Modelling induced bank filtration effects on freshwater ecosystems to ensure sustainable drinking water production

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DOI
10.1016/j.watres.2019.03.048

Original publication date
26 March 2019 (Available online)

Document version
Accepted manuscript

Published in
Water Research

Citation
Gillefalk M, Mooij WM, Teurlincx S, Janssen ABG, Janse JH, Chang M, et al. Modelling induced bank filtration effects on freshwater ecosystems to ensure sustainable drinking water production. Water Research. 2019;157:19-29.

Modelling induced bank filtration effects on freshwater ecosystems to ensure sustainable drinking water production

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Abstract

Induced bank filtration (IBF) is a water abstraction technology using different natural infiltration systems for groundwater recharge, such as river banks and lake shores. It is a cost-effective pre-treatment method for drinking water production used in many regions worldwide, predominantly in urban areas. Until now, research concerning IBF has almost exclusively focussed on the purification efficiency and infiltration capacity. Consequently, knowledge about the effects on source water bodies is lacking. Yet, IBF interrupts groundwater seepage and affects processes in the sediment potentially resulting in adverse effects on lake or river water quality. Securing sufficient source water quality, however, is important for a sustainable drinking water production by IBF.

In this study, we analysed the effects of five predicted mechanisms of IBF on shallow lake ecosystems using the dynamic model PCLake: declining CO_2 and nutrient availability, as well as increasing summer water temperatures, sedimentation rates and oxygen penetration into sediments. Shallow lake ecosystems are abundant worldwide and characterised by the occurrence of alternative stable states with either clear water and macrophyte dominance or turbid, phytoplankton-dominated conditions. Our results show that IBF in most scenarios increased phytoplankton abundance and thus had adverse effects on shallow lake water quality. Threshold levels for critical nutrient loading inducing regime shifts from clear to turbid conditions were up to 80 % lower with IBF indicating a decreased resilience to eutrophication. The effects were strongest when IBF interrupted the seepage of CO_2 rich groundwater resulting in lower macrophyte growth. IBF could also enhance water quality, but only when interrupting the seepage of groundwater with high nutrient concentrations. Higher summer water temperatures increased the share of cyanobacteria in the phytoplankton community and thus the risk of toxin production. In relative terms, the effects of changing sedimentation rates and oxygen penetration were small. Lake depth and size influenced the effect of IBF on critical nutrient loads, which was strongest in shallower and smaller lakes. Our model results stress the need of a more comprehensive ecosystem perspective including an assessment of IBF effects on threshold levels for regime shifts to prevent high phytoplankton abundance in the source water body and secure a sustainable drinking water supply.

Keywords

surface water-groundwater interaction, regime shift, shallow lakes, macrophytes, phytoplankton, PCLake

1. Introduction

Since more than a century, induced bank filtration (IBF), or bank filtration (BF), has served as a cost-effective and reliable drinking water production technique (Ray et al., 2003). Infiltration is induced by installing production wells close to rivers or lakes and pump large quantities of water resulting in a lowering of the hydraulic head at the wells below the surface water level (Fig. 1). Contaminants are filtered and attenuated while surface water flows through sediment and porous soils. So far, IBF has mostly been used throughout Europe (Sprenger et al., 2017), but the technique is increasingly applied on other continents as well (Ray et al., 2008, Gillefalk et al., 2018). IBF is put to use where groundwater resources are scarce but surface water quality is insufficient for direct use for drinking water production (Hiscock and Grischek, 2002). Apart from IBF, which is clearly planned and fully intentional, there is also unintentional BF, affecting surface waters in the same way as IBF (Acreman et al., 2000).

Existing studies on IBF focus on the purification capacity and the production quantity (Gillefalk et al. 2018). They usually investigate whether concentrations of unwanted compounds are sufficiently reduced during bank passage and how much water is purified. However, IBF interrupts groundwater seepage into surface waters due to a lowering of the groundwater table far below water levels of surface waters (Fig. 1). In Berlin (Germany), about 60 % of the drinking water comes from IBF (Hiscock and Grischek, 2002) which has resulted in a drawdown of groundwater levels by up to 5 m around three major lakes used for IBF (Schröter, 2015, Fig. 2A-C). A recent conceptual study indicates that cutting off groundwater seepage can significantly alter the water quality of the source water body due to several physical, chemical and biological processes (Gillefalk et al., 2018). In addition, surface water is infiltrated through sediments which might affect several processes in this compartment (Gillefalk et al., 2018). In Lake Müggelsee, a doubling of groundwater abstraction rates (data provided by Berliner Wasserbetriebe) by IBF in the 1970s was paralleled by a significant decrease in surface water quality, indicated by a decreased Secchi depth (data from Leibniz-Institute for Freshwater Ecology and Inland Fisheries' long-term monitoring, Fig. 2D). Groundwater abstraction rates were reduced in the 1990s and lake water quality recovered. A link between these processes, however, could not be made as studies on the effect of IBF on the quality of the source water body are completely lacking. This is surprising given the fact that the source water quality is of high importance for securing high drinking water quality and quantity.

Factors of major concern in source water quality are high phytoplankton abundance which can deteriorate infiltration effectiveness (Grischek and Bartak, 2016) and impair taste and odour (Hargesheimer and Watson, 1996). A high share of toxic cyanobacteria can break through to groundwater wells and increase the risk of toxin contamination in drinking water (Pazouki et al., 2016) and will lead to the need for chlorination, use of activated carbon or a combination of both (Zamyadi et al., 2012). Surface waters with a particular risk of high phytoplankton abundances and a high share of cyanobacteria are shallow lakes, the most abundant lake type in the world (Cael et al., 2016). They provide near optimum conditions for phytoplankton primary production due to regular mixing of the water column and phosphorus (P) release from sediments (Søndergaard et al., 2003). Abundant submerged vegetation stabilizes clear-water conditions and hinders phytoplankton, including cyanobacteria, blooms through nutrient uptake, provision of refuge for phytoplankton grazers, reduced sediment resuspension, increased sediment trapping and excretion of allelopathic substances (Scheffer et al., 1993). However, increasing nutrient loading above a critical threshold results in macrophyte losses and triggers a shift to the turbid state with phytoplankton dominance (Scheffer et al., 1993). Apart from declining source water quality for drinking water production, these regime shifts also lead to losses in biodiversity and other important ecosystem functions (Hilt et al., 2017). Lowland rivers with low flowing velocities and delta regions can respond to nutrient loading in a similar way with high phytoplankton abundances after macrophyte losses (Hilt et al., 2011).

In this study, we tested the hypothesis that IBF can significantly alter the water quality of source shallow lakes in terms of phytoplankton abundance and share of cyanobacteria. To test our hypothesis, we adapted an existing shallow lake ecosystem model and tested different scenarios combining several combinations of potential effects of IBF on groundwater seepage. Specifically, we expect that an IBF-induced reduction of groundwater seepage will 1) reduce macrophyte growth due to lower CO_2 availability leading to higher probability of shifts to a turbid state, 2) decrease nutrient loading via groundwater leading to a lower probability of shifts to a turbid state and 3) increase summer water temperatures leading to a higher share of cyanobacteria in the phytoplankton community (Fig. 3). We also expect that IBF will 4) increase particle sedimentation rates and 5) increase oxygen penetration depth into the sediment (Fig. 3). These mechanisms affect P release from sediments in opposite ways and thus promote either macrophyte or phytoplankton dominance (Fig. 3). Finally, we tested whether lake size and depth significantly modify IBF effects on source water quality. Both size and depth have been shown to potentially affect shallow lake resilience to disturbance (Janssen et al., 2014). Overall, knowledge on IBF effects is needed to lower the risk of unwanted regime shifts in source water bodies (Scheffer et al., 2009) and to aid the selection process for future IBF sites to secure an optimal and sustainable application of this drinking water production technique.

2. Material and methods

2.1 Ecosystem model PCLake

We used the dynamic ecosystem model PCLake to simulate the effect of IBF on shallow water systems. The investigated scenarios simulations were variations on the PCLake default settings, describing a theoretical shallow temperate lake in a European climate. It was chosen because of its sediment component with groundwater exchange (Fig. A.1) and because of its very short computational times which allowed testing a multitude of parameter combinations.

PCLake was developed in the 1990s to simulate the impact of eutrophication of shallow lakes (Janse, 2005). It has been calibrated and validated using data from more than 40 lakes in several countries in northern continental Europe, mainly lakes in the Netherlands (Aldenberg et al., 1995; Janse, 2005; Janse et al., 2010). Since the 1990s, the model has also been used to estimate impacts of various potential stressors, for example, climate change (Mooij et al., 2007, 2009), and input of terrestrial particulate organic matter (Lischke et al., 2014).

PCLake simulates different functional groups including fish (plankti-/benthivorous fish and predatory fish), zooplankton, zoobenthos, submerged plants and phytoplankton (Fig. A.1). Phytoplankton is divided into the subgroups green algae, diatoms and cyanobacteria with different traits such as the response to temperature and nutrient affinity, and respective typical seasonal successions expected in lake ecosystems (Table A.1). The subgroups' abundance is measured either as dry-weight, P weight or N weight, with a variable stoichiometry adjusted by nutrient concentration in the water column. Phytoplankton is found either in the water column or settled on the sediment surface and can be remobilized by the wind. Together with detritus, phytoplankton in the water column increases turbidity and lowers Secchi depth. The water body is completely mixed and the water column rests upon a sediment layer (default thickness 0.1 m). Exchange takes place with underlying groundwater (P and N, more on this later), overlaying atmosphere (e.g. O_2) as well as inflow and outflow of surface water and nutrients. Nutrients are distributed throughout the model (water column and sediment) through uptake, predation, grazing, egestion, mortality fluxes, mineralization, denitrification, feeding, settling, resuspension and sorption. Technically these fluxes are calculated using coupled differential equations, one for each state-variable. Apart from the state-variables there are also 410 parameters; a few of them were changed from their default settings during the runs (Table 1, Appendix B). An R script was used to run the DATM generated C++ code of PCLake (Database Approach To Modelling, Mooij et al., 2014). A detailed description of changes made follows below. For a full description of the model and its default parameter settings see Janse (2005).

PCLake is often used to show effects of changing nutrient loading on phytoplankton abundance expressed as phytoplankton chlorophyll *a* (chl *a*). Researchers, and lake managers alike, want to know at what nutrient load a lake will shift either from a clear-water state to a turbid or *vice versa*. To illustrate this, bifurcation plots show hysteresis and critical nutrient loads, which describe the nutrient load at which the system shifts from one state to the other (Fig. 4A; illustrated by the sudden shift in the response variable shown on the y-axis). The further to the left in the graph such shift is found a) the less resilient a lake is towards increasing nutrient loading (shift from clear to turbid state), or b) the more lowered must the nutrient load be for a recovery to take place (shift from turbid to clear state).

PCLake contains both phosphorus (P) and nitrogen (N) as essential nutrients for organismal growth. In PCLake, the load of P and N via surface water are coupled and, in our setup, the ratio is N:P = 7. In continuation, when mentioning nutrients, this should be understood as P and N.

In PCLake, the water temperature and light intensity is based on the long-term average for a temperate climate and is modelled as an average sine curve (Fig. A.2). The light intensity declines with increasing water depth following the Lambert-Beer law. The adaptations we made to simulate the impact of groundwater seepage are described below.

2.2 Adaptations to PCLake

We assessed potential impacts of IBF on lake water quality (Gillefalk et al., 2018) by first defining two major pathways of IBF: 1) interruption of groundwater seepage and 2) infiltration of lake water and particles into sediments. As a consequence, changes are expected in a) supply of CO_2 to submerged plants (macrophytes) affecting their growth rate, b) nutrient loading, c) lake water temperature, d) particle settling velocity and e) oxygen penetration depth (Fig. 3). To simulate these effects, we adapted PCLake (all equations as well as state and parameter values in Appendix B) in the following way:

2.2.1 CO_2 loading by groundwater seepage and its effects on plant growth

Effects of CO_2 infiltration on plant growth were added to the model through the two parameters cCO2W (CO_2 concentration in inflowing surface water) and cCO2Ground (CO_2 concentration in groundwater). When there is groundwater seepage (cQInf < 0) the two concentrations determine, together with the amount of surface water inflow and amount of seepage, the concentration of CO_2 in the total inflowing water (uCO2W) as follows:

If cQInf ≥ 0 (no groundwater seepage), then:

$$\boldsymbol{uCO2W = cCO2W} \tag{3}$$

If cQInf < 0 (groundwater seepage), then:

$$uCO2W = \frac{cQIn * cCO2W + |cQInf| * cCO2Ground}{(cQIn + |cQInf|)} \tag{4}$$

Where: cQIn = surface water inflow (default: 20 mm/d), cCO2W = CO_2 concentration in inflowing surface water (150 mmol/m^3), cQInf = infiltration/seepage rate (in mm/d, varies between runs), cCO2Ground = CO_2 concentration in groundwater (in mmol/m^3, varies between runs). For references see Table 2. The CO_2 in the total inflowing water (via surface water and groundwater) is assumed to be the same as in the lake. As such we must assume that the net production of CO_2 is negligible. This was done to keep the approach simple and not to make the model differ too much from its original, validated state.

The maximum macrophyte growth rate was changed from being a constant parameter to being dependent on CO_2 concentration in the lake water (uCO2W) as follows (Fig. A.3A):

If uCO2W ≤ cCO2W, then

$$uMuMaxVeg = cMuMaxVeg \tag{5}$$

If uCO2W > cCO2W, then:

$$uMuMaxVeg = cMuMaxVeg * \frac{(0.0013044 * uCO2W + 0.94940714)}{cMuMaxNorm} \tag{6}$$

If uCO2W > 600, then:

$$uMuMaxVeg = cMuMaxVeg * cMultiMuMaxVeg \tag{7}$$

Where cMuMaxVeg = default maximum growth rate at 20 °C (default: 0.2 g/g shoot/d), uCO2W = calculated CO_2 concentration in lake water (in mmol/m^3, varies between runs), cMuMaxNorm = a constant to normalize maximum growth rate at certain CO_2 level in the inflowing surface water (1.145). The value of cCO2Norm corresponds to the CO_2 concentration in the inflowing surface water (150 mmol/m^3) so that it follows the macrophyte growth rate in accordance with the results found by Madsen and Sand-Jensen (1994). The coefficients 0.0013044 and 0.94940714 are derived from a linear regression using the data from Madsen and Sand-Jensen (1994). cMultiMuMaxVeg = multiplication term equal to the one where uCO2W = 600, when uCO2W > 600 mmol/m^3, the macrophyte growth rate cannot benefit from increasing CO_2 concentrations (Madsen and Sand-Jensen (1994), therefore the maximum macrophyte growth rate (uMuMaxVeg) is 0.314 g/g shoot/d. In our scenarios, the resulting CO_2 concentration in the lake water from inflowing surface water and groundwater ranged from 150 to 600 mmol/m^3, depending on the parameter values of the run. For further discussion see section 4.1.3.

2.2.2 Nutrient loading from groundwater seepage

Simulations of changes in nutrient loading by groundwater were possible without adaptations in the equations. For parameter values used and references see Table 2.

2.2.3 Temperature changes from groundwater seepage

A water temperature parameter was introduced to account for the effect of groundwater. This addition allowed groundwater seepage to affect lake water temperature. When there was groundwater seepage, the introduced parameter for annual lake water temperature variation (uTmVar) was calculated according to (Fig. A.3B):

If cQInf ≥ 0 (no groundwater seepage), then:

$$\boldsymbol{uTmVar = cTMVar} \quad (1)$$

If cQInf < 0 (groundwater seepage), then:

$$\boldsymbol{uTmVar = \left(\frac{cQIn * (cTmAve + cTmVar) + |cQInf| * cTmGround}{2 * (cQIn + |cQInf|)} - cTmVar\right) + \left(cTmVar - \frac{cQIn * (cTmAve - cTmVar) + |cQInf| * cTmGround}{2 * (cQIn + |cQInf|)}\right)} \quad (2)$$

Where: cQIn = surface water inflow (default: 20 mm/d), cTmVar = annual lake water temperature variation (default: ±10 °C), cTmAve = annual lake water temperature (default: 12 °C), cQInf = infiltration/seepage rate (in mm/d, varies between runs), cTmGround = groundwater temperature (10 °C, Northern continental Europe, Berlin Senate 2016). The surface water inflow is assumed to have the same temperature as the lake if there is no groundwater seepage. For actual parameter values used and references for them see Table 2. In our scenarios, the lake water temperature variation was the smallest when groundwater seepage was 10 mm/d (cQInf = -10): 6.67 °C. When groundwater seepage was 5 mm/d (cQInf = -5): 8 °C. When groundwater seepage was zero or when lake water infiltrated into the groundwater (cQInf ≥ 0) the lake water temperature variation took its default value: 10 °C.

2.2.4 Changing sedimentation rate by seepage

We coupled lake water infiltration to the settling velocity of inorganic matter, detritus, cyanobacteria, green algae and diatoms so that if infiltration was equal to for example 5 mm/d, the settling velocity was increased by 5 mm/d (Fig. A.3C).

2.2.5 Changing sediment oxygen penetration by seepage

Lake water infiltration was coupled to the sediment oxidization depth. We assumed that extra oxygen would be brought into the sediment with IBF, so we set infiltration equal to added oxygen depth (Fig. A.3D). We assumed that the added oxygen via infiltration is consumed within a day and divided the added oxygen depth via IBF by the unit conversion constant cOxyCons = 1/d.

2.3 Tested parameter combinations and definition of a model run

Each model configuration was run for 100 years in total (Fig. A.4). First an initialization period of 50 years was run where the infiltration/seepage rate was kept constant at the respective rate for each of all configurations. For the last 50 years the model run is divided into two parts: 1) infiltration/seepage rate was kept constant and 2) infiltration/seepage rate was changed to a lower seepage rate or a higher infiltration rate (simulating IBF), thereby enabling a comparison between a lake without and with IBF. Summer average values of target parameters (summer average phytoplankton chl *a*, cyanobacteria, diatoms, macrophytes, Secchi depth, sediment oxygen penetration depth, maximum P adsorption) were used to compare scenarios, and the summer period was defined as 1 April – 30 September following Janse et al. (2010). The nutrient loading via surface water was varied between 0.1-10 mg $P/m^2/d$ and nitrogen (N) was coupled to P so that N concentration equalled seven times that of the P concentration. Similarly, groundwater nutrients concentrations in PCLake are by default set so that the value of phosphate (cPO4Ground) is equal to that of nitrate (cNO3Ground), which in turn is equal to a tenth of the ammonium concentration (cNH4Ground). These default proportions between N and P concentrations in the groundwater are similar to findings by Lewandowski et al. (2015). Of the ranges of groundwater-borne N and P loads to lakes they reported, the bulk of values fall within 0.8-16.5 mg/ N/m^2/year and 0.03-1.1 mg P/m^2/year. When running scenarios where cQInf ≥ 0 the groundwater nutrient and CO_2 concentrations were not varied since they would not have any effect, thereby saving computational time. The model runs were performed as follows:

a) First, we tested all parameter combinations of groundwater CO_2 and nutrient concentrations focussing on how they impact summer average phytoplankton chl *a*, cyanobacteria, diatoms and macrophytes at different nutrient loads and groundwater flow conditions (Table 3). We also tested how the isolated effect of seasonal temperature variation influenced the same parameters at different nutrient loads by running PCLake in its default mode (without the adaptations explained in 2.2) and setting the cTmVar parameter to 6.67, 8 and 10 °C, values that correspond to groundwater seepage rates 10, 5 and ≥ 0 mm/d. The lake depth and fetch were kept constant at their respective default values (2 m and 1000 m).

b) Second, we again tested the same parameter combinations as in a) (except for the isolated temperature runs) but focussing on the impact on sedimentation and sediment characteristics: sediment oxygen penetration depth and maximum P adsorption. The lake depth and fetch length were kept constant at their respective default values (2 m and 1000 m).

c) Finally, we tested the effects of lake size (expressed as fetch length in PCLake) and depth on IBF effects on phytoplankton chl *a* concentrations. The effect was investigated using an average parameter combination as follows: cQInf = -5 mm/d (seepage) and 5 mm/d (IBF), cPO4Ground = 0.02 mg P/L, cNH4Ground = 0.2 mg N/L, cNO3Ground = 0.02 mg N/L and cCO2Ground = 900 mmol/m3. Two lake sizes were compared: 1000 m (default) and 100 m fetch length. Two lake depths were compared: 2 m (default) and 1.5 m.

3. Results

Induced bank filtration (IBF) reduced the critical nutrient loads (expressed as P loads in all figures) at which regime shifts took place in shallow lakes in the majority of the investigated scenarios (Figs. 4, 5 and 6). This decrease in critical nutrient load was found both when the system was initially in a clear state and shifted to a turbid state (Fig. 6 left) and *vice versa* (Fig. 6 right). In addition, the difference between the critical nutrient load for shifting from clear conditions and shifting from turbid conditions was smaller for lakes with IBF compared to lakes with groundwater seepage (Fig. 6). This result points to a reduction in the range of nutrient loading, where the system could either be clear or turbid depending on initial conditions.

3.1 Effects of interrupted groundwater seepage: CO_2/nutrient concentrations and temperature variation

Effects of groundwater flow conditions in the initial state were important for the effect of IBF: lakes that infiltrated into the groundwater in the initial state were affected to a much lesser extent compared to groundwater-fed lakes (data not shown). The effect of IBF on critical nutrient loads was influenced by the concentration of nutrients and CO_2 in the seeping groundwater. A low concentration of nutrients and a high concentration of CO_2 in the initial condition resulted in a stronger effect of IBF (Fig. 6, Fig. A.5). Critical nutrient loads representing a switch from a clear to a turbid state were found to be up to four times higher when groundwater seeped into the lake compared to when applying IBF. The lower the nutrient concentration and the higher the CO_2 concentration in the groundwater seeping into the lake, the stronger the effect of reversing the groundwater flow was (Fig. A.5). In some specific cases, IBF was found to increase critical nutrient loads (Fig. 7: low CO_2, high P, Fig. A.5). This scenario occurred when the initial groundwater seeping into the lake contained high nutrient concentrations combined with low to middle high CO_2 concentrations. However, in most scenario combinations of groundwater CO_2 and nutrient concentrations, critical nutrient loads declined when applying IBF (Fig. A.6).

The model runs where temperature variation was decoupled from groundwater flow and instead independently changed showed small effects on critical nutrient loads (Fig. A.7A). However, they showed an increase in cyanobacteria abundance with increasing temperature variation (Fig. A.7B, corresponding to IBF scenarios).

Comparing the impact of the three parameters that are affected by the change from groundwater seepage to IBF, we found that the largest impact was due to the change in CO_2, then nutrients and lastly temperature variation, when looking at critical nutrient loads and changes in phytoplankton and vegetation abundance (Figs. A.7C, A.8A and A.8B). The change from a vegetation dominated state to a phytoplankton dominated state is facilitated by a change in turbidity (Fig. A.9).

3.2. Effects of increased sedimentation rate and sediment oxygen penetration

The combined effect of increased sedimentation rate and sediment oxygen penetration via IBF led to a net increase of sediment oxygen penetration depth in the IBF scenarios (Fig. A.10). The depth of sediment oxidization increased with increasing infiltration rates and decreased with increasing groundwater CO_2 and nutrient concentration. Under infiltrating conditions the increase was very similar to the increase of infiltration. The deeper oxygen penetration in the sediment increased maximum P binding capacity in the sediment (Fig. A.11).

3.3 Influence of lake depth and size

The effect of IBF on critical nutrient loads was greater for a simulated lake with smaller depth compared to a lake with larger depth; the shift of the critical nutrient loads was larger for the shallower lake (Fig. 8). Similarly, the fetch length made the relative effect of IBF smaller, i.e. applying IBF to a large lake changed the critical nutrient loads to a smaller extent than in the case of a smaller lake Fig. 8).

4. Discussion

Our model results clearly show that IBF has adverse effects on source water quality in most of the tested scenarios. The effects originated from IBF interrupting groundwater seepage, once the seepage was gone an increase of IBF withdrawal rate did not further strengthen the effects on source water quality. IBF negatively affects the threshold nutrient loading required for the freshwater shallow lake ecosystem to persist in a clear water state, the preferred state for water purification. Moreover, it increases the resilience of the turbid state, making it harder to shift to a clear state when IBF is applied. This persistence of the turbid state is unwanted due to the lower ecological water quality including lower biodiversity (Hilt et al., 2011) as well as increased risks of clogging of the sediment bed and presence of toxic cyanobacteria. The latter are not only directly disadvantageous for the ecosystem services of the water body, but can also impair IBF (Grischek and Bartak, 2016; Hargesheimer and Watson, 1996; Pazouki et al., 2016). These adverse effects were shown in our model results for temperate shallow lakes using parameter values that are well within plausible ranges that are found in the literature (Table 2). Consequently, it is conceivable that IBF leads to a decreased resilience of shallow lakes and slow-flowing lowland rivers to increasing nutrient loads which are expected in many areas worldwide due to urbanisation and climate warming. Effects of IBF were decreasing with increasing size and depth of the source lake. Securing a sustainable drinking water production by reliable and cost-effective IBF thus requires an extension of the assessment of IBF effects from the current focus on drinking water quality and quantity to source water bodies in the planning phase.

Several mechanisms in the model are together responsible for the effect of IBF on source water quality, mainly the interruption of groundwater seepage, increased particle sedimentation rate and increased oxygen penetration depth (Fig. 3), all of which are discussed in more detail below.

4.1 Consequences of interrupting groundwater seepage by IBF

Our model results indicate that water quality of lakes fed by groundwater declines when applying IBF, while lakes that are infiltrating in their natural condition will hardly be affected by IBF. In reality, lakes often are both infiltrating as well as gaining water through seepage, but the net-effect is that most lakes receive a net flux of water from groundwater sources (Rosenberry et al., 2015). The size of both seepage and IBF rates in our scenarios – 5 and 10 mm/d in both cases – are well within documented ranges; seepage values range from 0.05 to 190 mm/d (Rosenberry et al., 2015) and the abstraction rate in Lake Müggelsee is 22 mm/d (Zippel and Hannappel, 2008).

Interrupting groundwater seepage by IBF has consequences for CO_2 availability for macrophytes, nutrient loading and seasonal water temperature variation in source water bodies (Fig. 3, for a detailed review, see Gillefalk et al., 2018) which together can lead to opposing effects.

4.1.1 Consequences of interrupting groundwater nutrient loading

IBF could improve the water quality of source water bodies and increase their critical nutrient loads in case groundwater influx comprises a major share of the nutrient budget and as long as the CO_2 supply via groundwater is low. Under such conditions, IBF would interrupt the groundwater-born nutrient load and result in a recovery and shift back to clear conditions (Figs. 6 and A.5). A major contribution of groundwater seepage to nutrient loading has been shown for several lakes (Lewandowski et al., 2015). IBF could thus be part of a management strategy to combat this excessive nutrient loading. However, the critical nutrient load for switching back to the turbid state in those cases lies marginally higher which means that the clear state will remain sensitive to increased surface water nutrient loads.

4.1.2 Consequences for seasonal temperature variation

Interrupting groundwater influx by IBF results in an increased amplitude of the seasonal temperature variations in the source water bodies in temperate regions, as groundwater temperature is higher than surface water temperature in winter, and *vice versa* in summer (e.g. Cieśliński et al., 2016). In general, most biological processes are temperature-dependent and changing water temperature will thus have consequences for aquatic organisms and their interactions. In our IBF scenarios, lake water was 3.3 °C cooler in winter and 3.3 °C warmer in summer compared to initial states where lakes had groundwater seepage equal to 10 mm/d. When groundwater seepage was 5 mm/d, the difference was 2 °C cooler and warmer, respectively. These differences in temperature are similar to those found by Liu et al. (2016). Lower temperatures in winter can lead to changes in ice coverage with potential consequences for water quality aspects such as the timing of the spring phytoplankton bloom (Adrian et al., 2006). In PCLake though, a potential ice cover was not considered. In PCLake, all organism growth rates as well as mineralization of organic matter are temperature-dependent processes. Higher temperatures and higher P availability in summer have been shown to facilitate phytoplankton more than macrophytes. Especially cyanobacteria will profit due to their high P affinity and steeper temperature function as compared to other phytoplankton groups (Mooij et al., 2007). As a consequence, warmer lakes have a lower critical nutrient loading and a higher risk of cyanobacterial dominance (e.g. Mooij et al., 2007; Kosten et al., 2012). Cooler winter water temperatures in IBF-affected lakes could counterbalance this effect as temperate shallow lake ecosystems have been found to be most sensitive to temperature changes in winter and early spring (Mooij et al., 2007). Our model results, however, indicate that the net effects of IBF reinforce rather than dampen the effects of climate warming on shallow temperate lakes and slow-flowing lowland rivers, especially in cases where IBF would interrupt significant CO_2 inflow via groundwater. In our artificial scenarios, where temperature variation was changed, while keeping groundwater inflow = 0, the temperature had a much smaller impact on chl *a* concentration compared to groundwater nutrients and CO_2 concentrations (compare Fig. A.7A to Fig. 7 and Fig. A.7C to Figs. A.8A and A.8B). There was a small effect that lowered critical nutrient loads when temperature variation was higher, which represents scenarios with IBF (Fig. A.6A). A higher temperature variation, leading to higher summer temperatures did lead to higher cyanobacteria concentrations in the water (Fig. A.7B), both by lowering the critical nutrient loads and by increasing the cyanobacteria concentration in turbid states. But the latter is not visible when looking at scenarios produced using all parameters, because then the model showed that cyanobacteria are outcompeted by diatoms (Figs. A.8A and A.8B).

4.1.3 Consequences for groundwater CO_2 loading

In our scenarios, IBF-driven changes in CO_2 availability thus have stronger effects than those in water temperature. Interrupting groundwater influx by IBF can lower CO_2 concentrations in lake water since groundwater in general shows higher concentrations of CO_2 (Sand-Jensen and Borum, 1991; Sand-Jensen and Staehr, 2012). The majority of boreal lakes are CO_2-sustained by groundwater (Weyhenmeyer et al., 2015) and in tropical and temperate lakes CO_2 supersaturation is dependent on groundwater CO_2 coming from weathering of minerals rather than on internal production (Marcé et al., 2015). Lowered CO_2 concentrations negatively affect macrophyte growth since some species fully depend on CO_2 (Maberly, 1985; Maberly and Madsen, 1998) and others, which are able to use HCO_3^- in addition, still grow faster in CO_2-rich environments (Madsen and Sand-Jensen, 1994; Vadstrup and

Madsen, 1995; Olesen and Madsen, 2000), partly due to the higher metabolic cost of using HCO_3^- (Jones, 2005). Elevation of atmospheric CO_2 under eutrophic conditions may increase the growth rate of macrophytes using CO_2 and HCO_3^- by 100% and of macrophytes restricted to CO_2 assimilation by 200% (Schippers et al., 2004). The lack of groundwater-borne CO_2 due to IBF can be particularly relevant for macrophyte growth in summer since CO_2 concentrations in lakes reach their minimum in July (Weyhenmeyer et al., 2012). The effect might, therefore, be overestimated as increasing macrophyte biomass should decrease CO_2 concentrations. But the resulting CO_2 concentrations were similar to those measured close to where groundwater seeps out into a river (Maberly et al., 2015). Also, since macrophytes grow where groundwater enters, those areas can be assumed to have higher CO_2 concentrations than average lake water. Overall, the growth rate of macrophytes is a very sensitive parameter in PCLake and any decline favours phytoplankton abundance.

4.2 Consequences of increased sedimentation rate and sediment oxygen penetration

We assumed that IBF can increase particle sedimentation rates equal to the infiltration rates. In our model results, this increase in particle sedimentation rate did not increase oxygen consumption sufficiently to consume all the added oxygen through infiltration into sediments. The resulting net increase in the sediment oxidation depth led to more P being bound in the sediment and less P available for phytoplankton. But the effect is small; an increase of infiltration rate from 5 to 10 mm/d did not change the critical nutrient loads at all (Fig. A.5). An increase in sediment oxidation depth can have consequences for redox conditions affecting the removal of e.g. pharmaceutically active compounds during IBF (Wiese et al., 2011).

In deeper lakes, cold water from the bottom could, in theory, be withdrawn, potentially decrease the stratification stability and net sedimentation. But in general, sediments in deeper part of lakes are covered with fine particles and organic material, drastically reducing the permeability and infiltration rates. That is why infiltration at lake IBF sites only takes place in the littoral zone (Hoffmann and Gunkel, 2011)

4.3 Effect size depends on lake depth and size

Most lakes in the world are small (< 0.01 km²) (Verpoorter et al., 2014) and shallow (< 2.6 m) (Cael et al., 2016). Small and shallow lakes are in general more sensitive to changes than large or deep ones; accordingly, our simulations indicate that IBF effects on phytoplankton abundance are stronger when source water bodies are smaller and shallower. The macrophytes in a small system benefited more from the groundwater CO_2 inflow, after the interruption of seepage by IBF those systems reacted stronger. IBF effects can thus be minimized if larger and deeper water bodies are chosen for drinking water production. In addition, unintentional BF may also affect the water quality, especially in small aquatic ecosystems in the vicinity of source water bodies. This may impair their ecosystem functions and services such as provision of habitats for a diverse aquatic flora and fauna as well as carbon and nutrient retention (Hilt et al., 2017). Considering these effects in future planning will allow for a more comprehensive approach aiming at sustainable drinking water production with minimized negative effects on the water quality in both, target and neighbouring water bodies.

Conclusions

- Our results show that the major impact of IBF on shallow lakes is a result of interrupting groundwater seepage into the lake. In most scenarios this led to an increasing risk of a clear-water lake shifting to a turbid state and strengthening the persistence of the turbid state (lower critical nutrient loads), thus increasing the risk of the occurrence of potentially toxic cyanobacteria blooms. This effect was stronger in smaller and shallower lakes.
- As the valuable technique of IBF is spread over the world, choosing the most suitable sites to ensure sustainable drinking water production gains in importance. Modelling is a valuable tool to use for this purpose. Model simulations can help to avoid consequences that emerge from ecological and technological perspectives.

- Our model results are based on model input with realistic values for seepage rates, IBF rates, groundwater CO_2 and nutrient concentrations. Assumptions for our model input regarding effects on lake water temperature by changing groundwater regimes, effects of CO_2 on macrophyte growth and effects of groundwater-borne nutrient loading are well founded in existing literature. Based on well-embedded model input, this study could provide an explicit and flexible way to see the effects of IBF in different conditions.
- Further research on IBF effects on source water bodies is needed by expanding the scope to rivers and deeper lakes and by field investigations. Future management should aim at ensuring the sustainable use of IBF for drinking water supply by considering potential ecological impacts on all types of source water bodies.

Acknowledgements

The authors would like to thank the members of the DFG (German Research Foundation) Research Training Group “Urban Water Interfaces”.

We thank the many staff and students of the Leibniz-Institute of Freshwater Ecology and Inland Fisheries who run the long-term Müggelsee sampling and analysis, especially Rita Adrian, Tobias Goldhammer, Hans-Jürgen Exner, Jörg Gelbrecht, Thomas Hintze, Reinhard Hölzel, Antje Lüder, Ursula Newen, Kathrin Preuß, Thomas Rossoll, Jürgen Schreiber, Bernd Schütze and Barbara Stein.

We also want to thank the Berlin Senate Department for the Environment, Transport and Climate Protection, especially Antje Köhler, Alexander Limberg, Benjamin Creutzfeldt and Daniel Brüggemann, for providing data and discussions and the Berlin Wasserbetriebe, especially Dörte Siebenthaler, for her invaluable help during data collection.

Funding: This work was supported by the German Research Foundation [DFG research training group “Urban water interfaces”, grant no. GRK 2032/1].

Author contributions

MG and SH conceived the concept, wrote the manuscript and produced figures and tables. MG performed the modelling work. All authors contributed with important feedback during all stages of the modelling work and participated in choosing what results were relevant to include in final draft of the manuscript. JJ, ST and AJ provided technical help and hands-on solutions for the modelling work. JK was responsible for handling Müggelsee long-term data. All authors provided feedback on manuscript, including figures and tables. All authors have approved the final article.

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Table 1. Main parameter values for this study (default values of PCLake, Aldenberg et al., 1995; Janse, 2005).

Parameter	**Abbreviation**	**Value**
Marsh zone	-	Marsh zone not used
Inflow of surface water	cQIn	20 mm/d
Average water temperature	cTMAve	12 °C
Sediment depth	cDepthS	0.1 m
Sediment dry matter	fDtotS0	0.3 g solid/g sediment
Sediment organic fraction	fDOrgS0	0.1 g/g
Clay in inorganic matter	fLutum	0.1 g lutum/g DW
Iron in inorganic matter	fFeDIM	0.01 g Fe/g DW
Aluminium in inorganic matter	fAlDIM	0.01 g Al/g DW

Table 2. Literature values for key parameters used. Where relevant, the values are given as extremes and as averages along with the values used in the modelled scenarios.

Parameter	**Range, extreme (typical values)**	**Reference**	**In model**
Groundwater CO_2	18 – 7200 $mmol/m^3$ (630 - 1260 $mmol/m^3$)	Vesper and Edenborn, 2012; Macpherson, 2009	180, 360, 600, 900, 1200, 1500 $mmol/m^3$
River CO_2	54 - 360 $mmol/m^3$ (90 - 180 $mmol/m^3$)	Kempe et al., 1991; Campeau and Del Giorgio, 2014; Borges et al., 2018; Lauerwald et al., 2015	150 $mmol/m^3$
CO_2 => macrophyte growth	57-74 % increased growth depending on baseline	Madsen and Sand-Jensen, 1994	Calculated based on GW concentration. Max. 51 % with assumed river CO_2 = 150 $mmol/m^3$
Groundwater nutrient concentration	0.001 – 0.5 mg P/L, sewage plumes reaching 5 mg P/L (0.01-0.04 mg P/L) 0.15 – 9 mg N/L (0.5 – 5 mg N/L) N is sum of NO_3 and NH_4	Lewandowski et al., 2015; Kunkel et al., 2004	0.005, 0.02, 0.06, 0.1, 0.3, 0.8 mg P/L 0.055, 0.22, 0.66, 1.1, 3.3, 8.8 mg N/L (coupled to P)
Groundwater seepage	0.05 – 190 mm/d (median of measured values)	Rosenberry et al., 2015	-10, -5, 0 mm/d (cQInf < 0 = seepage)
Induced bank filtration	22 mm/d	Zippel and Hannappel, 2008	0, 5, 10 mm/d (cQInf > 0 = infiltration)
Nutrient loading (via surface water)	-	-	0.1 - 10 mg $P/m^2/d$ (0.7 – 70 mg $N/m^2/d$)

Table 3. All modelled parameter combinations. cQInfPre = infiltration during initialization period of simulated 50 years (negative values = seepage into lake, positive values = infiltration into groundwater), GW = groundwater, P = phosphorus (N in groundwater is coupled and takes the value of P * 11), cQInfPost = infiltration during last simulated 50 years, results were taken from the last of these 50 years.

cQInfPre (mm/d)	-10	-5	0	5	10
Initial state	Clear, Turbid	Clear, Turbid	Clear, Turbid	Clear, Turbid	Clear, Turbid
CO2 in GW (mmol/m^3)	0.005, 0.02, 0.06, 0.1, 0.3, 0.8	0.005, 0.02, 0.06, 0.1, 0.3, 0.8	-	-	-
P in GW (N is coupled) (mg P/L)	180, 360, 600, 900, 1200, 1500	180, 360, 600, 900, 1200, 1500	-	-	-
cQInfPost (mm/d)	-10, -5, 0, 5, 10	-5, 0, 5, 10	0, 5, 10	5, 10	10
Combinations	330	288	6	4	2

Figure 1. Groundwater level (dotted line) and seepage (blue arrow) into a surface water body without bank filtration (A). A production well installed to induce bank filtration resulting in a lower groundwater level and interrupted groundwater seepage into the surface water body (B).

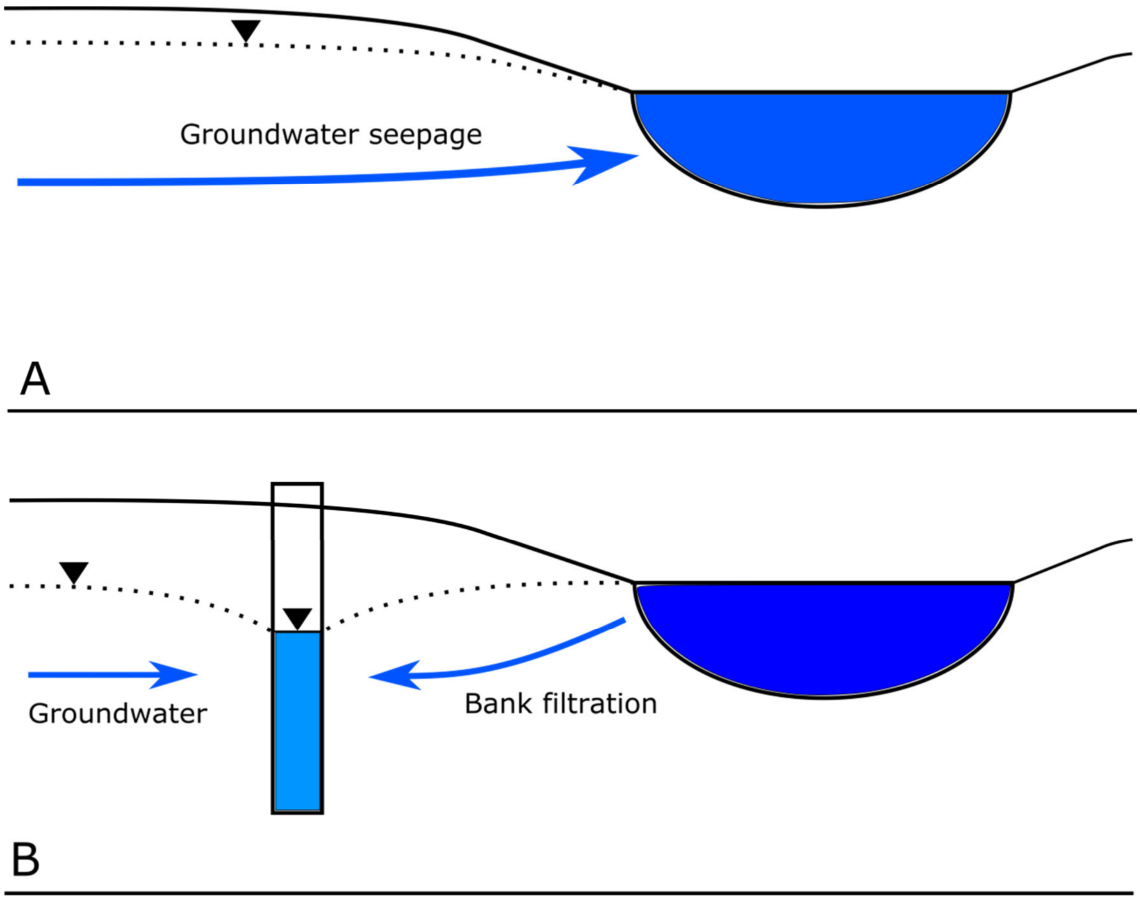


Figure 2. Lake surface elevation and groundwater (GW) level drawdown (grey area and purple GW isolines) around Lake Wannsee (A), Lake Tegel (B) and Lake Müggelsee (C) in Berlin (Germany) close to series of groundwater abstraction wells (red lines) installed for drinking water production by induced bank filtration. Groundwater abstraction rates and Secchi depth in Lake Müggelsee between 1960 and 2014 (D, data on GW abstraction rates from Berliner Wasserbetriebe).

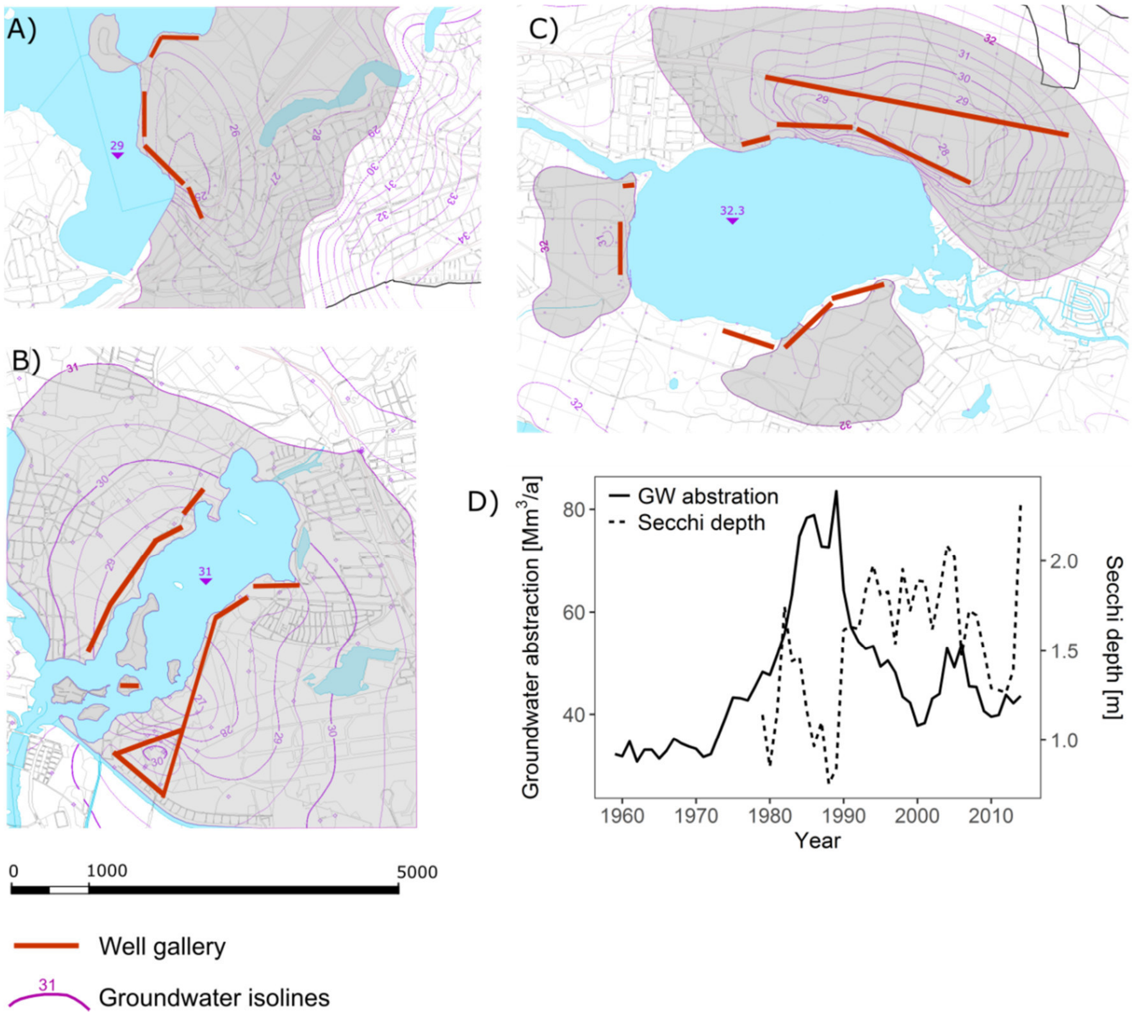


Figure 3. Expected effects of induced bank filtration on shallow lake ecosystems via interrupted seepage input of groundwater CO_2 (1), nutrients (2) and increased summer water temperature (WT, 3), as well as increased sedimentation rate (4) and increased sediment oxygen penetration depth (5) due to induced infiltration (+/- indicate increase/reduction, multiplication of signs reveals final effect).

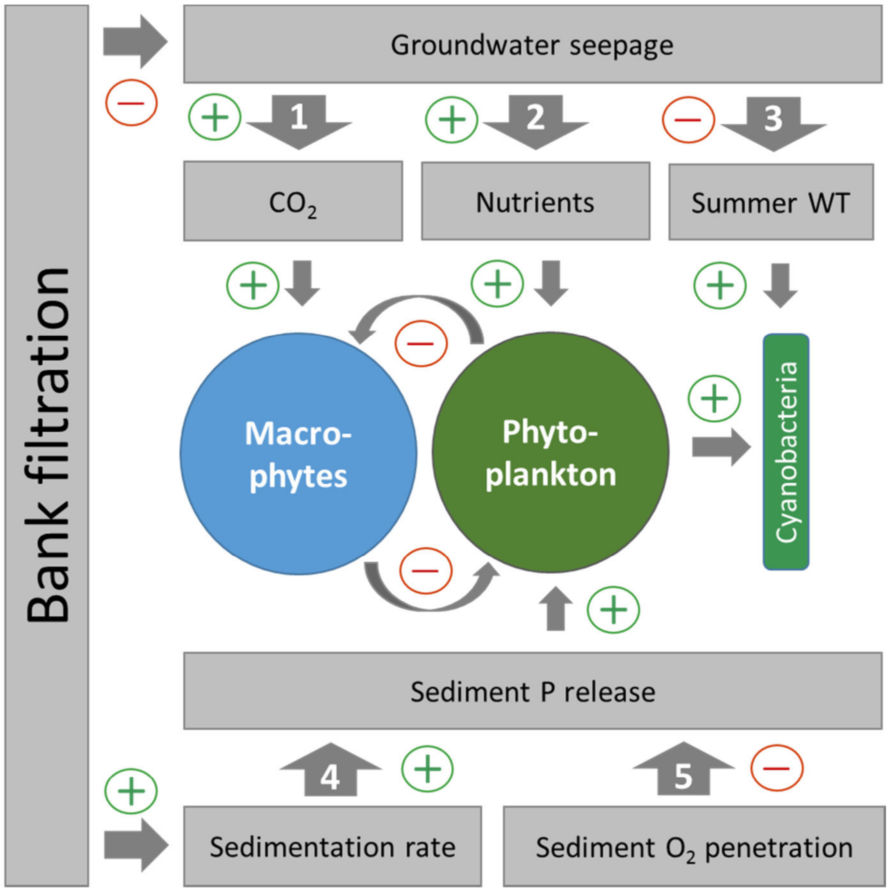


Figure 4. Summer average chlorophyll *a* (total (panel A) and cyanobacteria (panel B)) concentrations depending on nutrient loading (here displayed as phosphorus (P)) in a standard shallow lake with groundwater seepage (GW seepage) or induced bank filtration using average parameter values: cQInf (GW seepage) = -5 mm/d, cQInf (bank filtration) = 5 mm/d, cPO4Ground (groundwater PO_4 concentration) = 0.02 mg P/L, cNH4Ground (groundwater NH_4 concentration) = 0.2 mg N/L, cNO3Ground (groundwater NO_3 concentration) = 0.02 mg N/L and cCO2Ground (groundwater CO_2 concentration) = 900 mmol/m^3. Shaded areas indicate zones of hysteresis, small black arrows indicate the direction of the hysteresis, and grey arrows indicate the impact of induced bank filtration on critical nutrient loads.

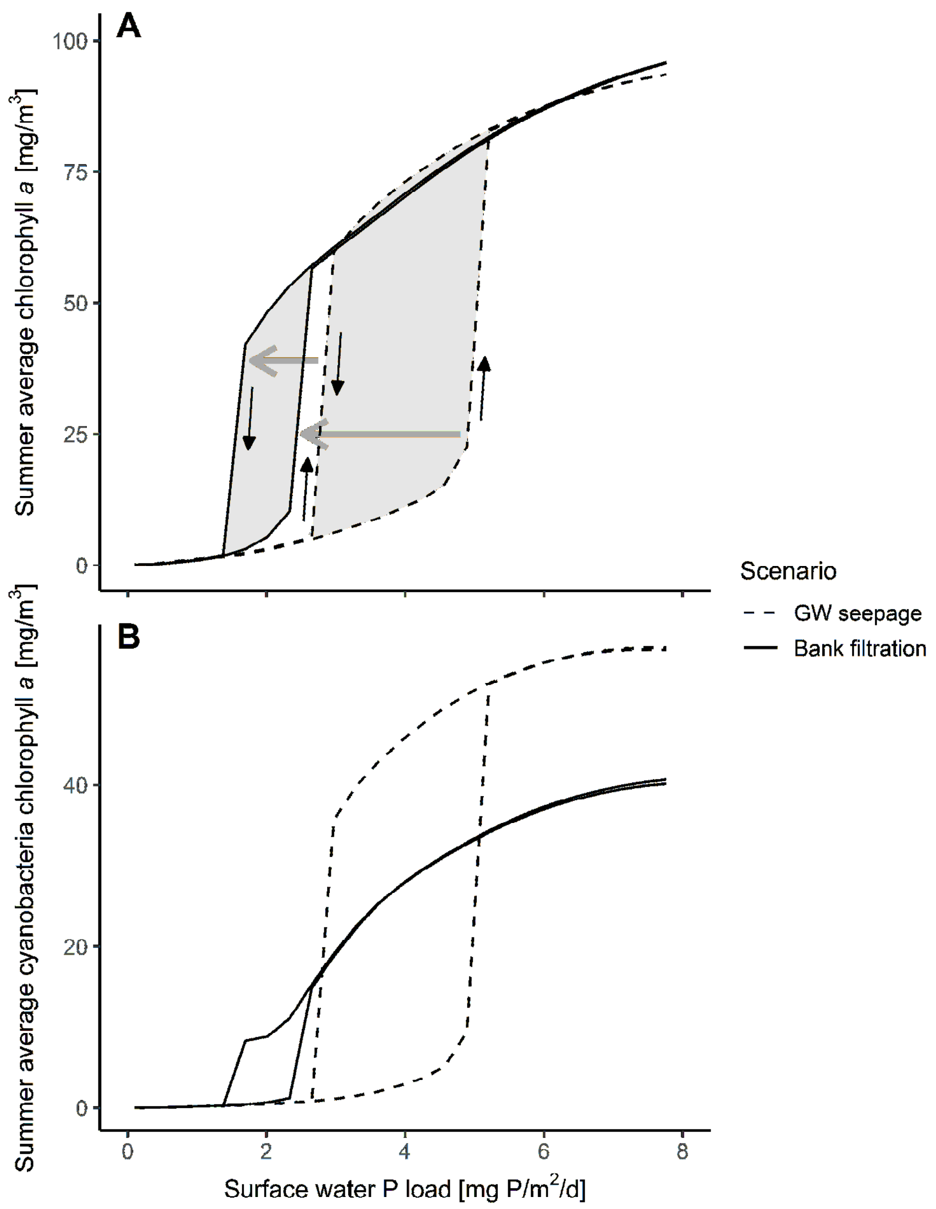


Figure 5. Chlorophyll *a* concentrations in the last year of a 50 year model run in a standard temperate shallow lake starting with clear-water conditions with groundwater seepage (GW seepage) or induced bank filtration using average parameter values: cQInf (GW seepage) = -5 mm/d, cQInf (bank filtration) = 5 mm/d, cPO4Ground (groundwater PO_4 concentration) = 0.02 mg P/L, cNH4Ground (groundwater NH_4 concentration) = 0.2 mg N/L, cNO3Ground (groundwater NO_3 concentration) = 0.02 mg N/L and cCO2Ground (groundwater CO_2 concentration) = 900 mmol/m^3. Nutrient loading via surface water: cPLoad (P load) = 3 mg P/m²/d, cNLoad (N Load) = 30 mg N/m²/d.

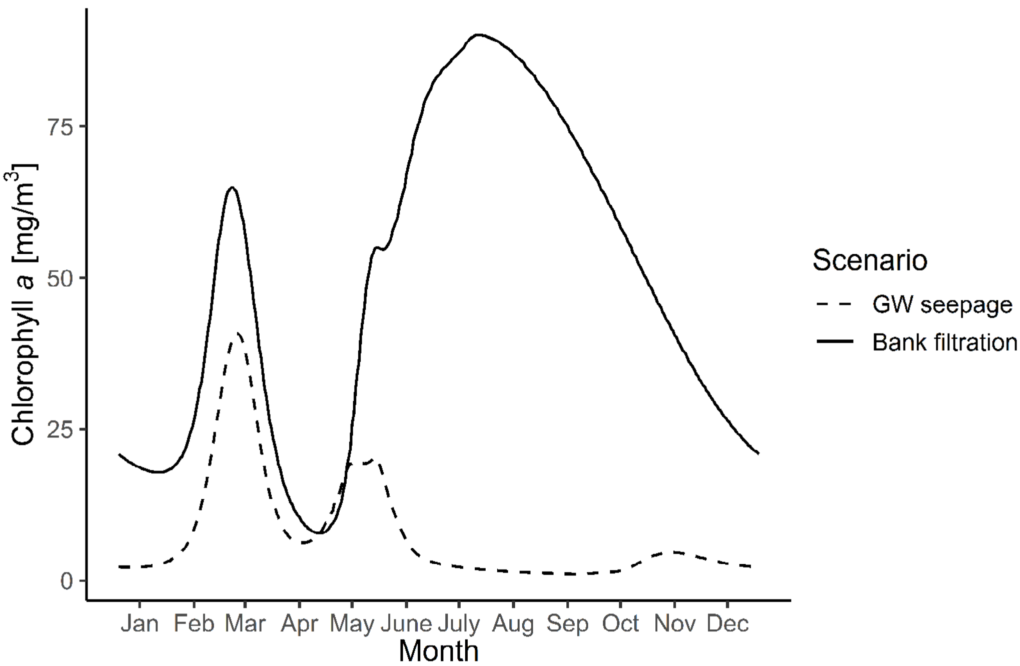


Figure 6. Critical phosphorus (P) loading in shallow model lake ecosystems initially in a clear-water (left) and turbid (right) state running for 50 years with groundwater seepage (groundwater flow = -10) and a subsequent 50 years with groundwater seepage (groundwater flow = -10, -5 mm/d), neither seepage nor infiltration (groundwater flow = 0 mm/d) or induced bank filtration (groundwater flow 5, 10 mm/d, grey background). The spread in critical P loads is due to differences in groundwater CO_2 and nutrient concentrations (details on different scenarios shown in Fig. A.5).

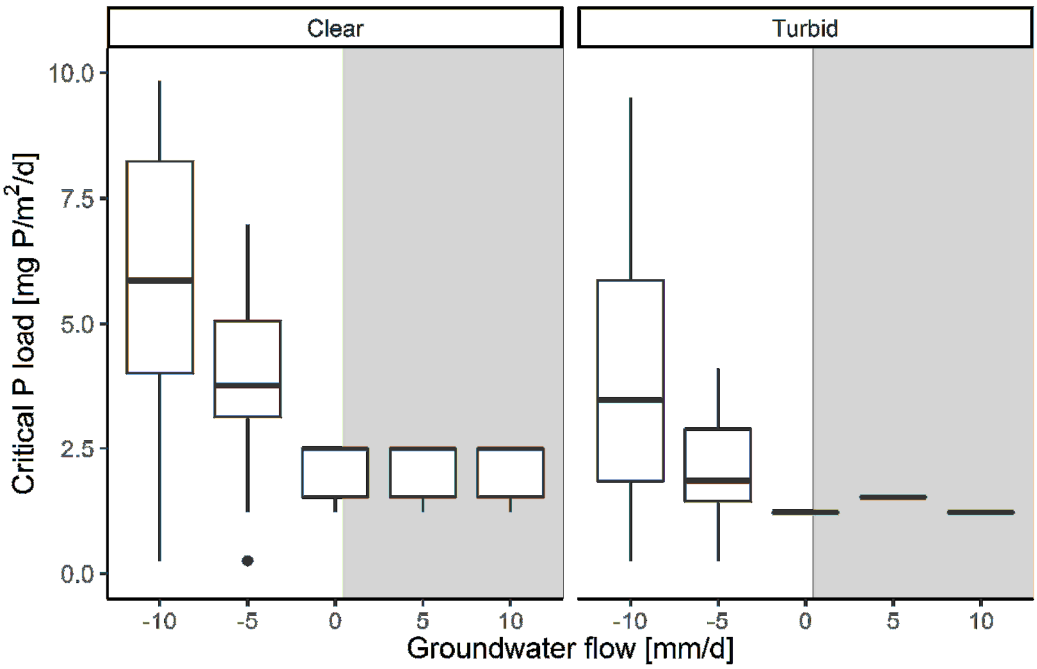


Figure 7. Chlorophyll *a* concentrations in a model shallow lake depending on phosphorus (P; low: 0.005 mg/L, high: 0.8 mg/L) and CO_2 (low: 180 mmol/m³, high: 1500 mmol/m³) concentrations in the groundwater in scenarios with groundwater seepage (cQInf = -5 mm/d) and induced bank filtration (cQInf = 5 mm/d) after a run-in period of 50 years with groundwater seepage (cQInf = -5 mm/d).

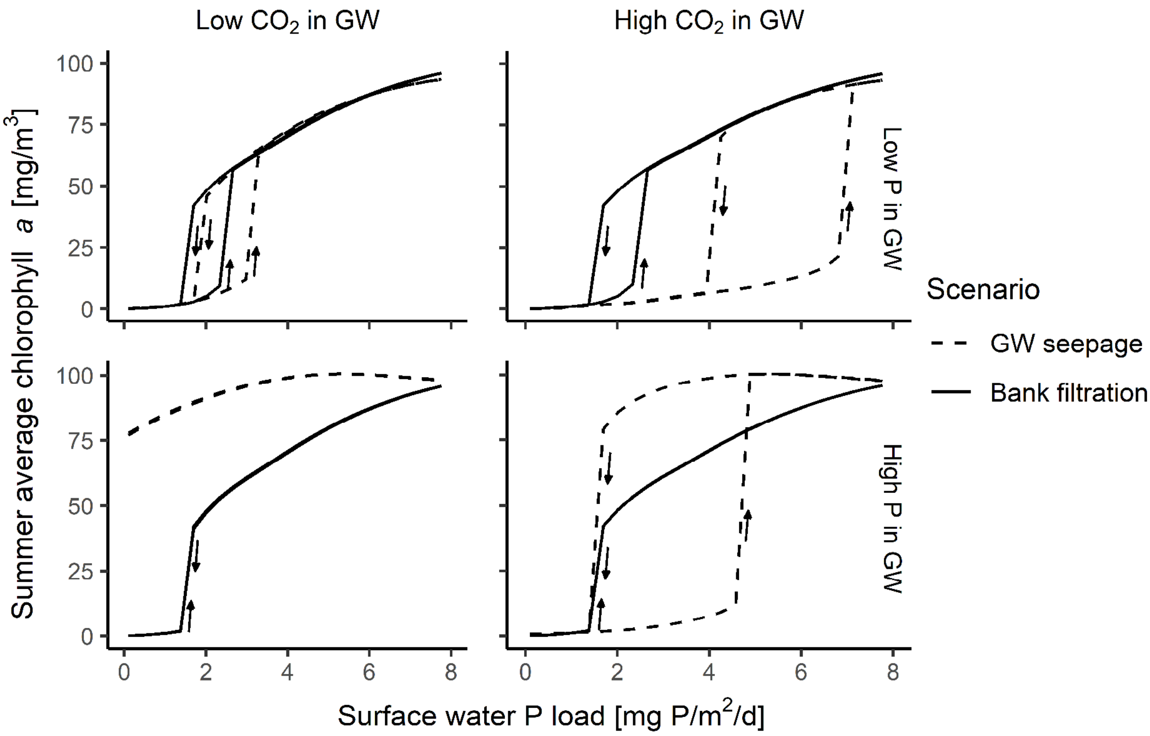


Figure 8. Chlorophyll *a* concentrations in a modelled shallow lake depending on fetch (low: 100 m, high, 1000 m) and water depth (low: 1.5 m, high: 2 m) in scenarios with natural groundwater inflow and induced bank filtration on shallow lake ecosystems. Scenarios with GW seepage (cQInf = -5 mm/d), Bank filtration (cQInf = 5 mm/d), CO_2 concentration in groundwater = cCO2Ground = 900 mmol/m^3, PO_4 concentration in groundwater = cPO4Ground = 0.02 mg/L, cNH4Ground = 0.2 mg N/L, cNO3Ground = 0.02 mg N/L.

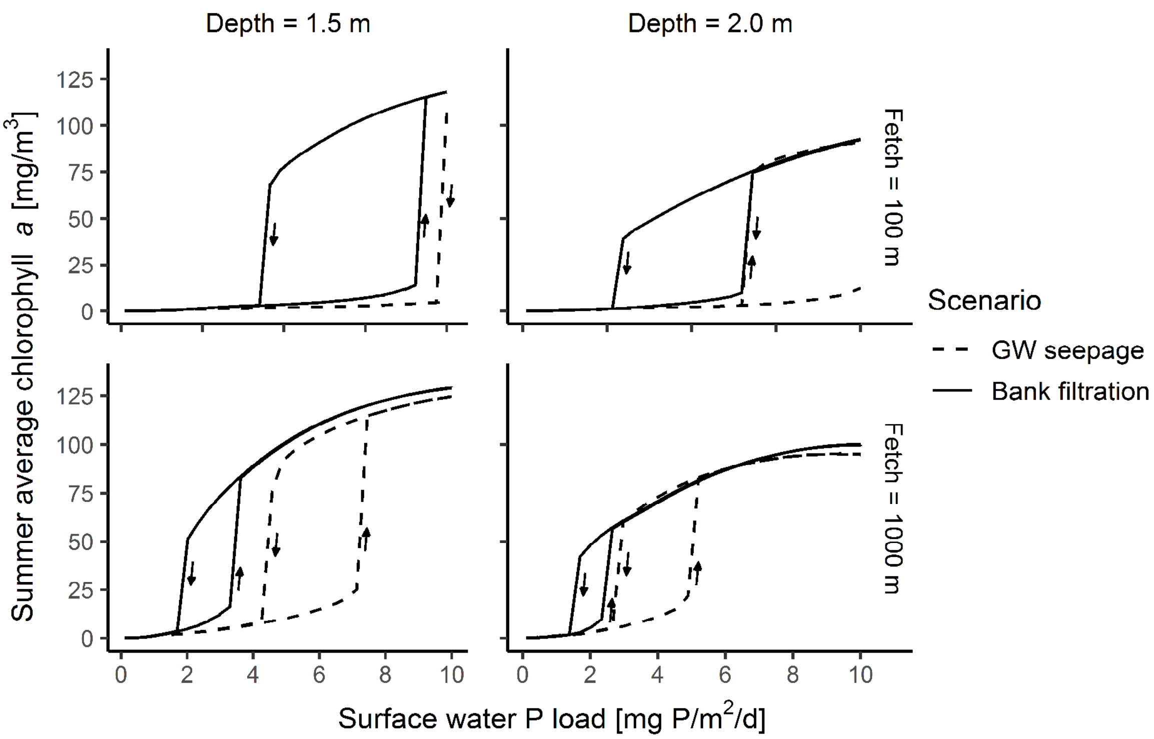


Table A.1. Characteristics of the three phytoplankton subgroups in PCLake.

Systematic group	**Characteristics**
Green algae	High growth rate. High loss rate through settling and zooplankton grazing. Not inhibited by high light intensities.
Diatoms	High growth rate. High loss rate through settling and zooplankton grazing. May be limited by silica. Low temperature optimum.
Cyanobacteria	High light affinity. High phosphorus uptake rate. Strong sensitivity to temperature. Low maximum growth rate.

Figure A.1. PCLake model structure (adapted from Janse, 2005). Adaptations made in connection to groundwater flow and by adding CO_2, highlighted in red.

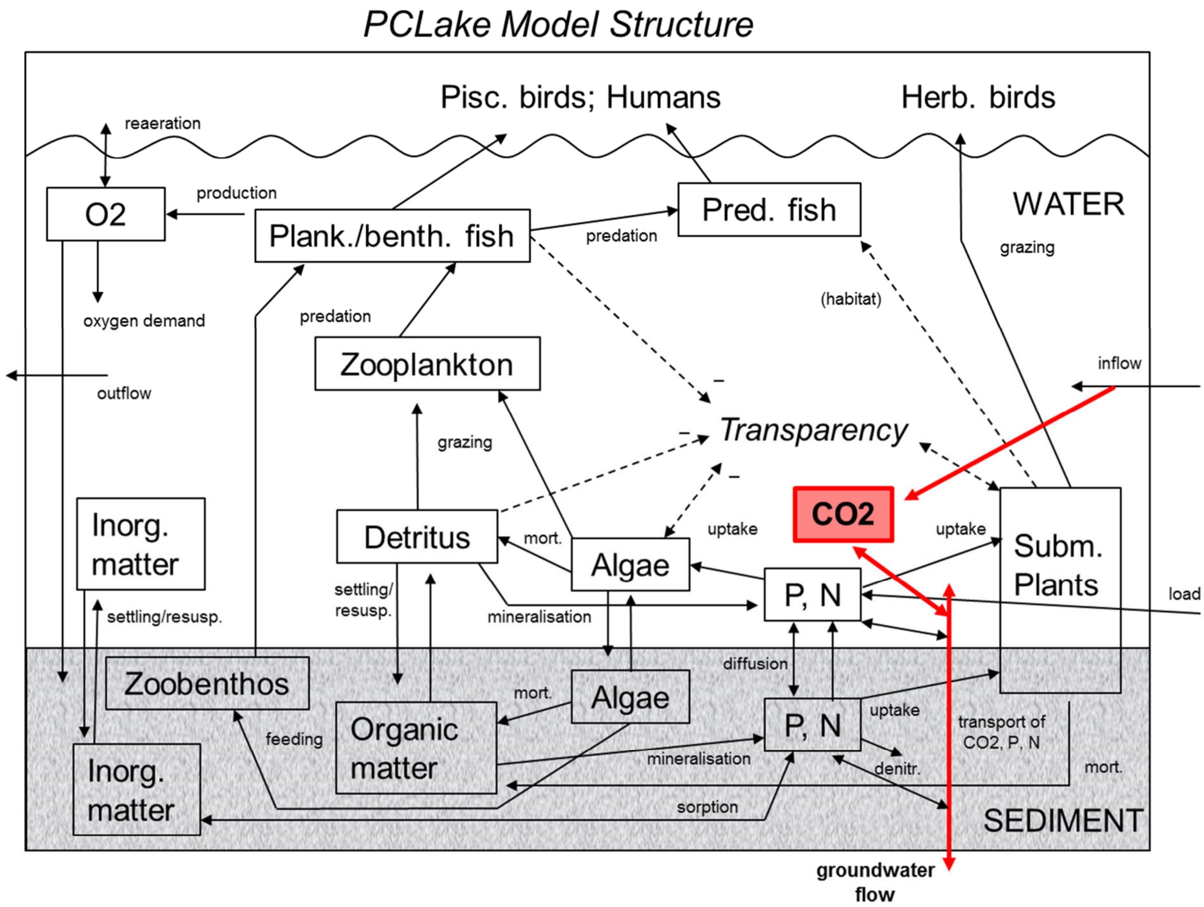


Figure A.2. Seasonal lake temperature variation. The “GW seepage” scenario represents a lake where groundwater seepage increases the temperature in winter and decreases it in summer compared to the “Bank filtration” scenario, where no groundwater seepage takes place.

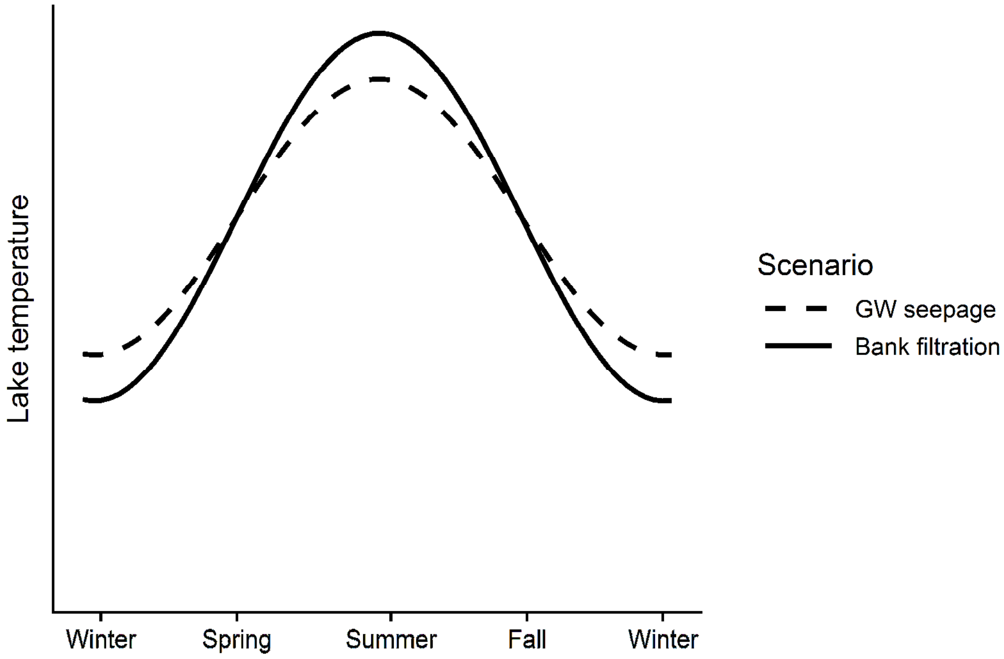


Figure A.3. Relationship between CO_2 concentration in the lake water and the maximum growth rate of macrophytes (B), between infiltration/seepage and lake temperature variation (A), between infiltration/seepage and added settling velocity (C) and between infiltration/seepage and increased oxygen penetration depth (D).

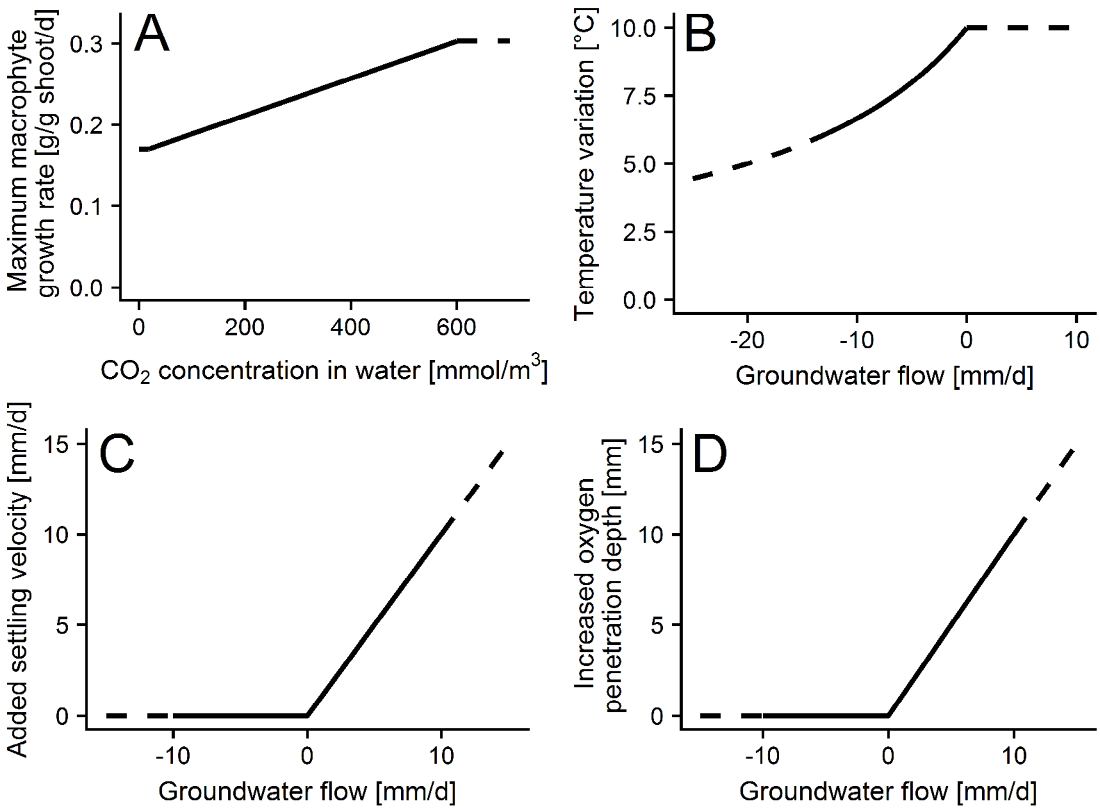


Figure A.4. A typical model scenario consists of two parts. The first part is an initialization period of 50 years where a stable state is reached. The second part consists of two versions: one where all the settings from the first part are kept constant, and a second where induced bank filtration is simulated by changing the groundwater flow term. In the end an output variable (typically summer average chlorophyll *a*) is used to examine the difference between groundwater seepage and induced bank filtration.

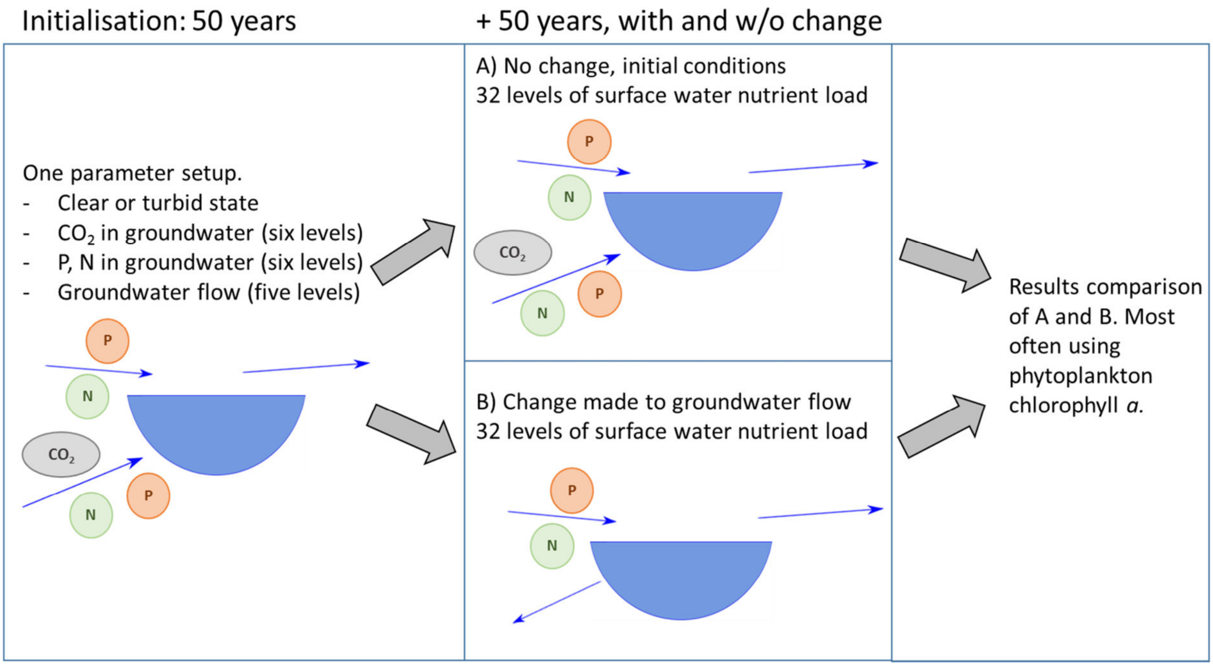


Figure A.5. Critical nutrient loading (here shown as phosphorus (P) values) in shallow model lake ecosystems initially in a clear-water (left) and turbid (right) state running for 50 years with groundwater seepage (groundwater flow = -10) and a subsequent 50 years with groundwater seepage (groundwater flow = -10, -5 mm/d), neither seepage nor infiltration (groundwater flow = 0 mm/d) or induced bank filtration (groundwater flow = 5, 10 mm/d, grey background). The symbols and colours indicate different combinations of CO_2 and P concentrations in groundwater (box plots in Fig. 6).

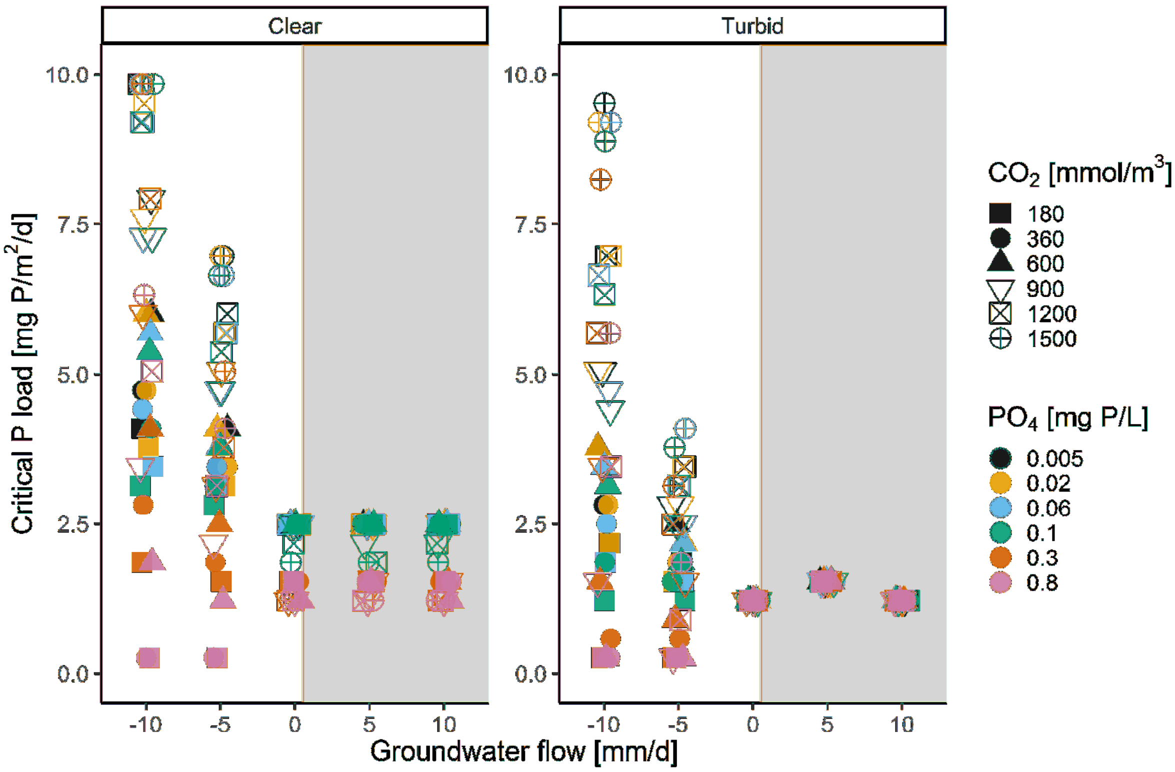


Figure A.6. Effects of induced bank filtration (IBF) on critical nutrient loads from clear to turbid state (A) and from turbid to clear state (B). IBF lowers critical nutrient loads (green), difference between groundwater seepage and IBF is small (grey) and IBF increases critical nutrient loads (blue). IBF scenario: cQInf = 5 mm/d, groundwater seepage: cQInf = -5 mm/d.

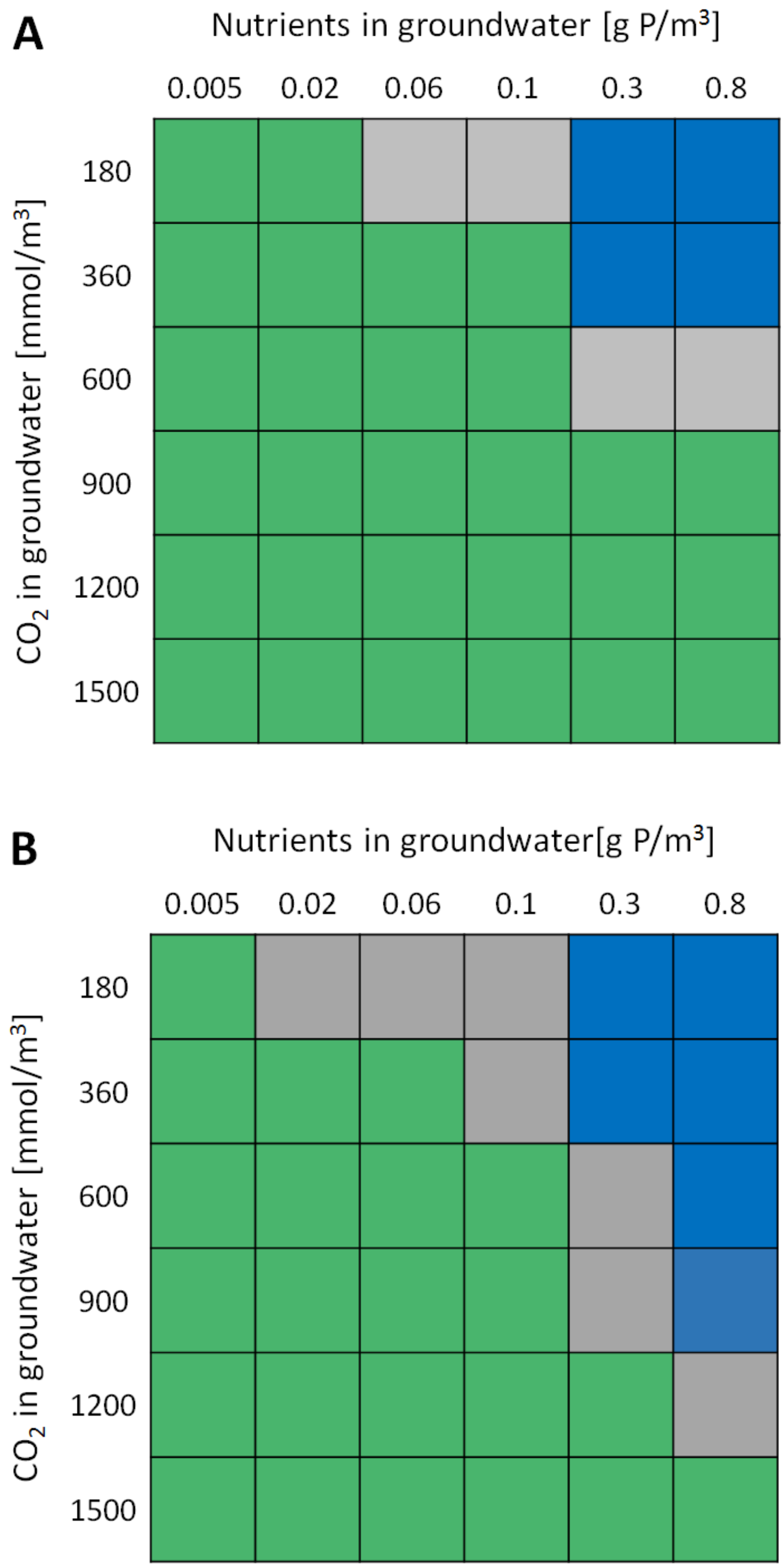
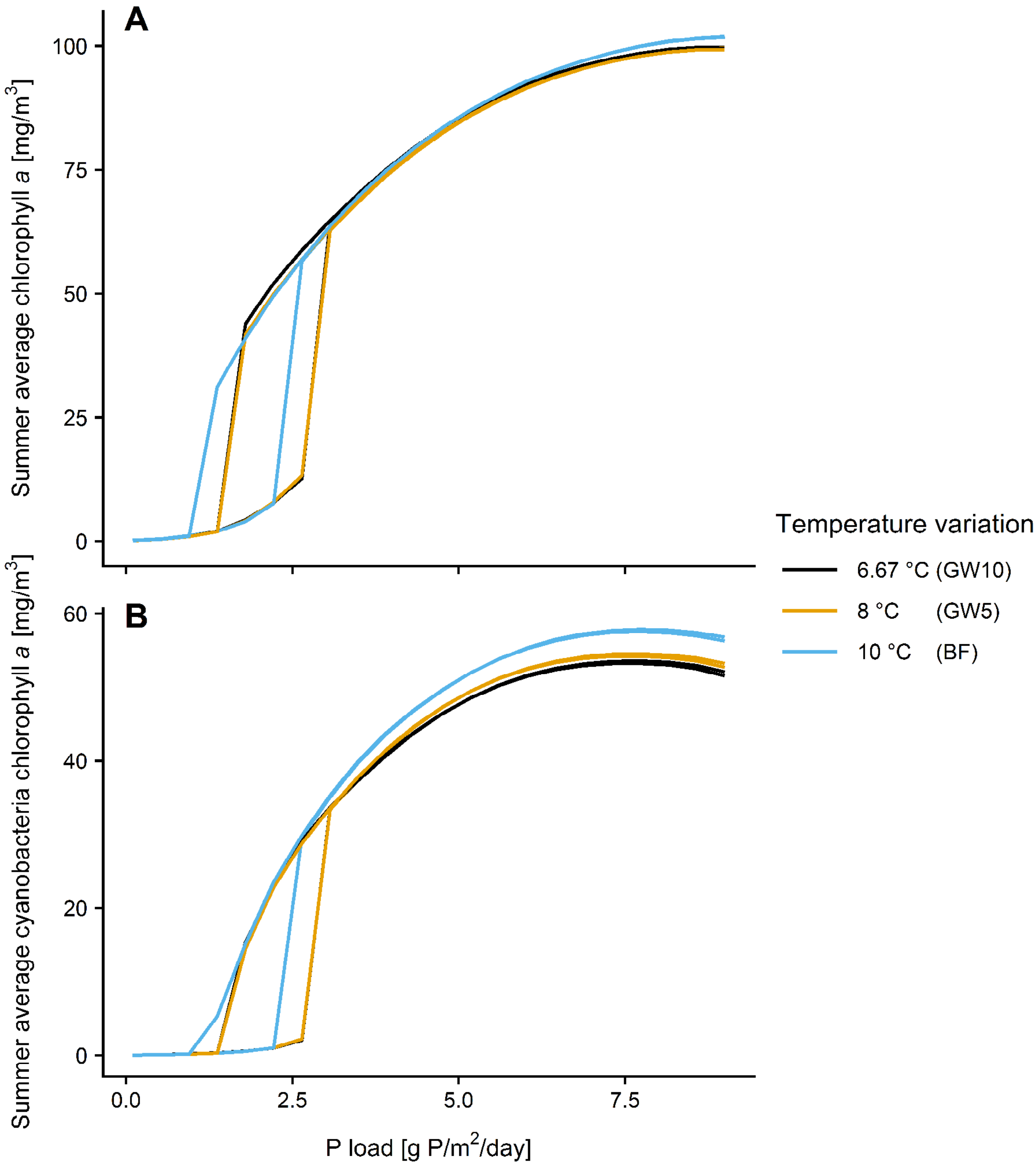
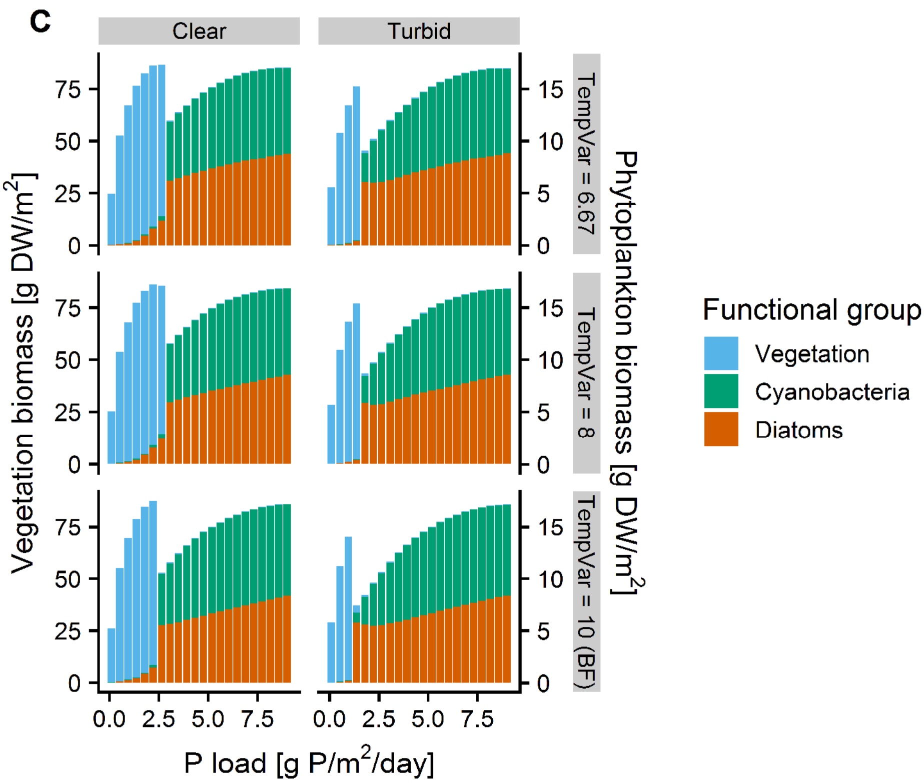


Figure A.7. Effects of changes in temperature variation (TempVar). A higher temperature variation lowers critical nutrient loads (A), increases cyanobacteria chlorophyll *a* (B) and promotes phytoplankton dominance over macrophyte vegetation at lower nutrient loads (C).





C
Clear
Turbid
TempVar = 6.67
TempVar = 8
TempVar = 10 (BF)
Vegetation biomass [g DW/m2]
Phytoplankton biomass [g DW/m2]
P load [g P/m2/day]
0.0
2.5
5.0
7.5
0
25
50
75
0
5
10
15
Functional group
Vegetation
Cyanobacteria
Diatoms

Figure A.8. Effects of changes in groundwater CO_2 (A) and nutrient (B) concentration on phytoplankton community and macrophyte vegetation.

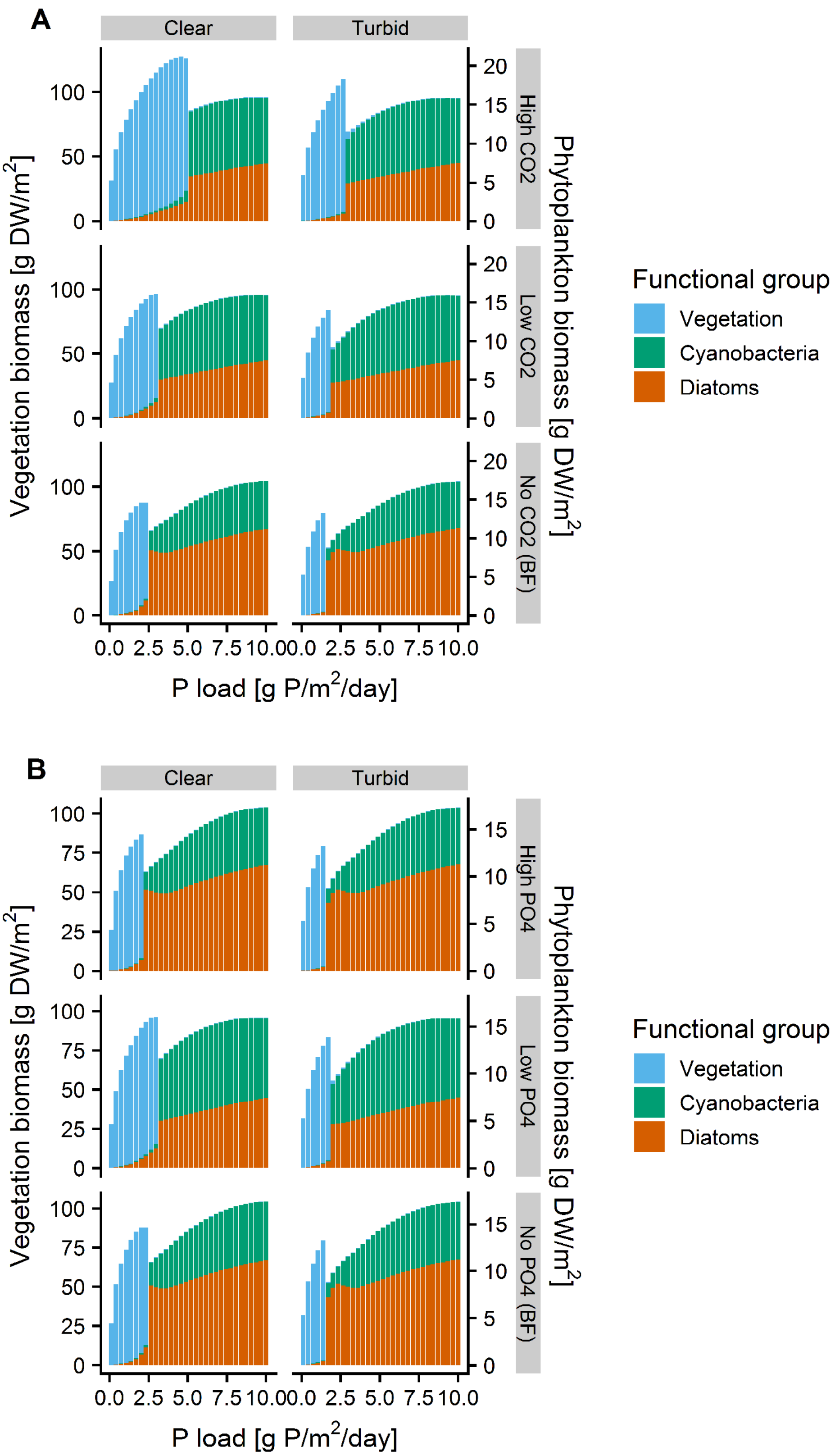


Figure A.9. Phytoplankton increases turbidity, lowers Secchi depth and shades macrophyte vegetation. The biomass of phytoplankton has been multiplied by five to better illustrate the shift between states.

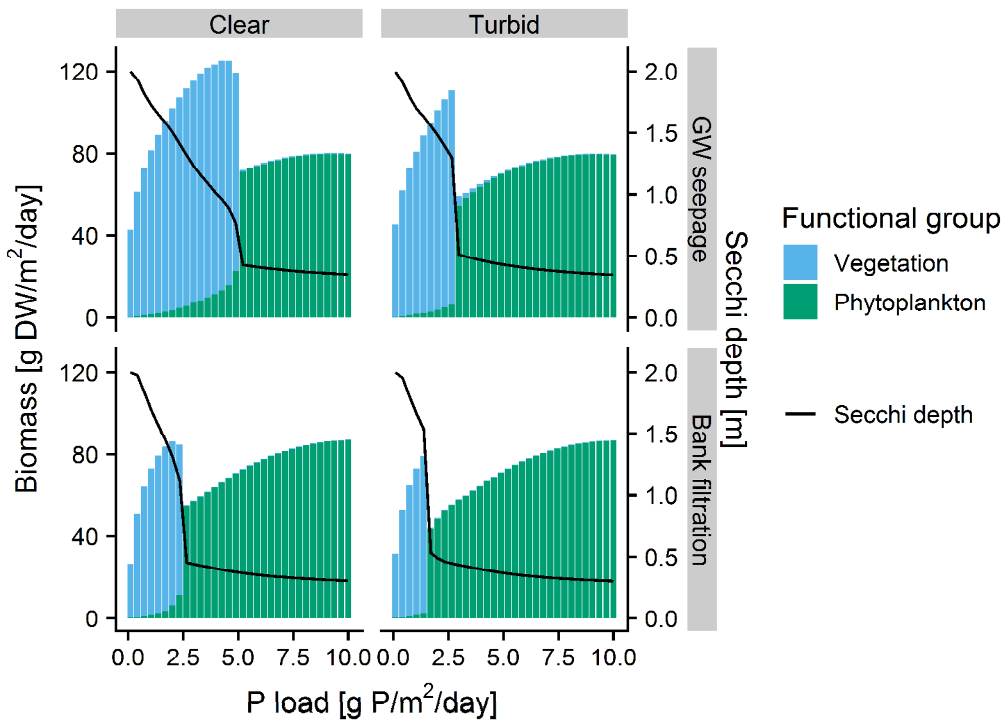


Figure A.10. Sediment oxygen penetration depth under initially clear-water (left) and turbid (right) conditions in a model shallow lake running for 50 years with groundwater seepage (groundwater flow = -10) and a subsequent 50 years with groundwater seepage (-10, -5 mm/d), neither seepage nor infiltration (groundwater flow = 0 mm/d) or induced bank filtration (5, 10 mm/d, grey background). Different dots indicate different combinations of CO_2 and P concentrations in groundwater.

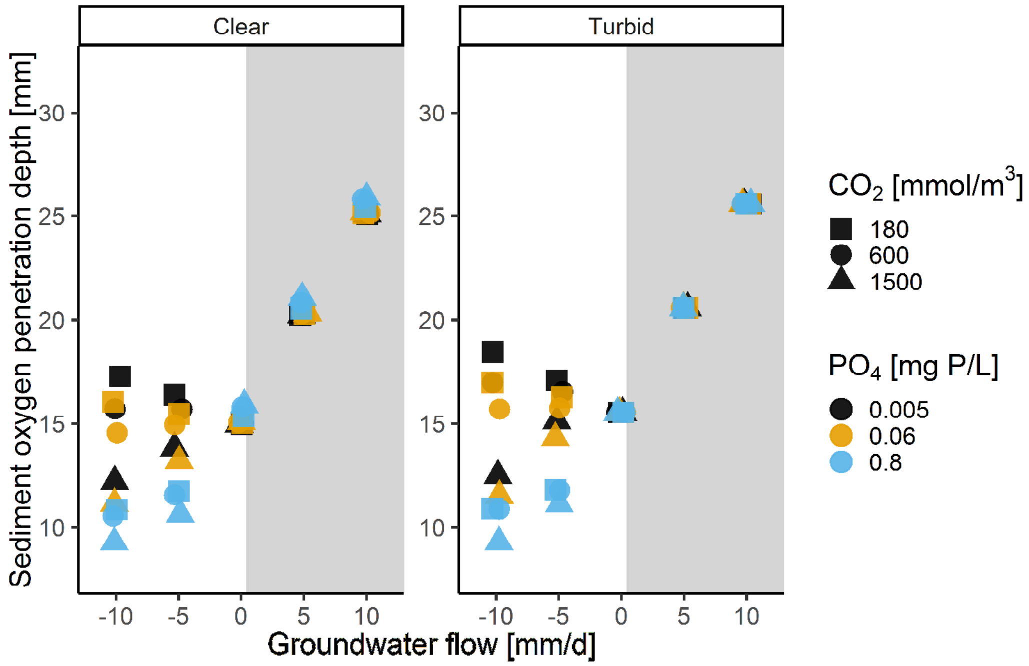
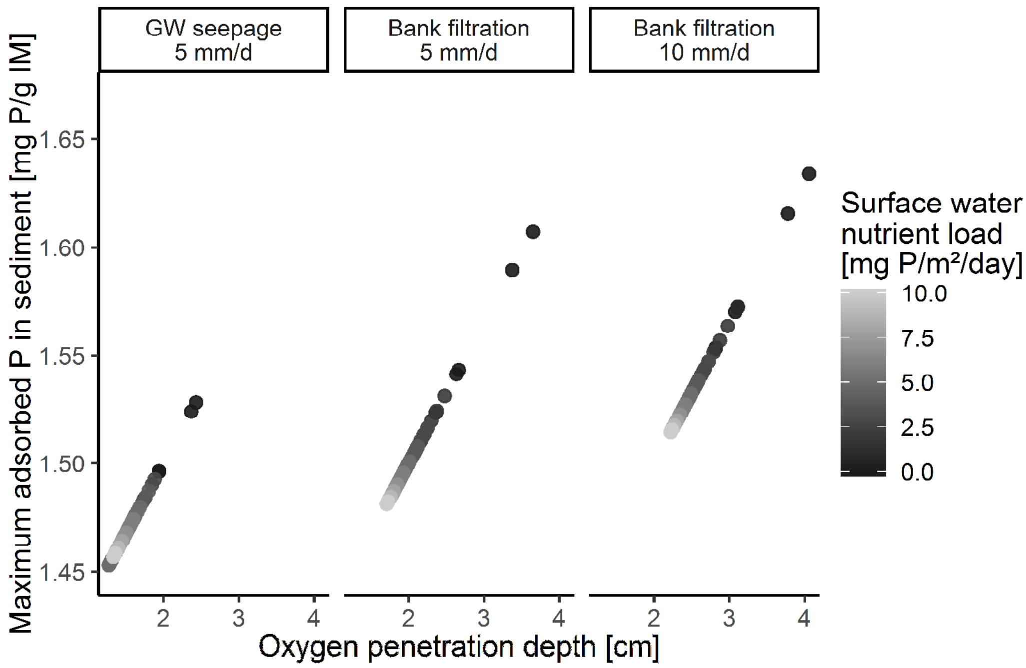


Figure A.11. Correlation between oxygen penetration depth and maximum adsorbed phosphorus (P) to inorganic matter (IM) in sediment in groundwater (GW) seepage and two bank filtration scenarios and with varying surface water nutrient load.



Appendix B: PCLake state values, parameter values and equations
Some of the values were varied between runs, they have been named "var". Those values can be found in the manuscript

<states>

name	unit	turbid state val	clear state valu	description
sDepthW	m	var	var	Depth_of_lake_water
sNH4W	gN/m3	0,100000001	0,0781417	N_in_NH4_in_lake_water
sNO3W	gN/m3	0,100000001	0,139291	N_in_NO3_in_lake_water
sPO4W	gP/m3	0,01	0,0668054	P_in_PO4_in_lake_water
sPAIMW	gP/m3	0	0,000238167	P_adsorbed_onto_IM_in_lake_water
sSiO2W	gSi/m3	3	3,72024	Dissolved_Si_in_lake_water
_sO2W_	gO2/m3	10	12,9174	Oxygen_in_lake_water
sDDetW	gDW/m3	2	3,16455	Detritus_DW_in_lake_water
sNDetW	gN/m3	0,050000001	0,0596219	Detritus_N_in_lake_water
sPDetW	gP/m3	0,005	0,00878401	Detritus_P_in_lake_water
sSiDetW	gSi/m3	0,02	0,147208	Detritus_Si_in_lake_water
sDIMW	gDIM/m3	5	3,84865	Inorganic_matter_in_lake_water
sDDiatW	gDW/m3	0,5	0,414496	Diatoms_DW_in_lake_water
sNDiatW	gN/m3	0,050000001	0,0175416	Diatoms_N_in_lake_water
sPDiatW	gP/m3	0,005	0,00183624	Diatoms_P_in_lake_water
sDGrenW	gDW/m3	0,5	0,0113223	Green_algae_DW_in_lake_water
sNGrenW	gN/m3	0,050000001	0,000875793	Green_algae_N_in_lake_water
sPGrenW	gP/m3	0,005	0,000127791	Green_algae_P_in_lake_water
sDBlueW	gDW/m3	3	0,0280964	Blue-greens_DW_in_lake_water
sNBlueW	gN/m3	0,300000004	0,00356158	Blue-greens_N_in_lake_water
sPBlueW	gP/m3	0,029999999	0,000663414	Blue-greens_P_in_lake_water
sDZoo	gDW/m3	0,050000001	0,199642	Zooplankton_DW_in_lake_water
sNZoo	gN/m3	0,0035	0,00989778	Zooplankton_N_in_lake_water
sPZoo	gP/m3	0,0005	0,00137144	Zooplankton_P_in_lake_water
sDFiAd	gDW/m2	2	2,88693	Adult_fish_DW_in_lake_water
sDFiJv	gDW/m2	0,5	0,353491	Young_fish_DW_in_lake_water
sNFiAd	gN/m2	0,200000003	0,295867	Adult_fish_N_in_lake_water
sNFiJv	gN/m2	0,050000001	0,0358126	Young_fish_N_in_lake_water
sPFiAd	gP/m2	0,044	0,0565285	Adult_fish_P_in_lake_water
sPFiJv	gP/m2	0,011	0,00740722	Young_fish_P_in_lake_water
sDPisc	gDW/m2	0,01	0,0755329	Predatory_fish_DW_in_lake_water
sNH4S	gN/m2	0,02	0,0378029	N_in_NH4_in_lake_sediment_pore_water
sNO3S	gN/m2	0,002	0,0255708	N_in_NO3_in_lake_sediment_pore_water
sPO4S	gP/m2	0,181702837	0,0199575	P_in_PO4_in_lake_sediment_pore_water
sPAIMS	gP/m2	17,98859821	2,02023	P_adsorbed_onto_IM_in_lake_sediment
sDDetS	gDW/m2	181,7030072	474,522	Detritus_DW_in_lake_sediment
sNDetS	gN/m2	4,542575248	6,05322	Detritus_N_in_lake_sediment
sPDetS	gP/m2	0,454257508	0,997002	Detritus_P_in_lake_sediment
sSiDetS	gSi/m2	1,817030032	14,4451	Detritus_Si_in_lake_sediment
sDHumS	gDW/m2	3452,357083	3719,32	Humus_DW_in_lake_sediment
sNHumS	gN/m2	172,6178567	166,104	Humus_N_in_lake_sediment
sPHumS	gP/m2	17,26178503	16,9661	Humus_P_in_lake_sediment
sDIMS	gDIM/m2	32706,54027	31706,9	Inorganic_matter_in_lake_sediment
sDDiatS	gDW/m2	0,001	0,204502	Diatoms_DW_on_lake_sediment
sNDiatS	gN/m2	0,0001	0,00914177	Diatoms_N_on_lake_sediment
sPDiatS	gP/m2	1E-05	0,000933588	Diatoms_P_on_lake_sediment
sDGrenS	gDW/m2	0,001	0,00308052	Green_algae_DW_on_lake_sediment
sNGrenS	gN/m2	0,0001	0,000245786	Green_algae_N_on_lake_sediment
sPGrenS	gP/m2	1E-05	3,54802E-05	Green_algae_P_on_lake_sediment
sDBlueS	gDW/m2	0,001	0,00148975	Blue-greens_DW_on_lake_sediment
sNBlueS	gN/m2	0,0001	0,000188868	Blue-greens_N_on_lake_sediment
sPBlueS	gP/m2	1E-05	3,52081E-05	Blue-greens_P_on_lake_sediment
sDVeg	gDW/m2	1	21,2055	Vegetation_DW_in_lake_water
sNVeg	gN/m2	0,02	0,740716	Vegetation_N_in_lake_water
sPVeg	gP/m2	0,002	0,074054	Vegetation_P_in_lake_water
sDBent	gDW/m2	1	2,4032	Zoobenthos_DW_in_lake_sediment
sNBent	gN/m2	0,07	0,108189	Zoobenthos_N_in_lake_sediment
sPBent	gP/m2	0,01	0,0178026	Zoobenthos_P_in_lake_sediment
sDepthWM	m	0,5	0,5	Depth_of_marsh_water
sNH4WM	gN/m3	0,100000001	0,1	N_in_NH4_in_marsh_water
sNO3WM	gN/m3	0,100000001	0,1	N_in_NO3_in_marsh_water
sPO4WM	gP/m3	0,01	0,01	P_in_PO4_in_marsh_water

sPAIMWM	gP/m3	0	0	P_adsorbed_onto_IM_in_marsh_water
sSiO2WM	gSi/m3	3	3	Dissolved_Si_in_marsh_water
_sO2WM_	gO2/m3	10	10	Oxygen_in_marsh_water
sDDetWM	gDW/m3	2	2	Detritus_DW_in_marsh_water
sNDetWM	gN/m3	0,050000001	0,05	Detritus_N_in_marsh_water
sPDetWM	gP/m3	0,005	0,005	Detritus_P_in_marsh_water
sSiDetWM	gSi/m3	0,02	0,02	Detritus_Si_in_marsh_water
sDIMWM	gDIM/m3	5	3,84865	Inorganic_matter_in_marsh_water
sDDiatWM	gDW/m3	0,5	0,5	Diatoms_DW_in_marsh_water
sNDiatWM	gN/m3	0,050000001	0,05	Diatoms_N_in_marsh_water
sPDiatWM	gP/m3	0,005	0,005	Diatoms_P_in_marsh_water
sDGrenWM	gDW/m3	0,5	0,5	Green_algae_DW_in_marsh_water
sNGrenWM	gN/m3	0,050000001	0,05	Green_algae_N_in_marsh_water
sPGrenWM	gP/m3	0,005	0,005	Green_algae_P_in_marsh_water
sDBlueWM	gDW/m3	3	3	Blue-greens_DW_in_marsh_water
sNBlueWM	gN/m3	0,300000004	0,3	Blue-greens_N_in_marsh_water
sPBlueWM	gP/m3	0,029999999	0,03	Blue-greens_P_in_marsh_water
sDZooM	gDW/m3	0,050000001	0,05	Zooplankton_DW_in_marsh_water
sNZooM	gN/m3	0,0035	0,0035	Zooplankton_N_in_marsh_water
sPZooM	gP/m3	0,0005	0,0005	Zooplankton_P_in_marsh_water
sNH4SM	gN/m2	1	1	N_in_NH4_in_marsh_sediment_pore_water
sNO3SM	gN/m2	0,01	0,01	N_in_NO3_in_marsh_sediment_pore_water
sPO4SM	gP/m2	0,181702837	0,181703	P_in_PO4_in_marsh_sediment_pore_water
sPAIMSM	gP/m2	17,98859821	17,9886	P_adsorbed_onto_IM_in_marsh_sediment
sDDetSM	gDW/m2	181,7030072	181,703	Detritus_DW_in_marsh_sediment
sNDetSM	gN/m2	4,542575248	4,54258	Detritus_N_in_marsh_sediment
sPDetSM	gP/m2	0,454257508	0,454258	Detritus_P_in_marsh_sediment
sSiDetSM	gSi/m2	1,817030032	1,81703	Detritus_Si_in_marsh_sediment
sDHumSM	gDW/m2	3452,357083	3452,36	Humus_DW_in_marsh_sediment
sNHumSM	gN/m2	172,6178567	172,618	Humus_N_in_marsh_sediment
sPHumSM	gP/m2	17,26178503	17,2618	Humus_Pin_marsh_sediment
sDIMSM	gDIM/m2	32706,54027	32706,5	Inorganic_matter_in_marsh_sediment
sDRootPhra	gDW/m2	5000	5000	Root_biomass_DW_in_marsh_sediment
sDShootPhra	gDW/m2	1000	1000	Shoot_biomass_DW_in_marsh_water
sNRootPhra	gN/m2	99,99999776	100	Root_biomass_N_in_marsh_sediment
sNShootPhra	gN/m2	19,99999955	20	Shoot_biomass_N_in_marsh_water
sPRootPhra	gP/m2	10,00000048	10	Root_biomass_P_in_marsh_sediment
sPShootPhra	gP/m2	2,000000095	2	Shoot_biomass_P_in_marsh_water
sDExtTotT	gDW/m2	36367,21336	44412,5	Total_amount_of_DW_moved_into_or_out_from_the_system
sNExtTotT	gN/m2	178,830732	233,735	Total_amount_of_N_moved_into_or_out_from_the_system
sPExtTotT	gP/m2	36,06459358	29,9042	Total_amount_of_P_moved_into_or_out_from_the_system
sSiExtTotT	gSi/m2	8,007180153	23,0079	Total_amount_of_Si_moved_into_or_out_from_the_system

<parameters>

name	unit	value	description
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ConstDepth	-	1	If_T_water_depth_kept_constant_by_daily_dredging
InclTran	-	1	transport_processes
InclPhytS	-	1	Include_phytoplankton_module
InclBed	-	1	Include_vegetation_module
InclWeb	-	1	Include_food_web_module
InclMarsh	-	0	Include_marsh_zone
InclSeason	-	1	Include_season
ReadTemp	-	0	If_TRUE_use_measured_time-series_of_water_temperature_otherwise_sinus
ReadLOut	-	0	If_TRUE_use_measured_time-series_of_light_otherwise_sinus
ReadVWind	-	0	If_TRUE_use_measured_time-series_of_wind_otherwise_constant
ReadQIn	-	0	If_TRUE_use_measured_time-series_of_inflow_otherwise_constant
ReadQOut	-	0	If_TRUE_use_measured_time-series_of_inflow_otherwise_constant
ReadQEv	-	0	If_TRUE_use_measured_time-series_of_evaporation_otherwise_constant
ReadPLoad	-	0	If_TRUE_use_measured_time-series_of_P_loading_otherwise_constant
ReadNLoad	-	0	If_TRUE_use_measured_time-series_of_N_loading_otherwise_constant
ReadNutFrac	-	0	If_TRUE_use_measured_time-series_of_loading_with_diff_nutrient_fractions
ReadPLoadPhyt	-	0	If_TRUE_use_measured_time-series_of_P_loading_algal_input_otherwise_constant
ReadDLoadDet	-	0	If_TRUE_use_measured_time-series_of_DDet_loading_otherwise_constant
ReadDLoadIM	-	0	If_TRUE_use_measured_time-series_of_DIM_loading_otherwise_constant
UseSeasonLoad	-	0	If_TRUE_use_different_inflow_and_loading_for_summer_and_winter_periods
UsePulseLoad	-	0	If_TRUE_use_a_pulse-wise_nutrient_loading

mTemp	oC		0	measured_time-series_of_water_temperature
mLOut	W/m2		0	measured_time-series_of_light
mVWind	m/s		0	measured_time-series_of_wind
mQIn	mm/day		0	use_measured_time-series_of_inflow
mQOut	mm/day		0	use_measured_time-series_of_outflow
mQEv	mm/day		0	use_measured_time-series_of_evaporation
mPLoad	gP/m2/day		0	use_measured_time-series_of_P_loading
mPLoadPO4	gP/m2/day		0	use_measured_time-series_of_PO4_loading
mPLoadOrg	gP/m2/day		0	use_measured_time-series_of_loading_P_bound_to_org_matter
mPLoadPhytTot	gP/m2/day		0	use_measured_time-series_of_P_loading_algal_input
mNLoad	gN/m2/day		0	use_measured_time-series_of_N_loading
mNLoadNH4	gN/m2/day		0	use_measured_time-series_of_NH4_loading
mNLoadNO3	gN/m2/day		0	use_measured_time-series_of_NO3_loading
mNLoadOrg	gN/m2/day		0	use_measured_time-series_of_loading_N_bound_to_org_matter
mDLoadDet	gDW/m2/day		0	use_measured_time-series_of_Detritus_loading
mDLoadIM	gDW/m2/day		0	use_measured_time-series_of_loading_of_DW_of_inorg_matter
BeginTime	day		0	begintime
EndTime	day		365	(=1_year)
YearZero	-		0	Note_also__Day_no_1_=_1_Jan_of_this_year
cFetch	m	var		wind_fetch
fMarsh	m2_marsh/m2_lak		0	relative_marsh_area
fLutum	-		0,1	lutum_content_of_inorg_matter
fFeDIM	gFe/gDW		0,01	Fe_content_of_inorg_matter
fAlDIM	gAl/gDW		0,01	Al_content_of_inorg_matter
cTmAve	oC		12	average_water_temperature
cTmGround	oC		10	groundwater_temperature
cTmVar	oC		10	annual_water_temperature_variation
cTimeLag	day		40	time_lag_for_temperature
cVWind	m/s		5	average_wind_speed
cTmVarInfMin	oC		5	annual_water_temperature_variation_minimum_used_for_infiltration
cQInfTmL	mm/day		-20	lower_boundary_for_infiltration_affecting_temperature_variation
cQInfTmU	mm/day		0	upper_boundary_for_infiltration_affecting_temperature_variation
cQInfCO2U	mm/day		0	upper_boundary_for_infiltration_affecting_CO2
cQInf	mm/day	var		infiltration_rate
cPBackLoad	gP/m2/d		0	Background_P_loading
cNBackLoad	gP/m2/d		0	Background_N_loading
cLDayAve	J/m2/day		10000000	annual_average_radiation
cLDayVar	J/m2/day		8000000	annual_variation_in_radiation
cfDayAve	-		0,5	average_day_length
cfDayVar	-		0,2	annual_variation_in_day_length
fRefl	-		0,2	the_fraction_photosynthetically_active_radiation_reflected_at_the_surface
cExtWat	m-1		0,5	background_extinction
cDredInterval	y		9999000	dredging_interval
cDredStart	y		9999000	first_dredging_year_(should_be_n_times__cDredInterval_)
cDepthRef	m		1,00E-28	reference_water_depth_for_dredging
cLengDred	day		10	length_of_dredging_period
fEffDred	-		0,95	dredging_efficiency_(<10)
fEffDredBent	-		0,5	dredging_efficiency_for_zoobenthos_(<10)
fPAR	-		0,48	fraction_photosynthetically_active_radiation_(PAR)
cExtSpDet	m2/gDW		0,15	specific_extinction_detritus
cExtSpIM	m2/gDW		0,05	specific_extinction_inert_matter
fDTotS0	g_solid/g_sedimer		0,3	initial_dry-weight_fraction_in_sediment
fDOrgS0	g/g		0,1	initial_organic_fraction_of_sediment_DW
fDDetS0	g/g		0,05	initial_detritus_fraction_of_sediment_organic_matter
fSedPhyt0	g/g		0,01	Fraction_diatoms_DW_on_lake_sediment
fPInorgS0	gP/gDW		0,0005	initial_inorg_P_fraction_in_sed
fPAdsS0	-		0,99	initial_adsorbed_fraction_of_inorg_P_in_sed
cPDDet0	gP/gDW_Detritus		0,0025	initial_P_fraction_in_detritus
cNDDet0	gN/gDW_Detritus		0,025	initial_N_fraction_in_detritus
cSiDDet0	gSi/gDW_Detritus		0,01	initial_Si_fraction_in_detritus_Tentative
cPDHum0	gP/gDW_Detritus		0,005	initial_P_fraction_in_humus
cNDHum0	gN/gDW_Detritus		0,05	initial_N_fraction_in_humus
cPDPhyt0	gP/gDW		0,01	initial_P_fraction_in_algae
cNDPhyt0	gN/gDW		0,1	initial_N_fraction_in_algae
cPDDiat0	gP/gDW		0,01	initial_P_fraction_in_diatoms
cNDDiat0	gN/gDW		0,1	initial_N_fraction_in_diatoms
cPDGren0	gP/gDW		0,01	initial_P_fraction_in_green_algae

cNDGren0	gN/gDW	0,1	initial_N_fraction_in_green_algae
cPDBlue0	gP/gDW	0,01	initial_P_fraction_in_blue-green_algae
cNDBlue0	gN/gDW	0,1	initial_N_fraction_in_blue-green_algae
cPDVeg0	gP/gDW	0,002	initial_P_fraction_in_veg
cNDVeg0	gN/gDW	0,02	initial_N_fraction_in_veg
cSiDDiat	mgSi/mgDW	0,15	Si/DW_ratio_of_daitoms
cPDZooRef	mgP/mgDW	0,01	reference_P/C-ratio_herb_zooplankton
cNDZooRef	mgN/mgDW	0,07	reference_N/C-ratio_herb_zooplankton
cPDBentRef	mgP/mgDW	0,01	reference_P/C_ratio_of_zoobenthos
cNDBentRef	mgN/mgDW	0,07	reference_N/C_ratio_of_zoobenthos
cPDFishRef	mgP/mgDW	0,022	reference_P/C_ratio_of_Fish
cNDFishRef	mgN/mgDW	0,1	reference_N/C_ratio_of_Fish
cPDPisc	mgP/mgDW	0,022	reference_P/C_ratio_of__Pi_sc
cNDPisc	mgN/mgDW	0,1	reference_N/C_ratio_of__Pi_sc
cQIn	mm/day	20	standard_water_inflow_if_not_measured
cQInSum	mm/day	20	summer_water_inflow_if_not_measured
cQInWin	mm/day	20	winter_water_inflow_if_not_measured
cDepthWMax	m	5	maximum_water_depth
cQInExtraApril1	mm/day	0	extra_inflow_at_start_of_summer
cQInExtraOct1	mm/day	0	extra_inflow_at_start_of_winter
cQOutExtraApril1	mm/day	0	extra_outflow_at_start_of_summer
cQOutExtraOct1	mm/day	0	extra_outflow_at_start_of_winter
cQEvAve	mm/day	1,5	standard_average_evaporation
cQEvVar	mm/day	1,3	standard_variation_in_evaporation
cPLoad	gP/m2/day	var	standard_P_loading_if_not_measured
cPLoadSum	gP/m2/day	0,005	summer_P_loading_if_not_measured
cPLoadWin	gP/m2/day	0,005	winter_P_loading_if_not_measured
fPO4In	-	0,5	fraction_PO4_in_input_(if_PO4_input_not_measured)
fPhytInWin	-	0,02	minimum_algal_fraction_in_organic_P_input
fPhytInSum	-	0,1	maximum_algal_fraction_in_organic_P_input
fDiatPhytIn	-	0,33	diatoms_fraction_of_algal_input
fGrenPhytIn	-	0,34	greens_fraction_of_algal_input
fBluePhytIn	-	0,33	blue-greens_fraction_of_algal_input
cNLoad	gN/m2/day	var	standard_N_loading
cNLoadSum	gN/m2/day	0,05	summer_N_loading
cNLoadWin	gN/m2/day	0,05	winter_N_loading
cNPLoadMeas	gN/gP	7	N/P_loading_if_P_is_measured_and_N_not
cNPPhytIn	gP/gDW	7	N/P_ratio_of_algal_input
cNPDetIn	gP/gDW	7	N/P_ratio_of_detrital_input
fNH4DissIn	-	0,5	NH4_fraction_of_dissolved_N_load_(if_NH4_not_measured)
cNDPhytIn	gN/gDW	0,07	N/day_ratio_of_algal_input
cNDDetIn	gN/gDW	0,07	N/P_ratio_of_detrital_input
cDIMIn	mgDW/l	5	IM_conc_in_inflow
_cO2In_	mgO2/l	5	O2_conc_in_inflow
cSiO2In	mgSi/l	3	SiO2_conc_in_inflow
cSiDDetIn	gSi/gDW	0,05	Si_content_of_sediment_detritus
cDZooIn	mgDW/l	0,1	zoopl_conc_in_inflowing_water
cDayApril1	day	91	April_1
cDayOct1	day	273	October_1
cLengChange	day	10	length_of_season_change
cNLoadS	gN/m2/day	0	N_fertilizer_to_sediment
fNH4LoadS	-	0,5	NH4_fraction_of_N_fertilizer_to_sediment
cDErosTot	g/m2/day	0,1	Erosion_input_(tentative)
fSedErosIM	-	0,95	instantly_sedimentating_fraction_of_IM
fDOrgSoil	-	0,1	fraction_soil_organic_matter
cPDSoilOM	gP/gDW	0,001	P/day_ratio_of_soil_organic_matter
cNDSoilOM	gN/gDW	0,01	N/day_ratio_of_soil_organic_matter
cPO4Ground	mgP/l	var	PO4_cone_in_groundwater
cNH4Ground	mgN/l	var	NH4_cone_in_groundwater
cNO3Ground	mgN/l	var	NO3_cone_in_groundwater
cCO2Ground	mmol/m3	var	CO2_conc_in_groundwater
cCO2MuMaxU	mmol/m3	600	Upper_boundary_for_CO2_conc_in_water_that_affects_MuMaxVeg_
cCO2W	mmol/m3	150	CO2_conc_in_surface_water
cCO2Norm	-	1,145	Constant_to_normalize_max_growth_rate_at_certain_CO2_level
cBMuMaxVeg	-	0,0013044	Constant_b_before_x_in_linear_equation_to_set_uMuMaxVeg_multiplier
cMMuMaxVeg	-	0,94940714	Constant_m_in_linear_equation_to_set_uMuMaxVeg_multiplier
cDepthS	m	0,1	sediment_depth

cCPerDW	gC/gDW	0,4	C_content_of_organic_matter
cRhoIM	g/m3_solid	2500000	density_of_sediment_IM
cRhoOM	g/m3	1400000	density_of_sediment_detritus
cTmRef	oC	20	reference_temperature
cAerRoot	-	0,727	coefficient_for_VWind^05
cAerLin	s/day	-0,371	coefficient_for_VWind_(is_negative)
cAerSquare	-	0,0376	coefficient_for_VWind^2
cThetaAer	1/e^oC	1,024	Temperature_coeff_for_reaeration_(Downing_&_Truesdale_1955)
cVSetIM	m/day	1	max_sedimentation_velocity_of_inert_org_matter_(10)
cVSetDet	m/day	0,25	max_sedimentation_velocity_of_detritus
cThetaSet	1/e^oC	1,01	temp_parameter_of_sedimentation
cSuspMin	-	6,1	minimum_value_of_logistic_empirical_suspended_matter_function
cSuspMax	-	25,2	maximum_value_of_logistic_empirical_suspended_matter_function
cSuspSlope	-	2,1	slope_of_logistic_empirical_suspended_matter_function
hDepthSusp	-	2	half_sat_value_of_depth_in_logistic_empirical_suspended_matter_function
cFetchRef	m	1000	reference_fetch
fLutumRef	-	0,2	reference_lutum_fraction_(of_sandy_clay_soils)
cSuspRef	-	0,5	reference_supsended_matter_function
kVegResus	m2/gDW	0,01	rel_resuspension_reduction_per_g_vegetation
kTurbFish	g/g_fish/day	1	relative_resuspension_by_adult_fish_browsing
kResusPhytMax	day-1	0,25	max_phytopl_resuspension
cResusPhytExp	(gDW/m2/day)-1	-0,379	exp_par_for_phytopl_resuspension
cThetaMinW	-	1,07	expon_temp_constant_of_mineralization_in_water
kDMinDetW	day-1	0,01	decomposition_constant_of_detritus
hO2BOD	mgO2/l	1	half-sat_oxygen_conc_for_BOD
O2PerNO3	-	1,5	mol_O2_formed_per_mol_NO3-_ammonified
cThetaMinS	-	1,07	expon_temp_constant_of_sediment_mineralization
kDMinDetS	day-1	0,002	decomposition_constant_of_sediment_detritus
fRefrDetS	-	0,15	refractory_fraction_of_sed_detritus
hNO3Denit	mgN/l	2	quadratic_half-sat_NO3_conc_for_denitrification
NO3PerC	-	0,8	mol_NO3_denitrified_per_mol_C_mineralised
kDMinHum	day-1	0,00001	maximum_decomposition_constant_of_humic_material_(1D-5)
kNitrW	day-1	0,1	nitrification_rate_constant_in_water
kNitrS	day-1	1	nitrification_rate_constant_in_sediment
cThetaNitr	1/eoC	1,08	temperature_coefficient_of_nitrification
O2PerNH4	-	2	mol_O2_used_per_mol_NH4+_nitrified
hO2Nitr	mgO2/l	2	half-sat_O2_conc_for_nitrification_in_water
kPDifPO4	m2/day	0,000072	mol_PO4_diffusion_constant
kNDifNO3	m2/day	0,000086	mol_NO3_diffusion_constant
kNDifNH4	m2/day	0,000112	mol_NH4_diffusion_constant
kO2Dif	m2/day	0,000026	mol_O2_diffusion_constant
cThetaDif	1/eoC	1,02	Temperature_coefficient_for_diffusion
fDepthDifS	-	0,5	nutrient_diffusion_distance_as_fraction_of_sediment_depth
cTurbDifNut	-	5	bioturbation_factor_for_diffusion
cTurbDifO2	-	5	bioturbation_factor_for_diffusion
kPSorp	day-1	0,05	P_sorption_rate_constant_not_too_high_->_model_speed
cRelPAdsD	gP/gDW	0,00003	max_P_adsorption_per_g_DW
cRelPAdsFe	gP/gFe	0,065	max_P_adsorption_per_g_Fe
cRelPAdsAl	gP/gAl	0,134	max_P_adsorption_per_g_Al
cKPAdsOx	m3/gP	0,6	P_adsorption_affinity_at_oxidized_conditions
fRedMax	-	0,9	max_reduction_factor_of_P_adsorption_affinity
coPO4Max	mgP/l	1	max_SRP_conc_in_pore_water
kPChemPO4	day-1	0,03	chem_PO4_loss_rate
cDayManVeg1	day	-9999000	first_mowing_day_(default_non-existent)
cDayManVeg2	day	-9999000	second_mowing_day_(Note_259_=_16_Sep)
fManVeg	-	0	Fraction_removed_by_management__for_submerged_plants
cLengMan	day	10	length_of_mowing_period
cYearStartBirds	y	0	first_year_of_birds_presence
cDayStartBirds	day	46	yearly_first_day_of_birds_presence
cDayEndBirds	day	288	yearly_last_day_of_birds_presence
cBirdsPerha	n/ha	0	number_of_birds_per_ha_vegetated_lake_(Default_=_0)
cDGrazPerBird	gDW/coot/day	45	daily_grazing_of_birds
hDVegBird	gDW/m2	5	half-sat_vegetation_biomassfor_birds_grazing
fDAssBird	-	0,5	birds_assim_efficiency
fDissEgesBird	-	0,25	fraction_dissolved_nutrient_of_coot_egestion
fDissMortVeg	-	0,25	fraction_dissolved_nutrients_from_died_plants
cLengAllo	day	15	duration_of_allocation_and_reallocation_phase

cLengMort	day	15	duration_of_autumn_mortality_period
UseEmpUpt	-	0	false_=_do_not_use_this_empirical_relation
fSedUptVegMax	-	0,998	maximum_sediment_fraction_of_nutrient_uptake
fSedUptVegCoef	-	2,66	sigm_regr_coeff_for_sediment_fraction_of_nutrient_uptake
fSedUptVegExp	-	-0,83	exponent_in_sigm_regr_for_sediment_fraction_of_nutrient_uptake
fRootVegSum	g_root_/_g_veg	0,1	root_fraction_outside_growing_season
fRootVegWin	g_root_/_g_veg	0,6	root_fraction_outside_growing_season
fFloatVeg	g_floating_/_g_sh	0	floating_fraction_of_shoot
fEmergVeg	g_floating_/_g_sh	0	emergent_fraction_of_shoot
fDepth1Veg	-	0	max_upper_depth_of_submerged_veget_layer_as_fraction_of_water_depth
fDepth2Veg	-	1	max_lower_depth_of_submerged_veget_layer_as_fraction_of_water_depth
cDLayerVeg	gDW/m2	0	biomass_of_a_single_layer_floating_leaves
cCovSpVeg	%_cover/gDW/m2	0,5	specific_cover
kMigrVeg	day-1	0,001	vegetation_migration_rate
cDVegIn	gDW/m2	1	external_vegetation_density
cTmInitVeg	oC	9	temperature_for_initial_growth
cDCarrVeg	gDW/m2	400	max_vegetation_standing_crop
cMuMaxVeg	g/g_shoot/day	0,2	maximum_growth_rate_of_vegetation_at_20oC
cMultiMuMaxVegU	-	1,51	upper_boundary_MuMaxVeg_multiplier
cQ10ProdVeg	-	1,2	temperature_quotient_of_production
hLRefVeg	W/m2_PAR	17	half-sat_light_at_20_oC
cExtSpVeg	m2/gDW	0,01	specific_extinction
kDRespVeg	day-1	0,02	dark_respiration_rate_of_vegetation
cQ10RespVeg	-	2	temperature_quotient_of_respiration
kMortVegSum	day-1	0,005	vegetation_mortality_rate_in_Spring_and_Summer_(low)
fWinVeg	-	0,3	fraction_surviving_in_winter
cDayWinVeg	day	259	end_of_growing_season_=_16_Sep
fDetWMortVeg	-	0,1	fraction_of_shoot_mortality_becoming_water_detritus
cPrefVegBird	-	1	edibility_for_birds
cVPUptMaxVeg	mgP/mgDW/day	0,01	maximum_P_uptake_capacity_of_vegetation
cAffPUptVeg	l/mgDW/day	0,2	initial_P_uptake_affinity_vegetation
cPDVegMin	mgP/mg	0,0008	minimum_P/day_ratio_vegetation
cPDVegMax	mgP/mgDW	0,0035	maximum_P/day_ratio_vegetation
cVNUptMaxVeg	mgN/mgDW/day	0,1	maximum_N_uptake_capacity_of_vegetation
cAffNUptVeg	l/mgDW/day	0,2	initial_N_uptake_affinity_vegetation
cNDVegMin	mgN/mgDW	0,01	minimum_N/day_ratio_vegetation
cNDVegMax	mgN/mgDW	0,035	maximum_N/day_ratio_vegetation
cPACoefMin	-	1,5	minimum_Poole-Atkins_coefficient
cPACoefMax	-	2,5	maximum_Poole-Atkins_coefficient
hPACoef	g/m2	3	decrease_constant_for_PA_coeff_with_DOMW
cSecchiPlus	m	0	maximum_Secchi_depth_above_water_depth
cEuph	-	1,7	conversion_constant_Secchi_depth_->_euphotic_depth
cCovSpPhyt	%/gDW/m2	2	specific_coverage_Tentative
cTmOptLoss	oC	25	optimum_temp_for_grazing
cSigTmLoss	oC	13	temperature_constant_of_grazing(sigma_in_Gaussian_curve)
fDissMortPhyt	-	0,2	soluble_nutrient_fraction_of_died_Algae
fDissLoss	-	0,25	dissolved_nutrient_fraction_of_grazing_loss
cMuMaxDiat	day-1	2	maximum_growth_rate_Diatoms
cTmOptDiat	oC	18	optimum_temp_diatoms
cSigTmDiat	oC	20	temperature_constant_diatoms(sigma_in_Gaussian_curve)
cExtSpDiat	m2/gDW	0,25	specific_extinction_Diatoms
UseSteeleDiat	-	1	Flag_1_=_use_Steele_function0_=_use_Lehman_function
cLOptRefDiat	W/m2	54	optimum_PAR_for_Diatoms_at_20_oC(Steele_function)
hLRefDiat	W/m2	1000	half-sat_PAR_at_20_oC(Lehmann_function)_Fake_value
cChDDiatMin	mgChl/mgDW	0,004	min_chlorophyll/C_ratio_Diatoms
cChDDiatMax	mgChl/mgDW	0,012	max_chlorophyll/C_ratio_Diatoms
kDRespDiat	day-1	0,1	maintenance_respiration_constant_diatoms(=_005_*_MuMax)
kLossDiat	-	0,25	grazing_loss_rate_for_Diatoms
kMortDiatW	day-1	0,01	mortality_constant_of_Diatoms_in_water
kMortDiatS	day-1	0,05	mortality_constant_of_sed_Diatoms
cVSetDiat	m/day	0,5	sedimentation_velocity_Diatoms
cVPUptMaxDiat	mgP/mgDW/day	0,01	maximum_P_uptake_capacity_of_Diatoms
cAffPUptDiat	l/mgDW/day	0,2	initial_P_uptake_affinity_Diatoms
cPDDiatMin	mgP/mgDW	0,0005	minimum_P/day_ratio_Diatoms
cPDDiatMax	mgP/mgDW	0,005	max_P/day_ratio_Diatoms
cVNUptMaxDiat	mgN/mgDW/day	0,07	maximum_N_uptake_capacity_of_Diatoms
cAffNUptDiat	l/mgDW/day	0,2	initial_N_uptake_affinity_Diatoms

cNDDiatMin	mgN/mgDW	0,01	minimum_N/day_ratio_Diatoms
cNDDiatMax	mgN/mgDW	0,05	max_N/day_ratio_Diatoms
hSiAssDiat	mgSi/l	0,09	half_sat_Si_for_diatoms
cMuMaxGren	day-1	1,5	maximum_growth_rate_greens
cTmOptGren	oC	25	optimum_temp_of_greens
cSigTmGren	oC	15	temperature_constant_greens(sigma_in_Gaussian_curve)
cExtSpGren	m2/gDW	0,25	specific_extinction_greens
UseSteeleGren	-	0	Flag_1_=_use_Steele_function0_=_use_Lehman_function
hLRefGren	W/m2	17	half-sat_PAR_for_green_algae_at_20_oC(Lehmann_function)
cLOptRefGren	W/m2	1000	optimum_PAR_at_20_oC(Steele_function)_Fake_value
cChDGrenMin	mgChl/mgDW	0,01	min_chlorophyll/C_ratio_greens
cChDGrenMax	mgChl/mgDW	0,02	max_chlorophyll/C_ratio_greens
kDRespGren	day-1	0,075	maintenance_respiration_constant_greens(=_005_*_MuMax)
kLossGren	-	0,25	grazing_loss_rate_for_greens
kMortGrenW	day-1	0,01	mortality_constant_of_Diatoms_in_water
kMortGrenS	day-1	0,05	mortality_constant_greens
cVSetGren	m/day	0,2	sedimentation_velocity_of_greens
cVPUptMaxGren	mgP/mgDW/day	0,01	maximum_P_uptake_capacity_of_greens
cAffPUptGren	l/mgDW/day	0,2	initial_P_uptake_affinity_greens
cPDGrenMin	mgP/mgDW	0,0015	minimum_P/day_ratio_greens
cPDGrenMax	mgP/mgDW	0,015	max_P/day_ratio_greens
cVNUptMaxGren	mgN/mgDW/day	0,07	maximum_N_uptake_capacity_of_greens
cAffNUptGren	l/mgDW/day	0,2	initial_N_uptake_affinity_greens
cNDGrenMin	mgN/mgDW	0,02	minimum_N/day_ratio_greens
cNDGrenMax	mgN/mgDW	0,1	max_N/day_ratio_greens
hSiAssGren	mgSi/l	0	half-sat_Si_conc_for_growth_of_green_algae_=_0
cMuMaxBlue	day-1	0,6	maximum_growth_rate_Bluegreens
cTmOptBlue	oC	25	optimum_temp_blue-greens
cSigTmBlue	oC	12	temperature_constant_blue-greens(sigma_in_Gaussian_curve)
cExtSpBlue	m2/gDW	0,35	specific_extinction_Bluegreens
UseSteeleBlue	-	1	Flag_1_=_use_Steele_function0_=_use_Lehman_function
cLOptRefBlue	W/m2	13,6	optimum_PAR_for_blue-greens_at_20_oC(Steele_function)
hLRefBlue	W/m2	1000	half-sat_PAR_at_20_oC(Lehmann_function)_Fake_value
cChDBlueMin	mgChl/mgDW	0,005	min_chlorophyll/C_ratio_Bluegreens
cChDBlueMax	mgChl/mgDW	0,015	max_chlorophyll/C_ratio_Bluegreens
cCyDBlueMin	mgChl/mgDW	0,004	min_c-phycocyanin/C_ratio_Bluegreens
cCyDBlueMax	mgChl/mgDW	0,06	max_c-phycocyanin/C_ratio_Bluegreens
kDRespBlue	day-1	0,03	maintenance_respiration_constant_blue-greens(=_005_*_MuMax)
kLossBlue	-	0,03	grazing_loss_rate_for_Blue-greens
kMortBlueW	day-1	0,01	mortality_constant_of_blue-greens_in_water
kMortBlueS	day-1	0,2	mortality_constant_Bluegreens
cVSetBlue	m/day	0,06	sedimentation_velocity_Blue-greens
cVPUptMaxBlue	mgP/mgDW/day	0,04	maximum_P_uptake_capacity_of_Bluegreens
cAffPUptBlue	l/mgDW/day	0,8	initial_P_uptake_affinity_Bluegreens
cPDBlueMin	mgP/mgDW	0,0025	minimum_P/day_ratio_Bluegreens
cPDBlueMax	mgP/mgDW	0,025	max_P/day_ratio_blue-greens
cVNUptMaxBlue	mgN/mgDW/day	0,07	maximum_N_uptake_capacity_of_Bluegreens
cAffNUptBlue	l/mgDW/day	0,2	initial_N_uptake_affinity_Bluegreens
cNDBlueMin	mgN/mgDW	0,03	minimum_N/day_ratio_Bluegreens
cNDBlueMax	mgN/mgDW	0,15	max_N/DW_ratio_blue-greens
hSiAssBlue	mgSi/l	0	half-sat_Si_conc_for_growth_of_blue-greens_=_0
cDBentIn	gDW/m2	0,01	external_zoobenthos_density
kMigrBent	day-1	0,001	zoobenthos_migration_rate
kMigrFish	day-1	0,001	fish_migration_rate
cDFiJvIn	gDW/m2	0,005	external_fish_density
cDFiAdIn	gDW/m2	0,005	external_fish_density
kHarvFishWin	day-1	0	fish_harvesting_fraction_in_winter
kHarvFishSum	day-1	0	fish_harvesting_fraction_in_summer
cDPiscIn	gDW/m2	0,001	external__Pi_sc_density
kMigrPisc	day-1	0,001	_Pi_sc_migration_rate
kHarvPiscWin	day-1	0	_Pi_sc_harvesting_fraction_in_winter
kHarvPiscSum	day-1	0	_Pi_sc_harvesting_fraction_in_summer
cFiltMax	ltr/mgDW/day	4,5	maximum_filtering_rate(when_DOMW=0)
hFilt	mgDW/l	1	half-sat_food_conc_for_filtering
cDCarrZoo	mg/l	25	carrying_capacity_of_zooplankton
cPrefDiat	-	0,75	selection_factor_for_Diatoms
cPrefGren	-	0,75	selection_factor_for_Greens

cPrefBlue	-	0,125	selection_factor_for_Bluegreens_Cal
cPrefDet	-	0,25	selection_factor_for_detritus
fDAssZoo	-	0,35	DW-assimilation_efficiency_of_herb_zooplankton
fDissEgesZoo	-	0,25	soluble_nutrient_fraction_of_by_herbzoopl_egested_food
kDRespZoo	day-1	0,15	maintenance_respiration_constant_herbzooplankton
kMortZoo	day-1	0,04	mortality_constant_herbzooplankton
fDissMortZoo	-	0,1	soluble_nutrient_fraction_of_died_zooplankton
cTmOptZoo	oC	25	optimum_temp_zooplankton
cSigTmZoo	oC	13	temperature_constant_zooplankton(sigma_in_Gaussian_curve)
cDCarrBent	gDW/m2	10	carrying_capacity_of_zoobenthos
kDAssBent	day-1	0,1	maximum_assimilation_rate
hDFoodBent	g/m2	200	half-saturating_food_for_zoobenthos
fDAssBent	-	0,3	C_ass_efficiency_of_zoobenthos
fDissEgesBent	-	0,25	soluble_nutrient_fraction_of_by_zoobenthos_egested_food
kDRespBent	day-1	0,005	maint_respiration_constant_of_zoobenthos
kMortBent	day-1	0,005	mortality_constant_of_zoobenthos
fDissMortBent	-	0,1	soluble_P_fraction_of_died_zoobenthos_P
cTmOptBent	oC	25	optimum_temp_of_zoobenthos
cSigTmBent	oC	16	temperature_constant_of_zoobenthos(sigma_in_Gaussian_curve)
fDBone	-	0,35	fraction_of_fish_C_fixed_in_bones_and_scales
fPBone	-	0,5	fraction_of_fish_P_fixed_in_bones_and_scales
cDCarrFish	gDW/m2	15	carrying_capacity_of_fish(=_100_gFW/m2Grimm_1983)
fDissEgesFish	-	0,25	soluble_nutrient_fraction_of_by_fish_egested_food
fDissMortFish	-	0,1	soluble_nutrient_fraction_of_died_fish(excl_bones_and_scales
cTmOptFish	oC	25	optimum_temp_of_fish
cSigTmFish	oC	10	temperature_constant_of_fish(sigma_in_Gaussian_curve)
cDayReprFish	-	120	reproduction_date_of_fish_=_1_May
fReprFish	-	0,02	yearly_reproduction_fraction_of_adult_fish
fAgeFish	-	0,5	yearly_ageing_fraction_of_young_fish
cRelVegFish	-	0,009	decrease_of_fish_feeding_per_%_vegetation_cover(max_001)
kDAssFiJv	day-1	0,12	maximum_assimilation_rate_of_young_fish
hDZooFiJv	g/m2	1,25	half-saturating_zooplankton_biomass_for_young_fish_predation
fDAssFiJv	-	0,4	C_assimilation_efficiency_of_young_fish
kDRespFiJv	day-1	0,01	maintenance_respiration_constant_of_young_fish
kMortFiJv	day-1	0,00137	specific_mortality_of_young_fish(=_01_y-1)
kDAssFiAd	day-1	0,06	maximum_assimilation_rate_of_adult_fish
hDBentFiAd	g/m2	2,5	half-saturating_zoobenthos_biomass_for_adult_fish_predation
fDAssFiAd	-	0,4	C_assimilation_efficiency_of_adult_fish
kDRespFiAd	day-1	0,004	maintenance_respiration_constant_of_adult_fish
kMortFiAd	day-1	0,00027	specific_mortality_of_adult_fish(=_01_y-1)
cDCarrPiscMax	gDW/m2	1,2	maximum_carrying_capacity_of__Pi_sc(=75_kg/ha)
cDCarrPiscMin	gDW/m2	0,1	minimum_carrying_capacity_of__Pi_sc(=6_kg/ha)
cDCarrPiscBare	gDW/m2	0,1	carrying_capacity_of__Pi_sc_for_lake_without_marsh_zone
cDPhraMinPisc	gDW/m2	50	min_reed_biomass_for__Pi_sc
cCovVegMin	%	40	min_submveg_coverage_for__Pi_sc
cRelPhraPisc	gDW/m2/%	0,075	rel__Pi_sc_density_per_%_reed_if_submveg_absent
cRelVegPisc	gDW/m2/%	0,03	extra_rel__Pi_sc_density_per_%_reed_if__aCovVeg__>__cCovVegMin
kDAssPisc	day-1	0,025	maximum_assimilation_rate
hDVegPisc	g/m2	5	half-sat_vegetation_biomass_for__Pi_sc_growth
hDFishPisc	g/m2	1	half-saturating_DFish_for__Pi_sc_predation
fDAssPisc	-	0,4	C_ass_efficiency_of__Pi_sc
fDissEgesPisc	-	0,25	soluble_P_fraction_of_by_fish_egested_food
kDRespPisc	day-1	0,005	maint_respiration_constant_of__Pi_sc
kMortPisc	day-1	0,00027	specific_mortality_of__Pi_sc_=_01_y-1
fDissMortPisc	-	0,1	soluble_nutrient_fraction_of_died__Pi_sc(excl_bones_and_scales
cTmOptPisc	oC	25	optimum_temp_of__Pi_sc
cSigTmPisc	oC	10	temperature_constant_of__Pi_sc(sigma_in_Gaussian_curve)
cDepthSM	m	0,1	sediment_depth
kExchMaxM	m3/m3_marshwat	1	maximum_dispersive_marsh_water_exchange_coefficient
hfMarsh	-	0,1	rel_marsh_area_where_exchange_is_50%
fDTotSM0	g_solid/g_sedimer	0,3	initial_dry-weight_fraction_in_sediment
fDOrgSM0	g_AFDW\g_solid	0,1	initial_organic_fraction_of_sed
fDDetSM0	g/g	0,05	initial_detritus_fraction_of_sediment_organic_matter
fPInorgSM0	gP/gDW	0,0005	initial_inorg_P_fraction_in_sed
cPDPhra0	gP/gDW	0,002	initial_P/day_ratio_of_reed
cNDPhra0	gN/gDW	0,02	initial_N/day_ratio_of_reed
cDensStemPhra	m-2	61,5	density_stem(+/-_139)

cTmInitPhra	oC	8	tempstart_initial_growth
fDAllPhra	-	0,3	allocation_fraction
kDAllPhra	1/day	0,05	allocation_rate
cDStemPhra	g/m	6	average_stem_weight
cQ10ProdPhra	-	2	temp_quotient_of_production
cMuPhraMax	1/day	0,03	maximum_growth_rate_reed
cDShootPhraMax	gDW/m2	3500	max_shoot_biomass_of_reed
cCovSpPhra	%_cover_per_gD/	0,1	specific_coverage
cPDPhraMin	-	0,0008	minPhra_P/day_-ratio
cPDPhraMax	-	0,003	maxPhra_P/day_-ratio
cNDPhraMin	-	0,008	minPhra_N/day_-ratio
cNDPhraMax	-	0,03	maxPhra_N/day_-ratio
cAffNUptPhra	l/mgDW/DWay	0,0002	N_uptake_affinity_reed
cAffPUptPhra	l/mgDW/DWay	0,0002	P_uptake_affinity_reed
cVNUptPhraMax	mgN/mgD/day	0,1	max_uptake_rate_N_001
cVPUptPhraMax	mgP/mgD/day	0,01	max_uptake_rate_P_0001
kDRespPhra	1/day	0,001	respiration_rate_of_reed
cQ10RespPhra	1/e^oC	2,5	temp_quotient_of_respiration
fDayWin	-	0,52	Start_autumn
fDRealPhra	-	0,85	reallocated_fraction_day
kDRealPhra	1/day	0,05	reallocation_rate_day
kDMortShootPhra	1/day	0	mortality_rate_shoots
kDMortRootPhra	1/day	0,000391	mortality_rate_roots
cDayWinPhra	day	259	begin_autumn(16_sept)
cDayManPhra	day	255	time_of_management
fManPhra	-	0	fraction_biomass_loss_by_management
kDManShootPhra	1/day	1	rate_of_management
cOxyCons	1/day	1	infiltrated_oxygen_consumed_in_one_day
DaysPerYear	d/y	365	DaysPerYear
TenDays	d	10	TenDays
HoursPerDay	h/d	24	HoursPerDay
SecsPerDay	s/d	86400	SecsPerDay
mmPerm	mm/m	1000	mmPerm
m2Perha	m2/ha	10000	m2Perha
mgPerg	mg/g	1000	mgPerg
gPerkg	g/kg	1000	gPerkg
gPerton	g/ton	1000000	gPerton
PerCent	%	0,01	PerCent
NearZero	-	1,00E-28	very_small_number_used_to_avoid_dividing_by_zero_
molO2molC	gO2/gC	2,6667	ratio_of_molweights
molO2molN	gO2/gN	2,2857	ratio_of_molweights
molNmolC	gN/gC	1,1667	ratio_of_molweights
cRhoWat	g/m3	1000000	density_of_water
_Pi_	-	3,141592654	Pi_(approx_314159)

<dynamics>

name	unit	equation	description
sTime	d	_sTime_ = _tir	time
TimeYears	y	_TimeYears_	Time_in_years
Day	-	_Day_ = _sTir	Time_(daynumber)_within_the_year_(0-365)
Years	y	_Years_ = _Ye	Time_in_calendar_years
uTmVar	oC	_uTmVar_ = _	Temperature_variation
uTm	oC	_uTm_ = _IF_	Forcing_function_temperature
uVWind	m/s	_uVWind_ = _	Forcing_function_wind_speed
ufDay	h/24h	_ufDay_ = _IF	day_length
uLDay	total_J/m2/d	_uLDay_ = _IF	total_daily_radiation
uLOut	total_J/m2/s_=_W	_uLOut_ = _IF	average_light_intensity_during_daytime
uLPARSurf	J/m2/s_PAR_=_W	_uLPARSurf_	average_PAR_at_zero_depth
aExtPhyt	m-1	_aExtPhyt_ =	contribution_of_algae_to_extinction
aExtDet	m-1	_aExtDet_ = _	detrital_contribution_to_extinction
aExtIM	m-1	_aExtIM_ = _c	contribution_of_inert_matter_to_extinction
aExtCoefOpen	m-1	_aExtCoefOpe	extinction_coefficient_without_vegetation
uQInSeason	m-1	_uQInSeason_	seasonal_inflow
uQEvSinus	mm/d	_uQEvSinus_	sinusoid_evaporation
uQEv	mm/d	_uQEv_ = _IF_	evaporation
uQInExtra	mm/d	_uQInExtra_ =	extra_inflow_(for_periodic_water_level_regulation
uQOutExtra	mm/d	_uQOutExtra_	extra_outflow_(for_periodic_water_level_regulation

uQIn	mm/d	_uQIn_ = _IF_	inflow
uQOut	mm/d	_uQOut_ = _I	outflow
uQDil	mm/d	_uQDil_ = _u	inflow_minus_evaporation
ukDil	d-1	_ukDil_ = _uQ	dilution_rate_of_substances
ukDilWat	d-1	_ukDilWat_ =	dilution_rate_of_water
ukOut	d-1	_ukOut_ = _u	outflow_rate
uTauWat	d	_uTauWat_ =	water_residence_time
uTauSubst	d	_uTauSubst_	residence_time_of_substances
vTranDepthW	m/d	_vTranDepthV	change_in_water_depth
akExchM	m3/m3_marsh_wa	_akExchM_ =	marsh_water_exchange_coefficient
afVolMarsh	m3_marsh/m3_lak	_afVolMarsh_	relative_marsh_volume
akExchL	m3/m3_lake_wate	_akExchL_ =	lake_water_exchange_coefficient
uCO2W	mmol/m3	_uCO2W_ =	CO2_in_lake_water
uMultiMuMaxVeg	-	_uMultiMuMa	MuMaxVeg_multiplier
uMuMaxVeg	g/g_shoot/day	_uMuMaxVeg	maximum_growth_rate_of_vegetation_at_20oC
oDPhytW	g/m3	_oDPhytW_ =	total_DW_phytoplankton_in_lake_water
oPPhytW	g/m3	_oPPhytW_ =	total_P_phytoplankton_in_lake_water
oNPhytW	g/m3	_oNPhytW_ =	total_N_phytoplankton_in_lake_water
aDPhytS	g/m2	_aDPhytS_ =	total_DW_phytoplankton_on_lake_sediment
aPPhytS	g/m2	_aPPhytS_ =	total_P_phytoplankton_on_lake_sediment
aNPhytS	g/m2	_aNPhytS_ =	total_N_phytoplankton_on_lake_sediment
oDOMW	gDW/m3	_oDOMW_ =	organic_seston
oDSestW	mgDW/l	_oDSestW_ =	total_seston
oPOMW	gP/m3	_oPOMW_ =	organic_P_in_water
oPSestW	gP/m3	_oPSestW_ =	total_seston_P_(incl_adsorbed
oPInorgW	gP/m3	_oPInorgW_ =	inorganic_P_in_water
oPTotW	gP/m3	_oPTotW_ =	total_P_in_water_(excl_animals_AND_vegetation)
oNDissW	gN/m3	_oNDissW_ =	SRN_in_water
oNOMW	gN/m3	_oNOMW_ =	orgseston_N
oNSestW	gN/m3	_oNSestW_ =	total_seston_N
oNkjW	gN/m3	_oNkjW_ = _o	kjeldahl_N_in_water
oNTotW	gN/m3	_oNTotW_ =	total_N_in_water_(without_animals_AND_vegetation)
bPorS	m3_water_m-3_se	_bPorS_ = (1.	porosity
bPorCorS	-	_bPorCorS_ =	sediment_porosity_corrected_for_tortuosity
aDTotS	g/m2	_aDTotS_ = _	total_sediment_(excl_biota)
aRhoTotS	g_solid_m-3_sedi	_aRhoTotS_ =	(apparent)_bulk_density_of_sediment
aRhoSolidS	g/m-3_solid	_aRhoSolidS_	average_solid_density
afDTotS	g_solid_g-1_sedin	_afDTotS_ = 1	sediment_dry-weight_fraction
afDOrgS	-	_afDOrgS_ =	total_organic_fraction_of_sediment_DW
afDetS	-	_afDetS_ = _s	detrital_fraction_of_sediment_organic_DW
afDetTotS	-	_afDetTotS_ =	detrital_fraction_of_total_sediment_DW
aPInorgS	gP/m2	_aPInorgS_ =	inorganic_P_in_sediment
aPTotAvailS	gP/m2	_aPTotAvailS	total_P_in_sediment_(excl_humus_animals_AND_vegetation)
aPTotS	gP/m2	_aPTotS_ = _	total_P_in_sediment_(excl_animals_AND_vegetation)
afPInorgS	gP/gD	_afPInorgS_ =	fraction_inorganic_P_in_sediment
afPTotS	gP/gD	_afPTotS_ =	total_P_fraction_in_sediment
afPO4S	-	_afPO4S_ =	fraction_dissolved_P_in_sediment
oPO4S	gP/m3	_oPO4S_ = _s	conc_dissolved_P_in_interstitial_water
aNDissS	gN/m2	_aNDissS_ =	total_dissolved_N_in_pore_water
aNkjAvailS	gN/m2	_aNkjAvailS_	kjeldahl_N_in_sediment_excl_humus
aNkjS	gN/m2	_aNkjS_ = _a	kjeldahl_N_in_sediment
aNTotAvailS	gN/m2	_aNTotAvailS	total_N_in_sediment_excl_humus
aNTotS	gN/m2	_aNTotS_ = _	total_N_in_sediment
afNInorgS	gN/gD	_afNInorgS_ =	fraction_inorganic_N_in_sediment
afNTotS	gN/gD	_afNTotS_ =	total_N_fraction_in_sediment
oNO3S	gN/m3	_oNO3S_ = _s	conc_dissolved_N-NO3_in_interstitial_water
oNH4S	gN/m3	_oNH4S_ = _s	conc_dissolved_N-NH4_in_interstitial_water
oNDissS	mgN/l	_oNDissS_ =	Dissolved_N_conc_in_sediment_needed_for_calc_of_veg_uptake_rate
rPDIMW	gP/gD	_rPDIMW_ =	P/D_ratio_of_water_DIM
rPDIMS	gP/gD	_rPDIMS_ =	P/D_ratio_of_sediment_DIM
rPDDetW	gP/gD	_rPDDetW_ =	P/D_ratio_of_water_detritus
rNDDetW	gN/gD	_rNDDetW_ =	N/D_ratio_of_water_detritus
rSiDDetW	gSi/gD	_rSiDDetW_ =	Si/D_ratio_of_water_detritus
rPDHumS	gP/gDW	_rPDHumS_ =	P_content_of_sediment_OM
rNDHumS	gN/gDW	_rNDHumS_ =	N_content_of_sediment_OM
rPDDetS	gP/gDW	_rPDDetS_ =	P_content_of_sediment_detritus
rNDDetS	gN/gDW	_rNDDetS_ =	N_content_of_sediment_detritus

rSiDDetS	gSi/gDW	_rSiDDetS_ =	Si_content_of_sediment_detritus
oDPhytWM	gSi/gDW	_oDPhytWM_	total_DW_phytoplankton_in_marsh_water
oPPhytWM	gSi/gDW	_oPPhytWM_	total_P_phytoplankton_in_marsh_water
oNPhytWM	gSi/gDW	_oNPhytWM_	total_N_phytoplankton_in_marsh_water
oSiDiatWM	gSi/gDW	_oSiDiatWM_	total_Si_diatoms_in_marsh_water
oDOMWM	mgD/l	_oDOMWM_ =	organic_seston
oDSestWM	mgDW/l	_oDSestWM_	total_seston
oPOMWM	mgP/l	_oPOMWM_ =	organic_P_in_water
oPSestWM	mgP/l	_oPSestWM_	total_seston_P(incl_adsorbed
oPInorgWM	mgP/l	_oPInorgWM_	inorganic_P_in_water
oPTotWM	mgP/l	_oPTotWM_ =	total_P_in_water
oNDissWM	mgN/l	_oNDissWM_	SRN_in_water
oNOMWM	mgN/l	_oNOMWM_ =	orgseston_N
oNSestWM	mgN/l	_oNSestWM_	total_seston_N
oNkjWM	mgN/l	_oNkjWM_ = _	kjeldahl_N_in_water
oNTotWM	mgN/l	_oNTotWM_ =	total_N_in_water
bPorSM	m3_water_m-3_se	_bPorSM_ = (	porosity
bPorCorSM	-	_bPorCorSM_	sediment_porosity_corrected_for_tortuosity
aDTotSM	g/m2	_aDTotSM_ =	total_sediment(excl_biota)
aRhoTotSM	g_solid_m-3_sedi	_aRhoTotSM_	(apparent)_bulk_density_of_sediment
aRhoSolidSM	g_m-3_solid	_aRhoSolidSM	average_solid_density
afDTotSM	g_solid_g-1_sedin	_afDTotSM_ =	sediment_dry-weight_fraction
afDOrgSM	-	_afDOrgSM_ =	total_organic_fraction_of_sediment_DW
afDetSM	-	_afDetSM_ = _	detrital_fraction_of_sediment_organic_DW
afDetTotSM	-	_afDetTotSM_	detrital_fraction_of_total_sediment_DW
aPInorgSM	gP/m2	_aPInorgSM_	inorganic_P_in_sediment
aPTotAvailSM	gP/m2	_aPTotAvailSI	total_P_in_sediment(excl_humusanimals_AND_vegetation)
aPTotSM	gP/m2	_aPTotSM_ =	total_P_in_sediment(excl_animals_AND_vegetation)
afPInorgSM	gP/gD	_afPInorgSM_	fraction_inorganic_P_in_sediment
afPTotSM	gP/gD	_afPTotSM_ =	total_P_fraction_in_sediment
afPO4SM	-	_afPO4SM_ =	fraction_dissolved_P_in_sediment
oPO4SM	gP/m3	_oPO4SM_ =	conc_dissolved_P_in_interstitial_water
aNDissSM	gN/m2	_aNDissSM_ =	total_dissolved_N_in_pore_water
aNkjAvailSM	gN/m2	_aNkjAvailSM	kjeldahl_N_in_sedimentexcl_humus
aNkjSM	gN/m2	_aNkjSM_ = _	kjeldahl_N_in_sediment
aNTotAvailSM	gN/m2	_aNTotAvailSI	total_N_in_sedimentexcl_humus
aNTotSM	gN/m2	_aNTotSM_ =	total_N_in_sediment
afNInorgSM	gN/gD	_afNInorgSM_	fraction_inorganic_N_in_sediment
afNTotSM	gN/gD	_afNTotSM_ =	total_N_fraction_in_sediment
oNO3SM	gN/m3	_oNO3SM_ =	conc_dissolved_N-NO3_in_interstitial_marsh_water
oNH4SM	gN/m3	_oNH4SM_ =	conc_dissolved_N-NH4_in_interstitial_marsh_water
oNDissSM	mgN/l	_oNDissSM_ =	Dissolved_N_conc_in_marsh_sediment
rPDIMWM	gP/gD	_rPDIMWM_ =	P/D_ratio_of_DIM_in_marsh_water
rPDIMSM	gP/gD	_rPDIMSM_ =	P/D_ratio_of_DIM_marsh_sediment
rPDDetWM	gP/gD	_rPDDetWM_	P/D_ratio_of_marsh_water_detritus
rNDDetWM	gN/gD	_rNDDetWM_	N/D_ratio_of_marsh_water_detritus
rSiDDetWM	gSi/gD	_rSiDDetWM_	Si/D_ratio_of_marsh_water_detritus
rPDHumSM	gP/gDW	_rPDHumSM_	P_content_of_marsh_sediment_OM
rNDHumSM	gN/gDW	_rNDHumSM_	N_content_of_marsh_sediment_OM
rPDDetSM	gP/gDW	_rPDDetSM_ =	P_content_of_marsh_sediment_detritus
rNDDetSM	gN/gDW	_rNDDetSM_	N_content_of_marsh_sediment_detritus
rSiDDetSM	gSi/gDW	_rSiDDetSM_	Si_content_of_marsh_sediment_detritus
aDTotM	gD/m2	_aDTotM_ = _	total_D_in_marsh
aPTotM	gP/m2	_aPTotM_ = _	total_P_in_marsh
aNTotM	gN/m2	_aNTotM_ = _	total_N_in_marsh
aSiTotM	gSi/m2	_aSiTotM_ = _	total_Si_in_marsh
iPPulse	-	_iPPulse_ = 1	-
uPLoadSeason	gP/m2/dag	_uPLoadSeas	seasonal_P_load
uPLoad	gP/m2/dag	_uPLoad_ = _	P_load
uPLoadPO4	gP/m2/dag	_uPLoadPO4_	P_load_PO4
uPLoadOrg	gP/m2/dag	_uPLoadOrg_	P_load_bound_to_org_matter
uPLoadPhytTot	gP/m2/d	_uPLoadPhyt	(total)_algal_P_input
uPLoadDet	gP/m2/d	_uPLoadDet_	detrital_P_input
uPLoadAIM	gP/m2/d	_uPLoadAIM_	Adsorbed_P_loading_(=0)
iNPulse	-	_iNPulse_ = 1	-
uNLoadSeason	gP/m2/d	_uNLoadSeas	seasonal_N_load
uNLoadPhytTot	gN/m2/d	_uNLoadPhyt	(total)_algal_N_input

uNLoad	gN/m2/d	_uNLoad_ = _	N_load
uNLoadDet	gN/m2/d	_uNLoadDet_	N_load_detritus
uNLoadOrg	gN/m2/d	_uNLoadOrg_	loading_N_bound_to_org_matter
uNLoadDiss	gN/m2/d	_uNLoadDiss_	N_loading_dissolved_(sum_of_NO2_and_NH4)
uNLoadNH4	gN/m2/d	_uNLoadNH4_	NH4_loading
uNLoadNO3	gN/m2/d	_uNLoadNO3_	NO3_loading
uNTotIn	mgN/l	_uNTotIn_ = _	external_N_conc
uDLoadDet	gDW/m2/d	_uDLoadDet_	detrital_DW_loading
uDLoadPhytTot	gDW/m2/d	_uDLoadPhyt	(total)_algal_DW_input
uDLoadIM	gDW/m2/d	_uDLoadIM_ =	loading_of_DW_of_inorg_matter
uDLoad	gD/m2/d	_uDLoad_ = _	total_DW_input
uPTotIn	gP/m3_=_mgP/l	_uPTotIn_ = _	external_P_concentration
uDLoadDiat	gD/m2/d	_uDLoadDiat_	Diat_input
uPLoadDiat	gP/m2/d	_uPLoadDiat_	Diat_input
uNLoadDiat	gN/m2/d	_uNLoadDiat_	Diat_input
uDLoadGren	gD/m2/d	_uDLoadGren	Gren_input
uPLoadGren	gP/m2/d	_uPLoadGren	Gren_input
uNLoadGren	gN/m2/d	_uNLoadGren	Gren_input
uDLoadBlue	gD/m2/d	_uDLoadBlue_	Blue_input
uPLoadBlue	gP/m2/d	_uPLoadBlue_	Blue_input
uNLoadBlue	gN/m2/d	_uNLoadBlue_	Blue_input
wDDilIM	gD/m3/d	_wDDilIM_ = _	dilution_of_DW_IM
wDDilDet	gD/m3/d	_wDDilDet_ =	dilllution_of_detritus
wPDilPO4	gP/m3/d	_wPDilPO4_ =	dilution_of_SRP
wPDilDet	gP/m3/d	_wPDilDet_ =	dilution_of_detritus
wPDilAIM	gP/m3/d	_wPDilAIM_ =	dilution_of_IM-ads_P
wNDilNH4	gN/m3/d	_wNDilNH4_ =	dilution_of_ammonium
wNDilNO3	gN/m3/d	_wNDilNO3_ =	dilution_of_nitrate
wNDilDet	gN/m3/d	_wNDilDet_ =	dilution_of_detritus
wO2Inflow	gO2/m3/d	_wO2Inflow_ =	oxygen_inflow
wO2Outfl	gO2/m3/d	_wO2Outfl_ =	oxygen_outflow
wDDilDiat	g/m3/d	_wDDilDiat_ =	dilution_of_Diat
wPDilDiat	gP/m3/d	_wPDilDiat_ =	dilution_of_Diat
wNDilDiat	gN/m3/d	_wNDilDiat_ =	dilution_of_Diat
wDDilGren	g/m3/d	_wDDilGren_	dilution_of_Gren
wPDilGren	gP/m3/d	_wPDilGren_	dilution_of_Gren
wNDilGren	gN/m3/d	_wNDilGren_	dilution_of_Gren
wDDilBlue	g/m3/d	_wDDilBlue_ =	dilution_of_Blue
wPDilBlue	gP/m3/d	_wPDilBlue_ =	dilution_of_Blue
wNDilBlue	gN/m3/d	_wNDilBlue_ =	dilution_of_Blue
wDDilPhyt	gD/m3/d	_wDDilPhyt_ =	total_algal_dilution
wPDilPhyt	gP/m3/d	_wPDilPhyt_ =	total_algal_dilution
wNDilPhyt	gN/m3/d	_wNDilPhyt_ =	total_algal_dilution
wDOutflTot	gD/m3/d	_wDOutflTot_	Outflow_of_DW
wPOutflTot	gP/m3/d	_wPOutflTot_	Outflow_of_P
wNOutflTot	gN/m3/d	_wNOutflTot_	Outflow_of_N
wDTranDiat	gN/m3/d	_wDTranDiat_	transport_flux_of_D_in_Diat
wPTranDiat	gN/m3/d	_wPTranDiat_	transport_flux_of_P_in_Diat
wNTranDiat	gN/m3/d	_wNTranDiat_	transport_flux_of_N_in_Diat
wDTranGren	gN/m3/d	_wDTranGren	transport_flux_of_D_in_Gren
wPTranGren	gN/m3/d	_wPTranGren	transport_flux_of_P_in_Gren
wNTranGren	gN/m3/d	_wNTranGren	transport_flux_of_N_in_Gren
wDTranBlue	gN/m3/d	_wDTranBlue_	transport_flux_of_D_in_Blue
wPTranBlue	gN/m3/d	_wPTranBlue_	transport_flux_of_P_in_Blue
wNTranBlue	gN/m3/d	_wNTranBlue_	transport_flux_of_N_in_Blue
wDTranPhyt	gD/m3/d	_wDTranPhyt_	total_transport_flux_of_D_in_Phyt
wPTranPhyt	gP/m3/d	_wPTranPhyt_	total_transport_flux_of_P_in_Phyt
wNTranPhyt	gN/m3/d	_wNTranPhyt_	total_transport_flux_of_N_in_Phyt
uSiLoadSiO2	gSi/m2/d	_uSiLoadSiO2	total_transport_flux_of_Si_in_SiO2
uSiLoadDet	gSi/m2/d	_uSiLoadDet_	total_transport_flux_of_Si_in_Det
uSiLoadDiat	gSi/m2/d	_uSiLoadDiat_	total_transport_flux_of_Si_in_Diat
uSiLoad	gSi/m2/d	_uSiLoad_ = _	Silica_loading
wSiDilSiO2	gSi/m3/d	_wSiDilSiO2_	Dilution_of_Si_in_SiO2
wSiDilDet	gSi/m3/d	_wSiDilDet_ =	Dilution_of_Si_in_detritus
wSiDilDiat	gSi/m3/d	_wSiDilDiat_ =	Dilution_of_Si_in_diatoms
wSiOutflTot	gSi/m3/d	_wSiOutflTot_	total_Si_surface_outflow
wSiTranSiO2	gSi/m3/d	_wSiTranSiO2	transport_flux_of_Si_in_SIO2

wSiTranDetW	gSi/m3/d	_wSiTranDetV	transport_flux_of_Si_in_detritus
tSiTranTotT	gSi/m3/d	_tSiTranTotT_	total_Si_transport_flux
wDTranZoo	gD/m3/d	_wDTranZoo_	net_migration_flux_of_D_in_Zoo
wPTranZoo	gP/m3/d	_wPTranZoo_	net_migration_flux_of_P_in_ZOO
wNTranZoo	gN/m3/d	_wNTranZoo_	net_migration_flux_of_N_in_Zoo
wDTranIMW	gD/m3/d	_wDTranIMW_	transport_flux_DW_in_IM
wDTranDetW	gD/m3/d	_wDTranDetV	transport_flux_DW_in_detritus
wO2TranW	gO2/m3/d	_wO2TranW_	transport_flux_O2
wPTranPO4W	gP/m3/d	_wPTranPO4\	transport_flux_of_P_in_PO4
wPTranAIMW	gP/m3/d	_wPTranAIMV	transport_flux_of_P_in_AIM
wPTranDetW	gP/m3/d	_wPTranDetV	transport_flux_of_P_in_detritus
wNTranNH4W	gN/m3/d	_wNTranNH4\	transport_flux_of_N_in_NH4
wNTranNO3W	gN/m3/d	_wNTranNO3\	transport_flux_of_N_in_NO3
wNTranDetW	gN/m3/d	_wNTranDetV	transport_flux_of_N_in_detritus
wDDilTot	gD/m3/d	_wDDilTot_ =	Total_DW_dilution_fluxes
wPDilTot	gP/m3/d	_wPDilTot_ =	Total_P_dilution_fluxes
wNDilTot	gN/m3/d	_wNDilTot_ =	Total_N_dilution_fluxes
wSiDilTot	gSi/m2/d	_wSiDilTot_ =	Total_SI_dilution_fluxes
tDTranTotT	gD/m2/d	_tDTranTotT_	total_transport_fluxes_of_DW_for_mass_balance_equations
tPTranTotT	gP/m2/d	_tPTranTotT_	total_transport_fluxes_of_P_for_mass_balance_equations
tNTranTotT	gN/m2/d	_tNTranTotT_	total_transport_fluxes_of_N_for_mass_balance_equations
wDExchIMM	gD/m3/d	_wDExchIMM_	exchange_flux_of_DW_in_IMM_between_marsh_and_lake_water
wPExchPO4M	gP/m3/d	_wPExchPO4I	exchange_flux_of_P_in_PO4M_between_marsh_and_lake_water
wPExchAIMM	gP/m3/d	_wPExchAIMI	exchange_flux_of_P_in_AIMM_between_marsh_and_lake_water
wNExchNH4M	gN/m3/d	_wNExchNH4	exchange_flux_of_N_in_NH4M_between_marsh_and_lake_water
wNExchNO3M	gN/m3/d	_wNExchNO3	exchange_flux_of_N_in_NO3M_between_marsh_and_lake_water
wSiExchSiO2M	gS/m3/d	_wSiExchSiO2	exchange_flux_of_Si_in_hSiO2M_between_marsh_and_lake_water
wO2ExchM	gO2/m3/d	_wO2ExchM_	exchange_flux_of_O2_in_hM_between_marsh_and_lake_water
wDExchDetM	gD/m3/d	_wDExchDetN	exchange_flux_of_DW_in_DetM_between_marsh_and_lake_water
wPExchDetM	gP/m3/d	_wPExchDetN	exchange_flux_of_P_in_DetM_between_marsh_and_lake_water
wNExchDetM	gN/m3/d	_wNExchDetN	exchange_flux_of_N_in_DetM_between_marsh_and_lake_water
wSiExchDetM	gSi/m3/d	_wSiExchDetN	exchange_flux_of_Si_in_hDetM_between_marsh_and_lake_water
wDExchDiatM	gD/m3/d	_wDExchDiatI	exchange_flux_of_DW_in_DiatM_between_marsh_and_lake_water
wPExchDiatM	gP/m3/d	_wPExchDiatI	exchange_flux_of_P_in_DiatM_between_marsh_and_lake_water
wNExchDiatM	gN/m3/d	_wNExchDiatI	exchange_flux_of_N_in_DiatM_between_marsh_and_lake_water
wSiExchDiatM	gS/m3/d	_wSiExchDiatI	exchange_flux_of_Si_in_DiatM_between_marsh_and_lake_water
wDExchGrenM	gD/m3/d	_wDExchGrer	exchange_flux_of_DW_in_GrenM_between_marsh_and_lake_water
wPExchGrenM	gP/m3/d	_wPExchGren	exchange_flux_of_P_in_GrenM_between_marsh_and_lake_water
wNExchGrenM	gN/m3/d	_wNExchGrer	exchange_flux_of_N_in_GrenM_between_marsh_and_lake_water
wDExchBlueM	gD/m3/d	_wDExchBlue	exchange_flux_of_DW_in_BlueM_between_marsh_and_lake_water
wPExchBlueM	gP/m3/d	_wPExchBluel	exchange_flux_of_P_in_BlueM_between_marsh_and_lake_water
wNExchBlueM	gN/m3/d	_wNExchBlue	exchange_flux_of_N_in_BlueM_between_marsh_and_lake_water
wDExchZooM	gD/m3/d	_wDExchZooN	exchange_flux_of_DW_in_ZooM_between_marsh_and_lake_water
wPExchZooM	gP/m3/d	_wPExchZooN	exchange_flux_of_P_in_ZooM_between_marsh_and_lake_water
wNExchZooM	gN/m3/d	_wNExchZooN	exchange_flux_of_N_in_ZooM_between_marsh_and_lake_water
wDExchIM	gD/m3/d	_wDExchIM_ =	exchange_flux_of_DW_in_IM_between_marsh_and_lake_water
wPExchPO4	gP/m3/d	_wPExchPO4_	exchange_flux_of_P_in_PO4_between_marsh_and_lake_water
wPExchAIM	gP/m3/d	_wPExchAIM_	exchange_flux_of_P_in_AIM_between_marsh_and_lake_water
wNExchNH4	gN/m3/d	_wNExchNH4_	exchange_flux_of_N_in_NH4_between_marsh_and_lake_water
wNExchNO3	gN/m3/d	_wNExchNO3	exchange_flux_of_N_in_NO3_between_marsh_and_lake_water
wSiExchSiO2	gSi/m3/d	_wSiExchSiO2	exchange_flux_of_Si_in_SiO2_between_marsh_and_lake_water
wO2Exch	gO2/m3/d	_wO2Exch_ =	exchange_flux_of_O2_in_O2_between_marsh_and_lake_water
wDExchDet	gD/m3/d	_wDExchDet_	exchange_flux_of_DW_in_Det_between_marsh_and_lake_water
wPExchDet	gP/m3/d	_wPExchDet_	exchange_flux_of_P_in_Det_between_marsh_and_lake_water
wNExchDet	gN/m3/d	_wNExchDet_	exchange_flux_of_N_in_Det_between_marsh_and_lake_water
wSiExchDet	gS/m3/d	_wSiExchDet_	exchange_flux_of_Si_in_Det_between_marsh_and_lake_water
wDExchDiat	gD/m3/d	_wDExchDiat_	exchange_flux_of_DW_in_Diat_between_marsh_and_lake_water
wPExchDiat	gP/m3/d	_wPExchDiat_	exchange_flux_of_P_in_Diat_between_marsh_and_lake_water
wNExchDiat	gN/m3/d	_wNExchDiat_	exchange_flux_of_N_in_Diat_between_marsh_and_lake_water
wSiExchDiat	gSi/m3/d	_wSiExchDiat_	exchange_flux_of_Si_in_Diat_between_marsh_and_lake_water
wDExchGren	gD/m3/d	_wDExchGrer	exchange_flux_of_DW_in_Gren_between_marsh_and_lake_water
wPExchGren	gP/m3/d	_wPExchGren	exchange_flux_of_P_in_Gren_between_marsh_and_lake_water
wNExchGren	gN/m3/d	_wNExchGrer	exchange_flux_of_N_in_Gren_between_marsh_and_lake_water
wDExchBlue	gD/m3/d	_wDExchBlue_	exchange_flux_of_DW_in_Blue_between_marsh_and_lake_water
wPExchBlue	gP/m3/d	_wPExchBlue_	exchange_flux_of_P_in_Blue_between_marsh_and_lake_water
wNExchBlue	gN/m3/d	_wNExchBlue_	exchange_flux_of_N_in_Blue_between_marsh_and_lake_water
wDExchZoo	gD/m3/d	_wDExchZoo_	exchange_flux_of_DW_in_Zoo_between_marsh_and_lake_water

wPExchZoo	gP/m3/d	_wPExchZoo_	exchange_flux_of_P_in_Zoo_between_marsh_and_lake_water
wNExchZoo	gN/m3/d	_wNExchZoo_	exchange_flux_of_N_in_Zoo_between_marsh_and_lake_water
tPInfPO4W	gP/m2/d	_tPInfPO4W_	infiltr_of_SRP
tNInfNH4W	gN/m2/d	_tNInfNH4W_	infiltr_of_ammonium
tNInfNO3W	gN/m2/d	_tNInfNO3W_	infiltr_of_nitrate
tPInfPO4S	gP/m2/d	_tPInfPO4S_ =	infiltration_of_interst_PO4
tNInfNH4S	gN/m2/d	_tNInfNH4S_ =	infiltration_of_interst_NH4
tNInfNO3S	gN/m2/d	_tNInfNO3S_	infiltration_of_interst_NO3
tNH4LoadS	gN/m2/d	_tNH4LoadS_	NH4_load_to_sediment_from_artificial_fertilizer
tNO3LoadS	gN/m2/d	_tNO3LoadS_	NO3_load_to_sediment_from_artificial_fertilizer
uDErosIM	gD/m2/d	_uDErosIM_ =	IM_input_from_banks
uDErosIMS	gD/m2/d	_uDErosIMS_	IM_input_to_sediment_from_banks
uDErosIMW	gD/m2/d	_uDErosIMW_	IM_input_to_water_column_from_banks
uDErosOM	gD/m2/d	_uDErosOM_	organic_matter_input_from_banks
uPErosOM	gP/m2/d	_uPErosOM_	organic_P_input_from_banks
uNErosOM	gN/m2/d	_uNErosOM_	organic_N_input_from_banks
uO2Sat	gO2/m3	_uO2Sat_ = 1	oxygen_saturation_concentration
kAer	m/d	_kAer_ = _cAe	reaeration_coefficient
uFunTmAer	-	_uFunTmAer_	temperature_function_of_reaeration
aFunLemnAer	-	_aFunLemnAe	duckweed_function_of_reaeration
tO2Aer	gO2/m2/d	_tO2Aer_ = _k	reaeration_flux_of_O2_into_the_water
uFunTmFish	-	_uFunTmFish_	temp_function_of_fish
tDTurbFish	g/m2/d	_tDTurbFish_	bioturbation_by_fish
tDTurbFishIM	g/m2/d	_tDTurbFishIM	IM_bioturbation_by_fish
aFunVegResus	-	_aFunVegRes	vegetation_dependence_of_resuspension
aFunDimSusp	-	_aFunDimSus	Empirical_suspended_matter_function_(logistic_fit_to_data)
tDResusTauDead	gD/m2/d	_tDResusTaul	resuspension_due_to_shear_stress
tDResusBareDead	gD/m2/d	_tDResusBare	resuspension_due_to_shear_stress_AND_fish
tDResusDead	gD/m2/d	_tDResusDea	resuspension_corrected_for_vegetation_effect
tDResusIM	gD/m2/d	_tDResusIM_	IM_resuspension
tDResusDet	gD/m2/d	_tDResusDet_	detrital_resuspension
akResusPhytRef	d-1	_akResusPhyt	phytoplankton_resuspension_rate_constant
tDResusPhytTot	gD/m2/d	_tDResusPhyt	phytoplankton_resuspension
tPResusDet	gP/m2/d	_tPResusDet_	resuspension_flux_of_detrital_P
tPResusPO4	gP/m2/d	_tPResusPO4	resuspension_flux_of_dissolved_P
tPResusAIM	gP/m2/d	_tPResusAIM_	resuspension_flux_of_P_adsorbed_onto_inert_matter
tNResusNO3	gN/m2/d	_tNResusNO3	resuspension_flux_of_nitrate
tNResusNH4	gN/m2/d	_tNResusNH4	resuspension_flux_of_ammonium
tNResusDet	gN/m2/d	_tNResusDet_	resuspension_flux_of_detrital_N
tSiResusDet	gSi/m2/d	_tSiResusDet_	resuspension_flux_of_detrial_SI
aFunTauSetOM	-	_aFunTauSet(	correction_factor_for_IM_settling_rate_(<=_1)
aFunTauSetIM	-	_aFunTauSetI	correction_factor_for_OM_settling_rate_(<=_1)
uFunTmSet	-	_uFunTmSet_	temperature_correction_of_sedimentation
uCorVSetIM	m/d	_uCorVSetIM_	corrected_sedimentation_velocity_of_IM
tDSetIM	gDW/m2/d	_tDSetIM_ = _	sedimentation_flux_of_inert_matter
tPSetAIM	gP/m2/d	_tPSetAIM_ =	sedimentation_flux_of_P_adsorbed_onto_inert_org_matter
uCorVSetDet	m/d	_uCorVSetDet	corrected_sedimentation_velocity_of_detritus
tDSetDet	gDW/m2/d	_tDSetDet_ =	sedimentation_flux_of_detritus
tPSetDet	gP/m2/d	_tPSetDet_ =	sedimentation_flux_of_detrital_P
tNSetDet	gN/m2/d	_tNSetDet_ =	sedimentation_flux_of_detrital_N
tSiSetDet	gSi/m2/d	_tSiSetDet_ =	sedimentation_flux_of_detrital_Si
kPMinDetW	d-1	_kPMinDetW_	P_mineralisation_constant_in_water
kNMinDetW	d-1	_kNMinDetW_	N_mineralisation_constant_in_water
kSiMinDetW	d-1	_kSiMinDetW_	Si_mineralisation_constant_in_water
uFunTmMinW	-	_uFunTmMinV	temp_function_of_mineralization_in_water
wDMinDetW	g/m3/d	_wDMinDetW_	decomposition
wPMinDetW	gP/m3/d	_wPMinDetW_	mineralization
wNMinDetW	gN/m3/d	_wNMinDetW_	mineralization
wSiMinDetW	gSi/m3/d	_wSiMinDetW	mineralization
aCorO2BOD	-	_aCorO2BOD	correction_of_O2_demand_in_water_at_low_oxygen_conc
wO2MinDetW	gO2/m3/d	_wO2MinDetV	O2_flux_due_to_mineralization_of_detritus
wDDenitW	gDW/m2/d	_wDDenitW_ =	mineralisation_flux_by_denitrification
wNDenitW	gN/m2/d	_wNDenitW_ =	Denitrification_flux
uFunTmNitr	-	_uFunTmNitr_	Temperature_dependence_for_nitrification
aCorO2NitrW	-	_aCorO2NitrW	oxygen_consumption_during_nitrification
wNNitrW	mgN/l/d	_wNNitrW_ = _	nitrification_flux
wO2NitrW	gO2/m3/d	_wO2NitrW_ =	O2_flux_due_to_nitrification

kPMinDetS	d-1	_kPMinDetS_	P_mineralisation_constant_in_sed
kNMinDetS	d-1	_kNMinDetS_	N_mineralisation_constant_in_sed
kSiMinDetS	d-1	_kSiMinDetS_	Si_mineralisation_constant_in_sed
uFunTmMinS	-	_uFunTmMinS	temp_function
tDMinDetS	gDW/m2/d	_tDMinDetS_	decomposition_of_upper_sediment
tPMinDetS	gP/m2/d	_tPMinDetS_ =	mineralization_of_P_in_upper_sediment
tNMinDetS	gN/m2/d	_tNMinDetS_	mineralization_of_N_in_upper_sediment
tSiMinDetS	gN/m2/d	_tSiMinDetS_	mineralization_of_Si_in_upper_sediment
uFunTmDif	-	_uFunTmDif_	temperature_function_of_diffusion
akO2DifCor	m2/d	_akO2DifCor_	corrected_O2_diffusion_coefficient
tSOD	gO2/m3/d	_tSOD_ = (_m	sediment_oxygen_demand
aDepthOxySed	m	_aDepthOxyS	oxygen_penetration_depth
afOxySed	-	_afOxySed_ =	fraction_aerobic_sediment
tDMinOxyDetS	gDW/m2/d	_tDMinOxyDe	aerobic_mineralisation
tO2MinDetS	gO2/m2/d	_tO2MinDetS	sediment_oxygen_demand
tDDenitS	gD/m/d	_tDDenitS_ =	mineralisation_flux_by_denitrification
tNDenitS	gN/m2/d	_tNDenitS_ =	Denitrification_flux
tNNitrS	gN/m2/d	_tNNitrS_ = _a	nitrification_flux
tO2NitrS	gO2/m2/d	_tO2NitrS_ =	O2_flux_due_to_nitrification
tDMinHumS	gDW/m2/d	_tDMinHumS	decomposition_of_upper_sediment_humus
tPMinHumS	gP/m2/d	_tPMinHumS	mineralization_of_P_in_upper_sediment_humus
tNMinHumS	gN/m2/d	_tNMinHumS	mineralization_of_N_in_upper_sediment_humus
aDepthDif	m	_aDepthDif_ =	average_diffusion_distance
tPDifPO4	gP/m2/d	_tPDifPO4_ =	diffusion_flux_of_dissolved_P_from_sediment_to_water
tNDifNO3	gP/m2/d	_tNDifNO3_ =	diffusion_flux_of_NO3_from_sediment_to_water
tNDifNH4	gP/m2/d	_tNDifNH4_ =	diffusion_flux_of_NH4_from_sediment_to_water
tO2Dif	gO2/m2/d	_tO2Dif_ = _k	O2_diffusion_(water_->_sediment)
tPDifGroundPO4	gP/m2/d	_tPDifGroundI	diffusion_flux_of_dissolved_P_from_pore_water_to_ground_water
tNDifGroundNO3	gN/m2/d	_tNDifGroundI	diffusion_flux_of_dissolved_NO3_from_pore_water_to_ground_water
tNDifGroundNH4	gN/m2/d	_tNDifGroundI	diffusion_flux_of_dissolved_NH4_from_pore_water_to_ground_water
aPAdsMaxW	gP/gD	_aPAdsMaxW	max_P_adsorption_per_g_inorg_matter_in_water
aKPAdsW	m3/gP	_aKPAdsW_ =	P_adsorption_affinity_corrected_for_redox_conditions
aPIsoAdsW	gP/gD	_aPIsoAdsW_	P_adsorption_isotherm_onto_inorg_matter_in_sediment
aPEqIMW	gP/m3	_aPEqIMW_ =	equilibrium_conc
wPSorpIMW	gP/m3/d	_wPSorpIMW	sorption_flux_in_water
aPAdsMaxS	gP/gD	_aPAdsMaxS	max_P_adsorption_per_g_inorg_matter_in_sediment
aKPAdsS	m3/gP	_aKPAdsS_ =	P_adsorption_affinity_corrected_for_redox_conditions
aPIsoAdsS	gP/gD	_aPIsoAdsS_	P_adsorption_isotherm_onto_inorg_matter_in_sediment
aPEqIMS	gP/m2	_aPEqIMS_ =	equilibrium_amount
tPSorpIMS	gP/m2/d	_tPSorpIMS_	sorption
tPChemPO4	gP/m2/d	_tPChemPO4	chem_loss_of_dissolved_P_from_pore_water
wDAbioIMW	gDW/m3/d	_wDAbioIMW	total_abiotic/microbial_DW_inorganic_matter_flux_in_water
wDAbioDetW	gDW/m3/d	_wDAbioDetW	total_abiotic/microbial_DW_detritus_flux_in_water
tDAbioIMS	gDW/m2/d	_tDAbioIMS_ =	total_abiotic/microbial_DW_inorganic_matter_flux_in_sediment
tDAbioDetS	gDW/m2/d	_tDAbioDetS_	total_abiotic/microbial_DW_detritus_flux_in_sediment
tDAbioHumS	gDW/m2/d	_tDAbioHumS	total_abiotic/microbial_DW_humus_flux_in_sediment
tDAbioTotT	gDW/m2/d	_tDAbioTotT_	total_abiotic/microbial_DW_flux_for_mass_balance_check
wO2AbioW	gO2/m3/d	_wO2AbioW_	total_abiotic/microbial_O2_flux_in_water
wPAbioDetW	gP/m3/d	_wPAbioDetW	total_abiotic/microbial_P_detritus_flux_in_water
wPAbioPO4W	gP/m3/d	_wPAbioPO4W	total_abiotic/microbial_dissolved_P_flux_in_water
wPAbioAIMW	gP/m3/d	_wPAbioAIMW	total_abiotic/microbial_P_absorbed_onto_inorganic_matter_flux_in_water
tPAbioDetS	gP/m2/d	_tPAbioDetS_	total_abiotic/microbial_P_detritus_flux_in_sediment
tPAbioHumS	gP/m2/d	_tPAbioHumS	total_abiotic/microbial_P_humus_flux_in_sediment
tPAbioPO4S	gP/m2/d	_tPAbioPO4S	total_abiotic/microbial_dissolved_P_flux_in_sediment
tPAbioAIMS	gP/m2/d	_tPAbioAIMS_	total_abiotic/microbial_P_absorbed_onto_inorganic_matter_flux_in_sediment
tPAbioTotT	gP/m2/d	_tPAbioTotT_	total_abiotic/microbial_P_flux_for_mass_balance_check
wNAbioNH4W	gN/m3/d	_wNAbioNH4W	total_abiotic/microbial_N_NH4_flux_in_water
wNAbioNO3W	gN/m3/d	_wNAbioNO3W	total_abiotic/microbial_N_NO3_flux_in_water
wNAbioDetW	gN/m3/d	_wNAbioDetW	total_abiotic/microbial_N_detritus_flux_in_water
tNAbioNH4S	gN/m2/d	_tNAbioNH4S	total_abiotic/microbial_N_NH4_flux_in_sediment
tNAbioNO3S	gN/m2/d	_tNAbioNO3S	total_abiotic/microbial_N_NO3_flux_in_sediment
tNAbioDetS	gN/m2/d	_tNAbioDetS_	total_abiotic/microbial_N_detritus_flux_in_sediment
tNAbioHumS	gN/m2/d	_tNAbioHumS	total_abiotic/microbial_N_humus_flux_in_sediment
tNAbioTotT	gN/m2/d	_tNAbioTotT_	total_abiotic/microbial_N_flux_for_mass_balance_check
wSiAbioSiO2W	gSi/m3/d	_wSiAbioSiO2	total_abiotic/microbial_Si_SiO2_flux_in_water
wSiAbioDetW	gSi/m3/d	_wSiAbioDetW	total_abiotic/microbial_Si_detritus_flux_in_water
tSiAbioDetS	gSi/m2/d	_tSiAbioDetS_	total_abiotic/microbial_Si_detritus_flux_in_sediment

tSiAbioTotT	gSi/m2/d	_tSiAbioTotT_	total_abiotic/microbial_Si_flux_for_mass_balance_check
uQEvPhra	mm/d	_uQEvPhra_ =	reed_evaporation(set_EQUAL_to_lake_evaporation)
tPEvPO4WM	gP/m2/d	_tPEvPO4WM	SRP_flux
tNEvNH4WM	gN/m2/d	_tNEvNH4WM	ammonium_flux
tNEvNO3WM	gN/m2/d	_tNEvNO3WM	nitrate_flux
tPInfPO4WM	gP/m2/d	_tPInfPO4WM	infiltr_of_SRP
tNInfNH4WM	gN/m2/d	_tNInfNH4WM	infiltr_of_ammonium
tNInfNO3WM	gN/m2/d	_tNInfNO3WM	infiltr_of_nitrate
tPInfPO4SM	gP/m2/d	_tPInfPO4SM_	infiltration_of_interst_PO4
tNInfNH4SM	gN/m2/d	_tNInfNH4SM_	infiltration_of_interst_NH4
tNInfNO3SM	gN/m2/d	_tNInfNO3SM_	infiltration_of_interst_NO3
tO2AerM	gO2/m2/d	_tO2AerM_ =	reaeration_flux_of_O2_into_the_water
tDSetIMM	g/m2/d	_tDSetIMM_ =	sedimentation_flux_of_inert_matter
tPSetAIMM	gP/m2/d	_tPSetAIMM_	sedimentation_flux_of_P_adsorbed_onto_inert_org_matter
tDSetDetM	g/m2/d	_tDSetDetM_	sedimentation_flux_of_detritus
tPSetDetM	gP/m2/d	_tPSetDetM_	sedimentation_flux_of_detrital_P
tNSetDetM	gN/m2/d	_tNSetDetM_	sedimentation_flux_of_detrital_N
tSiSetDetM	gSi/m2/d	_tSiSetDetM_	sedimentation_flux_of_detrital_Si
tDSetDiatM	g/m2/d	_tDSetDiatM_	sedimentation_flux_of_detritus
tPSetDiatM	gP/m2/d	_tPSetDiatM_	sedimentation_flux_of_detrital_P
tNSetDiatM	gN/m2/d	_tNSetDiatM_	sedimentation_flux_of_detrital_N
tSiSetDiatM	gSi/m2/d	_tSiSetDiatM_	sedimentation_flux_of_detrital_Si
tDSetGrenM	g/m2/d	_tDSetGrenM_	sedimentation_flux_of_detritus
tPSetGrenM	gP/m2/d	_tPSetGrenM_	sedimentation_flux_of_detrital_P
tNSetGrenM	gN/m2/d	_tNSetGrenM_	sedimentation_flux_of_detrital_N
tDSetBlueM	gDW/m2/d	_tDSetBlueM_	sedimentation_flux_of_detritus
tPSetBlueM	gP/m2/d	_tPSetBlueM_	sedimentation_flux_of_detrital_P
tNSetBlueM	gN/m2/d	_tNSetBlueM_	sedimentation_flux_of_detrital_N
tDSetPhytM	gDW/m2/d	_tDSetPhytM_	sedimentation_flux_of_detritus
tPSetPhytM	gP/m2/d	_tPSetPhytM_	sedimentation_flux_of_detrital_P
tNSetPhytM	gN/m2/d	_tNSetPhytM_	sedimentation_flux_of_detrital_N
tDSetTotM	gDW/m2/d	_tDSetTotM_ =	total_sedimentation_in_marsh
wDMinDetWM	gDW/m2/d	_wDMinDetWI	decomposition
wPMinDetWM	gP/m2/d	_wPMinDetWI	mineralization
wNMinDetWM	gN/m2/d	_wNMinDetWI	mineralization
wSiMinDetWM	gSi/m3/d	_wSiMinDetW	mineralization
aCorO2BODM	-	_aCorO2BOD	correction_of_O2_demand_in_water_at_low_oxygen_conc
wO2MinDetWM	gO2/m3/d	_wO2MinDetV	O2_flux_due_to_mineralization_of_detritus
wDDenitWM	gDW/m2/d	_wDDenitWM_	mineralisation_flux_by_denitrification
wNDenitWM	gN/m2/d	_wNDenitWM_	Denitrification_flux
aCorO2NitrWM	gN/m2/d	_aCorO2NitrV	oxygen_use_for_nitrification_in_marsh_water
wNNitrWM	mgN/l/d	_wNNitrWM_ =	nitrification_flux
wO2NitrWM	gO2/m3/d	_wO2NitrWM_	O2_flux_due_to_nitrification
tDMinDetSM	gDW/m2/d	_tDMinDetSM_	decomposition_of_upper_sediment
tPMinDetSM	gP/m2/d	_tPMinDetSM_	mineralization_of_P_in_upper_sediment
tNMinDetSM	gN/m2/d	_tNMinDetSM_	mineralization_of_N_in_upper_sediment
tSiMinDetSM	gN/m2/d	_tSiMinDetSM	mineralization_of_Si_in_upper_sediment
akO2DifCorM	m2/d	_akO2DifCorM	corrected_O2_diffusion_coefficient
tSODM	gO2/m3/d	_tSODM_ = _I	sediment_oxygen_demand
aDepthOxySedM	m	_aDepthOxyS	oxygen_penetration_depth
afOxySedM	-	_afOxySedM_	fraction_aerobic_sediment
tDMinOxyDetSM	gDW/m2/d	_tDMinOxyDe	aerobic_mineralisation
tO2MinDetSM	gO2/m2/d	_tO2MinDetSI	sediment_oxygen_demand
tDDenitSM	gDW/m2/d	_tDDenitSM_	mineralisation_flux_by_denitrification
tNDenitSM	gN/m2/d	_tNDenitSM_	Denitrification_flux
tNNitrSM	gN/m2/d	_tNNitrSM_ =	nitrification_flux
tO2NitrSM	gO2/m2/d	_tO2NitrSM_ =	O2_flux_due_to_nitrification
tDMinHumSM	gDW/m2/d	_tDMinHumSI	decomposition_of_upper_sediment_humus
tPMinHumSM	gP/m2/d	_tPMinHumSI	mineralization_of_P_in_upper_sediment_humus
tNMinHumSM	gN/m2/d	_tNMinHumSI	mineralization_of_N_in_upper_sediment_humus
aDepthDifM	m	_aDepthDifM_	average_diffusion_distance
tPDifPO4M	gP/m2/d	_tPDifPO4M_	diffusion_flux_of_dissolved_P_from_sediment_to_water
tNDifNO3M	gP/m2/d	_tNDifNO3M_	diffusion_flux_of_NO3_from_sediment_to_water
tNDifNH4M	gP/m2/d	_tNDifNH4M_	diffusion_flux_of_NH4_from_sediment_to_water
tO2DifM	gO2/m2/d	_tO2DifM_ = _	O2_diffusion(water_->_sediment)
tPDifGroundPO4M	gP/m2/d	_tPDifGroundI	diffusion_flux_of_dissolved_P_from_pore_water_to_ground_water
tNDifGroundNO3M	gN/m2/d	_tNDifGroundI	diffusion_flux_of_NO3_from_pore_water_to_ground_water

tNDifGroundNH4M	gN/m2/d	_tNDifGroundI	diffusion_flux_of_NH4_from_pore_water_to_ground_water
aPAdsMaxWM	gP/gD	_aPAdsMaxW	max_P_adsorption_per_g_inorg_matter_in_water_marsh
aKPAdsWM	m3/gP	_aKPAdsWM_	P_adsorption_affinitycorrected_for_redox_conditions
aPIsoAdsWM	gP/gD	_aPIsoAdsWN	P_adsorption_isotherm_onto_inorg_matter_in_sediment
aPEqIMWM	gP/m3	_aPEqIMWM_	equilibrium_conc
wPSorpIMWM	gP/m3/d	_wPSorpIMWI	sorption_flux_in_water
aPAdsMaxSM	gP/gD	_aPAdsMaxSI	max_P_adsorption_per_g_inorg_matter_in_sediment_marsh
aKPAdsSM	m3/gP	_aKPAdsSM_	P_adsorption_affinitycorrected_for_redox_conditions
aPIsoAdsSM	gP/gD	_aPIsoAdsSM	P_adsorption_isotherm_onto_inorg_matter_in_sediment
aPEqIMSM	gP/m2	_aPEqIMSM_	equilibrium_amount
tPSorpIMSM	gP/m2/d	_tPSorpIMSM	sorption
tPChemPO4M	gP/m2/d	_tPChemPO4I	chem_loss_of_dissolved_P_from_pore_water
aDayInitVeg	day	_aDayInitVeg_	Initial_growth_only_once_a_year
bfRootVeg	-	_bfRootVeg_ =	setting_root_fration
bfShootVeg	-	_bfShootVeg_	shoot_fraction
aDRootVeg	g/m2	_aDRootVeg_	root_biomass
aDShootVeg	g/m2	_aDShootVeg	shoot_biomass
aDEmergVeg	g/m2	_aDEmergVe(	emergent_biomass
aDFloatVeg	g/m2	_aDFloatVeg_	floating_biomass
bfSubVeg	-	_bfSubVeg_ =	submerged_fraction_of_shoot
aDSubVeg	g/m2	_aDSubVeg_	submerged_biomass
aExtVeg	m-1	_aExtVeg_ = _	contribution_of_plant_species_to_extinction_(submerged)
aDepth1Veg	m	_aDepth1Veg_	upper_depth_of_vegetation_layer_(minimum_=_0_m_=_surface)
aDepth2Veg	m	_aDepth2Veg_	lower_depth_of_vegetation_layer_(maximum_=_water_depth)
afCovSurfVeg	-	_afCovSurfVe	fraction_of_water_SURFACE_covered_by_plant_species
afCovEmergVeg	-	_afCovEmerg\	fraction_emergent_coverage
aCovVeg	-	_aCovVeg_ =	percent_cover
aDVeg	gDW/m2/d	_aDVeg_ = _s	total_plant_biomass
aPVeg	gP/m2/d	_aPVeg_ = _s	total_P_in_vegetation
aNVeg	gN/m2/d	_aNVeg_ = _s	total_N_in_vegetation
aExtCoef	m-1	_aExtCoef_ =	extinction_coefficient_incl_vegetation
aLPARBot	W/m2_PAR	_aLPARBot_ =	light_at_the_bottom
rPDVeg	mgP/mgDW	_rPDVeg_ = _	P/DW_ratio_of_vegetation
rNDVeg	mgN/mgDW	_rNDVeg_ = _	N/DW_ratio_of_vegetation
tDMigrVeg	gDW/m2/d	_tDMigrVeg_ =	migration_flux
tPMigrVeg	gP/m2/d	_tPMigrVeg_ =	net_migration_flux
tNMigrVeg	gN/m2/d	_tNMigrVeg_ =	net_migration_flux
uFunTmProdVeg	-	_uFunTmProd	temperature_function_of_vegetation_production
uFunTmRespVeg	-	_uFunTmRes|	temperature_function_of_vegetation_respiration
afPUptVegS	-	_afPUptVegS_	fraction_of_P_uptake_from_sediment
afNUptVegS	-	_afNUptVegS_	fraction_of_N_uptake_from_sediment
aVPUptMaxCrVeg	-	_aVPUptMax(	maximum_P_uptake_rate_of_vegetation_corrected_for_P/D_ratio
aVPUptVegW	mgP/mgD/d	_aVPUptVegV	P_uptake_RATE_by_subm_AND_floating_parts
aVPUptVegS	mgP/mgD/d	_aVPUptVegS	P_uptake_rate_by_roots
tPUptVegW	gP/m2/d	_tPUptVegW_	P_uptake_from_water
tPUptVegS	gP/m2/d	_tPUptVegS_	P_uptake_from_pore_water_(by_root_fraction)
tPUptVeg	gP/m2/d	_tPUptVeg_ =	total_P_uptake_vegetation
aVNUptMaxCrVeg	-	_aVNUptMax(	maximum_N_uptake_rate_of_vegetation_corrected_for_N/D_ratio
ahNUptVeg	gN/m3	_ahNUptVeg_	half-sat_constant_for_N_uptake
aVNUptVegW	mgN/mgD/d	_aVNUptVegV	N_uptake_RATE_by_subm_AND_floating_parts
afNH4UptVegW	-	_afNH4UptVe	fraction_ammonium_uptake_from_water_column_(from_WASP_model_EPA)
tNUptVegW	gN/m2/d	_tNUptVegW_	N_uptake_from_water_(by_shoots)
tNUptNH4VegW	gN/m2/d	_tNUptNH4Ve	NH4_uptake_of_vegetation_from_water
tNUptNO3VegW	gN/m2/d	_tNUptNO3Ve	NO3_uptake_of_vegetation_from_water
aVNUptVegS	mgN/mgD/d	_aVNUptVegS	N_uptake_RATE_of_roots
tNUptVegS	gN/m2/d	_tNUptVegS_	N_uptake_from_pore_water_(by_roots)
afNH4UptVegS	-	_afNH4UptVe	fraction_ammonium_uptake_from_pore_water_(from_WASP_model_EPA)
tNUptNH4VegS	gN/m2/d	_tNUptNH4Ve	NH4_uptake_of_vegetation_from_sediment
tNUptNO3VegS	gN/m2/d	_tNUptNO3Ve	NO3_uptake_of_vegetation_from_sediment
tNUptVeg	gN/m2/d	_tNUptVeg_ =	total_N_uptake_vegetation
aLPAR1Veg	W/m2_PAR	_aLPAR1Veg_	light_at_top_of_vegetation_layer
aLPAR2Veg	W/m2_PAR	_aLPAR2Veg_	light_at_bottom_of_vegetation_layer
uhLVeg	W/m2	_uhLVeg_ = _	half-sat_light_for_vegetation_production_at_current_temp
aLLimShootVeg	-	_aLLimShoot\	light_function_of_growth_based_on_shoot_fraction
aMuTmLVeg	g_prod./g_total_bi	_aMuTmLVeg	max_growth_rate_at_current_temp_AND_light
aPLimVeg	-	_aPLimVeg_ =	Droop_function_(P)_for_vegetation
aNLimVeg	-	_aNLimVeg_ =	Droop_function_(N)_for_vegetation

aNutLimVeg	-	_aNutLimVeg_	nutrient_limitation_function_of_vegetation
aMuVeg	g_prod./g_total_bi	_aMuVeg_ = _	actual_growth_rate_of_vegetation
bkMortVeg	d-1	_bkMortVeg_	mortality_constant
akDIncrVeg	d-1	_akDIncrVeg_	intrinsic_net_increase_rate_of_vegetation
tDEnvVeg	gDW/m2/d	_tDEnvVeg_ =	logistic_correction_of_vegetation
tDEnvProdVeg	gDW/m2/d	_tDEnvProdVe	logistic_correction_of_production
tDProdVeg	gDW/m2/d	_tDProdVeg_	vegetation_production
tDProdSubVeg	gDW/m2/d	_tDProdSubVe	submerged_production
tDRespVeg	g.m-2.d-1	_tDRespVeg_	dark_respiration_of_vegetation
tDEnvMortVeg	gDW/m2/d	_tDEnvMortVe	logistic_correction_of_mortality
tDMortVeg	gDW/m2/d	_tDMortVeg_ =	total_mortality_flux_DW_vegetation
tDMortVegW	gDW/m2/d	_tDMortVegW	mortality_flux_becoming_water_detritus
tDMortVegS	gDW/m2/d	_tDMortVegS_	mortality_flux_becoming_sediment_detritus
tDGrazVegBird	g/m2/d	_tDGrazVegBi	biomass_loss_due_to_grazing_of_birds
bkManVeg	d-1	_bkManVeg_ =	rate_constant_during_mowing_period
tDManVeg	gDW/m2/d	_tDManVeg_ =	Mowing_of_vegetation_DW
tPManVeg	gP/m2/d	_tPManVeg_ =	Mowing_of_vegetation_P
tNManVeg	gN/m2/d	_tNManVeg_ =	Mowing_of_vegetation_N
tDBedVeg	gDW/m2/d	_tDBedVeg_ =	derivative_of_vegetation_biomass
tO2ProdVeg	gO2/m2/d	_tO2ProdVeg_	vegetation_O2_production
tO2RespVegW	gO2/m2/d	_tO2RespVeg	submerged_O2_respiration
tO2RespVegS	gO2/m2/d	_tO2RespVeg	root_O2_respiration
tO2ProdVegS	gO2/m2/d	_tO2ProdVegS	O2_transport_to_roots
tO2ProdVegW	gO2/m2/d	_tO2ProdVegW	O2_used_for_vegetation_production
tO2UptNO3VegW	gO2/m2/d	_tO2UptNO3V	O2_production_to_water_due_to_NO3_uptake_by_macrophytes
tO2UptNO3VegS	gO2/m2/d	_tO2UptNO3V	O2_production_due_to_NO3_uptake_from_sed_by_macrophytes
tPExcrVeg	gP/m2/d	_tPExcrVeg_ =	P_excretion_by_vegetation
tPExcrVegS	gP/m2/d	_tPExcrVegS_	P_excretion_by_vegetation_in_sediment
tPExcrVegW	gP/m2/d	_tPExcrVegW	P_excretion_by_vegetation_in_water
tPMortVeg	gP/m2/d	_tPMortVeg_ =	P_mortality_flux_of_vegetation
tPMortVegPO4	gP/m2/d	_tPMortVegPO	mortality_flux_of_vegetation_becoming_dissolved_P
tPMortVegPO4S	gP/m2/d	_tPMortVegPO	mortality_flux_of_vegetation_becoming_dissolved_P_in_sediment
tPMortVegPO4W	gP/m2/d	_tPMortVegPO	mortality_flux_of_vegetation_becoming_dissolved_P_in_water
tPMortVegDet	gP/m2/d	_tPMortVegDe	mortality_flux_of_vegetation_becoming_detritus_P
tPMortVegDetW	gP/m2/d	_tPMortVegDe	mortality_flux_of_vegetation_becoming_detritus_P_in_water
tPMortVegDetS	gP/m2/d	_tPMortVegDe	mortality_flux_of_vegetation_becoming_detritus_P_in_sediment
tPGrazVegBird	gP/m2/d	_tPGrazVegBi	P_mortality_flux_of_vegetation_by_bird_grazing
tPBedVeg	gP/m2/d	_tPBedVeg_ =	total_vegetation_P_flux_in_bed_module
tNExcrVeg	gN/m2/d	_tNExcrVeg_ =	N_excretion_by_vegetation
tNExcrVegS	gN/m2/d	_tNExcrVegS_	N_excretion_by_vegetation_to_sediment
tNExcrVegW	gN/m2/d	_tNExcrVegW	N_excretion_by_vegetation_to_water
tNMortVeg	gN/m2/d	_tNMortVeg_ =	N_mortality_flux_of_vegetation
tNMortVegNH4	gN/m2/d	_tNMortVegNH	mortality_flux_of_vegetation_becoming_dissolved_N
tNMortVegNH4S	gN/m2/d	_tNMortVegNH	mortality_flux_of_vegetation_becoming_dissolved_N_in_sediment
tNMortVegNH4W	gN/m2/d	_tNMortVegNH	mortality_flux_of_vegetation_becoming_dissolved_N_in_water
tNMortVegDet	gN/m2/d	_tNMortVegDe	mortality_flux_of_vegetation_becoming_detritus_N
tNMortVegDetW	gN/m2/d	_tNMortVegDe	mortality_flux_of_vegetation_becoming_detritus_N_in_water
tNMortVegDetS	gN/m2/d	_tNMortVegDe	mortality_flux_of_vegetation_becoming_detritus_N_in_sediment
tNGrazVegBird	gN/m2/d	_tNGrazVegBi	N_mortality_flux_of_vegetation_by_bird_grazing
tNBedVeg	gN/m2/d	_tNBedVeg_ =	total_vegetation_N_flux_in_bed_module
tDAssVegBird	gDW/m2/d	_tDAssVegBir	DW_assimilation_by_herbivorous_birds
tDEgesBird	gDW/m2/d	_tDEgesBird_	DW_egestion_by_herbivorous_birds
tPAssVegBird	gP/m2/d	_tPAssVegBir	P_assimilation_by_herbivorous_birds
tPEgesBird	gP/m2/d	_tPEgesBird_	P_egestion_by_herbivorous_birds
tPEgesBirdPO4	gP/m2/d	_tPEgesBirdP	PO4_egestion_by_herbivorous_birds
tPEgesBirdDet	gP/m2/d	_tPEgesBirdD	P_detritus_egestion_by_herbivorous_birds
tNAssVegBird	gN/m2/d	_tNAssVegBir	N_assimilation_by_herbivorous_birds
tNEgesBird	gN/m2/d	_tNEgesBird_	N_egestion_by_herbivorous_birds
tNEgesBirdNH4	gN/m2/d	_tNEgesBirdN	NH4_egestion_by_herbivorous_birds
tNEgesBirdDet	gN/m2/d	_tNEgesBirdD	N_detritus_egestion_by_herbivorous_birds
wDBedDetW	gD.m-3.d-1	_wDBedDetW	total_DW_flux_from_Vegetation_module_to_water_detritus
tDBedDetS	gDW/m2/d	_tDBedDetS_	total_DW_flux_from_Vegetation_module_to_sediment_detritus
tDBedTotT	gDW/m2/d	_tDBedTotT_	total_DW_flux_from_Vegetation_module
wPBedPO4W	gP/m3/d	_wPBedPO4W	total_P_flux_from_Vegetation_module_to_PO4_in_water
wPBedDetW	gP/m3/d	_wPBedDetW_	total_P_flux_from_Vegetation_module_to_water_detritus
tPBedPO4S	gP/m2/d	_tPBedPO4S_	total_P_flux_from_Vegetation_module_to_pore_water_PO4
tPBedDetS	gP/m2/d	_tPBedDetS_	total_P_flux_from_Vegetation_module_to_sediment_detritus

tPBedTotT	gP/m2/d	_tPBedTotT_ =	total_P_flux_from_Vegetation_module
wNBedNH4W	gN/m3/d	_wNBedNH4V	total_N_flux_from_Vegetation_module_to_NH4_in_water
wNBedNO3W	gN/m3/d	_wNBedNO3V	total_N_flux_from_Vegetation_module_to_NO3_in_water
wNBedDetW	gN/m3/d	_wNBedDetW	total_N_flux_from_Vegetation_module_to_water_detritus
tNBedNH4S	gN/m2/d	_tNBedNH4S_	total_N_flux_from_Vegetation_module_to_NH4_in_pore_water
tNBedNO3S	gN/m2/d	_tNBedNO3S_	total_N_flux_from_Vegetation_module_to_NO3_in_pore_water
tNBedDetS	gN/m2/d	_tNBedDetS_	total_N_flux_from_Vegetation_module_to_sediment_detritus
tNBedTotT	gN/m2/d	_tNBedTotT_	total_N_flux_from_Vegetation_module
tO2BedW	gO2/m2/d	_tO2BedW_ =	total_water_O2_flux_in_vegetation_module
tO2BedS	gO2/m2/d	_tO2BedS_ =	total_sediment_O2_flux_in_vegetation_module
UseLoss	gO2/m2/d	_UseLoss_ =	-
uFunTmLoss	-	_uFunTmLoss	temp_function_of_grazing
rPDBlueW	-	_rPDBlueW_ =	P/D_ratio_of_Algae
rNDBlueW	-	_rNDBlueW_ =	N/D_ratio_of_Algae
rPDBlueS	-	_rPDBlueS_ =	P/D_ratio_of_Algae
rNDBlueS	-	_rNDBlueS_ =	N/D_ratio_of_Algae
uFunTmBlue	-	_uFunTmBlue	temperature_function_of_Algae
uFunTmProdBlue	-	_uFunTmProd	temperature_function_of_Algae
uFunTmRespBlue	-	_uFunTmResp	temperature_function_of_Algae
aVPUptMaxCrBlue	-	_aVPUptMaxC	maximum_P_uptake_rate_of_Algaecorrected_for_P/D_ratio
aVPUptBlue	mgP/mgDW/d	_aVPUptBlue_	P_uptake_rate_of_Algae
wPUptBlue	gP/m2/d	_wPUptBlue_	P_uptake_Algae
aVNUptMaxCrBlue	-	_aVNUptMaxC	maximum_N_uptake_rate_of_Algaecorrected_for_N/D_ratio
ahNUptBlue	mgN/l	_ahNUptBlue_	half-sat_NDissW_for_uptake_by_Algae
aVNUptBlue	mgN/mgDW/d	_aVNUptBlue_	N_uptake_rate_of_Algae
wNUptBlue	mgN/l/d	_wNUptBlue_	N_uptake_Algae
afNH4UptBlue	-	_afNH4UptBlu	fraction_ammonium_uptake_by_Algae
wNUptNH4Blue	mgN/l/d	_wNUptNH4B	ammonium_uptake_by_Algae
wNUptNO3Blue	mgN/l/d	_wNUptNO3B	nitrate_uptake_by_Algae
uMuMaxTmBlue	d-1	_uMuMaxTmE	max_growth_rate_of_Algae_at_ambient_temperature
aPLimBlue	-	_aPLimBlue_	Droop_function(P)_for_Algae
aNLimBlue	-	_aNLimBlue_	Droop_function(N)_for_Algae
aSiLimBlue	-	_aSiLimBlue_	silica_dependence_of_growth_rate
aLLimBlue	-	_aLLimBlue_ =	Light_function
aMuTmLBlue	d-1	_aMuTmLBlue	growth_rate_at_current_light_AND_temp
aNutLimBlue	d-1	_aNutLimBlue	nutrient_limitation_function_of_Algae
aMuBlue	d-1	_aMuBlue_ =	growth_rate
wDAssBlue	gD/m3/d	_wDAssBlue_	assimilation_Algae
rChDBlue	mg/mg	_rChDBlue_ =	chlorophyll-a/DW_ratio_Algae
oChlaBlue	mg/m3	_oChlaBlue_ =	chlorophyll-a_conc
aExtChBlue	m2/mg_chl-a	_aExtChBlue_	specific_extinction_per_unit_chlorophyll-a
ukDRespTmBlue	d-1	_ukDRespTml	temp_corrected_respiration_constant_of_Algae
wDRespBlueW	g/m2/d	_wDRespBlue	respiration_of_Algae_in_water
ukLossTmBlue	d-1	_ukLossTmBlu	daily_grazing_on_Algae
wDLossBlue	mgDW/l/d	_wDLossBlue_	Algae_grazing_loss
wDMortBlueW	g/m3/d	_wDMortBlue\	mortality_in_water
uCorVSetBlue	m/d	_uCorVSetBlu	corrected_sedimentation_velocity_of_Algae
tDSetBlue	g/m2/d	_tDSetBlue_ =	sedimentation_flux_of_Algae
tDResusBlue	g/m2/d	_tDResusBlue	resuspension_DW_blue-greens
tDRespBlueS	gD/m2/d	_tDRespBlueS	respiration_of_sediment_Algae
tDMortBlueS	g/m2/d	_tDMortBlueS	mortality_in_sed
ukDDecBlue	d-1	_ukDDecBlue_	total_loss_rate_of_algae_in_water(excl_dilution)
wPExcrBlueW	gP/m3/d	_wPExcrBlue\	P_excretion_Algae_in_water
wPLossBlue	mgP/l/d	_wPLossBlue_	Algae_grazing_loss
wPMortBlueW	gP/m3/d	_wPMortBlue\	mortality_Algae_in_water
tPSetBlue	gP/m2/d	_tPSetBlue_ =	sedimentation
tPResusBlue	gD/m2/d	_tPResusBlue	Resuspension_of_algae
tPExcrBlueS	gP/m2/d	_tPExcrBlueS	P_excretion_of_algae_in_sediment
tPMortBlueS	gP/m2/d	_tPMortBlueS	P_mortality_of_algae_in_sediment
wNExcrBlueW	gN/m3/d	_wNExcrBlue\	N_excretion_Algae_in_water
wNLossBlue	mgN/l/d	_wNLossBlue_	Algae_grazing_loss
wNMortBlueW	gN/m3/d	_wNMortBlue\	mortality_Algae_in_water
tNSetBlue	gN/m2/d	_tNSetBlue_ =	sedimentation
tNResusBlue	gD/m2/d	_tNResusBlue	Resuspension_of_algae
tNExcrBlueS	gN/m2/d	_tNExcrBlueS	N_excretion_of_algae_in_sediment
tNMortBlueS	gN/m2/d	_tNMortBlueS	N_mortality_of_algae_in_sediment
wDPrimBlueW	mgD/l/d	_wDPrimBlue\	total_PRIM_flux_to_algae_in_water

wPPrimBlueW	mgP/l/d	_wPPrimBlue\	Total_PRIM_flux_to_Algae
wNPrimBlueW	mgN/l/d	_wNPrimBlue\	Total_PRIM_flux_to_Algae
tDPrimBlueS	gD/m2/d	_tDPrimBlueS	total_flux_from_PRIM_module_to_sediment_Algae
tPPrimBlueS	gP/m2/d	_tPPrimBlueS	total_flux_from_PRIM_module_to_sediment_Algae
tNPrimBlueS	gN/m2/d	_tNPrimBlueS	total_flux_from_PRIM_module_to_sediment_Algae
rPDGrenW	-	_rPDGrenW_	P/D_ratio_of_Algae
rNDGrenW	-	_rNDGrenW_	N/D_ratio_of_Algae
rPDGrenS	-	_rPDGrenS_ =	P/D_ratio_of_Algae
rNDGrenS	-	_rNDGrenS_ =	N/D_ratio_of_Algae
uFunTmGren	-	_uFunTmGren	temperature_function_of_Algae
uFunTmProdGren	-	_uFunTmProd	temperature_function_of_Algae
uFunTmRespGren	-	_uFunTmResp	temperature_function_of_Algae
aVPUptMaxCrGren	-	_aVPUptMax(	maximum_P_uptake_rate_of_Algaecorrected_for_P/D_ratio
aVPUptGren	mgP/mgDW/d	_aVPUptGren	P_uptake_rate_of_Algae
wPUptGren	gP/m2/d	_wPUptGren_	P_uptake_Algae
aVNUptMaxCrGren	-	_aVNUptMax(	maximum_N_uptake_rate_of_Algaecorrected_for_N/D_ratio
ahNUptGren	mgN/l	_ahNUptGren	half-sat_NDissW_for_uptake_by_Algae
aVNUptGren	mgN/mgDW/d	_aVNUptGren	N_uptake_rate_of_Algae
wNUptGren	mgN/l/d	_wNUptGren_	N_uptake_Algae
afNH4UptGren	-	_afNH4UptGre	fraction_ammonium_uptake_by_Algae
wNUptNH4Gren	mgN/l/d	_wNUptNH4G	ammonium_uptake_by_Algae
wNUptNO3Gren	mgN/l/d	_wNUptNO3G	nitrate_uptake_by_Algae
uMuMaxTmGren	d-1	_uMuMaxTm(	max_growth_rate_of_Algae_at_ambient_temperature
aPLimGren	-	_aPLimGren_	Droop_function(P)_for_Algae
aNLimGren	-	_aNLimGren_	Droop_function(N)_for_Algae
aSiLimGren	-	_aSiLimGren_	silica_dependence_of_growth_rate
aLLimGren	-	_aLLimGren_	Light_function
aMuTmLGren	d-1	_aMuTmLGre	growth_rate_at_current_light_AND_temp
aNutLimGren	d-1	_aNutLimGre	nutrient_limitation_function_of_Algae
aMuGren	d-1	_aMuGren_ =	growth_rate
wDAssGren	gD/m3/d	_wDAssGren_	assimilation_Algae
rChDGren	mg/mg	_rChDGren_ =	chlorophyll-a/DW_ratio_Algae
oChlaGren	mg/m3	_oChlaGren_	chlorophyll-a_conc
aExtChGren	m2/mg_chl-a	_aExtChGren	specific_extinction_per_unit_chlorophyll-a
ukDRespTmGren	d-1	_ukDRespTm(	temp_corrected_respiration_constant_of_Algae
wDRespGrenW	g/m2/d	_wDRespGren	respiration_of_Algae_in_water
ukLossTmGren	d-1	_ukLossTmGr	daily_grazing_on_Algae
wDLossGren	mgDW/l/d	_wDLossGren	Algae_grazing_loss
wDMortGrenW	g/m3/d	_wDMortGren	mortality_in_water
uCorVSetGren	m/d	_uCorVSetGre	corrected_sedimentation_velocity_of_Algae
tDSetGren	g/m2/d	_tDSetGren_ =	sedimentation_flux_of_Algae
tDResusGren	gD/m2/d	_tDResusGren	resuspension_of_Algae
tDRespGrenS	gD/m2/d	_tDRespGrenS	respiration_of_sediment_Algae
tDMortGrenS	g/m2/d	_tDMortGrenS	mortality_in_sed
ukDDecGren	d-1	_ukDDecGren	total_loss_rate_of_algae_in_water(excl_dilution)
wPExcrGrenW	gP/m3/d	_wPExcrGren	P_excretion_Algae_in_water
wPLossGren	mgP/l/d	_wPLossGren	Algae_grazing_loss
wPMortGrenW	gP/m3/d	_wPMortGren	mortality_Algae_in_water
tPSetGren	gP/m2/d	_tPSetGren_ =	sedimentation
tPResusGren	gD/m2/d	_tPResusGren	Resuspension_of_algae
tPExcrGrenS	gP/m2/d	_tPExcrGrenS	P_excretion_of_algae_in_sediment
tPMortGrenS	gP/m2/d	_tPMortGrenS	P_mortality_of_algae_in_sediment
wNExcrGrenW	gN/m3/d	_wNExcrGren	N_excretion_Algae_in_water
wNLossGren	mgN/l/d	_wNLossGren	Algae_grazing_loss
wNMortGrenW	gN/m3/d	_wNMortGren	mortality_Algae_in_water
tNSetGren	gN/m2/d	_tNSetGren_ =	sedimentation
tNResusGren	gD/m2/d	_tNResusGren	Resuspension_of_algae
tNExcrGrenS	gN/m2/d	_tNExcrGrenS	N_excretion_of_algae_in_sediment
tNMortGrenS	gN/m2/d	_tNMortGrenS	N_mortality_of_algae_in_sediment
wDPrimGrenW	mgD/l/d	_wDPrimGren	total_PRIM_flux_to_algae_in_water
wPPrimGrenW	mgP/l/d	_wPPrimGren	Total_PRIM_flux_to_Algae
wNPrimGrenW	mgN/l/d	_wNPrimGren	Total_PRIM_flux_to_Algae
tDPrimGrenS	gD/m2/d	_tDPrimGrenS	total_flux_from_PRIM_module_to_sediment_Algae
tPPrimGrenS	gP/m2/d	_tPPrimGrenS	total_flux_from_PRIM_module_to_sediment_Algae
tNPrimGrenS	gN/m2/d	_tNPrimGrenS	total_flux_from_PRIM_module_to_sediment_Algae
rPDDiatW	-	_rPDDiatW_ =	P/D_ratio_of_Algae
rNDDiatW	-	_rNDDiatW_ =	N/D_ratio_of_Algae

rPDDiatS	-	_rPDDiatS_ =	P/D_ratio_of_Algae
rNDDiatS	-	_rNDDiatS_ =	N/D_ratio_of_Algae
uFunTmDiat	-	_uFunTmDiat_	temperature_function_of_Algae
uFunTmProdDiat	-	_uFunTmProd	temperature_function_production_of_Algae
uFunTmRespDiat	-	_uFunTmResp	temperature_function_respiration_of_Algae
aVPUptMaxCrDiat	-	_aVPUptMax(	maximum_P_uptake_rate_of_Algaecorrected_for_P/D_ratio
aVPUptDiat	mgP/mgDW/d	_aVPUptDiat_	P_uptake_rate_of_Algae
wPUptDiat	gP/m2/d	_wPUptDiat_ =	P_uptake_Algae
aVNUptMaxCrDiat	-	_aVNUptMax(	maximum_N_uptake_rate_of_Algaecorrected_for_N/D_ratio
ahNUptDiat	mgN/l	_ahNUptDiat_	half-sat_NDissW_for_uptake_by_Algae
aVNUptDiat	mgN/mgDW/d	_aVNUptDiat_	N_uptake_rate_of_Algae
wNUptDiat	mgN/l/d	_wNUptDiat_ =	N_uptake_Algae
afNH4UptDiat	-	_afNH4UptDia	fraction_ammonium_uptake_by_Algae
wNUptNH4Diat	mgN/l/d	_wNUptNH4D	ammonium_uptake_by_Algae
wNUptNO3Diat	mgN/l/d	_wNUptNO3D	nitrate_uptake_by_Algae
uMuMaxTmDiat	d-1	_uMuMaxTmD	max_growth_rate_of_Algae_at_ambient_temperature
aPLimDiat	-	_aPLimDiat_ =	Droop_function(P)_for_Algae
aNLimDiat	-	_aNLimDiat_ =	Droop_function(N)_for_Algae
aSiLimDiat	-	_aSiLimDiat_	silica_dependence_of_growth_rate
aLLimDiat	-	_aLLimDiat_ =	Light_function
aMuTmLDiat	d-1	_aMuTmLDiat	growth_rate_at_current_light_AND_temp
aNutLimDiat	d-1	_aNutLimDia	nutrient_limitation_function_of_Algae
aMuDiat	d-1	_aMuDiat_ = _	growth_rate
wDAssDiat	gD/m3/d	_wDAssDiat_	assimilation_Algae
rChDDiat	mg/mg	_rChDDiat_ =	chlorophyll-a/DW_ratio_Algae
oChlaDiat	mg/m3	_oChlaDiat_ =	chlorophyll-a_conc
aExtChDiat	m2/mg_chl-a	_aExtChDiat_	specific_extinction_per_unit_chlorophyll-a
ukDRespTmDiat	d-1	_ukDRespTml	temp_corrected_respiration_constant_of_Algae
wDRespDiatW	g/m2/d	_wDRespDiat\	respiration_of_Algae_in_water
ukLossTmDiat	d-1	_ukLossTmDia	daily_grazing_on_Algae
wDLossDiat	mgDW/l/d	_wDLossDiat_	Algae_grazing_loss
wDMortDiatW	g/m3/d	_wDMortDiatW	mortality_in_water
uCorVSetDiat	m/d	_uCorVSetDia	corrected_sedimentation_velocity_of_Algae
tDSetDiat	g/m2/d	_tDSetDiat_ =	sedimentation_flux_of_Algae
tDResusDiat	gD/m2/d	_tDResusDiat	resuspension_of_Algae
tDRespDiatS	gD/m2/d	_tDRespDiatS	respiration_of_sediment_Algae
tDMortDiatS	g/m2/d	_tDMortDiatS_	mortality_in_sed
ukDDecDiat	d-1	_ukDDecDiat_	total_loss_rate_of_algae_in_water(excl_dilution)
wPExcrDiatW	gP/m3/d	_wPExcrDiatV	P_excretion_Algae_in_water
wPLossDiat	mgP/l/d	_wPLossDiat_	Algae_grazing_loss
wPMortDiatW	gP/m3/d	_wPMortDiatV	mortality_Algae_in_water
tPSetDiat	gP/m2/d	_tPSetDiat_ =	sedimentation
tPResusDiat	gD/m2/d	_tPResusDiat	Resuspension_of_algae
tPExcrDiatS	gP/m2/d	_tPExcrDiatS_	P_excretion_of_algae_in_sediment
tPMortDiatS	gP/m2/d	_tPMortDiatS_	P_mortality_of_algae_in_sediment
wNExcrDiatW	gN/m3/d	_wNExcrDiatV	N_excretion_Algae_in_water
wNLossDiat	mgN/l/d	_wNLossDiat_	Algae_grazing_loss
wNMortDiatW	gN/m3/d	_wNMortDiatV	mortality_Algae_in_water
tNSetDiat	gN/m2/d	_tNSetDiat_ =	sedimentation
tNResusDiat	gD/m2/d	_tNResusDiat	Resuspension_of_algae
tNExcrDiatS	gN/m2/d	_tNExcrDiatS_	N_excretion_of_algae_in_sediment
tNMortDiatS	gN/m2/d	_tNMortDiatS_	N_mortality_of_algae_in_sediment
wDPrimDiatW	mgD/l/d	_wDPrimDiatV	total_PRIM_flux_to_algae_in_water
wPPrimDiatW	mgP/l/d	_wPPrimDiatV	Total_PRIM_flux_to_Algae
wNPrimDiatW	mgN/l/d	_wNPrimDiatV	Total_PRIM_flux_to_Algae
tDPrimDiatS	gD/m2/d	_tDPrimDiatS_	total_flux_from_PRIM_module_to_sediment_Algae
tPPrimDiatS	gP/m2/d	_tPPrimDiatS_	total_flux_from_PRIM_module_to_sediment_Algae
tNPrimDiatS	gN/m2/d	_tNPrimDiatS_	total_flux_from_PRIM_module_to_sediment_Algae
oChla	mg/m3	_oChla_ = _o(	total_chlorophyll-a
wDAssPhyt	gDW/m3/d	_wDAssPhyt_	total_algal_growth
wDRespPhytW	gD/m3/d	_wDRespPhyt	total_algal_respiration_in_water
wDMortPhytW	gD/m3/d	_wDMortPhyt\	total_algal_mortality_in_water
tDSetPhyt	gDW/m2/d	_tDSetPhyt_ =	total_phytoplankton_sedimentation
wDLossPhyt	gDW/m3/d	_wDLossPhyt_	total_phytoplankton_grazing_loss
wDPrimPhytW	gD/m3/d	_wDPrimPhyt\	total_of_PRIM_processes_of_algae_in_water
wPUptPhyt	gP/m3/d	_wPUptPhyt_	total_P_uptake_phytoplankton
wPExcrPhytW	gP/m3/d	_wPExcrPhyt\	total_P_excretion_phytoplankton_in_water

wPMortPhytW	gP/m3/d	_wPMortPhyt\	total_P_mortality_phytoplankton_in_water
tPSetPhyt	gP/m2/d	_tPSetPhyt_ =	total_sedimentation_of_algae
tPResusPhyt	gP/m2/d	_tPResusPhyt	-
wPLossPhyt	mgP/l/d	_wPLossPhyt_	total_grazing_loss
wPPrimPhytW	gP/m3/d	_wPPrimPhyt\	total_of_PRIM_processes_of_algae_in_water
wNUptPhyt	mgN/l/d	_wNUptPhyt_	total_N_uptake_phytoplankton
wNUptNH4Phyt	mgN/l/d	_wNUptNH4P	total_ammonium-N_uptake_phytoplankton
wNUptNO3Phyt	mgN/l/d	_wNUptNO3P	total_nitrate-N_uptake_phytoplankton
wNExcrPhytW	gN/m3/d	_wNExcrPhyt\	total_N_excretion_phytoplankton_in_water
wNMortPhytW	gN/m3/d	_wNMortPhyt\	total_N_mortality_phytoplankton_in_water
tNSetPhyt	gN/m2/d	_tNSetPhyt_ =	total_sedimentation_of_algae
tNResusPhyt	gN/m2/d	_tNResusPhyt	-
wNLossPhyt	mgN/l/d	_wNLossPhyt_	total_grazing_loss
wNPrimPhytW	gN/m3/d	_wNPrimPhyt\	total_of_PRIM_processes_of_algae_in_water
tDRespPhytS	g/m2/d	_tDRespPhytS	respiration_of_algae_on_bottom
tDMortPhytS	g/m2/d	_tDMortPhytS	mortality_of_algae_on_bottom
tDPrimPhytS	g/m2/d	_tDPrimPhytS	total_flux_of_algae_on_bottom
tPExcrPhytS	gP/m2/d	_tPExcrPhytS_	total_P_excretion_sediment_phytoplankton
tPMortPhytS	gP/m2/d	_tPMortPhytS_	total_phytoplankton_mortality
tPPrimPhytS	gP/m2/d	_tPPrimPhytS	total_flux_of_algae_on_bottom
tNExcrPhytS	gN/m2/d	_tNExcrPhytS_	total_N_excretion_sediment_phytoplankton
tNMortPhytS	gN/m2/d	_tNMortPhytS_	total_phytoplankton_mortality
tNPrimPhytS	gN/m2/d	_tNPrimPhytS	total_flux_of_algae_on_bottom
wSiUptDiat	mgSi/l/d	_wSiUptDiat_	Diatoms_silica_uptake
wSiExcrDiatW	mgSi/l/d	_wSiExcrDiat\	Si_excretion
wSiLossDiat	mgSi/l/d	_wSiLossDiat_	diatom_grazing_loss
wSiMortDiatW	gSi/m3/d	_wSiMortDiat\	Diatoms_mortality_in_water
tSiSetDiat	gSi/m2/d	_tSiSetDiat_ =	Diatoms_sedimentation
tSiResusDiat	gSi/m3/d	_tSiResusDiat	Diatoms_sedimentation
wSiPrimDiatW	gSi/m2/d	_wSiPrimDiat\	total_Si_flux_to_sed_diatoms_in_PRIM_module
rCyDBlue	mg/mg	_rCyDBlue_ =	C-phycocyanin/DW-ratio_blue-greens
oCyan	mg/m3	_oCyan_ = _r(	C-phycocyanin
fDDiat	-	_fDDiat_ = _sl	DW_fraction_of_algal_group_of_total_algae
wDPrimDetW	mg/l/d	_wDPrimDetW	Flux_to_water_detritus
tDPrimDetS	mg/l/d	_tDPrimDetS_	Flux_to_sediment_detritus
tDPrimTotT	gD/m2/d	_tDPrimTotT_	total_DW_flux
wO2ProdPhyt	gO2/m3/d	_wO2ProdPhy	O2_production_by_phytoplankton
wO2RespPhytW	gO2/m3/d	_wO2RespPh	O2_production_by_phytoplankton
wO2UptNO3Phyt	gO2/m3/d	_wO2UptNO3	O2_production_due_to_NO3_uptake_by_phytopl
wO2PrimW	gO2/m3/d	_wO2PrimW_	O2_flux_by_water_algae
tO2RespPhytS	gO2/m2/d	_tO2RespPhy	O2_respiration_by_sediment_algae
tO2PrimS	gO2/m2/d	_tO2PrimS_ =	O2_flux_by_sediment_algae
wPMortPhytPO4W	mgP/l/d	_wPMortPhytF	soluble_P_flux_from_died_Algae
wPMortPhytDetW	mgP/l/d	_wPMortPhytD	detrital_P_flux_from_died_Algae
wPLossPhytPO4	mgP/l/d	_wPLossPhytI	soluble_P_grazing_loss
wPLossPhytDet	mgP/l/d	_wPLossPhytI	detrital_P_grazing_loss
wPPrimPO4W	mgP/l/d	_wPPrimPO4\	SRP_in_water
wPPrimDetW	mgP/l/d	_wPPrimDetW	Detritus_in_water
tPMortPhytPO4S	gP/m2/d	_tPMortPhytP	soluble_P_flux_from_died_Algae
tPMortPhytDetS	gP/m2/d	_tPMortPhytD	detrital_P_flux_from_died_Algae
tPPrimDetS	gP/m2/d	_tPPrimDetS_	Sediment_detritus
tPPrimPO4S	gP/m2/d	_tPPrimPO4S	Pore_water_P
tPPrimTotT	gP/m2/d	_tPPrimTotT_	total_P_flux
wNMortPhytNH4W	mgN/l/d	_wNMortPhytI	ammonium_flux_from_died_Algae
wNMortPhytDetW	mgN/l/d	_wNMortPhytI	detrital_N_flux_from_died_Algae
wNLossPhytNH4	mgN/l/d	_wNLossPhytI	NH4-N_grazing_loss
wNLossPhytDet	mgN/l/d	_wNLossPhytI	detrital_N_grazing_loss
wNPrimNH4W	mgN/l/d	_wNPrimNH4\	ammonium_in_water
wNPrimNO3W	mgN/l/d	_wNPrimNO3\	nitrate_in_water
wNPrimDetW	mgN/l/d	_wNPrimDetW	Detritus_in_water
tNMortPhytNH4S	gN/m2/d	_tNMortPhytN	ammonium_flux_from_died_Algae
tNMortPhytDetS	gN/m2/d	_tNMortPhytD	detrital_N_flux_from_died_Algae
tNPrimNH4S	gN/m2/d	_tNPrimNH4S	Pore_water_ammonium
tNPrimNO3S	gN/m2/d	_tNPrimNO3S	Pore_water_nitrate
tNPrimDetS	gN/m2/d	_tNPrimDetS_	Sediment_detritus
tNPrimTotT	gN/m2/d	_tNPrimTotT_	total_N_flux
tSiExcrDiatS	gSi/m2/d	_tSiExcrDiatS	Si_excretion_of_bottom_Algae

tSiMortDiatS	gSi/m2/d	_tSiMortDiatS	mortality_of_bottom_Algae
wSiPrimSiO2W	mgSi/l/d	_wSiPrimSiO2	total_Si_flux_to_SiO2_in_PRIM_module
wSiPrimDetW	mgSi/l/d	_wSiPrimDetV	total_Si_flux_to_sed_detritus_in_PRIM_module
tSiPrimDiatS	gSi/m2/d	_tSiPrimDiatS	total_Si_flux_to_sed_diatoms_in_PRIM_module
tSiPrimDetS	gSi/m2/d	_tSiPrimDetS_	Sediment_detritus
tSiPrimTotT	gSi/m2/d	_tSiPrimTotT_	total_Si_flux
aPACoef	-	_aPACoef_ =	Poole-Atkins_coefficient
bSecchiMax	m	_bSecchiMax_	max_Secchi_depth
aSecchi	m	_aSecchi_ = _	Secchi_depth
aTransparency	m	_aTransparen	Secchi_depth
aDepthEuph	m	_aDepthEuph_	euphotic_depth
aRelDepthEuph	m	_aRelDepthEu	relative_euphotic_depth
aChlaH	mg_chlorophyll-a/	_aChlaH_ = _	Chla_per_m2
aCovPhytW	%	_aCovPhytW_	%_cover_with_algae
rExtChPhyt	m2/g_chl-a	_rExtChPhyt_	average_spec_extinction_of_algae_per_unit_chl-a
uFunTmZoo	-	_uFunTmZoo_	temp_function_of_zooplankton
rPDZoo	mgP/mgDW	_rPDZoo_ = _	P/D_ratio_herbzooplankton
rNDZoo	mgN/mgDW	_rNDZoo_ = _	N/C_ratio_herbzooplankton
oDFoodZoo	mgD/l	_oDFoodZoo_	food_for_zooplankton
aFilt	ltr/mgDW/d	_aFilt_ = _cFil	filtering_rate
ukDAssTmZoo	d-1	_ukDAssTmZ	max_assimilation_rate_of_zooplanktontemp_corrected
aDSatZoo	-	_aDSatZoo_ =	food_saturation_function_of_zooplankton
ukDRespTmZoo	d-1	_ukDRespTm	respiration_constant_of_zooplankton
ukDIncrZoo	d-1	_ukDIncrZoo_	intrinsic_rate_of_increase_of_zooplankton
wDEnvZoo	mg/l/d	_wDEnvZoo_	environmental_correction_of_zooplankton
wDAssZoo	mg/l/d	_wDAssZoo_	assimilation_of_zooplankton
wDConsZoo	mg/l/d	_wDConsZoo_	consumption_of_zooplankton
wDConsDetZoo	mg/l/d	_wDConsDetZ	DW_detritus_consumption_by_zooplankton
wDConsDiatZoo	mg/l/d	_wDConsDiatZ	DW_diatoms_consumption_by_zooplankton
wDConsGrenZoo	mg/l/d	_wDConsGrer	DW_greens_consumption_by_zooplankton
wDConsBlueZoo	mg/l/d	_wDConsBlue	DW_blue-greens_consumption_by_zooplankton
wDConsPhytZoo	mg/l/d	_wDConsPhyt	phytoplankton_consumption_by_zooplankton
wDEgesZoo	mg/l/d	_wDEgesZoo_	egestion_of_zooplankton
aCorDRespZoo	-	_aCorDRespZ	corr_factor_of_zoopl_respiration_for_P_and_N_content
wDRespZoo	mg/l/d	_wDRespZoo_	zoopl_respiration
wDMortZoo	mg/l/d	_wDMortZoo_	zoopl_mortalityincl_environmental_correction
oPFoodZoo	mgP/l	_oPFoodZoo_	Zooplankton_food
rPDFoodZoo	mgP/mgDW	_rPDFoodZoo	P/D_ratio_of_zooplankton_food
wPConsDiatZoo	mgP/l/d	_wPConsDiatZ	P_diatom_consumption_by_zoopl
wPConsGrenZoo	mgP/l/d	_wPConsGrer	P_green_consumption_by_zoopl
wPConsBlueZoo	mgP/l/d	_wPConsBlue	P_bluegreen_consumption_by_zoopl
wPConsPhytZoo	mgP/l/d	_wPConsPhyt	total_P_phytoplankton_consumption_by_zoopl
wPConsDetZoo	mgP/l/d	_wPConsDetZ	consumption_of_detrital_P
wPConsZoo	mgP/l/d	_wPConsZoo_	total_P_consumption
afPAssZoo	-	_afPAssZoo_	P_assimilation_efficiency_of_herbivores
wPAssZoo	mgP/l/d	_wPAssZoo_ =	assimilation_by_herbivores
wPEgesZoo	mgP/l/d	_wPEgesZoo_	P_egestion
wPEgesZooPO4	mgP/l/d	_wPEgesZooF	soluble_P_egestion
wPEgesZooDet	mgP/l/d	_wPEgesZooI	detrital_P_egestion
akPExcrZoo	d-1	_akPExcrZoo_	P_excretion_rate_of_herbivores
wPExcrZoo	mgP/l/d	_wPExcrZoo_	P_excretion
wPMortZoo	mgP/l/d	_wPMortZoo_	mortality
wPMortZooPO4	mgP/l/d	_wPMortZooP	soluble_P_mortality
wPMortZooDet	mgP/l/d	_wPMortZooD	detrital_P_mortality
oNFoodZoo	mgN/l	_oNFoodZoo_	Zooplankton_food
rNDFoodZoo	mgN/mgDW	_rNDFoodZoo	N/C_ratio_of_zooplankton_food
wNConsDiatZoo	mgN/l/d	_wNConsDiatZ	N_diatom_consumption_by_zoopl
wNConsGrenZoo	mgN/l/d	_wNConsGrer	N_green_consumption_by_zoopl
wNConsBlueZoo	mgN/l/d	_wNConsBlue	N_bluegreen_consumption_by_zoopl
wNConsPhytZoo	mgN/l/d	_wNConsPhyt	total_N_phytoplankton_consumption_by_zoopl
wNConsDetZoo	mgN/l/d	_wNConsDetZ	consumption_of_detrital_N
wNConsZoo	mgN/l/d	_wNConsZoo_	total_N_consumption
afNAssZoo	-	_afNAssZoo_	N_assimilation_efficiency_of_herbivores
wNAssZoo	mgN/l/d	_wNAssZoo_	assimilation_by_herbivores
wNEgesZoo	mgN/l/d	_wNEgesZoo_	N_egestion
wNEgesZooNH4	mgN/l/d	_wNEgesZooI	soluble_N_egestion
wNEgesZooDet	mgN/l/d	_wNEgesZooI	detrital_N_egestion

kNExcrZoo	d-1	_kNExcrZoo_	N_excretion_rate_of_herbivores
wNExcrZoo	mgN/l/d	_wNExcrZoo_	N_excretion
wNMortZoo	mgN/l/d	_wNMortZoo_	mortality
wNMortZooNH4	mgN/l/d	_wNMortZooN	soluble_N_mortality
wNMortZooDet	mgN/l/d	_wNMortZooD	detrital_N_mortality
wSiConsDiatZoo	mgSi/l/d	_wSiConsDiat	consumption_of_diatoms
uFunTmBent	-	_uFunTmBent	temp_function_of_zoobenthos
aDFoodBent	gD/m2	_aDFoodBent	food_for_zoobenthos
rPDBent	gP/gD	_rPDBent_ = _	P/D_ratio_of_zoobenthos
rNDBent	gN/g	_rNDBent_ = _	N/D_ratio_of_zoobenthos
tDMigrBent	gD/m2/d	_tDMigrBent_	migration_flux
aDSatBent	-	_aDSatBent_	food_limitation_function_of_zoobenthos
ukDIncrBent	d-1	_ukDIncrBent	intrinsic_net_increase_rate_of_zoobenthos
tDEnvBent	gD/m2/d	_tDEnvBent_ =	environmental_correction_of_zoobenthos
tDAssBent	gD/m2/d	_tDAssBent_ =	assimilation_of_zoobenthos
aDAssBentSp	d-1	_aDAssBentS	specific_assimilation_rate_of_zoobenthos
tDConsBent	gD/m2/d	_tDConsBent_	consumption_of_zoobenthos
tDConsDetBent	gD/m2/d	_tDConsDetBe	detritus_consumption_by_zoobenthos
tDConsDiatBent	gD/m2/d	_tDConsDiatB	diatoms_consumption_by_zoobenthos
tDConsGrenBent	gD/m2/d	_tDConsGrenI	greens_consumption_by_zoobenthos
tDConsBlueBent	gD/m2/d	_tDConsBlueE	blue-greens_consumption_by_zoobenthos
tDConsPhytBent	gD/m2/d	_tDConsPhytE	phutoplankton_consumption_by_zoobenthos
tDEgesBent	gD/m2/d	_tDEgesBent_	egestion_of_zoobenthos
tDRespBent	gD/m2/d	_tDRespBent_	respiration_of_zoobenthos
tDMortBent	gD/m2/d	_tDMortBent_	zoobenthos_mortality_incl_environmental_correction
aPFoodBent	gP/m2	_aPFoodBent	food_for_zoobenthos
rPDFoodBent	gP/gD	_rPDFoodBen	average_P/D_ratio_of_zoobenthos_food
tPConsDetBent	gP/m2/d	_tPConsDetBe	detrital_P_consumption_by_zoobenthos
tPConsDiatBent	gP/m2/d	_tPConsDiatB	diatom_P_consumption_by_zoobenthos
tPConsGrenBent	gP/m2/d	_tPConsGrenI	greens_P_consumption_by_zoobenthos
tPConsBlueBent	gP/m2/d	_tPConsBlueE	blue-greens_P_consumption_by_zoobenthos
tPConsPhytBent	gP/m2/d	_tPConsPhytE	phytoplankton_P_consumption_by_zoobenthos
tPConsBent	gP/m2/d	_tPConsBent_	total_P_consumption_of_zoobenthos
afPAssBent	-	_afPAssBent_	P_assim_efficiency_of_zoobenthos
tPAssBent	gP/m2/d	_tPAssBent_ =	P_assimilation_of_zoobenthos
tPEgesBent	gP/m2/d	_tPEgesBent_	egestion_of_zoobenthos
tPEgesBentPO4	gP/m2/d	_tPEgesBentF	SRP_egestion_of_zoobenthos
tPEgesBentDet	gP/m2/d	_tPEgesBentD	detrital_P_egestion_of_zoobenthos
tPExcrBent	d-1	_tPExcrBent_	P_excretion_of_zoobenthos
tPMortBent	gP/m2/d	_tPMortBent_	mortality_of_zoobenthos
tPMortBentPO4	gP/m2/d	_tPMortBentP	part_of_died_zoobenthos_P_becoming_dissolved_P
tPMortBentDet	gP/m2/d	_tPMortBentD	part_of_died_zoobenthos_P_becoming_detrital_P
tPMigrBent	gP/m2/d	_tPMigrBent_	net_migration_flux
aNFoodBent	gN/m2	_aNFoodBent	food_for_zoobenthos
rNDFoodBent	gN/gD	_rNDFoodBen	average_N/D_ratio_of_zoobenthos_food
tNMigrBent	gN/m2/d	_tNMigrBent_	Net_migration_flux
tNConsDetBent	gN/m2/d	_tNConsDetBe	detrital_N_consumption_by_zoobenthos
tNConsDiatBent	gN/m2/d	_tNConsDiatB	diatom_N_consumption_by_zoobenthos
tNConsGrenBent	gN/m2/d	_tNConsGrenI	greens_N_consumption_by_zoobenthos
tNConsBlueBent	gN/m2/d	_tNConsBlueE	blue-greens_N_consumption_by_zoobenthos
tNConsPhytBent	gN/m2/d	_tNConsPhytE	phytoplankton_N_consumption_by_zoobenthos
tNConsBent	gN/m2/d	_tNConsBent_	total_N_consumption_of_zoobenthos
afNAssBent	-	_afNAssBent_	N_assim_efficiency_of_zoobenthos
tNAssBent	gN/m2/d	_tNAssBent_ =	N_assimilation_of_zoobenthos
tNEgesBent	gN/m2/d	_tNEgesBent_	egestion_of_zoobenthos
tNEgesBentNH4	gN/m2/d	_tNEgesBentN	NH4_egestion_of_zoobenthos
tNEgesBentDet	gN/m2/d	_tNEgesBentD	detrital_N_egestion_of_zoobenthos
tNExcrBent	d-1	_tNExcrBent_	N_excretion_of_zoobenthos
tNMortBent	gN/m2/d	_tNMortBent_	mortality_of_zoobenthos
tNMortBentNH4	gN/m2/d	_tNMortBentN	part_of_died_zoobenthos_N_becoming_ammonium-N
tNMortBentDet	gN/m2/d	_tNMortBentD	part_of_died_zoobenthos_N_becoming_detrital_N
tSiConsDiatBent	gSi/m2/d	_tSiConsDiatE	diatom_consumption_by_zoobenthos
aDFish	gD_m-2	_aDFish_ = _s	total_fish_biomass
aPFish	gP_m-2	_aPFish_ = _s	total_fish_biomass
aNFish	gN_m-2	_aNFish_ = _s	total_fish_biomass
rPDFiJv	gP/gD	_rPDFiJv_ = _	P/D_ratio_of_young_fish
rPDFiAd	gP/gD	_rPDFiAd_ = _	P/D_ratio_of_adult_fish

rNDFiJv	gN/gD	_rNDFiJv_ = _	N/D_ratio_of_young_fish
rNDFiAd	gN/gD	_rNDFiAd_ = _	N/D_ratio_of_adult_fish
tDReprFish	gD_m-2_d-1	_tDReprFish_	Reproduction_flux
tDAgeFish	gD_m-2_d-1	_tDAgeFish_ =	Ageing
aFunVegFish	-	_aFunVegFish	vegetation_dependence_of_fish_feeding
aDSatFiJv	-	_aDSatFiJv_ =	food_limitation_function_of_young_fish
ukDIncrFiJv	d-1	_ukDIncrFiJv_	intrinsic_net_increase_rate_of_fish
tDEnvFiJv	gD/m2/d	_tDEnvFiJv_ =	environmental_correction_of_fish
tDAssFiJv	gD/m2/d	_tDAssFiJv_ =	assimilation_of_fish
tDConsFiJv	gD/m2/d	_tDConsFiJv_	zooplankton_consumption_of_fish
tDEgesFiJv	gD/m2/d	_tDEgesFiJv_	egestion_of_fish
tDRespFiJv	gD/m2/d	_tDRespFiJv_	respiration_of_fish
tDMortFiJv	gD/m2/d	_tDMortFiJv_	fish_mortality_incl_environmental_correction
tDMigrFiJv	gD/m2/d	_tDMigrFiJv_ =	migration_flux
aDSatFiAd	-	_aDSatFiAd_	food_limitation_function_of_adult_fish
ukDIncrFiAd	d-1	_ukDIncrFiAd_	intrinsic_net_increase_rate_of_fish
tDEnvFiAd	gD/m2/d	_tDEnvFiAd_ =	environmental_correction_of_fish
tDAssFiAd	gD/m2/d	_tDAssFiAd_ =	assimilation_of_fish
tDConsFiAd	gD/m2/d	_tDConsFiAd_	zoobenthos_consumption_of_fish
tDEgesFiAd	gD/m2/d	_tDEgesFiAd_	egestion_of_fish
tDRespFiAd	gD/m2/d	_tDRespFiAd_	respiration_of_fish
tDMortFiAd	gD/m2/d	_tDMortFiAd_	fish_mortality_incl_environmental_correction
ukHarvFish	d-1	_ukHarvFish_	fish_harvesting_constant
tDHarvFish	gD/m2/d	_tDHarvFish_	harvesting_of_fish
tDMigrFiAd	gD/m2/d	_tDMigrFiAd_	migration_flux
tDMortFish	gD/m2/d	_tDMortFish_	bent_fish_mortality
tDMortFishBot	g/m2/d	_tDMortFishBo	part_of_died_fish_DW_fixed_in_bones_and_scales
tDMortFishDet	gD/m2/d	_tDMortFishDe	part_of_died_fish_DW_becoming_detritus
tPReprFish	gP_m-2_d-1	_tPReprFish_	Reproduction_flux
tPAgeFish	gD_m-2_d-1	_tPAgeFish_ =	Ageing
tPMigrFiJv	gP/m2/d	_tPMigrFiJv_ =	net_migration_flux
tPConsFiJv	gP/m2/d	_tPConsFiJv_	(zooplankton)_P_consumption_by_FiJv
afPAssFiJv	-	_afPAssFiJv_	P_assim_efficiency_of_FiJv
tPAssFiJv	gP/m2/d	_tPAssFiJv_ =	P_assimilation_of_FiJv
tPEgesFiJv	gP/m2/d	_tPEgesFiJv_	egestion_of_FiJv
tPExcrFiJv	d-1	_tPExcrFiJv_ =	P_excretion_of_FiJv
tPMortFiJv	gP/m2/d	_tPMortFiJv_ =	mortality_of_FiJv
tPMigrFiAd	gP/m2/d	_tPMigrFiAd_	net_migration_flux
tPConsFiAd	gP/m2/d	_tPConsFiAd_	(zoobenthos)_P_consumption_by_FiAd
afPAssFiAd	-	_afPAssFiAd_	P_assim_efficiency_of_FiAd
tPAssFiAd	gP/m2/d	_tPAssFiAd_ =	P_assimilation_of_FiAd
tPEgesFiAd	gP/m2/d	_tPEgesFiAd_	egestion_of_FiAd
tPExcrFiAd	d-1	_tPExcrFiAd_	P_excretion_of_FiAd
tPMortFiAd	gP/m2/d	_tPMortFiAd_	mortality_of_FiAd
tPHarvFish	gP/m2/d	_tPHarvFish_	harvesting_of_FiAd
tPMortFish	gP/m2/d	_tPMortFish_	-
tPMortFishBot	gP/m2/d	_tPMortFishBo	part_of_died_fish_P_fixed_in_bones_AND_scales
tPMortFishPO4	gP/m2/d	_tPMortFishPO	part_of_died_fish_P_becoming_dissolved_P
tPMortFishDet	gP/m2/d	_tPMortFishDe	part_of_died_fish_PW_becoming_detritus
tPEgesFish	gP_m-2_d-1	_tPEgesFish_	total_fish_egestion
tPEgesFishPO4	gP/m2/d	_tPEgesFishP	SRP_egestion_of_fish
tPEgesFishDet	gP/m2/d	_tPEgesFishD	detrital_P_egestion_of_fish
tNReprFish	gN_m-2_d-1	_tNReprFish_	Reproduction_flux
tNAgeFish	gD_m-2_d-1	_tNAgeFish_ =	Ageing
tNMigrFiJv	gN/m2/d	_tNMigrFiJv_ =	net_migration_flux
tNConsFiJv	gN/m2/d	_tNConsFiJv_	(zooplankton)_N_consumption_by_FiJv
afNAssFiJv	-	_afNAssFiJv_	N_assim_efficiency_of_FiJv
tNAssFiJv	gN/m2/d	_tNAssFiJv_ =	N_assimilation_of_FiJv
tNEgesFiJv	gN/m2/d	_tNEgesFiJv_	egestion_of_FiJv
tNExcrFiJv	d-1	_tNExcrFiJv_	N_excretion_of_FiJv
tNMortFiJv	gN/m2/d	_tNMortFiJv_	mortality_of_FiJv
tNMigrFiAd	gN/m2/d	_tNMigrFiAd_	net_migration_flux
tNConsFiAd	gN/m2/d	_tNConsFiAd_	(zoobenthos)_N_consumption_by_FiAd
afNAssFiAd	-	_afNAssFiAd_	N_assim_efficiency_of_FiAd
tNAssFiAd	gN/m2/d	_tNAssFiAd_ =	N_assimilation_of_FiAd
tNEgesFiAd	gN/m2/d	_tNEgesFiAd_	egestion_of_FiAd
tNExcrFiAd	d-1	_tNExcrFiAd_	N_excretion_of_FiAd

tNMortFiAd	gN/m2/d	_tNMortFiAd_	mortality_of_FiAd
tNHarvFish	gN/m2/d	_tNHarvFish_	harvesting_of_FiAd
tNMortFish	gN/m2/d	_tNMortFish_	-
tNMortFishBot	gN/m2/d	_tNMortFishBo	part_of_died_fish_N_fixed_in_bones_AND_scales
tNMortFishNH4	gN/m2/d	_tNMortFishN	part_of_died_fish_N_becoming_dissolved_N
tNMortFishDet	gN/m2/d	_tNMortFishDe	part_of_died_fish_NW_becoming_detritus
tNEgesFish	gN_m-2_d-1	_tNEgesFish_	total_fish_egestion
tNEgesFishNH4	gN/m2/d	_tNEgesFishN	NH4_egestion_of_fish
tNEgesFishDet	gxN/m2/d	_tNEgesFishD	detrital_xN_egestion_of_fish
uFunTmPisc	-	_uFunTmPisc	temp_function_of_Pisc
tDMigrPisc	gD/m2/d	_tDMigrPisc_	migration_flux
aDCarrPisc	gD.m-2	_aDCarrPisc_	Carrying_capacity_of_Pisc_for_lake_without_OR_with_marsh_zone_resp
aFunVegPisc	-	_aFunVegPisc	vegetation_dependence_of_Pisc_growth_rate
aDSatPisc	-	_aDSatPisc_ =	food_limitation_function_of_Pisc
akDIncrPisc	d-1	_akDIncrPisc_	intrinsic_net_increase_rate_of_Pisc
tDEnvPisc	gD/m2/d	_tDEnvPisc_ =	environmental_correction_of_Pisc
tDAssPisc	gD/m2/d	_tDAssPisc_ =	assimilation_of_Pisc
tDConsPisc	gD/m2/d	_tDConsPisc_	consumption_of_Pisc
tDEgesPisc	gD/m2/d	_tDEgesPisc_	egestion_of_Pisc
tDConsFiJvPisc	gD/m2/d	_tDConsFiJvP	young_fish_consumption_by_Pisc
tDConsFiAdPisc	gD/m2/d	_tDConsFiAdP	adult_fish_consumption_by_Pisc
tDRespPisc	gD/m2/d	_tDRespPisc_	respiration_of_Pisc
tDMortPisc	gD/m2/d	_tDMortPisc_	mortality_of_Pisc(incl_environmental_correction)
tDMortPiscBot	g/m2/d	_tDMortPiscBo	part_of_died_fish_DW_fixed_in_bones_AND_scales
tDMortPiscDet	gD/m2/d	_tDMortPiscDe	part_of_died_Pisc_DW_becoming_detritus
ukHarvPisc	d-1	_ukHarvPisc_	fish_harvesting_constant
tDHarvPisc	gD/m2/d	_tDHarvPisc_	harvesting_of_Pisc
aPPisc	gP/m2	_aPPisc_ = _c	_Piscivorous_fish
tPConsFiJvPisc	gP/m2/d	_tPConsFiJvP	young_fish_consumption_by_Pisc
tPConsFiAdPisc	gP/m2/d	_tPConsFiAdP	adult_fish_consumption_by_Pisc
tPConsPisc	gP_m-2_d-1	_tPConsPisc_	total_P_consumption_by_Pisc
rPDFoodPisc	gP/gD	_rPDFoodPisc	average_P/D_ratio_of_Pisc_food
afPAssPisc	-	_afPAssPisc_	P_assim_efficiency_of_Pisc
tPAssPisc	gP/m2/d	_tPAssPisc_ =	P_assimilation_of_Pisc
tPEgesPisc	gP/m2/d	_tPEgesPisc_	egestion_of_Pisc
tPEgesPiscPO4	gP/m2/d	_tPEgesPiscP	SRP_egestion_of_Pisc
tPEgesPiscDet	gP/m2/d	_tPEgesPiscD	detrital_P_egestion_of_Pisc
tPExcrPisc	gP/m2/d	_tPExcrPisc_	respiration_of_Pisc
tPMortPisc	gP/m2/d	_tPMortPisc_	mortality_of_Pisc
tPMortPiscBot	gP/m2/d	_tPMortPiscBo	part_of_died_Pisc_P_fixed_in_bones_AND_scales
tPMortPiscPO4	gP/m2/d	_tPMortPiscPO	part_of_died_fish_P_becoming_dissolved_P
tPMortPiscDet	gP/m2/d	_tPMortPiscDe	part_of_died_Pisc_P_becoming_detrital_P
tPMigrPisc	gP/m2/d	_tPMigrPisc_ =	net_migration_flux
tPHarvPisc	gP/m2/d	_tPHarvPisc_	harvesting_of_Pisc
aNPisc	gN_m-2	_aNPisc_ = _c	Piscivorous_fish
tNConsFiJvPisc	gN/m2/d	_tNConsFiJvP	young_fish_consumption_by_Pisc
tNConsFiAdPisc	gN/m2/d	_tNConsFiAdP	adult_fish_consumption_by_Pisc
tNConsPisc	gN_m-2_d-1	_tNConsPisc_	total_N_consumption_by_Pisc
rNDFoodPisc	gN/gD	_rNDFoodPisc	average_N/D_ratio_of_Pisc_food
afNAssPisc	-	_afNAssPisc_	N_assim_efficiency_of_Pisc
tNAssPisc	gN/m2/d	_tNAssPisc_ =	N_assimilation_of_Pisc
tNEgesPisc	gN/m2/d	_tNEgesPisc_	egestion_of_Pisc
tNEgesPiscNH4	gN/m2/d	_tNEgesPiscN	SRN_egestion_of_Pisc
tNEgesPiscDet	gN/m2/d	_tNEgesPiscD	detrital_N_egestion_of_Pisc
tNExcrPisc	gN/m2/d	_tNExcrPisc_	respiration_of_Pisc
tNMortPisc	gN/m2/d	_tNMortPisc_	mortality_of_Pisc
tNMortPiscBot	gN/m2/d	_tNMortPiscBo	part_of_died_Pisc_N_fixed_in_bones_AND_scales
tNMortPiscNH4	gN/m2/d	_tNMortPiscN	part_of_died_fish_N_becoming_dissolved_N
tNMortPiscDet	gN/m2/d	_tNMortPiscDe	part_of_died_Pisc_N_becoming_detrital_N
tNMigrPisc	gN/m2/d	_tNMigrPisc_	net_migration_flux
tNHarvPisc	gN/m2/d	_tNHarvPisc_	harvesting_of_Pisc
wDWebZoo	mgDW/l/d	_wDWebZoo_	total_foodweb_flux_of_DW_in_Herbivorous_zooplankton
wPWebZoo	mgP/l/d	_wPWebZoo_	total_foodweb_flux_of_P_in_Herbivorous_zooplankton
wNWebZoo	mgN/l/d	_wNWebZoo_	total_foodweb_flux_of_N_in_Herbivorous_zooplankton
tDWebBent	gDW/m2/d	_tDWebBent_	total_foodweb_flux_of_DW_in_Zoobenthos
tPWebBent	gP/m2/d	_tPWebBent_	total_foodweb_flux_of_P_in_Zoobenthos
tNWebBent	gN/m2/d	_tNWebBent_	total_foodweb_flux_of_N_in_Zoobenthos

tDWebFiJv	gDW/m2/d	_tDWebFiJv_	total_foodweb_flux_of_DW_in_Young_fish
tPWebFiJv	gP/m2/d	_tPWebFiJv_	total_foodweb_flux_of_P_in_Young_fish
tNWebFiJv	gN/m2/d	_tNWebFiJv_	total_foodweb_flux_of_N_in_Young_fish
tDWebFiAd	gDW/m2/d	_tDWebFiAd_	total_foodweb_flux_of_DW_in_Adult_fish
tPWebFiAd	gP/m2/d	_tPWebFiAd_	total_foodweb_flux_of_P_in_Adult_fish
tNWebFiAd	gN/m2/d	_tNWebFiAd_	total_foodweb_flux_of_N_in_Adult_fish
tDWebPisc	g/m2/d	_tDWebPisc_	total_foodweb_flux_of_DW_in_predatory_fish
wDWebDetW	mg/l/d	_wDWebDetW	total_foodweb_flux_of_DW_in_Detritus_in_lake_water
wDWebDiatW	mg/l/d	_wDWebDiatW	total_foodweb_flux_of_DW_in_Diatoms_in_lake_water
wDWebGrenW	mg/l/d	_wDWebGren	total_foodweb_flux_of_DW_in_Greens_in_lake_water
wDWebBlueW	mg/l/d	_wDWebBlue\	total_foodweb_flux_of_DW_in_Blue-greens_in_lake_water
tDWebDetS	gDW/m2/d	_tDWebDetS_	total_foodweb_flux_of_DW_in_Sediment_detritus_in_lake
tDWebDiatS	g/m2/d	_tDWebDiatS_	total_foodweb_flux_of_DW_in_sediment_diatoms_in_lake
tDWebGrenS	g/m2/d	_tDWebGrenS	total_foodweb_flux_of_DW_in_sediment_greens_in_lake
tDWebBlueS	g/m2/d	_tDWebBlueS	total_foodweb_flux_of_DW_in_sediment_blue-greens_in_lake
tDWebPhytS	gDW/m2/d	_tDWebPhytS	total_food_web_flux_of_sediment_algae
tDWebTotT	gDW/m2/d	_tDWebTotT_	total_DW_in_system
wPWebPO4W	mgP/l/d	_wPWebPO4\	total_foodweb_flux_of_P_in_SRP_in_water_in_lake_water
wPWebDetW	mgP/l/d	_wPWebDetW	total_foodweb_flux_of_P_in_Detritus_in_lake_water
wPWebDiatW	mgP/l/d	_wPWebDiatW	total_foodweb_flux_of_P_in_Diatoms_in_lake_water
wPWebGrenW	mgP/l/d	_wPWebGren	total_foodweb_flux_of_P_in_Greens_in_lake_water
wPWebBlueW	mgP/l/d	_wPWebBlue\	total_foodweb_flux_of_P_in_Blue-greens_in_lake_water
tPWebPO4S	gP/m2/d	_tPWebPO4S	total_foodweb_flux_of_P_in_Pore_water_P_in_lake_sediment
tPWebDetS	gP/m2/d	_tPWebDetS_	total_foodweb_flux_of_P_in_Sediment_P_in_lake
tPWebDiatS	gP/m2/d	_tPWebDiatS_	total_foodweb_flux_of_P_in_sediment_diatoms_in_lake
tPWebGrenS	gP/m2/d	_tPWebGrenS	total_foodweb_flux_of_P_in_sediment_greens_in_lake
tPWebBlueS	gP/m2/d	_tPWebBlueS	total_foodweb_flux_of_P_in_sediment_blue-greens_in_lake
tPWebPhytS	gP/m2/d	_tPWebPhytS	total_food_web_flux_of_sediment_algae
tPWebTotT	gP/m2/d	_tPWebTotT_	total_P_in_system
wNWebNH4W	mgN/l/d	_wNWebNH4\	total_foodweb_flux_of_N_in_ammonium_in_water_in_lake_water
wNWebNO3W	mgN/l/d	_wNWebNO3\	total_foodweb_flux_of_N_in_nitrate_in_water_in_lake_water
wNWebDetW	mgN/l/d	_wNWebDetW	total_foodweb_flux_of_N_in_Detritus_in_lake_water
wNWebDiatW	mgN/l/d	_wNWebDiatW	total_foodweb_flux_of_N_in_Diatoms_in_lake_water
wNWebGrenW	mgN/l/d	_wNWebGren	total_foodweb_flux_of_N_in_Greens_in_lake_water
wNWebBlueW	mgN/l/d	_wNWebBlue\	total_foodweb_flux_of_N_in_Blue-greens_in_lake_water
tNWebNH4S	gN/m2/d	_tNWebNH4S	total_foodweb_flux_of_N_in_Pore_water_ammonium_in_lake_sediment
tNWebNO3S	gN/m2/d	_tNWebNO3S	total_foodweb_flux_of_N_in_Pore_water_nitrate_in_lake_sediment
tNWebDetS	gN/m2/d	_tNWebDetS_	total_foodweb_flux_of_N_in_Sediment_N_in_lake_sediment
tNWebDiatS	gN/m2/d	_tNWebDiatS_	total_foodweb_flux_of_N_in_sediment_diatoms_in_lake
tNWebGrenS	gN/m2/d	_tNWebGrenS	total_foodweb_flux_of_N_in_sediment_greens_in_lake
tNWebBlueS	gN/m2/d	_tNWebBlueS	total_foodweb_flux_of_N_in_sediment_blue-greens_in_lake
tNWebPhytS	gN/m2/d	_tNWebPhytS	total_food_web_flux_of_sediment_algae
tNWebTotT	gN/m2/d	_tNWebTotT_	total_N_in_system
wSiWebSiO2W	gSi/m3/d	_wSiWebSiO2	total_foodweb_flux_of_silica_in_SiO2_lake_water
wSiWebDetW	gSi/m3/d	_wSiWebDetW	total_foodweb_flux_of_silica_in_lake_water_detritus
tSiWebDetS	gSi/m2/d	_tSiWebDetS_	total_foodweb_flux_of_silica_in_sediment_detritus
tSiWebTotT	gSi/m2/d	_tSiWebTotT_	total_foodweb_flux_of_silica
aPrefAve	-	_aPrefAve_ =	average_selection_factor
wDConsZoo2	mg/l/d	_wDConsZoo2	total_zoopl_consumption(check)
aDConsZooSp	d-1	_aDConsZooS	specific_consumption_rate_of_zoopl(daily_ration)
aDAssZooSp	d-1	_aDAssZooSp	specific_C_assimilation_of_zooplankton
aDGrazSp	d-1	_aDGrazSp_ =	specific_DW_grazing(daily_grazing)
aPConsZooSp	d-1	_aPConsZooS	specific_P_consumption_OR_daily_ration
aPGrazSp	d-1	_aPGrazSp_ =	specific_P_grazing_OR_daily_grazing
aNConsZooSp	d-1	_aNConsZooS	specific_N_consumption_OR_daily_ration
aNGrazSp	d-1	_aNGrazSp_ =	specific_N_grazing_OR_daily_grazing
afDShootPhra	-	_afDShootPhr	Shoot/total_-ratio
rDSRPhra	-	_rDSRPhra_ =	Shoot/Root_-ratio
rPDShootPhra	-	_rPDShootPh	Shoot_P/D_-ratio
rNDShootPhra	-	_rNDShootPh	Shoot_N/D_-ratio
rPDRootPhra	-	_rPDRootPhra	Root_P/D_-ratio
rNDRootPhra	-	_rNDRootPhra	Root_N/D_-ratio
aLengShootPhra	-	_aLengShootF	-
bDayInitPhra	-	_bDayInitPhra	marks_start_of_root_allocation_to_shoot_of_phragmities
aDAllPhra	gD/m2	_aDAllPhra_ =	root_biomass_available_for_allocation_to_shoot
tDAllPhra	gD/m2/d	_tDAllPhra_ =	allocation_flux
tNTransPhra	gN/m2/d	_tNTransPhra	translocation_of_N_initial_growth

tPTransPhra	gP/m2/d	_tPTransPhra_	translocation_of_P_initial_growth
aVNUptPhraMaxCr	mgN/mgD/d	_aVNUptPhra	max_uptake_rate_at_current_N/D_ratio_AND_temp
ahNUptPhraS	mgP/l	_ahNUptPhra	half-saturating_N_concentration
aVNUptPhraS	mgN/mgD/d	_aVNUptPhra	N_uptake_rate(by_roots)
tNUptPhraS	gN/m2/d	_tNUptPhraS_	Total_N_uptake_of_reed
tNUptNH4PhraS	gN/m2/d	_tNUptNH4Ph	NH4_uptake_of_reed
tNUptNO3PhraS	gN/m2/d	_tNUptNO3Ph	NO3_uptake_of_reed
tNUptShootPhra	gN/m2/d	_tNUptShootP	N_uptake_shoot
tNUptRootPhra	gN/m2/d	_tNUptRootPh	N_uptake_root
aVPUptPhraMaxCr	mgP/mgD/d	_aVPUptPhra	max_uptake_rate_at_current_P/D_ratio_AND_temp
ahPUptPhraS	gP/m3	_ahPUptPhra	half-saturating_P_concentration
aVPUptPhraS	mgP/mgD/d	_aVPUptPhra	P_uptake_rate(by_roots)
tPUptPhraS	gP/m2/d	_tPUptPhraS_	Total_P_uptake_of_reed
tPUptShootPhra	gP/m2/d	_tPUptShootP	P_uptake_shoot
tPUptRootPhra	gP/m2/d	_tPUptRootPh	P_uptake_root
uFunTmProdPhra	-	_uFunTmProd	tempfunction_production_vegetation
ukDRespTmPhra	1/d	_ukDRespTm	maintenance_respiration_rate_at_current_temperature
aMuPhotPhra	1/d	_aMuPhotPhra	max_photosynthetic_rate_at_current_light_AND_temp
aNLimProdPhra	-	_aNLimProdP	Droop_function_N-limitation
aPLimProdPhra	-	_aPLimProdP	Droop_function_P-limitation
aNutLimPhra	-	_aNutLimPhra	nutrient_reduction_function
aMuPhra	1/d	_aMuPhra_ =	growth_rate
akDIncrPhra	1/d	_akDIncrPhra_	intrinsic_net_increase_rate_of_reed
tDDensPhra	gDW/m2/d	_tDDensPhra_	density_correction_of_reed
tDDensProdPhra	gDW/m2/d	_tDDensProd	density_correction_of_production
tDProdPhra	gDW/m2/d	_tDProdPhra_	production_of_reed
tDProdShootPhra	gDW/m2/d	_tDProdShoot	production_shoot_of_reed
tDProdRootPhra	gDW/m2/d	_tDProdRootF	production_root_of_reed
tDRespShootPhra	gDW/m2/d	_tDRespShoo	maintenance_respiration_shoot_of_reed
tDRespRootPhra	gDW/m2/d	_tDRespRoot	maintenance_respiration_root_of_reed
tO2RespRootPhra	gO2.m-2.d-1	_tO2RespRoo	root_O2_respiration
tO2FlowPhra	gO2/m2/d	_tO2FlowPhra	O2_flux_to_sediment
bDayRealPhra	-	_bDayRealPh	-
aDRealPhra	gDW/m2	_aDRealPhra_	shoot_biomass_available_for_reallocation_to_root
tDRealPhra	gDW/m2/d	_tDRealPhra_	reallocation_of_D_per_day_at_end_of_growing_season
tNRetrPhra	gN/m2/d	_tNRetrPhra_	retranslocation_of_N_end_growing_season
tPRetrPhra	gP/m2/d	_tPRetrPhra_	retranslocation_of_P_end_growing_season
tDMortShootPhra	gDW/m2/d	_tDMortShoot	mortality_of_shoots
tNMortShootPhra	gN/m2/d	_tNMortShoot	mortality_of_shoots
tPMortShootPhra	gP/m2/d	_tPMortShoot	mortality_of_shoots
tDMortRootPhra	gDW/m2/d	_tDMortRootP	mortality_of_roots
tNMortRootPhra	gN/m2/d	_tNMortRootP	mortality_of_roots
tPMortRootPhra	gP/m2/d	_tPMortRootP	mortality_of_roots
tDManShootPhra	gDW/m2/d	_tDManShoot	loss_flux_of_biomass_by_management
tNManShootPhra	gDW/m2/d	_tNManShoot	loss_flux_of_N_through_management
tPManShootPhra	gDW/m2/d	_tPManShoot	loss_flux_of_P_through_management
tDIMSM	gDW/m2/d	_tDIMSM_ = _	increase_in_inorganic_matter_in_sediment
tDHumSM	gDW/m2/d	_tDHumSM_ =	increase_in_sediment_humus_in_marsh
tDDetSM	gDW/m2/d	_tDDetSM_ =	increase_in_sediment_detritus_in_marsh
vDeltaSM	m/d	_vDeltaSM_ =	turnover_depth_in_marsh
tDBurIMM	gDW/m2/d	_tDBurIMM_ =	burial_flux_of_DW_in_inorganic_matter_in_marsh
tDBurOMM	gDW/m2/d	_tDBurOMM_	burial_flux_of_DW_in_organic_matter_in_marsh
tDBurDetM	gDW/m2/d	_tDBurDetM_	burial_flux_of_DW_in_detritus_in_marsh
tDBurHumM	gDW/m2/d	_tDBurHumM_	burial_flux_of_DW_in_humus_in_marsh
tDBurTotM	gDW/m2/d	_tDBurTotM_	total_DW_burial_flux_in_marsh
tPBurHumM	gP/m2/d	_tPBurHumM_	burial_flux_of_P_in_humus_in_marsh
tPBurDetM	gP/m2/d	_tPBurDetM_	burial_flux_of_P_in_detritus_in_marsh
tPBurAIMM	gP/m2/d	_tPBurAIMM_	burial_flux_of_P_absorbed_onto_inorganic_matter_in_marsh
tPBurPO4M	gP/m2/d	_tPBurPO4M_	burial_flux_of_dissolved_P_in_marsh
tPBurTotM	gP/m2/d	_tPBurTotM_	total_P_burial_flux_in_marsh
tNBurHumM	gN/m2/d	_tNBurHumM_	burial_flux_of_N_in_humus_in_marsh
tNBurDetM	gN/m2/d	_tNBurDetM_	burial_flux_of_N_in_detritus_in_marsh
tNBurNH4M	gN/m2/d	_tNBurNH4M_	burial_flux_of_dissolved_NH4_in_marsh
tNBurNO3M	gN/m2/d	_tNBurNO3M_	burial_flux_of_dissolved_NO3_in_marsh
tNBurTotM	gN/m2/d	_tNBurTotM_	total_N_burial_flux_in_marsh
tSiBurDetM	gSi/m2/d	_tSiBurDetM_	burial_flux_of_Si_in_detritus_in_marsh
tSiBurTotM	gSi/m2/d	_tSiBurTotM_	total_Si_burial_flux_in_marsh

vDeltaWM	m/d	_vDeltaWM_ =	marsh_water_depth_change
aRelDeltaWM	d-1	_aRelDeltaWM	relative_marsh_water_depth_change
tDSetTot	gD/m2/d	_tDSetTot_ =	total_settling
tPSetTot	gP/m2/d	_tPSetTot_ =	total_settling
tNSetTot	gN/m2/d	_tNSetTot_ =	total_settling
tDResusTot	gD/m2/d	_tDResusTot_	total_resuspension
tPResusTot	gP/m2/d	_tPResusTot_	total_P_resuspension_flux
tNResusTot	gN/m2/d	_tNResusTot_	total_N_resuspension_flux
bTimeDred	d	_bTimeDred_	dredging_time(every_nth_year)
aDepthStart	d	_aDepthStart_	update_dredget_layer
akDredDepth	d-1	_akDredDepth	rate_constant_of_deepening
akDred	d-1	_akDred_ = _I	rate_constant_of_dredging(exponential_function)
akDredBent	d-1	_akDredBent_	rate_constant_of_dredging_for_zoobenthos
vDredDepthW	m/d	_vDredDepthW	change_in_water_depth_due_to_dredging
tDDredDetS	gDW/m2/d	_tDDredDetS_	dredging_flux_of_DW_Detritus_in_lake_sediment
tPDredDetS	gP/m2/d	_tPDredDetS_	dredging_flux_of_P_Detritus_in_lake_sediment
tNDredDetS	gN/m2/d	_tNDredDetS_	dredging_flux_of_N_Detritus_in_lake_sediment
tSiDredDetS	gSi/m2/d	_tSiDredDetS	dredging_flux_of_Si_Det_in_lake_sediment
tPDredAIMS	gP/m2/d	_tPDredAIMS_	dredging_flux_of_P_absorbed_onto_inorganic_matter_in_lake_sediment
bRhoSolidSoil	g/m3	_bRhoSolidSo	average_solid_density_of_soil_material
tDDredNetSoil	gDW/m2/d	_tDDredNetSo	dredging_flux_of_DW_NetSoil_in_lake_sediment
tDDredNetIMS	gDW/m2/d	_tDDredNetIM	dredging_flux_of_DW_NetIMS_in_lake_sediment
tDDredNetHumS	gDW/m2/d	_tDDredNetHu	dredging_flux_of_DW_NetHum_in_lake_sediment
tPDredNetHumS	gP/m2/d	_tPDredNetHu	dredging_flux_of_P_NetHum_in_lake_sediment
tNDredNetHumS	gN/m2/d	_tNDredNetHu	dredging_flux_of_N_NetHum_in_lake_sediment
tDDredDiatS	gDW/m2/d	_tDDredDiatS	dredging_flux_of_DW_Diat_on_lake_sediment
tPDredDiatS	gP/m2/d	_tPDredDiatS	dredging_flux_of_P_Diat_on_lake_sediment
tNDredDiatS	gN/m2/d	_tNDredDiatS	dredging_flux_of_N_Diat_on_lake_sediment
tDDredGrenS	gDW/m2/d	_tDDredGrenS	dredging_flux_of_DW_Gren_on_lake_sediment
tPDredGrenS	gP/m2/d	_tPDredGrenS	dredging_flux_of_P_Gren_on_lake_sediment
tNDredGrenS	gN/m2/d	_tNDredGrenS	dredging_flux_of_N_Gren_on_lake_sediment
tDDredBlueS	gDW/m2/d	_tDDredBlueS	dredging_flux_of_DW_Blue_on_lake_sediment
tPDredBlueS	gP/m2/d	_tPDredBlueS	dredging_flux_of_P_Blue_on_lake_sediment
tNDredBlueS	gN/m2/d	_tNDredBlueS	dredging_flux_of_N_Blue_on_lake_sediment
tDDredPhytS	gDW/m2/d	_tDDredPhytS	dredging_flux_of_DW_Phyt_on_lake_sediment
tPDredPhytS	gP/m2/d	_tPDredPhytS	dredging_flux_of_P_Phyt_on_lake_sediment
tNDredPhytS	gN/m2/d	_tNDredPhytS	dredging_flux_of_N_Phyt_on_lake_sediment
tDDredBent	gDW/m2/d	_tDDredBent_	dredging_flux_of_DW_Bent_on_lake_sediment
tPDredBent	gP/m2/d	_tPDredBent_	dredging_flux_of_P_Bent_on_lake_sediment
tNDredBent	gN/m2/d	_tNDredBent_	dredging_flux_of_N_Bent_on_lake_sediment
tDDredVeg	gDW/m2/d	_tDDredVeg_	dredging_flux_of_DW_Veg_on_lake_sediment
tPDredVeg	gP/m2/d	_tPDredVeg_	dredging_flux_of_P_Veg_on_lake_sediment
tNDredVeg	gN/m2/d	_tNDredVeg_	dredging_flux_of_N_Veg_on_lake_sediment
tDDredNetTot	gDW/m2/d	_tDDredNetTo	total_DW_dredging_flux
tPDredNetTot	gP/m2/d	_tPDredNetTo	total_P_dredging_flux
tNDredNetTot	gN/m2/d	_tNDredNetTo	total_N_dredging_flux
tSiDredTot	gSi/m2/d	_tSiDredTot_ =	total_Si_dredging_flux
tDIMS	gDW/m2/d	_tDIMS_ = _tD	increase_in_inorganic_matter_in_sediment
tDHumS	gDW/m2/d	_tDHumS_ = _	increase_in_sediment_humus_in_lake
tDDetS	gDW/m2/d	_tDDetS_ = _t	increase_in_sediment_detritus_in_lake
vDeltaS	m/d	_vDeltaS_ = (	turnover_depth_in_lake
tDBurIM	gDW/m2/d	_tDBurIM_ = _	burial_flux_of_DW_in_inorganic_matter_in_lake
tDBurOM	gDW/m2/d	_tDBurOM_ =	burial_flux_of_DW_in_organic_matter_in_lake
tDBurDet	gDW/m2/d	_tDBurDet_ =	burial_flux_of_DW_in_detritus_in_lake
tDBurHum	gDW/m2/d	_tDBurHum_ =	burial_flux_of_DW_in_humus_in_lake
tDBurTot	gDW/m2/d	_tDBurTot_ =	total_DW_burial_flux_in_lake
tPBurHum	gP/m2/d	_tPBurHum_ =	burial_flux_of_P_in_humus_in_lake
tPBurDet	gP/m2/d	_tPBurDet_ =	burial_flux_of_P_in_detritus_in_lake
tPBurAIM	gP/m2/d	_tPBurAIM_ =	burial_flux_of_P_absorbed_onto_inorganic_matter_in_lake
tPBurPO4	gP/m2/d	_tPBurPO4_ =	burial_flux_of_dissolved_P_in_lake
tPBurTot	gP/m2/d	_tPBurTot_ =	total_P_burial_flux_in_lake
tNBurHum	gN/m2/d	_tNBurHum_ =	burial_flux_of_N_in_humus_in_lake
tNBurDet	gN/m2/d	_tNBurDet_ =	burial_flux_of_N_in_detritus_in_lake
tNBurNH4	gN/m2/d	_tNBurNH4_ =	burial_flux_of_dissolved_NH4_in_lake
tNBurNO3	gN/m2/d	_tNBurNO3_ =	burial_flux_of_dissolved_NO3_in_lake
tNBurTot	gN/m2/d	_tNBurTot_ =	total_N_burial_flux_in_lake
tSiBurDet	gSi/m2/d	_tSiBurDet_ =	burial_flux_of_Si_in_detritus_in_lake

tSiBurTot	gSi/m2/d	_tSiBurTot_ =	total_Si_burial_flux_in_lake
vDeltaW	m/d	_vDeltaW_ = _	lake_water_depth_change
aRelDeltaW	d-1	_aRelDeltaW_	relative_water_depth_change_due_to_sediment_turnover_AND_dredging
tDMarsTotT	g/m2lake/d	_tDMarsTotT_	Mass_balance_totals_of_DW_marsh_water_and_vegetation_module
tPMarsTotT	g/m2lake/d	_tPMarsTotT_	Mass_balance_totals_of_P_marsh_water_and_vegetation_module
tNMarsTotT	g/m2lake/d	_tNMarsTotT_	Mass_balance_totals_of_N_marsh_water_and_vegetation_module
tSiMarsTotT	g/m2lake/d	_tSiMarsTotT_	Mass_balance_totals_of_SI_marsh_water_and_vegetation_module
aDTotT	gD/m2	_aDTotT_ = (_	total_DW_in_system
aNTotT	gN/m2	_aNTotT_ = (_	total_N_in_system
aPTotT	gP/m2	_aPTotT_ = (_	total_P_in_system
aSiTotT	gSi/m2	_aSiTotT_ = (_	total_Si_in_system
aDError	gD/m2	_aDError_ = _	DW_mass_balance_error
aNError	gN/m2	_aNError_ = _	N_mass_balance_error
aPError	gP/m2	_aPError_ = _	P_mass_balance_error
aSiError	gSi/m2	_aSiError_ = _	Si_mass_balance_error
dDepthW	m/d	_dDepthW_ =	derivative_for_water_depth_change_in_lake_water
dNH4W	mgN/l/d	_dNH4W_ = _	derivative_for_N_ammonium_in_water_in_lake_water
dNO3W	mgN/l/d	_dNO3W_ = _	derivative_for_N_nitrate_in_water_in_lake_water
dPO4W	mgP/l/d	_dPO4W_ = _	derivative_for_P_SRP_in_water_in_lake_water
dPAIMW	mgP/l/d	_dPAIMW_ = _	derivative_for_P_P-adsorbed_onto_IM_in_water_in_lake_water
dSiO2W	mgSi/l/d	_dSiO2W_ = _	derivative_for_Si_dissolved_silica_in_water_in_lake_water
_dO2W_	gO2/m3/d	_dO2W_ = _w	derivative_for_O2_oxygen_in_water_in_lake_water
dDDetW	mg/l/d	_dDDetW_ = _	derivative_for_DW_Detritus_in_lake_water
dNDetW	mgN/l/d	_dNDetW_ = _	derivative_for_N_Detritus_in_lake_water
dPDetW	mgP/l/d	_dPDetW_ = _	derivative_for_P_Detritus_in_lake_water
dSiDetW	mgSi/l/d	_dSiDetW_ = _	derivative_for_Si_Detritus_in_lake_water
dDIMW	mg/l/d	_dDIMW_ = _	derivative_for_DW_inorg_matter_in_water_in_lake_water
dDDiatW	mg/l/d	_dDDiatW_ = _	derivative_for_DW_Diatoms_in_lake_water
dNDiatW	mgN/l/d	_dNDiatW_ = _	derivative_for_N_Diatoms_in_lake_water
dPDiatW	mgP/l/d	_dPDiatW_ = _	derivative_for_P_Diatoms_in_lake_water
dDGrenW	mg/l/d	_dDGrenW_ =	derivative_for_DW_Greens_in_lake_water
dNGrenW	mgN/l/d	_dNGrenW_ =	derivative_for_N_Greens_in_lake_water
dPGrenW	mgP/l/d	_dPGrenW_ =	derivative_for_P_Greens_in_lake_water
dDBlueW	mg/l/d	_dDBlueW_ =	derivative_for_DW_Bluegreens_in_lake_water
dNBlueW	mgN/l/d	_dNBlueW_ =	derivative_for_N_Bluegreens_in_lake_water
dPBlueW	mgP/l/d	_dPBlueW_ =	derivative_for_P_Bluegreens_in_lake_water
dDZoo	mg/l/d	_dDZoo_ = _w	derivative_for_DW_Zooplankton_in_lake_water
dNZoo	mgN/l/d	_dNZoo_ = _w	derivative_for_N_Zooplankton_in_lake_water
dPZoo	mgP/l/d	_dPZoo_ = _w	derivative_for_P_Zooplankton_in_lake_water
dDFiAd	gD/m2/d	_dDFiAd_ = _t	derivative_for_DW_Adult_whitefish_in_lake_water
dDFiJv	gD/m2/d	_dDFiJv_ = _t	derivative_for_DW_Juvenile_whitefish_in_lake_water
dNFiAd	gN/m2/d	_dNFiAd_ = _t	derivative_for_N_Adult_whitefish_in_lake_water
dNFiJv	gN/m2/d	_dNFiJv_ = _t	derivative_for_N_Juvenile_whitefish_in_lake_water
dPFiAd	gP/m2/d	_dPFiAd_ = _t	derivative_for_P_Adult_whitefish_in_lake_water
dPFiJv	gP/m2/d	_dPFiJv_ = _tl	derivative_for_P_Juvenile_whitefish_in_lake_water
dDPisc	g/m2/d	_dDPisc_ = _t	derivative_for_DW_predatory_fish_in_lake_water
dNH4S	gN/m2/d	_dNH4S_ = _t	derivative_for_N_Pore_water_ammonium_in_lake_water
dNO3S	gN/m2/d	_dNO3S_ = _t	derivative_for_N_Pore_water_nitrate_in_lake_water
dPO4S	gP/m2/d	_dPO4S_ = _t	derivative_for_P_Pore_water_SRP_in_lake_water
dPAIMS	gP/m2/d	_dPAIMS_ = _	derivative_for_P_P-adsorbed_onto_IM_in_sediment_in_lake_sediment
dDDetS	g/m2/d	_dDDetS_ = _	derivative_for_DW_Sediment_detritus_in_lake_sediment
dNDetS	gN/m2/d	_dNDetS_ = _	derivative_for_N_Sediment_detritus_N_in_lake_sediment
dPDetS	gP/m2/d	_dPDetS_ = _	derivative_for_P_Sediment_detritus_P_in_lake_sediment
dSiDetS	gSi/m2/d	_dSiDetS_ = _	derivative_for_Si_Sediment_detritus_Si_in_lake_sediment
dDHumS	gD/m2/d	_dDHumS_ =	derivative_for_DW_humus_in_lake_sediment
dNHumS	gN/m2/d	_dNHumS_ =	derivative_for_N_humus_in_lake_sediment
dPHumS	gP/m2/d	_dPHumS_ = _	derivative_for_P_humus_in_lake_sediment
dDIMS	gD/m2/d	_dDIMS_ = _tl	derivative_for_DW_inorg_matter_in_sediment_in_lake_sediment
dDDiatS	g/m2/d	_dDDiatS_ = _	derivative_for_DW_Sed_Diatoms_in_lake_sediment
dNDiatS	gN/m2/d	_dNDiatS_ = _	derivative_for_N_Sediment_diatoms_in_lake_sediment
dPDiatS	gP/m2/d	_dPDiatS_ = _	derivative_for_P_Sediment_diatoms_in_lake_sediment
dDGrenS	g/m2/d	_dDGrenS_ =	derivative_for_DW_Sed_Greens_in_lake_sediment
dNGrenS	gN/m2/d	_dNGrenS_ =	derivative_for_N_Sediment_green_algae_in_lake_sediment
dPGrenS	gP/m2/d	_dPGrenS_ =	derivative_for_P_Sediment_green_algae_in_lake_sediment
dDBlueS	g/m2/d	_dDBlueS_ = _	derivative_for_DW_Sed_Blue-greens_in_lake_sediment
dNBlueS	gN/m2/d	_dNBlueS_ = _	derivative_for_N_Sediment_blue-greens_in_lake_sediment
dPBlueS	gP/m2/d	_dPBlueS_ = _	derivative_for_P_Sediment_blue-greens_in_lake_sediment

dDVeg	gD/m2/d	_dDVeg_ = _tl	derivative_for_DW_Vegetation_in_lake_sediment
dNVeg	gN/m2/d	_dNVeg_ = _tl	derivative_for_N_Vegetation_in_lake_sediment
dPVeg	gP/m2/d	_dPVeg_ = _tl	derivative_for_P_Vegetation_in_lake_sediment
dDBent	gD/m2/d	_dDBent_ = _t	derivative_for_DW_Zoobenthos_in_lake_sediment
dNBent	gN/m2/d	_dNBent_ = _t	derivative_for_N_Zoobenthos_in_lake_sediment
dPBent	gP/m2/d	_dPBent_ = _t	derivative_for_P_Zoobenthos_in_lake_sediment
dDepthWM	m/d	_dDepthWM_	derivative_for_water_depth_change_in_marsh_water
dNH4WM	gN/m3/d	_dNH4WM_ =	derivative_for_N_NH4_in_water_in_marsh_water
dNO3WM	gN/m3/d	_dNO3WM_ =	derivative_for_N_NO3_in_water_in_marsh_water
dPO4WM	gP/m3/d	_dPO4WM_ =	derivative_for_P_PO4_in_water_in_marsh_water
dPAIMWM	gP/m3/d	_dPAIMWM_ :	derivative_for_P_P_adsorbed_onto_IM_in_water_in_marsh_water
dSiO2WM	gP/m3/d	_dSiO2WM_ =	derivative_for_Si_SiO2_in_marsh_water
_dO2WM_	gO2/m3/d	_dO2WM_ = _	derivative_for_O2_O2_in_water_in_marsh_water
dDDetWM	gD/m3/d	_dDDetWM_ =	derivative_for_DW_Detritus_in_marsh_water
dNDetWM	gN/m3/d	_dNDetWM_ =	derivative_for_N_detritus_in_marsh_water
dPDetWM	gP/m3/d	_dPDetWM_ =	derivative_for_P_detritus_in_marsh_water
dSiDetWM	gSi/m3/d	_dSiDetWM_ :	derivative_for_Si_detritus_in_marsh_water
dDIMWM	gD/m3/d	_dDIMWM_ =	derivative_for_DW_Inorg_matter_in_marsh_water
dDDiatWM	gD_m-3_d-1	_dDDiatWM_	derivative_for_DW_diatoms_in_marsh_water
dNDiatWM	gN_m-3_d-1	_dNDiatWM_	derivative_for_N_diatoms_in_marsh_water
dPDiatWM	gP_m-3_d-1	_dPDiatWM_ :	derivative_for_P_diatoms_in_marsh_water
dDGrenWM	gD_m-3_d-1	_dDGrenWM_	derivative_for_DW_greens_in_marsh_water
dNGrenWM	gN_m-3_d-1	_dNGrenWM_	derivative_for_N_greens_in_marsh_water
dPGrenWM	gP_m-3_d-1	_dPGrenWM_	derivative_for_P_greens_in_marsh_water
dDBlueWM	gD_m-3_d-1	_dDBlueWM_	derivative_for_DW_blue-greens_in_marsh_water
dNBlueWM	gN_m-3_d-1	_dNBlueWM_	derivative_for_N_blue-greens_in_marsh_water
dPBlueWM	gP_m-3_d-1	_dPBlueWM_	derivative_for_P_blue-greens_in_marsh_water
dDZooM	gD_m-3_d-1	_dDZooM_ = _	derivative_for_DW_zooplankton_in_marsh_water
dNZooM	gN_m-3_d-1	_dNZooM_ = _	derivative_for_N_zooplankton_in_marsh_water
dPZooM	gP_m-3_d-1	_dPZooM_ = _	derivative_for_P_zooplankton_in_marsh_water
dNH4SM	gN/m2/d	_dNH4SM_ =	derivative_for_N_NH4_in_water_in_marsh_sediment
dNO3SM	gN/m2/d	_dNO3SM_ =	derivative_for_N_NO3_in_marsh_sediment
dPO4SM	gN/m2/d	_dPO4SM_ =	derivative_for_P_PO4_in_marsh_sediment
dPAIMSM	gP/m2/d	_dPAIMSM_ =	derivative_for_P_P_adsorbed_onto_IM_in_marsh_sediment
dDDetSM	gD/m2/d	_dDDetSM_ =	derivative_for_DW_Detritus_in_marsh_sediment
dNDetSM	gN/m2/d	_dNDetSM_ =	derivative_for_N_detritus_in_marsh_sediment
dPDetSM	gP/m2/d	_dPDetSM_ =	derivative_for_P_detritus_in_marsh_sediment
dSiDetSM	gP/m2/d	_dSiDetSM_ =	derivative_for_P_detritus_in_marsh_sediment
dDHumSM	gD/m2/d	_dDHumSM_	derivative_for_DW_sediment_humus_in_marsh_sediment
dNHumSM	gN/m2/d	_dNHumSM_	derivative_for_N_sediment_humus_in_marsh_sediment
dPHumSM	gP/m2/d	_dPHumSM_	derivative_for_P_sediment_humus_in_marsh_sediment
dDIMSM	gD/m2/d	_dDIMSM_ = _	derivative_for_DW_Inorg_matter_in_sediment_in_marsh_sediment
dDRootPhra	gD/m2/d	_dDRootPhra_	derivative_for_DW_biomass_root_reed_in_marsh_sediment
dDShootPhra	gD/m2/d	_dDShootPhra	derivative_for_DW_biomass_shoot_reed_in_marsh_sediment
dNRootPhra	gN/m2/d	_dNRootPhra_	derivative_for_N_N_in_root_in_marsh_sediment
dNShootPhra	gN/m2/d	_dNShootPhra	derivative_for_N_N_in_shoot_in_marsh_sediment
dPRootPhra	gP/m2/d	_dPRootPhra_	derivative_for_P_P_in_root_in_marsh_sediment
dPShootPhra	gP/m2/d	_dPShootPhra	derivative_for_P_P_in_shoot_in_marsh_sediment
dDExtTotT	gD/m2/d	_dDExtTotT_ :	derivative_for_total_external_DW_flux_
dNExtTotT	gN/m2/d	_dNExtTotT_ :	derivative_for_total_external_N_flux_
dPExtTotT	gP/m2/d	_dPExtTotT_ :	derivative_for_total_external_P_flux_
dSiExtTotT	gSi/m2/d	_dSiExtTotT_	derivative_for_total_external_Si_flux_