Supplementary Materials

Table S1. Summary of land use coverage in the TCNS basins (expressed as % area of each basin).

	S133	S154	S154C	S191	S135	TCNS
Residential, Urban, Developed	34.2	8.7	0.5	5.4	6.3	9.6
Improved Pastures	33.1	52.7	80.0	50.5	22.2	46.2
Unimproved Pastures	4.0	4.6	0.0	5.3	6.3	5.0
Woodland Pastures	7.5	3.2	9.5	8.3	3.1	6.9
Dairy	0.0	0.4	0.0	1.9	0.1	1.2
Abandoned Dairy	0.0	10.6	0.0	4.3	0.2	4.3
Citrus	0.5	0.0	0.0	2.3	3.3	1.7
Field Crops	1.5	0.3	0.0	2.6	0.2	1.8
Nurseries	0.1	0.7	0.0	0.3	10.3	1.2
Other Agriculture	0.7	1.6	0.0	3.7	0.4	2.6
Row Crops	0.0	0.0	0.0	0.2	0.3	0.2
Sod	6.0	0.0	0.0	0.0	0.0	0.8
Spray Fields	0.0	0.1	0.0	1.3	0.0	0.8
Sugarcane	0.0	0.0	0.0	0.0	27.8	2.6
Wetlands	5.7	11.6	5.1	9.1	6.8	8.8
Natural (Forest, open water, others)	6.9	5.6	4.9	5.0	12.9	6.1
Total Area (km^2)	104	129	9	488	72	802

Table S2. Summary of physical and chemical properties of soils within the TCNS sub-watershed.

Soil[a,b,c]	% of TCNS Area	Hydrologic Group	pH	Organic Matter (%)	Clay (%)	Silt (%)	CaCO3 (%)	Cation Exchange Capacity (meq/100g)
Adamsville	0.25%	C	4.6-4.9	0.2-2.3	1-3.1	0.2-3.3	0	1.25-9.5
Anclote	0.00%	D	7	2.5-5.8	5.1-6.6	9.1-10.3	0	9-22.2
Ankona	0.00%	C/D	4-6.1	0.3-5.9	1-17.4	1.4-8.7	0	1.6-28.8
Arents	0.34%	B	5	0.5	3	4		2.6-3.9
Basinger	11.09%	D	4.3-5.4	0.1-3.9	0.6-1.9	0.4-1.1	0	0.9-19.1
Boca	0.00%	B/D	5.2-5.6	0.3-1.8	3.5-22.8	0.9-1.7	0	1.9-19.5
Bradenton	0.11%	D	6-6.5	0.3-5.2	3.4-15.3	2.9-5	0	2-25.4
Canova	0.84%	B/D	6-7	0.5-55	1.1-20.6	9.1-10.3	0	5.34-165.7
Chobee	0.05%	B/D	4.7-7.8	0.1-13.3	7.9-25.1	1.4-14.3	0	5-41.5
Floridana	13.04%	D	4.4-6	0.1-2.1	2.4-18.8	3.3-7.4	0	3.8-8.3
Ft Drum	0.25%	C	7.6-9	0.2-3.3	1.2-8.6	1.2-8.2	0-19.2	2.6-10.6
Gator	0.35%	D	4.7-8	0.2-74.6	5-30.7	5-15.2	0	6.1-227
Hallandale	0.01%	A/D	6-7	0.1-3.5	1-1.5	1-4	0	1.2-11.6
Hobe	0.05%	A	4.8-6.3	0.1-1.4	0.1-1.1	1.2-1.3	0	1-5
Holopaw	0.29%	B/D	4.2-6	0.3-1.1	1.3-18.3	5.8-7.5	0	4.3-4.7
Hontoon	0.04%	B/D	3.2-4	73.1-98.5	0	0	0	219-295
Immokalee	35.04%	B/D	3.5-5.8	0.1-5.8	0.4-0.9	1.3-4.8	0	1.1-18
Jonathan	0.01%	B	5.2-5.8	0.1-0.8	0.2-0.4	0.4-1	0	0.9-3
Jupiter	0.50%	B/C	7.3-7.8	1.3-3.9	3.8-5.2	2.3-3.5	0	5.3-14.5
Malabar	0.78%	B/D	3.8-5.4	0-1	0.5-16.5	0.6-2	0	3-3.9
Manatee	1.71%	D	7.4-8.1	0.1-1.5	4.3-13	0.6-5.6	0	2.9-5.7
Myakka	20.94%	B/D	5.2-6.6	0.1-1.9	0.3-1.2	3.3-7.3	0	1.2-6.5
Okeelanta	0.44%	B/D	6.2-6.5	0.3-36.6	0-3	0-2.4	0	1.9-110
Oldsmar	0.01%	C/D	4.5-5	0.1-1.2	0.9-15.7	0.5-2.9	0	3.1-4.7
Orsino	0.01%	A	5.1-5.5	0.1-0.6	0.3-0.7	0-1.3	0	0.9-2.5
Paola	0.03%	A	4.4-5.3	0-0.6	0.4-1.6	0.5-1.4	0	0.8-2.6
Parkwood	0.90%	B/D	7.5-8.1	0.1-3.9	3.1-26.5	0.5-9.6	0.7-48.6	5-14
Pendarvis	0.15%	C	4.2-5.8	0.2-6.4	0.4-6.3	0.9-10.8	0	2.4-20

Pineda	0.67%	B/D	5.2-6.4	0.3-0.8	0.8-27.4	0.9-3.6	0	3-5.5
Pinellas	0.08%	B/D	6.5-8	0.1-2.5	1.5-21.5	0.6-1.8	0	4-8.9
Placid	0.85%	D	4.4-6.4	0.2-3.3	0.5-3.9	0.5-6.6	0	1.9-10.7
Pomello	0.71%	C	4.9-5.6	0-1.6	0.4-4	0.3-3.8	0	1.2-5.5
Pompano	0.00%	B/D	3.7-5.6	0.1-4.1	0.2-2.9	0.1-2.1	0	1.3-13
Pople	0.77%	C/D	6.8-7.8	0.1-2.8	4.1-22.5	2.1-7	0	4.3-11.4
Punta	0.15%	B/C	4.1-5.3	0.2-10.7	0.6-7.3	0.2-2.7	0	2.2-32.65
Riviera	1.19%	D	4.2-6	0.1-4.8	1-21.3	2.8-7	0	4.2-15.6
Salerno	0.01%	B/D	4.4-5.9	0.1-4.1	0.4-6.6	0.4-2.8	0	1.85-13
Samsula	1.64%	B/D	3.5-4.5	0.5-99	0-6	0-6	0	3-297
Sanibel	0.06%	B/D	6.2-6.5	0.3-36.6	0-3	0-2.4	0	1.9-110
Satellite	0.12%	A	4.6-5.4	0-2.1	0.2-1	1.1-1.4	0	1-7
Smyrna	0.11%	B/D	4.2-5.1	0.2-2.2	0.6-3.5	0.8-3.2	0	1.7-7.5
St. Johns	0.14%	D	3.6-4.2	1.5-8.7	1-4.9	2.9-8.2	0	6-27.3
St. Lucie	0.03%	A	5.2-5.9	0.2-0.6	0.3-0.5	0-0.1	0	1.1-2.4
Terra Ceia	0.26%	B/D	4.7-5.9	6.2-99	0-1.9	0-10.1	0	19.7-297
Udorthents	1.19%	C	4.8	3	2	2	0	9.85
Valkaria	2.62%	B/D	5-5.6	0-3.1	0.7-1.6	1.2-2	0	1-10.3
Wabasso	1.20%	B/D	5.1-7	0.1-1.6	0.6-1.7	4.6-6.2	0	1.3-5.8
Waveland	0.96%	B/D	4.5-5.5	0.3-4	0.5-25.3	3.7-6.8	0	5.3-13
Winder	0.01%	B/D	5.8-8.7	0.1-0.6	1.1-20.5	1.2-13.3	0	3-4.2

a – Soil chemical properties vary across soil layers. b – Soil properties summarized in this table were obtained from the soil characteristic database in WAM. c – Additional soil properties can be accessed by visiting the United States Department of Agriculture/Natural Resources Conservation Service (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).

Table S3. Summary of Baseline WAM TCNS setup Performance During the Combined Calibration-Validation[a] Period.

	Flow					TP				
GOF[b]	**S191**	**S154**	**S133**	**S135**	**Overall TCNS**	**S191**	**S154**	**S133**	**S135**	**Overall TCNS**
NS	0.84	0.57	0.61	0.61	0.85	0.74	0.49	0.59	0.13	0.74
PBIAS (%)	5.09	4.89	-16.74	17.75	4.17	-2.46	4.02	-31.41	-4.65	-2.92
RSR	0.40	0.65	0.63	0.62	0.39	0.51	0.71	0.64	0.93	0.51
R^2	0.84	0.58	0.63	0.62	0.85	0.79	0.53	0.62	0.29	0.77
KGE	0.89	0.72	0.72	0.68	0.86	0.83	0.71	0.61	0.53	0.85

a – Calibration period (2003-2005, 2011-2013), Validation period (2006-2010). b – Goodness of fit (GOF) measures: NS – Nash-Sutcliffe efficiency [1], PBIAS - percentage bias [2], RSR – Root mean square error to observation standard deviation ratio [3], R^2 – coefficient of model determination [4], KGE – Kling and Gupta efficiency [5].

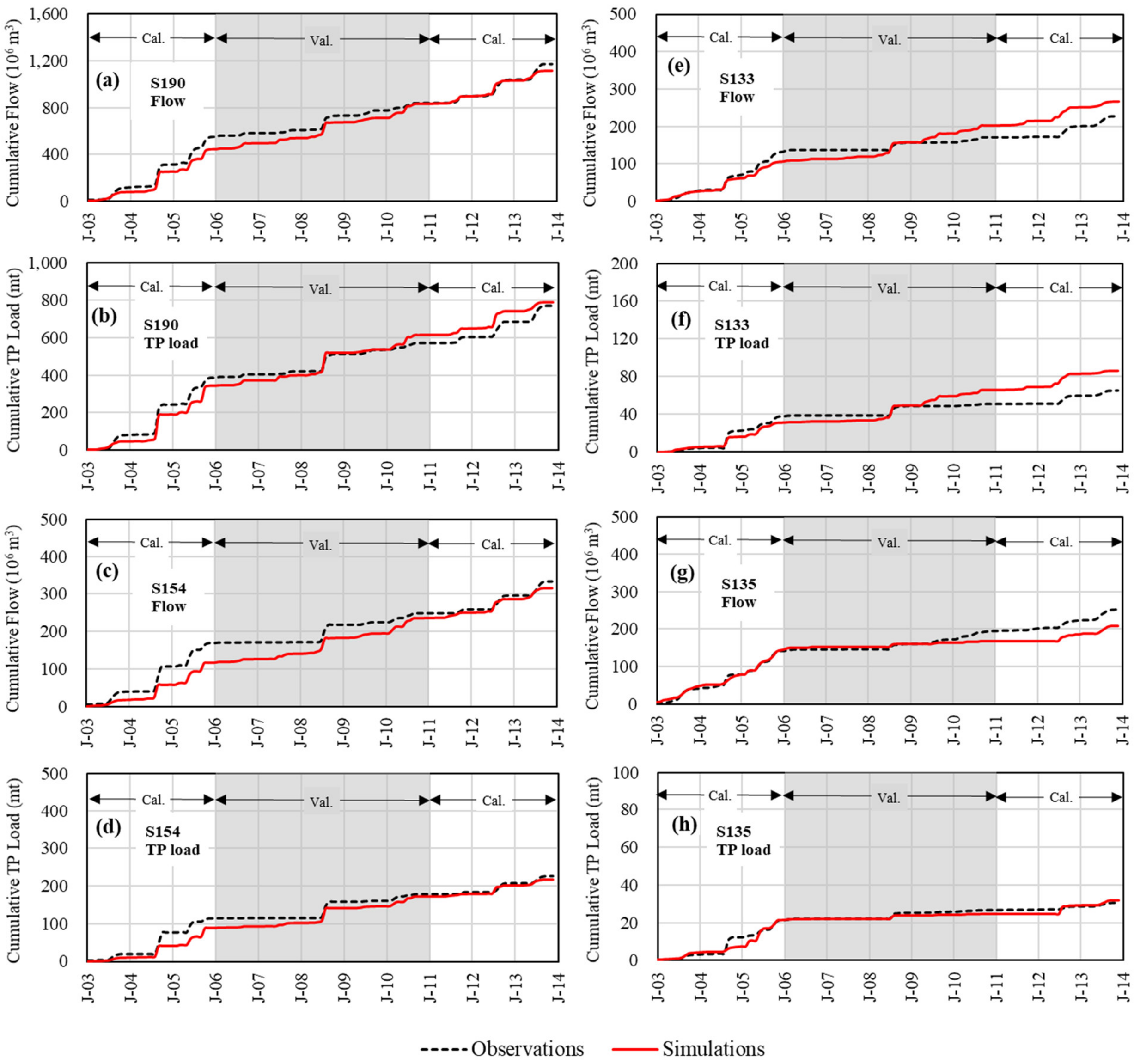

Figure S1. Comparison of observed and WAM simulated outputs over the calibration-validation period in the TCNS basins for (a) S191 flow, (b) S191 TP load, (c) S154 flow, (d) S154 TP load, (e) S133 flow, (f) S133 TP load, (g) S135 flow, and (h) S135 TP load.

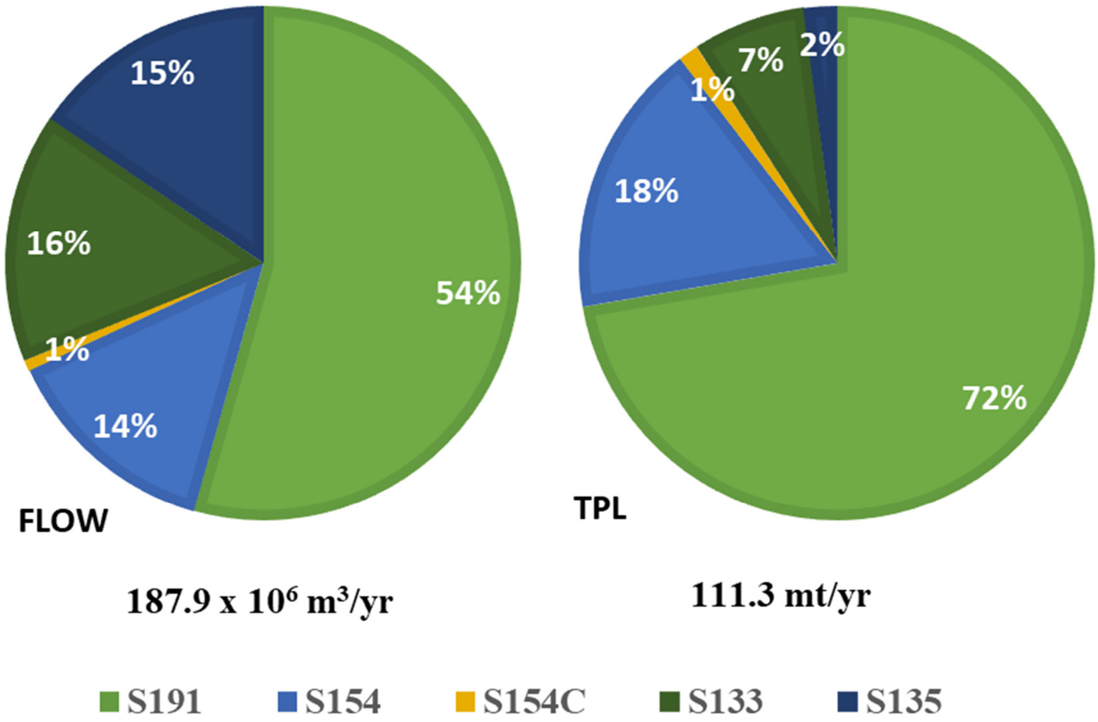

Figure S2. Distribution of TCNS flows and TP loads among basins. Average annual values were from the 21-year (1993-2013) simulation period.

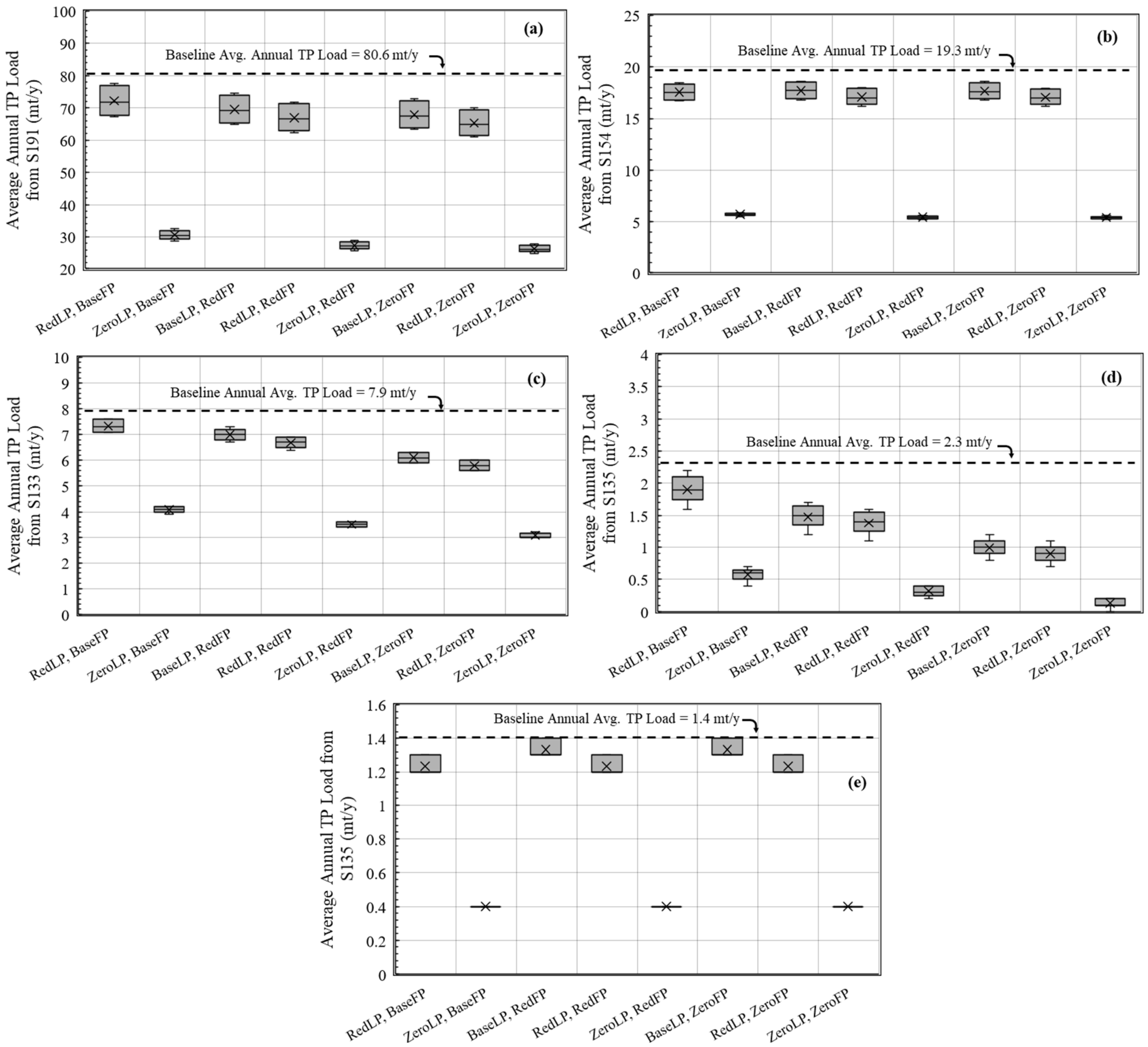

Figure S3. Average annual TP load distributions under the Baseline and eight alternative scenarios at individual TCNS basins (a) S191, (b) S154, (c) S133, (d) S135, and (e) S154C

The Everglades Agricultural Area Model (EAAMOD) overview

The EAAMOD simulates water control practices and the impacts of various cultural management scenarios on nutrient transport. Percolation and runoff in the EAAMOD are calculated using a vertical two-dimensional hydrologic model (WP). The soil profile is divided into three horizontal zones (the top zone, the middle impending layer zone representing the spodic horizon in flatwood soils and caprock for Histosols, and the lower zone) and a number of small vertical slices. The flow model within the EAAMOD uses the Dupuit-Forcheimer assumption (zero vertical hydraulic gradient) for two separate flow regimes in layers above and below an impeding layer such as the spodic horizon in flatwoods soils and the marl cap rock in histosols. The impeding layer is generally highly localized, and while water locally perches above the layer, it does not act as a confining layer. The one-dimensional horizontal flow model provides the water table depth and horizontal flow for each cell across the field between drainage ditches. The rate of flow through the spodic horizon is determined by solving the piezometric head distribution below the horizon and then using Darcy's Law across the impeding layer with the gradient across the horizon being the difference between the water table above it and the piezometric head below it. Water flow is simulated by using finite difference techniques with forcing functions representing pumped drainage/irrigation, culvert flow, rainfall and ET. Saturated horizontal flow above the mid- horizon is calculated by a fourth order Runge-Kutta method that solves the continuity equation for each cell using Darcy's Law within the saturated zone. The water budget is calculated in the top zone of cell *i* in the following equation:

$$\Delta S(i) = Q(i+1) - Q(i) + R(i) - ET(i) - QS(i) + P(i) \quad \text{(S-1)}$$

Where ΔS is the change in water storage in the top zone (inches of air void/hr), Q is the horizontal saturated flow (in/hr), R is rainfall (in/hr), ET is evapotranspiration (in/hr), QS is deep percolation through the middle restricting zone (in/hr), and P is the forced input or output— irrigation/drainage (in/hr) for up to two cells, typically ditches.

Rather than using the total water storage in a cell, the water profile algorithm keeps track of the air void volume (S). Therefore, a zero value for S would represent a saturated soil condition with no surface ponding. Surface ponding results in a value of S less than zero and typically would indicate that surface runoff is occurring, but could be a stagnant surface storage condition.

The air void volume S, is calculated for each time step t, in the following equation:

$$S(i,t) = S(i,t-1) + \Delta S(i,t).\Delta T \quad \text{(S-2)}$$

Where ΔT is equal to t (current time in hours) minus $t-1$ (previous time step in hours).

To represent actual water management in a field, a series of utility features within the model allow for controlled drainage through a pump, gravity flow through a culvert (bi-directional), flow over a weir, subsurface or surface irrigation, and variable crop ET parameters. Automatic scheduling of irrigation and drainage pump operations are available based upon the desired ditch water levels or soil moisture deficit. The flow properties of the pump(s), culvert(s), or weir(s) for specific land use types can be specified by the user in the management section for High Water Table Soils.

For flooding, the water profile algorithm allows flows from the ditch to fill each successive cell to the level of the ditch until the time step's flow volume is depleted. The flow volume is limited by the flow rate to the ditch cell and the conservation of mass within the ditch. This procedure continues until complete flooding occurs, at which time any subsequent flow due to a rise in ditch levels will be artificially applied to all cells. For surface runoff, the procedure is reversed except that artificial ET is used to move the water from the field to the ditch.

The phosphorus module of the EAAMOD is a simple conceptual model that accounts for various P pools and transport processes, including P in rainfall, irrigation and fertilization, removal by crop uptake, vertical movement with water (leaching and ET), mineralization of organic P depending upon the saturation condition, horizontal P movement with flow, and P partitioning between soluble, adsorbed, and suspended phases (when flooded). The EAAMOD's P module works on the same slicing and layered framework as flow.

The estimation of the P mass balance is closely related to the water inflows and outflows and to the hydraulic properties and variables. However, critical parameterizations influencing the phosphorus availability for transport are determined by the aerobic/anaerobic mineralization and the P adsorption/desorption processes. The mineralization process is captured by the Arrhenius equation as defined by Equation (S-3).

$$P_{\min} = A.B^{(T-20)} \quad \text{(S-3)}$$

Where A is the mineralization rate at 20ºC (representing the mean values for aerobic (A1) and anaerobic (A2) conditions) moderated for the mean daily temperature by B (reflecting B1 or B2 for the aerobic or anaerobic cases, respectively). The adsorption process was modeled by the Langmuir adsorption isotherm as determined by Equation (S-4).

$$P_{sol} = \frac{TP_{soil}}{\left[A \times R_s \times (\varepsilon + K \times DEN)\right]} \quad \text{(S-4)}$$

Where P_{sol} is the soluble phosphorus concentration in soil water (mg/L), TP_{soil} is the total phosphorus amount in the soil zone (kg), A is the surface area of the cell (ft^2), RZ is the root zone thickness (ft), ε is the porosity of the soil, K is the partitioning coefficient (mL/g) i.e. the amount of phosphorus in water divided by the amount of phosphorus in the adsorbed phase, and DEN is the bulk density of soil (g/mL).

The EAAMOD performs a P mass balance at the end of each time step along with a water mass balance to track pools of available P in the soil profile, and their transport across cell boundaries accounting for external P inputs and uptakes.

Lastly the sediment enriched phosphorus transport from overland (ditch eroded sediment P) and waterways (surface eroded sediment P) is estimated using exponential relationships in Equations (S-5) and (S-6), respectively.

$$D_P = C_1 \times V^{C2} \quad \text{(S-5)}$$

$$S_P = S_1 \times R^{S2} \quad \text{(S-6)}$$

Where $C1$ (mg/L) (typically 1.0) and $C2$ (typically in the range of 0.005 to 0.05) are the unit coefficient and exponent for the ditch sediment P erosion equation, V (ft/hr) is the ditch flow velocity, R is the discharge rate for surface runoff (cm/hr). $S1$ (mg/L, typically 2.0) and $S2$ (typically in the range of 0.005 to 0.05) are the unit coefficient and exponent for the surface sediment P, respectively.

Table S4. Summary of legacy and inorganic fertilizer phosphorus parameters for the TCNS land uses under the Baseline and Alternative Scenarios.

Land Use [Code in WAM]	Source Cell Model				Baseline Values			Reduction from Baseline		
	% Area	EAA MOD	GLE AMS	Special Case	Legacy P (kg/ha)	Inorganic P Fertilizer EAAMOD (kg/ha/yr)	Inorganic P Fertilizer GLEAMS (lb/ac/yr)	Legacy P	Inorganic P Fertilizer EAA MOD	Inorganic P Fertilizer GLE AMS
Low Density Residential [2]	4.30	4.26	0.04	-	10	6	5	0%	66%	75%
Commercial [3]	1.17	1.17	0.00	-	10	6	5	0%	0%	0%
Scrub [5]	2.21	2.07	0.14	-	0	0	-	0%	0%	-
Hardwood [6]	0.01	0.01	0.00	-	10	0	-	0%	0%	-
Hardwood Conifer [7]	1.58	1.51	0.07	-	0	0	-	0%	0%	-
Conifer Plantation [8]	0.03	0.03	0.00	-	20	3	1.5	0%	0%	0%

Water [9]	0.87	-	-	0.87	-	-	-	-	-	-
Bay Swamp [10]	0.16	-	-	0.16	-	-	-	-	-	-
Mixed Wetland Hardwoods [12]	2.79	-	-	2.79	-	-	-	-	-	-
Cypress [14]	0.06	-	-	0.06	-	-	-	-	-	-
Wetland Forested Mixed [15]	0.62	-	-	0.62	-	-	-	-	-	-
Freshwater Marshes [16]	5.18	-	-	5.18	-	-	-	-	-	-
Barren Land [17]	0.76	0.00	0.76	-	-	-	-	-	-	-
Transportation Corridors [18]	0.16	0.16	0.00	-	5	1	2	0%	0%	0%
Medium Density Residential [19]	2.22	2.20	0.02	-	10	6	30	0%	66%	33%
High Density Residential [20]	0.18	0.18	0.00	-	10	6	30	0%	66%	33%
Multiple Dwelling Units [21]	0.02	0.02	0.00	-	10	6	20	0%	50%	50%
Industrial [22]	0.11	0.11	0.00	-	10	6	5	0%	66%	0%
Managed Landscape [23]	0.25	0.25	0.00	-	25	6	20	0%	66%	0%
Row Crops [25]	0.16	0.16	0.00	-	530	43.67	30	0%	18%	33%
Improved Pasture [26]	32.28	31.77	0.51	-	250	0	5	10%	0%	100%
Unimproved Pasture [27]	4.52	4.30	0.22	-	100	0	3	5%	0%	100%
Woodland Pasture [28]	6.14	6.04	0.11	-	100	0	2	5%	0%	100%
Peach and Pecan Orchards [30]	0.18	0.18	0.00	-	200	44.5	10	0%	45%	70%
Cattle Feeding Operations [32]	0.20	-	0.20	-	-	-	-	-	-	-
Poultry Feeding Operations [33]	0.04	-	0.04	-	-	-	5	-	-	0%
Sod Farms [36]	0.77	0.77	0.00	-	160	27	150	5%	25%	27%

Ornamental Nurseries [37]	0.03	0.03	0.00	-	600	0	50	12.50%	0%	28%
Horse Farms [38]	0.22	0.22	0.00	-	30	0	10	33%	0%	70%
Dairies [39]	0.79	0.77	0.01	-	700	0	5	0%	0%	100%
Aquacul-ture [41]	0.05	-	-	0.05	-	-	-	-	-	-
Sewage Treatment [43]	0.03	-	0.03	-	-	-	10	-	-	0%
Field Crops [62]	1.49	1.48	0.01	-	30	20	30	0%	25%	33%
Sugarcane [68]	1.22	1.07	0.15	-	310	20	10	5%	25%	80%
Undevel-oped Resi-dential [70]	0.80	0.77	0.02	-	0	-	-	0%	-	-
Prisons [72]	0.15	-	0.15	-	-	-	5	-	-	0%
Mining [73]	0.28	-	-	0.28	-	-	-	-	-	-
Citrus [84]	1.74	1.73	0.00	-	100	38	38	3%	21%	24%
Intensive Pasture [85]	0.24	0.24	0.00	-	500	0	38.5	5%	0%	30%
Field Crops - Dairy Sprayfield [86]	0.78	0.78	0.00	-	350	0	-	0%	0%	-
Dairy High Intensity Area – Un-treated [87]	0.14	-	0.14	-	-	-	-	-	-	-
Abandoned Dairies [89]	4.09	4.06	0.03	-	550	0	-	3%	0%	-
Outer Pas-ture [90]	1.43	1.43	0.01	-	550	0	-	0%	0%	-
Open Wa-ter [92]	0.66	-	-	0.66	-		-	-	-	-
FDACS Sugarcane with Water Control Structures (16) [168]	1.40	1.31	0.09	-	310	20	10	5%	25%	80%
FDACS Abandoned Dairies with Water Control Structures (16) [189]	0.14	0.14	0.00	-	550	0	-	3%	0%	-
FDACS Field Crops -Dairy Sprayfield with Dairy	0.01	0.01	0.00	-	350	0	-	0%	0%	-

Improvements (1) [286]										
FDACS Dairy High Intensity Area - Dairy Improvements (1) [287]	0.00	-	0.00	-	-	-	-	-	-	-
FDACS Abandoned Dairies with Well and Trough Improvements (32) [289]	0.01	0.01	0.00	-	550	0	-	3%	0%	-
FDACS Outer Pasture with Dairy Improvements (1) [290]	0.07	0.07	0.00	-	550	0	-	0%	0%	-
FDACS Unimproved Pasture with Water Control Structures (16) [327]	0.45	0.45	0.00	-	100	0	3	5%	0%	100%
Woodland Pasture with Water Control Structures (16) [328]	0.58	0.58	0.00	-	50	0	2	5%	0%	100%
FDACS Horse Farms with Water Control Structures (16) [338]	0.03	0.03	0.00	-	30	0	10	0%	0%	70%
FDACS Dairy Improvements (1) [339]	0.02	0.02	0.00	-	700	0	5	0%	0%	100%
FDACS Dairy High Intensity Area - Drainage Improvements (2) [387]	0.02	-	0.02	-	-	-	-	-	-	-
FDACS Unimproved Pasture - Drainage	0.08	0.08	0.00	-	100	0	3	5%	0%	100%

and Water Control Structures (2 and 16) [427]										
Woodland Pasture with Wells and Troughs (32) [428]	0.04	0.04	0.00	-	50	0	2	5%	0%	100%
FDACS Dairy with Drainage Improvements (2) [439]	0.01	0.01	0.00	-	700	0	5	0%	0%	100%
FDACS Field Crops with Dairy Improvements (1) [462]	0.07	0.07	0.00	-	100	20	30	0%	25%	33%
FDACS Intensive Pasture with Drainage Improvements (2) [485]	0.05	0.05	0.00	-	500	0	38.5	5%	0%	30%
FDACS Dairy High Intensity Area - Dairy and Drainage Improvements (3) [487]	0.06	-	0.06	-	-	-	-	-	-	-
FDACS Abandoned Dairies with Fencing and Well and Trough Improvements (36) [489]	0.07	0.07	0.00	-	550	0	-	3%	0%	-
FDACS Outer Pasture with Dairy and Drainage Improvements (3) [490]	0.01	0.01	0.00	-	550	0	-	0%	0%	-
Woodland Pasture - Drain and Water Control	0.14	0.14	0.00	-	50	0	2	5%	0%	100%

Structures (2 and 16) [528]										
FDACS Field Crops with Drainage Improvements (2) [562]	0.23	0.23	0.00	-	30	20	30	0%	25%	33%
FDACS Intensive Pasture with Dairy and Drainage Improvements (3) [585]	0.06	0.06	0.00	-	500	0	38.5	5%	0%	30%
FDACS Field Crops (Dairy Sprayfield) Drain and Water Control Structures (18) [586]	0.01	0.01	0.00	-	350	0	-	0%	0%	-
FDACS Dairy with Drain and Dairy Improvements for Dairies (1 and 2) [639]	0.04	0.04	0.00	-	700	0	5	0%	0%	100%
FDACS Diary with Drainage and Water Control Structures (2 and 16) [739]	0.17	0.17	0.00	-	700	0	5	0%	0%	100%
FDACS Field Crops with Dairy and Drainage Improvements (3) [762]	0.01	0.01	0.00	-	30	20	30	0%	25%	33%
FDACS Improved Pasture with Drainage Improvements (2) [826]	0.46	0.46	0.00	-	250	0	5	5%	0%	100%
FDACS Field Crops - Drain and Water Control	0.01	0.01	0.00	-	5	20	30	0%	25%	33%

Structures (18) [862]										
FDACS Improved Pasture with Fencing (4) [926]	0.44	0.44	0.00	-	250	0	5	5%	0%	100%
FDACS Improved Pasture with Water Control Structures (16) [1026]	12.25	12.25	0.00	-	250	0	5	5%	0%	100%
FDACS Improved Pasture with Well and Trough (32) [1126]	0.57	0.57	0.00	-	250	0	5	5%	0%	100%
FDACS Improved Pasture - Drain and Water Control Structures (2 and 16) [1226]	0.23	0.23	0.00	-	250	0	5	5%	0%	100%
Tree Nurseries (Wet Retention) [1227]	1.21	1.11	0.10	-	350	43.5	50	5%	55%	40%

Table S5. Baseline WAM phosphorus attenuation parameters for land uses in the TCNS.

	Sol. PO4	**Sol. PO4**	**Sed PO4**	**Sed PO4**
Water Body	***a***	***Cb* (mg/L)**	***a***	***Cb* (mg/L)**
'Stream'	0.001	0.075	0.001	0.04
'S135 Typical Stream '	0.125	0.03	0.125	0.015
'S133 Typical Stream'	0.002	0.05	0.002	0.025
'S191 Typical Stream'	0.07	0.09	0.07	0.04
'S154 Typical Stream'	0.001	0.06	0.001	0.03
'Canal'	0.1	0.075	0.1	0.04
'S135 Typical Canal'	0.09	0.03	0.09	0.015
'S133 Typical Canal'	0.005	0.07	0.005	0.025
'S191 Typical Canal'	0.035	0.1	0.035	0.045
'Nubbin Slough STA'	0.0002	0.1	0.0003	0.01
'Taylor Creek STA'	0.0002	0.1	0.0003	0.01
'Lakeside Ranch STA'	0.0002	0.1	0.0003	0.01
'Freshwater Marshes'	1.00E-06	0.05	1.00E-05	0.03
'Wetland Mixed Forest'	9.00E-05	0.05	0.0004	0.05
'Cypress'	9.00E-05	0.05	4.00E-05	0.03
'Mixed Wetland Hardwoods'	1.00E-07	0.04	3.00E-07	0.02
'Bay Swamps'	8.50E-05	0.1	0.0003	0.1
'Dryland'[a]	1.00E-05	0.05	1.00E-05	0.03

a – all land uses that are not wetland or open water are grouped as Dryland.

Table S6. Summary of Baseline WAM TCNS setup Performance for Upstream Monitoring Locations and the S191 during a 10-year Period (2004-2013).

	Flow				TP load			
GOF[b,c]	**S191**	**USGS 02274010**	**USGS 0224505**	**USGS 02274490**	**S191**	**USGS 02274010**	**USGS 0224505**	**USGS 02274490**
NS	0.85	0.42	0.75	0.80	0.75	-0.43	-2.86	-0.39
PBIAS (%)	2.0	-5.8	-10.3	18.2	-8.0	-41.62	-179.4	-13.5
RSR	0.39	0.76	0.50	0.44	0.50	1.19	1.96	1.17
R^2	0.85	0.60	0.83	0.84	0.80	0.44	0.58	0.67
KGE	0.91	0.69	0.76	0.78	0.81	0.21	-1.37	0.13

a – Calibration period (2003-2005, 2011-2013), Validation period (2006-2010). b – Goodness of fit (GOF) measures: NS – Nash-Sutcliffe efficiency [1], PBIAS - percentage bias [2], RSR – Root mean square error to observation standard deviation ratio [3], R^2 – coefficient of model determination [4], KGE – Kling and Gupta efficiency [5]. c – Hydrologic and water quality model performance classification [6].Flow: Very Good (NS > 0.8, |PBIAS| < 5), Good (0.7 < NS ≤ 0.8, 5 < |PBIAS| ≤ 10, Satisfactory (0.5 < NS ≤ 0.7, 10 < |PBIAS| ≤ 15). Nutrients: Very Good (NS > 0.65, |PBIAS| < 15), Good (0.5 < NS ≤ 0.65, 15 < |PBIAS| ≤ 20), Satisfactory (0.35 < NS ≤ 0.5, 20 < |PBIAS| ≤ 30).

References

1. Nash, J.E.; Sutcliffe, J.V. River flow forecasting through conceptual models part I—A discussion of principles. *J. Hydrol.* **1970**, *10*, 282–290, doi:10.1016/0022-1694(70)90255-6.
2. Gupta, H.V.; Sorooshian, S.; Yapo, P.O. Status of Automatic Calibration for Hydrologic Models: Comparison with Multilevel Expert Calibration. *J. Hydrol. Eng.* **1999**, *4*, 135–143, doi:10.1061/(Asce)1084-0699(1999)4:2(135).
3. Moriasi, D.N.; Arnold, J.G.; Van Liew, M.W.; Bingner, R.L.; Harmel, R.D.; Veith, T.L. Model evaluation guidelines for systematic quantification of accuracy in watershed simulations. *Trans. ASABE* **2007**, *50*, 885–900, doi:10.13031/2013.23153.
4. Legates, D.R.; McCabe, G.J. Evaluating the use of "goodness-of-fit" measures in hydrologic and hydroclimatic model validation. *Water Resour. Res.* **1999**, *35*, 233–241, doi:10.1029/1998wr900018.
5. Gupta, H.V.; Kling, H.; Yilmaz, K.K.; Martinez, G.F. Decomposition of the mean squared error and NSE performance criteria: Implications for improving hydrological modelling. *J. Hydrol.* **2009**, *377*, 80–91, doi:10.1016/j.jhydrol.2009.08.003.
6. Moriasi, D.N.; Gitau, M.W.; Pai, N.; Daggupati, P. Hydrologic and Water Quality Models: Performance Measures and Evaluation Criteria. *Trans. ASABE* **2015**, *58*, 1763–1785.