

Table S3: Description of all papers included in the post-hoc second literature search in the scoping review (obtained Aug 2023). The full database is listed with an extra column categorising the papers into model categories used in the existing analysis.

DOI	YEAR	AUTHORS	JOURNAL	CATE-GORY	MODEL TYPE	Brief description
10.1080/01431161.2023.2209916	2023	Ball et al.	INTERNATIONAL JOURNAL OF REMOTE SENSING	Remote sensing	Unnamed machine learning code	Remote sensing plus machine learning to classify extent of restoration progress (old versus new sites) <i>Note:</i> no full access to article -- requested from authors but not obtained yet. So, cannot explicitly state which machine learning methods were employed
10.5194/bg-19-5707-2022	2022	Boonman et al.	Biogeosciences	Model combos	HYDRUS-2D and unnamed peat accumulation calculations	Process-based model of post-r wetting soil chemical and microbial decomposition dynamics
10.1016/j.rsase.2022.100786	2022	Dabrowska-Zielinska et al.	Remote Sensing Applications-Society and Environment	Remote sensing	Unnamed	Combining Sentinel 2/3/MODIS data to determine GPP more accurately for various vegetation types
10.1088/1748-9326/ac7969	2022	Dadap et al.	Environmental Research Letters	Remote sensing	Unnamed machine learning code	Neural network to predict soil moisture spatially using baseline data and extrapolating for climate scenarios
10.1080/02626667.2022.2099281	2022	Dimitrov et al.	Hydrological Sciences Journal	GHG dynamics	PHM - now a part of DIMONA	Applying PHM to a permafrost peatland and a raised bog using near-surface water content
10.7717/peerj.13418	2022	Grodzka-Lukaszewska et al.	PeerJ	Pure hydrology	FEFLOW	River-fen interactions modelling both conceptually and then using a groundwater modelling software
10.1007/s10021-023-00836-2	2023a	He et al.	Ecosystems	Coupled models	CoupModel	Modelling coupled GHG emissions and hydrological/chemical impacts on an actively extracted peatland
10.5194/hess-27-213-2023	2023b	He et al.	Hydrology and Earth System Sciences	Coupled models	CoupModel	Modelling impacts of beaver damming on water levels and associated GHGs
10.3390/rs15061673	2023	Ingle et al.	Remote Sensing	GHG dynamics	Multiple-regression statistics	Using eddy-covariance flux measurements with Sentinel 2A satellite imagery data to model to develop a hybrid GPP model for raised bogs in different climate scenarios
10.1002/eap.2702	2022	Ishtiaq et al.	Ecological Applications	GHG dynamics	EvPEM (within Stella)	Peat elevation modelling to evaluate carbon balance especially considering salinity
10.1002/rse2.363	2023	Jussila et al.	Remote Sensing in Ecology and Conservation	Remote sensing	QGIS, R - unnamed model	Using Sentinel-2 data and a decision tree model to quantify <i>aapa</i> mire wetness variation as a model for managing drought resistance
10.5194/bg-20-2387-2023	2023	Koch et al.	Biogeosciences	Global models	Machine learning: gradient-boosting decision tree	Predicting water table depth and calculating CO ₂ fluxes spatially as a function of machine learning outputs for an entire country land area: later, implementing rewetting peatland scenarios
10.1029/2021jg006774	2022	Kou et al.	Journal of Geophysical Research-Biogeosciences	Model combos	NEST-DNDC, Arctic Lake Biogeochem. Model (ALBM), & random forest model for land classification	Combining remote sensing with biogeochemical modelling to compare methane fluxes among different land cover types (including peatlands)
10.1111/gcb.16394	2022	Kwon et al.	Global Change Biology	GHG dynamics	ORCHIDEE-PCH4	Modelling the responses of GHG fluxes to peatland drying, incorporating 3 different northern regions
10.3389/feart.2022.835817	2022	Lambert et al.	Frontiers in Earth Science	Pure hydrology	MODFLOW	Investigating aquifer-peatland hydrological interactions
10.1002/hyp.14808	2023	Link et al.	Hydrological Processes	Pure hydrology	HYDRUS-1D	Simulations of burn depths in peat based on site hydrology
10.1016/j.jhydr.2022.128307	2022	Liu et al.	Journal of Hydrology	Coupled models	Regression statistics	Modelling carbon sequestration from eddy-covariance measurements to compare against climate reconstructions investigating the critical 30cm WTD hypothesis
10.1016/j.ecoleng.2022.106874	2023	McCarter et al.	Ecological Engineering	Coupled models	HYDRUS-1D	Solute transport models for industrially contaminated peatland remediation/restoration <i>Note:</i> Most parameters were taken from previous study and not determined from site measurements -- except for meteorological data found in Fig. S1.
10.1016/j.ejsobi.2023.103509	2023	Pettit et al.	European Journal of Soil Biology	GHG dynamics	Energetic food web models (R-based <i>soilfoodwebs</i>)	Modelling peatland soil fauna biomass and C/N fluxes based on climate warming and hydrology
issn: 0379-8682	2023	Puertas Orozco et al.	Revista de Geografia Norte Grande	Remote sensing	ArcGIS with SAGA	Landsat remote sensing of vegetation coverage to model vegetation change in an Andean peatland from 1985-2019 <i>Note:</i> Paper in Spanish: abstract/title translated to English.
10.3389/fenvs.2023.1121969	2023	Rissanen et al.	Frontiers in Environmental Science	GHG dynamics	Random Forest classification	Modelling methane emissions from forestry-drained peatlands. Models developed to classify moss-cover versus moss-free ditches and combined with emission factors. <i>Note:</i> 21 total sites were used to cover all areas of the country, with measurements taken within a 25-year period.
10.1002/hyp.14940	2023	Ross et al.	Hydrological Processes	Model combos	Random Forest classification with unnamed hydrology model	Combination of classification model (Sentinel 2 data) with catchment-scale hydrological model for Andean <i>bofedal</i> wetlands
10.1016/j.ecoser.2022.101414	2022	Schibalski et al.	Ecosystem Services	Model combos	FEFLOW, regression statistics	Combination of ecosystem service modelling based on land management/climate change scenarios with hydrological modelling for regional water balances, and regression models for vegetation communities
10.3390/f13071134	2022	Stenberg et al.	Forests	Model combos	Combination of SUSI Peatland Simulator,	Evaluating the impacts of strip cutting in forested peatlands

					SPaFHy, and an unnamed lateral water flux model	
<i>10.1016/j.geoderma.2022.116055</i>	2022	Tong et al.	Geoderma	GHG dynamics	Unnamed nonlinear regression	Evaluating the impacts of ditch cleaning (drainage) on GHG budgets (CO ₂ /CH ₄ balances) in forested peatlands, and extrapolating post-clear-cutting
<i>10.5194/bg-20-2099-2023</i>	2023	Urzainki et al.	Biogeosciences	Model combos	Canal Network Model and Peat Hydrological Model -- each unnamed	Hydrologically modelling canal blocking and translating results to CO ₂ emissions through a function of WTD
<i>10.1002/eco.2516</i>	2023	Wang and Petrone	Ecohydrology	GHG dynamics	Atmosphere-Plant Exchange Simulator (APES)	Measuring and modelling evaporation from hummocks and hollows in a montane fen
<i>10.1016/j.agrformet.2023.109364</i>	2023	Yuan et al.	Agricultural and Forest Meteorology	GHG dynamics	ELM-SPRUCE	Simulating energy and carbon fluxes in an Amazonian peatland using a northern peatland model, parametrised for tropical peatland here but originally developed for northern peatlands; this reference will be retained because it does not split the two models but rather expands the capabilities of the northern-focussed model.
<i>10.1029/2021jg006762</i>	2022	Zhao et al.	Journal of Geophysical Research-Biogeosciences	GHG dynamics	Peatland Terrestrial Ecosystem Model (PTeM) and the Holocene Peatland Model (HPM)	Comparing two simulations of carbon-related variables including decomposition, peat thickness, and NPP on North American peatlands