APPENDIX B

Information from Published Literature Used to Develop Loss Rates

Table B.1. Information from published literature used to develop loss rates for TN.

Description or name of wetlands	TN conc. entering wetland (mg/L)	TN conc. leaving wetland (mg/L)	TN percent reduction (%)	Hydraulic residence time (days)	First order decay rate for TN (1/day)	Average depth (m)	"k" value for PkC* model (m/yr)	Comments
Wetlands below Caernarvon Diversion [1]	1.94	0.51 – 0.89 [A]	38% [B]	"about two weeks"	0.034	not reported	--	Data were collected during a March 2001 pulse; reductions measured over a distance of about 33 – 39 km. Receives water from Mississippi River.
Fourleague Bay [2]	1.2 – 1.6	0.4 – 0.6	Feb: 42% [C] Mar: 38% [C] Apr: 37% [C]	Feb: 5.3 Mar: 5.0 Apr: 18.7	Feb: 0.103 Mar: 0.096 Apr: 0.025	~ 1	Feb: 37.6 Mar: 34.9 Apr: 9.0	Data collected during Feb. – April 1994. This is an open waterbody. Primary source of nutrients is Atchafalaya River.
City of Mandeville – Bayou Chinchuba wetland [3]	7.5	--	65%	77 [D]	0.014	approx. 0.3	1.5	Data collected during Sep. 1998 – Oct. 2000. This is a forested wetland receiving treated municipal wastewater.
City of Thibodaux treatment wetland [4]	12.6	1.08	91%	120	0.021	0.33	2.4	Data were collected during Mar. 1992 – Mar. 1994. This is forested wetland receiving treated municipal wastewater.
City of Luling treatment wetland [5]	7.06	1.18	83%	512 [D]	0.003	not reported	--	Data were collected during 2006 – 2013. This is forested wetland receiving treated municipal wastewater.
City of Breaux Bridge treatment wetland [5]	8.44	1.38	84%	410 [D]	0.004	not reported	--	Data were collected during 2001 – 2013. This is forested wetland receiving treated municipal wastewater.
Richland-Chambers treatment wetlands in Texas [6] [E]	PS1: 4.95 PS2: 4.43 PS3: 4.43 FSS: 3.53	PS1: 1.32 PS2: 1.14 PS3: 1.36 FSS: 1.44	PS1: 73% PS2: 74% PS3: 69% FSS: 59%	PS1: 9.2 PS2: 7.8 PS3: 11.2 FSS: 8.2	PS1: 0.144 PS2: 0.174 PS3: 0.105 FSS: 0.110	PS1: 0.29 PS2: 0.25 PS3: 0.28 FSS: 0.40	PS1: 33.0 PS2: 55.4 PS3: 29.0 FSS: 32.8	Data were collected during Nov. 1993 – Jul. 2000 for pilot systems and Jun. 2003 – May 2008 for field scale system. Inflow is from Trinity River.

Table B.1 (continued)

Description or name of wetlands	TN conc. entering wetland (mg/L)	TN conc. leaving wetland (mg/L)	TN percent reduction (%)	Hydraulic residence time (days)	First order decay rate for TN (1/day)	Average depth (m)	"k" value for PkC* model (m/yr)	Comments
Stormwater treatment wetlands in North Carolina [7]	0.74 – 2.69	0.56 – 2.06	not calculated	0.1 – 3.0	0.056 – 1.26 [F]	0.1 – 0.3	5.1 – 63.1 (median = 46.1)	Ranges are for 10 constructed wetlands receiving stormwater in different regions of North Carolina.
Olentangy River Wetland Research Park [8]	2.90 [G]	1.97 [G]	31.9%	3.7 [G]	0.104	approx. 0.4 [G]	16.1	Data were collected during 2004 – 2010. Inflow is from Olentangy River. Located in Ohio.
Des Plaines River Experimental Wetlands [9] [H]	< 0.5 to ~ 7.5 [I]	0.5 to 1.5 [I]	EW3: 54% EW4: 75% EW5: 59%	EW3: 12 EW4: 95 EW5: 13	EW3: 0.065 EW4: 0.015 EW5: 0.069	0.6 – 0.7 [G]	EW3: 14.6 EW4: 3.6 EW5: 16.7	Data were collected during Apr. – Nov. 1991. Inflow is from Des Plaines River. Located in Illinois.

Notes:

A. Concentrations leaving the wetland are affected by dilution as well as other (e.g., biological and chemical) processes.
B. The effects of dilution were excluded in the calculations for this reduction percentage.
C. Percent reduction was calculated as 100% minus the percent exported from the bay into the Gulf of Mexico.
D. Estimated value obtained from Table 1 in Hunter et. al. (2009).
E. PS1 = Pilot system #1, PS2 = Pilot system #2, PS3 = Pilot system #3, FSS = Fields scale system.
F. Calculated as "k" value for PkC* model divided by average depth. "k" values were calculated by the author.
G. Calculated using other information in the article.
H. EW3 = Experimental wetland #3, EW4 = Experimental wetland #4, EW5 = Experimental wetland #5.
I. Estimated from Figure 4 (time series plot) in article.

References:

[1] Lane et. al. (2004)
[2] Perez et. al. (2011)
[3] Brantley et. al. (2008)
[4] Zhang et. al. (2000)
[5] Hunter et. al. (2018)
[6] Kadlec et. al. (2011)
[7] Merriman et. al. (2017)
[8] Mitsch et. al. (2014)
[9] Phipps and Crumpton (1994)

Table B.2. Information from published literature used to develop loss rates for TP.

Description or name of wetlands	TP conc. entering wetland (mg/L)	TP conc. leaving wetland (mg/L)	TP percent reduction (%)	Hydraulic residence time (days)	First order decay rate for TP (1/day)	Average depth (m)	"k" value for PkC* model (m/yr)	Comments
Wetlands below Caernarvon Diversion [1]	0.16	0.059 – 0.065 [A]	35% [B]	"about two weeks"	0.031	not reported	--	Data were collected during a March 2001 pulse; reductions measured over a distance of about 33 – 39 km. Receives water from Mississippi River.
Fourleague Bay [2]	0.11 – 0.15	0.06 – 0. 10	Feb: 0% [C] Mar: 12% [C] Apr: 58% [C]	Feb: 5.3 Mar: 5.0 Apr: 18.7	Feb: 0 Mar: 0.025 Apr: 0.046	~ 1	Feb: 0 Mar: 9.1 Apr: 16.9	Data collected during Feb. – April 1994. This is an open waterbody. Primary source of nutrients is Atchafalaya River.
City of Mandeville – Bayou Chinchuba wetland [3]	2.0	--	50%	77 [D]	0.009	approx. 0.3	1.0	Data collected during Sep. 1998 – Oct. 2000. This is a forested wetland receiving treated municipal wastewater.
City of Thibodaux treatment wetland [4]	2.46	0.85	65%	120	0.009	0.33	1.1	Data were collected during Mar. 1992 – Mar. 1994. This is forested wetland receiving treated municipal wastewater.
City of Luling treatment wetland [5]	2.34	0.51	78%	512 [D]	0.003	not reported	--	Data were collected during 2006 – 2013. This is forested wetland receiving treated municipal wastewater.
City of Breaux Bridge treatment wetland [5]	2.42	0.47	81%	410 [D]	0.004	not reported	--	Data were collected during 2001 – 2013. This is forested wetland receiving treated municipal wastewater.
Richland-Chambers treatment wetlands in Texas [6] [E]	PS1: 0.727 PS2: 0.719 PS3: 0.724 FSS: 0.888	PS1: 0.457 PS2: 0.342 PS3: 0.347 FSS: 0.539	PS1: 37% PS2: 52% PS3: 52% FSS: 39%	PS1: 9.2 PS2: 7.8 PS3: 11.2 FSS: 8.2	PS1: 0.050 PS2: 0.095 PS3: 0.066 FSS: 0.061	PS1: 0.29 PS2: 0.25 PS3: 0.28 FSS: 0.40	PS1: 6.2 PS2: 10.9 PS3: 5.7 FSS: 10.7	Data were collected during Nov. 1993 – Jul. 2000 for pilot systems and Jun. 2003 – May 2008 for field scale system. Inflow is from Trinity River.

Table B.2 (continued)

Description or name of wetlands	TP conc. entering wetland (mg/L)	TP conc. leaving wetland (mg/L)	TP percent reduction (%)	Hydraulic residence time (days)	First order decay rate for TP (1/day)	Average depth (m)	"k" value for PkC* model (m/yr)	Comments
Stormwater treatment wetlands in North Carolina [7]	0.17 – 0.38	0.05 – 0.48	not calculated	0.1 – 3.0	0.048 – 1.01 [F]	0.1 – 0.3	4.4 – 84.2 (median = 37.0)	Ranges are for 10 constructed wetlands receiving stormwater in different regions of North Carolina.
Olentangy River Wetland Research Park [8]	0.148 [G]	0.085 [G]	42.7%	4.1 [G]	0.136	approx. 0.4 [G]	21.2	Data were collected during 1994 – 2001 and 2003 – 2010. Inflow is from Olentangy River. Located in Ohio.
37 large constructed wetlands [9]	median = 0.114	median = 0.038	variable	variable	--	variable	median = 12.5	This is literature review of wetlands with measured data; the PkC* model was calibrated for each system.

Notes:

A. Concentrations leaving the wetland are affected by dilution as well as other (e.g., biological and chemical) processes.
B. The effects of dilution were excluded in the calculations for this reduction percentage.
C. Percent reduction was calculated as 100% minus the percent exported from the bay into the Gulf of Mexico.
D. Estimated value obtained from Table 1 in Hunter et. al. (2009).
E. PS1 = Pilot system #1, PS2 = Pilot system #2, PS3 = Pilot system #3, FSS = Fields scale system.
F. Calculated as "k" value for PkC* model divided by average depth. "k" values were calculated by the author.
G. Calculated using other information in the article.

References:

[1] Lane et. al. (2004)
[2] Perez et. al. (2011)
[3] Brantley et. al. (2008)
[4] Zhang et. al. (2000)
[5] Hunter et. al. (2018)
[6] Kadlec et. al. (2011)
[7] Merriman et. al. (2017)
[8] Mitsch et. al. (2014)
[9] Kadlec (2016)