A. Articles in Category 1 (Not used for quantitative data extraction)

Reference (in category 1)	N	P	Comment on Quality Category
Abe K, Kato K, Ozaki Y (2010) Vegetation-based Wastewater Treatment Technologies for Rural Areas in Japan. Jarq-Japan Agricultural Research Quarterly. 44: 231-242.	Yes	Yes	Wastewater from milk production. Should have been excluded.
Ahn C W; Mitsch W J; (2002) Evaluating the use of recycled coal combustion products in constructed wetlands: an ecologic-economic modeling approach. Ecological Modelling. 150: 117-140.		Yes	modeling paper The authors may have published data elsewere
Avery L M; Frazer-Williams R A. D; Winward G, Shirley-Smith C, Liu S, Memon F A; Jefferson B (2007) Constructed wetlands for grey water treatment. International Journal of Ecohydrology & Hydrobiology. 7: 191-200.	Yes	Yes	not one year of measurements; even first two months after construction included at low flow
Ávila Cristina, Salas Juan Jose; Martin Isabel, Aragon Carlos, Garcia Joan (2013) Integrated treatment of combined sewer wastewater and stormwater in a hybrid constructed wetland system in southern Spain and its further reuse. Ecological Engineering. 50: 13-20.	Yes	Yes	It is too unclear how to summarize the data to get an annual load and removal rate as it seems that not all high flow events are included in the data set.
Ávila Cristina, Garfí Marianna, García Joan (2013) Three-stage hybrid constructed wetland system for wastewater treatment and reuse in warm climate regions. Ecological Engineering. 61, Part A: 43-49.	Yes		advanced wastewater treatment (raw wastewater plus mixing)
Beavers P D; Tully I K; (2005) Nutrient reduction evaluation of sewage effluent treatment options for small communities. Water Science and Technology. 51: 221-229.	Yes		It is possible that more data can be found through "The complete report on the project is available at the following website www.dlgp.qld.gov.au/local_govt/grants_subsidies/", but I could not find it
Bhadha J H; Jawitz J W; Min J H; (2011) Phosphorus Mass Balance and Internal Load in an Impacted Subtropical Isolated Wetland. Water Air and Soil Pollution. 218: 619-632.	Yes	Yes	Few samples (6 for a year). Good hydrologic budget, but very fluctuating water level, from 1 m below the surface to more than a m above. Thus retention per m2 "wetland" difficult to quantify.
Błazejewski R, Szajdak L, Hoppe-Wawrzyniak A (2007) Efficiency of constructed reed bed and reed pond as tertiary wastewater treatment stages during their start-up period. Ecohydrology and Hydrobiology. 7: 207-213.	Yes	Yes	Only mean hydraulic load is given for the whole period. Not known how that was measured. Wetlands receive a mixture of storm- and wastewater, and hence large flow variations are expected. Should be Category 1 due to lack of detailed hydrological data and therefore not possible to calculate mass removal rates and mass removal efficiencies
Borin M, Bonaiti G (2001) A constructed surface flow wetland for treating agriculture waste waters. Water Science & Technology. 44: 523.	Yes		Not suitable because of too complicated loading design
Bondar E, Kucera-Hirzinger V, Preiner S, Weigelhofer G, Schiemer F, Hein T (2007) The impact of an artificial water enhancement scheme on phosphorus dynamics in an urban floodplain system in Vienna (Austria). International Review of Hydrobiology. 92: 413-427.		Yes	Concentrations measured only monthly from April to October; however yearly water balance
Bouchard Roy, Higgins Matthew, Rock Chet (1995) Using constructed wetland-pond systems to treat agricultural runoff: A watershed perspective. Lake & Reservoir Management. 11: 29-36.	Yes	Yes	The nutrient retention system is composed of several units, including a wetland. However, performance of the wetland itself in nutrient retention cannot be evaluated.
Braskerud B C; (2002) Factors affecting phosphorus retention in small constructed wetlands treating agricultural non-point source pollution. Ecological Engineering. 19: 41-61.		Yes	Only outlet water quantified
Brix H, Schierup H H; (1989) Sewage treatment in constructed reed beds - Danish experiences. Water Science & Technology. 21: 1665-1668.	Yes		Wastewater treatment. Sampling only "Based on 8 to 12 quality control analyses annually" (cited from paper). Only annual measurements/balances shown
Browne W, Jenssen P D; (2005) Exceeding tertiary standards with a pond/reed bed system in Norway. Water Science and Technology. 51: 299-306.	Yes	Yes	No water balance, no information on frequency of sampling, primary wastewater

Additional file 4, Critical appraisal

Reference (in category 1)	N	P	Comment on Quality Category
Browning K, Greenway M (2003) Nutrient removal and plant biomass in a subsurface flow constructed wetland in Brisbane, Australia. Water Science and Technology. 48: 183-189.	Yes	Yes	The study deals with inorganic N and PO4. Total N retention could perhaps be calculated from Tab. 1, but the water budget is very rudimentary.
Chavan P V; Dennett K E; (2008) Wetland simulation model for nitrogen, phosphorus, and sediments retention in constructed wetlands. Water Air and Soil Pollution. 187: 109-118.	Yes	Yes	This paper is focused on presenting a model for the N and P removal in the wetland, but outflow concentrations and % removal is given in a graph. There is at leaast one other paper presenting more results (Chavan and Dennet, J Environmental Research and Development 2008)
Chavan P V; Dennett K E; Marchand E A; (2008) Behavior of pilot-scale constructed wetlands in removing nutrients and sediments under varying environmental conditions. Water Air and Soil Pollution. 192: 239-250.	Yes	Yes	mesocosm study with nice replication but many short-term experiments. No annual data available. Useful for discussion only
Chen Q F; Shan B Q; Yin C Q; Hu C X; (2007) An off-line filtering ditch-pond system for diffuse pollution control at Wuhan City Zoo. Ecological Engineering. 30: 373-380.	Yes	Yes	This is a combined syste, where the wetland part cannot be distinguished. Also there is a very large loss of water.
Christensen N, Mitsch W J; Jorgensen S E; (1994) A FIRST GENERATION ECOSYSTEM MODEL OF THE DES-PLAINES RIVER EXPERIMENTAL WETLANDS. Ecological Engineering. 3: 495-521.	Yes	Yes	This is a model paper using data from the Des-Plaines river experimental wetlands, and comparing measured outflow concentrations with modelled ones, hence a lot of effort is needed to extract the measured data. Data from that wetland system is presented in other papers so they will be included anyway.
Clausen J C; Guillard K, Sigmund C M; Martin Dors, K (2000) Water quality changes from riparian buffer restoration in Connecticut. Journal of Environmental Quality. 29: 1751-1761.	Yes	Yes	The part of the transect that it is a wetland has not been restored or created; they only have stopped cutting the trees in the treatment part, but the effect of this is not studied. The study is very detailed with estimates of groundwater flow, which is very diffcult in a riparian study. However, the water balance in comparsion with data on stream flow suggests that dilution with unknown groundwater may be a part of the calculated removal. The water balance discrepance is quite large, suggesting large unceratinties in the estimated N removal in this study.
Comeau Y, Brisson J, Reville J P; Forget C, Drizo A (2001) Phosphorus removal from trout farm effluents by constructed wetlands. Water Science and Technology. 44: 55-60.	Yes	Yes	No annual values
Cooper C M; Knight S S; (1990) Nutrient trapping efficiency of a small sediment detention reservoir. Agricultural Water Management. 18: 149-158.	Yes	Yes	five year study period, weekly sampling, no mass balances, means of yearly concentrations
Cooper P, Smith M, Maynard H (1997) The design and performance of a nitrifying vertical-flow reed bed treatment system. Water Science and Technology. 35: 215-221.	Yes	Yes	This paper sumarises results of other studies performed on the same Reed Bed Treatment System. Besides that the system was changed during the monitoring periode. There are only mean yearly values shown.
Craft C B; (1997) Dynamics of nitrogen and phosphorus retention during wetland ecosystem succession. Wetlands Ecology and Management. 4: 177-187.	Yes	Yes	Estuarine marches with saline water. See table 1 page 179. I think paper has to be discarded
David M B; Wall L G; Royer T V; Tank J L; (2006) Denitrification and the nitrogen budget of a reservoir in an agricultural landscape. Ecological Applications. 16: 2177-2190.	Yes	E	Although very large scale, there is good data on n removal in a lake in relation to residence time
de Sousa , J T, van Haandel , A , Lima E P. C; Guimaraes A V. A; (2003) Performance of constructed wetland systems treating anerobic effluents. Water Science and Technology. 48: 295-299.	Yes	Yes	3-year study. No info on sampling frequency. Average values for a thre-year period. Sparse statistical information (e.g. no info on number of samples.) Category 2 is on the limit
Duff J H; Carpenter K D; Snyder D T; Lee K K; Avanzino R J; Triska F J; (2009) PHOSPHORUS AND NITROGEN LEGACY IN A RESTORATION WETLAND, UPPER KLAMATH LAKE, OREGON. Wetlands. 29: 735-746.	Yes	Yes	1300 ha restored wetland - very comprehensive study - also efforts to make a complete waterbalance despite the very big area. Sampling on 15 dates in a sampling period lasting 17 month but interrupted in winter due to ice cover. There are too few measurements of nutrients during the years, and thus the mass balances are not at all reliable . Thus the criteria are NOT met.

Reference (in category 1)	N	P	Comment on Quality Category
Gunes K, Tuncsiper B (2009) A serially connected sand filtration and constructed wetland system for small community wastewater treatment. Ecological Engineering. 35: 1208-1215.	Yes	Yes	Sampling montly for approx 1.5 yars. No water balance. Sewage approx primary treated.
Eidson Gene W; Flite Oscar P; (2005) Multi-Year Research on the Use of Constructed Wetlands for Advanced Wastewater Treatment. Proceedings of the 2005 Georgia Water Resources Conference. : .	Yes		Summary paper with a few additional results (only Ammonia data shown). Dayly measurement of flow and presumable also Amonia. Other papers from this treatment must exist. Only concentration data
El Hamouri , B (2009) Rethinking natural, extensive systems for tertiary treatment purposes: The high-rate algae pond as an example. Desalination and Water Treatment. 4: 128-134.	Yes	Yes	Good study of exceptional design geared towards massive growth of algae. Much of the N removal is ammonia volatilization. However, The length of study is not reported. Furthermore, no water budget is reported. Average concentrations at inlet and outlet are reported, but it is unknown if the reported HLR is constant or represent an average. Based on the reported information it is not possible to calculate reliable annual mass removal rates.
Erler D V; Tait D, Eyre B D; Bingham M (2011) Observations of nitrogen and phosphorus biogeochemistry in a surface flow constructed wetland. Science of the Total Environment. 409: 5359-5367.	Yes	Yes	No info on hydrology. No retention values, only % reduction in concentrations. Several years, but only means for the multiyear period
Fink D F; Mitsch W J; (2004) Seasonal and storm event nutrient removal by a created wetland in an agricultural watershed. Ecological Engineering. 23: 313-325.	Yes	Yes	Only nitrate of the N fractions. Reasonable water budget to calculate from for one year Oct 1999-Sep 2000, though complicated hydrology. The annual removal data are for the entire four wetlands, concentrations are given by wetlands but not hydrological balance. TP mass removal rate is reported for one year (2000) whereas the reported loading rate is a two year mean. Not possible to extract necessary data.
Fisher J, Stratford C J; Buckton S (2009) Variation in nutrient removal in three wetland blocks in relation to vegetation composition, inflow nutrient concentration and hydraulic loading. Ecological Engineering. 35: 1387-1394.		Yes	Incomplete water balance
Fleischer S, Gustafson A, Joelsson A, Pansar J, Stibe L (1994) NITROGEN REMOVAL IN CREATED PONDS. Ambio. 23: 349-357.	Yes	Yes	Only inflow water quantified, detailed info unnessecary?
Forbes M G; Dickson K L; Saleh F, Waller W T; Doyle R D; Hudak P (2005) Recovery and fractionation of phosphorus retained by lightweight expanded shale and masonry sand used as media in subsurface flow treatment wetlands. Environmental Science & Technology. 39: 4621-4627.		Yes	Good control over hydrology and good sampling frequency. However, although the TP removal rate is reported (calculated as substrate TP increment), the loading rate is measured for SRP only. It is therefore not possible to evaluate this removal rate or calculate the removal efficiency.
Gao J, Chen S, Wang W, Yan Q, Jiang N, Ruiqin Z (2012) Effects of unpowered complex eco-technology on sewage purification in central Chinese rural areas. Polish Journal of Environmental Studies. 21: 1595-1602.	Yes	Yes	Only six months have been monitored divided on two seasons. If used for discussion, only the last part is a wetland, which then received pre-treated wastewater
Garcia-Lledo A, Ruiz-Rueda O, Vilar-Sanz A, Sala L, Baneras L (2011) Nitrogen removal efficiencies in a free water surface constructed wetland in relation to plant coverage. Ecological Engineering. 37: 678-684.	Yes		Uncertain hydrology (only inlet measurements) Only inorganic N
Gervin L, Brix H (2001) Removal of nutrients from combined sewer overflows and lake water in a vertical-flow constructed wetland system. Water Science and Technology. 44: 171-176.	Yes	Yes	Too few data are given so it is not possible to e.g. make mass balance for lake water period separate from sewer loads, hence effect modifiers can not be related to results. Contact authors, or find data in later publication
Gikas G D; Tsihrintzis V A; Akratos C S; (2011) Performance and modeling of a vertical flow constructed wetland-maturation pond system. Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering. 46: 692-708.	Yes	Yes	Only 2nd and 3rd stage can be included as first stage receive primary treated sewage. HLR not reported for individual stages, not possible to calculate mass removal rates.
Greenway M, Woolley A (1999) Constructed wetlands in Queensland: Performance efficiency and nutrient bioaccumulation. Ecological Engineering. 12: 39-55.	Yes	Yes	No info on sampling frequency and hydrologic budgets. Not possible to recalculate to annual retention.

Additional file 4, Critical appraisal

Reference (in category 1)	N	P	Comment on Quality Category
Griffin P, Jennings P, Bowman E (1999) Advanced nitrogen removal by rotating biological contactors, recycle and constructed wetlands. Water Science and Technology. 40: 383-390.	Yes		No hydrologic budget, no annual values
Gustafson A, Fleischer S, Joelsson A (1998) Decreased leaching and increased retention potential co-operative measures to reduce diffuse nitrogen load on a watershed level. Water Science and Technology. 38: 181-189.	Yes		No information on methodology. However, annual to-N retention values given, including min/max for several wetlands
El Hafiane , F , El Hamouri , B (2005) Anaerobic reactor/high rate pond combined technology for sewage treatment inthe Mediterranean area. Water Science and Technology. 51: 125-132.	Yes	Yes	
Ham J, Yoon C G; Kim H J; Kim H C; (2010) Modeling the effects of constructed wetland on nonpoint source pollution control and reservoir water quality improvement. Journal of Environmental Sciences-China. 22: 834-839.	Yes	Yes	Good data of concentrations for 2 years, but not sufficient info on hydrology
Hanson A (2008) CHEMICAL LIMNOLOGY AND WATERBIRD USE OF AN URBAN CONSTRUCTED WETLAND. Acta Zoologica Academiae Scientiarum Hungaricae. 54: 35-44.	Yes	Yes	There is no information on hydrology, thus loading and retention cannot be calculated
Herrmann J (2012) Chemical and biological benefits in a stormwater wetland in Kalmar, SE Sweden. Limnologica. 42: 299-309.	Yes	Yes	Study is not suitable for calculating N or P removal because of flawed hydrology/ sampling design
Hijosa-Valsero Maria, Sidrach-Cardona Ricardo, Becares Eloy (2012) Comparison of interannual removal variation of various constructed wetland types. Science of the Total Environment. 430: 174-183.	Yes	Yes	Hydrology is not clear. All seven mesocosms received 50 cm of water per day. Residence times only measured at the end of the study period.
Hoffmann C C; Baattrup-Pedersen A (2007) Re-establishing freshwater wetlands in Denmark. Ecological Engineering. 30: 157-166.	Yes		USE FOR DISCUSSION - Data are good quality but summarized without effect modifiers. No hydraulic load or concentration figures are given.
Huang J C; Mitsch W J; Johnson D L; (2011) Estimating biogeochemical and biotic interactions between a stream channel and a created riparian wetland: A medium-scale physical model. Ecological Engineering. 37: 1035-1049.		Yes	No complete water budget, only inflow quantified
Huber B, Luster J, Bernasconi S M; Shrestha J, Pannatier E G; (2012) Nitrate leaching from short-hydroperiod floodplain soils. Biogeosciences. 9: 4385-4397.	Yes		The article deals with nitrate dynamics in a restored riparian zone in a Swiss river. Since it is not a closed system a water balance cannot be measured.
Huertas E, Folch M, Salgot M, Gonzalvo I, Passarell C (2006) Constructed wetlands effluent for streamflow augmentation in the Beso's River (Spain). Desalination. 188: 141-147.	Yes	Yes	Nott possible to calculate retention, no analyses of Tot-P and Tot-N. No water budget, no info on sampling frequency, no Tot-P and -N analyses, ----
Hunter R, Lane R, Day J, Lindsey J, Day J, Hunter M (2009) Nutrient Removal and Loading Rate Analysis of Louisiana Forested Wetlands Assimilating Treated Municipal Effluent. Environmental Management. 44: 865-873.	Yes	Yes	This is a compilation of studies of 4 large forested, natural wetlands receiving secondary effleunt. Very low sampling frequency
Inamori R, Wang Y H; Yamamoto T, Zhang J X; Kong H N; Xu K Q; Inamori Y (2008) Seasonal effect on N2O formation in nitrification in constructed wetlands. Chemosphere. 73: 1071-1077.	Yes	Yes	This is a process study on N2O. No inflow concentration data, no hydrology data
Jackson J A; Sees M (2001) Rerating capacity of a constructed wetland treatment system. Water Science and Technology. 44: 435-440.	Yes	Yes	There is no water budget. Figures for N and P retention as a mean for 187-1997 are found in Tab 2, but it is nott possible to know how these figures were obtained. Load has been varied to test uptake capacity, but over a few months only.
Jenssen Petter D; Krogstad Tore, Paruch Adam M; Mæhlum Trond, Adam Kinga, Arias Carlos A; Heistad Arve, Jonsson Lena, Hellström Daniel, Brix Hans, Yli-Halla Markku, Vråle Lasse, Valve Matti (2010) Filter bed systems treating domestic wastewater in the Nordic countries – Performance and reuse of filter media. Ecological Engineering. 36: 1651-1659.	Yes	Yes	No water budget, not possible to calculate retention per unit area Not a wetland, planted with grass. Subsurface horizontal flow. TN (but as sum of inorganic N) and TP analyzed on unfiltered samples, but no info on samplng frequency

Reference (in category 1)	N	P	Comment on Quality Category
Jokerst A, Sharvelle S E; Hollowed M E; Roesner L A; (2011) Seasonal Performance of an Outdoor Constructed Wetland for Graywater Treatment in a Temperate Climate. Water Environment Research. 83: 2187-2198.	Yes	Yes	Good hydrology but wrong water type and lack of N and P data
Jordan T E; Whigham D F; Hofmockel K, Gerber N (1999) Restored wetlands in crop fields control nutrient runoff. Leiden: Backhuys Publishers.	Yes	Yes	One year study of seven restored surface flow wetlands in crop fields. Precipitation driven - i.e. episodic inflow of drainage water - thus only 10 sampling rounds during one year. Only concentrations of N and P species measured
Juston John M; DeBusk Thomas A; (2011) Evidence and implications of the background phosphorus concentration of submerged aquatic vegetation wetlands in Stormwater Treatment Areas for Everglades restoration. Water Resources Research. 47: W01511.		Yes	This is a study of internal P processing in Everglades wetlands dominated by submerged vegetation. P loading rate is reported from a number of wetland that have been studied over several years with frequent water sampling and flow measurements. However, there are no water balances and no info on P retention in the wetlands.
Kadlec Robert H; Bevis Frederick B; (2009) Wastewater treatment at the Houghton Lake wetland: Vegetation response. Ecological Engineering. 35: 1312-1332.	Yes	Yes	The wastewater is applied to the peatland only during half a year but data for 30 years. Hence does not fulfill the criteria of full years. Study is focused on vegetation changes and plant uptake, but this i thematic issue of EE and if combined with other papers this is a very comprehensive data set. Table 8 contains a 30 years mass balance
Kadlec R H; Hey D L; (1994) CONSTRUCTED WETLANDS FOR RIVER WATER-QUALITY IMPROVEMENT. Water Science and Technology. 29: 159-168.	Yes		
Ke F, Li W C; Li H Y; Xiong F, Zhao A N; (2012) Advanced phosphorus removal for secondary effluent using a natural treatment system. Water Science and Technology. 65: 1412-1419.		Yes	This is a one year study of P removal from secondary sewage using pilot-scale tanks with different vegetation. No water budget is presented, but possibly the loading rate of 1 m3/day could be used since water was pumped at a constant rate. Loading rate unclear though, but the water pressure was kept constant and the water treatment capacity was 1 m3 d-1. Only arithmetic means of P concentrations are given Should probably be excluded
Kiedrzynska Edyta, Kiedrzynski Marcin, Zalewski MacIej (2008) Flood sediment deposition and phosphorus retention in a lowland river floodplain: Impact on water quality of a reservoir, Sulejow, Poland. Ecohydrology and Hydrobiology. 8: 281-289.		Yes	Sedimentation and P content in settled sediment has been measured for a floodplain area (wetland), but this cannot be related to the amount of P that has flooded the same area as only the total riverine transport has been quantified.
Kim D G; Park J, Lee D, Kang H (2011) Removal of Nitrogen and Phosphorus from Effluent of a Secondary Wastewater Treatment Plant Using a Pond-Marsh Wetland System. Water Air and Soil Pollution. 214: 37-47.	Yes	Yes	A horizontal, surface flow system of a pond without vegetation and a constructed wetland with Phragmites for treatment of secondary sewage from Seoul, South Korea There is no water budget, only a statement that water is pumped to the pond, 2 100 m3/day, and discharged to a river after the wetland, 740 m3/day. Thus a lot of water seems to disappear from the inlet to the outlet There are concentrations for N and P in pond inlet, outlet and wetland outlet for a year, however, without accurate water inflow and outflow no loading can be calculated A max/mean and average load reduction (in %) has been calculated, but how?
Kimochi Y, Masada T, Mikami Y, Tsuneda S, Sudo R (2008) Tertiary treatment of domestic wastewater using zeolite ceramics and aquatic plants. Water Science and Technology. 58: 847-851.		Yes	No water budget but small-scale experiment with short HRT. Thus water input should be ≈ water output. 18 months study period, but divided into 3 runs with different HRT. No P retention data.
Knight R L; Winchester B H; Higman J C; (1985) Ecology, hydrology, and advanced wastewater treatment potential of an artificial wetland in North-central, Florida. Wetlands. 5: 167-180.	Yes	Yes	A one year study with monthly sampling and since the concentration variations are large in the inflow, this can not be sufficient for a good mass removal rate calculation
Knowlton M F; Cuvellier C, Jones J R; (2002) Initial performance of a high capacity surface-flow treatment wetland. Wetlands. 22: 522-527.	Yes		6 years of data on NH4 and TN and TP, but data already aggregated. Lack of hydrological data makes it difficult to calculate yearly removal rates
Kronvang Brian, Andersen Inga K; Hoffmann Carl Christian; Pedersen Morten L; Ovesen Niels B; Andersen H E; (2007) Water exchange and deposition of sediment and phosphorus during inundation of natural and restored lowland floodplains. Water, Air and Soil Pollution. 181: 115-121.		Yes	The natural floodplain is used as a comparison; retention is measured by mats and the quality of the load data is uncertain. It is unusal with a study of floodplains though.

Reference (in category 1)	N	P	Comment on Quality Category
Kronvang B, Hoffmann C C; Svendsen L M; Windolf J, Jensen J P; Dørge J (1999) Retention of nutrients in river basins. Aquatic Ecology. 33: 29-40.	Yes	Yes	Scale of study is catchment-oriented. No primary data for individual wetlands
Kuschk P, Wiessner A, Kappelmeyer U, Weissbrodt E, Kastner M, Stottmeister U (2003) Annual cycle of nitrogen removal by a pilot-scale subsurface horizontal flow in a constructed wetland under moderate climate. Water Research. 37: 4236-4242.	Yes		To-N not analyzed!
Kuusemets V, Mander U (1999) Ecotechnological measures to control nutrient losses from catchments. Water Science and Technology. 40: 195-202.	Yes	Yes	This is a conference presentation summarizin data that are presented in earlier more detailed papers, Mander & Mauring 1995, Mander et al 1997*2. The studies of wastewater treatment wetlands should not be included.
Larm Thomas (2000) Stormwater quantity and quality in a multiple pond-wetland system: Flemingsbergsviken case study. Ecological Engineering. 15: 57-75.	Yes	Yes	Exclude due to lack of a reliable water budget and infrequent sampling
Lenhart H A; Hunt W F; (2011) Evaluating Four Storm-Water Performance Metrics with a North Carolina Coastal Plain Storm-Water Wetland. Journal of Environmental Engineering-Asce. 137: 155-162.	Yes	Yes	Should be discussed, they measure water in and out, but there is infiltration of up to 50 % water, hence the removal is dependent on that. - Based on concentration differences, the wetland is releasing some N and P that the authors assign to start-up conditons as this is the first year after reconstruction.
Lenzi Mauro, Palmieri Roberto, Porrello Salvatore (2003) Restoration of the eutrophic Orbetello lagoon (Tyrrhenian Sea, Italy): Water quality management. Marine Pollution Bulletin. 46: 1540-1548.	Yes	Yes	This study focus on the different input of nutrients from fishfarms, phytotreatment areas - i.e. possibly different types of surface flow wetlands treating wastewater from fishfarm and anthopic sources. Butit is only the effluent from these facilities which are measured in order to establish the nutrient input to the lagoon. Thus it is not possible to calculate annual removal rates from the different treatment plants
Li G, Wu Z, Cheng S, Liang W, He F, Fu G, Zhong F (2007) Application of constructed wetlands on wastewater treatment for aquaculture ponds. Wuhan University Journal of Natural Sciences. 12: 1131-1135.	Yes	Yes	study not suitable at all
Li X N; Song H L; Lu X W; Xie X F; Inamori Y (2009) Characteristics and mechanisms of the hydroponic bio-filter method for purification of eutrophic surface water. Ecological Engineering. 35: 1574-1583.	Yes	Yes	No water budget Monthly sampling
Li D W; Zhang W S; Yin W, Lei A L; (2010) Combined Pond-Wetland Systems for Treatment of Urban Surface Runoff and Lake Water. Environmental Engineering Science. 27: 1027-1034.	Yes	Yes	no info on hydrology; bimonthly sampling; water too high in COD
Li X D; Paul E, Qiu J P; Roustan M, Wisniewski C, Mauviot P (2010) Rural Sewage Treatment by using Combined Process of Multi-layer Bio-filter and Constructed Wetland. In: Jin F M; Zhou Q, Wu B, Xie L 2nd International Symposium on Aqua Science, Water Resource and Low Carbon Energy. Melville: Amer Inst Physics, pages 185-188.	Yes	Yes	There is no hydrologic budget, only info on water loading (constant?).
Liikanen A, Puustinen M, Koskiaho J, Vaisanen T, Martikainen P, Hartikainen H (2004) Phosphorus removal in a wetland constructed on former arable land. Journal of Environmental Quality. 33: 1124-1132.		Yes	Exclude since not a full 1 year study without gaps and since retention cannot be calculated
Lin T, Zhang B X; Xia P H; Fu W J; Fu L Y; Hu J W; (2012) Removal of agricultural non-point source pollutants by ditch wetlands of the Maixi River, Guizhou Province, China. In: Wen Y X; Lei F H; Advances in Chemical Engineering, Pts 1-3. Stafa-Zurich: Trans Tech Publications Ltd, pages 2515-2520.		Yes	No water budget, no possibility to calculate retention of N and P
Lu Q, He Z L. L; Graetz D A; Stoffella P J; Yang X E; (2010) Phytoremediation to remove nutrients and improve eutrophic stormwaters using water lettuce (Pistia stratiotes L.). Environmental Science and Pollution Research. 17: 84-96.	Yes	Yes	No water budget, no possibility to calculate retention of N and P

Additional file 4, Critical appraisal

Reference (in category 1)	N	P	Comment on Quality Category
Lund M A; Lavery P S; Froend R F; (2001) Removing filterable reactive phosphorus from highly coloured stormwater using constructed wetlands. Water Science and Technology. 44: 85-92.		Yes	Only 6 months of sampling (2 months/4 months); no primary data given. Not suitable for data extraction
Mander Ü, Tooming A, Mauring T, Öövel M (2007) Performance dynamics of a LWA-filled hybrid constructed wetland in Estonia. Ecohydrology and Hydrobiology. 7: 297-302.	Yes	Yes	I understand that the paper presents data for 10 grab samples taken at a wastewater treating plant, where the HF wetland can be considered to receive tertiary treated wastewater. However, only average daily flows from those ten days are given, hence I do not think that the presented mass removal rates represent reasonabla annual removal rates (variable water loads are presented in Table 1). Could be discussed though as the outflow concentrations are farily stable.
Mann R A; (1990) PHOSPHORUS REMOVAL BY CONSTRUCTED WETLANDS - SUBSTRATUM ADSORPTION. Oxford: Pergamon Press Ltd.		Yes	No raw data available; data only based on concentration differences; summarized per season over 2 years.
Mateus D M. R; Pinho H J. O; (2010) Phosphorus Removal by Expanded Clay-Six Years of Pilot-Scale Constructed Wetlands Experience. Water Environment Research. 82: 128-137.		Yes	No water budget but info on (caonstant?) pumping rate. No data on sampling frequency. Not a complete year.
Matsuno Y, Tanida K, Hatcho N, Fujii K, Kochi K (2012) Performance of constructed wetland for nutrient removal of agricultural drainage. Chiang Mai University Journal of Natural Sciences. 11: 135-140.	Yes	Yes	biweekly and monthly sampling during 11 months of study. Only result from four periods: Land preparation, irrigation non-irrigation and entire study period. It is more a model study by use of STELLA
McCarey A E. D; Anderson B C; Martin D (2004) Monitoring spatial and temporal variations of phosphorus within a cold climate subsurface flow constructed wetland. Journal of Environmental Engineering and Science. 3: 51-60.		Yes	Samples taken with 3 weeks interval No measurement of outflow, thus no water balance N and P retention have been calculated based on mean (in)flow. Insufficient water budget.
Montgomery J A; Eames J M; (2008) Prairie Wolf Slough Wetlands Demonstration Project: A Case Study Illustrating the Need for Incorporating Soil and Water Quality Assessment in Wetland Restoration Planning, Design and Monitoring. Restoration Ecology. 16: 618-628.		Yes	Inlet and outlet flow quantified, but only bimonthly sampling of water
Moreno D, Pedrocchi C, Comin F A; Garcia M, Cabezas A (2007) Creating wetlands for the improvement of water quality and landscape restoration in semi-arid zones degraded by intensive agricultural use. Ecological Engineering. 30: 103-111.	Yes	Yes	No water budget 4-5 samplings/year (2 years)
Moustafa M Z; (1997) Graphical representation of nutrient removal in constructed wetlands. Wetlands. 17: 493-501.		Yes	Essentially a modelling paper
Moustafa M Z; (1999) Analysis of phosphorus retention in free-water surface treatment wetlands. Hydrobiologia. 392: 41-53.		Yes	no primary data present. Metastudy of local data set compared with EPADB; consult Moustafa 1996 (cited)
Newman J M; Lynch T (2001) The Everglades Nutrient Removal Project test cells: STA optimization status of the research at the north site. Water Science and Technology. 44: 117-122.	Yes	Yes	paper for discussion only. Very complicated set-up. Paper is too short for comprehension. Fig. 4 does not make sense (inflow or outflow concentration? Why does it increase?)
Noorvee Alar, Repp Kalev, Pöldvere Elar, Mander Ülo (2005) The Effects of Aeration and the Application of the k-C Model in a Subsurface Flow Constructed Wetland. Journal of Environmental Science & Health, Part A: Toxic/Hazardous Substances & Environmental Engineering. 40: 1445-1456.	Yes		No water balance and no nutrient loading found
Oberts Gary L; (1998) Long-term reductions in removal effectiveness: Lake McCarrons wetland treatment system. , .	Yes	Yes	They give very sparse information on how the monitoring and calculations have been done, and hence it is not possible to judge the quality of the table with results.
Oláh J, Pekár F, Szabó P (1994) Nitrogen cycling and retention in fish-cum-livestock ponds. Journal of Applied Ichthyology. 10: 341-348.	Yes		This is a meta-study, summarizing results from many PhD-theses Not possible to verify water and nutrient budgets for individual objects
Pansar J, Stibe L (1998) Phosphorus retention in created wetlands designed for nitrogen removal. In: Williams W D; Sladeckova A International Association of Theoretical and Applied Limnology, Vol 26, Pt 4. Stuttgart: E Schweizerbart'sche Verlagsbuchhandlung, pages 1568-1570.	Yes	Yes	

Additional file 4, Critical appraisal

Reference (in category 1)	N	P	Comment on Quality Category
Passy P, Garnier J, Billen G, Fesneau C, Tournebize J (2012) Restoration of ponds in rural landscapes: Modelling the effect on nitrate contamination of surface water (the Seine River Basin, France). Science of the Total Environment. 430: 280-290.	Yes	Yes	3 years study of pond receiving drainage water. Biweely sampling hydrological data seems ok. Only NO3 and TP shown in figure 4. Uncertain if input and output data can be retrieved. More a model paper
Paudel R, Min J H; Jawitz J W; (2010) Management scenario evaluation for a large treatment wetland using a spatio-temporal phosphorus transport and cycling model. Ecological Engineering. 36: 1627-1638.	Yes	Yes	This is a study with a strong emphasis om modelling. Although a figure with P concentrations is given, there is insufficient information on empirical spects.
Phipps R G; Crumpton W G; (1994) FACTORS AFFECTING NITROGEN LOSS IN EXPERIMENTAL WETLANDS WITH DIFFERENT HYDROLOGIC LOADS. Ecological Engineering. 3: 399-408.	Yes		Not a full year (april-november)
Reilly J F; Horne A J; Miller C D; (2000) Nitrate removal from a drinking water supply with large free-surface constructed wetlands prior to groundwater recharge. Ecological Engineering. 14: 33-47.	Yes		No explicit water budget, although daily flow has been measured at inlet and outlet, weekly nutrient samplings. No annual values, 3 approx half-year periods (phases) with different flow. Mass balance for Nitrate only. Although tis is the dominant species it is demonstrated that TKN concentration is increasing in the wetlands.
Reuter J E; Djohan T, Goldman C R; (1992) The use of wetlands for nutrient removal from a surface runoff in a cold climate region of California - results from a newly constructed wetland at Lake Tahoe. Journal of Environmental Management. 36: 35-53.	Yes	Yes	No measurements of water flow have been made, only estimates based on precipitation data. Sampling frequency was OK for concentration data
Richardson C J; Flanagan N E; Ho M C; Pahl J W; (2011) Integrated stream and wetland restoration: A watershed approach to improved water quality on the landscape. Ecological Engineering. 37: 25-39.	Yes	Yes	No annual values for N or P retention and no water budgets System changed during investigation
Rodrigo María A; Martín Miguel, Rojo Carmen, Gargallo Sara, Segura Matilde, Oliver Núria (2013) The role of eutrophication reduction of two small man-made Mediterranean lagoons in the context of a broader remediation system: Effects on water quality and plankton contribution. Ecological Engineering. 61, Part A: 371-382.	Yes	Yes	Monthly sampling. Obscure calculation of water balance
Rodriguez-Gallego L R; Mazzeo N, Gorga J, Meerhoff M, Clemente J, Kruk C, Scasso F, Lacerot G, Garcia J, Quintans F (2004) The effects of an artificial wetland dominated by free-floating plants on the restoration of a subtropical, hypertrophic lake. Lakes and Reservoirs: Research and Management. 9: 203-215.	Yes	Yes	Study of lake and three associated ponds. But there are no hydrological data. There are only concentration measured in the lake and the three associated ponds. No inlet outlet data. Has to be discarded
Romero J A; Comin F A; Garcia C (1999) Restored wetlands as filters to remove nitrogen. Chemosphere. 39: 323-332.	Yes		Rather summary description; only 6 months per year; monthly samples. Annual budgets not possible to extract.
Rushton B, Teague K (2005) Performance of a stormwater wet pond with side bank filters. , .	Yes	Yes	The authors state, and give clear evidence for, that there is a considerable inflow of groundwater, but the quality of the groundwater has not been measured. The largest negative retention numbers are in the months with large inflow of groundwater - hence the overall removal figures are not accurate even though the water balance is.
Rushton B T; (2004) Hydrologic and water quality characteristics in storm runoff from row crop farming. , .	Yes	Yes	IN the current paper it is not possible to combine the water balance table with the concentration table as it is not indicated what volumes the actual sampled water corresponds to. However, the monitoring program described is good and the data we need may exist in a later report - otherwise authors should be contacted.
Sakadevan K, Bavor H J; (1999) Nutrient removal mechanisms in constructed wetlands and sustainable water management. Water Science and Technology. 40: 121-128.	Yes	Yes	Large deficit in water budget. The water balance is too uncertain to allow for reliable retention calculations.
Salomao A L. D; Marques M, Severo R G; Roque O C. D; (2012) Engineered ecosystem for on-site wastewater treatment in tropical areas. Water Science and Technology. 66: 2131-2137.	Yes	Yes	Cannot find length of study, water budget, sampling frequency

Additional file 4, Critical appraisal

Reference (in category 1)	N	P	Comment on Quality Category
Schreijer M, Kampf R, Toet S, Verhoeven J (1997) The use of constructed wetlands to upgrade treated sewage effluents before discharge to natural surface water in Texel Island, The Netherlands - Pilot study. Water Science and Technology. 35: 231-237.	Yes	Yes	5 years study of free water surface flow (ditch) but with altered dimensions, volume, Q and HRT each year. No information about sampling frequency. Bad quality of figures to be extrated. No much info on hydrological data (only Q mean per year and HRT per year). On the limit to qualify for category 2.
Schwartz L N; Wallace P M; Gale P M; Smith W F; Wittig J T; McCarty S L; (1994) Orange County Florida Eastern Service Area reclaimed water wetlands reuse system. Water Science and Technology. 29: 273-281.	Yes	Yes	No info on sampling frequency and no info on water budget measurements
Scott J T; McCarthy M J; Gardner W S; Doyle R D; (2008) Denitrification, dissimilatory nitrate reduction to ammonium, and nitrogen fixation along a nitrate concentration gradient in a created freshwater wetland. Biogeochemistry. 87: 99-111.	Yes	Yes	The water budget is not solid, only inflow has been measured. Concentrations are measured during only four months each year. However, processes have been measured and the paper might be useful for the discussion
Senzia M A; Mashauri D A; Mayo A W; (2003) Suitability of constructed wetlands and waste stabilisation ponds in wastewater treatment: nitrogen transformation and removal. Physics and Chemistry of the Earth. 28: 1117-1124.	Yes		Cannot find length of study, water budget, sampling frequency
Lúcia Helena, Sipaúba-Tavares , Francisco Manoel de Souza; Braga (2008) Constructed wetland in wastewater treatment = Uso de “wetland” construído para tratamento de resíduos. Acta Scientiarum : Biological Sciences. 30: 261-265.	Yes	Yes	No water balance, some nutrient loading not accounted for.
Sipaúba-Tavares L H; Braga F M. de B; (2008) Constructed wetland in wastewater treatment. Acta Scientiarum - Biological Sciences. 30: 261-265.	Yes	Yes	This study cannot be used: 3 very different wastewater sources; concentrations only
Son Y K; Yoon C G; Kim H C; Jang J H; Lee S B; (2010) Determination of regression model parameter for constructed wetland using operating data. Paddy and Water Environment. 8: 325-332.	Yes	Yes	Several years of measurements with biweekly sampling and flow measurements However, no water budgets and no possibility to calculate retention.
Spieles D J; Mitsch W J; (2000) The effects of season and hydrologic and chemical loading on nitrate retention in constructed wetlands: a comparison of low- and high-nutrient riverine systems. Ecological Engineering. 14: 77-91.	Yes	Yes	
Stamenkovic J, Gustin M S; Dennett K E; (2005) Net methyl mercury production versus water quality improvement in constructed wetlands: Trade-offs in pollution control. Wetlands. 25: 748-757.	Yes	Yes	This is an article about methyl mercury No water budget and no retention figures. No HLR info.
Strand J A; Weisner S E. B; (2013) Effects of wetland construction on nitrogen transport and species richness in the agricultural landscape-Experiences from Sweden. Ecological Engineering. : .	Yes		This is a metastudy. Probably a high quality study but too little info on methods and effect modifiers (e.g. HLR) for individual wetlands. Ask authors about data for individual years!
Syversen N (2005) Effect and design of buffer zones in the Nordic climate: The influence of width, amount of surface runoff, seasonal variation and vegetation type on retention efficiency for nutrient and particle runoff. Ecological Engineering. 24: 483-490.	Yes	Yes	Data not suitable for extraction. Author must have good data. No indication of hydraulic load; no concentratins presented
Taylor M D; White S A; Chandler S L; Klaine S J; Whitwell T (2006) Nutrient management of nursery runoff water using constructed wetland systems. Horttechnology. 16: 610-614.	Yes	Yes	Montly sampling. No water budget and no calculation of loading and retention.
Terzakis S, Fountoulakis M S; Georgaki I, Albantakis D, Sabathianakis I, Karathanasis A D; Kalogerakis N, Manios T (2008) Constructed wetlands treating highway runoff in the central Mediterranean region. Chemosphere. 72: 141-149.	Yes	Yes	No hydrologic budgets possible; only tabulated mean concentrations and graphical representation of TN and TP concentrations over 2 years
Thomas P R; Glover P, Kalaroopan T (1995) An evaluation of pollutant removal from secondary treated sewage effluent using a constructed wetland system. Water Science and Technology. 32: 87-93.	Yes	Yes	not 12 months of study. Only mean values shown. Does not fulfil criteria at all

Additional file 4, Critical appraisal

Reference (in category 1)	N	P	Comment on Quality Category
Thullen J S; Sartoris J J; Walton W E; (2002) Effects of vegetation management in constructed wetland treatment cells on water quality and mosquito production. Ecological Engineering. 18: 441-457.	Yes	Yes	Good hydrology but only data for one half year and a 3-month period
Tuszyńska A, Worst M, Obarska-Pempkowiak H (2007) Pollutants removal effectiveness in hydrophyte filters with sequential vertical and horizontal flow. Ecohydrology and Hydrobiology. 7: 321-327.	Yes	Yes	There is no water budget and it is not possible to calculate annual removal on an area basis.
Wadzuk B M; Rea M, Woodruff G, Flynn K, Traver R G; (2010) Water-Quality Performance of a Constructed Stormwater Wetland for All Flow Conditions1. Journal of the American Water Resources Association. 46: 385-394.	Yes	Yes	Water flow has been measured during a number of sampling occasions, but it is very unclear for how long periods. However, the annual load and removal was based on an assumption that the stormflow was equal to the average rainfall in Pennsylvania * drainage area. Not good enough
Wang Wenlong, Gao Jingqing, Guo Xiao, Li Wenchao, Tian Xinyuan, Zhang Ruiqin (2012) Long-term effects and performance of two-stage baffled surface flow constructed wetland treating polluted river. Ecological Engineering. 49: 93-103.	Yes	Yes	No water budget Not possible to calculate retention
Velty S, Behrendt A, Zeitz J (2006) Natural wetland restoration and the use of municipal wastewater. Journal of Plant Nutrition and Soil Science-Zeitschrift Fur Pflanzenernahrung Und Bodenkunde. 169: 642-650.	Yes	Yes	This is a lysimeter study. Very little discharge (=outflow?), very high evapotranspiration???
Vikman A, Sarkkola S, Koivusalo H, Sallantaus T, Laine J, Silvan N, Nousiainen H, Nieminen M (2010) Nitrogen retention by peatland buffer areas at six forested catchments in southern and central Finland. Hydrobiologia. 641: 171-183.	Yes		not possible to make annual balances. Hydrological data sparse and it will not be possible to make a reliable waterbalance
Wang H G; Jawitz J W; White J R; Martinez C J; Sees M D; (2006) Rejuvenating the largest municipal treatment wetland in Florida. Ecological Engineering. 26: 132-146.	Yes	Yes	Hydraulic efficiency has been measured so actually a good study. Unclear about the sampling procedures, maybe previous studies can indicate the quality better. However, this is mainly a hydrology study, it is not possible to calculate mass balances and mass removal rates/efficiencies.
Wittgren H B; Tobiason S (1995) Nitrogen removal from pretreated wastewater in surface flow wetlands. Water Science and Technology. 32: 69-78.		Yes	One year only but good data. Mechanically and chemically treated wastewater, but no biological treatment, hence exclude the N data as it is a high NH_4 concentration wastewater. The P removal is not reported on a mass removal basis. Summary data are given in Andersson et al (2005).
Wu Z B; Zhang S, Cheng S P; He F (2007) Performance and mechanism of phosphorus removal in an integrated vertical flow constructed wetland treating eutrophic lake water. Fresenius Environmental Bulletin. 16: 934-939.		Yes	No water budget (only rough input loading), efficiency based on concentrations?
Wu H D; Huang P, Wang J S; (2012) Eutrophic-water treatment using a hybrid system of stabilization ponds and constructed wetlands. Romanian Biotechnological Letters. 17: 6869-6875.	Yes		No water budget Little info on nutrient concentrations Monthly sampling, during more than one year Not possible to calculate retention
Wynn T M; Liehr S K; (2001) Development of a constructed subsurface-flow wetland simulation model. Ecological Engineering. 16: 519-536.	Yes		summary of data set to calibrate model. HLR not shown. Not possible to calculate mass balances.
Yeh T Y; Wu C H; (2009) Pollutant removal within hybrid constructed wetland systems in tropical regions. Water Science and Technology. 59: 233-240.	Yes	Yes	It is informed that Southern Taiwan is located in tropical areas (page 235 second column first line. No info on sampling frequency nor on study length
Yeh T Y; Pan C T; Ke T Y; Kuo T W; (2010) Organic Matter and Nitrogen Removal within Field-Scale Constructed Wetlands: Reduction Performance and Microbial Identification Studies. Water Environment Research. 82: 27-33.	Yes		No water budget (only input), efficiency based on concentrations
Yi Q, Hur C, Kim Y (2009) Modeling nitrogen removal in water hyacinth ponds receiving effluent from waste stabilization ponds. Ecological Engineering. 35: 75-84.	Yes	Yes	Should maybe be excluded due to lack of specific water budget and cryptic mass balance, although Fig. 9 shows a mass balance. However with scant information: modeled or measured, which time span?, which unit?

Additional file 4, Critical appraisal

Reference (in category 1)	N	P	Comment on Quality Category
Yu Shaw L; Earles T Andrew; Fitch G Michael; (1998) Aspects of functional analysis of mitigated wetlands receiving highway runoff. Transportation Research Record. 1626: 21-30.		Yes	Eventdriven sampling from July 1995 to November 1996 . Problems with sampling. Only average values for retention of TP and PO4-P or decrease in concentration of TP and PO4-P. Not possible to make annual balances.
Zhang S Y; Li G, Wu H B; Liu X G; Yao Y H; Tao L, Liu H (2011) An integrated recirculating aquaculture system (RAS) for land-based fish farming: The effects on water quality and fish production. Aquacultural Engineering. 45: 93-102.	Yes	Yes	Only 5 months operation one year, and 6months next year - same seasons.
Zhang R, Li G, Zhou Q, Zhang X (2008) Relationships between loading rates and nitrogen removal effectiveness in subsurface flow constructed wetlands. Frontiers of Environmental Science and Engineering in China. 2: 89-93.	Yes		Inflow hydraulic load and inflow TN concentrations manipulated several times during the experiment There is no water budget and TN retention is given per day, no annual values and not possible to calculate
Zhang R, Zhou W B; Field R, Tafuri A, Yu S L; Jin K L; (2009) Field test of best management practice pollutant removal efficiencies in Shenzhen, China. Frontiers of Environmental Science & Engineering in China. 3: 354-363.	Yes	Yes	only summary data provided for 6 months; design and management unclear; for the discussion only
Zhang R S; Li G H; Zhou Q, Zhang X (2006) Relationships between loading rates and nitrogen removal effectiveness in subsurface constructed wetlands. Huanjing Kexue/Environmental Science. 27: 253-256.	Yes		Gradually increasing load complicates interpretation as the loads are not indicated somewhere. Insufficient info for concentrations and HL during different periods. Same as Zhang et al 2008. No water budget or info on HLR other than that it was changed several times.
Zhang X D; Chen J H; Xi D L; (2009) Applied Study of Ecological Fibre Padding and Ceramic in Micro-Polluted Water Treatment. Beijing: Science Press Beijing.	Yes	Yes	No specific water budget and no nutrient concentration figures Although it is stated that the test lasted for a year, only short-term results are given Not possible to calculate annual retention
Zhang X D; Chen J H; Xi D L; (2009) APPLIED STUDY OF FIBRE PADDING AND CERAMIC IN MICRO-POLLUTED WATER TREATMENT. In: Kim H, Yang J F; Sekino T, Lee S W; Eco-Materials Processing and Design X. Stafa-Zurich: Trans Tech Publications Ltd, pages 559-562.	Yes	Yes	Not suitable for extraction. No data on hydrology or residence time. Very summary descriptions

B. Articles in Category 2 (Acceptable for quantitative data extraction and meta-regression).

Reference (Category 2)	N	P	Comment on Quality Category
Abe K, Komada M, Ookuma A (2008) Efficiency of removal of nitrogen, phosphorus, and zinc from domestic wastewater by a constructed wetland system in rural areas: a case study. Water Science and Technology. 58: 2427-2433.	Yes	Yes	Only inlet water loading, outlet water calculated from inlet, prec., evapo, 1.9 days hydraulic retention
Abtew W, Piccone T, Pietro K (2007) Constructed wetlands for water quality improvement in surface water discharges to the everglades: Stormwater Treatment Areas. , .		Yes	Dayly loading and outflow;simulated data included; probably large amount of data; no info on sampling frequency
Andersen D C; Sartoris J J; Thullen J S; Reusch P G; (2003) The effects of bird use on nutrient removal in a constructed wastewater-treatment wetland. Wetlands. 23: 423-435.	Yes	Yes	Multiple years, but with modified wetlands. Influence of waterfowl.
Andersson J L; Owenius S.; Stråe D. (2012) Monitoring of stormwater ponds in five municipalities in the Stockholm region. Svenskt vatten Utveckling, Rapport 2012-02. In Swedish.	Yes	Yes	
Barten J (1983) Nutrient removal from urban stormwater by wetland filtration: The Clear Lake restoration project. : .	Yes	Yes	reasonable flow-proportional sampling scheme. Some extreme flows were overtopping the wetland
Bass K L; Evans R O; (2004) Water quality improvement by a small in-stream constructed wetland in North Carolina's Coastal plain. , .	Yes	Yes	The measured data on water flows are not presented but used for removal calculations. If they can be obtaained, Table 2 can be used to get annual data for more years.
Beutel M W; Newton C D; Brouillard E S; Watts R J; (2009) Nitrate removal in surface-flow constructed wetlands treating dilute agricultural runoff in the lower Yakima Basin, Washington. Ecological Engineering. 35: 1538-1546.	Yes		Multiple years, but only annual values, outflow volume not measured but pumped water so inflow accurate. Maybe category 3?
Black Courtney A; Wise William R; (2003) Evaluation of past and potential phosphorus uptake at the Orlando Easterly Wetland. Ecological Engineering. 21: 277-290.		Yes	only monthly datashown for one year. Includes also modeling results
Braskerud B C; (2002) Factors affecting nitrogen retention in small constructed wetlands treating agricultural non-point source pollution. Ecological Engineering. 18: 351-370.	Yes		Only monthly values shown. But dayly composite sampling took place
Bratli J L; Skiple A, Mjelde M (1999) Restoration of lake Borrevannet - Self-purification of nutrients and suspended matter through natural reed-belts. Water Science and Technology. 40: 325-332.	Yes	Yes	The natural reedswamp/reedbelt was isolated with a 250 m long PVC membrane!!! Is that created? Sampling inetval not mentioned but sampling was automatic
Bulc T G; Klemencic A K; Razinger J (2011) Vegetated ditches for treatment of surface water with highly fluctuating water regime. Water Science and Technology. 63: 2353-2359.	Yes	Yes	one year study, monthly and anual mass balances no concentration data. Limited information regarding hydraulics
Carleton J N; Grizzard T J; Godrej A N; Post H E; Lampe L, Kenel P P; (2000) Performance of a constructed wetlands in treating urban stormwater runoff. Water Environment Research. 72: 295-304.	Yes	Yes	Excellent water balance and sampling design; no direct data on input loads presented
Chang J, Yue C L; Ge Y, Zhu Y M; (2004) Treatment of polluted creek water by multifunctional constructed wetland in China's subtropical region. Fresenius Environmental Bulletin. 13: 545-549.	Yes	Yes	Very summary description of methods and wetland. It is a combination of vertical and 'reverse-vertical'(what is that?) flow; only monthly sampling frequency
Chavan Prithviraj V; Dennett Keith E; Marchand Eric A; Spurkland Lars E; (2008) Potential of constructed wetland in reducing total nitrogen loading into the Truckee River. Wetlands Ecology and Management. 16: 189-197.	Yes	Yes	Study period jan 2002 to Oct 2003, Biweekly sampling
Clausen J C; Guillard K, Sigmund C M; Dors K M; (2000) Ecosystem restoration - Water quality changes from riparian buffer restoration in Connecticut. Journal of Environmental Quality. 29: 1751-1761.	Yes		Reported mass balance does no correspond to 12 months but good hydraulic and nutrient mass balances. Contact author? This is a riparian zone, with a limited wetland adjacent to a stream.
Cook M J (2002) The use of constructed wetlands to remove nitrogen and phosphorus from pumped shallow groundwater. Dissertation, North Carolina State university.	Yes	Yes	TN not reported but TKN? But TN in Fig. 17

Reference (Category 2)	N	P	Comment on Quality Category
Haan J de; Schoot J R. van der; Verstegen H, Clevering O (2010) Removal of nitrogen leaching from vegetable crops in constructed wetlands. Acta horticulturae. : 139-144.	Yes	Yes	2-year study,biweekly sampling. Good waterbalance due to lining of constructed wetlands with PVC-liner.
Dolan Thomas J; Bayley Suzanne E; Zoltek Jr, John , Hermann Albert J; (1981) PHOSPHORUS DYNAMICS OF A FLORIDA FRESHWATER MARSH RECEIVING TREATED WASTEWATER. Journal of Applied Ecology. 18: 205-219.		Yes	Good hydrological study and weekly measurements of concentrations; not a full year of data; unclear what happened with outflow
El Hamouri , B (2009) Rethinking natural, extensive systems for tertiary treatment purposes: The high-rate algae pond as an example. Desalination and Water Treatment. 4: 128-134.	Yes	Yes	good study of exceptional design geared towards massive growth of algae. Much of the N removal is ammonia volatilization
Fink Daniel F; (2007) Effects of a pulsing hydroperiod on a created riparian river diversion wetland. Dissertation, Ohio State University.	Yes	Yes	
Flyckt L. (2010) Treatment results, operational experiences and cost efficiency in constructed wetlands for waste water treatment in Sweden. Masters thesis, Linköping University. In Swedish.	Yes	Yes	
Frankenbach Rolf I; Meyer Joseph S; (1999) Nitrogen removal in a surface-flow wastewater treatment wetland. Wetlands. 19: 403-412.	Yes		One-year study of surface flow teatment wetland of tertiary wastewater. Biweekly sampling
Gajewska M, Ambroch K (2012) Pathways of Nitrogen Removal in Hybrid Treatment Wetlands. Polish Journal of Environmental Studies. 21: 65-74.	Yes	Yes	Only VF and HF II can be used as HF I receives primary treated sewage
Harouiya N, Rue S M; Prost-Boucle S, Lienar A, Esser D, Molle P (2011) Phosphorus removal by apatite in horizontal flow constructed wetlands for small communities: pilot and full-scale evidence. Water Science and Technology. 63: 1629-1637.		Yes	2 and 3-year study of apatite containg constructed wetlands for retention of P. Weekly and biweekly sampling
Healy M, Cawley A M; (2002) Nutrient processing capacity of a constructed wetland in western Ireland. Journal of Environmental Quality. 31: 1739-1747.	Yes	Yes	2-year study of three cell surface flow wetland for removal of nutrients in tertiary weastewater. Data aggregated into yearly or summer values. Only mean concentration shown after statistical treatment of data
Heyvaert A C; Reuter J E; Goldman C R; (2006) Subalpine, cold climate, stormwater treatment with a constructed surface flow wetland. Journal of the American Water Resources Association. 42: 45-54.	Yes	Yes	
Hoagland C R; Gentry L E; David M B; Kovacic D A; (2001) Plant nutrient uptake and biomass accumulation in a constructed wetland. Journal of Freshwater Ecology. 16: 527-540.	Yes	Yes	Good water balance but not multiple years and no replication
Hoffmann C C; Kronvang B, Audet J (2011) Evaluation of nutrient retention in four restored Danish riparian wetlands. Hydrobiologia. 674: 5-24.	Yes	Yes	One wetland excluded due to too short period
Kieckbusch J J; Schrautzer J (2007) Nitrogen and phosphorus dynamics of a re-wetted shallow-flooded peatland. Science of the Total Environment. 380: 3-12.	Yes	Yes	Area is not given and only biweekly grab samples have been collected. However, hydrology seems well measured.
Kim H C; Yoon C G; Son Y K; Rhee H P; Lee S B; (2010) Effects of open water on the performance of a constructed wetland for nonpoint source pollution control. Water Science and Technology. 62: 1003-1012.	Yes	Yes	hydrology reasonable (inflow and outflow) but not specified per cell
Knight R L; Winchester B H; Higman J C; (1985) Ecology, hydrology, and advanced wastewater treatment potential of an artifical marsh/pond wetland in North-central Florida. , .	Yes	Yes	
Koskiaho J, Ekholm P, Raty M, Riihimaki J, Puustinen M (2003) Retaining agricultural nutrients in constructed wetlands - experiences under boreal conditions. Ecological Engineering. 20: 89-103.	Yes		Input and output water budget for one wetland, the other two only output. But no water data presented. Good sampling frequency.
Koskiaho J, Puustinen M, Kotamaki N (2009) Retention Performance of a Constructed Wetland as Measured Automatically with Sensors. Beijing: Science Press Beijing.		Yes	Good input water measurements, but less riable output. No actual annual water balance data in article. Graph of measured and calculated outflow.

Additional file 4, Critical appraisal

Reference (Category 2)	N	P	Comment on Quality Category
Leonardson L, Bengtsson L, Davidsson T, Persson T, Emanuelsson U (1994) NITROGEN-RETENTION IN ARTIFICIALLY FLOODED MEADOWS. Ambio. 23: 332-341.	Yes	Yes	good study with good hydrological data; management (10 cycles/year) special for flood meadows; only averages are given
Li L F; Li Y H; Biswas D K; Nian Y G; Jiang G M; (2008) Potential of constructed wetlands in treating the eutrophic water: Evidence from Taihu Lake of China. Bioresource Technology. 99: 1656-1663.	Yes	Yes	One-year study, biweekly sampling. Only concentrations showed togethet with percentage removal, but due to constant inflow of water it is poossible to calculate anual removal rates
Lu S Y; Zhang P Y; Jin X C; Xiang C S; Gui M, Zhang J, Li F M; (2009) Nitrogen removal from agricultural runoff by full-scale constructed wetland in China. Hydrobiologia. 621: 115-126.	Yes		good sampling frequency and chemical analysis; hydrology only known for inflow
Lu S Y; Zhang P Y; Cui W H; (2010) Impact of plant harvesting on nitrogen and phosphorus removal in constructed wetlands treating agricultural region wastewater. International Journal of Environment and Pollution. 43: 339-353.	Yes	Yes	Sampling once or twice a week. But only seasonal means shown.Inflow of water measured with ultrasonic flowmeter, but only average inflow rates for period May 2002 to June 2004 given (m3/day). Only Annual mass balance for TN and TP
Martin M, Oliver N, Hernandez-Crespo C, Gargallo S, Regidor M C; (2013) The use of free water surface constructed wetland to treat the eutrophicated waters of lake L'Albufera de Valencia (Spain). Ecological Engineering. 50: 52-61.	Yes	Yes	The hydraulic load has been increased stepwise during the 2 year study period.
Martin J R; Keller C H; Clarke R A; Knight R L; (2001) Long-term performance summary for the Boot Wetland Treatment System. . 44: 413-420.	Yes	Yes	8 years of monitoring. Only annual means of TP and TN concentration shown. OnAnual mass balances for TP and TN for eight years shown. Yearly data on water inflow, outflow HLR rainfall and evapotranspiration, but no comments to the obvious discrepansies and uncertainties in the waterbalance
Martín M, Gargallo S, Hernández-Crespo C, Oliver N (2013) Phosphorus and nitrogen removal from tertiary treated urban wastewaters by a vertical flow constructed wetland. Ecological Engineering. 61, Part A: 34-42.	Yes	Yes	difficult to compare because of ver low loading rate
Moustafa M Z; Havens K E; (2001) Identification of an optimal sampling strategy for a constructed wetland. Journal of the American Water Resources Association. 37: 1015-1028.	Yes	Yes	
Nungesser M K; Chimney M J; (2001) Evaluation of phosphorus retention in a South Florida treatment wetland. Water Science and Technology. 44: 109-115.		Yes	
Pomogyi P (1993) NUTRIENT RETENTION BY THE KIS-BALATON WATER PROTECTION SYSTEM. Hydrobiologia. 251: 309-320.	Yes	Yes	Results can be extracted for the first year between sampling points A and H; no information is given regarding the sampling frequency etc for the following years.
Radoux M, Cadelli D, Nemcova M (1997) A comparison of purification efficiencies of various constructed ecosystems (aquatic, semi-aquatic and terrestrial) receiving urban wastewaters. Wetlands Ecology and Management. 4: 207-217.	Yes	Yes	Mesokosm study. No outflow data.
Radoux M, Cadelli D, Nemcova M, Ennabili A, Ezzahri J (2003) Optimisation of extensive wastewater treatment systems under Mediterranean conditions (Morocco): Compared purification efficiency of artificial ecosystems. Leiden: Backhuys Publishers.	Yes	Yes	21 month study of wastewater treatment in Marocco. Level II and Level III data for secondary and tertiary wastewater can be used. Comparison of different pond types. Constant flow rate. Annual removal rates not calculated but can be done
Reinhardt M, Muller B, Gachter R, Wehrli B (2006) Nitrogen removal in a small constructed wetland: An isotope mass balance approach. Environmental Science & Technology. 40: 3313-3319.	Yes		
Sajn Slak, A , Bulc T G; Vrhovsek D (2005) Comparison of nutrient cycling in a surface-flow constructed wetland and in a facultative pond treating secondary effluent. . 51: 291-298.	Yes	Yes	Three year study but only results from one year. Monthly sampling, but apparently also dayly sampling. Monthly mass balances for NH_4, NO_3, OrgN, TN, PO_4, TP
Sartoris J J; Thullen J S; Barber L B; Salas D E; (2000) Investigation of nitrogen transformations in a southern California constructed wastewater treatment wetland. Ecological Engineering. 14: 49-65.	Yes		Study of marsh-pond-marsh system. Weekly sampling. Results shown for entire study period and for four selected periods as dayly loads in kg per ha. No hydrological data except that inlet load was 3785 to 7570 liter per day

Additional file 4, Critical appraisal

Reference (Category 2)	N	P	Comment on Quality Category
Thoren A K; Legrand C, Tonderski K S; (2004) Temporal export of nitrogen from a constructed wetland: influence of hydrology and senescing submerged plants. Ecological Engineering. 23: 233-249.	Yes		Monthly sampling but multiple years. Water budget? Ask Karin.
Toet S, Van Logtestijn , R S P; Kampf R, Schreijer M, Verhoeven J T. A; (2005) The effect of hydraulic retention time on the removal of pollutants from sewage treatment plant effluent in a surface-flow wetland system. Wetlands. 25: 375-391.	Yes	Yes	Large unaccounted term in N-budget, one-year study with several ditches of different plant dominance and 2 different HRT. Check with author (Jos).
Toet S, Van Logtestijn , R S P; Schreijer M, Kampf R, Verhoeven J T. A; (2005) The functioning of a wetland system used for polishing effluent from a sewage treatment plant. Ecological Engineering. 25: 101-124.	Yes	Yes	
Tonderski K S; Arheimer B, Pers C B; (2005) Modeling the impact of potential wetlands on phosphorus retention in a Swedish catchment. Ambio. 34: 544-551.		Yes	good hydrology and sampling frequency; not really primary data? Contact author
Wang H G; Jawitz J W; White J R; Martinez C J; Sees M D; (2006) Rejuvenating the largest municipal treatment wetland in Florida. Ecological Engineering. 26: 132-146.	Yes	Yes	Hydraulic efficiency has been measured so actually a good study. Unclear about the sampling procedures, maybe previous studies can indicate the quality better.
Vellidis G, Lowrance R, Gay P, Hubbard R K; (2003) Nutrient transport in a restored riparian wetland. Journal of Environmental Quality. 32: 711-726.	Yes	Yes	data from 1992 - 1999. but data shown for seasonal periods i.e autumn winter spring summer. Biweekly sampling 1992-97. Monthly sampling 1998-1999. It might be difficult to extract data from figures
Yi Q T; Yu J, Kim Y (2010) Removal patterns of particulate and dissolved forms of pollutants in a stormwater wetland. Water Science and Technology. 61: 2083-2096.	Yes	Yes	Excellent study, but data are difficult to compare perhaps?
Zhang R S; Li G H; Zhou Q, Zhang X (2006) Relationships between loading rates and nitrogen removal effectiveness in subsurface constructed wetlands. Huanjing Kexue/Environmental Science. 27: 253-256.	Yes		The gradually increasing load complicates evaluation as not coupling between In concentration for ind periods and load or removal cen be done
Zhou Sheng, Hosomi Masaaki (2009) Nitrogen removal from polluted river water by surface flow wetland with forage rice (Oryza sativa L. cv. Kusahonami). International Journal of Environmental Engineering. 1: 123-135.	Yes		Input - output studie with effect modifiers i.e plant uptake and denitrification. Tables 3 and 4 contains means for years 2004 and 2005 but study goes from May 2004 to October 2005

C. Articles in Category 3 (Acceptable for quantitative data extraction, meta-regression, and meta-analysis).

Reference (Category 3)	N	P	Comment on Quality Category
Abtew W, Goforth G, Germain G (2004) Stormwater treatment areas: Constructed wetlands for phosphorus removal in South Florida surface waters. , .		Yes	
Ardon M, Morse J L; Doyle M W; Bernhardt E S; (2010) The Water Quality Consequences of Restoring Wetland Hydrology to a Large Agricultural Watershed in the Southeastern Coastal Plain. Ecosystems. 13: 1060-1078.	Yes	Yes	
Batson J A; Mander U, Mitsch W J; (2012) Denitrification and a Nitrogen Budget of Created Riparian Wetlands. Journal of Environmental Quality. 41: 2024-2032.	Yes		Focusing on denitrification and N mass balances for three wetland sites at Olentangy River Wetlands Research Park
Behrends L L; Bailey E, Jansen P, Houke L, Smith S (2007) Integrated constructed wetland systems: design, CD operation, and performance of low-cost decentralized wastewater treatment systems. Water Science and Technology. 55: 155-161.	Yes		Only last units can used. First units receive raw wastewater
Borin M, Tocchetto D (2007) Five year water and nitrogen balance for a constructed surface flow wetland treating agricultural drainage waters. Science of the Total Environment. 380: 38-47.	Yes		
Braskerud B C; Hartnik T, Lovstad O (2005) The effect of the redox-potential on the retention of phosphorus in a small constructed wetland. Water Science and Technology. 51: 127-134.	Yes	Yes	Focus is on redox mesurements, hence the retention data may appear in another paper as well
Chen, H.J., Ivanoff, D., Pietro, K., 2015. Long-term phosphorus removal in the Everglades stormwater treatment areas of South Florida in the United States. Ecological Engineering, 79: 158-168.		Yes	
Coveney M F; Stites D L; Lowe E F; Battoe L E; Conrow R (2002) Nutrient removal from eutrophic lake water by wetland filtration. Ecological Engineering. 19: 141-159.	Yes	Yes	Good data set for 29 month period (loading noet homogeneous, even drought period included)
DeBusk T A; Grace K A; Dierberg F E; Jackson S D; Chimney M J; Gu B H; (2004) An investigation of the limits of phosphorus removal in wetlands: a mesocosm study of a shallow periphyton-dominated treatment system. Ecological Engineering. 23: 1-14.	Yes	Yes	Inflow but not outflow measured, high hydraulic load (0.8 d ret time) and sealed mesocosms means that water balance is relatively OK.
DeBusk T A; Kharbanda M, Jackson S D; Grace K A; Hileman K, Dierberg F E; (2011) Water, vegetation and sediment gradients in submerged aquatic vegetation mesocosms used for low-level phosphorus removal. Science of the Total Environment. 409: 5046-5056.		Yes	Replicated mesocosms with good inflow data, weekly sampling design and long-term monitoring
Domingos S S; Dallas S, Skillman L, Felstead S, Ho G (2011) Nitrogen removal and ammonia-oxidising bacteria in a vertical flow constructed wetland treating inorganic wastewater. Water Science and Technology. 64: 587-594.	Yes	Yes	1-year study with automatic composite samplers. Also equipped with flowmeters. Exact sampling frequence not given but n-infleunt=312 and n-effluent=301. Monthly values on cencentration and mass balances shown
Dunne E J; Coveney M F; Marzolf E R; Hoge V R; Conrow R, Naleway R, Lowe E F; Battoe L E; (2012) Efficacy of a large-scale constructed wetland to remove phosphorus and suspended solids from Lake Apopka, Florida. Ecological Engineering. 42: 90-100.		Yes	good hydrological data; weekly sampling; replicated design
Dunne Ed J; Coveney Michael F; Marzolf Erich R; Hoge Victoria R; Conrow Roxanne, Naleway Robert, Lowe Edgar F; Battoe Lawrence E; Inglett Patrick W; (2013) Nitrogen dynamics of a large-scale constructed wetland used to remove excess nitrogen from eutrophic lake water. Ecological Engineering. 61, Part A: 224-234.	Yes		good hydrological data; weekly sampling; replicated design
Fink D F; Mitsch W J; (2007) Hydrology and nutrient biogeochemistry in a created river diversion oxbow wetland. Ecological Engineering. 30: 93-102.	Yes	Yes	Good hydrological data. Frequent and adequate sampling design

Reference (Category 3)	N	P	Comment on Quality Category
Forbes M G; Dickson K L; Saleh F, Waller W T; Doyle R D; Hudak P (2005) Recovery and fractionation of phosphorus retained by lightweight expanded shale and masonry sand used as media in subsurface flow treatment wetlands. Environmental Science & Technology. 39: 4621-4627.		Yes	good control over hydrology; good sampling frequency
Gu B H; Dreschel T (2008) Effects of plant community and phosphorus loading rate on constructed wetland performance in Florida, USA. Wetlands. 28: 81-91.		Yes	good control over hydrology; good sampling frequency, interesting treatments
Gu B H; (2008) Phosphorus removal in small constructed wetlands dominated by submersed aquatic vegetation in South Florida, USA. Journal of Plant Ecology. 1: 67-74.	Yes	Yes	
Gumiero B, Boz B, Cornelio P, Casella S (2011) Shallow groundwater nitrogen and denitrification in a newly afforested, subirrigated riparian buffer. Journal of Applied Ecology. 48: 1135-1144.	Yes		Maybe not a wetland? Riparian zone with planted trees
Hoffmann C C; Heiberg L, Audet J, Schonfeldt B, Fuglsang A, Kronvang B, Ovesen N B; Kjaergaard C, Hansen H C. B; Jensen H S; (2012) Low phosphorus release but high nitrogen removal in two restored riparian wetlands inundated with agricultural drainage water. Ecological Engineering. 46: 75-87.	Yes	Yes	weekly pooled quality samples, measured inflow and outflow. Data on soil P sorption properties given in Table 7, plant uptake measured in one wetland
Johannesson K M; Andersson J L; Tonderski K S; (2011) Efficiency of a constructed wetland for retention of sediment-associated phosphorus. Hydrobiologia. 674: 179-190.		Yes	Retention of phosphorus through sedimentian in aconstructed wetland. Four year mass balance. Hydrological processes ok. Flow proportional sampling plus three period with intensive grab sampling - 2 times a day.
Jordan T E; Whigham D F; Hofmockel K H; Pittek M A; (2003) Nutrient and sediment removal by a restored wetland receiving agricultural runoff. Journal of Environmental Quality. 32: 1534-1547.	Yes	Yes	Annual rainfall on pg 1537, HL variations on pg 1538. Influence of hydrological differences between years on removal can be used
Juston J, DeBusk T A; (2006) Phosphorus mass load and outflow concentration relationships in stormwater treatment areas for Everglades restoration. Ecological Engineering. 26: 206-223.		Yes	Comparison of p retetntion in flowthrough wetlands, several years of data.Weekly composite sampling or biweekly grab sampling.Monthly or annual average values presented. Data already treated statistically
Kadlec R H; Bays J S; Mokry L E; Andrews D, Ernst M R; (2011) Performance analysis of the Richland-Chambers treatment wetlands. Ecological Engineering. 37: 176-190.	Yes	Yes	Pilot experiment replicated, not field scale experiment
Kadlec R H; Pries J, Lee K (2012) The Brighton treatment wetlands. Ecological Engineering. 47: 56-70.	Yes	Yes	Excellent study with very good hydrology data and several drivers studied
Kovacic D A; David M B; Gentry L E; Starks K M; Cooke R A; (2000) Effectiveness of constructed wetlands in reducing nitrogen and phosphorus export from agricultural tile drainage. Journal of Environmental Quality. 29: 1262-1274.	Yes	Yes	very good study with excellent hydrology measurements and flow-proportional sampling
Kovacic D A; Twait R M; Wallace M P; Bowling J M; (2006) Use of created wetlands to improve water quality in the Midwest - Lake Bloomington case study. Ecological Engineering. 28: 258-270.	Yes	Yes	High quality study. Detailed water budget. Flow-proportional, frequent samplig. 2 replicate wetlands. One year not complete, but only winter months missing?
Lu S Y; Wu F C; Lu Y, Xiang C S; Zhang P Y; Jin C X; (2009) Phosphorus removal from agricultural runoff by constructed wetland. Ecological Engineering. 35: 402-409.		Yes	Good hydrological study, frequent measurements. Good example of agricultural runoff (P) study
Mitsch W J; Cronk J K; Wu X Y; Nairn R W; Hey D L; (1995) PHOSPHORUS RETENTION IN CONSTRUCTED FRESH-WATER RIPARIAN MARSHES. Ecological Applications. 5: 830-845.		Yes	
Mitsch W J; Zhang L, Stefanik K C; Nahlik A M; Anderson C J; Bernal B, Hernandez M, Song K (2012) Creating Wetlands: Primary Succession, Water Quality Changes, and Self-Design over 15 Years. Bioscience. 62: 237-250.	Yes	Yes	Hydrologic budget-outflow?

Additional file 4, Critical appraisal

Reference (Category 3)	N	P	Comment on Quality Category
Moustafa M Z; White J R; Coghlan C C; Reddy K R; (2012) Influence of hydropattern and vegetation on phosphorus reduction in a constructed wetland under high and low mass loading rates. Ecological Engineering. 42: 134-145.	Yes	Yes	Effect of rainfall has not been included but all replicates should have received the same rainfall - reference is given to Moustafa, M.Z., White, J.R., Coghlan, C.C., Reddy, K.R., 2011. Influence of hydropattern and vegetation type on phosphorus dynamics in flow-through wetland treatment systems. Ecol. Eng. 37, 1369L 1378
Moustafa M Z; Chimney M J; Fontaine T D; Shih G, Davis S (1996) The response of a freshwater wetland to long-term "low level" nutrient loads - Marsh efficiency. Ecological Engineering. 7: 15-33.	Yes	Yes	Water budget specified in other article
Nairn Robert W; (1996) Biogeochemistry of newly created riparian wetlands; evaluation of water quality changes and soil development. Dissertation for the Degree of Doctor of Philosophy: The Ohio State University.	Yes	Yes	
Denis Newbold, J , Herbert Susan, Sweeney Bernard W; Kiry Paul, Alberts Stephen J; (2010) Water quality functions of a 15-year-old riparian forest buffer system. Journal of the American Water Resources Association. 46: 299-310.	Yes		Nice example of riparian buffer strip with long-term data and frequent sampling. Hydrology O.K.
O'Luanaigh N D; Goodhue R, Gill L W; (2010) Nutrient removal from on-site domestic wastewater in horizontal subsurface flow reed beds in Ireland. Ecological Engineering. 36: 1266-1276.	Yes		Only Phosphate-P is given for P.
Reinelt L E; Horner R R; (1995) Pollutant removal from stormwater runoff by palustrine wetlands based on comprehensive budgets. Ecological Engineering. 4: 77-97.		Yes	Two wetlands, one urban, one more rural
Reinhardt M, Gachter R, Wehrli B, Muller B (2005) Phosphorus retention in small constructed wetlands treating agricultural drainage water. Journal of Environmental Quality. 34: 1251-1259.		Yes	Very high sampling frequency (every 2 days or automatic), measured or modeled all water flows. P added continously from June 2001, OBS.
Rushton B T; Bahk B M; (2001) Treatment of stormwater runoff from row crop farming in Ruskin, Florida. Water Science and Technology. 44: 531-538.	Yes	Yes	This is a study with excellent methodology for (volume-proportional) sampling of stormwater inflow and pond outflow. Rain-driven system with large impact of El Nino/ la Nina events
Tanner C C; Sukias J P. S; (2011) Multiyear Nutrient Removal Performance of Three Constructed Wetlands Intercepting Tile Drain Flows from Grazed Pastures. Journal of Environmental Quality. 40: 620-633.	Yes	Yes	Multi-year data from three constructed wetlands treating agricultural drainage water. Only annual and summer winter data and yearly and winter summer balances shown
Tuncsiper B, Ayaz S C; Akca L, Samsunlu A (2005) Nitrogen management in reservoir catchments through constructed wetland systems. Water Science and Technology. 51: 175-181.	Yes	Yes	Good, controlled hydrology and good sampling
White J R; Reddy K R; Majer-Newman J (2006) Hydrologic and vegetation effects on water column phosphorus in wetland mesocosms. Soil Science Society of America Journal. 70: 1242-1251.		Yes	Three replicates for each treatment, one year
White J R; Reddy K R; Moustafa M Z; (2004) Influence of hydrologic regime and vegetation on phosphorus retention in Everglades stormwater treatment area wetlands. Hydrological Processes. 18: 343-355.		Yes	