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Project partners:

DIVERSITY, DISTRIBUTION OF VEGETATION AND THEIR SUITABILITY FOR THE AQUATIC WARBLER TO BREED IN THE WETLAND OF TYRAI

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Content

1. CHARACTERISATION OF VEGETATION

1.1. Compendium of Plant Communities

The vegetation of Tyrai Wetland belongs to 4 vegetation classes and consists of communities from 10 associations and 4 rankless units (table 1). The grassland vegetation predominates. Single trees and shrubs are observed in all territory except the northern part where they grow more abundantly.

Table 1

Cl. *Phragmito-Magnocaricetea* Klika in Klika et Novák 1941	*Phragmitetum australis* Schmale 1939
	Glycerietum maximae Hueck 1931
	Caricetum elatae W. Koch 1926
	Caricetum distichae (Steffen 1931) Jonas 1933
	Galio palustris-Caricetum ripariae Balátová-Tuláčková et al. 1993
	Phalaridetum arundinaceae (W. Koch 1926) Libbert 1931
Cl. *Molinio-Arrhenatheretea elatioris* R. Tx. 1937	*Molinietum caeruleae* W. Koch 1926
Cl. *Artemisietea vulgaris* Lohm., Prsg et R. Tx. in R. Tx. 1950	*Saponario officinalis-Petasitetum spurii* Passarge ex Walther 1977
Rankless units	Ecotonal plant communities composed by xerophytes
	Overgrowths of *Salix* sp. and tree groups of *Alnus glutinosa*
	Mosaic of plant communities composed by hygrophytes and halophytes
	Cultivated meadow with *Alopecurus pratensis*, which is under process of naturalization.

1.2. GENERAL CHARACTERISATION OF VEGETATION

1.2.1. Grassland

The widespread grassland plant communities are distributed in 99.61 % of all studied territory. It has been influenced by the hydrological conditions – periodical flooding and long-lasting high water level during vegetation period. For these certain conditions communities composed by forbs of helophytes from the *Phragmito-Magnocaricetea* class attain dominance in Tyrai wetland. These plant communities are distributed in the area of 498.36 ha and it makes up 92.27 % of all territory. Among of them, the largest plots (337.49 ha or 62.50 % of territory total) are covered by the communities of the *Phragmition* alliance.

Tall sedge communities (All. *Magnocaricion elatae*) are distributed in the considerably smaller area – 160.87 ha or 29.79 % of all territory.

Fertile meadow plant communities (Cl. *Molinio-Arrhenatheretea*) are distinguished in the area of 21.84 ha (4.04 %). Phytocenosis from the *Artemisietea vulgaris* class encompass the smallest area of the territory (0.3 ha). Rankless plant communities have been observed in the area of 17.17 ha (3.18 %).

Among of all plant communities the *Phragmitetum australis* is of the most widespread occurrence in this territory and the area of 329.07 ha is occupied by it.

These plant communities have a tendency to expand in extent: reed beds (fig. 4, contour 10) expansion is observed in a south direction and sedge communities are replaced by them in some plots. Smaller areas (87.98 ha) are occupied by the *Caricetum distichae*. Also, *Caricetum distichae* communities are found with tangles of the communities comprised by forbs of helophytes in the territory (47.98 ha).

1.2.2. Woody Plants

Due to unfavourable hydrological conditions, large areas are not occupied by woody plants – it makes up just 2.12 ha (0.39 % of territory total). Generally, there are small patches of pussy-willow or tree groups (*Salix cinerea, C. aurita, S. pentandra, S. caprea, S. fragilis*) and seldom – inconsiderable clump of Black alder (*Alnus glutinosa*). Under the influence of unfavourable hydrological conditions, woody plants have found their niche where drainage is more intensive or in more elevated sites of this territory. Single scrubs are observed in northern part of the territory (contour 42 and eastern part of contours 43 and 44).

1.2.3. Protected plant species

In Tyrai wetland 4 protected species listed in the Red Data Book of Lithuania have been observed. Their habitats concentration has been distinguished in northern, eastern and southern marginal parts of the territory.

Sea arrow-grass (*Triglochin maritimum*) – 2 (V) category

Small population of Sea Arrowgrass has been observed in contour 4 in the monodominant *Agrostis stolonifera* habitat of 100 m2, which intermixes into the *Caricetum distichae* plot. *Triglochin maritimum* plants are fertile and viable.

Sand leek (*Allium scorodoprasum*) – 3 (R) category

The Sand leek is distributed on embankment and in more elevated conformation sites near embankment in western periphery of northern part of the territory. The population is enriched by several hundreds of different age plant groups.

Meadow gladiolus (*Gladiolus imbricatus*) – 2 (V) category

Meadow gladiolus has been found in both the Purple moor grass communities (*Molinietum caeruleae*) and cultivated meadows. Single gladiolus plants have found their niche in southern part of the territory (contour 6), whereas in northern part (contour 42, 43) they grew abundantly (several hundreds) and most of them were fertile.

Blue moor grass (*Sesleria caerulea*) – 2 (V) category

Blue moor grasses flourish in the communities comprised by Purple moor grass (*Molinietum caeruleae*) (contour 43). There Blue moor grasses encompass just some part of the contour but in some sites it thrives abundantly. Population of Blue moor grass is viable and a lot of plants are fertile.

2. COVERAGE OF PLANT COMMUNITIES

The territory underwent a tenuous effect of anthropogenization, therefor plant communities are not fragmented and there are just 50 contours. The size of contours varies in extent (fig. 1–4) – from 0.20 ha to 110.98 ha. Prominently large plots of reed beds are distinguished in most part of the territory (contours 10, 26 and 31). Reed beds have a tendency to expand in extent. There are Two-ranked sedge (*Carex disticha*) plants observed in a marginal part of contour 10, therefor we can imply that previously there were communities of Two-ranked sedge and reed beds communities of high competitive ability have replaced them. These sedge communities were replaced by reed beds in contour 26 too.

Table 2. Coverage of Vegetation Contours

Contour No.	Plant communities	Area, ha
1	2	3
1	*Glycerietum maximae* and *Caricetum gracilis* mosaic	2.06
2	*Phragmitetum australis*	3.02
3	*Glycerietum maximae* and *Caricetum gracilis* mosaic	2.81
4	*Caricetum distichae* and other halophyte communities	43.5
5	*Glycerietum maximae* and *Caricetum gracilis* mosaic	3.27
6	*Molinietum caeruleae*	8.81
7	Hygrophyte and halophyte communities	10.14
8	*Phragmitetum australis*	4.18
9	*Caricetum distichae*	39.55
10	*Phragmitetum australis* mosaic	110.98
11	Eutropic hygrophyte community	1.20
12	*Caricetum distichae* and *Glycerietum maximae* mosaic	4.48
13	Halophyte communities	0.28
14	Overgrown Tall sedge communities by scrubs	0.72
15	*Caricetum distichae*	5.53
16	Overgrown Tall sedge communities by scrubs	1.25
17	Scrubs	0.22
18	Hygrophyte and halophyte communities	3.20
19	Scrubs	0.21
20	Hygrophyte and halophyte communities	1.41
21	*Caricetum distichae*	3.13
22	*Phragmitetum australis*	19.85
23	*Caricetum distichae*	3.05
24	*Phragmitetum australis*	0.24
25	Hygrophyte and halophyte communities	1.35
26	Replaced Two-ranked sedge communities by *Phragmitetum australis*	80.80

Table 2 (continuous)

1	*2*	3
27	*Phragmitetum australis*	1.95
28	Scrubs	0.78
29	Hygrophyte and halophyte communities	4.06
30	*Phalaridetum arundinaceae*	2.88
31	*Phragmitetum australis*	102.47
32	*Phragmitetum australis*	0.51
33	*Phragmitetum australis*	0.36
34	*Phalaridetum arundinaceae*	3.54
35	*Phragmitetum australis*	0.31
36	*Phragmitetum australis*	0.61
37	*Caricetum distichae*	9.22
38	*Phragmitetum australis*	1.09
39	*Phalaridetum arundinaceae*	4.12
40	*Phragmitetum australis*	1.24
41	Overgrowth of trees and scrubs	0.91
42	Cultivated meadow	0.20
43	*Molinietum caeruleae*	13.03
44	*Caricetum distichae*	27.49
45	*Phragmitetum australis*	1.46
46	*Caricetum ripariae* and other halophyte communities	2.39
47	Ecotonal xerophyte communities	0.71
48	*Saponario officinalis-Petasitetum spuriae*	0.30
49	Ecotonal xerophyte communities	2.80
50	*Caricetum elatae*	2.43
	Total :	**540.1**

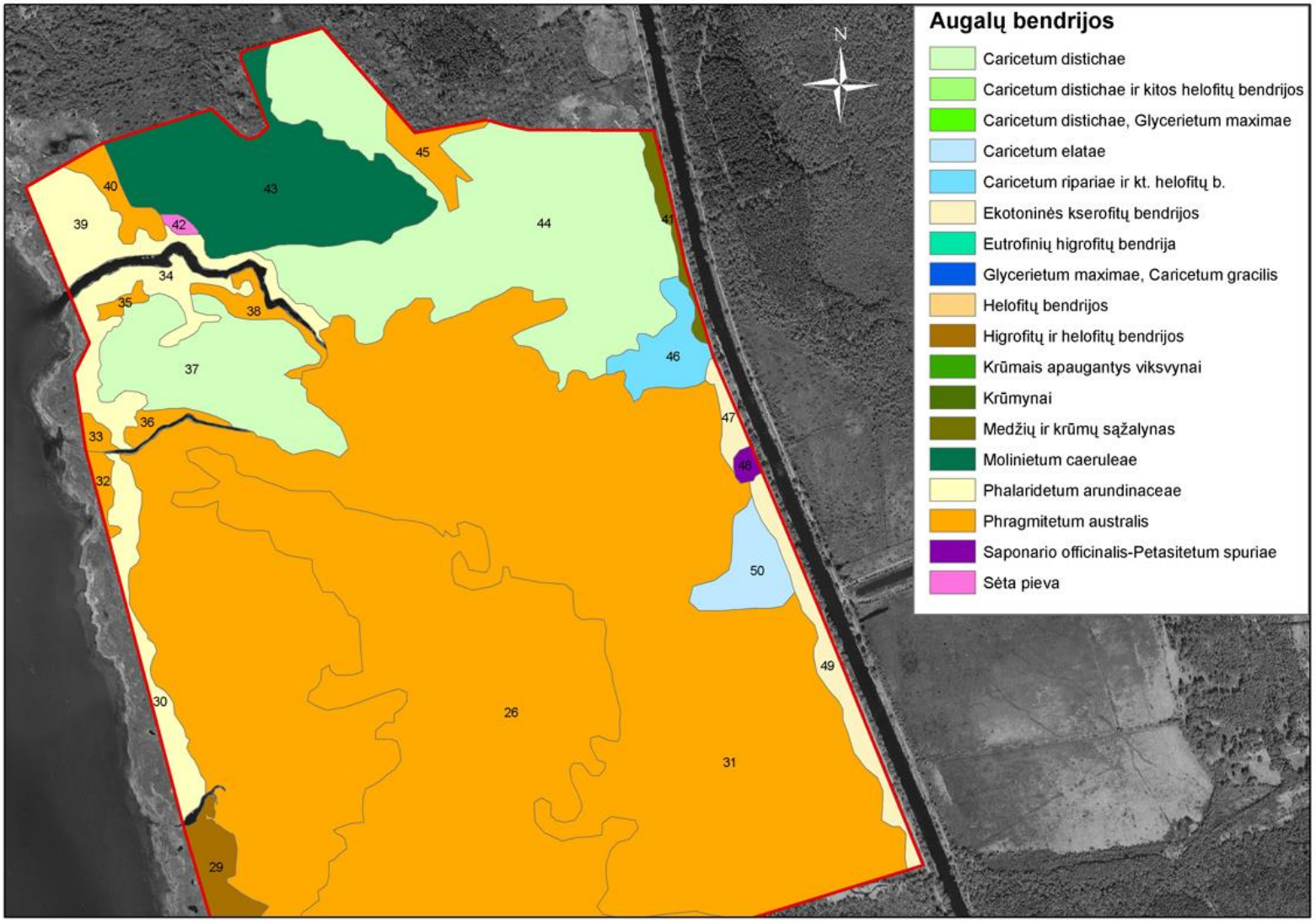

Fig. 1. Vegetation in northern part of Tyrai wetland.

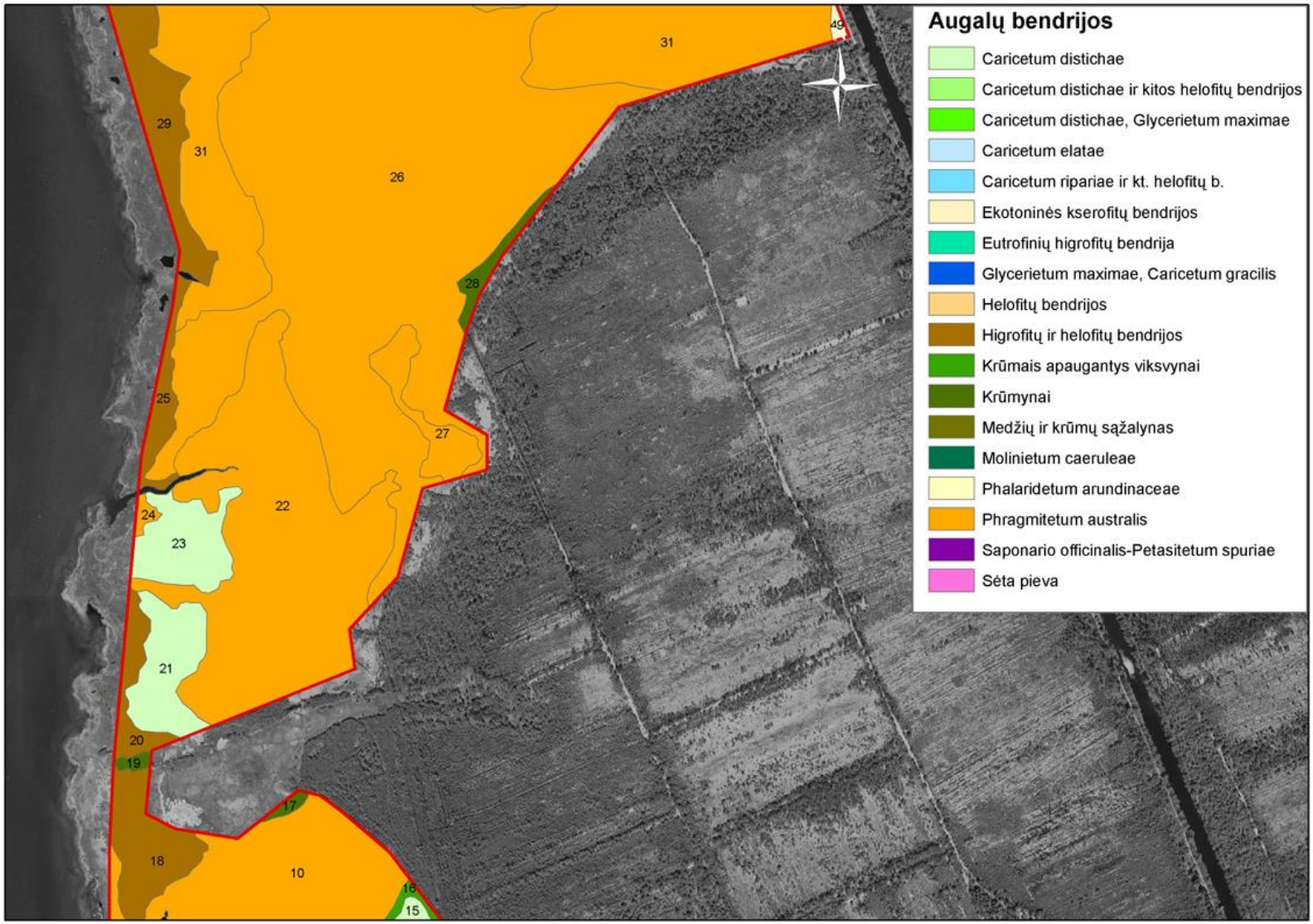

Fig. 2. Vegetation in central part of Tyrai wetland (to north forest side)

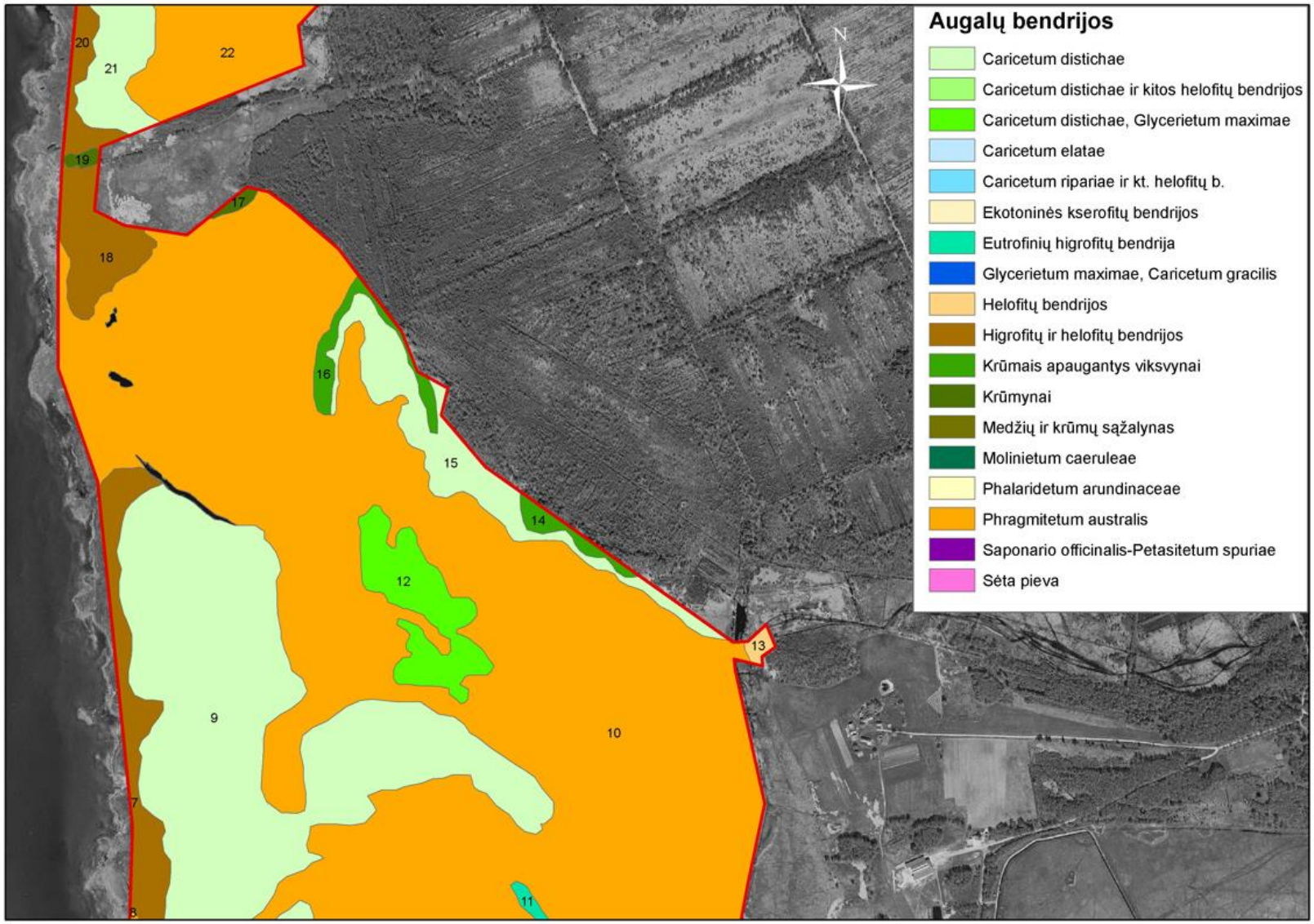

Fig. 3. Vegetation in central part of Tyrai wetland (to south forest side)

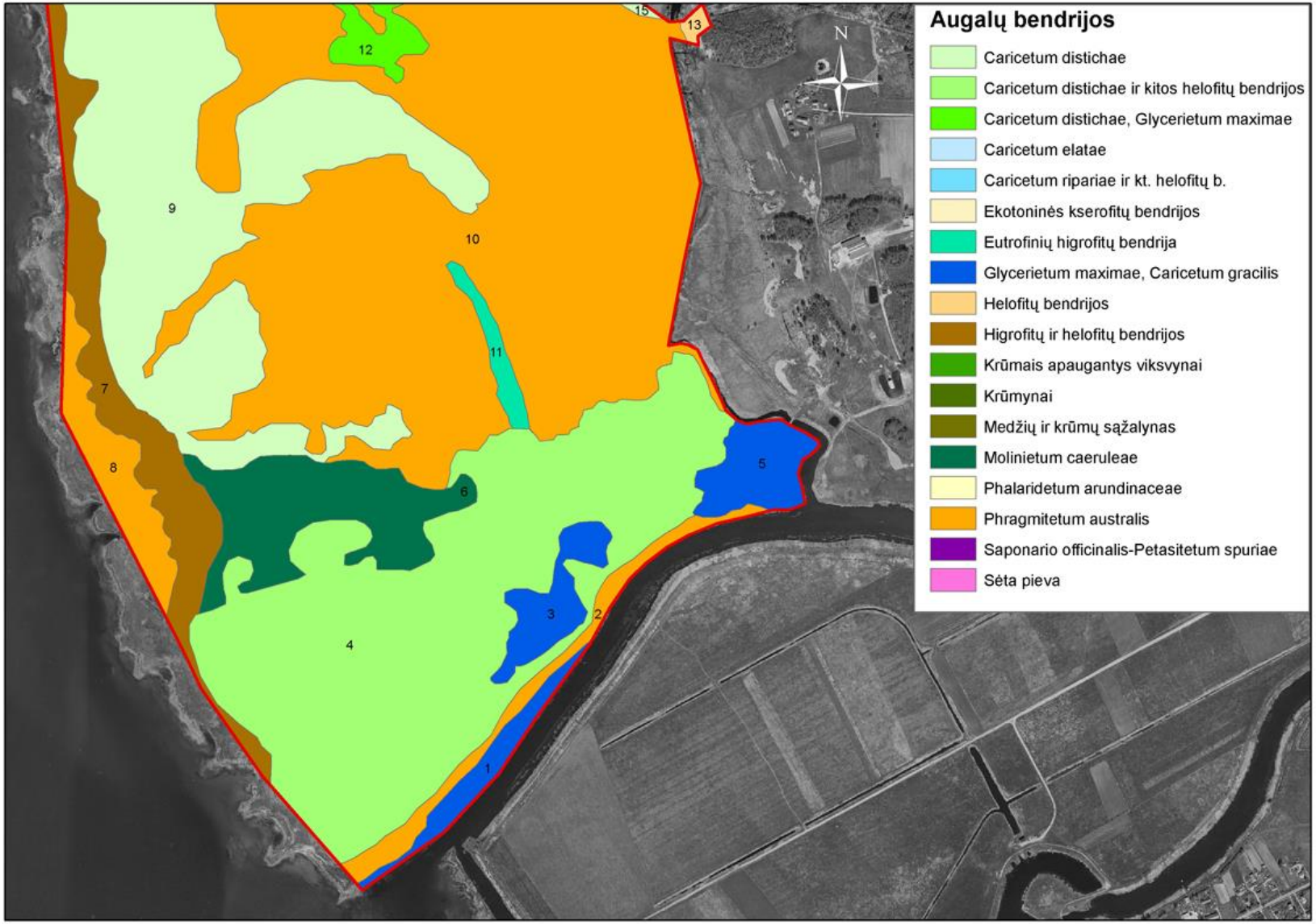

Fig. 4. Vegetation in southern part of Tyrai wetland.

3. BRIEF CHARACTERIZATIONS OF PLANT COMMUNITIES

Caricetum distichae

1. Physiognomy. Monodominant overgrowths of *Carex disticha*.
2. Coverage of shrubs. No scrubs.
3. Tussocks. Tussocks are observed just in northern part of the territory (northern part of contour 44)
4. Stability. Under the influence of constant hydrological and farming conditions, communities are stable, however, due to absence of mowing, the stands of the community are invaded by reeds.
5. Variations of species composition. Common reed (*Phragmites australis*) domination starts in unmown communities.
6. Successions, reasons and tendency. These communities vegetation without being mown have a tendency to be overgrown by reeds, under the influence of biomass accumulation, which increases habitat's trophicity.
7. Farming and intensity. Absence of mowing.
8. The key factors in the development of community. Fluctuations of hydrological regime and application of mowing treatment.

Caricetum elatae

1. Physiognomy. Conspicuously great tussocks formed by *Carex elata* where amongst them in stagnant water both hydrophytes and halophytes found their niche.
2. Coverage of shrubs. No scrubs.
3. Tussocks. Tussocks are observed.
4. Stability. Due to accumulation of biomass among tussocks, the ideal conditions are prepared for reeds to grow. Areas are sinking, therefor favourable conditions to thrive are found by hygrophytes.
5. Variations of species composition. Great variations are not established due to one plot is found. In shallow plots reed beds attain ascendancy.
6. Successions, reasons and tendency. Due to tussocks, the areas are not cultivated. Absence of farming creates ideal conditions for accumulation of biomass and changing of plant communities.

7. Farming and intensity. No farming activities.

8. The key factors in the development of community. Hydrological conditions.

Caricetum gracilis

1. Physiognomy. The overgrowth of *Carex acuta* monodominats.

2. Coverage of shrubs. No shrub layer.

3. Tussocks. No tussocks.

4. Stability. Like *Caricetum distichae*, under the influence of constant hydrological and farming conditions, communities are stable This is determined by the competitive ability of *Carex acuta* and its ability to form a dense overgrowth, where, under the influence of constant environmental conditions, plants of other separate species hardly penetrate through and grow singly. *Caricetum gracilis* phytocenosis, without having been mowed, remains stable for many years if it is not overgrown by reeds.

5. Variations of species composition. Variations are not established.

6. Successions, reasons and tendency. In Tyrai wetland these plant communities are rare and formed on lower and wetter areas than *Caricetum distichae* or *Phalaridetum arundinaceae*.

7. Farming and intensity. Absence of mowing.

8. The key factors in the development of community. Fluctuation of hydrological regime and mowing.

Galio palustris-Caricetum ripariae

1. Physiognomy. The overgrowths of monodominat *Carex riparia*

2. Coverage of shrubs. No shrub layer.

3. Tussocks. No tussocks are observed.

4. Stability. These communities are stable under the influence of constant hydrological and farming conditions.

5. Variations of species composition. Variations are not established because of communities are rare and occupy small areas.

6. Successions, reasons and tendency. These communities are distributed in the wettest areas where flooding is prolonged and other plants hardly can thrive under these extreme conditions and also it is very hard to outrival strife with dense and tall plants of *Carex riparia.* For this reasons these communities are fairly stable.

7. Farming and intensity. No farming.

8. The key factors in the development of community. Not established.

Glycerietum maximae

1. Physiognomy. The overgrowth of *Glyceria maxima* monodominat.
2. Coverage of shrubs. No shrub layer.
3. Tussocks. No tussocks.
4. Stability. Under the constant hydrological conditions, communities are quite stable.
5. Variations of species composition. In contour 3 *Carex disticha* and *Schoenoplectus tabernaemontani* flourish abundantly.
6. Successions, reasons and tendency. Absence of knowledge.
7. Farming and intensity. No farming.
8. The key factors in the development of community. Hydrological and trophic conditions.

Molinietum caeruleae

1. Physiognomy. Tussocks are formed by *Molinia carulea* with tangles of *Filipendula ulmaria* and *Bistorta major*.
2. Coverage of shrubs. Single trees are observed in contour 43.
3. Tussocks. Tussocks are observed.
4. Stability. There is a threat to be overgrown by scrubs and forbs of hygrophytes.
5. Variations of species composition. In community in contour 6 *Bistorta major* plants flourish abundantly, whereas in contour 43 *Sesleria caerulea* and *Gladiolus imbricatus* have been located. It is determined by soil carbonation in foregone contour.
6. Successions, reasons and tendency. Formation of shrub layer is observed, due to absence of farming and constant hydrological conditions.
7. Farming and intensity. Absence of grazing and mowing.
8. The key factors in the development of community. Hydrological and trophic conditions and absence of farming.

Phalaridetum arundinaceae

1. Physiognomy. Overgrowth of monodominat *Phalaroides arundinacea.*
2. Coverage of shrubs. In lower conformation sites these communities are not covered by scrubs but where water is shallower single scrubs occur.
3. Tussocks. No tussocks are observed.

4. Stability. The communities are stable under the influence of constant hydrological and farming conditions.

5. Variations of species composition. The composition of species is homogenous. *Phalaroides arundinacea* is a species of high competitive ability, which forms a dense and high herbal layer and its strong rootstocks are intertwined in the soil table, therefore separate species cannot thrive there and as a result, overgrowth of Reed canary grass can expand easily in the area by rivalling tracery communities of *Caricetum distichae.*

6. Successions, reasons and tendency. These communities are formed on slightly more elevated areas than reed beds. Under the influence of constant ecological conditions, Reed canary grass tends to expand in the area.

7. Farming and intensity. No farming activities.

8. The key factors in the development of community. Seasonal inundation of water, stability of ecological conditions and party – mowing.

Phragmitetum australis

1. Physiognomy. The overgrowth of monodominat *Pragmites australis*.

2. Coverage of shrubs. No shrub layer.

3. Tussocks. Tussocks are absent usually. They occur just in areas which are in contiguous with contour 50.

4. Stability. Under the constant conditions communities are stable and expand in area very quickly.

5. Variations of species composition. No variations.

6. Successions, reasons and tendency. In various areas communities are confined to the wettest and waterlogged habitats and have come to replace sedge and Reed canary grass communities (*Caricetum elatae, Caricetum distichae, Phalaridetum arundinaceae*) due to absence of farming. A constant mowing would give an opportunity for communities of sedge or Reed canary grass to regenerate.

7. Farming and intensity. No farming activities.

8. The key factors in the development of community. Cessation of mowing and partly – flooding of habitats.

Saponario officinalis-Petasitetum spurii

1. Physiognomy. Prominent large leaves of *Petasites spurius.*

2. Coverage of shrubs. No shrub layer.

3. Tussocks. No tussocks are observed.

4. Stability. These plant communities are rather stable.

5. Variations of species composition. These phytocenosis are infrequent, therefore variations of species composition are not established.

6. Successions, reasons and tendency. Absence of knowledge.

7. Farming and intensity. No farming activities.

8. The key factors in the development of community. Hydrological and trophic conditions.

Ecotonal plant communities composed by xerophytes

1. Physiognomy. These communities are formed by grasses such as *Festuca rubra* and *Calamagrostis epigeios*.

2. Coverage of shrubs. In some plots shrubs are observed.

3. Tussocks. No tussocks.

4. Stability. Rather stable.

5. Variations of species composition. These plant communities are very polymorphic.

6. Successions, reasons and tendency. Absence of knowledge.

7. Farming and intensity. No farming activities.

8. The key factors in the development of community. Hydrological and trophic conditions.

Mosaic of plant communities composed by hygrophytes and halophytes

1. Physiognomy. Plants such as *Elytrigia repens* and *Petasites spurius* attain preponderance.

2. Coverage of shrubs. No shrub layer.

3. Tussocks. No tussocks.

4. Stability. Conditionally stable.

5. Variations of species composition. In lower sites where more mud is accumulated nitrophilous species found their niche.

6. Successions, reasons and tendency. Absence of knowledge.

7. Farming and intensity. No farming activities.

8. The key factors in the development of community. Hydrological and trophic conditions and absence of farming.

Cultivated meadow with *Alopecurus pratensis*, which is under process of naturalization

1. Physiognomy. *Alopecurus pratensis* prevails.

2. Coverage of shrubs. Single shrubs.

3. Tussocks. No tussocks.

4. Stability. These communities are unstable. Under the influence of absence of mowing accumulation of biomass started and soil changed to more trophic, therefor nitrophylous and ruderal plant species have found their niche there

5. Variations of species composition. These phytocenosis are infrequent, therefore variations of species composition are not established.

6. Successions, reasons and tendency. Nitrophylous species are about to dominate there because of absence of farming.

7. Farming and intensity. No farming activities.

8. The key factors in the development of community. Trophic conditions and absence of farming.

4. SUITABLE PLANT COMMUNITIES FOR THE AQUATIC WARBLER

The Aquatic Warbler singing males are observed in the *Caricetum distichae* communities: contour 4 – 1 male, contour 44 – 4 males.

In Tyrai wetland the *Caricetum distichae* communities are distinguished in 8 contours, which make up 25.17 % of the territory total. In two contours (4 and 12) there are small tangles of plant community composed by Tall sedge as well as community comprised by Reed canary grass.

Table 3. The distribution and coverage of the *Caricetum distichae* in Tyrai wetland.

No. on map	Habitat	Area, ha
9	*Caricetum distichae*	39.55
15	*Caricetum distichae*	5.53
21	*Caricetum distichae*	3.13
23	*Caricetum distichae*	3.05
37	*Caricetum distichae*	9.22
44	*Caricetum distichae*	27.49
4	*Caricetum distichae* and other communities comprised by halophytes	43.5
12	*Caricetum distichae* with tangles of the *Glycerietum maximae*	4.48
	Total:	135.95

5. RECOMMENDATIONS ON MANAGEMENT OF THE TERRITORY FORMING SUITABLE PLANT COMMUNITIES FOR THE AQUATIC WARBLER

The vegetation in Tyrai wetland has formed formed under the influence of both environmental and anthropogenic factors.

The key environmental factors which have fated the distribution of vegetation are hydrological and trophic conditions. Hydrological conditions are of anthropogenic origin: in western and northern parts there are shallow canals and pits. However, these hydrological conditions are alike to natural.

Other man-induced factor of great importance is mowing. The mowing of sedge or meadow vegetation is very important factor in order to maintain plant communities from overgrowing by scrubs or reeds. In addition to, mowing is the key factor in maintenance of meadow plant communities' stability. We recommend applying mowing on reeds (contour 4) and scrubs (north-eastern part of contour 44) in overgrowing communities of the *Caricetum distichae* where Aquatic Warbler males have been observed. If any measurements will not be applied the area of contour 4 is about to decline in extent because of reeds invasion to its northern margin, whereas area of contour 44 will be fragmented by overgrowths of scrub.

The mowing has to be applied on the *Phalaridetum arundinaceae* communities' vegetation as it is a potentially suitable breeding ground for the Aquatic Warbler.

Also we recommend to mow *Phragmitetum australis* communities' vegetation (2 times per year) in order to minimise reeds encroachment into sedge communities. Intensive mowing can help in regeneration of Two-ranked sedge community in areas overgrown by reeds (contour 26). In all cases, hay must be taken away from the territory.

The vegetation of the *Molinio-Arrhenatheretea* class (contour 6 and 43) can be extensively mown or grazed.