

Lewis & Clark Lake/Niobrara River Delta Vegetation

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Christopher Boever and Mark Dixon

Missouri River Institute and Department of Biology
University of South Dakota



This 2008 aerial photo, taken by the U.S. Army Corps of Engineers, shows the area near Springfield, SD along the Missouri River. Sedimentation has significantly affected the Missouri River between Springfield, SD and Niobrara, NE.

Deltas forming on reservoirs have been termed 'novel' habitats and few studies on vegetation have been done. They are considered "novel" (new) because they are not normal features of natural rivers or lakes and associating them with natural deltas is difficult due to fluctuations in the water surface of reservoirs due to dam releases (Johnson 2002). In October of 2012, the Missouri River Institute toured the delta on Lewis and Clark Lake upstream from and downstream of Springfield, SD and visited several sandbars. Vegetation appears to be dominated by the common reed grass (*Phragmites australis*) and cattails (*Typha* species). Both are considered shallow water emergent plants (rooted in water with stems and foliage growing out of the water) as are different types of bulrush (*Scirpus* and *Schoenoplectus* species) which were also present along the edges of many sandbars. These species are adapted to a high water table and thrive in this marshy environment. This habitat may also be considered novel since

the fluctuating reservoir levels do not allow the marsh to experience periods of drying and hypoxia (low dissolved oxygen content in the water) that wetlands typically experience (Lanoo 1996).

Phragmites is native across the country but an introduced genetic variant exists (and appears to be present on the Niobrara delta) that spreads aggressively, potentially crowding out native wetland plants (Hoffman et al. 2008). *Phragmites* may have a competitive edge over other wetland species due to its ability to colonize bare patches after flooding via clonal growth traits (Havens et al. 2003; Lenssen et al. 2004). *Phragmites* has long tillers or “runners” that allow it colonize the sandbars quickly (Photo 1). In fact, early research on this species suggested that one plant has the potential to spread as much as 0.05 hectares (0.124 acres) in as little as two years (Fanshawe 1972). This ability has had impacts on wetland construction projects on the east coast (Havens et al. 1997). An ecosystem with high diversity and function is desired when building wetlands. If *Phragmites* becomes dominant, functions such as runoff absorption and water filtration may be lost or diminished (Havens et al. 1997).



Photo 1: *P. australis* tillers

Phragmites forms monodominant (dominance by a single species) plant communities (Havens et al. 2003) that may not have the diversity of habitat or sources of food for wildlife provided by more diverse wetland communities. Tidal freshwater plant communities can have as many as 100 different species; *Phragmites* dominance can reduce this number greatly (Chambers et al. 1999, Ailstock et al. 2001). It should be noted, however, that constructed wetlands in Virginia

showed a decline in *Phragmites* and an increase in tree and shrub cover over a 6 year period (Havens et al. 2003).

On the tour of the Lewis and Clark Lake/Niobrara River Delta a few sandbars (Photos 2 & 3) were observed with cottonwood (*Populus deltoides*) and willow (*Salix* species) saplings. Upon closer inspection of another sandbar, amid the tall reed grass, sandbar willow (*Salix interior*) was observed (Photo 4).



Photos 2 & 3: Cottonwood and willow on sandbars



Photo 4: Sandbar willow amid the tall reed grass

Cottonwood and willows cannot tolerate the chronically saturated soils and high water levels that the shallow water emergent species can and appear to be present only on those sandbars that have been built up far enough above the water table not to be affected by fluctuations in the reservoir levels. If tree and shrub recruitment occurs on these sandbars in the future, particularly on bars that were built higher by the 2011 flood, perhaps the reed grass dominance might be reduced.

A recent (2010-2012) faunal survey of the delta found a moderate diversity of animal species, with 79 species of birds, 5 species of frogs and toads, 4 species of turtles, and 1 species of mussel observed (Kerby and Swanson 2013). Few of these, however, were sensitive species of conservation concern. Kerby and Swanson (2013) speculated that the unnatural water fluctuations in the delta, particularly on "island" habitats vs. bank habitats, diminished its value as breeding habitat for marsh birds and amphibians. As mentioned above, the dominance of the plant community by non-native *Phragmites* and cattail may also limit its value as wildlife habitat. So, while the delta represents an extensive area of marsh habitat that is otherwise quite scarce on the present-day Missouri River, it probably does not represent high quality habitat for wetland species of greatest conservation need in South Dakota.

In summary, the delta forming on Lewis and Clark Lake is a novel habitat due to its difference from other deltas on estuaries or natural lakes, as well as having water levels that fluctuate with dam releases. The dominant plant species appears to be the non-native, invasive variety of

Phragmites (common reed grass) that colonizes bare sand quickly and potentially crowds out native plant diversity. Unnatural water fluctuations and low plant diversity may reduce wildlife diversity due to decreased quality of habitat and food sources. Under current river management, these conditions are likely to persist into the future over much of the delta. Sandbars in the delta that have built up farther above lake and river level, however, may support cottonwood and willow saplings, which - if they persist – eventually could reduce dominance of reed grass in those areas.

References

- Ailstock, M.S., C.M. Norman, and P.J. Bushman. 2001. Common reed *Phragmites australis*: Control and effects upon biodiversity in freshwater nontidal wetlands. *Restoration Ecology* 9(1):49-59.
- Chambers, R.M., L.A. Meyerson, and K. Saltonstall. 1999. Expansion of *Phragmites australis* into tidal wetlands of North America. *Aquatic Biology* 64:261-273.
- Fanshawe, D.B. 1972. The biology of the reed - *Phragmites mauritanus* Kunth. *Kirkia* 8:147-150.
- Havens, Kirk J., W.I. Priest, and H. Berquist. 1997. Investigation and long-term monitoring of *Phragmites australis* within Virginia's constructed wetland sites. *Environmental Management* 21:599-605.
- Havens, Kirk J., Harry Bergquist, and Walter I. Priest, III. 2003. Common reed grass, *Phragmites australis*, expansion into constructed wetlands: Are we mortgaging our wetland future? *Estuaries* Vol. 26, No.2B: 417-422
- Hoffman, J.D., S. Narumalani, D.R. Mishra, P. Merani, and R.G. Wilson. 2008. Predicting potential occurrence and spread of invasive plant species along the North Platte River, Nebraska. *Invasive Plant Science and Management*. 1:359-367.
- Johnson, W. Carter. 2002. Riparian vegetation diversity along regulated rivers: contribution of novel and relict habitats. *Freshwater Biology* Vol. 47: 749-759.
- Kerby, Jacob and David Swanson. 2013. Faunal Survey of the Delta Habitat of Upper Lewis and Clark Lake. South Dakota Department of Game, Fish and Parks Wildlife Action Plan Competitive Grant - Final Report. January 2013. 25 pages.
- Lanoo, M.J. 1996. *Okoboji Wetlands: A Lesson in Natural History*. University of Iowa Press.
- Lenssen, John P.M., Harry M. van de Steeg, and Hans de Kroon. 2004. Does disturbance favour weak competitors? Mechanisms of changing plant abundance after flooding. *Journal of Vegetation Science* Vol.15, No. 3: 305-314.

Additional photos:

The sandbar in the photo below is located downstream of Springfield, SD towards the open water of the lake. This view shows the open sand along the upstream edge of the sandbar with common reed grass (*Phragmites australis*) composing the dominant vegetation. Annual forbs (herbaceous vegetation) can also be seen.



Great Blue Heron (*Ardea herodias*) on a sandbar with cattail marsh (*Typha* species) in the background. In the foreground we can see bulrush (*Scirpus* species), a few herbaceous annuals, and some young common reed grass (*Phragmites australis*).



Below: shallow water emergent vegetation colonizing sandbars; *Phragmites* in the background



Vegetation cover varies from dense stands of *Phragmites* to cattail marsh to bare sand and even sand dunes. This is depicted in the following photo series (a-d):



(a)



(b)



(c)



(d)