



## **Sustainable utilisation of coastal reedbeds**

Background study  
Coastal Reed Project  
John Nurminen Foundation, 2021

## Background

The common reed (*Phragmites australis*) is a perennial grass that grows in the coastal zones of brackish and inland waters. It can form extensive and dense stands on shallow shores, especially in nutrient-rich lakes and coastal bays in the Baltic Sea. In suitable habitats, the common reed spreads effectively by seeds and vegetatively through rhizomes. The common reed overwinters with its rhizomes and grows new shoots each year.

The eutrophication of coastal waters in the Baltic Sea has benefited the common reed. The reed has spread rapidly particularly in shallow coastal bays. The reduced grazing on seashore meadows has also contributed to the ever-wider spread of reed beds.

Estimates of the size of reedbeds based on satellite surveys of Finland's coastal areas vary greatly, from 30,000 hectares to as much as 100,000 hectares. Dense stands of common reed bind substantial amounts of eutrophying nutrients from the coastal waters of the Baltic Sea. A one-hectare reed stand can contain 10 kg of phosphorus, 100 kg of nitrogen and over two tonnes of organic carbon.

## Impacts of the spread of common reed

Due to the strong spread of reed, many open coastal habitats and traditional landscapes have become overgrown and species adapted to them have declined. In the past, cattle grazing on seashore meadows kept the landscape open and reed spread under control, but now many open coastal biotopes have been classified as endangered. On the other hand, increased abundance of reedbed habitats has benefited some species of birds that were rare in Finland earlier, but have become more abundant due to the spread of the common reed.

Decomposing reed biomass accumulating in shallow water and at the waterline increases the shallowing of shores and accelerates overgrowth. The decomposition of dead reeds consumes oxygen from the coastal water. Decomposing reed biomass is also a source of methane emissions. Impenetrably thick reed stands also significantly hinder the recreational use of shores and lead to the overgrowth of traditional cultural landscapes on previously open shores.

That said, reedbeds growing in coastal zones may also be beneficial. Reeds bind soil with their roots and thus effectively prevent coastal erosion. In addition, the roots of the common reed also transport oxygen deep into the bottom sediment, maintain it in good condition and prevent the release of nutrients from the sediment back into the water. Reedbeds in estuaries trap solids and nutrients flowing from the land and prevent them from being carried away from the coastal zone further into the sea.

## Coastal Reed Project

The Coastal Reed Project was launched by the John Nurminen Foundation in 2020 with the aim of utilising the nutrients of reeds from eutrophic coastal waters. By mowing reed and utilising the accumulated reed biomass for applications such as the production of growing media, soil improvement and bedding material, a large amount of nutrients can be cost-effectively removed from coastal environments. At the same time, the project serves to protect biodiversity, such as in seashore meadows threatened by overgrowth. Reed cutting is planned and carried out in cooperation with experts to ensure that species specialized to reed habitats have enough living space.

## Significance of reed beds as habitats

Reedbeds are not uniform habitats – they can contain many different kinds of microhabitats. The most diverse reed environments have a varied structure, with islands of reeds and pools of open water. Within diverse reed stands, the areas of water vary in depth, too, and this creates a mosaic of many different types of habitats.

Diverse reed stands are important for biodiversity. Nutrient-rich coastal bays provide shelter and food for birds, fish, frogs, bats and a wide variety of invertebrates. Reed stands in coastal bays can feature abundant and diverse species of insects. Aquatic plants thrive on the edges and ponds of reed stands, providing shelter for plankton and fish fry.

Thick, overgrown reedbeds are less diverse: other vegetation among the reed is scarce and there is a lack of pools of open water and mosaic-like microhabitats. Species in extensive, homogenous reedbeds are less varied and many valuable species disappear. Decomposing reeds are shallowing the water – and this means that many birds' nests are no longer safe from small predators in the reeds. In addition, thick reedbeds provide fewer feeding grounds and places to shelter for waterfowl, aquatic insects and frogs.

## Birds

Reedbeds are important feeding and nesting areas for many birds. The most diverse birdlife can be found in mosaic-like reed stands with varied structures featuring a wide range of microhabitats. Pools of open water and the edges of reedbeds also serve as important feeding grounds and shelters for many birds that nest on land – there are also species that thrive in extensive and thick reed stands, such as the bearded reedling, great reed warbler and Eurasian reed warbler. Low seashore meadows and silt coasts next to reed stands foster diverse birdlife, as they provide suitable habitats for waders. In addition, waterfowl nesting in the reeds can feed on the meadows. For birds that nest in hard-to-reach parts of the reed stands, it is important to ensure that the water does not become too shallow, which would mean that their nests are no longer safe from land predators.

There are few endangered birds that nest in reedbeds in Finland (e.g., the common moorhen, black-headed gull, great reed warbler), but more species specialized in reed habitats are listed in Annex I of the EU Birds Directive. The Birds Directive seeks to protect wild birds and their habitats in the EU. Its Annex I specifies for which species Member States must designate special protected areas (Natura 2000). Reed birds listed in Annex I of the Birds Directive include the Eurasian bittern, black tern, Caspian tern, common tern, Arctic tern, whooper swan, tundra swan, common crane, little gull, bluethroat, smew, horned grebe, spotted crake, wood sandpiper and the birds of prey osprey, western marsh harrier and Montagu's harrier.

Although growth of coastal reedbeds has benefited certain bird species by increasing the amount of habitats suitable for them, extensive overgrowth of coastal areas has meant that species living on open seashore meadows, such as many waders, have become rarer. Coastal overgrowth is a major factor behind the endangerment of many seashore meadow species. Mosaic-like, diverse reed environments and open seashore meadows in their proximity maintain diverse birdlife. Studies show that reedbeds that are maintained by means of regular mowing foster larger numbers of different

wetland birds than thick, unmowed reedbeds. However, mowing should not be scheduled to take place during the bird nesting season – it should take place in late summer (August onwards) once the chicks have left their nests.

### **Insects and other invertebrates**

Diverse reedbeds maintain abundant species of insects, which are a major source of food for many birds, fish, and bats. Reedbeds are home to insects such as dragonflies, caddisflies and specialised owl moths (Noctuidae). Aquatic vegetation also provides shelter to insect larvae that live in water, aquatic insects such as diving beetles and planktonic crustaceans such as water fleas. In winter, the dry upright reeds provide places for reed insects to overwinter.

### **Fish**

Diverse reed habitats in coastal bays are important spawning and nursery grounds for spring spawners such as the pike, perch and the cyprinid fish. The fry of several species find shelter and nutrition among the aquatic vegetation. Larger predatory fish, such as the pike, like to hunt on the edges of reed stands. However, overly thick, homogenous reedbeds are not beneficial for fish, as they provide fewer places to feed and shelter than mosaic-like reed environments.

### **Strictly protected species (Annex IV of the EU Habitats Directive)**

The species specified in Annex IV of the EU Habitats Directive are strictly protected and the conditions of their habitats may not be altered in a way that hinders their reproduction and feeding. In addition, routes between habitats must not be cut off. The species in Annex IV of the EU Habitats Directive include, that thrive in reeds include for instance the moor frog and certain dragonflies. It is forbidden to destroy and compromise their breeding and resting places. The mammals that benefit from reed environments include e. g. bats and otters.

**Moor frogs** thrive in wet environments such as seashore meadows. In the spring, moor frogs spawn in the coastal waters of lakes, ponds and brackish bays where they also hibernate over winter. Coastal mowing with heavy equipment in spawning areas in the summer can pose a danger to young frogs and on seashore meadows also to adult frogs.

**Dragonflies** thrive in varied reed environments, which include both vegetation with aerial shoots and aquatic plants with floating leaves growing in pools of open water. Seven of the dragonfly species listed in Annex IV of the Habitats Directive can be found in Finland.

The aquatic invertebrates that inhabit reed environments include diver beetles, which live among aquatic vegetation and may benefit from mowing that increases the margins of reedbeds. That said, relatively little research data about this is available.

### **Traditional landscapes and coastal biotopes**

In traditional agriculture, meadows on the shores of sheltered bays were used as a source of livestock feed. Mowing and grazing kept the vegetation low and diverse, and the landscape open.

Due to changes in livestock farming there are only about 6,000 hectares of seashore meadows remaining, a tenth of the earlier area.

As a result of the decline in regular mowing of seashore meadows and grazing, and the eutrophication of coastal waters, traditional landscapes and seashore meadows that were once open have in many places become overgrown, as shrubs and the common reed have taken over space on meadows. At the same time, the typically zonal vegetation of meadows, the insects that are dependent on it and birds that thrive on open meadows have lost their habitats and many species have become endangered. A substantial share of the endangered species in our country (Finland) are in fact species that live in low seashore meadows, pastures and traditional landscapes. Open seashore meadows are among the most endangered habitats in Finland.

Open traditional landscapes on seashore meadows can be preserved and restored by mowing reeds growing on land and preventing the spread of the common reed onto open meadows. At the same time, this safeguards the preservation of endangered habitats and the endangered plant and animal species that live in them. When the mowed reeds are collected and taken away from the site, nutrients are removed from the meadow and the vegetation there has better possibilities to recover.

### **Sustainable utilisation of coastal reedbeds**

Mowing in connection with the restoration of seashore habitats and management of coastal areas overgrown with reeds creates large amounts of renewable raw material that is suitable for many uses and which should be recovered/collected. Mowed reeds have many applications ranging from biogas production and soil improvers to use as a peat substitute in growing media. As the requirements set for the raw materials depend on their intended use, in order to enable cost-effective utilisation it is recommended to take the use of the reed mass and its downstream users into account in the planning phase of mowing carried out to restore coastal habitats. Similarly, when planning mowing that is primarily intended to collect reed for utilisation, the species living in the reedbeds and the diversity of the reed and coastal habitats must be taken into account.

### **Nutrients**

The living biomass of the common reed is rich in nutrients (nitrogen and phosphorus) and organic carbon. Mowing reeds, particularly those growing in water, can recycle these nutrients out of the aquatic ecosystem. Studies show that mowing in the late summer, when the amount of nutrients in the biomass is at its highest, can remove an average of 5-10 kg of phosphorus and 50-100 kg of nitrogen per one hectare of thick reedstand. Mowing of thick reedbeds often also improves waterflow in shallow bays and reduces the accumulation of organic material that accelerates shallowing and overgrowth in bays.

In order to remove nutrients, it is essential to collect the mowed reed biomass and carry it away from the water and waterfront so that the nutrients in the reeds are not released back into the water when the reed mass decomposes. Mowed reeds piled up in the water or shore also releases methane as they decompose. In addition, if reeds are mowed in the early summer, reeds cut below the waterline can “pump” nutrients stored in the roots into the water. To avoid this, mowing should be scheduled for late summer (or, alternatively, the reeds should be cut above the waterline). In

shallow water areas, heavy mowing machines not only disturb the bottom but can also cause turbidity and release nutrients from bottom sediment into the water.

### **Planning and implementation of mowing**

In the best cases, mowing of coastal reeds in eutrophic sea bays can improve biodiversity, remove nutrients from the water and enable the utilisation of reed as raw material for growing media as a replacement for peat, for instance. The most economically viable option for removing nutrients and utilising reed mass would be to mow extensive and thick reedbeds. Mowing carried out to maintain the diversity of species living in reed stands and seashore meadows could seek to open up overgrown shores, but also to sustain a mosaic-like reed environment that is diverse enough for species that require different kinds of habitats.

The Centre for Economic Development, Transport and the Environment must always be notified about mechanical mowing in advance. The authority will assess the need for a permit on a case-by-case basis. Extensive, poorly planned mowing can be detrimental to water quality, species that live in reeds or the recreational use of shores. When planning mowing, one should take into account not only the practical technical feasibility of mowing, but also the diversity of the reed environment and the presence of birds and other protected species in the area. Mowing of protected areas must be planned in cooperation with the authorities. A permit is always required to mow small (less than 10 hectares) natural flads and gloe lakes (it is forbidden to endanger their natural state without permission from the Regional State Administrative Agency).

### **Demarcating of mowing sites**

#### **1) Habitats of strictly protected species**

Before carrying out measures in coastal areas (such as mowing reedbeds or dredging), the Centre for Economic Development, Transport and the Environment must be contacted to verify whether there are habitats of strictly protected species at the site or in its vicinity (species in Annex IV of the EU Habitats Directive) that might restrict the implementation of the measures.

#### **2) Bird nesting areas**

The most important nesting areas of birds that nest in reeds must be excluded from mowing locations as necessary. That said, excessive spread of reed in valuable bird sites can be prevented and the diversity of the reed environment maintained with well-planned, infrequent mowing at intervals of about five to eight years. Maintaining a diverse structure in reed stands benefits many bird species (in addition to reed stands, also open water areas and open seashore meadows).

#### **3) Estuaries and ditch mouths**

Permanently inhibiting reed growth in estuaries with frequently recurring mowing should be avoided, as the reeds trap solids and nutrients carried by rivers. It is recommended that mowing in estuaries should be carried out prudently and infrequently on a rotation basis at intervals of about three to five years.

#### **4) Narrow coastal reed stands**

Mowing of long and narrow reed zones along shores is most often not profitable from the perspective of the economic utilisation of reed material. However, mowing of narrow reed stands can open up coastal landscapes and improve opportunities for the recreational use of the shores.

#### **5) Reed cutting, transportation and storage**

Suitable mowing equipment should be selected for each site to avoid the release of nutrients from (coastal) bottom sediment, for instance. Cut reeds must be transported away from the water and shore. Accordingly, during the mowing planning phase, the location of the mowing site, the availability of a suitable temporary storage location nearby and adequate transportation connections for the removal of the cut reed biomass should be taken into account in advance.

### **Timing of mowing**

#### **1) Bird nesting season**

Mowing should not be scheduled to take place during bird nesting season. Instead, it should be done outside the nesting season, preferably after July, especially in locations that are valuable for birds (to be verified from the Centre for Economic Development, Transport and the Environment).

#### **2) Protection of the moor frog**

In moor frog habitats, mechanical mowing of reeds in the water or on the shore should be carried out in the winter (on ice) from November to March (species listed in Annex IV of the EU Habitats Directive).

#### **3) Nutrient removal**

The most effective means of removing the maximum amount of nutrients is to mow reeds growing in water in late summer, from mid-July to mid-August, as the largest amounts of nutrients are bound to the living reed biomass at that time. In the winter most of the reed nutrients are stored in the rhizome. Mowing at the beginning of the growing season might cause stored nutrients to be “pumped” from the roots into the water.

#### **4) Reed growth inhibition**

Repeated mowing in early summer inhibits reed growth more effectively than mowing in late summer. To maintain reed diversity, mowing could be planned to take place in different areas of the reedbed in alternate years, thereby reducing the amount of plant mass and slowing down overgrowth, but without entirely inhibiting reed growth (e.g. bird sites).

#### **5) Intended use of the mowed reed**

The intended use of the cut reed could influence the planning of mowing. Fresh reed material mowed in the summer is suitable for use as soil improver or as a growing medium, for instance. It would thus be best to collect and shred it during mowing. Tall reeds mowed in the winter are in demand as a building material or as a shredded raw material for bedding material, for instance, but weather conditions and a lack of equipment might limit winter mowing.

## Sources

- T. Ajospenpää: Suunnittelulla ja ruo'on hyötykäytöllä tehokkuutta rantojen hoitoon. Tuloksia ja kokemuksia VELHO-hankkeesta. (Planning and utilisation of reeds enhances efficiency in coast maintenance. Results and experiences from the VELHO project.) Centre for Economic Development, Transport and the Environment, reports 55/2014. Centre for Economic Development, Transport and the Environment for Southwest Finland, 2014.
- I. Ikonen and E. Hagelberg (eds.): Ruovikot ja merenrantaniityt. Luontoarvot ja hoitokokemuksia Etelä-Suomesta ja Virosta. (Reed growths and coastal meadows. Natural values and management experiences from Southern Finland and Estonia.) *SUOMEN YMPÄRISTÖ 37/2007*, Southwest Finland Regional Environment Centre, 2007.
- I. Ikonen and E. Hagelberg: Etelä-Suomen ruovikkostrategia. (Reed growth strategy for Southern Finland.) *Suomen ympäristö 9/2008*, Southwest Finland Regional Environment Centre, 2008.
- I. Joensuu: Järviruoko rantojen riesasta hyötykasviksi. (The common reed: from a coastal nuisance to a useful plant.) Finnish Environment Institute, 2013.
- H. Klemola, K. Härjämäki and K. Pihlaja: Opas ranta-alueiden monikäyttösuunnitteluun. (Guide to multipurpose planning of coastal areas.) Rural Network of Finland, 2013.
- E. Laukkonen, L. Vesikko, T. Hjerpe, L. Ahopelto, M. Marttunen, K. Kostamo, H. Pitkänen, S. Kuikka and K. Vesikko: Ruovikoituminen ja vedenlaatu Suomenlahdella: kyselytutkimuksen tulokset. (Reed growth and water quality in the Gulf of Finland: survey results.) *Suomen ympäristö 25/2012*. Finnish Environment Institute, 2012.
- T. Myllyviita, T. Mattila, P. Leskinen: Järviruo'on niittäminen ja hyötykäyttö. (Mowing and utilisation of the common reed.) *Suomen ympäristökeskuksen raportteja 27/2015*. Finnish Environment Institute, 2015.
- P. Paavilainen: Järviruo'on hyötykäyttö kosteikoissa haja-asutuksen jätevesien ja maatalouden valumavesien puhdistuksessa. (The use of common reed in wetlands for treatment of rural area wastewater and drainage.) Dissertation. Turku University of Applied Sciences, 2005.
- T. Pitkänen: Missä ruokoa kasvaa? – Järviruokoalueiden satelliittikartoitus Etelä-Suomen ja Viron Väinämeren rannikolla. (Where do reeds grow? Satellite mapping of common reed growth areas on the coasts of Southern Finland and the Väinameri Sea of Estonia.) Turku University of Applied Sciences, 2006.
- M. Priha (Ed.): Perinnebiotooppien hoitokortti 8 - Merenrantaniityt. (Heritage biotope management card 8 – Coastal meadows.) Finnish Food Safety Authority, 2003.  
<https://www.ruokavirasto.fi/globalassets/tietoa-meista/asiointi/opaat-ja-lomakkeet/viljelijat/tuet-ja-rahoitus/opaat-ja-esitteet/merenrantaniityt.pdf>
- K. Saramäki, J. Spoof, T. Tossavainen and I. Joensuu: Niitto- ja ruoppausopas. (Mowing and dredging guide.) Karelia University of Applied Sciences (B:27), 2014.
- M. Yli-Renko and E. Hagelberg: Ruovikoiden ravinteet peltoon – maaperän rakenne puhtaasti kuntoon. (Nutrients from reeds to fields – clean reconditioning of soil structure.) Final report of the Reedfield Project, 2018

Järki environmental advice project: [https://www.bsag.fi/wp-content/uploads/2019/07/jarki\\_isku\\_19\\_j%C3%A4rviruoko.pdf](https://www.bsag.fi/wp-content/uploads/2019/07/jarki_isku_19_j%C3%A4rviruoko.pdf)

Reedfield Project: <https://www.ymparisto.fi/ruokopelto>  
<https://www.ymparisto.fi/ruoko>

**For more information, please contact**

[www.rantaparturit.com](http://www.rantaparturit.com)

[www.suomenbiohiili.info](http://www.suomenbiohiili.info)

[www.biochar-hy.blogspot.fi](http://www.biochar-hy.blogspot.fi)