to find additional sources of funding. A Planning Committee, chaired by the university Associate Vice President (Research),

Professor Vaisey-Genser, was set up to locate potential sources of funding for us. The committee found this very difficult, but encouraged us to apply for a Natural Sciences and Engineering Research Council (NSERC) Infrastructure Grant. As part of the application, we needed to show that we had security of tenure over the site we occupied. This involved a request to the government to renew our lease for another 21 years. We put together what I thought was an impressive grant application.¹⁴⁸ All this fund-raising activity seemed surreal when closure was constantly at the back of our minds.

In compiling the necessary information for the grant application, I reflected upon how much more complicated the domestic side of the operation had become. Because of union rules, it was now not permissible for a cook to prepare breakfast at 7:30 or 8:00 AM and also the evening meal at 5:30 PM because this involved more time than a normal working day. We either needed two cooks or sufficient money to pay one cook overtime. Gone were the days when Gertie Mulder would cook breakfast, prepare lunch and supper and take time off when she felt the need to, retiring to their apartment to relax.

In spite of the threat of closure, we were able to add another building to the station. After lengthy discussions with the administration we managed to secure enough funds to build another, much-needed, third faculty cottage. Pre-packaged summer cottages had proved to be the least expensive type of accommodation available. Cottage #3 was erected just north of the drive to the front door of Mallard Lodge.

In the spring, Robert Barclay was awarded an NSERC University Research Fellowship. I was very pleased for him although the fellowship would preclude him from undertaking any Field Station administrative responsibilities. Robert could no longer meet and greet visitors, input weather data into our new computer or help me in the many ways that I had become accustomed to. I made a plea to the Dean of Science, Dr. Bigelow, to allow the Field Station to keep the budget item that had covered Robert's salary. I felt that it was essential that we be allowed to employ someone to undertake responsibilities such as the schools program, that Robert had to relinquish.¹⁴⁹ Thankfully, Dr. Bigelow restored the budget item the following month, from his special academic funds.¹⁵⁰ Unfortunately, this restoration was only temporary, as we learned later.

We were able to have Robert continue with the schools program by providing him with technical help to offset his involvement. In the spring and fall,

fourteen schools visited the station. The majority of the students were in Grade Nine and more of them came from rural schools than formerly. The program was no longer called the High School ecology Program because we now accommodated Grades 7-12. Unfortunately, ten schools had to cancel their trip because of transportation difficulties, mainly the cost of buses. Would that the Sportsman's Show was still sponsoring school trips! St. John's High School and St. James Collegiate again organized their own three-day visits.

Winter outings of three or four days were increasing in popularity and three schools took advantage of this experience. Several Cub Scout and Girl Guide groups spent a day investigating the flora and fauna of the marsh.

The American Institute of Biological Sciences, in conjunction with the Canadian Botanical Association, held an overnight field trip at the Station prior to their June conference in Grand Forks, North Dakota. Twenty one participants from across the US and Canada canoed through the marsh, had the opportunity to see a variety of marsh and dune ridge habitats and learned about our on-going studies. Researchers gave illustrated talks on the flora and fauna of the area and the Waterfowl Station organized a tour of their facilities.

In May, Drs. John Livingston, and Bill Gunn came from the CBC in Toronto to record bird songs. They showed us some of the techniques they use and impressed us with the patience required to capture elusive calls.

Student researcher Iain Suthers prepared a complete collection of fish found in the marsh, the insect collection was increased and proper display cases were obtained. Peter Balagus, a skilled taxidermist, prepared a number of mammal skins and mounts.

Robin and Robert Barclay became the proud parents of a son, Graham.

1984

Despite the continual rumors of our imminent closure, the news in May that we had been awarded an NSERC Infrastructure grant of \$30,000 was extremely cheering. The funds could enable us to improve our research facilities, compile environmental data in a more systematic fashion and also contribute to cost sharing a number of staff positions. NSERC was, however, critical of the amount of money we had requested given the limited use of our facilities by researchers from outside the University of Manitoba.

More good news came with another increase in use of the station to an all-time high. Twenty two

research projects involved scholars from five universities (Carleton, Manitoba, Ottawa, Queens and Toronto) (*Appendix Table 1*).¹⁵¹ Sixteen of these were zoological while six were botanical.

At this stage, Dean Bigelow felt that a review of the Field Station's activities and needs was required, so, early in the year, he set up a committee chaired by Associate Dean Peter Loewen.¹⁴⁹ It included Dr. Gordon Robinson from Botany, Dr. Jack Gee from Zoology and myself. The committee's report was due in January 1985.

In March, the Field Station Advisory Committee spent a long time discussing the draft lease. Two clauses had been added. First, the Water Control Branch would advise us before there was an overflow of the Diversion. Second, hay rights now showed the Field Station as Lessor not Lessee. This meant that we could make decisions about when hay cutting occurred and would be able to recover money from hay cutting. Also, a clause was added to ensure that the university could terminate the lease.

At the November Advisory meeting it was reported that the lease had been hastily processed by the government, because our next NSERC grant application required us to have security of our site. The lease was now with the university's Administration for ratification.¹⁵²

Three members of the NSERC Infrastructure Grants committee, accompanied by Dean Isaac and Mr. Jacobs from the Office of Research Administration, visited us on July 23. The group spent a considerable time examining our budget, inspecting the labs, living quarters and kitchen and talking informally to many of the graduate students and staff. We made it clear to the visitors that this NSERC grant could not solve all of our problems as we still had an extensive list of requirements. Our list included a small outboard motor, blinds for the labs, a telethermometer, insect cabinets, ovens, reading lamps, carpets for the Common Room and Cottage #3, compound microscopes, bicycles and shower curtains!

Despite our best efforts, the weekend course program continued to struggle. Dr. Rick Riewe's "Winter Survival" and Dr. Bob Jones' "Bird Migration" courses were the only weekends for which we could find suitable instructors.

During the spring, fifteen schools, many of them now regulars, took part in the Schools program organized by our Resident Biologist, Robert Barclay. As mentioned earlier, in order to compensate Robert for the time he spent with the School's program we provided him with technical help by graduate stu-

dents.¹⁵³ Fortunately, transport did not seem to pose a problem for the program this year. As usual, St. John's High School, and St. James Collegiate ran their own outdoor education programs, and Sisler High School did the same.

Armed with his NSERC grant, Robert applied for a position in the University of Manitoba's Department of Zoology. I thought he would be a shoo-in, but this was not to be. I think I was as shattered as Robert was when he did not get a job. But before long, he had secured a position in the Biology Department at the University of Calgary. So, in August, and with great reluctance, we said good-bye to the Barclays. Robert's perennial good humor, enthusiasm and innovativeness in research, plus his teaching skills had been a valuable part of life at the Station for the past three years, and his wife Robin had shown a consistent interest in all our activities. With Robert's departure, despite our expectations, we lost the funding for the Resident Biologist position.

Notwithstanding our hopes for a twelve-month Resident Biologist, we were eventually allowed to advertise for an eleven-month Biological Technician. Although better than nothing, I heartily disliked these less than full-time positions. An incumbent undoubtedly feels insecure, and anxious about getting a job at the end of the eleven months, and we are deprived, when they depart, of the experience they had gained while with us.

Nevertheless, we were pleased that Sandra Gadowski joined us as a Biological Technician in July, and had a little time to overlap with Robert. She became responsible for the maintenance of scientific equipment, the weather records and other data, and was to develop the insect collection and to help with the schools program. To this end, in the late summer and fall, she carried out insect sampling using sweep nets, and pan and Malaise light traps, all kindly lent us by the Department of Entomology. She also spent some time identifying specimens in Entomology on campus.

A wide variety of groups used our facilities for seminars and workshops. Included were several University of Manitoba departments, namely Math and Natural Science in the Department of Education, Physical Education and Recreation, and St. John's College. We also welcomed Nature Travel from Toronto, the Winnipeg Education Center, the Winnipeg Gliding Club, the Manitoba Naturalists' Society, Prairie Pens, the Portage Arts Council, the Federal Department of Fisheries, and the Winnipeg Department of Education.¹⁵¹ It was good to have visitors but for all these visits we had to find staff. More often than not, I had

to rush out to the station on a Friday night, after my lab that finished at 5:30 PM, to meet and greet the visitors and keep an eye on the weekend activities.

With the withdrawal of funds for the Resident Biologist, the Review Committee discussed the possibility of establishing a newly-defined Manager's position with an office at the station. This new position might replace the present Caretaker/Manager post presently under review by Employee Relations. As I was convinced that such a position was essential, I drew up a potential job description. I felt that a Manager should be responsible for (1) the smooth day-to-day operation of the Field Station and (2) ensure that maintenance tasks were carried out and participate where necessary. Furthermore, the Manager should (3) perform an "Inn-keeper" role, allocate accommodation for staff, students and visitors as well as (4) interact with visiting groups and serve their needs during their stay. In addition, the Manager should (5) hire seasonal staff, establish workloads and supervise work, and be responsible for providing and keeping inventories of supplies and equipment. In order to ensure maximum use of the facilities, he/she would (6) organize non-credit programs and workshops and their publicity. He/she would (7) liaise with the local community and the Waterfowl and Wetlands Research Station, and perform other related duties as required. I thought this description showed how much a Manager was needed. I had made several appeals previously to the Dean for funds to support a Resident Manager, remembering the days when Barry Wallis was my right-hand man to whom I could delegate numerous tasks. The fact that I was told that I was doing a "fine job" and that help was not available, did not alleviate the pressures I felt I was under. I taught in both Botany and Landscape Architecture, and had several graduate students as well as running the Field Station!

Slowly, our range of scientific equipment was improving. This year we purchased two water-level recorders, one to use in Cram Creek the other in Forster's Bay (*Figure 8*) and a Licor Solar Monitor was installed at the Campbell Stokes solarimeter.

Once again, we had problems with local fishermen. Dr. Gee's fish research became disrupted by the activities of bait fishermen who operated at the mouth of the Diversion. They were not happy when we asked them to move from that location, but Dr. Gee could not realistically continue his research in the face of such disruptions.

Our growing library collection was further enriched by reprints collected by the late David MacK-

enzie, a former graduate student, and by field guides from the estate of Dr. Josephine Rauch.

The Annual Seminar was held over two evenings in January in the slots allocated to departmental seminars in Botany and Zoology.¹⁵¹ These and the Open House, provided participants with an opportunity to outline their research to a diversified audience that included university Chancellor Mrs. Isabel Auld. The informal summer seminars that had become a tradition, did not occur, but were replaced by more formal presentations by guest speakers. We hoped to resurrect the informal seminars the following year.

The Introductory Ecology, Flora of Manitoba and Animal Populations courses were held during Summer Session (*Appendix Table 2*). Landscape Field Ecology and Field Ecology occupied their usual pre-term slots and Ornithology and Manitoba Prehistory visited us for weekends in the fall.

Two graduate students, Gordon Goldsborough and Heidi den Haan organized a T-shirt logo contest for which Peter Christie produced the winning design. Terry Ostrowski and his wife Sue had a son in September.

At the end of the season, the Users committee had a lively discussion¹⁵⁴ of pressing issues. These covered a wide range of topics such as improved accommodation for graduate students, the septic field and water supply and conflicts between teaching and research. In view of the fact that we had secured some funds for student accommodation, a good water supply and effective septic field became our top priorities.

On reflection, I felt that the Field Station seemed to be thriving, accepted as a valuable unit within the Faculty of Science and had NSERC support. It was a "going concern" and so could presumably be taken over by someone else. The new Director would, hopefully, enjoy a reduced teaching load and perhaps would be successful in securing funds for a manager. After considerable thought, I informed the Dean that I would resign as the Director in the fall of 1986.

The Annual Report¹⁵¹ showed that 35 graduate theses and 133 two-refereed papers had now resulted from work at the Field Station.

1985

Several encouraging things happened in 1985. Firstly, the Field Station Review Report¹⁵⁵ endorsed the role of the Field Station. Secondly, we were awarded a three-year NSERC Infrastructure grant of \$25,000 a year. The Review summarized the Station's history, recommended some changes in staffing and provided a schedule of priorities for facility development. To

employ a Manager was deemed to be more appropriate than a Resident Biologist. The Report stated that those who would benefit from such an appointment were: the caretaker responsible for maintenance; a technician responsible for routine scientific work at the station; the secretary responsible for secretarial duties on campus; the cook housekeeper responsible for supplying meals, and I might add, the Director!

The most pressing problems identified in the Report were the need for a new septic field for Mallard Lodge, as the present field was leaking. We also needed a better water supply, something that had been discussed for many years! Another requirement was an improvement in space for graduate students. Complaints had been received about crowding, with up to three or four students sharing some bedrooms. When courses were running, research space was often in critically short supply. General maintenance was also an area of concern. Present university policies dictated that Physical Plant and Energy Management would not maintain any off-campus buildings. This placed greater demands on the station budget than was the case for departments on campus. The Report added that it should also be remembered that most of the station buildings were old, and being used for purposes other than those for which they were designed. Continual repair of roofs, window frames, water and sewage systems etc. was therefore necessary.

Although funding was uncertain, the Review Committee recommended the following schedule:

1984-85 Survey and septic field up-grading; if funds allow, install up to four single person units for additional graduate student accommodation.

1985-86 Complete graduate student units and build a wash house with showers, toilets and wash basins.

1986-87 Construct a building similar to the East-West labs (now named Jennifer Shay labs) for research.

1987-88 Construct additional accommodation, perhaps four single units.

1988-89 Construct a lecture-seminar room to eliminate the need to use the common room for lectures.

The committee also recommended that non-credit weekend courses continue, the High School program should be promoted and a small user fee (perhaps \$1/student) charged, and that winter weekend use should be encouraged. With respect to summer courses, they pointed out that, at present, summer courses at the Field Station depend on the Departments of Botany and Zoology. Thus, the station had no control over staffing, course content or enrollments. Unfortunately, departments could cancel their offerings if they have

budget problems or for other reasons. The review suggested that courses at the Field Station should be allocated special numbers and that station fees should be reviewed annually. They also acknowledged that graduate courses could be given at the Field Station. And finally, they recommended a project to collate past data and incorporate it into a program which could be used to co-ordinate future research. My feeling was that all this could only be done with a full time Director or one with a substantially reduced teaching load.

The review considered that the top priority was the digging of a well to provide a potable water supply and installing an improved sewage system. Associate Dean Nora Losey, Mr. Robert McDowall and Mr. Ray Goertz were all involved in the achievement of an assured water supply. It was funded in no small part by our Infrastructure grant. After nineteen years, it was a great relief not to have to pump water from under the ice in winter and to spend so much time washing water filters.

The second outcome was the appointment of a Station Manager. In June, Russ Mead accepted this role and took up residence at the Station in Cottage #2 with his wife Heidi and their two young daughters. Considering his diversified job description, I found it difficult to comprehend how we had survived for so many years without such a person on staff.

During the year, the barn, the Bell house and Cottages #1 and #2 were re-roofed, we replaced the old army bunks in the lodge and carpeted the common room.

Claire Stephensen became the Cook-Housekeeper in January and with her two summer assistants, produced nutritious and attractive meals. One cook worked the morning shift, the other came in the mid-morning and stayed until after the evening meal.

Terry Ostrowski left our employ in December after a series of serious disagreements with the administration of the Field Station and an AESES (Association of Employees Supporting Education Services) hearing.

For the second time, the Annual Seminar was held in February, in the evening seminar slots in Botany and Zoology. The scheduling seemed to be a popular decision judging by the large attendance. Informal seminars also occurred throughout the summer.

Of the 22 research projects, thirteen were bird studies, six were botanical, two involved bats and one involved fish (*Appendix Table 1*).¹⁵⁶ A new Summer Session course entitled "Special Topics in Field Biology, Avian Migration Systems" was held in May (*Appendix Table 2*). It was attended by nine enthusiastic birders,

but "Introductory Scientific Photography" had to be canceled because of low numbers. The Flora of Manitoba attracted seven students in late July, and Field Ecology and Landscape Field Ecology occupied the pre-term slots. Some students cannot afford to enroll in Summer Session courses because they need to work during the summer. Others might find a course they planned to take was canceled because of low enrollment. This is an unfortunate situation because many courses are more effectively taught in a field setting. To have a bursary scheme would benefit both students and the station.

The debut of a winter field trip in the Principles of Ecology course was a great success. The students studied snow depths on the forested ridge, snow temperature profiles, mammal trapping and other aspects of winter ecology.

"Winter Survival" was the only Adult Education course we managed to run. Sandra Gadowski organized ten school visits, and our long-time supporters, St. John's High School and St. James's Collegiate brought 22 and 25 students respectively for four days of outdoor education.¹⁵⁶ Sandra took maternity leave in November, and a month later she and Randy welcomed a daughter. Jim Briskie replaced Sandra on a part-time basis and took the weather readings, carried out winter bird surveys, worked in the library and input data to the computer.

We revised the Users Manual, and produced a pamphlet outlining research projects.¹⁵⁷ Several housekeeping issues kept recurring such as the fact that a number of people had failed to record their telephone calls with the result that the station had to pay for their calls. To install a pay phone would cost us at least \$14,700, which we could not afford.

We were grateful that Mrs. Malaher donated books from the library of her late husband Gerald who had a long-standing interest in the Delta Marsh and was a friend of the station.

More than seventy people attended the July Open House, which we felt was a good way to inform the public of our programs.¹⁵⁸

In November, the University of Manitoba embarked upon a major fund-raising drive. We were asked to produce a wish list. Among other things we included a caretaker's cottage, two freezers, ten bicycles, ten dissecting microscopes, two Apple printers and a digital balance.

We made some changes to our accommodation. In order to reduce crowding, we removed a bed from each of the four-bedded rooms in Mallard Lodge and Criddle. We were still short of single rooms, faculty

accommodation and research space. The fear of closure had thankfully diminished but in order to justify expansion, we needed sustained use. Unfortunately, no one seemed to know how to achieve this.

1986

We began the year with a request from the Dean's office for a detailed justification for every item on the wish list we had prepared in December. We thought that we had done this already! We had to rearrange our priorities because our financial situation had become complicated. Owing to the early onset of winter, the water supply installation had not been completed and thus the designated funds had not been used. This necessitated a re-shuffling of priorities but gave us the opportunity to make unexpected purchases using the water system money. However, we needed assurance that funds would be available in the next fiscal year to complete the new water system.

Coping with these unexpected events consumed a great deal of time as did the planning of a series of Continuing Education weekends. Dr. Spencer Sealy offered to organize a bird migration weekend, Dr. Len Sawatski planned to present one on agricultural land use conflicts, Dr. Tim Ball, a weekend looking at historical documents and climate change, Dr. Terry Galloway, "An Introduction to Marsh Insects", Dr. George Lammers, a course on "Pleistocene Geology and Sedimentary Fossils", and I undertook to offer a weekend called "The Story of the Marsh."

For a variety of reasons the weekends that actually occurred were entirely different! Three were in the spring: a Haley's comet watch organized by Brandon University, "Nature Photography" with Robert Taylor and "Bird Migration" with Dr. Robert Jones. In September, blessed with beautiful weather Clarence Tillenius held a "Painting from Life" weekend. All these talented instructors were most generous with their time and expertise.

Twenty three research projects used our facilities (*Appendix Table 1*). Some projects were of short duration while others lasted from April until October.¹⁵⁹ Seven had a botanical focus and sixteen were zoological. The universities of Alberta, Calgary, Guelph, Ottawa and Manitoba were represented. Three projects involved PhD students and another PhD candidate from Berkeley, California visited us, five were MSc students and one an NSERC Summer Scholar.

Jim Briskie continued in his role as a part-time Biological Technician from January until April. He enthusiastically assisted with weather records, data analysis and undertook a winter bird survey as well as

looking after several school groups. Sandra Gadowski decided not to resume her position as our Biological Technician at the end of her maternity leave. This initially affected our ability to offer the Schools program. Nevertheless, we were successful in securing three government of Manitoba Careerstart students, each for four months. One student, Fernand Saurette, came on board to provide a schools program. He also took the daily weather readings, recorded phenological data, repaired the Station's field equipment, kept the labs in a ship-shape condition and assisted researchers when they required short-term help. We benefited from the other two CareerStart positions by employing one as a maintenance and the other as a domestic assistant. These extra pairs of hands were of great help throughout the summer. St. John's High School, St. James's Collegiate and Daniel MacIntyre High School all organized their own programs at the station.

The University of Manitoba Department of Interior Design ran a week-long Manitobarts course in May and presented us with a set of color slides illustrating their work. The Principles of Ecology course attracted nine students but it was the only Summer Session course with enough enrollment to run. Unfortunately, one department actually withdrew all its summer offerings. This action greatly inconvenienced some students, adding weight to our desire to have a say in the courses offered at the Station.

The Annual Seminar in March was well attended as were the four seminars given during the summer.¹⁵⁹

After Terry Ostrowski left, we continued our discussions with Employee Relations who advised us to appoint a resident maintenance person rather than a caretaker. John (Dick) Convery took up this position on April 1, and was joined by his wife Karen and their two children at the end of the school year. Their interest in all our activities was soon apparent by their enthusiastic participation. During the three months from January until April, when we had no caretaker or maintenance person, we were indebted to Russ Mead who willingly undertook many extra tasks to keep the station running smoothly.

In August, we sadly said good-bye to our secretary Joyce Volkens who had been promoted to an Administrative Assistant with Continuing Education. A capable secretary such as Joyce was of immeasurable value to someone in my position. Pat Gutowski was happy to accept this role.

Progress was made in organizing a group that might be called "The Friends of the Field Station."¹⁵⁹ Several biological stations have found such a group to be invaluable. Among other things, we could fore-

see our "Friends" using our facilities for special programs, they might produce a newsletter for interested individuals, solicit funds for the library, for bursaries and scholarships and help to publicize our activities. During times of severe financial constraints and rising costs of courses, student bursaries and scholarships become increasingly important. A meeting of potential Friends of the Field Station was planned for the summer. It was suggested that we continued to name buildings after famous naturalists and that Cottages #1, #2, and #3 be called Hind, Franklin and Ellis, respectively.

In early September, we celebrated the 20th Anniversary of the Field Station. We were delighted to welcome three people who were actively involved in the discussions that led to the foundation of the Station. Dr. Harry Duckworth (then Vice President of the University of Manitoba), Mr. Stuart Anderson (then Deputy Minister of Mines and Natural Resources in the Provincial Government) and Dr. Albert Hochbaum (then Director of the Delta Waterfowl Research Station). (Figure 74) An interesting program was enjoyed by more than eighty of our friends. A brief welcome was followed by a talk entitled "The role and importance of Field Stations" by Dr. Raleigh Robertson the Director of the Queen's University Biological Station. A review, by Dr. Eville Gorham from the University of Minnesota, of his long-term research on sedge productivity came next. A poster session by graduate students and faculty of their on-going research, led people to the labs where there was much lively discussion. In a marquee erected near the dining room we all enjoyed a splendid buffet luncheon and the opportunity to socialize.

After lunch, Dr. Robertson again took to the podium to talk about his tree swallow research. This was followed by another poster session, and I gave a slide presentation about the Station's early days.



Delta Marsh Field Station

Figure 74. Field Station 20th anniversary celebration. From left to right: Dr. Albert Hochbaum, Mr. Stuart Anderson, Dr. Jennifer Shay, and Vice-President Dr. Harry Duckworth.

After a social hour and dinner we reconvened to hear Dr. Gordon Robinson, Dr. Spencer Sealy and myself talk about the past, present and future research of our students and ourselves. Over the past 20 years, 37 students had earned their graduate degrees with research carried out the Field Station and 167 two-refereed papers had been published.

During the final event of the day, I was presented with a magnificent painting of Inkster Lane by Dr. Hochbaum. This heralded my impending resignation as Director of the Field Station to take effect at the end of the year.¹⁶⁰ Quoting from the 21st Annual Report¹⁵⁹ "The University Field Station and those associated with it, have been an integral part of my life for more than two decades. Though we have experienced many vicissitudes, we have made considerable progress to the point where our facilities and programs have greatly expanded. I appreciate the help of all those who have contributed to this effort, especially my husband Tom who has supported me with unfailing enthusiasm throughout. I am also grateful for the many friendships that I have made along the way. My fervent hope is that the Field Station will continue to make an important contribution to research and education for many decades to come."

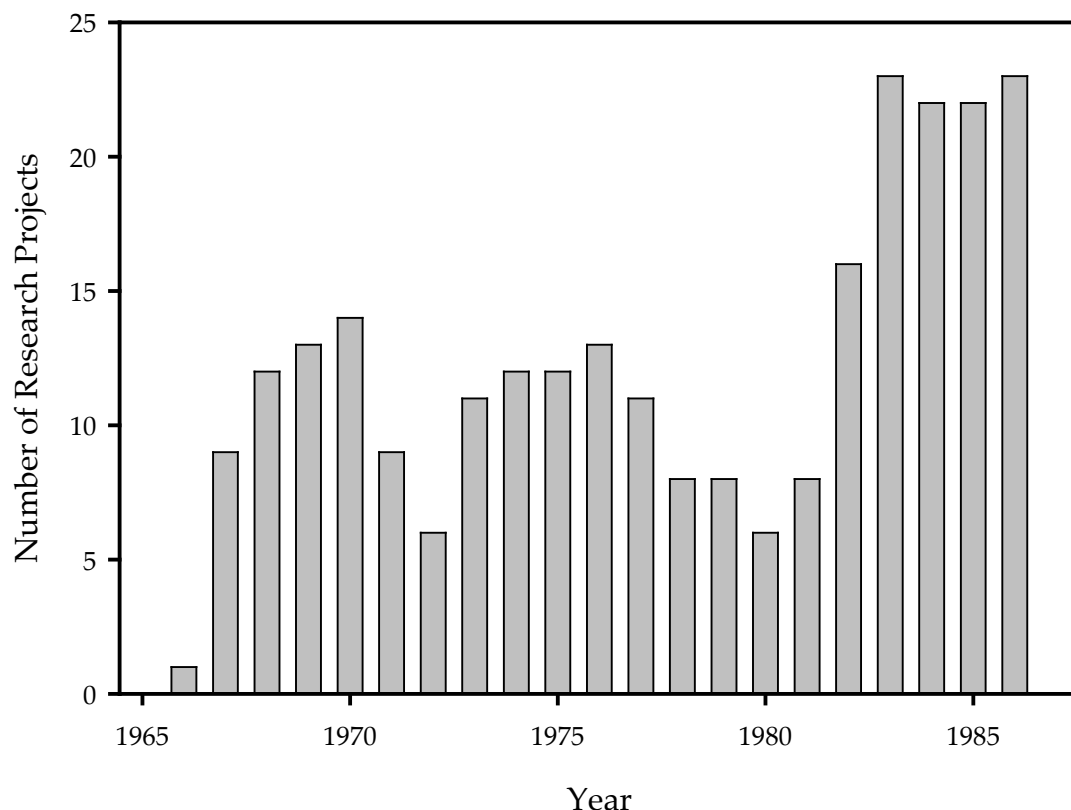


Figure 75. Histogram of research projects undertaken at the Field Station between 1966 and 1986.

Concluding Thoughts

Looking back over the first twenty years of the Field Station, we can celebrate a number of things. Despite many predictions that a field station in a marsh could never survive and that our efforts were doomed to fail, we actually survived. Not only did we survive, we prospered.

Initially, we aimed to provide facilities for research and training and co-operate with the Delta Waterfowl Research Station and other agencies in promoting research in freshwater marshes. Accordingly, we strove to develop the best facilities our resources could provide and promote ties with the Waterfowl Station, Provincial Government and other agencies.

Research was one of our prime aims, with the number of projects growing from one in 1966 to 23 projects in 1986. Over the years, however, the number of projects fluctuated widely, (*Figure 75*) governed, in part, by the availability of funds and supervisors. Unfortunately, we had no control over these factors. Nevertheless, 37 theses (4 BSc, 26 MSc, and 7 PhD) were completed and 167 papers published in two-refereed journals based on research carried out at the Field Station.

Our intention in undergraduate and graduate training was to develop a variety of high quality hands-on courses. We offered some courses such as

Introductory Ecology and Field Ecology many times but others including Phycology only once (*Table 1*). Summer Session courses took place entirely at the Field Station; others partly at the station and partly on campus. As with research projects, the number of credit courses varied widely from year to year. (*Figure 76*)

In addition to research and credit courses, we offered a variety of exciting programs for schools and the public. School visits usually involved field

exercises in both marsh and forested ridge habitats around the station. Students sampled vegetation, pond life and small mammals as a means of understanding the nature of forest and marsh ecosystems. More than 6,000 pupils experienced such a day in the marsh. We offered a number of workshops so that teachers could more confidently take their pupils into the field. We also hosted a wide variety of short courses for the public (*Table 2*). These weekends became popular and some, such as winter survival, were always fully subscribed.

The station became involved in further educational endeavors. Because I believed that written and verbal competence are important elements in any student's education, we organized annual seminars for researchers to report their findings. Their presentations became a permanent record in our annual reports which we circulated to members of the Organization of Biological Field Stations, to Canadian Field Stations and other interested parties.

The first few years of the Field Station were happy and challenging, despite the almost constant struggle to secure the funds needed to improve our modest laboratories and living accommodation. Without the continued and generous support of the Provincial Government and the university, I doubt if we would have survived.

Since the very earliest days our neighbors, the Portage Country Club, have allowed us to use their property for research projects, providing greater security than we had on our more publicly accessible land.

Over the years, although our financial fortunes fluctuated, sometimes wildly, we gradually became accepted as a viable unit in the Faculty of Science. This was aided in no small part by our securing NSERC infra-structure grants. The latter not only enhanced our credibility, they enabled us to improve our physical plant and staffing.

Judging by my conversations with field station directors across the continent, fluctuating fortunes seemed to plague almost all stations. Despite our individual and joint efforts to publicize our summer courses we soon discovered that we had little or no control either over the number of students in our courses, or the number of faculty and graduate student research projects

But what of the future? A key element at Delta has been an ability to provide individuals with the opportunity to work and learn in the field and experience nature at first hand. The station still offers this opportunity, and it is my sincere hope that it may continue to do so for many years to come. In spite of the many projects already carried out, there are innumerable avenues for future research and teaching, in part because of its diversity of lake, beach ridge, marsh, woodland and prairie habitats.

Field research and training is vital for the future. If we are to manage our natural resources effectively, we need to understand how natural systems work. Our Delta Field Station provides an ideal location in which to accumulate the relevant information. We have shown that teaching and research can be carried out harmoniously and without a negative impact on

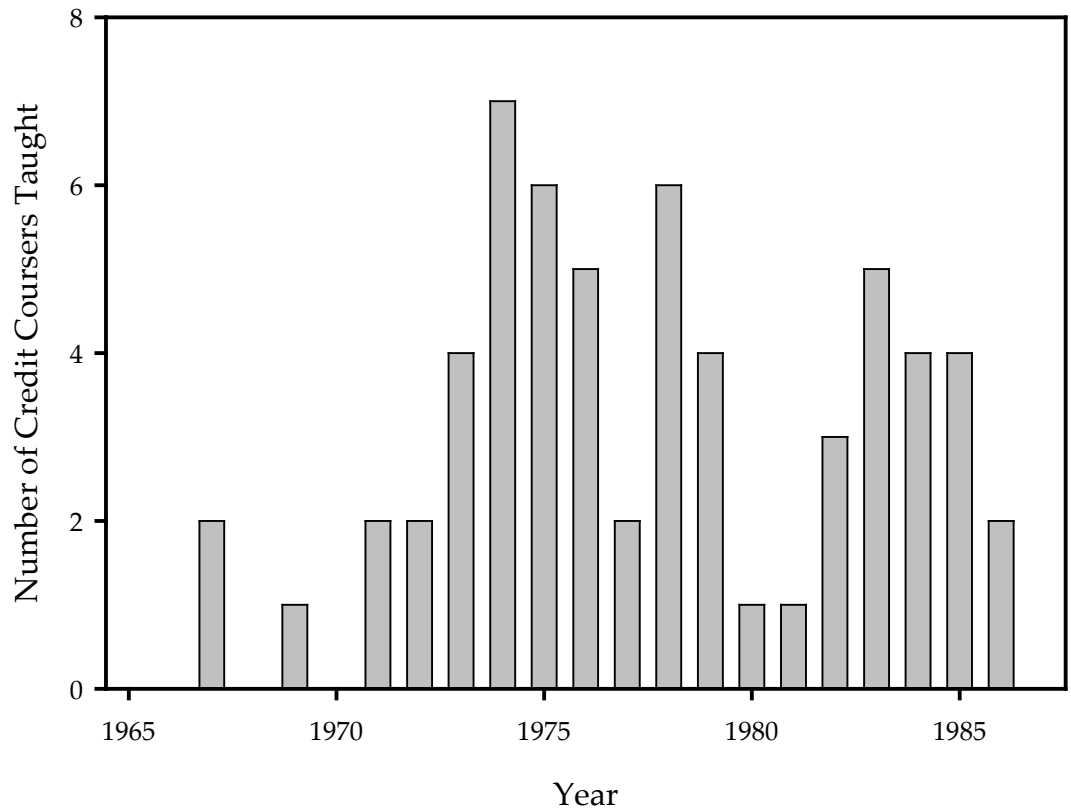


Figure 76. Histogram of credit courses given at the Field Station between 1966 and 1986.

the environment. Long may the Field Station continue to do so.

Acknowledgments

My husband Tom has been of inestimable help with constructive comments, practical assistance, and encouragement throughout. Brian Hubner and Shelley Sweeney provided essential archival aid. Drs. G. Goldsborough and J. Stewart read early versions of the first few years and gave helpful comments. Drs. R. D. Connor and J. Stewart did the same for an early version of the whole text. Drs. N. Losey and S. Sealy offered valuable comments on the penultimate draft. I am grateful to Dr. Goldsborough who formatted the final version. Any errors are mine.

Epilogue

On 24 November 2011, the Dean of the Faculty of Science announced the permanent closure of the Delta Marsh Field Station and the removal of most buildings on its site, ending the 45-year period of university occupancy here. This was the result of economic factors and a prolonged flood of the facility due to unprecedented high levels of adjacent Lake Manitoba.

The Delta Marsh

In all seasons, in all weathers,
We behold the marvel of the marsh.
Lashed by wind and waves for a
thousand years, it has endured,
But now human forces are encroaching,
invading, manipulating, testing
and straining its resilience.
In spite of this, unselfishly,
the marsh still offers food for our human spirits.
So, beyond our thankfulness for worldly things,
Beyond our material horizons,
We thank our natural world
for its life-sustaining gifts.

Tom Shay 1970

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Appendix A:

History of the University Field Station (Delta Marsh): The Transitional Years (1962-1966)

by Jennifer M. Shay

Reprinted from the Delta Marsh Field Station Annual Report, 1997

Late in his life, Donald H. Bain was anxious that the people of Manitoba should share in the conservation opportunities afforded by his land holdings, particularly those on the shores of Lake Manitoba at Delta Marsh and at Grant's Lake near Grosse Isle, Manitoba. Following his death in August 1962, there were suggestions that he had planned to give a large tract of land to the Provincial Government for that purpose. Unfortunately, appropriate arrangements were never made.

The initial executors of the Bain Estate, his nephew Albert J. B. Smale and his long-time employee Duncan H. McPherson, had the Bain properties appraised for estate tax purposes soon after his death. They put all the properties up for sale, with the exception of Bain's house at 69 Eastgate in Winnipeg. There was apparently considerable interest in the land at Delta, such as people at Portage la Prairie and the United States. A purchase offer made by Octave Enterprises, a land speculation company comprised of several Winnipeg attorneys, was accepted in mid-1963. However, the terms of Bain's will were unclear with respect to the power of the executors to sell real property, so the sale was postponed until an authorizing order was received from the Court of Queen's Bench in early 1964. In the meantime, the contents of Bain's Mallard Lodge were sold at a large, well-attended auction. Subsequently, Octave Enterprises began negotiating to re-sell the land to the Provincial Government. Octave assumed ownership in March 1964, having paid \$60,000 to the Bain Estate for the Delta land, and the titles were transferred to the Provincial Government one month later for \$125,000. Ultimately, the property acquired by the government also included all Bain's property at Grosse Isle, and Lot 23 on the west side of Portage la Prairie. Despite the changes in ownership, the property at Delta Marsh remained known as the "Bain Estate."

The circumstances of the land transfer from Octave Enterprises to the Provincial Government were challenged in the provincial legislature by the Honourable Gildas Molgat, Leader of the Liberal Party, who sat in opposition to the ruling Conservative Party of Premier Duff Roblin (Legislative Assembly of Manitoba 1965). In a lengthy response in the House, Mr. Sterling Lyon, the Minister of Natural Resources, gave several reasons in defense of the purchase.

Among these he said that (1) when the decision had been made to build the Portage Diversion connecting the Assiniboine River to Lake Manitoba, the Wildlife Branch believed the Diversion waters could be used to regulate marsh water level and thereby assist in marsh management, (2) the Inkster Farm (on the southeast corner of the Bain property at Delta) could be used to grow lure crops to reduce duck depredation on farmland in the Portage Plain, (3) the land could provide opportunities for muskrat and waterfowl research, including waterfowl depredation, in an area free from disturbance, and (4) the Bain Lodge might be used as field headquarters for the Department of Natural Resources or the University of Manitoba.

In late 1964, Dr. James C. Ritchie, at the time an Associate Professor in the Department of Botany at the University of Manitoba, was asked by the then Department Head Dr. E. Roy Waygood, to prepare a proposal for the development of the Bain Estate as a centre for field biology. At that time the Provincial Government had made some progress towards establishing a research station for aquatic biology at Grand Rapids, Manitoba and it hoped to promote research there by University faculty and students. Ritchie considered it unlikely that anyone would wish to work at the Bain Estate if the Grand Rapids facility became a reality, "since the water bodies and variety of aquatic biota in the latter were rich and interesting, while little enthusiasm could be found among freshwater biologists to study the shallow, impoverished Lake Manitoba." He noted "that the Bain property is located neither in a forest or grassland biotic province, it is in a geologically, physiographically, edaphically and biologically monotonous area, remarkable only for its paucity of different ecosystems." He felt there were much richer environments within "100 miles or less" of the University campus and doubted "that the development of field classes in biology—one of the most pressing needs in the Biology Division—would be hastened or helped by a centre on the Bain properties." He believed that "field training of ecologists in Canada should be forest-orientated," and that "it would be unwise to commit to an endeavor without a proper expectation of even moderate success" (Ritchie 1964).

Ritchie's memo went to the President of the University, and it is surprising that anyone at the Univer-

sity maintained an interest in suggesting a use for the Bain estate! But, not being completely discouraged by Ritchie's report, a second report was compiled by Dr. Waygood, Dr. W. George Barker (Chairman of the Division of Biology) and myself, in June 1965 (Waygood *et al.* 1965). The report was titled "The Bain Estate as a University Biological Summer Station." It stated that the University of Manitoba could undoubtedly benefit through the establishment of a field station, and close examination of the Bain Estate should take place for the following reasons:

- "1. It is an integral part of one of the finest freshwater marshes in North America.
2. It offers unique opportunities for the study of freshwater marsh ecology and its associated wildlife and their conservation. The area includes lake, marsh, woodland, prairie, and agricultural land, it offers interesting flora and fauna and is on a major bird migration route.
3. It should be an arm of the Division of Biology and not under a specific department.
4. It should be financed by a specific annual grant from the Provincial Government.
5. Consideration should be given to self containment or co-operation with the Delta Waterfowl Research Station.
6. It could serve graduate students, undergraduates, teachers and specialized groups."

On 15 August 1965, a group of Provincial Government and University personnel met at the Delta Waterfowl Station. The Province was represented by Mr. Stuart Anderson (Deputy Minister, Natural Resources), Mr. Eugene F. Bossenmaier (Chief, Wildlife Branch) and Mr. O. S. Eagleton; the University by Dr. George Barker (Biology), Dr. Robin D. Connor (Dean of Science), Dr. Harry E. Duckworth (University Vice President), Dr. Howard Lees (Head of Microbiology), Dr. Harold E. Welch (Head of Zoology), and myself. During the meeting it was made clear that the government would be sympathetic to a proposal to use the Bain Estate as a biological field station, but it should be realized that the Portage Diversion would divide the property into two parts and some of the most interesting biological areas would be on the east side of the Diversion channel.

Three possibilities were discussed concerning the location of the station. One was to have the laboratory facilities near the Bain lodge. The second was to use the lodge as a dormitory and build a lab on the east side of the Diversion; the third was to locate the laboratory on the site of the Delta Waterfowl Station. The second possibility received little attention, and

there was little support for the third unless a bridge was built over the Diversion. Nevertheless, it was felt that the University could derive considerable benefit from close association with scientists at the Delta Waterfowl Station. If the University Laboratory was built at the Delta Waterfowl Station, it could complement their laboratory facilities and there would be no need to duplicate library facilities. The next morning (16 August 1965), Dr. H. Albert Hochbaum joined the group. He noted that to date the University of Manitoba had not been prominent among the universities conducting research at the Delta Waterfowl Station, and he would welcome greater collaboration. He felt it would be an advantage to have the University Laboratory at his Station but that decision would rest with his Board. All agreed that the discussions that had taken place would be regarded as preliminary.

In November, 1965, a proposal was sent to Dr. Hugh Saunderson, President of the University, that the Provincial Government be respectfully requested, through the Department of Mines and Natural Resources, to make the Bain Estate available to the University, to furnish the Lodge as a dormitory and to build a laboratory at the Delta Waterfowl Station for the University of Manitoba. This was passed by the University Board of Governors in December 1965.

On 23 February 1966, the Province agreed to lease most, but not all, of the original Bain property to the University (Fig. 1). A temporary committee to oversee developments was set up by the University with Dr. Lees (Chairman), Drs Duckworth, Connor, Waygood, and Welch, and Mr. Stuart Anderson, to try and secure funding for basic necessities and research. Hopes were high but in the Province's 1966-67 budget there was no provision for support of the proposed Field Station, although the Honourable Sterling Lyon and Mr. Stuart Anderson were anxious for the project to go forward. They would support it with \$15,000 for the position of an ecologist to undertake research in the Delta Marsh. Dr. Michael Levin was subsequently appointed to this position for a two-year term. Apparently, other agencies were anxious to use the Bain Lodge (e.g., the Portage Home) and the University was encouraged by the government to use it for scientific purposes as soon as possible. I suspect that the University was unaware of the details of the financial negotiations involved in the government purchase of the Bain property, which had caused the government considerable embarrassment.

In the spring of 1966, Mrs. Colleen Nelson became the first resident at the University Field Station. She carried out research on day-old, downy ducklings and

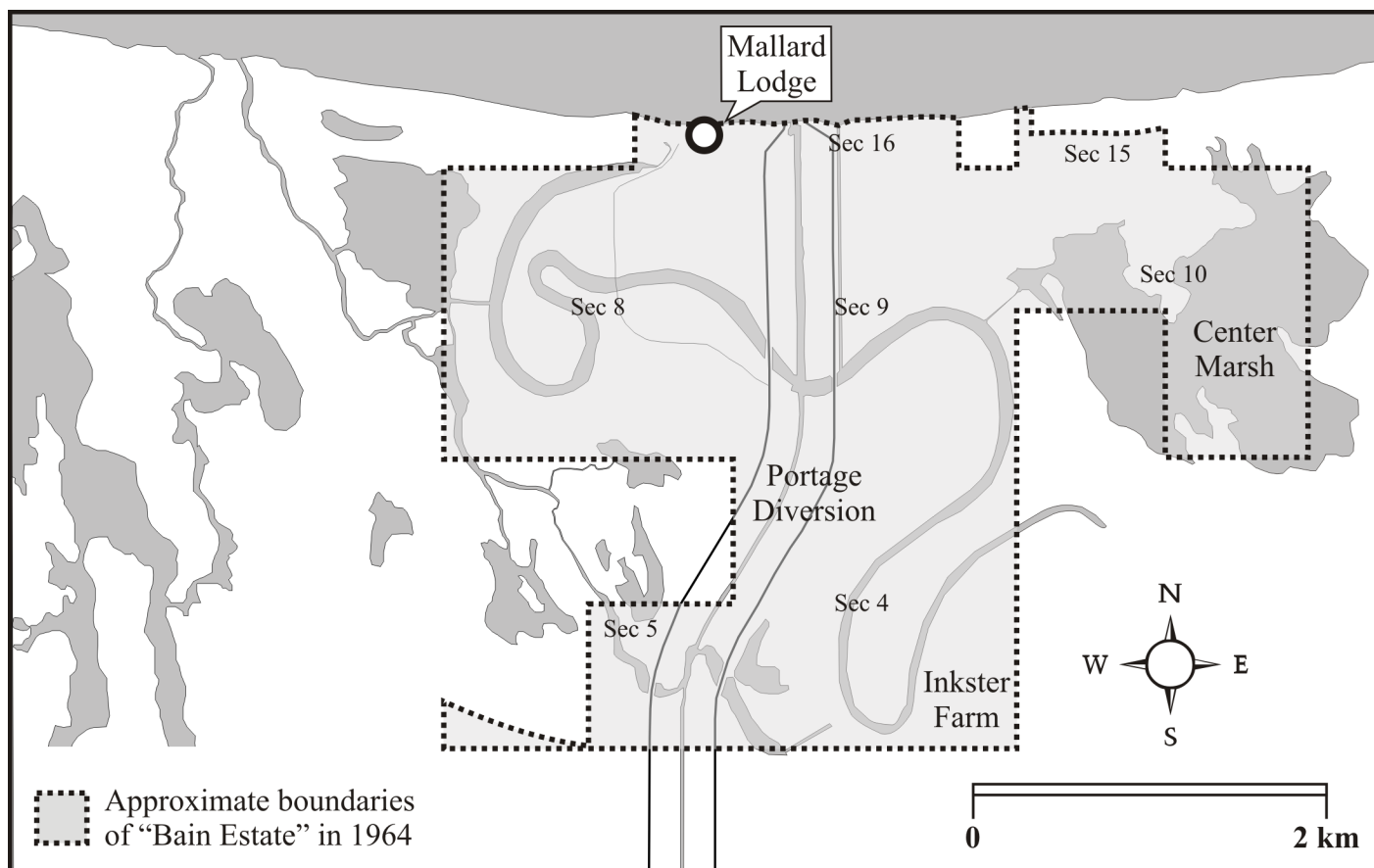


Figure 1. Location of the Bain property at Delta Marsh, most of which was leased to the University of Manitoba in 1967. Land that was not leased included the area covered by the Portage Diversion, and Section 10 (Township 14, Range 7W) on the east side of the property. The small southwest parcel in Section 5 was transferred to the Portage Country Club in partial compensation for land expropriated during construction of the Diversion.

produced stunningly beautiful paintings of them. (A book entitled "The Downy Waterfowl", that contains many of these paintings, was published by Delta Station Press in 1993.)

In May 1966, while on sabbatical leave, I was offered and accepted the role of Director of the newly named University Field Station (Delta Marsh). I returned to Winnipeg in September to teach in the Department of Botany and take up the challenge of developing the Field Station. I was totally committed to the importance of field work in the training of ecologists and of the need for facilities for field research in the Biological Sciences. Shortly thereafter Dr. Hochbaum requested a proposal from the University to present to his Board about the location of the University Laboratory. But after some discussions, he was told the University was undecided and wished to operate for a year before considering where to locate its laboratory facilities.

During the winter of 1966, a resident of Delta Beach was engaged to check the property on a regular basis and ensure that the heating system in Mallard

Lodge was maintained. In 1967, Mr. Nan Mulder was offered the job as the first Resident Caretaker of the station and his wife Gertie became the Cook-Caterer. So the first steps towards developing the field station had been taken.

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Appendix B, Table 1. Research topics conducted at the University Field Station, 1967–1986.
Unless specified, all work was carried out on Delta Marsh.

Dept	Researcher	Research Topic	Year																			
			67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Zoology	C. H. S. Watts	Intraspecific competition in red backed voles	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	A. B. Voss	Distribution of aquatic hydra	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	I. Lubinsky	Land and freshwater molluscs	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthropol.	M. Tamplin	History of settlement on the forested dune ridge	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	R. Evans	Breeding behaviour of gulls and terns	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	H. E. Welch	Mermethids that parasitize midges	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	H. E. Welch	Nematodes in marsh soils	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	M. H. Levin	Systematics of <i>Phragmites</i> and <i>Sonchus</i>	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	J. M. Walker	Net assimilation in <i>Phragmites</i> , <i>Typha</i> and <i>Scolochloa</i>	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	N. Merkel	Avoidance and photic responses in tadpoles	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	J. Yeung	Effects of early spring fire on emergent marsh vegetation	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	N. Orlando	Vegetation on the forested dune ridge	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	A. Sproule	Postglacial history	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	L. Hlynka	Helminths of leopard and wood frogs and Canadian toads	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	M. K. McNicholl	Courtship Behaviour of Forster's Tern (<i>Sterna forsteri</i>)	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UFS	J. F. Wright	Seasonal changes in benthos (Chironomidae) in a marsh bay	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	H. R. Bauer	Territory in Yellow Warblers	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Earth Sci	M. Lutchman	Groundwater flow and hydrochemistry in the Delta area	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Earth Sci	M. M. Fenton	Pleistocene geology: Portage la Prairie to Lake Manitoba	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	L. Hendzel	Nitrification processes in soils	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthropol	C. T. Shay	Archaeological work in the southern Lake Manitoba Area	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	G. Vascotto	Benthic investigations in Lake Manitoba	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	D. J. Bernard	Depth distribution of two shiners in Lake Manitoba	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	D. J. Brown	Phytoplankton production in Crescent Pond	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	T. O. Acere	Mark and recapture techniques in brook sticklebacks	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	S. F. Phillips	Radiation and evapotranspiration of <i>Phragmites communis</i>	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	P. G. Castling	Territoriality in Red-winged Blackbirds (<i>Agelaius phoeniceus</i>)	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	A. Frohlinger	Seasonal metabolic patterns in muskrats (<i>Ondatra zibethica</i>)	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	D. Krindle	Effects of the Assiniboine Diversion on Lake Manitoba	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix B, Table 1 (continued). Research topics conducted at the University Field Station, 1967–1986. Unless specified, all work was carried out on Delta Marsh.

Dept	Researcher	Research Topic	Year																							
			67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86				
UFS	E. Kucera	White-tailed deer food habits and winter habitat	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	A. J. Macaulay	Ecology of <i>Scirpus acutus</i> and <i>S. validus</i>	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	L. Siemieniuk	Benthos in Lake Manitoba (linked to the Assiniboine Diversion)	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	M. Aleksuk	Metabolic organization in cold-climate Mammals and Reptiles	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yale U	S. I. Rothstein	Experimental studies on brood parasitism in songbirds	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	J. M. Shay	Population and productivity in emergent marsh species	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	R. A. Janusz	Assiniboine Diversion and Lake Manitoba mercury levels	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	L. M. Landreth	Vegetation mapping from the Diversion to Cram Creek	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	M. Quaye	Life cycle of Rhabdias nematode parasites in frogs and toads	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pediatrics	B. J. Richardson	Biochemical genetic variation in small mammals	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	S. Bates	Production and population densities of leopard frog tadpoles	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	J. Pearn	Investigations into the fungal flora of the marsh	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	E. E. Mowbray	Effects of prescribed burning of <i>Phragmites communis</i>	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	E. Pip	Dynamics of plant-snail associations	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	J. Evans	Vegetation mapping and analysis	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	G. G. C. Robinson	Bacterial uptake of amino acids in the marsh and Lake Manitoba	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	S. Eddy	Population dynamics of leopard frogs (<i>Rana pipiens</i>)	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	G. Girman	Herbicide effects on the photosynthesis of algae	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	C. Tudorancea	Benthic fauna distribution and seasonal variation in Lake Manitoba	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	M. Rayner	Ecology and management of <i>Chenopodium rubrum</i>	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	R. MacArthur	Thermoregulation in muskrats (<i>Ondatra zibethica</i>)	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	G. R. P. Mutch	Winter dormancy in striped skunks	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	N. Hooper	Productivity of epiphytic algal communities	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	R. MacCharles	Ring-billed Gull biology and migration in Manitoba	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	D. Busby	Study of Crescent Lake, Portage la Prairie	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	M. Millen	Fungal succession in the marsh	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	B. Scaife	Helminths of amphibians	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	J. H. Gee	Biology of black bullhead (<i>Ictalurus melas</i>)	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	D. Hood	Seasonal parasites and hormones of Red-winged Blackbirds	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	H. E. Welch	Parasites of leopard frogs and Canadian toads	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	H. E. Welch	Ergasilus parasites in saugers and walleyes	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	S. G. Sealy	Breeding biology and productivity of Yellow Warblers	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	D. Busby	Food habits of Yellow Warblers	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	J. P. Goosen	Breeding ecology of Yellow Warblers	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-

Appendix B, Table 1 (continued). Research topics conducted at the University Field Station, 1967–1986. Unless specified, all work was carried out on Delta Marsh.

Dept	Researcher	Research Topic	Year																							
			67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86				
Zoology	J. Pearson	<i>Ergasilus</i> parasites of Lake Manitoba fishes	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-		
Zoology	S. Cosens	Habitat acoustics as a source of call selection in American Coots	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-		
Zoology	S. G. Sealy	Population biology and mating of Northern Orioles	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	X	X	X	-	-	-		
Zoology	S. G. Sealy	Foraging ecology of Warbling Vireos	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-		
Zoology	G. Yaremchuk	Adaptive significance of differing meristic counts in fish	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-		
Zoology	D. P. Swain	Temperature effects on parent fish inherited by offspring	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-		
Botany	J. M. Shay	A survey of vegetation in the Centre Marsh	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-		
Zoology	H. E. Welch	Survey of parasites of blackbirds (Icteridae)	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-		
Zoology	C. E. McKenzie	Parasites of muskrats (<i>Ondatra zibethica</i>)	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-		
Zoology	D. I. MacKenzie	Nest selection in kingbirds on the forested dune ridge	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-		
Zoology	R. L. Gamble	Ecology and distribution of <i>Mustela frenata</i> in Manitoba	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-		
Zoology	G. Kgoroba	Seasonal populations of the tick <i>Dermacentor variabilis</i>	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-		
Earth Sci	W. Last	The Lake Manitoba stratigraphic record	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-		
Zoology	B. O'Malley	Parasitism of L. Manitoba fish by <i>Ergasilus</i> spp.	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-		
UFS	G. F. Tande	Dendrochronological reconstruction of Lake Manitoba water levels	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-		
UFS	M. G. See	A fire management plan for portions of Oxbow Wood	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-		
Zoology	D. I. MacKenzie	Comparison of helminth fauna of Eastern and Western Kingbirds	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-		
Zoology	G. C. Biermann	Aspects of parental care in Yellow Warblers	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-		
U Toronto	S. Cosens	Sources of selection on avian vocalizations: territory size	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-		
Botany	N. Hooper-Reid	Investigation of the distribution of <i>Enteromorpha</i> sp.	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-		
Zoology	D. I. MacKenzie	Morphological variation in parasites of kingbirds	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-		
Botany	D. Thompson	Effects of fire on <i>Phragmites</i> -dominated plant communities	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-		
UFS	M. Watson	Small mammal ecology: forested dune ridge and adjacent marsh	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-		
UFS	M. Watson	Plant phenology	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-		
Zoology	D. I. MacKenzie	Tree species distribution on the forested dune ridge	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-		
Botany	G. G. C. Robinson	Use of nuclear track autoradiography to study periphytic algae	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-		
Zoology	J. Morgan	Foraging behaviour in Northern Orioles	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-		
Zoology	G. C. Biermann	Adult Yellow Warbler sizes in relation to sex, age and reproduction	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-		
Botany	G. G. C. Robinson	Effects of light on epiphytic algae growing on artificial substrates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-		
U Toronto	S. Cosens	Advertising behaviour in marsh and grassland Icterids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-		
Zoology	S. G. Sealy	Ecology and population structure of birds in the forested dune ridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	-	-		

Appendix B, Table 1 (continued). Research topics conducted at the University Field Station, 1967–1986. Unless specified, all work was carried out on Delta Marsh.

	Dept	Researcher	Research Topic	Year																						
				67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86			
	UFS	R. M. R. Barclay	Foraging strategies of insectivorous bats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	X		
	Botany	G. Goldsborough	Effects of simazine on the structure and metabolism of periphyton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-		
	Zoology	D. Guinan	Factors influencing selection of prey by foraging House Wrens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-		
	Zoology	S. G. Sealy	Migrations in a population of Least Flycatchers in Manitoba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-		
	Zoology	S. G. Sealy	Dynamics of breeding in a passerine community	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-		
	Botany	M. Zbigniewicz	Vegetation of the Assiniboine Diversion and the adjacent marsh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-		
	Botany	G. G. C. Robinson	Effects of two herbicides on algae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-		
	U Toronto	J. B. Falls	Song matching in Western Meadowlarks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-		
	Botany	G. Goldsborough	Dissolved silicon dynamics in a marsh channel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-		
	Zoology	H. E. den Haan	Fall migration and molt in warblers on the forested dune ridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-		
	Botany	T. M. Muhsin	Myecological studies on salt marsh plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-		
	Zoology	G. C. Pohajdak	Feeding structure of passerines on the forested dune ridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-		
	U Toronto	A. Horn	Responses of Western Meadowlarks to repertoires of graded sizes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-		
	Botany	J. M. Shay	Post-fire performance of <i>Phragmites australis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-		
	Botany	F. Schneider	Diatom community development on natural and artificial substrates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-		
	Zoology	J. M. Tugwood	Nest selection by Brown-headed Cowbirds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-		
	Lakehead	P. L. Wong	Taxonomy of the acuarioid nematodes of shorebirds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-		
	Zoology	I. M. Suthers	Daily and seasonal distribution of Blind Channel fish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-		
	UFS	R. M. R. Barclay	Nocturnal singing behaviour of Marsh and Sedge Wrens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-		
	UFS	R. M. R. Barclay	Nocturnal behaviour of flying squirrels and Barn Swallows	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-		
	Botany	G. Goldsborough	Ontogeny of a small marsh pond	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-		
	Zoology	H. E. den Haan	Fall migrations of Northern Waterthrushes and Ovenbirds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-		
	Zoology	P. N. Hebert	Decline of a Common Tern colony in southern Manitoba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-		
	U Ottawa	A. Isabelle	Predation impacts on Yellow-headed Blackbird reproduction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-		
	Botany	G. Kruszynski	Colonization by periphytic diatoms in the Blind Channel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	U Ottawa	M. Leonard	Factors influencing female choice in Marsh Wrens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-		
	Anthropol	K. McEwan	Projectile points from the University Field Station beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-		
	Zoology	F. Schneider	Movements of forage fish between Lake Manitoba and the marsh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-		

Appendix B, Table 1 (continued). Research topics conducted at the University Field Station, 1967–1986. Unless specified, all work was carried out on Delta Marsh.

Dept	Researcher	Research Topic	Year																							
			67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86				
Carleton U	P. Weatherhead	Egg laying patterns of the Brown-headed Cowbird	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-				
Zoology	M. Sheridan	Host nest selection in Brown-headed Cowbirds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-				
Oxford U	P. K. McGregor	Distance estimation by sound in Western Meadowlarks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	G. G. C. Robinson	Productivity of epipellic periphyton in the Blind Channel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	G. G. C. Robinson	Productivity of epipellic algae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	G. Goldsborough	Seasonal succession of diatom epiphyton on <i>Lemna minor</i> mats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
Botany	G. Goldsborough	Effects of triazine herbicides on algal communities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-				
Zoology	R. M. R. Barclay	Using old nests: costs and benefits to Barn Swallows	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
U Calgary	R. M. R. Barclay	Roosting behaviour of silver-haired bats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
U Calgary	R. M. R. Barclay	Foraging strategies of hoary bats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
Zoology	B. Beaver	Factors affecting swimbladder lift in two stickleback species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
Zoology	S. Cosens	Age-related variations in Yellow Warbler song repertoires	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
U Ottawa	M. Leonard	Separation of Marsh Wren and Yellow-headed Blackbird nests	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	G. G. C. Robinson	Colonization of submerged substrata by periphytic diatoms	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	S. Gurney	Effects of two triazine herbicides on marsh periphyton species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	H. E. den Haan	Fall migrations and moult of warblers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	B. J. Hann	Adaptive strategies of crustacean phyllopods in temporary ponds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	J. V. Briskie	Determination of clutch size in Least Flycatchers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
U Toronto	A. Horn	Behavioural ecology of Western Meadowlarks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X				
Botany	G. Kruszynski	Colonization of solid substrates by periphytic diatoms	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
U Ottawa	M. Leonard	Aggression by female Marsh Wrens: defense of nests or resources?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	A. McIlraith	Effect of simazine on the growth of <i>Lemna minor</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	K. Hobson	Intra- and interspecific interactions in a passerine community	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	D. Sutherland	Age-related reproductive success in Yellow Warblers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	I. Waters	Growth patterns of <i>Typha glauca</i> along a water depth gradient	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
U Toronto	T. E. Dickinson	Vocal behaviour of Western Meadowlarks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
U Guelph	C. Bartlett	Nematode parasites from American Coots	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
U Alberta	G. Goldsborough	Light penetration of a thick duckweed mat in a marsh channel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	N. C. Kenkel	Structure and dynamics of the forested dune ridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	A. McIlraith	Natural history of Lemnaceae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Botany	Dr. J. M. Shay	Influence of water levels on <i>Phragmites</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	D. J. Torrance	Brood division in American Coots	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	S. G. Sealy	Breeding strategies of Yellow Warblers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	S. G. Sealy	Breeding strategies of riparian birds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	S. G. Sealy	Interaction in a passerine community	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Zoology	K. Hobson	Protection of parentage strategies in Yellow Warblers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				

Appendix B, Table 1 (continued). Research topics conducted at the University Field Station, 1967–1986. Unless specified, all work was carried out on Delta Marsh.

Dept	Researcher	Research Topic	Year																			
			67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Zoology	D. Sutherland	Reproductive success in Yellow Warblers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Zoology	E. Wilner	Division of labor in American Robins	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Zoology	M. Hendrickson	Naïve parental Yellow Warblers responses to novel nest predator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
U Calgary	P. Faure	Roost selection in silver-haired bats during migration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Zoology	D. J. Torrance	Parental care in Barn Swallows	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
U Guelph	P. L. Wong	Nematodes in Semipalmated Sandpipers and Western Willets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Botany	G. G. C. Robinson	Ecology of epipellic algae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Zoology	B. J. Hann	Littoral zone microcrustaceans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Zoology	E. Straszynski	Population dynamics of tadpole shrimp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Total= 159	198	Year Totals	6	9	10	11	6	3	8	9	9	10	8	5	5	3	5	13	20	19	19	20

Appendix B, Table 2: Courses taught at the University Field Station (Delta Marsh), 1967–1986.

<i>Inst./Dept.</i>	<i>Course Title</i>	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Botany/Zoology	Introductory Ecology, Preterm, Fall	O	O	O	O	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthropology	Archaeology Field School	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	Comparative Cordate Zoology	X	-	O	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	The Plant Kingdom	X	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	Advanced Taxonomy	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	Marsh Ecology	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany	Plant Ecology, Fall	-	O	O	O	O	-	O	O	O	-	O	O	-	O	-	-	-	-	-	-
Botany	Plant Ecology, Summer	-	-	-	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-
Architecture	Environmental Studies	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Botany/Zoology	Introductory Ecology	-	-	-	-	X	X	X	X	X	X	-	X	X	-	-	X	X	X	-	-
Zoology	Animal Ecology	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Extension	Marshland series of weekend courses	-	-	-	-	-	-	O	O	O	O	O	O	O	O	O	O	-	-	-	-
Field Station	Weekend courses	-	-	-	-	-	O	-	-	-	-	-	-	-	-	-	O	O	O	O	O
Zoology	Ornithology, Summer	-	-	-	-	-	-	X	X	X	X	X	X	-	-	-	-	X	-	-	-
Zoology	Ornithology, Fall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	-
Botany	Phycology	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Entomology	Field Course	-	-	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zoology	Ecology of Animal Populations, Summer	-	-	-	-	-	-	-	X	X	X	X	-	X	-	-	-	-	-	X	-
Zoology	Ecology of Animal Populations, Fall	-	-	-	-	-	-	-	O	O	-	-	-	-	-	-	-	-	-	-	-
Botany	Taxonomy of Vascular Plants	-	-	-	-	-	-	-	X	X	X	-	X	X	-	-	-	-	-	-	-
Landscape	Landscape Ecology	-	-	-	-	-	-	-	-	O	O	O	O	O	O	O	O	O	O	O	O
Botany	Field Ecology	-	-	-	-	-	-	-	-	-	-	X	O	O	O	O	O	O	O	O	X
Anthropology	Prehistoric Human Ecology	-	-	-	-	-	-	-	-	-	O	-	O	-	O	-	-	O	-	-	O
Anthropology	Archaeological Field Techniques	-	-	-	-	-	-	-	-	-	O	-	-	-	-	-	-	-	-	-	-
U of Winnipeg	Winter Ecology	-	-	-	-	-	O	-	-	-	O	O	-	-	-	-	-	-	-	-	-
Geology	Principles of Quaternary Paleoclimate Reconstruction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	O	-
Botany	Marsh Ecology, Special Topics	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	-
Zoology	Wildlife Management	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	-	-	-	-	-
Anthropology	Archaeological Analysis	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	-	-	-	-
U of Regina	Cultural Geography	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	-	-	-
Botany	Flora of Manitoba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	-
U Field Station	Topics in Field Biology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Anthropology	Manitoba Prehistory	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-
Botany/Zoology	Principles of Ecology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X
Zoology	Topics: Avian Migration Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Interior Design	Manitobarts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O
Totals		2	0	1	0	2	2	4	7	6	5	2	6	4	1	1	3	5	4	4	2

Notes: X = Course taught entirely at the Field Station, O = Course taught partly at the Field Station

Appendix B, Table 3. Extension or weekend courses at the University Field Station, 1972–1986.

<i>Year</i>	<i>Description</i>	<i>Instructor(s)</i>	<i>Month</i>
1972	Bird populations	Dr. R. Jones	May
	Adaptation of mammals to winter*	Dr. R. Riewe	Dec
1973	Human survival in winter	Dr. R. Riewe	Feb
	Spring waterfowl migrations	Dr. B. Batt	April
	Wildlife photography	Mr. R. Taylor	May
	Marsh ecology	Dr. R. Nero	Sept
1974	Human survival in winter	Dr. R. Riewe	Jan
	Wildlife photography	Mr. R. Taylor	June
1975	Human survival in winter	Dr. R. Riewe	Jan
	Mammals in winter	Dr. R. Wrigley and Mr. G. Malaher	Feb
	Survival skills	Mr. R. Hamlin and Mr. R. Lay	March
	The story of the marsh	Dr. J. M. Shay	Nov
	Mammals in winter	Dr. R. Riewe	Dec
1976	Arctic lifestyles	Dr. R. Riewe and Mr. R. Pirt	Jan
	Winter survival	Mr. R. Hamlin and Mr. R. Lay	Feb
	Marsh ecology	Dr. J. M. Shay	Oct
1977	Winter involvement	Mr. A. Watson and Mr. A. Phillips	Jan
	Arctic lifestyles	Dr. R. Riewe, Mr. R. Pirt and Mr. D. McMaster	Jan
	Outdoor leadership	Mr. R. Lay and Mr. R. Hamlin	March
	Log houses	Mr. J. Lazotte and Mr. R. Patterson	April
	Nature photography	Mr. F. Walton and Mr. P. Taylor	May
	Tree ecology	Mr. C. K. Smith and Mr. J. Hreno	June
1978	Outdoor winter activities	Mr. R. Phillips and Mr. A. Watson	Jan
	Arctic lifestyles	Dr. R. Riewe and Mr. R. Pirt	Jan
	Building log houses	Mr. J. Lazotte and Mr. R. Patterson	April
	Spring bird migration	Dr. A. J. Macaulay and Dr. R. Nero	May
1979	Arctic style winter camping	Dr. R. Riewe, Mrs. J. Riewe, Mr. R. Pirt and Mr. K. Bloom	Jan
	Bird behaviour	Drs. R. Nero and A. J. Macaulay	May
	Building log houses	Mr. R. Patterson	May
	Wildlife photography	Mr. R. Taylor	June
	Painting and drawing in the marsh	Mr. G. E. Eliason	Oct
1980	Winter survival	Dr. R. Riewe	Jan
	Outdoor leadership	Mr. R. Lay	Feb
	Greenhouses and home gardening	Dr. J. Campbell	May
	Wildlife photography	Mr. R. Taylor	May
1981	Arctic survival	Dr. R. Riewe and Mr. W. Klenner	Jan
	Backyard vegetable gardening	Mr. G. Luther	April
	Nature photography	Mr. R. Taylor	May
	Brandon Photographers	Mr. W. Burgess	June
	Writers workshop	Dr. E. Kleiman	Nov
1982	Winter survival	Dr. R. Riewe	Jan
	Nature photography**	Mr. R. Taylor	May
	Marshes and men	Drs. J. M. Shay and R. Barclay	Oct
1983	Winter survival	Dr. R. Riewe	Jan
1984	Winter survival	Dr. R. Riewe	Jan
	Bird migration	Dr. R. Jones	May
1985	Winter survival	Dr. R. Riewe	March
1986	Halley's comet watch	Brandon University Extension Office	March
	Nature photography	Mr. R. Taylor	May
	Bird migration	Dr. R. Jones	May
	Painting from life	Mr. C. Tillenius	Sept

* First Marshland Series weekend extension course organized by Continuing Education.

** Ms. Judy Hay, who had organized the Marshland Series of extension courses, retired and Continuing Education ceased to offer the Marshland Series. Subsequent weekend courses were organized by the University Field Station.