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MONITORING REPORT
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DIVERSITY, DISTRIBUTION OF VEGETATION AND THEIR SUITABILITY FOR THE AQUATIC WARBLER TO BREED IN DAMBAVARAGIS MEADOWS AND KIAULYČIA SWAMP
(ŽUVINTAS BIOSPHERE RESERVE)

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1. The general overview of vegetation characteristic

The vegetation of Dambavaragis meadows and Kiaulyčia swamp consists of communities from 19 associations and 2 rankless units – phytocenons from 6 vegetation classes. Also, another alliance have been characterised – *Caricion lasiocarpae*, which syntaxonomical composition is not detailed.

The grassland

In Dambavaragis meadows and Kiaulyčia swamp plant communities belonging to the *Phragmito-Magnocaricetea* class prevail and are distributed in area of 184.52 ha. Among of them, the largest plots are covered by the communities of the *Magnocaricion* alliance (183.30 ha) and according to attained dominancy these communities are distributed as follows: *Thelypteridi-Phragmitetum* (155.89 ha), *Caricetum distichae* (14.75 ha), *Caricetum appropinquatae* (6.72 ha) and *Caricetum elatae* (4.57 ha).

Preponderant *Thelypteridi-Phragmitetum* phytocenosis (155.89 ha) from the *Magnocaricion* alliance are distributed alongside the Žuvintas Lake.

The *Caricetum distichae* communities (14.75 ha) which, unlike other phytocenosis of the *Magnocaricion* alliance are formed on slightly elevated areas. Often these communities along with *Caricetum appropinquatae* and *Carex lasiocarpa* community (*Magnocaricion*) comprise a complicated vegetation mosaic.

The *Caricetum appropinquatae* associations (6.72 ha) and *Carex lasiocarpa* communities (6.72 ha) have formed in alike *Caricetum distichae* habitats.

The *Caricetum elatae* (4.57 ha) as well as the *Thelypteridi-Phragmitetum* is confined to the wettest habitats compared with other communities from the *Magnocaricion* alliance.

During the last 15 years, declining in extent of these communities is observed and due to intrusion of reeds, they are replaced by the *Thelypterido-Phragmitetum*. In 1996, the communities of the *Caricetum elatae* formed a straight belt alongside the Žuvintas Lake in Dambavaragis meadows (BALSEVIČIUS, 1996).

Other plant communities belonging to the *Magnocaricion* alliance are distinguished in the smaller areas and do not attain a significant meaning in the field layer of the studied territory.

A small area is occupied by phytocenosis from the *Phragmition* alliance (1.22 ha). A single *Glycerietum maximae* community has been described. These communities have formed alongside the Bambena River in flooded habitats.

The *Scheuchzerio-Caricetea fuscae* class communities have been distinguished in the area of 20.15 ha. The *Caricion lasiocarpae* alliance phytocenosis are distributed in the area of 18.23 ha in the transitional swamp part, whereas the *Caricion davallianae* alliance – 1.92 ha in the peripheral swamp part.

The *Molinio-Arrhenatheretea* class communities are distributed in the area of 14.90 ha. Large areas are occupied by the *Carex disticha (Calthion*) phytocenosis (5.45 ha).

The central elevated conformation parts of the swamp are covered by the *Molinietum caeruleae* (4.83 ha). The *Deschampsietum cespitosae* (2.06 ha) is distributed in the fringe of the swamp and contiguous with the tall slender communities from the swamp side as well as with cultivated fields and meadows on the pothole slope of the swamp. In alike habitats the *Lysimachio vulgaris-Filipenduletum* (0.77 ha) has been distinguished. Other communities from the *Molinio-Arrhenathereta* are distributed patchily.

The scrubs

The *Alnetea glutinosae* class is represented by the association of *Salicetum pentandro-cinereae* in Dambavaragis meadows. There willow scrub communities are distributed in the area even of 14.33 ha and it makes up 6.13 % of all studied area of the territory.

The communities from the Salicetum pentandro-cinereae association have formed due to encroachment of scrubs in the swamp communities which belong to the Magnocaricion association.

2. *The coverage of plant communities*

Table 1

The covered areas by plant communities in Dambavaragis meadows and Kiaulyčia swamp

Plant community	2011		2013	
	Area, ha	%	Area, ha	%
Caricetum gracilis	0.09	0.04	0.09	0.04
Galio palustris-Caricetum ripariae	0.09	0.04	0.09	0.04
Poo palustris-Alopecuretum pratensis	0.20	0.09	0.20	0.09
Alopecuretum pratensis	0.23	0.10	0.23	0.10
Calamagrostietum strictae	0.28	0.12	0.28	0.12
Filipendulo-Geranietum	0.32	0.14	0.32	0.14
Carex lasiocarpa community (*Magnocaricion*)	0.39	0.17	0.39	0.17
Cirsietum rivularis	0.52	0.22	0.52	0.22
Lolio-Cynosuretum	0.52	0.22	0.52	0.22
Phalaridetum arundinaceae	0.52	0.22	0.52	0.22
Lysimachio vulgaris-Filipenduletum	0.77	0.33	0.77	0.33
Glycerietum maxime	1.22	0.52	1.22	0.52
Campylio stellati-Caricetum paniceae	1.92	0.82	1.92	0.82
Deschampsietum cespitosae	2.06	0.88	2.06	0.88
Caricetum elatae	4.57	1.95	4.57	1.95
Molinietum caeruleae	4.83	2.06	4.83	2.06
Carex disticha community (*Calthion*)	5.45	2.33	5.45	2.33
Caricetum appropinquatae	6.72	2.87	6.72	2.87
Salicetum pentandro-cinereae	14.33	6.13	14.33	6.13
Caricetum distichae	14.75	6.31	14.75	6.31
Caricion lasiocarpae	18.23	7.79	18.23	7.79
Thelypteridi-Phragmitetum	155.89	66.65	155.89	66.65
Total:	233.90	100.00	233.90	100.00

3. *The coverage of vegetation classes*

Table 2

The coverage of plant communities belonging to the different vegetation classes in Dambavaragis meadows and Kiaulyčia swamp

Vegetation class	2011		2013	
	Area, ha	%	Area, ha	%
ALNETEA GLUTINOSAE	14.33	6.13	14.33	6.13
MOLINIO-ARRHENATHERETEA ELATIORIS	14.90	6.37	14.90	6.37
SCHEUCHZERIO-CARICETEA NIGRAE	20.15	8.61	20.15	8.61
PHRAGMITO-MAGNOCARICETEA	184.52	78.89	184.52	78.89
Total:	233.90	100.0	233.90	100.0

4. *Compendium of plant communities*

ALNETEA GLUTINOSAE Braun-Blanquet et Tüxen 1943
- *Alnetalia glutinosae* Tüxen 1937
  - *Alnion glutinosae* (Malc. 1929) Meijer Drees 1936
    - *Salicetum pentandro-cinereae* (Almquist 1929) Passarge 1961

SCHEUCHZERIO-CARICETEA NIGRAE Tüxen 1937
- *Caricetalia davallianae* Braun-Blanquet 1949
  - *Caricion davallianae* Klika 1934
    - *Campylio stellati-Caricetum paniceae* Osvald 1925
  - *Caricion lasiocarpae* Vanden Berghen in Lebrun et al. 1949

MOLINIO-ARRHENATHERETEA ELATIORIS Tüxen 1937
- *Arrhenatheretalia elatioris* Pawłowski 1928
  - *Cynosurion* Tüxen 1947
    - *Lolio-Cynosuretum* Tüxen 1937

Molinietalia caeruleae Koch 1926
  - *Molinion caeruleae* Koch 1926
    - *Molinietum caeruleae* Koch 1926
  - *Calthion palustris* Tüxen 1937
    - *Carex disticha* bendrija (*Calthion*)
    - *Cirsietum rivularis* Nowiński 1927
    - *Deschampsietum cespitosae* Horvatić 1930
    - *Filipendulo-Geranietum*
    - *Lysimachio vulgaris-Filipenduletum* Balátová-Tuláčková 1978
  - *Alopecurion pratensis* Passarge 1964
    - *Alopecuretum pratensis* (Regel 1925) Steffen 1931
    - *Poo palustris-Alopecuretum pratensis* Shelyag-Sosonnko et al., 1985

PHRAGMITO-MAGNOCARICETEA Klika in Klika et Novák 1941
- *Phragmitetalia* Koch 1926
  - *Magnocaricion* Koch 1926
    - *Calamagrostietum strictae*
    - *Caricetum appropinquatae* Aszód 1935
    - *Caricetum distichae* Nowiński 1927
    - *Caricetum elatae* Koch 1926
    - *Caricetum gracilis* Savič 1926
    - *Carex lasiocarpa* bendrija (*Magnocaricion*)
    - *Galio palustris-Caricetum ripariae* Balátová-Tuláčková in Balátová-Tuláčková et al. 1993
    - *Phalaridetum arundinaceae* Libbert 1931
    - *Thelypteridi-Phragmitetum* Kuiper ex van Donselaar et al. 1961
  - *Phragmition* Koch 1926
    - *Glycerietum maximae* Nowiński 1930

5. *Brief characterizations of plant communities*

Salicetum pentandro-cinereae

1. Physiognomy. The community is formed by willow scrubs in more or less marshy habitats are dominated by *Salix cinerea* and species such as: *S. myrsinifolia, S. pentandra* flourish there too. The canopy of scrubs is dense, therefore a field layer is scarce. Often a tree storey is formed by juvenile trees of *Betula pubescens*. In Dambavaragis meadows fairly large plots are occupied by abundantly scrubbed sedge communities, however, these communities have not been inventoried and considered as scrub communities, if a scrub storey had not a dense canopy.
2. Coverage of shrubs. Generally, these scrub communities form a dense canopy and its projection coverage is up to 100 %.
3. Tussocks. No tussocks.
4. Stability. These communities are stable and have a characteristic species composition.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The plant communities have formed under the influence of cessation of mowing of sedge vegetation. These communities have a tendency to extend in the area because of absence of mowing of sedge vegetation around them. The *Salicetum pentandro cinereae* is a stadial community. Under process of succession, a tree layer will be formed (usually by *Betula pubescens*), which in turn will give a way to a woodland community of the *Carici elongatae-Alnetum* association.
7. Farming and intensity. No farming activities.
8 The key factors in the development of community. Non land-use.

Campylio stellati-Caricetum paniceae

1. Physiognomy. The multi-species dwarfish plant communities are formed in the marginal part of the swamp in the calcareous minerotrophic habitats where species such as: *Carex panicea, C. nigra, C. appropinquata, Deschampsia cespitosa, Carex flava, C. hostiana, C. distans, Filipendula ulmaria, Eriophorum angustifolium, Geum rivale, Potentilla erecta* and *P. anserina* predominate.
2. Coverage of shrubs. The first signs of intrusion of scrubs are observed.
3. Tussocks. No tussocks.
4. Stability. The community is stable. Species composition of the community has tenuously changed since 1996, however, there are no data whether areas occupied by this community has declined in extant because it was formerly distinguished with tangles of the *Calthion* meadows (BALSEVIČIUS, 1996).
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. These plant communities are formed in the marginal parts of Dambavaragis meadows in the calcareous minerotrophic habitats. Without having been mowed and grazed, these stands of the community will be invaded by scrubs.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Absence of knowledge.

Caricion lasiocarpae

1. Physiognomy. Sedge community is confined to acidic, infertile, peaty habitats in the transitional swamp where *Carex lasiocarpa, C. rostrata, C. chordorrhiza* and *C. limosa* predominate. Moss layer is composed by *Spagnum* sp.
2. Coverage of shrubs. The first signs of intrusion of scrubs are observed
3. Tussocks. No tussocks.
4. Stability. Under constant conditions these plant communities are stable. During last decades cane communities are replacing them.
5. Variations of species composition. Variations are not established.

6. Successions, reasons and tendency. These communities are in successional way to scrubs and canes.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Habitats confined to acidic, infertile and peaty soils in the transitional swamp.

Lolio-Cynosuretum

1. Physiognomy. The communities formed by mesophytes on swamp's pothole slopes where Festuca rubra, Dactylis glomerata, Centaurea jacea, Alchemilla ssp., Lathyrus pratensis, Stellaria graminea and Lotus corniculatus attain dominancy.
2. Coverage of shrubs. No shrub layer.
3. Tussocks. No tussocks.
4. Stability. Plant community is stable.
5. Variations of species composition. Variations of species composition are not established because these communities are distributed in a small area.
6. Successions, reasons and tendency. These communities have formed by replacing cultivated meadows. Due to succession characteristic species have found their niche there. Under the influence of regular mowing, succession way may be deflected to the Alopecuretum pratensis community.
7. Farming and intensity. Mowing and grazing activities are not applied.
8. The key factors in the development of community. Absence of knowledge.

Molinietum caeruleae

1. Physiognomy. Meadow communities are formed in the middle part of the swamp where *Molinia caerulea* prevails.
2. Coverage of shrubs. No shrub layer.
3. Tussocks. Slim tussocks are formed by *Molinia caerulea*.
4. Stability. These communities are stable and neither species composition nor plots covered by communities have been changed since 1996.
5. Variations of species composition. Variations are not established in that communities are distributed in small area.
6. Successions, reasons and tendency. Formation of shrub layer is observed.
7. Farming and intensity. Absence of grazing and mowing.
8. The key factors in the development of community. Absence of knowledge.

***Carex disticha* community (*Calthion*)**

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in springtime and *Carex disticha* attains dominance there. Despite that physiognomy of the community is very similar to *Caricetum distichae* physiognomy, characteristic species belonging to the class of *Molinio-Arrhenatheretea* are as dominants in this species-rich phytocenosis. Plant community is not numerous in hygrophilous species, therefor this community cannot be ascribed to the class of *Phragmito-Magnocaricetea.*
2. Coverage of shrubs. No shrub layer.
3. Tussocks. No tussocks.
4. Stability. These plant communities are stadial. In a marginal part of the swamp, they replaced *Deschampsietum cespitosae* plant community due to cessation of grazing and mowing.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Under the influence of cassation of grazing and mowing, these communities have replaced the *Deschampsietum cespitosae* and other phytocenoses of the *Calthion* alliance in peripheral habitats of the swamp where water level is minimal during springtides. The communities of the *Deschampsietum cespitosae* grassland, from the lake side, are

contiguous with *Caricetum distichae* sedge community which is confined to wetter habitats and characteristic meadow species are spread there sporadically. Therefore, in adjacent habitats flourished *Carex disticha* had a tendency to spread into meadows too. Without having been mowed, these marginal swamp meadows will be invaded by Willow scrubs. Most likely, changing of non-land treatment to mowing and grazing, succession may be deflected to *Deschampsietum cespitosae* grassland community, but this process also depends on hydrological regime in habitat.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Non land-use.

Cirsietum rivularis

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in springtime and *Cirsium rivulare* attains dominance there.
2. Coverage of shrubs. The communities are not covered by shrubs.
3. Tussocks. No tussocks layer.
4. Stability. These communities are stable but *Carex disticha* prevails in the field layer.
5. Variations of species composition. Variations are not established because of plant communities encompass a small area.
6. Successions, reasons and tendency. The *Cirsietum rivularis* is distributed in the area of 0.5 ha. It has formed in the tenuously flooded marginal parts of the swamp. There is a possibility of community's transformation to *Carex disticha* community (*Calthion*).
7. Farming and intensity. Absence of grazing and mowing.
8. The key factors in the development of community. Absence of knowledge.

Deschampsietum cespitosae

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in springtime and *Deschampsia cespitosa, Eleocharis uniglumis, Festuca rubra, Potentilla anserina, Carex hirta, Epilobium palustre, Equisetum palustre, Geum rivale* and *Agrostis stolonifera* are prominent there. There rather plenty of hygrophytes found their niche in the community.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. The area is poor in tussocks, which are formed by *Deschampsia cespitosa.*
4. Stability. The key factor in the development of the community is fated not just by grazing, but also by long inundation by water, during springtides, which had a great impact on the plant community formation in Dambavaragis meadows. As long as these communities vegetation are mown, these phytocenosis are quite stable and have a characteristic species composition. But in recent years, water level of the lake had been risen higher than usual, therefore it has affected communities' species composition – more hygrophilous species found their niche there.
5. Variations of species composition. Variations are not established because communities are spread in very similar habitats, besides, not in all areas some kind of treatment is applied.
6. Successions, reasons and tendency. The *Deschampsietum cespitosae* grassland is distributed in the very fringe part of the swamp, which from the lake side is contiguous with the communities comprised by forbs of helophytes or tall sedges, but from the slope of a lake pothole side it verges with cultivated meadows. These communities have formed under the influence of grazing in less flooded marginal parts of the swamp, but later their formation, also, has been influenced by a long-term inundation by water during springtime, because *Deschampsia cespitosa* is a species which tolerates both: inundation by water and prolonged trampling. At present vegetation of these communities is neither mown nor grazed. Due to the absence of grazing and mowing, these plant communities will be overgrown by scrubs, and in plots which verge with *Caricetum distichae* community, transformation to *Carex disticha* communities (*Calthion*) will be started. Under constantly higher water level than normal, most likely, these phytocenosis will be replaced by tall sedge communities.

7. Farming and intensity. Mowing and grazing treatment is not applied.
8. The key factors in the development of community. Grazing and flooding.

Lysimachio vulgaris-Filipenduletum

1. Physiognomy. The meadow communities are formed in seasonally flooded habitats where *Filipendula ulmaria* predominates. These plant communities are very alike to the *Filipendulo-Geranietum* but *Geranium palustre* is not observed there.
2. Coverage of shrubs. The plant community is not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. The communities are stadial. Their species composition is heterogeneous. These communities have formed by replacing *Deschampsietum cespitosae*, under the influence of cessation of grazing and mowing. There is no data collected about when these replacements were proceeded, however in Dambavaragis meadows these plant communities were also described in 1996 (BALSEVIČIUS, 1996).
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. These communities have formed by replacing *Deschampsietum cespitosae*, under the influence of cessation of grazing and mowing.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Cessation of grazing and mowing.

Alopecuretum pratensis

1. Physiognomy. Mesophylous plant communities which are formed in seasonally and just occasionally flooded habitats where *Alopecurus pratensis* prevails.
2. Coverage of shrubs. The plant community is not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. These communities are distributed in the marginal parts of meadow which is around the swamp. The plant communities are stable and have a characteristic species composition. These communities have formed by replacing cultivated meadows and abundant coenopopulation of *Dactylis glomerata* is still observed.
5. Variations of species composition. Variations are not established in that occupied area by the community is just of 0.23 ha.
6. Successions, reasons and tendency. These communities were described in 1996, and neither species composition nor distribution has changed since then. Absence of knowledge of subsequent trends of succession.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Absence of knowledge.

Poo palustris-Alopecuretum pratensis

1. Physiognomy. These communities are confined to flooded habitats where *Alopecurus pratensis* prevails. These communities are alike to the *Alopecuretum pratensis* physiognomically, however the species composition is enriched by hygrophytes.
2. Coverage of shrubs. The plant community is not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. These plant communities are stable and have a characteristic species composition. They comprise a vegetation mosaic with the *Dechampsietum cespitosae* and *Campylio stellati-Caricetum paniceae*.
5. Variations of species composition. Variations are not established in that occupied area by the community is just of 0.20 ha.
6. Successions, reasons and tendency. Absence of knowledge.

7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Absence of knowledge.

Calamagrostietum strictae

1. Physiognomy. Monodominat and species-poor overgrowths of *Calamagrostis stricta* are formed in less flooded marginal parts of the swamp.
2. Coverage of shrubs. The plant community is not covered by shrubs.
3. Tussocks. Absence of tussocks.
4. Stability. These communities are stable, under constant hydrological and farming conditions.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. In a marginal part of the swamp a fairly small fragment occupied by the community is described, therefore due to lack of data it is impossible to foresee the ways of succession.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. The factors are not established.

Caricetum appropinquatae

1. Physiognomy In the community *Carex appropinquata* predominates, but according to other plant communities formed by tall sedges, there is a rather great bunch of higrophyte species. A typical conformation covered by tussocks is formed by plant communities' edificator *Carex appropinquata*, therefore plants of one ecological group thrive on the tussocks and others – among them.
2. Coverage of shrubs. The communities are covered by shrubs in some places abundanlty.
3. Tussocks. Tussocks are formed by *Carex appropinquata.*
4. Stability. Under constant hydrological conditions, plant communities remain quite stable, but rapid encroachment of shrubs is observed.
5. Variations of species composition. Here *Carex elata* and *C. disticha* flourish at intervals abundantly because of these communities occur as complicated, contours like vegetation mosaic with these phytocenosis.
6. Successions, reasons and tendency. The communities as well as *Caricetum distichae* have formed in periodically flooded habitats and their intermixed with *Caricetum distichae* occur. In mid-summer water stands above the soil surface and ecotopes are seldom flooded. Communities without mowing for a long time have a tendency to be overgrown by shrubs of *Salix* genus.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Periodical inundation of habitats by water and partly – mowing.

Caricetum distichae

1. Physiognomy. Monodominant overgrowths of *Carex disticha*.
2. Coverage of shrubs. Encroachment of shrubs is observed.
3. Tussocks. No tussocks.
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 shrubs and in some places by reeds.
5. Variations of species composition. In all plots species composition is alike.
6. Successions, reasons and tendency. These communities vegetation without being mown or grazed have a tendency to be overgrown by shrubs and reeds.
7. Farming and intensity. Absence of mowing.
8. The key factors in the development of community. Periodical floodings and application of mowing treatment.

Caricetum elatae

1. Physiognomy. Phytocenosis are formed by monodominant tussocks *Carex elata* in the mid part of the swamp.
2. Coverage of shrubs. Community is not covered by shrubs because of the water level is too high.
3. Tussocks. Tussocks are formed by *Carex elata*.
4. Stability. Under the constant hydrological conditions, communities are quite stable, however their plots have declined in extent drastically since 1960 (MALAKAUSKIENĖ, 1968).
5. Variations of species composition. Species composition is very similar in all areas.
6. Successions, reasons and tendency. These plant communities are formed in the permanently flooded habitats near lakeshores. Compared with data of 1960 when these communities had formed a wide and unimodal vegetation belt in parallel with the lakeside reeds, they are currently located only in one place. The lakeshore plant communities of the *Caricetum elatae* have been replaced by overgrowths of the *Thelypteridi-Phrgamitetum*. In 1996, from one side these communities were surrounded by the *Thelypterido-Phragmitetum* and from another – *Magnocaricion* alliance communities (BALSEVIČIUS, 1996).
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Permanent flooding of the habitats and mowing.

Caricetum gracilis

1. Physiognomy. Monodominat and species-poor overgrowths of *Carex acuta* are confined to the permanently flooded habitats.
2. Coverage of shrubs. Communities are not covered by shrubs.
3. Tussocks. Tussocks are not observed.
4. Stability. These communities are stable, under constant hydrological and farming conditions.
5. Variations of species composition. These communities are located in small fragments, therefor variations of species composition are not established.
6. Successions, reasons and tendency. Communities patchily distributed in a marginal part of the swamp, where along with *Caricetum distichae* and *Caricetum appropinquatae* communities comprise a vegetation mosaic.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Favourable water level.

***Carex lasiocarpa* community (*Magnocaricion*)**

1. Physiognomy. These monodominant plant communities of *Carex lasiocarpa* with green mosses are formed in the central part of the swamp around the lake of Žuvintas. Traditionally, the communities formed by *Carex lasiocarpa* were ascribed to the *Caricion lasiocarpae* alliance of the *Scheuchezerio-Caricetea fuscae* class. The plant communities formed by *Carex lasiocarpa* are confined to the habitats of acidic reaction, and within bryophyte layer *Spagnum* species attain dominance. Communities distributed in habitats of neutral and alkaline reactions are ascribed to other different sub-associations of *Caricetum lasiocarpae*. Thus, this association was well-known, whereas plant communities of the different habitats with different plant species within their composition were ascribed to it. The only link to this syntaxon is an ascendancy of *Carex lasiocarpa*. Therefore, that approach is at variance with principals of the classification of vegetation, and absolutely different phytocenosis cannot be assigned to one association. In previous work (BALSEVIČIUS, 1996), a community of slender sedge was also ascribed to the association of *Caricetum lasiocarpae* in Dambavaragis meadows. In recent years, plant communities formed by *Carex lasiocarpa* in habitats of neutral reaction are ascribed by European phytocenologists to the association of *Peucedano-Caricetum lasiocarpae* belonging to the *Magnocaricion* alliance. In order

to avoid confusion in accepted traditional classification of Lithuania wetland vegetation, communities of wetland vegetation, in this work, are treated as phytocenon (rankless syntaxon) – *Carex lasiocarpa* community.
2. Coverage of shrubs. The plant communities are covered by shrubs in some places.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant hydrological and farming conditions, these communities are stable but due to absence of mowing, they are tend to be overgrown by shrubs.
5. Variations of species composition. The species composition is similar in all area.
6. Successions, reasons and tendency. These plant communities are formed in the similar habitats like *Caricetum distichae* and often their areas are overlapped by forming wide belts of ecotones and characteristic species of both communities are prevalent there. For this reason, there is no data about which of the communities are expanding and which are declining in extant.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Stability of hydrological regime and mowing.

Galio palustris-Caricetum ripariae

1. Physiognomy. Monodominat and species-poor overgrowths of *Carex riparia* are confined to the permanently flooded habitats.
2. Coverage of shrubs. Communities are not covered by shrubs.
3. Tussocks. Tussocks are not observed.
4. Stability. Like *Caricetum gracilis*, these communities are stable, under constant hydrological and farming conditions.
5. Variations of species composition. These communities are located in small fragments, therefor variations of species composition are not established.
6. Successions, reasons and tendency. Communities patchily distributed in a marginal part of the swamp, where along with *Caricetum distichae* and *Caricetum appropinquatae* communities comprise a vegetation mosaic.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Favourable water level.

Phalaridetum arundinaceae

1. Physiognomy. Monodominat and species-poor overgrowths of *Phalaroides arundinacea* in the permanently flooded marginal part of the swamp near the Bambena River.
2. Coverage of shrubs. Communities are not covered by shrubs.
3. Tussocks. Tussocks are not observed.
4. Stability. These communities are stable, under constant hydrological and farming conditions.
5. Variations of species composition. Variations of species composition are not established.
6. Successions, reasons and tendency. Communities are distributed alongside the river Bambena, where along with the *Glycerietum maximae* comprise a vegetation mosaic. Due to risen water level in Bambena, the plots of the community have increased in extent in last years.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Fluctuation of hydrological regime.

Thelypteridi-Phragmitetum

1. Physiognomy. A wide vegetation belt is formed by monodominant overgrowths of *Pragmites australis* with a quite abundance or abundance intermixes of sedge in the lakeside of Žuvintas.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.

4. Stability. Under constant conditions, these communities are stable and expand in the area quickly.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The communities have formed in the lakeside under the influence of absence of farming activities. A rapid invasion of the community to the areas covered by sedges is observed. Due to regular mowing of vegetation, sedges regeneration may be expected.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Cessation of mowing.

Glycerietum maximae

1. Physiognomy. Monodominat overgrowths of *Phalaroides arundinacea* are formed in flooded habitats alongside the river Bambena.
2. Coverage of shrubs. Communities are not covered by shrubs.
3. Tussocks. Tussocks are not observed.
4. Stability. These communities are stable, under constant hydrological and farming conditions.
5. Variations of species composition. Variations of species composition are not established.
6. Successions, reasons and tendency. These communities have formed under the influence of permanent habitats inundation by water, and along with *Phalaridetum arundinaceae* comprise a vegetation mosaic. Due to risen water level in Bambena River, the plots of the community have increased in extent in last years.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Fluctuation of hydrological regime (more intensive flooding of the habitats).

6. Suitable plant communities for the Aquatic Warbler

The Aqautic Warbler has been located in the *Caricetum elatae* community (4.57 ha – contour 25) in Dambavaragis meadows.

In Šyša polder, the Aqautic Warbler has been observed in plant communities of the *Caricetum gracilis, Caricetum distichae* and *Phalaridetum arundinaceae*. However, areas covered by *Caricetum gracilis* and *Phalaridetum arundinaceae* are very patchy and furthermore, these areas are flooded permanently in Dambavaragis meadows. In Kiaulyčia swamp these communities are not distinguished at all.

The *Caricetum distichae* is distributed in fairly large and unimodal plots in Dambavaragis meadows (contour 10 – 7.01 ha; contour 19 – 6.57 ha). Theoretically, these communities might be suitable for the Aquatic Warbler to breed too. In Belarus, the Aquatic Warbler is found in the *Caricetum appropinquatae* as well as in the communities formed by *Carex lasiocarpa* (KOZULIN, FLADE, 1999), however, areas covered by these communities are very patchy and small in Dambavaragis meadows.

7. Suitable parts of the territory for the Aquatic Warbler to breed

The southern part of the territory which is covered by the *Caricetum elatae* community (contour 25) is the most favourable for the Aquatic Warbler to breed.

If we consider that suitable areas for the bird to breed may theoretically be the purest areas of the *Caricetum distichae* and of the *Caricetum distichae* with tangles of the *Caricetum appropinquatae* and *Carex lasiocarpa* (*Magnocaricion*), by the same token the south-eastern part of the territory might be potentially favourable too (contours 19, 21 and 24).

8. Unsuitable (or still enough suitable but with unfavourable trends of succession) plant communities for the Aquatic Warbler and reasons of unfavourable successions

The communities from the classes of the *Molinio-Arrhenatheretea* are not preferred breeding grounds of this bird at all. These communities have formed in less flooded of mid moistness habitats. Thus, in order to protect the Aquatic Warbler, the management of the areas occupied by these communities is not of primary importance.

Also, due to bulk of floods, plant communities from the *Phragmition* alliance are not favourable for the Aquatic Warbler as well as *Caricion lasiocarpae* community with entire sphagnum layer in Kiaulyčia swamp.

Under applying measures for nature management and being in anticipation for regeneration of sedge communities, which are suitable for the Aquatic Warbler to breed, the scrubs of the *Salicetum pentandro-cinereae* require immediate removal as well as treatment of mowing of overgrowths of reed of the *Thelypterido-Phragmitetum* community. The sedgy areas have been replaced by these two communities. Especially, potentiality of the *Thelypterido-Phragmitetum* is of great importance because they succeeded *Caricetum elatae* and only in these plant communities of the Žuvintas Wetland, the Aquatic Warbler has been observed. Just 15 years ago, a wide and unimodal belt of these communities were spread in parallel with the Žuvintas lakeside reeds (BALSEVIČIUS, 1996).

The *Caricetum distichae, Caricetum appropinquatae* and *Carex lasiocarpa* communities have also unfavourable features, due to formation of shrub layer in there.

9. Recommendations on management of the territory forming suitable plant communities for the Aquatic Warbler

The vegetation in Dambavaragis meadows and Kiaulyčia swamp has formed under the influence of both environmental and anthropogenic factors. The key environmental factors which have fated the distribution of vegetation are: fertility of soil, and especially regime of moistness. The factor of inundation can be considered as of anthropogenic origin because duration of habitats' inundations influenced by spring tides and after them or after excess rainfall, also, partly depends on regulations of water level in the Žuvintas Lake. Other man-induced factors of great importance are mowing and grazing. The mowing of vegetation is very important factor in order to maintain plant communities, whereas heavy grazing – can be treated as more communities changing factor.

During decades no farming activities were underway in the greater part of the territory, therefor distribution of the vegetation has changed and apart this, communities are overgrown by scrubs and their species composition has altered too.

In order to form suitable plant communities for the Aquatic Warbler to breed, we have to pay attention to the intensiveness of mowing as well as to the favourable duration of floods and their intensiveness too.

The shrub communities must be removed from the territory and according to robustness of browses, they must be eliminated each year and at least for 3–5 years, otherwise shrubs will regenerate during two years and form a denser canopy. Cleaned from shrubs areas must be mown each year and hay must be taken away from there too.

The mowing of vegetation of the *Thelypterido-Phragmitetum* communities must be started immediately being in anticipation for the *Caricetum elatae* communities' regeneration because these plant communities are suitable for the Aquatic Warbler to breed. In order to achieve an efficient result, the mowing must be applied not less than 2 years whilst coenopopulation of the *Phragmites australis* will be withered.

The scrubs must be removed from other sedgy areas too and mowing must be applied each year or every other year in these plots. Furthermore, those areas where scrubs have been removed, the mowing should be preceded each year whilst they stop to regenerate themselves.

We recommend intensive mowing of vegetation in contours: 5, 9, 12 and 17.

The vegetation of the communities belonging to the class of *Molinio-Arrhenatheretea* may be mown or grazed extensively on the margin of the swamp.

10. Changes of vegetation during 2011–2013

Some parts of Dambavaragis meadows have been mown except the wettest habitats where canes and sedges thrive. In these habitats no farming activities has been applied and hydrological regime remained stable, therefore, vegetation is unchanged in Dambavarigis meadows during term of 2 years.

The plant communities from the *Phragmito-Magnocaricetea* class remained as dominants (184.52 ha). Plots of these associations' communities left stable in size and configuration.

By visual evaluation, in these meadows, no fluctuations of communities' species composition and abundance have been determined.

So, we present only the comparison of the *Caricetum elatae* community's composition changes, because of this plant community is very important for Aquatic Warbler population (Table 3).

Table 3

Changes of plant species composition in the *Caricetum elatae* community (LT08/2-No. 25) during years of 2011–2012.

Layers	Latin species name	30-08-2011	10-09-2013
C	*Carex elata*	5	5
	Utricularia intermedia	3	2
	Menyanthes trifoliata	2	2
	Potentilla palustris	2	1
	Iris pseudacorus	1	+
	Agrostis stolonifera	+	-
	Carex lasiocarpa	-	+
	Carex rostrata	+	+
	Epilobium palustre	+	+
	Eriophorum angustifolium	-	+
	Equisetum fluviatile	-	+
	Lysimachia thyrsiflora	+	-
	Lythrum salicaria	+	+
	Ranunculus lingua	+	+
D	*Calliergonella cuspidata*	1	1
	Coverage of layer, % (C)	85	85
	Coverage of layer, % (D)	5	5
	Grass layer, m	1.15	1.20

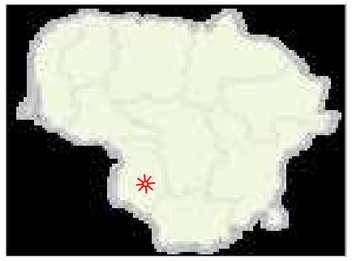
Fig. 1. The community of *Caricetum elatae* remained stable during two years. (LT08/2-No. 25).

11. *References*

BALSEVIČIUS A., 1996: Kiaulyčios pelkės botaninė įvairovė. Rankr., dep. Gamtos tyrimų ir ekologinio švietimo stotyje, Nr. B96-05. – Marijampolė.

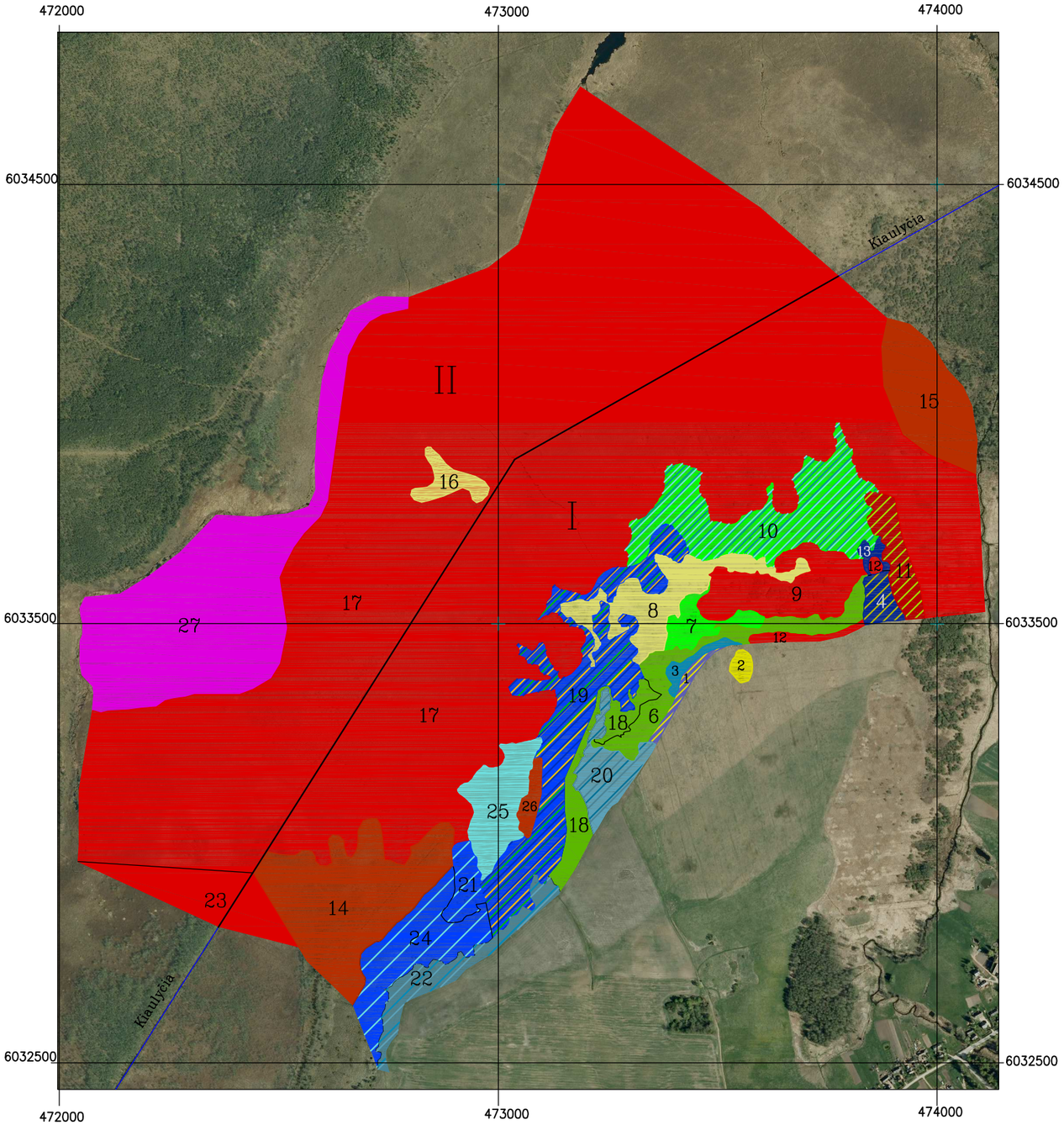
KOZULIN A., FLADE M., 1999: Breeding habitat, abundance and conservation status of the Aquatic Warbler *Acrocephalus paludicola* in Belarus. – Vogelwelt, 120: 97–111.

MALAKAUSKIENĖ O., 1968: Geobotaničeskij obzor nizinnovo bolota Žuvintas. – In: ZAJANČKAUSKAS P. (ed.), Zapoviednik Žuvintas. – Vilnius.



DAMBAVARAGIO PIEVOS IR KIAULYČIOS PELKĖ

M 1:5000



AIŠKINAMIEJI ŽENKLAI

I – Dambavaragio pievos

Augalų bendrija	Spalva	Spalvos kodas
Lolio-Cynosuretum		52
Alopecuretum pratensis		175
Cirsietum rivularis		144
Lysimachio vulgaris-Filipenduletum		166
Filipendulo-Geranietum		54
Thelypteridi-Phragmitetum		12
Carex disticha bendrija (*Calthion*)		74
Caricetum distichae		90
Molinietum caeruleae		53
Caricetum elatae		133
Carex lasiocarpa bendrija (*Magnocaricion*)		136
Glycerietum maxime		14
Phalaridetum arundinaceae		62
Salicetum pentandro-cinereae		24
Caricetum appropinquatae		160
Calamagrostietum strictae		164
Caricetum gracilis		94
Galio palustris-Caricetum ripariae		40
Campylio stellati-Caricetum paniceae		145
Deschampsietum cespitosae		147
Poo palustris-Alopecuretum pratensis		146

II – Kiaulyčios pelkė

Augalų bendrija	Spalva	Spalvos kodas	Kontūras
Thelypteridi-Phragmitetum		12	17
Molinietum caeruleae		53	16
Caricion lasiocarpae		212	27

2011–12–01

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Station of Nature Research and Environmental Education

MONITORING REPORT
(2011–2013)

DIVERSITY, DISTRIBUTION OF VEGETATION AND THEIR SUITABILITY FOR THE AQUATIC WARBLER TO BREED IN THE PENINSULA OF EPUŠĖ AND GREBELĖ MEADOWS (ŽUVINTAS BIOSPHERE RESERVE)

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1. The general overview of vegetation characteristic.

The grassland communities of the Grebelė meadow and Epušė peninsula belong to 4 vegetation classes (16 associations and 2 rankless units – phytocenons).

The grassland

Grasslands communities of *Phragmito-Magnocaricetea* class dominate in the Epušė peninsula and Grebelė meadow. Communities are distributed in the area of 87.15 ha. Among this group, the largest areas are covered by communities of the *Magnocaricion* alliance (79.07 ha): Ass. *Caricetum distichae* (30.38 ha), Ass. *Thelypteridi-Phragmitetum* (22.89 ha), Ass. *Caricetum appropinquatae* (9.03 ha), *Carex lasiocarpa* community (9.03 ha), etc. These communities are distinguished in the area even of 71.33 ha. It tots up to 69.66 % of all investigated area of the meadows of the peninsula of Epušė and Grabelė.

The most widely spread Ass. *Caricetum distichae* communities are formed on slightly elevated areas than other phytocenosis from the All. *Magnocaricion* in the meadows of both locations. In the south part of the territory these plant communities encompass a large area of 14.68 ha. In other large areas, these communities along with communities of the *Caricetum appropinquatae, Caricetum elatae* and *Carex lasiocarpa* (*Magnocaricion*) comprise a complicated vegetation mosaic. In a marginal part of the swamp, where habitats are wetter and surface-water occurs above the soil table, these communities occur intermixed with the *Caricetum gracilis, Phalaridetum arundinaceaea* and *Glycerietum maximae* communities. The plant communities of the *Caricetum distichae* with tangles of *Rorippo-Agrostietum* and *Carici-Menyanthetum trifoliatae* are distributed in flooded marginal swamp areas. A tendency of declining in areas of the *Caricetum distichae* plant community is observed in south and north parts of the investigated territory. These communities step aside for phytocenosis of the *Caricetum gracilis, Phalaridetum arundinaceae, Glycerietum maximae, Rorippo-Agrostietum* and *Carici-Menyanthetum trifoliatae*.

The phytocenosis of *Thelypteridi-Phragmitetum* belonging to the alliance of *Magnocaricion* have been distinguished in the large areas of the territory (22.89 ha), which are distributed on the banks of Žuvintas lake. In similar habitats like *Caricetum distichae*, association of the *Caricetum appropinquatae* and communities of the *Carex lasiocarpa* are formed too. These plant communities are found among plots occupied by *Caricetum distichae* in contour 20.

Among all communities of the *Magnocaricion* association, the plant communities of the *Caricetum elatae*, same as of *Thelypteridi-Phragmitetum* have been distinguished in the wettest habitats (4.31 ha). In the peninsula of Epušė these communities prevail there (contour 22). During the last 15 years, declining in extent of these communities is observed and due to intrusion of Reeds, they are replaced by *Thelypterido-Phragmitetum*. In 1996, the communities of the *Caricetum elatae* formed a straight belt alongside the lake of Žuvintas in the peninsula of Epušė and Grabelė meadows (BALSEVIČIUS, 1996).

Other communities from the *Magnocaricion* association are distributed on smaller areas and do not have a significant impact on the vegetation of studied territory. Among these poorly spread communities, the *Caricetum gracilis* (2.11 ha) and *Phalaridetum arundinaceae* (0.74 ha) are distributed on the larger area. These communities are also observed in the wetter habitats but in contrast to *Caricetum elatae*, the communities of these two associations are spread just in marginal part of the swamp where water level is higher than normal. In the peripheral part of the swamp, fragments of the communities of the associations such as *Iridetum pseudacori* (0.38 ha), *Carici-Menyanthetum trifoliatae* (0.11 ha) and *Peucedano-Calamagrostietum canescentis* (0.09 ha) are distinguished too.

Remarkably smaller area (8.08 ha) is occupied by phytocenosis of the *Phragmition* alliance. Among of them, prevalence of *Acoretum calami* (3.67 ha) and *Glycerietum maximae* (3.07 ha) is observed there. These communities are formed in the marginal part of the swamp, and generally, their habitats are inundated by water during summertime. A small plot of the *Phragmitetum australis* (1.34 ha) is distributed alongside Grabelė rivulet.

The communities of Cl. *Molinio-Arrhenatheretea* are distributed on the area of 7.15 ha. All associations, except *Rorripo-Agrostietum*, belong to the *Calthion* alliance. In large areas of Grabelė meadows (4.4 ha), the *Deschampsietum sespitosae* phytocenosis occurrence is observed. Under the influence of absence of meadow treatment, intrusion of uncommon species such as *Cirsium arvense, Epilobium hirsutum* is observed. The community of *Deschampsietum cespitosae* is formed in the very fringe part of the swamp which from the lake side is contiguous with the communities comprised by forbs of helophytes or tall sedges, but from the slope of a lake pothole side it verges with neglected fields and cultivated meadows. The *Carex disticha* community is formed in the similar habitats too (0.55 ha). These communities are from the *Caltion* alliance and can be characterized as moist meadows phytocenosis where *Carex distiha* attains dominance. These phytocenosis has formed under the influence of *Carex disticha* intrusion due to cessation of mowing and grazing of the meadows, which are distributed in marginal part of the swamp. In the peninsula of Epušė, the *Lysimachio vulgaris-Filipenduletum* grassland occurrence is observed on more elevated areas (1.92 ha). Among the *Magnocaricion* alliance, *Rorripo-Agrostietum* community fragment is described in the marginal part of the swamp. This community has formed under the influence of saturation of the *Caricetum distichae* phytocenosis.

The communities belonging to the *Galio-Urticetea* class are distinguished in the area of 0.96 ha. The only one association of the *Epilobietum hirsuti* is located. The communities of this association are formed in disturbed habitats, under the influence of cutting of scrubs and destruction of vegetation mat.

The scrubs

The *Alnetea glutinosae* class is represented by the association of *Salicetum pentandro-cinereae* in Grabelė meadows. The Willow scrub community is distributed in the area of 7.14 ha. The communities of the *Salicetum pentandro-cinereae* association have formed under the influence of colonising the swamp communities from the *Magnocaricion* association by scrubs. Some overgrowths of scrub have been cut off in last years but regeneration successfully took its previous position back. In Grabelė meadows, scrubs are distributed in the area of 7.14 ha and it tots up 6.97 % of investigated territory.

2. The coverage of plant communities

Table 1

The covered areas by plant communities in the peninsula of Epušė and Grabelė meadows.

No.	Plant community	2011		2013	
		Area, ha	%	Area, ha	%
1.	*Peucedano-Calamagrostietum canescentis*	0.09	0.09	0.09	0.09
2.	*Carici-Menyanthetum trifoliatae*	0.11	0.11	0.11	0.11
3.	*Iridetum pseudacori*	0.38	0.37	0.38	0.37
4.	*Carex disticha* community *(Calthion)*	0.55	0.54	0.55	0.54
5.	*Rorippo-Agrostietum*	0.64	0.63	0.64	0.63
6.	*Phalaridetum arundinaceae*	0.74	0.72	0.74	0.72
7.	*Calystegio-Epilobietum hirsuti*	0.96	0.94	0.96	0.94
8.	*Phragmitetum australis*	1.34	1.31	1.34	1.31
9.	*Lysimachio vulgaris-Filipenduletum*	1.92	1.88	1.92	1.88
10.	*Caricetum gracilis*	2.11	2.06	2.11	2.06
11.	*Glycerietum maximae*	3.07	3.00	3.07	3.00
12.	*Acoretum calami*	3.67	3.58	3.67	3.58

13.	*Deschampsietum caespitosae*	4.04	3.95	4.04	3.95
14.	*Caricetum elatae*	4.31	4.21	4.31	4.21
15.	*Salicetum pentandro-cinereae*	7.14	6.97	7.14	6.97
16.	*Carex lasiocarpa* community *(Magnocaricion)*	9.03	8.82	9.03	8.82
17.	*Caricetum appropinquatae*	9.03	8.82	9.03	8.82
18.	*Thelypteridi-Phragmitetum*	22.89	22.35	22.89	22.35
19.	*Caricetum distichae*	30.38	29.67	30.38	29.67
	Total:	102.40	100.00	102.40	100.00

4. The coverage of vegetation classes

Table 2

The coverage of plant communities belonging to the different vegetation classes in the peninsula of Epušė and Grebelė meadows

Vegetation class	**2011**		**2013**	
	Area, ha	**%**	**Area, ha**	**%**
Galio-Urticetea	0.96	0.94	0.96	0.94
Alnetea glutinosae	7.14	6.97	7.14	6.97
Molinio-Arrhenatheretea elatioris	7.15	6.98	7.15	6.98
Phragmito-Magnocaricetea	87.15	85.11	87.15	85.11
Total:	102.40	100.00	102.40	100.00

5. Compendium of plant communities

ALNETEA GLUTINOSAE Braun-Blanquet et Tüxen 1943
- *Alnetalia glutinosae* Tüxen 1937
  - *Alnion glutinosae* (Malc. 1929) Meijer Drees 1936
    - *Salicetum pentandro-cinereae* (Almquist 1929) Passarge 1961

MOLINIO-ARRHENATHERETEA ELATIORIS Tüxen 1937
- *Molinietalia caeruleae* Koch 1926
  - *Calthion palustris* Tüxen 1937
    - *Carex disticha* bendrija
    - *Deschampsietum cespitosae* Horvatić 1930
    - *Lysimachio vulgaris-Filipenduletum* Balátová-Tuláčková 1978
- *Trifolio fragiferae-Agrostietalia stoloniferae* Tüxen 1970
  - *Agropyro-Rumicion crispi* Nordhagen 1940 em. Tüxen 1950
    - *Rorippo-Agrostietum* (Moor 1958) Oberdofer et Th. Müller 1961

PHRAGMITO-MAGNOCARICETEA Klika in Klika et Novák 1941
- *Phragmitetalia* Koch 1926
  - *Magnocaricion* Koch 1926
    - *Caricetum appropinquatae* Aszód 1935
    - *Caricetum distichae* Nowiński 1927
    - *Caricetum gracilis* Savič 1926
    - *Caricetum elatae* Koch 1926
    - *Carex lasiocarpa* bendrija

Carici-Menyanthetum trifoliatae Soó 1955
Phalaridetum arundinaceae Libbert 1931
Peucedano-Calamagrostietum canescentis Simon 1960
Iridetum pseudacori Eggler 1933
Thelypteridi-Phragmitetum Kuiper ex van Donselaar et al. 1961
Phragmition Koch 1926
Acoretum calami Dagys 1932
Glycerietum maximae Nowiński 1930
Phragmitetum australis Savič 1926
GALIO-URTICETEA Passarge ex Kopecký 1969
Convolvuletalia sepium Tüxen 1950
Convolvulion sepium Tüxen 1947
Calystegio-Epilobietum hirsuti Hilbig et al. 1972

6. Brief characterizations of plant communities

Salicetum pentandro-cinereae

1. Physiognomy. Willow scrubs in marshy habitats are dominated by *Salix cinerea* and species such as *S. myrsinifolia, S. pentandra* flourish there too. The canopy of scrubs is dense, therefore a herb layer is scarce.
2. Coverage of shrubs. Generally, these communities form a dense canopy and its projection coverage is up to 100 %.
3. Tussocks. No tussocks are observed.
4. Stability. In third contour, communities are stable and have a characteristic species composition but in contour No. 8, these plant communities are formed by chaotic species and an abundance of nitrophytes is observed there. In this area, scrubs were removed some years ago but regenerated quickly, and due to destruction of soil table, species composition is changed.
5. Variations of species composition. The species composition of the regenerated plant communities vary from the communities, which are formed naturally or still in progress of development. There are more nitrophylous plant species and nitophytes cenopopulations attain abundance in the regenerating plant communities.
6. Successions, reasons and tendency. The plant communities have formed under the influence of cessation of mowing of sedges vegetation. These communities have a tendency to extend in the area because of absence of mowing of sedge vegetation around them. The *Salicetum pentandro cinereae* is a stadial community. Under process of succession, a tree layer will be formed (usually by *Betula pubescens*), which in turn will give a way to a woodland community of the *Carici elongatae-Alnetum* association.
7. Farming and intensity. In third contour, farming activities are not applied. In contour No. 8 scrubs were removed some years ago.
8. The key factors in the development of community. No treatment activities.

***Carex disticha* community (*Calthion*)**

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in springtime and *Carex disticha* attains dominance there. Despite that physiognomy of the community is very similar to *Caricetum distichae* physiognomy, characteristic species belonging to the class of *Molinio-Arrhenatheretea* are as dominants in this species-rich phytocenosis. Plant community is not numerous in hygrophilous species but

some like *Equisetum fluviatile* and *Peucedanum palustre* are observed. For these reasons, the communities cannot be ascribed to the class of *Phragmito-Magnocaricetea*.

2. Coverage of shrubs. The communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. These plant communities are stadial. In a marginal part of the swamp, they replaced *Deschampsietum cespitosae* plant community due to cessation of grazing and mowing.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Under the influence of cassation of grazing and mowing, these communities have replaced the *Deschampsietum cespitosae* grassland in peripheral habitats of the swamp where water level is minimal during springtides. The communities of the *Deschampsietum cespitosae* grassland, from the lake side, are contiguous with *Caricetum distichae* sedge community which is confined to wetter habitats and characteristic meadow species are spread there sporadically. Therefore, in adjacent habitats flourished *Carex disticha* had a tendency to spread into meadows too. Without having been mowed, these marginal swamp meadows will be invaded by Willow scrubs. Most likely, changing of non-land treatment to mowing and grazing, succession may be deflected to *Deschampsietum cespitosae* grassland community, but this process also depends on hydrological regime in habitat.
7. Farming and intensity. Grazing in some places.
8. The key factors in the development of community. No treatment activities.

Deschampsietum cespitosae

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in springtime and *Deschampsia cespitosa, Carex nigra, Persicaria amphibia, Equisetum palustre, Geum rivale, Potentilla anserina, Agrostis stolonifera* and *Eleocharis uniglumis* are prominent there. Rather plenty of hygrophytes such as: *Equisetum fluviatile, Carex vulpina, Epilobium palustre, Lycopus eurupaeus, Galium palustre, Scutellaria gelericulata* and *Solanum dulcamara* occur there.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. The area is poor in tussocks, which are formed by *Deschampsia cespitosa.*
4. Stability. The key factor in the development of the community is fated not just by grazing, but also by long inundation by water, during springtides, which had a great impact on the plant community formation in Grabelė meadows. As long as these communities vegetation are mown, these phytocenosis are quite stable and have a characteristic species composition. But in recent years, water level of the lake had been raisin higher than usual, therefore it has affected communities' species composition – more hygrophilous species found their niche there.
5. Variations of species composition. Variations are not established because communities are spread in very similar habitats, besides, not in all areas some kind of treatment is applied.
6. Successions, reasons and tendency. The *Deschampsietum cespitosae* grassland is distributed in the very fringe part of the swamp, which from the lake side is contiguous with the communities comprised by forbs of helophytes or tall sedges, but from the slope of a lake pothole side it verges with neglected fields and cultivated meadows. These communities have formed under the influence of grazing in less flooded marginal parts of the swamp, but their formation, also, is influenced by a long-term inundation by water during springtime, because *Deschampsia cespitosa* is a species, which tolerates both: inundation by water and prolonged trampling. At present, vegetation of these communities is not mown and grazed, therefore nitrophylous species such as *Cirsium arvense, Sonchus arvensis* and *Urtica dioica* are constant there. Due to the absence of grazing and mowing, these plant communities will be overgrown by scrubs, and in plots which verge with *Caricetum distichae* community, transformation to *Carex disticha* communities (*Calthion*) will be started. Under constantly higher water level than normal, most likely, these phytocenosis will be replaced by tall sedge communities.
7. Farming and intensity. Mowing and grazing treatment is not applied.

8. The key factors in the development of community. Grazing and flooding.

Lysimachio vulgaris-Filipenduletum

1. Physiognomy. These plant communities are confined to areas where habitats are reached by tide water just in springtime, and *Filipendula ulmaria* predominates there. In the communities' composition, other species such as: *Geum rivale, Phleum pratense, Deschampsia cespitosa, Galium verum, Potentilla anserine* and *Stachys palustris* attain dominance there as well.
2. Coverage of shrubs. The communities are slightly covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. The communities are stadial. Their species composition is heterogeneous and some nitrophytes, especially like *Cirsium arvense, Anthriscus sylvestris, Urtica dioica* occur there. Most likely, these communities have formed by replacing *Deschampsietum cespitosae*, under the influence of cessation of grazing and mowing, because of *Deschampsia cespitosa* is still an abundant component in these phytocenosis species composition. These fluctuations proceeded more than 50 years because *Lysimachio vulgaris-Filipenduletum* communities were described just in peninsula of Epušė, where due to reservation regime, during this time span, no farming treatment was applied.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Most likely, these communities have formed by replacing *Deschampsietum cespitosae*, under the influence of cessation of grazing and mowing. In the communities single *Frangula alnus* shrubs are observed.
7. Farming and intensity No farming treatment activities.
8. The key factors in the development of community. Cessation of mowing and grazing.

Rorippo-Agrostietum

1. Physiognomy. Sparse in species meadow communities are constantly flooded by water and formed by dwarfish mat plants. In the community *Agrostis stolonifera* dominates.
2. Coverage of shrubs. No scrub layer.
3. Tussocks. No tussocks are observed.
4. Stability. A stadial community.
5. Variations of species composition. Not established.
6. Successions, reasons and tendency. These communities replaced a saturated with water *Caricetum distichae* plant community. They are distributed in small area and are found with tangles of *Carici-Menyanthetum* and *Caricetum distichae* phytocenosis. Under decreasing of water level, the formation of sedge community starts and most likely of *Caricetum distichae* community.
7. Farming and intensity No farming is applied.
8. The key factors in the development of community. Saturation with water of sedge community, because of water level is raised.

Caricetum appropinquatae

1. Physiognomy The community of *Carex appropinquata* predominates, but according to other plant communities formed by tall sedges, there is a rather great bunch of species like *Carex disticha, Potentilla palustris, Lysimachia vulgaris, Iris pseudacorus, Calamagrostis stricta, Cirsium palustre, Peucedanum palustre* and *Geum rivale* in this plant community. Besides, this community is richer in species. A typical conformation covered by tussocks is formed by plant communities' edificator *Carex appropinquata*, therefore plants of one ecological group thrive on the tussocks and others – among them.
2. Coverage of shrubs. The communities are covered by shrubs in some places.
3. Tussocks. Tussocks are formed by *Carex appropinquata.*

4. Stability. Under constant hydrological conditions, plant communities remain quite stable.
5. Variations of species composition. *Carex lasiocarpa* and *C. disticha* flourish at intervals.
6. Successions, reasons and tendency. The communities as well as *Caricetum distichae* have formed in periodically flooded habitats and their intermixed with *Caricetum distichae* occur. In mid-summer water stands above the soil surface and ecotops are seldom flooded. Communities without mowing for a long time have a tendency to be overgrown by shrubs of *Salix* genus.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Periodical inundation of habitats by water and partly – mowing.

Caricetum distichae

1. Physiognomy. Overgrowths composed by *Carex disticha* monodominants.
2. Coverage of shrubs. The plant communities are covered by shrubs in some places.
3. Tussocks. No tussocks are observed.
4. Stability. Under the influence of stable hydrological and farming conditions, communities are stable, however, due to absence of mowing, the stands of the community are invaded by shrubs and in some places by Reeds.
5. Variations of species composition. In all plots the composition of species is alike.
6. Successions, reasons and tendency. Very wildly spread plant communities in the peninsula of Epušė and Grabelė meadows are formed on slightly elevated and less flooded areas. In contour 20, the *Caricetum distichae* community occur with tangles of *Caricetum appropinquatae* and *Carex lasiocarpa* plant communities. All these communities are formed in the same habitats and often their areas overlap due to formation of a wide ecotone belt where two or three communities' characteristic species, mentioned above, are dominants, therefore we do not have the answer about which of the communities spread further in the area, and which, on the contrary, wilt. Otherwise the situation is in contour 7, where *Caricetum distichae* is distributed on the whole area. However, in 1960, the *Caricetum rostratae* community predominated there, and at present, it is observed neither in the peninsula of Epušė nor in Grebelė meadows (MALAKAUSKIENĖ, 1968). Under the influence of raised water level of the Žuvintas lake, just after 2 years, i.e., in 2011, in the *Caricetum distichae* community, *Carex rostrata* attained dominance there, though in 1996, it was not observed in the communities (BALSEVIČIUS, 1996). Thus, it is most likely, that due to the raising of the water level, *Caricetum rostratae* might be replaced by *Caricetum distichae*.
7. Farming and intensity. Absence of mowing.
8. The key factors in the development of community. Fluctuations of hydrological regime and applying of mowing activities.

Caricetum gracilis

1. Physiognomy. Sparse in species *Carex acuta* overgrowths composed by monodominants are distributed in the permanently flooded marginal parts of the swamp.
2. Coverage of shrubs. Community is not covered by shrubs.
3. Tussocks. Tussocks are not observed.
4. Stability. Like *Caricetum distichae*, under stable hydrological and farming conditions, these communities are stable too.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Communities patchily distributed in a marginal part of the swamp, where along with *Acoretum calami* and *Glycerietum maximae* communities comprise a vegetation mosaic, but in less flooded habitats, are observed with tangles of the *Phalaridetum arundinaceae* community. During the investigations, in 1996, there these plant phytocenosis were described neither in Grabelė meadows nor in the peninsula of Epušė (BALSEVIČIUS, 1996). It is most likely, that occurrence of the community was fated by raised water level during last time.

7. Farming and intensity. No management treatment.
8. The key factors in the development of community. Fluctuations of hydrological regime.

Caricetum elatae

1. Physiognomy. Phytocenosis are formed by monodominant tussock *Carex elata* on the lakesides of Žuvintas.
2. Coverage of shrubs. Community is not covered by shrubs due to water level is too high. Tussocks. Tussocks are formed by *Carex elata.*
3. Stability. Under the constant hydrological conditions, communities are quite stable, but since 1960, drastic declining of community areas has been observed (MALAKAUSKIENĖ, 1968).
4. Esant pastovioms hidrologinėms sąlygoms, bendrijos gana stabilios, tačiau nuo 1960 metų jų plotai drastiškai sumažėjo (MALAKAUSKIENĖ, 1968).
5. Variations of species composition. Species composition is very similar in all areas.
6. Successions, reasons and tendency. These plant communities are formed in the permanently flooded habitats like *Caricetum gracilis*, but *Caricetum gracilis* community inhabits marginally flooded parts of the swamp, whereas *Caricetum elatae* – on flooded shores of the lake. Compared with 1960, when plant communities had formed a wide and unimodal vegetation belt just behind the lakeside Reeds, they are currently distinguished only in the peninsula of Epušė. The lakeshore plant communities of the *Caricetum elatae* have been replaced by overgrowths of *Thelypteridi-Phrgamitetum*.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Permanent flooding of the habitats and mowing.

Carex lasiocarpa* community *(Magnocaricion)

1. Physiognomy. These monodominant plant communities of *Carex lasiocarpa* with green mosses are formed in the central part of the swamp around the lake of Žuvintas. Traditionally, the communities formed by *Carex lasiocarpa* were ascribed to the *Caricion lasiocarpae* alliance of the *Scheuchezerio-Caricetea fuscae* class. The plant communities formed by *Carex lasiocarpa* are confined to the habitats of acidic reaction, and within bryophytes layer *Spagnum* species attain dominance. Communities distributed in habitats of neutral and alkaline reactions are ascribed to other different sub-associations of *Caricetum lasiocarpae*. Thus, this association was well-known, whereas plant communities of the different habitats with different plant species within their composition were ascribed to it. The only link to this syntaxon is an ascendancy of *Carex lasiocarpa*. Therefore, that approach is at variance with principals of the classification of vegetation, and absolutely different phytocenosis cannot be assigned to one association. In previous work (BALSEVIČIUS, 1996), a community of slender sedge was also ascribed to the association of *Caricetum lasiocarpae* in the peninsula of Epušė. In recent years, plant communities formed by *Carex lasiocarpa* in habitats of neutral reaction are ascribed by European phytocenologists to the association of *Peucedano-Caricetum lasiocarpae* belonging to the *Magnocaricion* alliance. In order to avoid confusion in accepted traditional classification of Lithuania wetland vegetation, communities of wetland vegetation, in this work, are treated as phytocenon (rankless syntaxon) – Carex lasiocarpa community.
2. Coverage of shrubs. The plant communities are covered by shrubs in some places.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant hydrological and farming conditions, these communities are stable but due to absence of mowing, they are tend to be overgrown by shrubs or in some places by Reeds. Variations of species composition. The species composition is similar in all area.
5. Successions, reasons and tendency. In the peninsula of Epušė, these plant communities are formed on slightly elevated and less flooded sites. In contour 20, the plant communities occur

as mosaics with *Caricetum distichae* and *Caricetum appropinquatae*. All these plant communities are formed in the same habitats and often their areas are overlapped by forming wide belts of ecotones and two or three, described above, characteristic species of the communities are prevalent there. For this reason, there is no data about which of the communities are expanding and which are declining in the area.

6. Farming and intensity. No management activities.
7. The key factors in the development of community. Stability of hydrological regime and mowing.

Carici-Menyanthetum trifoliatae

1. Physiognomy. Sparse in species, dwarfish plant communities of the swamp are distributed in the permanently flooded areas, where in herb layer *Menyanthes trifoliata* prevails.
2. Coverage of shrubs. The plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. These communities are stadial.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Under the influence of saturation of *Caricetum distichae* vegetation, these communities are formed by colonising exposed places. The plant communities are distinguished with tangles of *Rorripo-Agrostietum* and *Caricetum distichae* in small area. Under the influence of lowered water level, formation of sedge community starts, and most likely, the *Caricetum distichae* may take a place.
7. Farming and intensity. No farming treatment.
8. The key factors in the development of community. Saturation of sedge vegetation, under the influence of higher water level than normal.

Phalaridetum arundinaceae

1. Physiognomy. Sparse in species *Phalaroides arundinacea* overgrowths composed by monodominants are distributed in the permanently flooded marginal parts of the swamp.
2. Coverage of shrubs. The plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant hydrological and farming conditions, these communities are stable.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. These plant communities are distinguished with tangles of *Acoretum calami*, *Glycerietum maximae* and *Caricetum gracilis* in small marginal plots of the swamp, whereas in less flooded habitats, occur as mosaics with *Caricetum distichae* community. In last years, these communities area expanded by replacing *Caricetum distichae* plant community.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Fluctuations of hydrological conditions.

Peucedano-Calamagrostietum canescentis

1. Physiognomy. Sparse in species monodominant overgrowths of *Calamagrostis canescens* are formed in less flooded marginal parts of the swamp.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant hydrological and farming conditions, these communities are stable.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Just a small fragment is described in marginal part of the swamp, therefore due to lack of data it is unable to predict trends of succession.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Are not established.

Iridetum pseudacori

1. Physiognomy. Monodominant overgrowths of *Iris pseudacorus* are located just in one site on the margin of the swamp.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant hydrological and farming conditions, these communities are stable.
5. Variations of species composition. Variations are not established because of just one area of the community is located.
6. Successions, reasons and tendency. These communities are distributed in the similar habitats as well as *Caricetum gracilis*, *Acoretum calami* and *Glycerietum maximae*, and these plant communities occur intermixed with them too.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Are not established.

Thelypteridi-Phragmitetum

1. Physiognomy. A wide vegetation belt is formed by monodominant overgrowths of *Pragmites australis* with a quite abundance or abundance intermixes of sedge in the lakeside of Žuvintas.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant conditions, these communities are stable and expand in the area quickly.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The communities have formed in the lakeside under the influence of absence of farming activities. A rapid invasion of the community to the areas covered by sedges is observed. Due to regular mowing of vegetation, sedges regeneration may be expected.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Cessation of mowing.

Acoretum calami

1. Physiognomy. Monodominant overgrowths of *Acorus calamus* are located just in several sites on the margin of the swamp.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant hydrological and farming conditions, these communities are stable.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The community have formed on the margin of the swamp, under the influence of steady floods. These plant communities as well as *Caricetum gracilis*, *Iridetum pseudacori* or *Glycerietum maximae* thrive in similar habitats and their vegetation mosaic occur there. In the 1996-ties, this plant community was not registered in Grabelė meadows (BALSEVIČIUS, 1996).
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Variations of hydrological regime (more intensive flooding of habitats).

Glycerietum maximae

1. Physiognomy. Monodominant overgrowths of *Glyceria maxima* are formed on the margin of the swamp.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant hydrological and farming conditions, these communities are stable.
5. Variations of species composition. Variations are not established.

6. Successions, reasons and tendency. The community have formed on the margin of the swamp, under the influence of steady floods. These plant communities as well as *Caricetum gracilis, Iridetum pseudacori, Acoretum calami* or *Phalaridetum arundinaceae* thrive in similar habitats.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Variations of hydrological regime (more intensive flooding of habitats).

Phragmitetum australis

1. Physiognomy. Monodominant overgrowths of *Phragmites australis* are formed near the Grabelė rivulet.
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Under constant conditions, these communities are stable and expand in the area quickly.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. These communities have formed in flooded habitats near the Grabelė rivulet, under the influence of absence of farming activities. Due to regular mowing of vegetation, sedges regeneration may be expected.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Cessation of mowing and partly – flooding of habitats.

Calystegio-Epilobietum hirsuti

1. Physiognomy. Nitrophylous tall forb communities are formed due to elimination of scrubs and disturbance of soil surface. These communities are dominant with *Epilobium hirsutum* and *Urtica dioica.*
2. Coverage of shrubs. Plant communities are not covered by shrubs.
3. Tussocks. No tussocks are observed.
4. Stability. Communities are stadial.
5. Variations of species composition. Phytocenosis of similar species composition.
6. Successions, reasons and tendency. Communities are formed in disturbed habitat. Their succession trends are vague.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Soil surface disturbance and elimination of scrubs.

7. Suitable plant communities for the Aquatic Warbler

The Aquatic Warbler (*Acrocephalus paludicola*) is found neither in Grabelė meadows nor in the peninsula of Epušė.

The bird has been observed in the *Caricetum elatae* in Dambavaragis meadows, therefore it may be found in the same communities here too. In the peninsula of Epušė, the *Caricetum elatae* is distributed in the area just of 4.31 ha and, most likely, it is too small for the Aquatic Warbler to breed.

In the *Caricetum gracilis, Caricetum distichae* and *Phalaridetum arundinaceae* communities this bird has been found in Šyša polder. However, in Grabelė meadows, the areas of both *Caricetum gracilis* and *Phalaridetum arundinaceae* is very fragmented and, moreover, they are flooded permanently by water.

The *Caricetum distichae* is distinguished in large unimodal areas (contour 7; 14.68 ha) or occurs as a mosaic with the *Caricetum appropinquatae* and *Carex lasiocarpa* (*Magnocaricion*) (contour 20; 30.11 ha) in Grabelė meadows. Theoretically, these plant communities should also be

suitable for the Aquatic Warbler to breed. In Belarus, the Aquatic Warbler is found in the *Caricetum appropinquatae* as well as in the communities formed by *Carex lasiocarpa* (KOZULIN, FLADE, 1999).

8. Suitable parts of the territory for the Aquatic Warbler to breed

Whole part of the area which is not overgrown by Reeds would be suitable for the Aquatic Warbler If we consider that suitable areas for the bird to breed may theoretically be the purest areas of the *Caricetum distichae* and of the *Caricetum distichae* with tangles of the *Caricetum appropinquatae* and *Carex lasiocarpa* (*Magnocaricion*), by the same token the largest Grabelė meadows' part might be potentially suitable too (contours 7 and 20). Beside, these two meadow parts are divided by the Grabelė rivulet which is overgrown by stands of *Phragmitetum australis.*

8. Not suitable (or still enough suitable but with unfavourable trends of succession) plant communities for the Aquatic Warbler and reasons of unfavourable successions

The communities from the classes of the *Molinio-Arrhenatheretea* and *Galio-Urticetea* are not preferred breeding grounds of this bird at all. The former class communities are formed in less flooded of mid moisture habitats. The latter – in the wetter but in the most mechanically disturbed habitats (by digging of ponds and eliminating of scrubs). Thus, the management of the areas occupied by these communities is not of primary importance.

Also, due to bulk of floods, plant communities from the *Phragmition* alliance are not suitable for the Aquatic Warbler. The vegetation of overgrowths of the *Phragmitetum australis* around the Grabelė rivulet is in urgent need of mowing because the territory is defragmented by them.

Under applying measures for nature management and being in anticipation for regeneration of sedge communities, which are suitable for the Aquatic Warbler to breed, the scrubs of the *Salicetum pentandro-cinereae* require immediate removal as well as overgrowths of reeds of the *Thelypterido-Phragmitetum* treatment of mowing. The sedgy area has been replaced by these two communities. Especially, potential of the *Thelypterido-Phragmitetum* is of great importance because they succeeded *Caricetum elatae* and only in these plant communities of the Žuvintas Wetland, the Aquatic Warbler has been observed. Just 15 years ago, a wide and unimodal belt of these communities were spread in parallel with the Žuvintas lakeside Reeds (BALSEVIČIUS, 1996).

The *Caricetum distichae, Caricetum appropinquatae* and *Carex lasiocarpa* communites have also unfavourable features, due to their coverage of scrubs. By the way, in large areas where scrubs were removed, an intensive regeneration is observed.

9. Recommendations on management of the territory forming suitable plant communities for the Aquatic Warbler

The vegetation in Grabelė meadows and Epušė peninsula has formed under the influence of both environmental and anthropogenic factors. The key environmental factors which have fated the distribution of vegetation are soil richness and, especially, regime of moisture. The factor of inundation can be considered as of anthropogenic origin because duration of habitats' inundations influenced by spring tides and after them or after excess rainfall, also, partly depends on regulations of water level in the Žuvintas Lake. Other man-induced factors of great importance are mowing and grazing. The mowing of vegetation is very important factor in order to maintain plant communities, whereas heavy grazing – can be treated as more communities changing factor.

During decades no farming activities were underway in the greater part of the territory, therefor distribution of the vegetation is changed and apart this, communities are overgrown by scrubs and their species composition is altered too.

In order to form suitable plant communities for the Aquatic Warbler to breed in Grabelė meadows and the peninsula of Epušė, we have to pay attention to the intensiveness of mowing as well as to favourable duration of floods and their intensiveness too.

The scrub communities must be removed from the territory and according to robustness of browses, they must be eliminated each year and at least for 3–5 years, otherwise scrubs will regenerate during two years and form a denser canopy. Cleaned from scrubs areas must be mown each year and hay must be taken away from there too.

The mowing of the vegetation of the *Thelypterido-Phragmitetum* must be started immediately being in anticipation for the *Caricetum elatae* regeneration because this community is the most suitable for the Aquatic Warbler to breed. In order to achieve an efficient result, the mowing must be applied not less than 2 years whilst cenopopulation of the *Phragmites australis* will be withered. In order to overturn defragmentation of the territory, the covered shores by Reeds of the Grabelė rivulet must be mown (*Phragmitetum australis*). It must be taken into consideration that habitats of the Grabelė rivulet shores are flooded by water therefor it is a complicated task to do, whereas mowing in winter allows us to take away just a grass biomass and rarefy stand of the community.

Other sedgy areas must be mown each year or every other year. Furthermore, those areas where scrubs have been removed, the mowing should be preceded each year whilst they stop to regenerate themselves.

We recommend mowing in the following contours: 2, 4, 8, 9, 13, 14, 15, 17, 19, 21, 23, and 25. The vegetation of the communities belonging to the class of *Molinio-Arrhenatheretea* may be mown or grazed extensively on the margin of the swamp.

10. Vegetation changes during 2011–2013

The farming activitites were applied but only after investigations of vegetation in September in Grabelė meadows and Epušė peninsula. The marginal swamp *Carex disticha* communites (*Calthion*) vegetation, as annualy, has been grazed. Cl. *Phragmito-Magnocaricetea* plant ommunities were mowed in 2013. Under the influence of constant hydrologiacal conditions, vegetation has not altered during two years. The influence of mowing to vegetation could be assessed just in 2015. Therefore, only visual communities' evaluation has been carried out.

Salicetum pentandro-cinereae scrubs as well as their off shoots were eliminated. In *Salicetum pentandro-cinereae* shrubs of quite a chaotic species composition, growing *Salix* offshoots, which, after being eliminated, still regrow. These regenerated overgrowths are still needed to be classified as *Salicetum pentandro-cinereae* communities untill offshoots of *Salix* scrubs wither and won‘t regenerate.

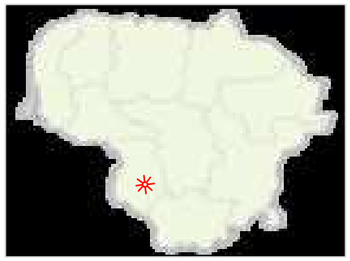
Ass. *Caricetum distichae* (30.38 ha) and Ass. *Thelypteridi-Phragmitetum* (22.89 ha) from the *Phragmito-Magnocaricetea* (87.15 ha) class remained as dominants. Plots of these associations' communities left stable in size and configuration. Also, no alteration is observed in communities' species composition and abundance.

11. Literature

BALSEVIČIUS A., 1996: Kiaulyčios pelkės botaninė įvairovė. Rankr., dep. Gamtos tyrimų ir ekologinio švietimo stotyje, Nr. B96-05. – Marijampolė.

KOZULIN A., FLADE M., 1999: Breeding habitat, abundance and conservation status pf the Aquatic Warbler *Acrocephalus paludicola* in Belarus. – Vogelwelt, 120: 97–111.

MALAKAUSKIENĖ O., 1968: Geobotaničeskij obzor nizinnovo bolota Žuvintas. – In: ZAJANČKAUSKAS P. (ed.), Zapoviednik Žuvintas. – Vilnius.



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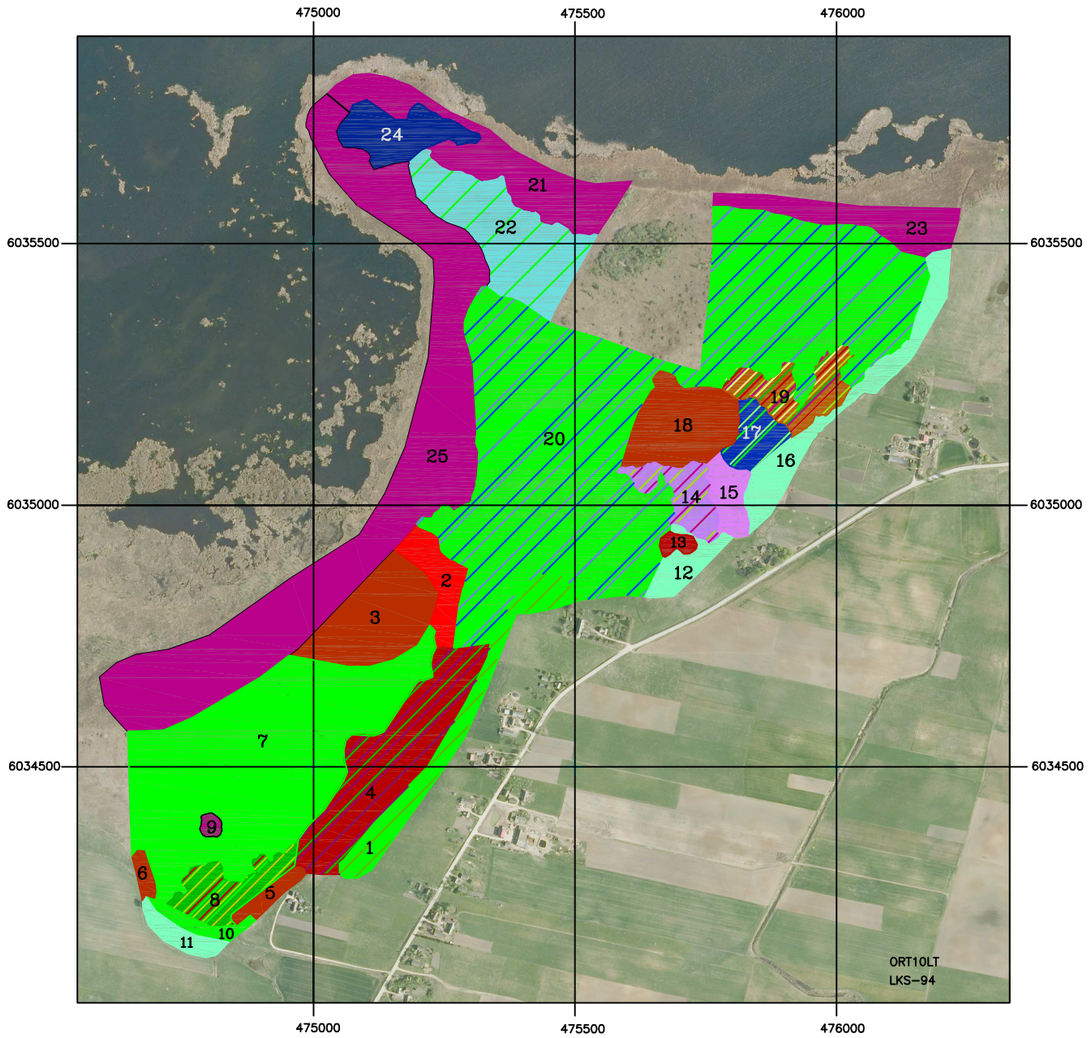


AIŠKINAMIEJI ŽENKLAI

Augalų bendrija	*Spalva*	*Spalvos kodas*
Salicetum pentandro-cinereae		*24*
Acoretum calami		*226*
Phragmitetum australis		*10*
Rorippo-Agrostietum		*164*
Deschampsietum cespitosae		*111*
Lysimachio vulgaris-Filipenduletum		*166*
Glycerietum maximae		*14*
Carex disticha bendrija (*Calthion*)		*74*
Caricetum distichae		*90*
Caricetum gracilis		*94*
Iridetum pseudacori		*34*
Phalaridetum arundinaceae		*62*
Thelypteridi-Phragmitetum		*224*
Carici-Menyanthetum trifoliatae		*91*
Carex lasiocarpa bendrija (*Magnocaricion*)		*163*
Caricetum appropinquatae		*160*
Peucedano-Calamagrostietum canescentis		*61*
Caricetum elatae		*133*
Calystegio-Epilobietum hirsuti		*201*

The project “Securing Sustainable Farming to Ensure Conservation of Globally Threatened Bird Species in Agrarian Landscape (Baltic Aquatic Warbler)“ (**LIFE09NAT/LT/000233**) is co-financed by the European Union LIFE+ Programme, Republic of Lithuania, Republic of Latvia and the project partners

Project partners:

Station of Nature Research and Environmental Education

MONITORING REPORT
(2011–2013)

DIVERSITY, DISTRIBUTION OF VEGETATION AND SUITABILITY FOR BREEDING OF THE AQUATIC WARBLER IN ISLAND SALA

Head of work group dr. Arūnas Balsevičius
Work group: Ričardas Narijauskas
Map designer Andželika Blockuvienė
Translator Ričardas Narijauskas

Marijampolė, 2011-2013

1. The general overview of vegetation characteristic

The vegetation of island consists of communities from 2 associations.

The grassland

The vegetation of island belongs to the *Magnocaricion* alliance of the *Phragmito-Magnocaricetea* class. Prevailing *Thelypteridi-Phragmitetum* community (9.64 ha) is distributed in the peripheral island parts. The *Caricetum elatae* communities (0.85 ha) have formed in slightly elevated areas in the central part of the island Sala.

2. *The coverage of plant communities*

Table 1

The covered areas by plant communities in the island Sala

Plant community	2011		2013	
	Area, ha	%	Area, ha	%
Caricetum elatae	0.85	8.11	0.85	8.11
Thelypteridi-Phragmitetum	9.64	91.89	9.64	91.89
Total:	10.48	100	10.48	100

3. *The coverage of vegetation classes*

Table 2

The coverage of plant communities belonging to the different vegetation classes in the island Sala

	2011		2013	
Vegetation class	Area, ha	%	Area, ha	%
PHRAGMITO-MAGNOCARICETEA	10.48	100	10.48	100

4. *Compendium of plant communities*

Phragmito-Magnocaricetea Klika in Klika et Novák 1941
- *Phragmitetalia*
  - *Magnocaricion* Koch 1926
    - *Caricetum elatae* Koch 1926
    - *Thelypteridi-Phragmitetum* Kuiper ex van Donselaar et al. 1961

5. *Brief characterizations of plant communities*

Caricetum elatae

1. Physiognomy. Phytocenosis are formed by monodominant tussocks *Carex elata* in the mid part of the island.
2. Coverage of shrubs. Community is not covered by shrubs because of the water level is too high.
3. Tussocks. Tussocks are formed by *Carex elata*.
4. Stability. Under the constant hydrological conditions, communities are quite stable.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Encroachment of reeds.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Permanent flooding and mowing of the habitats.

Thelypteridi-Phragmitetum

1. Physiognomy. A wide vegetation belt is formed by monodominant overgrowths of *Pragmites australis* with a quite abundance or abundance intermixes of *Thelypteris palustris* or sedge in the peripheral island parts.
2. Coverage of shrubs. The communities are not covered by shrubs.
3. Tussocks. Absence of tussocks.
4. Stability. Under constant conditions, these communities are stable and expand in the area.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The communities have formed under the influence of absence of farming activities. An invasion of the community to the areas covered by sedges is observed. Due to regular mowing of vegetation, sedges regeneration may be expected.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Cessation of mowing.

6. Suitable plant communities for the Aquatic Warbler

The Aquatic Warbler has not been located in the island. Favourable *Caricetum elatae* community plot is too small (0.85 ha) for the Aquatic Warbler to breed.

7. Suitable parts of the territory for the Aquatic Warbler to breed

All the island territory is unsuitable for the Aquatic Warbler to breed.

8. Unsuitable (or still enough suitable but with unfavourable trends of succession) plant communities for the Aquatic Warbler and reasons of unfavourable successions

Under applying measures for nature management and being in anticipation for regeneration of sedge communities, which are suitable for the Aquatic Warbler to breed, the

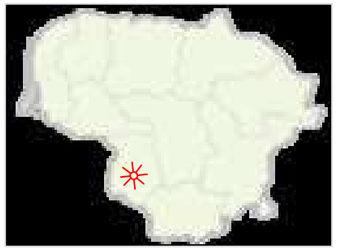
overgrowths of reed of the *Thelypterido-Phragmitetum* community require immediate mowing. The *Caricetum elatae* has been replaced by this community.

9. Recommendations on management of the territory forming suitable plant communities for the Aquatic Warbler

Immediate mowing of the *Thelypterido-Phragmitetum* community vegetation is required in order to regenerate vegetation of the *Caricetum elatae* communities, which are suitable for the Aquatic Warbler to breed. In order to achieve an efficient result, the mowing must be applied not less than 2 years whilst coenopopulation of the *Phragmites australis* will be withered.

10. Changes of vegetation during 2011–2013

In island territory no farming actives were applied, hydrological conditions left the same, therefore island vegetation changes were not determined during 2 years of investigations. The plant communities of the association of the *Thelypteridi-Phragmitetum* and *Caricetum elatae* from the *Phragmito-Magnocaricetea* class remained as dominant. Plots of these associations' communities left stable in size and configuration. Also, no fluctuation is observed in communities' species composition and abundance.



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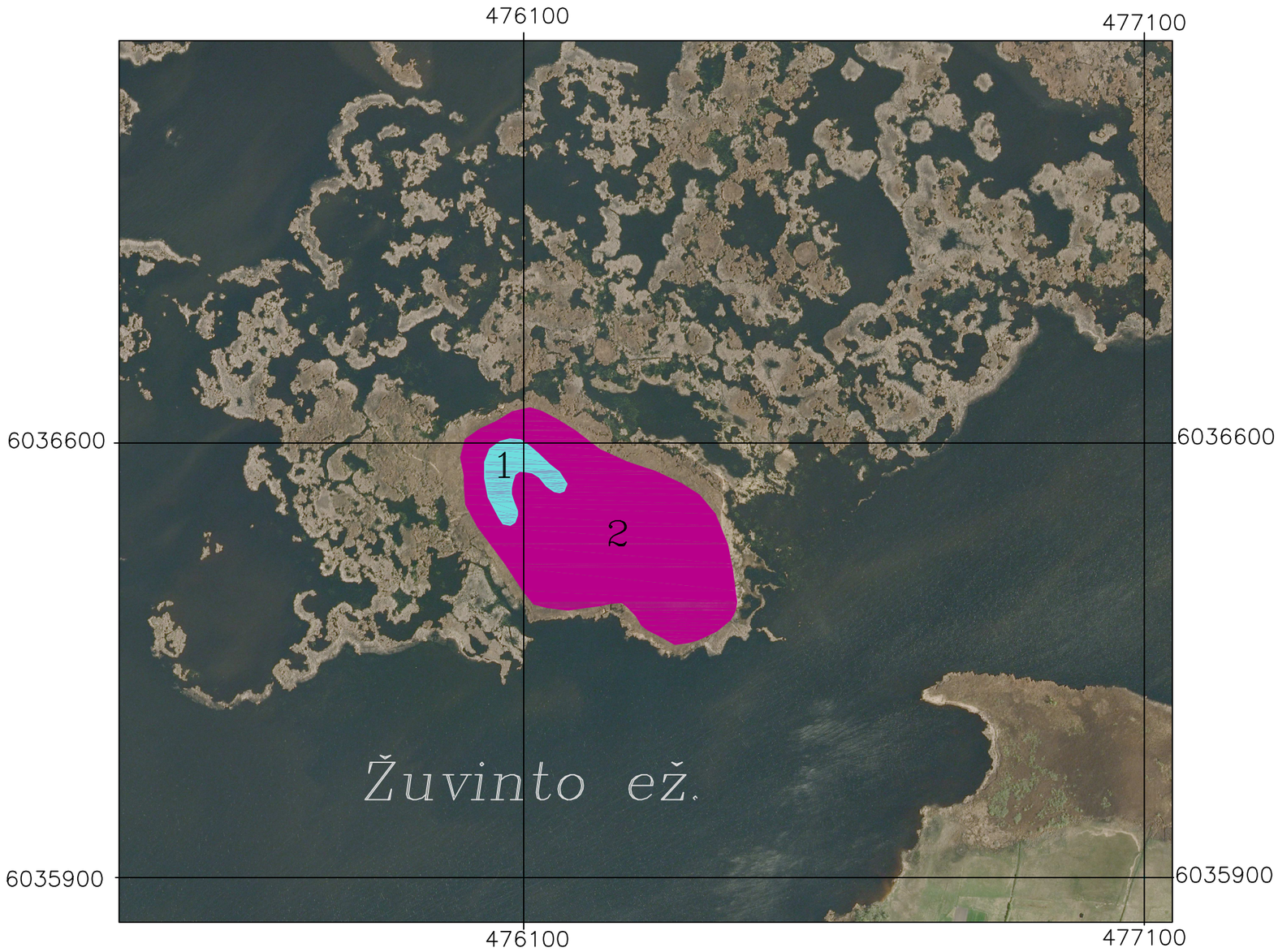
2011-2013



Augalų bendrija	*Spalva*	*Spalvos kodas*
Thelypteridi-Phragmitetum		*224*
Caricetum elatae		*133*

The project "Securing Sustainable Farming to Ensure Conservation of Globally Threatened Bird Species in Agrarian Landscape (Baltic Aquatic Warbler)" (**LIFE09 NAT/LT/000233**) is co-financed by the European Union LIFE+ Programme, Republic of Lithuania, Republic of Latvia and the project partners

Project partners:

Station of Nature Research and Environmental Education

MONITORING REPORT
(2011–2013)

DIVERSITY, DISTRIBUTION OF VEGETATION AND THEIR SUITABILITY FOR THE AQUATIC WARBLER TO BREED IN LIEPAKOJAI SWAMP (ŽUVINTAS BIOSPHERE RESERVE)

Head of work group dr. Arūnas Balsevičius
Work group: Saulius Lisauskas, Ričardas Narijauskas, Eglė Norkevičienė
Map designer Andželika Blockuvienė
Translator Ričardas Narijauskas

Marijampolė, 2013

1. *The general overview of vegetation characteristic*

The vegetation in Liepakojai swamp consists of communities from 15 associations and 3 rankless units – phytocenons from 6 vegetation classes.

The grassland

In Liepakojai swamp plant communities belonging to the *Phragmito-Magnocaricetea* class prevail and are distributed in area of 68.20 ha. Among of them, the largest plots are covered by the communities of the *Magnocaricion* alliance (66.90 ha) and according to attained dominancy these communities are distributed as follows: *Caricetum distichae* (28.88 ha), *Caricetum appropinquatae* (13.24 ha) and *Caricetum elatae* (11.72 ha).

These 3 prevailing plant communities encompass the area of 53.84 ha. It makes up 49.72 % of all studied area in Liepakojai swamp.

In Liepakojai swamp the *Caricetum distichae* community is of widespread occurrence, which, unlike other phytocenosis of the *Magnocaricion* alliance, is formed on slightly elevated areas. In central part of the territory these communities are distinguished in the large areas (in contour 10 – 13.84 ha, contour 45 – 7.96 ha). These communities along with the *Caricetum appropinquatae*, *Caricetum elatae* and *Carex lasiocarpa* community (*Caricion davallianae*) comprise a complicated vegetation mosaic. The *Caricetum distichae* with tangles of the *Carici-Menyanthetum trifoliatae* is distributed on a flooded area in the southern part of the swamp. The declining tendency in extent of the *Caricetum distichae* communities is observed in the southern part of the studied territory. Here these communities are on the successional way to the phytocenosis of the *Carici-Menyanthetum trifoliatae*, furthermore, invasion of *Typha latifolia* is observed there too (*Caricetum distichae Typha latifolia* facies is distinguished).

Associations of the *Caricetum appropinquatae* (21.33 ha) occur with tangles of the *Carex lasiocarpa* (*Caricion davallianae*) and *Carex disticha* (*Caricion davallianae*) and *Caricetum distichae*, which are distributed in the habitats of the similar moistness.

The *Caricetum elatae* (11.72 ha) is confined to the wettest habitats compared with other communities from the *Magnocaricion* alliance and comprises vegetation mosaics with the *Caricetum distichae* and *Caricetum appropinquatae*. The largest plots occupied by these plant communities are in the central part of the swamp – contour 10 (11.07 ha).

Fairly large areas in the territory are encompassed by the *Thelypteridi-Phragmitetum* phytocenosis (8.88 ha), which are ascribed to the *Magnocaricion* alliance. These phytocenosis are distributed in the northwestern part of the territory but some separate plots occupied by these communities occur in other parts too.

Other plant communities belonging to the *Magnocaricion* alliance are distinguished in the smaller areas and do not attain a significant meaning in the field layer of the studied territory. Among these communities, lager plots are occupied by *Carici-Menyanthetum trifoliatae* (1.73 ha) and *Caricetum diandrae* (0.95 ha). Also, these plant communities are distinguished in the wetter habitats and communities of these two associations on the contrary to *Caricetum elatae* are distributed just in the peripheral part of the swamp where water level is higher than normal.

A small area is occupied by phytocenosis from the *Phragmition* alliance (1.30 ha). Among of them *Phragmitetum australis* prevails (0.74 ha), which occurrence is observed in the southern part of the swamp and as a rule, its habitats are inundated by water in summer. A small area colonized by *Acoretum calami* community (0.56 ha) is located in the southern part of the swamp too. There these plant communities have distributed near canals.

In Liepakojai swamp plant communities belonging to the *Scheuchzerio-Caricetea fuscae* class are distinguished in the area of 14.60 ha. All the associations and phytocenons are ascribed to the *Caricion davallianae* alliance. The *Carex lesiocarpa* community attains preponderance (9.12 ha). It comprises a vegetation mosaic along with *Caricetum distichae*, *Caricetum appropinquatae* and *Caricetum elatae*. An area of 4.11 ha is occupied by *Carex disticha* communities. These

communities are spread just in the northern part of the swamp (contour 2) and occur as mosaics with *Carex lasiocarpa* community (*Caricion davallianae*) and *Caricetum appropinquatae* association. These two communities have formed in the permanently flooded swamp's habitats. In marginal habitats of the swamp, which are periodically inundated by water, fragments of the *Campylio stellati-Caricetum paniceae* phytocenosis are located (0.42 ha).

The *Molinio-Arrhenatheretea* class communities are distributed in the area of 4.77 ha. All the associations are from the *Calthion* alliance. All the communities have been distinguished in the fringes of the swamp, which are periodically inundated by water. The largest plots (3.19 ha) are covered by *Carex disticha* community. These phytocenosis from the *Calthion* alliance are confined to the wet meadows where *Carex disticha* predominates. Phytocenosis of that kind have formed due to *Carex disticha* invasion under the influence of cessation of mowing of the meadows in the fringes of the swamp. Other plant communities are distributed in the smaller areas than 1 ha: *Lysimachio vulgaris-Filipenduletum* (0.76 ha), *Deschampsietum cespitosae* (0.68 ha) and *Cirsietum rivularis* (0.14 ha). Here the vegetation of the communities is neither mown nor grazed, therefor invasion of uncharacteristic species (*Cirsium arvense*, *Epilobium hirsutum*) is observed. The *Deschampsietum cespitosae* is distributed in the very fringe of the swamp and contiguous with the tall slender communities from the swamp side as well as with cultivated fields and meadows on the pothole slope of the swamp.

The communities belonging to the *Galio-Urticetea* class are distinguished in the area of 0.05 ha. The only one association of the *Anthriscetum sylvestris* is located. The community of this association has formed under the influence of absence of grazing and mowing in the meadow in the fringe of the swamp.

The scrubs and forests

The *Alnetea glutinosae* class is represented by the association of *Salicetum pentandro-cinereae* in Liepakojai swamp. There Willow scrub community is distributed in the area even of 21.33 ha and it makes up 19.70 % of all studied area of the territory. The communities from the *Salicetum pentandro-cinereae* association have formed due to encroachment of scrubs in the swamp communities which belong to the *Magnocaricion* association.

The *Querco-Fagetea* class is represented by the only one *Stellario nemorum-Alnetum glutinosae* association (0.27 ha).

2. The coverage of plant communities

Table 1

The covered areas by plant communities in Liepakojai swamp.

No.	**Plant community**	**2011**		**2013**	
		Plotas, ha	**%**	**Plotas, ha**	**%**
1.	*Anthriscetum sylvetris*	0.05	0.05	0.05	0.05
2.	*Cirsietum rivularis*	0.14	0.13	0.14	0.13
3.	*Stellario nemorum-Alnetum glutinosae*	0.27	0.25	0.27	0.25
4.	*Campylio stellati-Caricetum paniceae*	0.42	0.39	0.42	0.39
5.	*Acoretum calami*	0.56	0.52	0.56	0.52
6.	*Deschampsietum caespitosae*	0.68	0.63	0.68	0.63
7.	*Phragmitetum australis*	0.74	0.68	0.74	0.68
8.	*Lysimachio vulgaris-Filipenduletum*	0.76	0.70	0.76	0.70
9.	*Caricetum diandrae*	0.95	0.88	0.95	0.88
10.	*Caricetum distichae Typha latifolia* facija	1.50	1.39	1.50	1.39

11.	*Carici-Menyanthetum trifoliatae*	1.73	1.60	1.73	1.60
12.	*Carex disticha* bendrija (*Calthion*)	3.19	2.95	3.19	2.95
13.	*Carex disticha* bendrija (*Caricion davallianae*)	4.11	3.80	4.11	3.80
14.	*Thelypteridi-Phragmitetum*	8.88	8.20	8.88	8.20
15.	*Carex lasiocarpa* bendrija (*Caricion davallianae*)	9.12	8.42	9.12	8.42
16.	*Caricetum elatae*	11.72	10.82	11.72	10.82
17.	*Caricetum appropinquatae*	13.24	12.23	13.24	12.23
18.	*Salicetum pentandro-cinereae*	21.33	19.70	16.34	15.09
19.	Iškirstos *Salicetum pentandro-cinereae* bendrijos	00.00	0.00	4.99	4.61
20.	*Caricetum distichae*	28.88	26.67	28.88	26.67
	Total:	108.28	100.00	108.28	100.00

3. The coverage of vegetation classes

Table 2

The coverage of plant communities belonging to the different vegetation classes in Liepakojai swamp

Vegetation class	**2011**		**2013**	
	Plotas, ha	**%**	**Plotas, ha**	**%**
Galio-Urticetea	0.05	0.05	0.05	0.05
Querco-Fagetea	0.27	0.25	0.27	0.25
Molinio-Arrhenatheretea	4.77	4.41	4.77	4.41
Scheuhzerio-Caricetea fuscae	13.65	12.61	13.65	12.61
Alnetea glutinosae	21.33	19.70	21.33	19.70
Phragmito-Magnocaricetea	68.20	62.98	68.20	62.98
Total:	108.28	100.00	108.28	100.00

4. Compendium of plant communities

QUERCO-FAGETEA Braun-Blanquet et Vlieger 1937
Fagetalia sylvaticae Pawłowski in Pawłowski et al. 1928
Alno-Ulmion Braun-Blanquet et Tüxen 1943
Stellario nemorum-Alnetum glutinosae Lohmeyer 1957

ALNETEA GLUTINOSAE Braun-Blanquet et Tüxen 1943
Alnetalia glutinosae Tüxen 1937
Alnion glutinosae (Malc. 1929) Meijer Drees 1936
Salicetum pentandro-cinereae (Almquist 1929) Passarge 1961

SCHEUCHZERIO-CARICETEA NIGRAE Tüxen 1937
Caricetalia davallianae Braun-Blanquet 1949
Caricion davallianae Klika 1934
Campylio stellati-Caricetum paniceae Osvald 1925
Carex disticha bendrija
Carex lasiocarpa bendrija

MOLINIO-ARRHENATHERETEA ELATIORIS Tüxen 1937
Molinietalia caeruleae Koch 1926
Calthion palustris Tüxen 1937
Carex disticha bendrija
Cirsietum rivularis Nowiński 1927
Deschampsietum cespitosae Horvatić 1930
Lysimachio vulgaris-Filipenduletum Balátová-Tuláčková 1978

PHRAGMITO-MAGNOCARICETEA Klika in Klika et Novák 1941
Phragmitetalia Koch 1926
Magnocaricion Koch 1926
Caricetum appropinquatae Aszód 1935
Caricetum diandrae Jonas 1933
Caricetum distichae Nowiński 1927
Caricetum distichae Nowiński 1927 *Typha latifolia* facija
Caricetum elatae Koch 1926
Carici-Menyanthetum trifoliatae Soó 1955
Thelypteridi-Phragmitetum Kuiper ex van Donselaar et al. 1961
Phragmition Koch 1926
Acoretum calami Dagys 1932
Phragmitetum australis Savič 1926

GALIO-URTICETEA Passarge ex Kopecký 1969
Glechometalia hederaceae Tüxen in Tüxen et Brun-Hool 1975
Aegopodion podagrariae Tüxen 1967
Anthriscetum sylvetris Hadač 1978

5. Brief characterizations of plant communities

Stellario nemorum-Alnetum glutinosae

1. Physiognomy. Successional and poor in species *Alder carr* is formed in swampy habitats where species of the *Galio-Urticetea* dominate, whereas species of the *Querco-Fagetea* are not numerous there.
2. Coverage of shrubs. In the described plant community the coverage of scrubs is 30 %.
3. Tussocks. No tussocks.
4. Stability. Just small patches of the area (0.27 ha) are covered by this community and it is formed by replacing moist meadows (*Calthion*) communities.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The community has formed due to cessation of mowing of moist meadows. Under the progress of secondary succession, nemoral species will increase in number.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Non land-use.

Salicetum pentandro-cinereae

1. Physiognomy. The community formed by Willow scrubs in more or less marshy habitats are dominated by *Salix cinerea* and species such as: *S. myrsinifolia, S. pentandra* flourish there too. The canopy of scrubs is dense, therefore a field layer is scarce. Often a tree storey is formed by juvenile trees of *Betula pubescens*.

2. Coverage of shrubs. Generally, these scrub communities form a dense canopy and its projection coverage is up to 100 %.
3. Tussocks. No tussocks.
4. Stability. These communities are stable and have a characteristic species composition
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The plant communities have formed under the influence of cessation of mowing of sedge vegetation. These communities have a tendency to extend in the area because of absence of mowing of sedge vegetation around them. The *Salicetum pentandro cinereae* is a stadial community. Under process of succession, a tree layer will be formed (usually by *Betula pubescens*), which in turn will give a way to a woodland community of the *Carici elongatae-Alnetum* association.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Non land-use.

Campylio stellati-Caricetum paniceae

1. Physiognomy. The multi-species dwarfish plant communities are formed in the marginal part of the swamp in the calcareous minerotrophic habitats where species such as: *Carex panicea, Carex nigra, Juncus articulatus, Carex distans, Carex hostiana, Epipactis palustris, Carex appropinquata, Deschampsia cespitosa, Succisa pratensis, Equisetum palustre, Geum rivale* and *Carex flava* dominate.
2. Coverage of shrubs. The first signs of intrusion of scrubs are observed.
3. Tussocks. No tussocks.
4. Stability. These communities are stable. Species composition of the community has tenuously changed since 1997, but due to encroachment of scrubs of *Salicetum pentandro-cinereae* these plots have declined in extent in Liepakojai swamp (BALSEVIČIUS, 1997).
5. Variations of species composition. No variations.
6. Successions, reasons and tendency. These plant communities are formed in the marginal part of the swamp in the calcareous minerotrophic habitats. During last decade, according to the collected data, species composition left constant, but large community plots vanished due to coverage of shrubs.
7. Farming and intensity. Absence of farming activities.
8. The key factors in the development of community. Absence of knowledge.

***Carex disticha* community (*Caricion davallianae*)**

1. Physiognomy. Plant communities are formed in the swamp calcareous habitats where *Carex disticha* prevails. In a field layer calciphyte species from the *Caricetalia davallianae* order attain abundance there therefore this community is not ascribed to the *Magnocaricion* alliance.
2. Coverage of shrubs. No scrub layer.
3. Tussocks. No tussocks.
4. Stability. Communities are stable.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Phytocenosis are formed in the calcareous habitats of the swamp. Without having been mowed and grazed, these stands of the community will be invaded by scrubs.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Calcareous habitats.

***Carex lasiocarpa* community (*Caricion davallianae*)**

1. Physiognomy. These monodominant plant communities of *Carex lasiocarpa* with green mosses are formed in the eastern part of Liepakojai swamp. Traditionally, the

communities formed by *Carex lasiocarpa* were ascribed to the All. *Caricion lasiocarpae* of the Cl. *Scheuchezerio-Caricetea fuscae*. The plant communities formed by *Carex lasiocarpa* are confined to the habitats of acidic reaction, and within bryophytes layer *Spagnum* species attain dominance. Communities distributed in habitats of neutral and alkaline reactions are ascribed to other different sub-associations of the *Caricetum lasiocarpae*. Thus, this association was well-known, whereas plant communities of the different habitats with different plant species within their composition were ascribed to it. The only link to this syntaxon is an ascendancy of *Carex lasiocarpa*. Therefore, that approach is at variance with principals of the classification of vegetation, and absolutely different phytocenosis cannot be assigned to one association. In previous work (BALSEVIČIUS, 1997), a community of slender sedge was also ascribed to the association of *Caricetum lasiocarpae* in Liepakojai swamp. In recent years, plant communities formed by *Carex lasiocarpa* in the calcareous habitats are ascribed by European phytocenologists to the association of *Campylio stellati-Caricetum lasiocarpae* belonging to the *Caricion davallianae* alliance. In order to avoid confusion in accepted traditional classification of Lithuania wetland vegetation, communities of wetland vegetation, in this work, are treated as phytocenon (rankless syntaxon) – *Carex lasiocarpa* community.

2. Coverage of shrubs. No shrub layer is observed.
3. Tussocks. No tussocks.
4. Stability. Under constant hydrological and farming conditions, these communities are stable but due to absence of mowing, they are tend to be invaded by shrubs.
5. Variations of species composition. The species composition is similar in all area.
6. Successions, reasons and tendency. These plant communities have formed on slightly elevated and less flooded sites and occur as mosaics with the *Carex disticha* community (*Caricion davallianae*) of the similar ecology and *Caricetum appropinquatae*. All these plant communities are formed in the same habitats and often their areas are overlapped by forming wide belts of ecotones and two or three, described above, characteristic species of the communities are prevalent there. For this reason, there is no data about which of the communities are expanding and which are declining in the area.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Stability of hydrological regime and mowing.

***Carex disticha* community (*Calthion*).**

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in spring and autumn and *Carex disticha* attains dominance there. Despite that physiognomy of the community is very similar to *Caricetum distichae* physiognomy, characteristic species belonging to the class of *Molinio-Arrhenatheretea* are as dominants in this species-rich phytocenosis. Plant community is not numerous in hygrophilous species but some like *Equisetum fluviatile* and *Peucedanum palustre* are observed. For these reasons, the communities cannot be ascribed to the Cl. *Phragmito-Magnocaricetea*.
2. Coverage of shrubs. The communities are not covered by shrubs.
3. Tussocks. No tussocks layer.
4. Stability. These plant communities are stadial. In a marginal part of the swamp, they replaced *Deschampsietum cespitosae* plant community due to cessation of grazing and mowing.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Under the influence of cassation of grazing and mowing, these communities have replaced the *Deschampsietum cespitosae* grassland in peripheral habitats of the swamp where water level is minimal during springtides. The communities of the *Deschampsietum cespitosae* grassland, from the lake side, are

contiguous with *Caricetum distichae* sedge community which is confined to wetter habitats and characteristic meadow species are spread there sporadically. Therefore, in adjacent habitats flourished *Carex disticha* had a tendency to spread into meadows too. Without having been mowed, these marginal swamp meadows will be invaded by Willow scrubs. Most likely, changing of non-land treatment to mowing and grazing, succession may be deflected to *Deschampsietum cespitosae* grassland community, but this process also depends on hydrological regime in habitat.

7. Farming and intensity. No farming activities.
8. The key factors in the development of community. No treatment activities.

Cirsietum rivularis

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in springtime and *Cirsium rivulare* attains dominance there.
2. Coverage of shrubs. The communities are not covered by shrubs.
3. Tussocks. No tussocks layer.
4. Stability. These communities are stable but *Carex disticha* prevails in the field layer.
5. Variations of species composition. Variations are not established because of plant communities encompass a small area.
6. Successions, reasons and tendency. The *Cirsietum rivularis* is distributed in the western part of the swamp. They have formed in the tenuously flooded parts of the swamp.
7. Farming and intensity. No grazing and mowing.
8. The key factors in the development of community. Unknown.

Deschampsietum cespitosae

1. Physiognomy. The meadow communities are formed in a marginal part of the swamp which is flooded by water in springtime and autumn where *Deschampsia cespitosa, Carex nigra, Festuca rubra, Phleum pratense, Carex hirta, Filipendula ulmaria, Valeriana officinalis, Poa pratensis, Alopecurus pratensis, Equisetum palustre, Geum rivale. Gana daug higrofitų rūšių: Carex disticha, C. vulpina, Peucedanum palustre, Scutellaria galericulata, Lythrum salicaria* and *Lycopus europaeus* are prominent there.
2. Coverage of shrubs. The communities are not covered by shrubs.
3. Tussocks. The area is poor in tussocks which are formed by *Deschampsia cespitosa*.
4. Stability. The key factor in the development of the community in the marginal parts of the Liepakojai swamp is fated not just by grazing, but also by long inundation by water during springtides. As long as these communities vegetation are mown, these phytocenosis are quite stable and have a characteristic species composition. But in recent years, water level of the lake had been raisin higher than usual, therefore it has affected communities' species composition – more hygrophilous species found their niche there.
5. Variations of species composition. Variations are not established because communities are spread in very similar habitats.
6. Successions, reasons and tendency. The *Deschampsietum cespitosae* is distributed in the western fringe part of the swamp. These communities have formed under the influence of grazing in less flooded marginal parts of the swamp, but their formation, also, is influenced by a long-term inundation by water during springtime, because *Deschampsia cespitosa* is a species, which tolerates both: inundation by water and prolonged trampling. Currently vegetation of these communities is not mown and grazed, therefore species such as: *Cirsium arvense* and *Anthriscus sylvestris* flourish there. Due to the absence of grazing and mowing, these plant communities will be overgrown by scrubs, and in plots which verge with *Caricetum distichae* community, transformation to *Carex disticha* communities (*Calthion*) will be started. Most likely that being under constantly higher water level than normal, these phytocenosis will be replaced by tall sedge communities. It is possible that

due to *Carex disticha* invasion during last decade the plots of the community declined in extent

7. Farming and intensity. Mowing and grazing treatments are not applied.
8. The key factors in the development of community. Grazing, floods.

Lysimachio vulgaris-Filipenduletum

1. Physiognomy. The meadow communities are formed in seasonally flooded habitats where *Filipendula ulmaria* predominates. The species composition of the community is also enriched by other species such as *Festuca rubra, Juncus effusus* and *Persicaria amphibia*.
2. Coverage of shrubs. The plant community is slightly covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. The communities are stadial. Their species composition is heterogeneous. Most likely, these communities have formed by replacing *Deschampsietum cespitosae*, under the influence of cessation of grazing and mowing, because of *Deschampsia cespitosa* is still an abundant component in these phytocenosis species composition. There is no data collected when these replacements were proceeded but in Liepakojai swamp these plant communities were described in 1997 as well (BALSEVIČIUS, 1997).
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. These communities have formed by replacing *Deschampsietum cespitosae*, under the influence of cessation of grazing and mowing.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Cessation of grazing and mowing.

Caricetum appropinquatae

1. Physiognomy. *Carex appropinquata* predominates in the community, but according to other plant communities formed by tall sedges, there is a rather great bunch of species like *Carex lasiocarpa, Iris pseudacorus, Menyanthes trifoliata, Potentilla palustris, Epipactis palustris, Potentilla palustris, Peucedanum palustre* and *Lythrum salicaria* in this plant community. Besides, this community is richer in species. A typical microconformation covered by tussocks is formed by plant communities' edificator *Carex appropinquata*, therefore plants of one ecological group thrive on the tussocks and others – among them.
2. Coverage of shrubs. The communities are covered by shrubs in some places.
3. Tussocks. Tussocks are formed by *Carex appropinquata*.
4. Stability. Under constant hydrological conditions, plant communities are quite stable.
5. Variations of species composition. *Carex lasiocarpa* and *C. disticha* flourish at intervals.
6. Successions, reasons and tendency. The communities as well as *Caricetum distichae* have formed in periodically flooded habitats and their intermixed with *Caricetum distichae, Carex lasiocarpa* community (*Caricion davallianae*), *Carex disticha* community (*Caricion davallianae*) occur. Often ecotope belts or contours, which are formed among these plant communities, are overlapping each other, therefore a successional direction is vague. These communities without being mown for a long time have a tendency to be overgrown by shrubs of *Salix* genus.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Periodical inundation of habitats by water and partly – mowing.

Caricetum diandrae

1. Physiognomy. The species-rich helophytes communities are formed in the marginal part of the swamp in the springy habitats and species such as: *Carex diandra, Potentilla palustris, Equisetum fluviatile, Carex lasiocarpa, Carex appropinquata, Lysimachia thyrsiflora, Peucedanum palustre, Equisetum palustre, Deschampsia cespitosa* and *Carex nigra* are numerous there. Even though this multi-species phytocenosis as tradition is

ascribed to the *Scheuchzerio-Caricetea fuscae* class in Lithuania but characteristic species belonging to the *Phragmito-Magnocaricetea* class predominate there, and for this reason, we as well as Czech phytocenologists (Hájková, 2011) ascribed it to the *Phragmito-Magnocaricetea* class. Species of the *Scheuchzerio-Caricetea fuscae* class are of high constancy but do not attain abundance there.

2. Coverage of shrubs. No shrub layer in the community.
3. Tussocks. No tussocks.
4. Stability. These communities are stable. Species composition has tenuously changed since 1997 (BALSEVIČIUS, 1997).
5. Variations of species composition. No variations.
6. Successions, reasons and tendency. The communities are formed in the peripheral springy flooded habitats of the swamp. During last decade, according to the collected data, species composition left constant. It is probably influenced by the peculiarities of the habitats.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Unknown.

Caricetum distichae

1. Physiognomy. Overgrowths composed by *Carex disticha* monodominants.
2. Coverage of shrubs. Encroachment of shrubs is observed.
3. Tussocks. No tussocks.
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 shrubs and in some places by reeds.
5. Variations of species composition. In all plots species composition is alike but last years in more flooded southern part of the swamp *Typha latifolia* facies of this association is formed. 6. Successions, reasons and tendency. In Liepakojai swamp these plant communities are of widespread occurrence there. Also these communities are found with tangles of *Caricetum appropinquatae* and *C. lasiocarpa* community (*Caricion davallianae*) which flourish in habitats of the similar moist, therefore it is hard to ascertain which communities' plot increased or decreased in extent. Due to waterlogging of the habitats these communities might be replaced by the *Typhetum latifoliae* or *Carici-Menyanthetum trifoliatae*. These communities vegetation without being mown or grazed have a tendency to be overgrown by shrubs.
7. Farming and intensity. Absence of mowing.
8. The key factors in the development of community. Fluctuations of hydrological regime and applying of mowing treatment.

Caricetum elatae

1. Physiognomy. Phytocenosis are formed by monodominant tussock *Carex elata*.
2. Coverage of shrubs. Community is not covered by shrubs because of the water level is too high.
3. Tussocks. Tussocks are formed by *Carex elata*.
4. Stability. Under the constant hydrological conditions, communities are quite stable
5. Variations of species composition. Species composition is very similar in all areas.
6. Successions, reasons and tendency. These plant communities are formed in the permanently flooded habitats, therefore other distinguished sedge communities are theoretically unable to replace them in Liepakojai swamp unless the areas of the *Caricetum elatae* tend to be overgrown by reeds.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Permanent flooding of the habitats and mowing.

Carici-Menyanthetum trifoliatae

1. Physiognomy. Sparse in species, dwarfish plant communities of the swamp are distributed in the permanently flooded areas where in a field layer *Menyanthes trifoliata* prevails.
2. Coverage of shrubs. The plant communities are not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. These communities are stadial.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. These communities are formed in southern flooded part of the swamp, under the influence of saturation of *Caricetum distichae* vegetation.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Saturation of sedge vegetation, due to the higher water level than normal.

Thelypteridi-Phragmitetum

1. Physiognomy. Monodominant overgrowths of *Phragmites australis* with a quite abundance or abundance intermixes of sedge.
2. Coverage of shrubs. The plant communities are not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. Under constant conditions, these communities are stable and expand in the area quickly.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. The communities have formed under the influence of absence of farming activities. A rapid invasion of the community to the areas covered by sedges is observed. Due to regular mowing of vegetation, sedges regeneration may be expected.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Cessation of mowing.

Acoretum calami

1. Physiognomy. Monodominant overgrowths of *Acorus calamus* are located in the southern flooded part of the swamp.
2. Coverage of shrubs. The plant communities are not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. Under constant conditions, these communities are stable
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Under the influence of flooding, these communities have formed near canals in the swamp.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Fluctuations of the hydrological regime (more intensive flooding of the habitats).

Phragmitetum australis

1. Physiognomy. Dense overgrowths composed by monodominant of *Phragmites australis*.
2. Coverage of shrubs. The plant communities are not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. Under constant conditions, these communities are stable and expand in the area quickly.

5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. These communities have formed in the flooded habitats, under the influence of absence of farming activities. Due to regular mowing of vegetation, sedges regeneration may be expected.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Cessation of mowing and partly – flooding of habitats.

Anthriscetum sylvetris

1. Physiognomy. The community is formed by high nitrophils replacing the unmown meadow community where both *Anthriscus sylvestris* and *Urtica dioica* prevail.
2. Coverage of shrubs. The plant communities are not covered by shrubs.
3. Tussocks. No tussocks.
4. Stability. These communities are stadial.
5. Variations of species composition. Variations are not established.
6. Successions, reasons and tendency. Trends of succession are vague.
7. Farming and intensity. No farming activities.
8. The key factors in the development of community. Absence of farming activities.

6. Suitable plant communities for the Aquatic Warbler

The Aquatic Warbler (*Acrocephalus paludicola*) is not found in Liepakojai swamp. The bird has been observed in the *Caricetum elatae* in Dambavaragis meadows, therefore it may be found in the same communities here too, all the more because these *Caricetum elatae* communities cover an area of 11.07 ha in Liepakojai swamp (contour 10) and this area might be quite enough for the Aquatic Warbler to locate in (in Dambavaragis meadows this community is distributed only on area of 3.09 ha).

In the *Caricetum gracilis*, *Caricetum distichae* and *Phalaridetum arundinaceae* communities this bird has been found in Šyša polder. However, in Liepakojai swamp, the communities of both *Caricetum gracilis* and *Phalaridetum arundinaceae* are not distinguished.

The *Caricetum distichae* occupies large and unimodal plots (contour 10 – 13.84 ha, contour 45 – 7.96 ha) or it is found with tangles of the *Caricetum appropinquatae* and *Carex lasiocarpa* communities (*Caricion davallianae*) in Liepakojai swamp. The community of *Carex disticha* (*Caricion davallianae*) is inventoried in Liepakojai swamp (contour 2 – 4.11 ha) which is physiognomically very alike to the *Caricetum distichae.* Theoretically, these two communities might be suitable for the Aquatic Warbler to breed. In Belarus, the Aquatic Warbler is found in the *Caricetum appropinquatae* as well as in the communities formed by *Carex lasiocarpa* (KOZULIN, FLADE, 1999).

7. Suitable parts of the territory for the Aquatic Warbler to breed

The best area for the Aquatic Warbler to breed might be the central and northern not covered by reeds and scrubs parts of the Liepakojai swamp, if we take into account that, theoretically, this bird prefers sites where plant communities or their mosaics are comprised by predominating species such as: *Carex disticha, Carex elata, Carex appropinquata* or *Carex lasiocarpa*. Here, communities of the *Caricetum elatae, Caricetum distichae, Carex disticha* (*Caricion davallianae*), *Carex lasiocarpa* (*Caricion davallianae*) and *Caricetum appropinquatae* are distributed patchily (contours: 2, 7, 10, 14, 15 and 45).

Due to overgrowth of reeds and scrubs, the sedge communities are fragmented into 3 parts (in northern, central and southern swamp parts). Besides, these sedge communities are in the successional stage to scrubs (especially in northern and southern parts). Fragmentation of that kind deteriorates sedge communities suitability for the Aquatic Warbler to breed.

8. Unsuitable (or still enough suitable but with unfavourable trends of succession) plant communities for the Aquatic Warbler and reasons of unfavourable successions

All the communities from the class of the *Molinio-Arrhenatheretea* and *Galio-Urticetea* as well as dwarfish plant communities belonging to the *Scheuchzerio-Caricetea fuscae* (*Campylio stellati-Caricetum paniceae*) class are unfavourable for the Aquatic Warbler to breed. Plant communities from the *Molinio-Arrhenatheretea* and dwarfish plant communities from the *Scheuchzerio-Caricetea fuscae* have formed in less flooded of mid moistness habitats. Communities from the *Galio-Urticetea* are distributed in the same habitats but their formation is influenced by absence of grazing and mowing. Thus, in order to protect the Aquatic Warbler, the management of the areas occupied by these communities is not of primary importance.

Due to bulk of floods, plant communities from the *Phragmition* alliance are not suitable for the Aquatic Warbler. It is most likely, that formation of sedge communities (it is probably – *Caricetum elatae*) starts, under the influence of intensive mowing of overgrowths of *Phragmitetum australis.*

However, the sedge communities formation starts (it is probably – *Caricetum elatae*), under the influence of intensive mowing of overgrowths of the *Phragmitetum australis*.

Under applying measures for nature management and being in anticipation for regeneration of sedge communities, which are suitable for the Aquatic Warbler to breed, the scrubs of the *Salicetum pentandro-cinereae* require immediate removal as well as treatment of mowing of overgrowths of reed of the *Thelypterido-Phragmitetum* community. The sedgy areas has been replaced by these two communities.

Also, communities have unfavourable features from the *Magnocaricion* alliance: *Caricetum distichae, Caricetum appropinquatae* as well as communities belonging to the *Caricion davallianae* alliance: *Carex lasiocarpa* and *Carex disticha*, due to encroachment of scrubs in them.

The transformation from *Caricetum distichae* into *Typhetum latifoliae* and *Carici-Menyanthetum trifoliatae* has started under the influence of risen water level in southern part of the swamp and these plant communities are not suitable for the Aquatic Warbler.

9. Recommendations on management of the territory forming suitable plant communities for the Aquatic Warbler

The vegetation in Liepakojai swamp has formed under the influence of both environmental and anthropogenic factors. The key environmental factors which have fated the distribution of vegetation are: properties of soil (especially pH) and regime of moistness. The factor of inundation can be considered as of anthropogenic origin because duration of habitats' inundations influenced by spring tides and after them or after excess rainfall, also, partly depends on regulations of water level in the Žuvintas Lake. Other man-induced factors of great importance are mowing and grazing. The mowing of vegetation is very important factor in order to maintain plant communities, whereas heavy grazing – can be treated as more communities changing factor.

During decades no farming activities were underway in the greater part of the territory, therefor distribution of the vegetation has changed and apart this, communities are overgrown by scrubs or reeds and their species composition has altered too.

In order to form suitable plant communities for the Aquatic Warbler to breed in Liepakojai swamp, we have to pay attention to the intensiveness of mowing as well as to the favourable duration of floods and their intensiveness too.

The scrub communities must be removed from the territory in contours: 1, 3, 6, 9, 13, 16, 24–31, and according to robustness of browses, they must be eliminated each year and at least for 3–5 years, otherwise scrubs will regenerate during two years and form a denser canopy. Cleaned from scrubs areas must be mown each year and hay must be taken away from there too.

The mowing of vegetation of the *Thelypterido-Phragmitetum*, *Phragmitetum australis* and *Caricetum distichae Typha latifolia* facies communities must be started immediately being in anticipation for the sedge communities' regeneration because these plant communities are suitable for the Aquatic Warbler to breed. In order to achieve an efficient result, the mowing must be applied not less than 2 years whilst coenopopulation of the *Phragmites australis* will be withered.

It must be taken into consideration that some parts of habitats are flooded by water, therefor it is a complicated task to do, whereas mowing of reeds in winter allows us to take away just a grass biomass and rarefy stand of the community.

We recommend intensive mowing of vegetation in contours: 5, 8, 17, 19, 20, 36, 38 and 41.

The scrubs must be removed from other sedgy areas too and mowing must be applied each year or every other year in these plots. Furthermore, those areas where scrubs have been removed, the mowing should be preceded each year whilst they stop to regenerate themselves.

Peripheral swamp communities' vegetation of the *Molinio-Arrhenatheretea, Scheuchzerio-Caricetea fuscae* (*Campylio stellati-Caricetum paniceae*) and *Galio-Urticetea* classes can be extensively mown or grazed.

In order to stop invasion of *Typha latifolia* in the southern part of the swamp, hydrological regime must be regulated. During time of investigations, it is noticed, that this plant intrudes rapidly by replacing communities of the *Caricetum distichae.*

10. Vegetation changes during 2011–2013

In Liepakojai swamp farming activities have not been applied before the beginning of repeated investigations of vegetation. Under the influence of constant hydrological conditions, vegetation has not altered during two years. Therefore, only visual communities' evaluation has been carried out.

There, in the first decade of winter, some areas have been cleaned from the *Salicetum pentandro-cinereae* scrubs. However, in the *Salicetum pentandro-cinereae* communities growing *Salix* shrubs after being eliminated, still regenerate. These regenerated overgrowths are still needed to be classified as *Salicetum pentandro-cinereae* communities untill offshoots of *Salix* scrubs wither and won‘t regenerate.

Thus, in the territory prevailing communities are from the *Phragmito-Magnocaricetea* class (68.20 ha) and the largest plots are covered by the *Caricetum distichae* community (28,88 ha). The area of 4.99 ha has been cleaned from scrubs of the *Salicetum pentandro-cinereae,* but due to classification peculiarities, the plot covered by these plant communities remained the same in extant (12.33 ha).

11. References

BALSEVIČIUS A., 1997: Žuvinto rytinio ir šiaurrytinio apyežerio augalija. Rankr., dep. Gamtos tyrimų ir ekologinio švietimo stotyje, Nr. B97-08. – Marijampolė.

HÁJKOVÁ P., 2011: MCG05 Caricetum diandrae Jonas 1933. In: CHYTRÝ M. (ed.), Vegetace České republiky. 3. Vodní a mokřadní vegetace. – Praha, 538–541.

KOZULIN A., FLADE M., 1999: Breeding habitat, abundance and conservation status of the Aquatic Warbler *Acrocephalus paludicola* in Belarus. – Vogelwelt, 120: 97–111.

LIEPAKOJAI

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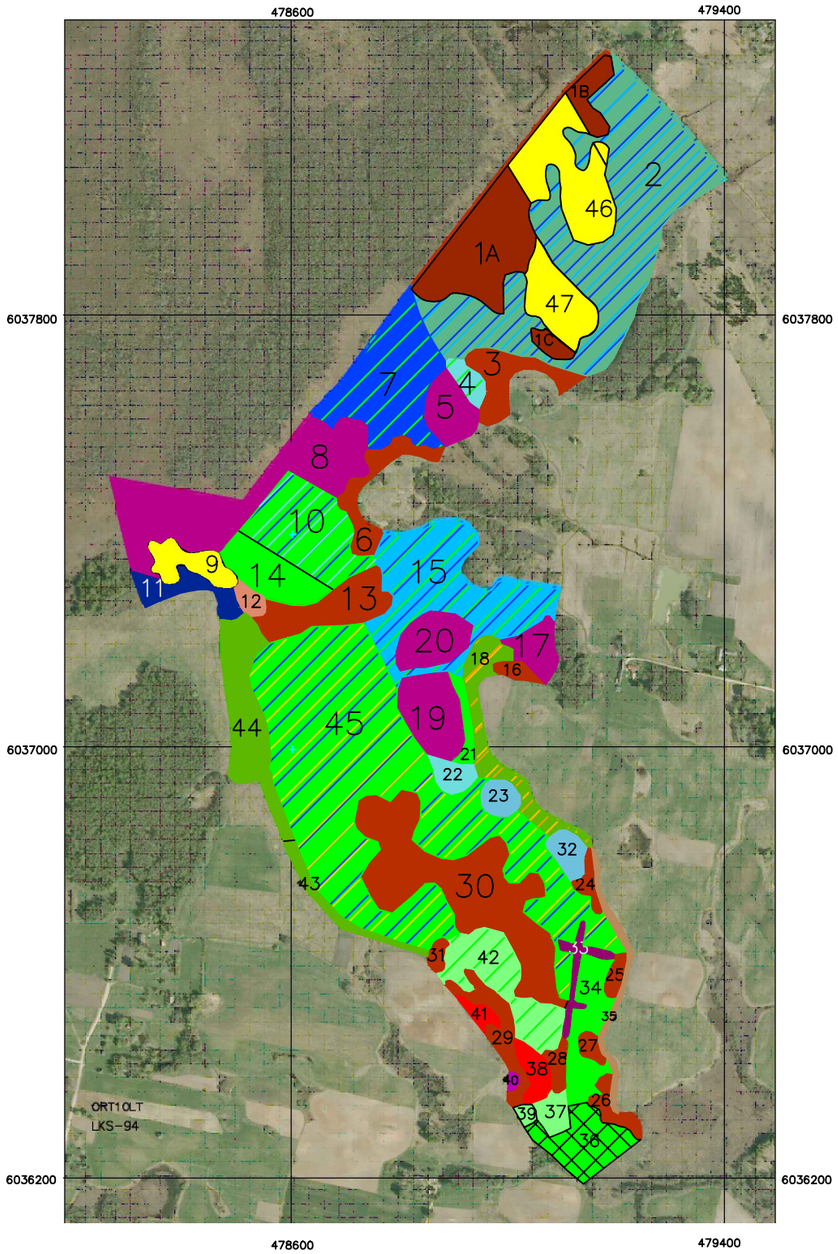

AIŠKINAMIEJI ŽENKLAI

Augalų bendrija	*Spalva*	*Spalvos kodas*
Salicetum pentandro-cinereae		*24*
Campylio stellati-Caricetum paniceae		*40*
Carex disticha bendrija (*Caricion davallianae*)		*115*
Acoretum calami		*226*
Phragmitetum australis		*10*
Deschampsietum cespitosae		*111*
Lysimachio vulgaris-Filipenduletum		*166*
Carex disticha bendrija (*Calthion*)		*74*
Carici-Menyanthetum trifoliatae		*91*
Caricetum distichae		*90*
Caricetum distichae Typha latifolia facija		*90*
Cirsietum rivularis		*42*
Caricetum appropinquatae		*160*
Thelypteridi-Phragmitetum		*224*
Carex lasiocarpa bendrija (*Caricion davallianae*)		*140*
Stellario nemorum-Alnetum glutinosae		*23*
Caricetum elatae		*133*
Anthriscetum sylvetris		*214*
Caricetum diandrae		*143*
Iškirstos *Salicetum pentandro-cinereae* bendrijos		*2*

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