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Student Corner

Saline Systems in Austria

We drove along a small dirt road, hedged in by reeds on one side and grapevines on the other. In a fallow field, small biplanes refueled and took off, flying precariously low to the vineyards. Every few seconds, we heard the Pop! Pop! Pop! of gunshots. “Don’t worry, those aren’t real guns,” Lucas, the park intern, reassured us, “it is an automated sound machine to scare away the birds.” The birds refer to the 340+ species that migrate through this small region in western Austria every year on their way to Africa. Unfortunately, the bird migration corresponds with the grape harvest, so a miniature war of sound and wind replays itself every autumn. After all, the birds and the grapes are both here for the same reasons: salt and water.

I am currently abroad in Austria with members of the NSF-IGERT group from the University of Nebraska-Lincoln to study the resilience and adaptive management of stressed watersheds. I am leading a small discussion group focusing on the resilience and management of saline systems. Several of us study saline systems in Nebraska. Because these unique systems exist both in Nebraska and Austria, we are excited for the opportunity to visit and research how these two countries’ systems compare. We recently began our study by visiting Austria’s saline systems, and would like to share what we have learned so far. For our discussion, we focus on Williams’ (2002) prediction of two different threats related to salt and aquatic systems in the coming decades: the loss of naturally saline lakes, and the anthropogenic salinization of freshwater lakes. We visited examples of both situations in Austria: Neusiedler See and Hallstättersee.

Neusiedler See: A Threatened Saline Lake

First, we visited the National Park of Neusiedler See-Seewinkel to learn about imperiled saline water bodies. Neusiedler See hosts one large (315 km²), very shallow (1.8 m max. depth) alkaline lake, the namesake of the region. Fed only by precipitation and continually mixed by wind, the lake hosts one of the largest reed belts in Europe (Figure 1). This feature has earned the area designations as a UNESCO Cultural Heritage Site as well as a Bird Heritage Site, and its management must serve a delicate balance between these two.

We met with Alois Lang, who has worked at the park since its inception in 1983, and has encyclopedic knowledge of the physical and natural characteristics of the area and the intricacies of its conservation. He explained that the strong winds mixing the lake also push sand out of the lake onto the eastern shore, providing the sandy soil that the vineyards covet. This soil grades into a more saline soil in the Seewinkel region, which is also dotted by transient, groundwater-fed saline ponds, and finally into black soil suitable for other types of agriculture. Until 70 years ago, the land was mainly used for pasturing cattle, haying, and harvesting reed for house thatching. The vineyards arrived in the 1960s and ‘70s, changing the landscape.

Next, we met with Prof. Alois Herzig, the former director of the park and biological station, and Harry, who is in charge of park education. They animatedly discussed the park’s

Figure 1. The second-largest reed belt in Europe fringes Neusiedler See.
management successes and challenges. Rather than owning land, the park annually rents the land and the right to manage it from the local landowners. In this way, the park is composed of 10,000 hectares of little islands of land surrounded by agriculture and linked together by plots that have gone fallow as part of a government-subsidized program.

The management of the land depends entirely upon the decisions of the 28 national park staff; they are not given goals by government entities such as bird population numbers or hectares conserved. If they notice something that works, they continue to do it. For example, they noticed that cattle-grazed land provided more bird habitat than mowed land or unmanaged land, so they paid to borrow traditional grey cattle from southern Austria and Hungary. In this way, they reintroduced a traditional land use practice in the region that also serves an ecological function.

The national park has enjoyed other successes in addition to recovering grasslands. The lake was once used as an eel fishery, introducing an exotic species that decimated the local fish population. In order to become a national park, the government required this industry be stopped, helping to recover the lake’s natural species assemblage.

They also count successes within the community of Neusiedler See. The national park serves as a role model for sustainable land use, and through the years they have witnessed a change in the way local residents value and use their land. Much of the land is now rented to the park or allowed to go fallow because it is of economic value to the whole community for the ecotourism it brings, which supports stable jobs so young people can afford to stay in the community.

The national park faces challenges ahead. The first is money. The current budget is based on a contract between the regional and national governments, each paying 50 percent of a budget upon which the governments decide every year. The budget for 2014 is uncertain as both governments consider defunding both the national park and the fallow land subsidy. Should the park be unable to pay its rent to landowners – which already requires 60 percent of the budget – the landowners may choose to redevelop the land. The budget restrictions also leave only 3 percent for monitoring and 2.5 percent for education. The park does not receive revenue from tourism, so its land management, tourism advertising, and monitoring data rely solely on personal agreements it has made with local landowners, industries, and university researchers in Vienna.

Ecologically, the main challenge is now water retention. Water management in the area focuses on maintaining stable lake levels and avoiding floods. Water is also free and unlimited, so sloppy water use is common. This inefficient consumption lowers the water table so much that the smaller Seewinkel saline ponds, which naturally tend to dry up in the summer, are drying up permanently because the groundwater that feeds them is now too deep. The park has lost 60 ponds in this way, and now focuses on educating the public on the importance of saving the remaining 40 ponds in its area.

Figure 2. The view of Lake Hallstättersee from the salt mine mountain.
pools to extract the salt. The system is so efficient that the mine only employs 28 workers total. Because of the loss of jobs in the mining industry, young people have left town for opportunities elsewhere; the population has shrunk by half, and many of the houses have become rental properties for tourists.

Hallstättersee receives wastewater discharges from the mine through one of its tributaries. On two occasions in the last few decades, the brine pipes burst, releasing large amounts of brine into the lake. News reports suggested that the brine sank to the bottom immediately and therefore had no impact on the lake; we were interested in the effects of sudden intense additions salt on the benthic ecosystem. Ficker and others (2011) found that the brine spills caused ectogenic meromixis (the lake stops mixing during turnover periods) and hypoxia (low or no oxygen) in the deeper regions of the lake that showed temporary die-off of benthic fauna. Even though one brine spill was much larger than the other, the lake took the same amount of time to recover from the shock by flushing the salt out of its basin (three years, or six times its water residence time). As far as we can tell culturally and economically, though the lake is beautiful, here salt is king. The lake is lucky that it has the natural ability to respond rather quickly to the occasional “oops” of large brine spills, because the salt isn’t going anywhere soon.

Many of our group members were struck by how similar the Neusiedler See region was to the Nebraska Sandhills in appearance and ecological function, and how the Salzkammergut compared to some of our other study sites. We look forward to returning home to Nebraska and to continue our ongoing study on how saline systems in Austria and Nebraska compare in their ecological and social resilience and management.

References

Victoria Chraibi is a Ph.D. student at the University of Nebraska-Lincoln in earth and atmospheric science, with emphases in paleolimnology and science education. She is a member of the NSF-IGERT program on the resilience and adaptive management of stressed watersheds. She holds an M.S. in water resources science from the University of Minnesota Duluth and a B.A. in biology from Hanover College.