Scientific data analysis to support modelling for aquatic risk assessment

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There is a strong need to establish ecological baseline responses as a means to create workable tools for the risk assessment of aquatic macrophytes. This project was aimed at collating quantitative field data to characterize the baseline biotic and abiotic parameters in edge-of-field water bodies in Europe. The project collected information of a selection of 30 common macrophytes from streams, ponds and ditches including species information, abiotic data and some functional traits. The data show that most of the macrophyte species characteristic for ponds, streams and ditches have a wide distribution in Europe. Most of them are already used in Species Sensitivity Distributions and aquatic macrophyte mesocosm and potted plant studies. The quantitative data is collated in a database, that can serve to support a reference tier for aquatic macrophyte risk assessment and to support aquatic macrophyte models.

Keywords: aquatic macrophytes, field data, edge-of-field, reference tier, risk assessment

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Contents

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Preface

There is a strong need to establish ecological baseline responses as a means to create workable tools for the risk assessment of aquatic macrophytes. This project aimed at collating quantitative field data to characterize the baseline biotic and abiotic parameters in the edge-of-field water bodies.

Summary

There is a strong need to establish an ecological baseline as a means to create workable tools for aquatic macrophyte risk assessment. This project aimed at collating quantitative field data to characterize the baseline biotic and abiotic parameters in edge-of-field water bodies in Europe. The project collected information from freshwater edge-of-field aquatic ecosystems to identify: 1.) which macrophyte species grow in different water body types (ponds, streams and ditches) and which species can be considered as characteristic species, 2.) which abiotic conditions prevail in edge-of-field ponds, streams and ditches and which can be considered as key conditions and are also relevant for macrophyte models and 3.) which functional traits do these characteristic macrophytes species represent.

We followed a stepwise methodology to meet the project aims. First, we explored available databases at the European level, openly published datasets and datasets available in The Netherlands and surrounding countries of the central zone to select a group of 30 macrophyte species characteristic for edge-of-field ponds, streams and ditches. Secondly, we explored databases and published literature to extract the key conditions under which these macrophytes grow under field conditions, how wide they are distributed over Europe, how often they are used in Species Sensitivity Distributions and microcosm and mesocosm studies and which growth forms and functional traits they represent.

The data show that most of the macrophyte species characteristic for ponds, streams and ditches have a wide distribution in Europe. The characteristic species show a large overlap with those tested in mesocosm studies. The selected aquatic macrophytes typically grow in water which is circum-neutral (average pH 7.4), buffered (average alkalinity 2.6), has a medium to high nutrient content and medium salinity and chlorinity levels.

A database has been constructed including information about 30 aquatic macrophytes. Parameters included are scientific and common names, taxonomic information, growth forms, a selection of functional traits, presence in the three selected categories of water types, use in SSDs or micro- and mesocosm studies, and surface water, pore water and sediment quality at the stands of these aquatic macrophytes.

The collated database can serve to support a reference tier for aquatic macrophyte risk assessment and to support macrophyte models.

1 Introduction

1.1 Needs

There is a strong need to establish an ecological baseline as a means to create workable tools for the risk assessment of aquatic macrophytes, amongst others, in edge-of-field aquatic ecosystems such as ponds, streams and ditches. Information is needed on which macrophyte species grow in different water body types, which species can be considered as characteristic species and characteristic for specific environmental conditions, which abiotic conditions prevail in edge-of-field aquatic ecosystems, which can be considered as key conditions and are also relevant for macrophyte models, and which functional traits do these characteristic macrophytes species represent.

1.2 Aim

The project aims are:

1. Describing the baseline and variability of naturally present macrophytes in the environment and specifically edge-of-field freshwater bodies (ponds, streams and ditches);
2. Describe the abiotic factors affecting growth of macrophytes in these freshwater bodies, especially these linked to the conditions modelled in aquatic macrophyte models.

This project aims at collating quantitative field data to characterize the baseline biotic and abiotic parameters in edge-of-field water bodies. Therefore, a selection of macrophyte species including representative species from the different growth forms is identified. These selected macrophyte species will be common species from small and shallow water bodies in edge-of-field agricultural areas (ditches, ponds, streams) and characteristic for different sub-types of water bodies.

1.3 Research questions

Research questions were:

1. Which macrophyte species grow in edge-of-field water bodies (ponds, streams and ditches) and which species can be considered as characteristic species for these water types?
2. Which macrophyte species can be distinguished for specific subtypes of water bodies, such as acidic, alkaline and static / flowing water bodies?
3. What are the abiotic conditions and their variability in edge-of-field ponds, streams and ditches and which can be considered as key conditions for the characteristic macrophytes, and are also relevant for macrophyte models?
4. Which main functional traits are represented by the characteristic species?

After having answered question 1 above, the following research question will be:

5. How do these species link to the regulatory species *Lemna* sp. and *Myriophyllum spicatum* in terms of abiotic conditions and growth forms?

2 Materials and methods

2.1 Stepwise methodology to answer the research questions

Step 1: to identify which macrophytes grow in edge-of-field freshwater bodies (ponds, streams and ditches) in agricultural areas and which species can be considered as characteristic species?

To collect information about which macrophytes grow in edge-of-field freshwater bodies, we explored the EVA database: http://euroveg.org/eva-database. This database is based upon vegetation plot observations from all over Europe (Fig. 1). Such plots typically contain a full list of vascular (and often also non-vascular) plant species, estimation of cover-abundance of each species, location and various additional information on vegetation structure and environmental features in the plot (Chytrý M. et al., 2016). The EVA dataset contains a total of 1,847,463 vegetation plots, of which 1,612,287 were georeferenced (see Figure 1). We explored if enough information about the type of water body (stream, pond, ditch) is included in the relevé information (descriptive field) to specifically select the aquatic macrophytes in these water bodies. Relevés are vegetation plot data with information on species composition and species abundance. The aim of this exercise is to deduce characteristic macrophyte species occurring in small and shallow water bodies with their average abundance. The characteristic macrophyte species comprise different growth forms (sediment-rooted and submerged; sediment-rooted emergent; free-floating; sediment-rooted and floating-leaved).

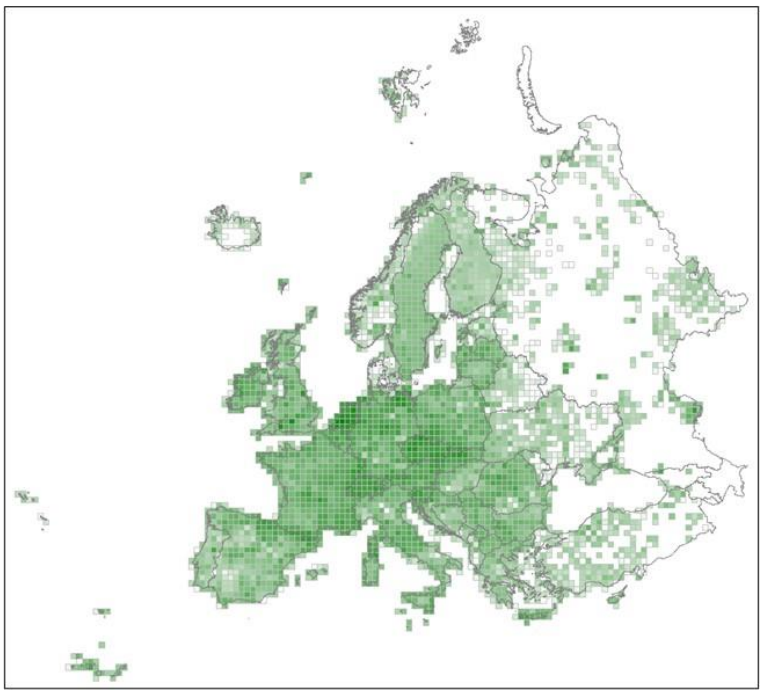

Figure 1 *Density distribution of the total of 1,612.287 georeferenced vegetation plots in EVA and other vegetation plots provided for this project in 50 x 50 km grid cells (accessed on 28 November 2019).*

As the EVA database did not include enough information about the type of water body in the descriptive field, we approached the question from another angle, i.e. based on vegetation classes known to grow in small, shallow water bodies (e.g. *Lemnetea, Phragmitetea, Potametea* and others), we selected plant species and relevés, which were checked for their location in edge-of-field surface waters. Relevé sampling is a flexible and powerful tool for collecting information on species composition and species abundance in vegetation plots.

The selected relevés were summarized in synoptic vegetation tables which give information about the characteristic, constant and discriminating species, their frequency of occurring and their mean abundance. Based on these synoptic vegetation tables, we identified 30 characteristic species including representative species from the different growth forms.

The Dutch National Vegetation Database was explored to extract data from lowland streams, ponds and ditches. This database covers all plant communities in The Netherlands and includes a total of 710,000 vegetation plots. From this database a selection was made for the three categories, i.e. lowland stream, pond and ditch. For these categories vegetations plots were retrieved by searching for specific words in the database in the narrative field 'Remarks'. For lowland streams the search terms used were 'beek' and 'beken', for ponds these search terms were 'poel' and 'poelen' and for ditches these were 'sloot' and 'sloten'.

In addition we collected information from open literature (via searches in Scopus, Web of Science and Google Scholar) and openly published databases in repositories. This information is expected to support the characteristic species identified with the EVA database or can potentially add additional species to the list of characteristic species. Also we searched for biomass data of the selected characteristic species in the literature, as biomass is an important endpoint of macrophyte effect models. The literature searches were performed based on keywords. Search strings used were:

For the selected aquatic macrophytes it was investigated how wide they are distributed over Europe and how often they are used in Species Sensitivity Distributions and microcosm and mesocosm studies for pesticide regulatory purposes. The distribution maps were generated using a combination of the EVA database (http://euroveg.org/eva-database) and the Global Biodiversity Information Facility GBIF (https://www.gbif.org).

Step 2: Describe the abiotic factors affecting growth of macrophytes, especially these linked to the conditions modelled in aquatic macrophyte models.

To collect abiotic data for the selected macrophytes, the variability of the data and the amplitude of the species, we used several approaches:

1. We used the reports of De Lyon and Roelofs (1986a;b) to identify the most important abiotic factors for the characteristic species identified in step 1. De Lyon and Roelofs (1986a;b) performed an extensive monitoring study in the 1980's to measure water, sediment- and pore water quality at stands with aquatic macrophytes species. They statistically analysed these data and generated tables with the preferred abiotic conditions for the specific macrophytes in terms of classes for abiotic conditions. The preferred abiotic conditions for the specific macrophytes identified in step 1 were presented in summary tables and bar diagrams. These abiotic conditions were used to distinguish water body sub-types and their characteristic vegetation. A division by size and depth is less applicable for the aim of this project, as all water bodies are edge-of-field water bodies and per definition very shallow to shallow. As the regulatory water bodies all are small water bodies (ditches, ponds and streams), the size differences within these water bodies were not a discriminating factor for aquatic macrophytes. For the interpretation and categorization of the abiotic conditions, the tables included in De Lyon and Roelofs (1986b) were used.
2. We also explored the data collected and published in Arts & Smolders (2008a;b) and Arts et al. (2007). Although these data represent reference data for vegetation types, the abiotic conditions and the differences therein give information at the level of the vegetation classes which are useful for this study.
3. We also performed a search within databases or published papers, including Scopus, Web of Science and Google Scholar. The searches were performed based on keywords, i.e. taxonomic names, water quality, abiotic, sediment, pore water quality.
4. We performed a search for datasets in open repositories within the scope of this project. E.g. in the repository https://data.4tu.nl/ and other repositories.

Step 3: functional traits of the identified aquatic macrophytes

Based on literature we identified the following functional traits of the identified aquatic macrophytes: growth form and growth morphology (Den Hartog & Van der Velde, 1988; Maltby et al., 2010); leaf traits (leaf area, leaf dry matter content (LDMC) and Specific Leaf Area (SLA)) based on Lukács et al 2017 and Chmara et al. (2019); reproduction based on available species information.

2.2 Project boundaries

We did not explore national datasets all over Europe. Instead, we explored datasets at the European level, openly published datasets in data repositories and datasets available in The Netherlands and surrounding countries of the central zone. We limited the exercise to freshwater water bodies, so water bodies with brackish and saltwater conditions are excluded. The extraction of traits of the identified characteristic species from the TRY database was not part of this research but was considered as a next step. However, based on literature we identified some functional traits of the selected macrophytes. We limited our analysis to permanent water bodies, so intermittent or temporal water bodies were excluded.

3 Results

3.1 Step 1: identification of characteristic macrophytes from lowland streams, ponds and ditches

For the lowland streams, ponds and ditches the respective numbers of vegetation plots found in the Dutch National Vegetation Database were 3,749, 1,693 and 12,835, respectively. A summary of the three categories can be found in Annex 1. For each category and for each species two numbers have been included. The first one is the frequency indicating in how many vegetation plots a specific species occurs expressed as a percentage value. The Mip value (Mean if present) indicates the mean percentage cover of the species over the vegetation plots in which the species occurs. The synoptic table offers a quick overview of similarities and differences between the three categories, i.e. streams, ponds and ditches (Annex 1).

The EVA (European Vegetation Archive) database including vegetation plot data all over Europe did not have information in the narrative field 'Remarks' so a selection of specific data from streams, ponds and ditches could not be made.

For the final selection of the 30 aquatic macrophytes the Synoptic_table_lowlandStreams_Ponds_Ditches selected from the Dutch National Vegetation Database was considered, combined with expert judgement based on observations of species occurrences in the field (Annex 1). It was taken care that the selected aquatic macrophytes cover the different growth forms, i.e. free-floating macrophytes, sediment-rooted and floating macrophytes, sediment-rooted and emergent macrophytes, and sediment-rooted and submerged macrophytes. Terrestrial plants which were still present in the synoptic table were omitted from the list. For the final selection of the aquatic macrophytes a frequency criterium indicating in how many vegetation plots a specific species occurs was applied to all three categories. This criterium was a frequency of more than 8 %. The Mip values have not been used for the final selection, as the mean percentage cover of a species over the vegetation plots in which the species occurs, is also dependent on the growth form of the species.

For each category (lowland streams, ponds and ditches) a list of characteristic macrophytes resulted from the process described above. The results of the selection of characteristic macrophytes are presented in Annex 2. This table presents the scientific names of the macrophytes, their common names, taxonomic information (genus, family, order), the presence of the macrophytes in the three selected categories of water bodies (lowland streams, ditches and ponds), and their common use in micro- and mesocosm studies and in Species Sensitivity Distributions (SSDs). Twenty-two macrophyte species out of the 30 species (73 %) have been commonly used in micro- and mesocosm studies (GLP unpublished data) and 19 out of the 30 species (63 %) have been commonly used in Species Sensitivity Distributions (SSDs) (Annex 2). The macrophyte species used in SSDs were based on published studies (Périllon et al., 2021; Lewis and Thursby, 2018; Van Wijngaarden et al., 2010; Giddings et al., 2013) as well as on GLP unpublished data.

3.2 Geographic distribution of the characteristic macrophytes

As the selection of the 30 aquatic macrophytes was based upon the Dutch National Vegetation Database, the question arose how wide the selected macrophytes are distributed over Europe and thus how representative they are for the different regulatory zones in Europe.

The distribution maps of the 30 selected aquatic macrophytes are presented in Annex 3. From the maps it is clear that the GBIF database (in grey) fills many gaps and adds to the EVA database (the latter in green), especially in Scandinavia. The distribution maps clearly show that almost all selected aquatic macrophytes have a wide distribution over Europe, covering the central zone and (parts of) the northern and southern zones. Only the *Callitriche* species have a stricter Atlantic distribution and are more limited in their occurrence.

3.3 Step 2: Identification of abiotic factors

All abiotic results collected so far are included in Annex 4 and 5. Annex 4 includes collected abiotic data for the 30 selected aquatic macrophytes. Annex 5 includes detailed abiotic data for 6 macrophyte species. The literature numbers in the appendices correspond with the references summarized in Chapter 7 of this report.

The selected aquatic macrophytes grow in circum-neutral surface water (average pH 7,4). The water is buffered (alkalinity 2,6), medium to high in nutrient content and medium in salinity and chlorinity levels (Figure 2).

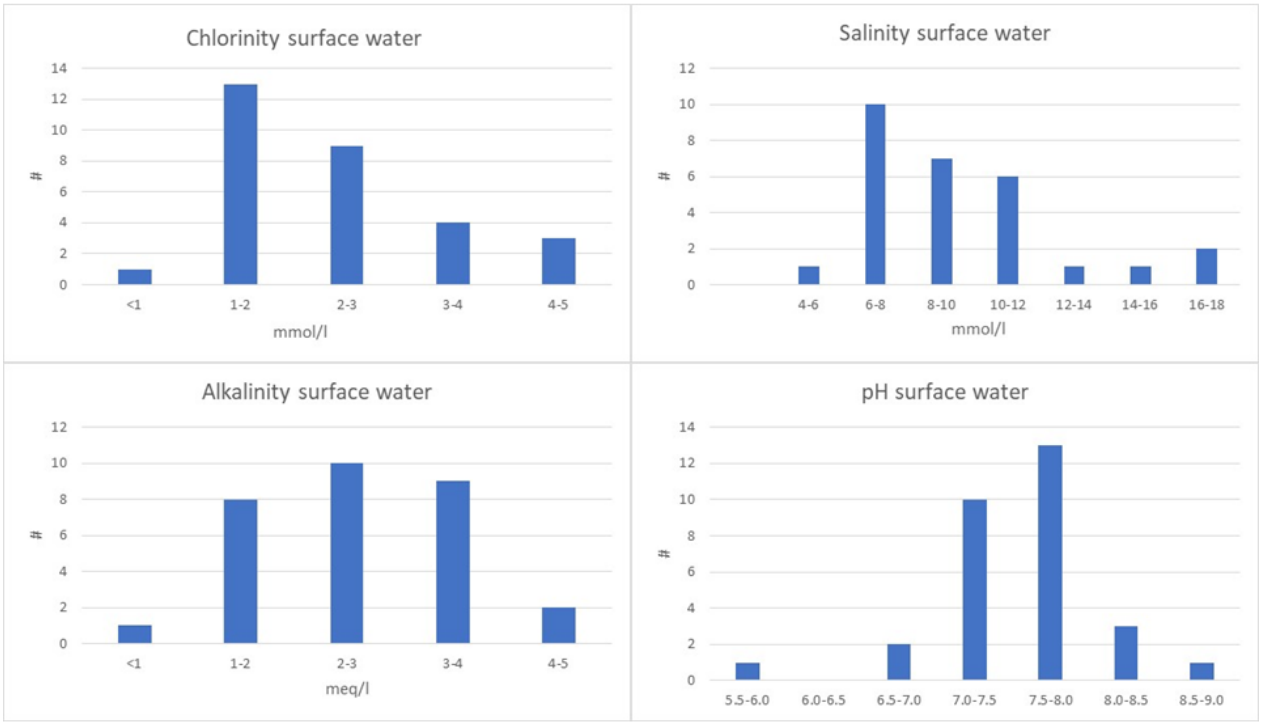

Figure 2 *Water quality parameters at the stands of 30 aquatic macrophytes representative for lowland streams, ponds and ditches in Europe.*

The alkalinity of pore water shows that the pore water is buffered to strongly buffered (Figure 3). pH is circumneutral. The phosphorus and nitrate-nitrogen concentrations in the pore water are medium to high, and the ammonium-nitrogen concentration is high as well (Figure 3).

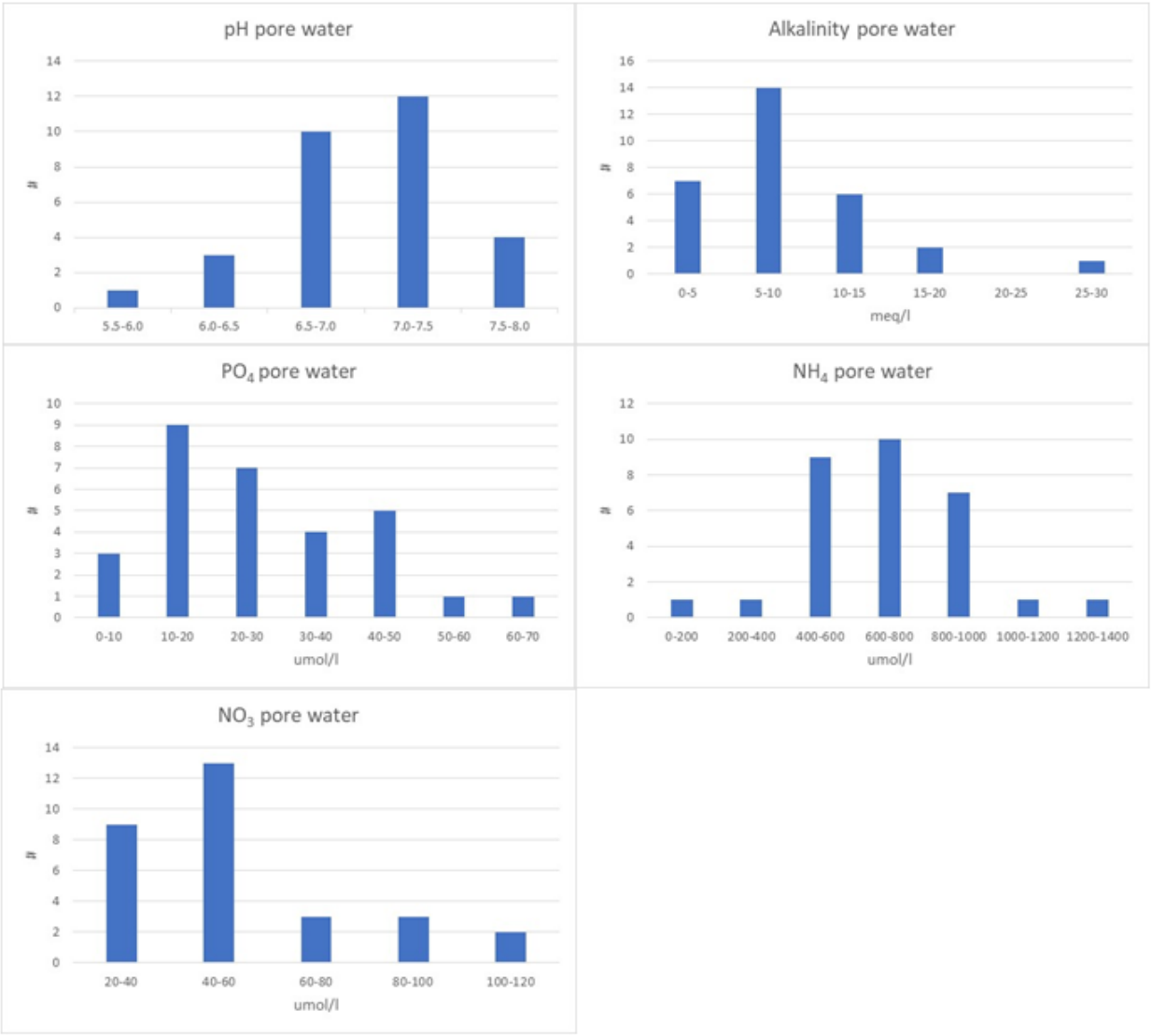

Figure 3 *Pore water quality parameters at the stands of 30 aquatic macrophytes representative for streams, ponds and ditches in Europe.*

3.4 Step 3: identification of functional traits of the identified aquatic macrophytes

Macrophyte morphological and physiological characteristics (mainly aboveground and belowground biomass data, growth rates and standing crop) are included in Annex 4 and all references are also summarized in chapter 7 of this report. Growth form and growth morphology (Den Hartog & Van der Velde, 1988; Maltby et al., 2010); leaf traits (leaf area, leaf dry matter content (LDMC) and Specific Leaf Area (SLA)) based on Lukács et al., 2017 and Chmara et al. (2019) and reproduction are separately included in Annex 6 of this report.

The aquatic growth form system distinguished by Den Hartog and Van der Velde (1988) is a more elaborated growth form system compared to that of Maltby et al. (2010) (Annex 6). Den Hartog and Van der Velde (1988) distinguish: Myriophyllid species, which are anchored submerged plants with long stems and finely divided submerged leaves without specialised floating leaves; Nymphaeid species, which are anchored plants with floating entire leaves attached to a submerged rhizome by an elongate petiole, sometimes also with submerged lanceolate, rhombic or orbicular leaves; Peplid species which are anchored plants with oblong and spatulate leaves, the upper ones forming floating rosettes, adapted to air metabolism; Pleustophytes are plants which are not attached at all, and float freely in the water; Parvopotamid species, which are anchored plants with submerged linear to oblong entire leaves; Ceratophyllid plants which are submerged pleustophytes with finely divided submerged leaves and without floating leaves; Elodeid plants, which are submerged rooted plants without a rhizome and whorls of linear or oblong leaves; Hydrocharid plants, i.e. macrophytes with stolons floating freely on the water surface with rosettes of specialised floating leaves; Lemnid plants, i.e. plants floating freely on the water surface of which the upper side of the fronds is adjusted to air metabolism and the lower side is adapted to life in water; Helophytes, which are plants that root in the sediment and the basal parts of which are often continually submerged but whose leaves and inflorescences emerge far above the water surface.

The data about Specific Leaf Area (SLA) are diverse and also not consistent among the same species and growth forms.

Aquatic macrophytes mainly propagate vegetatively from plant fragments (shoots, stolons) and from rhizomes (Annex 6).

Information about the compartments of the environment (sediment, pore water, water column, air) used by aquatic macrophytes for their growth and anchoring, is important to be used in the risk assessment for aquatic macrophytes. This gives insight where exposure to herbicides and fungicides with a herbicidal mode of action might occur.

3.5 Representativity of *Lemna* sp., *Myriophyllum spicatum* and *Glyceria maxima* in terms of abiotic conditions and growth forms

Lemna sp. is a representative of the free-floating macrophytes (pleustophytes). Several lemnid species have been identified as being representative of ditches, ponds and streams (Annex 1). *Myriophyllum spicatum* is a representative of the sediment-rooted, submerged macrophytes (Myriophyllids). *Myriophyllum spicatum* was added to the risk assessment to cover cases where *Lemna* sp. is not sensitive; where the mode of action of the herbicide or fungicide with a herbicidal mode of action is specially targeting dicot species and where the test item is adsorbing to the sediment (Maltby et al., 2010). Currently a ring-tested test protocol for *Glyceria maxima* is with the OECD for discussion and approval. *Glyceria maxima,* a sediment-rooted emergent macrophyte (helophyte), is considered a good addition to the species array of macrophytes for testing herbicides or fungicides with a herbicidal mode of action, as this monocot species is especially appropriate to test grass herbicides. From the worksheet 'data' it can be seen that the three test species fall within the range of abiotic conditions covering the range of the conditions of the identified macrophytes. Each of the three test species represent a different growth form sensu Den Hartog and Van der Velde (1988) and Maltby et al. (2010) and are therefore considered a good representation of the diversity in aquatic macrophyte growth forms.

4 Discussion

To deduce a selection of aquatic macrophytes representative of lowland streams, ponds and ditches from the European EVA database was unfortunately not possible, as this database did not include the detailed information necessary to assign vegetation plot data to a specific water type. Fortunately, the Dutch National Vegetation Database did contain this information and we could deduce a list of aquatic macrophyte species characteristic of lowland streams, ponds and ditches. As this selection was based upon the Dutch National Vegetation Database, the question arose how widely the selected aquatic macrophytes are distributed over Europe and thus can be considered appropriate to be used in the risk assessment for aquatic macrophytes in Europe. Therefore, we studied this by collating distribution maps for the 30 selected aquatic macrophytes over Europe. This analysis shows that most of the aquatic macrophytes are widely distributed across Europe (Annex 3). Dispersal mechanisms, clonal growth, small-scale heterogeneity and adaptations to a stressful environment might play a role why most aquatic plants are so widely distributed (Santamaria, 2002). Sesin et al. (2023) mention two distinctive adaptive mechanisms that improve the survival, reproduction, and dispersal of plant species: phenotypic plasticity and local adaptation (i.e., the capacity of a species to rapidly adapt genetically by virtue of a diverse gene pool (Ward et al., 2008; Riis et al., 2010)).

Although widely distributed over Europe, it would be worthwhile to dive more into the representativity of the 30 selected aquatic macrophytes for the three different regulatory zones in Europe (northern, central and southern zone) and if, for example, in the Mediterranean region macrophytes more characteristic of semi-permanent water body types and warmer climates should be added to the list of characteristic species. This makes the aquatic macrophyte risk assessment more fit-for-purpose for this climatic zone.

Based on Den Hartog and Van der Velde (1988) the 30 macrophytes selected to be characteristic of lowland streams, ponds and ditches represent 10 different growth forms (Annex 6). The various growth forms are of great importance for the vegetation structure in a water body (Den Hartog and Van der Velde, 1988) and provide shelter and food to other aquatic organisms. The number of growth forms existing in one community is restricted (Den Hartog and Van der Velde, 1988) and not all growth forms occur at one spot and at the same time. However, in a macrophyte-rich community sediment-rooted submerged and emergent macrophytes as well as rooted macrophytes with floating leaves and free-floating macrophytes are in many cases represented. Growth forms are linked to certain environmental conditions, under which they represent the most efficient solutions for plant life (Den Hartog and Van der Velde, 1988). Maltby et al. (2010) classified aquatic macrophytes by their growth habit, the four categories being less detailed compared to Den Hartog and Van der Velde (1988). In this report we have also classified the selected aquatic macrophytes according to the compartments of the water body they use for their growth. Annex 6 shows that most of the aquatic macrophytes are exposed to sediment, to water as well as to air. Vegetative reproduction is the most common way of propagation.

Specific Leaf Area (SLA) was one of the traits for which data were available for a range of aquatic macrophytes. SLA is highly variable (Annex 6) and is suitable as an endpoint in aquatic macrophyte testing but is less suitable as a plant trait.

Ditches are generally shallow, macrophyte-dominated and can potentially include a high biodiversity (Peeters et al., 2014). Besides water quality (and especially total available phosphorus), geographical location, management status of the ditch, its dimensions, water-supply mechanisms, the soil/substrate present, crop type and bank management influence aquatic plant diversity (Mountford and Arnold, 2006).

The water quality of stands containing the 30 selected aquatic macrophytes comprises circum-neutral and buffered surface water with a medium to high nutrient content, salinity and chlorinity. Only one species was found in acid surface water (*Juncus effusus*). That means, in general, species characteristic of ponds, lowland streams and ditches do not represent acid conditions. As the current velocity in ditches and lowland streams

is generally low (with exceptions of high water velocities during periods of high water discharges e.g. after heavy rainfall) these systems can be considered as slowly flowing. Ponds are stagnant waters.

Mesocosms and microcosms are small-scale ecosystems which simulate realistic natural conditions, environmentally processes and realistic pesticide exposure regimes (EFSA, 2013). They are also referred to as aquatic model ecosystems and are enclosed systems that are artificially constructed with samples from, or portions of, natural ecosystems (EFSA, 2013). They include an assemblage of organisms representing several trophic levels. With increasing microcosm and mesocosm size, the foodweb becomes complexer.

In addition to direct effects on sensitive and / or vulnerable species, microcosm and mesocosm studies enable the study of effects on tolerant species by a number of ecological mechanisms, such as competitive release and trophic cascades (Fleeger et al., 2003). Such effects are called indirect (or secondary) contaminant effects (Fleeger et al., 2003). Only in studies at the population, community, or ecosystem level can indirect contaminant effects, which are very common in ecosystems, be detected. For aquatic macrophytes potted plant mesocosm studies meet the requirements of at least 8 macrophyte populations in a mesocosm study. In such a design rooted macrophytes are grown in plant pots with sediment or in small floating rings for free-floating macrophytes (Maltby et al., 2010). Such an experimental design is also adequate to study direct effects on algae populations in the water layer as well as indirect effects between algae and macrophytes and between algae and zooplankton. Mesocosms do not need to exactly simulate natural conditions at all levels, but key features at both structural and functional levels should be preserved in order to ensure ecological representativity (Caquet et al., 2000).

Reliability of information on ecotoxicological effects of chemicals tested in aquatic mesocosms closely depends on the representativity of biological processes or structures that are likely to be affected. In macrophyte mesocosms this means including a range of growth forms, the presence of natural structures as well as ecosystem processes such as decomposition, sedimentation, and nutrient uptake. Our study shows that the majority of the macrophyte species characteristic for ponds, lowland streams and ditches are used in aquatic macrophyte mesocosm studies and Species Sensitivity Distributions (73 and 63 %, respectively). Thus we can conclude that aquatic macrophyte mesocosm studies are representative of the naturally growing aquatic macrophyte vegetations in ponds, lowland streams and ditches.

5 Conclusions and recommendations

5.1 Conclusions

This project has collected quantitative macrophyte field data that can be used to define a reference tier for aquatic macrophyte risk assessment. The quantitative data include species information, abiotic data and some functional traits and are collated in a database attached to this report. The data show that most of the macrophyte species characteristic for ponds, streams and ditches have a wide distribution in Europe and belong to the category of "common" species. Most of them are already used in Species Sensitivity Distributions and aquatic macrophyte mesocosm and potted plant studies. An important result of this study is the collated database, that can serve to support a reference tier for aquatic macrophyte risk assessment and to support aquatic macrophyte models.

5.2 Recommendations

- For the southern zone (Mediterranean region) it is recommended to explore which aquatic macrophytes should be added to the list of characteristic species as here many water bodies are intermittent or temporal, and therefore macrophytes more characteristic of semi-permanent water body types could be found. Also macrophyte species characteristic of warmer climates might be relevant for the southern zone.
- It is recommended to collate more traits for the aquatic macrophytes by using the TRY-database (https://www.try-db.org/TryWeb/Home.php).
- As a positive outcome of this project, a scientific publication is considered useful and important in the light of current discussions in the regulatory community in Europe. This publication might include a discussion of the representativeness of regulatory driven selection of macrophyte species in ecotoxicological testing for edge of field macrophyte communities. The paper can go into more detail into macrophyte species used in the different tiers of the macrophyte risk assessment (Tiers 1, 2 and 3) and into the comparison of these species with the characteristic species in ponds, streams and ditches in the field. Also abiotic conditions in these edge-of-field water bodies can be compared with those in mesocosm studies with aquatic macrophytes. Important literature will be included and discussed in the light of the findings.

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Annex 1 Synoptic tables for lowland streams, ponds and ditches, respectively, presenting species with a frequency above or equal to 8 %

	aquatic	semi aquatic	terrestrial	Lowland streams
Number of plots				3749
Species name				*frequency*
Glyceria fluitans	1			44
Agrostis stolonifera			1	35
Ranunculus repens			1	30
Phalaris arundinacea		1		30
Phragmites australis	1			27
Glyceria maxima	1			25
Lemna minor	1			24
Poa trivialis			1	23
Juncus effusus	1			23
Holcus lanatus			1	22
Galium palustre s.l.		1		21
Alisma plantago-aquatica	1			20
Myosotis scorpioides s.l.		1		19
Sparganium emersum	1			19
Cardamine pratensis		1		18
Persicaria hydropiper		1		17
Mentha aquatica		1		17
Alnus glutinosa			1	16
Callitriche platycarpa	1			16
Urtica dioica			1	16
Lycopus europaeus		1		16
Elodea nuttallii	1			15
Lythrum salicaria		1		15
Equisetum palustre	1			15
Callitriche species	1			15
Juncus articulatus		1		14
Potamogeton natans	1			14
Lotus pedunculatus		1		14
Lysimachia vulgaris		1		13
Sparganium erectum s.l.	1			13
Juncus acutiflorus		1		11
Cirsium palustre		1		11
Rumex acetosa			1	11
Persicaria amphibia	1			11
Taraxacum sect. Ruderalia			1	11
Salix cinerea			1	11
Zygnemataceae species	1			11
Filipendula ulmaria		1		10
Callitriche obtusangula	1			10
Iris pseudacorus	1			10
Trifolium repens			1	10
Alopecurus geniculatus			1	10
Myosotis laxa subsp. cespitosa		1		10
Lemna gibba (vlak)	1			9
Berula erecta		1		9
Calliergonella cuspidata		1		9
Ranunculus acris			1	8
Angelica sylvestris			1	8
Ranunculus flammula		1		8
Rumex obtusifolius			1	8
Brachythecium rutabulum			1	8
Cerastium fontanum subsp. vulgare			1	8
Rorippa amphibia		1		8
Potamogeton crispus	1			8
Equisetum fluviatile	1			8
Glechoma hederacea			1	8
Typha latifolia	1			8

	aquatic	semi aquatic	terrestrial	Ponds
Number of plots				1693
Species name				*frequency*
Phragmites australis	1			36
Lemna minor	1			29
Glyceria fluitans	1			26
Agrostis stolonifera			1	25
Alisma plantago-aquatica	1			22
Juncus effusus	1			21
Typha latifolia	1			21
Eleocharis palustris s.s.	1			19
Mentha aquatica		1		18
Lycopus europaeus		1		18
Lythrum salicaria		1		18
Juncus articulatus		1		18
Galium palustre s.l.		1		17
Ranunculus repens			1	16
Ranunculus flammula		1		15
Juncus bulbosus s.l.		1		15
Hydrocotyle vulgaris		1		15
Holcus lanatus			1	13
Potamogeton natans	1			12
Lysimachia vulgaris		1		12
Persicaria amphibia	1			11
Salix cinerea			1	11
Alopecurus geniculatus			1	11
Glyceria maxima	1			10
Poa trivialis			1	10
Myosotis scorpioides s.l.		1		10
Urtica dioica			1	10
Iris pseudacorus	1			10
Calliergonella cuspidata		1		10
Solanum dulcamara			1	10
Lemna trisulca	1			10
Equisetum palustre	1			9
Lotus pedunculatus		1		9
Zygnemataceae species	1			9
Trifolium repens			1	9
Juncus bufonius				9
Phalaris arundinacea		1		8
Cardamine pratensis		1		8
Cirsium arvense			1	8
Salix alba			1	8
Gnaphalium uliginosum			1	8

	aquatic	semi aquatic	terrestrial	Ditches
Number of plots				12835
Species name				*frequency*
Glyceria maxima	1			40
Agrostis stolonifera			1	38
Phragmites australis	1			34
Glyceria fluitans	1			33
Lemna minor	1			31
Persicaria amphibia	1			26
Elodea nuttallii	1			24
Spirodela polyrhiza	1			24
Ranunculus repens			1	23
Alisma plantago-aquatica	1			23
Equisetum fluviatile	1			23
Lemna trisulca	1			23
Holcus lanatus			1	21
Phalaris arundinacea		1		20
Poa trivialis			1	20
Galium palustre s.l.		1		19
Sparganium erectum s.l.	1			18
Hydrocharis morsus-ranae	1			18
Myosotis scorpioides s.l.		1		17
Equisetum palustre	1			17
Juncus effusus	1			16
Zygnemataceae species	1			14
Cardamine pratensis		1		13
Mentha aquatica		1		13
Lythrum salicaria		1		13
Rumex acetosa			1	13
Sagittaria sagittifolia	1			13
Persicaria hydropiper		1		12
Urtica dioica			1	12
Callitriche species	1			12
Juncus articulatus		1		12
Iris pseudacorus	1			12
Eleocharis palustris s.s.	1			12
Potamogeton pusillus	1			12
Ceratophyllum demersum	1			12
Lotus pedunculatus		1		11
Butomus umbellatus	1			11
Potamogeton natans	1			10
Taraxacum sect. Ruderalia			1	10
Filipendula ulmaria		1		10
Berula erecta		1		10
Cerastium fontanum subsp. vulgare			1	10
Glechoma hederacea			1	10
Festuca rubra			1	10
Elytrigia repens			1	10
Carex acuta		1		10
Lemna gibba/minor	1			10
Alopecurus geniculatus			1	9
Ranunculus acris			1	9
Rorippa amphibia		1		9
Elodea canadensis	1			9
Ranunculus sceleratus			1	9
Valeriana officinalis		1		9
Lycopus europaeus		1		8
Lysimachia vulgaris		1		8
Cirsium arvense			1	8
Anthoxanthum odoratum			1	8
Hottonia palustris	1			8
Ranunculus circinatus	1			8
Lemna gibba	1			8

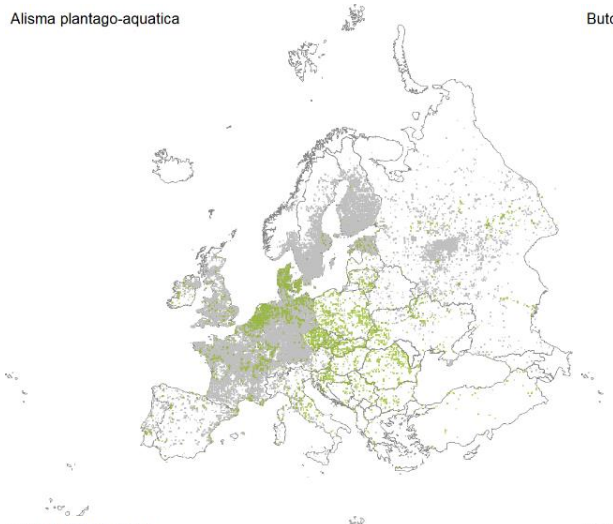
Annex 2 Macrophytes representative for ponds, streams and ditches and their taxonomy and use in mesocosms and SSDs

The table below presents the scientific names of the 30 aquatic macrophytes, their common names, their taxonomy and their use in regulatory mesocosm studies and Species Sensitivity Distributions (SSDs).

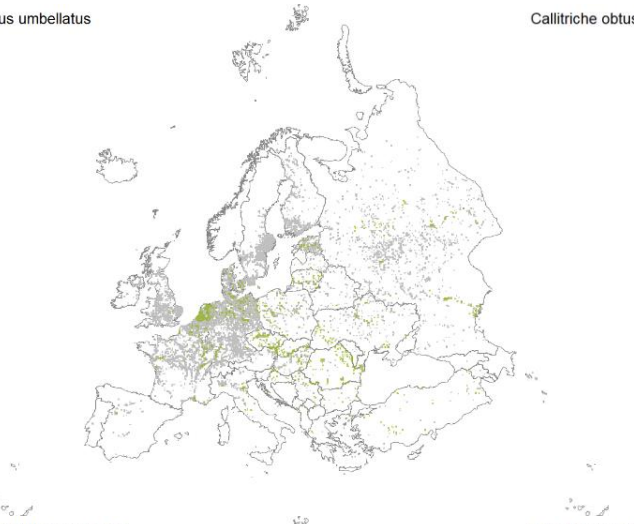
		Water type								
Scientific name	**English name**	**ditch**	**lowland stream**	**pond**	**Genus**	**Family**	**Order**	**Clade**	**Commonly used in regulatory mesocosms**	**Commonly used in SSDs**
Alisma plantago-aquatica	Common water-plantain	1	1	1	Alisma	Alismataceae	Alismatales	Mono	x	
Butomus umbellatus	Flowering rush	1			Butomus	Butomaceae	Alismatales	Mono		
Callitriche obtusangula	Blunt-fruited Water-starwort		1		Callitriche	Callitrichaceae	Lamiales	Eudicot	x	
Callitriche platycarpa	Various-leaved water-starwort		1		Callitriche	Callitrichaceae	Lamiales	Eudicot	x	x
Ceratophyllum demersum	Coontail	1			Ceratophyllum	Ceratophyllaceae	Ceratophyllales	Mono	x	x
Eleocharis palustris	Common spike-rush	1		1	Eleocharis	Cyperaceae	Poales	Mono	x	x
Elodea canadensis	Canadian pondweed	1	1		Elodea	Hydrocharitaceae	Alismatales	Mono	x	x
Elodea nuttallii	Western waterweed	1	1	1	Elodea	Hydrocharitaceae	Alismatales	Mono	x	x
Equisetum fluviatile	Water horsetail	1			Equisetum	Equisetaceae	Equisetales	Sporeplant		
Glyceria fluitans	Floating sweet-grass	1	1	1	Glyceria	Poaceae	Poales	Mono		
Glyceria maxima	Great manna grass	1	1	1	Glyceria	Poaceae	Poales	Mono	x	x
Hottonia palustris	Water violet	1			Hottonia	Primulaceae	Ericales	Eudicots	x	x
Hydrocharis morsus-ranae	Common frogbit	1			Hydrocharis	Hydrocharitaceae	Alismatales	Mono	x	
Iris pseudacorus	Yellow iris	1	1	1	Iris	Iridaceae	Asparagales	Mono	x	x
Juncus effusus	Common rush	1	1	1	Juncus	Juncaceae	Poales	Mono		x
Lemna gibba	Gibbous duckweed	1	1		Lemna	Araceae	Alismatales	Mono	x	x
Lemna minor	Common duckweed	1	1	1	Lemna	Araceae	Alismatales	Mono	x	x
Lemna trisulca	Star duckweed	1		1	Lemna	Araceae	Alismatales	Mono	x	x
Myriophyllum spicatum	Eurasian watermilfoil			1	Myripophyllum	Haloragaceae	Saxifragales	Eudicot	x	x
Persicaria amphibia	Water knotweed	1	1	1	Persicaria	Polygonaceae	Caryophyllales	Eudicot	x	
Phragmites australis	Common reed	1	1	1	Phragmites	Poaceae	Poales	Mono		
Potamogeton crispus	Crisp-leaved pondweed		1		Potamogeton	Potamogetonaceae	Alismatales	Mono	x	x
Potamogeton natans	Broad-leaved pondweed	1	1	1	Potamogeton	Potamogetonaceae	Alismatales	Mono	x	x
Potamogeton pusillus	Lesser pondweed	1			Potamogeton	Potamogetonaceae	Alismatales	Mono		
Ranunculus circinatus	Fan-leaf water-crowfoot	1			Ranunculus	Ranunculaceae	Ranunculales	Eudicot	x	x
Sagittaria sagittifolia	Arrowhead	1			Sagittaria	Alismataceae	Alismatales	Mono	x	x
Sparganium emersum	European bur-reed		1		Sparganium	Typhaceae	Poales	Mono		
Sparganium erectum	Bur Reed	1	1		Sparganium	Typhaceae	Poales	Mono	x	x
Spirodela polyrhiza	Greater duckweed	1			Spirodela	Araceae	Alismatales	Mono	x	x
Typha latifolia	Broadleaf cattail		1	1	Typha	Typhaceae	Poales	Mono		

Annex 3 Distribution maps of the 30 selected aquatic macrophytes

Alisma plantago-aquatica

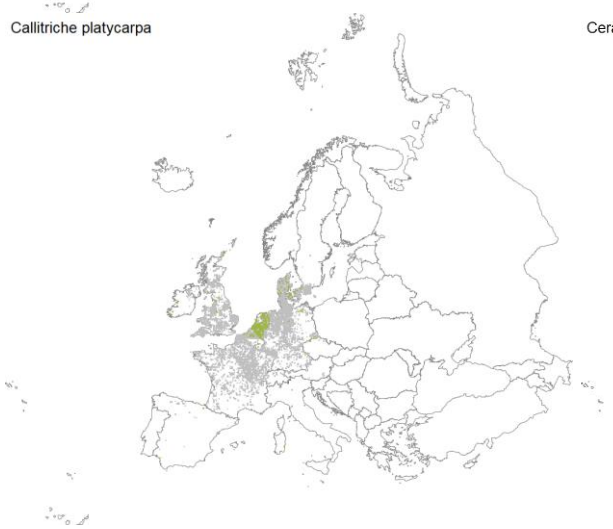


Butomus umbellatus

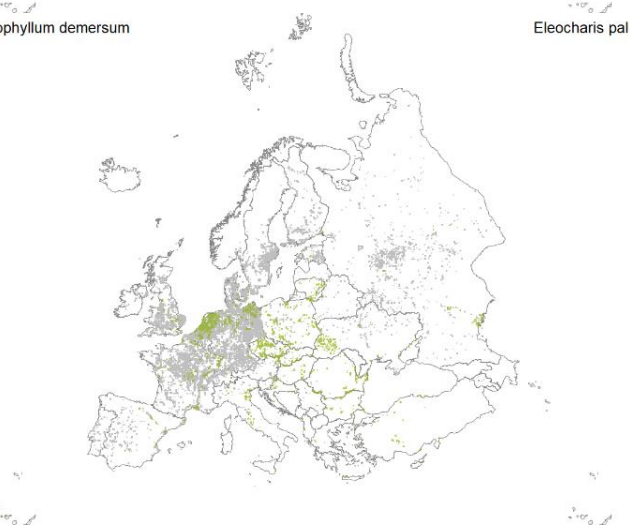


Callitriche obtusangula

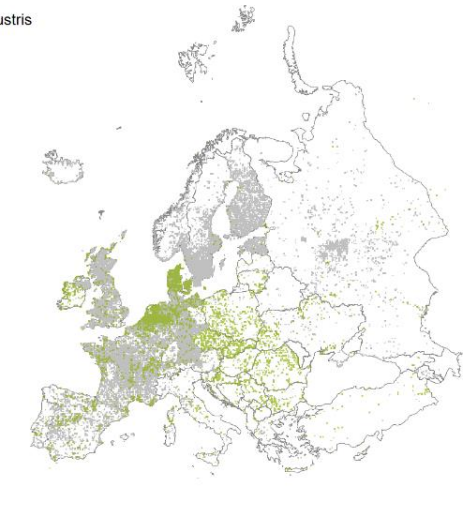
Callitriche platycarpa



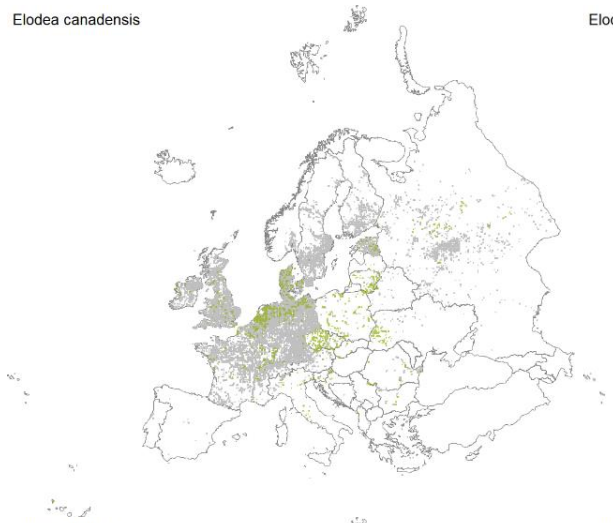
Ceratophyllum demersum



Eleocharis palustris

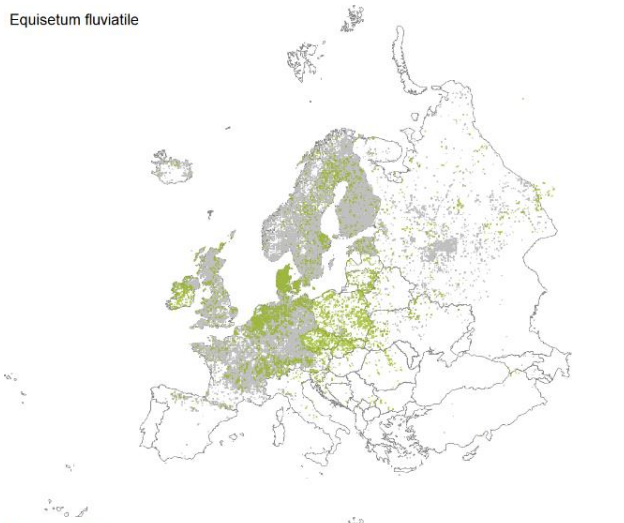


Elodea canadensis

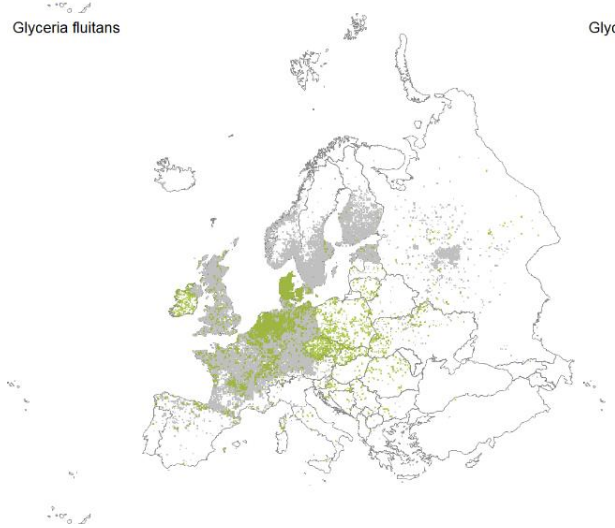


Elodea nuttallii

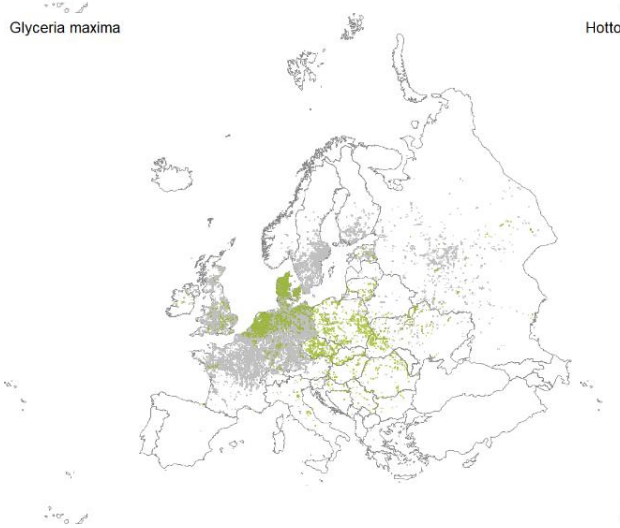
Equisetum fluviatile



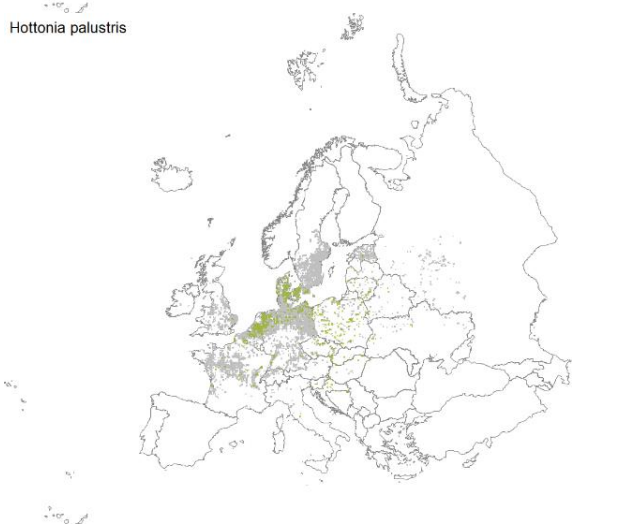
Glyceria fluitans



Glyceria maxima

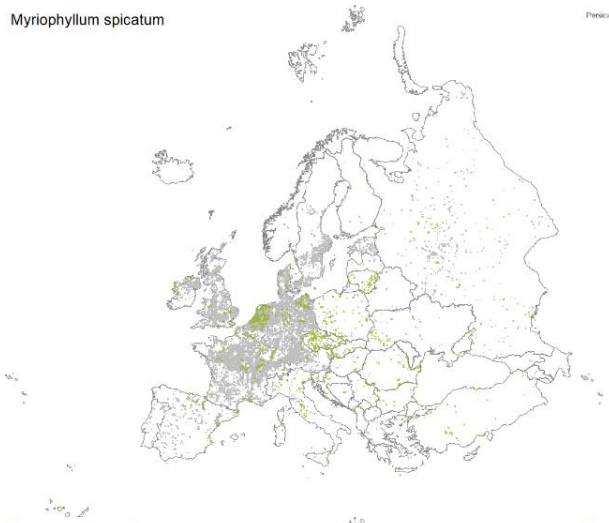


Hottonia palustris

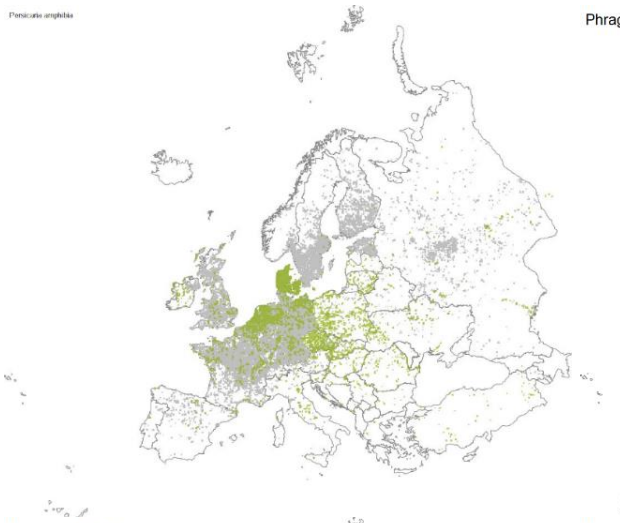



Hydrocharis morsus-ranae
Iris pseudacorus
Juncus effusus
Lemna gibba
Lemna minor
Lemna trisulca

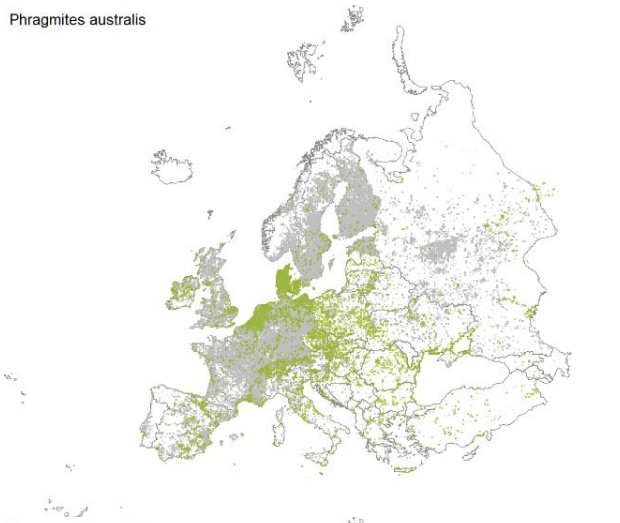
Myriophyllum spicatum



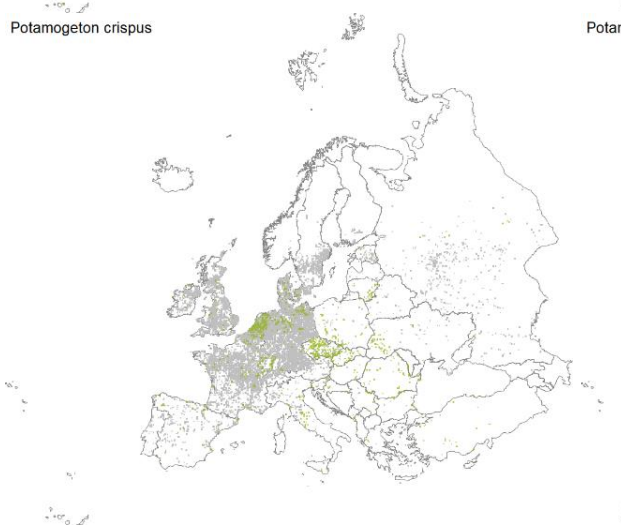
Persicaria amphibia



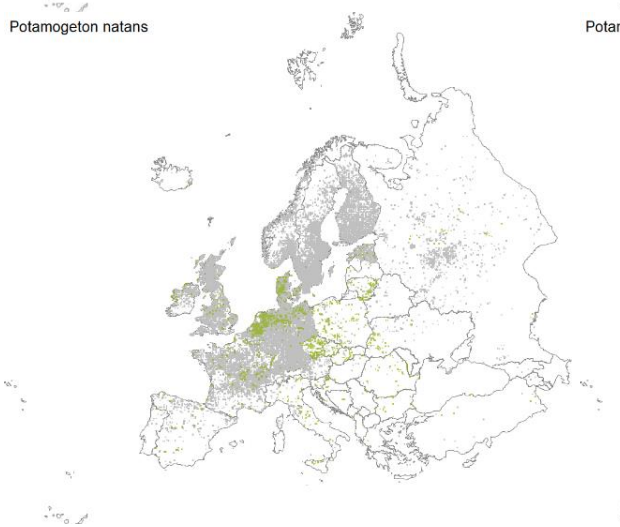
Phragmites australis



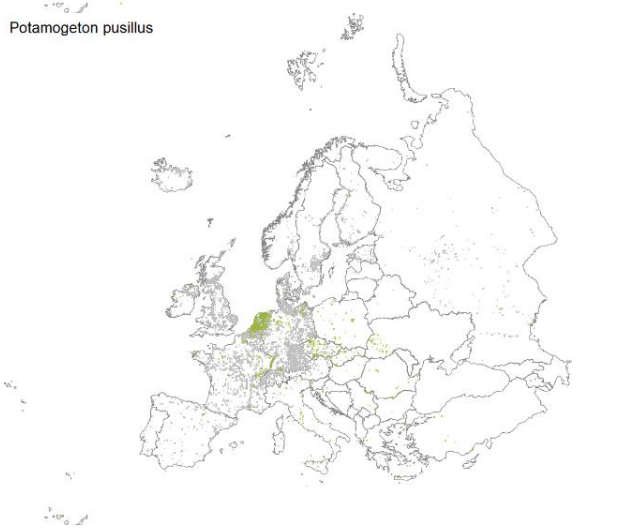
Potamogeton crispus



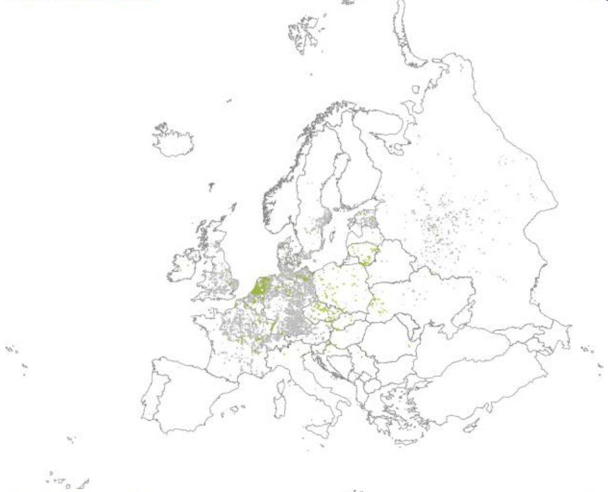
Potamogeton natans



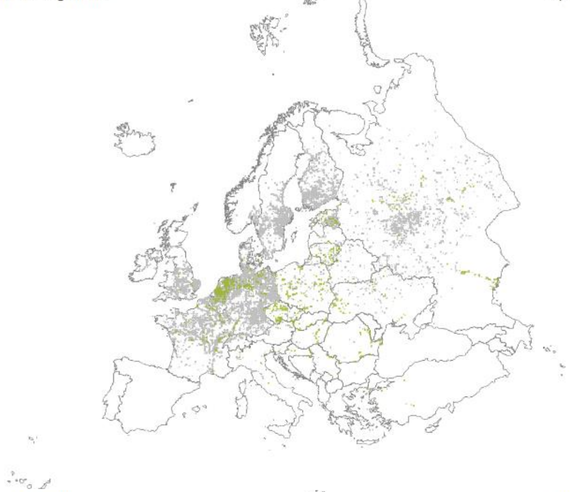
Potamogeton pusillus



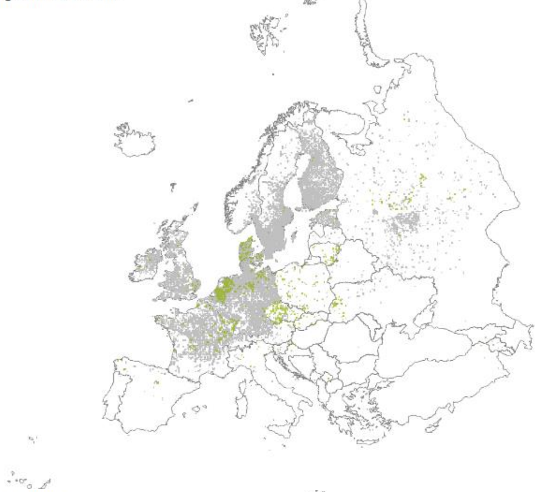
Ranunculus circinatus



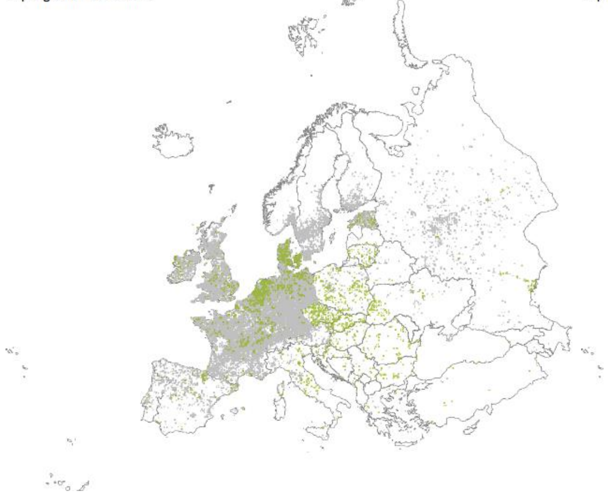
Sagittaria sagittifolia



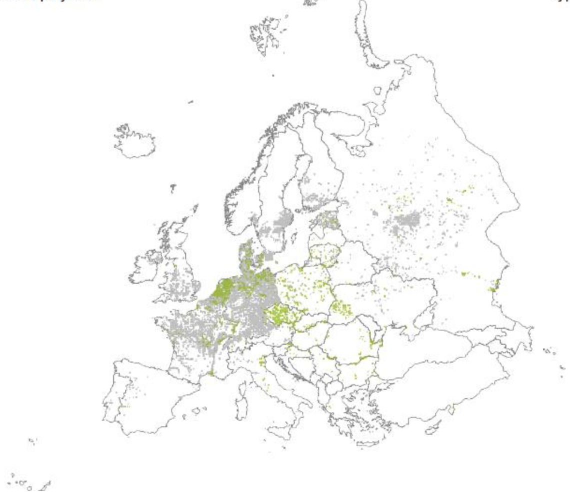
Sparganium emersum



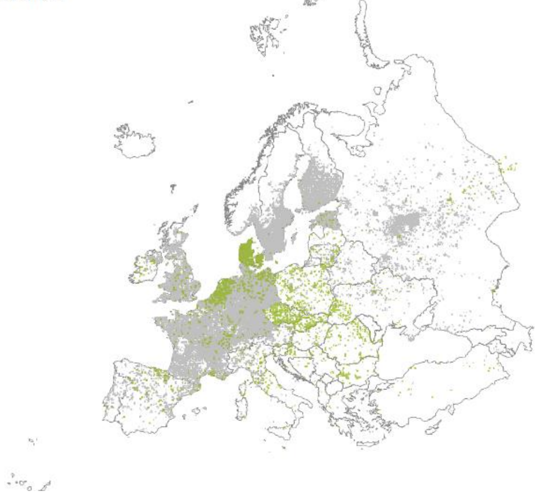
Sparganium erectum



Spirodela polyrhiza



Typha latifolia



Annex 4 Abiotic and traits data of the 30 selected macrophytes

compartment	remarks	analyse	unit	grams per mol	statistical parameter	literature	plant	Alisma plantago- aquatica	Butomus umbellatus	Callitriche obtusangula	Callitriche platycarpa	Ceratophyllum demersum	Eleocharis palustris s.s.	Elodea canadensis	Elodea nuttallii	Equisetum fluviatile	Glyceria fluitans	Glyceria maxima	Hottonia palustris	Hydrocharis morsus-ranae	Iris pseudacorus	Juncus effusus	Lemna gibba	Lemna minor	Lemna trisulca	Myriophyllum spicatum	Persicaria amphibia	Phragmites australis	Potamogeton crispus	Potamogeton natans	Potamogeton pusillus	Ranunculus circinatus	Sagittaria sagittifolia	Sparganium emersum	Sparganium erectum s.l.	Spirodela polyrhiza	Typha latifolia
surface water		pH			weighted averages	1		7.1	7.7	8	7.2	7.8	7.3	7.4	7.6	7.3	7.1	7.6	7.1	7.5	6.9	5.6	7.7	7.5	7.8	8.5	7.8	7.1	7.7	6.9	8	8.2	7.7	7	7.7	7.6	7
surface water		alk	meq/l		weighted averages	1		1.6	2.9	4.5	3.4	3.4	1.9	2.3	2.8	2	1.8	3.3	1.8	2.4	1.8	0.5	4.2	2.5	3.1	3.5	2.9	2.3	3.5	1.3	3	3.2	2.6	1.6	2.7	3	1.5
surface water		free CO2	mmol/l	44.0	weighted averages	1		0.5	0.4	0.2	0.8	0.4	0.5	0.4	0.4	0.5	0.7	0.5	0.6	0.5	0.7	6.9	0.6	0.4	0.3	0.1	0.4	0.6	0.5	0.7	0.3	0.2	0.3	0.5	0.3	0.4	0.8
surface water		Fe	µmol/l	55.8	weighted averages	1		10.2	7.9	13.1	7	4.8	7.2	11.9	7.2	10.1	13.3	8.5	13.7	8	12.2	16.3	8.2	7.2	6.1	3.3	6.5	6.4	3.6	13.9	5	4.5	9.6	13.5	7.9	5.5	10.1
surface water		Ca	mmol/l	40.1	weighted averages	1		0.63	0.73	0.94	1.07	1.03	0.64	0.64	0.82	0.75	0.63	1.1	0.61	0.77	0.99	0.35	1	0.75	0.85	0.88	0.85	1.1	1.07	0.56	0.77	0.82	0.8	0.67	0.91	0.82	0.67
surface water		Na	mmol/l	23.0	weighted averages	1		1.55	2.39	3.73	1.79	3.54	2.55	1.44	2.43	1.47	1.72	1.96	1.32	1.81	1.59	0.59	4.12	2.34	3.17	4.76	1.93	2.29	1.65	1.37	3.04	2.73	1.62	1.44	2.07	2.25	1.33
surface water		K	µmol/l	39.1	weighted averages	1		127	176	279	90	242	166	70	149	57	174	132	76	103	126	103	368	202	196	298	103	210	109	113	187	159	87	119	123	169	98
surface water		Mn	µmol/l	54.9	weighted averages	1		2	1.2	2.3	7	2.5	1.8	2	2.1	2.3	3	3.1	1.3	1.8	2.5	1.8	4.7	1.9	1.7	1.2	1.3	2.7	3.9	2.7	1.6	1	1.5	2	1.4	2.1	1.9
surface water		PO4	µmol/l	95.0	weighted averages	1		1.8	4.4	4.8	3.9	10.1	5.3	1.8	4.9	1.3	3	4.4	1.9	4.3	1.9	1.2	19.7	4.4	7.1	9	4.3	5	4.3	1.8	6	6.1	2.9	2.4	3.6	6.6	2.6
surface water		NO3	µmol/l	62.0	weighted averages	1		42.2	5.9	21.5	35.1	19.6	9.6	30.2	26	10.4	49.7	24.9	28.9	11.3	11.6	44.5	19.4	25.2	8.7	8.9	9	19.4	40.9	42.9	23.7	4.4	20.2	68.3	11.3	15.5	24.1
surface water		NH4	µmol/l	18.0	weighted averages	1		13	5.1	10.1	19.6	24.6	18.8	7.7	15	5.1	21.3	17.1	10.5	11.2	7.3	26	46.8	17.2	10.1	7	12.1	19.7	12.9	16.8	8.6	3.6	7.1	21.3	8.2	19.7	14.6
surface water		N-mineral	µmol/l	14.0	weighted averages	1		70	12	28	58	40	35	39	44	15	78	48	48	22	23	79	55	51	21	22	24	46	57	71	35	7	29	92	23	32	43
surface water		NH3	µmol/l	17.03	weighted averages	1		0.2	0.1	0.4	0.1	0.6	0.2	0.2	0.3	0.1	0.4	0.3	0.1	0.2	0.1	0.1	0.8	0.3	0.5	1.4	0.2	0.4	0.3	0.1	0.8	0.6	0.1	0.1	0.1	0.3	0.1
surface water		PO4	µmol/l	95.0	median	1				1	0.9	5.3		0	1.7				0.6	1.7			11.3	1.7	2	4.2			2.7		2.9	4.7				5.3	
surface water		SO4	mmol/l	96.1	weighted averages	1		0.83	0.81	1.52	0.88	0.9	0.79	0.58	0.84	0.56	0.83	0.61	0.63	0.51	0.38	0.7	0.9	0.79	0.72	1.1	0.62	0.74	0.83	0.63	0.97	0.85	0.71	0.72	0.47	0.71	0.59
surface water		Cl (chlorinity)	mmol/l	70.0	weighted averages	1		1.55	2.28	4.43	1.93	3.99	2.57	1.4	2.73	1.44	1.74	2.03	1.45	1.81	1.6	0.75	4.77	2.46	3.43	4.97	2.05	2.61	1.76	1.43	3.27	3.04	1.66	1.49	2.08	2.34	1.46
surface water		Mg	mmol/l	24.3	weighted averages	1		0.5	0.71	1.42	0.57	0.99	0.76	0.42	0.73	0.41	0.66	0.57	0.42	0.46	0.49	0.23	0.95	0.88	1.08	1.32	0.6	0.71	0.52	0.4	0.97	0.79	0.5	0.49	0.61	0.61	0.4
surface water		salinity	mmol/l		weighted averages	1		7.2	9.6	14.5	10.1	13.8	9.3	6.3	10.1	6.7	8.6	9.5	6.7	7.2	7.7	4.1	17.2	9.6	11.7	17.7	9.4	11.3	8.7	6.3	11.1	11	7.7	7.4	9.1	9.8	6.6
surface water		turbidity	ppm		weighted averages	1		6.1	5	12.8	3.2	6.1	5.6	3	5.9	3.7	7.6	11.7	3.3	6.2	17.3	12.3	14.5	6.2	6.7	8.7	6.3	10.3	5.8	5.4	8.6	8.4	9.7	5.5	5.8	7.5	8.3
surface water		detergents	ppm		weighted averages	1		0.08	0.03	0.07	0.07	0.06	0.07	0.01	0.05	0.01	0.06	0.03	0.01	0.01	0.03	0.01	0.09	0.04	0.04	0.12	0.06	0.07	0.03	0.04	0.03	0.01	0.01	0.04	0.06	0.06	0.03
surface water		Si	µmol/l	28.1	1 separate measurement	2				154.9	235								234.3																			
surface water		Al	µmol/l	27.0	1 separate measurement	2				1.1	1.3								1																			
surface water		HCO3	µmol/l	61.0	1 separate measurement	2				1562	170								1993																			
surface water		Dissolved oxygen	(mg L−1)		mean	28																														2.5	
surface water		Ammonia	(mg L−1)		mean	28																														15.25	
surface water		Nitrite	(mg L−1)		mean	28																														0.008	
surface water		Nitrate	(mg L−1)		mean	28																														0.921	
surface water		Phosphate	(mg L−1)		mean	28																														1.52	
surface water		Conductivity	(µS cm−1)		mean	28																														1150	
surface water	from figure	soluble reactive P (SRP)	(µg P/l)		median	32																				120								100			
surface water	from figure	NH4	(µg N/l)		median	32																				100								120			
surface water	from figure	total P	(µg P/l)		median	32																				200								210			
surface water	from figure	NO3	mg N/l		median	32																				4.4								5			

compartment	remarks	analyse	unit	grams per mol	statistical parameter	literature	plant	Alisma plantago-aquatica	Butomus umbellatus	Callitriche obtusangula	Callitriche platycarpa	Ceratophyllum demersum	Eleocharis palustris s.s.	Elodea canadensis	Elodea nuttallii	Equisetum fluviatile	Glyceria fluitans	Glyceria maxima	Hottonia palustris	Hydrocharis morsus-ranae	Iris pseudacorus	Juncus effusus	Lemna gibba	Lemna minor	Lemna trisulca	Myriophyllum spicatum	Persicaria amphibia	Phragmites australis	Potamogeton crispus	Potamogeton natans	Potamogeton pusillus	Ranunculus circinatus	Sagittaria sagittifolia	Sparganium emersum	Sparganium erectum s.l.	Spirodela polyrhiza	Typha latifolia
pore water sediment		pH			weighted averages	1		6.8	7.2	7.6	7	7.4	6.7	7	7.2	6.8	6.6	7.1	6.3	6.8	6.2	5.7	7.5	6.8	7.2	7.5	7	6.7	7.3	6.6	7.6	7.4	6.9	6.7	7	7.1	6.3
pore water sediment		alk	meq/l		weighted averages	1		4.5	9.9	25	16.7	9.8	6.5	5.3	10.3	5.6	6.3	9.8	3.3	6	3.1	0.6	10.2	6.9	8.3	16	10.8	4.7	14.9	3.2	13.2	11.5	6.4	4.6	6.4	8	5.7
pore water sediment		SO4	mmol/l	96.1	weighted averages	1		1.05		2.68	0.35	0.98	1.64	0.41	0.86	0.2	1.7	0.77	0.45	0.38			1.56	1.14	1.01	0.2	0.79	2.24	0.2	0.94	0.74	1.27	0.76	0.73	0.47	0.51	0.79
pore water sediment		Cl	mmol/l	70	weighted averages	1		1.97	3.25	11.13	3.27	5.13	3.51	1.26	3.61	1.11	4.5	2.01	1.55	1.66		1.42	6.21	3.59	6.73	5.55	2.85	4.35	1.41	1.43	7.18	3.58	1.29	0.75	1.6	2.97	1.6
pore water sediment		vrij CO2	mmol/l	44	weighted averages	1		1.1	0.5	0.6	0.8	0.9	0.6	1	1.1	1.4	1.5	2.8	2.5	0.8	2	3.4	0.7	1.1	0.7	0.7	0.9	0.8	0.9	1.1	0.6	1.2	0.9	0.8	0.8	0.9	1.4
pore water sediment		Ca	mmol/l	40.1	weighted averages	1		1.65	1.46	3.72	2.94	2.4	1.47	1.57	2.22	1.41	1.75	1.36	1.31	1.13	1.18	0.94	1.53	1.46	1.4	2.1	2.17	1.82	4.17	1.21	2.12	2.37	1.39	1.66	1.56	1.46	1.65
pore water sediment		Mg	mmol/l	24.3	weighted averages	1		1.73		3.73	1.34	2.03	3.36	0.9	1.75	1.16	2.13	1.36	0.85	0.94			2.82	1.4	3.93	1.75	1.72	2.32	1.13	0.86	2.28	2.6	1.72	0.74	1.35	1.4	1.02
pore water sediment		Na	mmol/l	23	weighted averages	1		2.91	4.25	21.4	3.77	5.97	4.13	1.64	4.5	2.08	7.28	3.26	1.99	1.95		1.71	7.31	4.14	7.33	6.95	4.01	4.91	2.18	2.12	9.36	4.34	1.88	1.89	2.32	4.48	2.01
pore water sediment		K	µmol/l	39.1	weighted averages	1		605	485	2733	706	1122	774	475	833	378	1340	564	355	446		340	1407	895	1193	1298	621	889	865	524	1468	800	446	588	456	773	609
pore water sediment		Fe	µmol/l	55.8	weighted averages	1		1307	647	1847	1450	528	374	1183	924	1075	1461	1076	1448	540	1120	873	440	745	409	575	727	667	1373	960	615	713	826	850	719	472	711
pore water sediment		Mn	µmol/l	54.9	weighted averages	1		106		51	97	155	22	91	150	69	100	61	66	21			136	46	31	82	52	62	37	41	38	88	65	30	22	35	41
pore water sediment		PO4	µmol/l	95	weighted averages	1		13.5	18.5	59.9	25.3	49.1	10	18.9	33.3	6.5	17.4	22.2	14.2	21.7	4.9	7.3	60.9	30.4	33.2	44.9	22	14	35.7	15.3	47	44.4	23.6	23	15.6	43	21.2
pore water sediment		NO3	µmol/l	62	weighted averages	1		70	54	58	49	57	66	41	53	35	90	32	66	29	111	104	50	53	32	31	50	53	46	81	35	23	47	80	32	38	59
pore water sediment		NH4	µmol/l	18	weighted averages	1		503	914	1125	642	955	454	770	735	731	526	732	554	704	404	195	939	731	781	1332	497	656	889	583	896	895	670	402	536	846	340
pore water sediment		N-mineraal	µmol/l	14	weighted averages	1		508	938	1034	658	1043	572	812	798	753	643	834	619	628	475	299	967	776	821	1390	511	741	906	668	858	824	725	465	488	860	443
pore water sediment		Si	µmol/l	28.1	1 separate measurement	2				367.8	271.2								404.6																		
pore water sediment		Al	µmol/l	27	1 separate measurement	2				1.5	0.8								3.7																		
pore water sediment		HCO3	µmol/l	61	1 separate measurement	2				4124	562								1229																		
pore water sediment	from figure	soluble reactive P (SRP)	(µg P/l)		median	32																				1								0.3			
pore water sediment	from figure	NH4	(µg N/l)		median	32																				1								0.6			
sediment		Organic matter (ash-free dry weight)	%		weighted averages	1		11	17	23	7	25	11	6	17	11	11	15	20	29	27	15	27	21	30	19	16	26	4	16	23	24	9	12	25	28	21
sediment		Organic matter (rhizome level, 105 degrees)	%		mean	13																					14.82										
sediment		pH (rhizome level)			mean	13																					6.9										
sediment		Moisture (rhizome level)	%		mean	13																					4.87										
sediment		density	g/l		1 separate measurement	2				1.45	1.44								1.26																		
sediment		tot P	(umol/gdw)	30.97	mean	1				16.9	15.3	15.1		10	12.5				17.7	15.4			16.6	12.3	13.1	13.3			12.9		14.4	14.6				17.2	
sediment		redox	(mvolt)		weighted averages	1		-39.8	-197.3	-139.4	-64	-199.1	28.8	-109.8	-136.7	-113.9	11.4	-138.3	-68.2	-171.2		117.4	-209.3	-122.4	-186.8	-196.1	-76.5	-61.2	-109.1	-73.2	-133	-166.3	-115.2	-44	-183.7	-179	-106.8
sediment		CaCO3 Carbonaat	umol/g dw	100.09	weighted averages	1		86.1	105.2	511.9	245.1	247.7	96	58.7	206	36.9	24.7	97.2	9.8	73.1	1.1	0.3	223.5	68.6	108.5	288.1	116.3	86.1	342.4	6.4	217.7	272.2	30	27.7	107.4	130.9	75.1
sediment		tot Ca	umol/g dw	40.1	weighted averages	1		47	62	248	96	140	69	42	97	47	46	72	38	91	79	26	157	60	115	133	81	100	128	27	148	145	35	36	93	120	62
sediment		tot Mg	umol/g dw	24.3	weighted averages	1		117	97	201	158	164	67	76	171	119	128	176	135	109		33	143	108	136	176	161	78	150	44	176	179	121	61	102	148	43
sediment		tot Al	umol/g dw	27	1 separate measurement	2				194.92	21.44								243.08																		
sediment		tot Si	umol/g dw	28.1	1 separate measurement	2				15.57	6.35								32.12																		
sediment		tot Zn	umol/g dw	65.38	1 separate measurement	2				0.41	0.04								1.01																		
sediment		tot K	umol/g dw	39.1	weighted averages	1		82		128	51	96	24	41	96	89	89	71	78	72			91	44	92	101	88	32	60	35	73	118	111	16	68	82	26
sediment		tot Fe	umol/g dw	55.8	weighted averages	1		141	170	227	205	227	77	211	201	175	118	220	212	247	121	59	173	138	183	248	152	91	202	77	235	230	158	109	197	242	71
sediment		tot Mn	umol/g dw	54.9	weighted averages	1		8	6	7	11	10	5	6	10	7	6	8	6	11		1	9	7	6	7	7	4	11	2	8	7	6	3	5	10	2
sediment		PO4	umol/g dw	95	weighted averages	1		9.5	10	19.6	15.7	13.6	7	9	11.7	12.2	9.7	13.9	19.2	13.6	13.2	6	15.6	10.6	12.5	12.1	11.4	8.9	11.5	7.5	12.5	13	11	9.5	11.1	16.8	9.3
sediment		N-tot	umol/g dw	14	weighted averages	1		105	185	151	89	329	120	59	176	138	90	164	156	367	283	124	324	176	329	200	173	216	294	111	226	294	116	93	242	392	105
sediment		fraction >200 um van sediment	%		weighted averages	1		25	24	18	24	25	27	26	26	23	30	20	25	19	6	34	25	24	24	26	21	23	24	35	17	25	29	40	20	18	26
sediment		fraction between 50 en 200 um from sediment	%		weighted averages	1		38	36	34	40	25	50	38	33	35	42	34	36	31	36	46	31	42	34	27	38	45	34	44	22	25	31	36	33	26	50
sediment		fraction between 2 and 50 um from sediment	%		weighted averages	1		25	25	24	23	23	18	21	23	41	21	27	28	31	74	22	26	22	23	23	26	26	24	14	32	24	25	18	41	31	17
sediment		fraction > 2 um sediment	%		weighted averages	1		9	14	18	12	26	6	14	16	10	5	19	10	22	17	1	19	12	19	27	15	6	24	6	28	23	17	6	16	27	9
sediment	from figure	total P	ug/g		median	31									1530											230								1450			
sediment	from figure	total N	%		median	31									7											5								5			
sediment	from figure	inorganic P	ug/g		median	31									310											60								340			
sediment	from figure	organic C	%		median	31									0.9											0.9								1.7			
sediment	from figure	silt/clay	%		median	31									15											9								18			
sediment	from figure	organic matter	%		median	31									3											2								4			
sediment	from figure	Total N	mg /100g DW		median	32																				500								175			
sediment	from figure	total P	mg /100g DW		median	32																				50								55			

compartment	remarks	analyse	unit	grams per mol	statistical parameter	literature	plant	Alisma plantago-aquatica	Butomus umbellatus	Callitriche obtusangula	Callitriche platycarpa	Ceratophyllum demersum	Eleocharis palustris s.s.	Elodea canadensis	Elodea nuttallii	Equisetum fluviatile	Glyceria fluitans	Glyceria maxima	Hottonia palustris	Hydrocharis morsus-ranae	Iris pseudacorus	Juncus effusus	Lemna gibba	Lemna minor	Lemna trisulca	Myriophyllum spicatum	Persicaria amphibia	Phragmites australis	Potamogeton crispus	Potamogeton natans	Potamogeton pusillus	Ranunculus circinatus	Sagittaria sagittifolia	Sparganium emersum	Sparganium erectum s.l.	Spirodela polyrhiza	Typha latifolia
Plant																																						
above ground		biomassa dry weight	g/m2		max	3									822																							
above ground		biomassa dry weight	g/m2		max	10																												247				
above ground		biomassa dry weight	g/m2		min	3									5																							
above ground		biomassa dry weight	g/m2		max	4																	150	50													
above + in soil		Total biomassa dry weight	kg/m2		mean (max)	7												1.52																			
above + in soil		Total biomassa dry weight	kg/m2		mean (min)	7												0.46																			
in soil		Total biomassa dry weight	g/m2		max	10																												169				
above ground		RGR	gg/day		mean	4																	0.22	0.2													
above + in soil		RGR	gg/day		mean	9																										0.079					
stems		stem densities	n/m2		?	5																							168								
stems		stem densities	n/m2		?	10																												236				
leaves		leaf area index	m2/m2		?	6																							4.2								
floating leaves		SLA (specific leaf area)	(m2/ kg−1)		mean	8											33.1																			
floating leaves		SLA (specific leaf area)	(m2/ kg−1)		mean	11																												40				
emergent leaves		SLA (specific leaf area)	(m2/ kg−1)		mean	8											34.5																			
emergent leaves		SLA (specific leaf area)	(m2/ kg−1)		mean	11																												35				
submersed leaves		SLA (specific leaf area)	(m2/ kg−1)		mean	9																										32					
submersed leaves		SLA (specific leaf area)	(m2/ kg−1)		mean	11																												91				
leaves		LA (leaf area)	mm2		mean	12						22.86		30.27												142.51			417.4	2960.02							
leaves		LDW (leaf dry wright)	mg		mean	12						0.28		0.22												1.87			5.11	172.23							
leaves		SLA (specific leaf area)	mm2 /mg-1		mean	12						99.92		143.72												104.29			93.9	17.28							
leaves		LAR (leaf area ratio)	m2/kg		mean	9																										18					
underground organs		RGR	gg/day		max	14			1.5019																												
uptake		dissolved inorganic nitrogen (DIN)	mg N kg drymatter/h		1 separate measurement	15					33																			50							
above soil biomass density data		RGR	d-1		1 separate measurement	15					0.04																			0.02							
shoots and roots		RGR	d-1		mean	16																															
shoots and roots		RGR	d-1		mean	16								0.046															0.035							
aboveground	Lab test	RGR (dw)	d-1		mean	17						0.05														0.068										
aboveground	Lab test	RGR (main shoot length)	d-1		mean	17						0.063														0.082										
aboveground	Lab test	RGR (total shoot length)	d-1		mean	17													0.054																	
aboveground	Lab test	RGR ()	d-1		mean	17																				0.082										
aboveground	Lab test	RGR (number of leaves)	d-1		mean	17																															
aboveground	Lab test	RGR (number of leaves main shoot)	d-1		mean	17																				0.045										
aboveground	Lab test	RGR	d-1		mean	18																0.015														0.04
shoots		biomass	g ashfree drw /m2		max	19																						1247								
roots		biomass	g ashfree drw /m2		max	19																						286								
shoots		RGR	d-1		max	19																						0.057								
roots		RGR	d-1		max	19																						0.014								
standing crop		biomass	g ashfree drw /m2		max	20									10											305.6	420.4									
standing crop		LAI (leaf area index)	m2/m2		max	20									1.33											1.3	1.33									
standing crop		biomass	g ashfree drw /m2		min	20									0.09											160.4	143.7									
standing crop		biomass	g ashfree drw /m2		max	21						115																									
standing crop		biomass	g ashfree drw /m2		min	21						40																									
standing crop		biomass	g ashfree drw /m2		max (growing season)	22						62.8																									
standing crop		biomass	g ashfree drw/day /m2		mean (growing season)	22						0.174																									
above ground		biomass	g ashfree drw /m2		max (growing season)	22															185.6							216.3	1422.6							19.3		
underground		biomass	g ashfree drw /m2		max (growing season)	22															178.2							66.1	291.9							22.9		
above ground		biomass	g ashfree drw/day /m2		mean (growing season)	22															0.58							0.676	4.186							0.06		
underground		biomass	g ashfree drw/day /m2		mean (growing season)	22															0.112							0.041	0.305							0.015		
standing crop		biomass (dw)	g/m2		max	24																									80						
shoots	lab test	RGR	d-1		mean	25								0.086												0.088										
fronts/plant		biomass	dry weight g/m2		mean	26																		117.6	48.2											
above ground		biomass	dry weightg/m2		mean	27														37.94																
above ground		density	specimen/m2		max	27														170																
above ground		density	shoots/m2		max	27														545																
above ground		RGR	gg−1 day−1		mean	28																														0.22	
above ground		biomass production	dry weight kg ha−1 month−1		mean	28																														2020	
underground		underground biomass (dw)	dry weightg/m2		mean	29										20.1																					
shoots		yearly shoot production biomass (dw)	dry weightg/m2		min	29										10																					
shoots		yearly shoot production biomass (dw)	dry weightg/m2		max	29										21																					
leaves		biomass	dry weightg/m2		max	30																													252			
leaves		Annual production	g dry wt/m2/year		max	30																													554			
leaves		biomass	dry weightg/m2		min	30																													216			
leaves		Annual production	g dry wt/m2/year		min	30																													517			

Annex 5 Detailed abiotic data for 6 macrophyte species

		water	organic top layer				organic top layer																								
				per kg dw			destruction mmol/kg dw																								
		flow rate (class)	thickness (cm)	moisture	density	OM %	Al	As	B	Ca	Cd	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	N	C	C:N
species																															
Callitriche obtusangula	mean	2.18	6.86	52.26	0.84	14.73	145.60	0.18	2.98	275.88	0.02	0.32	0.16	0.19	484.96	0.00	7.27	22.36	20.73	0.00	69.03	0.29	52.47	0.09	70.16	17.84	0.26	3.16	257.03	4676.39	18.01
Callitriche obtusangula	n	11.00	11.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Callitriche obtusangula	max	4.00	25.00	79.77	1.59	47.29	445.00	0.64	11.74	1380.10	0.04	0.63	0.31	0.31	2164.68	0.00	13.39	56.75	72.69	0.00	215.96	0.56	177.54	0.18	224.51	33.65	1.07	7.60	585.46	12272.39	20.96
Callitriche obtusangula	min	0.00	0.00	24.30	0.24	0.12	44.88	0.01	0.56	10.84	0.00	0.04	0.05	0.05	60.80	0.00	2.53	6.09	1.05	0.00	2.81	0.07	6.08	0.02	5.70	10.74	0.00	0.99	28.56	566.16	15.96
Callitriche platycarpa	mean	0.33	4.17	73.84	0.33	34.79	480.86	0.07	1.04	118.44	0.02	0.14	0.35	0.30	79.53	0.00	7.55	27.75	3.71	0.00	421.81	0.20	49.14	0.18	70.80	33.86	0.25	0.94	678.28	12110.04	18.31
Callitriche platycarpa	n	3.00	3.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Callitriche platycarpa	max	1.00	11.00	89.93	0.55	58.40	819.98	0.13	1.63	212.49	0.05	0.26	0.51	0.54	141.58	0.00	12.36	48.59	7.13	0.00	518.75	0.36	88.68	0.30	126.97	48.59	0.45	1.72	1120.95	19740.73	19.01
Callitriche platycarpa	min	0.00	0.00	57.74	0.10	11.19	141.75	0.01		24.38	0.00	0.01	0.19	0.05	17.48	0.00	2.74	6.92	0.29	0.00	324.87	0.04	9.60	0.06	14.64	19.14	0.04	0.16	235.61	4479.34	17.61
Ceratophyllum demersum	mean	1.33	30.00	71.35	0.41	19.65	115.34	0.11	7.20	173.35	0.01	0.16	0.14	0.15	1292.73	0.00	4.84	12.36	26.44	0.01	112.12	0.16	98.41	0.07	39.72	36.53	0.31	1.58	517.64	7672.33	15.05
Ceratophyllum demersum	n	3.00	3.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Ceratophyllum demersum	max	2.00	50.00	81.27	0.59	29.67	148.47	0.12	8.51	248.89	0.02	0.18	0.19	0.21	1458.42	0.00	6.36	15.60	29.55	0.01	221.60	0.22	118.90	0.09	60.13	37.27	0.49	2.01	728.26	10548.93	15.62
Ceratophyllum demersum	min	1.00	0.00	61.43	0.22	9.62	82.21	0.10	5.89	97.81	0.01	0.14	0.09	0.09	1127.04	0.00	3.32	9.11	23.34	0.00	2.65	0.10	77.92	0.04	19.31	35.79	0.13	1.15	307.01	4795.72	14.49
Elodea Canadensis	mean	1.50	1.25	45.65	0.81	4.14	67.07	0.13	2.70	76.80	0.01	0.33	0.09	0.11	441.58	0.00	2.96	7.86	11.91	0.00	7.29	0.24	20.05	0.03	15.98	12.00	0.09	1.14	107.10	1731.79	16.17
Elodea Canadensis	n	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Elodea Canadensis	max	2.00	2.50	45.65	0.81	4.14	67.07	0.13	2.70	76.80	0.01	0.33	0.09	0.11	441.58	0.00	2.96	7.86	11.91	0.00	7.29	0.24	20.05	0.03	15.98	12.00	0.09	1.14	107.10	1731.79	16.17
Elodea Canadensis	min	1.00	0.00	45.65	0.81	4.14	67.07	0.13	2.70	76.80	0.01	0.33	0.09	0.11	441.58	0.00	2.96	7.86	11.91	0.00	7.29	0.24	20.05	0.03	15.98	12.00	0.09	1.14	107.10	1731.79	16.17
Elodea nuttallii	mean	0.78	33.17	60.48	0.54	11.21	114.54	0.16	5.72	481.02	0.01	0.10	0.18	0.19	848.29	0.00	5.72	33.67	13.27	0.00	5.44	0.18	68.09	0.06	90.61	25.61	0.56	1.36	313.36	5202.77	19.59
Elodea nuttallii	n	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Elodea nuttallii	max	1.00	70.00	78.29	1.11	23.81	154.61	0.37	9.38	1723.28	0.02	0.26	0.29	0.36	1505.36	0.00	9.32	80.23	34.21	0.01	11.40	0.44	141.78	0.12	254.13	55.64	2.32	3.20	664.00	10657.16	41.98
Elodea nuttallii	min	0.00	6.50	32.29	0.22	1.81	70.26	0.03	1.45	97.69	0.00	0.04	0.10	0.05	249.00	0.00	3.81	17.75	5.93	0.00	2.40	0.10	7.35	0.03	13.81	10.10	0.11	0.37	42.84	1798.40	13.15
Hottonia palustris	mean	0.25	3.63	55.94	0.61	7.22	88.28	0.06	1.32	550.53	0.00	0.04	0.11	0.08	184.03	0.00	5.62	36.46	14.36	0.00	472.13	0.08	15.62	0.04	95.19	12.99	0.40	0.86	149.94	2825.26	18.37
Hottonia palustris	n	4.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Hottonia palustris	max	1.00	10.00	66.87	0.77	10.20	113.44	0.15	2.17	1569.60	0.00	0.06	0.15	0.10	319.86	0.00	7.53	86.93	40.84	0.01	1408.84	0.14	20.88	0.04	184.97	15.13	1.09	0.98	221.33	4312.82	20.01
Hottonia palustris	min	0.00	0.00	49.36	0.41	4.99	63.24	0.01	0.79	27.93	0.00	0.01	0.08	0.07	101.92	0.00	3.44	7.39	0.54	0.00	3.34	0.02	12.58	0.03	29.56	10.37	0.04	0.67	92.82	1448.71	15.61

		organic top layer													sediment											
		NaCl umol/kg												NaCl	umol/l bodem										
		NO3-	NH4+	Al	Ca	Fe	K	Mg	Mn	P	S	Si	Zn	pH	NO3-	NH4+	Al	Ca	Fe	K	Mg	Mn	P	S	Si	Zn
species																										
Callitriche obtusangula	mean	16.4	1731.9	10.2	24123.2	224.0	2194.1	2488.2	1588.9	11.1	2472.6	703.9	4.5	6.2	5.9	843.0	7.3	12322.7	156.2	1268.1	1280.7	764.1	5.4	2239.4	383.0	2.5
Callitriche obtusangula	n	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Callitriche obtusangula	max	63.8	4072.6	13.5	51575.8	816.3	4507.5	7600.3	6378.8	31.4	6575.4	1338.3	15.0	6.7	17.7	2154.0	15.0	16459.3	794.1	2420.1	2106.5	1767.9	10.0	9605.7	886.1	5.3
Callitriche obtusangula	min	0.6	7.7	3.7	4745.6	1.0	755.6	600.9	78.2	1.1	324.3	79.4	0.1	5.8	0.8	11.3	3.2	7563.6	1.4	696.9	529.9	38.5	1.6	394.7	116.0	0.1
Callitriche platycarpa	mean	72.2	2849.0	197.6	48730.7	53.1	3256.9	7430.4	562.1	10.8	2257.7	1686.1	1.9	6.1	12.0	382.4	39.0	8654.6	6.7	597.0	1140.4	67.3	1.5	338.8	272.6	0.4
Callitriche platycarpa	n	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Callitriche platycarpa	max	124.4	5317.4	312.4	81388.5	100.7	5355.6	13220.9	1085.8	20.0	4051.8	2937.6	2.8	6.1	13.0	556.7	45.3	8788.5	10.5	633.3	1384.1	113.7	2.1	424.2	307.5	0.5
Callitriche platycarpa	min	20.0	380.7	82.8	16072.9	5.4	1158.2	1639.9	38.3	1.6	463.5	434.7	1.0	6.1	10.9	208.1	32.7	8520.7	2.9	560.7	896.7	20.9	0.9	253.4	237.7	0.3
Ceratophyllum demersum	mean	30.3	3911.2	9.6	50005.1	8429.9	1634.2	3766.7	2224.6	17.9	977.2	6070.1	5.9	6.1	10.3	1090.5	3.2	16992.9	2492.4	558.7	1475.4	939.8	6.3	347.8	2031.4	2.0
Ceratophyllum demersum	n	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ceratophyllum demersum	max	41.3	6586.5	13.6	67929.0	13438.5	2201.7	4074.1	2408.5	23.2	1243.7	8413.2	8.3	6.1	11.5	1446.6	3.4	19066.6	2951.5	633.9	2056.0	1431.4	7.5	422.5	2215.0	2.1
Ceratophyllum demersum	min	19.3	1235.8	5.7	32081.3	3421.3	1066.6	3459.3	2040.6	12.7	710.8	3727.0	3.5	6.0	9.1	734.5	3.0	14919.2	2033.3	483.6	894.8	448.2	5.1	273.1	1847.8	1.8
Elodea Canadensis	mean	15.9	595.7	5.7	16776.6	21.6	1482.3	1848.0	1026.6	8.5	1378.2	1079.6	0.3	6.4	12.9	481.5	4.6	13560.0	17.5	1198.1	1493.7	829.8	6.9	1114.0	872.6	0.2
Elodea Canadensis	n	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Elodea Canadensis	max	15.9	595.7	5.7	16776.6	21.6	1482.3	1848.0	1026.6	8.5	1378.2	1079.6	0.3	6.4	12.9	481.5	4.6	13560.0	17.5	1198.1	1493.7	829.8	6.9	1114.0	872.6	0.2
Elodea Canadensis	min	15.9	595.7	5.7	16776.6	21.6	1482.3	1848.0	1026.6	8.5	1378.2	1079.6	0.3	6.4	12.9	481.5	4.6	13560.0	17.5	1198.1	1493.7	829.8	6.9	1114.0	872.6	0.2
Elodea nuttallii	mean	16.7	928.8	26.8	36877.7	5340.1	1373.1	3522.0	442.0	15.7	4727.7	3103.9	2.7	6.4	6.7	359.4	12.9	16904.4	1770.5	666.1	1649.8	183.2	7.9	2538.6	1129.6	1.0
Elodea nuttallii	n	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Elodea nuttallii	max	43.2	2353.4	100.4	56271.3	17340.1	3247.5	5535.1	964.4	25.0	22369.3	8393.9	7.8	7.6	11.3	746.4	46.4	22916.7	4954.9	1188.7	2934.6	536.3	17.3	10497.0	2429.2	2.5
Elodea nuttallii	min	-0.3	165.7	9.5	14366.1	1.4	797.9	1005.7	18.2	7.0	567.1	111.0	0.1	5.2	-0.2	126.2	3.5	12581.1	1.4	368.3	1119.4	14.2	5.3	205.7	86.5	0.1
Hottonia palustris	mean	11.8	886.5	14.1	35055.3	37.2	1428.4	2915.5	142.3	15.3	6412.7	633.6	0.2	6.8	5.8	478.9	8.0	19687.8	23.4	811.6	1610.2	74.4	8.2	3674.5	336.2	0.1
Hottonia palustris	n	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hottonia palustris	max	23.3	1274.0	17.9	51562.0	80.9	1816.5	4548.3	230.6	24.6	9511.8	1078.1	0.3	7.5	9.5	820.2	11.5	21913.3	52.1	1043.4	1858.6	112.6	10.0	5504.5	440.6	0.2
Hottonia palustris	min	1.0	140.7	6.8	24975.3	14.8	848.2	1984.4	21.3	6.8	2534.9	314.6	0.0	6.0	0.8	107.7	5.2	16079.8	6.1	649.2	1277.6	16.3	5.2	1632.1	240.8	0.0

		organic top layer																							
		destruction mmol/l																							
		Al	As	B	Ca	Cd	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	N	C	
species																									
Callitriche obtusangula	mean	72.15	0.08	1.27	78.73	0.01	0.26	0.08	0.10	181.17	0.00	4.00	10.54	7.84	0.00	102.58	0.21	21.35	0.05	31.00	11.57	0.08	2.21	108.61	1957.52	
Callitriche obtusangula	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
Callitriche obtusangula	max	123.34	0.16	2.77	326.11	0.02	0.72	0.10	0.15	511.50	0.00	4.86	13.41	17.18	0.00	315.48	0.53	41.95	0.07	61.25	17.13	0.25	3.91	162.27	3401.42	
Callitriche obtusangula	min	30.35	0.02	0.33	17.27	0.00	0.01	0.05	0.07	26.54	0.00	2.36	8.89	1.53	0.00	0.78	0.03	9.68	0.02	9.08	5.70	0.00	0.37	45.52	902.36	
Callitriche platycarpa	mean	81.68	0.01	0.21	17.79	0.00	0.02	0.08	0.04	12.19	0.00	1.40	4.44	0.45	0.00	158.83	0.03	7.27	0.03	10.65	7.78	0.03	0.13	123.09	2257.97	
Callitriche platycarpa	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Callitriche platycarpa	max	85.84	0.01	0.25	22.25	0.00	0.03	0.10	0.06	14.82	0.00	1.50	5.09	0.75	0.00	283.65	0.04	9.28	0.03	13.29	10.46	0.05	0.18	128.83	2449.26	
Callitriche platycarpa	min	77.51	0.01	0.17	13.33	0.00	0.01	0.05	0.03	9.56	0.00	1.29	3.78	0.16	0.00	34.01	0.02	5.25	0.03	8.00	5.09	0.02	0.09	117.35	2066.68	
Ceratophyllum demersum	mean	40.73	0.04	2.68	56.40	0.00	0.06	0.05	0.05	495.07	0.00	1.69	4.42	11.34	0.00	66.14	0.05	36.21	0.02	12.34	15.00	0.09	0.56	171.21	2583.53	
Ceratophyllum demersum	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Ceratophyllum demersum	max	48.86	0.06	3.50	58.13	0.01	0.09	0.05	0.05	669.82	0.00	1.98	5.41	17.56	0.00	131.70	0.06	46.31	0.02	13.21	22.15	0.11	0.69	182.46	2850.20	
Ceratophyllum demersum	min	32.61	0.03	1.87	54.66	0.00	0.04	0.04	0.05	320.31	0.00	1.40	3.43	5.13	0.00	0.58	0.05	26.11	0.02	11.48	7.86	0.08	0.44	159.95	2316.86	
Elodea Canadensis	mean	54.21	0.11	2.19	62.07	0.01	0.27	0.07	0.09	356.91	0.00	2.39	6.35	9.63	0.00	5.90	0.20	16.21	0.03	12.92	9.70	0.07	0.93	86.56	1399.76	
Elodea Canadensis	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Elodea Canadensis	max	54.21	0.11	2.19	62.07	0.01	0.27	0.07	0.09	356.91	0.00	2.39	6.35	9.63	0.00	5.90	0.20	16.21	0.03	12.92	9.70	0.07	0.93	86.56	1399.76	
Elodea Canadensis	min	54.21	0.11	2.19	62.07	0.01	0.27	0.07	0.09	356.91	0.00	2.39	6.35	9.63	0.00	5.90	0.20	16.21	0.03	12.92	9.70	0.07	0.93	86.56	1399.76	
Elodea nuttallii	mean	56.60	0.08	2.54	291.66	0.00	0.04	0.10	0.10	363.62	0.00	2.97	22.11	7.20	0.00	3.13	0.08	28.76	0.03	43.01	11.35	0.32	0.63	126.64	2233.74	
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
Elodea nuttallii	max	86.96	0.18	4.59	1044.60	0.01	0.09	0.21	0.28	694.88	0.00	5.79	89.30	19.02	0.00	11.86	0.16	46.78	0.10	119.25	25.69	1.09	1.59	210.59	3380.03	
Elodea nuttallii	min	31.87	0.01	1.15	51.11	0.00	0.02	0.04	0.05	195.33	0.00	1.38	4.05	2.17	0.00	1.07	0.04	3.45	0.01	15.37	5.81	0.07	0.30	47.68	1560.18	
Hottonia palustris	mean	52.49	0.03	0.71	232.53	0.00	0.02	0.06	0.05	97.54	0.00	3.16	16.96	6.07	0.00	360.81	0.04	8.93	0.02	49.67	7.60	0.17	0.54	84.68	1590.90	
Hottonia palustris	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Hottonia palustris	max	73.03	0.06	0.89	641.41	0.00	0.03	0.06	0.06	130.71	0.00	3.79	35.52	16.69	0.00	1078.37	0.06	9.63	0.03	75.58	8.67	0.45	0.75	103.84	2077.57	
Hottonia palustris	min	36.02	0.01	0.61	21.38	0.00	0.01	0.05	0.04	78.02	0.00	2.63	5.66	0.41	0.00	1.37	0.02	8.53	0.01	19.03	6.18	0.03	0.28	59.76	932.72	
		sediment																								
		destruction mmol/kg dw																								
		Al	As	B	Ca	Cd	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	N	C	C:N
species																										
Callitriche obtusangula	mean	84.22	0.03	0.81	143.06	0.00	0.07	0.11	0.08	56.99	0.00	4.76	31.16	3.08	0.00	355.70	0.10	6.15	0.04	8.87	12.85	0.17	0.76	18.17	634.28	28.37
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	8
Callitriche obtusangula	max	336.25	0.07	2.29	819.24	0.01	0.17	0.28	0.30	114.34	0.00	18.06	132.58	10.88	0.00	1773.82	0.19	14.19	0.15	29.91	27.16	0.94	1.60	42.84	940.83	44.31
Callitriche obtusangula	min	31.42	0.00	0.48	3.51	0.00	0.02	0.03	0.02	13.15	0.00	1.54	2.97	0.29	0.00	2.72	0.03	2.85	0.01	2.71	8.54	0.00	0.16	0.00	183.17	20.60
Callitriche platycarpa	mean	57.26	0.00	0.76	12.69	0.00	0.01	0.12	0.05	16.95	0.00	2.13	7.33	0.26	0.00	233.28	0.04	3.07	0.02	4.76	11.73	0.01	0.08	54.74	1040.74	19.41
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	75.72	0.01	1.48	13.35	0.00	0.01	0.19	0.10	21.14	0.00	2.63	8.31	0.33	0.00	377.29	0.05	4.56	0.03	9.09	13.35	0.02	0.09	64.26	1223.91	21.69
Callitriche platycarpa	min	33.25	0.00	0.39	12.30	0.00	0.01	0.04	0.03	11.06	0.00	1.84	5.64	0.19	0.00	1.34	0.02	1.21	0.01	0.85	10.59	0.00	0.05	35.70	774.31	17.49
Ceratophyllum demersum	mean	96.21	0.07	5.35	212.27	0.01	0.05	0.22	0.09	807.63	0.00	3.54	40.80	12.33	0.00	221.64	0.12	44.86	0.08	45.88	13.60	0.29	0.59	280.83	4143.53	15.99
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
Ceratophyllum demersum	max	139.57	0.16	11.31	338.58	0.02	0.06	0.30	0.13	1635.64	0.00	5.83	103.09	29.74	0.01	600.27	0.25	102.07	0.19	85.29	15.78	0.45	1.01	692.56	9075.24	18.88
Ceratophyllum demersum	min	46.08	0.02	1.81	63.48	0.00	0.03	0.04	0.04	111.95	0.00	1.82	6.46	1.75	0.00	2.24	0.03	8.78	0.02	3.53	11.06	0.06	0.29	0.00	524.53	13.10
Elodea Canadensis	mean	44.14	0.07	2.55	13.61	0.00	0.16	0.06	0.02	445.53	0.00	2.10	4.25	6.15	0.00	1115.92	0.13	14.80	0.01	16.54	9.73	0.01	0.66	14.28	474.58	27.40
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Elodea Canadensis	max	50.66	0.14	4.58	20.41	0.01	0.27	0.09	0.04	858.23	0.00	2.78	4.44	11.46	0.00	2081.29	0.21	25.37	0.02	30.61	10.59	0.02	0.78	28.56	782.64	27.40
Elodea Canadensis	min	37.62	0.01	0.52	6.80	0.00	0.05	0.03	0.00	32.82	0.00	1.43	4.06	0.83	0.00	150.54	0.04	4.23	0.01	2.48	8.88	0.00	0.54	0.00	166.52	27.40
Elodea nuttallii	mean	87.84	0.03	1.38	119.88	0.00	0.03	0.11	0.06	139.46	0.00	4.74	28.47	1.82	0.00	110.40	0.08	8.49	0.03	41.37	14.02	0.13	0.37	99.96	1903.86	
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8
Elodea nuttallii	max	157.50	0.10	2.22	526.88	0.01	0.06	0.22	0.20	341.66	0.00	8.58	64.88	5.15	0.00	403.91	0.15	26.08	0.12	132.02	18.69	0.56	1.12	399.83	6635.75	
Elodea nuttallii	min	36.27	0.00	0.50	15.23	0.00	0.01	0.04	0.01	28.58	0.00	2.93	9.63	0.36	0.00	1.28	0.03	2.67	0.01	1.17	9.86	0.00	0.05	0.00	149.87	
Hottonia palustris	mean	79.82	0.05	1.29	326.68	0.00	0.03	0.15	0.08	192.80	0.00	4.33	32.66	2.50	0.00	257.74	0.10	12.74	0.03	49.20	12.19	0.33	0.59	251.68	5507.59	20.61
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2
Hottonia palustris	max	94.45	0.11	3.07	959.82	0.01	0.05	0.23	0.17	515.34	0.00	5.64	97.42	5.10	0.00	586.10	0.15	35.26	0.04	103.60	18.21	0.95	0.98	892.47	18250.39	20.77
Hottonia palustris	min	72.24	0.00	0.43	15.36	0.00	0.01	0.06	0.02	21.42	0.00	3.67	8.01	0.50	0.00	3.60	0.04	2.49	0.02	5.50	9.53	0.00	0.29	0.00	191.50	20.45

		sediment												NaCl	umol/l bodem										
		NaCl umol/kg																							
		NO3-	NH4+	Al	Ca	Fe	K	Mg	Mn	P	S	Si	Zn	pH	NO3-	NH4+	Al	Ca	Fe	K	Mg	Mn	P	S	Si	Zn
species																										
Callitriche obtusangula	mean	29.73	477.04	26.00	7834.13	196.96	782.66	1244.02	299.83	4.14	1165.66	324.40	8.18	6.38	47.61	642.29	38.03	11350.46	256.70	1152.84	1768.81	412.59	6.05	1831.86	458.93	12.15
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	180.32	3398.84	118.89	20497.70	1841.54	1872.97	5478.32	1796.14	10.52	4871.77	1398.42	40.02	8.22	310.00	4282.12	181.05	25591.76	2320.12	2359.71	6902.01	2262.92	14.97	8306.67	1745.95	55.35
Callitriche obtusangula	min	0.90	0.36	1.73	421.23	0.93	414.83	78.28	0.58	0.64	217.68	55.82	0.04	4.66	1.53	0.55	2.98	641.47	1.58	614.45	119.21	0.86	1.03	331.49	95.18	0.06
Callitriche platycarpa	mean	10.12	164.59	5.22	4913.71	2.76	697.65	678.95	38.33	1.02	271.73	178.38	0.12	6.40	14.20	230.76	7.35	6894.94	3.89	984.09	956.92	54.06	1.42	384.14	251.39	0.18
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	11.83	326.70	5.71	5765.15	3.92	800.40	856.85	75.53	1.92	336.30	192.75	0.20	7.13	16.18	462.95	8.09	7889.71	5.55	1151.10	1214.19	107.02	2.63	483.65	273.13	0.28
Callitriche platycarpa	min	7.33	9.93	4.97	3591.07	2.01	627.38	581.04	16.34	0.25	202.24	163.18	0.07	5.94	10.55	14.28	6.81	5164.49	2.90	858.58	795.17	23.49	0.36	276.77	223.31	0.11
Ceratophyllum demersum	mean	16.65	1680.21	10.69	26240.90	2376.29	786.36	2453.05	331.48	8.90	1528.39	1037.10	1.54	6.54	16.28	998.63	11.30	21443.36	1418.96	689.36	2000.62	208.41	7.53	1522.29	829.48	0.97
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	20.97	4891.01	15.82	46143.37	6807.71	1219.10	4117.38	886.11	16.63	1975.97	1767.71	4.17	7.87	24.77	2811.42	22.08	26523.89	3913.17	729.94	2899.77	509.35	9.62	2110.39	1313.39	2.40
Ceratophyllum demersum	min	11.25	74.43	4.98	9174.72	2.15	456.52	526.69	0.55	3.20	1164.74	113.85	0.04	5.60	12.01	79.50	5.32	12809.49	3.00	637.39	735.35	0.77	3.42	830.30	158.95	0.06
Elodea Canadensis	mean	24.24	105.53	12.26	5176.76	3.42	739.28	715.63	135.73	2.72	848.50	166.44	3.79	6.47	35.24	144.95	17.37	7207.52	4.74	1039.32	996.99	186.69	3.87	1191.32	234.12	5.61
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	37.77	182.75	12.68	7397.67	5.36	894.92	1012.38	230.72	2.82	1052.15	199.61	7.47	6.63	55.94	247.95	17.53	10037.09	7.28	1214.23	1373.59	313.05	4.17	1427.55	270.83	11.06
Elodea Canadensis	min	10.71	28.32	11.84	2955.85	1.48	583.63	418.87	40.73	2.62	644.85	133.28	0.11	6.30	14.53	41.94	17.20	4377.95	2.20	864.42	620.39	60.33	3.56	955.09	197.40	0.15
Elodea nuttallii	mean	9.90	114.02	12.60	13452.35	28.54	678.04	1452.88	64.56	3.22	2063.89	472.35	1.43	6.94	10.84	137.85	15.12	14048.69	26.69	825.61	1522.26	72.22	3.35	2346.69	443.39	2.21
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	27.43	217.66	48.83	40226.86	146.98	936.37	4387.95	213.74	10.60	8085.20	1962.10	10.83	8.60	21.19	306.94	50.99	28526.31	104.23	1301.61	3111.65	223.18	7.52	8252.89	1391.40	17.58
Elodea nuttallii	min	2.22	6.45	1.82	3783.65	0.58	350.69	229.38	0.67	0.73	162.57	56.69	0.00	5.62	3.60	9.48	2.01	5187.81	0.60	468.38	314.51	0.92	1.00	222.90	83.30	0.00
Hottonia palustris	mean	13.25	98.77	7.50	24987.08	37.19	1020.00	2065.72	105.07	2.79	1195.81	671.67	0.59	6.78	7.56	56.69	8.69	12028.35	10.48	809.70	998.42	30.06	2.38	1300.17	218.05	0.32
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	38.40	278.31	11.31	77241.33	142.44	2075.48	6393.12	397.99	5.52	2629.08	2475.85	1.71	8.36	11.30	69.41	16.27	17727.36	32.69	1141.20	1467.26	91.34	3.83	2865.37	568.22	0.39
Hottonia palustris	min	1.92	33.33	3.66	5262.42	1.33	526.03	501.85	3.97	0.97	552.43	58.51	0.20	5.44	2.09	45.50	1.68	8760.95	1.45	476.34	824.57	6.62	1.05	168.74	63.76	0.23

		sediment																										
		destructie mmol/l																										
		Al	As	B	Ca	Cd	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	N	C	vocht	dicht	om%
species																												
Callitriche obtusangula	mean	121.94	0.04	1.21	224.85	0.00	0.11	0.16	0.12	84.27	0.00	6.89	48.23	4.69	0.00	541.56	0.15	9.16	0.06	13.67	19.20	0.26	1.14	26.31	958.72	22.19	1.53	1.74
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	423.64	0.08	3.39	1213.48	0.01	0.21	0.40	0.51	144.05	0.00	22.75	196.39	18.71	0.00	2531.53	0.28	17.72	0.26	51.00	34.22	1.40	2.42	53.97	1617.41	30.31	1.72	4.61
Callitriche obtusangula	min	54.04	0.00	0.82	5.34	0.00	0.03	0.04	0.04	20.02	0.00	2.42	5.12	0.49	0.00	3.43	0.05	4.34	0.02	4.07	14.30	0.00	0.25	0.00	261.41	15.39	1.25	0.46
Callitriche platycarpa	mean	80.36	0.00	1.09	17.88	0.00	0.01	0.17	0.08	23.81	0.00	3.00	10.32	0.36	0.00	324.47	0.05	4.30	0.03	6.68	16.52	0.01	0.11	46.64	1003.17	25.83	1.41	1.71
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	107.30	0.01	2.13	19.19	0.00	0.01	0.25	0.15	28.93	0.00	3.78	11.95	0.47	0.00	516.33	0.07	6.46	0.04	12.88	18.91	0.03	0.13	91.06	1734.32	29.23	1.44	2.96
Callitriche platycarpa	min	47.82	0.00	0.56	16.84	0.00	0.01	0.05	0.04	15.68	0.00	2.61	7.99	0.26	0.00	1.93	0.03	1.74	0.01	1.23	15.22	0.00	0.06	0.00	215.53	20.77	1.37	0.49
Ceratophyllum demersum	mean	91.07	0.05	4.05	225.15	0.01	0.05	0.22	0.08	605.91	0.00	3.93	52.74	8.47	0.00	138.28	0.15	32.09	0.05	41.36	13.44	0.30	0.50	186.08	2990.76	40.23	1.01	12.11
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	143.78	0.09	6.50	472.72	0.01	0.09	0.43	0.12	940.19	0.00	8.14	143.93	17.10	0.00	345.04	0.35	58.67	0.11	91.09	16.85	0.63	0.58	398.09	5216.58	58.15	1.40	28.08
Ceratophyllum demersum	min	49.22	0.02	2.52	67.80	0.00	0.03	0.05	0.04	156.30	0.00	1.71	6.90	2.44	0.00	3.13	0.03	12.25	0.02	4.92	8.02	0.06	0.40	0.00	732.34	24.52	0.57	0.73
Elodea Canadensis	mean	62.23	0.10	3.49	18.89	0.01	0.22	0.08	0.03	606.53	0.00	3.02	6.02	8.39	0.00	1523.42	0.17	20.34	0.02	22.60	13.76	0.01	0.93	19.37	654.25	20.51	1.42	1.89
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	68.74	0.18	6.21	27.69	0.01	0.37	0.12	0.06	1164.44	0.00	4.11	6.02	15.55	0.01	2823.87	0.29	34.42	0.02	41.53	14.37	0.03	1.06	38.75	1061.87	24.44	1.48	3.28
Elodea Canadensis	min	55.71	0.01	0.77	10.08	0.00	0.07	0.04	0.01	48.62	0.00	1.94	6.02	1.24	0.00	222.97	0.06	6.26	0.02	3.68	13.15	0.00	0.81	0.00	246.63	16.57	1.36	0.51
Elodea nuttallii	mean	105.01	0.03	1.57	149.29	0.00	0.04	0.14	0.07	145.16	0.00	5.83	36.11	2.15	0.00	151.16	0.10	8.73	0.04	45.76	16.59	0.16	0.40	91.56	1736.87	27.50	1.23	3.57
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	190.03	0.10	2.69	774.19	0.01	0.07	0.23	0.20	291.83	0.00	9.01	95.33	7.57	0.00	593.50	0.22	18.49	0.12	137.85	25.39	0.83	1.14	283.53	4705.65	48.29	1.62	13.38
Elodea nuttallii	min	49.74	0.00	0.75	23.11	0.00	0.01	0.05	0.02	39.19	0.00	2.11	8.28	0.49	0.00	1.75	0.04	3.66	0.01	1.61	12.74	0.00	0.07	0.00	68.49	16.64	0.71	0.27
Hottonia palustris	mean	84.23	0.03	0.86	375.71	0.00	0.04	0.15	0.06	112.38	0.00	5.02	42.91	2.05	0.00	364.89	0.10	7.17	0.03	38.68	11.62	0.37	0.54	82.33	2210.69	38.47	1.11	13.35
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	130.37	0.07	1.03	1381.19	0.00	0.08	0.32	0.11	165.22	0.00	8.11	140.18	5.32	0.00	975.75	0.22	8.43	0.05	112.91	15.87	1.37	1.06	204.83	4188.58	79.04	1.66	39.36
Hottonia palustris	min	21.68	0.00	0.71	25.30	0.00	0.01	0.05	0.04	35.65	0.00	0.84	3.08	0.54	0.00	0.83	0.03	4.15	0.01	7.92	4.18	0.00	0.18	0.00	318.81	17.79	0.23	0.93

		pore water organic top layer																	
		pH	alkmeq/l	ext.	turb.	EGV (µs/cm)	CO2 µmol/l	HCO3 µmol/l	TIC	NO3	NH4	PO4	Na	K	Cl	Al	As	B	Ca
species																			
Callitriche obtusangula	mean	6.74	0.00	0.00	0.00	881.83	2141.13	6465.37	8606.49	1.71	333.12	1.03	1163.60	429.77	1310.79	1.79	0.39	9.34	2773.54
Callitriche obtusangula	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Callitriche obtusangula	max	7.20	0.00	0.00	0.00	1396.00	3790.20	12199.74	14508.10	3.46	1004.45	2.57	1943.56	1255.59	2454.32	3.67	0.84	22.33	3880.51
Callitriche obtusangula	min	5.58	0.00	0.00	0.00	290.00	596.15	453.14	3159.80	0.42	43.91	0.39	471.74	77.59	540.81	0.77	0.00	1.02	796.51
Callitriche platycarpa	mean	6.69	0.00	0.00	0.00	161.10	393.78	806.12	1199.91	19.26	12.97	0.27	340.29	53.54	352.89	2.20	0.00	0.51	459.66
Callitriche platycarpa	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Callitriche platycarpa	max	6.77	0.00	0.00	0.00	200.10	411.20	921.85	1298.22	37.09	15.72	0.29	448.21	62.42	561.80	2.46	0.00	0.76	528.37
Callitriche platycarpa	min	6.61	0.00	0.00	0.00	122.10	376.37	690.39	1101.59	1.42	10.22	0.25	232.36	44.65	143.99	1.93	0.00	0.26	390.95
Ceratophyllum demersum	mean	6.80	0.00	0.00	0.00	503.50	1742.94	4360.03	6102.97	0.54	403.25	3.89	351.15	67.46	471.40	0.86	0.07	4.75	2110.22
Ceratophyllum demersum	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ceratophyllum demersum	max	6.85	0.00	0.00	0.00	637.00	2453.98	5674.39	8128.36	0.78	757.47	6.80	355.05	91.68	473.38	1.28	0.08	5.94	2672.03
Ceratophyllum demersum	min	6.75	0.00	0.00	0.00	370.00	1031.90	3045.68	4077.58	0.30	49.04	0.98	347.26	43.25	469.42	0.44	0.06	3.55	1548.42
Elodea Canadensis	mean	7.09	0.00	0.00	0.00	756.00	1166.27	5954.53	7120.80	0.58	127.20	0.43	1631.91	368.50	933.28	0.51	0.05	17.87	2611.95
Elodea Canadensis	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Elodea Canadensis	max	7.09	0.00	0.00	0.00	756.00	1166.27	5954.53	7120.80	0.58	127.20	0.43	1631.91	368.50	933.28	0.51	0.05	17.87	2611.95
Elodea Canadensis	min	7.09	0.00	0.00	0.00	756.00	1166.27	5954.53	7120.80	0.58	127.20	0.43	1631.91	368.50	933.28	0.51	0.05	17.87	2611.95
Elodea nuttallii	mean	7.11	0.00	0.00	0.00	557.56	1104.26	4756.34	5860.60	0.63	103.20	1.02	824.26	128.21	983.48	0.65	0.10	4.96	2013.46
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	7.93	0.00	0.00	0.00	823.00	2464.05	6397.97	8267.66	1.84	226.92	1.76	1919.02	353.91	2027.83	1.60	0.19	9.13	3498.18
Elodea nuttallii	min	6.75	0.00	0.00	0.00	361.00	172.26	3448.69	4461.68	-0.04	14.01	0.42	296.09	18.57	381.10	0.37	0.01	2.59	1470.80
Hottonia palustris	mean	6.86	0.00	0.00	0.00	669.67	1830.21	5883.49	7713.70	1.67	120.40	0.95	729.34	222.34	914.66	2.44	0.14	4.30	2690.14
Hottonia palustris	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Hottonia palustris	max	7.06	0.00	0.00	0.00	798.00	2237.80	7498.25	9068.29	2.74	191.15	1.19	1047.02	444.95	1102.89	5.15	0.23	6.51	3560.75
Hottonia palustris	min	6.50	0.00	0.00	0.00	445.00	1570.04	2923.27	5161.07	0.04	32.87	0.81	468.65	79.65	555.33	0.39	0.03	2.71	1296.14

		pore waterorganic top layer																		
		Cd	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	NO3/NH4
species																				
Callitriche obtusangula	mean	0.01	1.28	0.04	0.06	916.87	0.00	594.73	579.04	146.74	0.11	1114.17	0.49	15.47	0.01	195.69	404.74	6.37	1.92	0.01
Callitriche obtusangula	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Callitriche obtusangula	max	0.04	3.52	0.06	0.08	2059.53	0.00	1564.22	858.99	326.63	0.37	1798.52	1.01	44.88	0.04	643.98	661.52	10.71	7.25	0.03
Callitriche obtusangula	min	0.00	0.00	0.02	0.03	58.11	0.00	132.07	200.21	12.41	0.00	601.80	0.06	2.85	0.00	27.91	272.68	1.91	0.21	0.00
Callitriche platycarpa	mean	0.00	0.03	0.04	0.06	12.95	0.00	96.38	102.39	1.74	0.00	454.20	0.09	0.98	0.00	164.27	171.71	1.04	0.45	1.86
Callitriche platycarpa	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Callitriche platycarpa	max	0.00	0.05	0.05	0.09	19.04	0.00	110.74	157.37	2.34	0.01	586.75	0.11	1.20	0.00	311.51	216.60	1.24	0.75	3.63
Callitriche platycarpa	min	0.00	0.01	0.04	0.02	6.86	0.00	82.02	47.41	1.14	0.00	321.65	0.07	0.77	0.00	17.03	126.82	0.84	0.16	0.09
Ceratophyllum demersum	mean	0.00	0.01	0.02	0.02	755.58	0.00	85.94	245.80	32.07	0.00	129.04	0.05	27.23	0.01	26.03	612.35	3.18	0.73	0.01
Ceratophyllum demersum	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ceratophyllum demersum	max	0.00	0.02	0.02	0.02	1110.91	0.00	105.90	262.05	56.31	0.01	162.58	0.05	31.57	0.01	34.90	615.14	4.65	0.95	0.02
Ceratophyllum demersum	min	0.00	0.00	0.01	0.01	400.26	0.00	65.97	229.55	7.83	0.00	95.49	0.04	22.89	0.01	17.15	609.56	1.72	0.50	0.00
Elodea Canadensis	mean	0.00	0.45	0.01	0.02	508.06	0.00	420.65	500.63	143.42	0.02	11.83	0.24	1.37	0.01	386.53	333.92	4.80	0.74	0.00
Elodea Canadensis	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Elodea Canadensis	max	0.00	0.45	0.01	0.02	508.06	0.00	420.65	500.63	143.42	0.02	11.83	0.24	1.37	0.01	386.53	333.92	4.80	0.74	0.00
Elodea Canadensis	min	0.00	0.45	0.01	0.02	508.06	0.00	420.65	500.63	143.42	0.02	11.83	0.24	1.37	0.01	386.53	333.92	4.80	0.74	0.00
Elodea nuttallii	mean	0.00	0.01	0.01	0.03	507.81	0.00	177.65	305.30	25.02	0.00	712.90	0.03	20.35	0.00	229.13	449.33	3.29	1.00	0.02
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	0.01	0.04	0.05	0.07	972.85	0.00	401.44	540.39	59.95	0.02	1608.27	0.06	36.76	0.01	998.54	739.41	5.42	6.35	0.10
Elodea nuttallii	min	0.00	0.00	0.00	0.00	81.79	0.00	41.08	145.87	8.10	0.00	5.19	0.00	4.05	0.00	9.20	134.81	1.84	0.17	0.00
Hottonia palustris	mean	0.00	0.01	0.04	0.05	287.31	0.00	198.26	435.04	21.26	0.00	799.17	0.06	21.36	0.00	102.36	297.40	5.08	0.21	0.03
Hottonia palustris	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Hottonia palustris	max	0.00	0.03	0.11	0.06	465.99	0.00	310.97	516.91	27.34	0.00	920.81	0.11	45.76	0.01	226.62	428.38	6.20	0.39	0.08
Hottonia palustris	min	0.00	0.00	0.01	0.04	57.22	0.00	65.39	313.41	9.17	0.00	651.57	0.02	8.24	0.00	38.48	192.06	2.86	0.06	0.00

		pore water sediment																	
		pH	alkmeq/l	ext.	turb.	EGV (µs/c	CO2 µmol	HCO3 µm	TIC	NO3	NH4	PO4	Na	K	Cl	Al	As	B	Ca	Cd
species																				
Callitriche obtusangula	mean	6.66	0.00	0.00	0.00	661.05	1920.63	5308.62	7229.25	152.13	190.38	0.78	951.70	250.63	1089.83	2.96	0.28	6.60	2031.68	0.01
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	7.17	0.00	0.00	0.00	1430.00	4650.84	14144.25	18795.09	1509.68	637.77	1.89	1591.27	834.92	1861.53	18.41	0.96	21.32	3715.79	0.03
Callitriche obtusangula	min	4.73	0.00	0.00	0.00	128.50	258.28	50.80	944.42	0.20	4.36	0.31	466.88	62.99	595.51	0.41	0.00	0.75	140.40	0.00
Callitriche platycarpa	mean	6.80	0.00	0.00	0.00	315.33	801.57	2344.43	3146.00	3.17	54.67	0.33	690.95	155.22	841.12	1.74	0.03	1.66	912.37	0.00
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	7.01	0.00	0.00	0.00	527.00	1002.09	4206.82	5208.91	5.71	143.42	0.42	842.09	298.49	1147.88	2.73	0.05	2.79	1627.83	0.00
Callitriche platycarpa	min	6.66	0.00	0.00	0.00	175.00	403.83	923.10	1326.93	1.30	1.59	0.19	490.45	57.94	508.90	0.14	0.00	0.09	460.06	0.00
Ceratophyllum demersum	mean	6.90	0.00	0.00	0.00	565.67	1537.44	4680.72	6218.17	0.75	304.89	1.02	555.04	60.10	710.89	0.89	0.15	4.84	2372.92	0.00
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	7.08	0.00	0.00	0.00	838.00	2277.32	6723.91	8472.04	0.94	833.97	1.15	984.72	75.07	1310.34	2.22	0.29	10.07	3233.71	0.01
Ceratophyllum demersum	min	6.67	0.00	0.00	0.00	333.00	586.88	2928.19	3515.07	0.36	7.53	0.78	302.48	35.85	346.32	0.08	0.01	2.17	1377.31	0.00
Elodea Canadensis	mean	6.87	0.00	0.00	0.00	657.50	1242.04	4045.95	5287.99	0.47	77.54	0.90	1564.15	437.44	1426.63	0.63	0.11	14.36	1943.51	0.00
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	7.07	0.00	0.00	0.00	769.00	1373.97	5400.21	6510.31	0.66	118.79	1.40	1880.13	484.02	1701.42	0.88	0.18	23.37	2469.51	0.00
Elodea Canadensis	min	6.67	0.00	0.00	0.00	546.00	1110.10	2691.70	4065.67	0.28	36.29	0.41	1248.17	390.87	1151.85	0.38	0.05	5.34	1417.50	0.00
Elodea nuttallii	mean	7.09	0.00	0.00	0.00	484.29	781.40	3679.91	4461.31	0.95	48.70	0.82	768.73	109.52	924.22	0.33	0.08	2.51	1781.92	0.00
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	7.55	0.00	0.00	0.00	781.00	1878.30	5967.77	7846.07	2.10	145.08	2.04	1949.20	284.23	2066.28	1.11	0.24	4.37	3287.13	0.00
Elodea nuttallii	min	6.85	0.00	0.00	0.00	170.60	277.80	1371.64	1724.98	0.06	5.30	0.24	285.68	14.94	321.27	0.10	0.00	1.44	533.97	0.00
Hottonia palustris	mean	6.72	0.00	0.00	0.00	579.50	1897.00	4738.26	6635.26	1.23	18.60	0.39	597.44	85.71	689.56	1.02	0.07	3.38	2422.13	0.00
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	7.14	0.00	0.00	0.00	763.00	2770.14	7268.86	9180.56	2.36	46.71	0.72	895.21	155.15	1267.36	2.63	0.17	6.53	3515.37	0.00
Hottonia palustris	min	6.25	0.00	0.00	0.00	371.00	1147.77	1309.69	3068.10	0.40	5.10	0.22	285.05	21.29	359.38	0.26	0.01	1.97	905.38	0.00

		pore water sediment																	
		Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	NO3/NH4
species																			
Callitriche obtusangula	mean	0.38	0.03	0.05	603.16	0.00	360.28	395.54	82.96	0.03	873.29	0.21	8.31	0.01	240.38	307.93	4.48	0.99	33.51
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	1.74	0.08	0.08	2070.87	0.00	1171.77	637.19	361.84	0.13	1519.93	1.00	29.66	0.03	833.69	491.46	10.83	3.30	346.18
Callitriche obtusangula	min	0.00	0.00	0.02	0.46	0.00	92.26	45.34	0.13	0.00	171.00	0.06	0.54	0.00	31.96	147.53	0.21	0.20	0.00
Callitriche platycarpa	mean	0.02	0.04	0.02	40.35	0.00	224.67	230.34	7.15	0.01	550.48	0.14	1.46	0.00	144.85	228.27	1.66	0.31	0.33
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	0.03	0.07	0.03	83.27	0.00	409.34	400.12	9.36	0.01	683.53	0.26	2.62	0.00	361.93	268.76	2.35	0.45	0.82
Callitriche platycarpa	min	0.01	0.00	0.01	17.76	0.00	80.07	87.23	2.75	0.00	345.32	0.06	0.83	0.00	17.53	158.86	0.98	0.17	0.04
Ceratophyllum demersum	mean	0.01	0.04	0.02	613.24	0.00	64.39	316.47	13.81	0.01	394.23	0.07	11.50	0.01	375.78	460.21	3.40	1.19	0.05
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	0.02	0.06	0.02	1468.22	0.00	77.74	382.40	25.22	0.02	925.78	0.10	11.98	0.02	999.83	597.88	5.26	2.26	0.12
Ceratophyllum demersum	min	0.00	0.01	0.01	138.45	0.00	55.58	234.03	3.04	0.00	47.67	0.05	10.88	0.00	28.39	255.45	1.61	0.27	0.00
Elodea Canadensis	mean	0.40	0.01	0.04	354.01	0.00	357.02	426.53	69.96	0.01	955.17	0.25	8.16	0.00	546.78	257.93	3.74	0.71	0.01
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	0.58	0.02	0.06	368.01	0.00	438.89	510.86	107.83	0.01	1068.93	0.33	14.83	0.00	600.38	293.21	4.32	0.89	0.01
Elodea Canadensis	min	0.23	0.00	0.02	340.01	0.00	275.14	342.20	32.09	0.01	841.41	0.16	1.50	0.00	493.17	222.65	3.16	0.54	0.01
Elodea nuttallii	mean	0.00	0.01	0.03	95.93	0.00	154.33	276.55	14.76	0.01	561.08	0.04	7.98	0.00	316.21	345.31	2.73	0.66	0.06
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	0.01	0.04	0.08	190.08	0.00	370.63	498.88	50.07	0.06	1592.31	0.09	14.83	0.01	882.92	525.20	5.12	3.16	0.28
Elodea nuttallii	min	0.00	0.00	0.00	5.26	0.00	36.63	88.10	2.16	0.00	23.49	0.01	1.76	0.00	12.60	103.34	0.84	0.13	0.00
Hottonia palustris	mean	0.01	0.02	0.04	74.93	0.00	120.78	375.60	24.51	0.01	657.31	0.06	4.45	0.00	345.76	283.50	4.22	1.26	0.14
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	0.04	0.06	0.06	141.06	0.00	233.09	533.38	54.07	0.02	878.30	0.15	12.43	0.01	530.64	468.70	6.54	2.63	0.39
Hottonia palustris	min	0.00	0.00	0.02	15.86	0.00	38.50	225.27	7.02	0.00	292.02	0.03	0.99	0.00	34.13	131.87	2.12	0.24	0.01

		surface water																		
		pH	alk meq/l	ext.	turb.	EGV (µs/cm)	CO2 µmol/l	HCO3 µmol/l	TIC	NO3	NH4	PO4	Na	K	Cl	Al	As	B	Ca	Cd
species																				
Callitriche obtusangula	mean	7.27	1.89	0.00	3.82	430.15	210.27	1789.07	1999.34	213.72	6.23	1.37	1252.27	168.97	946.12	4.36	0.01	2.73	1110.67	0.00
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	8.20	5.62	0.00	8.00	839.00	539.40	5648.80	6188.19	1043.75	15.97	9.57	4788.49	524.98	1313.21	14.50	0.05	9.95	2958.18	0.00
Callitriche obtusangula	min	6.80	0.59	0.00	0.00	194.60	48.07	543.03	751.38	0.41	2.08	0.12	497.60	48.43	342.85	0.12	0.00	0.07	579.55	0.00
Callitriche platycarpa	mean	6.66	1.05	0.00	2.33	242.57	301.39	985.14	1286.53	105.02	9.05	0.29	575.79	96.31	602.23	8.88	0.01	1.74	629.13	0.00
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	7.15	2.37	0.00	4.00	473.00	400.36	2333.85	2731.98	236.51	11.37	0.39	1079.83	204.01	1276.66	16.25	0.02	4.32	1250.59	0.00
Callitriche platycarpa	min	6.34	0.18	0.00	0.00	56.20	105.67	96.16	201.84	2.96	7.66	0.18	167.34	26.48	54.17	0.41	0.00	0.16	104.12	0.00
Ceratophyllum demersum	mean	7.57	2.58	0.00	3.67	479.00	208.15	2475.30	2683.45	47.14	8.65	3.73	1842.83	194.56	488.75	0.93	0.02	4.05	1134.10	0.00
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	8.20	3.03	0.00	6.00	839.00	321.04	3183.87	3231.95	130.20	15.97	9.57	4788.49	524.98	593.57	1.43	0.05	9.95	1165.07	0.00
Ceratophyllum demersum	min	7.21	2.31	0.00	0.00	296.00	48.07	2061.27	2316.60	4.42	2.71	0.46	335.93	28.74	342.85	0.47	0.00	1.03	1101.59	0.00
Elodea Canadensis	mean	7.31	2.43	0.00	3.00	485.00	280.97	2170.79	2451.77	107.65	9.75	0.52	1140.26	215.84	1210.93	1.28	0.02	6.52	1453.74	0.00
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	7.46	2.92	0.00	4.00	528.00	405.01	2463.28	2868.29	121.06	12.80	0.85	1275.48	331.64	1233.40	1.98	0.03	10.80	1732.69	0.00
Elodea Canadensis	min	7.17	1.95	0.00	2.00	442.00	156.93	1878.31	2035.24	94.25	6.70	0.20	1005.05	100.03	1188.47	0.59	0.01	2.23	1174.78	0.00
Elodea nuttallii	mean	7.49	2.81	0.00	2.44	452.44	245.93	2701.41	2947.34	28.23	4.31	0.28	934.39	99.06	1106.30	0.41	0.02	2.47	1475.22	0.00
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	8.22	5.18	0.00	8.00	678.00	398.13	5107.62	5492.36	100.99	11.37	0.55	2038.88	204.01	2357.59	1.39	0.05	4.77	2973.13	0.00
Elodea nuttallii	min	7.15	2.09	0.00	0.00	280.00	34.31	1971.55	2204.47	0.90	0.70	0.09	316.75	25.57	586.36	0.07	0.00	1.01	938.08	0.00
Hottonia palustris	mean	7.09	3.68	0.00	4.50	456.50	558.97	3576.86	4135.83	1.99	22.53	0.36	480.17	90.17	631.50	1.25	0.03	1.46	1912.12	0.00
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	7.64	5.23	0.00	6.00	678.00	923.28	5361.20	5654.44	2.88	67.15	0.65	801.31	166.30	1030.66	2.05	0.06	2.25	2973.13	0.00
Hottonia palustris	min	6.10	0.64	0.00	2.00	248.00	293.23	476.85	1400.13	0.78	0.70	0.05	89.81	10.58	93.01	0.26	0.00	0.83	593.94	0.00

		surface water																	
		Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	NO3/NH4
species																			
Callitriche obtusangula	mean	0.04	0.01	0.05	15.81	0.00	251.27	294.96	1.93	0.01	1090.08	0.12	4.05	0.00	457.47	155.54	2.09	0.22	42.07
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	0.16	0.03	0.08	30.87	0.00	590.40	457.08	3.03	0.02	3976.75	0.45	20.35	0.01	649.28	218.28	5.97	0.61	230.21
Callitriche obtusangula	min	0.00	0.01	0.03	0.80	0.00	77.59	148.06	0.90	0.00	4.55	0.05	0.28	0.00	293.68	85.84	0.87	0.01	0.16
Callitriche platycarpa	mean	0.01	0.02	0.03	11.73	0.00	147.17	179.77	1.37	0.00	608.05	0.07	1.38	0.00	316.68	158.18	1.26	0.10	12.04
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	0.02	0.03	0.06	26.79	0.00	271.39	339.39	1.79	0.00	955.97	0.11	1.66	0.01	584.16	225.93	2.30	0.14	29.08
Callitriche platycarpa	min	0.00	0.01	0.01	2.99	0.00	63.57	35.54	1.00	0.00	299.97	0.05	1.11	0.00	78.05	28.09	0.25	0.05	0.39
Ceratophyllum demersum	mean	0.01	0.01	0.02	27.12	0.00	228.09	227.53	3.11	0.01	1976.83	0.06	8.79	0.00	274.55	162.27	1.67	0.08	3.57
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	0.02	0.01	0.04	45.33	0.00	590.40	285.14	5.92	0.02	3976.75	0.12	20.35	0.00	594.68	204.45	1.89	0.21	8.15
Ceratophyllum demersum	min	0.00	0.01	0.01	10.29	0.00	46.74	197.66	1.18	0.00	376.44	0.02	1.77	0.00	112.92	85.84	1.54	0.00	0.94
Elodea Canadensis	mean	0.03	0.00	0.05	24.43	0.00	296.23	364.45	3.32	0.01	550.01	0.11	1.92	0.00	687.79	151.33	2.33	0.13	12.72
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	0.04	0.01	0.08	33.03	0.00	375.12	398.65	5.54	0.01	1089.08	0.14	3.09	0.01	839.44	171.59	2.54	0.23	18.08
Elodea Canadensis	min	0.03	0.00	0.03	15.83	0.00	217.35	330.25	1.10	0.00	10.94	0.09	0.74	0.00	536.14	131.07	2.12	0.03	7.36
Elodea nuttallii	mean	0.01	0.01	0.03	20.56	0.00	146.28	319.24	1.58	0.01	977.75	0.04	1.30	0.00	407.50	148.63	2.76	0.03	6.49
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	0.02	0.03	0.08	32.67	0.00	271.39	458.61	2.74	0.02	1684.37	0.11	2.92	0.01	736.79	263.96	4.90	0.08	22.42
Elodea nuttallii	min	0.00	0.00	0.00	1.38	0.00	48.54	155.36	0.13	0.00	422.05	0.01	0.61	0.00	120.27	29.69	1.47	0.00	0.18
Hottonia palustris	mean	0.01	0.01	0.04	56.68	0.00	144.53	309.00	20.13	0.00	894.85	0.02	3.72	0.00	345.94	156.64	3.09	0.06	0.93
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	0.02	0.03	0.06	91.30	0.00	280.84	458.61	69.35	0.00	1321.25	0.05	9.60	0.00	736.79	310.08	4.90	0.12	3.35
Hottonia palustris	min	0.00	0.00	0.01	20.36	0.00	7.05	193.19	2.74	0.00	655.68	0.00	1.22	0.00	12.02	10.46	1.08	0.03	0.04

		organic top layer																											
		thickness	per kg dw			destruction mmol/kg dw																							
			vocht	dicht	om%	Al	As	B	Ca	Cd	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	N	C
species																													
Callitriche obtusangula	mean	2.18	37.60	1.17	8.65	107.31	0.11	2.04	227.72	0.01	0.20	0.13	0.14	281.72	0.00	5.29	27.10	13.09	0.00	298.56	0.20	31.11	0.07	41.05	15.02	0.23	1.92	143.45	2782.37
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	4.00	79.77	1.72	47.29	445.00	0.64	11.74	1380.10	0.04	0.63	0.31	0.31	2164.68	0.00	13.39	132.58	72.69	0.00	1773.82	0.56	177.54	0.18	224.51	33.65	1.07	7.60	585.46	12272.39
Callitriche obtusangula	min	0.00	16.07	0.24	0.12	31.42	0.00	0.48	3.51	0.00	0.02	0.03	0.03	13.15	0.00	1.54	2.97	0.31	0.00	2.74	0.03	2.85	0.01	2.71	8.54	0.00	0.16	0.00	183.17
Callitriche platycarpa	mean	0.33	56.15	0.70	23.36	331.66	0.05	1.19	83.41	0.02	0.09	0.24	0.21	59.24	0.00	5.91	21.27	2.56	0.00	281.65	0.14	33.16	0.12	47.49	26.10	0.17	0.64	473.61	8448.02
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	1.00	89.93	1.44	58.40	819.98	0.13	1.63	212.49	0.05	0.26	0.51	0.54	141.58	0.00	12.36	48.59	7.13	0.00	518.75	0.36	88.68	0.30	126.97	48.59	0.45	1.72	1120.95	19740.73
Callitriche platycarpa	min	0.00	20.77	0.10	0.49	33.25	0.01	0.46	13.35	0.00	0.01	0.04	0.03	17.48	0.00	2.63	6.92	0.25	0.00	1.34	0.02	1.21	0.01	0.85	10.59	0.02	0.05	64.26	1124.00
Ceratophyllum demersum	mean	1.33	55.74	0.74	13.34	111.22	0.08	5.40	228.42	0.01	0.13	0.20	0.13	899.14	0.00	5.17	42.60	18.21	0.00	75.50	0.19	68.53	0.05	27.66	28.04	0.36	1.15	345.09	5289.73
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	2.00	81.27	1.40	29.67	148.47	0.12	8.51	338.58	0.02	0.18	0.30	0.21	1458.42	0.00	6.36	103.09	29.55	0.01	221.60	0.25	118.90	0.09	60.13	37.27	0.49	2.01	728.26	10548.93
Ceratophyllum demersum	min	1.00	24.52	0.22	0.73	82.21	0.03	1.81	97.81	0.00	0.06	0.09	0.09	111.95	0.00	3.32	9.11	1.75	0.00	2.24	0.10	8.78	0.02	3.53	11.06	0.13	0.29	0.00	524.53
Elodea Canadensis	mean	1.50	31.11	1.14	2.32	52.34	0.07	1.61	41.80	0.00	0.19	0.06	0.06	237.20	0.00	2.87	5.96	6.37	0.00	78.92	0.14	12.14	0.02	9.23	10.44	0.05	0.84	53.55	949.15
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	2.00	45.65	1.48	4.14	67.07	0.13	2.70	76.80	0.01	0.33	0.09	0.11	441.58	0.00	2.96	7.86	11.91	0.00	150.54	0.24	20.05	0.03	15.98	12.00	0.09	1.14	107.10	1731.79
Elodea Canadensis	min	1.00	16.57	0.81	0.51	37.62	0.01	0.52	6.80	0.00	0.05	0.03	0.00	32.82	0.00	2.78	4.06	0.83	0.00	7.29	0.04	4.23	0.01	2.48	8.88	0.00	0.54	0.00	166.52
Elodea nuttallii	mean	0.78	60.48	0.54	11.21	114.54	0.16	5.72	481.02	0.01	0.10	0.18	0.19	848.29	0.00	5.72	33.67	13.27	0.00	5.44	0.18	68.09	0.06	90.61	25.61	0.56	1.36	313.36	5202.77
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	1.00	78.29	1.11	23.81	154.61	0.37	9.38	1723.28	0.02	0.26	0.29	0.36	1505.36	0.00	9.32	80.23	34.21	0.01	11.40	0.44	141.78	0.12	254.13	55.64	2.32	3.20	664.00	10657.16
Elodea nuttallii	min	0.00	32.29	0.22	1.81	70.26	0.03	1.45	97.69	0.00	0.04	0.10	0.05	249.00	0.00	3.81	17.75	5.93	0.00	2.40	0.10	7.35	0.03	13.81	10.10	0.11	0.37	42.84	1798.40
Hottonia palustris	mean	0.25	61.71	0.51	15.26	89.82	0.07	1.76	489.98	0.01	0.04	0.13	0.11	266.86	0.00	5.13	30.70	12.05	0.00	354.99	0.09	20.53	0.03	90.92	14.29	0.39	0.85	335.57	6681.54
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	1.00	79.04	0.77	39.36	113.44	0.15	3.07	1569.60	0.01	0.06	0.21	0.17	515.34	0.00	7.53	86.93	40.84	0.01	1408.84	0.14	35.26	0.04	184.97	18.21	1.09	0.98	892.47	18250.39
Hottonia palustris	min	0.00	49.36	0.23	4.99	63.24	0.01	0.79	27.93	0.00	0.01	0.08	0.07	101.92	0.00	3.44	7.39	0.54	0.00	3.34	0.02	12.58	0.03	29.56	10.37	0.04	0.67	92.82	1448.71

		organic top layer												organic top layer												
		NaCl umol/kg												NaCl	umol/l bodem											
		NO3-	NH4+	Al	Ca	Fe	K	Mg	Mn	P	S	Si	Zn	pH	NO3-	NH4+	Al	Ca	Fe	K	Mg	Mn	P	S	Si	Zn
species																										
Callitriche obtusangula	mean	34.66	973.88	22.89	14605.35	124.04	1452.52	1546.13	876.16	7.83	1483.86	440.51	3.51	6.31	45.49	505.45	30.22	8971.53	88.08	1091.68	999.72	431.84	5.60	1435.54	300.71	3.09
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	180.32	4072.57	118.89	51575.84	816.25	4507.52	7600.28	6378.78	31.36	6575.36	1338.28	14.97	8.10	310.00	2154.00	181.05	16459.26	794.08	2420.12	2106.50	1767.95	14.97	9605.71	886.14	12.81
Callitriche obtusangula	min	0.57	0.36	1.73	421.23	0.98	414.83	78.28	0.58	0.64	217.68	67.07	0.04	4.66	0.83	0.55	2.98	641.47	1.44	614.45	119.21	0.86	1.10	331.49	102.14	0.05
Callitriche platycarpa	mean	50.56	1902.68	133.41	33684.14	36.04	2438.06	5153.26	380.15	7.30	1617.21	1183.82	1.33	6.43	11.50	259.71	28.39	7491.21	5.46	781.69	1047.39	52.70	1.11	387.09	267.65	0.37
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	124.37	5317.43	312.40	81388.51	100.74	5355.58	13220.94	1085.83	20.03	4051.83	2937.57	2.83	7.13	13.02	556.69	45.30	8788.48	10.55	1151.10	1384.12	113.68	2.10	483.65	307.54	0.53
Callitriche platycarpa	min	7.33	9.93	4.98	3591.07	2.01	800.40	598.96	16.34	0.25	336.30	179.21	0.20	6.08	10.55	14.28	7.17	5164.49	2.90	560.68	861.40	20.93	0.36	253.45	237.67	0.28
Ceratophyllum demersum	mean	26.12	2632.50	11.70	36395.00	5620.62	1241.62	2686.71	1483.22	14.24	1039.74	4084.68	3.96	6.68	15.11	762.01	9.48	15598.43	1662.60	584.95	1228.70	626.79	7.41	773.93	1407.25	1.32
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	41.30	6586.51	15.82	67929.01	13438.46	2201.73	4074.10	2408.48	23.16	1243.67	8413.21	8.31	7.87	24.77	1446.59	22.08	19066.58	2951.48	637.39	2055.95	1431.41	9.62	1626.18	2215.02	2.09
Ceratophyllum demersum	min	17.74	75.18	5.67	9174.72	2.15	456.52	526.69	0.55	6.89	710.82	113.85	0.04	6.03	9.07	104.97	2.99	12809.49	3.00	483.57	735.35	0.77	5.09	273.15	158.95	0.06
Elodea Canadensis	mean	26.85	312.01	8.77	9866.22	11.55	1032.97	1133.44	533.69	5.67	1011.54	606.45	3.88	6.36	34.41	261.71	11.07	8968.99	9.83	1031.27	1057.05	445.07	5.53	1034.54	535.01	5.65
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	37.77	595.70	11.84	16776.58	21.61	1482.31	1848.01	1026.64	8.53	1378.24	1079.62	7.47	6.41	55.94	481.49	17.53	13560.03	17.47	1198.11	1493.70	829.80	6.89	1113.99	872.63	11.06
Elodea Canadensis	min	15.93	28.32	5.70	2955.85	1.48	583.63	418.87	40.73	2.82	644.85	133.28	0.28	6.30	12.88	41.94	4.61	4377.95	2.20	864.42	620.39	60.33	4.17	955.09	197.40	0.23
Elodea nuttallii	mean	16.74	928.76	26.75	36877.72	5340.08	1373.05	3522.02	442.03	15.72	4727.71	3103.88	2.73	6.43	6.74	359.39	12.91	16904.37	1770.49	666.06	1649.84	183.21	7.85	2538.65	1129.64	0.95
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	43.23	2353.39	100.45	56271.25	17340.11	3247.51	5535.11	964.43	25.04	22369.29	8393.87	7.85	7.59	11.33	746.40	46.37	22916.71	4954.91	1188.75	2934.65	536.27	17.29	10496.99	2429.21	2.49
Elodea nuttallii	min	-0.26	165.65	9.48	14366.11	1.44	797.90	1005.66	18.18	7.03	567.14	111.04	0.15	5.24	-0.20	126.24	3.47	12581.14	1.37	368.32	1119.38	14.16	5.29	205.68	86.46	0.09
Hottonia palustris	mean	18.46	734.46	12.39	45601.81	63.51	1590.18	3784.88	206.21	12.88	4993.33	1094.19	0.59	6.60	6.57	375.12	6.40	19197.70	25.75	727.81	1574.48	78.63	6.48	2798.05	394.19	0.19
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	38.40	1273.95	17.90	77241.33	142.44	2075.48	6393.12	397.99	24.59	9511.80	2475.85	1.71	7.49	9.51	820.21	11.53	21913.25	52.07	1043.37	1858.61	112.63	10.05	5504.48	568.22	0.39
Hottonia palustris	min	1.02	140.68	6.84	24975.33	14.81	848.20	1984.44	21.31	5.52	735.25	314.62	0.02	5.99	0.78	63.87	1.68	16079.80	6.05	476.34	1277.64	16.31	1.27	168.74	240.82	0.02

		organic top layer																							
		destructie mmol/l																							
		Al	As	B	Ca	Cd	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	N	C
species																									
Callitriche obtusangula	mean	83.16	0.06	1.33	157.75	0.01	0.18	0.11	0.12	126.04	0.00	4.24	28.23	7.13	0.00	453.51	0.17	15.55	0.06	21.17	14.61	0.17	1.52	64.70	1436.15
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	146.69	0.16	3.39	1213.48	0.02	0.72	0.40	0.51	511.50	0.00	9.69	196.39	18.71	0.00	2531.53	0.53	41.95	0.26	61.25	22.50	1.40	3.91	162.27	3401.42
Callitriche obtusangula	min	30.35	0.00	0.33	5.34	0.00	0.01	0.04	0.04	20.02	0.00	2.36	5.12	0.53	0.00	0.78	0.03	4.34	0.02	4.07	5.70	0.00	0.25	0.00	261.41
Callitriche platycarpa	mean	70.39	0.01	0.85	18.26	0.00	0.01	0.07	0.04	17.07	0.00	2.19	6.94	0.42	0.00	106.53	0.03	5.42	0.02	7.51	10.26	0.03	0.11	82.06	1577.16
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	85.84	0.01	2.13	22.25	0.00	0.03	0.10	0.06	26.84	0.00	3.78	11.95	0.75	0.00	283.65	0.04	9.28	0.03	13.29	15.22	0.05	0.18	128.83	2449.26
Callitriche platycarpa	min	47.82	0.01	0.17	13.33	0.00	0.01	0.05	0.03	9.56	0.00	1.29	3.78	0.16	0.00	1.93	0.02	1.74	0.01	1.23	5.09	0.02	0.06	0.00	215.53
Ceratophyllum demersum	mean	75.08	0.04	2.63	195.17	0.00	0.07	0.17	0.07	382.15	0.00	3.84	50.92	8.38	0.00	45.14	0.15	28.22	0.03	9.87	15.15	0.27	0.51	114.14	1966.46
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	143.78	0.06	3.50	472.72	0.01	0.09	0.43	0.12	669.82	0.00	8.14	143.93	17.56	0.00	131.70	0.35	46.31	0.03	13.21	22.15	0.63	0.69	182.46	2850.20
Ceratophyllum demersum	min	32.61	0.03	1.87	54.66	0.00	0.04	0.04	0.05	156.30	0.00	1.40	3.43	2.44	0.00	0.58	0.05	12.25	0.02	4.92	7.86	0.08	0.40	0.00	732.34
Elodea Canadensis	mean	54.96	0.06	1.48	36.08	0.00	0.17	0.06	0.05	202.76	0.00	3.25	6.19	5.43	0.00	114.43	0.13	11.24	0.02	8.30	11.43	0.04	0.87	43.28	823.19
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	55.71	0.11	2.19	62.07	0.01	0.27	0.07	0.09	356.91	0.00	4.11	6.35	9.63	0.00	222.97	0.20	16.21	0.03	12.92	13.15	0.07	0.93	86.56	1399.76
Elodea Canadensis	min	54.21	0.01	0.77	10.08	0.00	0.07	0.04	0.01	48.62	0.00	2.39	6.02	1.24	0.00	5.90	0.06	6.26	0.02	3.68	9.70	0.00	0.81	0.00	246.63
Elodea nuttallii	mean	56.60	0.08	2.54	291.66	0.00	0.04	0.10	0.10	363.62	0.00	2.97	22.11	7.20	0.00	3.13	0.08	28.76	0.03	43.01	11.35	0.32	0.63	126.64	2233.74
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	86.96	0.18	4.59	1044.60	0.01	0.09	0.21	0.28	694.88	0.00	5.79	89.30	19.02	0.00	11.86	0.16	46.78	0.10	119.25	25.69	1.09	1.59	210.59	3380.03
Elodea nuttallii	min	31.87	0.01	1.15	51.11	0.00	0.02	0.04	0.05	195.33	0.00	1.38	4.05	2.17	0.00	1.07	0.04	3.45	0.01	15.37	5.81	0.07	0.30	47.68	1560.18
Hottonia palustris	mean	44.78	0.03	0.71	192.09	0.00	0.02	0.06	0.05	102.73	0.00	2.58	13.49	4.84	0.00	270.82	0.04	8.72	0.02	41.73	6.74	0.15	0.45	114.72	2240.32
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	73.03	0.06	0.89	641.41	0.00	0.03	0.06	0.06	130.71	0.00	3.79	35.52	16.69	0.00	1078.37	0.06	9.63	0.03	75.58	8.67	0.45	0.75	204.83	4188.58
Hottonia palustris	min	21.68	0.01	0.61	21.38	0.00	0.01	0.05	0.04	78.02	0.00	0.84	3.08	0.41	0.00	0.83	0.02	8.09	0.01	17.93	4.18	0.03	0.18	59.76	932.72

		pore water organic top layer																
		pH	EGV (µs/cm)	CO2 µmol/l	HCO3 µmol/l	TIC	NO3	NH4	Nanorg	PO4	Na	K	Cl	Al	As	B	Ca	Cd	Co
species																			
Callitriche obtusangula	mean	6.61	673.50	1741.04	4701.73	6442.77	151.43	196.38	347.81	1.02	1039.86	292.88	1172.65	3.04	0.25	6.45	2078.15	0.01	0.74
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	7.20	1396.00	3790.20	12199.74	14508.10	1509.68	1004.45	1514.04	2.57	1943.56	1255.59	2454.32	18.41	0.84	22.33	3880.51	0.04	3.52
Callitriche obtusangula	min	4.73	128.50	258.28	50.80	944.42	0.42	4.36	45.10	0.36	471.74	62.99	540.81	0.41	0.00	0.75	140.40	0.00	0.00
Callitriche platycarpa	mean	6.79	283.07	596.55	1939.69	2536.24	13.67	14.98	28.65	0.31	473.63	135.19	524.13	1.51	0.02	1.27	849.05	0.00	0.02
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	7.01	527.00	1002.09	4206.82	5208.91	37.09	18.99	47.31	0.38	740.32	298.49	866.59	2.46	0.05	2.79	1627.83	0.00	0.05
Callitriche platycarpa	min	6.61	122.10	376.37	690.39	1101.59	1.42	10.22	17.14	0.25	232.36	44.65	143.99	0.14	0.00	0.26	390.95	0.00	0.01
Ceratophyllum demersum	mean	6.86	615.00	1744.67	5147.99	6892.66	0.67	293.22	293.89	2.97	562.34	70.00	751.04	0.69	0.14	3.89	2484.72	0.00	0.01
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	6.97	838.00	2453.98	6723.91	8472.04	0.94	757.47	757.77	6.80	984.72	91.68	1310.34	1.28	0.29	5.94	3233.71	0.00	0.02
Ceratophyllum demersum	min	6.75	370.00	1031.90	3045.68	4077.58	0.30	49.04	49.82	0.98	347.26	43.25	469.42	0.36	0.06	2.17	1548.42	0.00	0.00
Elodea Canadensis	mean	6.88	651.00	1270.12	4323.11	5593.23	0.43	81.74	82.17	0.91	1440.04	426.26	1317.35	0.69	0.12	11.60	2014.72	0.00	0.51
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	7.09	756.00	1373.97	5954.53	7120.80	0.58	127.20	127.78	1.40	1631.91	484.02	1701.42	0.88	0.18	17.87	2611.95	0.00	0.58
Elodea Canadensis	min	6.67	546.00	1166.27	2691.70	4065.67	0.28	36.29	36.57	0.43	1248.17	368.50	933.28	0.51	0.05	5.34	1417.50	0.00	0.45
Elodea nuttallii	mean	7.11	557.56	1104.26	4756.34	5860.60	0.63	103.20	103.83	1.02	824.26	128.21	983.48	0.65	0.10	4.96	2013.46	0.00	0.01
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	7.93	823.00	2464.05	6397.97	8267.66	1.84	226.92	227.77	1.76	1919.02	353.91	2027.83	1.60	0.19	9.13	3498.18	0.01	0.04
Elodea nuttallii	min	6.75	361.00	172.26	3448.69	4461.68	-0.04	14.01	15.41	0.42	296.09	18.57	381.10	0.37	0.01	2.59	1470.80	0.00	0.00
Hottonia palustris	mean	6.78	609.00	2065.19	5377.54	7442.73	1.35	91.57	92.92	0.77	618.27	172.07	775.84	1.94	0.11	3.75	2518.39	0.00	0.02
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	7.06	798.00	2770.14	7498.25	9068.29	2.74	191.15	193.38	1.19	1047.02	444.95	1102.89	5.15	0.23	6.51	3560.75	0.00	0.04
Hottonia palustris	min	6.50	427.00	1570.04	2923.27	5161.07	0.04	5.10	5.49	0.22	285.05	21.29	359.38	0.39	0.01	2.11	1296.14	0.00	0.00

		pore water organic toplayer																	
		Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sr	Zn	NO3/NH4	Fe/P
species																			
Callitriche obtusangula	mean	0.03	0.05	568.16	0.00	407.65	441.14	89.51	0.06	935.19	0.32	12.49	0.01	221.91	323.55	4.55	1.75	33.51	56.15
Callitriche obtusangula	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Callitriche obtusangula	max	0.08	0.08	2059.53	0.00	1564.22	858.99	326.63	0.37	1798.52	1.01	44.88	0.04	643.98	661.52	10.71	7.25	346.18	220.60
Callitriche obtusangula	min	0.00	0.03	0.46	0.00	92.26	45.34	0.13	0.00	171.00	0.06	0.54	0.00	27.91	147.53	0.21	0.21	0.00	0.46
Callitriche platycarpa	mean	0.03	0.04	14.56	0.00	200.70	201.63	4.27	0.00	530.64	0.08	0.96	0.00	230.16	204.06	1.48	0.40	1.28	14.71
Callitriche platycarpa	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Callitriche platycarpa	max	0.05	0.09	19.04	0.00	409.34	400.12	9.33	0.01	683.53	0.11	1.20	0.00	361.93	268.76	2.35	0.75	3.63	19.34
Callitriche platycarpa	min	0.00	0.01	6.86	0.00	82.02	47.41	1.14	0.00	321.65	0.06	0.77	0.00	17.03	126.82	0.84	0.16	0.09	8.91
Ceratophyllum demersum	mean	0.02	0.02	581.41	0.00	77.24	274.86	25.78	0.00	394.62	0.06	21.78	0.01	350.63	493.38	3.88	0.57	0.01	27.54
Ceratophyllum demersum	n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ceratophyllum demersum	max	0.03	0.02	1110.91	0.00	105.90	332.99	56.31	0.01	925.78	0.07	31.57	0.01	999.83	615.14	5.26	0.95	0.02	48.53
Ceratophyllum demersum	min	0.01	0.01	233.06	0.00	59.85	229.55	7.83	0.00	95.49	0.04	10.88	0.00	17.15	255.45	1.72	0.27	0.00	12.68
Elodea Canadensis	mean	0.01	0.04	438.03	0.00	347.90	421.41	87.76	0.02	540.38	0.29	8.10	0.00	439.85	278.29	3.98	0.64	0.01	198.24
Elodea Canadensis	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Elodea Canadensis	max	0.02	0.06	508.06	0.00	420.65	500.63	143.42	0.02	1068.93	0.33	14.83	0.01	493.17	333.92	4.80	0.74	0.01	371.65
Elodea Canadensis	min	0.01	0.02	368.01	0.00	275.14	342.20	32.09	0.01	11.83	0.24	1.37	0.00	386.53	222.65	3.16	0.54	0.00	24.82
Elodea nuttallii	mean	0.01	0.03	507.81	0.00	177.65	305.30	25.02	0.00	712.90	0.03	20.35	0.00	229.13	449.33	3.29	1.00	0.02	34.68
Elodea nuttallii	n	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Elodea nuttallii	max	0.05	0.07	972.85	0.00	401.44	540.39	59.95	0.02	1608.27	0.06	36.76	0.01	998.54	739.41	5.42	6.35	0.10	137.36
Elodea nuttallii	min	0.00	0.00	81.79	0.00	41.08	145.87	8.10	0.00	5.19	0.00	4.05	0.00	9.20	134.81	1.84	0.17	0.00	5.39
Hottonia palustris	mean	0.03	0.04	250.75	0.00	158.32	382.60	19.31	0.00	672.39	0.05	16.34	0.00	85.30	340.22	4.35	0.81	0.04	44.82
Hottonia palustris	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hottonia palustris	max	0.11	0.06	465.99	0.00	310.97	516.91	27.34	0.00	920.81	0.11	45.76	0.01	226.62	468.70	6.20	2.63	0.08	109.68
Hottonia palustris	min	0.00	0.02	57.22	0.00	38.50	225.27	9.17	0.00	292.02	0.02	1.29	0.00	34.13	192.06	2.16	0.06	0.00	5.67

Annex 6 Growth forms and functional traits of the aquatic macrophytes

The table below presents growth forms and some functional traits of the 30 aquatic macrophytes.

		Growth form 1	Growth form 2 (Maltby et al. 2010)					Specific leaf area (SLA; mm2,mg.-1)			Leaf area and dry matter content		Propagation		Which compartments do the plants use				Water body		
Scientific name	**English name**	**Den Hartog & Van der Velde, 1988**	**rooted and emersed**	**rooted and submersed**	**free-floating**	**rooted with floating leaves**	**submersed pleustophyte**	**Specific leaf area (SLA; mm2,mg.-1)[1]**	**SLA SD[1]**	**SLA[3]**	**LA (mm[2])**	**Leaf Dry Matter Content (mg)[2]**	**Reproduction by seeds**	**Vegetative reproduction**	**water**	**sediment and water**	**water and air**	**sediment, water and air**	**ditch**	**lowland stream**	**pond**
Alisma plantago-aquatica	Common water-plantain	Helophyte	1										1					1	1	1	1
Butomus umbellatus	Flowering rush	Helophyte	1										1	1				1	1		
Callitriche obtusangula	Blunt-fruited Water-starwort	Peplid		1						94.26(1.2)	26.76 (0.77)	79.77 (1.72)		1		1				1	
Callitriche platycarpa	Various-leaved water-starwort	Peplid		1						127.93(3.77)	32.03(1.47)	68.47(2.74)		1		1				1	
Ceratophyllum demersum	Coontail	Ceratophyllid					1	99.92	74.74	126.25(14.09)	108.68(20.9)	46.22(4.41)		1		1			1		
Eleocharis palustris	Common spike-rush	Helophyte	1											1			1		1		1
Elodea canadensis	Canadian pondweed	Elodeid		1				143.72	35.21	175.26(9.23)	26.26(1.17)	76.38(4.52)		1		1			1	1	
Elodea nuttallii	Western waterweed	Elodeid		1						224.81(4.6)	27.73(1.35)	62.29(2.56)		1		1			1	1	1
Equisetum fluviatile	Water horsetail	Helophyte	1										1	1				1	1		
Glyceria fluitans	Floating sweet-grass	Nymphaeid				1							1	1				1	1	1	1
Glyceria maxima	Great manna grass	Helophyte	1										1	1				1	1	1	1
Hottonia palustris	Water violet	Myriophyllid	1							187.5(11.82)	257.74(3.61)	45.88(2.73)	1	1				1	1		
Hydrocharis morsus-ranae	Common frogbit	Hydrocharid				1				151.97(2.86)	1365.46(57.91)	32.41(1.4)		1				1	1		
Iris pseudacorus	Yellow iris	Helophyte	1										1	1				1	1	1	1
Juncus effusus	Common rush	Helophyte	1											1				1	1	1	1
Lemna gibba	Gibbous duckweed	Lemnid			1					41.31(3.03)	18.79(0.66)	56.87(2.17)		1			1		1	1	
Lemna minor	Common duckweed	Lemnid			1					267.66(75.7)	7.88(0.71)	70.05(6.75)		1			1		1	1	1
Lemna trisulca	Star duckweed	Pleustophyte					1			151.12(11.26)	48.63(16.95)	42.57(4.14)		1	1				1		1
Myriophyllum spicatum	Eurasian watermilfoil	Myriophyllid		1				104.29	30.23	111.28(2.85)	111.5(6.21)	64.99(2.26)		1		1					1
Persicaria amphibia	Water knotweed	Hydrocharid				1							1	1				1	1	1	1
Phragmites australis	Common reed	Helophyte	1										1	1				1	1	1	1
Potamogeton crispus	Crisp-leaved pondweed	Parvopotamid		1				93.9	25.9	198.67(5.95)	499.91(12.37)	45.33(1.52)		1		1				1	
Potamogeton natans	Broad-leaved pondweed	Nymphaeid				1		17.28	2.9	186.1(4.8)	3736.92(238.7)	31.7(1.6)		1				1	1	1	1
Potamogeton pusillus	Lesser pondweed	Parvopotamid		1										1		1			1		
Ranunculus circinatus	Fan-leaf water-crowfoot	Myriophyllid		1									1	1		1			1		
Sagittaria sagittifolia	Arrowhead	Helophyte	1										1	1				1	1		
Sparganium emersum	European bur-reed	Nymphaeid				1				96.01(3.12)	5247.5(555.75)	42.5(1.14)	1	1				1		1	
Sparganium erectum	Bur Reed	Helophyte	1										1	1				1	1	1	
Spirodela polyrhiza	Greater duckweed	Lemnid			1					145.83(38.2)	45.86(5.2)	42.84(3.51)		1			1		1		
Typha latifolia	Broadleaf cattail	Helophyte	1										1	1				1		1	1

[1] Chmara et al., 2019; [2]Lukács et al., 2017.

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