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Marijampolė Botanical Center

MONITORING REPORT
(2011–2013–2015)

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

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1. CHARACTERISATION OF VEGETATION

1.1. Compendium of Plant Communities

In 2011–2015, vegetation of Tyrai wetland belonged to 4 vegetation classes and consisted of communities from 10 associations and 4 rankless units (Table 1). The grassland vegetation predominated. Single trees and shrubs observed in all territory except the northern part where they grew 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 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 helophytes from the *Phragmito-Magnocaricetea* class attained dominance in Tyrai wetland. These plant communities distributed in 498.36 ha and it made 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*) distributed in the considerably smaller area – 160.87 ha or 29.79 % of all territory.

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

Among of all plant communities the *Phragmitetum australis* is of the most widespread occurrence in this territory and occupied 329.07 ha. According to data of 2011 years these plant communities had a tendency to expand in extent: reed beds (Fig. 4, contour 10) expansion observed in a south direction and sedge communities replaced by them in some plots. Smaller areas (87.98 ha) occupied by the *Caricetum distichae*. Also, *Caricetum distichae* communities 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

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

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

Small population of sea arrow-grass has been observed in contour 4 in the monodominant *Agrostis stolonifera* habitat of 100 m^2, which intermixes into the *Caricetum distichae*. *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 investigated 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 *Molinietum caeruleae* communities 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 *Molinietum caeruleae* communities (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 not fragmented and there are just 50 contours. The size of contours varies in extent – from 0.20 ha to 110.98 ha. Prominently large plots of reed beds distinguished in most part of the territory (contours 10, 26 and 31).

Table 2. Coverage of vegetation contours in Tyrai wetland, 2011–2015.

Contour No.	Plant communities	2011		2013		2015	
		Area, ha	%	Area, ha	%	Area, ha	%
1	*Glycerietum maximae* and *Caricetum gracilis* mosaic	2.06	0.38	2.06	0.38	2.06	0.38
2	*Phragmitetum australis*	3.02	0.56	3.02	0.56	3.02	0.56
3	*Glycerietum maximae* and *Caricetum gracilis* mosaic	2.81	0.52	2.81	0.52	2.81	0.52
4	*Caricetum distichae* and other halophyte communities	43.5	8.05	43.5	8.05	43.5	8.05
5	*Glycerietum maximae* and *Caricetum gracilis* mosaic	3.27	0.61	3.27	0.61	3.27	0.61
6	*Molinietum caeruleae*	8.81	1.63	8.81	1.63	8.81	1.63
7	Hygrophyte and halophyte communities	10.14	1.88	10.14	1.88	10.14	1.88
8	*Phragmitetum australis*	4.18	0.77	4.18	0.77	4.18	0.77
9	*Caricetum distichae*	39.55	7.32	39.55	7.32	39.55	7.32
10	*Phragmitetum australis* mosaic	110.98	20.55	110.98	20.55	110.98	20.55
11	Eutropic hygrophyte community	1.20	0.22	1.20	0.22	1.20	0.22
12	*Caricetum distichae* and *Glycerietum maximae* mosaic	4.48	0.83	4.48	0.83	4.48	0.83
13	Halophyte communities	0.28	0.05	0.28	0.05	0.28	0.05
14	Overgrown tall sedge communities by scrubs	0.72	0.13	0.72	0.13	0.72	0.13
15	*Caricetum distichae*	5.53	1.02	5.53	1.02	5.53	1.02

16	Overgrown tall sedge communities by scrubs	1.25	0.23	1.25	0.23	1.25	0.23
17	Scrubs	0.22	0.04	0.22	0.04	0.22	0.04
18	Hygrophyte and halophyte communities	3.20	0.59	3.20	0.59	3.20	0.59
19	Scrubs	0.21	0.04	0.21	0.04	0.21	0.04
20	Hygrophyte and halophyte communities	1.41	0.26	1.41	0.26	1.41	0.26
21	*Caricetum distichae*	3.13	0.58	3.13	0.58	3.13	0.58
22	*Phragmitetum australis*	19.85	3.68	19.85	3.68	19.85	3.68
23	*Caricetum distichae*	3.05	0.56	3.05	0.56	3.05	0.56
24	*Phragmitetum australis*	0.24	0.04	0.24	0.04	0.24	0.04
25	Hygrophyte and halophyte communities	1.35	0.25	1.35	0.25	1.35	0.25
26	Replaced Two-ranked sedge communities by *Phragmitetum australis*	80.80	14.96	80.80	14.96	80.80	14.96
27	*Phragmitetum australis*	1.95	0.36	1.95	0.36	1.95	0.36
28	Scrubs	0.78	0.14	0.78	0.14	0.78	0.14
29	Hygrophyte and halophyte communities	4.06	0.75	4.06	0.75	4.06	0.75
30	*Phalaridetum arundinaceae*	2.88	0.53	2.88	0.53	2.88	0.53
31	*Phragmitetum australis*	102.47	18.97	102.47	18.97	102.47	18.97
32	*Phragmitetum australis*	0.51	0.09	0.51	0.09	0.51	0.09
33	*Phragmitetum australis*	0.36	0.07	0.36	0.07	0.36	0.07
34	*Phalaridetum arundinaceae*	3.54	0.66	3.54	0.66	3.54	0.66
35	*Phragmitetum australis*	0.31	0.06	0.31	0.06	0.31	0.06
36	*Phragmitetum australis*	0.61	0.11	0.61	0.11	0.61	0.11
37	*Caricetum distichae*	9.22	1.71	9.22	1.71	9.22	1.71
38	*Phragmitetum australis*	1.09	0.20	1.09	0.20	1.09	0.20
39	*Phalaridetum arundinaceae*	4.12	0.76	4.12	0.76	4.12	0.76
40	*Phragmitetum australis*	1.24	0.23	1.24	0.23	1.24	0.23
41	Overgrowth of trees and scrubs	0.91	0.17	0.91	0.17	0.91	0.17
42	Cultivated meadow	0.20	0.04	0.20	0.04	0.20	0.04
43	*Molinietum caeruleae*	13.03	2.41	13.03	2.41	13.03	2.41
44	*Caricetum distichae*	27.49	5.09	27.49	5.09	27.49	5.09
45	*Phragmitetum australis*	1.46	0.27	1.46	0.27	1.46	0.27
46	*Caricetum ripariae* and other halophyte communities	2.39	0.44	2.39	0.44	2.39	0.44
47	Ecotonal xerophyte communities	0.71	0.13	0.71	0.13	0.71	0.13
48	*Saponario officinalis-Petasitetum spuriae*	0.30	0.06	0.30	0.06	0.30	0.06

49	Ecotonal xerophyte communities	2.80	0.52	2.80	0.52	2.80	0.52
50	*Caricetum elatae*	2.43	0.45	2.43	0.45	2.43	0.45
	Total :	**540.1**	**100.0**	**540.1**	**100.0**	**100.0**	**540.1**

Table 3. Coverage of plant communities in Tyrai wetland, 2011–2015.

No.	Plant community	2011		2013		2015	
		Area, ha	%	Area, ha	%	Area, ha	%
1.	*Glycerietum maximae* ir *Caricetum gracilis* mosaic	8.14	1.51	8.14	1.51	8.14	1.51
2.	*Phragmitetum australis*	137.29	25.42	137.29	25.42	137.29	25.42
3.	*Caricetum distichae* and other halophyte communities	43.5	8.05	43.5	8.05	43.5	8.05
4.	*Molinietum caeruleae*	21.84	4.04	21.84	4.04	21.84	4.04
5.	Hygrophyte and halophyte communities	20.16	3.73	20.16	3.73	20.16	3.73
6.	*Caricetum distichae*	87.97	16.29	87.97	16.29	87.97	16.29
7.	*Phragmitetum australis* mosaic	110.98	20.55	110.98	20.55	110.98	20.55
8.	Eutropic hygrophyte community	1.2	0.22	1.2	0.22	1.2	0.22
9.	*Caricetum distichae* and *Glycerietum maximae* mosaic	4.48	0.83	4.48	0.83	4.48	0.83
10.	Halophyte communities	0.28	0.05	0.28	0.05	0.28	0.05
11.	Overgrown tall sedge communities by scrubs	1.97	0.36	1.97	0.36	1.97	0.36
12.	Scrubs	1.21	0.22	1.21	0.22	1.21	0.22
13.	Replaced Two-ranked sedge communities by *Phragmitetum australis*	80.80	14.96	80.80	14.96	80.80	14.96
14.	*Phalaridetum arundinaceae*	10.54	1.95	10.54	1.95	10.54	1.95
15.	Overgrowth of trees and scrubs	0.91	0.17	0.91	0.17	0.91	0.17
16.	Cultivated meadow	0.20	0.04	0.20	0.04	0.20	0.04
17.	*Caricetum ripariae* and other halophyte communities	2.39	0.44	2.39	0.44	2.39	0.44
18.	Ecotonal xerophyte communities	3,51	0.65	3,51	0.65	3,51	0.65
19.	*Saponario officinalis-Petasitetum spuriae*	0,30	0.06	0,30	0.06	0,30	0.06
20.	*Caricetum elatae*	2.43	0.45	2.43	0.45	2.43	0.45
	Total:	**540.10**	**100.0**	**540.1**	**100.0**	**540.1**	**100.00**

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. Plant communities mowed in 2013–2014. Not all areas mowed in 2015.
8. The key factors in the development of community. Fluctuations of hydrological regime and application of mowing treatment.
9. Vegetation changes (1 Fig.). Since 2011, in Tyrai wetland, areas covered by the *Caricetum distichae* community, have not changed and their species composition altered insignificantly. Just trifling changes of fluctuation determined, e.g., in 2013, previously abundant component *Galeopsis* sp. not found in some plant communities' plots. In 2015, plant communities' composition changes were also tenuous.

Fig. 1A. The *Caricetum distichae* (LT01-7) in Tyrai wetland in 2011

Fig. 1A. The *Caricetum distichae* (LT01-7) in Tyrai wetland in 2013. Physiognomy of the community is unchanged. *Carex disticha* is vital and fertile. No alterations in community are determined.

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 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. Mowing.
8. The key factors in the development of community. Hydrological conditions.
9. Vegetation changes. Just insignificant fluctuation changes in species composition determined (Fig. 2). In 2015, due to drought hydrophytes vanished in plant community.

Fig. 2B. The *Caricetum elatae* (LT01-12) in Tyrai wetland, in 2011

Fig. 2B. The *Caricetum elatae* (LT01-12) in Tyrai wetland in 2013.

Caricetum gracilis

1. Physiognomy. The overgrowth of *Carex acuta* (monodominant).
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 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. Some areas mowed.
8. The key factors in the development of community. Fluctuation of hydrological regime and mowing.
9. Vegetation changes. No essential changes are determined.

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. Mowing.
8. The key factors in the development of community. Not established.
9. Vegetation changes. Plant community remained stable.

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. In 2013–2014, some areas mowed.
8. The key factors in the development of community. Hydrological and trophic conditions.
9. Vegetation changes. Plant communities are stable in unmowed areas and species composition remained unchanged (Fig. 3).

Fig. 3A. The *Glycerietum maximae* (LT01-12) in Tyrai wetland, in 2011

Fig. 3B. The *Glycerietum maximae* (LT01-12) in Tyrai wetland, in 2013.

Molinietum caeruleae

1. Physiognomy. Tussocks are formed by *Molinia carulea* with tangles of *Filipendula ulmaria* and *Bistorta major.*
2. Coverage of shrubs. No shrubs layer.
3. Tussocks. Tussocks 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* located.
6. Successions, reasons and tendency. Plant communities are stable. During monitoring species composition remained unchanged.
7. Farming and intensity. It was mowed in 2013–2014.
8. The key factors in the development of community. Hydrological and trophic conditions and absence of farming.
9. Vegetation changes. Compared collected data of monitoring of 2011 and 2013, shows that species increased (almost double time) in the *Molinietum caerulea* plant communities. However, these species are usual and characteristic to the *Molinia* meadows; therefore, it is most likely, that during such a short time significant increasing is impossible. Probably, for the first monitoring time authors did not describe all the species in the plot. They chose just abundant plant species, or relevés were carried out in smaller plot than methodology requires. In 2015, species composition remained unchanged.

Phalaridetum arundinaceae

1. Physiognomy. Overgrowth of monodominat *Phalaroides arundinacea.*
2. Coverage of shrubs. No shrubs layer.
3. Tussocks. No tussocks 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. Mowing.
8. The key factors in the development of community. Seasonal inundation of water, stability of ecological conditions and party – mowing.
9. Vegetation changes. Plant communities remained stable.

Phragmitetum australis

1. Physiognomy. The overgrowth of monodominat *Pragmites australis*.
2. Coverage of shrubs. No shrub layer.
3. Tussocks. No tussocks observed.

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. In 2012–2015, reed beds mowed intensively.
8. The key factors in the development of community. Cessation of mowing and partly – flooding of habitats.
9. Vegetation changes. Until 2013 in studied plots plant communities remained stable. In 2015, in studied areas after intensive mowing abundance of reeds decreased very much and regeneration of sedges (*Carex disticha, C. elata*) coenopopulations stared. In plant community increased number of species. Intensive mowing (1–3 times per year) stopped reeds expansion and their coenopopulations became weak. Reed beds succession into sedge community started.

Saponario officinalis-Petasitetum spuria

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. In 2013–14, plant community mowed (once per year).
8. The key factors in the development of community. Hydrological and trophic conditions.
9. Vegetation changes. Plant communities' composition, structure and coverage remained stable.

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

9. Vegetation changes. Alterations not investigated.

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. In 2013–2014, plant community mowed.
8. The key factors in the development of community. Hydrological and trophic conditions and absence of farming.
9. Vegetation changes. In mowed areas abundance of nitrophilous species decreased. Abundance of *Alopecurus pratensis* coenopopulations increased.

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

1. Physiognomy. *Alopecurus pratensis* prevails.
2. Coverage of shrubs. No shrub layer.
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, therefore nitrophylous and ruderal plant species found their niche in the territory.
5. Variations of species composition. These phytocenoses are infrequent; therefore variations of species composition are not established.
6. Successions, reasons and tendency. Nitrophylous species were about to dominate there because of absence of farming. Farming activity stabilized plant communities' condition.
7. Farming and intensity. Plant community was mowed in 2013–2014.
8. The key factors in the development of community. Trophic conditions and absence of farming.
9. Vegetation changes. Edificator *Alopecurus pratensis* coenopopulations increased. Abundance of ruderal species (*Anthriscus sylvestris, Cirsium arvense*) augmented.

4. SUITABLE PLANT COMMUNITIES FOR THE AQUATIC WARBLER

The aquatic warbler singing males observed in the *Caricetum distichae* communities: Contour 4 – 1 male, Contour 44 – 4 males in 2011. In Tyrai wetland the *Caricetum distichae* communities distinguished in 8 contours, which made 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 4. The distribution and coverage of the *Caricetum distichae* in Tyrai wetland, 2011–2015.

No. on map	Habitat	Area, ha		
		2011	2013	2015
9	*Caricetum distichae*	39,55	39,55	39,55
15	*Caricetum distichae*	5,53	5,53	5,53
21	*Caricetum distichae*	3,13	3,13	3,13
23	*Caricetum distichae*	3,05	3,05	3,05
37	*Caricetum distichae*	9,22	9,22	9,22
44	*Caricetum distichae*	27,49	27,49	27,49
4	*Caricetum distichae* and other communities comprised by halophytes	43,5	43,5	43,5
12	*Caricetum distichae* with tangles of the *Glycerietum maximae*	4,48	4,48	4,48
	Total:	135,95	135,95	135,95

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

The vegetation in Tyrai wetland 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 but wetland is not dried.

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 recommended apply mowing on reeds (Contour 4) and scrubs (north-eastern part of Contour 44) in overgrowing communities of the *Caricetum distichae* where aquatic warbler males observed.

The mowing must be applied on the *Phalaridetum arundinaceae* communities' vegetation as it is a potentially suitable breeding ground for the aquatic warbler.

Also we recommended to mow *Phragmitetum australis* communities' vegetation (2 times/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 (Contours 6 and 43) can be extensively mown or grazed.

6. Changes of vegetation

In 2013, vegetation relevés of Tyrai wetland were carried out in all monitoring plots, which were distinguished in 2011. Hydrological conditions remained constant, therefore, during two years, vegetation remained stable. Plant communities from the *Phragmitetum australis* association remained as dominants. Also, coverage of other association communities has not altered as well as their plots configuration. Relevés, which were carried out in monitoring plots, show insignificant changes in the plant communities' species composition and abundance.

Meanwhile, in certain plots, and especially in those where flourished species-rich communities, in 2013, a double number of species were registered. In our opinion, authors, who carried out the first monitoring stage, had a different approach in carrying out of relevés than methodology required. Most probably, just abundantly grew plant species were described or relevés were carried out in a smaller plot. For this reason, we cannot compare data of two years monitoring stages of some association plant communities (particularly – *Molinietum caerulaea*).

In 2015, essential *Phragmitetum australis* plant communities' changes recorded. Due to intensive mowing (1–3 times/year) was able to stop the reeds spreading. Weakened reed coenopopulations significantly reduced their abundance and communities physiognomy changed. Reeds began to vanish and in their plot development of sedge communities started. It is likely that in wetter habitats will *Caricetum elatae* form and in drier ones *Caricetum distichae.* Project activities time was not enough to complete the restoration of sedge communities. Current Tyrai wetland reed beds are stadial helophyte plant communities due to mowing started to transform into sedge communities.

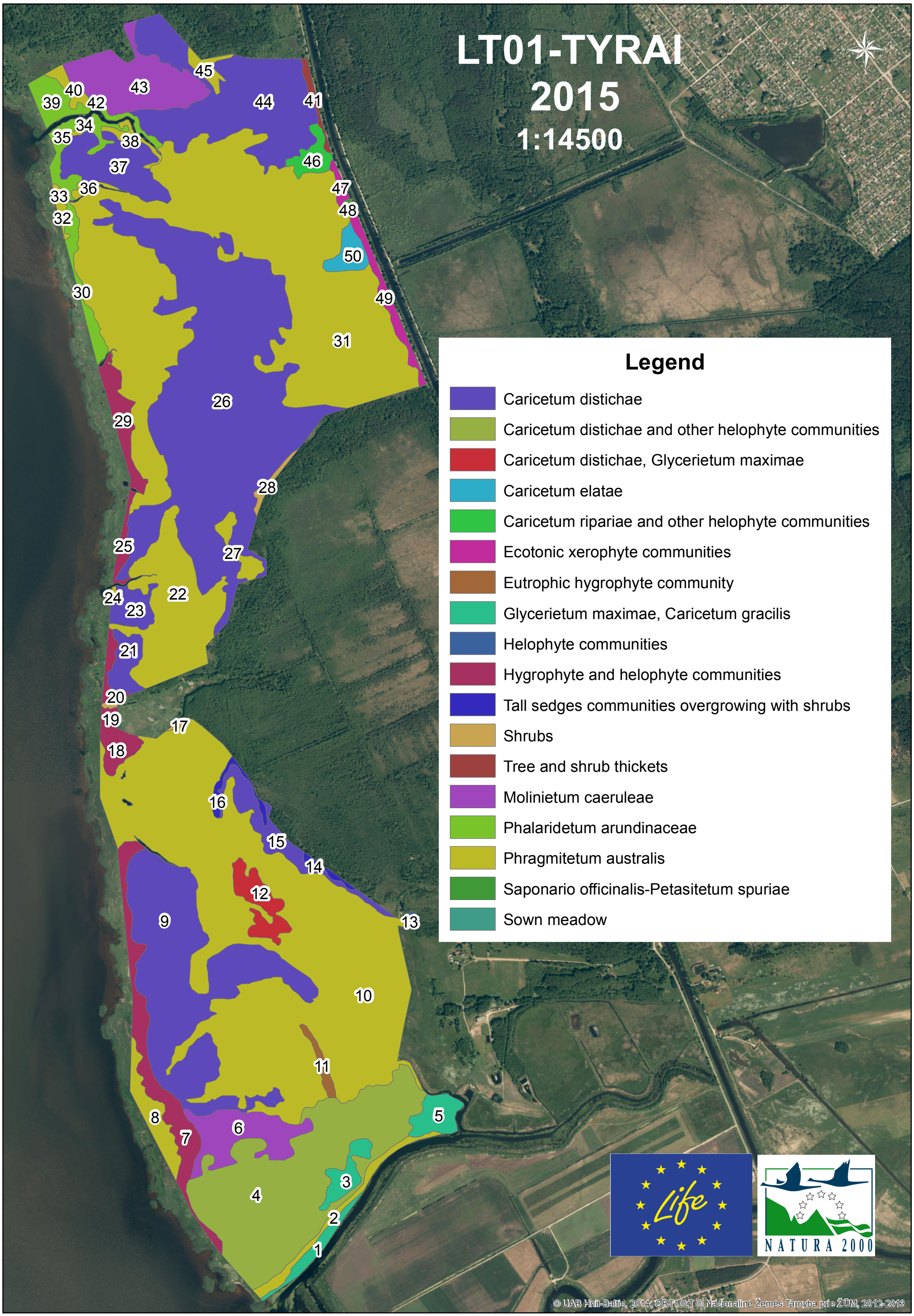
Other plant communities' composition and structure essentially unchanged. In some meadow communities, mowing decreased nitrophilous species coenopopulations. Due to drought previously usual pleustophytes vanished in sedge and helophyte plant communities.

Tyrai wetland vegetation is poorly influenced by man-induced activities, therefore its vegetation characterized as natural and stable. Therefore, huge tall sedge and meadow plant communities unchanged even mowing was started.

Note. Due to technical problems plant communities' photo fixation was not performed in 2015.

11. Conclusions

1. Tyrai wetland hydrological conditions just slightly changed; therefore typical tall sedge and wet meadow vegetation are stable and remained almost unchanged during project.
2. Unmowed Tyrai wetland overgrown by reeds, which changed the landscape of wetland. During project, intensive mowing weakened reed coenopopulations and decreased their abundancy, therefore formation of sedge communities started.
3. Mowing had a positive impact on neglected grassland communities too – nitrophilous species coenopopulations withered in the meadow plant communities.


LT01-TYRAI
2015
1:14500
Legend
Caricetum distichae
Caricetum distichae and other helophyte communities
Caricetum distichae, Glycerietum maximae
Caricetum elatae
Caricetum ripariae and other helophyte communities
Ecotonic xerophyte communities
Eutrophic hygrophyte community
Glycerietum maximae, Caricetum gracilis
Helophyte communities
Hygrophyte and helophyte communities
Tall sedges communities overgrowing with shrubs
Shrubs
Tree and shrub thickets
Molinietum caeruleae
Phalaridetum arundinaceae
Phragmitetum australis
Saponario officinalis-Petasitetum spuriae
Sown meadow
Life
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