



Conference or Workshop Item

Wood, M.D.; **Beresford, N.A.**; **Barnett, C.L.**; Copplestone, D..
2011 Radioecology of temperate coastal sand dunes: A synthesis.
[Lecture] In: *Radioecology & Environmental Radioactivity -
Environment & Nuclear Renaissance, Hamilton, Ontario, Canada, 19
- 24 June 2011*. Hamilton, Ontario, McMaster University

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Radioecology of temperate coastal sand dunes: A synthesis

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Temperate coastal sand dunes are amongst the most dynamic landscapes on earth, their evolution being mediated by both climatic and environmental conditions. Formed at the interface between terrestrial and aquatic environments, these biodiversity-rich ecosystems are a valuable resource that deliver a range ecosystem services (the benefits people derive from ecosystems). Sand dune ecosystem services include agricultural products, storm protection through coastal defence, river water purification and tourism. Sustainable delivery of these ecosystem services is dependent on the maintenance of the structure and function of these ecosystems. In combination with conservation legislation that protects certain dune biota, there is clear justification for minimising anthropogenic impacts on these coastal sand dunes.

Given that many nuclear reactors within temperate coastal regions are located close to coastal sand dune complexes, there is a need to demonstrate that radionuclide discharges from current and proposed nuclear development do not impact significantly on these ecosystems. However, until recently, little was known about the transfer of radionuclides in temperate coastal sand dune ecosystems, leading to uncertainty in Ecological Risk Assessments for sand dune sites.

Since 2001, a suite of studies have contributed to improving our understanding of coastal sand dune radioecology (Coplestone *et al.*, 2001; Wood *et al.*, 2008; Wood *et al.*, 2009a; Wood *et al.* 2009b; Wood, 2010). These studies consider the transfer of radionuclides to sand dunes, the behaviour of radionuclides within sand dune soils, foodchain transfer of these radionuclides and the application of environmental radiation protection models to determine whether sand dunes are adequately protected from the effects of ionising radiation. This synthesis paper will draw on the findings of these studies to review the current state of knowledge on temperate coastal sand dune radioecology. This will be contrasted with the knowledgebase for other interface ecosystems, such as saltmarshes and estuaries, and emerging research priorities will be identified.

References

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