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Table S1| Summary of the risk and benefits of different extreme event stress on ecosystem service delivery based on and expert-led comprehensive review of the literature.

Weather Stress	Land Category	Ecosystem Service	Risk	Benefit
Extreme heat and drought	Conservation	Biodiversity	Loss of suitable habitat[1-3]	New species emergence, historic outcompeted species return[1]
		Genetic resources	Loss of suitable habitat, rare/niche species outcompeted by invasive species [1-3]	Historic outcompeted species return[1]
		Recreation	Loss of access, increase risk with access to stressed systems, loss of leisure tourism related to wildlife diversity[1]	Increase in wildlife leisure and tourism through increased migratory wildlife presence (e.g. wildfowl)[1]
		Cultural identity	Change in landscape, way of life, historic practices[1]	
	Agriculture	Food production	Reduction in yield[4-10] reduction in nutritional quality of food (e.g. protein content in grain)[11], increased incidence of weed encroachment, pests and disease[1, 10, 12-16], increased potential for heat stress[1, 10, 11, 17], increased periods of unsuitable conditions for farm management activities (e.g. use of heavy machinery, fertilizer/effluent application, stock grazing).	Increase in yield & increased growing season length[1, 10, 18-20]. More suitable conditions for certain crops e.g. wine production[1, 10, 21]
		Pollination	Reduction in pollinator species[3, 22, 23]	
		Soil fertility	Change in nutrient cycling - unexpected responses (microbial community structure[24-26], change in rhizodeposition[27, 28], low moisture reducing nutrient diffusion to roots[29]).	
		Atmospheric regulation	Increase in GHG emissions (increased microbial activity - soil respiration[26, 28], pulse of emission following rewetting of dry soils[26, 30-32], disruption of N and C cycles through changes to microbial community[26], reduction in NPP reducing C sink[28]), decrease in C uptake through reduced photosynthesis[28, 33]	Increased utilisation of mineral N stores with prolonged growth period, reduction in N_2O, reduction in emissions during drought periods[24], possible increase in C sequestration due to increased biomass and growing season[1]

	Water regulation	Reduction in water quantity through increased irrigation[1]. Possible reduction in water quality through increased nutrient loss with increased SOM mineralisation, dry wetting pulse and associated dissolved and sediment bound nutrients, increase solubilisation rates and nutrient cycling rates at higher temperature, reduced pollutant attenuation, increased temperature and low baseflow increase algal bloom risk, soil structure changes (cracking, hydrophobicity) increases pollutant transport[2, 34, 35] [11].	Increased utilisation of mineral N stores with prolonged growth period reducing NO_3 leaching, increased temperatures can reduce N loading through reduced leaching and/or increased denitrification[36]
	Natural hazard regulation	Increased flood risk due to lack of vegetative cover, reduced infiltration and increased water repellency[37, 38], increased risk of erosion and landslips[1]. Climate feedback loops increasing the risk of further extreme events (e.g. drought/flood)[1]	
	Cultural identity	Change in visual landscape, change of livelihood	
Woodlands	Timber production	Reduction in yield through reduced growth and pest and disease outbreak (drought stressed trees more susceptible to pest and disease)[1, 2, 6, 10, 28, 39-44]	Increased growing season length
	Biodiversity	Loss of suitable habitat, loss of species through pest and disease outbreaks[1-3, 44]	Emergence of new species through reduced competition
	Soil fertility	Change in nutrient cycling - unexpected responses (microbial community structure, change in rhizodeposition, low moisture reducing nutrient diffusion to roots)[26, 28, 29, 45]	
	Atmospheric regulation	Increase in GHG emissions[1, 2, 46] (increased microbial activity - soil respiration, pulse of emission following rewetting of dry soils[30, 32], disruption of N and C cycles through changes to microbial community[26, 47, 48], reduction in NPP reducing C sink[28, 31, 33, 47]. Drying of deep organic soils increasing O_2 diffusion and stimulating SOM loss.	Possible increase in C sequestration due to increased growing season length

	Water regulation	Increased evapotranspiration rates depleting soil water reserves and drawdown of groundwater resources. Possible reduction in water quality through increased nutrient loss with dry wetting pulse and associated dissolved and sediment bound nutrients, reduced pollutant attenuation, increased temperature and low baseflow increase algal bloom risk[11, 26, 34, 35].	
	Natural hazard regulation	Increased flood risk due to lack of vegetative cover, reduced infiltration and increased water repellency, increased risk of erosion and landslips[1], increased wind-through due to dead wood stock[49], increased dead wood debris block watercourses heightening flood risk and provides fuel for increased wildfire risk[1, 10, 49]. Climate feedback loops increasing the risk of further extreme events (e.g. drought/flood)[1, 28]	
	Recreation	Loss of access, increase risk with access to stressed systems	
	Cultural identity	Change in landscape, way of life, historic practices, loss of culturally important ancient woodlands	
Carbon stores	Biodiversity	Loss of suitable habitat, loss of species through pest and disease outbreaks[1-3]	
	Environmental regulation (climate and water)	Reduction in water storage capacity of peat and potential for hydrophobicity, C sink transitions to C source through water table drawdown and increased risk of largescale moorland fires[1, 28, 48]. Release of DOC, nutrients and pollutants bound to organic matter reducing water quality[1, 28]. Drying of previously waterlogged deep organic soils increasing O_2 diffusion and stimulating SOM loss.	Reduction in freeze thaw events reduce C and nutrient pulse[28, 32]
	Natural hazard regulation	Increased flood risk due to lack of vegetative cover, reduced infiltration and increased water repellence, increased risk of erosion and landslip[1]. Increased fuel heightening increased wildfire risk and large moorland fires[48]. Climate feedback loops increasing the risk of further extreme events (e.g. drought/flood)[1].	

		Recreation	Loss of access, increased risk with access to stressed systems - ecological damage, increased wildfire risk, smoke and air quality issues due to wild fires[1, 48].	
		Cultural identity	Change in landscape, way of life, historic practices	
Reduced winter cold spells	Conservation	Biodiversity	Loss of suitable habitat[1-3]	New species emergence[1]
		Genetic resources	Loss of suitable habitat for cold requiring species, rare/niche species outcompeted by invasive species[1-3]	
		Recreation	Loss of access, increase risk with access to stressed systems, reduction in activities requiring normal winter temperatures - e.g. snow, ice (skiing, skating)	Warmer temperatures could increase use
		Cultural identity	Change in landscape, way of life, historic practices	
	Agriculture	Food production	Reduction in yield depending on crop type (requirement for cold snaps[10, 15, 50], reduction in hardiness to possible late/spring frost[10, 15, 18], increased weed encroachment[10, 12, 15, 16, 40], increased incidence of pests and disease[10, 12, 15, 16, 40, 50-52])	More suitable conditions for certain crops[10, 18, 21], increased growing season length[1, 10, 18], reduction in periods of frozen ground limiting farm operations (e.g. effluent spreading)
		Pollination	Early emergence, pollinator stress to sudden cold snaps[22, 53, 54], possible asynchronicity of flowering and pollinator activity[10, 22, 53, 54]	Possible increase in pollinators if more flowering and nectar collecting days[53]
		Soil fertility	Change in nutrient cycling due to change microbial activity and community- unexpected responses[26, 28], potential for nutrient loss through increased freeze-thaw cycles[26, 55, 56], depletion of nutrients through increased growth	Possible nutrient pulse for rapid plant growth through freeze thaw pulses[55], increase in C sequestration due to increased growing season[1]
		Atmospheric regulation	Increased periods of soil respiration increasing GHG emissions[1, 26, 46], pulse of emissions following increased freeze-thaw cycles[26, 28, 30, 32]	Increased utilisation of mineral N stores and soil P with prolonged growth period, reduced likelihood of effluent to frozen ground

	Water regulation	Possible reduction in water quality through increase in nutrient/contaminant/sediment loss following increased freeze thaw cycles[26, 34, 55, 56], depletion of soil moisture with increased growth, reduction in water quantity if groundwater stores dominated by snowmelt recharge	Increased utilisation of mineral N stores and soil P with prolonged growth period, reduced likelihood of effluent to frozen ground
	Natural hazard regulation	Less storage of large precipitation events as snow in uplands increasing flood risk, depletion of soil moisture increasing spring drought risk	Reduced flood risk due to more vegetative cover in winter, reduced frozen ground for run-off
	Cultural identity	Change in visual landscape, change of livelihood	
Woodlands	Timber production	Tree mortality due to increased pest and disease outbreaks[1, 10, 38, 40-42, 49, 57]	Increased yield due to winter growth periods[1, 10]
	Biodiversity	Loss of habitat for cold requiring species[1-3]	New species emergence[1]
	Soil fertility	Change in nutrient cycling due to change microbial activity and community- unexpected responses[26, 28], potential for nutrient loss through increased freeze-thaw cycles[26, 55], depletion of nutrients through increased growth	Possible nutrient pulse for rapid plant growth through freeze thaw pulses[55], increase in C sequestration due to increased growing season[1]
	Atmospheric regulation	Increased periods of soil respiration increasing GHG emissions[1, 26, 46], pulse of emissions following increased freeze-thaw cycles[25, 26, 30, 32]	
	Water regulation	Possible reduction in water quality through increase in nutrient/contaminant/sediment loss following increased freeze thaw cycles[26, 34, 55, 56], depletion of soil moisture with increased growth, reduction in water quantity if groundwaters stores dominated by snowmelt recharge	
	Natural hazard regulation	Less storage of large precipitation events as snow in uplands increasing flood risk, increased evapotranspiration may intensify storm events, depletion of soil moisture increasing spring drought risk	Reduced flood risk due to more active tree growth, reduced frozen ground for run-off

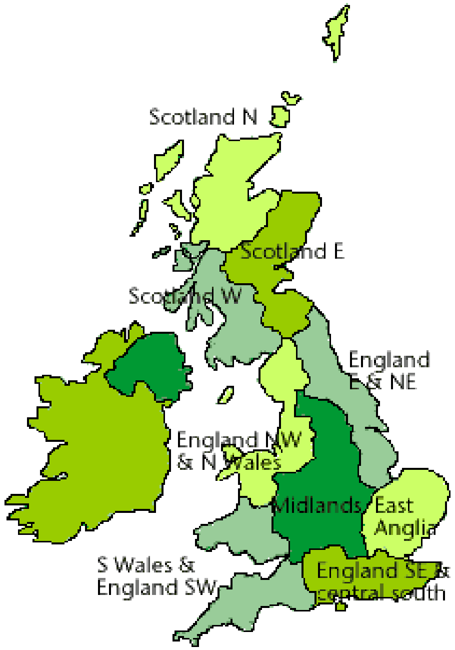
		Recreation	Increase risk with access to stressed systems, increased likelihood of health hazards e.g. from ticks in following seasons[14]	Warmer temperatures could increase use
		Cultural identity	Change in visual landscape, way of life, historic practices, loss of culturally important ancient woodlands	
	Carbon stores	Biodiversity	Loss of habitat for cold requiring species[1-3]	New species emergence[1]
		Environmental regulation (climate and water)	Increased soil respiration in winter and increased freeze thaw events increasing C loss, GHG emissions and impacting on water quality[26, 28, 30-32, 34, 46, 56]., Reduction in snow and ice decreasing water storage, change in water supply dynamics to downstream catchments	
		Natural hazard regulation	Increased flood risk: Less storage of large precipitation events as snow, repeated freeze-thaw events changing soils water holding capacity, Increased erosion risk due to freeze-thaw events[1]	
		Recreation	Reduction in activities requiring normal winter temperatures - e.g. snow, ice (skiing, skating)	Warmer temperatures could increase use
		Cultural identity	Change in landscape, way of life, historic practices	
Extreme rainfall	Conservation	Biodiversity	Loss of suitable habitat[1, 2]	New species emergence[1]
		Genetic resources	Loss of suitable habitat, rare/niche species outcompeted by invasive species[1, 2]	
		Recreation	Loss of access, increase risk with access to stressed systems	
		Cultural identity	Change in landscape, way of life, historic practices	
	Agriculture	Food production	Reduction in yield[1, 2, 7, 9, 10, 58-62], crop spoilage[40], increased weed encroachment[10, 12, 58-61], increased incidence of pests and disease[10-12, 15, 16, 40, 51, 58-61], increased periods of unsuitable conditions for farm management activities (e.g. use of heavy machinery, fertilizer/effluent application, stock grazing)[1, 58, 60, 61], increased cost associated with debris management[58].	

	Pollination	Reduction in pollinator species due to limited nectar supply and favourable flying days	Possible increase in pollinators if more flowering weed species present
	Soil fertility	Change in nutrient cycling - unexpected responses[26, 63], potential for nutrient loss through erosion and leaching reducing fertility[7, 63], loss of soil fauna e.g. earthworms[61, 63]	Increase in nutrient resource for rapid plant growth following event and generation of fertile flood plains.
	Atmospheric regulation	Increase in GHG emissions (CH_4, N_2O), pulse of CO_2 on wetting[26, 28, 30, 32, 47, 63], and cultivation for re-sowing following the event, increase NH_3 emissions[63], reduction of vegetative cover increasing atmospheric particulates	Reduction in OM decomposition increasing C storage[28]
	Water regulation	Reduction in water quality through increase in nutrient/contaminant/sediment loss[10, 11, 34, 36, 55, 63-68]	Recharge of depleted groundwater stores
	Natural hazard regulation	Increased flood risk due to lack of vegetative cover, possible compaction and loss of soil structure increased risk of erosion and landslips[1]	
	Cultural identity	Change in visual landscape, change of livelihood	
Woodlands	Timber production	Reduction in growth[1, 10], increased pest and disease[38, 40]	New species emergence[1]
	Soil fertility	Change in nutrient cycling - unexpected responses[26], potential for nutrient loss reducing fertility through erosion, loss of soil fauna e.g. earthworms[69], loss of mycorrhizal associations[70]	Increase in nutrient resource for rapid plant growth following event and generation of fertile flood plains.
	Atmospheric regulation	Pulse of GHG emissions (CO_2, CH_4, N_2O)[26, 28, 32, 47], reduction of leaf cover increasing atmospheric particulates	Reduction in OM decomposition increasing C storage[28]
	Water regulation	Reduction in water quality through increase in nutrient/contaminant/sediment loss[10, 11, 34, 36, 55, 63-68]	Recharge of depleted groundwater stores
	Natural hazard regulation	Increased risk of erosion and landslips[1, 10]	
	Recreation	Loss of access, increase risk with access to stressed systems	

	Cultural identity	Change in visual landscape, way of life, historic practices, loss of culturally important ancient woodlands	
Carbon stores	Biodiversity	Loss of suitable habitat[1, 2]	New species emergence[1]
	Environmental regulation (climate and water)	Pulse of GHG emissions (CO_2, CH_4, N_2O)[26, 28, 30, 32], reduction of vegetative cover increasing atmospheric particulates, potential for large scale sediment and DOC and organic nutrient (P and N) export and acidic runoff from uplands[28]	May reset drained systems providing natural marsh /moorland habitat [28]
	Natural hazard regulation	storage capacity over whelmed - downstream flooding	
	Recreation	Loss of access, increase risk with access to stressed systems	
	Cultural identity	Change in visual landscape, way of life, historic practices	

Table S2| Summary statistics of the change in probability that all four extreme event thresholds will be exceeded within the same year for the UK as a whole and for the individual regions defined by the Met Office in the accompanying figure.

	UK	N. Ireland	Scotland N.	Scotland E.	Scotland W.	England E. & N.E.	England N.W. and Wales N.	Midlands	East Anglia	England S.W. and Wales S.	England S.E. and central S.
Mean	0.275	0.119	0.013	0.193	0.001	0.585	0.153	0.507	0.545	0.253	0.387
Median	0.264	0.001	0.000	0.074	0.000	0.611	0.049	0.554	0.527	0.292	0.356
Lower quartile	0.000	0.000	0.000	0.001	0.000	0.561	0.002	0.381	0.496	0.028	0.272
Upper quartile	0.518	0.223	0.000	0.379	0.007	0.687	0.305	0.645	0.584	0.409	0.493
Count	10359	558	1250	988	926	930	886	1484	771	1172	808



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