

Supplementary material

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Groundwater salinity in the Horn of Africa: Spatial prediction modeling and estimated people at risk

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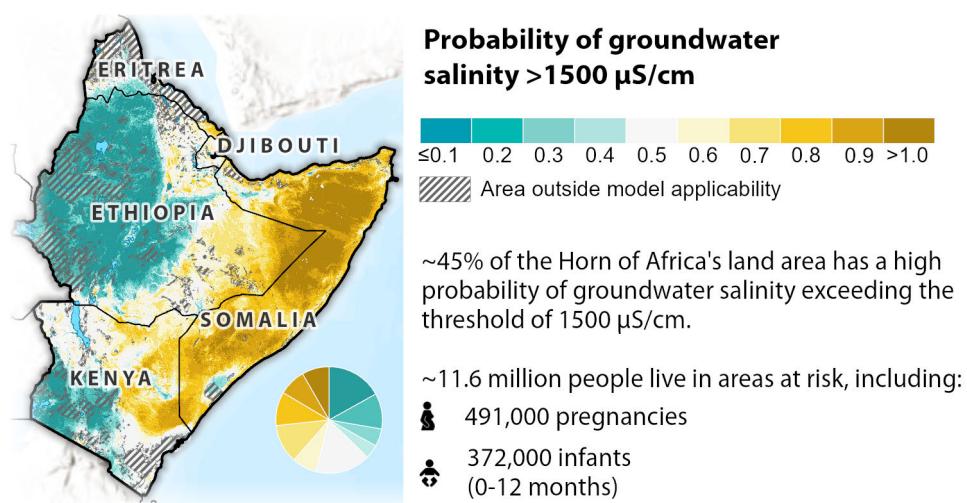
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Highlights:

- Groundwater salinity health risk maps created for the Horn of Africa
- Drivers of high salinity: precipitation, recharge, fractured rocks, evaporation, ocean proximity
- The most strongly-affected areas are Somalia, northeast Kenya, and the Somali region of Ethiopia
- 11.6 million people, incl. 400k infants and 500k pregnant women at risk from high salinity groundwater
- Five of Somalia's 18 regions have >50% of infants exposed to unsafe salinity levels

Graphical abstract



Supplementary material

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FIGURES

S1. Geology map

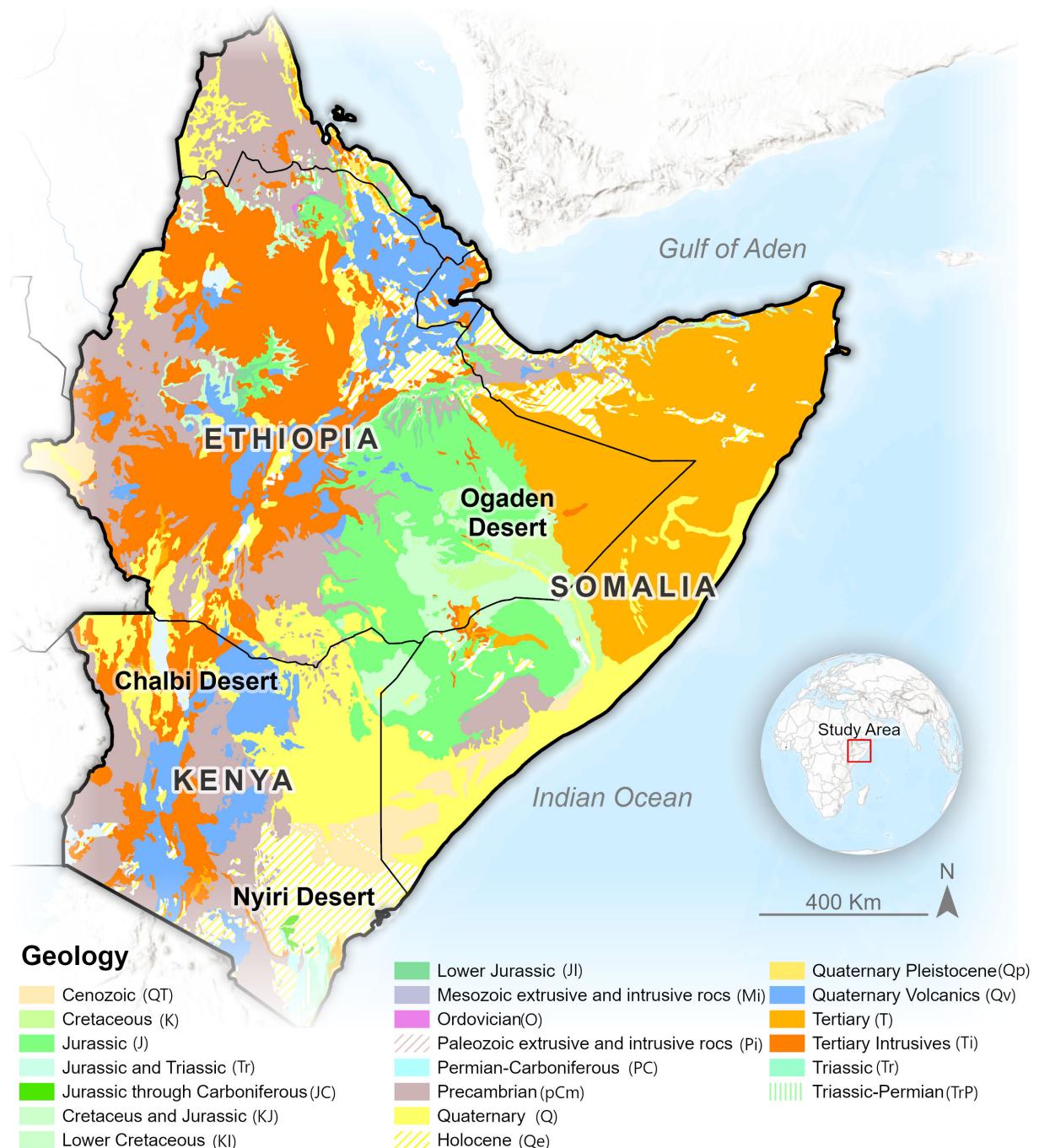


Fig. S1. Geology map of Horn Africa, USGS (Persits et al., 1997).

S2. Predictor variable maps

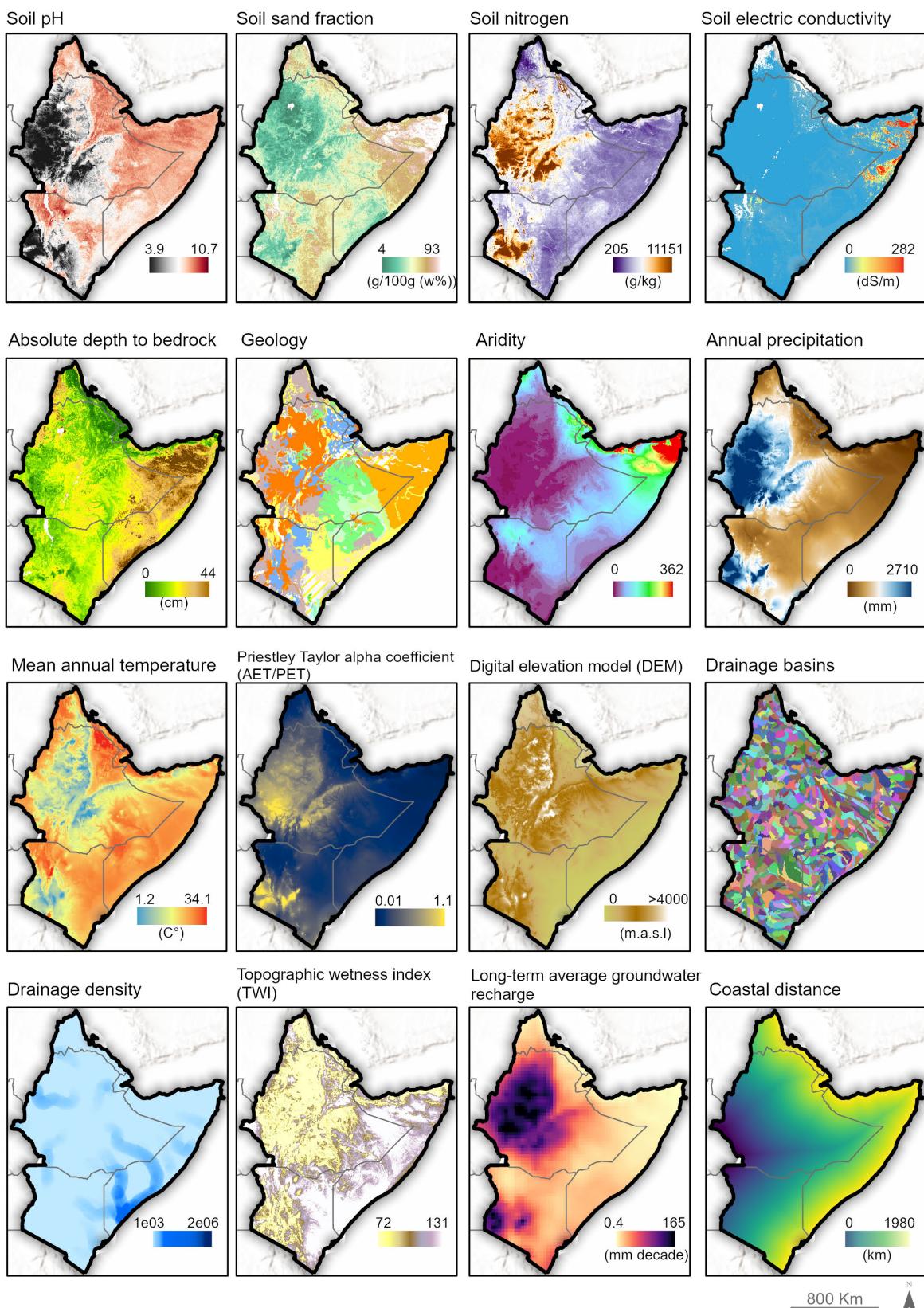


Fig. S2. Predictor variables. The description of the geology classes can be seen in detail in Fig. S1, Geology Map.

S3. Estimation of the percentage of area at risk

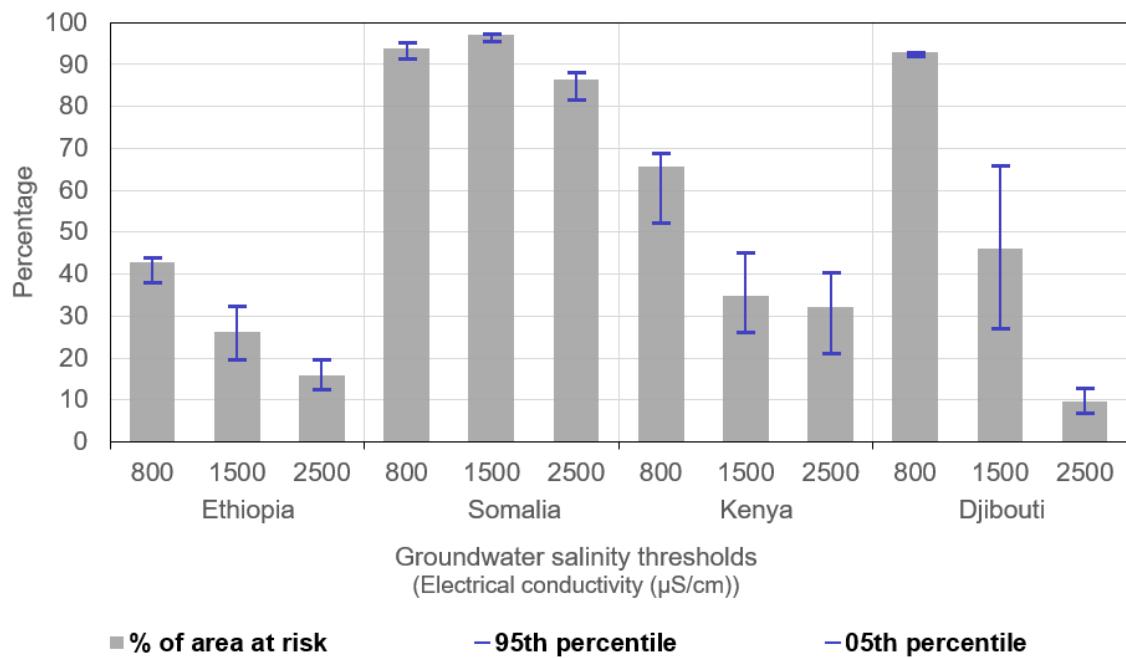


Fig. S3. Estimation of the percentage of area at risk for each of the countries in the horn of Africa according to the three thresholds studied.

S4. Measures of the importance of random forest variables EC 800 (μS/cm)

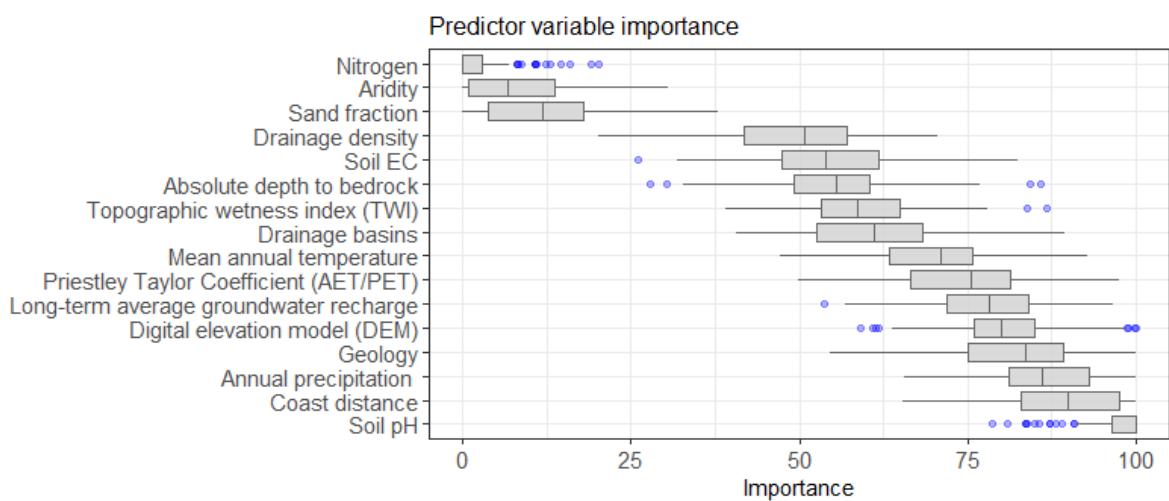


Fig. S4. Distribution of the relative importance of the 16 final predictor variables from 100 iterations.

S5. Measures of the importance of random forest variables EC 1500 ($\mu\text{S}/\text{cm}$)

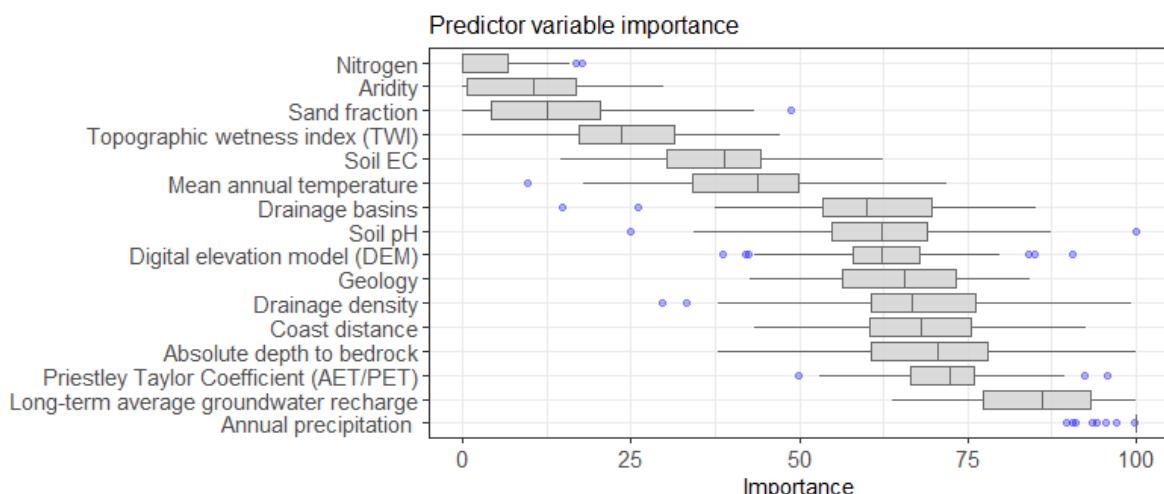


Fig. S5. Distribution of the relative importance of the 16 final predictor variables from 100 iterations.

S6. Measures of the importance of random forest variables EC 2500 ($\mu\text{S}/\text{cm}$)

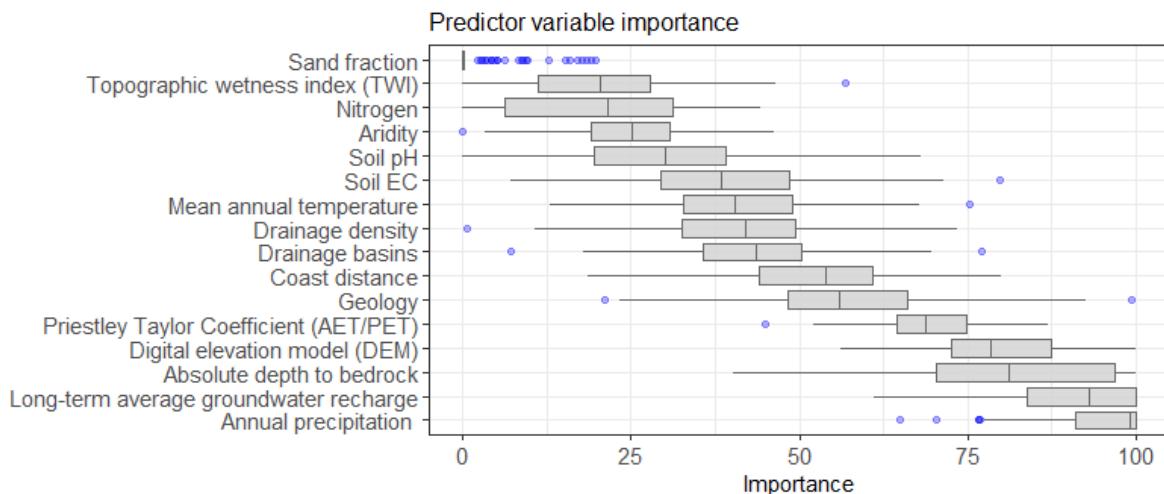


Fig. S6. Distribution of the relative importance of the 16 final predictor variables from 100 iterations.

S7. Partial dependence plots for the predictor variables EC 800 ($\mu\text{S}/\text{cm}$)

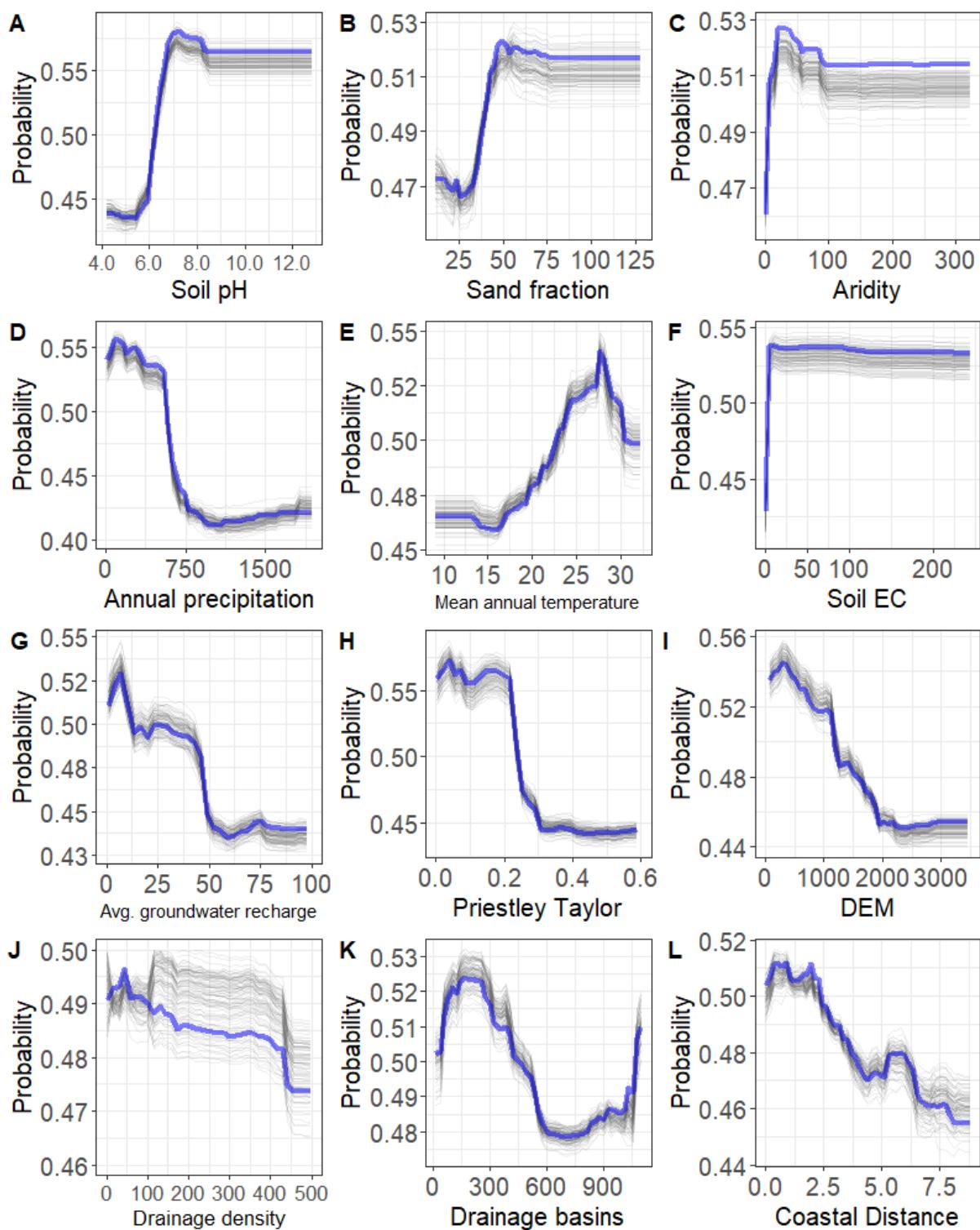


Fig. S7. Partial dependence plots for the predictor variables. The x-axis shows the distribution of the data for the explanatory variable, and the y-axis reports the impact of the variable on the prediction of salinity in concentrations greater than EC 800 ($\mu\text{S}/\text{cm}$).

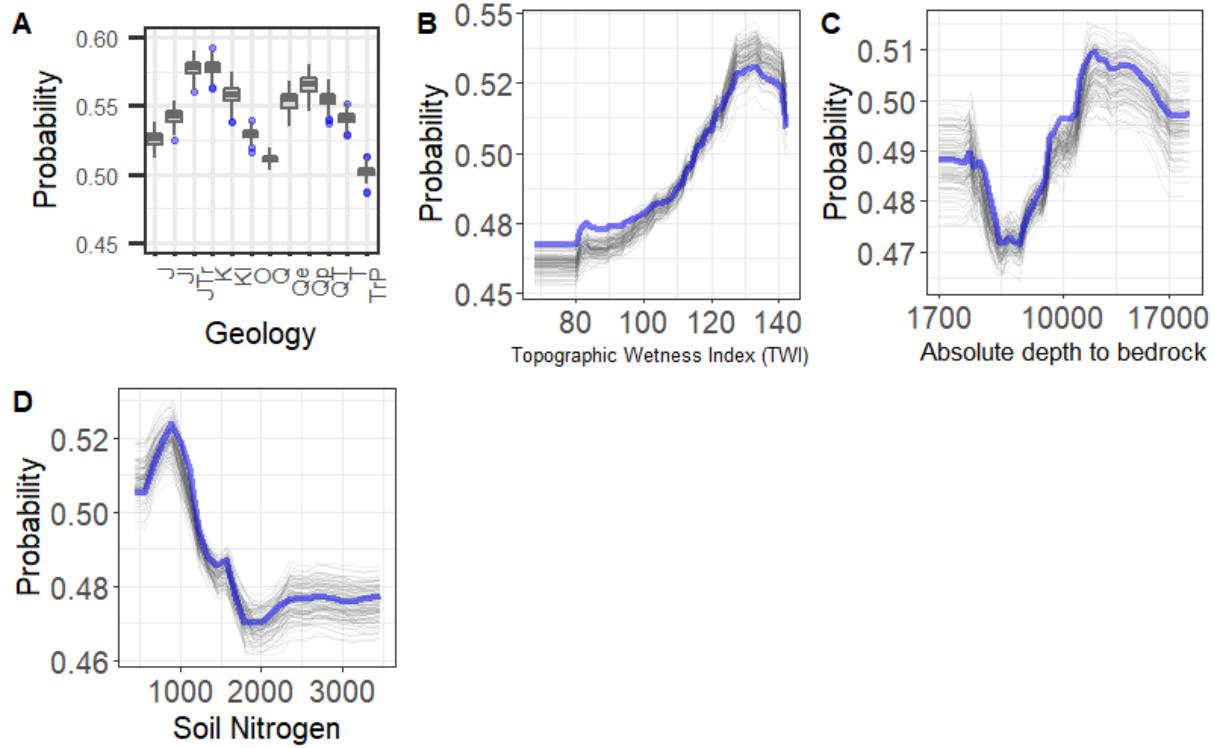


Fig. S7, continued. Partial dependence plots for the predictor variables. The x-axis shows the distribution of the data for the explanatory variable, and the y-axis reports the impact of the variable on the prediction of salinity in concentrations greater than EC 800 ($\mu\text{S}/\text{cm}$). Symbols of the Geology plot: Cretaceous (K), Jurassic (J), Jurassic through Carboniferous (JC), Jurassic Triassic (JTr), Cretaceous Jurassic (KJ), Lower Cretaceous (Kl), Lower Jurassic (Jl), Ordovician (O), Holocene (Qe), Quaternary Pleistocene (Qp), Cenozoic (QT), Tertiary (T), Triassic-Permian (TrP).

S8. Partial dependence plots for the predictor variables EC 1500 ($\mu\text{S}/\text{cm}$)

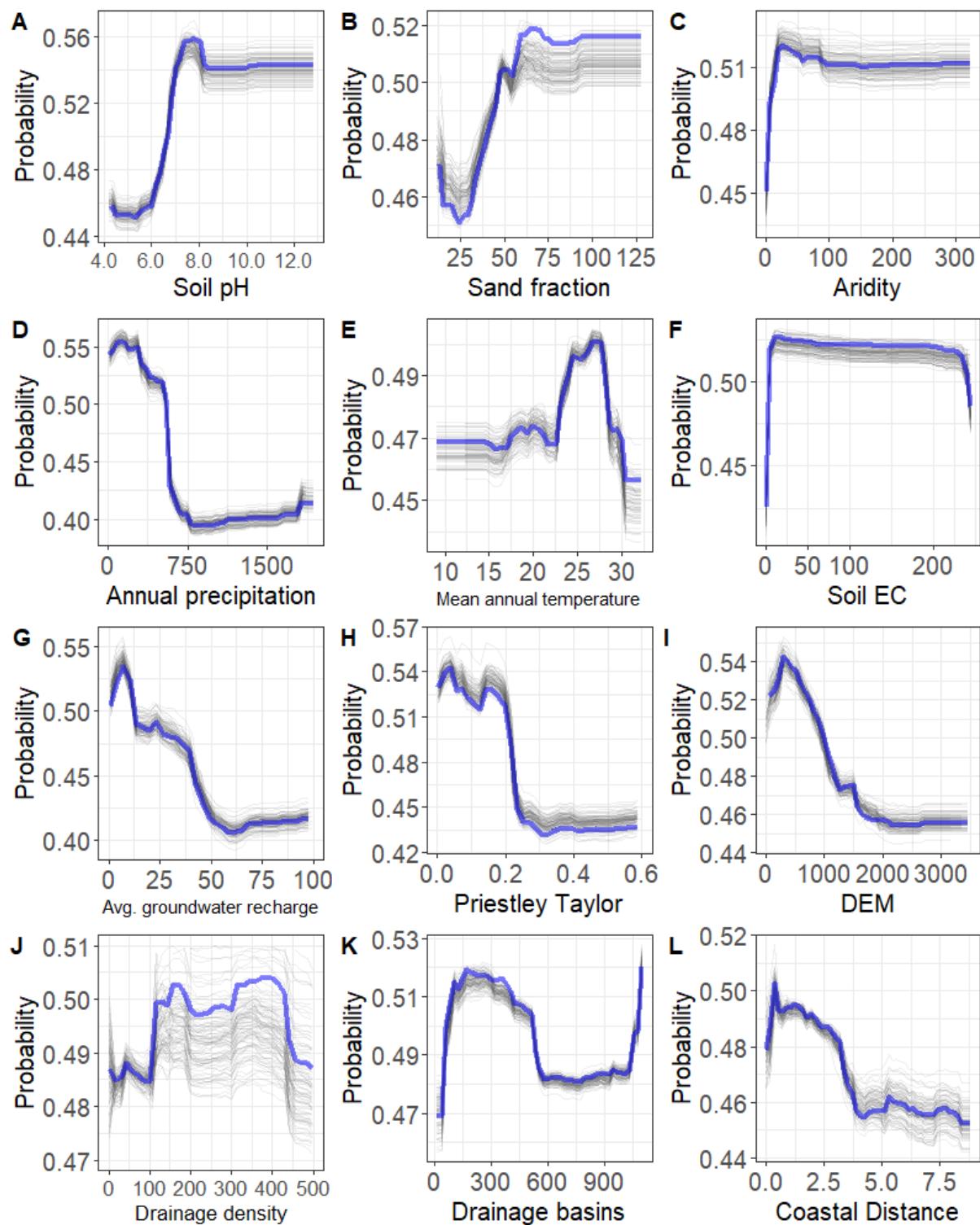


Fig. S8. Partial dependence plots for the predictor variables. The x-axis shows the distribution of the data for the explanatory variable, and the y-axis reports the impact of the variable on the prediction of salinity in concentrations greater than EC 1500 ($\mu\text{S}/\text{cm}$).

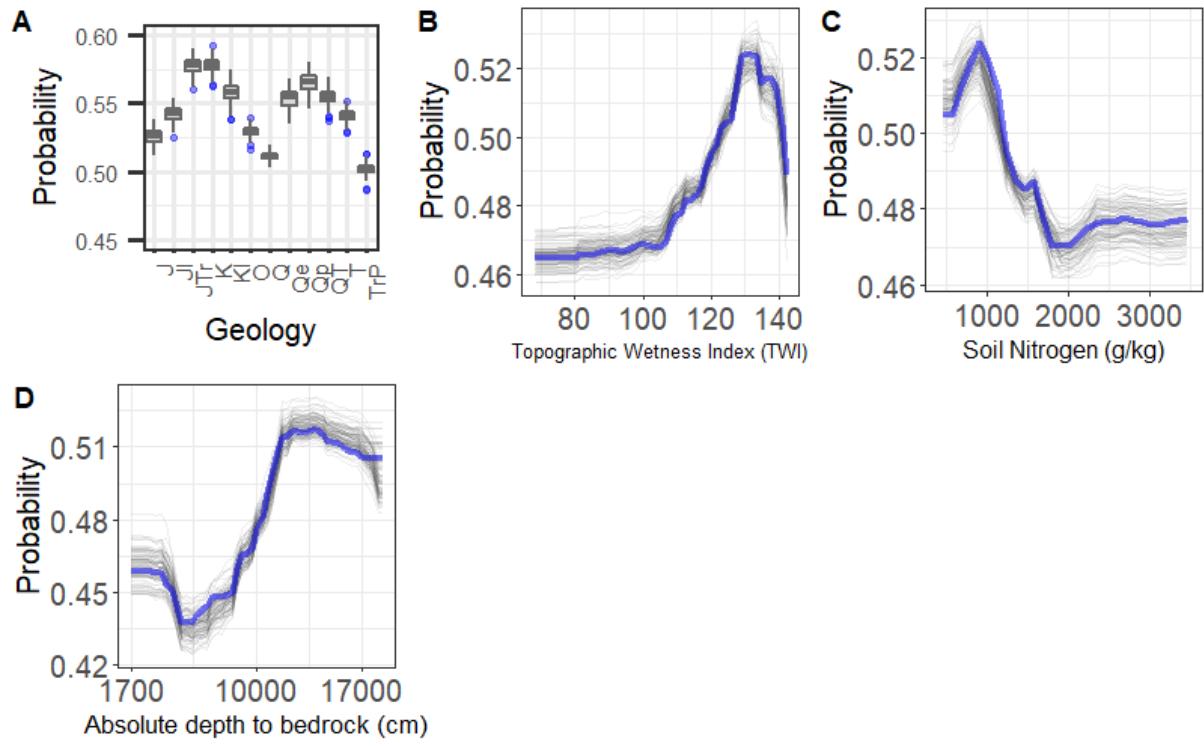


Fig. S8, continued. Partial dependence plots for the predictor variables. The x-axis shows the distribution of the data for the explanatory variable, and the y-axis reports the impact of the variable on the prediction of salinity in concentrations greater than EC 1500 ($\mu\text{S}/\text{cm}$). Symbols of the Geology plot: Cenozoic (QT), Cretaceous (K), Jurassic(J), Jurassic Triassic (JTr), Cretaceous Jurassic (KJ), Lower Cretaceous (Kl), Lower Jurassic (Jl), Ordovician (O), Holocene (Qe), Quaternary Pleistocene (Qp), Tertiary (T).

S9. Partial dependence plots for the predictor variables EC 2500 ($\mu\text{S}/\text{cm}$)

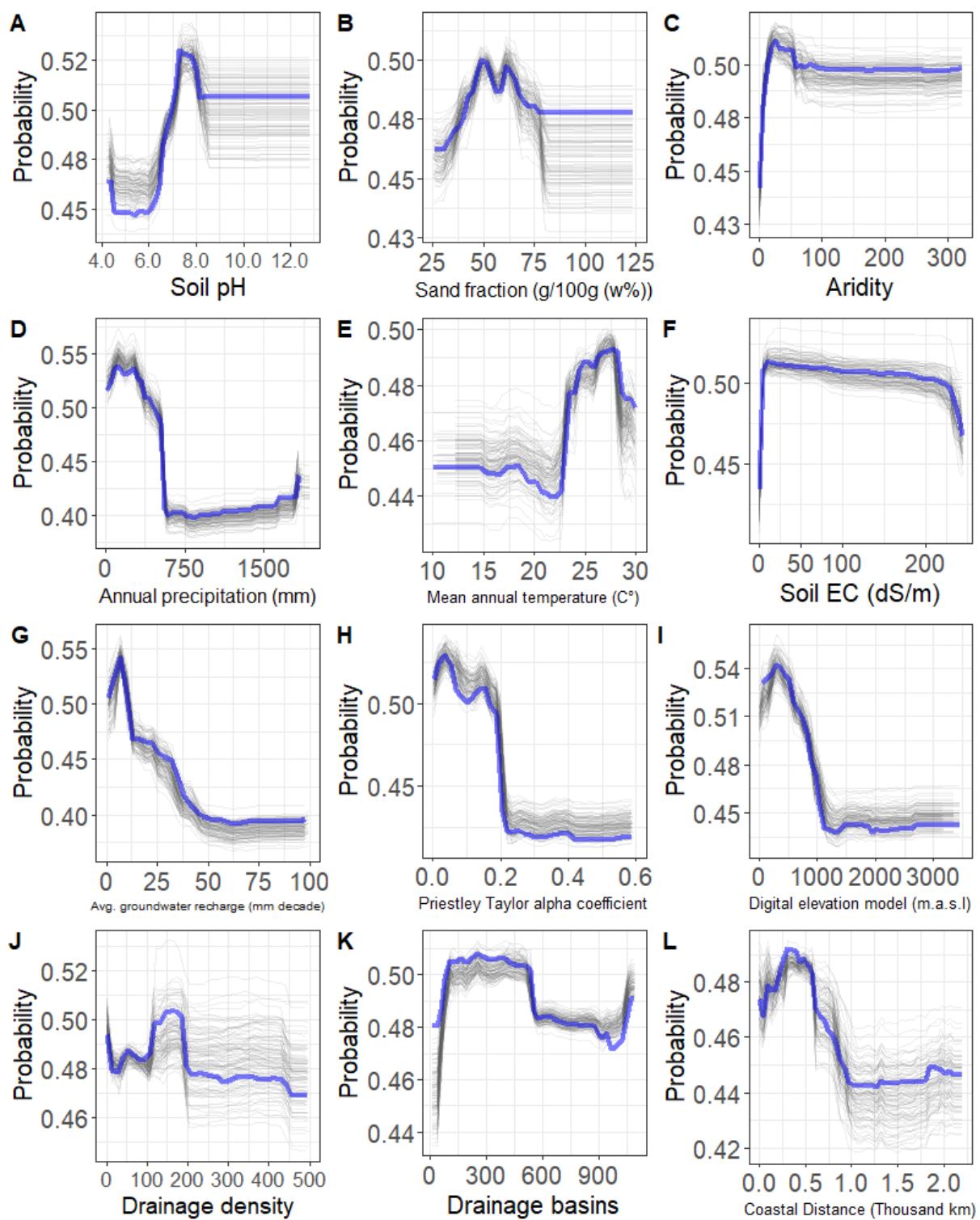


Fig. S9. Partial dependence plots for the predictor variables. The x-axis shows the distribution of the data for the explanatory variable, and the y-axis reports the impact of the variable on the prediction of salinity in concentrations greater than EC 2500 ($\mu\text{S}/\text{cm}$).

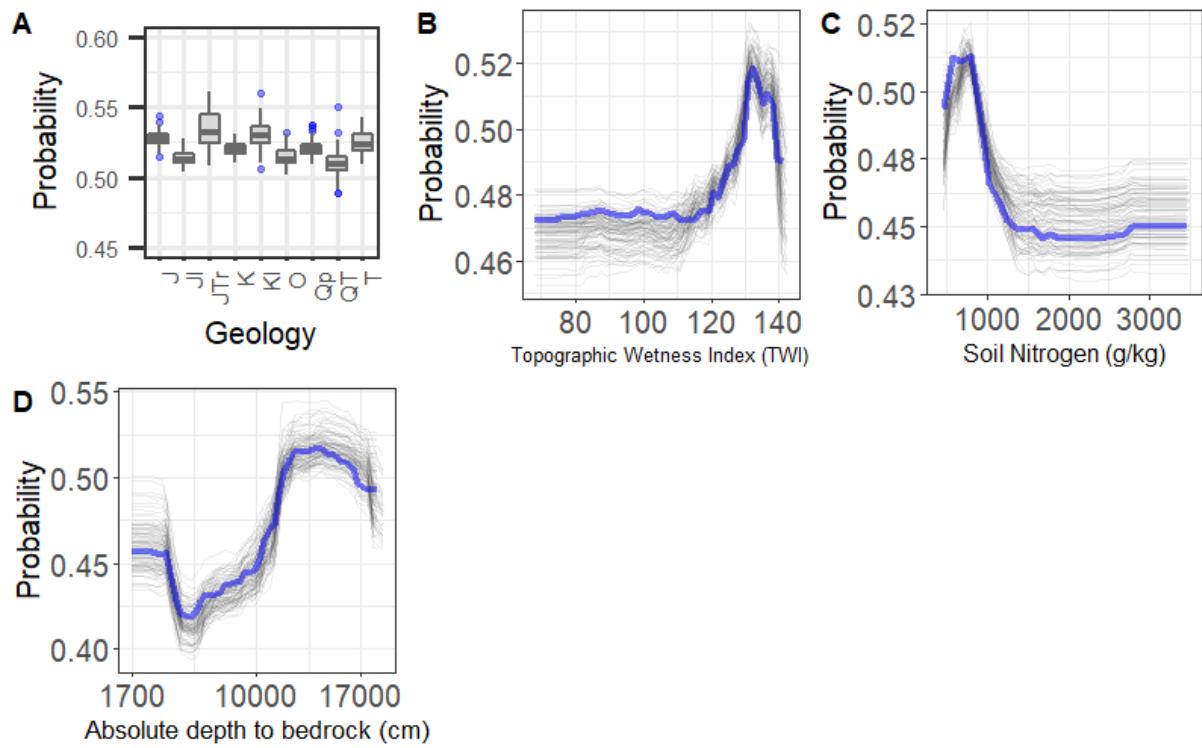


Fig. S9, continued. Partial dependence plots for the predictor variables. The x-axis shows the distribution of the data for the explanatory variable, and the y-axis reports the impact of the variable on the prediction of salinity in concentrations greater than EC 2500 ($\mu\text{S}/\text{cm}$). Symbols of the Geology plot: Cretaceous (K), Jurassic (J), Jurassic Triassic (JTr), Lower Cretaceous (Kl), Lower Jurassic (Jl), Ordovician (O), Quaternary Pleistocene (Qp), Cenozoic (QT), Tertiary (T).

S10. Population of the study area for each first-level administrative unit

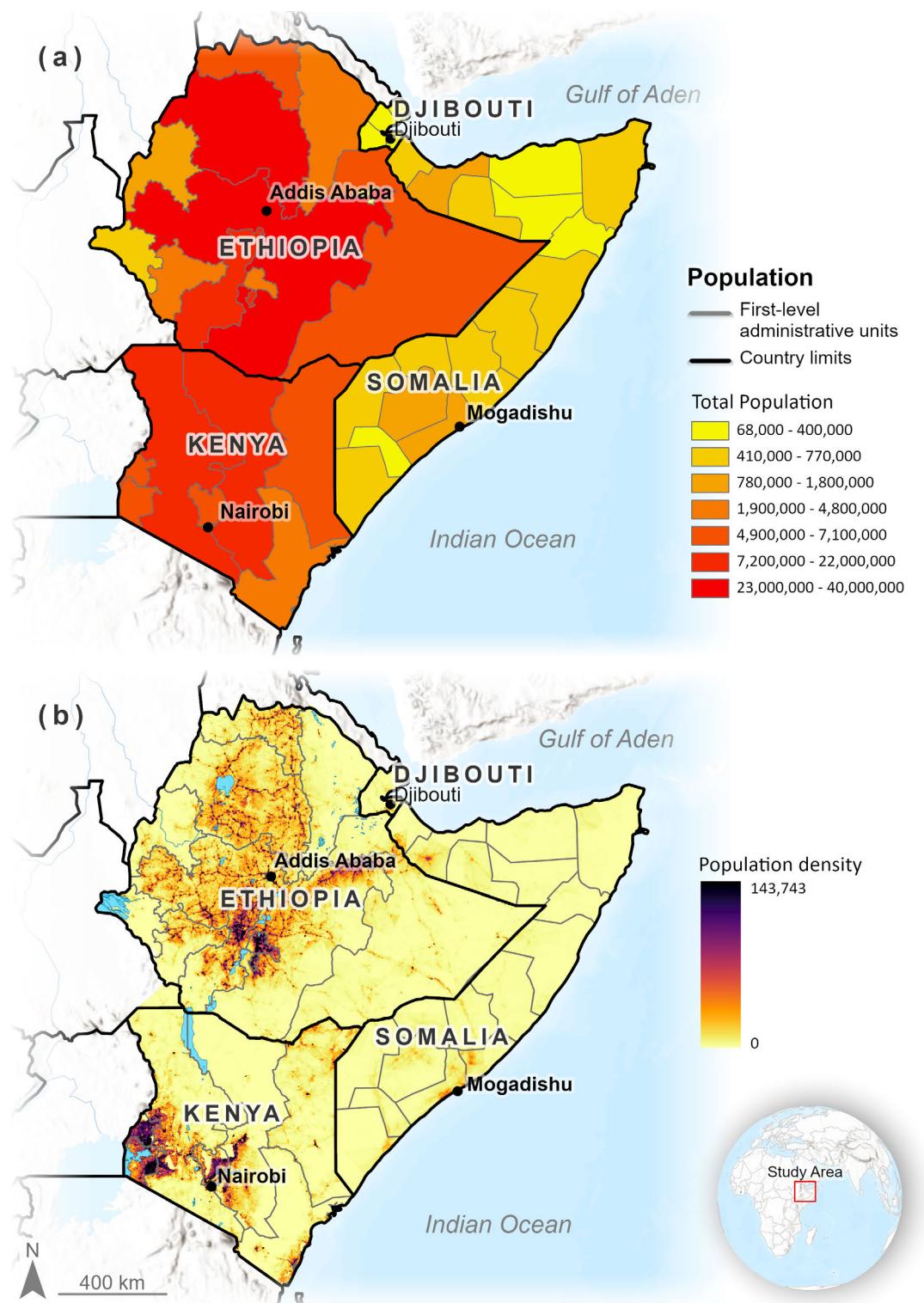


Fig. S10. Population of the study areas. Figure (a) presents the total population for the first level administrative units, and figure (b) presents the population density for the first level administrative units. All the maps were created by the authors using ArcGIS Pro v.2.7.2 software. Base maps are from Esri within ArcGIS Pro v.2.7.2 and are credited to: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community.

TABLES

Salinity data

Table S1. Summary by country of the distribution of groundwater salinity concentrations and sources used for analysis and modeling.

Country	Source	No of samples	% N EC>800 µS/cm	% N EC>1500 µS/cm	% N EC>2500 µS/cm
Ethiopia	(Tadesse, 2020)	18	33	11	11
	(Bairu et al., 2013)	10	100	40	10
	(WASH, 2020)	213	59	29	12
	(Acacia, 2020a)	549	12	3	2
	(Ministry of Agriculture, 2018)	10	100	100	10
	(Addisu Deressa Geleta, 2012)	142	74	28	10
	(Charity Water, 2020)	369	27	3	1
	(Rango et al., 2010)	25	40	24	8
	(Tadesse, 2013)	44	57	20	11
	(Brhane, 2016)	17	24	0	0
	(Demlie et al., 2008)	42	17	5	5
	(Tadesse et al., 2010)	9	44	11	11
	(Reimann et al., 2002)	107	46	21	5
	(Bretzler et al., 2011)	72	40	22	4
	(Adem, 2012)	13	23	15	8
	(Gulta Abdurahman and Moltot, 2018)	25	16	0	0
	(Ayenew et al., 2009)	83	51	17	7
	(UNHCR, 2020)	6	0	0	0
	(Acacia, 2020b)	719	100	42	16
	(Gebrehiwot et al., 2011)	20	45	0	0
	Total	2493	38	14	5
Kenya	(Ashun, 2014)	36	25	0	0
	(Tanui et al., 2020)	59	20	19	17
	(Ezekiel et al., 2017)	39	85	69	41
	(Sottas, 2013)	25	48	8	4
	(Kanoti, 2021)	69	62	23	9
	(Blandenier, 2015)	293	84	35	19
	(Makokha K. Jacquelyne, 2017)	9	0	0	0
	(Muraguri and A, 2013)	60	0	0	0
	(Rusiniak and Sekula, 2021)	35	63	34	20
	(Owango Wadira, 2020)	42	76	60	45
	(Kang'ethe, 2015)	9	44	11	11
	(UNHCR, 2020)	20	70	5	0
	Total	696	61	28	17
	(FAO-SWALIM, 2018)	2025	88.5	76.1	57.9
	(FAO-SWALIM, 2020)	3382	96	0.5	0.4
	(Nasreldin et al., 2016)	50	100	94	86
	Total	5457	87.4	29.3	22.4
Total		8646	61.1	40.7	27.8

Predictor variables

Table S2. List of variables tested for the modelling of groundwater contamination by salinity. The final selected variables are highlighted in grey (for features selection, see methods).

Class	Predictor variable	Resolution	Reference
Soil	Clay fraction (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Sand fraction (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Silt fraction (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Electric conductivity of the soil (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Absolute depth to bedrock	250 meters	ISRIC (Hengl et al., 2015)
	Cation exchange capacity of the soil (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Soil water capacity until wilting point (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Soil texture class (USDA system)	250 meters	(Hengl, 2018a)
	Soil taxonomi class (USDA system)	250 meters	(Hengl and Nauman, 2018)
	Soil organic carbon density in kg per cubic-m (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Soil organic carbon content (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Normalized difference vegetation index (NDVI)	250 meters	(U.S. Geological Survey (USGS), 2022)
	Soil hidraulic conductivity	1 Kilometer	(Gupta et al., 2021)
	Soil hidraulic properties	250 meters	(Simons et al., 2020)
	Soil coarse fragments (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Soil pH (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
	Soil Nitrogen (2m depth)	250 meters	ISRIC (Hengl et al., 2015)
Geology	Soil Manganese (2m depth)	250 meters	ISRIC (Hengl et al., 2017)
	Soil Sodium (2m depth)	250 meters	ISRIC (Hengl et al., 2017)
	Soil Potassium (2m depth)	250 meters	ISRIC (Hengl et al., 2017)
Climate	Geology	polygon	USGS (Persits et al., 1997)
	Temperature	1 Kilometer	WorldClim (Fick and Hijmans, 2017)
	Priestley Taylor alpha coefficient (AET/PET)	1 Kilometer	CGIAR (Trabucco and Zomer, 2010)
	Potential evapotranspiration (PET)	1 Kilometer	CGIAR (Trabucco and Zomer, 2010)
	Actual evapotranspiration (AET)	1 Kilometer	CGIAR (Trabucco and Zomer, 2010)
	Mean annual precipitation	1 Kilometer	CGIAR (Trabucco and Zomer, 2019)
Topography	Aridity (MAP/MAE)*	1 Kilometer	CGIAR (Trabucco and Zomer, 2019)
	Slope	90 meters	HydroSHEDS/WWF(Lehner et al., 2008)
	Digital elevation model (DEM)	90 meters	HydroSHEDS/WWF(Lehner et al., 2008)
	Terrain forms	250 meters	OpenLandMap (Amatulli et al., 2018)
	Drainage basins	250 meters	
	Drainage density	250 meters	
	Topographic wetness index (TWI)	1 Kilometer	OpenLandMap (Hengl, 2018b)
	Water table depth (WTD)	1 Kilometer	(Fan et al., 2013)
	Long-term average groundwater recharge	1 Kilometer	(MacDonald et al., 2021)
Others	Coastal distance	250 meters	
	Crop land	1 Kilometer	(ESA, 2017)
	Urban areas	1 Kilometer	(ESA, 2017)
	Shrubland	1 Kilometer	(ESA, 2017)
	Grass land	1 Kilometer	(ESA, 2017)
	Sparse vegetation	1 Kilometer	(ESA, 2017)

*Aridity = Mean Annual Precipitation (MAP)/Mean Annual Potential Evaporation (MAE)

Estimates of the affected population for the first level administrative units

Table S3. Estimate of the total affected population. The range is based on cut-off points at the 0.05 and 0.95 percentile.

Country	Region	Total population in the risk area (EC > 800 µS/cm) (Thousand)	% of Total population affected (EC > 800 µS/cm)	Total population in the risk area (range) (EC > 1500 µS/cm) (Thousand)	% of Total population affected (EC > 1500 µS/cm)	Total population in the risk area (EC > 2500 µS/cm) (Thousand)	% of Total population affected (EC > 2500 µS/cm)
Ethiopia	Afar	878 (778-904)	48% (42-49)	264 (153-391)	14% (8-21)	27 (12-66)	1.5% (0.6-3.6)
	Amhara	55 (39-64)	0.2% (0.2-0.3)	1 (1-1)	0% (0-0)	0 (0-0)	0% (0-0)
	Dire Dawa	150 (142-155)	32% (30-33)	1 (0-4)	0.3% (0.1-0.8)	1 (0-1)	0.1% (0-0.3)
	Harari	34 (29-36)	13% (11-14)	9 (1-18)	3.3% (0.5-6.8)	0 (0-0)	0% (0-0)
	Oromia	1218 (866-1381)	3.1% (2.2-3.5)	215 (132-323)	0.5% (0.3-0.8)	8 (4-19)	0% (0-0)
	SNNP	178 (121-212)	1.3% (0.9-1.6)	38 (18-57)	0.3% (0.1-0.4)	8 (5-14)	0.1% (0-0.1)
	Somali	3412 (3081-3468)	55% (49-55)	2184 (1653-2729)	35% (26-44)	1310 (986-1640)	21% (16-26)
	Tigray	280 (143-343)	4.8% (2.4-5.8)	0 (0-1)	0% (0-0)	0 (0-0)	0% (0-0)
	Total	6,204 (5,201-6,562)	6% (5-6.3)	2,712 (1,959-3,522)	2.6% (1.9-3.4)	1,354 (1,008-1,739)	1.3% (1-1.7)
Somalia	Awdal	239 (225-242)	54% (50-54)	75 (54-102)	17% (12-23)	28 (22-34)	6% (5-8)
	Bakool	276 (274-276)	60% (60-60)	276 (272-276)	60% (60-60)	272 (268-274)	59% (59-60)
	Banadir	458 (458-458)	37% (37-37)	451 (432-457)	36% (35-37)	227 (102-354)	18% (8-28)
	Bari	309 (308-309)	55% (55-55)	307 (300-309)	55% (53-55)	267 (250-281)	47% (45-50)
	Bay	539 (539-539)	59% (59-59)	539 (538-539)	59% (59-59)	493 (476-507)	54% (52-55)
	Galgaduud	298 (295-299)	59% (58-59)	300 (297-300)	59% (58-59)	298 (267-283)	59% (53-56)
	Gedo	278 (264-282)	55% (52-56)	274 (258-278)	54% (51-55)	275 (260-283)	54% (51-56)
	Hiiraan	293 (293-293)	59% (59-59)	293 (292-293)	59% (59-59)	288 (274-292)	58% (55-59)
	Lower Juba	180 (178-181)	32% (32-33)	167 (158-175)	30% (28-31)	146 (128-159)	26% (23-29)
	Lower Shabelle	715 (713-713)	57% (56-57)	698 (679-704)	55% (54-56)	476 (411-527)	38% (33-42)
	Middle Juba	128 (123-129)	36% (35-37)	110 (103-117)	31% (29-33)	76 (71-78)	22% (20-22)
	Middle Shebelle	440 (438-440)	57% (57-58)	440 (437-441)	57% (57-58)	412 (349-401)	54% (46-52)
	Mudug	315 (314-315)	58% (58-58)	315 (313-315)	58% (58-58)	311 (303-315)	57% (56-58)
	Nugaal	110 (110-110)	60% (60-60)	110 (109-110)	60% (59-60)	110 (110-110)	60% (60-60)

	Sanaag	226 (226-226)	57% (57-57)	220 (217-222)	55% (55-56)	217 (212-220)	54% (53-55)
	Sool	131 (131-131)	60% (60-60)	131 (131-131)	60% (60-60)	131 (130-131)	60% (60-60)
	Togdheer	327 (316-331)	55% (53-55)	312 (296-327)	52% (50-55)	269 (247-285)	45% (41-48)
	Woqooyi G.	357 (290-383)	34% (28-37)	288 (223-358)	28% (21-34)	123 (90-179)	12% (9-17)
	Total	5,620 (5,494-5,661)	51% (50-51)	5,304 (5,109-5,455)	48% (46-49)	4,416 (3,970-4,715)	40% (36-43)

	Coast	773 (349-909)	19% (8-22)	511 (292-762)	12% (7-18)	144 (122-148)	3.5% (2.9-3.6)
	Eastern	953 (687-1035)	13% (10-15)	231 (172-307)	3% (2-4)	120 (82-165)	1.7% (1.2-2.3)
	North-Eastern	3113 (2978-3138)	51% (49-52)	2322 (1774-2592)	38% (29-43)	1573 (1216-2036)	26% (20-34)
Kenya	Nyanza	155 (89-187)	2.3% (1.3-2.7)	3.4 (3.4-4.91)	0% (0-0.1)	0 (0-0)	0% (0-0)
	Rift Valley	577 (373-654)	3.9% (2.5-4.4)	97 (29-244)	0.7% (0.2-1.7)	36 (22-53)	0.2% (0.2-0.4)
	Western	0.14 (0-1)	0% (0-0)	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Total	5,572 (4,475-5,925)	10% (8-11)	3,164 (2,272-3,910)	6% (4-7)	1,873 (1,442-2,403)	3% (3-4)

	Ali Sabeh	71 (71-71)	51% (51-51)	19 (8-28)	13% (6-21)	0.1 (0-1.3)	0.1% (0-0.9)
	Obock	36 (36-36)	53% (53-53)	33 (31-35)	49% (45-51)	21 (17-25)	31% (25-37)
	Tadjourah	78 (75-79)	46% (45-47)	46 (25-67)	27% (15-40)	0.4 (0-1.7)	0.3% (0-1)
Djibouti	Dilkhil	70 (70-69)	50% (50-50)	15 (5-35)	11% (3-25)	0.6 (0.1-1.3)	0.4% (0.1-0.9)
	Djibouti	274 (274-274)	43% (43-43)	273 (272-275)	43% (43-44)	9 (3-18)	1.4% (0.5-2.9)
	total	528 (525-529)	46% (46-46)	387 (341-441)	34% (30-39)	31 (21-48)	2.7% (1.8-4.2)

Total Population	17,924 (15,695-18,676)	11% (9-11)	11,567 (9,680-13,328)	7% (6-8)	7,674 (6,441-8,904)	5% (4-5)
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Table S4. Pregnant women potentially affected by salinity by country and first-level administrative units. The range is based on cut-off points at the 0.05 and 0.95 percentile.

Country	Region	Pregnancies in the risk area (EC > 800 µS/cm) (Thousand)	% of Pregnancies affected (EC > 800 µS/cm)	Pregnancies in the risk area (range) (EC > 1500 µS/cm) (Thousand)	% of Pregnancies affected (EC > 1500 µS/cm)	Pregnancies in the risk area (EC > 2500 µS/cm) (Thousand)	% of Pregnancies affected (EC > 2500 µS/cm)
Ethiopia	Addis Ababa	0.06 (0-0.06)	0% (0-0)	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Afar	41 (37-42)	48% (43-49)	15 (9.4-20)	17% (11-24)	1.8 (0.7-3.7)	2% (0.8-4.3)
	Amhara	4.3 (3.1-4.8)	0.4% (0.3-0.5)	0.1 (0-0.1)	0% (0-0)	0 (0-0)	0% (0-0)
	Dire Dawa	4.7 (4.5-4.8)	25% (24-25)	0.1 (0-0.2)	0.5% (0.1-1)	0 (0-0.1)	0.2% (0.1-0.4)
	Harari	1.8 (1.6-1.8)	19% (18-20)	0.4 (0-1.2)	4.6% (0.3-13)	0 (0-0)	0% (0-0)
	Oromia	60 (44-67)	3.5% (2.6-3.9)	12 (7-19)	0.7% (0.4-1.1)	0.3 (0.1-0.9)	0% (0-0.1)
	SNNP	6.6 (4.1-8)	1.2% (0.7-1.5)	1 (0.5-1.7)	0.2% (0.1-0.3)	0.1 (0.1-0.2)	0% (0-0)
	Somali	201 (182-204)	55% (50-56)	139 (105-170)	38% (29-47)	84 (64-104)	23% (18-29)
	Tigray	14 (7-17)	5.5% (2.8-6.9)	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Total	333 (284-350)	8% (7-8)	167 (122-213)	4% (3-5)	86 (65-109)	2% (1.5-2.5)
Somalia	Awdal	11.9 (11-12.2)	42% (39-43)	4.8 (3.8-7.1)	17% (14-25)	0.8 (0.7-1)	3% (2-4)
	Bakool	13.9 (13.9-14)	58% (58-58)	14 (13.9-14)	58% (58-58)	13.7 (13.6-13.9)	57% (57-58)
	Banadir	19.4 (19.4-19.4)	25% (25-25)	19 (17.2-19.3)	25% (22-25)	11.6 (5.1-15.3)	15% (7-20)
	Bari	13.9 (13.9-13.9)	34% (34-34)	13.8 (13.6-13.9)	34% (33-34)	12.6 (12.1-12.9)	31% (29-31)
	Bay	24.8 (24.7-24.8)	50% (50-50)	24.2 (24-24.5)	49% (49-50)	18.6 (18.2-19.3)	38% (37-39)
	Galgaduud	11.4 (11.3-11.5)	49% (48-49)	11.5 (11.4-11.5)	49% (49-49)	11.4 (10.3-10.8)	49% (44-46)
	Gedo	12.1 (11.2-12.3)	49% (45-50)	12.2 (11.1-12.3)	49% (45-50)	12.5 (11.6-12.8)	51% (47-52)
	Hiiraan	16.5 (16.5-16.5)	56% (56-56)	16.5 (15.9-16.5)	56% (54-56)	15.2 (14.2-16.1)	52% (48-55)
	Lower Juba	11.7 (11.7-11.8)	36% (36-36)	10.8 (10.1-11.6)	33% (31-35)	9.7 (8.6-10.9)	30% (26-33)
	Lower Shabelle	31.6 (31.5-31.6)	45% (45-45)	31.1 (30.3-31.4)	45% (43-45)	20.9 (18.3-23)	30% (26-33)
	Middle Juba	5.9 (5.9-6)	29% (28-29)	5.6 (5.5-5.6)	27% (26-27)	4.5 (4.4-4.6)	22% (21-22)
	Middle Shebelle	18.2 (18.1-18.2)	45% (45-45)	18.2 (18.1-18.2)	45% (45-45)	16.8 (14.7-16.6)	41% (36-41)
	Mudug	13.9 (13.9-13.9)	45% (45-45)	13.9 (13.9-13.9)	45% (45-45)	13.9 (13.7-13.9)	45% (44-45)

	Nugaal	3 (3-3)	35% (35-35)	3 (3-3)	35% (34-35)	3 (3-3)	35% (35-35)
	Sanaag	9.4 (9.3-9.4)	49% (48-49)	9 (8.7-9.1)	47% (45-47)	8.9 (8.8-9.1)	46% (46-47)
	Sool	3.9 (3.9-3.9)	39% (39-39)	3.9 (3.9-3.9)	39% (39-39)	3.8 (3.8-3.9)	38% (38-38)
	Togdheer	12.9 (12.3-13.2)	42% (40-43)	12.6 (11.9-13.1)	41% (39-43)	11.1 (9.9-11.8)	36% (32-38)
	Woqooyi G.	16.2 (13.3-16.9)	24% (20-25)	12.5 (10.6-16)	19% (16-24)	4.9 (4.1-6.4)	7% (6-9)
	Total	251 (245-252)	40% (39-40)	237 (227-245)	38% (36-39)	194 (175-205)	31% (28-33)

Kenya	Central	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Coast	37.6 (15.3-44.8)	17% (7-20)	23 (12-36.5)	10% (5-17)	4.74 (4.25-4.85)	3.1% (2.8-3.2)
	Eastern	37.5 (26.1-41.3)	11% (8-12)	7.9 (5.7-10.7)	2% (1.7-3)	4.25 (3.08-5.81)	1.2% (0.9-1.7)
	North-Eastern	30.8 (29.2-31.2)	50% (47-51)	20.2 (16.3-22.5)	33% (26-37)	14.67 (11.86-17.69)	24% (19-29)
	Nyanza	7.6 (4.1-9.3)	2.2% (1.2-2.7)	0.1 (0.1-0.1)	0% (0-0)	0 (0-0)	0% (0-0)
	Rift Valley	16.4 (10-18.8)	3.1% (2-4)	2.6 (0.8-6.7)	0.5% (0.1-1.3)	1.06 (0.62-1.54)	0.2% (0.1-0.3)
	Western	0.01 (0-0.04)	0% (0-0)	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Total	130 (85-145)	6% (4-7)	54 (35-77)	3% (2-4)	25 (20-30)	1.2% (0.9-1.4)

Djibouti	Ali Sabeh	1.2 (1.2-1.2)	37% (37-37)	0.3 (0.2-0.5)	10% (5-15)	0 (0-0)	0.1% (0-0.3)
	Obock	0.7 (0.7-0.7)	53% (53-54)	0.7 (0.6-0.7)	50% (47-52)	0.4 (0.3-0.5)	30% (24-36)
	Tadjourah	1.4 (1.3-1.4)	45% (44-45)	0.7 (0.3-1.1)	24% (9-38)	0 (0-0)	0.2% (0-0.8)
	Dikhil	1.5 (1.5-1.5)	44% (44-44)	0.3 (0.1-0.7)	9% (3-22)	0 (0-0)	0.2% (0-0.6)
	Djibouti	8.6 (8.6-8.6)	44% (44-44)	8.4 (8.4-8.6)	43% (42-43)	0.1 (0-0.5)	0.5% (0.1-2.5)
	total	13.4 (13.3-13.4)	44% (43-44)	10.4 (9.5-11.6)	34% (31-38)	0.5 (0.4-1)	1.7% (1.1-3.4)

Total Pregnancies	764 (642-805)	11% (9-11)	491 (405-582)	7% (6-8)	310 (264-350)	4% (4-5)
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Table S5. Infant population (0-12 months) potentially affected by salinity by country and first-level administrative units. The range is based on cut-off points at the 0.05 and 0.95 percentile.

Country	Region	Infants in the risk area (EC > 800 µS/cm) (Thousands)	% of Infants affected (EC > 800 µS/cm)	Infants in the risk area (range) (EC > 1500 µS/cm) (Thousands)	% of Infants affected (EC > 1500 µS/cm)	Infants in the risk area (EC > 2500 µS/cm) (Thousands)	% of Infants affected (EC > 2500 µS/cm)
Ethiopia	Afar	20.7 (18.1-21.3)	47% (41-48)	6 (3.5-9)	14% (8-20)	0.7 (0.3-1.6)	1.5% (0.7-3.6)
	Amhara	1.6 (1.2-1.9)	0.2% (0.2-0.3)	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Dire Dawa	4.1 (3.9-4.3)	32% (30-33)	0 (0-0.1)	0.3% (0.1-0.8)	0 (0-0)	0.1% (0-0.3)
	Harari	1 (0.9-1.1)	13% (11-14)	0.3 (0-0.5)	3.3% (0.5-6.7)	0 (0-0)	0% (0-0)
	Oromia	48.8 (34.5-55.3)	3.2% (2.3-3.7)	8.2 (4.9-12.5)	0.5% (0.3-0.8)	0.3 (0.2-0.7)	0% (0-0)
	SNNP	6.6 (4.5-8)	1.4% (0.9-1.7)	1.5 (0.7-2.2)	0.3% (0.1-0.4)	0.3 (0.2-0.4)	0.1% (0-0.1)
	Somali	79.5 (71.2-81)	54% (48-55)	49.9 (37.2-63.3)	34% (25-43)	28.9 (21.7-36.3)	20% (15-25)
	Tigray	10 (5.1-12.2)	5% (2.6-6.1)	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Total	172 (139-185)	4.9% (4-5.3)	66 (46-88)	1.9% (1.3-2.5)	30.1 (22.4-39.1)	0.9% (0.6-1.1)
Somalia	Awdal	7.9 (7.4-8)	53% (50-54)	2.5 (1.8-3.4)	17% (12-23)	0.9 (0.7-1.1)	6% (5-8)
	Bakool	11.3 (11.3-11.3)	60% (60-60)	11.3 (11.2-11.3)	60% (60-60)	11.2 (11-11.3)	59% (59-60)
	Banadir	18.9 (18.9-18.9)	37% (37-37)	18.6 (17.8-18.9)	36% (35-37)	9.4 (4.2-14.6)	18% (8-29)
	Bari	12.9 (12.9-12.9)	55% (55-55)	12.9 (12.6-12.9)	55% (53-55)	11.2 (10.5-11.8)	47% (45-50)
	Bay	22.2 (22.2-22.2)	59% (59-59)	22.1 (22.1-22.2)	59% (59-59)	20.3 (19.6-20.8)	54% (52-55)
	Galgaduud	12 (11.9-12.1)	59% (58-59)	12.1 (12-12.1)	59% (58-59)	12 (10.8-11.4)	59% (52-56)
	Gedo	11.3 (10.8-11.5)	55% (53-56)	11.2 (10.6-11.4)	55% (52-56)	11.2 (10.6-11.5)	55% (52-56)
	Hiiraan	11.9 (11.9-11.9)	59% (59-59)	11.9 (11.9-11.9)	59% (59-59)	11.7 (11.2-11.9)	58% (55-59)
	Lower Juba	7.4 (7.3-7.4)	32% (32-32)	6.8 (6.5-7.2)	30% (28-31)	6 (5.2-6.5)	26% (23-29)
	Lower Shabelle	29.4 (29.3-29.4)	57% (57-57)	28.7 (27.9-29)	55% (54-56)	19.6 (16.9-21.7)	38% (33-42)
	Middle Juba	5.2 (5.1-5.3)	36% (35-37)	4.5 (4.2-4.8)	31% (29-33)	3.1 (2.9-3.2)	22% (20-22)
	Middle Shebelle	18.1 (18-18.1)	57% (57-58)	18.1 (18-18.1)	57% (57-58)	16.9 (14.3-16.5)	54% (46-52)
	Mudug	12.9 (12.8-12.9)	58% (58-58)	12.9 (12.8-12.9)	58% (58-58)	12.7 (12.3-12.8)	58% (56-58)
	Nugaal	4.6 (4.6-4.6)	60% (60-60)	4.6 (4.5-4.6)	60% (59-60)	4.6 (4.6-4.6)	60% (60-60)

	Sanaag	7.6 (7.6-7.6)	57% (57-57)	7.4 (7.3-7.4)	55% (55-56)	7.3 (7.1-7.4)	54% (53-55)
	Sool	4.4 (4.4-4.4)	60% (60-60)	4.4 (4.4-4.4)	60% (60-60)	4.4 (4.4-4.4)	60% (60-60)
	Togdheer	10.9 (10.6-11.1)	55% (53-55)	10.4 (9.9-10.9)	52% (49-55)	9 (8.3-9.5)	45% (41-48)
	Woqooyi G.	11.9 (9.6-12.7)	34% (28-37)	9.5 (7.4-11.9)	27% (21-34)	4.1 (3-6)	12% (9-17)
	Total	221 (216-222)	51% (50-51)	210 (203-215)	49% (47-50)	175 (158-187)	41% (36-43)

Kenya	Central	0 (0-0)	0.0%	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Coast	25 (11.5-29.3)	20% (9-23)	16.7 (9.6-24.8)	13% (8-19)	5.3 (4.5-5.4)	4.1% (3.5-4.3)
	Eastern	3.9 (2.1-4.2)	15% (11-16)	7.3 (5.4-9.6)	3.8% (2.8-5)	3.8 (2.7-5.2)	2% (1.4-2.7)
	North-Eastern	85 (81-86)	50% (48-51)	63 (48-70)	38% (29-43)	42 (33-55)	26% (20-33)
	Nyanza	5 (2.8-6)	2% (1-3)	0.1 (0.1-0.1)	0% (0-0.1)	0 (0-0)	0% (0-0)
	Rift Valley	16 (10-19)	3% (2-4)	2.6 (0.8-6.4)	0.6% (0.2-1.4)	1 (0.6-1.5)	0.2% (0.1-0.3)
	Western	0.01 (0-0.04)	0.0%	0 (0-0)	0% (0-0)	0 (0-0)	0% (0-0)
	Total	160 (127-171)	11% (8-11)	90 (64-111)	5.6% (4-7)	52 (40-67)	3.3% (2.5-4.2)

Djibouti	Ali Sabeh	1.4 (1.4-1.4)	51% (51-51)	0.4 (0.2-0.6)	14% (6-21)	0 (0-0)	0.1% (0-1)
	Obock	0.7 (0.7-0.7)	53% (53-53)	0.7 (0.6-0.7)	49% (45-52)	0.4 (0.3-0.5)	31% (25-36)
	Tadjourah	1.6 (1.5-1.6)	46% (45-47)	0.9 (0.5-1.4)	27% (15-40)	0 (0-0)	0.3% (0-1)
	Dilkhil	1.4 (1.4-1.4)	50% (50-50)	0.3 (0.1-0.7)	11% (3-26)	0 (0-0)	0.4% (0.1-0.9)
	Djibouti	4.5 (4.5-4.5)	48% (48-48)	4.6 (4.5-4.6)	48% (48-48)	0.2 (0.1-0.4)	1.8% (0.7-4)
	total	9.6 (9.6-9.6)	49% (49-49)	6.8 (5.9-7.9)	35% (30-40)	0.6 (0.4-0.9)	3.1% (2-4.8)

Total Infant	563 (492-588)	10% (9-11)	372 (319-422)	7% (6-8)	259 (221-294)	5% (4-5)
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