

# Final Technical Report

January 1, 2022 – October 31, 2023

<b>TITLE of AGREEMENT</b>	CWR in EURISCO
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<b>ABSTRACT</b> (Maximum 200 words)	<p><b>Identification of priority taxa and populations.</b> A list of 144 CWR priority species was established representing 53 genera of 15 families.</p> <p><b>Preparation of the national database structure.</b> The structure of the CWR National Inventory database was created containing both information at the taxon and population levels.</p> <p><b>Organizing the network of data providers.</b> Nature Research Centre and State Forest Service are major institutions developing the network of data providers with State Service for Protected Areas pending involvement. GBIF is a significant data provider. A contribution from iNaturalist has been proved effective. Contacts with farmers should still be established as well as protected area managers should be contacted in-place regarding the details of the data collection.</p> <p><b>Collecting and organizing the data according to the agreed principles and data exchange format.</b> In total, 45 sites were selected as potential CWR genetic reserves with multispecies populations representing 83 CWR priority species. Hotspots of priority CWR occurrences were identified and mapped on 4×4 km grid cells with QGIS. In total, 293,615 recent records of occurrences of 140 CWR priority species are available.</p> <p><b>Providing the data to EURISCO.</b> Providing the data to EURISCO is expected to be finished in December 2023.</p>
<b>KEYWORDS</b>	<p>Country/Region: Lithuania/Europe.</p> <p>Crop(s): Crop wild relatives for food and agriculture.</p> <p>Subject: Preparation of <i>in situ</i> CWR datasets for inclusion in EURISCO.</p>

## CWR in EURISCO

Final Technical Report  
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Based on the Principles for the Inclusion of CWR Data in EURISCO (van Hintum and Iriondo, 2022) the following activities were implemented:

### 1. Identification of priority taxa and populations

Prioritization of CWR species was carried out with the focus on plant genetic resources for food and agriculture with native species and archaeophytes given top priority. For that purpose, the following lists of crops/species and criteria were used:

1. Annex I. List of crops covered under the multilateral system of the International Treaty on Plant Genetic Resources for Food and Agriculture ([FAO, 2001](#)).

2. Lithuanian national plant variety lists.

3. Wild species relatedness to crops.

4. Socio-economic and cultural importance including use traditions of the species.

5. Threat status of species.

The invasive character of some species, like *Lactuca serriola*, *Prunus cerasifera*, and, partly, *Armoracia rusticana*, was considered as well. Prickly lettuce (*L. serriola*) is a particularly rapidly spreading species and invading different natural plant communities, while cherry plum (*P. cerasifera*) pose threat by hybridization with the native species *P. spinosa* (Rašomavičius, pers. comm.; [GRIIS: Gudžinskas et al., 2023](#)). Also, several published data sources from the Nordic countries (Fitzgerald et al., 2018; 2019; Weibull & Phillips, 2020), Czech Republic (Taylor et al., 2017), and the Netherlands (van Treuren et al., 2017) were analyzed to facilitate the process. CWR checklist and inventory data template was employed (Thormann et al., 2017) as well. In the result, 53 genera of food (including culinary herbs, aromatic plants, and berries) and forage species were selected belonging to 15 families. A list of 144 CWR priority species including 135 native (including archaeophytes) and 9 naturalized ones (excaped from cultivation, mostly), was generated which still should be considered a working version. The summary of the prioritized CWR inventory is presented in Table 1 (see supplemental Excel file for the full list).

Table 1. Summary of the prioritized Lithuanian CWR inventory (ver. 3).

Family	Genera #	Species #	Species %	Genera with numbers of species
Poaceae	19	47	32.6	Agrostis (5), Alopecurus (4), Anthoxanthum (3), Arrhenatherum (1), Avenula (1), Briza (1), Bromus (1), Cynosurus (1), Dactylis (1), Deschampsia (2), Elymus (1), Festuca (8), Glyceria (4), Helictochloa (1), Leymus (1), Lolium (1), Phalaris (1), Phleum (2), Poa (8)
Fabaceae	11	46	31.9	Anthyllis (1), Astragalus (3), Lathyrus (7), Lotus (2), Medicago (2), Melilotus (2), Onobrychis (2), Ononis (1), Securigera (1), Trifolium (14), Vicia (11)
Rosaceae	5	16	11.1	Fragaria (3), Malus (2), Prunus (3), Pyrus (2), Rubus (6)
Lamiaceae	3	6	4.2	Mentha (3), Origanum (1), Thymus (2)
Brassicaceae	2	5	3.5	Barbarea (2), Rorippa (3)
Amaryllidaceae	1	6	4.2	Allium (6)
Ericaceae	1	5	3.5	Vaccinium (5)
Apiaceae	4	4	2.8	Angelica (1), Carum (1), Daucus (1), Pastinaca (1)
Grossulariaceae	1	3	2.1	Ribes (3)

Asparagaceae	1	1	0.7	Asparagus (1)
Asteraceae	1	1	0.7	Cichorium (1)
Betulaceae	1	1	0.7	Corylus (1)
Cannabaceae	1	1	0.7	Humulus (1)
Papaveraceae	1	1	0.7	Papaver (1)
Elaeagnaceae	1	1	0.7	Hippophae (1)
Total: 15	53	144	100	

As seen from Table 1, nearly 2/3 (or 64.5%) of the prioritized species are members of the two families, Poaceae (47 species) and Fabaceae (46 species), the absolute majority of which are forage crop relatives. Regarding the legal protection, 17 CWR priority species (11.8%) are protected by the [Order of the Minister of Environment](#). These are evaluated according to the IUCN categories and criteria at the national level (Table 2).

Table 2. Legally protected CWR priority species

#	Species	IUCN category and criteria*
1	<i>Allium angulosum</i> L.	EN B1ab(ii,iii)+2ab(ii,iii)
2	<i>Allium scorodoprasum</i> L.	VU A4ac
3	<i>Allium vineale</i> L.	EN B2ab(iii,iv,v)
4	<i>Alopecurus arundinaceus</i> Poir.	VU D2
5	<i>Astragalus danicus</i> Retz.	NT B2b(iii); B1b(iii)
6	<i>Festuca altissima</i> All.	DD
7	<i>Festuca psammophila</i> (Čelak.) R. M. Fritsch	EN B1ab(ii,iii,v)+2ab(ii,iii,v)
8	<i>Glyceria lithuanica</i> (Gorski) Gorski	VU B1ab(iii)+2ab(iii)
9	<i>Helictochloa pratensis</i> (L.) Romero Zarco	VU D2
10	<i>Lathyrus laevigatus</i> (Waldst. & Kit.) Gren.	NT B2
11	<i>Lathyrus pisiformis</i> L.	EN B1ab(iv)+2ab(iv)
12	<i>Poa remota</i> Forselles	NT B2
13	<i>Prunus spinosa</i> L.	VU B1ab(ii,iii,v)+2ab(ii,iii,v)
14	<i>Trifolium lupinaster</i> L.	EN B2b(iii)c(iv)
15	<i>Trifolium rubens</i> L.	EN B2ab(i,ii,iii,iv)
16	<i>Vicia lathyroides</i> L.	EN B2b(iii)c(ii)
17	<i>Vicia pisiformis</i> L.	NT B1+2

\* Source: Rašomavičius, 2021.

It must be noted that the current CWR priority list of 144 species has been more strictly focused on plant genetic resources for food and agriculture if compared to the previously published version of 180 CWR priority species (Labokas et al., 2016).

## 2. Preparation of the national database structure

**Data sources.** The *in situ* CWR National Inventory database has been created by combining target taxa occurrence data from four major datasets: 1) Database of EU habitat mapping in Lithuania (BIGIS); 2) Database of Herbarium of Nature Research Centre (BILAS); 3) Lithuanian Vegetation Database (EU-LT-001); and 4) Global Biodiversity Information Facility (GBIF). Most of the recent data are contained in BIGIS and GBIF (Table 3). The compiled database can run in both Microsoft Access and QGIS formats. Hotspot analysis of priority CWR occurrences performed with QGIS in 4×4 km grid cells showed that the highest numbers of the target species occurrences are in the north-western and south-eastern parts of the country, totalling to 150 grid cells with 37–58 species each (dark and darkest green

cells, Figure 1), where most of the potential genetic reserve sites (red dots, Figure 1) are identified as well (see also Figure 2 for details).

Table 3. Numbers of occurrences of CWR priority species (ver. 3)\* in four databases by time.

	BIGIS	BILAS	EU-LT-001	GBIF	Total
Older than 10 years	0	7673	19	21	7713
Recent data	284264	9	2155	7187	<b>293615**</b>
Total	284264	7682	2174	7208	301328

\* The numbers refer to 140 out of 144 CWR priority species. No data on *Barbarea stricta*, *Lathyrus pisiformis*, *Onobrychis arenaria*, *Vaccinium microcarpum*.

\*\*The most important number is 293615 which includes multiple occurrences of the same species per grid cell 4×4 km. Thus, the total number of unique species records per grid cell is less and amounts to 68686.

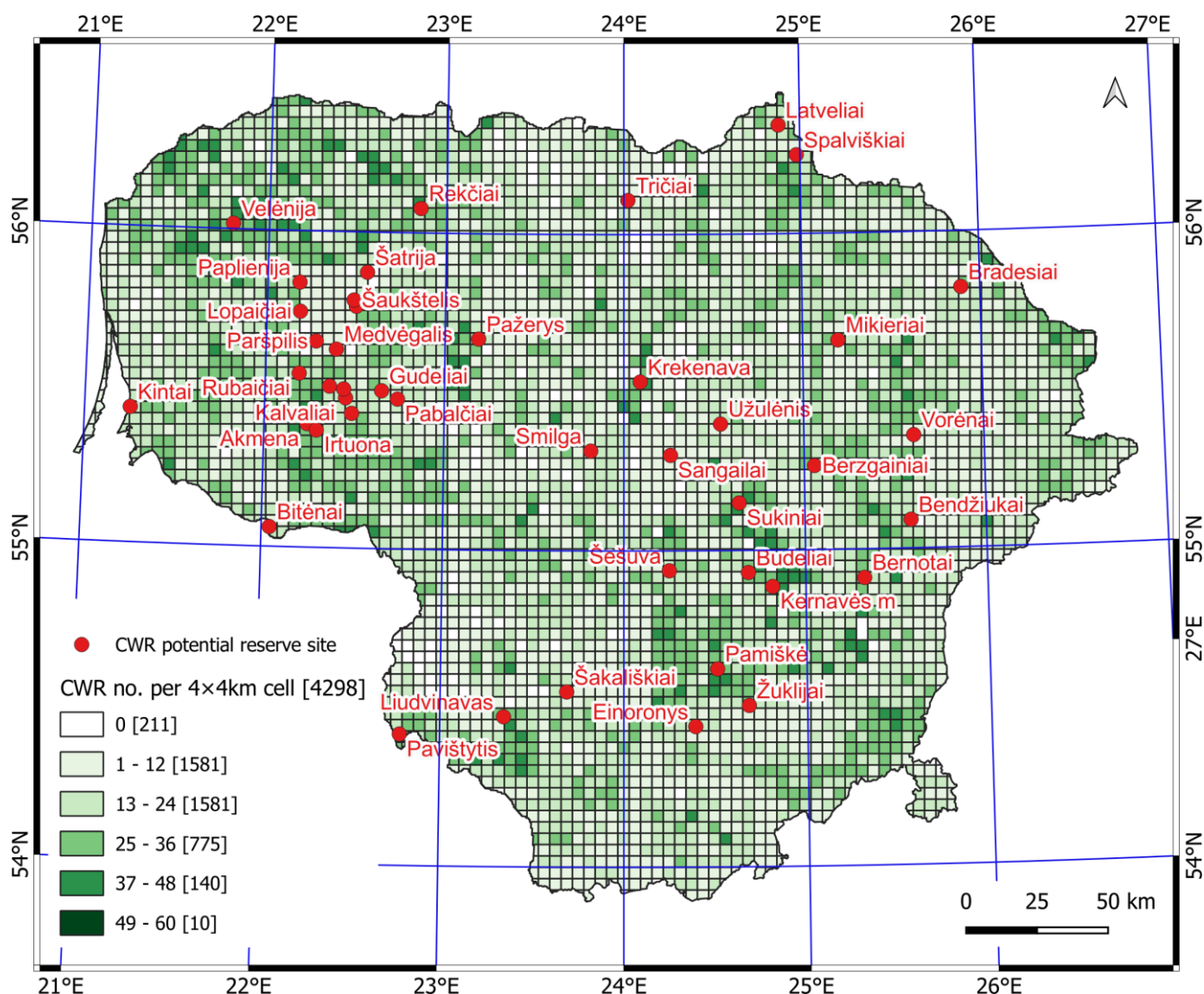


Figure 1. Results of QGIS hotspot analysis of 140 CWR priority species occurrences in 4×4 km grid cells in Lithuania. Different shades of green indicate different ranges of unique species numbers per cell with numbers of such cells in square brackets. Data source: working file package at: <https://drive.google.com/drive/folders/1StfLBVX3k93QCxBO-PLgDW6YQBwOsY-g?usp=sharing>

**Database structure.** There are two types of information tables in the CWR National Inventory database. The first one is taxon level information which consists of Taxon ID, Family, Genus, Species, and Notes. Taxon ID is a unique code which helps to identify taxon and serves as a link between the tables. The Family column contains family name information for each taxon; Genus is the name of genus for each taxon; Species is the scientific name of species; this descriptor is mandatory. To avoid synonyms and ambiguous species names, Euro+Med PlantBase (2006+) is used as a core taxonomic information system for vascular plants. The second type of information tables provides information at the population level. The descriptors for each population are Population ID, Taxon name, Date, Geographical coordinates, Country, Location name, Grid cell number, Relative abundance, Habitat, Observer or data owner and Primary data source. Population ID is a unique code which helps to identify populations. Taxon names help to identify specific population; this field takes information from taxon data table. Date is the most recent date the population was observed. Geographical coordinates are latitude and longitude (two separate columns) of location expressed in decimal degrees in WGS-84 coordinate system. Country is the name of the country where the CRW population was observed. Location name could be the name of the forest, lake, or river as well as the nearest village or town. Grid cell numbers are computer-generated numbers in column-major order (thus, in the Figure 1, each grid cell is numbered from 1 through 4298). Relative abundance usually is the cover (in percentage or Braun-Blanquet scale) of individuals of a taxon in a habitat. Observer or data owner is the name of the person who observed the taxon; if such information is not available, then there will be data owner name. Primary data source is the name of the database from which data was selected. Also, there is a plan to add the third data table with information about each of CWR traits. A snapshot of the data structure and sources is provided in Table 4.

Table 4. Data structure and sources with numbers of occurrences of CWR priority species\*

Data structure	Data source				Total
	BIGIS	BILAS	EU-LT-001	GBIF	
Main data table	284264	7682	2174	7208	301328
Taxon name	+	+	+	+	
Date	+	+	+	+	
Geographical coordinates	+	+	+	+	
coordinateUncertaintyMeters	+	-	+	+	
Country	+	+	+	+	
Location name	-	+	+	+	
Grid cell number	+	+	+	-	
Relative abundance	+	+	+	-	
Habitat	+	+	+	-	
Observer/Data owner	+	+	+	+	
Primary data source	+	+	+	+	
Additional data table					
Family	+	+	+	+	
Genus	+	+	+	+	
Species	+	+	+	+	

\* The numbers refer to the occurrences of 140 out of 144 priority CWR species (ver. 3).

A lack of distribution data on four CWR priority species has been reasoned by species identification problems (*Barbarea stricta* vs *B. vulgaris* and *Vaccinium microcarpum* vs *V. oxycoccos*) and rareness of species (*Lathyrus pisiformis* and *Onobrychis arenaria*).



### 3. Organizing the network of data providers

Both Nature Research Centre and State Forest Service cooperate in organizing the network of data providers and making it operational. Further, a key role should be performed by the individual NRC's researchers and their groups through their own research projects. A significant contribution is being obtained through the Global Biodiversity Information Facility (GBIF), particularly with the recent data (see Table 3). Regarding the rare and threatened species, the Protected Species Information System (SRIS) of the Ministry of Environment (Lietuvos Respublikos aplinkos ministerija, 2013) will be employed. Moreover, the project on establishing the National Biodiversity Information Platform at the Ministry of Environment (<https://biip.lt/>) is in progress. The hosting of all biodiversity related data in one information system is very relevant to CWR *in situ* conservation.

Meanwhile, the protected area managers, mainly botanists and ecologists of the state parks are seen as real in-place collaborators. An official letter of invitation to collaborate on CWR distribution data collection and sharing was sent to the State Service for Protected Areas under the Ministry of Environment. Some communication has already started with the experts of Dzūkija-Suvalkija Directorate of Protected Areas, but it still needs to be extended across the country. Similarly, to achieve effective cooperation with landowners and farmers direct communication needs to be established. Meanwhile, some local communities and social networking groups, like Facebook and iNaturalist, are effectively engaged on voluntary basis. These groups are among the most useful collaborators. For example, at [iNaturalist](https://www.inaturalist.org/), currently there could be found 56 observations for *Asparagus officinalis*, 52 for *Ribes nigrum*, 53 for *Angelica archangelica*, 52 for *Mentha aquatica*, 38 for *Pyrus pyraeaster*, 20 for *Rubus nessensis*, and so on. Although these observations should be verified, they are valuable sources for the target species distribution data enrichment. The potential data providers also include representatives from different research institutes and universities, particularly those working in related research fields. For example, the recently finished project "Inventory of alien and invasive species in Lithuania" provide data about the status of *Asparagus officinalis*, or the research project on native and alien plant species coexisting on roadsides could help with collecting data about species occurring in those marginal habitats. The pathway of data could be linked through the newly established Biodiversity Information Platform (<https://biip.lt/>) which incorporates the Protected Species Information System (SRIS), or through the Lithuanian vegetation database (EU-LT-001) maintained by the Nature Research Centre.

### 4. Collecting and organizing the data according to the agreed principles and data exchange format

In a separate action, 45 potential CWR genetic reserve sites were identified and mapped on the climate map (Figure 2). Out of these, 29 sites were established during the project implementation period in 2022 through 2023. The rest of the sites were originally established in 2011–2021 (based on our previous studies, see Labokas, Karpavičienė, 2018, *inter alia*) with the oldest ones reinventoried during the project years. These 45 sites contain 83 CWR priority species (57.6%) with 748 records in total (Appendix 1). The suggested site sizes vary from 0.22 to 23.40 hectares.

The most frequent species are *Dactylis glomerata* (33 sites), *Vicia cracca* (32 sites), *Corylus avellana* (28 sites), *Phleum pratense* (26 sites), *Prunus padus* (26 sites), *Rubus idaeus* (24 sites), *Thymus pulegioides* (23 sites), *Fragaria viridis* (22 sites), *Poa angustifolia* (21 sites), *Fragaria vesca* (20 sites), and *Trifolium medium* (20 sites). The least represented populations are those of *Allium angulosum*, *A. scorodoprasmum*, *A. vineale*, *Asparagus officinalis*, *Hippophae rhamnoides*, *Mentha aquatica*, *Onobrychis viciifolia*, *Poa trivialis*, *Rubus nessensis*, *R. plicatus*, *Trifolium campestre*, *T. hybridum*, *Vaccinium myrtillus*, *V. oxycoccos*, *V. vitis-idaea*, *Vicia pisiformis*, and *V. tetrasperma*, each occurring in one single site of the 45 sites investigated. The cover-abundance data of each CWR species estimated on Braun-Blanquet scale is available but not presented in this report. We have grouped the distribution of 83 CWR species across the 45 sites into 5 frequency groups (Table 5). As seen from Table 5, the required minimum of 5 populations, as proposed by Dulloo et al. (2008), has not yet been achieved for 36 CWR species, while the minimum of 10 populations, as suggested by Whitlock et al. (2016) for relatively widespread species, has not been achieved for 20 more species.

Table 5. Distribution of 83 CWR priority species across 45 potential CWR genetic reserve sites.

Frequency group	No. of CWR occurrence sites	No. of CWR species	% CWR priority list
1	1–4	36	25.0
2	5–9	20	13.9
3	10–14	3	2.1
4	15–19	13	9.0
5	≥20	11	7.6
Total species in 45 sites		<b>83</b>	<b>57.6</b>
Full priority list		<b>144</b>	100.0
Total records in 45 sites	<b>748</b>		

The selected 45 potential CWR genetic reserve sites were mapped with QGIS showing that they represent all 4 climate regions and 7 of 10 subregions of the country (Figure 2) and are in different national protected areas and/or NATURA 2000 sites of Community importance (SCIs) (Appendix 1). As seen from Figure 2, only three climatic subregions (A1, A2, and B5) are not represented by the current study, while subregions C7, D8 and D9 are the least represented ones. These results will be considered when planning further research and data collection.

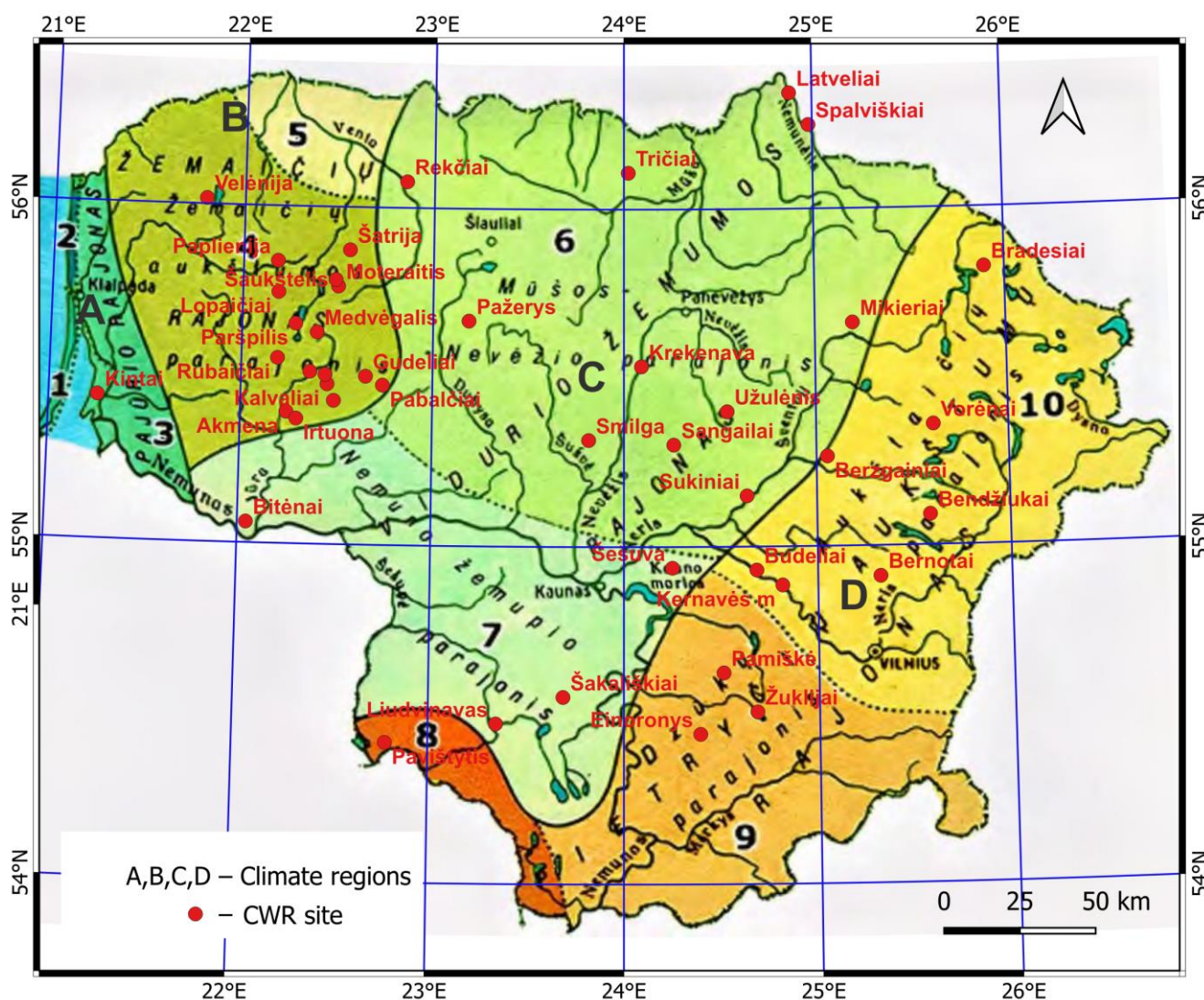


Figure 2. Distribution of 45 potential CWR genetic reserve sites (red dots) in the context of climatic subdivisions of Lithuania (Lithuanian Hydrometeorological Service, 2015). Climate regions with numbers of subregions: A – Pajūrio (Littoral) (1, 2, 3); B – Žemaičių (Samogitian) (4, 5); C – Vidurio žemumos (Middle Lowland) (6, 7); D – Pietryčių aukštumų (Southeast Uplands) (8, 9, 10). For the details on CWR genetic reserve sites see Appendix 1.

At the Nature Research Centre, we also focused on passport descriptors of CWRs and slightly elaborated on some of them. As the potential genetic reserve sites are concrete polygons with such features as area and boundaries, we have designated a respective descriptor, site ID, which includes either (a) managing institution abbreviation and a number, e.g., AGB03382, where AGB is an abbreviation of the former Plant Gene Bank (Lith. *Augalų genų bankas*, which has been merged with the State Forest Service), or (b) research institution abbreviation, short date of the first observation (in the format YYMMDD) and a 3-letter site name abbreviation, e.g., NRC200722REK, where NRC stands for Nature Research Centre, and REK indicates the site name Rekčiai). In the former case the site is [approved by the Ministry of Environment](#), and in the latter case approval is pending (see Appendix 1). Furthermore, as most of the sites are multispecies ones, a separate population ID (POPID) for each of them could be derived based on the site ID by just adding a 6-letter code for the species name. For example, the population of *Corylus avellana* from Budeliai site (see record #23, Appendix 1) would be coded as NRC230531BUD\_CORAVE (with or without underscore), *Pyrus communis* – as NRC230531BUD\_PYRCOM, *Fragaria vesca* – as NRC230531BUD\_FRAVES, etc. In general, 8 out of 11 passport descriptors comply with those recommended by the guiding document "Principles for the Inclusion of CWR Data in EURISCO" (see Appendix 1).

## 5. Providing the data to EURISCO

All preconditions for providing data to EURISCO has been met, the Lithuanian CWR database has been created, the list of target taxa compiled and the relations between different data sources established. The structure of the database contains all mandatory descriptors (NICODE, INSTCODE, ACCENUMB and GENUS) required for the upload to EURISCO, as well as the recommended ones such as SPECIES, POPID (=population ID), OBSDATE (=latest observation date), MNGINSTCODE (=INSTCODE, institution code) and ORIGCTY (country of occurrence). Thus, the data rendering is expected to be implemented within a month or so. Additionally, there is information available about habitat type, data owner, precise geographical coordinates and cover or abundance of species in a community. Also, there is a possibility to add more attribute data (like soil properties, vegetation structure data, measurements of some plant traits) as the primary data sources, especially the Lithuanian vegetation database (EU-LT-001), contain quite a wide scope of data. The only challenge at this moment is to create or adapt a tool for data management which must be as simple as possible, while being able to handle big data fluently.

## Conclusion

Prioritization of CWR taxa could be made based solely on their use in plant breeding of economically important crops. In this case even the invasive species can be prioritized (see, e.g., Fitzgerald et al., 2018). However, for the *in situ* conservation some other criteria are preferred, like species nativeness and threat level, to justify CWR conservation in natural or seminatural habitats and comply with the local regulations. The latter concept complies with the actions to mitigate the impact of climate change on plant communities and whole ecosystems. Thus, it is followed by the current project as well.

Two approaches of CWR genetic reserve site selection have been employed parallelly in this project which can complement each other: (1) the targeted site selection approach based on evaluation of preselected sites like ancient hillfort sites (which are state protected archaeological objects), sites of community importance (SCI, NATURA 2000 network) and national protected areas including protection zones of water bodies; all 45 potential genetic reserve sites have been selected by this way covering 83 species or 57.6% of the national CWR priority list, and (2) the database approach based on analysis of several large plant databases for CWR species distribution; multiple hotspots of priority CWR species have been identified by this way covering 140 species or 97.2% of the priority list. Although both approaches have their own advantages and drawbacks, they are useful in selecting the most appropriate wild population (MAWP) sites for the establishment of the national CWR genetic reserve network and facilitating both creation of the European genetic reserve network and smooth *in situ* CWR dataset inclusion in EURISCO, which is the ultimate objective of this project.



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**Appendix 1.** Passport data of potential genetic reserve sites for *in situ* conservation of CWR populations in Lithuania.

#	Site ID	Managing institution	Site name*	Municipality	Latitude	Longitude	Year**	Area, ha***	CWR species <sup>1</sup>	Protected area <sup>2</sup>	Habitat type <sup>3</sup>	Climate reg <sup>4</sup>
1	AGB03382	State Forest Service	Bitėnai	Pagėgiai	55.06184	22.04471	2011	8.5	<i>Allium angulosum</i> <i>Allium oleraceum</i> <i>Allium scorodoprasum</i> <i>Allium vineale</i> <i>Fragaria viridis</i> , etc.	Šilėnai BR, Rambynas RP, next to <a href="#">SCI Ragainės vingis LTSIU0003</a>	6510	C7
								Subtotal		15		
2	AGB04376	State Forest Service	Mikieriai	Anykščiai	55.66159	25.19773	2015	3.8	<i>Fragaria viridis</i> <i>Fragaria vesca</i> <i>Medicago falcata</i> <i>Poa angustifolia</i> <i>Festuca rubra</i> , etc.	Šventoji LR <a href="#">SCI Šimonių giria LTANYB001</a> BP Šimonių giria	6210	C6
								Subtotal		17		
3	AGB04468	State Forest Service	Kintai	Šilutė	55.42643	21.25395	2016	2	<i>Rubus plicatus</i> <i>Rubus caesius</i> <i>Rubus idaeus</i> <i>Lotus corniculatus</i> <i>Festuca gigantea</i> , etc.	Kintai BR <a href="#">SCI Kintų pievos ir miškai LTKLA0004</a>	–	A3
								Subtotal		15		
4	AGB04828	State Forest Service	Bradesiai	Zarasai	55.822	25.89349	2018	3.9	<i>Trifolium 6 species</i> , <i>Dactylis glomerata</i> <i>Festuca rubra</i> <i>Phleum pratense</i> <i>Thymus pulegioides</i> , etc.	Sartai RP <a href="#">SCI Zalvės upės slėnis LTZAR0028</a>	6210	D10
								Subtotal		20		
5	AGB05263	State Forest Service	Krekenava	Panevėžys	55.53415	24.09143	2019	9.1	<i>Medicago falcata</i> <i>Rubus caesius</i> <i>Fragaria viridis</i> <i>Ribes nigrum</i> <i>Poa angustifolia</i> , etc.	Krekenava RP <a href="#">SCI Nevėžio vidurupio slėnis LTPAN0012</a>	6530	C6
								Subtotal		22		
6	AGB05640	State Forest Service	Velėnija	Plungė	56.01676	21.79567	2020	5.4	<i>Mentha aquatica</i> <i>Vaccinium oxycoccos</i> <i>Vaccinium myrtillus</i> <i>Vaccinium vitis-idaea</i> <i>Lathyrus pratensis</i> , etc.	Žemaitija NP <a href="#">SCI Žemaitijos nacionalinis parkas LTPLU0009</a>	7140	B4
								Subtotal		9		
7	AGB05642	State Forest Service	Medvėgalis	Šilalė	55.6277	22.39278	2020	5.1	<i>Fragaria vesca</i> <i>Lathyrus sylvestris</i> <i>Origanum vulgare</i> <i>Poa nemoralis</i>	Medvėgalis Hillfort site, Varniai RP <a href="#">SCI Medvėgalio pievos LTSIL0003</a>	6210, 6510	B4

								<i>Dactylis glomerata, etc.</i>				
							Subtotal		16			
8	AGB02968	State Forest Service	Vorėnai	Molėtai	55.35748	25.6097	2022	0.5 <i>Festuca rubra</i>	Vorėnai Hillfort site	–		D10
								<i>Medicago falcata</i>				
								<i>Origanum vulgare</i>				
								<i>Trifolium medium</i>				
								<i>Vicia cracca, etc.</i>				
							Subtotal		22			
9	AGB04375	State Forest Service	Bernotai	Vilnius Dist.	54.90947	25.32245	2022	1.5 <i>Festuca rubra</i>	Bernotai Hillfort site	–		D10
								<i>Medicago falcata</i>				
								<i>Thymus pulegioides</i>				
								<i>Trifolium alpestre</i>				
								<i>Arrhenatherum elatius, etc.</i>				
							Subtotal		23			
10	NRC200722REK	NRC (pending)	Rekčiai	Šiauliai Dist.	56.07736	22.8535	2020	3.6 <i>Rubus caesius</i>	Rekčiai Hillfort site, Venta RP	6210, 6510		C6
								<i>Daucus carota</i>	<a href="#">SCI Ventos upės slėnis aukščiau Papilės LTAKM0006</a>			
								<i>Festuca rubra</i>				
								<i>Thymus pulegioides</i>				
								<i>Dactylis glomerata, etc.</i>				
							Subtotal		22			
11	NRC200715SAT	NRC (pending)	Šatrija	Telšiai	55.8727	22.558	2020	10.06 <i>Fragaria viridis</i>	Šatrija Hillfort site, Varniai RP	6210		B4
								<i>Phleum phleoides</i>	<a href="#">SCI Šatrijos pievos LTTEL0010</a>			
								<i>Poa angustifolia</i>				
								<i>Thymus pulegioides</i>				
								<i>Trifolium arvense, etc.</i>				
							Subtotal		20			
12	NRC200716PAP	NRC (pending)	Paplienija	Telšiai	55.83674	22.17979	2020	10.99 <i>Poa nemoralis</i>	Paplienija Hillfort site, Minija LR	9180, 6270		B4
								<i>Corylus avellana</i>				
								<i>Dactylis glomerata</i>				
								<i>Elymus caninus</i>				
								<i>Festuca gigantea, etc.</i>				
							Subtotal		19			
13	NRC200715MOT	NRC (pending)	Moteraitis	Telšiai	55.76457	22.4997	2020	4.4 <i>Thymus pulegioides</i>	Moteraitis Hillfort site, Varniai RP	6210		B4
								<i>Fragaria viridis</i>	<a href="#">SCI Moteraičio pievos LTTEL0009</a>			
								<i>Phleum phleoides</i>				
								<i>Trifolium alpestre</i>				
								<i>Trifolium arvense, etc.</i>				
							Subtotal		16			
14	AGB05658	State Forest Service	Pavištytis	Vilkaviškis	54.41533	22.78184	2021	1.8 <i>Phleum phleoides</i>	Pavištytis Hillfort site, Vištytis RP	6210		D8
								<i>Dactylis glomerata</i>	<a href="#">SCI Pavištyčio pievos LTVIK0003</a>			
								<i>Fragaria viridis</i>				
								<i>Medicago falcata</i>				
								<i>Trifolium alpestre, etc.</i>				
							Subtotal		16			

15	NRC210720SAK	NRC (pending)	Šakališkiai	Marijampolė	54.55398	23.68895	2021	0.22	<i>Allium oleraceum</i> <i>Poa angustifolia</i> <i>Thymus pulegioides</i> <i>Fragaria viridis</i> <i>Medicago falcata, etc.</i>	Šakališkiai Hillfort site	6210, 6270	C7
								Subtotal		18		
16	NRC210720LIU	NRC (pending)	Liudvinavas	Marijampolė	54.4742	23.34622	2021	2.93	<i>Fragaria viridis</i> <i>Medicago falcata</i> <i>Allium oleraceum</i> <i>Dactylis glomerata</i> <i>Phleum pratense, etc.</i>	Liudvinavas Hillfort site	6210	C7
								Subtotal		18		
17	NRC220622TRI	NRC (pending)	Tričiai	Pakruojis	56.10793	24.02301	2022	0.39	<i>Fragaria viridis</i> <i>Festuca rubra</i> <i>Medicago falcata</i> <i>Fragaria vesca</i> <i>Poa angustifolia, etc.</i>	Tričiai Hillfort site	–	C6
								Subtotal		19		
18	NRC220727ZUK	NRC (pending)	Žuklijai	Trakai	54.50982	24.68262	2022	1.31	<i>Festuca rubra</i> <i>Allium oleraceum</i> <i>Thymus pulegioides</i> <i>Trifolium pratense</i> <i>Fragaria vesca, etc.</i>	Žuklijai Hillfort site, Aukštadvaris RP	6210	D9
								Subtotal		23		
19	NRC220727EIN	NRC (pending)	Einoronys	Alytus Dist.	54.44435	24.39077	2022	1.34	<i>Medicago falcata</i> <i>Phleum pratense</i> <i>Trifolium medium</i> <i>Festuca rubra</i> <i>Festuca pratensis, etc.</i>	Einoronys Hillfort site Pivašiūnai GMR	–	D9
								Subtotal		20		
20	NRC220727GER	NRC (pending)	Geruliai	Alytus Dist.	24.27053	54.53128	2022	1.11	<i>Origanum vulgare</i> <i>Trifolium medium</i> <i>Poa angustifolia</i> <i>Prunus padus</i> <i>Vicia cracca, etc.</i>	Geruliai Hillfort site	–	D9
								Subtotal		20		
21	NRC220727PAM	NRC (pending)	Pamiškė	Trakai	54.62611	24.51146	2022	1.74	<i>Festuca rubra</i> <i>Thymus pulegioides</i> <i>Trifolium alpestre</i> <i>Fragaria viridis</i> <i>Malus sylvestris, etc.</i>	Pamiškė Hillfort site, Aukštadvaris RP	6210	D9
								Subtotal		31		
22	NRC220817BEN	NRC (pending)	Bendžiukai	Molėtai	55.09028	25.58466	2022	2.74	<i>Trifolium medium</i> <i>Poa angustifolia</i>	Bendžiukai Hillfort site	6510	D10



								<i>Pyrus communis</i> <i>Phleum pratense</i> <i>Malus sylvestris, etc.</i>				
							Subtotal		15			
23	NRC230531BUD	NRC (pending)	Budeliai	Kaišiadorys	54.93017	24.68439	2023	10.62 <i>Corylus avellana</i> <i>Pyrus communis</i> <i>Prunus padus</i> <i>Fragaria vesca</i> <i>Fragaria viridis, etc.</i>	Budeliai Hillfort site and LR	–		D10
							Subtotal		22			
24	NRC230531SES	NRC (pending)	Šešuva	Kaišiadorys	54.937222	24.250261	2023	11.76 <b>Allium ursinum</b> <sup>9</sup> <i>Corylus avellana</i> <i>Rubus idaeus</i>	<a href="#">Šešuva BR, SCI Būdos ir Pravieniškių miškai</a>	9020		C7
							Subtotal		3			
25	NRC230510AKM	NRC (pending)	Akmena	Tauragė	55.390246	22.239336	2023	0.5 <b>Allium ursinum</b> <i>Corylus avellana</i> <i>Prunus padus</i> <i>Pyrus communis</i> <i>Elymus caninus</i> <i>Fragaria vesca</i> <i>Lathyrus vernus</i> <i>Poa nemoralis</i> <i>Rubus idaeus</i>	Pagramantis RP	9180		B5
							Subtotal		9			
26	NRC230510SMI	NRC (pending)	Smilga	Kėdainiai	55.315665	23.816354	2023	1.77 <b>Allium ursinum</b> <i>Corylus avellana</i> <i>Lathyrus vernus</i> <i>Prunus padus</i>	Smilga municipal LR	–		C6
							Subtotal		4			
27	NRC230525SPA	NRC (pending)	Spalviškiai	Biržai	56.248754	24.979481	2023	0.5 <b>Allium ursinum</b> <i>Corylus avellana</i> <i>Lathyrus vernus</i>	<a href="#">SCI Biržų giria LTBR001</a> next to Biržų girios BR	–		D10
							Subtotal		3			
28	NRC230525UZU	NRC (pending)	Užulėnis	Ukmergė	55.400091	24.537527	2023	2.36 <b>Allium ursinum</b> <i>Prunus padus</i> <i>Corylus avellana</i>	<a href="#">SCI Tautiškių-Užulėnio miškai LTUKMB001</a>	–		C6
							Subtotal		3			
29	AGB04237	State Forest Service	Kernavės m	Širvintos	54.885253	24.817136	2014	1.5 <i>Fragaria viridis</i> <i>Medicago falcata</i> <i>Bromus inermis</i> <i>Phleum phleoides</i> <i>Poa angustifolia</i> <i>Thymus serpyllum, etc.</i>	Neris river protection zone <a href="#">Next to SCI Kernavės apylinkės LTSIR0006</a>	–		D10
							Subtotal		29			

30	AGB05264	State Forest Service	Pažerys	Kelmė	55.667127	23.187486	2019	2.16	Phleum pratense Deschampsia cespitosa Mentha arvensis Trifolium pratense Anthoxanthum odoratum Prunus padus, etc.	<a href="#">SCI Šimšų miškas LTKEL0007</a>	–	C6
								Subtotal		15		
31	NRC230510IRT	NRC (pending)	Irtuona	Tauragė	55.370702	22.291614	2023	23.4	<b>Allium ursinum</b> Corylus avellana Ribes nigrum Rubus idaeus Lathyrus vernus	Irtuona river protection zone	9160;9180; 91E0	B5
								Subtotal		5		
32	NRC230525LAT	NRC (pending)	Latveliai	Biržai	56.343430	24.878400	2023	20.3	<b>Allium ursinum</b> Corylus avellana Rubus idaeus Lathyrus vernus	<a href="#">SCI Biržų giria LTBIRB001</a>	–	D10
								Subtotal		4		
33	NRC230719BER	NRC (pending)	Berzgainiai	Ukmergė	55.265833	25.056667	2023	2.79	Fragaria viridis Medicago falcata Poa angustifolia Avenula pubescens Festuca rubra Phleum pratense Rubus idaeus, etc.	Berzgainiai Hillfort site	6210 (part)	D8
								Subtotal		22		
34	NRC230822SAU	NRC (pending)	Šaukštelis	Telšiai	55.784167	22.485833	2023	1.86	Fragaria viridis Agrostis capillaris Dactylis glomerata Festuca rubra Corylus avellana Malus sylvestris, etc.	<a href="#">SCI Sprūdės pievos LTTTEL0014</a> Šaukštelis Hillfort site	6210	B5
								Subtotal		29		
35	NRC230719SAN	NRC (pending)	Sangailai	Kėdainiai	55.301944	24.258889	2023	1.10	Fragaria viridis Dactylis glomerata Festuca rubra Medicago falcata Origanum vulgare Rubus caesius, etc.	Sangailai Hillfort site	6270	C6
								Subtotal		23		
36	NRC230719SUK	NRC (pending)	Sukiniai	Ukmergė	55.150278	24.637500	2023	7.19	Rubus idaeus Corylus avellana Rubus caesius Malus sylvestris	<a href="#">SCI Žuvintės upė ir jos slėniai LTUKM0016</a> Žuvintė LR, Sukiniai Hillfort site	–	C6

									Lathyrus sylvestris, etc.				
								Subtotal		21			
37	NRC230822PAB	NRC (pending)	Pabalčiai	Raseiniai	55.473611	22.739444	2023	0.44	Festuca rubra Corylus avellana Dactylis glomerata Fragaria vesca Prunus padus Vicia sepium, etc.	<a href="#">SCI Balčios upė LTRAS0007</a> Balčia Hydrographical Reserve Balčia Hillfort site	9180	B5	
								Subtotal		14			
38	NRC230822GUD	NRC (pending)	Gudeliai	Kelmė	55.499167	22.650000	2023	0.60	Corylus avellana Lathyrus vernus Poa nemoralis Prunus padus Ribes alpinum Vicia sepium Vicia sylvatica	Gudeliai Hillfort site		B5	
								Subtotal		7			
39	NRC230822JUS	NRC (pending)	Juškaičiai	Tauragė	55.425833	22.485278	2023	0.74	Trifolium medium Prunus padus Rubus idaeus Phleum pratense Fragaria viridis Dactylis glomerata, etc.	Juškaičiai Hillfort site	6510 (part)	B5	
								Subtotal		19			
40	NRC230822KAL	NRC (pending)	Kalvaliai	Šilalė	55.474444	22.450000	2023	0.60	Corylus avellana Astragalus glycyphyllos Dactylis glomerata Malus sylvestris Poa angustifolia Rubus idaeus Vicia cracca, etc.	Kalvaliai Hillfort site	–	B5	
								Subtotal		19			
41	NRC230822PRI	NRC (pending)	Prienai	Šilalė	55.502420	22.438490	2023	0.66	Agrostis capillaris Lathyrus pratensis Trifolium medium Trifolium montanum Trifolium pratense Trifolium repens, etc.	Prienai Hillfort site	6210 (part)	B5	
								Subtotal		15			
42	NRC230822PAR	NRC (pending)	Paršpilis	Šilalė	55.651944	22.279444	2023	1.74	Agrostis capillaris Festuca rubra Fragaria viridis Prunus avium Prunus padus	<a href="#">SCI Paršežerio-Lūksto pelkių kompleksas</a> Burbiškiai Hillfort site, Sietuva LR, Varniai RP	–	B5	

									Ribes spicatum Rubus idaeus, etc.				
								Subtotal		24			
43	NRC230823LOP	NRC (pending)	Lopaičiai	Rietavas	55.744722	22.186667	2023	0.83	Corylus avellana Festuca ovina Poa angustifolia Prunus padus Rubus idaeus Trifolium medium, etc.	<a href="#">SCI Lopaičių miškas LTRIE0002</a> Ruškis LR, Lopaičiai Hillfort site	–		B5
								Subtotal		17			
44	NRC230823RUB	NRC (pending)	Rubaičiai	Šilalė	55.549167	22.188333	2023	1.26	Rubus idaeus Corylus avellana Prunus padus Poa nemoralis Ribes spicatum Phalaris arundinacea Humulus lupulus, etc.	Rubaičiai Hillfort site	9070		B5
								Subtotal		14			
45	NRC230823VED	NRC (pending)	Vedriai	Šilalė	55.510278	22.359167	2023	0.50	Agrostis capillaris Corylus avellana Dactylis glomerata Fragaria vesca Malus sylvestris Ribes spicatum Trifolium repens, etc.	SCI Pagramančio regioninis parkas II LTSIL0011 Vedriai Hillfort site	–		B5
								Subtotal		11			
	Total records									748			
	Total species									83			
	Total SCIs									22			

\* Site name corresponds to the name of the nearest settlement or landmark (hill, river, lake).

\*\* Year or the last observation.

\*\*\* Recommended area size for the genetic reserve.

<sup>1</sup> If total CWR species number per site exceeds 10, the most abundant ones in each CWR site are listed only.

<sup>2</sup> Protected area and Natura 2000 site abbreviations:

- BP Biosphere Polygon
- BR Botanical Reserve
- GMR Geomorphological Reserve
- HF Hillfort
- HR Hydrographical Reserve
- LR Landscape Reserve
- NP National Park
- RP Regional Park



SCI Natura 2000 Site of Community Importance, Habitats Directive. Reference document:

[https://eur-lex.europa.eu/eli/dec\\_impl/2023/245/oj](https://eur-lex.europa.eu/eli/dec_impl/2023/245/oj)

<sup>3</sup> Habitat types according to the Interpretation Manual of European Union Habitats, version EUR 28, 2013

([https://www.mase.gov.it/sites/default/files/archivio/allegati/rete\\_natura\\_2000/int\\_manual\\_eu28.pdf](https://www.mase.gov.it/sites/default/files/archivio/allegati/rete_natura_2000/int_manual_eu28.pdf)):

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)

6270 \*Fennoscandian lowland species-rich dry to mesic grasslands

6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)

6530 \*Fennoscandian wooded meadows

7140 Transition mires and quaking bogs

9020 \*Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus*, *Tilia*, *Acer*, *Fraxinus* or *Ulmus*) rich in epiphytes

9180 \*Tilio-Acerion forests of slopes, screes and ravines

<sup>4</sup> Climate regions of Lithuania with numbers of subregions:

A – Pajūrio (Littoral) (1, 2, 3)

B – Žemaičių (Samogitian) (4, 5)

C – Vidurio žemumos (Middle Lowland) (6, 7)

D – Pietryčių aukštumų (Southeast Uplands) (8, 9, 10)

For details see: <http://www.meteo.lt/en/climate-regions-of-lithuania>

<sup>5</sup> Species name in **bold** indicates its absolute prevalence in a site. Here this concerns *Allium ursinum*.