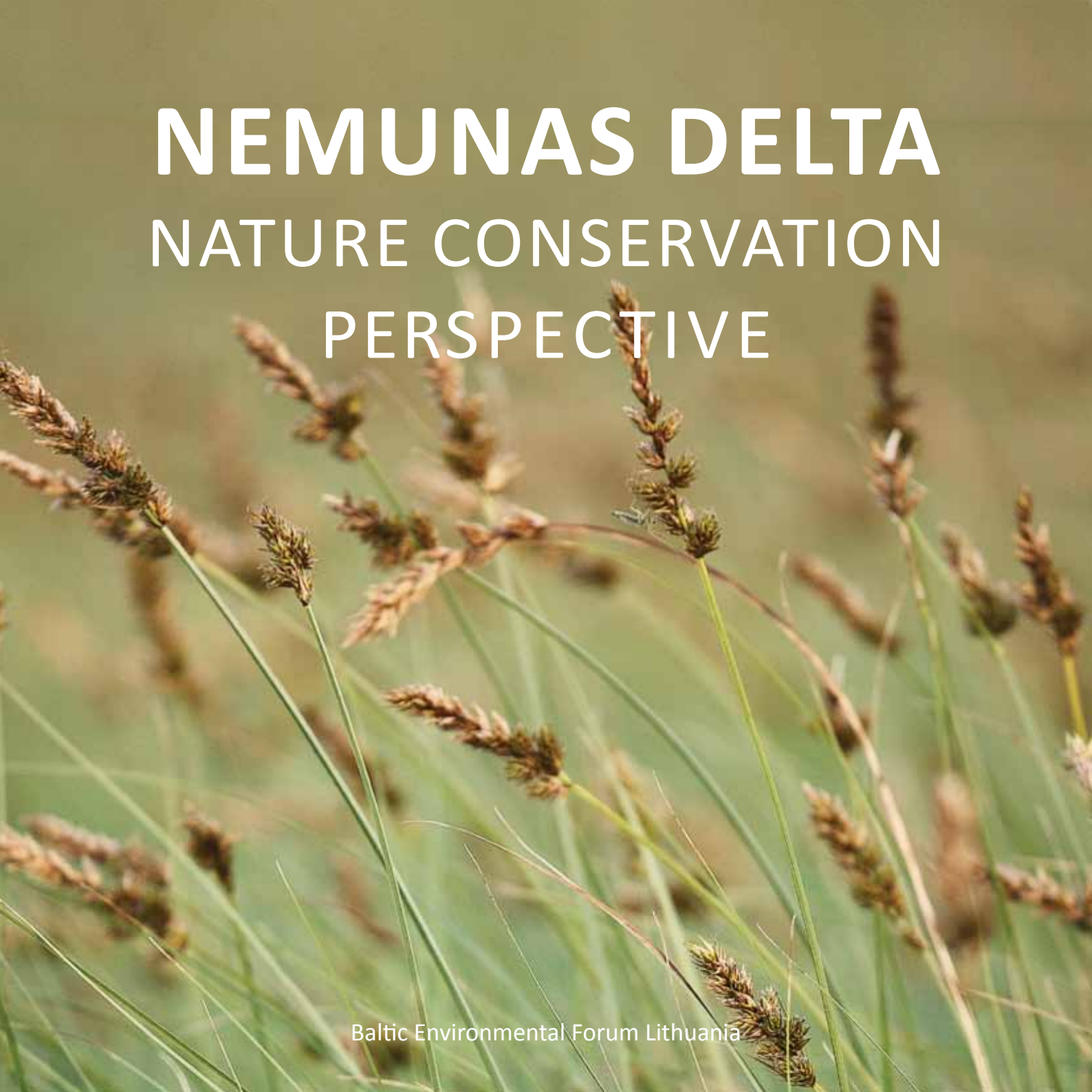

# NEMUNAS DELTA

## NATURE CONSERVATION PERSPECTIVE

Baltic Environmental Forum Lithuania

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Baltic Environmental Forum Lithuania
Nemunas Delta. Nature conservation perspective

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# INTRODUCTION

The Aquatic Warbler *(Acropcephalus paludicola)* is one of the migratory songbirds not only in Lithuania, but also in Europe. The threat of extinction for this species is real today more than ever before. For this reason it is increasingly important for local communities to take responsibility for its protection. This bird is not a loner, avoiding places frequented by people. It prefers fen mires or wet floodplain meadows, where it can feel a careful hand of the owner, where lush grass is mown annually keeping habitats open, not overgrown with shrubs and reed. In fact, the Aquatic Warbler avoids abandoned meadows that have not been mown for several years, or are managed too intensively. Therefore conservation of this species is subject to environmentally friendly farming.

Farmers of Sysa polder in Silute region of West Lithuania joined a nature conservation initiative lead by Baltic Environmental Forum Lithuania and agreed to postpone mowing of meadows until July 2012. This allowed the birds to raise their first brood. The agreement saved one third of the country's Aquatic Warbler population that year. Important breeding habitat restoration work started at Tulkiarage polder (Silute region) in 2011 and at Tyrai flooded meadows in Klaipeda region in 2012. All this work aims to restore habitats (nearly 850 ha) that are important breeding areas for the Aquatic Warbler as well as other meadow birds in the region.

This publication is for the farmers of Nemunas Delta region, but we hope it will also reach other communities or even visitors. Here you will find information about natural values of this unique land, nature conservation efforts, traditional farming practices and new economic opportunities. You will also find out why biodiversity conservation is so important. We also tell a story of one small bird – the Aquatic Warbler, which still returns to these fertile floodplain meadows, even though it no longer breeds in many other European countries. One may wonder, why does it still entrust its broods to meadows of Nemunas Delta and Tyrai mire? Why should it be saved and what does it have to do with local farmers? We hope to answer these questions and offer some ideas on how to help these birds. Please share your thoughts with neighbours and nature conservation experts. It is possible that you might just help preserve the song of the Aquatic Warbler for future generations of Nemunas Delta.

*Photo by J. Sendzikaite*

# NATURAL FEATURES AND VALUES OF NEMUNAS DELTA

Nemunas Delta is the region 48 km to the East above the Nemunas mouth, where the river branches off to Rusne and Gilija and wide floodplain turns gradually into flat lowland in the West. The lowest part of Lithuania – 0,27 meters below sea level is in Uostadvaris village in Rusne Island near Dumblys lake. During the last six thousand years, the Nemunas Delta was slowly formed of the silt (sand and sludge) brought by Nemunas, Minija and other rivers. Due to the constant accumulation of alluvial silt, the delta had slowly risen up by expanding towards the Curonian Lagoon. Over time the silt filled-up some river branches, forming small lakes, also known as oxbow lakes. The only lagoon lake in Lithuania – Kroku Lanka was also formed in a similar manner (Basalykas, 1965).

Nemunas Delta is one of the few places in Europe where rather severe flooding takes place each year. As snow begins to melt at the end of winter, water levels rise and large areas up to 400 km$^2$ get flooded. Most often flooding starts at the end of March, and continues for 2-3 weeks and sometimes even longer.


▲▼ *Flood in Rusne (2010)*


▼ *Oxbow lakes of Nemunas Delta*


◀ *Flood in Zalgiriai forest, 1999.*

*Strong flood waters have destroyed embankments of Aukstumale peatbog (The great flood of 1958).* ▼




◀ *Flood at Silgaliai village – floating on shed doors (around 1956).*

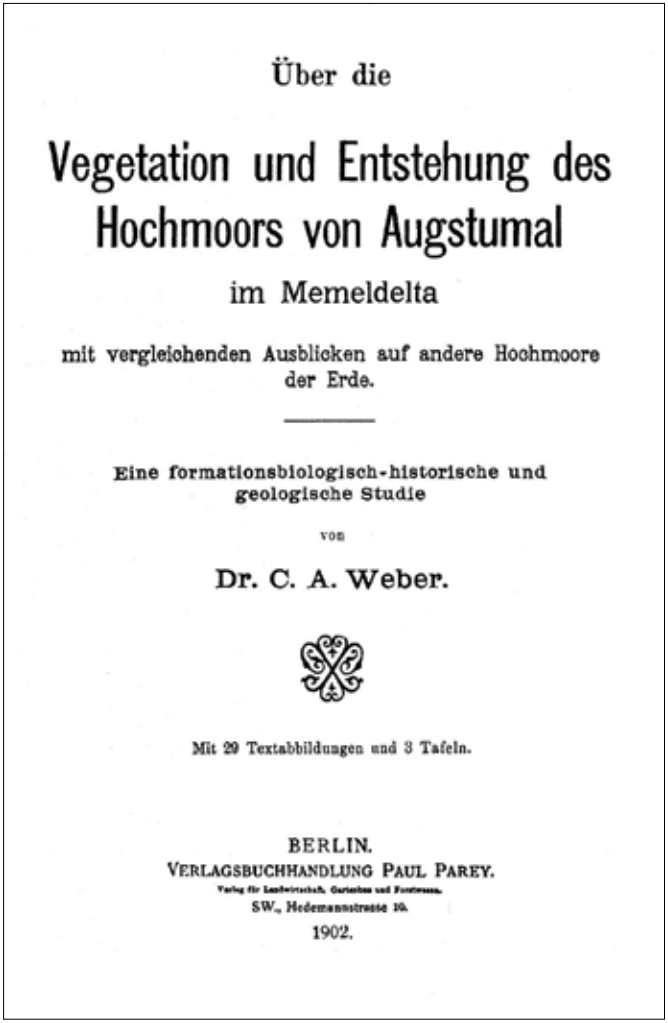

▲ *Aukstumale raised bog (Silute region).*

▼ *Ornithological station at Vente Cape.*


Vast areas of floodplain meadows as well as raised bogs (Aukstumale, Medziokles, Berstu, Lietgiriu mires) found in this region are unique in Lithuania. One of them – the raised bog of Aukstumale – is considered *locus classicus* (in Latin – classical place, example) by wetland researchers as it marks the beginning of wetland science worldwide. A monograph by Carl Albert Weber (Weber, 1902), a German botanist who studied vegetation and ecology of Aukstumale raised bog, is the first scientific study on wetland ecosystems in the world.

The first ornithological station in Lithuania has been founded in Vente Cape by a famous Lithuanian professor Tadas Ivanauskas in 1929. Some 50 000–80 000 birds are ringed here each year.

The first Lithuanian monograph titled "Meadows of Nemunas floodplain" summarizing comprehensive research on floodplain meadows was published in 1955. Nature of Nemunas Delta remains an important subject of modern research in Lithuania to date.



Über die

Vegetation und Entstehung des Hochmoors von Augstumal

im Memeldelta

mit vergleichenden Ausblicken auf andere Hochmoore der Erde.

Eine formationsbiologisch-historische und geologische Studie

von

Dr. C. A. Weber.

Mit 29 Textabbildungen und 3 Tafeln.

BERLIN.
VERLAGSBUCHHANDLUNG PAUL PAREY.
SW., Hedemannstrasse 10.
1902.

▲ *Title page of C.A. Weber's monograph (Weber, 1902).*

◀ *Cover and title page of the book "Meadows of Nemunas floodplain" (1955).*

◀ *Logo of Nemunas Delta Regional Park features a very rare bird – Aquatic Warbler.*

Nemunas Delta Regional Park was established in 1992 with an aim to preserve the valuable landscape, ecosystems and cultural heritage of the Nemunas Delta.

More than 600 flowering plant species are found in the park and more than 20 of them are listed in the Lithuanian Red Data Book (9 % of protected flowering plants in Lithuania): Spear-leaved Skullcap *(Scutellaria hastifolia)*, Cross-leaved Heath *(Erica tetralix)*, Deer-grass *(Trichophorum cespitosum)*, Fringed Water-lily *(Nymphoides peltata)*, White Water-lily *(Nymphaea alba)*, etc.

294 bird species are found in the park (90 % of ornithological fauna of Lithuania). 170 bird species are breeding in Nemunas Delta annually, and 33 of them are very rare: Aquatic Warbler, Corn Crake *(Crex crex)*, Great Snipe *(Gallinago media)*, Northern Pintail *(Anas acuta)*, White-tailed See-eagle *(Haliaeetus albicilla)*, etc.


▲ *Cross-leaved Heath (Aukstumale raised bog)*


▲ *Deer-grass (Aukstumale raised bog)*


▲ *Spear-leaved Skullcap (Sysa and Tulkiarage polders)*


▲ *White Water-lily*

▲ *Bird migration in Sysa polder*

▲ *Aquatic Warbler*

▲ *Northern Lapwing*

During spring and autumn migration this region is an important stopover for hundreds of thousands of swans and geese.

Nemunas Delta and Curonian Lagoon have been long known as the region of fishers. Up to 20 species of fish spawn in polders' canals, Common Bream *(Abramis brama)*, Northern Pike *(Esox lucius)*, Crucian Carp *(Carassius carassius)* being among the most valued. The polders of Nemunas Delta are one of few places in Lithuania where protected fish species Weatherfish *(Misgurnus fossilis)* are found.

Some 50 mammal species are found in the Nemunas Delta, 14 of them are protected species such as Northern Birch Mouse *(Sicista betulina)*, Ermine *(Mustela erminea)*, European Otter *(Lutra lutra)*, and eight bat species considered rare in Europe, amongst them – Pond and Brandt's Bats *(Myotis dasycneme, M. brandtii)*, Lesser Noctule and Common Noctule *(Nyctalus leisleri, N. noctula)*. Rare species of Northern Crested Newt *(Triturus cristatus)* and Natterjack Toad *(Bufo calamita)* are also found in wetlands of Nemunas Delta (Svazas, 2009).

▲ *Meadow Pipit*

▲ *Common Snipe*

▲ *Black-tailed Godwit*

▲ *Common Redshank*

*Photos by Z. Morkvenas*

*Venice of Nemunas Delta in the beginning of 20th century* ▶

*Photo from archives of Herder Institute (Germany)*

This region is famous worldwide for its unique and rich nature. In 1993 Nemunas Delta was included in the list of wetlands of international importance and is protected under Ramsar Convention. Since 1998 it is a Baltic Sea Protected Area designated by Helsinki Commission (HELCOM), and part of the network of protected areas of European importance (Natura 2000) since 2004.

Farming in a protected area is never easy because most agricultural activities are restricted (e.g. limited use of fertilizers and pesticides, ploughing, mowing, grazing, new constructions). In the 21st century farmers are using various technologies including heavy machinery enabling much better performance in most cases, but, on the other hand, posing a much greater threat to biodiversity. Therefore farming requires taking into consideration not only family welfare but nature conservation as well. Our natural environment is much more vulnerable today than it was a hundred years ago, when most farming was manually and with horses. But times are changing and clocks cannot be turned back… Therefore, concern for conservation of natural values is much more urgent than ever before. Conservation of rural landscape in Nemunas Delta relies mainly on environmentally friendly farming practices.

The aim of this kind of farming is not only an improvement of environmental quality, but biodiversity conservation as well. This should therefore not be a concern of nature conservation experts alone. Responsible society does not only consume natural resources, it also takes care of nature conservation, replenishment of natural resources, and, if possible – their restoration.

# FARMING TRADITIONS IN NEMUNAS DELTA

In this region powerful annual floods and ice-drifts shape the landscape. Although they do have threatening destructive forces, the locals have long understood their natural impact on the land. The floods are changing the landscape, fertilizing meadows, revitalizing nature after winters and sometimes even carry timber. People eventually adjusted to the rhythm of the river, while for some, goods brought by the water became an important part of their livelihood.

Such natural conditions determined distinctive lifestyle, customs, trades, and farming traditions in Nemunas Delta. This region has been home for unique, rather closed communities of fishermen, gardeners, grassland and wetland farmers. Fishermen lived near the water, while wetland farmers stayed around mires, and those making a living of forests lived in local woods. Coastal inhabitants harvested reed that was used for covering roofs. Floods have always obstructed traditional farming practices in this region. Powerful water washed out the land or covered it with silt, making farming possible only in higher fertile areas protected from floods – this was where farmers growing vegetables and potatoes had settled.

It was obvious that fertile soil was simply meant for grassy vegetation to flourish, therefore floodplain meadows tempted cattle breeders – grassland farmers. Their homesteads or entire villages (Rupkalviai, Pietiniai Girininkai, etc.) were established on elevated


▲ *Gardeners of the Nemunas Delta in the beginning of 20th century*


▲ *Grassland farmers of the Nemunas Delta in the beginning of 20th century*

meadow areas keeping them away from floods. Historic records of Livonian and Teutonic Orders mention Nemunas floodplain meadows as objects of utmost importance – suitable for grazing warhorses, mowing and setting-up new stud farms. Martynas Purvinas (2007) writes that *during times of cavalry wars vast grassland areas bore importance similar to modern oil business enterprises*. They provided livestock with fresh grass and hay, which was supplied to the military and rail horses. Hay was particularly important for goods and passenger traffic, post and household operations. According to M. Purvinas (2007), *natural conditions also required adjustment of hay preparation methods. Dried hay used to be stacked on wooden platforms lifted by 0.5-1 m above ground to protect it from autumn floods. The harvest was usually removed by sledge in winter, when wet meadows were frozen. Some stacks were transported down the rivers and channels in summer using large boats. Transporting hay by horse-drawn waggons was only possible in a few areas. Hay stock was stored in special raised domestic shelters. The rest of it was transported to neighbouring Königsberg and other cities by boats. The meadows were mowed three times per year, providing for most of East Prussia and some regions of Lithuania*. At the time grassland farming was rather intensive, but considering the technologies used we could say it was environmentally friendly. There was no use of mineral fertilizers and pesticides, meadows

were mowed after the floods had naturally receded and grass had grown lush. Moreover, the grass was cut by scythe, and only later – using horse-drawn mowers. Meadows were fully mown, for the forage was of great value in winter. Farming was particularly favourable for biodiversity-rich floodplain meadows at the time.

Such meadow-use traditions persisted until the World War II. The war had a significant impact on grassland farmers' lives: polders were abandoned and water pumping stations were destroyed, while some Prussians and farmers of German descent retired to Germany or were deported to Siberia. Large meadows remained unmanaged or managed poorly, grass was barely harvested and some hay was left rotting in the fields. A special meadow drainage and management scheme was created in 1953 and installation of new polders began. Establishment of an automated Grass forage production depot was initiated in 1959 and 17 production plants were constructed. Grass forage was produced by 12 single-purpose farms, mowing around 10 000 hectares of meadows some 3-4 times per season. 30 000 – 40 000 tons of forage was produced each year (Dainiuviene, 2001). Although these were impressive forage production rates, such intensive farming had a degrading effect on the region's meadow biodiversity.

After restoration of Lithuania's independence in 1990, during the agricultural reform polder use has changed. Due to rising energy prices and decreasing demand for the grass flour forage its production stopped. Polder meadows were distributed among smaller owners, leaseholders and enterprises with varied abilities and needs for farming. Since that time water level adjustment needs also changed, meadows were only used for grass harvesting, use of fertilizers stopped and mowing was performed only once per season (Dainiuviene, 2001). Changes in farming had a positive impact on biological diversity – number of plants, insects and bird species started to increase. Typical meadow species such as sedge, canary-grass and foxtail had "returned" to cultivated areas, even though less accessible wet meadows remained abandoned and eventually were overgrown with reed and shrubs.

Meadow conservation in our climatic zone is highly dependent on human activity. Therefore abandoned Nemunas Delta and Tulkiarage polder meadows can only be restored if farming continues.

▼ *Hay transportation in the beginning of 20th century*

# BIODIVERSITY AND ITS ROLE

## What is biodiversity?

Biological diversity is diversity of all living organisms (plants, animals, mushrooms, microorganisms, etc.) as well as genes and ecosystems (meadows, forests, wetlands, water bodies, etc.). Humans are only a small part of it.

## Why biodiversity needs protection?

All combinations of genes, species and ecosystems of the world are unique natural creations that are related to other living organisms and their surrounding environment (air, water, soil, etc.). Each biodiversity component plays a role in the nature and is an important element of global life network. Therefore biodiversity:

• Is a result of a long natural development process (evolution) as well as a unique repository of natural information, which nature continues to use for creating new combinations of genes and even species;

• It ensures ecosystem stability and restoration possibility following natural (e.g. forest windfalls) or man-made (forest fires) disasters. The bigger natural biodiversity, the more resilient it is to the negative environmental or human impact;

• Stabilises climate (plants absorb carbon dioxide and release oxygen); reduces pollution (plants and ecosystems (meadows, wetlands, forests, etc.) are able to absorb harmful chemical compounds present in soil and water);

• Protects soil and water resources by maintaining metabolism. Microorganisms (mushrooms, bacteria), invertebrates (worms, insects) and other decomposers are important producers of the productive soil layer by reprocessing of plant and animal remains.

It is also a valuable source for new species development and environmentally friendly alternative for chemical pest and invasive species control using their natural enemies. For example, wasps and ladybirds help destroy pest larvae and eggs, birds and other animals also feed on vermin, and bacteria and viruses-based biological cleaning substances exist. Many raw materials used by the industry and households are results of biodiversity in one way or another (food, pharmaceuticals, timber, coal, oil, gas, flax, silk, wool, natural paints, wax, etc.). Biological diversity is valuable for humans not only in economic sense, but also in ecological, aesthetic, historical, scientific, cognitive, educational, recreational and other aspects.

*The EU LIFE+ project poster by M. Karpaviciute illustrating links between Aquatic Warbler and other species of its habitat.* ▶

*Ecosystem services – generous gifts from nature. Adapted from the Millennium Ecosystem Assessment (2005)* ▼


## Why should we be concerned about biodiversity loss?

Our planet's survival just like our health depends on biodiversity. Degradation of the living world will eventually have an effect on humanity: it will result in increasing problems due to shortage of quality fresh water and food as man-made ecosystems become less resistant to pests and diseases. Lack of healthy living environment will lead to our own diminishing health. Therefore by losing biological diversity we contribute to environmental degradation and negatively affect our own wellbeing and that of our children. By destroying biodiversity we refuse the benefit provided by natural ecosystems also called the ecosystem services. These services include food, drinking water and fuel provision, cleaning of the environment, etc. Have you ever thought of what service is provided to us by insects that are pollinating most agricultural and wild plants? Sudden extinction of these invertebrates would result in the disappearance of most flowering plant species. Such drastic changes in nature would cause many problems (i.e. food and oxygen shortages) and lead to human extinction along with the rest of the living world. Are we capable to value the gifts provided to us by nature? Money or productive land units cannot be measures for everything. Is Nemunas Delta landscape only a supplier of agricultural goods? The beauty of its nature has already inspired numerous generations of artists who painted pictures, wrote songs and poems about it. Last but not least – there is an immaterial value in experiences brought back home by nature lovers and other visitors of this region.

Our life is influenced not only by the events taking place in our immediate environment, but also by what is happening thousands of kilometres away. The things we do at home do have an effect on daily lives of people in distant countries. Here is a small example: each Aquatic Warbler that fledges in Lithuania visits many European countries on the way to wintering sites in Africa and interacts with natural ecosystems. Our failure to protect it in Lithuania will inflict irreversible changes in other countries.


▲ *Protection of rare species requires cooperation between farmers and nature conservation specialists*

## Agricultural activities that negatively affect biodiversity in the Nemunas Delta:

• **Intensive mowing and grazing:** Mowing of meadows (technology, timing, etc.) influences the structure of grassland communities, animal welfare and survival possibilities;

• **Meadow ploughing and re-sowing:** Ploughing and mowing in early spring or beginning of summer destroys nests and young birds. Newly sowed grass is considered more valuable from an agronomic point of view. But from a biodiversity perspective there are fewer plant and animal species which means a poorer feeding base for birds;

• **Fertilization:** Fertilization changes the structure of grasslands – economically less valued plants are replaced by tall and more productive grass species. This decreases plant diversity and reduces the number of invertebrates, especially insects;

• **Pesticide use:** Pesticides are used to protect crops from pests and diseases. Unfortunately these hazardous chemicals also destroy soil microorganisms, plants, insects and other invertebrates. It reduces feeding base for birds, predatory insects and even mammals. Most pesticides and their by-products tend to bio-accumulate and disrupt

growth and development of living organisms, can cause mutations or death. One infamous example is DTT, a pesticide used widely during post-war period and banned in Lithuania since 1970. Its harmful features were noticed in 1950s and 1960s, after sudden extinction of bird (especially predatory) populations. It became obvious that this pesticide is both very toxic and reduces calcium uptake in organisms. Birds were unable to hatch the brood, because thin egg-shells could not hold their weight;

• **Land abandonment:** Meadows are threatened by decreased grass forage demand. With the absence of mowing and grazing, old grass accumulates and meadows start overgrowing with shrubs. Habitat changes in a way that it becomes unsuitable for birds of open landscape. Thick grass layer prevents their free movement and feeding as well as grass regeneration. Plant variety and number of insects gradually decreases. Some species require rather large habitat area for protection from predators. Therefore meadows overgrown with reed and shrubs are avoided by birds as highly unsafe habitats;

• **Elimination of small landscape elements:** Single trees or their groups, shrubs, groves, small fens and ponds, rivers, hills and other small landscape elements are very important for biodiversity conservation. Sometimes they are the only haven for many bird and animal species, whose suitable habitats have been destroyed. These are their feeding and breeding places as well as shelter from predators and agricultural machinery.

## Birds as biodiversity and environmental quality indicators

Birds are closely related to the local flora and fauna that meets their feeding, breeding and protection needs. The number of species and their population status are linked with their living environment condition and its changes. Therefore they are good biodiversity indicators. Birds of agricultural landscape are used as ecological indicators in national rural development programmes. Nevertheless, the state of most meadow bird species highly depends on agricultural practices and environmental protection measures used. Studies show that 40 % of all threatened bird species in Europe are negatively affected by intensive farming, while 20 % of them are going extinct because of land abandonment (Tucker, Heath, 1994; Kurlavicius, 2010).

Extensively managed meadows and pastures are the most valuable natural bird habitats in Lithuania. Wet meadows are home to 23 bird species, protected not only in our country, but also in entire Europe: Spotted Crake *(Porzana porzana)*, Ruff *(Philomachus pugnax)*, Black-tailed Godwit *(Limosa limosa)* etc. All five globally threatened bird species breeding in Lithuania are dependent on natural or semi-natural wet meadows and pastures – Aquatic Warbler, Corn Crake, Great Snipe, Dunlin *(Calidaris alpina)* and Lesser White-fronted Goose *(Anser erythropus).*


Photo by Z. Morkvenas

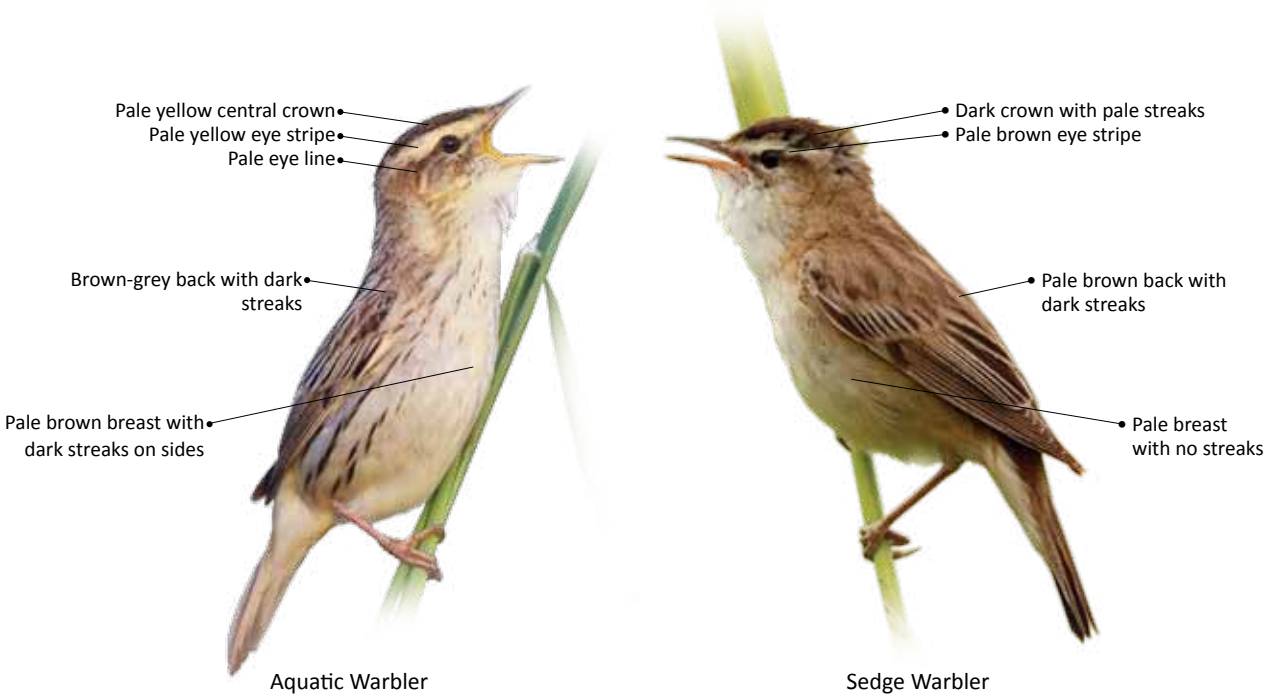
## Is extinction of single species very significant?

Extinction of even one species disrupts the entire food chain and thus poses a threat to other species. Such a phenomenon is called the *domino effect* i.e. when pushing one dice destroys an entire structure, i.e. extinction of one species affects entire ecosystem by changing it irreversibly. It is important to understand that species can only be protected by their living environment conservation (restoration).

In other words, reckless human actions severely affect not only natural environment, but our own lives as well. In 1950s China there was a decision to eliminate all House Sparrows *(Passer domesticus)* because they consumed nearly half of the rice harvest and other cereal cultures. It was permitted to catch, to shoo, to shoot, and poison them, there were even rewards for "significant elimination results". After this was achieved, pests attacked fields causing much greater damage. Only then the war against these small birds was called-off and measures were taken in order to retrieve them – sparrows were protected and even imported from other countries.

◀ *Aquatic Warbler is way more vulnerable than its relative – Sedge Warbler*

# WHAT IS AQUATIC WARBLER?




▲ *Distinctive features of Aquatic Warbler and Sedge Warbler*

## What does it look like?

The Aquatic Warbler is 13 centimeters in length, it weighs around 11 grams. It is greyish brown in colour with visible pale stripes on the back and dark streaks on the rump. The bird also has a pale yellow eye stripe, but its most distinguishing feature is a pale yellow crown stripe that sets it apart from the much more common relative species – the Sedge Warbler *(Acrocephalus schoenobaenus)*.

## Aquatic Warbler – globally threatened bird species

The Aquatic Warbler is one of the rarest migratory songbirds in Europe. This passerine species is included into Annex I of the European Union's Wild Birds Directive, Appendix II of the Bern Convention on the Conservation of European Wildlife and Natural Habitats and Appendix I of Bonn Convention on the Conservation of Migratory Species of Wild Animals as globally threatened species (Preiksa, 2007; Flade, Lachman, 2008; Pranaits, 2010). It is also listed in the Lithuanian Red Data Book (Rasomavicius, 2007) as vulnerable (category 2(V)) species, which is facing threat of extinction.

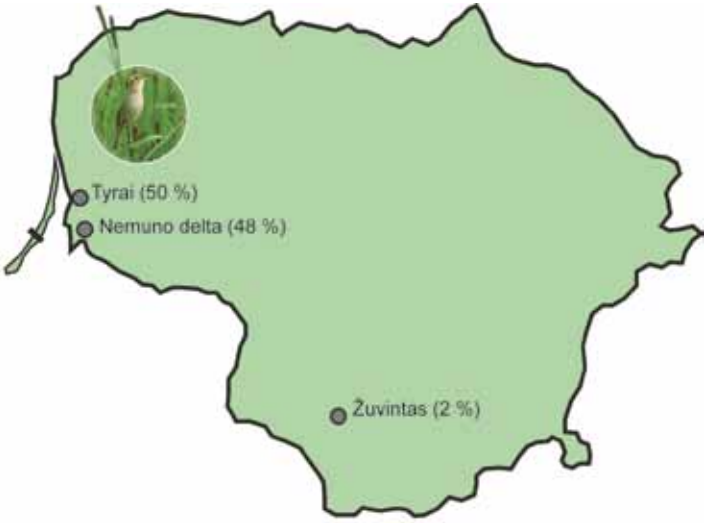
▼ *Aquatic Warbler was breeding only in Lithuania, Belarus, Ukraine and Poland in 2012*


## Why is it going extinct in Europe?

The Aquatic Warbler used to be common all over the continent from France to Western Siberia, from Latvia to Italy in vast open sedge meadows and open mires which still existed at the time. In the 20th century most of the habitats suitable for the Aquatic Warbler in Europe were drained or transformed into intensively cultivated land (fertilized, mowed and grazed) or were completely abandoned. For these reasons currently this small bird breeds only in Belarus, Poland, Ukraine and Lithuania, although just a few years ago it was also breeding in Germany, Hungary and Latvia.

A significant number of birds are going extinct because important habitats in wintering sites are being destroyed. Main Aquatic Warbler wintering site at the Senegal River delta (West Africa) is turned into rice and sugarcane plantations, while the remaining natural vegetation is suffering from droughts, intense grazing and salinization of drained areas. Only some 11 000–16 000 Aquatic Warbler males remain in Europe today (species population is assessed by counting singing males).

The Aquatic Warbler is threatened because it has very specific needs for feeding and reproduction. Only few suitable habitats are left in Europe and for this reason this species is facing extinction.




▲ *Distribution of Aquatic Warbler in Lithuania, 2012*

## It still breeds in Lithuania

The Aquatic Warbler is recorded in three types of habitats in Lithuania: in two-ranked sedge mires on the coast of the Curonian Lagoon, in rich flooded meadows of Nemunas Delta dominated by sedges and canary-grass and heterogeneous fen mires of Zuvintas Biosphere Reserve (Pranaitis, 2010). Currently there are only few suitable breeding habitats for the Aquatic Warbler in Lithuania – this equals to 1 240 hectares, or 50 times less than the area covered by the administrative region of Silute in Western Lithuania (170 625 ha).

The knowledge about past distribution of the Aquatic Warbler in Lithuania is scarce. Professor Tadas Ivanauskas (Pranaitis, 2010) was the first who saw and described this species in Lithuania. In the 3rd volume of "Birds of Lithuania" (lit. "Lietuvos paukščiai") he writes: *I found it in Lithuania at the Zuvintas Lake, but it is more rare than the Sedge Warbler. It is common on the Eastern coast of the Curonian Lagoon and breeds there* (Ivanauskas, 1964). Nonetheless, first bird counts took place only in 1986. 32 singing males were counted in wet meadows surrounding Zuvintas Lake at the time (compared to one in 2012). In 1994 some 250-300 singing males were counted in the Tyrai mire at the Curonian Lagoon near Priekule, and further new breeding places were discovered at the Nemunas Delta. According to counts by the Lithuanian Ornithological Society some 223-247 singing males were recorded in Lithuania in 2000. Aquatic Warbler was breeding in Zuvintas, near the Curonian Lagoon (Tyrai and Serpiejai mires and Svencele meadows) as well as at Nemunas Delta (old Minija riverbed, Sausgalviai meadows, Sysa polder, Rusne Island and Sakuciai meadows). During the last decade the number of these birds has significantly decreased both in Zuvintas and in Tyrai mires, where unmanaged sedge meadows have overgrown with reed. In 2004 Aquatic Warbler population was discovered in Sysa polder of Nemunas Delta. In 2011 there were 90 singing males counted in Lithuania, while a year later, in 2012 – only 62, a total population shrinking by a third.

## Why Aquatic Warblers are going extinct in our country?

The main reason for Aquatic Warbler extinction is habitat loss and degradation due to:

- Unfavourable hydrological regime during their breeding period, habitat drainage or flooding because of irregular water level management in polders;
- Intensive farming (early mowing, grazing, fertilisation, grassland re-sowing, renovation of drainage systems, etc.);
- Complete termination of land management.

Aquatic Warbler is an insectivore with particular living environment needs. It breeds in open and spacious habitats – sedge mires or wet marshy meadows, where water level stays up to 10-15 cm above the land surface form spring through mid-summer. Immediately after finding suitable conditions they start nesting and breeding. This small bird avoids intensively grazed areas because of different grassland structure. Such areas are dominated by plant species resistant to trampling such as Tufted Hair-grass *(Deschampsia cespitosa)* and Meadow Buttercup *(Ranunculus acris)*, etc.

At the end of May, the female Aquatic Warbler lays 4-6 eggs in her nest and sits on them for up to 13 days. The female is taking care of the brood on her own, therefore it is very important that the meadow is rich in insects and other invertebrates it feeds on – dipterous insects, maggots, mosquitoes, spiders and others. First the brood stays in the nest for 15-16 days, and therefore it is important to postpone mowing till the end of June. Early mowing is dangerous for Aquatic Warbler even in the most suitable habitats – heavy farming machinery destroys nests with eggs and broods. As Aquatic Warblers' lifespan is only few years, poor breeding for several years in a row might lead to rapid extinction of the entire population in the area. Therefore it is very important to involve farmers in Aquatic Warbler conservation.

▼ *Aquatic Warbler female is taking care of the brood on its own and is feeding only up to 30 meters from the nest. These rare birds can only breed in meadows rich in insects and other invertebrates.*

*Photo by Z. Morkvenas*


▲ *Important Aquatic Warbler habitat – Sysa polder in May*

## Where does Aquatic Warbler breed in the Nemunas Delta?

One may wonder why has the Aquatic Warbler chosen these particular wet meadows and sedge mires? Living in dry meadow with no fear of loosing nests in heavy spring and summer storms leading to flooding might seem much simpler. Nevertheless, Aquatic Warbler has been living in these habitats for many years now. It is a bird of wet meadows. Since such natural habitats have almost completely disappeared, the species had to adapt to breed in rich flooded meadows of man-made polders in the Nemunas Delta.

# AQUATIC WARBLER'S HABITATS

## How to distinguish their habitats?

Polders of Nemunas Delta were at the epicentre of intensive farming a few decades ago. Today they are dominated by sedge, canary-grass and foxtails. Spacious, wet meadows are a true heaven for the Aquatic Warbler. Most areas where it breeds today have been either recently mowed or grazed. However, this bird does not breed in pastures, as it prefers open, mown meadows with no shrubs or layers of old grass that are impeding feeding.

*Two-ranked Sedge meadows are the most favoured by the Aquatic Warbler* ▶

*Aquatic Warblers are also found in Reed Canary-grass and Meadow Foxtail communities* ▼

*Photos by J. Sendzikaite*

▲ *Marsh-marigold and Water Avens are the first spring flowers of Aquatic Warbler meadows*

Vegetation characterizes Aquatic Warbler habitats the best. Tall, moisture-loving plants, adapted to anoxic conditions during temporal flooding are common here. Water is covering these meadows in spring, early summer and in the beginning of autumn. Yellow flowers of Marsh-marigold *(Caltha palustris)* are the first to bloom in spring followed by red-brown Water Avens *(Geum rivale).*

In summer other tall, gross grasses are sprouting up – Reed Canary-grass *(Phalaroides arundinacea)*, Meadow Foxtail *(Alopecurus pratensis)*, Reed Sweet Grass *(Glyceria maxima)*, Two-ranked and Slender Tufted Sedges *(Carex disticha, C. acuta)*, Common Comfery *(Symphytum officiale)* and others. In June green meadows light up with silvery brooms of foxtails, blue trusses of Tufted Vetches *(Vicia cracca)*, yellow blooms of Meadow Vetchling *(Lathyrus pratensis)* and reddish Ragged Robins *(Lychnis flos-cuculi)*.

## Plants of Aquatic Warbler habitat

*Two-ranked Sedge* ▲

*Slender Tufted Sedge* ▲

*Common Sedge* ▲

*Reed Sweet Grass* ▲

*Meadow Vetchling* ▲

*Common Comfery* ▲

*Tufted Vetch* ▲

*Ragged Robin* ▲

*Photos by J. Sendzikaite*

## How different farming practices affect meadow ecosystems?

Natural conditions determined meadow use in Nemunas Delta until the middle of the 20th century. Normally meadows were mowed in July, after water receded and fields became dry. The grass was cut by scythe, and only later – using horse-drawn mowers. This prevented wild animal loss and destruction of bird nests. Mown grass was dried in fields (saving invertebrates) and ready-made hay was removed later. As haymaking continued until mid-August, most birds would have fledged by then, insect larvae – matured, and plants – seeded. Such meadow management was very biodiversity-friendly (Kurlavicius, 2010).

From the middle of the 20th century humans started transforming natural landscape of Nemunas Delta. Natural floodplain meadows were reclaimed for agriculture: the land was drained, ploughed and re-sowed. Installation of summer and winter polder systems began, powerful water-pumping stations and drainage channels were built. Water level was regulated in the way most suited for farming and mowing, and therefore groundwater level was kept at 1.3-1.6 m during summer (Malisauskas, 1999). These measures enabled faster meadow drainage and growth of vegetation intended for grass forage production. Rich


▲ *Animals are grazed in dry areas of Sysa polder*


▲ *Wet sedge meadows of Sysa polder often remain unmanaged*

meadows were cultivated very intensively: grass was cut early and mowing took place 3-4 times per season. However, these meadows were rather poor from a biodiversity point of view – as species variety was low. Early and frequent mowing is lethal for meadow birds that are not able to raise their brood, and also negatively affects insects (especially day-flying moths). Plants are also unable to mature and sow their seeds.

At the end of the 20th century a new agricultural reform started and demand for forage decreased. Most meadows were mowed only once a year (extensive farming, e.g. in Sysa polder), while other areas were abandoned and remained unmanaged. Plant variety started changing and sedges with tall grasses such as Reed Canary-grasses and Meadow Foxtails were coming back. Unmanaged areas meadows became overgrown with shrubs and reed (e.g. in Tulkiarage polder), and thick layer of old vegetation started accumulating. In such conditions grassland ageing began, as old vegetation prevented seed germination. Insect variety also started decresing. With changing habitat conditions, birds abandoned these areas. It shows that mowing with biomass removal is absolutely necessary for meadow restoration. It helps to restore vegetation structure and increase invertebrate variety for bird and animal species to be able to return to the ecosystem. Environmentally friendly meadow management is important for maintaining an open landscape of Nemunas Delta floodplain, it is also key for the conservation of a rare bird species – the Aquatic Warbler.

# ENVIRONMENTALLY FRIENDLY FARMING

## Mowing and nature protection

A lot of useful information on meadow management can be found in publications by professor Petras Kurlavicius (2008, 2010). Meadow use does not only affect grassland structure, but welfare of wild animals as well. From the biodiversity conservation point of view mowing time and machinery are of great importance.

**Mowing time**. Areas important for Aquatic Warbler conservation should be mown as late as possible. Early mowing poses great danger for this species survival, as it destroys nests with eggs and young broods. Therefore, the most suitable mowing time is after July 15th, when most birds have fledged and are able to escape from the field. Most passerine birds, including Aquatic Warbler, have adaptation strategies that include several broods per season. This is due to relatively high bird mortality during breeding, migration and wintering periods. Considering that Aquatic Warbler is extremely threatened by extinction in Lithuania and elsewhere, it is very important to put all efforts in saving not only its first brood but the second one as well. For this purpose, scientific research suggests to delay mowing after August 15$^{th}$. Such late mowing is important for many plant, insect and bird species.

Although late mowing is necessary for biodiversity conservation and restoration of biological diversity, it negatively affects forage quality. Biomass harvested after August 15$^{th}$ is no longer suitable for forage preparation and can be used only as animal bedding or for biofuel production. Therefore state compensations are foreseen for those farmers, who will take part in Aquatic Warbler conservation initiatives and agree to postpone mowing for this purpose. This is seen as a compromise – farmers are compensated for their losses and Aquatic Warbler has a chance to survive.

**Mowing machinery.** Modern tractors with automated mowers are able to manage vast areas in short periods of time. Unfortunately such powerful machinery is dangerous for many meadow species. Often meadows are mowed from the sides by mowing inwards. This kind of mowing forces birds and small mammals towards the centre of the meadow where they are eventually killed by the machinery.

▼ *Early mowing in Sysa polder*

Environmental friendly farming adjusts to natural conditions to reduce biodiversity loss. The most popular recommendation is to start working at the centre of the field and move outwards or to the sides of the field. However, these recommendations might be difficult to apply in polders of Nemunas Delta, where drainage channels divide meadows. In this case it is advised to install special intimidators, i.e. on a frame with fixed hanging chains with 40-50 cm gaps in between. Such installation is most effective when the chains reach the ground at a distance no less than 1 m from the cutter (Kurlavicius, 2010).

Another problem farmers in wet meadows are facing is ruts and turf destruction caused by heavy machinery.


▲ *Meadow restoration in Tulkiarage polder*

Experience in countries like Poland, Belarus and others shows that wide-tracked tractors are particularly effective in working large wet meadow areas with minimized soil damage. At the groundwater level reaching 20-30 cm grasslands of the Nemunas Delta polders can be managed using usual farming machinery: it is enough to double its wheels and underinflate tyres to reduce pressure to the soil surface.

**Biomass handling** is very important for conservation of biological diversity. Mown grass should be removed from the field, because accumulation of old biomass affects soil negatively. It impedes plant growth and seed germination in spring. As grass starts to decompose it releases nitrogen into the soil and promotes growth of poor vegetation such as nettles, chervils, etc.

A fauna friendly mown grass management is a traditional one – it includes drying it in the field and removal afterwards. Most invertebrates are destroyed during mechanical grass shredding and automated collection. Modern forage production technologies are very effective and enable mowing several times per season. However this leads to degradation of insect communities in few years time (Kurlavicius, 2008).

Environmentally friendly agriculture presents farmers with a challenge. They must weigh pros and cons of machinery and techniques to be able to balance economic benefits and environmental impacts.

**Recommendations for animal protection during mowing. It is important to take into account:**

- **Mowing date.** Late mowing protects bird nests, eggs and broods. Therefore, if there is possibility some areas should be left for later mowing. Please remember that most birds raise their brood in the beginning of July, while others together with Corn Crake – after July 15$^{th}$, while second brood of Aquatic Warbler hatches only after August 15$^{th}$. Mowing dates should be adjusted accordingly;

- **Mowing direction.** Properly chosen mowing direction, e.g. from the centre to the sides of the field provides an opportunity for wild animals to escape the danger;

- **Mowing equipment.** Scissor mowers help save more wild animals compared to other types of equipment. It does reduce mowing speed, but nonetheless please consider using them in order to save small mammals, birds and amphibians. All of them are important for the ecosystem;

- **Intimidation measures.** Install fixtures for intimidating meadow wildlife during mowing, e.g. metal frame with chains. This will help protect many species during mowing season;

- **Mowing strategy.** It is useful to leave small areas

that are not mown for biodiversity protection reasons. These can be used as hides by birds or small animals, while plants can mature and sow their seeds there;

• **Mowing height.** The higher the grass cutting level (recommended up to 10-15 cm), the greater survival chance there is for birds and their broods as well as other small animals;

• **Mowing frequency.** The longer the break between first and second mowing, the greater is the number of wild animals, particularly birds, that survive.


◄ *Late-cut biomass is used for biofuel production*

## Alternative ways of using meadow biomass

Choosing favourable mowing time and avoiding early mowing is very important for Aquatic Warbler conservation as well as protection of other meadow bird species. Unfortunately this clashes with farmers' interests to stock necessary forage for winter. The most valuable forage is produced from early harvest in June. This coincides with the most active breeding time of meadow wildlife whose destiny depends on farming decisions.

Perennial grass biomass can be used not only for forage and bedding production. It is also a useful renewable energy source reducing the use of fossil fuel. Grass which is no longer suitable as forage is turned into fuel briquettes and pellets (also used as animal litter). From environmental protection point of view, such fuel is clean and carbon neutral: $CO_2$ emissions released during combustion are equal to those absorbed by growing plants.

*Grass briquetting facility in Poland* ▶

Photo by Z. Morkvenas

Grass vegetation is attractive for biofuel production because it can be harvested annually, while timber takes several years and even decades. Most valuable are these plants that produce large volumes of fibrous biomass as this affects energy effectiveness. According to Lithuanian scientists, this also depends on mowing time. Most biomass can be harvested by mowing the grass in July and August. However, the most useful biomass for energy production purposes should be cut at the end of the summer, beginning of autumn, and in spring (in March) (Kryzeviciene et al., 2005). Natural conditions prevent from mowing last year's grass in spring in the Nemunas Delta because of flood, therefore the best time for this purpose is August. This would be in the best interest of both biodiversity and Aquatic Warbler.

*Grass used for forage production* ▼

Photo by Z. Morkvenas


▲ *The Aquatic Warbler welcome event with local community in Sysa polder*

## FUTURE OF AQUATIC WARBLER DEPENDS ON FARMERS

Aquatic Warbler is a small bird which is very dependent on the goodwill of farmers. The threat of extinction for this species is more real today than ever before; therefore environmentally friendly farming and meadow restoration are important in order to save each bird. Farmers can have a dual role – whether to be be an enemy or a saviour for the Aquatic Warbler. Here they do have a choice.

Our experience in Nemunas Delta shows that local communities and farmers are willing to join nature conservation efforts. Close cooperation between conservation experts and farmers leads to mutual agreements to delay mowing and protect the birds. Such agreement in meadows of Sysa provides great inspiration to approach farmers in other areas important for Aquatic Warbler. Aquatic Warbler welcome event in Nemunas Delta is becoming a popular local tradition, bringing together communities and farmers for a chance to get to know this species and, with a bit of luck and good weather, to hear its soft song. Once again, it proves that there are many ways to help save Aquatic Warbler and all of them are very important today.

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This publication for farmers introduces a unique nature of the Nemunas delta region. It talks about the delta's farming traditions, the role of biodiversity, and explains the purpose of environment friendly farming requirements.

## AGRI-ENVIRONMENTAL CHECKLIST

### For environment friendly farming in the meadows of Nemunas delta:

- Mowing should start after July 15th;
- Mowing should be done from the centre outwards or to the sides of the field;
- Mechanic intimidation measures should be used during mowing;
- Mowing machinery must not damage turf and soil;
- Height of mown vegetation should be 10-15 cm;
- Biomass should be dried and removed from the field;
- Grazing should be extensive (1 livestock unit per hectare) to avoid damage to birds and their broods.

### For environmentally friendly farming in habitats important for Aquatic Warbler:

- Mowing should start after July 15th, in Aquatic Warbler breeding areas – after August 15th (late mowing);
- Mowed grass should be removed from the field;
- No grazing or very extensive grazing (0,2 livestock unit per hectare, i.e. 1 cattle per 5 hectares of wet meadow).

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