

The Links that Bind Aquatic Ecosystems

The four papers in this BRIDGES cluster illustrate the importance of physical and conceptual linkages between marine, estuarine, and freshwater ecosystems. Key points include:

- Marine, estuarine, and freshwater ecosystems are physically linked via longitudinal movement and exchange of materials. The delivery of marine-derived material by Pacific salmon to fresh waters exemplifies the movement of material between ecosystems. Transformation and retention of such material can involve several processes, such as flocculation, but the role of these processes in material exchange needs closer study in all aquatic ecosystems ([Petticrew et al. 2011](#)).
- Conceptual linkages among aquatic ecosystems have received less attention by scientists than physical linkages, yet a few examples exist. Secreted biological material (exudates), including slimes, mucus, silk, and chitin, are present in all aquatic ecosystems, and are important in many processes, such as particle formation, adsorption, and binding ([Wotton 2011](#)). Also, bioturbation and biodeposition (e.g., feces, dead plants) are important in all benthic habitats where they influence sediment characteristics and material exchange between the sediment and water column. The nature and importance of these processes depends upon the organisms involved and the environmental context, but they need further study in all aquatic environments, and could benefit from inter-ecosystem research ([Mermillod-Blondin 2011](#)).
- Teaching aquatic science as an integrated whole and conducting inter-ecosystem research will promote exchange of ideas, encourage use of novel approaches and concepts, and help identify linkages and similarities among freshwater, estuarine, and marine ecosystems ([Chaloner and Wotton 2011](#)).



The Yukon Delta spreads out across a tundra plain in southwestern Alaska, where the Yukon and Kuskokwim Rivers meander toward the Bering Sea, embedded within a matrix of thousands of ponds and lakes. The natural-color image acquired by the Landsat 7 satellite illustrates the prevalence of aquatic habitats and their potential to interact with each other through the processes described in this Bridges cluster. For example, the pale color of the seawater around the delta testifies to the huge movement of material from rivers into estuaries and the surrounding sea. (Above: NASA Earth Observatory; lower left: US Fish and Wildlife Service.)

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