Recent Morphological Changes And Future Management Of Crescent Beach, Lunenburg County, Nova Scotia

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Geological Survey of Canada

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Abstract

The monitoring of Crescent Beach began in 1978. Since then it has essentially maintained its basic physical character of a wide, low gradient, sandy beach, backed by a narrow dune ridge. The dunes have not deteriorated as rapidly as predicted in an report written in the mid-1970s (Bowen et al, 1975). A net increase in sand levels across the intertidal and upper beach during the early- to mid -1980s led to a net sediment accumulation along both sides of a wooden retaining fence situated along the seaward side of the dunes at both ends of the beach. Unfortunately all of the sediment which accumulated seaward of the fence, except the new dunes at the east end of the beach, was removed during the fall and winter storms of 1991-1992. Also, there was evidence that the primary dune crest shifted slightly landward at the western end of the beach during the 14 year period. The marginal improvement in dune width is encouraging. In the short term there is a need for better management of Crescent Beach and some recommendations are presented. But, in the long term, the narrow width, lack of new sediment and room to retreat make Crescent Beach extremely vulnerable to wave attack and to larger scale adjustments in its physical character as relative sea level rises at rates of 35 to 47 cm/century.

Introduction

Crescent Beach is a popular recreational sand beach located at the head of Green Bay, on the South Shore of Nova Scotia (Fig. 1). This 2 km long, 40 to 65 m wide bayhead barrier connects the mainland shore to George Island which is part of a series of islands collectively known as the LaHave Islands. The low (<2°) gradient beach facing Green Bay is separated from the tidal flats and salt marsh of Dublin Bay by 2.0 to 4.5 m high sand dunes and a paved road which runs the length of the beach. The dunes are highest near the eastern end of the beach between survey lines 33 and 35 (Fig. 1, 2). Meguma sandstones, greywackes and slates outcrop along the sides of the bays and a submerged rock ledge exists at the mouth of Green Bay. The shoreface is a low angled (<0.5°) planar slope devoid of bars or rip channels. Bryant (1977) concluded that the absence of bars was the result of insufficient wave energy for current generation and sediment entrainment necessary for bar formation.

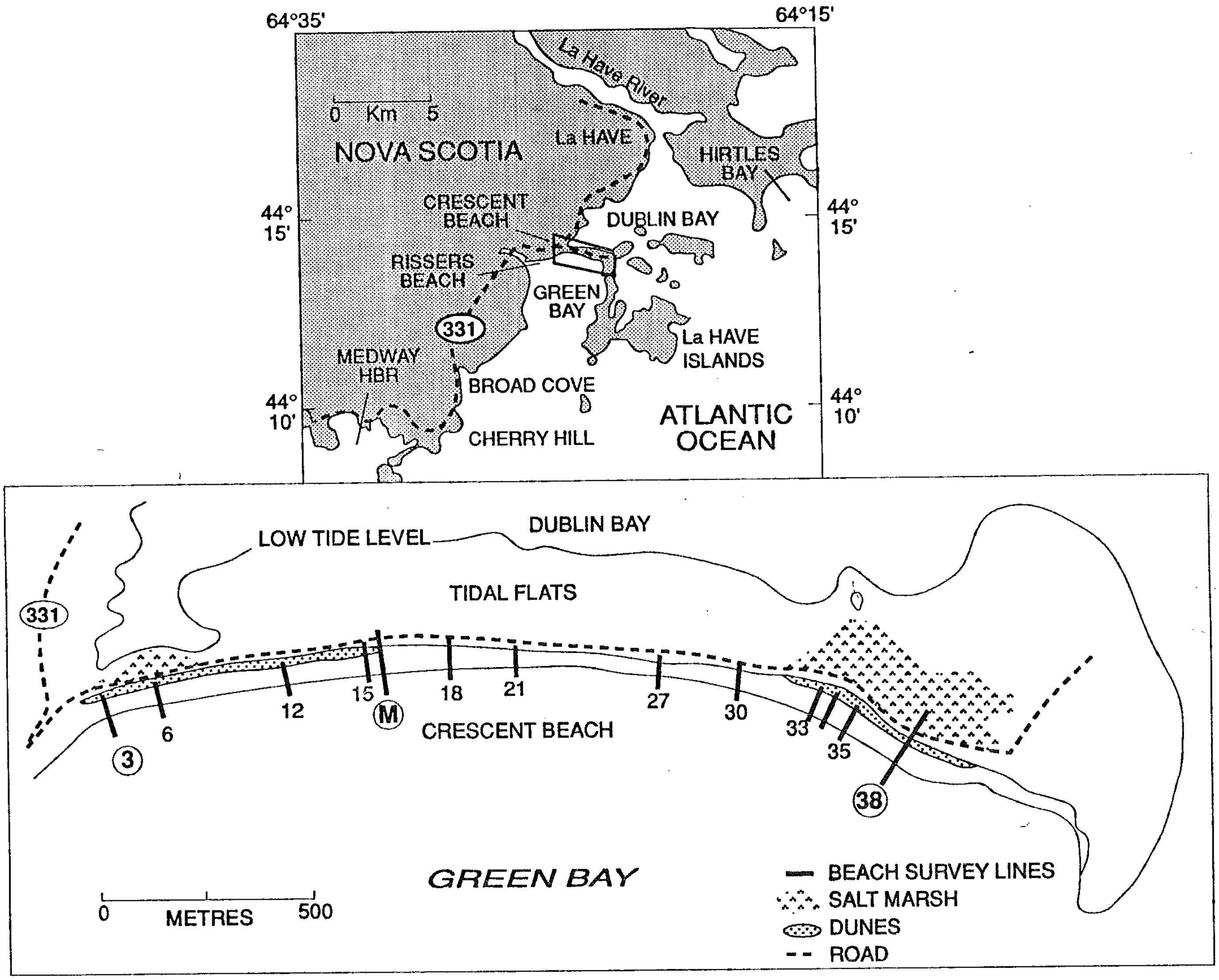


Figure 1. Location map of (a) Crescent Beach, Lunenburg County and (b) the beach survey lines established along Crescent Beach in 1980 (Wittmann, 1982). Lines 3, M and 38 were used to monitor beach changes between 1978 and 1992. The map is based on the 1976 air photo (from Wittmann, 1982).

Water depths in Green Bay are less than 11 m (CHS, 1973). In the bay an estimated 15-20 m of unconsolidated material overlies bedrock. The majority of unconsolidated sediment, on the basis of 3.5 KHz records, appears to be estuarine material with only a thin cover of sand of modal size 2.5 to 3 phi (Piper et al. 1986).

Sand grains sampled from the beach have been described as petrographically mature (Bowen et al., 1975). There is little evidence of an input of new material. Mean grain size of the dune sand was 1.75-2.75 Ø, and for the beach sand 1.85-2.86 Ø (Wittmann, 1982). The only large source of sand for beach development appears to be offshore in Green Bay (Bowen et al., 1975). Bryant (1977) showed that the longshore variation in mean settling velocity for sand collected along the mid-foreshore zone was very low, ie. < 1.2 cm/sec/km except at the sheltered east end of the beach. He attributed the uniformity in sediment alongshore to low wave energy and its dissipation across the lower beach face. There is no known inshore wave climate data for the area; large tidal range is 2.2 m (Gregory et al. 1993) and storm surges in the order of 0.6 m can be expected at least on the outer coast during northeasterly storms (Taylor, in prep.).

Scientific interest in the beach has been minor. However, from a coastal management point of view, Crescent Beach, with its severely degraded dunes, offers a sharp contrast to the stable, well vegetated dunes of nearby Rissers Beach, a provincial park (Ricketts and Taylor, 1988). Crescent Beach was also one of the sites examined during a province wide survey of sand dunes in 1991 by Hale (1992) who lists it as one of the six most degraded dune systems in the province. Previous coastal geology studies of Crescent Beach have included a brief overview of the physical setting, historic useage and major events (Table 1) affecting beach stability by Bowen et al. (1975) and a sediment sampling study by Bryant (1977). A single beach survey line was established in 1978 for future monitoring studies by Munroe (1980); Wittmann (1982) examined seasonal fluctuations in beach morphology at 12 lines (Fig. 1) during the fall and winter of 1980-81; and a resurvey of three cross beach lines in 1981 (Taylor et al., 1985) one in 1983 and three lines again in 1986 and 1992 (including Line M established by Munroe) were completed as part of a ten year monitoring program of selected beaches on mainland Nova Scotia. The last two sets of data form the main input for the present report.

The sand dunes of Crescent Beach have been breached, eroded and severely degraded during storm events and by intense useage by people (Table 1, Fig. 2). It is implied in the report by Bowen et al. (1975) that the beach has been in roughly the same location since the turn of the century however older maps and air photos were not available to confirm longer term changes in the beach position.

Table 1. Major events which affected the stability and evolution of Crescent Beach, Lunenburg County (from Bowen et al., 1975; Wittmann, 1982).

1762	- Beach privately owned but used by publicuntil 1951 when acquired by provincial government.
1900	- Duneline described as continuous but "cliff-like", and extensive salt marshes were auctioned for cutting rights of salt hay.
1905	- Barrier breached by sea during January 25-27 storm; repaired by locals who dumped whole spruce trees into breach.
1920s	- Continuous dune reestablished by 1920 but by mid -1920s in an exceptionally dry summer, a severe fire damaged dune and salt marsh plants; erosion and sand mobility increased-waves overwashed through dunes, cut the road, and sand was increasingly blown into marsh areas.
1930	- Armour rock placed along damaged beach areas by federal government.
1938	- Long plank seawalls built along length of beach.
1940s	- Eastern end of seawall fails and line of old car bodies dumped into breach to trap sand. Result was a steep narrow dune.
1951	- Nova Scotian government acquires possession of beach.
1955	- Air photos show a continuous duneline.
1956	- Central section of beach severely damaged in storm of December 30.
1957	- Seawall of boulder rip rap added along central part of beach and road built along backshore to connect mainland to LaHave Islands
1970	- Dept. of Highways places boulders at access ramps to beach to stop vehicular traffic on beach -short lived action.
1972	- Storms in February damage west end of dunes; patched by old posts and driftwood-job creation program establishes new wooden seawalls.
1974	- Eastern end of wooden seawall collapsing; boulder rip rap placed landward o seawall.
1970s	- Where dunes are low the sand flats in Dublin Bay are accreting as a result of sand transport from the beach and removal of sand from highways.
1980s	- Repairs to parts of wooden fence line located at seaward edge of primary duneline.
1991	- Northeasterly storm, October 29,30 - 0.7 m storm surge -large waves comb down beach and erode seaward edge of dunes.
1992	- Northeasterly storm, February 2, produces large snowfall, 0.6 m storm surge.
1993	- Extensive icefoot built during "Storm of the Century" (March 13,14) and snowdrifts protect upper beach and dunes from high energy waves.

Figure 2. View to the east along Crescent Beach (people at line M) illustrating the narrow duneline, the tidal flats of Dublin Bay (left), the location of the highest dunes (background), and position of the wooden retaining fence (photo May 13, 1992).

Table 2. Rates of sediment accumulation (+) / erosion (-) measured along three lines surveyed across Crescent Beach, Lunenburg Co., between 1978 and 1992. Changes along the survey lines are illustrated in Figure 3.

Survey Line	Years of Survey	Change in Sediment Levels (in metres) Dune*	Upper Foreshore	Lower Foreshore
3	1980-81	+0.5 to+0.7	0.0 to -0.5	+0.2 to +0.3
	1981-86	+0.2 to +0.5	+0.4 to +0.5	+0.2
	1986-92	+0.1 to +0.4	-0.2	-0.3 to -0.4
M	1978-81	+1.2	+0.4	+0.6
	1981-83	trace -	-0.6 to -0.7	-0.4 to -0.5
	1983-86	+0.3 to +0.9	+0.6 to +0.8	+0.4 to +0.6
	1986-92	+0.1 to +0.4	-0.3 to -0.4	-0.1 to -0.5
38	1980-81	--------	-0.2 to -0.3	-0.1 to +0.1
	1981-86	+0.5 to +0.9	+0.3	-0.1
	1986-92	trace +	+0.3 to -0.2	-0.2 to +0.2

* Only includes dunes landward of the wooden retaining fence.

Wittmann (1982) using air photos compared the beach morphology in 1955 to 1976. She reported that the duneline had been cut back and the dunes along central portion of the beach had been severely deflated and breached. On the Dublin Bay side the extent of salt marsh vegetation had been reduced. Before construction in 1956-57 of the highway along the backshore, the beach itself was used as the main transportation link to the LaHave Islands. Vehicle access to the beach has continued except for a brief few periods when boulder rip rap was emplaced in an attempt to block vehicles from driving on the beach. Wooden retaining walls and/or fences have been erected at various times and at several locations along the seaward face of the duneline to protect the road and reduce further deterioration of the dunes. Boulder rip rap was also placed in the dunes along the central portion of the beach.

Beach Survey Data (1978 to 1992)

Wittmann (1982) monitored 12 survey lines spaced along the length of Crescent Beach (Fig. 1) during the fall and winter of 1980-81. The lines were surveyed in October, November and February. During the four month period the beach face slope at all survey lines except the most eastern one (L38) was lowered by an average of 0.3 to 0.5 m, resulting in a steepening by one degree. Loss of sediment was greatest between October and November when the upper beach and summer berm deposits were combed down. Maximum lowering of the beach face was measured at lines 27 to 35 where 0.5 to 1.1 m of sand was removed. At line 38 there was a net sediment loss between October and November, but by February the lower beach had recovered to, and slightly above, the October level. The surveys showed only slight erosion of the seaward dune slope.

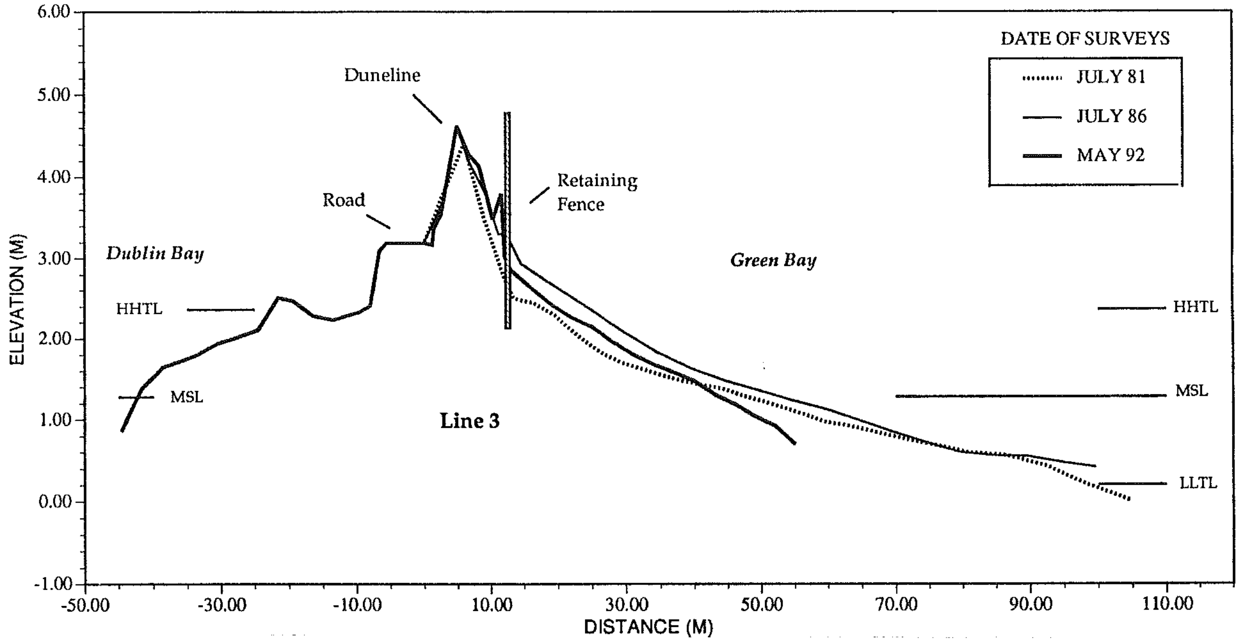
A resurvey of two of the twelve lines in the summer of 1981 showed that both lines 3 and 38 had experienced a net loss of sediment around the wooden retaining fence; with the least change at line 38 (Taylor et al., 1985). At another line (line M) where surveys were completed in 1978 and 1981, there was a net sediment accumulation of 47 m^3 across the dune and foreshore zones. 42 % of the increase occurred landward of the retaining fence. A subsequent survey of line M in February 1983 showed that the upper beach face was combed down by 0.6 to 0.7 m and the lower beach slope by slightly less amounts (Fig. 3, Table 2).

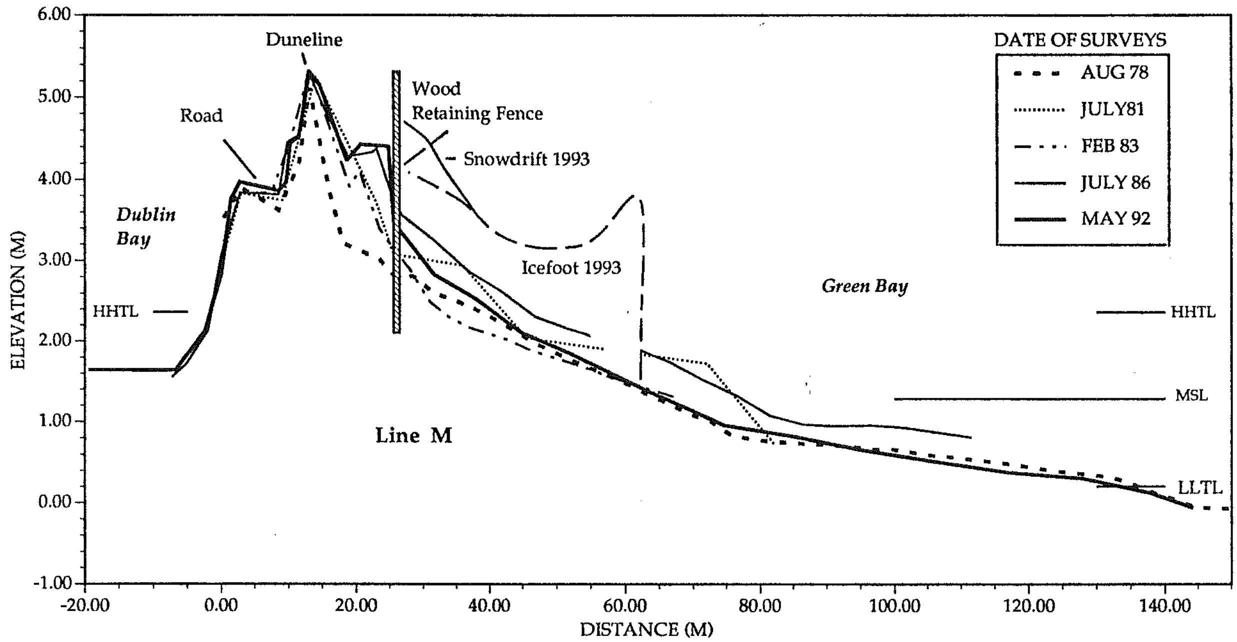
A closer examination of the surface morphology along three survey lines, selected as representative of the ends and west-central portion of the beach (lines 3, M, 38, Fig. 1,3) showed the following changes during the period 1981 to 1992.

Line 3- In 1981 scouring occurred at the base of the wooden fence and the main duneline but by 1986 sand levels had increased by 0.2 to 0.7 m across the beach and dunes (Table 2, Fig. 3a). The greatest accretion was registered just seaward of the wooden retaining fence. The crest of the primary dune aggraded by 0.3 m but shifted 1.5 m landward by 1986. By 1992 the dune crest again had increased in height but a net loss of 0.4 m of sand was recorded at the retaining fence and across the lower beach face. The most disturbing change registered between 1986 and 1992 was the steepening of the lower beach face and its resultant 50 m landward retreat at lower low tide level (Fig 3a).

Line M- By 1986 a net sand accumulation of close to 1 m was measured along both sides of the wooden retaining fence and the beach registered the highest sand levels since 1981 (Fig. 3b). Sand accumulation decreased to less than 0.6 m farther landward from the fence. By 1992 there was a slight increase in height (0.2 m) and landward shift in position of the primary dune crest. The reduction in dune growth between 1986 and 1992 suggests that sand levels have reached an equilibrium level relative to the height of the wooden fence. Sand levels in 1992 on the landward side of the fence were 0.8 to 0.95 m below the upper fence rail. By 1992 waves had scoured 0.2 to 0.3 m of sand from around the base of the fence (another log line exposed-Fig. 4); damaged parts of the fence and sand levels across the beach face had not yet recovered to their 1986 level. Very little of the dunes had survived seaward of the fenceline (Fig. 4). A comparison of surveys in 1986 and 1992 also suggested that the northern shoulder of the road had been built up, possibly as a result of road grading to compensate for the winnowing of material by waves at the base of the road bank.

Line 38- Sequential surveys since 1980 have shown that the beach face slope is very stable and that this is an area of substantial dune growth (Fig. 3c). Net fluctuations in sand levels across the beach face were generally less than 0.3 m between surveys. Landward of the retaining fence the dunes grew by as much as 1.3 m in height and 10 m in width between 1980 and 1986. The seaward dune slope was covered by lush marram in 1986 as a result of sediment accumulation. Six years later in 1992 there was little net change in dune morphology. Only a small reduction in dune height adjacent to the wooden fence was observed and the cover by wild rose was much greater adjacent to the road. Seaward of the retaining fence the foredune had increased in width (5 m), height (0.5 m) and become densely vegetated despite showing signs of having been flooded by waves. New dunes extended eastward and westward of the survey line but stopped about 20-30 m to the west near survey line 35 where the beach orientation changed. Between 1981 and 1992 the upper foreshore slope experienced only a net lowering of 0.2 m.


DATE OF SURVEYS
JULY 81
JULY 86
MAY 92
Duneline
Road
Retaining Fence
Dublin Bay
Green Bay
HHTL
MSL
LLTL
Line 3
ELEVATION (M)
DISTANCE (M)


DATE OF SURVEYS
AUG 78
JULY81
FEB 83
JULY 86
MAY 92
Duneline
Road
Wood Retaining Fence
Snowdrift 1993
Icefoot 1993
Dublin Bay
Green Bay
HHTL
MSL
LLTL
Line M
ELEVATION (M)
DISTANCE (M)

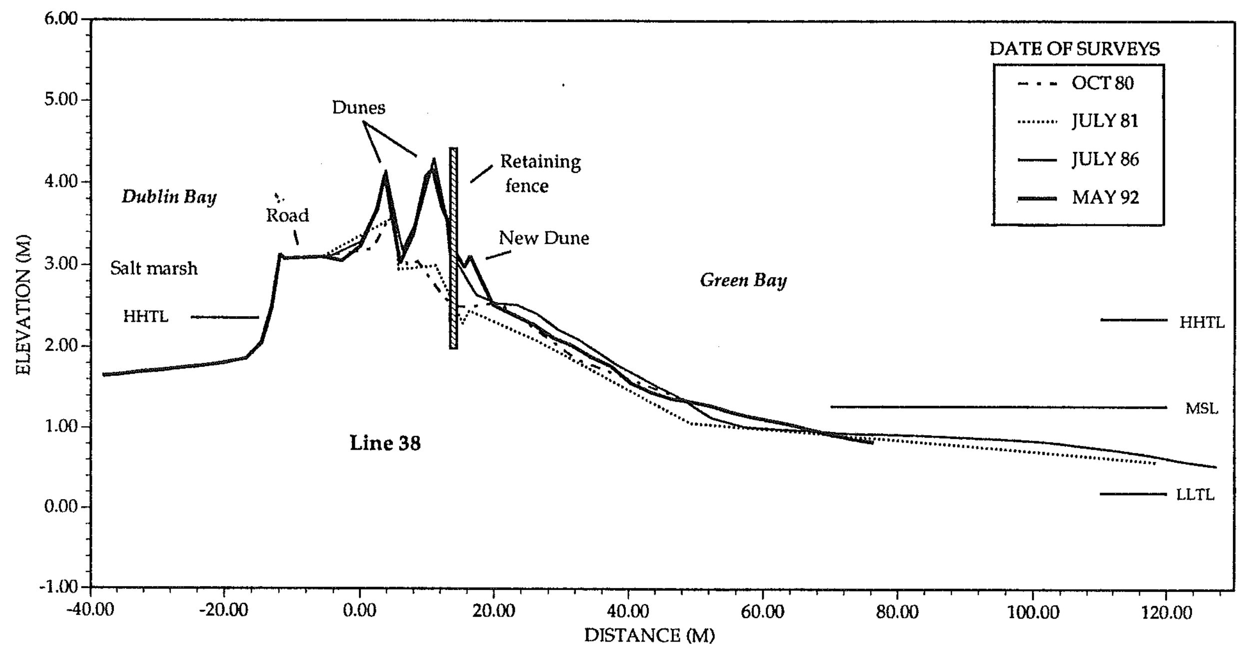

DATE OF SURVEYS
OCT 80
JULY 81
JULY 86
MAY 92
Dunes
Retaining fence
Road
New Dune
Dublin Bay
Salt marsh
Green Bay
HHTL
MSL
LLTL
Line 38
ELEVATION (M)
DISTANCE (M)

Figure 3. (Opposite page) Cross-section profiles surveyed between 1978 and 1992 at: a) line 3, b) line M, and c) line 38, Crescent Beach. The location of survey lines is shown in Figure 1. Survey datum was mean sea level (1.28 m).

Winter 1993 Observations

Several major storms struck the area in the winter of 1993 including the so called " Storm of the Century", (only really applies to southern USA) on March 13, 14. A brief visit was made to Crescent Beach on March 20, 1993 to assess the condition of the beach and the extent of snow and icefoot. Only photographs, visual observations and taped measurements were completed. Dublin Bay was covered by sea ice and snow. The dunes were snow covered. At survey line M snow drifts extended 10-12 m seaward of the retaining fence onto an icefoot which extended an additional 28.5 m seaward to just below mean sea level (Fig. 3b). The icefoot which was composed primarily of compacted slush ice and some brash ice was estimated to be 1 m thick. The seaward edge of the icefoot had been built by breaking waves to a thickness of 2.2 m and slightly thicker where exposure to waves was greater. The icefoot was rapidly ablating on March 20 because of the return of warmer air temperatures. The icefoot protected the upper beach from winds and waves during the largest storms of the winter. However, the vertical wall of ice along the seaward edge of the icefoot may have caused increased wave reflection and scouring of the lower beach face. No surveys could be completed to confirm this hypothesis. It is not known how often an extensive icefoot forms at Crescent Beach. Based on observations along the Eastern Shore, an extensive icefoot only occurred when there was a large quantity of sea ice offshore, such as in March 1987 and 1993 and/or large snowfalls were followed by several days of extremely cold air temperatures. The sea ice was broken down by waves during large storms and then transported inshore as brash ice where it collected in the bays and estuaries. Snowdrifts extended seaward across the upper beach slope from the beach crest or dunes and solidified above high tide limit if cold temperatures persisted. In most years only a thin, narrow icefoot has been observed at high tide level along most Atlantic Nova Scotia beaches. The icefoot only existed for a few days or weeks.

Drifting snow is another important aspect of winter. At Crescent Beach large snow drifts extended landward from the dunes across the highway. Because of the lack of shoulders along the road the snow had to be pushed by plows into extremely high walls of snow and ice along the duneline. The net effect of the plows on the dune morphology could not be assessed but, the action illustrates the inability of the beach and dune to migrate naturally landward. The dunes which are presently squeezed between the sea and the road can only grow upward which will increase the amount of both snow and sand drifting across the highway; therefore increase the necessity and frequency of plowing and grading, and increase the potential loss of sediment.

Interpretation of Beach Survey Data

Surveys at three sites along Crescent Beach during the past 10-14 years provide quantitative information on the seasonal and longer term changes that have occurred along this beach.

1. Between 1978 and 1992 there has been a slight landward shift in the position of primary dune crest but an increase in the width of the duneline because of sediment accumulation along both sides of the retaining fence particularly toward the central and eastern ends of the beach. Only at the east end of the beach (L 38) did new dunes build and become stabilized by vegetation seaward of the retaining fence. The beach appeared to be building in the early 1980s with maximum sand levels recorded in July of 1986. By 1992 the sand levels across the beach had returned to nearly the same level as the 1978-1981 period. During the 14 years the beach, with the exception of the west end (line 3), has maintained a similar low gradient, dissipative slope. The low sand levels recorded in 1992 across the beach, the damage to the wooden retaining fence and the scouring around its base were attributed to a series of high energy northeasterly storms that struck Atlantic Nova Scotia during the fall and winter of 1991-1992, eg. Halloween and Feb. 1, 1992 storms (Bigio, 1992, Taylor, in prep). The increased steepening and retreat of the lower beach slope observed in 1992 at line 3 (Fig. 3a) is disturbing if it represents a longer term loss of shoreface sand, however; the change may only represent a short term loss as a consequence of the 1991-92 storms. Subsequent surveys will be required to confirm the significance of this change.

2. Beach surveys completed at different times of the year suggest that net seasonal fluctuations in sand levels across the beach face are most commonly less than 0.6 m but can be as much as 1.1 m along the east central part of the beach where a larger summer berm can be developed. The upper beach slope is built to maximum levels between July and October and much of this accumulated sand is combed downslope and offshore by November. Minimum sand levels have been recorded across the beach in February, May and July however a net accumulation of sediment can occur in the winter, e.g. February 1981. In any given year large snowdrifts and/or an icefoot can protect the upper beach slope from wind and wave scouring for days to weeks depending on the climatic conditions between January and April. The exact timing of beach buildup or erosion can be extremely variable depending on the short term wave conditions. Therefore these observations of seasonal fluctuations in beach form should only be used as a guide when planning beach management strategies.

Figure 4. (a) General and (b) close-up views of sediment scouring observed along retaining fence at and near survey line M (arrow) in 1992.

3. The wide intertidal sandflat along Crescent Beach is the primary source of sediment for upper beach slope and dune building. The net increase in sand levels across the beach between 1981 and 1986 was reflected by a net accumulation of 0.3 to 1.3 m (0.1 to 0.3 m/a) of sand landward of the wooden retaining fence at all survey lines during that period. Dune progradation also occurred seaward of the retaining fence at several sites during the 1980s where seaweed and other flotsam were left in place to trap sand and initiate plant growth. However much of the new dune growth was destroyed by the storms of 1991-1992. Only at the east end of the beach near line 38 (Fig. 5) did dunes build and stabilize with vegetation sufficient to withstand the storm waves in 1991-92. The survival of the dunes at the eastern end of the beach was also because this is a more wave sheltered area which exhibits less seasonal fluctuations in sand levels and it is an area of net sediment deposition. Wind scouring of blowouts within the highest dunes just to the west of L 38 also probably contributes to the net increase in sediment supply.

4. The highest dunes found near the eastern end of the beach between survey lines 27 and 35 are the product of prevailing westerly and northwesterly winds. These larger dunes also exist where the largest seasonal fluctuations in beach slope were recorded (Wittmann, 1982). The increase in beach change could be attributed to greater exposure to longer period waves from the south which tend to be directed inshore in the vicinity of survey lines 27-35 (Wittmann, 1982; Fig. 6). Wave refraction diagrams for shorter period waves from the south illustrate that they are more evenly dissipated along the length of the beach.

5. A wide, low gradient beach face is the best natural defence for dunes against wave attack. It dissipates more wave energy across the lower beach slope but it does not eliminate wave attack on the dunes. The physical condition of the dunes at Cresent Beach has marginally improved during the past 14 years but its narrow width, steep slopes, numerous blowouts and the lack of room to expand either landward or seaward still make it extremely vulnerable to storm wave attack and erosion, as was observed in 1992 (Fig. 4). The physical condition of the primary duneline varies alongshore (Fig. 7). In most cases the dunes are anchored in place by the wooden retaining fence that was established along both ends of the duneline. This study did not examine changes along the low central portion of Crescent Beach, nor the highest portion of the dunes. There is still insufficient survey information or sediment cores to quantify the amount of sediment lost into Dublin Bay from the beach and dunes. These topics and the recent recession along the lower foreshore slope at the west end of Crescent Beach need further examination.

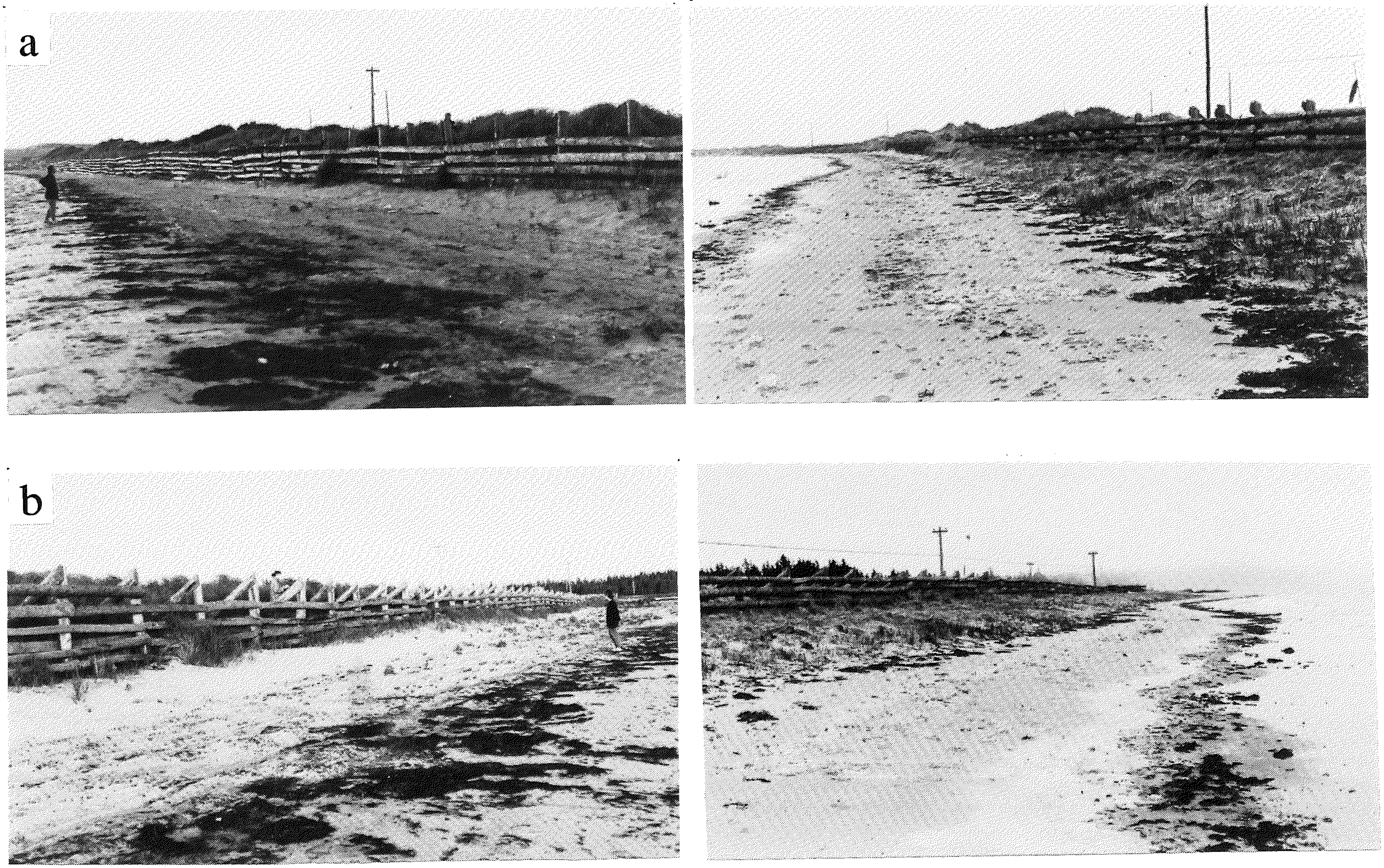


Figure. 5. Beach changes to the west (a) and east (b) of survey line 38 (people on line) showing the extent of new dune growth and stabilization during the period 1986-1992. (photos: (left) July 22, 1986,(right) May 13, 1992).

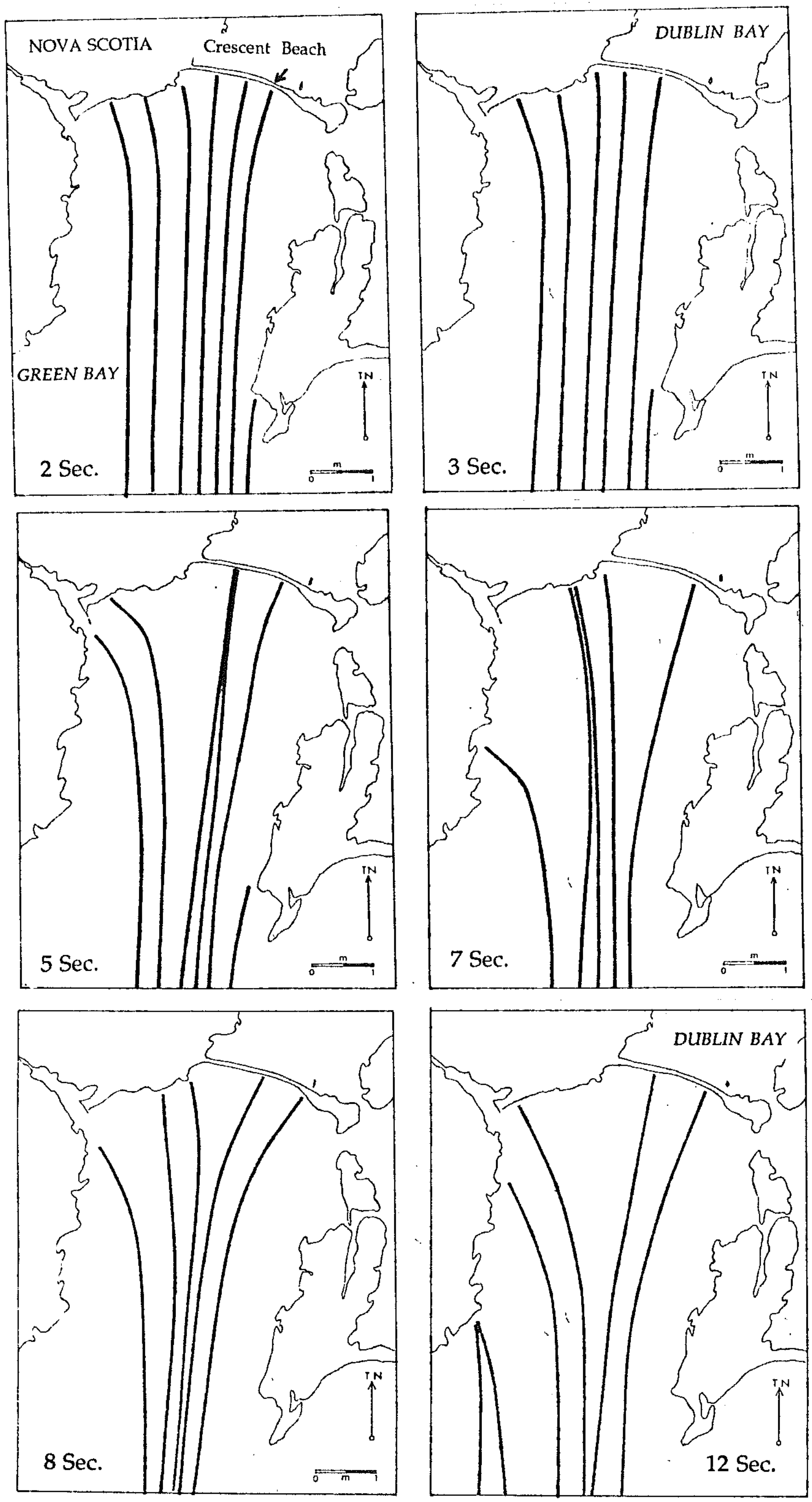


Figure 6. Wave refraction diagrams produced by Wittmann (1982) for waves entering Green Bay from the south suggest that waves of 2 to 3 second period are little affected by shoaling. Near line M there appears to be some convergence of 5 second period waves but divergence for 7 and 8 second period waves which are more influenced by seabed shoaling.

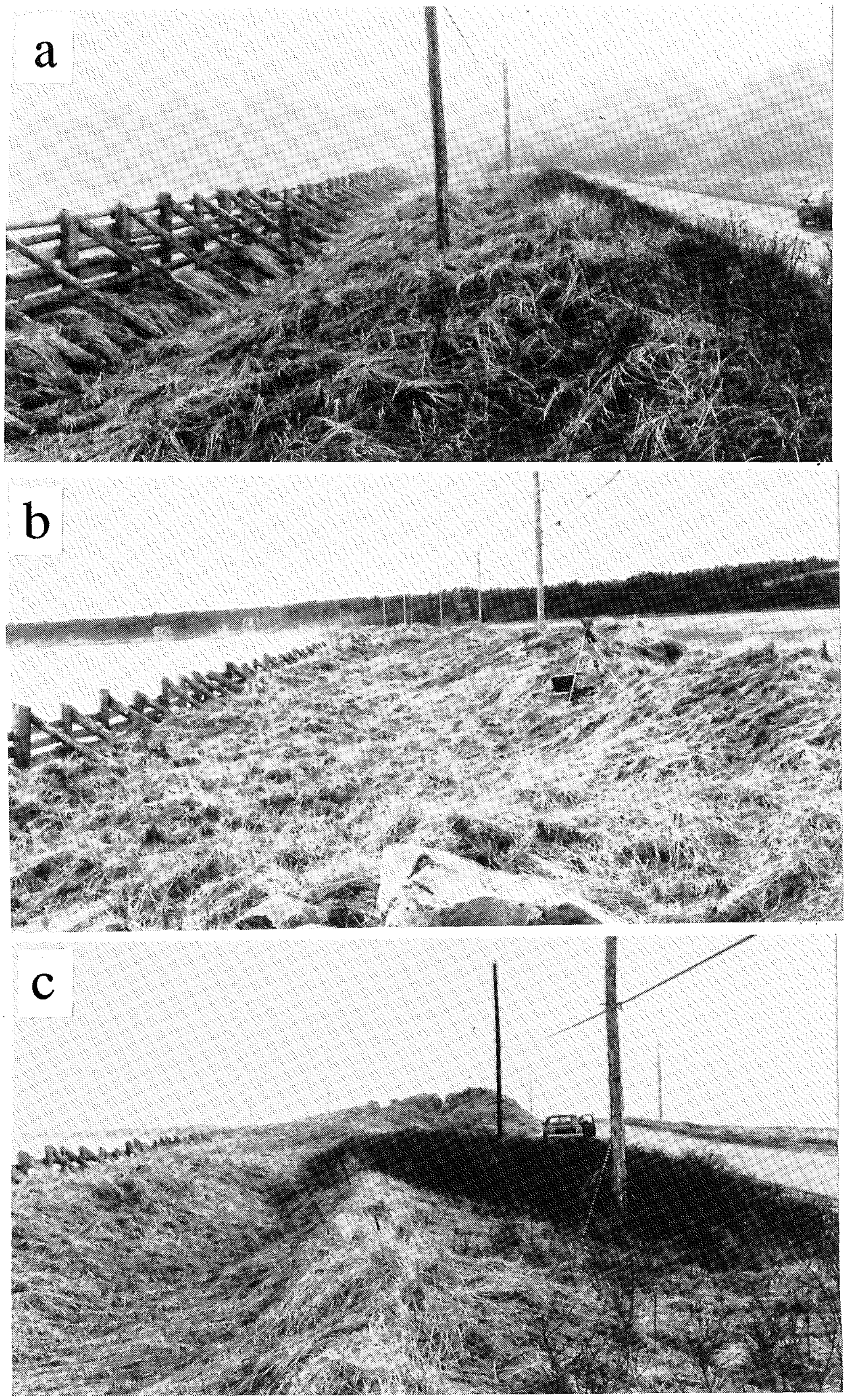


Figure 7. Views looking westward showing the condition of the primary duneline in May 1992: (a) at line 3 where sand has not completely infilled landward side of the wooden fence; (b) at line M where sediment accumulation was greater back of the fence; and (c) at line 38 where a new dune developed back of the wooden fence and wild rose bushes are spreading and stabilizing the backdune slope.

Coastal Management of Cresent Beach

From a geologic point of view coastal dunes are an integral part of a beach system. They store sediment for future beach nourishment and increase beach crest height thus forming a natural defense against wave overwash and inland flooding.

There is no doubt that there is a need for better management of the dunes at Crescent Beach, one only has to look at the difference at Lawrencetown Beach, Halifax County, between 1982 and 1992 to see the improvement in dune stability brought about by careful management and restricted access to the beach. Today, Crescent Beach is a platform for a multitude of uses including transportation, communication, recreation and biological habitat. Previous management decisions at Crescent Beach have focussed on protecting the road; they have not always been made in the best interest of the natural environment, as reflected in the comments by Bowen et al. (1975). They concluded that "... the boulder wall, represents the opposition to natural processes rather than adaptation to them." They also criticised future management plans. "The various subsequent efforts to stabilize the beach were doomed to failure. ... with no (new) sand supply the beach must retreat landwards to recover, reworking all the sand now deposited in the flats behind the road." Fortunately their prediction that the dunes will disappear at both ends of the system did not come true. However, the facts are that relative sea level is rising at rates of 3.5 to 4.7 mm/a as shown by tidal records from Halifax and Yarmouth (Shaw and Forbes, 1990); there is no large source of new sediment available for beach progradation (Piper et al.,1986) and a road blocks the natural retreat of Crescent Beach, as it adjusts its form to these changing environmental conditions. Management strategies for Crescent Beach, particularly for the long term, need to consider the primary purpose(s) for management. Is it to maintain a primary transportation and communication link to the LaHave Islands; is it to preserve a natural coastal environment and habitat, is it to be a major recreational site, or is it to be a natural defence against the sea for Dublin Bay? Management strategies will differ depending on the goals that are to be attained.

The Nova Scotia Department of Natural Resources has begun to develop plans to manage Crescent Beach through restricted public access across the dunes and improved parking facilities on the Dublin Bay side of the road. These plans have been postponed because of opposition by local residents who want more time to reflect on plans for the beach and Dublin Bay.

At present, the narrow extent of dunes at Crescent Beach make it a very risky place to build permanent man-made facilities. Unlike Lawrencetown Beach and many of the larger beach systems in Lunenburg County, e.g. Cherry Hill Beach, Medway Harbour (Fig. 1), there is little room on Crescent Beach to integrate man-made facilities with nature, or space (assuming the road remains) for coastal features to recover if forced landward by natural processes. The most important steps in maintaining Crescent Beach in its present position for as long as possible are: 1) keep the loss of sediment from the beach system to a minimum; 2) improve the longshore continuity of the dunes and keep the breaks through the duneline to a minimum; 3) keep the dune crest height at an elevation that restricts large scale wave overwash. Some ways that would assist coastal managers in maintaining or improving the integrity of Crescent Beach are listed in the following recommendations.

It is recommended that:

1. careful thought be given to the location of access routes through the dunes from proposed parking lots. Experience has shown that where walkways, stairs and other structures extend seaward of the main duneline they are subject to damage and/or scouring by waves during storms. Walkways through the dunes and parking areas can become focal points for wave overwash and flooding. Wave overwash transports sediment landward often into the backshore estuary where it forms the foundation for a future beach, but the sediment is essentially lost for present beach building. The absence of well defined dunes along the central portion of Crescent Beach make it an attractive site for walkways. However this part of the beach also has a history of being overwashed during storms. Before establishing walkways it would be useful to correlate the position of former wave washover channels (using air photographs) with areas of wave convergence or higher wave energy (from wave refraction diagrams) to determine which areas should not be developed.

2. that the wooden retaining fence be maintained and possibly extended along the central part of the beach. Despite the unsightly appearance, the wooden retaining fence with its widely spaced, horizontally aligned logs has proven to be successful in trapping sand and in securing the duneline. The fence also allowed a free exchange of wind blown sediment between the foreshore and the dunes at all times. Foreshore sands are nitrogen rich. A constant supply of new sand to the dunes enhances vegetation growth which in turn helps to stabilize the dune. Local wave scouring was experienced along the fence but because of its size and stability (as opposed to snow fences) the scouring of the dunes has been much less than if the fenceline had not been established. In winter the fence also causes snow drifting along its seaward side which protects the fence and dunes against storm waves. An extension of the fence along the central part of the beach could enhance sediment accumulation across the backshore but it may be harder to stabilize the sediment because this is also an area of greater wave exposure and potential wave scouring.

NOTE: It would be better to build the dunes using more natural techniques such as transplanting vegetation but the size and width of the dunes along the central beach must be increased before the duneline can survive. Once sediment has accumulated landward of the fence, vegetation is required to stabilize it. If vegetation does not naturally spread into the area, then it must be introduced through transplanting.

3. that at least some of the seaweed and other flotsam be allowed to accumulate along the seaward base of the wooden retaining fence as a way to promote dune progradation and new dunes. Seeds and nutrients for plant growth are often contained in the debris. Plant growth will enhance dune building seaward of the fence and better protect the backshore(and fence) against future storms. A cover of vegetated debris can also reduce water scouring at the base of the fence.

4. that large quantities of sand blown onto the highway be returned to the beach as a way of reducing the loss of sediment to the beach system. Dune sand blown landward onto the road and tidal flats of Dublin Bay is essentially lost from the beach system. When a large quantity of sand is blown onto the road there should be more effort made to collect it and distribute the sediment along the intertidal beach slope and not just grade or plow it into the back dune slope.

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