

## 2011 Current Environmental Issue

### **Salt and Fresh Water Estuaries**

Salt water estuaries are semi-enclosed areas where sea water and freshwater mix. Freshwater estuaries are regions where lake and river waters mix. Estuaries are among the most productive ecosystems on earth and have been considered by some to be second only to the rainforests in productivity. They also are important as a first line of defence against the destructive power of the oceans caused by hurricanes, tropical storms, strong gales, high tides, and other natural disturbances. New Brunswick borders the southern Gulf of St. Lawrence which has been called one large estuary. Many of the coastal estuaries in New Brunswick are sheltered by sand dunes, bays, harbours, and salt marshes. These systems are driven mainly by fresh water runoff and tidal influences of the saltwater resulting in rich and diverse aquatic and terrestrial ecosystems.

As an example, one of the largest estuarine areas in Eastern Canada is the Tantramar Salt Marshes, located adjacent to the 2011 Canon Envirothon base in Sackville, New Brunswick, Canada. Estuaries in New Brunswick as in other parts of North America are under pressure for habitation, industrial uses, and recreation. Since Acadian settlers arrived from France in the mid 1500's, the Tantramar marshes and estuaries have been dyked, drained for farming and even mined for salt. Even prior to this the Mi'kmaq First Nations used these lands for bird hunting, shellfish gathering and fishing, sometimes modifying streams and drainages to facilitate their gathering.

Despite these changes, these estuarine marshlands still provide valuable ecosystem functions such as habitat for wildlife, a place for hundreds of marine organisms to spawn, filter sediments and pollutants, and acting as a buffer between land and ocean by absorbing floodwaters and dissipating storm surges.

# Freshwater Estuary Questions and Answers

## 1. What academic researcher first came up with the concept of "freshwater estuary"?

I don't know the name of the researcher that first came up with the concept of "freshwater estuary", but this concept is becoming increasingly recognized by a wide range of scientists and organizations. For more information, see Wisconsin's Freshwater Estuary Initiative. <http://freshwaterestuary.uwex.edu/estuary.html>

## 2. Can you give me a reference of any research which makes reference to a "freshwater estuary"?

Information about freshwater estuaries can be found at the NOAA (National Oceanic and Atmospheric Administration) National Ocean Service Education website. [http://oceanservice.noaa.gov/education/kits/estuaries/media/supp\\_estuar05e\\_fresh.html](http://oceanservice.noaa.gov/education/kits/estuaries/media/supp_estuar05e_fresh.html)

Wisconsin is making an effort to increase awareness and promote stewardship of freshwater estuaries,

“The St. Louis River freshwater estuary, which is situated on the border between Wisconsin and Minnesota, is located at the headwaters of the Great Lakes. The river represents the largest United States tributary to one of the world’s largest freshwater resources. Near the end of its 179 mile journey, the river slows and spreads into a diverse 21-mile long, 12,000-acre freshwater estuary. The freshwater estuary is surrounded by two communities and includes an international harbor. A NERR designation will complement existing community, university, agency, and non-government resources that exist in the area. A second NERR site in the Great Lakes region will create an important platform for collaborative freshwater estuary research and comparative studies.”

Learn more about Wisconsin's Freshwater Estuary Initiative. <http://freshwaterestuary.uwex.edu/estuary.html>

## 3. Is Lake Erie of the Great Lakes the only example of a freshwater estuary?

Examples of freshwater estuaries can be found across North America. On page 50 of the Estuaries resource material [http://www.envirothon.org/pdf/2011/materials\\_for\\_estuaries.pdf](http://www.envirothon.org/pdf/2011/materials_for_estuaries.pdf) (pdf), you learn that freshwater estuaries are unique combinations of river and lake water that can be found under the following conditions. “Unlike brackish estuaries that are tidally driven, freshwater estuaries are storm-driven. In freshwater estuaries the composition of the

water is often regulated by storm surges and subsequent seiches (vertical oscillations, or sloshing, of lake water). While the Great Lakes do exhibit tides, they are extremely small. Most changes in the water level are due to seiches, which act like tides, exchanging water between the river and the lake. Stratification and mixing of water in freshwater estuaries is also due to changes in temperature differences between stream water and lake waters. The shallow waters of streams respond quicker to changes in temperature changes than deeper lake waters. These changes affect the temperature of the water, its pH, dissolved oxygen and the salinity of the water of the two water bodies, thus influencing the chemistry of this type of estuarine system.”

“Three common characteristics are frequently used to define a freshwater estuary: 1) a drowned river mouth; 2) a zone where lake and river waters mix; and 3) influence from seiche or wind tides. A fourth characteristic that some, but not all, freshwater estuaries have is a bar or spit that partially encloses the river mouth. “

#### **4. Are there any examples of freshwater estuaries in Virginia or in any of the other states of the United States or in provinces of Canada?**

An example of a freshwater estuary is the combination of river and lake water where the Potomac River flows into Abel reservoir. Abel Lake is located in Stafford County, near Falmouth, Virginia.

#### **5. Are the fresh-salt mixing areas of the Great Salt Lake in Utah (or other salt lakes there or in California) considered to be "estuaries"? If they are, how are they classified? They are not freshwater ones and they don't connect to the sea. Therefore they don't seem to meet any definition of "estuary".**

The Great Salt Lake in Utah (or any other salt lake) would not qualify as an estuary since it does not have large mixing of water bodies such as in a salt water estuary (i.e. river meets the sea) and freshwater estuary (i.e. massive freshwater system meets the lake) and is landlocked as opposed to fresh and salt water estuaries. One of the major characteristic of an estuary is that it is highly productive which a salt lake is not since they only have a few species living in them that can support super saline water such as brine shrimp, brine flies and some algae. I would not include salt lakes in either of our estuarine categories.