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LAKE HURON CENTRE FOR COASTAL CONSERVATION

Beach Conservation

Environmental Impacts of Vehicles on Lake Huron's Beach and Dune Systems

Introduction

The use of motorized vehicles on beaches of Lake Huron has occurred historically, particularly along the Southeast shore in areas like Sauble, Boiler, Grand Bend and Ipperwash Beaches. This practice has met with disfavour over the last 30 years as more intensive recreational use of Lake Huron's beaches has occurred. There are still remnants of this practice occurring at Sauble Beach and at Ipperwash. This practice is being challenged throughout the world as a better understanding develops of the environmental consequences of allowing vehicles on beaches.

This position document outlines the scientific context of why beach use by vehicles, including parking, is inappropriate from an environmental standpoint. Both geomorphic and biological reasons are provided. While there are pressures on municipalities to offer beach space as an option for the increasing demands for parking by beach users, this option has long term, negative consequences to the very resource that attracts people to the region. The argument that revenue generation from paid beach parking could fund conservation efforts along the shoreline is short-sighted and contradictory. The issue of beach-dune impairment can never be resolved if these damaging actions are occurring because of sanctioned beach parking. The argument is further flawed if other funding alternatives are available. Beach and dune conservation efforts in Southampton, in the municipality of Saugeen Shores, for example, were made through environmental grants amounting to over $120,000. Friends of Sauble Beach raised nearly $100,000 to implement a dune conservation plan.

The Lake, the Beach and the Dunes – constantly in motion.

Besides air and precipitation, three materials are exchanged across the dune/beach interface: sand, groundwater, and living and dead organic material (Stephenson, 1999). Virtually all coastal dunefields receive sand from and/or supply sand to beaches. Groundwater moves from the land into the lake through confined or unconfined aquifers. This groundwater may be discharged in large volumes in some places and can contain high nutrient levels, thereby adding significantly to the nutrient pool of the beach and shore zone.

Several types of organic materials may be exchanged across the dune/beach interface: insects are often blown from land towards the lake; *carrion* and *wrack* (strand line) cast ashore may provide a

food source for dune plants or animals; larger animals in the dunes, such as birds, may be dependent on organisms for food; and organic litter from the dunes may be blown into the beach system. Other than sand, which may be transported in large volumes in high energy situations, the absolute quantities of the above materials transported across most dune/beach interfaces are fairly small (Stephenson, 1999). However, the impacts of these materials (groundwater nutrients and organic materials) may be significant to both systems. Thus, although dunes and beaches are discrete, terrestrial and aquatic, wind-controlled and wave controlled systems respectively, and although the interactions between them are quantitatively small, they are essentially interdependent and interacting.

Vehicle impacts on the Physical Structure and Biology of the Beach

Strand lines, or wrack lines, often contain considerable amounts of organic matter, which *macrofaunal invertebrates*, bacteria and fungi break down, releasing nutrients into the sand and eventually back to the lake. Strand lines also contain fragments and seeds of dune plants and are therefore significant sites for new dune development on open sand.

Research shows that vehicle traffic compacted beach sand at depth, but loosened the surface of the beach, thus making it more susceptible to wind and/or swash activity. The shearing and compressional effects of vehicle passage extended to a depth of approximately 20 cm. The shear stresses of turning wheels loosened the sand and broke underground *rhizomes* as well as crushing seedlings of annuals and young plants of perennials such as *Ammophila breviligulata* (American Beachgrass). Vehicle impact also decreased the rate of decay of organic material. The normal bacterial content associated with the organic drift were normally very high, but were markedly reduced when vehicles pulverized the deposits (Stephenson, 1999).

In other research, *backshore* areas subjected to either short or long-term heavy vehicle and pedestrian traffic were demonstrated to have decreased top and root production, percent cover, and diversity of vegetation compared with un-impacted areas. Impacted areas were also characterized by a lack of embryo dunes and microclimatic changes.: As the intensity of human activity increased, so did the following characteristics: average wind velocities near the ground surface, evaporation, wind-carried sand particles near the ground surface, soil pH, average soil temperature and range in temperature, soil bulk density, and soil-water content.

Vehicle access across a dune can have extensive impacts on the dune. The bare tracks provide an opening for wind scouring and the development of a blowout.

SUVs and boat trailers, ATVs, and snow mobiles are all vehicles that can damage or destroy dune systems. Dunes are simply too sensitive to withstand the effects of vehicles.

These changes made environmental conditions more demanding for remaining plants in the immediate area as well as for plants further inland (Stephenson, 1999). In addition to beach plants, there are a number of sensitive insect and microfaunal species reliant on the beach environment on Lake Huron beaches and are vulnerable to major disturbances like vehicle use (S. Marshall, personal communication, 2005)

Vehicle impacts on the Physical Structure and Biology of the Dunes

For vehicles to impact the beach they must first cross through the dune. The fragile nature of dunes and the destructiveness of vehicles and even pedestrian traffic on dunes is well documented (Peach, 2004). Dunes along Lake Huron have been subject to increasing degradation as more people utilize the shoreline for recreation and relaxation. This despite the fact that Great Lakes dunes are considered to be of national significance (Jalava, 2004). In the Great Lakes, dunes are considered to be rare as many are comprised of relic sand supplies not being able to regenerate themselves if damaged. They also exhibit high concentrations of specialized and at-risk species. Some of the main human-sourced threats to dune habitats include:

- Dune removal or alteration due to cottage development and cottage parking
- Damage to plants and habitat from foot traffic and vehicles;
  Habitat fragmentation from human caused breaches and blow-outs to dunes (including vehicle access to beaches);
- Invasion by alien, invasive plant species (exacerbated by unnatural disturbances and
- Impacts to dunes, including vehicle and pedestrian traffic). (Jalava, 2004).

Since dunes are a finite resource, it is critical to manage people's interaction with these features so that negative impacts are kept to a minimum. Beaches are inextricably linked to dunes and so management of dunes must necessarily include the proper management of beaches (Peach, 2004). As discussed earlier, vehicle impacts to beaches can cause structural alterations that lead to increased beach erosion by wind. These alterations disrupt the delicate balance of physical conditions found on the beach – dune region. In addition, sand compaction by vehicles in the backshore area can negatively impact dune plants that would otherwise reduce wind erosion of the beach.

Fluctuating Water Levels

Water levels on Lake Huron are dynamic and can fluctuate over the short term (hours or days), follow annual patterns of highs and lows, and change over the long-term (years). Changes in water levels, particularly long-term fluctuations can have an impact on the width of the beach.

In recent years we have had a period of lower than average levels on Lake Huron. This has translated into much wider beaches in areas where there is a shallow nearshore profile (eg. Sauble and Ipperwash Beaches). These periods of wider beaches have often corresponded with proposals to consider allowing parking on beaches. Wider beach periods, however, correspond to dune building periods and dune plant community expansion. The expansion of beach and dune vegetation occurs at a time when sand erosion from the beach by wind is predominant. This process preserves the natural cycling of sand from the dune to the beach to the nearshore and back to the dune. Vehicle parking during these dune building periods could have the effect of interfering with the very dune function that is necessary to maintain the integrity of the dunes and help preserve its capacity to prevent sand loss from the system.

During high lake levels, much of the beach can be inundated, particularly during storm events. High lake levels usually corresponds with dune erosion periods, when seed and plant exchanges with the beach are occurring. Again, this is a period where vehicle parking on the beach would be inappropriate as this seed and plant exchange process could be undermined. However, requests for parking on beaches during this time are understandably less.

Conclusion

Based on the preceding discussion, we conclude that the use of beaches as parking facilities is an inappropriate and short sighted action that will

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Providing Leadership in Coastal Conservation

have long lasting implications. It will have negative environmental consequences that could compromise the ecological functioning of the dunes, ultimately undermining conservation efforts being made by the community. The national significance of the beach-dune systems of Lake Huron as well as the depleted sand source that created the beach system should be added cause for taking a precautionary approach to this issue. Municipalities should take a leadership role in dune conservation by taking a firm stand against permitting beaches for parking. As stewards of this resource, we must consider a long term vision, and understand that there will be long term benefits achieved from protecting this resource. These benefits extend beyond environmental to include economic and social factors.

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