Fifteen years of vegetation monitoring on a Dry Cottonwood Sand Dune at Long Point, Ontario following a reduction in deer browse.

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Abstract:
Long Point, Ontario is a 35 km sand spit projecting eastward from the north shore of Lake Erie. Over-browsing by White-tailed Deer for many decades had a profound effect on the vegetation of Long Point. Between 1989 and 1991 over 500 were culled from the sandspit under the site Management Plan for Long Point National Wildlife Area. As part of a long-term project to document the response of the vegetation, permanent plots on a young, partially stabilized dune dominated by Eastern Cottonwood (*Populus deltoides*) have been monitored annually for 15 years. In the first few years following deer removal overall cover of ground layer vegetation and litter increased slightly, with little change in species composition. After about five years shrubs and vines started to establish. Since 2003 the increase in shrub biomass has been exponential. Riverbank Grape (*Vitis riparia*) has increased the most. The Mean Conservatism Coefficient of the ground layer vegetation has decreased as broad-leaved shrubs replace dune grasses. The diameter of existing Eastern Cottonwood trees has increased slightly, but no recruitment of tree species other than Eastern Red Cedar (*Juniperus virginiana*) has been observed.

Long Point, Ontario is a 35 Km sand spit projecting eastwards from the north shore of Lake Erie.

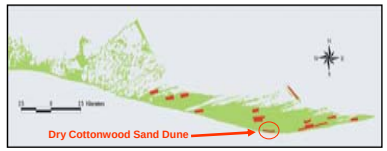
Dune ridges alternate with sloughs and marshes. The youngest and most active dunes are found at the eastern end of the sand spit and along the south shore.

Most of the land base on Long Point forms the Long Point National Wildlife Area and is managed by the Canadian Wildlife Service of Environment Canada.

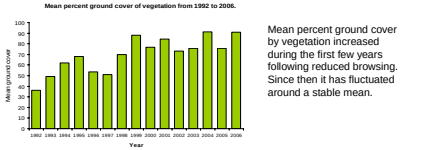
Over-browsing by White-tailed Deer for many decades had a profound effect on the vegetation of Long Point. Very little tree regeneration was taking place. Shrubs, other than less palatable species such as Junipers (*Juniperus communis* and *J. virginiana*), were almost absent except on isolated ridges and island. Those shrubs that did exist had tree-like growth form because the lower branches were browsed (Reznicek and Catling, 1989).

Between 1989 and 1991 over 500 White-tailed Deer were culled from the sand spit under the site Management Plan for Long Point National Wildlife Area.

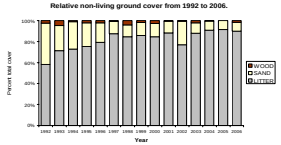
In 1991, 15 permanent Breeding Bird Census (BBC) plots of between 8 and 13 ha in size were established to monitor the recovery of vegetation and bird populations following removal of deer. Plots cover the range of terrestrial habitat types and successional stages found on Long Point (Bradstreet et al., 1991)



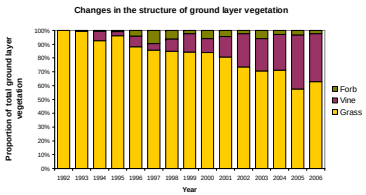
Shrub stem counts and ground cover vegetation have been monitored annually since 1992 in 10 permanent quadrats in each of the BBC plots. Tree size and density were measured in 1991 and 2001. This poster reports changes to the vegetation for the **Dry Cottonwood Sand Dune** on young stabilized shoreline dune ridges.



Mean percent ground cover by vegetation increased during the first few years following reduced browsing. Since then it has fluctuated around a stable mean.

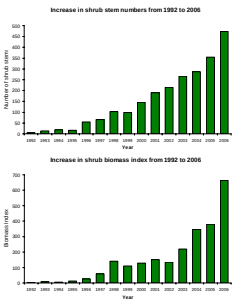


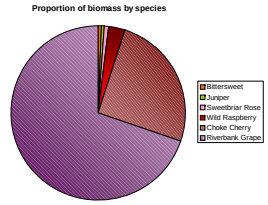
The amount of litter also increased during the first years after deer removal and has since stabilized.



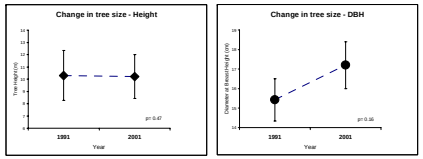
Both broad-leaved herbaceous species (forbs) and shrubs have increased the proportion of their ground cover at the expense of dune grasses. After increasing to about 3-5% the relative amount of forbs has remained fairly stable, while shrubs have continued to increase.

Shrub stem numbers have increased fairly steadily since monitoring began. A shrub stem biomass index was calculated from the numbers of shrub stems in different size classes (<0.5 m; 0.5-1.0 m; >1.0 m; >2.0m). Shrub biomass recruitment was slow for the first 4 years while individuals were small, but then started to increase more rapidly. Since 2003 more shrubs have been moving up into larger size classes and there is a significant acceleration in the total biomass accumulation.



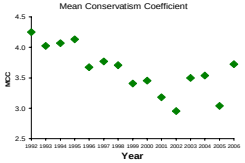


Riverbank Grape (*Vitis riparia*) is by far the most abundant shrub in the Dry Cottonwood Sand Dune, making up about 70% of the shrub biomass. Other common broad-leaved shrubs are Choke Cherry (*Prunus virginiana*) and Wild Red Raspberry (*Rubus idaeus*).



Tree density and mean tree height did not change between 1991 and 2001, but the mean diameter at breast height increased significantly ($p<0.05$). As trees age they continue to grow, but the tips of branches break off during wind storms and a certain amount of self pruning takes place, especially in drought years with lower lake levels. Eastern Cottonwood is the only species of tree size in the plot.

Mean Conservatism Coefficient (MCC) is a measure of site quality. A high MCC is found in sites that contain greater numbers of conservative species with specific habitat requirements (Wilhelm and Ladd, 1988, Oldham *et al.*, 1995). MCC of the Dry Cottonwood Sand Dune fell in the years immediately following deer removal. This can be attributed to the increase in the number of generalist species such as Riverbank Grape and Choke Cherry that became established once deer were removed. These plants are favored browse species for White-tailed Deer. Dune grasses, which dominated the ground layer prior to deer removal, are more specialist species with higher conservatism coefficients.



Beach Grass (*Ammophila brevilgulata*), a highly conservative species.

The grass dominated ground layer of the Dry Cottonwood Sand Dune in 1991...

... contrasts with the shrub cover in 2006.

Co-author Michael Bradstreet demonstrating Choke Cherry regeneration on the Dry Cottonwood Sand Dune.

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