

Aquatic and marsh plants
at the Arboretum and the Department of Physiography
in Bolestraszyce
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Bolestraszyce Arboretum's collection of aquatic and marsh plants is among the most valuable in the country. Several ponds of various sizes and wetlands provide vast potential for the cultivation of these species. The collection comprises nearly four hundred taxa (Table. 1, 2), among which it is worth pointing out protected plants (managed by Ewa Antoniewska since 1987), species and varieties of water lilies *Nymphaea* and irises from the *Laevigatae* group (Fig. 1): *Iris ensata*, *I. laevigata*, *I. versicolor*, *I. virginica*, *I. pseudacorus* (Piórecki 2016). The latter are a National Collection run by Dr Narcyz Piórecki, confirmed in 2007¹.

Since the founding of the Arboretum (1975), Professor Jerzy Piórecki has been creating within the garden a collection of local aquatic and marsh plants alongside endangered plants and those becoming obsolete among Polish flora, as well as compiling documentation concerning the biology, ecology and population numbers of these species in habitats in Poland. An important aim was to gradually discover the growth and cultivation conditions of this group of plants (Piórecki 1992). In 1977, the water caltrop *Trapa natans* was among the newly introduced species (Fig. 2).

This species became the focus of research conducted by Professor Jerzy Piórecki, the detailed results of which were published in 1980 (Piórecki 1980). The study examined over 200 natural habitats. In addition, the researchers performed experiments in semi-natural and laboratory conditions. To this day, their results are a valuable resource used by specialists and experts in this field. Current cultivation of the caltrop in the Arboretum comprises two ponds of a total area of 0.87 ha. Their depth ranges between 0.4 and 1.5 metres and the water is alkaline. The caltrop appears here individually or in small, compact patches with a surface area no greater than 10 m².

Another aquatic plant with a long tradition of cultivation in Bolestraszyce Arboretum is the water clover *Marsilea quadrifolia* (Fig. 3), a water fern which is strictly protected in Poland. The cultivation of this plant in the Arboretum began in 1987. It was sourced from its last natural habitat in the Goczałkowickie Lake. Initially brought to the Botanical Garden in Warsaw, it was later transported to Bolestraszyce Arboretum (Piórecki 1992). It thrives in wet, periodically flooded areas, in fertile alkaline soils. In garden conditions, it requires constant care, as it does not tolerate competition from other plants. At the start of every vegetative period new planting areas are prepared, in which, for the first few years, it grows well, producing large quantities of sori. However, over time, it weakens and dies. It is also grown in artificial conditions, i.e., in containers larger than 10l, which are transferred into a cool greenhouse for the winter. The current cultivation area in bodies of water within Bolestraszyce Arboretum exceeds 40m².

In the 1980s, Professor Jerzy Piórecki introduced the first colourful varieties of water lilies *Nymphaea* as well as swamp cypresses *Taxodium distichum* to the Arboretum (Fig. 4). Several dozens of these unique trees were planted on the lower terrace, around the ponds and in the small pond. Between 1982-

1984, following the recultivation of the ponds, old varieties of water lilies *Nymphaea* were planted: 'Plenissima', 'Candidissima Rosea', 'Marliaceae Chromatella', 'Conqueror' (Fig. 5), which were provided by Dr Kazimierz Kozak (Maria Curie-Skłodowska University Botanical Garden in Lublin). In 1986, the collection was increased by the addition of more cultivars, which were grown at the turn of the 19th century by the famous French gardener Joseph Bory Latour Marliac: 'Attraction', 'Marliacea Albida', 'Marliacea Rosea' (Fig. 6). It was also supplemented by natural forms: the white water lily *Nymphaea alba*, the dwarf water lily *Nymphaea candida* and the yellow water lily *Nuphar lutea*. In the mid-1990s, a new pond of 0.42 ha, called the large pond, was created as part of the development process of the collection of aquatic and marsh plants.

Winter 2003/2004 saw the recultivation of the medium pond for the second time in the Arboretum's history. Dr Narcyz Piórecki took charge of coordinating this process. For the duration of the works, the historical varieties of water lilies growing in the pond were removed and stored in the cold basement below the chapel. Following the completion of the desilting of the pond's bottom, a total of 1250 rhizomes were replanted. Additionally, the size of the island in the medium pond was increased by approximately 74 m²; its banks were landscaped and reinforced. Shelves totalling 85m in length, designed for planting waterside plants, mainly irises from the *Laevigatae* series, were created in the pond bank area from the heath side and around the island (Komarnicki 2014). A zigzag footbridge was constructed too, allowing for the close observation of aquatic plants and animals (Fig. 7).

Medium pond (Fig. 8). From the footbridge crossing the pond, plants in the depths of the water are visible; among others, an underwater carpet of hornwort *Ceratophyllum demersum*, clumps of Canadian waterweed *Elodea canadensis*, *Batrachium circinatum* (Fig. 9), species of pondweeds (*Potamogeton natans*, *P. lucens*, *P. crispus*). Sedges, irises, rushes and the warm-favouring *Cyperus* species: the umbrella papyrus *Cyperus alternifolius* and the papyrus sedge *Cyperus papyrus*, removed from the greenhouses for the summer, grow on specially-prepared rafts. The pond's greatest decorations are the colourful variety of *Nymphae* (Fig. 10), commonly known as water lilies, as well as white water lilies *Nymphaea alba* sourced from their natural habitat. These flower at the end of May and their final blooms appear even in early October. The protected species are particularly noteworthy: the water caltrop *Trapa natans* (Fig. 11), the fringed water lily *Nymphoides peltata* (Fig. 12), the floating fern *Salvinia natans* (Fig. 13) and the water clover *Marsilea quadrifolia*.

Small pond. Near the footpath cutting across the middle of the pond, more than 90 swamp cypress *Taxodium distichum* grow in the water (Fig. 15). In their undergrowth, the broadleaf cattail *Typha latifolia* forms a dense aggregation with the purple loosestrife *Lythrum salicaria*, the great hairy willowherb *Epilobium hirsutum* and the simplestem bur-reed *Sparganium erectum* (Fig. 14). At the edges of the cattails grows the northern water hemlock *Cicuta virosa*, the great water-parsnip *Sium latifolium* and several species of sedges, including the cyperus sedge *Carex pseudocyperus*. The exposed water surface is colonised by duckweeds: *Lemna minor*, *L. trisulca*, the common duckmeat *Spirodela polyrhiza* and the rootless duckweed *Wolffia arrhiza*, forming a dense, green layer. In early spring, the bogbean *Menyanthes trifoliata* (Fig. 16), the marsh-marigold *Caltha palustris* (Fig. 17) and the foreign Asian skunk-cabbage *Lysichiton camtschatcensis* (Fig. 18) bloom here. Irises grown in specially-prepared habitats, including *Iris versicolor*, *I. virginica*, *I. pseudacorus* and *I. fulva*.

Large pond. This is dominated by winter-hardy varieties of water lilies (Fig. 19), white water lilies *Nymphaea alba* and dwarf water lilies *Nymphaea candida*, as well as their hybrids. Shallower areas are populated by the common mare's-tail *Hippuris vulgaris*, which forms underwater carpets in the pond's deeper parts. In the bankside area grow small tufts of the lakeshore bulrush *Schoenoplectus lacustris*

together with the flowering rush *Butomus umbellatus* and the water forget-me-not *Myosotis palustris*. A significant part of the bankside area is home to the broadleaf cattail *Typha latifolia*, the yellow flag *Iris pseudacorus* and its many varieties (Fig. 20), the great manna grass *Glyceria maxima*, several species of sedges, and, once in a while, the purple loosestrife *Lythrum salicaria* and the great hairy willowherb *Epilobium hirsutum* as well as local species of rushes: *Juncus effusus* and *Juncus inflexus*. The narrowleaf cattail *Typha angustifolia* and the fine-leaved water-dropwort *Oenanthe aquatica* enter into the water's depths, creating small aggregations. Local species are accompanied by cultivated species and varieties, mainly *Laevigatae* irises, winter-hardy water lilies, protected species: the chairmaker's bulrush *Schoenoplectus americanus*, the bog bulrush *Schoenoplectus mucronatus*, the water caltrop *Trapa natans*, the fringed water lily *Nymphoides peltata*, the floating fern *Salvinia natans* and the water clover *Marsilea quadrifolia*, as well as the foreign pickerelweed *Pontederia cordata* (Fig. 21), native to the American continents. Its significant decorative qualities have made it a popular choice for planting in gardens.

The varieties of water lilies *Nymphaea* introduced to Bolestraszyce Arboretum come from the Prague Botanical Garden, the Maria Curie-Skłodowska University Botanical Garden in Lublin, the University of Wrocław Botanical Garden, the University of Warsaw Botanical Garden, from private collections and aquatic nurseries. Currently, the collection of winter-hardy forms comprises 2 species and 107 varieties, whereas the number of tropical forms is 2 species and 14 varieties (Tab. 1, 2). Particularly noteworthy are the water lilies with large and unusually coloured, including 'Clyde Ikins' (Fig. 22), 'Wanvisa' (Fig. 23), 'Sunny Pink' (Fig. 24) and 'Perry's Double Yellow'. Because of the ponds' depth, many cultivars of the moderately growing and dwarf type were planted in the smallest ponds (Fig. 25, 26, 27). The old French varieties are interspersed with the newest ones bred in recent years. Among them are also the varieties created by the first Polish breeders, pioneers of hybridisation: 'Anna', 'Helena', 'Inka', 'Magda', 'Yellow James' (Tab. 2). Since 2009, the collection has been enriched with exotic plants: the Asian sacred lotuses *Nelumbo nucifera* (Fig. 28), the South American yellow lotuses *Nelumbo lutea* (Fig. 29) and tropical water lilies. The past six years have seen the creation of the so-called mini water gardens, including the floral sundial, to display these species (Fig. 30). These are small, warm basins perfect for the cultivation of heat-loving species. The creator of these garden fixtures was Dr Narczyz Piórecki. The first tropical variety, 'Tina' (Fig. 31), was planted in the garden in 2014, in subsequent years joined by: *Nymphaea nouchali* var. *caerulea* (Fig. 32), *Nymphaea pubescens* (Fig. 33), 'Avalanche', 'Bagdad', 'Doris Holt', 'Islamorada', 'King of Siam', 'Larp Prasert', 'Nangkwag', 'Queen of Siam', 'Star of Siam', 'Suwanna', 'Tropic Sunset', 'Ultra Violet' and 'Valentine' (Tab. 1, 2). At the Arboretum, tropical lilies are displayed outdoors, which is unusual in our country. However, this method of cultivation requires necessary nurturing procedures to be performed. We have established effective methods for preserving tubers (Fig. 34) over the winter period, which guarantees the successful cultivation of these plants in our climate conditions.

The Arboretum's collection of aquatic plants is a precious research and educational resource. The practical lectures about the life forms of aquatic and marsh plants are very popular. They also cover topics related to the biology, ecology and physiology of plants. The educational trail 'Plants and animals of the aquatic environment' runs alongside two ponds and across two wooden decks.



Fig. 1. Irises from the *Laevigatae* group, Medium pond, 2013, photo: M. Czernicki



Fig. 2. Water caltrop *Trapa natans*, photo: M. Czernicki



Fig. 3. Water clover *Marsilea quadrifolia*, photo: M. Czernicki



Fig. 4. Swamp cypresses *Taxodium distichum*. Medium pond, 2017, photo: M. Czernicki



Fig. 5. Garden variety of the water lily 'Conqueror', photo: M. Czernicki



Fig. 6. Garden variety of the water lily 'Attraction'. Large pond, 2016, photo: M. Czernicki



Fig. 7. Zigzag footbridge. Medium pond, 2015, photo: N. Piórecki



Fig. 8. View of the medium pond, 2016, photo: N. Piórecki



Fig. 9. *Batrachium circinatum*, photo: M. Czernicki



Fig. 10. Colourful varieties of *Nymphaea* water lilies. Medium pond, 2016, photo: N. Piórecki



Fig. 11. Water caltrop *Trapa natans*. Germinating seeds, photo: M. Czernicki



Fig. 12. Fringed water lily *Nymphaoides peltata*, photo: M. Czernicki



Fig.13. Floating fern *Salvinia natans*, photo: M. Czernicki



Fig. 14. Simplestem bur-reed *Sparganium erectum*, photo: M. Czernicki



Fig. 15. View of the collection of swamp cypresses *Taxodium distichum*. Small pond, 2020, photo: N. Piórecki



Fig. 16. Bogbean *Menyanthes trifoliata*, photo: M. Czernicki



Fig. 17. Marsh-marigold *Caltha palustris*, photo: M. Czernicki



Fig. 18. Asian skunk-cabbage *Lysichiton camtschatcensis*, photo: M. Czernicki



Fig. 19. View of the collection of winter-hardy varieties of *Nymphaea* water lilies. Large pond, 2016, photo: M. Czernicki



Fig. 20. Yellow flag *Iris pseudacorus* and its varieties. Large pond, 2013, photo: M. Czernicki



Fig. 21. Pickerelweed *Pontederia cordata*, photo: M. Czernicki



Fig. 22. Garden variety of the water lily 'Clyde Ikins', photo: M. Czernicki



Fig. 23. Garden variety of the water lily 'Wanvisa', photo: M. Czernicki



Fig. 24. Garden variety of the water lily 'Sunny Pink'. Very small pond, 2017, photo: M. Czernicki



Fig. 25. Very small pond with the collection of winter-hardy and tropical varieties of water lilies and sacred lotuses *Nelumbo nucifera*, 2020, photo: N. Piórecki



Fig. 26. Very small pond in the form of a sundial with a collection of tropical lilies, 2020, photo: M. Czernicki



Fig. 27. Very small pond with the collection of winter-hardy varieties of water lilies and sacred lotuses *Nelumbo nucifera* and yellow lotuses *Nelumbo lutea*, 2015, photo: N. Piórecki



Fig. 28. Sacred lotus *Nelumbo nucifera*, photo: M. Czernicki



Fig. 29. Yellow lotus *Nelumbo lutea*, photo: M. Czernicki



Fig. 30. Part of the so-called mini water gardens – the floral sundial, 2016, photo: N. Piórecki



Fig. 31. Garden variety of the tropical lily 'Tina', photo: M. Czernicki



Fig. 32. Tropical water lilies *Nymphaea nouchali* var. *caerulea*. Sundial, 2020, photo: M. Czernicki



Fig. 33. Tropical water lilies *Nymphaea pubescens*. Sundial, 2019, photo: M. Czernicki



Fig. 34. Tubers of tropical water lilies, photo: M. Czernicki

Tab. 1. Species and varieties of aquatic and marsh plants of the temperate, subtropical and tropical zones cultivated at Bolestraszyce Arboretum

Species / variety		Source / year of introduction
Scientific name	Common name	
<i>Acorus calamus</i> L.	Sweet flag	Hurko – old San river bed / 1995, 2002 Ogrody Wodne – nursery / 2008
<i>Acorus calamus</i> 'Variegatus'	Sweet flag, variety	University of Wrocław Botanical Garden / 2002
<i>Acorus gramineus</i> 'Hakuro-nishiki'	Sweet flag, variety	Ogrody Wodne – nursery / 2009
<i>Acorus gramineus</i> 'Ogon'	Sweet flag, variety	Ogrody Wodne – nursery / 2009
<i>Alisma lanceolatum</i> With.	Lanceleaf water plantain	Oczko Wodne – shop / 2010
<i>Alisma plantago-aquatica</i> L.	Common water-plantain	Bolestraszyce – local species
<i>Alisma subcordatum</i> Raf.	American water plantain	Ogrody Wodne – nursery / 2003, 2007

<i>Azolla caroliniana</i> L.	Carolina mosquito fern	Origin unknown
<i>Batrachium aquatile</i> (L.) Dumort.	Common water-crowfoot	Origin unknown
<i>Batrachium circinatum</i> (Sibth.) Fr.		Bolestraszyce – local species
<i>Berula erecta</i> (Huds.) Coville	Lesser water-parsnip	Bolestraszyce – local species
<i>Butomus umbellatus</i> L.	Flowering rush	Zakrzów near Sandomierz / 1987 Hurko – old San river bed / 1995
<i>Butomus umbellatus</i> ‘Schneeweisschen’	Flowering rush, variety	Ogrody Wodne – nursery / 2006
<i>Calla palustris</i> L.	Bog arum	Zbydniów – San Lower Valley / 1989
<i>Caltha palustris</i> L.	Marsh-marigold	Starzawa / 1995 Cisowa Arboretum / 1997, 2004
<i>Caltha palustris</i> ‘Auenwald’	Auenwald marsh-marigold	Ogrody Wodne – nursery / 2006, 2011
<i>Caltha palustris</i> ‘Multiplex’	Double marsh-marigold	Ogrody Wodne – nursery / 2006, 2016
<i>Caltha palustris</i> var. <i>alba</i>	White marsh-marigold	Ogrody Wodne – nursery / 2002, 2008
<i>Canna glauca</i> ‘Endeavor’	Water canna, variety	Bylinowy Pan – Rzeszów / 2018
<i>Canna glauca</i> ‘Erebus’	Water canna, variety	Bylinowy Pan – Rzeszów / 2018
<i>Canna glauca</i> ‘Ra’	Water canna, variety	Bylinowy Pan – Rzeszów / 2018
<i>Cardamine amara</i> L.	Large bitter-cress	Bolestraszyce – local species
<i>Carex acutiformis</i> Ehrh.	Lesser pond-sedge	Bolestraszyce – local species
<i>Carex conica</i> ‘Variegata’	Birdfoot sedge	Ogrody Wodne – nursery / 2006
<i>Carex grayi</i> J. Carey	Gray’s sedge	Origin unknown
<i>Carex morrowii</i> ‘Variegata’	Japanese sedge, variety	Ogrody Wodne – nursery / 2007
<i>Carex muskingumensis</i> ‘Aureovariegata’	Muskingum sedge, variety	Ogrody Wodne – nursery / 2007
<i>Carex nigra</i> (L.) Reichard	Common sedge	Bolestraszyce – local species
<i>Carex ornithopoda</i> ‘Variegata’	Bird’s foot sedge (variegated)	Ogrody Wodne – nursery / 2007
<i>Carex paniculata</i> L.	Greater tussock-sedge	Makowa – Pogórze Przemyskie / 1995
<i>Carex pendula</i> Huds.	Weeping sedge	Ogrody Wodne – nursery / 2011
<i>Carex pseudocyperus</i> L.	Cyperus sedge	Bolestraszyce – local species
<i>Carex riparia</i> ‘Variegata’	Greater pond sedge (variegated)	Ogrody Wodne – nursery / 2006
<i>Ceratophyllum demersum</i> L.	Hornwort	Bolestraszyce – local species
<i>Cicuta virosa</i> L.	Northern water hemlock	Bolestraszyce – local species Surochów – old San river bed / 1980
<i>Cirsium palustre</i> (L.) Scop. Coss. ex Scop.	Marsh thistle	Origin unknown
<i>Cladium mariscus</i> (L.) Pohl	Swamp sawgrass	Adam Mickiewicz University in Poznań Botanical Garden / 2002
<i>Colocasia esculenta</i> (L.) Schott	Taro	Private collection – A. Zawisza / 2020
<i>Colocasia gigantea</i> (Blume ex Hassk.) Hook. f.	Giant elephant ear	Private collection – A. Zawisza / 2020
<i>Colocasia</i> sp.		Private collection – A. Zawisza / 2020

<i>Cyperus alternifolius</i> L.	Umbrella papyrus	University of Wrocław Botanical Garden / 1990, 1995
<i>Cyperus eragrostis</i> Lam.	Tall flatsedge	Origin unknown
<i>Cyperus esculentus</i> L.	Yellow nutsedge	Origin unknown
<i>Cyperus haspan</i> L.	Dwarf papyrus	Private collection – A. Zawisza / 2020
<i>Cyperus papyrus</i> L.	Papyrus sedge	Origin unknown / 2010 Private collection – P. Pawlikowski / 2020
<i>Drosera intermedia</i> Hayne	Oblong-leaved sundew	Syców Arboretum / 2019
<i>Drosera rotundifolia</i> L.	Round-leaved sundew	Syców Arboretum / 2019
<i>Eichhornia crassipes</i> (Mart.) Solms	Common water hyacinth	Ogrody Wodne – nursery / 2006–2010 Hydroflora – nursery / 2020
<i>Eleocharis acicularis</i> (L.) Roem. & Schult.	Needle spikerush	Ogrody Wodne – nursery / 2006
<i>Eleocharis palustris</i> (L.) Roem. & Schult.	Common spike-rush	Surochów – old San river bed / 2007
<i>Elodea canadensis</i> Michx.	Canadian waterweed	Origin unknown
<i>Epilobium hirsutum</i> L.	Great hairy willowherb	Bolestraszyce – local species
<i>Epilobium palustre</i> L.	Marsh willowherb	Bolestraszyce – local species
<i>Equisetum hyemale</i> L.	Rough horsetail	Ogrody Wodne – nursery / 2008
<i>Equisetum palustre</i> L.	Marsh horsetail	Bolestraszyce – local species
<i>Equisetum scirpoides</i> L. Michx.	Dwarf horsetail	Ogrody Wodne – nursery / 2009
<i>Eupatorium cannabinum</i> L.	Hemp-agrimony	Bolestraszyce – local species
<i>Filipendula rubra</i> 'Venusta'	Queen-of-the-prairie	Ogrody Wodne – nursery / 2012
<i>Filipendula ulmaria</i> L. Maxim.	Meadowsweet	Starzawa / 1987, 2002
<i>Filipendula ulmaria</i> 'Variegata'	Variegated meadowsweet	Ogrody Wodne – nursery / 2006
<i>Galium palustre</i> L.	Common marsh bedstraw	Bolestraszyce – local species
<i>Geranium palustre</i> L.	Marsh cranesbill	Bolestraszyce – local species
<i>Gladiolus imbricatus</i> L.	Meadow gladiolus	University of Wrocław Botanical Garden / 2002
<i>Gladiolus palustris</i> Gaudin	Marsh gladiolus	University of Wrocław Botanical Garden / 2002
<i>Glyceria fluitans</i> (L.) R.Br.	Floating sweet-grass	Bolestraszyce – local species
<i>Glyceria maxima</i> (Hartm.) Holmb.	Great manna grass	Bolestraszyce – local species
<i>Glyceria maxima</i> 'Variegata'	Variegated manna grass	Ogrody Wodne – nursery / 2006
<i>Gratiola officinalis</i> L.	Common hedge hyssop	Ogrody Wodne – nursery / 2012
<i>Hippuris vulgaris</i> L.	Common mare's-tail	Ogrody Wodne – nursery / 2002
<i>Houttuynia cordata</i> 'Chameleon'	Heart-leaved houttuynia 'Chameleon'	Origin unknown
<i>Hydrocharis morsus-ranae</i> L.	Frogbit	Hurko – old San river bed / 1983 Zator – Oświęcim Basin / 2002
<i>Hydrocotyle vulgaris</i> L.	Common pennywort	Roztocze / 1994 Ogrody Wodne – nursery / 2006

<i>Iris pseudacorus</i> L.	Yellow flag	Hurko – old San river bed / 1983, 2002 Walawa – old San river bed / 1995
<i>Iris</i> series <i>Laevigatae</i> (<i>I. ensata</i> , <i>I. laevigata</i> , <i>I. pseudacorus</i> , <i>I. versicolor</i> , <i>I. virginica</i>)		National Collection / 2007 (http://ptob.sggw.pl/kolekcje/Bolestraszyce_iris.htm)
<i>Juncus effusus</i> L.	Common rush	Bolestraszyce – local species
<i>Juncus effusus</i> ‘Spiralis’	Corkscrew rush	Ogrody Wodne – nursery / 2006
<i>Juncus ensifolius</i> Wikstr.	Swordleaf rush	Ogrody Wodne – nursery / 2007, 2012
<i>Juncus inflexus</i> L.	Hard rush	Bolestraszyce – local species
<i>Lemna minor</i> L.	Common duckweed	Bolestraszyce – local species
<i>Lemna trisulca</i> L.	Star duckweed	Bolestraszyce – local species
<i>Limnobium spongia</i> (Bosc) Steud.	American frogbit	Ogrody Wodne – nursery / 2006–2009 Hydroflora – nursery / 2020
<i>Lobelia cardinalis</i> L.	Cardinal flower	Ogrody Wodne – nursery / 2007, 2012
<i>Lobelia</i> ‘Queen Victoria’	Cardinal flower, variety	Ogrody Wodne – nursery/2007–2013 Bylinowy Pan – Rzeszów / 2018
<i>Lychnis flos-cuculi</i> L.	Ragged-robin	Bolestraszyce – local species
<i>Lysichiton americanus</i> Hultén & H.St. John	American skunk-cabbage	Przelewice Dendrological Garden / 1996 Ogrody Wodne – nursery / 2006, 2008
<i>Lysichiton camtschaticensis</i> (L.) Schott	Asian skunk-cabbage	Ogrody Wodne – nursery / 2007, 2010
<i>Lysimachia ciliata</i> ‘Firecracker’	Fringed loosestrife, variety	Ogrody Wodne – nursery / 2009
<i>Lysimachia nummularia</i> L.	Creeping Jenny	Bolestraszyce – local species
<i>Lysimachia nummularia</i> ‘Aurea’	Golden creeping Jenny	Origin unknown
<i>Lysimachia punctata</i> L.	Dotted loosestrife	Origin unknown
<i>Lysimachia punctata</i> ‘Alexander’	Dotted loosestrife ‘Alexander’	Ogrody Wodne – nursery / 2006, 2009
<i>Lysimachia thyrsoflora</i> L.	Tufted loosestrife	Ogrody Wodne – nursery / 2006
<i>Lysimachia vulgaris</i> L.	Yellow loosestrife	Origin unknown
<i>Lythrum salicaria</i> L.	Purple loosestrife	Bolestraszyce – local species
<i>Marsilea quadrifolia</i> L.	Water clover	Goczałkowice – Warsaw University Botanical Garden / 1987
<i>Mentha aquatica</i> L.	Water mint	Bolestraszyce – local species
<i>Menyanthes trifoliata</i> L.	Bogbean	Origin unknown
<i>Myosotis scorpioides</i> L.	Water forget-me-not	Bolestraszyce – local species
<i>Myosotis scorpioides</i> ‘Variegata’	Water forget-me-not, variety	Ogrody Wodne – nursery / 2006, 2009
<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Parrot feather watermilfoil	Ogrody Wodne – nursery / 2009
<i>Myriophyllum spicatum</i> L.	Spiked watermilfoil	Bolestraszyce – local species
<i>Myriophyllum verticillatum</i> L.	Whorl-leaf watermilfoil	Wrzawy – Lower San Valley / 2003
<i>Nasturtium officinale</i> R.Br.	Watercress	Oczko Wodne – shop / 2011
<i>Nelumbo lutea</i> (Willd.) Pers.	Yellow lotus	Ogrody Wodne – nursery / 2013

<i>Nelumbo nucifera</i> Gaertn.	Sacred lotus	Ogrody Wodne – nursery / 2013, 2018
<i>Nelumbo</i> ‘Alba Striata’	Lotus, variety	Ogrody Wodne – nursery / 2009
<i>Nelumbo</i> ‘Crystal Beauty’	Lotus, dwarf variety	Ogrody Wodne – nursery / 2015
<i>Nelumbo</i> ‘First Lady’	Lotus, variety	Ogrody Wodne – nursery / 2009
<i>Nelumbo</i> ‘Momo Botan’	Lotus, dwarf variety karłowata	Ogrody Wodne – nursery / 2013
<i>Nelumbo</i> ‘Mrs. Perry D. Slocum’	Lotus, variety	Ogrody Wodne – nursery / 2009
<i>Nelumbo</i> sp.	Lotus	Private collection – D. Mamcarczyk / 2017
<i>Nuphar japonica</i> DC.	East Asian yellow water lily	Bylinowy Pan – Rzeszów / 2018
<i>Nuphar lutea</i> (L.) Sm.	Yellow water lily	Świniary – Sandomierz Basin / 1987
<i>Nymphaea alba</i> L.	White water lilies	Świniary – Sandomierz Basin / 1987
<i>Nymphaea candida</i> L.	Dwarf water lilies	Origin unknown
<i>Nymphaea nouchali</i> var. <i>caerulea</i> (Savigny) Verdc.	Blue water lilies	Private collection – D. Mamcarczyk / 2019, 2020
<i>Nymphaea pubescens</i> Willd.	Hairy water lily	Private collection – D. Mamcarczyk / 2019
<i>Nymphoides peltata</i> (S.G. Gmel.) Kuntze	Fringed water lily	Zator –Oświęcim Basin / 1987
<i>Oenanthe aquatica</i> (L.) Poir.	Fine-leaved water-dropwort	Bolestraszyce – local species
<i>Orontium aquaticum</i> L.	Golden-club	Ogrody Wodne – nursery / 2012
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Common reed	Bolestraszyce – local species
<i>Phragmites australis</i> ‘Variegatus’	Variegated common reed	Ogrody Wodne – nursery / 2006
<i>Phragmites karka</i> ‘Variegatus’	Striped Norfolk reed	Ogrody Wodne – nursery / 2006
<i>Pilularia globulifera</i> L.	Pillwort	University of Wrocław Botanical Garden
<i>Pistia stratiotes</i> L.	Water cabbage	Ogrody Wodne – nursery / 2006–2012 Hydroflora – nursery / 2020
<i>Polygonum amphibium</i> L.	Longroot smartweed	Trzcinica k. Jasła – old Ropa river bed / 2010
<i>Pontederia cordata</i> L.	Pickerel weed	University of Wrocław Botanical Garden / 2004
<i>Pontederia cordata</i> ‘Alba’	White pickerel weed	Ogrody Wodne – nursery / 2008
<i>Pontederia cordata</i> ‘Rosea’	Pink pickerel weed	Ogrody Wodne – nursery / 2006
<i>Pontederia lanceolata</i> Nutt.	Giant pickerel weed	Ogrody Wodne – nursery / 2007
<i>Potamogeton crispus</i> L.	Crisp-leaved pondweed	Bolestraszyce – local species
<i>Potamogeton lucens</i> L.	Shining pondweed	Bolestraszyce – local species
<i>Potamogeton natans</i> L.	Broad-leaved pondweed	Bolestraszyce – local species
<i>Potentilla palustris</i> L. (Scop.)	Purple marshlock	Origin unknown
<i>Ranunculus lingua</i> L.	Greater spearwort	Hurko – old San river bed / 1995
<i>Ranunculus lingua</i> ‘Grandiflora’	Greater spearwort, variety	Ogrody Wodne – nursery / 2007
<i>Rorippa amphibia</i> (L.) Besser	Great yellowcress	Bolestraszyce – local species

<i>Rosa palustris</i> Marshall	Swamp rose	Ogrody Wodne – nursery / 2006
<i>Rumex longifolius</i> DC.	Dooryard dock	Origin unknown
<i>Sagittaria australis</i> 'Benni'	Longbeak arrowhead, variety	Ogrody Wodne – nursery / 2009
<i>Sagittaria graminea</i> 'Crushed Ice'	Grass-leaved arrowhead, variety	Ogrody Wodne – nursery / 2010
<i>Sagittaria latifolia</i> Willd.	Broadleaf arrowhead	Ogrody Wodne – nursery / 2006
<i>Sagittaria latifolia</i> 'Flore Pleno'	Broadleaf arrowhead, variety	Ogrody Wodne – nursery / 2009
<i>Sagittaria sagittifolia</i> L.	Arrowhead	Bolestraszyce – local species
<i>Salvinia natans</i> (L.) All.	Floating fern	Rzemień near Mielec / 1983, 1984
<i>Schoenoplectus americanus</i> (Pers.) Volkart	Chairmaker's bulrush	University of Wrocław Botanical Garden / 1995
<i>Schoenoplectus lacustris</i> (L.) Palla	Lakeshore bulrush	Bolestraszyce – local species
<i>Schoenoplectus lacustris</i> 'Albescens'	White rush	Ogrody Wodne – nursery / 2006
<i>Schoenoplectiella mucronata</i> (L.) J.Jung & H.K.Choi	Bog bulrush	Poreba Wielka Ogrody Wodne – nursery / 2007, 2011
<i>Schoenoplectus tabernaemontani</i> 'Zebrinus'	Softstem bulrush, variety	Ogrody Wodne – nursery / 2002
<i>Sium latifolium</i> L.	Great water-parsnip	Bolestraszyce – local species
<i>Solanum dulcamara</i> L.	Bittersweet nightshade	Bolestraszyce – local species
<i>Solanum dulcamara</i> 'Variegatum'	Variegated bittersweet nightshade	Ogrody Wodne – nursery / 2002
<i>Sparganium erectum</i> L. emend. Rchb.	Simplestem bur-reed	Bolestraszyce – local species
<i>Spirodela polyrhiza</i> (L.) Schleid.	Common duckmeat	Bolestraszyce – local species
<i>Stratiotes aloides</i> L.	Water soldiers	Izbica near Zamość – Roztocze / 1987 Surochów – old San river bed / 2000
<i>Symphytum officinale</i> L.	Common comfrey	Bolestraszyce – local species
<i>Thalia dealbata</i> Fraser	powdery alligator-flag	Ogrody Wodne – nursery / 2015
<i>Thelypteris confluens</i> (Thunb.) C.V. Morton	Marsh fern	Ogrody Wodne – nursery / 2007
<i>Trapa natans</i> L.	Water caltrop	Sońnica / 1977–1985
<i>Typha angustifolia</i> L.	Narrowleaf cattail	Bolestraszyce – local species
<i>Typha gracilllis</i> Jordan	Medium bulrush	Ogrody Wodne – nursery / 2006
<i>Typha latifolia</i> L.	Broadleaf cattail	Bolestraszyce – local species
<i>Typha latifolia</i> 'Variegata'	Variegated broadleaf cattail	Ogrody Wodne – nursery / 2006
<i>Typha laxmannii</i> Lepech.	Graceful cattail	Ostrów near Przemyśl – quarry / 2013
<i>Typha minima</i> Funck	Miniature cattail	University of Wrocław Botanical Garden / 1995
<i>Utricularia vulgaris</i> L.	Common bladderwort	Bolestraszyce – local species
<i>Veronica beccabunga</i> L.	European brooklime	Bolestraszyce – local species
<i>Wolffia arrhiza</i> (L.) Horkel ex Wimm.	Rootless duckweed	Origin unknown
<i>Zantedeschia aethiopica</i> (L.) Spreng.	Calla lily	Private collection – A. Zawisza / 2020

Tab. 2. Garden varieties (cultivars) of winter-hardy and tropical water lilies grown at Bolestraszyce Arboretum.

Variety	Pochodzenie / rok wprowadzenia
'Albatros'	Ogrody Wodne – nursery / 2011
'Almost Black'	Ogrody Wodne – nursery / 2010
'Anna'	Private collection – M. Miązek / 2019
'Arc en Ciel'	Oczko Wodne – shop / 2011 Ogrody Wodne – nursery / 2011
'Atropurpurea'	University of Wrocław Botanical Garden / 2010
'Attraction'	MCSU Botanical Garden in Lublin / 1986 University of Wrocław Botanical Garden / 2006
'Aurora'	Ogrody Wodne – nursery / 2006
'Avalanche**'	Private collection – D. Mamcarczyk / 2018
'Bagdad**'	Private collection – D. Mamcarczyk / 2019
'Barbara Dobbins'	Ogrody Wodne – nursery / 2006
'Baroness Orcy'	University of Wrocław Botanical Garden / 2006
'Bernice Ikins'	Ogrody Wodne – nursery / 2011
'Berthold'	University of Wrocław Botanical Garden / 2006
'Black Princess'	Ogrody Wodne – nursery / 2012
'Burgundy Princess'	Ogrody Wodne – nursery / 2006
'Candidissima Rosea'	Prague Botanical Garden – MCSU Botanical Garden in Lublin / 1982–1984
'Caroliniana'	University of Wrocław Botanical Garden / 2006
'Caroliniana Nivea'	France – aquatic nursery
'Caroliniana Perfecta'	University of Wrocław Botanical Garden / 2006
'Caroliniana Rosea'	University of Wrocław Botanical Garden / 2006
'Celebration'	Ogrody Wodne – nursery / 2010
'Charles de Meurville'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2007
'Clyde Ikins'	Ogrody Wodne – nursery / 2010 Lilie Wodne – nursery (K. Kruszewski) / 2012
'Colonel A.J. Welch'	Private collection – J. Konkel / 2002
'Colorado'	Lilie Wodne – nursery (K. Kruszewski) / 2014 Ogrody Wodne – nursery / 2006
'Conqueror'	Prague Botanical Garden – MCSU Botanical Garden in Lublin / 1982–1984 University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2007
'Denver'	Ogrody Wodne – nursery / 2015
'Doris Holt**'	Private collection – D. Mamcarczyk / 2020
'Ellisiana'	Ogrody Wodne – nursery / 2006

'Escarboucle'	Ogrody Wodne – nursery / 2006
'Esmeralda'	University of Wrocław Botanical Garden / 2006 University of Warsaw Botanic Garden / 2009
'Fabiola'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2007
'Firecest'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2006
'Froebelii'	University of Wrocław Botanical Garden / 2006
'Georgia Peach'	Ogrody Wodne – nursery / 2006
'Gloire du Temple-sur-Lot'	Ogrody Wodne – nursery / 2009
'Gloriosa'	Ogrody Wodne – nursery / 2006
'Gold Medal'	University of Wrocław Botanical Garden / 2013
'Gonnere'	Ogrody Wodne – nursery / 2006
'Hal Miller'	Ogrody Wodne – nursery / 2010
'Helena'	Private collection – M. Miązek / 2019
'Hidden Violet'	Ogrody Wodne – nursery / 2011
'Hollandia'	Ogrody Wodne – nursery / 2006
HxT 2018 – siewka	Private collection – D. Mamcarczyk / 2020
'Indiana'	Ogrody Wodne – nursery / 2016
'Inka'	Private collection – M. Miązek / 2018
'Inner Light'	Ogrody Wodne – nursery / 2009
'Islamorada'*	Private collection – D. Mamcarczyk / 2019, 2020
'James Brydon'	Ogrody Wodne – nursery / 2006
'Joey Tomocik'	Ogrody Wodne – nursery / 2006
'Karl Eplle'	University of Wrocław Botanical Garden / 2006
'King of Siam'*	Private collection – D. Mamcarczyk / 2018, 2019
'Larp Prasert'*	Private collection – D. Mamcarczyk / 2020
'Laydekeri Fulgens'	Ogrody Wodne – nursery / 2017
'Lemon Mist'	Ogrody Wodne – nursery / 2018
'Lily Pons'	Ogrody Wodne – nursery / 2010
'Little Sue'	Ogrody Wodne – nursery / 2013
'Lucida'	Ogrody Wodne – nursery / 2015
'Magda'	Private collection – D. Mamcarczyk / 2020
'Marliacea Albida'	MCSU Botanical Garden in Lublin / 1986 University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2007
'Marliacea Carneae'	University of Wrocław Botanical Garden / 2006
'Marliacea Chromatella'	Prague Botanical Garden – MCSU Botanical Garden in Lublin / 1982–1984 University of Wrocław Botanical Garden / 2006

'Marliacea Rosea'	MCSU Botanical Garden in Lublin / 1986 University of Wrocław Botanical Garden / 2006
'Masaniello'	University of Wrocław Botanical Garden / 2006
'Mayla'	Ogrody Wodne – nursery / 2006
'Meteor'	University of Wrocław Botanical Garden / 2006
'Madame Wilfron Gonnere'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2007
'Murillo'	University of Wrocław Botanical Garden / 2006
'Nangkwaq'*	Private collection – D. Mamcarczyk / 2018, 2019
'Newton'	University of Wrocław Botanical Garden / 2006
'Nigel'	Ogrody Wodne – nursery / 2010
'Norma Gedy'	University of Wrocław Botanical Garden / 2006
'Odorata Julianae'	University of Wrocław Botanical Garden / 2006
'Paul Harriot'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2006
'Peace Lily'	Ogrody Wodne – nursery / 2010
'Peaches and Cream'	Ogrody Wodne – nursery / 2017
'Perry's Baby Red'	Ogrody Wodne – nursery / 2010
'Perry's Double White'	Ogrody Wodne – nursery / 2006
'Perry's Double Yellow'	Ogrody Wodne – nursery / 2016
'Perry's Magnificent'	Ogrody Wodne – nursery / 2017
'Perry's Orange Sunset'	Ogrody Wodne – nursery / 2014
'Perry's Red Dwarf'	Ogrody Wodne – nursery / 2010
'Perry's Red Glow'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2010
'Perry's Stellar Red'	University of Wrocław Botanical Garden / 2006
'Perry's Strawberry Pink'	University of Wrocław Botanical Garden / 2006
'Phoebus'	University of Wrocław Botanical Garden / 2006
'Pink Opal'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2010
'Pink Sensation'	Ogrody Wodne – nursery / 2014
'Plennissima'	Prague Botanical Garden – MCSU Botanical Garden in Lublin / 1982–1984
'Pygmaea Helvola'	Ogrody Wodne – nursery / 2006
'Pygmaea Rubra'	Ogrody Wodne – nursery / 2006
'Queen of Siam'*	Private collection – D. Mamcarczyk / 2018
'Ray Davies'	University of Wrocław Botanical Garden / 2006
'Red Paradise'	Ogrody Wodne – nursery / 2014
'Red Spider'	Ogrody Wodne – nursery / 2010
'Rene Gerard'	University of Wrocław Botanical Garden / 2006

'Robinsoniana'	University of Wrocław Botanical Garden / 2006
'Rose Arey'	University of Wrocław Botanical Garden / 2006 Ogrody Wodne – nursery / 2008
'Rosenymphe'	Oczko Wodne – shop / 2011
'Rosy Morn'	Ogrody Wodne – nursery / 2017
'Shady Lady'	Ogrody Wodne – nursery / 2017
'Sioux'	Ogrody Wodne – nursery / 2006
'Souvenir de Fridolfing'	University of Wrocław Botanical Garden / 2006
'Star of Siam'*	Private collection – D. Mamcarczyk / 2019, 2020
'Starburst'	Ogrody Wodne – nursery / 2017
'Sulphurea'	Ogrody Wodne – nursery / 2006
'Sunny Pink'	Ogrody Wodne – nursery / 2010 Lilie Wodne – nursery (K. Kruszewski) / 2005
'Suwanna'*	Private collection – D. Mamcarczyk / 2020
'Texas Dawn'	Ogrody Wodne – nursery / 2010
'Tina'*	Ogrody Wodne – nursery / 2010, 2013 Private collection – D. Mamcarczyk / 2018
'Tropic Sunset'*	Private collection – D. Mamcarczyk / 2018, 2019
'Ultra Violet'*	Private collection – D. Mamcarczyk / 2019, 2020
'Valentine'*	Private collection – D. Mamcarczyk / 2020
'Virginalis'	University of Wrocław Botanical Garden / 2006
'Walter Pagels'	Ogrody Wodne – nursery / 2006
'Wanvisa'	Ogrody Wodne – nursery / 2016
'White Sultan'	Ogrody Wodne – nursery / 2010
'William Falconer'	University of Wrocław Botanical Garden / 2006
'Yellow James'	Private collection – M. Miązek / 2019
'Yellow Queen'	Ogrody Wodne – nursery / 2017
'Yellow Sensation'	Lilie Wodne – nursery (K. Kruszewski) / 2012

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