THE ESSENTIAL

NATURAL HISTORY

Not many Islanders want to get close to salt marshes. Those that do usually have ulterior motives. For a few weeks each fall, hunters huddle behind their blinds, nursing their coffee and cursing the weather. Leaning over the edge of a tidal creek in the spring of the year, smelt fishers delight in the sheer abundance of fish (and, perhaps, in the notion that someone else will be cleaning their catch). While concentrating on fish or fowl, old-fashioned hunter-gatherers may absorb some marsh mud at the knees, or subconsciously note a slick of surface oil on a nearby pool, but the marsh is secondary.

When noticed, salt marsh can be beautiful. Picture, for instance, golden waves of thick grass, highlighted by an autumn sun, with skeins of geese wheeling overhead. That image is a lot more attractive than green stink holes in summer. But green stink holes are probably what most people see — and smell — when they think “marsh.” (And what they probably hear are the fateful sounds of horse flies and mosquitoes.) “Let’s not go there,” they probably say.

That’s too bad, because salt marshes are good for us, whether we go there or not. Not only that, salt marshes are fascinating places. They can even be poetic. Consider Longfellow’s “Evangeline,” or Bliss Carman’s “Low Tide at Grand Pré.” Normally, of course, anyone reading about salt marshes is almost guaranteed to be put to sleep by the arcane jargon of plant zones, the physics of moons and tides, the chemistry of salt contents (salinities), off-putting scientific names for salt marsh plants and creatures, and the stretch of imagination required to understand the food chain that originates on a tidal marsh.

Prince Edward Island’s salt marshes have not inspired much poetry. And after receiving some excellent early press, they have attracted successively less attention over the centuries. Only in recent years have scientific study and the growing ecological movement put salt marsh back on the map.

Boggy Marsh vs. Marshy Bog

Prince Edward Island’s land mass totals about 566,000 hectares (1.4 million acres). In that total, there are 29,377 hectares (72,590 acres) of wetland, but only about 20% of it, 6,241 hectares (15,420 acres), is salt marsh. These average about 6.8 hectares in size, with West Prince marshes being slightly smaller than this, and rather larger marshes being typical of northeastern Kings County. The largest unbroken tract of salt marsh lies in the upper reaches of the Percival River estuary on the northern shore of Egmont Bay. The acreage on the Hillsborough River and its tributaries totals 734 hectares (1,813 acres), but some marsh, such as the area impounded by the railway crossing at the village of Mount Stewart, has been so modified by drainage that not all of it qualifies as salt marsh in the Prince Edward Island Wetland Inventory. Other notable tracts of tidal marsh include the Pownal and Alexandra Bay marshes in southern Queen’s County, and the marshes along the Grand River on Malpeque Bay.

These, then, are the Island’s salt marshes, good-looking — from a distance. But to appreciate them, we have to get much closer.

Salt marshes share certain features with other wetlands, such as bogs. The plants and animals in both systems must be well adapted to harsh conditions: in bogs, acidity; in salt marshes, salinity. Our roadsides and even woodlands host many European weeds, but there are few foreign invaders in bogs and salt marshes (purple loosestrife being a notable exception). Most cannot survive there.
Both bogs and salt marshes have a high peat content, and some texts refer to salt marsh soil as peat. Typically, there is a good deal of variation in the amount of decaying organic matter in salt marshes. It is also recognized that deposition of sediments is the main way that salt marshes grow. For instance, the depth of soil in the Fundy salt marshes is up to 37 meters in some areas. Peat bogs do not contain much true soil clays or silts.

Bogs and marshes also share some similarities in their geography. Both may feature a waterlogged “moat” near the junction of upland and wetland, which makes these areas somewhat inaccessible to people. A bog moat may contain Sphagnum moss and deep-rooted woody plants; the salt marsh’s moat is the rush bed, which is vegetated with a two-meter high plant known as the hard-stemmed bulrush. The southeast shore of the Dunk River salt marshes, easily visible from Highway 1A, has an extensive (dark green) rush bed, which is actually a foot lower in elevation than the surrounding marsh. Perhaps the best examples of rush beds are at Green Park Provincial Park near Port Hill. Why these rush beds form is unknown (to me, at least); it is true, however, that salt marshes that have been greatly modified by drainage may lack a well defined rush bed.

Finally, both bogs and marshes feature cranberry as well as plants that are not well known to the general public. For instance, if, while picking cranberries on the upper verges of a salt marsh, you find a sharp plant poking up your nostrils, chances are you already know at least one other marsh plant, the Baltic rush (juncus balticus).

In the Zone

Salt marshes differ from bogs in an obvious way. The bog is influenced chiefly by rain, fog, and sun. To the casual observer, it just sits there, and not much seems to happen that we can see and note. Salt marshes, on the other hand, boast dynamic environments. Twice each day on Prince Edward Island, the tide stretches its fingers up into the marsh. The daily flooding, the salinity of the flood waters, and the slope of the marsh, which regulates how far inland the tides will extend, all influence the zones of vegetation that typify the marsh eco-system. These vegetation zones have not yet been celebrated in song, but they have taken up a lot of space in the scientific literature, and are often diagrammed for the reader.

First in the diagram comes the “pioneer zone” of extremely salt-tolerant plants. Chief among them is cordgrass, Spartina alterniflora. This grass colonizes mud flats and traps sediments, building the salt marsh outward towards the sea. A number of juicy morsels reside in the cordgrass flats, including the larvae of the horsefly, that popular escort for many marsh excursions. In winter as well as summer, black ducks feeding in the cordgrass edge of tidal creeks may find abundant red spider mites there. Canada geese eat the roots of the cordgrass itself.

The second zone (sorry, “pioneer zone” is about as poetic as the terminology gets) extends to the mean high water mark. Sometimes referred to as the salt meadow, it is dominated by Spartina patens, a fine low grass that lies prostrate over much of the zone. This is the “marsh hay” cut for fodder by early Island settlers. Other plants here include a grass with an operatic name, Puccinellia, and a plant that gardeners and florists may know well, the sea lavender, Limonium. This year, the Committee on the Status of Endangered Wildlife in Canada declared a
small, sea lavender-dependent butterfly, the Maritime ringlet, to be endangered. Oddly, it is found only on the marshes of Bathurst, New Brunswick, although sea lavender is widely distributed along the Atlantic coast in both Canada and the United States. On Prince Edward Island, you may pick sea lavender without worrying about endangering a small butterfly, but in some jurisdictions, there are restrictions on picking the sea lavender itself, because it has been over-harvested for use in dried flower arrangements. One method of increasing sea lavender populations is to cut the competition, that is, *Spartina patens*.

The third salt marsh zone — the high salt marsh — is flooded only by the highest spring tides and storm tides. Besides this irregular flooding, fresh water from creeks and springs flowing into the marsh and run-off from the upland may affect the vegetation here. In fact, not all the plants found in this zone live only in salt marshes. For example, the dominant plant, *Spartina pectinata*, known by the uninspiring name of broad-leaf (which tells nothing of its amazing ability to excrete salt), is also the dominant vegetation of the St. John River floodplain in New Brunswick.

Another amazing plant of the high salt marsh is also a grass, the common reed (*Phragmites communis*), which regularly grows to heights of three meters. It has an almost worldwide distribution, and like *Spartina patens*, it grows in large monocultures. In some parts of North America, it is considered a nuisance, and considerable money is spent in trying to eradicate it from salt marshes. On Prince Edward Island, *Phragmites* has a rather restricted distribution, but tends to be found in areas where the Acadians settled the marshes. In Old France and along the St. Lawrence, *Phragmites* was once used as roofing thatch and perhaps it was also used here; it is reported to have an insulation value of R40 (when used in the requisite thickness). Whether the Acadians encouraged its growth for that reason is not known. It may just be that the dyked marshes provide a habitat favourable to its growth. Among other places, *Phragmites communis* can be seen at Mount Stewart, Tracadie Bay, Tryon, on the Dunk River upstream from Highway 1A, at St. Chrysostome in the Evangeline region, along the Narrows at the western entrances of Malpeque Bay, and at the head of the Percival River marshes. It can also be seen in a non-salt marsh location in the ditch along Highway 2, near the turnoff to Grand River.

**Truly appreciating Phragmites** may take practice, but some marsh plants make an immediate impact. On the very upper edge of the marsh, the wanderer may encounter a thicket of wild rose. With their pale blooms and, later, their orange hips, the roses are a picturesque feature in the beautiful little salt marshes of Green Park Provincial Park at Port Hill (and provide an attractive habitat for garter snakes). At the opposite end of the spectrum, the marsh along the nearby Grand River, plays host to an extensive growth of upright stemmed poison ivy, which is artfully concealed in the tall grasses; tangled vines of the same plant very obviously cover the old dykes at Baptiste Creek in Alaska.

**Pan Handles**

Crossing a salt marsh requires stamina. The upper zone is not really that dry, and the grasses and reeds are thick and tangly, and wrap around your boots. The explorer must continually skirt around pools and the winding creeks that alternately fill and partially drain them with each tide. We have now arrived at what some ecologists evocatively call “zone four.” (Other ecologists have gone so far as to define no less than eight zones, but I go no further on this point except to say that the “rush zone” fits in here somewhere.)

The pools, which are scattered helter-skelter across the salt meadow, are also called pans. They are more complicated than you would suspect, although if you fall in, they are all wet, even at low tide. At the Brackley Bay salt marsh, eight different types of pans have been identified, including simple depressions, compound depressions, pans formed when clumps of meadowgrass impound water, vehicle track pans, channel pans, and pans gouged out by ice.

My favourites are the ones called “rotten spot pans” and, although I’ve only recently read of them, I feel I have personally encountered them many times. They are 15-25 centimetres deep and nearly as wide, about the size of a boot, in fact. If ever an ankle was sprained in the salt marsh, the rotten spot pan was the cause. One means of controlling mosquitoes is to level the marsh by filling in these rotten spots, thus destroying the habitat for the larvae.

This is what is done in the extensive marshes of New Jersey. A second approach used there is to connect all the pools to ditches, which drain them at low tide and at high tide allow better access to a larger area for the larva-munching mummichog (*Fundulus heteroclitus*).

There is another type of salt pan, and while it is not noted at Brackley Beach, it is a feature of many island marshes. This is the hole left by the excavation of mussel mud in the 19th and 20th centuries. *Most mud*

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*For more on mussel mud, see David Weale’s “The Mud Diggers,” in Number 5 (Fall-Winter 1978).*
was actually taken from riverbeds, but extraction from the salt marsh may have been much easier. If perhaps lower in calcium content, marsh mud probably contained a high nutrient content, and certainly would have added organic matter to the soil. Many marshes were mined for mud, including DeGros Marsh in Lot 54, Fullertons Marsh on the Hillsborough River, and Salutation Cove, near Lower Bedeque. The last two are especially rich in mud-digging pools.

My Favourite Marshians?

The zoning on the marsh also extends to some of the animal life. A good illustration of this can be found in three species of periwinkles (snails). Two species live mainly on the mud flats below the marsh or in the tidal creeks. They shed their eggs into the water or in a gel. The third species is the wholly marsh-dwelling rough periwinkle (*Littorina saxatilis*). It is hermaphroditic and bears live young with fully developed shells, thereby ensuring reproductive success in the face of the alternating flooding and drying that occurs in salt meadows.

Stylized diagrams usually show salt marshes sloping downward from their upland edge to the seaward side, but this is not always so. In one of the marshes at Green Park, for example, the main entry point for seawater is probably the tidal creek. This marsh has a quite detectable slope downward from the bay to the upland. Likewise, a small inlet of salt marsh running perpendicular to, and draining into, the Percival River estuary is at a higher elevation on its seaward edge. In 1994, a beaver took advantage of this, and by building a two-meter wide dam in the creek that winds through the centre of the marsh, it was able to flood the entire width and depth of the marsh inlet, some five acres. The dam was already there; the beaver had just plugged the leak.

Settlers of the Marsh

Beavers are not the only ones to have applied engineering principles to the Island's salt marshes. The marshes were an essential part of our settlement history. De Pensens, the French commandant of Île Saint-Jean from 1726 to 1737, noted how hard it was to clear the forested upland, and spoke somewhat ruefully of the Acadians, who were “accustomed to work only in easy marshes.” The preference for farming marshland over clearing forest was partly cultural in origin. The Acadian settlers brought with them from France (and mainland Acadia) a strong tradition of farming marshland. Draining marshes is arguably as much work as cutting down trees; but for the Acadians, it was a case of doing what they were used to doing.

The allure of the tidal marsh was its provision of marsh hay as fodder for cattle. After sailing up the Hillsborough River in 1751, Colonel Franquet described the marshes on either side of Glenfinnan Island (*l'isle aux chevres*) as supporting a coarse salt grass, “yet tender and wholesome” for cattle. These perceptions can be taken with a pinch of coarse salt when one considers that contemporaries at St. Peters Harbour fed rough, waxy, dry dune grass to cattle in place of hay. In short, any grass would do to feed a beast on a forested island, and salt marshes had lots of grass. The point was that without clearing so much as an acre of land, a crop could be harvested for over-wintering the livestock that were so much a part of European farming culture.

The famous census taken by Sieur de La Roque in 1752 showed 2,223 Acadians settled at 28 locations on Île Saint-Jean. The sites had been chosen, according to historian D. C. Harvey, to provide seagoing communications routes and ready access to marshland pastures. Those pasture lands meant survival for the struggling settlers, and the Acadians probably lived as close to them as possible, literally on the verge of upland and marsh (this despite the mosquitoes noted by Franquet — and experienced by just about every Islander since). The evidence of settlement patterns in early descriptive accounts is bolstered by archaeological finds, such as an old forge found at Allisary Creek (near Mount Stewart) and a wooden platform and carpenters' tools found at DeGros Marsh in 1909.*

Few Acadians escaped the mass deportations of 1758, but their works live on in the dykes and drainage ditches that they built (and others often maintained) along many of the Island's estuaries, rivers, and bays. Remnants of Acadian drainage works can be seen at Dingwells Mills, Mount Stewart, Pisiquid, Glenfinnan, Johnston's River, and many other sections of the Hillsborough River (the Acadians' *Riviere du Nord-Est*). Salt marshes also figured prominently in other notable Acadian settlements, including Point Prim, Bedeque, Tryon, and Malpeque (on the west side of Malpeque Bay near present-day Port Hill). The remains of old, probably Acadian, dykes can be seen, too, on the Grand River where Highway 2 crosses it at Wellington.

Subsequent settlers were quick to take advantage of the Acadians' marshland legacy. When Highland Scots arrived at Tracadie and Scotchfort in 1772, they naturally gravitated towards the abandoned Acadian settlements and their marsh pastures. Partly to assume freehold possession, but also to take advantage of the extensive hay marshes along the river, the Highlanders soon took up land at other nearby locales previously occupied by the French, such as Pisiquid and Glenfinnan. Likewise, the Earl of Selkirk found the Highland tenants he had planted in Belfast in 1803 arguing, and, in one case, scheming, over the disposition of marshlands at St. Peter's Harbour.

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*The provenance of the latter is admittedly unclear; DeGros Marsh has a French name, but there is little other evidence of Acadian settlement there. A local farmer found the tools buried 18 inches below the surface of the marsh.
Orwell and Point Prim (modern day Camerons Island). He also recorded that certain inland farmers at Vernon River were in the habit of coming to Orwell to cut hay. Selkirk resolved to partition the salt marshes in a fair way so that those disadvantaged by the site of their leases would still have access to fodder. In his *Account of Prince Edward Island*, Selkirk’s contemporary, John Stewart of Mount Stewart, puts less emphasis than Selkirk on marshland, but notes the importance of marsh hay. For any new settler or prospective landlord looking for property, the availability of marsh hay was an important criterion.

That marsh hay was considered valuable, especially in those years when dense forest blanketed most of the potential pastureland, is unquestionable, but there are varying reports about its usefulness. John Stewart in 1806 (and generations of milk drinkers since) knew that cows that deserted the upland pasture for a foray into the marsh delivered a product that tasted something like marsh mud, or even worse. Perhaps the exclusion of tidal waters from the marsh improved the taste of the milk. It is likewise difficult to imagine that the hay was good stuff. Hay from the *Spartina patens* zone might frequently have included marsh arrow grass (*Triglochin maritima*), a plant poisonous to livestock. Moreover, the hay was not cut until late July or August (the same time as for conventional hays), and nutritional content would have been low, according to modern recommendations for forage crop harvest. Still, when winter snows made outdoors grazing impossible, a store of marsh hay was indispensable.

It was difficult to use horses or oxen in the marsh (despite employing special “mud shoes” to distribute the animal’s weight more widely, somewhat in the manner of snowshoes). That problem may explain why the summer harvest was not removed until after the winter freeze-up. One wonders how well the hay came through the ravages of weather and various fungi in the interim. One trick to protect it was to cover the marsh hay with the water-repellent stalks of *Spartina alterniflora* (a denizen of the pioneer zone). However, the latter’s high salt content caused cattle to develop an unusual thirst, and contributed to sores in their mouths. Nevertheless, Lord Selkirk outlined the value of a ton of marsh hay, and trade in hay apparently continued on until about 1850, when enough upland product finally became available to meet demand.* Farmers continued to cut marsh hay for their own uses well into the 20th century, until the 1940s in Tryon.

**Drains, Dykes, and Aboiteaux**

The Acadian “works” that the early British settlers exploited were an ingenious yet practical blend of strategies that not only modified the salt marshes for agriculture, but accomplished a wholesale renovation of an ecosystem. Historical sources have left us a very good idea of how the Acadians proceeded. First, they erected dykes to prevent the tide from encroaching on the marsh. These were formed of river mud and extended along the edges of the rivers and tidal creeks. Sods of marsh grass, cut and laid over the

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*On the Tantramar Marshes on the Mainland marsh hay was exported in bulk to urban markets as late as the turn of this century.*
dyke, took root, helping to stabilize the embankment. Dyke-building only sounds simple. As J. D. Conlon of the Maritime Marshland Rehabilitation Administration noted, men who were experienced in the art could "get a satisfactory bond to the existing dyke, when sods cut and placed by others have leaked at the joint, dried and fallen apart." It was labour intensive work, all done with hand-held tools, including spades.

When finished, the dykes varied from one to a half to two metres in height, and were three to four metres wide at the base. They required some maintenance, yet the remnants of some dykes have lasted as long as 200 years with no upkeep whatever.

Besides dykes to keep out the tide, the Acadians constructed drainage ditches to purge the marshes of any fresh waters originating from snow melt, rainfall, run-off, springs, and creeks. The main drainage ditches ran perpendicular to the river, but they collected waters from an extensive series of feeder ditches that ran laterally across the marsh. According to a researcher on the Dunk River, ditches ran generally in straight lines and were two to five feet deep. (The author can confirm this finding. The grass-covered ditch on the Dunk marshes that I fell into in 1975 was about four feet deep at high tide, judging from the fact that it submerged completely the binoculars around my neck.) Bruce Pigot has researched the extensive works at Mount Stewart. He estimates that a 30-acre block of marsh entailed about 9,000 feet (2,745 metres) of ditches emptying through the dykes.

Preventing the tide from penetrating the salt marsh while allowing fresh water to drain out posed a problem that was solved by the "aboioueau" or "aboiteau." The aboioueau was a sort of bridge with a clapper gate or valve fixed to the opening where the water flowed through. The gate was held closed by the force of an in-running tide, but was pushed open as the tide declined by the flow of fresh water draining through the sluice into the tidal area. The aboioueau was basically a box of marsh mud supported structurally by sod, brush, and poles. The bottom of the aboioueau might be lined with planks. Though it sounds pretty flimsy, an operating aboioueau could last for up to 70 years without maintenance.

The Acadians' drainage techniques were well understood by those that followed. Lord Selkirk had an eye to emulating them when he wrote about Lot 62 in his diary: "Three or four creeks we passed ... appear as if they would make fine bottom land if the Creek were dammed and sluiced, to complete the Embankment that the sand has nearly made."

**Going Dry**

While Acadian dykes, ditches and aboioueaux were surprisingly durable, few traces of them would likely remain had not later settlers kept up — and sometimes extended — the work begun during the French regime. An aboioueau at Tryon apparently survived into the 1930s, and its point of placement is still known as the "Bito" Bridge. At Bedeque, British settlers kept up the Acadians' ditches for generations. According to oral history collected by David Cairns, a dam called a "bito" was built across the south arm of the Dunk River in the late 1800s. A similar project is recounted in oral traditions around Pisquid; the large aboioueau built by local farmers across the mouth of the Pisquid River in 1895 floated away at the first high spring tides.

At nearby Mount Stewart, there is a long history, which continued into the 1960s, of using the marsh for hay and pasture, but between Acadian abandonment and the 1890s, upkeep may have been left to chance. In a conversation with the late Doris MacAssey in 1983, she recalled how as a child in the first part of this century, she participated in digging parties organized period-

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An aerial photo of the Pisquid River taken in 1935. The lattice of drainage ditches in the marshland flanking the river reflects nearly two centuries of agriculture on the marsh there. (This aerial photograph ©1935 Her Majesty the Queen in Right of Canada, reproduced from the collection of the National Air Photo Library with permission of Natural Resources Canada.)
ically to maintain the ditches on the salt marshes around Mount Stewart. (Her role, she remembered, was mainly to tag along and help eat the picnic lunch.) As an adult, Mrs. MacAssey drove her cattle from the village to the family's six-acre field on the marsh each day for a number of years.

By the early 20th century, the Island government was taking a hand in converting salt marsh to farmland in various places across the province. About 1900, as at Bedeque (and perhaps Tryon), the government constructed an aboiteau at Mount Stewart to replace the existing draw bridge. In 1926 the aboiteau was superseded by the current railway bridge, which was installed a few yards upstream. Its two small culverts continue to restrict tidal flow.

The last efforts directed at converting salt marsh to agricultural land on the Island took place at Johnston's River, a tributary of the Hillsborough. In 1948, the Government of Canada passed the Maritime Marshland Rehabilitation Act, through which the federal government committed itself to provide both engineering expertise and the wherewithal to install aboiteaus and dykes to reclaim agricultural lands. The Prince Edward Island government in turn, agreed to maintain the drainage ditches, secure agreement of landowners to the project, and provide rights-of-way where necessary. In 1950, a concrete aboiteau with a wooden clapper gate, the first of its kind, was installed in Johnston's River at a cost of $19,165 in order to "protect" 250 acres of land.

Over the next seven years, a total of $550 was spent to maintain the structure and possibly the dykes.

By 1968, priorities were changing. That year, to counter ongoing "schemes to create additional pasture and hayland by further drainage" the Canadian Wildlife Service floated a proposal (pardon the pun) to have the marshlands and some surrounding upland purchased and designated as a National Wildlife Area. Photographs taken at that time indicate that a fairly efficient drainage project was still functioning there. Neither further drainage nor a National Wildlife Area came of the proposal. In 1971, the aboiteau was replaced by a water control structure designed to flood the marsh with brackish water. With some modifications, this has been maintained to the present day.

Food For Thought

Settlers had a rather simple view of food chains in the marsh. It can be summarized as follows:

Marsh grass $\rightarrow$ Cattle $\rightarrow$ Settler

Even biologists have some difficulty in conjuring up a truer picture, because relationships in the marsh are often not obvious. As mentioned earlier, horsesflies, mosquitoes, and mummichogs are prominent marsh residents, but it is a challenge to illustrate the big picture of interdependent creatures, plants, and animals in a vast chain or web of life.

For example, one should distinguish between residents and visitors. A number of generalist feeders, such as raccoons, mink, great blue herons, and gulls, come to the marsh for snacks, but do not depend on it for survival. The resident grazing mammal is the muskrat, which dens under the marsh mud along the tidal creeks and ditches. The few birds that actually breed in the salt marsh, such as the willet and the sharp-tailed sparrow, may indeed be specialists that find something essential to their propagation there. The salt marsh also hosts a number of less conspicuous animals. Among them are some tiny clams and snails whose chief claim to fame is food for black ducks. They are common, but at the same time foreign to us. One example is the amethyst clam (Gemma gemma), only a half centimetre long, and considered for years to be a "baby quahog." This is the most common invertebrate in the Cape Jourimain salt marshes, at the New Brunswick end of the Confederation Bridge. Another is the Baltic macka, which grows to four centimetres and looks like a somewhat larger small quahog. Finally, there is the salt marsh-specific ribbed mussel, which is big and relatively common. We see its empty shells on the mud flats, but most of us fail to realize its origins.

As the foregoing examples illustrate, there are many secrets to discover in a salt marsh, so it will come as no surprise now to find that much of the salt marsh food web may be based quite simply on detritus. Debris. Rotten stuff. Marsh plants capture the sun's energy. Most of them remain ungrazed by anything until winter knocks them over into the mat and mud. Tidal action and bacteria attack and help break the plants down into debris. Blue-green algae and diatoms are major unseen producers in the tidal creeks and mud banks, giving a noticeably slimy texture to the mud. In that mud, bacterial digestion of organic matter can take place in the absence of oxygen. One of the by-products is the "rotten egg gas" (hydrogen sulfide) that gives the marsh such a pleasant odour at night. There are other contributors to the mix, such as storm tossed bits or even windrows.
of seaweed, eelgrass, and the occasional clam. The decomposers get at them, too. And as surely as a tide deposited some debris, it will carry some back to sea as it recedes.

This is where the picture is still pretty muddy (so to speak) for ecologists, because a marsh that continually traps eel grass in lines at the high tide mark — and other sediments that cause the marsh to grow towards the sea — is trapping a lot of energy. However, scientific study also illustrates that the marsh exports some of the basic elements required for life, nitrogen and phosphorous, for example. Lack of nitrogen may limit growth in saltwater systems, and the ability of the salt marsh to export nitrogen has given a lot of credence to the notion that the wonderful productivity of the northern ocean originates in good part in the coastal marshes. Larval fishes of many species drift to coastal waters and undergo accelerated growth with the aid of what I call “Salt Marsh Formula 1,” the contents of which varies seasonally and is still being investigated. These days, marsh drainage on a grand scale is unlikely to be permitted.

Who Owns The Marshes?

The Acadians and, later, the Selkirk settlers spent a good bit of time trying to establish title to the salt marshes. As early as the 1730s, De Pensens petitioned French authorities to grant written assurances of title until a formal deed could be drafted, while Franquet recommended that an expert survey be undertaken to help settle this question, which still festered in 1751. At the beginning of the 19th century, the Earl of Selkirk acquired title to two towns, and assumed the right of conveyance of the marshes on them. By the mid-19th century, the marshes were less valued, yet claims of title were still easily implied by various land documents, and explicitly recognized by grants from the Commissioner of Deeds, whose position was established in 1853. Charles Palmer acquired his marshland near Mount Stewart by a deed of conveyance in 1872. The 1880 Meacham’s Atlas shows the marsh upstream of Mount Stewart as being divided up among both named parties or, alternately, “various owners,” and a plan of the area in the Land Registry Office in Charlottetown shows the marsh holdings of the Palmer Estate and adjacent landowners on the marsh in 1901. There are many similar parcels of salt marsh where a chain of title extends back many years, particularly if the land had a demonstrated agricultural value. Bruce Pigot has reported that some deeds for holdings on the Piscud River specifically instruct the owners to maintain the dykes.

Ownership became more blurred as the dykes disappeared and agricultural use of the marsh declined. Today, deed holders no longer go to the marsh to harvest hay, and owners do not pay district school taxes on these parcels. Like Franquet, they long for a survey that will actually describe where their parcel lies, but the information is now lost. The inland farmers who owned a chunk of marsh may have had a deed declaring title to, say, “three acres of marsh at Tryon,” but it is unlikely that the whereabouts of their parcels can be settled, since the marshland plots are not physically adjacent to the upland farms. The boundaries of the upland farms may be well defined, but those boundaries provide no clues about the location of the accompanying marsh property.
Halsbury’s *Laws of England* states that the “soil of the seashore, and of the bed of estuaries and arms of the sea and of tidal rivers, so far as the tides ebbs and flows, is *prima facie* vested of common right in the Crown, unless it has passed to a subject by grant or possessory title.” In the end, as sure as Nature will determine what goes on in the salt marsh, title claims are a matter for lawyers. They may have their say — but so will Nature. One day all this land may be reclaimed by the tides.

**The Marsh of Progress?**

It is the nature of humans to modify their environment, and salt marshes have come in for quite a bit of alteration over the years. On Prince Edward Island, we have not lost 50-80% of salt marshes through conversion to agricultural land, as in the Bay of Fundy region, but to one extent or other, most of our marshes have been dyked, ditched, drained, or mined. They have also been dammed. They have been drenched with diesel oil to control mosquitoes (this was before the energy crisis). They have been burned each spring in certain locations; infilled on most waterfronts, and elsewhere top-dressed with topsoil to facilitate cottage development and golf courses; and used as a dumping ground for dredge spoil. Salt marshes have generally been hostile to foreign plants, but recent environmental change seems to have favoured one

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The marsh is one of the marshes’ larger residents.

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invader, the purple loosestrife.

In the next century, we may discover that global warming really is more than just a theory. As ice caps melt and sea levels rise, the salt marshes that contribute to the growth of the Island on the south shore may reach further inland — but be flooded continuously on the seaward side. Much of downtown Charlottetown, unless bolstered by a giant seawall, might revert to salt marsh. If coastal waters were to warm appreciably, more southern species may displace some of the current marsh dwellers. It is tempting to fantasize that the marshlands’ least favoured export, mosquitoes, might even disappear one day.

But all of this is not very scientific speculation. Even if great scale changes are afoot, they are just a blip in the horizon of the extremely resilient coastal marsh. Mosquitoes, too, will no doubt survive.

**Sources**


Human settlement on the marsh and the importance of salt marshes are described in various places, notably D. C. Harvey’s *The French Regime on Prince Edward Island* (New Haven: Yale University Press, 1927) and A. H. Clark’s *Three Centuries and the Island* (Toronto: University of Toronto Press, 1959). Lord Selkirk’s Diary, 1803-1804 was published by the Champlain Society (edited by Patrick White) in 1958. Community histories by Frank Pigot, *The History of Mt. Stewart* (Charlottetown, 1975), and the North Tryon Historical Society, *Remember Yesteryear: A History of North Tryon*, 1769-1992, were particularly helpful, as was a short article by Bruce Pigot in the *Island Naturalist*, “Acadian Structures on the Mt. Stewart Salt Marsh.”

A number of important articles are unpublished. Among them I might mention the Canadian Wildlife Service 1968 proposal for a National Wildlife Area, which is in the files of the Fish and Wildlife Division of the provincial Department of Fisheries and Environment. As a departmental employee, and in the course of purchasing salt marsh properties through the auspices of the North American Waterfowl Management Plan, I assembled many files of title searches, which help to illustrate ownership patterns. Dawne Gallant, paralegal, and Serge Bernard, provincial Chief Surveyor, have provided much needed interpretation of this information.

My appreciation of salt marshes has been enhanced by visitation to the marshes, and visits with my peers, Colin MacKinnon of the Canadian Wildlife Service and John Wile of Ducks Unlimited Canada, to the Fundy dykelands. The task of sketching a salt marsh has been greatly aided by comments from Harry Holman and the editors in a last ditch effort to make hay while the sun shines. Finally, thank you to Randy Dibblie, who created maps for use in this article.