Wolf, bird and bread!

European Environment Agency

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Eyüp Yüksel was relaxing in Ankara on a warm autumn day in 2000, drinking tea from a traditional glass cup, when he heard the news that Tuz Gölü — Lake Tuz or Salt Lake — had been declared a protected area. As one of the staff of the Turkish Environmental Protection Agency for Special Areas (EPASA) he had been waiting and hoping for this decision but he was still excited to hear the announcement and concerned enough to wonder 'How can we manage such a big area?'

The challenge for Eyüp, his colleagues in EPASA, the many people we met on our journey, and everybody living in the area is how to maintain the area's economy and environment, both of which are inter-dependent. Most of the 150 000 people living in the area depend largely on agriculture. Given the high salt levels in the soil, a unique

Photo: Lake Tuz at sunset © Gordon McInnes

Photo: Loads of sugar beet at weigh-bridge © Gordon McInnes

ecosystem has evolved around the lake, and there are limits to which crops can be grown there.

The major crops grown in the region are sugar-beet (6.4 % of the total production in Turkey in 2008) and maize. But growing these crops is water intensive, and the water table has sunk from 4 metres below the surface to more than 50 metres below the surface in recent years. This has added to the costs of local farmers, and in some cases has forced them to abandon their fields. After years of uncontrolled use of groundwater for irrigation, wells now need to be registered for use. Climate change and increasing temperatures are expected to exacerbate water scarcity even further, affecting not only the economy but also the life in this unique ecosystem.

The day after the announcement, Eyüp was busy with his colleagues organising a trip to the area. Firstly, there were the formalities of visiting the Governor of Konya, the biggest city in the region, as well as the mayors and governors of the many towns and villages around the lake in the surrounding provinces of Ankara, Konya and Aksaray.

Eyüp remembers this first visit well, criss-crossing the flat Anatolian plain around the lake

There are 14 Special Environmental Protection Areas in Turkey, established by decree in the period 1988 to 2004. Lake Tuz Special Protection Area (SEPA) is by far the largest protected area. It was designated in 2000, and at 7 414 km^2, it covers a larger area than all the other SEPAs combined. In fact, it is almost as the size of Cyprus. EPASA, now part of the Ministry of Environment and Urbanisation, has the broad and ambitious aim 'to protect natural beauty, historical and cultural sources, biological diversity, and living and non-living entities underwater and above-water; to pass these values to further generations; to provide regional development within the framework of sustainability; and to make society aware of the environment'. All of the SEPAs include water-bodies, both marine and inland.

Situated close to the centre of Turkey in the middle of the Anatolian Plain, Lake Tuz looks like a giant white cloud or snow-covered mountain range when seen from space. The lake is one of the biggest salt lakes in the world, covering around 1 500 km^2 within the SEPA. It is quite shallow, and during the hot, dry summer months, the water evaporates to leave a thick crust, which is scraped off to provide up to 70 % of the salt produced in Turkey.

with the sun high in the sky above the distant horizon. He also recalls the time he saw many sheepdogs defending their sheep and their patches of land, and imagined the sheep thanking the dogs by forming neat lines and being respectful. He also remembers seeing salt-dust blowing in the wind, turning plants, machinery and people into white sculptures reminiscent of classical art. He returns regularly to the lake to follow up on his plans for the area. These plans include working to control possible impacts from a newly established salt factory, and developing an ecosystem evaluation of the lake. On his trips to the lake, he also explores the area to find plant species, some of which are new to him and new to science. He keeps a lookout for bustards but finds none. This concerns him. Bustards are the most famous birds of the steppe habitat around the lake, but their numbers are much reduced due to habitat destruction and reductions in water supply. Eyüp recalls the words of İlhami Kızıroğlu, the famous Turkish ornithologist and author of 'The Pocket Book of Birds of Turkey' among many other publications:

Photo: View across Lake Tuz steppe habitat © Gordon McInnes

'Without birds, the world, life, becomes intolerable'. 'We must protect these birds!' thinks Eyüp, as he reflects on what is known and unknown about bustard ecology.

Eyüp meets with local farmers who want to plant trees to provide shadow and cooler temperatures during the summer to help them rest and their children play. But there are few trees in this area of open, wind-swept farmland. Eyüp asks one of the farmers, a grandfather: 'Do you realise the importance of your area? Especially the unique local plants, famous globally and in Europe?'. 'No', replies the farmer, 'we deal only with animal fodder and sugar beet! And helping our children to grow up and get married.'

This farmer was focused on his immediate responsibilities rather than wider aspects of biodiversity when he replied. However, he was doubtless aware of the tradition passed down through the centuries by farmers in this region who say 'Kurda, kuşa ve aşa!' ('Wolf, bird and bread!') when they sow seeds in their fields, giving priority first to the wolves, and then to the birds to benefit from the seeds, before letting the rest grow into corn for bread to feed their families.

Lake Tuz is one of the finest lakes in Turkey for birds. This large water area with cold, wet winters provides a major wintering area for water birds, particularly those adapted to a salty environment. Flamingoes (*Phoenicopterus ruber*), avocets (*Rercurvirostra avocetta)*, ruddy shell ducks (*Tadorna ferruginea)* as well as ringed plovers (*Charadrius hiaticula*), common cranes (*Grus grus*), and white-fronted geese (*Anser albifrons*) live in large flocks on the lake. Due to the low human population in this area, and the plentiful aquatic animals around the fresh water sources, birds also inhabit the many ponds, meadows and cultivated areas around the lake. There are 11 Important Bird Areas around the lake in the Konya Basin, nine of which have protected area status. These areas provide breeding grounds for 8 of the 13 globally threatened bird species breeding in Europe.

The area around the lake is also renowned for its rare and endangered halophytic (salt-loving) plants and insects, some of which are found only in this area. Many of the plants exhibit special adaptations to allow for rapid photosynthesis that speeds growth in the severe climate conditions. They have adapted to some of the harshest conditions known on earth, withstanding extremes of temperature, high salinity, low mineral nutrients and high radiation. They take in the salty water through their roots and so-called excretive plans can release salt back into the environment through glandular cells in their leaves and upper parts, becoming encrusted in salt and appearing like marble-white living sculptures. Other halophytic plants known as succulents can minimise salt toxicity by increasing the water content in large fleshy cavities known as vacuoles.

21 different halophytic steppe plants endemic to the area have been identified, 11 of which are considered at risk of extinction. The succulent species *Bolboschoenus maritimus* (saltmarsh bulrush or Bayonet grass) is found in the salt marshes immediately surrounding the lake. In less saline conditions further afield, a limited number of species including *Suaeda carnosissima*, *Salicornia europeaeae* (edible common glasswort or Samphire) and *Salsola crassa* are able to grow. In addition to these, there is a wide range of other species including small bush plants like *Halocnemum strobilaceum*, *Halimone verrucifera* and *Camphorosma monspeliaca* (a medicinal herb), as well as flowering plants like *Limonium* (sea lavender or marsh-rosemary), *Taraxacum farinosum* and *Frankenia hirsute* (hairy sea heath).

Four species of plant from the Ranunculus, Iberis, Anthemis and Linum genera unknown elsewhere were also discovered in very limited numbers and distribution in the vicinity of the lake.

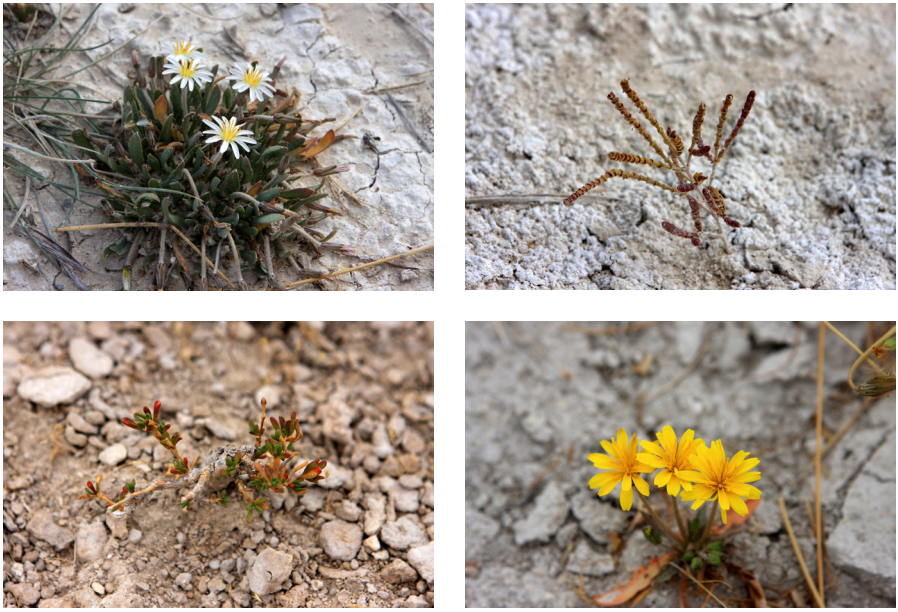

Photo: Example flora from Lake Tuz © Gordon McInnes

In 2009, we visited the Lake Tuz Special Environmental Protection Area, travelling with Eyüp, his boss Mehmet Menengiç, and his colleagues Emrah Manap, Murat Karahan, Nuran Şen, Nisa Nur Akan and Muktedir Demirbüken, as well as two leading Turkish specialists on the lake's ecology, Dr Alptekin Karagöz and Dr Ahmet Duran.

It took us three days to reach Lake Tuz, and much of the time we were not convinced we would ever see it! We started on day one in Ürgüp to the east of Lake Tuz in the centre of Cappadocia, an area of amazing rock formations with an extensive cultural heritage. We then moved on to Konya, home of Mevlana Celaleddin-i Rumi and his Whirling Dervishes. Then, over the next two days, we met with governors, mayors and local farmers living close to the lake. We also visited a salt works and a water treatment plant and municipal waste disposal site built with EPASA funds to help reduce the environmental

Cappadocia lies immediately to the east of Lake Tuz. It is an unbelievable area, full of strange rock formations — fairy chimneys, domes, caves and valleys — carved by the action of water and wind from the lava that poured from the volcanoes of Mount Erciyes and Mount Hasan over 10 000 years ago. People have lived in this area since Neolithic (new stone age) times when the lava cooled. They carved out churches, houses and even underground cities (more than 36 in total) in the soft tufa rock. The underground cities were used by these different peoples over the centuries as hidden places of worship, food stores, wine cellars, stables, housing, and shelters from enemies and wild animals, including wolves. Some of the cities have floors that can be blocked off by millstones, impossible to open from the outside. Although there were dangers from hostile invaders, the area was clearly attractive as a fertile farming area in which to live. Some of the cities supported 10 000 people with underground facilities for storing grain, cooking food in communal kitchens, and making wine. It was not until the late 20th century that the Neolithic artefacts and some of the underground cities were rediscovered. Now the region is a major tourist attraction.

pressures on the sensitive ecosystem, before finally reaching the lake.

Throughout the journey, we were treated to the best of Turkish hospitality, taking tea and lunch as guests of honour with the local majors and governors as well as their families.

On day two when we met local governors, mayors and farmers in Altınekin ('Golden crop' in English), Dr Karagöz and Dr Duran made extended presentations with information on the historical development of Lake Tuz. These presentations included lots of photos and graphs of the lake ecosystem and its salt-loving plants, many of which are endemic to the area, and some of which have only recently become known to science. In addition, we visited a demonstration pilot plot for drip-irrigated sugar-beet production initiated and partly funded by EPASA. Here, Adem Kaya explained the arrangement for providing loans to farmers to buy equipment and showed us the

Konya is a major Turkish city of over one million inhabitants lying south of Lake Tuz. It has a rich cultural history with evidence of settlements from the Neolithic period almost 9 000 years ago. It particularly blossomed in the Seljuk era in the late 12th century (prior to the Ottoman period), when several major buildings were constructed in Konya, including the Alaaddin Mosque, the oldest historical building in Konya, and several schools (madrassas) where theology, astronomy and other sciences were taught. In this period, Konya also ruled most of eastern Anatolia and several ports on the Mediterranean and Black Seas. Konya is most famous as the resting place of Mevlana Celaleddin-i Rumi, the 13th century Islamic poet and theologian.

In generosity and helping others be like a river
In compassion and grace be like the sun
In concealing others' faults be like the night
In anger and fury be like the dead
In modesty and humility be like the earth
In tolerance be like the sea
Either exist as you are or be as you look

The Seven Advice of Mevlana Celaleddin-i Rumi
13th Century Islamic Poet

Mevlana was clearly a shrewd observer of human nature and the natural world around him. The Mevlana Sufi Order, also known as Whirling Dervishes, was founded in Konya by the followers of Mevlana after his death in 1273.

results that can be achieved through use of this technology: 37 % less water, 17 % less fertiliser and 50 % less fuel to produce larger beet with higher sugar content. EPASA has extended the pilot to other towns and farms around the lake to spread the word on the benefits — economic, environmental and social — brought through drip-irrigation.

The farmers were impressed by the results, but hesitant

to take on loans to fund the new equipment despite the relatively low costs. A drip irrigation factory has been built by the Konya Cooperative of Sugar Beet Producers, which has over 56 000 partners and sells pipes to its members with 15 months credit at 1 % interest rate. Despite these low rates, farmers were concerned about the uncertainties they faced in the short-term with variable market prices for their crop and long-term concerns over the climate and water supply.

On the final day, we first explored the habitats around the lake. At this point, the lake itself was still out of sight and we could not get closer because rain was expected and there was a risk that we could get stranded on the open steppe. Instead we moved on to a second meeting with the local farmers in the village hall in Günyüzü where we were also welcomed by the local school children.

Here, the local farmers highlighted their concerns about the changing climate, the salinisation of the soil and the difficulty in securing enough water as the water table dropped further and further. They highlighted the need for planting trees, and asked for advice on the best types of trees to plant in the area. They repeated their interest in drip-irrigation, but asked for more financial support. One frustrated farmer spoke up: 'I borrowed money to switch my fields to drip-irrigation, which required 50 000 Turkish lira in total.

Photo: Mehmet Menengiç with sugar-beet grown with and without drip-irrigation © Gordon McInnes

I had to pay half of it myself. I had the means and I did it. But only a handful of farmers in this region have the means to pay half. The Ministry should step in and provide grants to farmers. The whole country would benefit from the switch, not only local farmers.' One by one, the farmers asked quietly and politely for more help from the local mayor, the national government and from Europe to enable them to maintain their livelihoods, their families and the culture of the area.

After an impressive lunch with the mayor of Günyüzü, Mehmet Kale, as well as his family and other local mayors and farmers, we drove through a dust-storm with visibility down to 20 metres to the Yavsan salt-works on the edge of the lake. The Yavsan salt-works is one of the three salt-works on the lake, and its director taught us about the lake's salt production. Finally we arrived at the lake itself, alongside the mounds of salt scraped from the lake surface in recent weeks. After the dust-

Photo: 'Welcome to Günyüzü!' © Gordon McInnes

Photo: Meeting with farmers in the Pavilion in Günyüzü © Gordon McInnes

storm the light was failing, and the lake looked like a pinkish snow-scene disappearing into the mist. On our journey, we had seen how the lake ecosystem is being protected by reducing the pressures from the agricultural and other economic activities, and how farmers are adapting to changing climate, new technologies and living in a protected area. This journey was now over.

Before arriving in the area, there had been unconfirmed reports of wolves (referred to as monsters or 'canavar' in Turkish) returning to the Lake Tuz area. Wolves used to be a common feature of Lake Tuz and the surrounding area, benefitting from the rich diversity of both wild and farm animals. They may be returning. If so, this will allow farmers to continue their traditional mantra 'wolf, bird and bread' and share their produce with other inhabitants dependent on this unique ecosystem.

Acknowledgements

This story was prepared in close cooperation with Eyüp Yüksel with help from his EPASA colleagues as well as Gülcin Karadeniz and John O'Doherty (EEA).

Photo: Piles of salt at the Yavşan Works © Gordon McInnes

Front cover photo: © Gordon McInnes

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