Reference	Geographic Location	Biome	Observation Site	Vegetation				Max Rooting Depth (m)	Method	Profile Data?	Climate			Drainage			Soil					Human Alteration	Latitude (degree)	Longitude (degree)	Elevation (m)	Author Notes	Notes
				Phenology / Leaf Form	Growth Form / Stature	Common Name	*Species Name*				Annual Ppt (mm)	Seasonality	PET (mm)	Topo Position	Water Table Range (m)	Mean WT Depth (m)	Texture / Type	Hardpan Nature	Depth (m)	Bedrock Nature	Depth (m)						
Aaltonen, 1920	Lapland, Sodankyla, N.	boreal forest	Kaunisvaaran kangas	evergreen needle-leaf	tree	pine	*Pinus sp.*	0.98	excavation	drawings							sandy, stone						67.2470	26.8505	170		mean of 12 pines (1, 0.75, 0.35, 1.25, 0.5, 0.85, 0.5, 0.6, 1.55, 2.45,
Aaltonen, 1920	Lapland, Sodankyla, N.	boreal forest	Pitkän palot	evergreen needle-leaf	tree	pine	*Pinus sp.*	1.00	excavation	drawings							stone-free heath sand						67.8536	26.6652	228		mean of 3 pines (1.2, 0.8, 1)
Aaltonen, 1920	Lapland, Sodankyla, N.	boreal forest	Rakkiluoston kangas	evergreen needle-leaf	tree	pine	*Pinus sp.*	0.56	excavation	drawings							much stone						67.1522	26.9400	238		mean of 7 pines (1.8, 0.5, 0.15, 0.3, 0.2, 0.8, 0.2)
Aaltonen, 1920	Lapland, Sodankyla, N.	boreal forest	Ojalahden Lehto	evergreen needle-leaf	tree	spruce	*Picea sp.*	0.90	excavation	drawings													66.6373	25.3457	100		mean of 4 spruce (0.9, 0.9, 0.8, 1)
Aaltonen, 1920	Lapland, Sodankyla, N.	boreal forest	Pitkan palot	deciduous broard-leaf	tree	birch	*Betula sp.*	0.85	excavation	drawings							stone-free heath sand						67.8536	26.6652	228		mean of 2 birch (0.9, 0.8)
Abbott et al. 1991	SE Idaho, INEL	semi-arid shrub-steppe	undisturbed site	perennial rhizomatous	bunch grass	crested wheatgrass	*Agropyron cristatum L.*	0.75 - 1	^{131}I radio tracer	yes	224	36% in Apr-Jun					sandy loam to clay; calcic			basalt	1.25	transplanted 2yr ago	43.5227	-112.0525	1441	Soil moisture, rather than soil disturbance, seemed to dictate root depth; The field work for this study was conducted in June and July of 1987 and 1988, two very dry years that received only half of the usual winter soil moisture recharge; Variations in the soil water content are frequently the major cause of differences in maximum rooting depth; soil moisture is measured to the maximum depth allowed (20-141 cm) by the underlying bedrock; The maximum	nice data showing how the wetting depth and the resulting soil moisure profile determines rooting depth, regardless distrubance - all it matters is the depth of soil wetting; site location guessed, to be near the INEL on an undistrubed lot
Abbott et al. 1991	SE Idaho, INEL	semi-arid shrub-steppe	undisturbed site	perennial	grass	bottlebrush squirreltail	*Elymus elymoides*	0.5 - 0.75	^{131}I radio tracer	yes	224	36% in Apr-Jun					sandy loam to clay; calcic			basalt		transplanted 2yr ago	43.5227	-112.0525	1441		
Abbott et al. 1991	SE Idaho, INEL	semi-arid shrub-steppe	undisturbed site	perennial	grass	stream bank wheatgrass	*Elymus lanceolatus*	0.75 - 1	^{131}I radio tracer	yes	224	36% in Apr-Jun					sandy loam to clay; calcic			basalt	1.25	transplanted 2yr ago	43.5227	-112.0525	1441		
Abbott et al. 1991	SE Idaho, INEL	semi-arid shrub-steppe	undisturbed site	perennial	grass	basin wildrye	*Leymus cinerus*	1 - 1.25	^{131}I radio tracer	yes	224	36% in Apr-Jun					sandy loam to clay; calcic			basalt	1.25	transplanted 2yr ago	43.5227	-112.0525	1441		
Abbott et al. 1991	SE Idaho, INEL	semi-arid shrub-steppe	undisturbed site	evergreen needle-leaf	shrub	big sagebrush	*Artemesia tridentata*	0.75 - 1	^{131}I radio tracer	yes	224	36% in Apr-Jun					sandy loam to clay; calcic			basalt		transplanted 2yr ago	43.5227	-112.0525	1441		
Abbott et al. 1991	SE Idaho, INEL	semi-arid shrub-steppe	undisturbed site	deciduous broard-leaf	shrub	yellow rabbitbrush	*Chrysothamnus*	1 - 1.25	^{131}I radio tracer	yes	224	36% in Apr-Jun					sandy loam to clay; calcic			basalt		transplanted 2yr ago	43.5227	-112.0525	1441		
Abdelkrim et al., 2014	Algeria, N. Africa	Atlas Sahara	tree-3, male	deciduous broard-leaf	tree	Atlas pistachio	*Pistacia atlantica*	> 0.8	excavating half tree	drawings				dayas (alluvial			sandy-silt, calcareous	limestone hardpan	0.8				35.5530	3.9369	580		7 trees were excavated but very near one another; excavation
Abdi et al., 2010	N slope of Alborz	temperate broad-leaf	experimental forest of U.	deciduous broard-leaf	tree	Persian Ironwood	*Parrotia persica*	> 0.7	trench	yes	1200	rain mostly in winter		on a west-facing slope			thin soil mantle over bedrock			calcareous bedrock (Jura	1		36.5972	51.5609	381	The site has relatively thin soil mantle, underlain by calcareous bedrock (Jura,	lat-lon given cannot be right - putting it far south with z=2100m
Addington et al., 2006	SW Georgia, US	Subtropical moist forest	xeric site	evergreen needle-leaf	tree	Longleaf pine	*Pinus palustris*	2.20	excavation	yes	1310			upland sand ridge			deep sandy / Typic						31.2640	-84.4945	49	The two sites are located ≈5 km from one another and they experience similar climate. The sites were defined as xeric and mesic based on the drainage characteristics	lat-lon approx.
Addington et al., 2006	SW Georgia, US	Subtropical moist forest	mesic site	evergreen needle-leaf	tree	Longleaf pine	*Pinus palustris*	2.00	excavation	yes	1310			upland terrace			sandy loam, sandy clay loam	argillic horrizon	0.5				31.2212	-84.4730	42		lat-lon approx., max root depth extrap from Fig.3
Albaugh et al., 2006	Virginia / N. Carolina, SE	temperate broad-leaf	Virginia Piedmont (P)	evergreen needle-leaf	tree	Loblolly pine	*Pinus taeda L.*	1.90	excavation	yes	1092			well drained			clay soil					pine plantations	36.6800	-77.9900	107		profile data available
Albaugh et al., 2006	Virginia / N. Carolina, SE	temperate broad-leaf	N. Carolina Lower Coastal	evergreen needle-leaf	tree	Loblolly pine	*Pinus taeda L.*	1.90	excavation	yes	1219			pooly drained			clay soil					pine plantations	35.1103	-76.5991	1		profile data available; site moved off the water to the nearest forest
Albaugh et al., 2006	Virginia / N. Carolina, SE	temperate broad-leaf	N. Carolina Sandhills (S)	evergreen needle-leaf	tree	Loblolly pine	*Pinus taeda L.*	3.50	excavation	yes	1220			well drained			sandy soil					pine plantations	34.9100	-79.4800	80		profile data available; extralolated beyond 2.9m
Alexandre & Ouedraogo,	Burkina Faso, west Africa	tree savanna	The Watinoma	deciduous broard-leaf	tree	Acacia albida	*Faidherbia albida*	5.90	excavation	yes				poorly drained		5.9	deep sandy soil					repeatedly cut and	13.6164	-2.2887	346	In Watinoma, F. albida is restricted to a plain, characterized by deep sandy soils and	Google search this village name found a map; water table inferred
Alexandre & Ouedraogo,	Burkina Faso, west Africa	tree savanna	Rakaye Yarse, Sissili	deciduous broard-leaf	tree	Acacia albida	*Faidherbia albida*	2.20	excavation	yes						32	1m rich sandy soil on compact	compact clay	1m			repeatedly cut and	11.3180	-2.2265	325	Figure 2 is typical of the peculiar morphology of F. albida existing in this	situated in the classified forest of Nazinon in Sissili province, 100 km
Angadi & Entz, 2002	Southern Manitoba,	Canadian Prairie	Carman Research	annual	herb	sunflower	*Helianthus annuns*	1.20	trench	yes	310			flat land			Sandy clay loam					annual crop	49.4998	-97.9478	258	Many studies have reported rooting depth in sunflower beyond 2.0 m, which is deeper	extrapolated from Fig. 2A.; location picked to be on an area that looks
Angadi & Entz, 2002	Southern Manitoba,	Canadian Prairie	Winnipeg Plant Science	annual	herb	sunflower	*Helianthus annuns*	1.80	trench	yes	340			flat land			clay loam					annual crop	49.8125	-97.1208	231	In sunflower, the tap root is the major channel for conducting water from deep in	inferred from deepest soil water depletion; location picked near
Antos, 1988	Cascade Mt., N. Oregon	Mountain forest	an old-growth Tsuga	perennial	herb, with storage organ	Avalanche Lily	*Erythronium montanum*	0.19 (0.15-0.2)	excavation	drawings	2000	winter rain		high slope forest			deep pumice soils						45.3033	-121.5124	1220	E. montanum and C. umbrora differ markedly in underground morphology; E ontanumb as a short, segmented rhizome-or corm-like structure with a terminal	E. montanum and C. umbrora were examined in an old-growth Tsuga heterophylla-Abies amabilis forest at 1,220 m elevation, with a shrub layer of Vaccinium membranaceum and an herb layer including Cornus canadensis and R. lasiococcus. The other four species were examined at a lower elevation (1,040 m), 1 km away from the first site, in a wet, old-growth, streambottom
Antos, 1988	Cascade Mt., N. Oregon	Mountain forest	an old-growth Tsuga	perennial rhizomatous	semi-succulent herb	queencup beadlily	*Clintonia uniflora*	0.23 (0.15-0.3)	excavation	drawings	2000	winter rain		high slope forest			deep pumice soils						45.3033	-121.5124	1220		
Antos, 1988	Cascade Mt., N. Oregon	Mountain forest	a wet, old-growth,	perennial rhizomatous	herb	Twistedstalk	*Streptopus roseus*	0.14 (0.1-0.19)	excavation	drawings	2000	winter rain		stream bottom			deep pumice soils						45.3086	-121.5020	1040	Both S. roseus and S. stellata have long rhizomes that persist for approximately the same number of years, but the structure of the rhizome and root systems differs	
Antos, 1988	Cascade Mt., N. Oregon	Mountain forest	a wet, old-growth,	perennial rhizomatous	herb	starry false lily of the	*Smilacina stellata*	0.26 (0.18-0.33)	excavation	drawings	2000	winter rain		stream bottom			deep pumice soils						45.3086	-121.5020	1040		
Antos, 1988	Cascade Mt., N. Oregon	Mountain forest	a wet, old-growth,	perennial rhizomatous	herb	strawberryl eaf	*Rubus pedatus*	0.17 (0.11-0.26)	excavation	drawings	2000	winter rain		stream bottom			deep pumice soils						45.3086	-121.5020	1040	Rubus pedatus and R. lasiococcus spread across the forest floor via stolons; The roots of R. lasiococcus reached more than twice the length and depth of those of R	
Antos, 1988	Cascade Mt., N. Oregon	Mountain forest	a wet, old-growth,	perennial rhizomatous	herb	roughfruit berry	*Rubus lasiococcus*	0.44 (0.27-0.61)	excavation	drawings	2000	winter rain		stream bottom			deep pumice soils						45.3086	-121.5020	1040		
Archer et al., 2002	Almeria, SE Spain	Dry Mediterrane	Retama-site	perennial	shrub	broom bush	*Retama sphaerocarpa*	2.00	coring	yes	300-350	mainly Sept-May		lower alluvial fan			alluvial loamy sands and fine						37.1257	-2.3697	628	the presence of deep larger diameter roots in shrub areas form large open channels at deeper soil depths, facilitating deep-water percolation, while presence of thin shallow	sites pinpointed using elevation (630m), upper and lower alluvial
Archer et al., 2002	Almeria, SE Spain	Dry Mediterrane	Anthyllis-site	perennial	shrub		*Anthyllis cytisoides*	1.50	coring	yes	300-350	mainly Sept-May		upper alluvial fan			alluvial loamy sands and fine						37.1267	-2.3673	632		rooting depth determined by Table 4 (abundant roots, esp. at Retama
Armas et al., 2010	Almeria, S coast of Spain	Dry Mediterrane		evergreen needle-leaf	tree	Phoenicean Juniper	*Juniperus phoenicea*	2.50	coring	no	220	mainly winter		on top of dunes		3.5	dune sand						36.6903	-2.7000	4	sap isotopic signatures of isolated juniper matched that of soil 1 m above the water	rooting depths inferred from plant water use (1m soil water vs. GW at
Armas et al., 2010	Almeria, S coast of Spain	Dry Mediterrane		evergreen broad-leaf	shrub	mastic	*Pistacia lentiscus*	3.50	coring	no	220	mainly winter		on top of dunes		3.5	dune sand						36.6929	-2.6960	4	In this dry system the physiology of lentisc seems to be relatively independent of	water table depth inferred from Fig.2 and related text... here salt
Arndt, et al., 2004	Taklamakan desert, W.	arid desert		perennial legume	herb	camelthorn or manna	*Alhagi sparsifolia*	5	excavation	drawings	40	hot dry summer	2600	foreland of oasis	> 7.5		pure silt						37.0196	80.7031	1358	All investigated species showed high rates of water use... water potentials did not indicate drought stress and neither transpiration nor sap flow displayed the midday depression so common among plants in water-limited environments... soil water content was negligible in soil layers	lat-lon approx.
Arndt, et al., 2004	Taklamakan desert, W.	arid desert		deciduous broad-leaf	shrub or small tree	salt cedar	*Tamarix ramosissima*	2	excavation	drawings	40	hot dry summer	2600	river bed	1.0 - 2.0		pure silt						37.0224	80.7052	1353		lat-lon approx.
Arndt, et al., 2004	Taklamakan desert, W.	arid desert		deciduous broad-leaf	tree	Euphrates Poplar or	*Populus euphratica*	4	excavation	drawings	40	hot dry summer	2600	foreland of oasis		4.6	pure silt						37.0217	80.7021	1356		lat-lon approx.
Arndt, et al., 2004	Taklamakan desert, W.	arid desert		deciduous	shrub		*Calligonum caput-*	7	excavation	drawings	40	hot dry summer	2600	foreland of oasis	> 7.5		pure silt						37.0231	80.6988	1358		lat-lon approx.
Ash et al., 1975	North Carolina	temperate mixed forest	Tidewater Research	perennial	C3 bunchgrass	tall fescue	*Festuca arundinacea*	1.5	soil coring to 1.65m	yes				flat terrace, artificially			loamy sand, mottled grey C					drained by tiles /	35.8747	-76.6555	5	Although these features were characterized primarily by differences in soils, root biomass based on collections at depths down to 165 cm did not differ significantly between locations. Significant seasonal differences in root biomass were	with seasonal distribution - it shows that root wbiomass changes across the season in the shallow soils, not deeper layers, at least for perennial grass such as this
Ash et al., 1975	North Carolina	temperate mixed forest	Upper Coastal Plain	perennial	C3 bunchgrass	tall fescue	*Festuca arundinacea*	1.5	soil coring to 1.65m	yes				flat terrace, artificially			mottled fine sandy loam					drained by tiles /	35.8941	-77.6801	29		
Ash et al., 1975	North Carolina	temperate mixed forest	Piedmont Research	perennial	C3 bunchgrass	tall fescue	*Festuca arundinacea*	1.5	soil coring to 1.65m	yes				3-5% slope, well drained			clay loam						35.6992	-80.6201	223		
Badia et al., 2011	Bajo Cinca, NE Spain	Mediterran desert	Platform	evergreen needle-leaf	xerophytic shrub	rosemary	*Rosmarinus officinalis.*	0.35	soil pits	no	350	hot and windy	1240	on top of structural			thin loam, with stone	cemented carbonate	0.6-1.5				41.6315	0.1568	277	Rising water table with the planned large-scale irrigation is warned for the platform and step units, and drainage and salt water disposal is recommended for the depressions, but no water table data was	
Badia et al., 2011	Bajo Cinca, NE Spain	Mediterran desert	Step	perennial	nitrohalophilous herb		*Artemisia herba-alba.*	0.35	soil pits	no	350	hot and windy	1240	on mid-slope step			thin loam, with stone	lithic contact (R	0.5				41.6314	0.1463	271		
Badia et al., 2011	Bajo Cinca, NE Spain	Mediterran desert	Depression	perennial	halophilous herb		*Suaeda vera, Atriplex*	0.6-0.8	soil pits	no	350	hot and windy	1240	in depression			silty loam or silty clay loam.						41.6361	0.1357	251		
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	shrub	Winterfat (White-	*Eurotia ceratoides*	9.2	excavation	drawings	100-200	falls in early spring				9	loamy Sierozem						45.0655	68.1023	145	Thus, in loamy soil desert where the ground water is rather deep, the root	location guessed
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	shrub	Winterfat (White-	*Eurotia ceratoides*	6.1	excavation	drawings	100-200	falls in early spring					meadow Sierozem						45.0278	67.4246	127		location guessed to be in the saline meadows in southwest
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	shrub	Winterfat (White-	*Eurotia ceratoides*	3	excavation	drawings	100-200	falls in early spring					quick sand (dune??)						44.2836	69.2907	359		location guessed to be on active dunes
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	shrub	Winterfat (White-	*Eurotia ceratoides*	2.9	excavation	drawings	100-200	falls in early spring					road metal soil						45.1175	67.4173	125		cannot find definition of soil; location guessed to be along a high
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial legume	small thorny shrub	Camel thorn	*Alhagi pseudoalhagi*	3.4	excavation	drawings	100-200	falls in early spring				6.5	meadow Sierozem						45.0427	67.2934	124	Thus, on meadow-sierozomic saline soil, where the ground water is at 6.5 m depth, the root system of some deep-rooted plants (Alhagi pseudoalhagi and Karelinia	location guessed to be in the saline meadows in southwest
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	subshrub		*Karelinia caspia*	0.97	excavation	drawings	100-200	falls in early spring				6.5	meadow Sierozem						45.0412	67.2955	125		
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	shrub, sclerophyte		*Artemisia terra-albae*	2	excavation	drawings	100-200	falls in early spring		tend to be in			loamy Sierozem						44.9656	68.0852	137		location guessed to be in depressions
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	shrub, stem succulent		*Anabasis salsa*	7.3	excavation	drawings	100-200	falls in early spring					saline crust						46.1823	68.7113	186		location guessed
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	perennial	leaf succulent	forage kochia	*Kochia prostrata*	4.1	excavation	drawings	100-200	falls in early spring					light chestnut calcareous soil						44.9840	68.0829	138		location guessed
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	evergreen tiny-leaf	small tree	saxaul, black saxaul	*Haloxylon aphyllum*	10	excavation	drawings	100-200	falls in early spring				4.1	alluvial meadow chestnut soil	compact sand	1.5				44.9470	68.2609	146	Thus, the deeply rooted desert tree Haloxylon aphyllum - on alkali soils reaches 4. 1 m, on half-fixed hilly sands on brown sandy loam soil 7.3 m, and with deep	location guessed to be near the edge of the riparian meadow with
Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	evergreen tiny-leaf	small tree	saxaul, black saxaul	*Haloxylon aphyllum*	10	excavation	drawings	100-200	falls in early spring				10	half-fixed hillock sand						44.9279	68.0524	153		location guessed to be on stablized dunes

Baitulin, 1996	Southern Kazakhstan	xeric shrubland	southern desert	evergreen tiny-leaf	small tree	saxaul, black saxaul	*Haloxylon aphyllum*	7.3	excavation	drawings	100-200	falls in early spring				7.3	loamy-sandy chestnut soil						44.9747	68.2713	148	deposits of ground water up to 10 m depth (Gin, 6.4, P and C), due to ground water	location guessed to be higher than the alluvial meadow site
Bakker et al., 2006	SW France	Mediterranean pine	wet site	evergreen needle-leaf	tree	Maritime Pine	*Pinus pinaster*	0.8-1.0	coring	yes				0.4 - 1.3	1.2		eaolian sand / Entic to Densic		0.5			plantation	44.7211	-0.7420	61		lat-lon moved 700m NE to match 61m elevation
Bakker et al., 2006	SW France	Mediterranean pine	dry site	evergreen needle-leaf	tree	Maritime Pine	*Pinus pinaster*	2.5-3.0	coring	yes				2.0 - 3.0	2.9		eaolian sand / Entic to Densic	spodic horizon	0.3			plantation	44.5769	-0.8101	66	The spodic horizon is locally cemented and forms a hardpan that can be continuous over several meters to tens of meters (occurring at 60% of sampling points). At	lat-lon moved 74m SW to match 66m elevation
Bakker et al., 2006	SW France	Mediterranean pine	wet site	perrenial grass	grass	purple moor-grass	*Molinia caerulea*	0.80	coring	yes	950			regional depression	0.4 - 0.8	0.7	eaolian sand / Entic to Densic	spodic horizon	0.5			plantation	44.7211	-0.7420	61		the Landes of Gascogne forest range in south western France; In one typical 'humid' and one typical 'dry' site, situated at 25 and 45 km southwest of Bordeaux, respectively.
Bakker et al., 2006	SW France	Mediterranean pine	wet site	fern	herb	bracken fern, eagle	*Pteridium aquilinum*	0.20	coring	yes	950			regional depression	0.4 - 0.8	0.7	eaolian sand / Entic to Densic	spodic horizon	0.5			plantation	44.7211	-0.7420	61	This species is only found at the wet site.	
Bakker et al., 2006	SW France	Mediterranean pine	dry site	fern	herb	bracken fern, eagle	*Pteridium aquilinum*	1.20	coring	yes	950			regional high	2.0 - 3.0	1.5	eaolian sand / Entic to Densic	spodic horizon	0.3			plantation	44.5769	-0.8101	66	Site fertility determined by organic matter content and depth of water table which is known to limit root growth... Humid site more fertile with 2-3fold higher total C and N... At humid site, total fine root biomass = 3.6t/ha and max rooting depth = ~0.9 m, so sampling effort down to 1.2 m was	
Bakker et al., 2006	SW France	Mediterranean pine	wet site	evergreen shrub	shrub	common gorse, dwarf	*Ulex europaeus, U.*	0.70	coring	yes	950			regional depression	0.4 - 0.8	0.7	Entic to Densic	spodic horizon	0.5			plantation	44.7211	-0.7420	61		
Bakker et al., 2006	SW France	Mediterranean pine	dry site	evergreen shrub	shrub	common gorse, dwarf	*Ulex europaeus, U.*	1.30	coring	yes	950			regional high	2.0 - 3.0	1.5	eaolian sand / Entic to Densic	spodic horizon	0.3			plantation	44.5769	-0.8101	66		extrapolated from Fig.1
Bakker et al., 2006	SW France	Mediterranean pine	dry site	evergreen shrub	shrub	besom heath, bell	*Erica scoparia, E.*	1.40	coring	yes	950			regional high	2.0 - 3.0	1.5	eaolian sand / Entic to Densic	spodic horizon	0.3			plantation	44.5769	-0.8101	66		extrapolated from Fig.1
Bannan, 1940	Ontario, CA, Lake Sup. N	Boreal forest		deciduous needle-leaf	tree	larch	*Larix laricina*	1.22	exavation	drawings	748						humus, glay, medium-coarse						48.7387	-86.3831	224	The mature larch trees examined had shallow root systems. In nine of the ten	lat-lon approx.
Bannan, 1940	Ontario, CA, Lake Sup. N	Boreal forest		evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.30	exavation	drawings	748						humus, glay, medium-coarse						48.7288	-86.3806	210	The root habit of adult black spruce on the plain resembled that of the larch. Lateral	lat-lon approx.
Bannan, 1940	Ontario, CA, Lake Sup. N	Boreal forest		evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.37	exavation	drawings	748						humus, glay, medium-coarse						48.7327	-86.3711	243	The root systems of the larger white spruce trees were exceedingly variable in form. Six	lat-lon approx.
Bannan, 1940	Ontario, CA, Lake Sup. N	Boreal forest		evergreen needle-leaf	tree	jack pine	*Pinus Banksiana*	1.52	exavation	drawings	748						humus, glay, medium-coarse						48.7276	-86.3666	242	Adult jack pine had the deepest root habit of the species studied. Tap roots were	lat-lon approx.
Becker et al., 1999	Brunei, Andulau	Tropical rainfores		evergreen broad-leaf	small tree		*Anisophyllea disticha*	0.30	excavation	no	> 3000			well-drained (but			2-15cm O, clay-sand, clay						4.6585	114.5193	60	Rooting depth and the proportion of root surface area in the upper 20 cm of soil did not differ significantly between life-forms because some treelets/shrubs at Andulau were deep-rooted; all saplings studied were deep-rooted. We attribute this strong difference to the lower soil content of available nutrients at Andulau where rainfall shortage is less severe and regular	An earlier study (Becker amd Castello, 1990) reported that even saplings of trees have deeper roots than mature shrubs. This study compared to that, and found there is no difference between samplings and shrubs rooting depth. The difference is that here there is more rain, shorter dry season, but
Becker et al., 1999	Brunei, Andulau	Tropical rainfores		evergreen broad-leaf	small tree		*Tarenna sp.*	0.20	excavation	no	> 3000			well-drained (but			2-15cm O, clay-sand, clay						4.6585	114.5193	60		
Becker et al., 1999	Brunei, Andulau	Tropical rainfores		evergreen broad-leaf	small tree		*Eurycoma longifolia*	1.80	excavation	no	> 3000			well-drained (but			2-15cm O, clay-sand, clay						4.6585	114.5193	60		
Becker et al., 1999	Brunei, Andulau	Tropical rainfores		evergreen broad-leaf	small tree		*Antidesma cf. leucopodum*	1.50	excavation	no	> 3000			well-drained (but			2-15cm O, clay-sand, clay						4.6585	114.5193	60		
Becker et al., 1999	Brunei, Andulau	Tropical rainfores		evergreen broad-leaf	shrub		*Ixora sp.*	1.10	excavation	no	> 3000			well-drained (but			2-15cm O, clay-sand, clay						4.6585	114.5193	60		
Berish, 1982	near Turrialba,	Tropical premontane	70yr secondary old	evergreen broad-leaf	tree			1.10	soil corning	yes	2700	Jan-Mar dry					weathered pyroclastic					70yr old secondary-	9.8799	-83.6662	650	Fine roots are concentrated near the surface esp. at the 70yr old forest site	mzx depth extrapolated to below 0.85m sampling depth
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	1.22	exavation	drawings				15% NW slope			5cm litter, 20cm coarse gravely				granite	1.22		39.1158	-105.0367	2835	from a tree 90 yrs old, 23' high, and 5" d.b.h. Maximum root penetration was 4' and	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	evergreen needle-leaf	tree	Douglas fir	*Pseudotsuga menziesii*	1.52	exavation	drawings				25% N slope			5cm litter, 20cm coarse gravely				granite	1.37-2		39.1189	-105.0604	2560	from a tree 80 yrs old, 21' high, 5.5" d. b.h. Maximum root penetration was 5' and	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	deciduous broad-leaf	shrub	Mountain mahogany	*Cercocarpus montanus*	1.52	exavation	drawings				25% N slope			5cm litter, 20cm coarse gravely				granite	1.37-2		39.1189	-105.0604	2560	The mountain mahogany was 4.5' high; maximum root penetration was 5' and	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	perennial	bunch grass	Mountain muhly	*Muhlenbergia montana*	0.85	exavation	drawings				25% N slope			5cm litter, 20cm coarse gravely				granite	1.37-2		39.1189	-105.0604	2560	Mountain muhly had a fibrous root system consisting of 316 individual roots. The grass	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	perennial	bunch grass	Arizona fescue	*Festuca arizonica*	0.85	exavation	drawings				25% N slope			5cm litter, 20cm coarse gravely				granite	1.37-2		39.1189	-105.0604	2560	Arizona fescue also had a fibrous root system, consisting of 290 individual roots.	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	evergreen broad-leaf	woody ground cover	Kinnikinnick	*Arctostaphylos uva-ursi*	0.91	exavation	drawings				25% N slope			5cm litter, 20cm coarse gravely				granite	1.37-2		39.1189	-105.0604	2560	Only part of the root system of kinnikinnick was excavated. The main root was a	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	deciduous broad-leaf	tree	Quaking aspen	*Populus tremuloides*	1.52	exavation	drawings				25% N slope			5cm litter, 20cm coarse gravely				granite	1.37-2		39.1189	-105.0604	2560	from a tree 70 yrs old, 26' in height, and 4.5" d. b.h. Max root penetration was 5' and	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Edloe gravelly sandy-loam	evergreen needle-leaf	tree	Ponderosa pine	*Pinus ponderosa*	1.52	exavation	drawings				25% N slope			5cm litter, 20cm coarse gravely				granite	1.37-2		39.1189	-105.0604	2560	The ponderosa pine was 85 yrs old, 19' high, and 4.5" d.b.h. Max root penetration was	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Chubbs stony-Loam site	deciduous broad-leaf	tree	Quaking aspen	*Populus tremuloides*	1.28	exavation	drawings				20% N slope			3-5cm litter, 25cm dark stony				limestone, with fin soil in	1.5-2.1		39.1017	-105.0904	2377	Chubbs soils developed from Madison limestone are calcareous, loose, and	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Chubbs stony-Loam site	evergreen broad-leaf	woody ground cover	Kinnikinnick	*Arctostaphylos uva-ursi*	0.61	exavation	drawings				20% N slope			3-5cm litter, 25cm dark stony				limestone, with fin soil in	1.5-2.1		39.1017	-105.0904	2377	The small kinnikinnick plant had a root system that penetrated the soil to 2' and a	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Chubbs stony-Loam site	evergreen needle-leaf	tree	Douglas fir	*Pseudotsuga menziesii*	1.46	exavation	drawings				20% N slope			3-5cm litter, 25cm dark stony				limestone, with fin soil in	1.5-2.1		39.1017	-105.0904	2377	was 72 yrs old, 24' heigh, and 5" d. b. h... root system had a max penetration of 4.8'.	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Chubbs stony-Loam site	evergreen needle-leaf	tree	Ponderosa pine	*Pinus ponderosa*	1.71	exavation	drawings				20% N slope			3-5cm litter, 25cm dark stony				limestone, with fin soil in	1.5-2.1		39.1017	-105.0904	2377	was from a tree that was 63 yrs old, 25' high, exhibited little branching and had a	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Chubbs stony-Loam site	perennial	bunch grass	Mountain muhly	*Muhlenbergia montana*	1.04	exavation	drawings				20% N slope			3-5cm litter, 25cm dark stony				limestone, with fin soil in	1.5-2.1		39.1017	-105.0904	2377	plant was 0.5' high and 6" in diameter... max penetration of the roots was 3.4' and	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Chubbs stony-Loam site	shrub	Mountain mahogany	*Cercocarpus montanus*	1.52	exavation	drawings				20% N slope			3-5cm litter, 25cm dark stony				limestone, with fin soil in	1.5-2.1		39.1017	-105.0904	2377	The mountain mahogany plant was 4' high. Its root system had a maximum	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Chubbs stony-Loam site	perennial	bunch grass	Arizona fescue	*Festuca arizonica*	0.94	exavation	drawings				20% N slope			3-5cm litter, 25cm dark stony				limestone, with fin soil in	1.5-2.1		39.1017	-105.0904	2377	The fibrous root system of Arizona fescue consisted of 780 individual roots... plant	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Skeletal soil from	evergreen needle-leaf	tree	Douglas fir	*Pseudotsuga menziesii*	0.82	exavation	drawings				NW exposure 7-			loose fine grey sand on				sandstone, fractured into	0.1-0.15		39.1555	-105.0799	2545	All systems had roots that penetrated the shallow soil mass, trailed along the parent	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Skeletal soil from	deciduous broad-leaf	tree	Quaking aspen	*Populus tremuloides*	0.73	exavation	drawings				NW exposure 7-			loose fine grey sand on				sandstone, fractured into	0.1-0.15		39.1555	-105.0799	2545	from a tree that was 110 yrs old, 22' high, and 7" d.b.h. Max penetration of the	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Skeletal soil from	evergreen needle-leaf	tree	Ponderosa pine	*Pinus ponderosa*	0.85	exavation	drawings				NW exposure 7-			loose fine grey sand on				sandstone, fractured into	0.1-0.15		39.1555	-105.0799	2545	was 75 yrs old, 19' high, and 5" d.b.h. Its root system had a max penetration of 2.8'	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Skeletal soil from	evergreen broad-leaf	woody ground cover	Kinnikinnick	*Arctostaphylos uva-ursi*	0.61	exavation	drawings				NW exposure 7-			loose fine grey sand on				sandstone, fractured into	0.1-0.15		39.1555	-105.0799	2545	This plant had a very shallow root system with max penetration of 2'. Most of the	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Skeletal soil from	perennial	bunch grass	Mountain muhly	*Muhlenbergia montana*	0.82	exavation	drawings				NW exposure 7-			loose fine grey sand on				sandstone, fractured into	0.1-0.15		39.1555	-105.0799	2545	plant was 0. 9' high and 6" in diameter. Its roots penetrated to a max depth of 2.7'	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Skeletal soil from	deciduous broad-leaf	shrub	Mountain mahogany	*Cercocarpus montanus*	1.07	exavation	drawings				NW exposure 7-			loose fine grey sand on				sandstone, fractured into	0.1-0.15		39.1555	-105.0799	2545	The mountainmahogany plant was 5' high. Max penetration of the roots was 3.5' and	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Berndt and Gibbons, 1958	Front Range Rockies, near	mountain forest	Skeletal soil from	perennial	bunch grass	Arizona fescue	*Festuca arizonica*	0.79	exavation	drawings				NW exposure 7-			loose fine grey sand on				sandstone, fractured into	0.1-0.15		39.1555	-105.0799	2545	The fibrous root system of Arizona fescue consisted of 308 individual roots. The plant	Manitou Experimental Forest... Missouri Gulch Watershed, lat-lon
Bhattachan et al., 2012	Kalahari Desert, NW.	subtropical dry forest	Shakawe	deciduous broad-leaf	tree, small tree, tree, tree	silver cluster leaf,	*Terminalia sericea,*	0.61	exavation	yes	539	6		S. bank Okavango		25	thick, homogeneous						-18.3642	21.8419	1002		Root depth has 95% roots fitted by authors except Kuke where roots do not follow exponential - so it is extrapolated from Fig.3. WT depth differ from others. In Okavango (Shakawe), WT is near surface (Bauer, 2004; McCarthy, 2006;
Bhattachan et al., 2012	Kalahari Desert, W.	subtropical dry forest	Kuke	deciduous broad-leaf	tree, tree, tree, tree	silver cluster leaf, lace	*Terminalia sericea,*	2.00	exavation	yes	439	5		at the foot hill of ridge			thick, homogeneous						-20.9767	22.4800	1065		
Bhattachan et al., 2012	Kalahari Desert, W.	subtropical dry forest	Tshane	deciduous broad-leaf	shrub, small tree, shrub	box thorn, black thorn,	*Lycium species,*	1.88	exavation	yes	358	5		near playa with salt			thick, homogeneous						-24.0169	21.8689	1122		
Bhattachan et al., 2012	Kalahari Desert, SW.	subtropical dry forest	Bokspits	deciduous broad-leaf	shrub, small tree, tree, tree	three thorns,	*Rhigozum trichotomum,*	1.08	exavation	yes	177	6		near dry river bed		100	thick, homogeneous						-26.8942	20.6983	854		
Bishop, 1962	NE Oregon, US	temperate evergreen		evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.99	exavation	drawings				on gentle N-facing slope			pumicite sitl, basalt clay / Tolo				basalt	1		45.2435	118.5494	1258	Lateral roots in top 12" of pumicite soil... vertical roots extended to the rock layer at	Starkey Experimental Forest was readily located on Google Earth.
Bleby et al., 2010	Edwards Plateau, Cen.	savannah and		evergreen or nearly	tree	Texas live oak, gum	*Quercus fusiformis,*	20	excavation and cave	drawings	630	0					calcreous soil, karst				Cretaceous limestone	0.2		30.9167	-99.9000	623	All species had shallow lateral roots near the surface and deep tap roots to at least	The study shows roots penetrating calcreous rocks to great depths and
Bobich & Huxman,	near Tucson, AZ	Arid desert	U. Arizona Desert	perennial	shrub	Ocotillos	*Fouquieria splendens*	0.29	exavation	drawings				on a gentle S-facing										32.2167	-111.0833	903	The root systems of the excavated ocotillos were generally very shallow, with no roots	same site as Cannon 1913 work, but giving no info on soil or precip
Boggie, 1977	Inverness-shire,	temperate broadleaf	1	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.10	excavation	yes						0.11	deep peat					plantation	57.1407	-4.7366	209	Root growth of many species is inhibited in the presence of excessive soil moisture but it is well established that the oxygen deficiency usually accompanying this condition is the main factor affecting plant growth... Earlier work on these plots showed evidence of dieback at the	the 1972 paper has a site plot... used to locate sites
Boggie, 1977	Inverness-shire,	temperate broadleaf	2	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.15	excavation	yes						0.19	deep peat					plantation	57.1407	-4.7366	209		O concentration and root mass are measured at difference depth to well below WT, showing high correlation between the two
Boggie, 1977	Inverness-shire,	temperate broadleaf	3	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.20	excavation	yes						0.25	deep peat					plantation	57.1407	-4.7366	209		
Boggie, 1977	Inverness-shire,	temperate broadleaf	4	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.40	excavation	yes						0.33	deep peat					plantation	57.1407	-4.7366	209		
Bonal et al., 2000	French Guiana	Tropical rainforest	DVD-site (deep vertical	evergreen broad-leaf	tree		*Eperua falcata*	3.50	O-18 and soil pit	no	2900	double dry Aug-Nov, Feb	1500	on top of small hill			reddish-brown sandy-loamy to						5.1758	-52.9121	75	The two species clearly differed in the vertical distribution of the rooting systems. E. falcata developed a strong tap-root which can prospect deep horizons, down to	lat-lon (in the ocean), site selected to be "near Petit-Saut dam" and "altitude 30m", and from Poszwa (2002) "30 km west from Kourou"; the closest to 30m elevation is 34m in this area
Bonal et al., 2000	French Guiana	Tropical rainforest	DVD-site (deep vertical	evergreen broad-leaf	tree		*Dicorynia guianensis*	1.60	O-18 and soil pit	no	2900	double dry Aug-Nov, Feb	1500	on top of small hill			reddish-brown sandy-loamy to						5.1758	-52.9121	75		
Bonal et al., 2000	French Guiana	Tropical rainforest	SLD-site (shallow	evergreen broad-leaf	tree		*Eperua falcata*	2.00	O-18 and soil pit	no	2900	double dry Aug-Nov, Feb	1500	downslope of the hill			clayey-silty alterite with	compact laterite	1				5.1657	-52.8932	56	In D. guianensis, the rooting system densely colonised the upper horizon, with	

Bonal et al., 2000	French Guiana	Tropical rainforest	SLD-site (shallow	evergreen broad-leaf	tree		*Dicorynia guianensis*	1.00	O-18 and soil pit	no	2900	double dry Aug-Nov, Feb	1500	downslope of the hill			clayey-silty alterite with	compact laterite	1				5.1657	-52.8932	56	long and abundant lateral roots (up to 17 m), while depths of root prospection were	PET from Poswa (2002); WT should be very shallow but no data
Bornman et al., 2004	Olifants Estuary, W-	Mediterranean, wetland	200m on transect-3	sucullent halophyte	herb	samphires, or	*Sarcocornia pillansii*	1.20	soil cores	yes				Hummock	0.6-1.1		loam on silt-loam, then sand						-31.7060	18.2064	4	Where the groundwater was accessible (<1.5 m) and had a low ion concentration	water table read from Fig 3(b) for Hummock and (c) for inter-
Bornman et al., 2004	Olifants Estuary, W-	Mediterranean, wetland	100m on transect-3	sucullent halophyte	herb	samphires, or	*Sarcocornia pillansii*	1.20	soil cores	yes				Inter-Hummock	0.4-0.9		clay-loam on loam, then silt-						-31.7050	18.2060	2	(<80 mS/cm), S. pillansii extended its roots down to the water-table, where a suitable	hummock; roots observed at Tract-3, 100m and 200m points
Bornyasz et al., 2005	Southern California, US	Mediterranean woodland	Santa Margarita	evergreen broad-leaf	tree	coast live oak	*Quercus agrifolia*	>4	newly exposed	yes	97 - 720 (mean 355)	90% in Oct-Apr		base of an ESE to SE			coarse-loamy, well-drained		0.24 - 1.0	granite, highly fractured and			33.4379	-117.1824	231	Roots were confined to the fracture spaces within each of the weathered bedrock	picked a site at 231m elevation, on the road, and near the reserve
Bouillet, 2002	Coastal Congo	plantation on ploughed	9yr old tree site	evergreen broad-leaf	tree	forest Red Gum x	*Eucalyptus PF1 (hybrid E.*	4.00	trench wall	yes	1200	5		on a flat hill			deep sandy (85%) arenosols						-4.1533	11.6888	77	One year after planting the root system extended to depth beyond 3 m, although	location too coarse, site chosen at highest point within 1o box in
Breda et al., 1995	NE France	temperate broadleaf	Champenoux forest, 30-	deciduous broard-leaf	tree	sessile oak	*Quercus petraea*	2.00	trench wall	yes				on very gental slope			silty-clay loam (30cm),						48.7338	6.3261	237	Temporal variation of soil water content was measured down to -200 cm.	trench stopped at 1.6m; max depth inferred from soil water depletion
Breda et al., 1995	NE France	temperate broadleaf	Champenoux forest, 30-	deciduous broard-leaf	tree	pedunculate oak	*Quercus robur*	1.60	trench wall	yes				on very gental slope			silty-clay loam (30cm),						48.7338	6.3261	237		
Briones et al., 1996	Chihuahuan desert, N-C	arid desert	Mapimí Biosphere	evergreen broad-leaf	shrub	creosote bush,	*Larrea tridentata*	> 0.75	trench wall	yes	264	72% falls in Jun-Sep		2 % to 6 % sloping			clay loam (0.25m) on	calcareous claystone	0.8-1.2				26.4893	-103.4374	1100		location at 1100m elevation, near the centr of the lat-lon box
Briones et al., 1996	Chihuahuan desert, N-C	arid desert	Mapimí Biosphere	perennial	tussock grass	tobosa, tobosagrass	*Hilaria mutica*	0.73	trench wall	yes	264	72% falls in Jun-Sep		2 % to 6 % sloping			clay loam (0.25m) on	calcareous claystone	0.8-1.2				26.4893	-103.4374	1100		location at 1100m elevation, near the centr of the lat-lon box
Briones et al., 1996	Chihuahuan desert, N-C	arid desert	Mapimí Biosphere	perennial	cactus	prickly pear	*Opuntia rastrera*	0.28	trench wall	yes	264	72% falls in Jun-Sep		2 % to 6 % sloping			clay loam (0.25m) on	calcareous claystone	0.8-1.2				26.4893	-103.4374	1100		location at 1100m elevation, near the centr of the lat-lon box
Brunel, 2009	Cananea, Mexico, near	xeric shrubland	site-B (bottom),	deciduous broard-leaf	tree	velvet mesquite	*Prosopis velutina*	5.00	O-18	no	507	67% in Jul-Oct		bottom of a small	5.0-10.0		thick alluvium						30.9688	-110.2815	1560	groundwater recharge occurred from winter precipitation, although more than	given lon is off by 9 degrees; should be 110W (Cananea, Mexico), not
Brunel, 2009	Cananea, Mexico, near	xeric shrubland	site-S (summit),	perennial	grass	Grama, and three awns	*Bouteloua sp., and*	0.30	O-18	no	507	67% in Jul-Oct		on top of terrace,	30.0-40.0		alluvium, with much gravel and						30.9660	-110.2829	1533	At Site S, δ18O of xylem water indicates that trees were using either groundwater,	The sites are separated by 1km; rooting depth at site-B inferred
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		evergreen	cushion shrub		*Brachyclados caespitosus*	<1m	excavation	no	178	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	Predawn Phi-Leaf ranged from -4.0 MPa for shallow rooted shrubs to -1.0 MPa for	It shows difference across species at a single site. .. Rooting depth
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		deciduous	dwarf shrub		*Euphorbia collina*	<1m	excavation	no	178	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	deep rooted shrubs, suggesting that roots of the latter have access to bundant	varied greatly across species, but woody plants in general have
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		deciduous	cusion shrub		*Mulinum spinosum*	<1m	excavation	no	178	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	moisture, whereas shallow-rooted shrubs are adapted to use water mainly by small	deeper roots; larger woody plants have deeper roots than smaller
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		evergreen	small shrub		*Senecio filaginoides*	<1m	excavation	no	178	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	rainfall events... Every event generates a	woody plants. .. It also shows roots
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		evergreen	tall shrub		*Adesmia boronioides*	<2m	excavation	no	188	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	pulse of moisture, which, depending on the	No water table depth given, but
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		evergreen	tall shrub		*Colliguaya integerrima*	2.00	excavation	no	188	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	rain amount and evaporation, can last a	Fig.2 shows increasing dry-season soil moisture with depth at nearly
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		deciduous	tall shrub		*Lycium chilense*	1.50	excavation	no	188	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	C. integerrima has a conspicuous tap root that penetrates to a depth of about 200 cm.	saturation at 3m depth; discussion
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		evergreen	tall shrub		*Berberis heterophylla*	>2.5	excavation	no	188	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	L. chilense has numerous roots that reach depths of 150 cm but none of them	also hints GW as source:
Bucci et al., 2009	Patagonia, NW Santa	dry steppe		evergreen	tall shrub		*Schinus johnstonii*	>2.5	excavation	no	188	6				3	gravely sandy loam or gravely	calcareous stony layer	0.8-1 to 1.2-1.5				-46.5167	-71.0500	400-420	The root systems of S. johnstonii and B. heterophylla have a prominent single axis	"consistent with earlier observations (Soriano, 1987, 1990,
Bunger & Thomson,	Oklahoma Pan Handle,	temperate steppe		deciduous broad-leaf	tree	Asiatic elm	*Ulmus pumila*	9.14	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.5898	-101.6189	1001	Usually from 2 to 6 vertical roots of each elm grew straight down through the	root extended to 30' as suggested in Fig.1 as they are still strong
Bunger & Thomson,	Oklahoma Pan Handle,	temperate steppe		deciduous broad-leaf	tree	Osage orange	*Toxylon pomiferum*	9.75	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.5972	-101.6189	999	The vertical roots were followed to a depth of 27' through a calcareous layer. In an	root extended to 32' - there are still 6 large roots at bottom of pit
Bunger & Thomson,	Oklahoma Pan Handle,	temperate steppe		deciduous broad-leaf	tree	Eastern red cedar	*Juniperus virginiana*	7.92	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.5888	-101.6367	1006	Under one tree, 11 roots extended through the calcareous layer and continued	rooting depth extended to 26' from 25' in Table-1
Bunger & Thomson,	Oklahoma Pan Handle,	temperate steppe		deciduous broad-leaf	tree	Black locus	*Robinia pseudoacacia*	8.53	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.6118	-101.6187	999	From 4-7 of these deep-penetrating roots extended vertically throught he calcareous	rooting depth extended to 28' from 26' in Table-1
Bunger & Thomson,	Oklahoma Pan Handle	temperate steppe		deciduous broad-leaf	tree	Russian mulberry	*Morus alba*	3.96	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.6166	-101.5999	995	The deepest root excavated was 12.5 feet, with only a few completely penetrating the	
Bunger & Thomson,	Oklahoma Pan Handle	temperate steppe		deciduous broad-leaf	tree	Thornless honey locust	*Gleditsia triacanthos*	3.35	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.6333	-101.6376	1009	Depth of penetration of vertical roots of the living tree was slightly over 11 feet and	
Bunger & Thomson,	Oklahoma Pan Handle	temperate steppe		deciduous broad-leaf	tree	Seedling apricot	*Prunus armerdaca*	2.44	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.5912	-101.6129	999	The deepest root penetrated to 7.7 feet, but the majority were in the first 6 feet of	
Bunger & Thomson,	Oklahoma Pan Handle	temperate steppe		deciduous broad-leaf	tree	Ash	*Fraxinus species*	1.83	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.5740	-101.6472	1011	These roots did not penetrate the calcareous layer at any place for more than	
Bunger & Thomson,	Oklahoma Pan Handle	temperate steppe		deciduous broad-leaf	tree	Western black walnut	*Juglans ruvestris*	1.83	excavation	drawings	335						Richfield silt loam	calcareous layer	1.5-2.1			planted as wind break	36.6021	-101.5875	992	The deepest root penetrated 5.6 feet, but none penetrated the calcareous layer more	
Büttner & Leuschner,	NW Germany	temperate deciduous		deciduous broad-leaf	tree	European beech,	*Fagus sylvatica*	0.60	soil cores	yes	730						7.2cm O, on sandy, acidic,						52.7504	10.5039	115	Live fine roots of both species showed highest densities in the upper, less	Here the nutrient poor mineral soil
Büttner & Leuschner,	NW Germany	temperate deciduous		deciduous broad-leaf	tree	sessile oak, Cornish oak,	*Quercus petraea*	0.60	soil cores	yes	730						7.2cm O, on sandy, acidic,						52.7500	10.5000	119	decomposed OF horizon of the organic profile, and declined sharply downwards.	may have caused roots to be
Canham et al., 2012	Whiteman Park, SW	Mediterranean woodland		evergreen broad-leaf	tree	candlestick banksia	*Banksia attenuata*	3.70	soil cores	yes	778	6			3-3.75		deep medium-coarse sand						-31.8000	115.9333	48	The Gnangara groundwater mound underlies the park, supporting groundwater	mostly in the thick organic layer
Canham et al., 2012	Whiteman Park, SW	Mediterranean woodland		evergreen broad-leaf	tree	holly-leaved banksia	*Banksia ilicifolia*	3.70	soil cores	yes	778	6			3-3.75		deep medium-coarse sand						-31.8000	115.9333	48	dependent ecosystems including large areas of phreatophytic Banksia woodland.	in-growth bags at multiple depths to monitor root response to water table rise-fall. Growth seen at deepest bag (3.6m) following the
Cannon, 1911	Sonoran Desert,	arid desert	Tumamoc Hill	annual	herb		*Amaranthus palmeri,*	0.15	excavation	some photos	284	NAM and winter rain		top of flat hills			adobe clay, amlpais (from			lava rock	<0.5		32.2163	-111.0048	874	The penetration of the roots of the cactus type lie within 2 to 5 cm. of the surface	rooting depth is mean of 22 obs across specimen and species -
Cannon, 1911	Sonoran Desert,	arid desert	Tumamoc Hill	perennial, some	herb		*Echinocactus wislizenii,*	0.20	excavation	some photos	284	NAM and winter rain		top of flat hills			adobe clay, amlpais (from			lava rock	<0.5		32.2163	-111.0048	874		mean across individuals and species: 20, 25, 15, 15, 15, 14, 20,
Cannon, 1911	Sonoran Desert,	arid desert	Tumamoc Hill	semi-evergreen	shrub	brittlebush	*Encelia Farinosa*	0.55	excavation	some photos	284	NAM and winter rain		top of flat hills			adobe clay, amlpais (from			lava rock	<0.5		32.2163	-111.0048	874		only one specimen
Cannon, 1911	Sonoran Desert,	arid desert	Bajada	perennial, some	perennial herb	saguaro, Pencil	*Carnegiea gigantea,*	0.55	excavation	some photos	284	NAM and winter rain		long side slopes			adobe clay	caliche	from 0.3-0.5 down				32.2151	-110.9985	807		mean across individuals and species: 30, 30, 77, 50, 35, 36, 123,
Cannon, 1911	Sonoran Desert,	arid desert	Bajada	evergreen broad-leaf	shrub		*Covillea tridentata,*	0.68	excavation	some photos	284	NAM and winter rain		long side slopes			adobe clay	caliche	from 0.3-0.5 down				32.2151	-110.9985	807		mean across individuals and species: 53, 18, 37.5, 38, 100, 180,
Cannon, 1911	Sonoran Desert,	arid desert	Floodplain, Santa Cruz	evergreen broad-leaf	shrub	Snakewood, etc.	*Condalia spathulata,*	1.36	excavation	some photos	284	NAM and winter rain		floodplain, bottom land			sand, adobe						32.2369	-111.0205	733	Where there is considerable depth of soil and the water table is close to the surface,	170 (Covillea), 75 (Koberlinieа), 180 (Condalia), 136 (Zizíphus), 120
Cannon, 1911	Sonoran Desert,	arid desert	Floodplain, Santa Cruz	deciduous broad-leaf	tree	velvet mesquite	*Prosopis velutina,*	5.0-8.0	excavation	some photos	284	NAM and winter rain		floodplain, bottom land			sand, adobe						32.2369	-111.0205	733	The most deeply placed roots of Prosopis known to the writer are those of plants	
Cannon, 1913	Northern Sahara,	arid desert	On the plain south of the	perennial	shrub		*Acanthyllis tragacanthoi*	0.30	excavation	some photos	198			on the flat plain									33.4888	2.9419	863	The largest specimen studied possessed a tap-root 3 cm. in diameter at the crown,	on the plain south of Laghouat, near the road
Cannon, 1913	Northern Sahara,	arid desert	near Ghardaia	perennial	herb		*Deverra scoparia*	0.20	excavation	some photos	114			on the hamada			stony desert with little soil						32.5703	3.9124	485	Deverra scoparia was found to have a main root running directly downward 20 cm.	east of the city, along the road
Cannon, 1913	Northern Sahara,	arid desert	east of Ghardaia, mid	perennial	herb	Esfand, wild rue, Syrian	*Peganum harmala*	0.30	excavation	some photos	114			mid valley			fine sand, then hard layer, then	hard stratum	0.2				32.4089	3.9250	401	The first specimen of Peganum studied in this habitat was about 30 cm. high and in	
Cannon, 1913	Northern Sahara,	arid desert	east of Ghardaia, mid	evergreen needle-leaf	shrub	saxaul	*Haloxylon articulatum*	0.31	excavation	some photos	114			mid valley			fine sand, then hard layer, then	hard stratum	0.2				32.4039	3.9254	402	The shoot of the specimen of Haloxylon examined was about 50 cm. high; its	
Cannon, 1913	Northern Sahara,	arid desert	east of Ghardaia, mid	evergreen needle-leaf	shrub		*Henophyton deserti*	0.75	excavation	some photos	114			mid valley			fine sand, then hard layer, then	hard stratum	0.2				32.4051	3.9310	400	The shoot of the plant was about 30 cm. high, and, in spite of the long dry season,	
Cannon, 1913	Northern Sahara,	arid desert	east of Ghardaia, mid	perennial	shrub	Esfand, wild rue, Syrian	*Peganum harmala*	0.27	excavation	some photos	114			mid valley			fine sand, then hard layer, then	hard stratum	0.2				32.3908	3.9466	394	A gnarled main root was foimd to take a zigzag course through 27 cm. of hardpan to	
Cannon, 1913	Northern Sahara,	arid desert	on the hills NW of Biskra	evergreen needle-leaf	shrub	saxaul	*Haloxylon scoparium*	1.13	excavation	some photos	199			on the hill									34.8731	5.7160	142	The root-system of Haloxylon scoparium, as has already been seen to be the case	
Cannon, 1913	Northern Sahara,	arid desert	on the hills NW of Biskra	perennial	herb	Esfand, wild rue, Syrian	*Peganum harmala*	0.61	excavation	some photos	199			on the hill									34.8731	5.7160	142	One of these was Peganum harmala, whose roots v/ere examined at Ghardaia.	
Cannon, 1913	Northern Sahara,	arid desert	on the hills NW of Biskra	perennial	herb	downy plantain	*Plantago albicans*	0.71	excavation	some photos	199			on the hill									34.8731	5.7160	142	Its root-system was also studied with the following results : The tap-root is strongly	
Cannon and Starrett, 1956	Mesa land, N. New Mexico	mountain forest	top of Mesa La Ventana,	evergreen needle-leaf	tree	pinon pine, juniper	*Pinus edulis, Juniperus*	19.81	uranium as tracer	no	457			top of flat mountain		~20	thin soil on a well-fractured			fractured sandstone			35.8420	-106.9562	2231	On the buttes of La Ventana Mesa the coal is capped by a well-fractured 65-foot	top of North Butte, near western part where tree samples taken.
Cardinael et al., 2015	N. of Montpellier	subhumid Mediterrane	inter cropping site: trees	deciduous broad-leaf	tree	Black walnut	*Juglans regia×nigra L.*	> 4.0	trench wall to 4m	yes	951			flat, 1 degree	5.0 - 7.0	6.00	silty deep alluvial fluvisols,						43.7240	4.0426	74	The site is near the Lez river watershed and the depth from the soil surface to the	site give is in natural forests; moved to Restinclières, an inter-cropping
Cardinael et al., 2015	N. of Montpellier	subhumid Mediterrane	inter cropping site: trees	annual	grass	Durum wheat	*Triticum turgidum L.*	> 1.6	trench wall to	yes	951			flat, 1 degree	5.0 - 7.0	6.00	silty deep alluvial fluvisols,						43.7240	4.0426	74	water table usually oscillates between 5 m in winter and 7 m in the summer	similar to Fig.1a but higher
Carrick, 2003	SW South Africa	xeric shrubland.	across fence of different	perennial	small-leaf succulent		*Leipoldtia schultzei*	0.18	excavation	yes, + drawings	135						sandy loam over loose bedrocks			crumbling bedrock		~ 0.3	-30.4128	18.2497	1105	Vertical separation in the rooting morphologies of the three shrubs is clearly	the fence can be located on GE; nearest site to the given lat-lon.
Carrick, 2003	SW South Africa	xeric shrubland.	across fence of different	perennial	small-leaf succulent		*Ruschia robusta*	0.28	excavation	yes, + drawings	135						sandy loam over loose bedrocks			crumbling bedrock		~ 0.3	-30.4128	18.2497	1105	both Ruschia and Leipoldtia are predominantly shallow but lateral rooting...	

Carrick, 2003	SW South Africa	xeric shrubland	across fence of different	perennial	shrub		*Hirpicium alienatum*	0.4	excavation	yes, + drawings	135						sandy loam over loose bedrocks			crumbling bedrock	~ 0.3		-30.4128	18.2497	1105	Roots that extended to a depth > 30 cm were not sampled. Only one Hirpicium	
Carter and Gregorich,	Prince Edward	cropland	Harrington Research	perennial	grass	tall fescue	*Lolium arundinaceu*	> 0.9	coring, and	yes	1077			flat farm land			fine sandy loam on glacial till					7yrs after grass	46.3333	-63.1667	54	At the end of the study in November, 2007, the depth of root penetration was	grass moves SOC deeper into the profile
Castellanos et al., 1991	W coast Mexico, near	tropical deciduous	Estacion de Biologia	deciduous broad-leaf	tree		*Bursera excelsa,*	0.9	trench excavatio	yes	707	dry seaon Nov-Jun		30% SW-facing slope			sandy loam, low O	hardpan	0.5-1				19.4990	-105.0472	58	The soil consists of a 50-100 cm deep sandy loam with low organic matter content (1-	site chosen on SW-facing slope near road at the institute; max root
Castelli et al., 2000	central Nevada	riparian medow	Big Creek, wet meadow	perennial	sedge	Nebraska sedge	*Carex nebrascensis,*	0.6	soil pit	yes	480					0.1	Aquic cryoboroll,						39.3244	-117.1211	2146		
Castelli et al., 2000	central Nevada	riparian medow	Big Creek, mesic	perennial	grass	Kentucky bluegrass	*Poa pratensis ssp.*	0.3	soil pit	yes	480					0.29	Aquic cumulic cryoboroll,						39.3244	-117.1211	2146		
Castelli et al., 2000	central Nevada	riparian medow	Big Creek, dry meadow	perennial	grass	Mat muhly	*Muhlenbergia richardsonis*	0.67	soil pit	yes	480					0.20	Aquic cryoboroll,						39.3244	-117.1211	2146		
Castelli et al., 2000	central Nevada	riparian medow	Big Creek, sage brush	perennial	shrub	sagebrush	*Artemisia tridentata*	0.91	soil pit	yes	480					0.25	Pachic cryoboroll,						39.3244	-117.1211	2146		
Castelli et al., 2000	central Nevada	riparian medow	Corral Canyon, wet	perennial	sedge	Nebraska sedge	*Carex nebrascensis,*	1.3	soil pit	yes	510					0.03	Haplocryoll						39.1204	-116.8107	2377		
Castelli et al., 2000	central Nevada	riparian medow	Corral Canyon, mesic	perennial	grass	Kentucky bluegrass	*Poa pratensis ssp.*	1.28	soil pit	yes	510					0.33	Aquic cumulic haplocryoll						39.1204	-116.8107	2377		
Castelli et al., 2000	central Nevada	riparian medow	Corral Canyon, dry	perennial	grass	Mat muhly	*Muhlenbergia richardsonis*	0.85	soil pit	yes	510					0.30	Pachic haplocryoll						39.1204	-116.8107	2377		
Castelli et al., 2000	central Nevada	riparian medow	Corral Canyon, sage	perennial	shrub	sagebrush	*Artemisia tridentata*	0.52	soil pit	yes	510					0.90	Pachic haplocryoll						39.1204	-116.8107	2377		
Cattanio et al., 2004	Combu Isl, near Belem,	lowland tropical	High	evergreen broad-leaf	tree		*Dicotyledonous sp (92%);*	3.5	soil pit + coring	yes	2800			high point, tidal			heavier (more clay)						-1.5011	-48.4700	15	These observations suggest that root biomass occurred below the 1 m sampling	author report topo range of 3-4m, but on GoogleEarth the elevation is
Cattanio et al., 2004	Combu Isl, near Belem,	lowland tropical	Intermediate	evergreen broad-leaf	tree		*Dicotyledonous sp (92%);*	3	soil pit + coring	yes	2800			middle point, tidal			sandy clay						-1.5035	-48.4629	14	The presence of relatively high root biomass deep in the soil profile is especially	fine root profile; location guessed max depth extrapolated from Fig3
Cattanio et al., 2004	Combu Isl, near Belem	lowland tropical	Low-Lying	evergreen broad-leaf	tree		*Euterpe oleracea;*	2.5	soil pit + coring	yes	2800			low point, tidal			lighter (sandier)						-1.5087	-48.4656	13	this study did not detect a higher concentration of root biomass near the soil	fine root profile; location guessed
Ceballos et al., 2012	Parana River Delta,	wetland	natural, undrained	perennial	tall grass	club rush	*Scirpus giganteus*	0.30	soil cores	yes	1100			river delta	<0.3		0.3m organic over mineral						-34.1390	-58.7091	3	Vertical root distributions were very contrasting between wetlands and tree plantations mirroring soil organic carbon distribution patterns. While marshes roots	Lat-lon given for the 3 forest stands but not wetland sites. Rooting data
Ceballos et al., 2012	Parana River Delta,	wetland	drained, poplar	deciduous broad-leaf	tree	eastern cottonwood	*Populus deltoides*	1.00	excavation	yes	1100			drained high	1-2.5m		0.3m organic over mineral					drained and	-34.1516	-58.7197	5		given for the mean of 3 sites, so the center of each landcover type is
Cerri and Volkoff, 1987	Central Amazon, by	tropical rainforest	Instituto Nacional da	evergreen broad-leaf	tree			>5	3 trenches	yes	2100	Jul-Sep low		pleateau with			yellow latosols, deep, well-						-2.5970	-60.0496	124	75% of total roots is located in the first 50 cm and 90% in the first 100 cm. Plant	known as Bacia Modelo, near Manaus, where several other
Chapman, 1970	South England,	heathland		evergreen broad-leaf	shrub	common heather,	*Calluna vulgaris, Ulex*	0.5	soil cores	yes				on the heath			well-developed humus iron						50.7185	-2.1368	15	The upper 20 cm of the soil profile contain 92% of the total root system	the elevation of 15m in Chapman-1967 is used to locate a heath site
Chapman, 1979	South England,	heathland	First dune ridge,	evergreen broad-leaf	shrub	common heath	*Calluna vulgaris,*	0.3	soil cores and blocks	yes				dune ridge			dune sand						50.6638	-1.9518	5		xy in UK national grid ref, converted to lat-lon at
Chapman, 1979	South England,	heathland	Second dune ridge,	evergreen broad-leaf	shrub	common heath	*Calluna vulgaris, Ulex*	0.6	soil cores and blocks	yes				dune ridge			dune sand						50.6674	-1.9518	5		all rooting depth data is from Fig.1, soil organic matter profile
Chapman, 1979	South England,	heathland	Third dune ridge,	evergreen broad-leaf	shrub	common heath	*Calluna vulgaris, Ulex*	1.5	soil cores and blocks	yes				dune ridge			dune sand						50.6692	-1.9568	5		
Chapman, 1979	South England,	heathland	Furzebrook Road	evergreen broad-leaf	shrub	common heath	*Calluna vulgaris, Ulex*	1.8	soil cores and blocks	yes				near ridge top			dune sand						50.6664	-2.1047	30		dimorphic roots
Chapman, 1979	South England,	heathland	Studland A	evergreen broad-leaf	shrub	common heath	*Calluna vulgaris, Ulex*	1.7	soil cores and blocks	yes				100m away from lake			dune sand						50.6602	-1.9632	10		dimorphic roots; the elevation is switched with Studland C, from 15
Chapman, 1979	South England,	heathland	Studland B	evergreen broad-leaf	shrub	common heath	*Calluna vulgaris, Ulex*	1.3	soil cores and blocks	yes				on saddle of a ridge			dune sand						50.6593	-1.9660	8		dimorphic roots
Chapman, 1979	South England,	heathland	Studland C	evergreen broad-leaf	shrub	common heath	*Calluna vulgaris, Ulex*	2	soil cores and blocks	yes				200m from lake			dune sand						50.6557	-1.9618	15		dimorphic roots; the elevation is switched with Studland A, from 10
Cheyney, 1929, 1932	Northern Minnesota	Boreal forest		deciduous broad-leaf	shrub	rose bush	*Rosa blanda*	0.98	excavation	no				hilltop, 5-7m above			coarse sand						47.1684	-95.1649	486	By far the greater part of the roots are in the upper 6 inches of soil. The roots of	site chosen near road, on ridge between road and a swamp, in a
Cheyney, 1929, 1932	Northern Minnesota	Boreal forest		deciduous broad-leaf	shrub	June berry, choke	*Amelanchier sanguinea,*	0.61	excavation	no				hilltop, 5-7m above			coarse sand						47.1684	-95.1649	486	lousewort, grasses, strawberries, aster, twin flower, false lily-of-the-valley, ladies	forest patch 150ft from the swamp, and 5-7m above the swamp
Cheyney, 1929, 1932	Northern Minnesota	Boreal forest		evergreen needle-leaf	tree	Jack pine	*Pinus banksiana*	1.68	excavation	drawings				hilltop, 5-7m above			coarse sand						47.1684	-95.1649	486	tobaccod, warf dogwood,and bearberry are almost entirely within the first 6 inches.	feet high
Cheyney, 1929, 1932	Northern Minnesota	Boreal forest		perennial	grass, herbs	lousewort, grasses,	*Pedicularis aguilina,*	0.15	excavation	no				hilltop, 5-7m above			coarse sand						47.1684	-95.1649	486	The roots of the others are very largely in	
Christina et al., 2011	Itatinga, São Paulo, SE	plantation	sandy soil site	evergreen broad-leaf	tree	flooded gum	*Eucalyptus grandis*	15.8	soil cores +	yes	1367	6 mon dry season		top of a hill		17.5	sandy, deep Ferralsols (>10			Cretaceous sandstone		3.5 yr old plantation,	-23.0225	-48.5995	869	Early vertical tree growth was found to be fast above and below ground, reaching	same sites as Laclau, 2013...but different trees... rooting and water
Christina et al., 2011	Itatinga, São Paulo, SE	plantation	sandy soil site	evergreen broad-leaf	tree	flooded gum	*Eucalyptus grandis*	14	soil cores +	yes	1367	6 mon dry season		top of a hill		16	sandy, deep Ferralsols (>10			Cretaceous sandstone		6 yr old plantation,	-23.0243	-48.5989	861	The root front, as well as height growth, followed a similar pattern up to 42 months	same sites as Laclau, 2013...but different trees... rooting and water
Christina et al., 2016	S~ao Paulo State, SE	plantation		evergreen broad-leaf	tree	flooded gum	*Eucalyptus grandis*	16		yes	1430	85% in Oct-May		hill top		16	deep Ferralsols on Cretaceous			Cretaceous sandstone			-22.9678	-48.7278	750		this is a modeling study but nearly all the variables are also measured
Claus & George, 2005	Leinefelde, C. Germany	temperate deciduous	oldest of 3 stand	deciduous broad-leaf	tree	European beech,	*Fagus sylvatica,*	0.5	soil coring to 30cm	yes	750			Very gently to gently			Stagnic to Haplic Luvisol (O rich,					111yr old shelterbelt	51.3333	10.3723	468	At all age-classes of the Leinefelde site, there were very few roots in the thin	lat-lon pinpointed by elevation; max depth extrapolated from Fig.2
Claus & George, 2005	Tharandt, E. Germany	temperate deciduous	oldest of 4 stand	evergreen needle-leaf	tree	Norway spruce	*Picea abies, Deschampsia*	0.6	soil coring to 30cm	yes	820			Very gently to gently			Dystric to Dystri-Stagnic					97yr old plantation	50.9271	13.4897	486	The organic layer was thicker in Tharandt than in Leinefelde and Roccarespampani	lat-lon pinpointed by elevation; max depth extrapolated from Fig.2
Claus & George, 2005	Roccarespampani, C. Italy	temperate deciduous	oldest of 3 stand	deciduous broad-leaf	tree	Turkey oak, Austrian oak	*Quercus cerris,*	0.7	soil coring to 30cm	yes	936			Flat to very gently			Luvisol with high clay content					16yr old, coppiced	42.4027	11.9249	175	At the Roccarespampani site, the same trend was apparent, although the decrease	lat-lon pinpointed by elevation; max depth extrapolated from Fig.2
Cline et al. 1977	Hanford, SC Washington	shrub-steppe	Arid Lands Ecology	evergreen needle-leaf	shrub	sagebrush / bluebunch	*Artemesia tridentata /*	> 1.6	soil cores to 1.6m	yes	220			gentle, east-facing slope			Ritzville silt-loam						46.5804	-119.8299	396	Through the summer, transpiration continued in the wheatgrass community	site guessed to be on the same slope but higher at 396m elevation
Cline et al. 1977	Hanford, SC Washington	shrub-steppe	Arid Lands Ecology	annual	grass	cheatgrass	*Bromus tectorum*	0.8	soil cores to 1.6m	yes	192			gentle, east-facing slope			Ritzville silt-loam					invaded abandoned	46.5782	-119.7908	305	the cheatgrass community because the plants die by mid-May. The cheatgrass	site guessed to look like abandoned farmland at 305m elevation within
Coile, 1937	North Carolina,	Temperate mixed forest	Duke Forest	evergreen needle-leaf	tree	loblolly pine	*Pinus taeda L*	0.91	excavation	yes							loam over clay					early cultivated,	36.0291	-78.9912	149	There is a preponderancoef the smallest size-classo f roots (<0.1 inch in diameter)	max depth extrapolated from Fig.4
Coile, 1937	North Carolina,	Temperate mixed forest	Duke Forest	evergreen needle-leaf	tree	shortleaf pine	*Pinus echinata Mill.*	1.02	excavation	yes							sandy loam, clay loam, then clay					early cultivated,	36.0251	-78.9790	152	a heavy, compact, plastic clay B horizon, the physical nature of the B horizon makes	max depth extrapolated from Fig.4
Coile, 1937	North Carolina,	Temperate mixed forest	Duke Forest	deciduous broad-leaf	tree	post oak, blackjack	*Quercus stellata*	0.91	excavation	yes							loam, clay loam, then clay					early cultivated,	36.0216	-78.9805	161	The clay of the B horizon is extremely plastic, and water movement through it is	max depth extrapolated from Fig.4
Coile, 1937	North Carolina,	Temperate mixed forest	Duke Forest	deciduous broad-leaf	tree	white oak, black oak,	*Q. alba L., Q. velutina*	1.42	excavation	yes							clay					early cultivated,	36.0239	-78.9974	165	soil developed from igneous rock, deeply weathered; The open, friable character of	max depth extrapolated from Fig.4
Coile, 1937	North Carolina,	Temperate mixed forest	Duke Forest	deciduous broad-leaf	tree	red gum, yellow	*Liquidambars tyraciflaua L.,*	2.44	excavation	yes							sandy clay loam, then sandy loam					early cultivated,	36.0180	-78.9882	181	The deep penetration of all roots is especially noticeable in this soil, which is	max depth extrapolated from Fig.4; a fluctuating water table within
Comino & Druetta, 2010	NW Italy, foothill of	temperate broadleaf	Site A	perennial	grass	meadow fescue,	*Festuca pratensis,*	2.0-3.0	excavation?	no	1092			foothill, till / alluvium 10-			sand/silt						44.8194	7.3186	357	This research investigates the stabilizing action offered by grass roots, which in the	
Comino & Druetta, 2010	NW Italy, foothill of	temperate broadleaf	Site B	perennial	grass	meadow fescue,	*Festuca pratensis,*	2.0-3.0	excavation?	no	1092			foothill, till / alluvium 10-			sand/gravel						44.8264	7.3028	402	This research investigates the stabilizing action offered by grass roots, which in the	
Comino & Druetta, 2010	NW Italy, foothill of	temperate broadleaf	Site C	perennial	grass	meadow fescue,	*Festuca pratensis,*	2.0-3.0	excavation?	no	1092			foothill, till / alluvium 10-			silt/sand						44.7972	7.2781	437	This research investigates the stabilizing action offered by grass roots, which in the	
Coughenour et al., 1990	Turkana County, NW	subtropical dry forest		deciduous broad-leaf	tree		*Acacia tortilis*	3.5	excavation	yes	200			bank of a large river			deep sandy soils						2.1916	36.1430	530	The larger trees occur only near ephemeral streambeds or rivulets; Tap roots were	Rooting depth from Fig.3. Location approximate. Lacking info on exact
Coughenour et al., 1990	Turkana County, NW	subtropical dry forest		deciduous broad-leaf	tree		*Acacia reficiens*	2.4	excavation	yes	300			upland			deep sandy soils						2.2763	36.2652	636	occurring most often on upland nonriparian sites; A small fraction of unaccounted total	site locations, only the deepest root of each species is reported
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	bunch grass	needle-and-thread grass	*Stipa comata*	1.1	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						50.4098	-107.7897	762	Two to seven white-t o cream-colou-ded main roots support each shoot of the	Lots of guess work in the exact location. It is easy to locate the few
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	bunch grass	needle-and-thread grass	*Stipa comata*	0.99	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130	bunch. Some penetrate vertically, but	black soil and brown soil sites and
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	needle-and-thread grass	*Stipa comata*	0.63	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.2223	-107.7828	693	others descend at various oblique angles to reach positions 1 8-36 cm laterally from the	identify their features (knoll, level,
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	needle-and-thread grass	*Stipa comata*	1.07	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971	central axis of the plant, before turning abruptly downward. Some of thel atter are	lower slope etc.) and assign the
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	needle-and-thread grass	*Stipa comata*	0.85	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538	so nearly horizontal that they reach depths of only 5 -10 cm in their lateral journey.	sites accordingly, it is difficult to
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	1.27	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130		locate sandy and gravelly sites,
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	1.02	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						50.3864	-107.6228	752	This more vigorous and more mesophytic grass occurs only in the far northern Great Plains and is most abundant in dark brown loam soils of the Canadian prairies; The	particularly the sites in the dark brown soils zone with many possible sites fitting the description. Thus the rough locations are identified that are on
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	0.85	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.2223	-107.7828	693		On Google Earth, these area, particularly the dark brown and

Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516	mean maximum depth of penetration is similar to that of S. comata, but in the two instances where these species were studied in the same excavation S. sparteavar. curtiseta was the deeper by 18 and 28 cm; The effect of increased southern exposure is to produce deeper roots, while the more mesic situation on lower slopes and northern exposures reduced their depth	black soil zones, are dotted with potholes, so dense that it is sometimes difficult to have an unbroken flat piece of land. Strangely the study never mentioned drainage conditions and their influence on roots.
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	0.68	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	1.05	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	0.8	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	0.8	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		sites with natural vegetation selected to represent the 1965 condition, but the place is so farmed today that it is sometimes difficult; keep this in mind when comparing with observed rooting depth - annual crops likely have much shallower roots than reported here, particularly with the
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	bunch grass	Porcupine grass	*Stipa spartea var. curtiseta*	1.4	trench wall	drawings	305-308 across sites		635-760 across sites	level			gravel subsoil						52.5213	-106.9281	519		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sod-forming rhizomatous	western wheatgrass	*Agropyron smithii*	1.27	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						50.4098	-107.7897	762	Excavations of eighty-seven root systems in nine Saskatchewan stands have revealed that shoots of this sod-forming grass originate from tough, wiry rhizomes; Depth of rooting varies considerably with climate, soil and topographic position (Table 1). In ordinary upland sites maximum depth was usually 120-150 cm, but in sand it was only 60-90 cm (Fig. 2). The shallower depth in sand was associated with oblique penetration of the major roots, before they	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sod-forming rhizomatous	western wheatgrass	*Agropyron smithii*	1.37	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						50.3864	-107.6228	752		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	western wheatgrass	*Agropyron smithii*	0.68	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	western wheatgrass	*Agropyron smithii*	1.65	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						52.2223	-107.7828	693		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	western wheatgrass	*Agropyron smithii*	1.52	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	western wheatgrass	*Agropyron smithii*	1.55	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.52	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130	It occurs as a dominant principally in the moister parts of the grassland in the 'Prairie Provinces' of Canada. During the present study1 20 root systems were examined in seventeen stands. The data indicate that the root system is very similar to that of A . smithii. These two species were more deeply penetrating than any other dominant with which either was associated on loam soils	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.42	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						50.3864	-107.6228	752		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.12	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.2223	-107.7828	693		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.22	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.42	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.3	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.15	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	sod-forming rhizomatous	thickspike wheatgrass	*Agropyron dasystachyu*	1.1	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.85	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554	It is the most xerophytic grass in the Canadian prairies, dominating in unmodified grasslands only on relatively arid sandy loam soils, but being the major species in overgrazed pasture lands. Observations of fifty root systems in thirteen locations in Saskatchewan during the present study corroborate the dense, widely spreading nature of the root system. Of particular significance in relation to its drought resistance is the occurrence of numerous, horizontally positioned roots which grow radially in all directions from the bases of stems. This characteristc is	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.75	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.9	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971		discussed the influence of topo position: roots on hilltops are wider and shallower compared to roots in lower slopes
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.38	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.75	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.4	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	sod-forming rhizomatous	blue grama	*Bouteloua gracilis*	0.53	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						49.9261	-109.5363	762	On the basis of a study of thirty-three plants in ten stands it can be concluded that this species exhibits the least extensive root system of the major grasses of this region. The most common maximum depth was 60 cm, with the majority of the roots ending within 30 cm of the surface. maximumd epthw as from3 3 to 75 cm	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.75	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.33	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.58	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	bunch grass	prairie Junegrass	*Koeleria cristata*	0.65	trench wall	drawings	305-308 across sites		635-760 across sites	level			gravel subsoil						52.5213	-106.9281	519		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Rough Fescue	*Festuca scabrella*	1.02	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.2223	-107.7828	693	thep rincipal climax dominant within the black soils of Alberta, western Saskatchewan and north-central Montana; Rhizomes emerge either laterally or from underneath the crown. These radiate in all directions and give rise to new shoots usually within a few centimetres of the parent; During the present study seventeen plants were examined in six stands. The	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Rough Fescue	*Festuca scabrella*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	Rough Fescue	*Festuca scabrella*	0.68	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	bunch grass	Rough Fescue	*Festuca scabrella*	0.8	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	bunch grass	Rough Fescue	*Festuca scabrella*	1.1	trench wall	drawings	305-308 across sites		635-760 across sites	level			gravel subsoil						52.5213	-106.9281	519		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.65	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						49.9261	-109.5363	762		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.68	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130	C. eleocharis is the most abundant sedge in the Canadian prairies; This species is a sod former with rhizomes reaching 30 cm long; Roots arise from the bases of clumps and from shoot-free nodes on the rhizomes, but the former roots penetrate more deeply. Many smaller and shorter roots grow from the bases of shoots and radiate to occupy the soil to a depth of 8-15 cm for a distance up to 25 cm from the clump.	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.35	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.35	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.5	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.6	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.38	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	sedge, sod forming	needle-leaf sedge	*Carex eleocharis*	0.65	trench wall	drawings	305-308 across sites		635-760 across sites	level			gravel subsoil						52.5213	-106.9281	519		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	green needlegrass	*Stipa viridulias*	1.1	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501	It grows under conditions of more dependable moisture supply than is usual	soil-topo zone inferred from author statement of moist sites
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	sod-forming rhizomatous	prairie sandreed	*Calamovilfa longifolia*	1.8	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971	is characteristic of recently disturbed sand; propagates by tough, wiry rhizome; The	soil-topo zone inferred from author statement of sandy sites
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	bunch grass	sand dropseed	*Sporobolus cryptandrus*	0.78	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971	a nother species on recently stabilized sand, but with extremely fine roots arising	soil-topo zone inferred from author statement of sandy sites
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	1.47	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						49.1008	-109.9123	882	most abundant forb. The central axis of the plant develops a tap root system while adventitious roots are produced from the horizontal stems. The relative extent of development of the thick, deeplyp	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	1.02	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	0.81	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.2223	-107.7828	693		Reporting contradicting results:

Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	0.88	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971	enetrating tap root and its largest branches, as compared to the mass of fibrous roots developing in the surface layers of soil, is determined apparently by habitat characteristics. In locations where moisture is often deficient near the surface of the soil, but where occasional moisture penetration to considerable depth permits establishment of deep roots, the tap root system is well developed. However, tap roots are not found where deep	roots in arid sites are deeper AND shallowers than more mesic sites. What's going on? Also mentioned that occasional deep penetration of rain water can lead to deep roots. Also mentioned the plasticity of the roots.
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	0.51	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	1.47	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	0.78	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	0.66	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	woody shrub	fringed sagebrush,	*Artemisia frigida*	0.66	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	forb	spiny phlox, carpet phlox	*Phlox hoodii*	0.68	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						49.1008	-109.9123	882	the second most abundant forb in the Canadian Mixed Prairie, possesses tap roots that ranged from 30 to 95 cm in depth. Depth of root penetration was greatest in the well developed soils of level areas and lower slopes (Table 5, Fig. 6). In shallow soil of slopes the roots sometimes did not exceed 30 cm in depth. In sandy soils the depth of rooting was restricted to 41 cm, but the laterals were usually much more dense and more widely spreading than in soils of finer texture	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	forb	spiny phlox, carpet phlox	*Phlox hoodii*	0.66	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	spiny phlox, carpet phlox	*Phlox hoodii*	0.41	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	spiny phlox, carpet phlox	*Phlox hoodii*	0.3	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						52.2223	-107.7828	693		It is puzzling that here the roots are shallower and wider in sandy soils!
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	spiny phlox, carpet phlox	*Phlox hoodii*	0.76	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	spiny phlox, carpet phlox	*Phlox hoodii*	0.56	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	spiny phlox, carpet phlox	*Phlox hoodii*	0.41	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.61	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.78	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						50.3864	-107.6228	752	This species has a generalized root system composed of both tap root and fibrous roots (Table 5, Fig. 7). Unlike the two forbs already discussed, the root system of this species is most extensive under the cool, mesic conditions of the Fescue Prairie and mesic micro-environments within the Mixed Prairie. The shallowest rooting occurred in arid situations caused by climatic location or topographic position.	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.91	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.2223	-107.7828	693		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.48	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.86	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.68	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.51	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	0.81	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						52.6939	-107.8172	554		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Black Soil Zone	perennial	forb	Pasque Flower	*Anemone patens var.*	1.22	trench wall	drawings	305-308 across sites		635-760 across sites	level			gravel subsoil						52.5213	-106.9281	519		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	subshrub	broom snakeweed,	*Gutierrezia diversifolia*	0.93	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						49.0290	-109.8397	864	has a tap root 4-6 mm in diameter which gives rise to five to nine thinner lateral roots within a few centimetres of the soil surface. These run obliquely downward to produce a lateral spread commonly between 10 and 25 cm in the surface 30 cm of soil. The range in maximum depth was from 42 to 130 cm. Both the depth of penetration and the extent of lateral spread tended to be greater in drier climate and in exposed locations	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	subshrub	broom snakeweed,	*Gutierrezia diversifolia*	1.3	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						49.5654	-109.4951	1130		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	subshrub	broom snakeweed,	*Gutierrezia diversifolia*	0.51	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	subshrub	broom snakeweed,	*Gutierrezia diversifolia*	0.66	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	subshrub	broom snakeweed,	*Gutierrezia diversifolia*	0.51	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	subshrub	broom snakeweed,	*Gutierrezia diversifolia*	0.86	trench wall	drawings	305-308 across sites		635-760 across sites	north slope			loam						51.8188	-106.2573	543		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	perennial	subshrub	acy tansyaster	*Haplopappus spinulosus*	1.6	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						49.0290	-109.8397	864	a thick woody tap root 5-8 mm in diameter and dark brown in colour was found to be	Rooting depth from Fig. 8
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	subshrub	hairy false goldenaster	*Chrysopsis villosa*	2.4	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971	The tap root is 3-10 mm in diameter and penetrates vertically. Abundant, small,	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies		perennial	forb	lesser spikemoss,	*Selaginella densa*	0.2-0.5	trench wall	drawings	305-308 across sites		635-760 across sites													S. densa is a clubmoss that grows in dense mats that sometimes occupy 50% of the	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	Missouri goldenrod,	*Solidago missouriensis*	1.32	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501	propagates by a tough, woody rhizome; Roots (0.3-0.8 mm in diameter) are	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb, legumous	prairie thermopsis	*Thermopsis rhombifolia*	1.7	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501	This legume(Fig. 8) propagates by very tough, light coloured, rhizomes 3 -5 mm in diameter. Roots descend at intervals of 8-30 cm from locations near the base of a	
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb, legumous	thermopsis	*Thermopsis rhombifolia*	0.75	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516		
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	white heath aster	*Aster ericoides*	0.8	trench wall	drawings	305-308 across sites		635-760 across sites	knoll			loam						51.7463	-106.7275	516	the tough, wiry rhizomes vary from 2 to 5 mm in diameter; These give rise to light	rooting depth from Fig. 7
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb, legumous	lemon scurfpea	*Psoralea lanceolata*	1.22	trench wall	drawings	305-308 across sites		635-760 across sites	lower slope			loam						52.1391	-106.7899	501	This legume (Fig. 10) is effective as sand binder, due to an extensive network of	rooting depth from Fig.10
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	forb	dotted gayfeather,	*Liatris punctata*	1.3	trench wall	drawings	305-308 across sites		635-760 across sites	south slope			loam						52.0770	-106.2829	538	two to four laterals originate from the thicker part of the tap root (Fig. 10). These	rooting depth from Fig.10
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Brown Soil Zone	Biennial, Perennial	subshrub	scarlet globemallo	*Sphaeralcea coccine*	1.8	trench wall	drawings	305-308 across sites		635-760 across sites	level			loam						49.0290	-109.8397	864	characterized by a deeply penetrating, sparsely branched tap root which	Rooting depth from Fig. 9
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies	Dark Brown Soil Zone	perennial	subshrub	rush skeletonpla	*Lygodesmia juncea*	3	trench wall	drawings	305-308 across sites		635-760 across sites	level			sand						49.7591	-109.5000	971	This composite is characteristic of sandy soil. The tap root is 2-9 mm in diameter	Rooting depth from Fig. 9; makes sense that sandy soils favor deeper
Coupland & Johnson, 1965	southern Saskatchewan	Canadian Prairies		perennial	forb	field horsetail	*Equisetum arvense*	3	trench wall	drawings	305-308 across sites		635-760 across sites													Other species encountere during this study which were judged to belong to this group	
Cuevas et al., 1991	Puerto Rico	tropical rainforest	Pine Plantation	evergreen needle-leaf	tree	Caribbean pine	*Pinus caribaea*	0.4	coring + in growth	yes	3810	no dry season		gental (5%) SW facing			48% clay, 31% silt, 21% sand					plantation after crops	18.3049	-65.8382	350	In both forests the majority of fine roots were in the top 10 cm of soil. Secondary	max depth extrapolated from live fine root biomass in Fig 7
Cuevas et al., 1991	Puerto Rico	tropical rainforest	Secondary Forest Site	evergreen broad-leaf	tree		*Tabebuia heterophylla*	0.5	coring + in growth	yes	3810			gental (5%) SW facing			33% clay, 41% silt, 26% sand					secondary forest after	18.3238	-65.8352	350	values for the secondary forest were similar to those reported by Klinge and	max depth extrapolated from live fine root biomass in Fig 7
Curt et al., 2001	eastern France	plantation	7	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	0.6	trench wall	yes	1300						Regosols (sandy-gravely), stone			Devono-Dinatian	0.3-0.6		46.0997	4.4276	900	The shallowest soils (type 7) experienced a rapid linear decrease of TFR biomass	elevation and precip linearly interpolated; location picked by
Curt et al., 2001	eastern France	plantation	6	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	0.6	trench wall	yes	1215						Cambic Arenosols			Devono-Dinatian			46.0860	4.4132	810	For type 6, the TFR biomass decreased continuously and rapidly according to soil	10 trees
Curt et al., 2001	eastern France	plantation	5	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	0.8	trench wall	yes	1132						Dystric Cambisol (loamy clay)			granite/sandstone			46.0745	4.4556	720	Types 4 and 5 presented a comparable profile, with a fine-root concentration in the A-horizon	9 trees
Curt et al., 2001	eastern France	plantation	4	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	0.9	trench wall	yes	1049						Dystric Cambisol (loamy clay), on			Devono-Dinatian	0.61-0.9		46.0500	4.4107	630		10 trees
Curt et al., 2001	eastern France	plantation	3	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	0.9	trench wall	yes	966						Cambisols (loamy-sand),			Devono-Dinatian			46.0447	4.5121	540	The profile of type 3 resembled that of type 1, but it gained much lower values.	14 trees
Curt et al., 2001	eastern France	plantation	1	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	1.2	trench wall	yes	883						Cambisols (loamy-sand),			Devono-Dinatian	0.91-1.2		46.0183	4.4910	450	The root biomass slowly decreased with soil depth for types 1 and 2. They both	10 trees
Curt et al., 2001	eastern France	plantation	2	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	1.3	trench wall	yes	800						Cambisols (loamy-sand) on			Devono-Dinatian	>1.2		46.0000	4.4992	350	Douglas-fir seems to be a pliable and adaptive species: variation in habit and	13 trees
Dai et al., 2015	Xinjiang province,	arid desert	dune valley	evergreen needle-leaf	large shrub C4	saxaul, black saxaul,	*Haloxylon ammodendro*	3.8	O18 isotope	no	70–180	25% as snow	>2000	dune valley		3.8	dune sand						44.5583	87.7857	435	The sand dune site was 11 m higher than the inter-dune site, with the groundwater table at about 4 m for the inter-dune lowland and 15 m for dune crest	location best to reconcile "345m elevation" and "dune top is 11m above dune valley" and the given lat-lon; rooting depth inferred from
Dai et al., 2015	Xinjiang province,	arid desert	dune ridge	succulent stem/no leaf	large shrub C4	white saxaul	*Haloxylon persicum*	15	O18 isotope	no	70–180	25% as snow	>2000	dune crest		15	dune sand						44.5384	87.8029	446		
Danjon et al., 2005	S. of Bordeaux,	drained plantation	Landes de Gascogne	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	0.9	excavation	3D imaging	900			on a ridge, better-	0.5-1.3	0.9		iron pan	0.9			drained moor and	44.4893	-0.9419	54	It has a shallow winter water table and experiences water shortage during late	exact location of each of the 24 excavated gtrees are not given, but discussion of topo-sequence is informative; 3 locations are chosen based on Fig.1 and discussions
Danjon et al., 2005	S. of Bordeaux,	drained plantation	Landes de Gascogne	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	0.92	excavation	3D imaging	900			mid slope	0.3-1.1	0.7		iron pan	0.9			drained moor and	44.4930	-0.9483	48	When the sinkers reached the hard pan, they produced several dozen roots running	
Danjon et al., 2005	S. of Bordeaux,	drained plantation	Landes de Gascogne	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	0.98	excavation	3D imaging	900			in a trough, poorly-	0.1-0.9	0.5						drained moor and	44.4953	-0.9517	38		
Da Silva et al., 2015	N of Manaus, Brazil	evergreen tropical	access road to INPA field	evergreen broad-leaf	tree	Cabbage Palm	*Euterpe precatoria*	1	excation to 1m	no	2547	Jul-Oct can be dry		lower slope			clay rich Oxisols on plateau,						-2.5940	-60.2121	80	a solitary palm reported as the most abundant tree species in the Amazon; In	longitude given is 11-35 west, in the E Atlantic ocean. So location

Das & Chaturvedi	Pusa, Bihar, NE India	agrisivicultur e: trees	Research farm.	evergreen broad-leaf	tree	Auri, Earleaf acacia,	*Acacia auriculiformis*	2	soil cores +	yes	1160	80% fall in monsoon Jun					sandy loam					tree/crop intercroppi	25.9833	85.8000	53	root distribution for five, four-year-old agroforestry tree species... Root spread exceeded the crown cover for all tree species. The first order lateral roots were more horizontal than the second order. The length and diameter of the main root were highest in A. indica (108.3 cm) and B. ceiba (23.2 cm) respectively. Maximum length of lateral roots was recorded in B. variegata	mean rooting depth of 5 trees; WT should be shallow here but it is not
Das & Chaturvedi	Pusa, Bihar, NE India	agrisivicultur e: trees	Research farm.	evergreen broad-leaf	tree	Neem, Nimtree,	*Azadirachta indica*	1.2	soil cores +	yes	1160	80% fall in monsoon Jun					sandy loam					tree/crop intercroppi	25.9833	85.8000	53		mean rooting depth of 5 trees; WT should be shallow here but it is not
Das & Chaturvedi	Pusa, Bihar, NE India	agrisivicultur e: trees	Research farm.	drought-deciduous	tree	Orchid tree, Camel's	*Bauhinia variegata*	1	soil cores +	yes	1160	80% fall in monsoon Jun					sandy loam					tree/crop intercroppi	25.9833	85.8000	53		mean rooting depth of 5 trees; WT should be shallow here but it is not
Das & Chaturvedi	Pusa, Bihar, NE India	agrisivicultur e: trees	Research farm.	deciduous broad-leaf	tree	Red Silk-Cotton; Red	*Bombax ceiba*	1.6	soil cores +	yes	1160	80% fall in monsoon Jun					sandy loam					tree/crop intercroppi	25.9833	85.8000	53		mean rooting depth of 5 trees; WT should be shallow here but it is not
Das & Chaturvedi	Pusa, Bihar, NE India	agrisivicultur e: trees	Research farm.	evergreen broad-leaf	tree		*Wendalendia exserta*	2.1	soil cores +	yes	1160	80% fall in monsoon Jun					sandy loam					tree/crop intercroppi	25.9833	85.8000	53		mean rooting depth of 5 trees; WT should be shallow here but it is not
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	alpine bistort	*Polygonum viviparum*	0.3	exavation	drawings				moist meadow			stony scree						41.3613	-106.2945	3283	This plant possesses a deeply imbedded, short rhizomea bout 7 mm. in diamete;	rhizomatous roots; Typical habitats include moist short grassland,
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	leaf-succulent, storage roots	alpine lewisia,	*Lewisia pygmaea (A.*	0.1	exavation	drawings				moist meadow			stony scree						41.3613	-106.2945	3283	Lewisia has a thick fleshy tap root in whicha great quantity of starch is stored; In	likes moist sites
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	leaf-succulent and evergreen	moss campion,	*Silene acaulis Linn*	0.2	exavation	drawings				scree slope, on eastern			stony scree						41.3605	-106.2914	3304	From the crown of a young plant prostrate branches arise which fork repeatedly, and	It grows mainly in dry, gravelly localities, but also in damper
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	spring sandwort	*Arenaria aequicaulis A.*	0.15	exavation	drawings				scree slope			stony scree						41.3707	-106.2756	3373	Many lateral branches originate from a crown about two centimeters below the	synonym of Minuartia verna (L.) Hiern. grow in otherwise
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb		*Arenaria sajanensis*	0.4	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	This mat plant is one of the most abundant "alpines" in the central Rockies. From the	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	leaf-succulent	Rocky Mountain	*Paronychia pulvinata A.*	0.31	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	The root system of this plant is very extensive but otherwise lacks distinctive	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	leaf-succulent	Few-seeded Draba	*Draba oligosperma*	0.26	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	The primary root and each of the few laterals produces a system of intricately	Widespread on rocky ridges and montane slopes, often down to the
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	leaf-succulent	wormleaf stonecrop	*Sedum stenopetalum*	0.1	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	The principal branches of this succulent-leaved species are decumbent, and in	It can be found in many types of rocky habitat, such as cliffs, talus,
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	diamondleaf saxifrage	*Saxifraga rhomboidea*	0.1	exavation	drawings				moist meadow			stony scree						41.3538	-106.3144	3337	A great many blackish, firm-textured roots which radiate symmetrically outward and	Moist places in sagebrush-covered slopes to subalpine
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	mountain meadow	*Potentilla diversifolia*	0.48	exavation	drawings				moist meadow			stony scree						41.3538	-106.3144	3337	Several shoots may arise from buds at the base of the crown which is about one to	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb		*Potentilla pinnatisecta*	0.35	exavation	drawings				moist meadow			stony scree						41.3538	-106.3144	3337	The strong tap root of this species usually gives rise to two or more laterals at a depth	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb		*Sieversia turbinata*	0.37	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	A closely crowded row of adventitious roots arises from each of these oblique	clonal roots
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	legume forb	Parry Clover	*Trifolium parryi*	0.24	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	The root system of this clover is both extensive and diffuse, while also beneath	N-fixing nodules
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	legume forb	Shaggy Leaf Trifolium	*Trifolium dasyphyllum*	0.38	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	The primaryr root systemc onsists of a thoroughly taneled mass of root branches	N-fixing nodules
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	annual	forb	pygmyflowe r,	*Androsace subumbellata*	0.1	exavation	drawings				scree slope			stony scree						41.3418	-106.3256	3247	There are few annuals in the alpine tundra, but among these Androsace is one of the	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb, matt forming	tufted phlox	*Phlox caespitosa*	0.35	exavation	drawings				sunny open woodland			stony scree						41.3530	-106.2942	3293	The plant has a tap root which gives rise to a great many finely branched whitish	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	Rocky Mountain	*Polemonium confertum*	0.55	exavation	drawings				scree slopes and talus			stony scree						41.3418	-106.3256	3247	At a depth of about eight to ten centimeters the strong tap root of this lant	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	arctic alpine,	*Eritrichium argenteum*	0.24	exavation	drawings				scree slopes and talus			stony scree						41.3418	-106.3256	3247	The tap root, which is about 2 to 4 mm. in diameter, is smooth, rigid, nd unbranched	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb, rhizomous	dwarf mountain	*Erigeron compositus*	0.09	exavation	drawings				scree slopes and talus			stony scree						41.3418	-106.3256	3247	At a depth of less than a decimeter the tap root has completely divided into a diffuse	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	featherleaf fleabane	*Erigeron pinnastisectu*	0.28	exavation	drawings				scree slopes and talus			stony scree						41.3418	-106.3256	3247	This plant produces a tap root which gives rise to laterals of almost equal size.; A few	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	Old Man of the	*Rydbergia grandiflora*	0.2	exavation	drawings				moist meadow			stony scree						41.3538	-106.3144	3337	This compositep ossessesa stout tap root which tapers rapidly. The thickness of the	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb, rhizomous	Bear River fleabane	*Erigeron ursinus*	0.1	exavation	drawings				sunny open woodland			stony scree						41.3530	-106.2942	3293	From the short, erect caudex, which in older specimens becomes branched, there	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	Common yarrow	*Achillea subalpina*	0.16	exavation	drawings				scree slopes and talus			stony scree						41.3418	-106.3256	3247	From the seedlingo f this plant amaze of horizontal subterraneans tems radiates in	
Daubenmire, 1941	Medicine Bowel Range,	alpine tundra	scree slope, on eastern	perennial	forb	alpine sagebrush	*Atremisia scopulorum*	0.25	exavation	drawings				scree slopes and talus			stony scree						41.3418	-106.3256	3247	The primary root system practically disappears with age, the plant depending	Assuming that the specimen selected for illustrationw as in each
David et al., 2004	near Évora, SE Lisbon,	Mediterrane an woodland	Herdade da Mitra	evergreen broad-leaf	tree	sweet acorn oak	*Quercus rotundifolia*	13	sap flow, stem	no	665	90% in Oct-Apr	1760		13-15	14	very shallow (0.3m deep)			fractured gneiss	0.3	crown pruned,	38.5265	-8.0184	243	Tree roots must thus have direct access to the 13m deep water table in order to	site moved to match given elevation and to aforesst; rooting
David et al., 2013	near Lisbon, Portugal	Mediterrane an woodland	Companhia das Lezirias	evergreen broad-leaf	tree	cork oak	*Quercus suber L.*	6.5	excavatio n	drawing	708	mostly in Oct-Apr	1347		1.5-4.5	4.5	well-drained deep Haplic						38.8337	-8.8189	19	Results showed a dimorphic root system with a network of superficial roots linked to	site moved closer to 15m elevation; most comprehensive study with
Davidson et al., 2011	Tapajos, Para, Brazil	Tropical seasonal	Tapajos National	evergreen broad-leaf	tree			18.00	soil cores	yes	2000	6 (Jul-Dec)		plateau			deeply weathered						-2.8978	-54.9528	198	Active water uptake by deep roots to approximately 18 m depth can be inferred	root activity infered from soil water depletion; pertaining to the forest,
Davis et al., 1983	Tasmania, Australia	tree savana	Stoodley	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	0.90	soil coring to 80cm	yes	1200			mid slope			krasnozem, basic, igneous,					plantation	-41.4018	146.4315	200	On these five soils Pinus radiata exhibited similar plasticity of root form. Soil organic matter content provided the best correlation with root concentration wn the five sites. The high correlation is likely to be due to the favourable moisture and nutritional environments, where organic matter levels are greater, and to the observed preference for roots to grow	tree height=17.5m, dbh=24.0cm; location guessed to be in neet-rows
Davis et al., 1983	Tasmania, Australia	tree savana	Strahan	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	0.90	soil coring to 80cm	yes	1200			depression		0.8	groundwater podzol, deep					plantation	-42.1433	145.3131	14		tree height=15.2m, dbh=13-9cm; location guessed to be in
Davis et al., 1983	Tasmania, Australia	tree savana	Long Hill 1	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	0.90	soil coring to 80cm	yes	1200			broad crest			podzol, sedimentary					plantation	-41.3915	146.5210	300		tree height=9.7m, dbh=13-5cm; location guessed to be on the
Davis et al., 1983	Tasmania, Australia	tree savana	Long Hill 2	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	0.90	soil coring to 80cm	yes	1200			base of slope			podzol, sedimentary					plantation	-41.3744	146.5149	271		tree height=8.9m, dbh=10.1cm; location guessed to be at the base
Davis et al., 1983	Tasmania, Australia	tree savana	Mt. Helen	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	0.90	soil coring to 80cm	yes	1200			mid slope			podzol, acid igneous					plantation	-41.2611	147.5203	443		tree height=15.2m, dbh=24.0cm; location guessed to be on midslope
Dawson, 1993	Ithaca, NY	temporate hardwood		deciduous broad-leaf	tree	sugar maple	*Acer saccharum*	1.5	soil cores/pits	yes				near creek	1.25-8		glacial till, silty loam,	fragipan	0.25-1.3				42.4428	-76.4935	127	Examination of root distributions obtained from soil cores and pits revealed that some	rooting depth inferred from author notes (below hardpan of 1.3m,
Dawson & Pate, 1996	SW Australia, near Perth	Mediterra woodland	site-1	evergreen broad-leaf	tree	Banksia	*Banksia prionotes*	1.8-2.6	H isotope, excavatio	photos					1.8-2.6		deep Bassendean						-31.5500	115.6833	24	The shallow lateral roots and deeply penetrating tap (sinker) roots obtained water of different origins over the course of a winter-wet/summer-dry annual cycle	in a natural open Banksia woodland on deep Bassendean sand near
Dawson & Pate, 1996	SW Australia, near Perth	Mediterra woodland	site-2	evergreen broad-leaf	tree	Eucalyptus	*Eucalyptus globulus, E.*	5	H isotope, excavatio	photos		4-6				4.5	deep sand on gravel						-34.7927	116.0706	59		given lat-lon off - not pointing to 310km south of Perth (177km east-
Day, 1941	Upper P., Michigan	Boreal forest	plantation on Dunbar Forest	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	0.79	excavatio n	drawings				level, slow subsoil			very fine sandy loam					plantation	46.3382	-84.2262	179	trees I and II had favorable moisture conditions in that early seasons oil moisture was not excessive and late season soil moisture was usually adequate. sinker	14 yrs old, 8.5 feet high, max lateral 10.3 feet., Lat-lon approx
Day, 1941	Upper P., Michigan	Boreal forest	plantation on Dunbar Forest	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.01	excavatio n	drawings				level, slow subsoil			very fine sandy loam					plantation	46.3382	-84.2262	179		14 yrs old, 11 feet high, max lateral 14.6 feet., Lat-lon approx
Day, 1941	Upper P., Michigan	Boreal forest	plantation on Dunbar Forest	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	0.49	excavatio n	drawings				level, slow subsoil			very fine sandy loam					plantation	46.3382	-84.2262	179	Tree III was exposed to excessive moisture in the early part of the growing season...	13 yrs old, 6 feet high, max lateral 14.3 feet., Lat-lon approx
Day, 1941	Upper P., Michigan	Boreal forest	Natural site off Dunbar	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.89	excavatio n	drawings				Pine plain, good			leached sand						46.3067	-84.2462	196	It will be noted that trees IV and V have the largest root systems despit the fact that they are not the largest trees nor are they any older than the other trees. They	12 yrs old, 6.3 feet high, max lateral 17.5 feet., Lat-lon approx
Day, 1941	Upper P., Michigan	Boreal forest	Natural site off Dunbar	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.52	excavatio n	drawings				Pine plain, good			leached sand						46.3067	-84.2462	196		14 yrs old, 5.3 feet high, max lateral 18.3 feet., Lat-lon approx
Dell et al., 1983	Jarrahdale, W.A.,	Mediterra forest	undisturbed forest, upland	evergreen broad-leaf	tree	jarrah	*Eucalyptus marginata*	14.00	excavatio n + coring	yes + photos	1000	80% in 5 winter mon		upland position			gavelly sand (0.3m), on						-32.3383	116.0904	273	A dense mat of surface roots occupied the shallow topsoil (30 cm deep). Sinker roots,	best illustration of root channels, repeatedly used by roots, rich in
Dell et al., 1983	Jarrahdale, W.A.,	Mediterra forest	undisturbed forest,	evergreen broad-leaf	tree	jarrah	*Eucalyptus marginata*	40	excavatio n + coring	yes + photos	1000	80% in 5 winter mon		lowland position		15	gravely sand (1.3m), on			granite	14		-32.3426	116.0882	243	Fine roots were recovered to 40 m at the downslope site (Fig. 6). These roots	author: "our observation of a potentiometric surface at 15 m in a
Derbel and Chaieb, 2012	Central Tunisia	Saharian desert		perennial	xerophytic shrub	phog	*Calligonum polygonoides*	2.2	excavatio n	drawings	47	no rain Jun-Aug		dune			sand						33.4911	8.7969	27	The coarse root systems of C. polygonoides were characterized by an intensive shallow	Longitude gives 79° - interpreted as 49"... tap root short but lateral
Derbel and Chaieb, 2012	Central Tunisia	Saharian desert		perennial, evergreen	xerophytic shrub		*Ephedra alata - alenda*	1.9	excavatio n	drawings	47	no rain Jun-Aug		dune			sand						33.3803	8.7393	44	E. alata showed a dual strategy, that is, development of a deep taproot with	
Derbel and Chaieb, 2012	Central Tunisia	Saharian desert		perennial	xerophytic shrub		*Anthyllis henoniana*	1.2	excavatio n	drawings	47	no rain Jun-Aug		reg			loamy sand						33.2847	9.6914	203	Anthyllis henoniana was a tap-rooted perennial shrub. Its short pivot root	
Derbel and Chaieb, 2012	Central Tunisia	Saharian desert		perennial	xerophytic shrub		*Henophyton deserti*	1.6	excavatio n	drawings	47	no rain Jun-Aug		deflation			sand						33.2847	9.7114	197	The root system of H. deserti was both deep and surface branched. It was	
Dittmer, 1959	North-Central Arizona	arid desert		perennial	small shrub	bush morning-glory	*Ipomoea leptophylla*	1.85	excavatio n	drawings				on dunes			sand						35.4248	-106.6531	1652	most conspicuous of the larger species on the dunes and throughout most of the	Most of the work was done on the dunes in the vicinity of the Santa
Dittmer, 1959	North-Central Arizona	arid desert		annual	herb	prickly Russian	*Salsola pestifer A.*	0.67	excavatio n	drawings				dune margin			caly / graval						35.4415	-106.6512	1622	occupies much of the soil around the margins of dunes. It is characterized by a	Root systems of 13 species were examined from several sites
Dittmer, 1959	North-Central Arizona	arid desert		perennial	herb	Silverleaf nightshade	*solanum elaeagnifoliu*	1.14	excavatio n	drawings				shallow sandy areas			sand with hard caliche	caliche					35.3818	-106.6305	1685	grows in shallow sandy areas where the ground is quite solidly p acked, often in	The dunes extend for about 20 miles along an intermittent stream.
Dittmer, 1959	North-Central Arizona	arid desert		annual	herb	Texas croton	*Croton texensis*	0.32	excavatio n	drawings				shifting dune sand			sand						35.3837	-106.5931	1641	found rathera bundantly on the shifting dune sands. It develops a long tap root with	

Dittmer, 1959	North-Central Arizona	arid desert		perennial	shrub	rubber rabbitbrush,	*Chrysothamnus nauseosus*	> 3.92	excavation	drawings				side of 12' tall bank		sand, gravel, hard clay, then						35.3808	-106.5814	1618	the tallest of the shrubs growing in the dune area. The root system is	roots penetrated all hard layers
Dittmer, 1959	North-Central Arizona	arid desert		annual	herb	flatspine burr	*Franseria acanthicarpa*	1.54	excavation	drawings				loose dune sand		sand						35.3798	-106.5960	1670	The plant has a conspicuous tap root which is very deep-penetrating (Fig. 6). This root	
Dittmer, 1959	North-Central Arizona	arid desert		perennial	shrub	small-leaf globemallo	*Sphaeralcea parviflora A.*	0.8	excavation	drawings				dune margin		compact sand-clay						35.3913	-106.5923	1624	a large tap root and several major roots arising from the base of the plant. The tap	
Dittmer, 1959	North-Central Arizona	arid desert		perennial	shrub	broom dalea	*Dalea scoparia A.*	1.52	excavation	drawings				loose dune sand		sand						35.3985	-106.6469	1655	grows freely in the loose sand with its long slender and sparingly-branched roots often	
Dittmer, 1959	North-Central Arizona	arid desert		perennial	cactus	Abrojo, Candelabru	*Opuntia arborescens*	0.91	excavation	drawings				dune margin		sand						35.4432	-106.6595	1630	commonly found on the margins in the more compact sandy clay soils. It is one of	
Do et al., 2008	Sahel, northern	arid desert		semi-evergreen or	tree	Umbrella thorn acacia	*Acacia tortilis*	25	soil samples	no	280		>2000		31	deep and sandy						16.3333	-15.4167	26	39 mature individuals located in a 1-ha area protected since 1989. Acacia tortilis	northern Senegal, near village Souilene (16°20' N, 15°25'W, 5–10
Donovan et al., 1996	Mono Lake, California	arid desert		deciduous broad-leaf	shrub	rubber	*Chrysothamnus nauseosus*	4	soil pits and cores	to 1m	160	little in Jun-Aug		2km from the closed	3.4 - 5.0	4.2	2-3.6m dune sand on lake						38.0817	-118.9632	1958	Both shrub species are phreatophytic, indicating that they are generally rooted	site moved 0.36km from given lat-lon (to minute) to be at 1958m
Donovan et al., 1996	Mono Lake, California	arid desert		deciduous broad-leaf	shrub	greasewood, seepwood,	*Sarcobatus vermiculatus*	4	soil pits and cores	to 1m	160	little in Jun-Aug		2km from the closed	3.4 - 5.0	4.2	2-3.6m dune sand on lake						38.0817	-118.9632	1958	Roots of both species penetrate much deeper than 1m and were occasionally	elevation and at the same distance from lake shore
Dorji et al., 2013	near Nam Tso lake, central	alpine meadow		perennial	sedge	bog sedges	*Kobresia pygmaea*	0.1	unclear	no	415	falls mainly Jun-Sep										30.7175	91.0407	4872	We defined K. pygmaea as a shallow-rooted, early-flowering species because it	The mean annual temperature is -0.6°C; permafrost likely
Dorji et al., 2013	near Nam Tso lake, central	alpine meadow		perennial	herb		*Potentilla saundersiana*	0.1	unclear	no	415	falls mainly Jun-Sep										30.7175	91.0407	4872	We defined P. saundersiana as a shallow-rooted, mid-flowering species because it	
Dorji et al., 2013	near Nam Tso lake, central	alpine meadow		perennial	herb		*Astragalus rigidulus*	0.3	unclear	no	415	falls mainly Jun-Sep										30.7175	91.0407	4872	We defined A. rigidulus as a deeprooted, late-flowering species because it has a	
Dorji et al., 2013	near Nam Tso lake, central	alpine meadow		deciduous	shrub		*Potentilla fruticosa*	0.3	unclear	no	415	falls mainly Jun-Sep										30.7175	91.0407	4872	We defined P. fruticosa as a deep-rooted, mid-flowering species because it is a shrub	
Douglas, 1989	Denali National Park,	Taiga	East Branch of Toklat River	deciduous broad-leaf	clonal shrub	Setchell's willow	*Salix setchelliana*	0.1	excavation	drawing	360	mostly in summer		ephemeral gravel bars			sandy -gravelly						63.5051	-149.9788	980	This willow is found in the Alaska Range and western Yukon Territory on gravelly and sandy substrata. Vertical shoots	a drawing shows rooting depth of 6cm; author states up to 10cm, the given lat-lon moved to a bar and to match given elevation
Douglas, 1989	Denali National Park,	Taiga	the Teklanika River	deciduous broad-leaf	clonal shrub	Setchell's willow	*Salix setchelliana*	0.1	excavation	drawing	360	mostly in summer		ephemeral gravel bars			sandy -gravelly						63.6871	-149.5889	750	(rooms) arise from a horizontal root	
Drexhage & Gruber, 1998	N. Harz Mountain,	temperate forest	north-facing slope	evergreen needle-leaf	tree	Norway spruce	*Picea abies*	1	root excavation	to 1m	1315	evenly distributed		12 degree N facing slope			Coarse textured			Devonian sandstone	3.5		51.6850	10.4205	514	The maximum depth of skeletal roots varied between 0.5 and 1.0 m on the north-facing slope and between 0.7 and 0.8 m on the southfacing slope (Fig. 3). The maximum rooting depth measured on the plateau area was 0.8 m	This study focuses on structural roots only (woody skeleton roots); excavation terminated where tap roots is thinner than 5mm; annual root growth rates measured by rings
Drexhage & Gruber, 1998	N. Harz Mountain,	temperate forest	south-facing slope	evergreen needle-leaf	tree	Norway spruce	*Picea abies*	0.8	root excavation	to 1m	1315	evenly distributed		18 degree S-facing slope			Coarse textured			Devonian sandstone	3.5		51.6818	10.4173	514		
Drexhage & Gruber, 1998	N. Harz Mountain,	temperate forest	plateau site	evergreen needle-leaf	tree	Norway spruce	*Picea abies*	0.8	root excavation	to 1m	1315	evenly distributed		5 degree plateau			Coarse textured			Devonian sandstone	3.5		51.6831	10.4199	585		
Dumortier, 1991	Belgium	temperate wetland	wet site	perennial	grass	Acute Sedge, ...	*Carex acuta, Glyceria*	0.2	soil cores	yes				alluvial plain	0 - 0.6		no profile, humus (0.1m)						51.1004	3.6702	4	The investigation was carried out in two hayfields in the nature reserve 'Bourgoyen-	
Dumortier, 1991	Belgium	temperate wetland	dry site	perennial	grass	Yorkshire fog, sweet	*Holus lanatus,*	1	soil cores	yes				alluvial plain	0 - 0.9		no profile, humus (0.1m)						51.1009	3.6671	6		
Du et al., 2010	SE China, Gutian	subtropic evergreen		perennial	rhizomatous forb		*Diplopterygium glaucum*	< 0.3 (rhizome)	cutting	no	1964	monsoonal										29.2452	118.1220	409	thesoilwascut down	location is center of box given
Duncan, 1935	near Bloomingdale	temperate deciduous	on edge of forests	deciduous broad-leaf	rhizomtous shrub	shining sumac,	*Rhus copallina L.*	1.42	excavation	drawing	1016	evenly distributed					limy and sandy clay or mixture				in abandoned	39.1137	-86.6567	269	propogates largely by long rhizomatous roots; laterals end with dense clusters of	"growth water is present in the soils nearly all times; all the roots
Duncan, 1935	near Bloomingdale	temperate deciduous	open pastures	deciduous broad-leaf	shrub	Climbing prairie rose,	*Rosa setigera Michaux*	0.64	excavation	drawing	1016	evenly distributed		near the top of a grassy			limy and sandy clay or mixture				in abandoned	39.0917	-86.6346	252	seven lateral roots, extending horizonally to upto 1.35m; numerous secondary	non-glciated terrain of southern Indiana
Duncan, 1935	near Bloomingdale	temperate deciduous	old pastures, in Brown	deciduous broad-leaf	shrub	Climbing prairie rose,	*Rosa setigera Michaux*	1.57	excavation	drawing	1016	evenly distributed		old pasture on top of a			limy and sandy clay or mixture				in abandoned	39.0765	-86.1494	220	the 5 laterals are similar to above; the tap root, the deepest of any found, extended	
Duncan, 1935	near Bloomingdale	temperate deciduous	forest edge	deciduous broad-leaf	rhizomtous shrub	Allegheny blackberry,	*Rubus allegheniensi*	1.03	excavation	drawing	1016	evenly distributed					limy and sandy clay or mixture				in abandoned	39.1146	-86.5829	221	many branching laterals; canes arise from superficial laterals forming the crown, from	canes biennial, roots perennial
Duncan, 1935	near Bloomingdale	temperate deciduous	hilltop	deciduous broad-leaf	tree	large-tooth or big-tooth	*Populus grandidentat*	1.2	excavation	drawing	1016	evenly distributed		on top or side of hills			limy and sandy clay or mixture				in abandoned	39.0646	-86.6254	288	many root suckers as far as 13.1m away from parent; the vertical roots are rather	
Duncan, 1935	near Bloomingdale	temperate deciduous	on top of ridges	deciduous broad-leaf	small tree	Sassafras, White	*Sassafras officinale*	1.35	excavation	drawing	1016	evenly distributed		on top of ridges			limy and sandy clay or mixture				in abandoned	39.0192	-86.6003	289	extensive network of lateral roots with suckers; pernicious week tree	
Duncan, 1935	near Bloomingdale	temperate deciduous	hilly sites	deciduous broad-leaf	stolonous shrub	Coralberry, Indian	*Symphoricarpos orbiculatus*	1.18	excavation	drawing	1016	evenly distributed		hilly localities			limy and sandy clay or mixture				in abandoned	39.1487	-86.4628	249	produces numerous stolons or runners which root at intervals in the course over	"Weaver and Kramer (32) found that this plant in Nebraska
Duncan, 1935	near Bloomingdale	temperate deciduous	old pasterures	deciduous broad-leaf	large climbing vine	common greenbrier	*Smilax rotundifolia L.*	1.5	excavation	drawing	1016	evenly distributed					limy and sandy clay or mixture				in abandoned	39.0397	-86.5124	223	spread by numerous rhizomes which send up shoots in intervals; feeding roots	
Dupuy & Dreyfus, 1992	Central Senegal,	grass savanna	Louga	deciduous broad-leaf	tree	Acacia albida	*Acacia albida*	34	soil coring	rhizobia profile	300			farm fields		34						15.6357	-16.2646	43	Up to now, it has been generally observed that populations of rhizobia were restricted to the upper soil horizons, mostly because studies were focused on annual crops with relatively shallow root systems. When dealing with deeply rooting trees, rhizosphere microorganisms, including	Fine roots abundance seems to correlate with rhizobium abundance. The two clusters of high rhizobia populations near the clearly rhizobia are more abundant in moist soil, likely because there root presence is inferred from rhyzobium presence in root
Dupuy & Dreyfus, 1992	Central Senegal,	grass savanna	Diokaul	deciduous broad-leaf	tree	Acacia albida	*Acacia albida*	16.5	soil coring	rhizobia profile	500			farm fields		16.5						15.3682	-16.5186	50		
Dupuy & Dreyfus, 1992	South Senegal,	tree savanna	Djinaki	deciduous broad-leaf	tree	Acacia albida	*Acacia albida*	4.5	soil coring	rhizobia profile	1100			paddy fields		4.5						12.9557	-16.4591	12		
Dupuy & Dreyfus, 1992	South Senegal,	tropical rainforest	Kabrousse	deciduous broad-leaf	tree	Acacia albida	*Acacia albida*	1.5	soil coring	rhizobia profile	1500			paddy fields		1.5						12.3502	-16.7166	6		
Dye, 1996	Mpumalanga, N. South	plantation	site-1, less sandy, 4yr old	evergreen broad-leaf	tree	flooded gum	*Eucalyptus grandis*	>8	unclear	no	1459			relatively flat ridge			53-79% sand, ferralsols			granite	>38m	plantation, recharge	-24.8167	30.7167	1610	at Site 1, it is evident that significant soil water uptake was occurring, particularly at	Frankfort State Forest...rooting depth inferred from soil water
Dye, 1996	Mpumalanga, N. South	plantation	site-2, 2km away, sandier,	evergreen broad-leaf	tree	flooded gum	*Eucalyptus grandis*	>28	unclear	no	1459			relatively flat ridge			56-93% sand, ferralsols			granite	>38m	plantation, recharge	-24.8283	30.7146	1730	There was relatively little change in soil water uptake with increasing soil depths to	2km from site-1, with sandier soil...
Eamus et al., 2002	near Darwin, Australia	tropical Eucalypt	Humpty Doo site	evergreen broad-leaf	tree	Darwin Stringybark	*Eucalyptus tetrodonta*	>4	trench	yes	1651	95% in Nov-Mar					infertile loamy sand						-12.5780	131.1139	44		lat-lon so messed up! 120 south???? that given for Humpty
Eamus et al., 2002	near Darwin, Australia	tropical Eucalypt	Humpty Doo site	evergreen broad-leaf	tree (legume)	Cooktown Ironwood	*Erythrophleum*	>3	trench	yes	1651	95% in Nov-Mar					infertile loamy sand						-12.5780	131.1139	44		trench depth is 2m, but Fig.2 root biomass profiles are used to project
Eis, 1974	Vancouver Island,	temperate evergreen	Chemainus silt loam	evergreen needle-leaf	tree	western hemlock	*Tsuga heterophylla*	1.25	excavated	yes				well drained	~1.00		silty loam, on gravely silty	hardpan of impervious	0.8-0.9				48.8113	-123.9977	178	The study was conducted in the Cowichan Lake ar~a on Vancouver Island, British	rootind depth is mean of 9 trees
Eis, 1974	Vancouver Island,	temperate evergreen	Chemainus silt loam	evergreen needle-leaf	tree	western red cedar	*Thuja plicata*	1.19	excavated	yes				well drained	~1.00		silty loam, on gravely silty	hardpan of impervious	0.8-0.9				48.8113	-123.9977	178	a high water table during winter and spring in Chemainus soils formed a barrier to root	mean of 9 trees; frequent mottling and the mentioning of roots
Eis, 1974	Vancouver Island,	temperate evergreen	Chemainus silt loam	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	1.32	excavated	yes				well drained	~1.00		silty loam, on gravely silty	hardpan of impervious	0.8-0.9				48.8113	-123.9977	178		rootind depth is mean of 6 trees
Eis, 1974	Vancouver Island,	temperate evergreen	Shallow organic forest	evergreen needle-leaf	tree	western hemlock	*Tsuga heterophylla*	0.37	excavated	yes				excessively drained						Bedrock of volcanic	0.25		48.8244	-123.9926	354	lateral roots often crossed rock crevices, but the tap root had a tendency to	rootind depth is mean of 9 trees
Eis, 1974	Vancouver Island,	temperate evergreen	Shallow organic forest	evergreen needle-leaf	tree	western red cedar	*Thuja plicata*	0.37	excavated	yes				excessively drained						Bedrock of volcanic	0.25		48.8244	-123.9926	354	Mature trees on shallow organic soil (Table 1) averaged 6-9 km of fine roots.	rootind depth is mean of 9 trees
Eis, 1974	Vancouver Island,	temperate evergreen	Shallow organic forest	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	0.37	excavated	yes				excessively drained						Bedrock of volcanic	0.25		48.8244	-123.9926	354		rootind depth is mean of 6 trees
Eis, 1987	Vancouver Island,	temperate evergreen	Shawnigan stony sandy	evergreen needle-leaf	tree	western hemlock,	*Tsuga heterophylla,*	0.85	hydraulic excavatio	yes				gentle slopes by			stony (20%) fine sand to loamy	cemented sand	1.2				48.8007	-124.1341	183	three trees (3 different species) of not too different size growing in similar soil and	unlike the earlier study, the three species are lumped together
Eis, 1987	Vancouver Island,	temperate evergreen	Chemainus silt loam	evergreen needle-leaf	tree	western hemlock,	*Tsuga heterophylla,*	1.2	hydraulic excavatio	yes				valley floor	2.3 - 3.5	2.9	1.2m loamy sand over						48.8127	-124.1337	167	in Chemainus soil, having about 1.2 m of stone-free, fine loamy sand over the same	Originally all trees had a well-developed taproot, but with
Eis, 1987	Vancouver Island,	temperate evergreen	Sallow sandy soil on	evergreen needle-leaf	tree	western hemlock,	*Tsuga heterophylla,*	0.6	hydraulic excavatio	yes				rough mountain			stony (40%) sandy loam or			andesite	0.3 - 0.5		48.7975	-124.1144	264	On hillsides, root penetration is restricted by bedrock, which is seldom deeper than	Root density decrease with depth, then increases sharply just above
Elliott, 1924	off Lake Mendota,	temperate broadleaf	U. Wisconsin Marsh	annual	grass	corn	*Zea mays*	0.3	excavation	drawing				flat		0.76	peat soil					drained with tiles	43.1254	-89.4434	270	The tract was part of a peat marsh dyked off from Lake Mendota and under-drained	
Ellsworth & Sternberg,	central Florida	subtropical scrub forest	Sandhill Recently	evergreen broad-leaf	tree	myrtle oak / sand live	*Quercus myrtifolia*	> 1.5	coring to 1.5m,	no	1346	61% in Jun-Sep		on high sand ridge	24.3 +/- 0.1	24.3	well-drained, acid, sands,					burned 2002	27.1880	-81.3364	65	depth of water uptake did not differ between deciduous and evergreen species;	cores too shallow, esp for sandy soils; evergreen or deciduous did
Ellsworth & Sternberg,	central Florida	subtropical scrub forest	Sandhill Recently	deciduous broad-leaf	tree	scrub hickory /	*Carya floridana*	> 1.5	coring to 1.5m,	no	1346	61% in Jun-Sep		on high sand ridge	24.3 +/- 0.1	24.3	well-drained, acid, sands,					burned 2002	27.1880	-81.3364	65	when deciduous woody species had leaves, they accessed principally deep water	not differ in uptake depth in upper soils (<1.5m deep) but they may
Esler & Rundel, 1999	Namaqualand, South Africa		Augrabies, near Port	leaf-succulent	shrub		*Stoebaria sp.*	0.16	excavation	drawing	162	in winter and spring		rocky and hilly			sandy						-28.6024	20.3227	626	Roots drawn from field excavations at Augrabies, near Port Nolloth, Northern Cape Province. Soil catenas are similar at both sites, with shallow rocky soils on the bajada (apron veld) slopes grading into deeper sandy soils below. Except in run-on situations or deep coarse soils with high rates of infiltration, both chamaephytes and phanerophytes in the Succulent Karoo have surprisingly shallow rooting profiles. Few species in our field	the site lat-lon moved to Augrabies where roots were excavated, not
Esler & Rundel, 1999	Namaqualand, South Africa		Augrabies, near Port	leaf-succulent	shrub		*Enarganthe octonaria*	0.1	excavation	drawing	162	in winter and spring		rocky and hilly			sandy						-28.6024	20.3227	626		the site lat-lon moved to Augrabies where roots were excavated, not
Esler & Rundel, 1999	Namaqualand, South Africa		Augrabies, near Port	leaf-succulent	shrub		*Zygophyllum prismatocarp*	0.17	excavation	drawing	162	in winter and spring		rocky and hilly			sandy						-28.6024	20.3227	626		the site lat-lon moved to Augrabies where roots were excavated, not
Esler & Rundel, 1999	Namaqualand, South Africa		Augrabies, near Port	leaf-succulent	shrub		*Ruschia sp.*	0.05	excavation	drawing	162	in winter and spring		rocky and hilly			sandy						-28.6024	20.3227	626		the site lat-lon moved to Augrabies where roots were excavated, not
Esler & Rundel, 1999	Namaqualand, South Africa		Augrabies, near Port	leaf-succulent	shrub		*Cephalophyllum sp.*	0.07	excavation	drawing	162	in winter and spring		rocky and hilly			sandy						-28.6024	20.3227	626		the site lat-lon moved to Augrabies where roots were excavated, not
Esler & Rundel, 1999	Namaqualand, South Africa		Augrabies, near Port	leaf-succulent	shrub		*Euphorbia wallichii*	0.2	excavation	drawing	162	in winter and spring		rocky and hilly			sandy						-28.6024	20.3227	626		the site lat-lon moved to Augrabies where roots were excavated, not
Esler & Rundel, 1999	Mojave Desert,		Midhill site	perennial	clumping grass		*Hilaria rigida*	0.4	excavation	drawing	145	mostly in spring		on the side of a wash			granite alluvium >30 deep						35.1000	-115.4833	1288	Root drawn from Cody-1986. The first site is located on both sides of a wash which	Site location taken from Cody-1986 from which root data is reproduced

Esler & Rundel, 1999	Mojave Desert,		Midhill site	stem succulent	shrub		turpentine broom	*Opuntia ramossissima*	1.47	excavation	drawing	145	mostly in spring		on the side of a wash			granite alluvium >30 deep						34.8000	-115.6333	1227	runs north off the Mid Hills between Mexican Water Spring and Chicken Water Spring. The procedure was repeated at two sites near the base of the Granite Mountains... some 38 km from the Mid Hills site... The greater above-ground structural diversity in the Mojave Desert is reflected in its greater range of rooting depth and form in below-ground architecture (Figure 3).	Site loation taken from Cody-1986 from which root data is reproduced
Esler & Rundel, 1999	Mojave Desert,		Midhill site	deciduous broad-leaf	shrub		turpentine broom	*Thamonosma montana*	1.3	excavation	drawing	145	mostly in spring		on the side of a wash			granite alluvium >30 deep						34.8000	-115.6333	1227		Site loation taken from Cody-1986 from which root data is reproduced
Esler & Rundel, 1999	Mojave Desert,		Granite Mountain site	deciduous broad-leaf	shrub	California Buckwheat	*Eriogonum fasciculatum*	1.1	excavation	drawing	145	mostly in spring		level terrain			granite alluvium						35.1000	-115.4833	1288		Site loation taken from Cody-1986 from which root data is reproduced
Esler & Rundel, 1999	Mojave Desert,		Granite Mountain site	deciduous broad-leaf	shrub	rayless goldenhead	*Acamptopappus*	1	excavation	drawing	145	mostly in spring		level terrain			granite alluvium						35.1000	-115.4833	1288		Site loation taken from Cody-1986 from which root data is reproduced
Esler & Rundel, 1999	Mojave Desert,		Granite Mountain site	deciduous broad-leaf	shrub	spiny menodora	*Mendora spinescens*	1.3	excavation	drawing	145	mostly in spring		level terrain			granite alluvium						35.1000	-115.4833	1288		Site loation taken from Cody-1986 from which root data is reproduced
Esler & Rundel, 1999	Mojave Desert,		Granite Mountain site	evergreen broad-leaf	small tree	Mojave yucca or	*Yucca schidigera*	0.6	excavation	drawing	145	mostly in spring		level terrain			granite alluvium						35.1000	-115.4833	1288		Site loation taken from Cody-1986 from which root data is reproduced
Estrada-Medina et al.,	Merida city, Yucatán,	subtropical dry forest	limestone quarry	drought-deciduous	tree	..., Gumbo-limbo	*Neomillspaugia*	9	root count on quarry	no				exposed quarry walls		9.3	rocky, shallow (0.3m), red,			laja layer	0.3-2.5		20.9049	-89.6340	6	The laja layer is very hard but dissolution karst features and fractures allow roots to	roots penetrates into karst limestone to tap GW
Fan et al., 2012	Xinjiang Uygur, NW	xeric shrubland		perennial	C3 grass		*Karelinia caspica*	1.6	soil sample	yes	134		1877	north slope Tianshan		2.5	chloride-sulfate saline soi						44.7151	85.3785	356	In contrast, the deep-rooted C3 species K. caspica had a larger root/shoot ratio that	root mass distribution peaks at 1.0m depth
Fan et al., 2012	Xinjiang Uygur, NW	xeric shrubland		annual	C4 grass		*Atriplex tatarica*	0.75	soil sample	yes	134		1877	north slope Tianshan		2.5	chloride-sulfate saline soi						44.7151	85.3785	356	As a shallow-rooted C4 species, A. tatarica displayed lower stomatal conductance,	root massdistribution peaks at 0.15m depth
Farrington et al., 1989	Near Perth, Western	Meditarranean woodland	Banksia woodland on	evergreen broad-leaf	trees, tall shrubs, ground		*Banksia attenuata, B.*	8	soil coring to water	yes	800	90% in Apr-Oct	1843	dune top	10.8-12	11.4	humus podzol: leached grey	organic hardpan	6				-31.5212	115.8536	86	The site is on a dune slope of Banksia woodland with a permanent water table at	given lat-lon is off, SW of site in the ocean; given map is used to locate
Farrington et al., 1989	Near Perth, Western	Meditarranean woodland	Banksia woodland mid	evergreen broad-leaf	trees, tall shrubs, ground		*Banksia attenuata, B.*	8	soil coring to water	yes	800	90% in Apr-Oct	1843	dune slope	8.3-9.3	8.8	humus podzol: leached grey	organic hardpan	6				-31.5263	115.9111	78	Core samples taken from three profiles at the top, middle and bottom of the slope	Authors note that "depth to water table, which ranged from 4 to 12m over the site, had little effect on total evaporation." ET did not vary
Farrington et al., 1989	Near Perth, Western	Meditarranean woodland	Banksia woodland	evergreen broad-leaf	trees, tall shrubs, ground		*Banksia attenuata, B.*	4.9	soil coring to water	yes	800	90% in Apr-Oct	1843	sbovr dune bottom	4.3-5.4	4.9	humus podzol: leached grey	organic hardpan	6				-31.5382	115.9370	70	Variation in water table depth over the range present at the site (4-12m) had little	
Farrish, 1991	Near Ruston, N. Louisiana	temperate mix forest	PH-1: upland mixed forest	deciduous broad-leaf,	tree	loblolly pine, southern	*Pinus taeda, Quercus*	> 0.9	soil coring to 0.9m	yes				well-drained			loamy sand, on clay loam, on						32.4760	-92.5934	78	fine roots were found in the deepest sampling layer; Based on extrapolation	6.5km SE of Ruston; this study also differentiate fine roots, and
Farrish, 1991	Near Ruston, N. Louisiana	temperate mix forest	PH-2: upland mixed forest	deciduous broad-leaf,	tree	loblolly pine, southern	*Pinus taeda, Quercus*	> 0.9	soil coring to 0.9m	yes				well-drained			loamy sand, on clay loam, on						32.4591	-92.6120	79	There was also a significant difference in	2.5km from PH-1, maintaining
Farrish, 1991	Near Ruston, N. Louisiana	temperate mix forest	BH: bottomland	deciduous broad-leaf	tree	water oak, sweetgum,	*Quercus nigra,*	> 1.0	soil coring to 1.0m	yes				on fluvial floodplain	0-1.5		loamy sand, on silt loam, poorly-						32.9921	-92.8801	40	76% of biomass and 81% of surface area was located in the upper 40 cm of soil; 5-	both fine root biomass and surface area 6.5km radius from Ruston 56 north of Ruston on the floodplain of Corney Creek, the
February et al., 2011	Namaqualand, W. South	ecotone between		perennial	shrub	Swart T'nouroebos	*Ruschia robusta*	1	excavation	yes	116						nutrient poor coarse sands						-30.5333	18.7167	873	The proportion of root material that belongs to shrubs was significantly higher	max rooting depth extrapolated from Fig. 3 using last 3 points
February et al., 2011	Namaqualand, W. South	ecotone between		perennial	C4 grass		*Stipagrostos brevifolia*	1.2	excavation	yes	116						nutrient poor coarse sands						-30.5333	18.7167	873	The proportion of root material that may be attributed to grasses is lower in the top	max rooting depth extrapolated from Fig. 3 using last 3 points
February et al., 2013	near Darwin, Australia	broadleaved woody		evergreen broad-leaf	tree		*Eucalyptus tetrodonta,*	>0.6	soil pit to 0.6m	yes	1708						sandy loams derived from	laterite	0.6				-12.4095	130.9204	41	Where water is not limiting to tree growth, such as at our study site, fire exclusion will	Eucalyptus dominate; tree roots dominate over annual-perennial
Fenner, 1980	W of Tsavo Natl Park, S	thorn bushland		deciduous broad-leaf	emergent tree	Baobab	*Adansonia digitata*	1.8	gully bank exposure	no	496	no or little rain May-Oct		near bottom of									-2.3289	38.1472	670	These calculations give the following dimensions: height of tree 32.0 m; length	a study demonstrating the amazing storage capacity of Baobad; like
Fisher et al., 2007	Caxiuana National	tropical rainforest	nautral site	evergreen broad-leaf				> 10	soil pits to 10m	yes	2272					10 (in wet season)	yellow Oxisol, 75–83% sand,	stony/laterite layer	3.0 - 4.0				-1.7176	-51.4600	50	The site elevation is 15m above river level in the dry season, and the water table has	Natural site has roots >10m deep, site with 50% through-fall stop at
Foldats & Rutkis, 1975	N Venezuela	tropical savanna	site 7 with WTD obs	evergreen broad-leaf,	tree or shrub	chaparro, curata or	*Curatella americana*	5.0	excavation	no		dry season Nov-Apr			1.7 - 7.4	4.6	macropores,						8.8538	-67.3775	94	The principal physical factors determining the phenology of Curatellaa mericana	"The main roots of the species run close to the soil surface and may
Foldats & Rutkis, 1975	N Venezuela	tropical savanna	site 7 with WTD obs	evergreen broad-leaf	tree or shrub	manteco	*Byrsonima crassifolia*	<5	excavation	no		dry season Nov-Apr			1.7 - 7.4	4.6	heavier soil, low macropores,						8.8538	-67.3775	94	In the Biological Station, chaparros and mantecos live in the same macroclimate.	"the root system of manteco is shallower than that of chaparro;
Flombaum & Sala, 2012	INTA Rio Mayo,	Patagonian steppe		perennial	bunch grass	Desert needle grass	*Stipa speciosa*	0.5	unclear	no	170	rain mostly in fall and					coarse textured with gravel and					species removed/	-45.6833	-70.2667	430	Shrubs have deep roots and absorb water from deeper layers whereas grasses with their shallow roots take up water from upper soil layers. Water resources in these two layers have different seasonal dynamics and consequently shrubs and grasses are linked to two distinct resources. Species in Patagonia show high degree of niche complementarity as a result of traits affecting carbon, water, microclimate, and nitrogen dynamics of the ecosystem.	Rooting depth from Fig.1
Flombaum & Sala, 2012	INTA Rio Mayo,	Patagonian steppe		perennial	bunch grass		*Stipa humilis*	0.45	unclear	no	170	rain mostly in fall and					coarse textured with gravel and					species removed/	-45.6833	-70.2667	430		
Flombaum & Sala, 2012	INTA Rio Mayo,	Patagonian steppe		perennial	bunch grass		*Poa ligularis*	0.7	unclear	no	170	rain mostly in fall and					coarse textured with gravel and					species removed/	-45.6833	-70.2667	430		
Flombaum & Sala, 2012	INTA Rio Mayo,	Patagonian steppe		perennial	shrub	neneo, black grass, grass	*Mulinum spinosum*	0.95	unclear	no	170	rain mostly in fall and					coarse textured with gravel and					species removed/	-45.6833	-70.2667	430		
Flombaum & Sala, 2012	INTA Rio Mayo,	Patagonian steppe		perennial	shrub		*Adesmia volckmanni*	1.4	unclear	no	170	rain mostly in fall and					coarse textured with gravel and					species removed/	-45.6833	-70.2667	430		
Flombaum & Sala, 2012	INTA Rio Mayo,	Patagonian steppe		perennial	shrub	Yuyo moro, rosemary,	*Senecio filaginoides*	1.7	unclear	no	170	rain mostly in fall and					coarse textured with gravel and					species removed/	-45.6833	-70.2667	430		
Follett et al., 1974	SE North Dakota	crop land	A	annual	grass	corn	*Zea mays L.*	0.52	excavation	yes				poorly drained	0.57-1.46	1.33	Fossum sandy loam					crops	46.1359	-98.1233	407	As previously discussed, site A was poorly aerated particularly below 30 cm. Although	lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	B	annual	grass	corn	*Zea mays L.*	0.73	excavation	yes				poorly drained	0.96-1.85	1.71	Fossum sandy loam					crops	46.1358	-98.1327	408	General notes: Ten sites, representing a range of water table conditions, were	lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	C	annual	grass	corn	*Zea mays L.*	0.72	excavation	yes				poorly to somewhat	1.13-2.02	1.89	Hamar sandy loam					crops	46.1327	-98.1422	410	Roots at site C (Fig. 2B) suggest that depth of rooting did not continue to proceed as	lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	D	annual	grass	corn	*Zea mays L.*	0.82	excavation	yes				poorly drained	1.27-2.16	2.02	Fossum fine sandy loam					crops	46.1398	-98.1495	414	General notes: Root distribution was observed to be highly dependent upon	lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	E	annual	grass	corn	*Zea mays L.*	0.81	excavation	yes				poorly drained	1.37-2.26	2.12	Fossum loamy fine sand					crops	46.1327	-98.1599	415		lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	F	annual	grass	corn	*Zea mays L.*	0.81	excavation	yes				moderately well drained	1.42-2.31	2.18	Hecla loamy sand					crops	46.1421	-98.1642	416	Root systems at sites F and J were deeper than at site C, apparently as a result of	lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	G	annual	grass	corn	*Zea mays L.*	0.91	excavation	yes				moderately well drained	1.64-2.54	2.4	Hecla loamy fine sand					crops	46.1294	-98.1763	417		lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	H	annual	grass	corn	*Zea mays L.*	0.91	excavation	yes				moderately well drained	1.79-2.67	2.54	Hecla loamy fine sand					crops	46.1424	-98.1754	422		lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	I	annual	grass	corn	*Zea mays L.*	0.83	excavation	yes				moderately well drained	1.80-2.69	2.56	Hecla loamy sand					crops	46.1271	-98.1940	426		lat-lon aprox on line from Oakes westward
Follett et al., 1974	SE North Dakota	crop land	J	annual	grass	corn	*Zea mays L.*	0.85	excavation	yes				moderately well drained	1.88-2.77	2.64	Hecla loamy fine sand					crops	46.1191	-98.1998	425	Root systems at sites F and J were deeper than at site C, apparently as a result of	lat-lon aprox on line from Oakes westward
Frangi & Lugo, 1985	Puerto Rico, Luquillo	subtropical floodplain		evergreen broad-leaf	tree	montane palm	*Prestoea montana*	1	soil pits + coring	yes	3870-4700			floodplain	0.25-2.00	1.12	coarse with clay lenses						18.2795	-65.7587	750	Almost pure palm stands are found on steep slopes and in floodplains of mountain	location determined by given elevaton on GoogleEarth, on north-
Franzluebbers &	central Georgia, US	managed pasture		perennial	grass	Coastal' bermudagra	*Cynodon dactylon*	> 1.5	soil coring	Org C profile	1250		1560	15 ha upland field			sandy loam					forest converted	33.3514	-83.4042	169		nearest ~15ha upland field is selected; SOC obs only - roots
Freycon et al., 2015	Central African	semi-deciduous	Mbaiki, profile-1	semi-deciduous	emergent tree	sapele or sapelli	*Entandrophragma*	>10	trench wall	yes	1740	dry season in Nov-Mar		top of a plateau			Ferralsols developed on	gravel at 1-3m, on	1.0-3.0	weathered sandstone	4		3.8775	17.9056	564	In the present study, wewere unable to reach themaximumrooting depth and	differentiating fine vs. coarse roots
Freycon et al., 2015	Central African	semi-deciduous	Mbaiki, profile-2	semi-deciduous	emergent tree	sapele or sapelli	*Entandrophragma*	8	trench wall, plus	yes	1740	dry season in Nov-Mar		top of a plateau			Ferralsols developed on	gravel at 1-3m, on	1.0-3.0	weathered sandstone	4		3.8856	17.9036	586	Rooting depth was observed down to a depth of 8m in the Ferralsol at Mbaiki 2;	Deep rooting could also enable the roots to reach the water table, whose depth is estimated to range
Freycon et al., 2015	Central African	semi-deciduous	Ngotto, profile-1	semi-deciduous	emergent tree	sapele or sapelli	*Entandrophragma*	3	trench wall	yes	1740	dry season in Nov-Mar		top of a plateau			Arenosols developed on						4.0208	17.1719	637	In the two topsoil profile at the Ngotto site,we observed a dense root mat;	from 8 to 25 m (Bonsor &
Freycon et al., 2015	Central African	semi-deciduous	Ngotto, profile-2	semi-deciduous	emergent tree	sapele or sapelli	*Entandrophragma*	5.2	trench wall, plus	yes	1740	dry season in Nov-Mar		top of a plateau			Arenosols developed on						4.0278	17.1600	626	Rooting depth was observed down to a depth of 5.20 m in the Arenosol at Ngotto 2	At Ngotto, we were obliged to stop digging at a depth of 3m, due to
Gaines et al., 2015	Shale Hills CZO, central	temperate mixed	ridge	deciduous broad-leaf	tree	oak, maple, pine	*Quercu, Acer, Pinus species*	1	soil coring to 0.99m	yes	1006	evenly distributed		ridge, well drained			well-draines silt loam, shale			fractured shale of many	~0.5		40.6421	-77.9065	278	Based on multiple lines of evidence, including stable isotope natural abundance,	root length sampling was done on N-facing slope near outlet
Gaines et al., 2015	Shale Hills CZO, central	temperate mixed	mid slope	deciduous broad-leaf	tree	oak, maple, pine	*Quercu, Acer, Pinus species*	1	soil coring to 1.09m	yes	1006	evenly distributed		mid slope, well drained			well-draines silt loam, shale			fractured shale of many	~1.0		40.6425	-77.9072	269	sap flux and soil moisture depletion patterns with depth, the majority of water	this is a good example of per-humid climate with frequent rain and
Gaines et al., 2015	Shale Hills CZO, central	temperate mixed	valley	deciduous broad-leaf	tree	oak, maple, pine	*Quercu, Acer, Pinus species*	1	soil coring to 1.02m	yes	1006	evenly distributed		valley, not as well		0.5	fine loam, higher clay			fractured shale of many	~2.0		40.6428	-77.9075	260	Due to seasonally saturated conditions, valley soils had redoximorphic features at	
Gary, 1963	Salt River, C. Arizona	Riparian forest	higher bank	evergreen or deciduous	tree	five-stamen Tamarisk	*Tamarix pentantra*	3.66	excavation	yes				higher bank with 10'		3.05	sandy loam 3', caly 1.5', sandy					introduced species	33.5337	-111.6244	414	Where the water table is deep, tamarisk produced long tap roots, and branch root development is vertical in direction. Radial or horizontal spread of the branch roots is	beautiful scaled-drawings, like Sprakling and Reed; 5 trees of 11ft
Gary, 1963	Salt River, C. Arizona	Riparian forest	lower bank	evergreen or deciduous	tree	five-stamen Tamarisk	*Tamarix pentantra*	0.64	excavation	yes				lower bank with		0.76	clay 1', sand/gravel 2'					introduced species	33.5543	-111.6279	411		one 17ft tall 4in diameter tree
Gary, 1963	Salt River, C. Arizona	Riparian forest	lower bank (2.5' above	deciduous broad-leaf	shrub	seep-willow baccharis	*Baccharis glutinosa*	0.58	excavation	yes				lower bank (2.5' above		0.76	clay 1', sand/gravel 2'						33.5539	-111.6252	411	The plant is seldom found away from sources of perennial surface water...All	8 plants of 10ft tall and 1" diameter
Gary, 1963	Salt River, C. Arizona	Riparian forest	sandy site with 4' WTD	evergreen	rhizomatous shrub	arrowweed	*Pluchea sericea*	1.31	excavation	yes				sandy site with 4' WTD		1.22	sand						33.5546	-111.6227	412	Lateral root development was exhibited on all plants excavated. Most arrowweed	3 plants of 6' tall and 0.7" diameter
Gaze et al., 1998	Sahel, SW Niger	grass savanna	4km W of ICRISAT	deciduous broad-leaf	shrub		*Guiera senegalensis*	>3.5	soil samples	yes	585		2294	2-3% slope		32	sandy (2-5m deep)	weathered laterite	2.0 - 5.0			regenerating natural	13.2265	2.2567	214	This sandy soil was 2 to 5 m deep overlying a weathered laterite layer. Below this was a	roots for G. s. are not followed below 2m (Fig.2) but water
Gaze et al., 1998	Sahel, SW Niger	grass savanna	4km W of ICRISAT	annual and perennial	herbs and grass		*Cassia mimosoides,*	0.4	soil samples	yes	585		2294	2-3% slope		32	sandy (2-5m deep)	weathered laterite	2.0 - 5.0			regenerating natural	13.2283	2.2538	214	maximum depth of wetting front in 1993 is 3.75 - 4.0m (Table-1)	given longitude off - should be 2 degree E, not 20; there is a photo
Gemmer, 1928	W. Florida, Choetawhatc	subtropical moist forest		evergreen needle-leaf	tree	Longleaf pine	*Pinus palustris*	2.13	excavation	drawing							sandy coastal plain						30.5701	-86.6001	50	The tap-root was five and a half feet long, stocky, and a firm anchor for the little tree.	Figure shows max depth at 7 feet; location at the center of the
Gentile et al., 2003	S. Uruguay	temporate grassland		perennial	grass	tall fescue	*Festuca arundinacea*	1.7	soil coring	yes	1100	evenly distributed					silty clay loam					mixed cropping	-34.3320	-57.6834	61	The maximum rooting depth was greater than 1 m for each of the species. All three	extrapolated from Fig.1 - very uncertain

Gentile et al., 2003	S. Uruguay	temporate grassland		perennial	herb	alfalfa	*Medicago sativa L.*	2	soil coring	yes	1100	evenly distributed					silty clay loam					mixed cropping	-34.3320	-57.6834	61	Tall fescue and chicory had a large number of root axes present in the top 20 cm.	extrapolated from Fig.1 - very uncertain
Gentile et al., 2003	S. Uruguay	temporate grassland		perennial	herb	chicory	*Cichorium intybus L.*	1.8	soil coring	yes	1100	evenly distributed					silty clay loam					mixed cropping	-34.3320	-57.6834	61		extrapolated from Fig.1 - very uncertain
Germon et al. 2016	S France, Restinclières	Mediterranean woodland	alley-cropping plot	deciduous broad-leaf	tree	eastern black walnut	*Juglans regia×nigra*	4.7	mini rhizotron	no	873	min Jul, max Sep-Dec			5.0 - 7.0	6	silty clay (25 % clay 60 % silt)					crop-tree intercroppi	43.7047	4.0343	62	Deep (>2.5 m) root growth occurred at two distinct periods, at bud break in spring and	the lat-lon given is in a forest on ridge top; moved to nearest inter-
Gevorkiantz et al., 1943	Northern Minnesota	Boreal forest	Cutfoot Experimental	evergreen needle-leaf	tree	jack pine	*Pinus banksiana*	2.9	excavation	no													47.5458	-94.0635	413	...root washing studies on the Cutfoot Experimental Forest near Deer River,	The author did not conduct the study but report "Conducted by H.
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-1, or Site-C in Gile et al.,	evergreen broad-leaf	shrub	creosotebush	*Larrea tridentata*	1.6	excavation	drawings	247	8 month dry season		upper bajada, 4%			loamy, with gravel-stone	petrocalcic horizon	0.3				32.4709	-106.7538	1400	Radial spread of both roots > 2 m...some angled upward to <7 cm of surface. Several	root depth read from Fig.13 in Gile et al., 19988 (Site-C)
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-1, or Site-C in Gile et al.,	semi-deciduous	shrub	tarbush	*Flourensia cernua*	1.00	excavation	drawings	247	8 month dry season		upper bajada, 4%			loamy, with gravel-stone	petrocalcic horizon	0.3				32.4709	-106.7538	1400	most tarbush roots were above petrocalcic horizon but were traced into the	root depth read from Fig.14 in Gile et al., 19988 (Site-C)
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-2, or Site-A in Gile et al.,	evergreen broad-leaf	shrub	creosotebush	*Larrea tridentata*	5.50	excavation	drawings	247	8 month dry season		toe of bajada, 1%			fine loamy	2 calcic horizons	0.8 and 2.3				32.4828	-106.7369	1316	Roots of both plants extended through calcic horizon... root of one traced to a	root sketch shown in Fig.2; root not followed below 5m but appears
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-2, or Site-A in Gile et al.,	semi-deciduous	shrub	tarbush	*Flourensia cernua*	3.50	excavation	drawings	247	8 month dry season		toe of bajada, 1%			fine loamy	2 calcic horizons	0.8 and 2.3				32.4828	-106.7369	1316	A few roots of a tarbush 0·9 m tall and 1·2 min diameter were excavated at Site-2...	A drawing of this root system appears in Gile et at. (1998).
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-2, or Site-A in Gile et al.,	perennial	herb	silver-leaf nightshade,	*Solanum elaeagnifolium*	1.10	excavation	drawings	247	8 month dry season		toe of bajada, 1%			fine loamy	2 calcic horizons	0.8 and 2.3				32.4828	-106.7369	1316	Root systems of tobosa and three perennial forbs were excavated at Site 2.	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-3, or Site-B in Gile et al.,	evergreen broad-leaf	shrub	creosotebush	*Larrea tridentata*	2.00	excavation	drawings	247	8 month dry season		on bajada, 2% slope			fine sandy loamy						32.4886	-106.7515	1334	Most roots occurred in upper 1m. Roots of separate plants were highly intermingled,	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-3, or Site-B in Gile et al.,	semi-deciduous	shrub	tarbush	*Flourensia cernua*	1.50	excavation	drawings	247	8 month dry season		on bajada, 2% slope			fine sandy loamy						32.4886	-106.7515	1334	Roots of a plant 1·2 m tall and 0·9 m in diameter excavated... Tarbush roots were	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-3, or Site-B in Gile et al.,	perennial	herb	desert zinnia,	*Zenia acerosa,*	1.10	excavation	drawings	247	8 month dry season		on bajada, 2% slope			fine sandy loamy						32.4886	-106.7515	1334	Roots of perennial forb desert zinnia and shrub-like broom snakeweed... had short	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-4	semi-deciduous	shrub	tarbush, Berlandier's	*Flourensia cernua,*	3.00	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon					32.5227	-106.7435	1315	Tarbush roots spread laterally ~2·2 m and some grew at upward angles to <2 cm of	root depth from Fig.5, Fig.6 and Fig.7, site on road - easy to locate
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-4	perennial	grass	black grama	*Bouteloua eriopoda*	0.45	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon					32.5227	-106.7435	1315	Radial extension was about 40 em and a few roots reached the top of the calcic	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-4	perennial	grass	fluffgrass	*Dasyochloa pulchella*	0.30	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon					32.5227	-106.7435	1315	Roots had a lateral spread of 29 cm and reached 30 cm depth.	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-4	perennial	grass	bush muthly	*Muhlenbergia porteri*	0.65	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon					32.5227	-106.7435	1315	Bush muhly roots extended laterally 40 em and to 65 em depth (Fig. 7)	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-4	perennial	grass	red threeawn	*Aristida purpurea*	0.95	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon					32.5227	-106.7435	1315	Red threeawn roots extended laterally 94 em and to the top of the calcic horizon (Fig.	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-5	perennial	herb	desert holly, sicklepod	*Perezia nana, Hoffmanseggia*	1.00	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon	0.7-2.5				32.5244	-106.7488	1316	Site 5 is dominated by tarbush and the stoloniferous, sod-forming burrograss...	site just off road
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-5	perennial	herb	flameflower	*Talinum angustissimum*	0.70	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon	0.7-2.5				32.5244	-106.7488	1316	Three flameflower tubers, one of which is shown in Fig. 8, were excavated and the	root depth from Fig.8
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-5	semi-deciduous	shrub	tarbush	*Flourensia cernua*	3.00	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon	0.7-2.5				32.5244	-106.7488	1316	Although not illustrated, roots of burrograss were traced to a depth of 1 m	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-6	semi-deciduous	shrub	tarbush	*Flourensia cernua*	5.50	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon	0.8-1.2				32.5280	-106.7502	1316	Several major branches traced through the calcic horizon, which extended from about	site just off road
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-6	perennial	grass	tobosa	*Pleuraphis mutica*	1.00	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon	0.8-1.2				32.5280	-106.7502	1316	Tobosa roots had well developed first-order branches and spread laterally about	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-6	perennial	grass	burrograss	*Scleropogon brevifolius*	1.10	excavation	drawings	247	8 month dry season		toe of bajada,			fine loamy	argillic horizon	0.8-1.2				32.5280	-106.7502	1316	Roots of burrograss had a lateral spread of about 20 em and penetrated into the calcic	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-8	evergreen photo stem	shrub	crucifixion thorn	*Koeberlinia spinosa*	6.00	excavation	drawings	247	8 month dry season		fan-toe slope, 0.5%			fine silt						32.5458	-106.7310	1316	At Site 8 roots of a large crucifixion thorn plant 1·5 m tall and 2·5 min diameter were	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-8	semi-deciduous	shrub	tarbush	*Flourensia cernua*	2.20	excavation	drawings	247	8 month dry season		fan-toe slope, 0.5%			fine silt						32.5458	-106.7310	1316	Roots of a tarbush plant 78 em tall and 65 em in diameter were excavated at site 8	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-8	perennial	herb	wrinkled globemallo	*Sphaeralcea hastulata*	1.60	excavation	drawings	247	8 month dry season		fan-toe slope, 0.5%			fine silt						32.5458	-106.7310	1316	Root systems of two wrinkled globemallow plants about 15 em tall... Nine major	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-8	perennial rhizomatous	grass	ear muhly	*Muhlenbergia grenacea*	1.25	excavation	drawings	247	8 month dry season		fan-toe slope, 0.5%			fine silt						32.5458	-106.7310	1316	Roots of ear muhly at Site 8 originated in clusters from nodes on a stolon at 7 cm	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-9	evergreen photo stem	shrub	crucifixion thorn	*Koberlinia spinosa*	3.30	excavation	drawings	247	8 month dry season		fan-toe slope, 0.5%			fine silt						32.5444	-106.7259	1316	Roots of 2 small crucifixion thorn... Tap roots of both well-developed, tap root of	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-9	evergreen broad-leaf	shrub	four-wing saltbush	*Atriplex canescens*	3.50	excavation	drawings	247	8 month dry season		fan-toe slope, 0.5%			fine silt						32.5444	-106.7259	1316	Roots of a four-wing saltbush plant 1·5 m tall and 1 m in diameter with a 5 em tall, 50	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-9	perennial sod-forming	burrograss	burrograss	*Scleropogon brevifolius*	0.96	excavation	drawings	247	8 month dry season		fan-toe slope, 0.5%			fine silt						32.5444	-106.7259	1316	Roots of burrograss at Site 9 penetrated to 96 em depth but were abundant only to 60	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-17	deciduous broad-leaf	tree	honey mesquite	*Prosopis glandulosa*	3.00	excavation	drawings	247	8 month dry season		Mesa surface, 2%			mosaic of sandy or coarse-loamy	petrocalcic horizon					32.6745	-106.8661	1337	The well-developed tap roots of the three old mesquite plants penetrated to the level	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-12	deciduous broad-leaf	tree	honey mesquite	*Prosopis glandulosa*	5.20	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6060	-106.8411	1326	Calcic pebbles and blocks were found at 78 cm depth but the extremely dense and	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-12	perennial	herb	broom snakeweed	*Gutirrezia sarothrae*	2.40	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6060	-106.8411	1326	The broom snakeweed plant portrayed in Fig. 14 was 36 cm tall and 60 cm in	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-12	perennial	herb	soap tree yaca	*Yucca elata*	0.90	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6060	-106.8411	1326	The access trench at Site 12 provided an opportunity to excavate roots of a soap	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-12	perennial bunch, sod-	grass	mesa dropseed,	*Sporobolus flexuosus,*	1.05	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6060	-106.8411	1326	At Site 12 the root systems of black grama, mesa dropseed [Spombolus flexusosus	Fig. 20
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-12	perennial	herb	rattlesnake weed	*Euphorbia albomatgainat*	0.83	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6060	-106.8411	1326	One of the common perennial forbs at Site 12 was rattlesnake weed (EuphoTbia	Fig.21
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-12	perennial	herb	wooly-white	*Hymenopappus flavescens*	0.86	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6060	-106.8411	1326	Both first-order branches and the two branches of the tap root were traced to	Fig.21
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-14	evergreen broad-leaf	shrub	four-wing saltbush	*Atriplex canescens*	3.50	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6001	-106.8507	1327	Another second-order branch with a beginning diameter of 2·3 mm was traced	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-14	annual	herb	purple curlleaf	*Nama hispidum*	0.80	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6001	-106.8507	1327	Although the top of the tap root was 4 mm in diameter it was only 0·6 mm in diameter	Fig.24
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-14	annual	herb	flax	*Linum australe*	0.60	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.78-2				32.6001	-106.8507	1327	The f1ax plant was 23 em tall and had a very sparse root system. The root was 2·3	Fig.24
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-13	evergreen broad-leaf	shrub	three fans	*Krameria lanceolata*	0.60	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	1.9-2.1				32.6000	-106.8435	1329	The plants were parasitc and large numbers of haustoria were attached to	Fig. 19
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-13	perennial	herb	Cooley's bundleflowe	*Desmanthus cooleyi.*	2.10	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	1.9-2.1				32.6000	-106.8435	1329	Two of these branches penetrated through the petrocalcic horizon to depths of 1·9 and	Fig.22
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-13	perennial	herb	caesalpinia	*Caesalpinia jamesii.*	1.95	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	1.9-2.1				32.6000	-106.8435	1329	The tap root, which branched at 1· 5 m, was traced through a fracture in the	Fig.22
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-13	perennial	herb	dwarf dalea	*Dalea nana*	1.30	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	1.9-2.1				32.6000	-106.8435	1329	From 60 to 90cm depth the numerous first and second order branches grew in all	Fig.22
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-13	annual	herb	faintcrown	*Aphanostephus*	1.40	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	1.9-2.1				32.6000	-106.8435	1329	The 21 em tall faintcrown plant had a prominent tap root 0·7 mm in diameter at	Fig.24. Author notes "The depths attained by faintcrown and purple
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-13	annual	herb	spectacle-pod	*Dimorphocarpa wislizenii*	0.80	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	1.9-2.1				32.6000	-106.8435	1329	The 24cm tall spectacle-pod plant had a number of relatively short horizontal	Fig.24
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-15	perennial	herb	twin-leaf senna	*Cassia bauhinioides*	1.70	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.85				32.6049	-106.8481	1319	tap root traced into a fissure in the petrocalcic horizon to a depth of 85 cm.	Fig. 23
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-15	perennial	herb	silverleaf nightshade	*Solanum elaeagnifolium*	2.40	excavation	drawings	247	8 month dry season					coarse-loamy	argillic horizon	0.85				32.6049	-106.8481	1319	The deeper rooted plant shown in Fig. 23 ended at 2·14 m depth with a terminal	Fig.23
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-16	perennial	herb	leatherweed	*Croton pousii*	1.40	excavation	drawings	247	8 month dry season		0.25% slope			coarse-loamy	argillic horizon	0.75				32.5931	-106.8610	1334	in Fig. 26 even first-order branches sometimes grew upward for an appreciable	Fig.26
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-16	deciduous broadleaf	tree	honey mesquite	*Prosopis glandulosa*	2.60	excavation	drawings	247	8 month dry season		0.25% slope			coarse-loamy	argillic horizon	0.75				32.5931	-106.8610	1334	A few roots from a mesquite plant 68 em tall and 1.5 min diameter were excavated	Fig.25
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-11	deciduous broadleaf	tree	honey mesquite	*Prosopis glandulosa*	5.50	excavation	drawings	247	8 month dry season		lake basin, nearly level			fine silty, a paleosol at 3.2m						32.5918	-106.7415	1321	mesquite is invading a tobosa and burrograss dominated ephemeral lake	on the road, north of site-10
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-11	perennial	herb	wooly sumpweed	*Iva dealbata*	3.10	excavation	drawings	247	8 month dry season		lake basin, nearly level			fine silty, a paleosol at 3.2m						32.5918	-106.7415	1321	A few first-order branches originated above 1 m depth but there was a notable lack of	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-7	perennial	herb	longleaf ephedra	*Ephedra trifurca*	5.10	excavation	drawings	247	8 month dry season					coarse-loamy	calcic horizon	0.6-2				32.5362	-106.7505	1316	Roots were traced outward 7·1 m from the root crowns and one second-order branch	Fig.28
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-7	perennial, bunch	grass	purple threeawn	*Aristida purpurea*	1.70	excavation	drawings	247	8 month dry season					coarse-loamy	calcic horizon	0.6-2				32.5362	-106.7505	1316	Roots traced to 1-3 m depth... One tap root was traced to 1·7 m depth where it	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-7	perennial	herb	wrinkled globemallo	*Sphaeralcea hastulata*	3.40	excavation	drawings	247	8 month dry season					coarse-loamy	calcic horizon	0.6-2				32.5362	-106.7505	1316	Roots arose from a 2·6 mm diameter rhizome at 6 cm depth... Another tap root	

Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-7	perennial	herb	desert zinnia	*Zinnia grandiflora*	1.50	excavation	drawings	247	8 month dry season					coarse-loamy	calcic horizon	0.6-2				32.5362	-106.7505	1316	The tap root, with an upper diameter of 3·3 mm, was traced to 1·5 mm depth (Fig. 29).	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-7	perennial	herb	leatherweed	*Croton pottsii*	1.60	excavation	drawings	247	8 month dry season					coarse-loamy	calcic horizon	0.6-2				32.5362	-106.7505	1316	At 77 cm depth the tap root divided into several branches about 1 mm in diameter.	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-7	perennial	herb	broom snakeweed	*Gutirrezia sarothrae*	1.50	excavation	drawings	247	8 month dry season					coarse-loamy	calcic horizon	0.6-2				32.5362	-106.7505	1316	a 35 cm tall broom snakeweed. .. a number of 2 to 3 mm diameter first-order	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-10	perennial sod-forming	grass	black grama	*Bouteloua eriopoda*	1.60	excavation	drawings	247	8 month dry season		ridge top, 1% slope			coarse-loamy	calcic horizon	1.38				32.5680	-106.7431	1322	Root systems of the above species are illustrated in Fig. 30. Roots of Lehmann	half way from junction to head quarter
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-10	perennial, bunch	grass	spike dropseed	*Sporobolus contractus*	1.30	excavation	drawings	247	8 month dry season		ridge top, 1% slope			coarse-loamy	calcic horizon	1.38				32.5680	-106.7431	1322	lovegrass and spike dropseed were traced to depths of 1·2 and 1·3 m, respectively.	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-10	perennial, bunch	grass	Lehmann lovegrass	*Eragrostis lehmanniana*	1.20	excavation	drawings	247	8 month dry season		ridge top, 1% slope			coarse-loamy	calcic horizon	1.38				32.5680	-106.7431	1322	Black grama roots were traced to 1·6 m depth. Roots of all three species had large	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-10	perennial	herb	leatherwee	*Croton pottsii*	1.78	excavation	drawings	247	8 month dry season		ridge top, 1% slope			coarse-loamy	calcic horizon	1.38				32.5680	-106.7431	1322	Leatherweed was common at Site 10 and roots of one plant are shown in Fig. 31. At	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-10	perennial	herb	paperflower	*Psilostrophe tagetina*	1.76	excavation	drawings	247	8 month dry season		ridge top, 1% slope			coarse-loamy	calcic horizon	1.38				32.5680	-106.7431	1322	The rather massive root crown had a diameter of 11·4 mm and the tap root was	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-18	evergreen broad-leaf	shrub	Torrey's ephedra	*Ephedra torreyana*	0.70	excavation	drawings	247	8 month dry season		0.5% slope			gypsum soil						32.6870	-106.7872	1320	Overall, the gypsum was dense but some areas were so dense that roots did not	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-18	perennial, bunch	grass	gypgrass	*Sporobolus nealleyi*	0.19	excavation	drawings	247	8 month dry season		0.5% slope			gypsum soil						32.6870	-106.7872	1320	Roots traced to 19 cm depth but most spread horizontally up to 53 cm between 4	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-18	perennial	herb	White Sands mustard	*Nerisyrenia linearifolia*	0.62	excavation	drawings	247	8 month dry season		0.5% slope			gypsum soil						32.6870	-106.7872	1320	Major roots had beginning diameters of about 1·3 mm but terminal portions were	
Gibbens and Lenz, 2001;	Chihuahuan Desert, New	xeric shrubland	Site-18	perennial	herb	scarlet gaura	*Gaura coccinea*	0.47	excavation	drawings	247	8 month dry season		0.5% slope			gypsum soil						32.6870	-106.7872	1320	The White Sands mustard plant was 13 cm tall. The tap root had a diameter of 1·65	
Glover, 1950	British Somaliland	semi-arid desert	Guban Ged Dobo	perennial, succulent	shrub		*Adenium somalense*	1.40	excavation	drawings	250			below the escaarpmen			alluvial sand						10.1225	45.2053	579	In the vertical plane the roots reached an overall lateral development of 3.4 metres	site moved slightly to match given elevation (lat-long was given as
Glover, 1950	British Somaliland	semi-arid desert	5 miles E of Hargeisa on	perennial, succulent	herb		*Aloe sp.*	0.65	excavation	drawings	450			on plateau			alluvial sand						9.5918	44.122	1338	The plant examined was 15 cm high with a fleshy horizontal rhizome 45 cm long and 5	
Glover, 1950	British Somaliland	semi-arid desert	Guban Ged Dobo	perennial, succulent	herb		*Caralluma sp.*	0.50	excavation	drawings	250			below the escaarpmen			alluvial sand						10.1225	45.2053	579	From the surface down to about 8cm the soil was slightly darker due to the presence	site moved slightly to match given elevation (lat-long was given as
Glover, 1950	British Somaliland	semi-arid desert	Guban Ged Dobo	perennial, succulent	herb		*Euphorbia sp.*	0.70	excavation	drawings	250			below the escaarpmen			alluvial sand						10.1225	45.2053	579	There was a low sand mound at the base of the plant. The overall lateral extent of the	site moved slightly to match given elevation (lat-long was given as
Glover, 1950	British Somaliland	semi-arid desert	Guban Ged Dobo	perennial, succulent	herb		*Sansevieria ehrenbergii*	0.90	excavation	drawings	250			below the escaarpmen			alluvial sand						10.1225	45.2053	579	A mass of coarse fibrous roots emerged from the junction of the rhizome with the	site moved slightly to match given elevation (lat-long was given as
Glover et al., 2010	C. Kansas, US	crop land	Niles Site	perennial	grass		*26 species*	2.00	soil coring	yes												unfertilized, harvested	38.9676	-97.4732	364	Plant root C, measured at the Niles field site, was 6.7 times greater and the rooting	location slightly moved to grass / crop boundary (lat-lon-given falls in
Glover et al., 2010	C. Kansas, US	crop land	Niles Site	annual	grass	winter wheat	*Triticum aestivum*	1.00	soil coring	yes												fertilized	38.9677	-97.4724	364		
Greenland & Kowal, 1960	near Kade, S Ghana	moist tropical		semi-deciduous	tree		*Diospyros spp.,*	1.65	soil coring	yes	1650			level area of mid lower			silty clay, silty-sandy clay,	ironstone concretions	0.23			50yr old secondary	6.0776	-0.8467	152		location guessed by elevation and slope aspect, to be in a forest not
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Tamarix transect	deciduous broad-leaf	shrub	Saltcedar	*Tamarix ramosissima*	21.90	not clear	no	35	2600		dune top		22.7	silt						37.049	80.747	1362	Water-saturated soil was detected at a depth of 5m at the T. ramosissima site...	The statement left suggests that capillary firnge is 5-4.2=0.8m; since
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Tamarix transect	deciduous broad-leaf	shrub	Saltcedar	*Tamarix ramosissima*	13.20	not clear	no	35	2600		midslope		14	silt						37.0594	80.7405	1353		No actual root data is given, so rooting depth is assumed to be
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Tamarix transect	deciduous broad-leaf	shrub	Saltcedar	*Tamarix ramosissima*	10.80	not clear	no	35	2600		lower slope		11.6	silt						37.0686	80.7279	1348		
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Tamarix transect	deciduous broad-leaf	shrub	Saltcedar	*Tamarix ramosissima*	6.50	not clear	no	35	2600		dune valley		7.3	silt						37.0810	80.7231	1343		
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Populus transect	deciduous broad-leaf	tree	Euphrates Poplar,	*Populus euphratica*	22.15	not clear	no	35	2600		dune top		23.7	silt						36.9897	80.7226	1371	Water-saturated soil was detected at a depth of 7.25 m at the P. euphratica site...	the statement left suggests that capillary firnge is 9.8-7.25=1.55m;
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Populus transect	deciduous broad-leaf	tree	Euphrates Poplar,	*Populus euphratica*	15.25	not clear	no	35	2600		midslope		16.8	silt						37.0000	80.7162	1360		No actual root data is given, so rooting depth is assumed to be
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Populus transect	deciduous broad-leaf	tree	Euphrates Poplar,	*Populus euphratica*	10.65	not clear	no	35	2600		lower slope		12.2	silt						37.0057	80.6880	1358		
Gries et al., 2003	Taklamakan Desert, W.	arid desert	Populus transect	deciduous broad-leaf	tree	Euphrates Poplar,	*Populus euphratica*	8.25	not clear	no	35	2600		dune valley		9.8	silt						37.0111	80.6694	1355		
Groeneveld & Crowley, 1988	Owen Valley, CA	arid desert	natural site	halophytic	shrub	Torrey's saltbush	*Atriplex torrey*	2	trench wall + soil	drawings				arid valley floor		2.2 (top of cap rise at	sandy						36.8162	-118.1494	1164		two sites: artificially flooded or natural; only natural site used; lat
Groeneveld & Crowley, 1988	Owen Valley, CA	arid desert	natural site	perennial	shrub	grey rabbitbrush	*Chrysothamnus nauseosus*	2.4	trench wall + soil	drawings				arid valley floor		2.5 (top of cap rise at	sandy						36.8162	-118.1494	1164	Typically, this species differs from Atriplex torrey by having less strongly expressed	and lon read from Google Earth with WTD in 2.5m range nearest to
Haase et al., 1996	SE Spain	Mediterra shrubland	near well-4	mostly leaf-less	shrub	yellow broom	*Retama sphaerocarpa*	28	lithium chloride	no	218			valley floor		28	sand, gravel						37.1333	-2.3667	655	Water containing lithium chloride as a chemical tracer was applied to the bottom	The field site is in the Rambla Honda, a valley with ephemeral
Haasis, 1921	Near Flagstaff,	arid desert		evergreen needle-leaf	tree	western yellow pine	*Pinus ponderosa*	0.66	excavation	drawings				on S slope below San			Gravelly: Loose or loamy,			basalt			35.2581	-111.6734	2261		286 seedlings studied but data given for 3 only... the oldest, a 4yr
Haigh, 1966	Zululand, South Africa	subtropical dry forest	plantation	evergreen needle-leaf	tree	Caribbean pine	*Pinus caribaea*	5.00	excavation	photo + drawings	825						deep sand					plantation	-27.9255	31.5841	507	aged 16 1/2 yrs (Fig. 2). Tree height about 70' ... Excavation was stopped at a depth of	extrapolated to 16' from Fig.2
Haigh, 1966	Zululand, South Africa	subtropical dry forest	plantation	evergreen needle-leaf	tree	slash pine	*Pinus elliottii*	4.57	excavation	photo + drawings	825						deep sand					plantation	-27.9265	31.5826	504	aged 15 yrs (Fig.4, plate-1), tree height about 60', taproots were found to end at a	only trees > 5yr old are included here, all lat-lon guessed
Haigh, 1966	Zululand, South Africa	subtropical dry forest	plantation	evergreen broad-leaf	tree	lemon-scented	*Eucalyptus citriodora*	0.94	excavation	photo + drawings	825					0.91	deep sand					plantation	-27.9266	31.5840	471	aged 5 1/2 yrs (Fig.5).. Tree height about 20 feet. Two trees were excavated both of	only trees > 5yr old are included here, all lat-lon guessed
Haigh, 1966	Zululand, South Africa	subtropical dry forest	plantation	evergreen broad-leaf	tree	lemon-scented	*Eucalyptus citriodora*	1.55	excavation	photo + drawings	825					1.52	deep sand					plantation	-27.9262	31.5849	494	which had strongly developed taproots and side roots. In each case the tap roots ended	only trees > 5yr old are included here, all lat-lon guessed
Hao et al., 2006	Guangdong Province,	subtropical moist forest		evergreen broad-leaf	tree		*Castanopsis chinensis*	0.7	excavation + soil	yes + photos	1927						lateritic red earth rich in						23.1333	112.5833	97	Pioneer tree roots in the first stage of natural succession were of two types, one	7 species excavated but maximum depth reported only for 1 of them
He & Zhang, 2003	Inner Mongolia,	arid desert	fixed sandland	evergreen needle-leaf	shrub	Savin Juniper or	*Sabina vulgaris*	1.04	excavation	no	360	80% fall Jun-Sep	1230–2650	dune slope			sand					desert due to humans	39.0015	109.1421	1317	The S. vulgaris plants in the lowland with the highest water content showed the shallowest rooting profile with ca. 90% of the roots occurring in the top 60 cm of soil, whereas the plants in the fixed sandland with the lowest water content showed the	Research station location was found in Liu et al., 2010; chose nearest site with given elevation (<1350m) and relief (<10 im 300mx300m area)
He & Zhang, 2003	Inner Mongolia,	arid desert	shifting sandland	evergreen needle-leaf	shrub	Savin Juniper or	*Sabina vulgaris*	1.02	excavation	no	360	80% fall Jun-Sep	1230–2650	dune top			sand					desert due to humans	39.0035	109.1415	1320		
He & Zhang, 2003	Inner Mongolia,	arid desert	lowland	evergreen needle-leaf	shrub	Savin Juniper or	*Sabina vulgaris*	0.86	excavation	no	360	80% fall Jun-Sep	1230–2650	dune valley			sand					desert due to humans	39.0005	109.1431	1315		
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Tie Summit site	evergreen needle-leaf	shrub	Chamise	*Adenostorna fasciculaturn*	> 2.45	excavation	drawings + photos				summit			sandy loam, on loose rock		0.6-1.5	hard but deeply			34.3896	-118.0816	1513	Its root system was generally found to be deeply penetrating... Fine roots were observed in tiny cracks in unweathered rock 25 feet below the surface. Some	More authors' notes: Measurements and observa- tions made on 68 plants at 14 locations in the San Gabriel and San Bernardino Mountains showed the following: 1. Chaparral species and their root systems can be placed into three categories: (a) woody, usu- ally sprouting shrubs with deep-penetrating and wide-spreading systems; (b) woody, usually non- sprouting shrubs with shallow but wide-spreading systems; and (c) subshrubs with shallow, fibrous systems. 2. Roots of some species grew through fractures in the rock or through weathered rock to a depth of at least 28 feet. Subterranean rock crevices were often filled with a mat of living roots. 3. The depth of soil and the extent to which the underlying rock is weathered and
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	road cut - City Creek	evergreen needle-leaf	shrub	Chamise	*Adenostorna fasciculaturn*	7.62	road cut	drawings + photos				face of road cuts			either gravel terraces or						34.1864	-117.1777	795		
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Tie Summit site	evergreen broad-leaf	shrub	Eastwood marizainita	*Arctostaphylos glandalosa*	> 2.74	excavation	drawings + photos				summit			sandy loam, on loose rock		0.6-1.5	hard but deeply			34.3896	-118.0816	1513	In road cuts, roots were observed to a depth of 17 feet. Roots of this species seemed able to penetrate into rock cracks	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	road cut - City Creek	evergreen broad-leaf	shrub	Eastwood marizainita	*Arctostaphylos glandalosa*	5.18	road cut	drawings + photos				face of road cuts			either gravel terraces or						34.1864	-117.1777	795		
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Mount Lowe	evergreen broad-leaf	shrub	Chaparral whitethorn	*Ceanothus leucoderuis*	> 3.66	excavation	drawings + photos							loose coarse sand (0.15m),		0.45	Lowe granodiorit,			34.2249	-118.1095	1372	The specimens excavated had sparsely branched, deeply penetrating root systems.	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	road cut - Tujunga	evergreen broad-leaf	shrub	Chaparral whitethorn	*Ceanothus leucoderuis*	3.66	road cut	drawings + photos				face of road cuts			either gravel terraces or			granitic			34.3055	-118.2610	599	This plant differed from most of the other chaparral species in having a prominent tap	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Brown	evergreen broad-leaf	large shrub	Christmasberry	*Photinia arbutifolia*	> 1.98	excavation	drawings + photos				north side of rounded			litter, humus (0.08-0.15m) on		0.6-1.8	weathered Wilson diorite			34.2269	-118.1600	762	One shrub of this species only 2.5 feet high was excavated at the Brown Mountain site.	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	road cut - Tujunga	evergreen broad-leaf	tree	Canyon live oak	*Quercus chrysolepis*	7.32	road cut	drawings + photos				face of road cuts			either gravel terraces or			granitic			34.3055	-118.2610	599	This tree species was observed only on road cuts, where roots were found at a	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Brown	evergreen broad-leaf	shrub	California scrub oak	*Quercus dumosa*	> 2.44	excavation	drawings + photos				north side of rounded			litter, humus (0.08-0.15m) on		0.6-1.8	weathered Wilson diorite			34.2269	-118.1600	762	The root system was extensive and contained many branches up to 3 inches in diameter. These large roots were somewhat contorted and usually angled	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	road cut - Tujunga	evergreen broad-leaf	shrub	California scrub oak	*Quercus dumosa*	8.53	road cut	drawings + photos				face of road cuts			either gravel terraces or			granitic			34.3055	-118.2610	599		
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - the Colby site	evergreen broad-leaf	shrub	Bigberry manzanita	*Arctostaplylos glallca*	> 2.59	excavation	drawings + photos							sandy loam (0.15m), loose			anorthosit	0.91		34.1969	-118.0831	1006	The major roots of this nonsprouting species were large laterals radiating in all	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Brown	evergreen broad-leaf	shrub	Hoaryleaf ceanothus	*Ceanothus crassifolius*	> 1.37	excavation	drawings + photos				north side of rounded			litter, humus (0.08-0.15m) on		0.6-1.8	weathered Wilson diorite			34.2269	-118.1600	762	The root system of this nonsprouting species was shallow and composed of	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Tie Summit site	evergreen broad-leaf	shrub	Mojave Desert	*Ceanothus greggii var.*	> 1.37	excavation	drawings + photos				summit			sandy loam, on loose rock		0.6-1.5	hard but deeply			34.3896	-118.0816	1513	had roots similar to hoary- leaf ceanothus except that the spread of the root systems	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Brown	evergreen broad-leaf	shrub	Hairy ceanothus	*Ceanothus olihagitilis*	> 1.83	excavation	drawings + photos				north side of rounded			litter, humus (0.08-0.15m) on		0.6-1.8	weathered Wilson diorite			34.2269	-118.1600	762	had prominent tap roots and many well-branched but relatively short laterals... The	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Tie Summit site	evergreen broad-leaf	shrub	Birchleaf mountain-	*Cercocarpus betuloides*	> 1.52	excavation	drawings + photos				summit			sandy loam, on loose rock		0.6-1.5	hard but deeply			34.3896	-118.0816	1513	The root systems were sparsely branched, widely spreading, and confined mainly to	

Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - George's Gap	evergreen broad-leaf	subshrub	Bush monkeyflow	*Diplacus longiflorus*	> 0.76	excavation	drawings + photos				steep east-facing slope			coarse, loose gravel			Lowe granodiorite	>4		34.2726	-118.1864	1097	The much-branched, shallow fibrous root system of this subshrub extended	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - George's Gap	evergreen broad-leaf	subshrub	Thickleaf verbasanta	*Eriodictyon crassifolium*	> 1.37	excavation	drawings + photos				steep east-facing slope			coarse, loose gravel			Lowe granodiorite	>4		34.2726	-118.1864	1097	The only specimen of this subshrub excavated was growing in deep gravel at	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - George's Gap	evergreen broad-leaf	subshrub	California buckwheat	*Eriogonum fasciculatum*	> 1.22	excavation	drawings + photos				steep east-facing slope			coarse, loose gravel			Lowe granodiorite	>4		34.2726	-118.1864	1097	In the deep soil at the George's Gap site, the roots penetrated 4 feet and extended	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Brown	Summer deciduous	subshrub	Deerweed	*Lotus scoparious*	> 1.13	excavation	drawings + photos				north side of rounded			litter, humus (0.08-0.15m) on			weathered Wilson diorite	0.6-1.8		34.2269	-118.1600	762	The 2 plants of deerweed excavated at the Brown Mountain site differed from the	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - George's Gap	evergreen broad-leaf	subshrub	White sage	*Salvia apiana*	> 1.52	excavation	drawings + photos				steep east-facing slope			coarse, loose gravel			Lowe granodiorite	>4		34.2726	-118.1864	1097	The single specimen of this sub-shrub studied had developed a shallow root	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - San Dimas	evergreen broad-leaf	subshrub	Black sage	*Salvia mellifera*	> 0.61	excavation	drawings + photos				old terrace			clay loam, on hardpan, cracks	hardpan	1-1.5				34.2341	-117.7312	762	The root system of this subshrub closely resembled that of white sage except that	
Hellmers et al., 1955	San Gabrial / Bernardino	Chaparral	hydraulic - Mount Lowe	perennial	subshrub	Chaparral yucca	*Yucca whipplei*	> 0.76	excavation	drawings + photos							loose coarse sand (0.15m),			Lowe granodiorit,	0.45		34.2249	-118.1095	1372	This species had a spreading fibrous root system with most roots concentrated in	
Hendrick & Pregitzer,	N. lower peninsula,	temperate hardwood	southern forest	deciduous broad-leaf	tree	sugar and red maple,	*Acer saccharum,*	> 1.0	minirhizotrons to	yes	850						Alfic and Typic Haplorthods on						43.6667	-86.1500	264	shallow roots were responsible for the majority of total production and mortality.	southern site has dimorphic root production all yr except spring
Hendrick & Pregitzer,	N. lower peninsula,	temperate hardwood	northern forest	deciduous broad-leaf	tree	sugar and red maple,	*Acer saccharum,*	> 1.0	minirhizotrons to	yes	810						Entic and Typic Haplorthods on						44.3833	-85.8333	302	Nearly half of all roots growing and dying in the 1 -m profile occurred in the upper 20	
Heyward, 1933	east of Pensacola,	subtropical moist forest	typical longleaf pine	evergreen needle-leaf	tree	longleaf pine	*Pinus palustris*	4.32	excavation	drawings + photo							deep sand (96-98%)						30.4940	-86.7071	24	Drainage is excessive over most of the area... The straight downward course of the taproot, with but minor deviations in direction, is typical for the trees examined...Perhaps the most striking characteristic of both the lateral and the	mean rooting depth of 6 saplings is 1.73m (range: 51-108"), only one
Heyward, 1933	east of Pensacola,	subtropical moist forest	typical longleaf pine	evergreen needle-leaf	tree	longleaf pine	*Pinus palustris*	1.91	excavation	drawings + photo							deep sand (96-98%)						30.4984	-86.7005	32		mean rooting depth of 6 trees is 1.53m, excluding tree X which was
Heyward, 1933	east of Pensacola,	subtropical moist forest	site poorly drained by a	evergreen needle-leaf	tree	longleaf pine	*Pinus palustris*	0.74	excavation	drawings + photo			0.71				deep sand (96-98%)						30.4910	-86.7023	13		mean rooting depth of 3 trees is 0.63m (range 22-29").
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	tall shrub		*Protea neriijolia*	>3	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Re-seeder	location moved slightly to z=400m; mean of 2 specimens
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	tall shrub		*Protea repens*	>3	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Re-seeder	mean of 2 specimens
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	mid-high shrub		*Leucadendron salignum*	>3.5	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Resprouts from a lignotuber	
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	mid-high shrub		*Erica plukenetii*	0.40	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Re-seeder	mean of 2 specimens
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	mid-high shrub		*Cliffortia ruscifolia*	1.50	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Re-seeder	mean of 2 specimens
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	mid-high shrub		*Otholobium fruticans*	1.50	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Resprouts from a lignotuber	
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	geophyte		*Aristea major*	1.45	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Resprouts from a rhizome	mean of 6 specimens
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	evergreen broad-leaf	geophyte		*Watsonia pyramidata*	0.40	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Resprouts from a corm	mean of 2 specimens
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	perennial	grass (graminoid)		*Ischyrolepis gaudichaudia*	0.20	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Resprouts from a stolen	mean of 3 specimens
Higgins et al., 1987	E of Cape Town, South	mountain fynbos,	4m closed shrubland	perennial	grass (graminoid)		*Terraria bromoides*	0.88	excavation	yes	1700	60% in May-Aug					loamy sand, with quartzite			sandstones			-33.9479	18.9218	400	Resprouts from a creeping rhizome	mean of 4 specimens
Hipondoka et al., 2003	Kalahari Sandveld of	the north site		evergreen broad-leaf	tree	black thorn, ...	*Acacia mellifera,*	1.5	soil pits	yes	400						deep sand						-22.3974	21.7208	1088	Both sites showed a healthy grass cover, with no sign of overgrazing... The root profiles exhibited more abundant and dominant grass roots in the surface soil, especially down to 30-cm depth, even in the pits located under the tree canopies... Tree roots are more abundant under tree	The field sites are located in the deep Kalahari Sandveld of Botswana. The first site is ~ 80km south of Ghanzi, lat-lon guessed -
Hipondoka et al., 2003	Kalahari Sandveld of	the north site		perennial	grass			1.1	soil pits	yes	400						deep sand						-22.3974	21.7208	1088		
Hipondoka et al., 2003	Kalahari Sandveld of	the south site		evergreen broad-leaf	tree	Kalahari-sand Acacia,	*Acacia luederitzii, A.*	1.6	soil pits	yes	365						deep sand						-24.0029	21.8617	1123		The second site is located further south, near Tshane. lat-long guessed - just outside and north of the town Tshane, at a site with
Hipondoka et al., 2003	Kalahari Sandveld of	the south site		perennial	grass			1	soil pits	yes	365						deep sand						-24.0029	21.8617	1123		
Hironaka 1961	Gem County, Idaho	semi-arid pasture		annual	bunchgrass	cheatgrass	*Bromus tectorum*	0.91	growth cloth bags	no	381			3° slope facing west			Brent silt loam, developed on an						43.9227	-116.4728	792	site guessed to on a west-facing slope on alluvial fan with 792m elevation near crop	
Hironaka 1961	Gem County, Idaho	semi-arid pasture		annual	bunchgrass	medusahead	*Elymus caput-medusae*	1.02	growth cloth bags	no	381			3° slope facing west			Brent silt loam, developed on an						43.9227	-116.4728	792	site guessed to on a west-facing slope on alluvial fan with 792m elevation near crop	
Hironaka 1961	Gem County, Idaho	semi-arid pasture		perennial	grass	desert crested	*Agropyron desertorum*	0.74	growth cloth bags	no	381			3° slope facing west			Brent silt loam, developed on an						43.9227	-116.4728	792	site guessed to on a west-facing slope on alluvial fan with 792m elevation near crop	
Hironaka 1961	Gem County, Idaho	semi-arid pasture		perennial	grass	intermediate	*Agropyron intermedium*	0.81	growth cloth bags	no	381			3° slope facing west			Brent silt loam, developed on an						43.9227	-116.4728	792	site guessed to on a west-facing slope on alluvial fan with 792m elevation near crop	
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Lithraea caustica*	>> 0.6	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073	The deep rooting pattern of L. caustica is very obvious. Roots with diameters > 2.5	root biomass is still increasing with depth at 0.63m
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Cryptocarya alba*	> 0.6	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073	Cryptocarya alba is different: Most of the stronger roots were found in the 20-40 cm	
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Colliguaya odorifera*	> 0.6	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073	Colliguaya odorifera is shallow rooting with most of the stronger roots growing in the	
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Baccharis rosmarinifolia*	>> 0.6	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073		root biomass is still increasing with depth at 0.63m
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Mutisia retusa*	0.2	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073	At 60cm depth further excavation proved to be nearly impossible; At this depth fine roots were rare but considerable numbers of thicker roots, mostly from Lithraea caustica, were found penetrating the deeper soil layers; approximately five times the shoot biomass of Lithraea caustica is found below ground; intricate meshwork, and grafts were frequently observed at crossings not only between roots of the same shrub but also between	
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Haplopappus sp.*	0.4	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073		
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Satureja gilliesii*	0.2	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073		
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Talguenea quinquenerd*	>> 0.6	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073		root biomass is still increasing with depth at 0.63m
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Stachys sp.*	0.2	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073		
Hoffmann, 1978	near Santiago,	Mediterranean, Chilean		evergreen broad-leaf	sclerophyllous shrubs		*Trichocereus chilgensis*	0.3	excavation	yes	350			27° NE facing slope			compact, hard, clay-sand-gravel			decomposed igneous	0.63		-33.0685	-70.9999	1073		
Holdo & Timberlake	North province, W	tree savanna / subtropical	upper catena, woodland	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	2.6	excavation	drawings	650	falls mostly in Nov-Mar		on hill top			deep, medium-textured						-18.6413	27.0328	1065	There were marked differences in root profile depth and shape among trees found	max rooting depth data from Fig.5. Only upper and lower catena
Holdo & Timberlake	North province, W	tree savanna / subtropical	upper catena, woodland	deciduous broad-leaf	tree	African Rosewood,	*Guibourtia coleosperma*	1.7	excavation	drawings	650	falls mostly in Nov-Mar		on hill top			deep, medium-textured						-18.6413	27.0328	1065	that trees shift their relative root mass allocation to deeper soil as a function of	water logging could be a cause of shallow rooting in the valleys.
Holdo & Timberlake	North province, W	tree savanna / subtropical	upper catena, woodland	deciduous broad-leaf	tree	Mukusi, Rhodesian	*Baikiaea plurijuga*	2.1	excavation	drawings	650	falls mostly in Nov-Mar		on hill top			deep, medium-textured						-18.6413	27.0328	1065	there was a clear indication of increasing species richness and basal area up the	But no groundater measurements are taken
Holdo & Timberlake	North province, W	tree savanna / subtropical	lower catena, low shrubs	deciduous broad-leaf	shrub	Wild syringa	*Burkea africana*	0.9	excavation	drawings	650	falls mostly in Nov-Mar		lower slope			deep, medium-textured						-18.6434	27.0336	1050	maximum tree size increased up the catena... a sequence of species	locations are easily found on GE to match the right elevation at end
Holdo & Timberlake,	North province, W	tree savanna / subtropical	lower catena, low shrubs	deciduous broad-leaf	shrub	Lekkerbreek	Ochna pulchra	1.25	excavation	drawings	650	falls mostly in Nov-Mar		lower slope			deep, medium-textured						-18.6434	27.0336	1050		this is a great study on vegetation-catena relations
Holdo & Timberlake,	North province, W	tree savanna / subtropical	lower catena, low shrubs	deciduous broad-leaf	shrub	silver cluster leaf or silver	*Terminalia sericea*	1.2	excavation	drawings	650	falls mostly in Nov-Mar		lower slope			deep, medium-textured						-18.6434	27.0336	1050		
Horton, 1958	near Banf, Canadian	mountain forest	Coarser soils, Tree 10	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	3.51	excavation	drawings			3.51				lower foothills (at			loamy fine sand/gravel/clay			51.0211	-115.0710	1486	It shows that deep penetration is not essential for fair height growth. Its lateral	Deepest roots of mature trees are reported here in this soil group
Horton, 1958	near Banf, Canadian	mountain forest	Finer soils, Tree 19	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	1.52	excavation	drawings			1.52				foothils			loam/clay/clay loam/stony clay			51.0277	-115.0377	1411	Tree 19 had a secondary set of lateral roots in the finer stratum at the two-foot level	Deepest roots of mature trees are reported here in this soil group
Horton, 1958	near Banf, Canadian	mountain forest	Peat soils, Tree 25	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.70	excavation	drawings			0.46				half bog			peat/boulder pavement/clay/			50.9940	-115.0765	1385	Soil water for Tree 25 is stagnant (a half-bog). Rooting is definitely restricted by the	Tree 25 is chosen (285yrs old), oldest in this soil group. Water
Hosegood & Howland,	north of Nairobi,	plantation		evergreen broad-leaf	tree	Sydney blue gum	*Eucalyptus saligna*	6.10	soil coring	yes							loam, deep, free draining latosol			volcanic	5		-1.2187	36.6436	2073	All compartments were situated on the same slope and subjected to the same soil	Sampling stopped at 15' depth but significant root mass suggests
Hosegood & Howland,	north of Nairobi,	plantation		evergreen needle-leaf	tree	Mexican weeping	*Pinus patula*	6.10	soil coring	yes							loam, deep, free draining latosol			volcanic	5		-1.2187	36.6436	2073	The soil profile was capable of being fully exploited by the roots, although immature	The location guessed by selecting a point closest to the 1S, 37E lat-lon, but at right elevation (2073m, or 6800ft) to the NE, at a place that looked like tree plantations NW of Muguga
Hosegood & Howland,	north of Nairobi,	plantation		evergreen needle-leaf	tree	Mexican cypress	*Cupressus benthamii*	7.62	soil coring	yes							loam, deep, free draining latosol			volcanic	5		-1.2187	36.6436	2073	full root penetration in depth was achieved by all species regardless of the marked	
Hosegood & Howland,	north of Nairobi,	plantation		evergreen needle-leaf	tree	Mexican White Cedar	*Cupressus lusitanica*	7.62	soil coring	yes							loam, deep, free draining latosol			volcanic	5		-1.2187	36.6436	2073		
Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	deciduous broad-leaf	tree	plum	*Prunus persica*	4.90	exposure by	descriptive, with	1207	mostly in Jun Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam. 75% sand-					orchards	25.9837	85.6804	58	the plum has 2 root systems, a swell developed superficial system in the surface	Author: after mid monsson, a colloidal condition of the soil
Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	deciduous broad-leaf	tree	peach	*Prunus communis*	4.70	exposure by	descriptive, with	1207	mostly in Jun Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam. 75% sand-					orchards	25.9837	85.6804	58	the distribution of superficial and deep root systems, and the periodicity of root activity	develops; the pore spaces near the surface become water-logged and

Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	deciduous broad-leaf	tree	custard apple	*Anona squamosa*	4.29	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam, 75% sand-					orchards	25.9837	85.6804	58	the root system of custard apple is very similar to that of plum and peach: in the 12	surface become water-logged and percolation stops; the plants soon respond to the altered soil conditions; the absorbing roots in the lower layers die; the soil acts as vast reservoir of water and make up for the uneven rain; trees burst into activity in Mar-May, hot and dry part of the year, perhaps the most striking feature of vegetation in this area; when grass is planted
Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	evergreen broad-leaf	tree	mango	Mangifera indica	4.70	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam, 75% sand-					orchards	25.9837	85.6804	58	root distribution and periodicity of root activities of this evergreen resemble those	
Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	evergreen broad-leaf	tree	Guava	*Psidium guyava*	4.40	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam, 75% sand-					orchards	25.9837	85.6804	58	there is an abundant superficial system, which gives off numerous branches, which	
Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	evergreen broad-leaf	tree	Litchi	*Nephelium litchi*	3.80	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam, 75% sand-					orchards	25.9837	85.6804	58	mostly like the others, but the deep root system is less strongly developed;	
Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	evergreen broad-leaf	tree	sour lime	*Citrus medica*	2.00	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam, 75% sand-					orchards	25.9837	85.6804	58	similar to litchi, but deep roots are even less developed; strong aversion to clay; the	
Howard, 1925	Pusa, N Bihar, India, on the	orchards and rice fields	tree experiment	evergreen broad-leaf	tree	Loquat	*Eriobotrya japonica*	4.90	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5	calcareous silt loam, 75% sand-					orchards	25.9837	85.6804	58	the two root system and perodicity is similar to mango; roots found 1 feet below	
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	deciduous broad-leaf	tree	Indian Rosewood	*Dalbergia sissoo*	4.50	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9886	85.6879	59	two kinds of roots occurred - a well-developed surface system which was then	an forest in Pusa Research Institute, N Bihar, India is chosen
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	deciduous broad-leaf	tree	Indian gooseberry	*Phyllanthus emblica*	5.80	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9886	85.6879	59	all the forest trees are similar to the fruit trees with 2 root systems; the deep root	
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	evergreen broad-leaf	tree	Tree Jasmine,	*Millingtonia hortensis*	5.20	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9886	85.6879	59	best example of tree repairing deep roots damaged by the continued rise of water	
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	deciduous broad-leaf	tree	Indian lilac	*Melia azadirachta*	4.00	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9886	85.6879	59	the deep roots of this tree differs from others - they do not grow vertically dwon	
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	evergreen broad-leaf	tree	Indian banyan,	*Ficus benghalensis*	4.90	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9851	85.6912	59	deep root repair observed	
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	semi-evergreen,	tree	sacred fig	*Ficus religiosa*	5.80	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9851	85.6912	59	deep root repair observed	
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	deciduous broad-leaf	tree	teak	*Tectona grandis*	4.00	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9851	85.6912	59	deep root repair observed	
Howard, 1925	Pusa, N Bihar, India, on the	subtropical monsoon	forest site	deciduous broad-leaf	tree	Flame of the Forest	*Butea frondosa*	5.20	exposure by	descriptive, with	1207	mostly in Jun-Oct monsoon		ridges, on old alluvium	1.1 - 6.1	5.2	calcareous silt loam, 75% sand-						25.9851	85.6912	59	deep root repair observed	
Hubble et al., 2010	SW Western Australia,	Mediterranean wood land	Jewel cave	evergreen broad-leaf	tree	Karri	*Eucalyptus diversicolour*	>20	exposure in cave	no													-34.2739	115.0985	80	We present our own evidence of Karri roots (Eucalyptus diversicolour) presenting	location of Jewel cave found on GoogleEarth
Hubble et al., 2010	Victoria, Australia	subtropical dry forest	Goulburn River	evergreen broad-leaf	tree	River Red Gum	*Eucalyptus camuldulensis*	>7	exposure by bank	no				river bank	8.0 - 9.0								-37.0306	145.1330	150	the Australian River Red Gum E. camuldulensis which is common to	
Hulbert, 1955	Lewiston, Nez Perce County,	semi-arid thrub-steppe		winter annual	bunchgrass	cheatgrass	*Bromus tectorum*	2.00	soil pits, LiCl tracer,	yes	381	mostly in winter		S-facing side of			sand/silt loam	caliche	1.5				46.4378	-117.0053	350	The soil was wetted at least down to the caliche layer during the winter; The long roots were found to be so nearly straight and vertical; Roots were found to be very abundant in the top 2 to 3 din of soil, becoming gradually sparser in the deeper layers. B. japonicus had a greater proportion of roots at the 8-14 dm depths than the others; Judging by the results of the first method, it is believed that all these data from the lithium method are less than	location guessed to be on the south facing side of the river, 4 mi N of Lewiston, near an old highway by farm fields at 350m elevation; hint on wetting depth to be the depth of caliché
Hulbert, 1955	Lewiston, Nez Perce County,	semi-arid thrub-steppe		winter annual	bunchgrass	field brome	*Bromus japonicus*	1.50	soil pits, LiCl tracer,	yes	381	mostly in winter		S-facing side of			sand/silt loam	caliche	1.5				46.4378	-117.0053	350		
Hulbert, 1955	Lewiston, Nez Perce County,	semi-arid thrub-steppe		annual / biennial	grass	meadow brome	*Bromus commutatus*	1.50	soil pits, LiCl tracer,	yes	381	mostly in winter		S-facing side of			sand/silt loam	caliche	1.5				46.4378	-117.0053	350		
Hulbert, 1955	Lewiston, Nez Perce County,	semi-arid thrub-steppe		annual / biennial	grass	poverty brome	*Bromus sterilis*	1.50	soil pits, LiCl tracer,	yes	381	mostly in winter		S-facing side of			sand/silt loam	caliche	1.5				46.4378	-117.0053	350		
Hulbert, 1955	Lewiston, Nez Perce County,	semi-arid thrub-steppe		annual	grass	rattlesnake brome	*Bromus brizaeformis*	1.50	soil pits, LiCl tracer,	yes	381	mostly in winter		S-facing side of			sand/silt loam	caliche	1.5				46.4378	-117.0053	350		
Hulbert, 1955	Lewiston, Nez Perce County,	semi-arid thrub-steppe		annual	grass	bald brome	*Bromus racemosus*	1.50	soil pits, LiCl tracer,	yes	381	mostly in winter		S-facing side of			sand/silt loam	caliche	1.5				46.4378	-117.0053	350		
Imai et al., 2010	Sabah, Malaysian	lowland tropical rain	Deramakot Forest	evergreen broad-leaf	tree		*Dipterocarp spp.*	1.10	soil pits and core	yes	3500	no pronounced		mean of 3 positions			Acrisols poor in nutrients, well			Tertiary sedimentary			5.3667	117.4167	156	We excavated three soil pits down to 1 m deep under closed canopy at each of the	max rooting depth extrapolated from 1m profile
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	District Park Cave	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	5.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		30.2137	-97.8630	241		Lat-lon given in Table-1, but the values seem off, with 141' and 85" etc. ..emailed author but did not receive response... assuming that the strange minute and second values are simply decimal minutes, lat-lon thus obtained...but they are highly questionable...some in the middle of cities/towns... elevation from Google...
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Seven Room Cave	deciduous broad-leaf	tree	Texas Cedar Elm	*Ulmus crassifolia*	5.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		30.6707	-97.6907	232		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Pearson's Lost Cave	deciduous broad-leaf	tree	Sugar Hackberry	*Celtis laevigata*	6.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0443	-98.4895	414		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Pearson's Lost Cave	evergreen needle-leaf	tree	Ashe Juniper	*Juniper ashei*	6.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0443	-98.4895	414		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Spyglass Cave	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	6.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		30.2567	-97.7910	174		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Cotterell Cave	evergreen needle-leaf	tree	Ashe Juniper	*Juniper ashei*	7.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		30.3693	-97.7632	269		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Cotterell Cave	deciduous broad-leaf	tree	Durand oak	*Quercus sinuata*	7.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		30.3693	-97.7632	269		A case of roots penetrating deep through fractured limestone
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Mystery Hole	deciduous broad-leaf	tree	Texas Cedar Elm	*Ulmus crassifolia*	7.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0298	-98.5063	424		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Sour Cave	deciduous broad-leaf	tree	Texas Cedar Elm	*Ulmus americana*	7.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0393	-98.4800	409		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Sour Cave	evergreen needle-leaf	tree	Ashe Juniper	*Juniper ashei*	7.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0393	-98.4800	409		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Thurtle Shell Cave	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	8.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0422	-98.4805	403		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Cave of Many Names	deciduous broad-leaf	tree	Texas Cedar Elm	*Ulmus crassifolia*	9.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0420	-98.5052	428		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Natural Bridge (south)	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	9.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		29.6920	-98.3417	316		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Sweet Cave	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	11.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0395	-98.4808	410		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Cicurina Cave	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	14.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		31.0472	-98.5042	404		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Powell's Cave	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	18.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		30.9282	-99.9155	627		
Jackson et al., 1999	Cent-Eastern Edwards	savanna and woodland	Honey Creek Cave	evergreen broad-leaf	tree	live oak	*Quercus fusiformis*	22.00	cave exposure	no	600-800						shallow, calcareou			fractured Cretaceous	<0.2		29.8353	-98.5192	403		
Jackson et al., 2002	Jornada, NM	savanna and woodland	grass patch	perennial	grass	Black Grama	*Bouteloua eriopoda*	1.70	soil coring	yes	230												32.4966	-106.7848	1376	Each site contained adjacent grassland and shrub/woodland communities where management practices have contributed to woody plant expansion into native	All depth given contains 95% roots, not max
Jackson et al., 2002	Jornada, NM	savanna and woodland	woody stand	evergreen broad-leaf	tree	mesquite, creosote,	*Prosopis, Larrea,*	5.40	soil coring	yes	230												32.4965	-106.7847	1376		LTER site, lat-lon given in 0.1 degree, points chosen across
Jackson et al., 2002	Sevilleta, NM	savanna and woodland	grass patch	perennial	grass	Black Grama	*Bouteloua eriopoda*	0.60	soil coring	yes	277												34.2694	-106.7383	1582	Rooting depths, nematode distributions, and the integrated depth of soil cation uptake all changed substantially with woody plant invasion (Table 1). Mean 95% rooting depths were 2m deeper on average for the woody vegetation at the six paired	LTER site, lat-lon given in 0.1 degree, points chosen across
Jackson et al., 2002	Sevilleta, NM	savanna and woodland	woody stand	evergreen broad-leaf	tree	mesquite, creosote,	*Prosopis, Larrea,*	2.00	soil coring	yes	277												34.2694	-106.7383	1583		LTER site, lat-lon given in 0.1 degree, points chosen across
Jackson et al., 2002	Central Plains Experimental	savanna and woodland	grass patch	perennial	grass	Blue grama	*Bouteloua gracilis*	0.90	soil coring	yes	322												40.8853	-104.6948	1669		CPER=Central Plains Experimental Range, Shortgrass Steppe LTER
Jackson et al., 2002	Central Plains Experimental	savanna and woodland	woody stand	evergreen broad-leaf	tree	mesquite, creosote,	*Prosopis, Larrea,*	4.00	soil coring	yes	322												40.8852	-104.6948	1669	Along the precipitation gradient, woody plant invasion increased contents of SOC and soil organic nitrogen (SON) at the drier sites, and decreased them at the wetter	CPER=Central Plains Experimental Range, Shortgrass Steppe LTER
Jackson et al., 2002	Vernon, TX	savanna and woodland	grass patch	perennial	grass	feather grass,	*Stipa sp.*	0.90	soil coring	yes	660												33.8993	-99.3993	376		The 200,000-ha Waggoner ranch is the long-term research site for the
Jackson et al., 2002	Vernon, TX	savanna and woodland	woody stand	evergreen broad-leaf	tree	mesquite, creosote,	*Prosopis, Larrea,*	5.80	soil coring	yes	660												33.9005	-99.3984	374		The 200,000-ha Waggoner ranch is the long-term research site for the
Jackson et al., 2002	Riesel, TX	savanna and woodland	grass patch	perennial	grass	little bluestem	*Schizachyrium scoparium*	0.80	soil coring	yes	840												31.4995	-96.6010	146		The Riesel site maintained by the USDA/ Agriculture Research
Jackson et al., 2002	Riesel, TX	savanna and woodland	woody stand	evergreen broad-leaf	tree	mesquite, creosote,	*Prosopis, Larrea,*	2.80	soil coring	yes	840												31.4997	-96.6008	146		The Riesel site maintained by the USDA/ Agriculture Research
Jackson et al., 2002	Engeling, TX	savanna and woodland	grass patch	perennial	grass	beard grass, bluestem	*Andropogon sp.*	3.30	soil coring	yes	1070												31.9001	-95.8994	109	Only Engeling showed no evidence of increased rooting depths with woody plant	The Gus Engeling Wildlife Management Area operated by the
Jackson et al., 2002	Engeling, TX	savanna and woodland	woody stand	evergreen broad-leaf	tree	mesquite, creosote,	*Prosopis, Larrea,*	2.50	soil coring	yes	1070												31.8999	-95.9001	107	Relatively wet grasslands are often highly productive, allocating a large proportion of	The Gus Engeling Wildlife Management Area operated by the
Jaramello et al., 2003	Tuxtlas, SE Mexico	tropical rainforest	Primary Forests (3	evergreen broad-leaf	tree		*Nectandra ambigens.*	2.00	soil pits and coring	yes	> 4000	Mar-May < 150mm/mon					well-drained, coarse-textured				undisturbed		18.5833	-95.0833	333	conducted in the Los Tuxtlas Region in the state of Veracruz, Mexico, within the	Extrapolated below 1m by putting the mean distribution in Table-4; the plot locations are not given so the mean of 3 plots are used to represent rooting depth at 3 sites found on GoogleEarth matching the
Jaramello et al., 2003	Tuxtlas, SE Mexico	tropical rainforest	Secondary Forests (8, 20,	evergreen broad-leaf	tree		*Panicum maximum.*	1.10	soil pits and coring	yes	> 4000	Mar-May < 150mm/mon					well-drained, coarse-textured				recovering forest after		18.5488	-95.0546	78	All root size classes were present throughout the profile but some of them	
Jaramello et al., 2003	Tuxtlas, SE Mexico	tropical rainforest	Pastures (12, 20, 28yr)	perennial	grass		*Paspalum conjugatum.*	0.90	soil pits and coring	yes	> 4000	Mar-May < 150mm/mon					well-drained, coarse-textured				pasture after clear		18.5408	-95.1036	613	In three microplots in pasture, we only sampled to a depth of 80 cm because of	

Jennings, 1974	Phuduhudu, cen. Kalahari,		Borehole No. 1028	evergreen broad-leaf	tree	Motlopi or Shepherd's	*Boscia albitrunca*	68 - 141	deep well bores	no						141	deep sandy soils, finer in	calcrete					-23.9500	22.9712	1118	In 1958 the writer retrieved living rootlets from an unused borehole (No. 1028) at	no borehole lat-lon given. The lat-lon of Phuduhudu is entered here
Jennings, 1974	near Werda, S. Kalahari		Borehole No. 1197	evergreen broad-leaf	tree	Motlopi or Shepherd's	*Boscia albitrunca*	30 - 78.6	deep well bores	no						97.5	deep sandy soils, finer in	calcrete					-25.2608	23.3172	1031	The writer has also recovered tree roots from a borehole at Eersterus (No. 1197),	lat-lon of Werda, in southern Kalahari, is entered here;
Jimenez et al., 2009	Colombian Amazon	tropical rainforest	Amacayacu National	evergreen broad-leaf	tree		*Terra firme species*	0.5	ingrowth +	no	3335	2					clay loam / Endostagnic						-3.7200	-70.3100	105	the terrain is slightly undulated and uniform, with soils moderately deep, well	Did not mention how the max depths are obtained but given in Table-1. Fine roots data are obtained from ingrow cores inserted to 20cm depth only...
Jimenez et al., 2009	Colombian Amazon	tropical rainforest	Amacayacu National	evergreen broad-leaf	tree		*Terra firme species*	0.5	ingrowth +	no	3335	2					clay loam / Endostagnic						-3.7200	-70.3000	110	the clay loam soil forest, with less limitation in soil resources, showed a lower	
Jimenez et al., 2009	Colombian Amazon	tropical rainforest	Biological Station Zafire,	evergreen broad-leaf	tree		*Caatinga species*	1	ingrowth +	no	3335	2					loamy sand / Orteinic Podzol						-4.0100	-69.9100	130		
Jipp et al, 1998	Paragominas, Para, NE	tropical rainforest	matual forest site	evergreen broad-leaf	tree	171 species in Sha	*Leguminosae, Sapotaceae,*	>18	deep soil shaft	yes	1803	6	2400	upper slope of terrace			clay (Latosol), on ironstone,	ironstone (plinthite)	5.0-12.0			natural	-2.9176	-47.3564	133	The maximum depth of rooting in this forest has not yet been determined, but	authors: "the water table is more than 40m below the surface
Jipp et al, 1998	Paragominas, Para, NE	tropical rainforest	pasture site	perennial	grass	Guinea grass,	*Panicum maximum,*	6	deep soil shaft	yes	1803	6	2400	upper slope of terrace			clay (Latosol), on ironstone,	ironstone (plinthite)	5.0-12.0			deforested, regularly	-2.9271	-47.3500	125	The pastures that are replacing mature forest in eastern Amazonia appear to be	soil water at 8m depth lags rainfall by 1mon in dry soil to 3mon in wet
Jobbagy & Jackson, 2004	Pampas, Argentina	temperate steppe	plantation	evergreen broad-leaf	tree	River Red Gum	*Eucalyptus camaldulensi*	5.70	soil coring	no	980			upland		5.8	silty loam					plantation	-36.0333	-57.8383	30	The deepest tree roots in the plantation were found at 5–6m depth, coincident with	
Jobbagy & Jackson, 2004	Pampas, Argentina	temperate steppe	native grassland	perennial	grass		*typical composition*	1.70	soil coring	no	980			lower		1.7	silty loam						-36.0308	-57.8363	10	the upper boundary of a fully reduced (gley) sediment layer of blue-greenish color	
Jobbagy et al., 2011	Central Monte,	desert (oasis)	A	semi-evergreen	tree	algarrobo	*Prosopis flexuosa*	7.70	O and H isotopes	no	156	9		low interdune	less than 0.1 m	9.5	sandy						-32.3685	-68.0358	553	based on isotopic evidence, assumed to be at least top of the capillary zone	
Jobbagy et al., 2011	Central Monte,	desert (oasis)	B	semi-evergreen	tree	algarrobo	*Prosopis flexuosa*	5.00	O and H isotopes	no	156	9		(extremely) low	less than 0.1 m	6.8	sandy						-32.4267	-68.0118	559	based on isotopic evidence, assumed to be at least top of the capillary zone	
Jobbagy et al., 2011	Central Monte,	desert (oasis)	C	semi-evergreen	tree	algarrobo	*Prosopis flexuosa*	5.30	O and H isotopes	no	156	9		low interdune	less than 0.1 m	7.1	sandy						-32.3955	-68.0366	554	based on isotopic evidence, assumed to be at least top of the capillary zone	
Johnson et al., 2013	outside Panama,	seasonal-dry tropical	Parque Natural	evergreen broad-leaf	liana	Hoopvine, black basket	*Trichostigma octandrum*	0.60	soil coring	no	1800	Jan-Apr (150mm)				0.6	Ancon clay with ≥ 25% clay and ≥						8.9856	-79.5469	27	Deeper coring revealed that the deeper layers, consisting of water-logged, very fine	Reported waterlogging at 60cm interpretated to represent
Johnson et al., 2013	outside Panama,	seasonal-dry tropical	Parque Natural	evergreen broad-leaf	host tree	wild cashew or espavé	*Anacardium excelsum*	0.60	soil coring	no	1800	Jan-Apr (150mm)				0.6	Ancon clay with ≥ 25% clay and ≥						8.9856	-79.5469	27	grained soil, were almost completely devoid of roots at a depth of 60 cm, so we	Here is a case that the shallow-rooting, likely due to water-logging,
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - intermediate	perennial	forb	mountain everlasting,	*Antennaria dioica*	0.095	excavation	no								permofrost					68.5000	20.2500	640	A minimum of twenty plants of each species was carefully excavated to retain as	GE zoom-in is messed up here, preventing seeing the polygons of 3
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - intermediate	perennial	forb	alpine bartsia,	*Bartsia alpina*	0.016	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - stable site	perennial	grass (rhizomatous)	Lappland reedgrass	*Calamagrostis lapponica*	0.033	excavation	no								permofrost					68.5000	20.2500	640	The samples from stable ground were collected from tundra areas with Betula	
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - frost heaved	perennial	grass	hair-like sedge	*Carex capillaris*	0.029	excavation	no								permofrost					68.5000	20.2500	640	The samples from disturbed ground at Kamasjaure were collected on systems of	
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - intermediate	perennial	forb (forming moss-like	moss bell heather	*Cassiope hypnoides*	0.090	excavation	no								permofrost					68.5000	20.2500	640	Only one of the species, Cassiope hypnoides, had a vertical tap root	
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - intermediate	evergreen	drawrf shrub	Arctic bell-heather,	*Cassiope tetragona*	0.013	excavation	no								permofrost					68.5000	20.2500	640	The roots of dwarf shrubs were shorter and more horizontal than those of the other life	
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - stable site	perennial	tufted grass	Hard Fescue	*Festuca ovina*	0.034	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - frost heaved	perennial	tufted grass	Hard Fescue	*Festuca ovina*	0.039	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - frost heaved	perennial	forb	northern firmoss, fir	*Lycopodium selago*	0.023	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - stable site	perennial	forb	Lapland lousewort	*Pedicularis lapponica*	0.011	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - intermediate	evergreen	drawrf shrub	blue heath, purple	*Phyllodoce coerulea*	0.029	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Abisko - stable site	perennial	forb (rhizomatous)	alpine bistort	*Polygonum viviparum*	0.021	excavation	no								permofrost					68.3486	18.8083	385	Sampling at Abisko took place on stable ground with graminoids, mostly Carex	site moved slightly to non-forest areas with z=385m
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - frost heaved	perennial	forb	alpine bistort	*Polygonum viviparum*	0.015	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - frost heaved	deciduous broad-leaf	shrub (prostrate,	net-leaved willow,	*Salix reticulata*	0.018	excavation	no								permofrost					68.5000	20.2500	640		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - stable site	perennial	forb (rhizomatous)	European goldenrod,	*Solidago virgaurea*	0.046	excavation	no								permofrost					68.5000	20.2500	640	Solidago virgaurea had the thickest roots	
Jonasson & Callaghan,	Sweedish Lapland	tundra	Abisko - stable site	perennial	forb	Scottish asphodel,	*Tofieldia pusilla*	0.015	excavation	no								permofrost					68.3486	18.8083	385		
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - frost heaved	perennial	forb	Scottish asphodel,	*Tofieldia pusilla*	0.019	excavation	no								permofrost					68.5000	20.2500	640	Tofieldia pusilla differed from the other species studied by having curled roots,	
Jonasson & Callaghan,	Sweedish Lapland	tundra	Kamasjaure - stable site	deciduous broad-leaf	shrub	common bilberry,	*Vaccinium myrtillus*	0.007	excavation	no								permofrost					68.5000	20.2500	640		
Jones et al., 1996	Monroe county, SW	swamp forest	N and S site data lumped	mixed broad- and needle-	tree		*Magnolia virginiana,*	0.50	50cm soil cores	yes	608 - 1189			periodically flooded	0 - 0.35	0.2							31.5586	-87.4895	11	When averaged over 19 mo and all sites, live-root mass was greater on higher	location very vague (county); no info on soil properties
Jonsson, 1988	Morogoro, E. Tanzania	subtropical dry forest	farm land	annual crop	grass	maize	*Zea mays*	0.80	soil coring to 1m	yes	870	mostly in Nov-May		near the river			sandy loams, poor in Org and					farm land	-6.8316	37.6333	496		2yr old tree; extralopated from fig 1
Jonsson, 1988	Morogoro, E. Tanzania	subtropical dry forest	tree plantation	evergreen broad-leaf	legume tree	kassod tree	*Cassia siamea*	0.90	soil coring to 1m	yes	870	mostly in Nov-May		near the river			sandy loams, poor in Org and					tree plantation	-6.8376	37.6308	498		2yr old tree; extralopated from fig 1
Jonsson, 1988	Morogoro, E. Tanzania	subtropical dry forest	tree plantation	evergreen broad-leaf	tree	Forest Red Gum	*Eucalyptus tereticornis*	1.40	soil coring to 1m	yes	870	mostly in Nov-May		near the river			sandy loams, poor in Org and					tree plantation	-6.8376	37.6276	498		2yr old tree; extralopated from fig 1; E. camoldulensis data not
Jonsson, 1988	Morogoro, E. Tanzania	subtropical dry forest	tree plantation	evergreen broad-leaf	legume tree	white leadtree	*Leucaena leucocephala*	1.50	soil coring to 1m	yes	870	mostly in Nov-May		near the river			sandy loams, poor in Org and					tree plantation	-6.8418	37.6297	502		6yr old tree; extralopated from fig 1
Jonsson, 1988	Morogoro, E. Tanzania	subtropical dry forest	tree plantation	deciduous to semi-	legume tree	chilean mesquite	*Prosopis chilensis*	1.00	soil coring to 1m	yes	870	mostly in Nov-May		near the river			sandy loams, poor in Org and					tree plantation	-6.8437	37.6301	504		2yr old tree; extralopated from fig 1
Joslin et al., 2006	Oak Ridge, TN	temperate broad-leaf	west ORR sites	deciduous broad-leaf	tree	white oak, chestnut	*Quercus alba L., Q. prinus*	> 0.9	soil coring to 0.9m	yes	1358			upland									35.9150	-84.3902	303	All sites are upland-oak forests; Cores were divided into four mineral soil-depth intervals (0–15, 15–30, 30–60, 60–90 cm); Averaging across all sites, approx. 50% of	sites roughly located based on the EOS article by Trumbore et al., 2002; coring seems to encounter and be stopped at rocky material;
Joslin et al., 2006	Oak Ridge, TN	temperate broad-leaf	east ORR sites	deciduous broad-leaf	tree	white oak, chestnut	*Quercus alba L., Q. prinus*	> 0.9	soil coring to 0.9m	yes	1358			upland									35.9875	-84.2854	300		
Kalisz et al., 1987	Cumberland Plateau, E.	temperate mixed forest	beech-dominated	deciduous broad-leaf	tree	beech, hickory, oak	*Fagus grandifolia,*	1.35	soil pits	yes, fine vs. coarse	1170	evenly distributed					well-drained stony sandy			interbed sandstone,	1.5		37.4500	-83.1333	415	Root abundance (LA; length per unit ground surface area) increased along the	The max root depths are not different among mesic, transitional,
Karasz, 1996	Central Hungary,	temperate mixed forest	7	evergreen needle-leaf	tree	common juniper	*Juniperus communis L.*	0.98	excavation	drawing	550			SE facing sandy slope			sand						46.8444	19.1626	94	In sandy soils, the 94yr old juniper develops a shallow, extensive root system. About	The great asynmetry toward downhill is remarkable, explaining
Karimov & Molotkovski,	Pamiro-Alay, W Tajikistan	dry steppe	tugai association	perennial	grass	ravennagrass, elephant	*Erianthus ravennae*	1.25	soil monolith	drawing				riparian zone									37.2453	68.3834	325	Graminaceous Tugai plants, such as Erianthus ravennae (L.) Beauv. and	This is about the tugai vegetation association. Tugay, also spelt tugai, is a form of riparian forest or woodland associated with fluvial
Karimov & Molotkovski,	Pamiro-Alay, W Tajikistan	dry steppe	tugai association	perennial	grass	wild sugarcane,	*Saccharum spontaneum*	1.0 - 1.5	soil monolith	no				riparian zone									37.2211	68.3036	325	Graminaceous Tugai plants, such as Erianthus ravennae (L.) Beauv. and	
Karimov & Molotkovski,	Pamiro-Alay, W Tajikistan	dry steppe	halophyte association	perennial	shrub		*Halostachus caesia*	2.40	soil monolith	drawing				on salt flat									37.2120	68.5235	325	Annual halophytes develop a tap root which does not penetrate deeper than 1.5-	from Fig.1B
Karimov & Molotkovski,	Pamiro-Alay, W Tajikistan	dry steppe	tugai association	deciduous broad-leaf	tree		*Populus pruinosa*	4.0 - 6.0	soil monolith	no				riparian zone									37.2618	68.3643	330	Trees, such as Populus pruinosa Schrenk and Elaeagnus angustifolia L. (Tugai indicators) are deeply rooted (4-6 m) and have extremely ramified tap root systems.	too bad there is no water table data - it is likely that what the authors meant by "soil water" is groundwater
Karimov & Molotkovski,	Pamiro-Alay, W Tajikistan	dry steppe	tugai association	deciduous or evergreen	small tree	silver berry, oleaster,	*Eleagnus angustifolia*	4.0 - 6.0	soil monolith	no				riparian zone									37.2826	68.4280	330		
Karimov & Molotkovski,	Pamiro-Alay, W Tajikistan	dry steppe	forests	evergreen needle-leaf	tree	juniper	*Juniperus spp.*	4.00	soil monolith	drawing				higher slope with							4		37.1699	68.2879	338	Their tap roots, which reach very dry soil or the mother rock at a depth of 4 m, do not	
Karimov & Molotkovski,	Pamiro-Alay, W Tajikistan	dry steppe	semi savanna association	perennial	forb		*Rheum maximoviczii*	0.62	soil monolith	drawing				away from riparian									37.2234	68.2853	395	A strong root system is developed by many of these plant species, in which organic	Fig. 1C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	不動公園	evergreen needle-leaf	small shrub	sago palm, king sago,	*Cycas revoluta*	1.00	excavation	drawing							sandy loam										32yr old 1.5m tall; roots flatten out on top of C horizon horizontally
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	deciduous broad-leaf	tree	ginkgo, ginkgo tree,	*Ginkgo biloba Linn.*	2.50	excavation	drawing							sandy loam										40yr old 14m tall; deep roots vertical in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	kaya, Japanese	*Torreya nucifera Sieb.*	2.00	excavation	drawing							humus loam										14yr old 9m tall; deep roots vertical in B horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Japanese yew,	*Taxus cuspidata*	2.00	excavation	drawing							loam										50yr old 11m tall; deep roots vertical in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	small tree	Japanese yew,	*Taxus cuspidata*	1.20	excavation	drawing							loam										30yr old 3m tall; end roots vertical in B Hhorizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	English yew, European	*Taxus baccata Linn.*	1.60	excavation	drawing							loam										50yr old 9m tall; end roots vertical into C horizon

Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	yew plum pine,	*Podocarpus macrophyllus*	2.40	excavation	drawing							sandy loam										40yr old 9m tall; end roots vertical into C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Kagoshima 鹿児島	evergreen needle-leaf	tree	Asian bayberry	*Podocarpus nagi Zoll. et*	2.50	excavation	drawing							loam						31.5980	130.5506	91		location estimated; 50yr old 15m tall; end roots vertical in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	monkey puzzle tree,	*Araucaria araucana K.*	0.60	excavation	drawing							sandy soil										35yr old 4m tall; shallow lateral roots, all in A horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Oeasawara 小笠原国有林	evergreen needle-leaf	tree	hoop pine, colonial	*Araucaria cunninghamii*	3.20	excavation	drawing							sandy loam to sand						27.0702	142.2163	237		location estimated; 50yr old 16m tall; very deep, strong single tap
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	八ヶ岳	evergreen needle-leaf	tree	Nikko fir	*Abies homolepis*	1.80	excavation	drawing							loam										50yr old 13m tall; end roots vertical into C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	momi fir	*Abies firma Sieb. et Zucc.*	3.30	excavation	drawing							sand loam to humus loam										36yr old 14m tall; several deep tap roots with fine branches near end
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Asahikawa 旭川営林署	evergreen needle-leaf	tree	Sakhalin fir	*Abies sachalinensis*	1.70	excavation	drawing							loam						43.7521	142.3496	120		location estimated; 60yr old 14m tall; end roots vertical ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Hachimantai 八幡平	evergreen needle-leaf	tree	Maries' fir	*Abies mariesii Mast.*	1.40	excavation	drawing							sandy loam						39.9430	141.0857	285		location estimated; 40yr old 10m tall; end roots vertica into C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Mt. Fuji 富士山	evergreen needle-leaf	tree	Veitch's fir, Veitch's	*Abies veitchii Lindl.*	1.50	excavation	drawing					on steep slope		shallow sandy loam on volcanic			volcanic			35.3715	138.6965	2164		location estimated; 80yr old 17m tall; end roots vetical into C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Mt. Fuji 富士山	evergreen needle-leaf	tree	Veitch's fir, Veitch's	*Abies veitchii Lindl.*	1.20	excavation	drawing					on steep slope		shallow sandy loam on volcanic			volcanic			35.3715	138.6965	2164		location estimated; 80yr old 19m tall; end roots vetical into C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Mt. Fuji 富士山	evergreen needle-leaf	tree	Veitch's fir, Veitch's	*Abies veitchii Lindl.*	0.60	excavation	drawing					on steep slope		shallow sandy loam on volcanic			volcanic			35.3715	138.6965	2164		location estimated; 80yr old 17m tall; much smaller and sparser roots
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	southern Japanese	*Tsuga sieboldii Carr.*	1.90	excavation	drawing							loam										63yr old 15m tall; end roots vertical in B horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	八ヶ岳	evergreen needle-leaf	tree	northern Japanese	*Tsuga diversifolia*	1.40	excavation	drawing							loam										80yr old 16m tall; end roots vertical in C horizaon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	eastern hemlock,	*Tsuga canadensis*	1.40	excavation	drawing							loam										35yr old 8m tall; roots through 2.5 paleosol sequences, dense fine
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	八ヶ岳	evergreen needle-leaf	tree	Jezo spruce, Yezo spruce,	*Picea jezoensis var.*	1.10	excavation	drawing							sandy loam										90yr old 16m tall; extentive shallow roots ending in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	八ヶ岳	evergreen needle-leaf	tree	Japanese bush spruce	*Picea maximowiczii*	0.80	excavation	drawing							humus loam										85yr old 15m tall; extentive shallow roots ending in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	八ヶ岳	evergreen needle-leaf	tree	Alcock spruce	*Picea bicolor Mayr (Picea*	0.80	excavation	drawing							loam										60yr old 14m tall; extentive shallow roots ending in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	Koyama's spruce	*Picea koyamai*	1.60	excavation	drawing							sandy loam										70yr old 16m tall; extensive lateral roots: several vertical roots through
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	Norway spruce	*Picea exelsa Link. (Picea*	1.30	excavation	drawing							sandy loam										80yr old 16m tall; extentive shallow roots penetrating 2 paleosols
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Norway spruce	*Picea exelsa Link.*	2.30	excavation	drawing							sandy loam										47yr old 10m tall; several branching tap roots ending in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Morinda spruce,	*Picea smithiana*	1.40	excavation	drawing							sandy loam										60yr old 14m tall; shallow roots all in A horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	八ヶ岳	deciduous needle-leaf	tree	Japanese larch,	*Larix leptolepis*	2.30	excavation	drawing							sand loam to humus loam										55yr old 19m; large shallow lateral roots; deep roots vertical into C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	八ヶ岳	deciduous needle-leaf	tree	Japanese larch,	*Larix leptolepis*	1.00	excavation	drawing							sand loam to humus loam										30yr old 14m; large shallow lateral roots ending in A horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Korean red pine,	*Pinus densiflora*	2.90	excavation	drawing							loam										45yr old 14m tall; depp tap roots into C horizon ending in fine
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	Korean red pine,	*Pinus densiflora*	3.50	excavation	drawing							loam										40yr old 16m tall; two very deep tap roots penetrating 3 paleosols
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Korean red pine,	*Pinus densiflora*	0.70	excavation	drawing							sandy loam										30yr old 2m tall; small shallow roots mostly in A, flatten out at B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	black pine, Japanese	*Pinus thunbergii*	2.30	excavation	drawing							sandy loam										40yr old 15m tall; 2 tap roots branching into C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	black pine, Japanese	*Pinus thunbergii*	3.30	excavation	drawing							sandy loam										45yr old 16m tall; two very deep tap roots penetrating 3 paleosols
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	five-needle pine,	*Pinus pentaphylla*	1.00	excavation	drawing							sandy loam										50yr old 15m tall; finely branched roots ending in B horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	five-needle pine,	*Pinus pentaphylla*	1.60	excavation	drawing							sandy loam										30yr old 5m tall; roots penetrating 2.5 paleosols with denser roots in A
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	Korean pine	*Pinus koraiensis*	2.30	excavation	drawing							sandy loam										60yr old 16m tall; roots penetrating 3 paleosols
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	Korean pine	*Pinus koraiensis*	2.00	excavation	drawing							sandy loam										60yr old 15m tall; roots penetrating 3 paleosols, ending in C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	shrub	Siberian dwarf pine,	*Pinus pumila Regel*	0.50	excavation	drawing							sandy loam										25yr old 2m tall; shallow roots all in A horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	pitch pine	*Pinus rigidrt Mill.*	2.60	excavation	drawing							sandy loam										50yr old 14m tall; evenly fine branched roots ending in C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	pitch pine	*Pinus rigidrt Mill.*	3.40	excavation	drawing							sandy loam										60yr old 18m tall; deep roots penetrating 3 paleosols, ending in C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	eastern white pine,	*Pinus strobus Linn.*	2.80	excavation	drawing							sandy loam										30yr old 10m tall; many tap roots penetrate nearly 2m into C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	eastern white pine,	*Pinus strobus Linn.*	0.90	excavation	drawing							sandy loam										55yr old 19m; large shallow lateral root plate with fine roots going
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	eastern white pine,	*Pinus strobus Linn.*	1.40	excavation	drawing							sandy loam										55yr old 16m tall; like above, but fine roots reached much deeper,
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	eastern white pine,	*Pinus strobus Linn.*	1.60	excavation	drawing							sandy loam										55yr old 18m tall; like above, but one tap penetrated 2.5 paleosol,
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	eastern white pine,	*Pinus strobus Linn.*	1.20	excavation	drawing							sandy loam										55yr ??m tall; land steeply sloping, strong tap roots went down,
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	eastern white pine,	*Pinus strobus Linn.*	2.40	excavation	drawing							sandy loam										45yr old 15m tall; tap roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Bunge's pine,	*Pinus bungeana*	1.20	excavation	drawing							sandy loam										35yr old 3.5m tall; strong tap roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	loblolly pine	*Pinus taeda Linn.*	2.00	excavation	drawing							sandy loam										50yr old 15m tall; many deep vertical roots penetrate vertically
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	loblolly pine	*Pinus taeda Linn.*	3.50	excavation	drawing							sandy loam										40yr old 15m tall; deep tap root penetrated 3 paleosols into C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	loblolly pine	*Pinus taeda Linn.*	3.80	excavation	drawing							sandy loam										35yr old 17m tall; miltiple tap roots penetrated 3 paleosols and 1 whole
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	longleaf pine,	*Pinus palustris Mill.*	2.60	excavation	drawing							sandy loam										50yr old 16m tall; 2 strong tap roots penetrate deep into C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	maritime pine, cluster	*Pinus pinaster*	2.40	excavation	drawing							sandy loam										45yr old 15m tall; 2 tap roots penetrate nearly 2m deep into C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Bhutan pine, blue	*Pinus griffithii McCleland*	1.30	excavation	drawing							loam										50yr old 14m tall; shallow lateral roots with short vertical roots
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	Jack pine, grey pine,	*Pinus banksiana*	2.00	excavation	drawing							sandy loam										40yr old 14m tall; shallow roots on sloping soil with a few deeper
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Scots pine	*Pinus sylvestris*	2.00	excavation	drawing							sandy loam										60yr old 14m tall; strong tap root ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小笠原国有林	evergreen needle-leaf	tree	Luchu pine, Okinawa	*Pinus luchuensis*	3.20	excavation	drawing							sandy loam to loam										25yr old 7m tall; very sparsely branched, tap roots penetrate over
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	deodar cedar,	*Cedrus deodara*	2.40	excavation	drawing							sandy loam										40yr old 14m tall; evenly distributed roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小桜山国有林	evergreen needle-leaf	tree	deodar cedar,	*Cedrus deodara*	2.40	excavation	drawing							sandy loam										16m tall; few tap roots penetrating and terminating in 3 paleosols
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree		*Keteleeria davidiana*	4.10	excavation	drawing							humus loam										60yr old 12m tall; numerous strong lateral roots bend sharply
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	木曽	evergreen needle-leaf	tree	Japanese umbrella-	*Sciadopitys verticillata*	1.80	excavation	drawing							sandy loam										60yr old 8m tall; evenly distributed roots ending in C

Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Japanese sugi pine or	*Cryptomeria japonica D.*	2.40	excavation	drawing							sandy loam											50yr old 16m tall; several tap roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小磯井澤水産研究場	evergreen needle-leaf	tree	Japanese sugi pine or	*Cryptomeria japonica D.*	1.80	excavation	drawing							sandy loam											25yr old; evenly distributed, with many fine roots, few large roots,
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	China-fir (though not	*Cunninghamia lanceolata*	1.60	excavation	drawing							loam											40m old 8m tall; even roots, tap roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Tokyo U 東大演習林	deciduous needle-leaf	tree	dawn redwood	*Metasequoia glyptostroboi*	2.40	excavation	drawing							sandy loam							35.7187	139.7452	946		location estimated; 25yr old 8m tall; even roots ending vertically in
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	coastal redwood,	*Sequoia sempervirens*	2.60	excavation	drawing							loam, sandy loam											50yr old 12m tall; many tap roots ending in C vertically
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	deciduous needle-leaf	tree	baldcypress, cypress,	*Taxodium distichum*	2.80	excavation	drawing							humus loam											40yr old 16m tall; very deep and vertical tap roots ending with fine
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Japanese	*Thuja standishii*	1.20	excavation	drawing							humus loam											40yr old 11m tall; shallow even roots ending in C
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	northern white-cedar	*Thuja occidentalis*	1.00	excavation	drawing							loam											25yr old 5m tall; shallow roots mostly in A, large lateral roots bend
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小椋山国有林	evergreen needle-leaf	tree	northern white-cedar	*Thuja occidentalis*	1.40	excavation	drawing							loam											8m tall; roots penetrating and ending in 2 paleosols, with dense
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	small tree	Chinese thuja,	*Biota orientalis*	1.40	excavation	drawing							humus loam											45yr old 8m tall; boney roots with fine roots attached, ending on top
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小椋山国有林	evergreen needle-leaf	small tree	Chinese thuja,	*Biota orientalis*	1.10	excavation	drawing							loam											40yr old 14m tall; roots penetrate 2 paleosols with dense roots in each
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	木曽	evergreen needle-leaf	tree	false arborvitae,	*Thujopsis dolabrata*	1.90	excavation	drawing							humus loam											60yr old 16m tall; one deep tap root penetrate into rocky saprolite
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Japanese cypress,	*Chamaecyparis obtusa*	1.50	excavation	drawing							loam											65yr old 17m tall; dense fine roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	木曽	evergreen needle-leaf	tree	Japanese cypress,	*Chamaecyparis obtusa*	1.70	excavation	drawing							loam											18m tall; dense roots penetrated 1.5m into rocky saprolite!
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小椋山国有林	evergreen needle-leaf	tree	Japanese cypress,	*Chamaecyparis obtusa*	0.80	excavation	drawing							loam											40yr old 15m tall; roots into 2 paleosols, with dense roots in each
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小椋山国有林	evergreen needle-leaf	tree	Japanese cypress,	*Chamaecyparis obtusa*	0.90	excavation	drawing							loam											40yr old 14m tall; roots into 2 paleosols, with dense roots in each
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	sawara cypress	*Chamaecyparis pisifera var.*	0.50	excavation	drawing							loam											30yr old 3m tall; shallow roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小椋山国有林	evergreen needle-leaf	tree	sawara cypress	*Chamaecyparis pisifera*	1.00	excavation	drawing							loam											60yr old 15m tall; even and ense roots through 2 paleosols
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	sawara cypress	*Chamaecyparis pisifera var.*	1.10	excavation	drawing							loam											30yr old 9m tall; even roots ending in B horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	sawara cypress	*Chamaecyparis pisifera var.*	1.20	excavation	drawing							humus loam											40yr old 9m tall; even roots less dense, through A,B, and A again
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	小椋山国有林	evergreen needle-leaf	tree	sawara cypress	*Chamaecyparis lawsoniana*	1.10	excavation	drawing							loam											25yr old 8m tall; fin roots ending in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	Monterey cypress	*Cupressus macrocarpa*	1.80	excavation	drawing							sandy loam											70yr old 12m tall; strong vertical roots reaching top of C horizon
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	shrub	shore juniper	*Juniperus conferta Parl.*	0.60	excavation	drawing							sandy loam											35yrs old 0.8m tall; shallow roots ending in shallow B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	shrub	Bonin Islands	*Juniperus taxifolia*	0.40	excavation	drawing							sandy loam											30yr old 0.6m tall; sparse woody roots reaching top of B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Okayama 岡山	evergreen needle-leaf	small tree	needle juniper	*Juniperus utilis Koidz.*	0.70	excavation	drawing				on a slope with			sandy loam							34.6583	133.9476	77		location estimated; 35yr old 6m tall; extensive lateral roots in B
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	Miura 三浦半島 Peninsula	evergreen needle-leaf	tree	savin juniper,	*Sabina chinensis*	1.80	excavation	drawing							sandy loam							35.2426	139.6448	89		location estimated; 70yr old 15m tall; strong roots with fine branches
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	small tree	Chinese juniper	*Juniperus chinensis var.*	0.60	excavation	drawing							sandy loam											10yr old 3.4m; fine even roots ending in B; no large woody roots
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	small tree	yan bai (yan juniper)	*Sabina sargentii*	0.70	excavation	drawing							sandy loam											60yr old 1.2m; sparse wavey large woody roots have fine branches;
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	shrub	pu di bai (paving	*Sabina procumbens*	0.60	excavation	drawing							sandy loam											30yr old 1.2m; sparse wavey, and mostly lateral large woody roots
Karizumi, 1979	Nine-state, Hokkaido,	temperate broadleaf	林試	evergreen needle-leaf	tree	red cedar, eastern	*Sabina virginiana*	1.20	excavation	drawing																		30yr old 5m tall; even roots ending in B
Karrfalt, 1981	New York?			perennial	rhizomatous herb	lesser clubmoss,	*Selaginella selaginoides*	0.01	excavation	photos																		
Kellman, 1990	Veracruz, Mexico (La	seasonal tropical	Modern Dune	evergreen broad-leaf,	legume tree, tree,	Guanacaste, Spanish	*Eterolobium cyclocarpum,*	2.50	soil coring to 2m	yes	1300	nearly all in Jun-Sept		coastal dunes			dune sand							19.3805	-96.3176	22	In the field, total fine root biomass to all depths sampled was significantly larger in the recent sand than in the weathered;	location inferred fronm "At the research site a fossil dune has been
Kellman, 1990	Veracruz, Mexico (La	seasonal tropical	Fossil Dune, more	evergreen broad-leaf,	legume tree, tree,	Guanacaste, Spanish	*Eterolobium cyclocarpum,*	1.50	soil coring to caliche	yes	1300	nearly all in Jun-Sept		coastal dunes			dune sand, with higher clay	caliche	1.3-1.8m					19.3395	-96.3173	21	These data indicate that, in weathered	Rooting depth from Fig.3
Kenzo et al., 2009	Sarawak, Malaysia	secondary growth	Niah Forest Reserve	evergreen broad-leaf	tree		*Endospermum diadenum*	2.30	excavation	no	2800						Sandy loam						secondary growth	3.6506	113.6997	45	rooting depth of most individuals was less than 1m (Figure 4e). Only several species	This species is represented at the Niah forest site, mentioned by
Kenzo et al., 2009	Sarawak, Malaysia	secondary growth	road side, in Sungai Liku	evergreen broad-leaf	tree		*Fagraea racemosa*	1.20	excavation	no	2400						Sandy loam						secondary growth	4.2361	114.0627	60	such as Fagraea racemosa and Endospermum diadenum showed relatively	This is a pioneer species, most likely present at the road side site as
Kerfoot, 1963	Mbeya Peak, SW Tanzania	Afromontane forest	Mbeya Peak	evergreen broad-leaf	tree	umDakane, White Pear	*Apodytes dimidiata*	6.10	excavation	no	1651	evenly distributed		near Mbeya Peak			Gneissic-derived sandy loam			deep weathered				-8.8612	33.4205	2438	Vertical roots and some rootlets penetrating deep weathered schist and	
Kimber, 1974	Near Jarrahdale, W	Mediterranean dry forest	site-3, Jarrahdale	evergreen broad-leaf	tree	jarrah	*Eucalyptus marginata*	14.90	quarry wall	yes	1000	80% in 5 winter mon		on a steep slope,		15	gravely sand (1.2m), laterite (	laterite duracrust	1.2-2.5m					-32.3511	116.0485	215	The results indicate that jarrah has a dense lateral root system confined to the gravel	The best illustration of dimorphic roots, but no max depth data for
Kleinhampl & Koteff, 1960	Canyon Land, S. Utah	arid desert	Area 17	evergreen needle-leaf	tree	pinon pine / juniper	*Pinus edulis / Juniperus*	2.13	naural uranium	no							fractured sandstone and			sandstone /limestone				37.7332	-111.0935	1801		All location data inferred from Plate 7, a detailed map of the study area
Kleinhampl & Koteff, 1960	Canyon Land, S. Utah	arid desert	Area 16	evergreen needle-leaf	tree	pinon pine	*Pinus edulis*	7.62	naural uranium	no							fractured sandstone and			sandstone /limestone				37.7260	-111.1100	1678		
Kleinhampl & Koteff, 1960	Canyon Land, S. Utah	arid desert	Area 15	evergreen needle-leaf	tree	pinon pine / juniper	*Pinus edulis / Juniperus*	15.24	naural uranium	no							fractured sandstone and			sandstone /limestone				37.7532	-111.1068	1855		
Kleinhampl & Koteff, 1960	Canyon Land, S. Utah	arid desert	Area 12	evergreen needle-leaf	tree	pinon pine / juniper	*Pinus edulis / Juniperus*	18.29	naural uranium	no							fractured sandstone and			sandstone /limestone				37.8328	-111.2254	1866		
Kleinhampl & Koteff, 1960	Canyon Land, S. Utah	arid desert	Area 5	evergreen needle-leaf	tree	pinon pine / juniper	*Pinus edulis / Juniperus*	21.34	naural uranium	no							fractured sandstone and			sandstone /limestone				37.9892	-111.2174	1984		
Kleinhampl & Koteff, 1960	Canyon Land, S. Utah	arid desert	Area 19	evergreen needle-leaf	tree	pinon pine / juniper	*Pinus edulis / Juniperus*	33.53	naural uranium	no							fractured sandstone and			sandstone /limestone				37.8781	-111.0312	1563		
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-2	evergreen needle-leaf	shrub	big sagebrush	*Artemeisia tridentata*	2.50	excavation	yes	176			base of alluvial fan			sandy-loam to silty loam							46.5327	-119.6300	203	Tap-root with wel l-developed laterals in the upper meter	soil texture based on other studies at the same site (e.g., Link) and author notes that soil texture is similar across the 4 sites; max rooting depth is based on profile data for species, and the rest given as mean of more than one samples +/- std, but estimated to a single value by Samples et al 2015, who appear to have direct access to data being in the same lab; locations of samples are estimated: zooming in GE, the sites with more larger shrubs likely are the sites of large shrub samples, and vice versa. Also have seasonal profiles for 4 species
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-2	deciduous broad-leaf	shrub	gray rabbitbrush	*Chrysothamnus nauseosus*	2.50	excavation	yes	176			base of alluvial fan			sandy-loam to silty loam							46.5327	-119.6300	203	Strong tap- root with few laterals in upper meter	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-1	deciduous broad-leaf	shrub	green rabbitbrush	*Chrysothamnus viscidiflorus*	1.60	excavation	no	176			midslope to river			sandy-loam to silty loam							46.5566	-119.5004	180	Strong tap- root with few laterals in upper meter	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-2	deciduous broad-leaf	shrub	antelope bitterbrush	*Purshia tridentata*	3.00	excavation	no	176			base of alluvial fan			sandy-loam to silty loam							46.5327	-119.6300	203	Tap-root with a number of small lateral roots in upper meter	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-2	deciduous broad-leaf	shrub	spiny hopsage	*Grayia spinosa (Grayia)*	1.95	excavation	no	176			base of alluvial fan			sandy-loam to silty loam							46.5327	-119.6300	203	Apparently not tap -rooted ; many woody roots in upper meter	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-1	perennial	grass	needle and thread grass	*Stipa comata*	1.60	excavation	no	176			midslope to river			sandy-loam to silty loam							46.5566	-119.5004	180	Fibrous shallow roots appear to have mycorrhizal sheath	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-3	perennial	grass	indian rice grass	*Oryzopsis hymenoides*	1.25	excavation	no	176			further downslope			sandy-loam to silty loam							46.4716	-119.3672	152	Fibrous root system extends about one meter laterally from the center of the plant	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-4	perennial	forb / subshrub	hoary aster	*Aster canescens*	1.55	excavation	no	176			near river			sandy-loam to silty loam							46.4926	-119.2917	134	Weak tap-root which tapers to single-root size at a depth generally about 10-20 cm.	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-1	perennial	forb / subshrub	turpentine cymopterus	*Cymopterus terebinthinus*	1.60	excavation	no	176			midslope to river			sandy-loam to silty loam							46.5566	-119.5004	180	Strong storage tap- root which smells of "bitter carrot." Grows more or less	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-4	perennial	forb / subshrub	Carey's balsamroot	*Balsamorhiza careyana*	1.50	excavation	no	176			near river			sandy-loam to silty loam							46.4926	-119.2917	134	Strong storage tap-root which does not grow vertically, but tends to be at an angle	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-4	perennial	forb / subshrub	snowy buckwheat	*Eriogonum niveum*	1.50	excavation	no	176			near river			sandy-loam to silty loam							46.4926	-119.2917	134	Hany laterals at about 5- 10 cm below the surface; tap-root at 10 cm is no larger than	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-2	summer annual	forb	Russian thistle	*Salsola kali*	2.09	excavation	yes	176			base of alluvial fan			sandy-loam to silty loam							46.5327	-119.6300	203	Tap- root strong but many laterals present at all depths, especially late in the season	

Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-1	summer annual	forb	bursage	*Ambrosia acanthicarpa*	1.80	excavation	yes	176			midslope to river			sandy-loam to silty loam						46.5566	-119.5004	180	Tap-root , but tapers rapidly, many thread-like laterals	
Klepper et al., 1985	Hanford, SC Washington	semi-arid shrub-steppe	site-3	summer annual	forb	prickly lettuce	*Latuca serriola*	0.85	excavation	no	176			further downslope			sandy-loam to silty loam						46.4716	-119.3672	152	Shallow, weak tap-root; many small laterals, especially in upper few cm	
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	perennial	grass	common reed	*Phragmites australis*	0.70	excavation for	no	1581			hummock in the bog		0.2	peat						35.0586	135.7693	75		the study site is a bog-fen system. Authors mention that the soils are water-logged, but no water table data given. The site is a pond with bogs on Google Earth. The Value of 0.2m is taken here from Fig 3 for it seems to be the mean root reach.
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	perennial	grass	Chinese silver grass,	*Miscanthus sinensis*	0.25	excavation for	no	1581			hummock in the bog		0.2	peat						35.0586	135.7693	75		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	perennial	herb	bog-bean, buckbean	*Menyanthes trifoliata*	0.30	excavation for	no	1581			hummock in the bog		0.2	peat						35.0586	135.7693	75		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	perennial	herb		*Lobelia sessilifolia*	0.15	excavation for	no	1581			hummock in the bog		0.2	peat						35.0586	135.7693	75		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	deciduous broad-leaf	shrub	panicled hydrangea	*Hydrangea paniculata*	0.20	excavation for	no	1581			hummock in the bog		0.2	peat						35.0586	135.7693	75		Rooting depth data from Fig.3
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	evergreen broad-leaf	shrub or small tree	Japanese holly, box-	*Ilex crenata*	0.18	excavation for	no	1581			hummock in the bog		0.2	peat						35.0586	135.7693	75		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	evergreen needle-leaf	tree	Japanese red pine	*Pinus densiflora*	0.13	excavation for	no	1581			hummock in the bog		0.2	peat						35.0586	135.7693	75		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	perennial	grass	common reed	*Phragmites australis*	2.50	excavation for	no	1581			fen		0.2	peat						35.0579	135.7722	82	Thus, the significance of Phragmites' deep rooting is that nutrients from deeper soils	
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	perennial	herb	bog-bean, buckbean	*Menyanthes trifoliata*	1.20	excavation for	no	1581			fen		0.2	peat						35.0579	135.7722	82		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	perennial	herb	Rabbit-ear iris	*Iris laevigata*	0.30	excavation for	no	1581			fen		0.2	peat						35.0579	135.7722	82		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	annual	herb	bur marigold,	*Bidens frondosa*	0.05	excavation for	no	1581			fen		0.2	peat						35.0579	135.7722	82		
Kohzu et al., 2003	northern Kyoto City,	wetland	Mizoro Site (Mizorogaike	annual or perennial	herb	bloodgrass	*Isachne globosa*	0.15	excavation for	no	1581			fen		0.2	peat						35.0579	135.7722	82		
Kokoreva, 1996	Kazakhstan, northern	dry steppe		deciduous broard-leaf	tree	Dzhungarian Hawthorn	*Crataegus songorica C.*	4.00	excavation	drawing							clayey chernozem,						43.2418	76.9905	1000	powerful lateral roots which penetrate to a depth of 4 m for Crataegus songorica and more than 6 m for C. almaatensis	location guessed, to be in a natural forest at 1000m elevation, near the universities
Kokoreva, 1996	Kazakhstan, northern	dry steppe		deciduous broard-leaf	tree	Almaty hawthorn	*Crataegus songorica C.*	6.40	excavation	drawing							clayey chernozem,						43.2418	76.9905	1000		
Koteen et al., 2011	Marin County, N-C	Mediterranean grassland	Tennessee Valley site,	perennial	rhizomatous grass		*Agrostis halli*	0.70	soil coring	yes to 0.5m	900	dry season May-Sept		0-2% slope, NE facing			sandy loam, sandstone/shale			sandstone /shale			37.8610	-122.5225	220	we found consistently higher stocks of carbon in soils of the native perennial grass community relative to the non-native annual community, particularly at soil	location moved 200m to east to be on NE facing slope with z=220m
Koteen et al., 2011	Marin County, N-C	Mediterranean grassland	Tennessee Valley site,	perennial	bunch grass		*Festuca rubra*	0.70	soil coring	yes to 0.5m	900	dry season May-Sept		0-2% slope, NE facing			sandy loam, sandstone/shale			sandstone /shale			37.8610	-122.5225	220		location moved 200m to east to be on NE facing slope with z=220m
Koteen et al., 2011	Marin County, N-C	Mediterranean grassland	Tennessee Valley site,	annual	grass		*Avena barbata,*	0.50	soil coring	yes to 0.5m	900	dry season May-Sept		0-2% slope, NE facing			sandy loam, sandstone/shale			sandstone /shale		invasive European	37.8610	-122.5225	220	annual grass root system concentrated in the top 10–20 cm of soil	location moved 200m to east to be on NE facing slope with z=220m
Koteen et al., 2011	Marin County, N-C	Mediterranean grassland	Bolinas Lagoon	perennial	grass		*Nassella pulchra,*	0.70	soil coring	yes to 0.5m	900	dry season May-Sept		0-5% slope, S facing			sandy loam, sandstone/shale			sandstone /shale			37.9310	-112.6730	168		location given very accurate! (on S facing slope with z=168m)
Koteen et al., 2011	Marin County, N-C	Mediterranean grassland	Bolinas Lagoon	annual	grass		*Brachypodium*	0.50	soil coring	yes to 0.5m	900	dry season May-Sept		0-5% slope, S facing			sandy loam, sandstone/shale			sandstone /shale		invasive European	37.9310	-112.6730	168		location given very accurate! (on S facing slope with z=168m)
Krishnamurthy et al., 2012	Patancheru, S.C. India	subtropical dry forest		semi-evergreen	shrub /small tree	Barbados Nut, Purging	*Jatropha curcas*	1.40	soil sampling	yes + photos	265						sandy clay loam to clay, gravel						17.5012	78.2790	519	The rooting depth was 1.4 m with a greater root length distribution at the surface soil...	lat-lon moved 1km to E to match reported elevation of 549m, in a
Kubota et al., 2005	central Japan	temperate broadleaf	the 1500m site	deciduous broard-leaf	tree	Japanese beech	*Fagus crenata*	0.25	unclear	no	2100			facing NE			moderately water-retentive			andesite and basalt			36.8417	138.7347	1500		only regional precip given - should differ among the 3 sites of ver
Kubota et al., 2005	central Japan	temperate broadleaf	the 900m site	deciduous broard-leaf	tree	Japanese beech	*Fagus crenata*	1.50	unclear	no	2100			facing NE			moderately water-retentive			andesite and basalt			36.8889	138.7694	900		Rooting depths are assumed the same as "rooting zone depth" given
Kubota et al., 2005	central Japan	temperate broadleaf	the 550m site	deciduous broard-leaf	tree	Japanese beech	*Fagus crenata*	0.40	unclear	no	2100			facing N; on a river			moderately water-retentive			andesite and basalt			36.9222	138.7661	550		no soil texture given for the hiest and lowest sites, but mentioned
Kuiper, 1992	coastal Netherland	temperate broadleaf		evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	0.8	excavation	no							well drained, dry, brown						52.0796	5.6498	36	The plots are located 3 km north of the city of Ede, in the central part of The	
Kutschera-Mitter, 1996	near Windhoek,	semiarid desert		evergreen	leaf succulent shrub	Windhoek Aloe	*Aloe littoralis*	0.4	excavation	drawing				highland partly									-22.5925	16.9966	1659	In warmer regions with a semiarid or arid climate roots often grow only horizontally	position guessed to be in the highlands near Windhoek,
Kutschera-Mitter, 1996	near Uis Myn, Namibia	semiarid desert		evergreen	shrub	myrrh	*Commiphora saxicola*	0.35	excavation	drawing				SW slope without									-21.2141	14.8564	802	In warmer regions with a semiarid or arid climate roots often grow only horizontally	position guessed to be on SW slope high above valley
Kutschera-Mitter, 1996	Swakopmund, Erongo,	arid desert		no leaf, photosynthetic	shrub	nara	*Acanthosicyos horrida*	4.75	excavation	drawing				dry valley above sea-									-22.6893	14.5278	7	Plants in dry desert valleys with great fluctuations of ground water level, without	position guesses to be on a dry valley floor near the mouth 7m
Laclau et al., 2004, 2001	N. of Poite Noire, Congo	plantation		evergreen broad-leaf	tree	white gum	*Eucalyptus alba x hybrids*	> 6.0	trech wall	yes	1200	dry season May-Sept					deep Ferralic Arenosols, 85%					plantation	-4.5895	11.8491	80	From the 2001 paper: There was both vertical and horizontal anisotropy in the	site picked in plantation 80m elevation 20km N of Pointe Noire;
Laclau et al., 2013	Itatinga, São Paulo, SE	plantation	sandy soil site	evergreen broad-leaf	tree	flooded gum	*Eucalyptus grandis*	12	trench wall + soil	yes	1360	6				14	sandy, deep Ferralsols (>10			Cretaceoussandstone	>10	6 yr old plantation,	-23.0226	-48.6083	850	Soil cores showed that the deepest roots reached a depth of 11.4 ± 1.6m at 2.1years	lat-lon moved 3.5km to east to z=850m; same sites as Christina,
Laclau et al., 2013	Itatinga, São Paulo, SE	plantation	clayey soil site	evergreen broad-leaf	tree	flooded gum	*Eucalyptus grandis*	11	trench wall + soil	yes	1360	6				14	clayey, deep Ferralsols (>10			basalt	>10	6 yr old plantation,	-23.0770	-48.6361	850	The mean FRD (find root density) down to a depth of 10m was 40% higher in the	excavation stopped at 10m but Fig. 3b and Fig. 4D and E suggest much
Lamont et al., 1984	Bot River, South Africa	Mediterranean, fynbos of	Bot River, natural stand	evergreen broad-leaf	small tree or shrub	Yellow Tulip	*Leucadendron laureolum*	>0.6	excavation	yes							Humus, sand and gravel, rocks			sandstone	0.6		-34.3000	19.1500	40	Roots were excavated 0.35m from the base of a 1.8 m high plant about 13 years old,	Bot River is the only natural setting in this study of potted experiments
Lawson et al., 1968	NE Ghana, Mole Reserve	tropical tree savanna	mid-slope site only	mixed deciduous/ev	tree		*Burkea africana,*	0.9	excavation	yes				midslope, 5° slope facing			sandy loam, on loam, on clay			sandstone, phyllites,	1-4m	frequently burnt	9.4024	-1.9846	165	Marked concentration of tree roots was observed at a depth of 20-30 cm, i.e.	From Fig.16b and 17
Lawson et al., 1970	S Ghana, near Kade, Agr Res	moist semi-desiduous	upper slope-Bekwai series	semi-evergreen	tree		*Celtis mildbraedii,*	0.6	soil monoliths	yes	1700	2 dry season (Jan, Aug)		upper slope			humus-10cm, well-drained			phyllite (fine-grained		some timber	6.1503	-0.9119	193	The three sites showed marked differences in the total quantity of roots and also showed variation in the size class distribution of the roots particularly in the	From Fig 14. Roots are deeper than show; assumed to end in the next 10cm for site 1 and 3, and next 20cm for site 2; dominant species
Lawson et al., 1970	S Ghana, near Kade, Agr Res	moist semi-desiduous	middle slope-Nzima series	semi-evergreen	tree		*Piptadeniastrum africanum*	0.7	soil monoliths	yes	1700	2 dry season (Jan, Aug)		mid slope			humus-10cm, well-drained			phyllite (fine-grained		some timber	6.1537	-0.9103	180		
Lawson et al., 1970	S Ghana, near Kade, Agr Res	moist semi-desiduous	lower slope alluvium,	semi-evergreen	tree		*Carapa procera,*	0.6	soil monoliths	yes	1700	2 dry season (Jan, Aug)		lower slope		0.5	humus-10cm, poorly-drained			phyllite (fine-grained		potery evidence of	6.1572	-0.9086	169	A grey sandy light clay or loamy soil developed in local alluvium; often under	WTD inferred from mottled soils and author's mentioning of shallow
Lee and Laurenroth,	N-central Colorado,	temperate steppe	sandy-clay-loam location	perennial	bunch grass	Blue grama	*Bouteloua gracilis*	0.92	excavation + soil	yes + drawings	321						sandy clay loam, 67% sand, 13%					protected from cattle	40.8634	-104.6055	1649	Despite the fact that the soil surface is not completely covered by the aboveground	Given lat-lon wrong (put you 250km NW Fort Collins, not 6km
Lee and Laurenroth,	N-central Colorado,	temperate steppe	sandy-loam location	perennial	bunch grass	Blue grama	*Bouteloua gracilis*	1.1	excavation + soil	yes + drawings	321						sandy loam, 79% sand, 10% silt					protected from cattle	40.8759	-104.6206	1653	The primary differences between locations were the greater depth of root	lat-lon picked on sandy soil patch with sparser and larger plants, as
Lee and Laurenroth,	N-central Colorado,	temperate steppe	sandy-clay-loam location	deciduous broad-leaf	sub shrub	broom snakeweed	*Gutierrezia sarothrae*	1.05	excavation + soil	yes + drawings	321						sandy clay loam, 67% sand, 13%					protected from cattle	40.8634	-104.6055	1649	On the SCL location, G. sarothrae had lateral roots which extended 20-40 cm	lat-lon picked on a sandy clay soil patch 2km SE of sandy site
Lee and Laurenroth,	N-central Colorado,	temperate steppe	sandy-loam location	deciduous broad-leaf	sub shrub	broom snakeweed	*Gutierrezia sarothrae*	2.05	excavation + soil	yes + drawings	321						sandy loam, 79% sand, 10% silt					protected from cattle	40.8759	-104.6206	1653	the only G. sarothrae individual excavated on the SL location had roots which	sandier soils seem to favor both shallow root concentration AND
Lee and Laurenroth,	N-central Colorado,	temperate steppe	sandy-loam location	evergreen broad-leaf	shrub	Four-wing saltbush	*Atriplex canescens*	2.03	excavation + soil	yes + drawings	321						sandy loam, 79% sand, 10% silt					protected from cattle	40.8759	-104.6206	1653	A. canescens possesses a very large diameter tap root which extends to the	
LeRoux et al. 1995	Cote d'Ivoire, wetern Africa	tree savanna	Lamto Reserve	deciduous broad-leaf	shrubs		*Gus sonia barteri,*	2	soil cores	yes	1210	Dec-Jan		flat, near river			sandy, tropical ferruginous						6.2167	-5.0333	72	water uptake by both grass and shrub species was consistently from the top soil layer in this humid savanna. Similar patterns of soil water uptake, by these two	site is flat and near a large meandering river; soil water profile
LeRoux et al. 1995	Cote d'Ivoire, wetern Africa	tree savanna	Lamto Reserve	perennial	bunch grass		*Hyparrhenia diplandra,*	1.7	soil cores	yes	1210	Dec-Jan		flat, near river			sandy, tropical ferruginous						6.2167	-5.0333	72		no water competition and vertical partitioning as suggested by the 2-
Lewis and Burgy, 1964	Placer County, CA	Mediterranean woodland	Well 3BN, 1961 injection	deciduous broad-leaf	tree	live, blue, valley oak	*Quercus wislizenii, Q.*	5.88	tritiated water in	no				in a howllow		7.41				metamorphosed	1.0-2.0		38.9819	-121.2267	474	diamond core drill holes which penetrate the fractured and jointed metamorphic rock well into the saturated zone. These holes provide observation wells for groundwater measurements and access for the injection of tritiated water into the groundwater zone... In all the injection tests, significant amounts of tritiated water have been found in the water extracted	The 1962 and 63 injections in 3 wells formed a triangle, one near the top of the SW-facing slope (I-B1), and the other near the valley bottom (I-B2 slightly lower, and I-B3 higher); The author suggests that the capillary rise is about 5 feet, which should be deducted when estimating rooting depths;
Lewis and Burgy, 1964	Placer County, CA	Mediterranean woodland	Well 6A, 1961 injection site	deciduous broad-leaf	tree	black, blue oak	*Q. kellogii, Q. douglasii*	11.31	tritiated water in	no				in a hill side facing NE		12.83				metamorphosed	1.0-2.0		38.9786	-121.2256	655		
Lewis and Burgy, 1964	Placer County, CA	Mediterranean woodland	Well I-B1, 1962 + 1963	deciduous broad-leaf	tree	live, blue oak	*Quercus wislizenii, Q.*	20.39	tritiated water in	no				near top of a SW-facing		21.92				metamorphosed	1.0-2.0		38.9827	-121.2244	585		
Lewis and Burgy, 1964	Placer County, CA	Mediterranean woodland	Well I-B2, 1962 + 1963	deciduous broad-leaf	tree	live, blue oak	*Quercus wislizenii, Q.*	14.94	tritiated water in	no				at the lower bottom of		16.46				metamorphosed	1.0-2.0		38.9822	-121.2259	474		
Lewis and Burgy, 1964	Placer County, CA	Mediterranean woodland	Well I-B3, 1962 + 1963	deciduous broad-leaf	tree	live, blue oak	*Quercus wislizenii, Q.*	15.45	tritium tracer in	no				at the upper bottom of		16.98				metamorphosed	1.0-2.0		38.9817	-121.2253	479		
Lichtenegger & Kutschera-	Kleve, Germany,	temperate forest		perennial	thorny forb	field eryngo	*Eryngium campestre*	4.30	excavation	drawing				on river terrace			deep alluvium						51.8243	6.1278	14	Hear the end of the pole root a tassel shaped ramification may be found, if the	habitat: dry grassy areas near the coast
Lichtenegger & Kutschera-				perennial	forb		*Scorzonera villosa*	1.15	excavation	drawing				on river terrace			deep alluvium									The root shape of S. villosa (Fig.2) is adapted to a very dry soil. The thicker first	
Lichtenegger & Kutschera-				perennial	forb	small pasque	*Pulsatilla pratensis*	0.80	excavation	drawing				on river terrace			black earth with a wide and									In black earth areas with a wide and crusty lime horizon the grov1th of the pole root	
Lichtenegger & Kutschera-				perennial	forb	goldilocks aster	*Aster linosyris*	0.52	excavation	drawing				on river terrace			moderately deep to cleep									due to changes in temperature, daylength and moisture during the year, the lateral	
Lichtenegger & Kutschera-				perennial	forb	German Greenweed	*Genista germanica*	0.90	excavation	drawing				on river terrace			betiveen black earth and brown									The pole root grows deeper, with increasing moisture. If temperature is high	habiat: Thickets, poor pastures and heaths
Lichtenegger & Kutschera-				perennial	legumous forb	Common kidneyvetch,	*Anthyllis vulneraria*	1.70	excavation	drawing				on river terrace												If the amount of nutrients is not sufficient to strengthen the lateral roots, they stay	

Lichtenegger & Kutschera-				perennial	legumous forb		*Trigonella balancae*	2.00	excavation	drawing				on river terrace			brown earth										
Lichtenegger & Kutschera-	in north of Caucasus.			perennial	shrub		*Astragalus denudatus*	1.50	excavation	drawing				on steep slope												The wide cone shaped root volume can be found on plants which are groidng on	
Lichtenegger & Kutschera-	Istria, Croatia			perennial	forb	hawkbits (in the	*Leontodon tuberosus*	0.75	excavation	drawing							red earth						44.9347	13.8479	69	Cone shaped, downwards dilated root types are formed, if the soil is temporarily	location guessed to be in non-forested nature area of red earth
Lichtenegger & Kutschera-	north of Eurgenland.			perennial	forb	rush skeletonwee	*Chondrilla juncea*	2.40	excavation	drawing							black earth									It is characteristic for plants which are able to grow deeply if the surface is too dry.	
Lichtenegger & Kutschera-				perennial	legumous forb	clover	*Trifolium trichocephalu*	1.25	excavation	drawing																If the roots grow only just under the surface, so that the less branched pole root	
Lichtenegger & Kutschera-	in north of Caucasus.	Mediterranean woodland		perennial	forb		*Carum caucasicum*	1.10	excavation	drawing				alpine, NW Caucasus											1850	in high mountain regions the pole root may not be branched at all in the uppermost soil	
Lichtenegger & Kutschera-	near Hainz, Germany	temperate forest		biennial	forb	Orcanette sands	*Onosma arenarium*	1.30	excavation	drawing				on sand terraces			sand						50.0135	8.2103	124	If a more or less horizontally spreading root system exists, ... the root is still growing	location gussed to be in "Mainz Sand Dunes." Nature reserve
Lichtenegger & Kutschera-				perennial	forb	Spanish Catchfly	*Silene otites*	0.50	excavation	drawing																Eeg shaped root types are formed, if there is less rooting at depth and less rooting	habitat: shallow, well-drained, light calcareous soils
Lichtenegger & Kutschera-				perennial	forb	primrose	*Primula vulgaris*	0.21	excavation	drawing							moist and cold soil									Umbrella shaped root types are formed, if the roots, after growing downwards in a	habitat: open woods and shaded hedgerows
Lichtenegger & Kutschera-		Marsh		perennial	forb (an orchid)	western marsh	*Dactylorhiza majalis*	0.09	excavation	drawing							peat soil									On warmed peat soil, roots orginating deeper grow upwards in a bow. Therefore	habitat: nitrogen-poor marsh areas
Lichtenegger & Kutschera-		Alpine		perennial	shrub	Scotch heather	*Calluna vulgaris*	0.30	excavation	drawing				alpine/subalpine												If the depth of rooting is very small but lateral spreading is very large, a discoid	
Lichtenegger, 1996	S. Austria	temperate broadleaf	Carinthian basin	perennial	forb	stemless carline	*Carlina acaulis*	4.08	excavation	yes				lowland valley									46.6442	14.2883	450	It is shown that in climatic zones with	Table 2 gives profile of many species, contrasting the alpine vs.
Lichtenegger, 1996	S. Austria	temperate broadleaf	Heiligenblut region	perennial	forb	stemless carline	*Carlina acaulis*	1.23	excavation	no				subalpine slope									47.0438	12.8348	1420	distinct seasons, the depth of root	coline elevation zones. Without
Lichtenegger, 1996	S. Austria	temperate broadleaf	GroBglockner region	perennial	forb	stemless carline	*Carlina acaulis*	0.66	excavation	yes				alpine slope									47.0483	12.7678	2070	penetration in the soil mainly depends on	exact elevation data the location
Lichtenegger, 1996	S. Austria	temperate broadleaf	alpine belt	perennial	grass	alpine oateras	*Avena versicolor*	0.30	excavation	drawing				alpine slope									46.8932	12.8579	1990	the degree to which the ground is warmed	cannot be even guessed, so only
Lichtenegger, 1996	S. Austria	temperate broadleaf	subalpine belt	perennial	forb	Dwarf Yellow	*Potentilla aurea*	0.55	excavation	yes + drawing				subalpine slope									46.9158	12.8871	1640	up and on the intensity of temperature fluctuations. Warm lowland soils have deeper roots than the cooler soils from higher altitudes. The shallower roots at high altitudes are correlated with denser	elevation and rooting depth from Fig.4 elevation from Fig.5, rooting depth from Table-2
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	dry	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.6	peat block sampling	yes	508				0.59-0.95	0.8	peat to depth examined						55.1681	-114.2769	598	The study area is located 40 km east of Slave Lake, Alta., along Provincial Highway	locations well defined by map in Fig.1
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	medium	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.3	peat block sampling	yes	508				0.17-0.7	0.5	peat to depth examined						55.1647	-114.2816	597	Samples were restricted to hummocks because it was assumed that most of the	WTD from time series plot in Fig.2
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	wet	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.2	peat block sampling	yes	508				0.02-0.39	0.22	peat to depth examined						55.1620	-114.2850	596	Clearly, roots of black spruce and tamarack penetrate deeper in peatlands when the	max rooting depth from Tab.3
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	very wet	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.3	peat block sampling	yes	508				0-0.16	0.14	peat to depth examined						55.1786	-114.3365	617	In general, trees on sites with greater depth of water table had higher growth	this is a very nice study on how local WTD variations constrain
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	dry	deciduous needle-leaf	tree	tamarack, eastern	*Larix laricina*	0.6	peat block sampling	yes	508				0.59-0.95	0.8	peat to depth examined						55.1681	-114.2769	598	Deep roots, even though they make up a small portion of the total biomass of fine	
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	medium	deciduous needle-leaf	tree	tamarack, eastern	*Larix laricina*	0.4	peat block sampling	yes	508				0.17-0.7	0.5	peat to depth examined						55.1647	-114.2816	597	We speculate that the increase in the fine roots in the surface layers of the sites with	
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	wet	deciduous needle-leaf	tree	tamarack, eastern	*Larix laricina*	0.3	peat block sampling	yes	508				0.02-0.39	0.22	peat to depth examined						55.1620	-114.2850	596	Rooting depth was strongly correlated with depth to water table. On wet sites, roots of	
Lieffers & Rothwell,	Central Alberta, CA	boreal forest	very wet	deciduous needle-leaf	tree	tamarack, eastern	*Larix laricina*	0.3	peat block sampling	yes	508				0-0.16	0.14	peat to depth examined						55.1786	-114.3365	617	There was a strong positive correlation between fine root biomass and depth of	
Link et al. 1990	Hanford, SC Washington	semi-arid shrub-steppe		annual	bunch grass	cheatgrass	*Bromus tectorum L.*	0.5	excavation	no	160	mostly in fall / winter					loamy sand on coarse sand					burned 6yr ago	46.4056	-119.3333	134	The greatest depth of roots observed for large individuals of cheatgrass was 45 to 50	
Link et al. 1990	Hanford, SC Washington	semi-arid shrub-steppe		perennial	grass	Sandberg's bluegrass	*Poa sandbergii*	0.35	excavation	no	160	mostly in fall / winter					loamy sand on coarse sand					burned 6yr ago	46.4056	-119.3333	134	cm, which reaches into the coarse sand zone of the profile. The greatest depth	
Link et al. 1994	Hanford, SC Washington	semi-arid shrub-steppe		evergreen broad-leaf	shrub	spiny hopsage	*Grayia spinosa*	2.15	soil coring	yes	160	mostly in fall / winter		dune crest			silty loam						46.5836	-119.7329	245	Integrated root biomass down to 195cm	
Link et al. 1994	Hanford, SC Washington	semi-arid shrub-steppe		evergreen needle-leaf	shrub	big sagebrush	*Artemesia tridentata*	2.15	soil coring	yes	160	mostly in fall / winter		dune swale			silty loam						46.5838	-119.7342	243	was significantly greater under the G. spinosa coppice dunes than under the A. tridentata swales (9x more, esp. in top	
Liu et al., 2008	central Taklimakan	arid desert	near Tazhong station Taklim	deciduous broad-leaf	tree		*Tamarix taklamakane*	1.4	excavation	no	37		3639	flat dune valley		1.3	sand						39.1105	83.6697	1083	The sight on the ground is high mobile compound sand hill. The ground water is	a low spot in a dune valley in nearest the given lat-lon is selected
Livesley et al., 2000	Nyabeda, western	grass savanna		evergreen broad-leaf	tree	southern silky oak,	*Grevillea robusta*	> 3.0	trench wall to	yes	1800						very fine, kaolinitic, 73%					inter-cropping	0.1000	34.5667	1330	Root length density of grevillea, senna and maize was greatest in the topsoil and	elevation seems 100m higher on GE; caution: trees only 3 years old;
Livesley et al., 2000	Nyabeda, western	grass savanna		deciduous broad-leaf	small tree	Spectacular cassia,	*Senna spectabilis*	> 3.0	trench wall to	yes	1800						very fine, kaolinitic, 73%					inter-cropping	0.1000	34.5667	1330	generally decreased exponentially with depth. Root length density of both tree	A classi example of deep soil, abundant rain, and exponential profile
Livesley et al., 2000	Nyabeda, western	grass savanna		annual	grass	corn	*Zea mays*	1.6	soil coring to 1.8m	yes	1800						very fine, kaolinitic, 73%					inter-cropping	0.1000	34.5667	1330	species decreased in the topsoil during the cropping season (Figures 3 and 4)	
López et al. 2001	NE Spain	Mediterranean dry forest	Prades Experimental	evergreen broad-leaf	tree	evergreen oak, holly	*Quercus ilex L.*	> 0.6	minirhizotron	yes	537	mostly in winter	1051	NE facing			well structured clay-loam				0.0-0.8-1.5		41.2183	0.9176	700	Fine root density was higher in the 50–60-cm depth interval than in the 40–50-cm	site slightly moved to be NE facing at 650-750m elevation; soil water
Lee and Lamont, 1990	SW Australia	sclerophyuous scrub-heath		evergreen broad-leaf	tree	Banksia	*Banksia hookeriarra /*	8	excavation	yes	530					8	deep, freely drained, podzol						-29.8667	115.2500	83	the mass of thinker roots remained substantial and ropped little with	A study site was chosen 280 km north of Perth, W.A. and 6 km
Lyford and Wilson, 1964	Central MA, Harvard	temperate deciduous	Prospect Hill Track,	deciduous broad-leaf	tree	red maple	*Acer rubrum*	3.5	soil pits	no				very gentle SW facing			fine sandy loam, free drained and						42.5345	-72.1922	342	Woody roots are up to 25 meters long... Each full grown root fan bears from 1 to 5	found a map of prospect hill track showing compartments on Harvard
Ma et al., 2013; 2014	Yulin, Shaanxi Province, C.	dry steppe	F-5, not irrigated or	deciduous broad-leaf	tree	jujube, red date,	*Ziziphus jujube*	10	soil coring	yes	490	50% in July-Sept	1574	S facing upper			sandy loam (1.2m rain					plantation	38.3265	109.7091	1102	At each sampling point, a soil core method using a LuoYang shovel was employed...	Given lat-lon way off (wrong province). Ma-2014 gives Yulin
MacDougal, 1937	Sequoia National Park,	mountain forest	Crescent Meadow	evergreen needle-leaf	tree	giant sequoia,	*Sequoia gigante*	1.83	upturned root plate	no				on the edge of Crescent						granite			36.5547	-118.7483	2045	High water level in the bog with accompanying softening of the soil was an	
Martin, 1968	Cambridgeshire, England	temperate deciduous	Buff Wood, Mercurialis	perennial	herb, woodland	dog's mercury	*Mercurialis perennis*	> 0.15	excavation	no				well-drained			chalky boulder-clay						52.1371	-0.1270	90	Examination of the root profiles of Mercurialis perennis shows that in the	excellent analysis on water-logging, or what are the true causes
Martin, 1968	Cambridgeshire, England	temperate deciduous	Buff Wood, Primula	perennial	herb, woodland	dog's mercury	*Mercurialis perennis*	< 0.10	excavation	no				poorly drained			chalky boulder-clay						52.1359	-0.1326	71	Mercurialis areas the roots of this species extend to a depth of 15 cm or more; this is	including O stress, CO2 toxicity, ferrous and manganous ion toxicity
Martin and Chambers,	Central Nevada, US	desert reparian	Corral Canyon	perennial	sedge grass, grass	Nebraska sedge,	*Carex nebrascensis,*	0.4	minirhizotron	no	310	60% as snow			0-1.2	0.4	aquic cryoborrols to						39.1204	-116.8107	2368	Large yearly and seasonal differences among water tables largely determined the	
Martin and Chambers,	Central Nevada, US	desert reparian	Cahill Canyon	perennial	sedge grass, grass	Nebraska sedge,	*Carex nebrascensis,*	0.6	minirhizotron	no	310	60% as snow			0-1.5	0.6	aquic cryoborolls						39.4660	-117.0334	2325	rooting activity and depth in these mesic meadows and influenced treatment	roots only observed to 0.45cm; values here extrapolated according to the authors' statement that root activities tracked the water table
Martin and Chambers,	Central Nevada, US	desert reparian	Emigrant Canyon	perennial	sedge grass, grass	Nebraska sedge,	*Carex nebrascensis,*	0.8	minirhizotron	no	310	60% as snow			0-2.4	1.4	aquic cryoborolls						39.5098	-117.0183	2174	responses. Little rooting activity occurred within or at the surface of the water table	
Matthes-Sears &	S.Ontario, Canada	temperate broadleaf	on cliff face at Jail	evergreen needle-leaf	small tree	eastern white cedar,	*Thuja occidentalis*	0.35	excavation	no				on nearly vertical cliff			no soil			lime stone	0		43.5081	-79.9299	306	The results showed that the majority of trees grew in rock without soil or in very	location from Briand-1991, not the site given (Guelph) which is a
Mauer and Palatova,	Krtny, E Czech Republic	plantation	80yr old stand	evergreen needle-leaf	tree	Douglas-fir	*Pseudotsuga menziesii*	1.51	excavation	no				flat land			cambisol, mesotrophic,			granodiorite		plantation	49.2921	16.7472	454		a mature stand near Krtny
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Bruce County, Grey-Sauble	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.33	trench wall	no						1.5	silty loam					plantation	44.4722	-80.3611	496	The mean rooting depth on healthy sites was 195 cm, significantly deeper than the	At all paired sites (healthy vs. sick), forest stands are picked with one
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Bruce County, Grey-Sauble	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.19	trench wall	no						1.5	silty loam					plantation	44.4707	-80.3619	496		Near Grey-Sauble Conservation Authority nearest to the location
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Simcoe County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.97	trench wall	no							loamy sand					plantation	44.1505	-79.8877	218	on the Baxter 249b site scattered windthrow of living trees was also	Large forests nearest the town of Baxter is chosen
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Simcoe County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.64	trench wall	no							loamy sand					plantation	44.1510	-79.8869	218		Large forests nearest the town of Baxter is chosen
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Simcoe County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.51	trench wall	no							gravely loam					plantation	44.5017	-79.8589	227		The large forest stands near Phelpston is chosen
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Simcoe County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.79	trench wall	no							gravely loam					plantation	44.4990	-79.8585	227		The large forest stands near Phelpston is chosen
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Dufferin County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.84	trench wall	no							sand					plantation	44.2530	-80.0663	283		The forest near Randwick is chosen
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Dufferin County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.43	trench wall	no							sand					plantation	44.2544	-80.0603	283		The forest near Randwick is chosen
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Northumberland County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.4	trench wall	no							sand					plantation	44.0767	-78.5031	268		Near Ganaraska Forest Centre; hard to tell healthy from sick
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Northumberland County,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.6	trench wall	no							sand					plantation	44.0767	-78.5031	268		Near Ganaraska Forest Centre; hard to tell healthy from sick
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Norfolk County, Miller	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.31	trench wall	no							fine sand / sandy loam					plantation	42.9218	-80.3190	232		Could not locate Miller Lumber; a plantation-like forest stand (with

McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Norfolk County, Miller	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.51	trench wall	no							fine sand / sandy loam					plantation	42.9214	-80.3170	232		Could not locate Miller Lumber; a plantation-like forest stand (with
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	York Region, North 30b,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.12	trench wall	no							sand					plantation	44.1432	-79.3371	237		location picked closest to point given in fig.1
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	York Region, North 30b,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	0.99	trench wall	no							sand					plantation	44.1401	-79.3291	237		location picked closest to point given in fig.1
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Parry Sound District, Gurd	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.2	trench wall	no							gravely sandy loam					plantation	46.0013	-79.4334	335	Water deficit (possibly combined with bark beetle attack) was determined as the cause	location picked closest to point given in fig.1
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Parry Sound District, Gurd	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.36	trench wall	no							gravely sandy loam					plantation	45.9969	-79.4316	335	Water deficit (possibly combined with bark beetle attack) was determined as the cause	location picked closest to point given in fig.1
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Durham Region,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.29	trench wall	no							sand					plantation	44.1615	-79.1235	246		location picked closest to point given in fig.1
McLaughlin et al., 2011	southern Ontario,	temperate broadleaf	Durham Region,	evergreen needle-leaf	tree	red pine	*Pinus resinosa*	1.35	trench wall	no							sand					plantation	44.1575	-79.1224	246		location picked closest to point given in fig.1
McQuilkin, 1935	Pinelands, central NJ	pine barrens of coastal	Lebanon State Forest	evergreen needle-leaf	tree	pitch pine	*Pinus rigida*	2.74	excavation	no				ridge top, excessive			Lakewood sand (coastal plain						39.8879	-74.5089	48	on sterial and dry ridge top; and active mycorrhizae were collected as deep as 7	this study has photos of pine seedling roots that are tap roots only in yr-1, starting lateral roots in yr-2, with lateral roots progressively getting longer, stronger, more branched, then manu sinker roots reach same
McQuilkin, 1935	Pinelands, central NJ	pine barrens of coastal	Lebanon State Forest	evergreen needle-leaf	tree	pitch pine	*Pinus rigida*	> 1.52	excavation	no				lower slope, good			Lakewood sand (coastal plain						39.8911	-74.4935	39	on lower but still well drained site	
McQuilkin, 1935	Pinelands, central NJ	pine barrens of coastal	Lebanon State Forest	evergreen needle-leaf	tree	pitch pine	*Pinus rigida*	2	excavation	no				steep slope on water		0.91	Lakewood sand (coastal plain						39.9049	-74.5007	37	the presence of mycorrhizae far below a permanent water table is even more	
McQuilkin, 1935	Pinelands, central NJ	pine barrens of coastal	Lebanon State Forest	evergreen needle-leaf	tree	pitch pine	*Pinus rigida*	1.52	excavation	no				flat valley bottom		0.2	Lakewood sand (coastal plain						39.9174	-74.5152	28	It is possible that conditions in the pine barrens permit a greater degree of aeration	
McQuilkin, 1935	Pinelands, central NJ	pine barrens of coastal	Lebanon State Forest	evergreen needle-leaf	tree	shortleaf pine	*Pinus echinata*	2.74	excavation	no				ridge top, excessive			Lakewood sand (coastal plain						39.8879	-74.5089	48	It occurs in mixture with P. rigida and the oaks, or, locally, in almost pure stands.	
McQuilkin, 1935	Near Mount Alo, S.	temperate mixed forest	Mont Alto State Forest	evergreen needle-leaf	tree	pitch pine	*Pinus rigida*	1.07	partial excavation	no				on high ridges in			raw, podsolized, stony, and high						39.8263	-77.4824	595	(compare to sandy coastal plains) Vertical roots were generally weaker in both	site estimated to be on a ridge by the road in the state forest
Meinzer, 1927	Tooele Valley, Utah	arid valleys of the US SW	margin of Great Salt	succulent alkali-	shrub	pickleweed	*Allenrolfea occidentalis*	0.61	excavation	drawing				on low hummocks		0.61	clay						40.6503	-112.3958	1285	large tap root; usually preferring a slightly better drained and less saline soil	
Meinzer, 1927	Tooele Valley, Utah	arid valleys of the US SW	margin of Great Salt	succulent, deciduous	shrub	big greasewood	*Saroobatm vermdoulatus*	1.09	excavation	drawing				furhter back from the									40.6169	-112.3411	1308	practically certain that greasewood habitually sends its well-developed taproot	location constrained by plate-I of Kearney et al. (1914) where the
Meinzer, 1927	Escalante Valley, Utah	arid valleys of the US SW	Hendrickson alfafa farm	perennial forage	forb	alfafa	*Medicago sativa*	2.74	excavation	drawing				valley edge at base of	1.92 - 2.80	2.59							38.3371	-113.0355	1523	in the NE. % sec. 36, T. 28 S., R. 11 W.; The capillary fringe is 3.5 feet or a little more in	using EarthPoint Township KMZ on GoogleEarth
Mendes et al., 2016	SC Portugal, Tagus valley	Mediterra woodland	Belmonte	evergreen broad-leaf	tree	cork oak	*Quercus suber L.*	2.50			629			alluvial valley	2.5 - 3.8	3	AR interspersed with Stagnic						38.8819	-8.7969	31	Cork oak relies upon a dimorphic root system which allows the access and use of groundwater resources during the summer	elevation given 22m, lower than GE. Rooting depth here is inferred - no direct measurements. Correlation between cork rings and
Mendes et al., 2016	SC Portugal, Tagus valley	Mediterra woodland	Carro Quebrado	evergreen broad-leaf	tree	cork oak	*Quercus suber L.*	2.00			629			alluvial valley	2.0 - 3.1	2.5	Haplic Arenosols (AR) on sand						38.8358	-8.8172	24	dry season	
Mensah & Jenik, 1968	S Ghana	tropical semi-deceduous	Esukawkaw Forest	semi evergreen	tree	Iroko	*Ohlorophora excelsa*	1.1	excavation	yes + drawings													6.3333	-0.7500	176	A well developed tap-root was present in all mature trees excavate at both research sites; A mighty tap-root remained; We could not follow the full depth of its	depth inferred from the profile (Fig 4) and statemnet that sinker roots
Mensah & Jenik, 1968	S Ghana	tropical semi-deceduous	U of Ghana Agricultural	semi evergreen	tree	Iroko	*Ohlorophora excelsa*	3.5	excavation	yes + drawings													6.1667	-0.9167	188		The deeper root at site-1 near Kade is chosen; depth inferred from Fig
Wenforth & Walker, 1996	S. South Australia	Mediterra shrubland		evergreen broad-leaf	small tree	Swamp Paperbark	*Melaleuca halmaturoru*	0.5	root obs chamber +	yes				swamp, with		0.8							-36.2918	140.0765	27	Water uptake concentrated in deeper parts of soil profile when groundwater was at its	lat-lon given is in the center city of Keith. Moved to 30km SW of Keith,
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	sparse tree cluster site	evergreen broad-leaf	small thorny shrub	Desert Yaupon,	*Schaefferia cuneifolia*	1.4	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam over claypan	argillic horizon	0.40				27.6695	-98.1883	77	The decrease in root biomass with increasing soil depth was exponential in	location approximate
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	sparse tree cluster site	deciduous broad-leaf	small thorny shrub	Texas buckthorn	*Ziziphus obtusifolia*	1.6	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam over claypan	argillic horizon	0.40				27.6695	-98.1883	77	Root densities of species in discrete clusters (claypan present) were typically	location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	sparse tree cluster site	evergreen broad-leaf	small thorny shrub	Desert Hackberry	*Celtis pallida*	2	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam over claypan	argillic horizon	0.40				27.6695	-98.1883	77	2H and 18O values of stem water from all plants in groves were lower than those of	location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	sparse tree cluster site	deciduous broad-leaf	legume tree	honey mesquite	*Prosopis glandulosa*	2.1	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam over claypan	argillic horizon	0.40				27.6695	-98.1883	77	Groundwater (>60 m below the surface) was sampled from four wells on the La	location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	sparse tree cluster site	evergreen broad-leaf	understory shrub	Wild Lime	*Zanthoxylum fagara*	1.6	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam over claypan	argillic horizon	0.40				27.6695	-98.1883	77		location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	dense tree grove site	evergreen broad-leaf	understory shrub	Texas Guajacum	*Porlieria angustifolia*	1.2	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam soil 2m deep						27.6667	-98.2010	81		location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	dense tree grove site	evergreen broad-leaf	small thorny shrub	Desert Yaupon,	*Schaefferia cuneifolia*	1.2	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam soil 2m deep						27.6667	-98.2010	81		location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	dense tree grove site	deciduous broad-leaf	small thorny shrub	Texas buckthorn	*Ziziphus obtusifolia*	2	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam soil 2m deep						27.6667	-98.2010	81		location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	dense tree grove site	evergreen broad-leaf	small thorny shrub	Desert Hackberry	*Celtis pallida*	1.6	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam soil 2m deep						27.6667	-98.2010	81		location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	dense tree grove site	deciduous broad-leaf	legume tree	honey mesquite	*Prosopis glandulosa*	2.4	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam soil 2m deep						27.6667	-98.2010	81	while P. glandulosa roots were abundant throughout the 200 cm sampling depth,	location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland	dense tree grove site	evergreen broad-leaf	understory shrub	Wild Lime	*Zanthoxylum fagara*	1.4	1.5m corning	yes	720	70% in Apr-Sept	1540			> 60	sandy loam soil 2m deep						27.6667	-98.2010	81		location approximate; rooting depth from fig5
Midwood et al., 1998	near Alice, S. Texas	savanna parkland		deciduous broad-leaf	C4 grass			1.8	soil coring	yes	720	70% in Apr-Sept	1540			> 60	sandy loam over claypan	argillic horizon	0.40				27.6712	-98.1990	79		location approximate; rooting depth from fig 4
Montoroi et al. 2016	Khon Kaen, NE Tailand	tropical savanna /	PBK1, hill top	evergreen broad-leaf	tree	Dipterocarpus	*Dipterocarpus s forest*	> 32	deep well boring	yes	1634	mostly May-Oct		hill top		20 (current)	sand layer over claey layer over			densely fractured	0.70	deforested farm land	16.3307	102.7430	183	The distribution of root biomass as a function of depth indicates a high amount of root biomass at a depth ranged from 20 m to 32 m; The current presence of a water	dimorphic roots clearly shown under hill top; water table has risen after deforestation which has preserved the roots 60vrs after
Montoroi et al. 2016	Khon Kaen, NE Tailand	tropical savanna /	PBk5, mid slope	evergreen broad-leaf	tree	Dipterocarpus	*Dipterocarpus s forest*	26	deep well boring	yes	1634	mostly May-Oct		mid slope		13 (current)	sand layer over claey layer over			densely fractured	2.50	deforested farm land	16.3330	102.7432	177		
Mooney et al., 1980	Pampa del Tamarugal,	arid desert		evergreen broad-leaf	legume tree	Tamarugo	*Prosopis tamarugo*	> 3.5	excavation	no	<1			center of basin	5.0-12.0							plantation	-20.5420	-69.6584	980	It is proposed that in its native habitat, where there is essentially no precipitation,	there is a dense rooting mat that may serve as storage at night; soil
Moore et al., 2010	S. Texas	xeric shrubland	native vegetation	evergreen broad-leaf	shrub	honey mesquite	*Prosopis glandulosa,*	2.25	soil corning	fitted curve	600					> 30	deep to very deep, sandy						28.4519	-99.1841	148	Permanent groundwater tables are far below the root zone (30+ m) and do not	exact plot locations not given; 95% root depth in deepest of 6 cores
Mordelet et al., 1997	Côte d'Ivoire	W African humid	under canopy	semi deciduous	small tree		*Bridelia ferruginea,*	1	soil pit (0.2x0.2m	yes	1200	dry season Dec-Feb		on the plateau			sandy, gravel/stone					burned annually	6.2189	-5.0245	95	Tree density increases along a catena from a herbaceous savanna underneath a	this study has monthlyl root profiles for 13 months
Mordelet et al., 1997	Côte d'Ivoire	W African humid	open savanna	semi deciduous	small tree		*Bridelia ferruginea,*	1.2	soil pit (0.2x0.2m	yes	1200	dry season Dec-Feb		base of plateau,			sandy, gravel/stone					burned annually	6.2193	-5.0192	83	Tree and grass root distributions widely overlapped and both were mostly located	same site as Le Roux, 1995, but with seasonal rooting profiles
Mordelet et al., 1997	Côte d'Ivoire	W African humid	under canopy	perennial	tuft-grass, C4		*Hyparrhenia spp. and*	0.75	soil pit (0.2x0.2m	yes	1200	dry season Dec-Feb		on the plateau			sandy, gravel/stone					burned annually	6.2189	-5.0245	95		all max rooting depth extrapolated from the fig3
Mordelet et al., 1997	Côte d'Ivoire	W African humid	open savanna	perennial	tuft-grass, C4		*Hyparrhenia spp. and*	0.8	soil pit (0.2x0.2m	yes	1200	dry season Dec-Feb		base of plateau,			sandy, gravel/stone					burned annually	6.2193	-5.0192	83		
Moreno-Chacon &	S. C. Chile	subtropical moist forest	Valdivian rain forest in	evergreen broad-leaf	tree	coihue, cojeüe	*Nothofagus dombeyi*	0.8	soil coring	yes to 0.8m	3500	10% in summer					fertile, well drained, derived						-40.6518	-72.1480	580	fine root biomass of N. dombeyi declined significantly more steeply with depth than	"Parque Nacional Puyehue" helped out the site on a location more like
Mulia & Dupraz, 2006	N. of Montpellier,	subhumid Mediterrane	Ve´ze´nobres site	deciduous broad-leaf	tree	hybrid poplar	*Populus euramericana*	3	soil coring to 3m	yes	1172	mostly in winter			3.0 - 4.0	3.50	sandy alluvial fluvisol, 8% clay,					plantation	44.0297	4.1661	138	In both our plots, the alluvial water table was 3–4 m deep at the end of the summer,	site moved to a nearby tree plantation at 138m elevation;
Mundell et al., 2007	near Roblin, Manitoba, CA	Priarie posholes		deciduous broad-leaf	tree	trembling aspen	*Populus tremuloides*	0.111	trench wall	no	475						subxeric silty clay Orthic Gray						51.2149	-101.3327	552		in nearest forest to lat-lon given; the site is amongst many water-filled potholes, appears pooly drained, but drainage was not
Mundell et al., 2007	near Roblin, Manitoba, CA	Priarie posholes		deciduous broad-leaf	shrub	beaked hazel	*Corylus cornuta*	0.081	trench wall	no	475						subxeric silty clay Orthic Gray						51.2149	-101.3327	552		
Nardini et al., 2016	Trieste, NE Italy	temperate hardwood	Bac Cave	deciduous broad-leaf	tree	mahaleb cherry, St	*Prunus mahaleb*	13	cave soil	no							clay cave soil			limestone			45.6333	13.8667	400	The Bac Cave is 16mdeep and extends for about 130 m. The base is covered by clay	the other 2 species uptake water between surface rain and deep
Nepstad et al., 1994	Paragominas, Para, NE	tropical rainforest	"degrated" pasture site	evergreen broad-leaf	tree		*Leguminosae, Sapotaceae,*	12	deep soil shaft	yes	1803	6	2400	S. facing gentle slope			deeply weathered clay					not "well managed"	-2.9270	-47.3588	130	Roots were most abundant near the soil surface, as expected, but were found in	same site as Jipp (1998) which has no "degraded pasture" data; a site
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Alpine belt	perennial	alpine shrub		*Rhodiola coccinea*	0.3	trench	no				alpine slope									43.0722	77.0651	3470	Most typical in the alpine belt are low-grass and mixed grass alpine meadows. Alpine plants are characterised by shallow root systems (to a depth of 55 cm) influenced by soil water availability and a short growing period (Table 1). The branching of alpine plant roots is abundant and roots are formed of the 3rd to 5th order.	location guessed by max elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Alpine belt	perennial	rhizomatous herb		*Carex melanantha*	0.55	trench	no				alpine slope									43.0722	77.0651	3470		location guessed by max elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Alpine belt	perennial	rhizomatous herb		*Dracocephalum imberbe*	0.38	trench	no				alpine slope									43.0722	77.0651	3470		location guessed by max elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Alpine belt	perennial	rhizomatous herb	ice poppy	*Papaver croceum*	0.35	trench	no				alpine slope									43.0722	77.0651	3470		location guessed by max elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Alpine belt	perennial	rhizomatous herb		*Leontopodium*	0.23	trench	no				alpine slope									43.0722	77.0651	3470		location guessed by max elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Alpine belt	perennial	grass		*Cobresia capilliformis*	0.16	trench	no				alpine slope									43.0722	77.0651	3470		location guessed by max elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Subalpine belt	evergreen needle-leaf	shrub to small tree	Turkestan juniper,	*Juniperus turkestanica*	1.6	trench	no				sub alpine slope									43.1102	77.0780	2540	In the subalpine belt, high-grass and mixed grass meadows predominate. The	location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range,	dry steppe	Subalpine belt	perennial	forb		*Phlomis oreophila*	0.55	trench	no				sub alpine slope									43.1102	77.0780	2540		location guessed by elevation range given and vegetation type on

Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Subalpine belt	perennial	rhizomatous herb		*Alchemilla obtusa*	0.37	trench	no				sub alpine slope									43.1102	77.0780	2540	predominance of rhizomatous types of below-ground organs with the roots spread close to the surface is more frequent in the alpine and subalpine belts.	location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Subalpine belt	perennial	rhizomatous grass	alpine meadow-	*Poa alpina*	0.38	trench	no				sub alpine slope									43.1102	77.0780	2540		location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Subalpine belt	perennial	rhizomatous herb		*Polygonum nitens*	0.06	trench	no				sub alpine slope									43.1102	77.0780	2540		location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Forest belt	evergreen needle-leaf	tree	Schrenk's spruce.	*Picea schrenkiana*	1.5	trench	no				forested slope									43.1689	77.0138	1438	The number of species in the forest belt is higher, a variety of plant forms occurs (trees, shrubs and grasses) and the degree of root-system penetration increases (to a depth of 350 cm). Among graminaceous plants there are many species rooted near the surface influenced by frequent precipitation. Many graminaceous plants of the forest belt are characterised by the disappearance of the tap root with age and change of the tap-root system to the	location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Forest belt	deciduous broad-leaf	rhizomatous shrub	burnet rose	*Rosa spinosissima*	2	trench	no				forested slope									43.1689	77.0138	1438		location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Forest belt	perennial	forb		*Hypericum scabrum*	0.74	trench	no				forested slope									43.1689	77.0138	1438		location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Forest belt	perennial	forb	Lesser meadow-	*Thalictrum collinum*	0.42	trench	no				forested slope									43.1689	77.0138	1438		location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Forest belt	perennial	shrub		*Cotoneaster megalocarpa*	3.5	trench	no				forested slope									43.1689	77.0138	1438		location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Forest belt	perennial	rhizomatous forb	brittle bladder-	*Cystopteris filix-fragilis*	0.19	trench	no				forested slope									43.1689	77.0138	1438		location guessed by elevation range given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	deciduous broad-leaf	tree	wild apple	*Malus sieversii*	7.2	trench	no				mixed shrub/tree									43.2286	76.9848	1000	The abundance of species and vital forms in plant communities of the forest-shrub belt with a large high participation of trees and shrubs intensifies the differentiation of the below-ground sphere. Particularly the tree root systems penetrate deeply into the soil (to a depth of 720 cm) . Most species here are characterised by a tap-root system, less frequently by a rhizomatous root system and for graminaceous species by a fibrillose type. The branching is intensive and proceeds up to the formation of the roots of the 3rd to 6th order, in the trees it can reach the 7th to 8th order (Table 1). The	location guessed by min elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	deciduous broad-leaf	tree	Turkestan Shrub	*Acer semenovii*	5.1	trench	no				mixed shrub/tree									43.2286	76.9848	1000		location guessed by min elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	deciduous broad-leaf	tree	Wild apricot	*Armeniaca vulgaris*	3.6	trench	no				mixed shrub/tree									43.2286	76.9848	1000		location guessed by min elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	deciduous broad-leaf	shrub	Iberian spirea	*Spiraea hypericifolia*	2	trench	no				mixed shrub/tree									43.2286	76.9848	1000		location guessed by min elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	perennial	shrub		*Artemisia santolinifolia*	1.4	trench	no				mixed shrub/tree									43.2286	76.9848	1000		location guessed by min elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	perennial	shrub		*Ajania fastigiata*	1.2	trench	no				mixed shrub/tree									43.2286	76.9848	1000		location guessed by min elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	perennial	grass	Kentucky bluegrass	*Poa pratensis*	0.42	trench	no				mixed shrub/tree									43.2286	76.9848	1000		location guessed by min elevation given and vegetation type on
Nesterova, 1996	Zailiisky Alatau Range	dry steppe	Shrub forest belt	perennial	rhizomatous sedge		*Carex turkestanica*	0.4	trench	no				mixed shrub/tree									43.2286	76.9848	1000		location guessed by min elevation given and vegetation type on
Neykova et al., 2011	Mt. Kenya area, C Kenya	crop land	Kithoka	annual	grass	corn	*Zea mays L.*	> 1.4	trench wall	yes	1500 - 2400			on crest of a plateau			clay Haplic Nitisols derived					crops	0.1191	37.6706	1457		max depth not reached; single crop and inter-cropping with legume
Neykova et al., 2011	Mt. Kenya area, C Kenya	crop land	Thuura	annual	grass	corn	*Zea mays L.*	> 1.4	trench wall	yes	1500 - 2400			almost level area			clay rich Vitric Gleysols derived					crops	0.0649	37.7476	1159		max depth not reached; single crop and inter-cropping with legume
Nicoll & Ray, 1996	Cumbria, U.K.	plantation		evergreen needle-leaf	tree	Sitka spruce	*Picea sitchensis*	0.56	excavation	no	1300			slope 0-14°	0.42 - ?		peat gley					plantation	55.1000	-2.7919	200-245	Rooting depth restricted by water table... root system morphology adapted to resist	given lat-lon does not match z; moved NW to 200m; wtd is for
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	bunch grass	bulbous canary	*Phalaris aquatica*	1.4	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192	The differences in rooting depth and root density between Hamilton and Warrak	mean of 4 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	C_3 bunch grass	cock's-foot, orchard	*Dactylis glomerata*	0.92	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192		mean of 2 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	C_3 bunch grass	tall fescue	*Festuca arundinacea*	1.37	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192		mean of 3 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	bunch grass	perennial ryegrass,	*Lolium perenne*	1.15	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192		mean of 2 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	bunch grass	tall wheatgrass,	*Thinopymm ponticum*	1.32	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192		this dataset has root density profiles
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	annual or perennial	grass	Harlan brome,	*Bromus stamineus*	1.46	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192		
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	herb	ribwort plantain,	*Plantago lanceolata*	1.06	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192		
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	grass	weeping grass,	*Microlaena stipoides*	1.12	soil coring	yes	690						clay loam					managed pasture	-37.8333	142.0167	192		
Nie et al., 2008	Victoria, S. Australia	managed pasture	Hamilton site	perennial	grass	kikuyu grass	*Pennisetum clandestinum*	2.01	soil coring	yes	690							compacted stony-	0.7-1.1			managed pasture	-37.8333	142.0167	192	The deepest rooting culttivar was Whittet kikuyu with a depth of at least 2 m	
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	bunch grass	bulbous canary	*Phalaris aquatica*	0.94	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309	The higher root densities in the 0.1-0.7 m soil layer at Warrak than at Hamilton (Table	mean of 4 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	C_3 bunch grass	cock's-foot, orchard	*Dactylis glomerata*	0.87	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		mean of 2 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	C_3 bunch grass	tall fescue	*Festuca arundinacea*	0.92	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		mean of 3 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	bunch grass	perennial ryegrass,	*Lolium perenne*	0.76	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		mean of 2 cultivars
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	bunch grass	tall wheatgrass,	*Thinopymm ponticum*	0.75	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	annual or perennial	grass	Harlan brome,	*Bromus stamineus*	0.82	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	herb	ribwort plantain,	*Plantago lanceolata*	0.88	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	grass	weeping grass,	*Microlaena stipoides*	0.71	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		
Nie et al., 2008	Victoria, S. Australia	managed pasture	Warrak site	perennial	grass	kikuyu grass	*Pennisetum clandestinum*	1.27	soil coring	yes	550							compacted stony-	0.7-1.1			managed pasture	-37.2333	143.1167	309		
Nie et al., 2014	NW Guangxi province, SW	subtropical moist forest	Mulian catchment -	semi-deciduous	tree		*Radermachera sinica*	0.62	excavation	no	1389	70-80% in May-Sept		steep midslope			thin soil (<30cm), clay to			dolomite	0.1-0.4		24.7250	108.3083	522	Hillslopes are characterized by steep slopes (approximately 60 %) and shallow soils	
Nie et al., 2014	NW Guangxi province, SW	subtropical moist forest	Mulian catchment -	deciduous broad-leaf	shrub		*Alchornea trewioides*	0.37	excavation	no	1389	70-80% in May-Sept		steep midslope			thin soil (<30cm), clay to			dolomite	0.1-0.4		24.7250	108.3083	522	the three habitats were selected from midslope positions on hillslopes of similar	
Nie et al., 2014	NW Guangxi province, SW	subtropical moist forest	Mulian catchment -	semi-deciduous	tree		*Radermachera sinica*	1.17	excavation	no	1389	70-80% in May-Sept		steep midslope			1m soil-rock frag mixture,			dolomite	0.1-0.4		24.7214	108.2985	393	In all the three habitats, maximum rooting depths were no deeper than 120 and 40 cm for the tree and shrub species, respectively. Maximum radial extents were extremely	The relatively humid climate may be the reason that roots did not penetrate deeper into fractures. Earlier findings of such were in
Nie et al., 2014	NW Guangxi province, SW	subtropical moist forest	Mulian catchment -	deciduous broad-leaf	shrub		*Alchornea trewioides*	0.35	excavation	no	1389	70-80% in May-Sept		steep midslope			1m soil-rock frag mixture,			dolomite	0.1-0.4		24.7214	108.2985	393		
Nie et al., 2014	NW Guangxi province, SW	subtropical moist forest	Guzhou catchment,	semi-deciduous	tree		*Radermachera sinica*	0.68	excavation	no	1389	70-80% in May-Sept		steep midslope			rock outcrops, soil (loam) or			limestone	0		24.9069	107.9432	509	The habitat is dominated by exposed rock with few soil patches midway to the top of	
Nie et al., 2014	NW Guangxi province, SW	subtropical moist forest	Guzhou catchment,	deciduous broad-leaf	shrub		*Alchornea trewioides*	0.26	excavation	no	1389	70-80% in May-Sept		steep midslope			rock outcrops, soil (loam) or			limestone	0		24.9069	107.9432	509		
Niiyama et al., 2010	Malay Peninsula	tropical rainforest		evergreen broad-leaf	tree		*Sindora coriacea*	4	excavation	no	2000			west-facing slope			Ultisol			granite			2.9833	102.3000	121	The maximum depth of tap roots was about 4 m, which was recorded for the	
Nijland et al., 2010	S. France	Mediterranean	1	evergreen broad-leaf	shrub		*Arbutus unedo,*	7	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow soil, with mostly			Flysch/Schist: layered mix of			43.5575	3.2896	252	The soils in the area are shallow and are poorly developed with often only an AC or AR profile. The downward transition of soil into weathered rock often has an indistinct boundary and tree roots often penetrate deeply into weathered, fractured, or faulted rock. The top layer shows little difference, because some early September rainfall wetted the top part of the soil profile. The common pattern nowshows a three-layer profile: a top layer with a high lateral variability, a second layer with water abstraction by trees during the summer, and a base with no change at all. The depth of each zone is very different for the geological substrates in the study area (Fig. 9). In the flysch and basalt, the vegetation	not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	2	evergreen broad-leaf	shrub		*Arbutus unedo,*	9	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow soil, with mostly			Flysch/Schist: layered mix of			43.5601	3.2947	191		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	3	evergreen broad-leaf	shrub		*Arbutus unedo,*	7.5	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow soil, with mostly			Flysch/Schist: layered mix of			43.5675	3.2867	638		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	4	evergreen broad-leaf	shrub	mixed herbs and shrubs,		8	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					In low areas, loose sand of up			Dolomite: gray Jurassic	< 2		43.6326	3.2144	367		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	5	evergreen broad-leaf	shrub	mixed herbs and shrubs,		8.5	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					In low areas, loose sand of up			Dolomite: gray Jurassic	< 2		43.6355	3.2058	384		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	6	evergreen broad-leaf	shrub		*Quercus ilex*	7	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow acid soils w. many			Basalt: quaternary		grazing pasture	43.5927	3.2589	364		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	9	evergreen broad-leaf	shrub		*Arbutus unedo,*	4.7	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow soil, with mostly			Flysch/Schist: layered mix of			43.5631	3.2902	251		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	10	evergreen broad-leaf	shrub	mixed herbs and shrubs,		11	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					In low areas, loose sand of up			Dolomite: gray Jurassic	< 2		43.6349	3.2157	365		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	11	evergreen broad-leaf	shrub		*Quercus ilex, Quercus*	12	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow rocky soils w. high clay			Calcareous sandstones:			43.6208	3.2356	437		not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	12	evergreen broad-leaf	shrub		*Quercus ilex, Quercus*	11	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow rocky soils w. high clay			Calcareous sandstones:			43.6172	3.2382	420		not direct measurement; max rooting depth taken as max depth

Nijland et al., 2010	S. France	Mediterranean	13	evergreen broad-leaf	shrub		*Arbutus unedo*	10	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow soil, with mostly			Flysch/Schist: layered mix of			43.5897	3.2802	374	8). In the flysch and basalt, the vegetation uses water from the soil down to 4 m, with	not direct measurement; max rooting depth taken as max depth
Nijland et al., 2010	S. France	Mediterranean	14	evergreen broad-leaf	shrub		*Quercus ilex*	3.7	elec. Resis.	soil water uptake	800 - 1000	rain mostly in spring and					Shallow acid soils w. many			Basalt: quaternary		grazing pasture	43.5626	3.2808	297	maximum extraction around 2 mdeep. On the calcareous sandstone,water is used	not direct measurement; max rooting depth taken as max depth
Niklas et al., 2002	Sonora, Mexico.	arid desert		succulent	large cactus	Mexican giant	*Pachycereus pringlei*	1.15	excavation	no				west-facing bajada									29.0582	-112.0800	235	The root system of P. pringlei is laterally extensive but shallow;three large lateral	
Nilsen et al., 1983	Harper's Well, S. CA	arid desert		deciduous broad-leaf	tree	Honey Mesquite	*Prosopis Glandulosa*	4.0 - 6.0	soil coring	no				valley floor	4.0 - 6.0		clay loam, then sand/clay lenses						33.0888	-115.9074	-30	There is a permanent, stable groundwater table which varies spatially between depths	authors note: "Harper's Well, our study site, lies at an elevation of -
Nippert et al., 2010	S. Kansas	riparian forest	well 1.1	deciduous broad-leaf	shrub	salt cedar	*Tamarix ramosissima*	0.34	diurnal well level	no	560			floodplain	0 - 0.5	0.34	coarse silts to medium sands					invasive shrubs	37.0439	-99.7566	561	Five Tamarix individuals in the vicinity (within 5 m) of each well were randomly	Locations clearly marked on a map in Butler et al., 2008 (Kansas GS
Nippert et al., 2010	S. Kansas	riparian forest	well 1.2	deciduous broad-leaf	shrub	salt cedar	*Tamarix ramosissima*	1.45	diurnal well level	no	560			floodplain	1.0 - 1.6	1.45	coarse silts to medium sands					invasive shrubs	37.0451	-99.7564	561	The diel water table fluctuations decreased very abruptly as the water table fell past	Open-File Report 2008-13); max rooting depth inferred from O18
Nippert et al., 2010	S. Kansas	riparian forest	well 3.1	deciduous broad-leaf	shrub	salt cedar	*Tamarix ramosissima*	0.85	diurnal well level	no	560			floodplain	0.5 - 1.1	0.85	coarse silts to medium sands					invasive shrubs	37.0459	-99.7527	560	the most likely explanation of changes in the strength of diel fluctuations is that	and WTD time series where below
Nippert et al., 2010	S. Kansas	riparian forest	well 3.2	deciduous broad-leaf	shrub	salt cedar	*Tamarix ramosissima*	1.25	diurnal well level	no	560			floodplain	0.9 - 1.4	1.25	coarse silts to medium sands					invasive shrubs	37.0471	-99.7520	559	groundwater uptake would be expected to decrease as the water table dropped past	a previous miminum depth diurnal cycles of WTD diminished in the
Nobel & Zutta, 2005	Southern California	NW Sonoran Desert	Agave Hill	drought-deciduous	xerophytic shrub	ocotillo, flaming	*Fouquieria splendens*	0.42	excavation	no	220	bimodal, late summer,		E facing slope									33.6345	-116.3931	453	The maximum rooting depth steadily increased with plant height up to about	Highest occurrence on E-facing slopes
Nulsen et al., 1986	near Newdegate	Mediterranean dry forest	near site-3	evergreen broad-leaf	tree	chapped mallee, sand	*Eucalyptus pileata, E.*	28	drill core	no	376	60% in May-Oct	2200				sand/gravel, mottled, hard	silicified hardpan of	1 - 4.5	granitic Archaean	50		-33.1062	118.9937	317	During drilling of a bore on the Catchment 150 m south of neutron probe Site 3 in the	vertually no runoff, and no deep drainage - no groundwater under
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 01	deciduous broad-leaf	tree	Buffalo Thorn	*Ziziphus mucronata*	8.00	lithium chloride	no	437					8	loamy fine sand						-22.3243	26.8402	1086	The Kalahari sandveld, on the western side of the escarpment, with thick sand and	
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 02	deciduous broad-leaf	tree	Blade thorn	*Acacia fleckii*	28.00	lithium chloride	no	437					36	loamy fine sand						-22.4924	26.5081	1126	poorly developed drainage, deep groundwater; land mostly flat and slopes	all drill-hole locations are read off from Fig. 5.1, in UTM, and converted to lat-lon on Google Earth. UTM zone 35K
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 03	deciduous broad-leaf	tree	Kalahari Christmas	*Dichrostachys cinerea*	20.00	lithium chloride	no	437					36	loamy fine sand						-22.4924	26.5081	1126	The sandveld area is quite flat and is dominated by free draining coarse to loamy	
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 04	deciduous broad-leaf	tree	Silver Terminalia	*Terminalia sericea*	15.00	lithium chloride	no	437					36	loamy fine sand						-22.4924	26.5081	1126	fine Kalahary sands with high permeability, high infiltraitnos rate and high retention	Soil excavation not conducted.
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 07	evergreen broad-leaf	tree	Shepherd's tree	*Boscia albitrunca*	20.00	lithium chloride	no	437					78	loamy fine sand						-22.3942	26.3892	1214	All trees in the vicinity of the injected drill holes show a clear and surprisngly fast response, which proves the transport of the tracers from depths of at least the	Lithium (Li) is released at bottom of drill holes besides trees, and its content minitored in twiggs and leaves. Trees are 1.3 to 8.1m away from the drill holes, but mosly within 5m. Tracor is taken up in one day in all trees except for one (T13) where injection was at 70m deep (sharp rise in day-3). The depth of tracer release (top of 3m-long perferated casing) is taken as rooting depth (at least that deep). It could also be upward capillary rise that brought the deep tracers to the shallower roots. In any event, these depths indicate that exploited by the roots, if indirectly
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 08	deciduous broad-leaf	tree	Blade thorn	*Acacia fleckii*	15.00	lithium chloride	no	437					78	loamy fine sand						-22.3942	26.3892	1214		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 09	deciduous broad-leaf	tree	Blade thorn	*Acacia fleckii*	15.00	lithium chloride	no	437					78	loamy fine sand						-22.3942	26.3892	1214		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 10	deciduous broad-leaf	tree	Camel thorn,	*Acacia erioloba*	35.00	lithium chloride	no	437					78	loamy fine sand						-22.3942	26.3892	1214		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 10	evergreen broad-leaf	tree	Shepherd's tree	*Boscia albitrunca*	35.00	lithium chloride	no	437					78	loamy fine sand						-22.3942	26.3892	1214		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 11	deciduous broad-leaf	tree	Camel thorn,	*Acacia erioloba*	55.00	lithium chloride	no	437					79	loamy fine sand						-22.3626	26.4662	1225		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 12	deciduous broad-leaf	tree	Camel thorn,	*Acacia erioloba*	40.00	lithium chloride	no	437					79	loamy fine sand						-22.3506	26.4550	1228		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 13	evergreen broad-leaf	tree	Shepherd's tree	*Boscia albitrunca*	40.00	lithium chloride	no	437					79	loamy fine sand						-22.3402	26.4321	1223		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 14	deciduous broad-leaf	tree	Camel thorn,	*Acacia erioloba*	70.00	lithium chloride	no	437					80	loamy fine sand						-22.3134	26.4283	1221		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 15	evergreen broad-leaf	tree	Shepherd's tree	*Boscia albitrunca*	70.00	lithium chloride	no	437					80	loamy fine sand						-22.3134	26.4283	1221		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 16	deciduous broad-leaf	tree	Camel thorn,	*Acacia erioloba*	47.00	lithium chloride	no	437					80	loamy fine sand						-22.3134	26.4283	1221		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 17	evergreen broad-leaf	tree	violet tree	*Securidaca longipedunculata*	60.00	lithium chloride	no	437					76	loamy fine sand						-22.2770	26.4759	1228		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 18	evergreen broad-leaf	tree	violet tree	*Securidaca longipedunculata*	40.00	lithium chloride	no	437					76	loamy fine sand						-22.2770	26.4759	1228		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 19	evergreen broad-leaf	tree	violet tree	*Securidaca longipedunculata*	30.00	lithium chloride	no	437					77	loamy fine sand						-22.2770	26.4759	1228		
Obakeng, 2007	Kalahari sandveld, E.	grass/tree savanna	drill hole 20	deciduous broad-leaf	tree	Camel thorn,	*Acacia erioloba*	20.00	lithium chloride	no	437					76	loamy fine sand						-22.2770	26.4759	1228		
Ohnuki et al., 2008	Kampong Thom	tropical evergreen	DEF1	evergreen broad-leaf	tree		*Dipterocarpus costatus,*	10.00	trench wall	yes				flat terrace 10m above	2.0 - 9.4		loamy sand, on sandy-caly loam,						12.7992	105.4612	89		
Oliveira et al., 2005	35km S. of Brasilia, Brazil	Cerrado (grass/tree	Cerrado denso	evergreen broad-leaf	trees		*semi-closed canopy forest*	5.75	soil coring + deep	yes	1500	May-Sept		galery forest			clayey red latossol (Oxisol)						-15.9550	-47.8888	1100	Two adjacent ecosystems (<1 km apart) were selected on the basis of contrasting	sites are at Reserva Ecologica do Instituto Brasileiro de Geografia e
Oliveira et al., 2005	35km S. of Brasilia, Brazil	Cerrado (grass/tree	Campo sujo	evergreen broad-leaf	grasses		*grass ecosystem*	4.00	soil coring + deep	yes	1500	May-Sept		open slope			clayey red latossol (Oxisol)	plinthite layer	4.00				-15.9457	-47.8868	1100	Campo sujo is a grassy vegetation with interspersed small shrubs (maximum	Max root depth suggested to be the depth of the plinthite layer
Oosterbaan & Nabuurs,	Netherland	temperate deciduous	Hardenberg	deciduous broad-leaf	tree	English oak	*Quercus robur*	0.90	trench wall	no					0.8 - 1.9		Reclaimcd peat soil with sandy					reclaimed peatland	52.5572	6.5692	22	Unhealthy oak trees were found to be most prevalent on sites with a high groundwater level (i.e. < 40cm below the surface) in the spring… At the 5 locations several common tendencies can be found. In the first place depth of the root system is closely related to groundwater class, as Figure 4 illustrates. On wet soils (groundwater class III or V) the root systems are 30- 40cm	root depth data taken from Fig. 4; lat-lon approximate from Fig.1 and Google Earth
Oosterbaan & Nabuurs,	Netherland	temperate deciduous	Ulvenhout	deciduous broad-leaf	tree	English oak	*Quercus robur*	0.80	trench wall	no					0.4 - 1.9		Reclamcd peat soil with sandy					reclaimed peatland	51.5833	4.6950	17		
Oosterbaan & Nabuurs,	Netherland	temperate deciduous	Staphorst	deciduous broad-leaf	tree	English oak	*Quercus robur*	0.60	trench wall	no					0.25 - 1.9		Moist humus podsol soil					reclaimed peatland	52.6505	6.2036	4		
Oosterbaan & Nabuurs,	Netherland	temperate deciduous	Wieringermeer	deciduous broad-leaf	tree	English oak	*Quercus robur*	0.50	trench wall	no					0.2 - 1.8		Moist humus podsol soil					reclaimed peatland	52.8964	5.0208	2		
Oosterbaan & Nabuurs,	Netherland	temperate deciduous	De Boom	deciduous broad-leaf	tree	English oak	*Quercus robur*	0.40	trench wall	no					0.2 - 1.2		Moist, moderately acid					reclaimed peatland	52.0979	5.4091	2		
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	6yr old regrowth site	evergreen broad-leaf	tree		*Cecropia distachya*	0.30	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108	root system characterized by the presence of distinct aerial stilt roots; all adventitious organs which develop on young saplings and later emerge at a higher level near lenticels on stem. These organs create an arch-like structure and become rooted in the soil more than 1 m away; successively juvenile taproots hardly penetrate below a depth of 0.3 m, but in mature trees they can reach down to 1 m; The root system in Vismia species is generally poor in branching and is characterized by geotropic laterals growing from the coarse	Fig.1-2, pioneer species; lat-lon too coarse, site location guided by
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	14yr old regrowth site	evergreen broad-leaf	tree		*Cecropia ficifolia*	0.18	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108		Fig.1-3, pioneer species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	14yr old regrowth site	evergreen broad-leaf	tree		*Cecropia sciadophylla*	0.17	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108		Fig.1-4. pioneer species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	37yr old regrowth site	evergreen broad-leaf	tree		*Cecropia sciadophylla*	0.26	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108		Fig.1-5, pioneer species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	6yr and 14yr old regrowth	evergreen broad-leaf	tree		*Vismia macrophylla*	0.28	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108		3 specimen (Fig.3-2,3,4), pioneer species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	14yr old regrowth site	evergreen broad-leaf	tree		*Vismia iagurensis*	0.35	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108		2 specimen (Fig.3-5,7), pioneer species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	18yr old regrowth site	evergreen broad-leaf	tree		*Vismia glaziovii*	0.55	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108		Fig.3-6, pioneer species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	14yr and 18yr old regrowth	evergreen broad-leaf	tree		*Miconia poeppigii*	0.46	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108	Older specimens often display thickened plagiotropic roots which spread on the soil	4 specimen (Fig.5-2,3,4,5), pioneer species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	37yr old regrowth site	evergreen broad-leaf	tree		*Goupia glabra*	0.70	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108	characterized by a robust stump base and adjacent root spurs; the root skeleton is	2 specimen (Fig.7-2,3), climax species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	14yr and 37yr old sites	evergreen broad-leaf	tree		*Clathrotropis macrocarpa*	1.08	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108	Deeply penetrating taproot richly branched in its upper section dominates the root	3 specimen (Fig.9-2,3,4), climax species
Pavlis & Jenik, 2000	Colombian Amazonia,	lowland tropical	18yr old regrowth site	evergreen broad-leaf	tree		*Brosimum rubescens*	1.50	excavation, soil	yes + drawings	3059	none		on low terrace, 10-			silt loam /loamy sand in A, clay					secondary regrowth	-0.6132	-72.3778	108	A bunh of sinkers penetrates below the maximum observed in other tree species	Fig.11-1, climax species
Pearson, 1965	Rexburg, E Idaho	semi-arid shrub-steppe	Ricks College campus	evergreen needle-leaf	shrub	big sagebrush	*Artemesia tridentata*	0.55	excavation	drawling	270	<30% in May-Sep		Snake river plateau			sandy loam of lava origin		0.6	sheet lava	0.6	grazed	43.8127	-111.7916	1492	Most of the root mass, over 80%, was concentrated in the upper 20 cm of the soil	a case of bedrock stopping roots
Pelaez et al., 1994	La Pampa Province,	dry steppe		perennial	tussock grass		*Stipa tenuis*	0.60	root chamber	yes	344	dry summer	744	well drained			shallow soil, medium to	caliche	0.6			overgrazed grassland,	-38.7500	-63.7500	93	The root system of the two grass species and C. microphylla is mainly distributed in the upper layers (10-40cm) of the soil prifile, while that of P. caldenia descended through the soil profile to the caliche layer. The main root of C. microphylla branched at about 20-30cm depth and some of the	
Pelaez et al., 1994	La Pampa Province,	dry steppe		perennial	bunch grass	speargrass	*Piptochaetium*	0.60	root chamber	yes	344	dry summer	744	well drained			shallow soil, medium to	caliche	0.6			overgrazed grassland,	-38.7500	-63.7500	93		
Pelaez et al., 1994	La Pampa Province,	dry steppe		evergreen broad-leaf	shrub		*Condalia microphylla*	0.55	trench wall	drawings	344	dry summer	744	well drained			shallow soil, medium to	caliche	0.6			overgrazed grassland,	-38.7500	-63.7500	93		Rooting depth from Fig.5a; this species has thick cuticle and very
Pelaez et al., 1994	La Pampa Province,	dry steppe		deciduous broad-leaf	legumous shrub	calden	*Prosopis caldenia*	0.80	trench wall	drawings	344	dry summer	744	well drained			shallow soil, medium to	caliche	0.6			overgrazed grassland,	-38.7500	-63.7500	93		rooting depth from Fig. 5b
Pereira and Hosegood,	Kinale, Kanya	grass savanna	plantation	evergreen needle-leaf	tree	Monterey Pine	*Pinus Radiata*	4.57	excavation	drawings	1113			level, no surface			sandy loam, clay, high-perm			volcanic ash and tuff		plantation	-0.9173	36.6009	2621		
Pereira and Hosegood,	Kinale, Kanya	grass savanna	plantation	evergreen needle-leaf	tree	Monterey cypress	*Cupresses macrocarpa*	4.57	excavation	drawings	1113			level, no surface			sandy loam, clay, high-perm			volcanic ash and tuff		plantation	-0.9250	36.0953	2617		root depth data take from fig 1.

Pereira and Hosegood,	Kinale, Kanya	grass savanna	native bamboo	perennial	grass	African Mountain	*Arundinaria alpina*	3.96	excavation	drawings	1113			level, no surface			sandy loam, clay, high-perm			volcanic ash and tuff			-0.9327	36.6045	2577		
Phillips, 1963	near Tucson, Arizona	Sonoran Desert	slopes of the Sierrita	deciduous broad-leaf	tree	mesquite	*Prosopis juliflora*	53.00	open-pit mine	no				lower hill		73	roots in gravel between layers						31.8424	-111.0429	988	root found in open mine pit, with all vegetation already stripped... Between	a mine pit closest to vegetation in the south and with the appearance
Pinheiro et al., 2013	Aiuaba, Brazil	Caatinga (Savanna)	soil-veg-assoc 1	deciduous broad-leaf	tree	catingueira	*Caesalpinia pyramidalis*	0.67 - 0.78	trench wall	no	560	70% in Feb-Apr	2500				Acrisol			crystaline-sedimentary	1-2.5		-6.7000	-40.2800	535	The results showed that the effective depth of the Caatinga roots range from 0.60 m to 0.78 m in non-restrictive deep soils, three times smaller than values commonly used in hydrological models. Vegetation adapted to shallow soils, presenting effective root	effective depth reported: 90% root area on 1x1m walls; elevation from
Pinheiro et al., 2013	Aiuaba, Brazil	Caatinga (Savanna)	SVA-2	deciduous broad-leaf	tree		*Piptadenia obliqua*	0.60 - 0.67	trench wall	no	560	70% in Feb-Apr	2500				Luvisol			crystaline-sedimentary	0.8-2.5		-6.7000	-40.2800	535		
Pinheiro et al., 2013	Aiuaba, Brazil	Caatinga (Savanna)	SVA-3	evergreen broad-leaf	tree	Mimosa	*Mimosa tenuiflora*	0.36	trench wall	no	560	70% in Feb-Apr	2500				Regosol			crystaline-sedimentary	0.4		-6.7000	-40.2800	535		
Preston, 1942	Colorado, 40km W of	mountain forest	Pingree Park Campus site	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	1.83	excavation	yes + drawings				on campus, near fire			gravely sandy loam, glacial						40.5691	-105.5927	2751	At the Pingree Park site it was noted that the tap- root is normally strongly	campus/reservoir easily located, latlon approx, mentioning drainage
Preston, 1942	Colorado, 40km W of	mountain forest	Hourglass Lake site	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.91	excavation	yes + drawings				on edge of reservoir, 0-			gravely sand, glacial morainic						40.5766	-105.6302	2864	In both sites the majority of the roots are in the upper few inches of soil, but the	needed by well or trenche to excavate deeper roots but water
Price, 1911	Ain Sefra, NW Algeria	arid desert, Sahara	sand dune	perennial	grass	Drinn	*Aristida pungens*	0.08	excavation	no				sand dune			dune sand						32.7378	-0.5998	1100	In the Algerian Sahara it is characteristic of, and appears to be confined to, the sandy as	"few inches" is taken to be 3 inches
Price, 1911	Ain Sefra, NW Algeria	arid desert, Sahara	sand dune	annual	grass	wall barley, false barley	*Hordeum murinum L.*	0.1	excavation	no				sand dune			dune sand						32.7378	-0.5998	1100	What is apparently a sand form of the common barley-grass of waste places was	
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Island at entrance of	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.07	excavation	drawings				well drained slope with a			moss/leaf mold (6cm), brown			frost table	1.7		56.0859	-96.4886	176	For comparison, the root systems of the same species were also investigated in a deep (several hundred feet) sandy soil in the neighborhood of the Brule river near the south shore of Lake Superior in Douglas County, Wisconsin. This tree is the	On a well drained slope with a south exposure, situated on a large island at the entrance of the Nelson river into Split lake (about 56°23'N lat. and 96°25'W long.) the soil was not frozen above a depth of 170
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Island at entrance of	evergreen needle-leaf	tree	white spruce	*Picea Canadensis*	0.80	excavation	drawings				well drained slope with a			moss/leaf mold (6cm), brown			frost table	1.7		56.0859	-96.4886	176		
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Island at entrance of	deciduous broad-leaf	tree	willow	*Salix sp.*	0.80	excavation	drawings				well drained slope with a			moss/leaf mold (6cm), brown			frost table	1.7		56.0859	-96.4886	176		
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Brule River Site	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.12	excavation	drawings							deep sandy soil						46.6986	-91.6055	218	The particular plant figured was found in the deep, sandy soil near the Brule river in	It appears that black roots have shallow rooting habits that are
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Hill overlooking	evergreen needle-leaf	tree	jack pine	*Pinus Banksiana*	0.80	excavation	drawings							deep, thawed soil						56.0480	-96.9086	184	Jack pine -1 is a decided contrast to black spruce. It is found on drier soils, deeper	"The individual represented in figure 1, of which practically all the
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Brule River Site	evergreen needle-leaf	tree	jack pine	*Pinus Banksiana*	0.50	excavation	drawings							deep sandy soil						46.6986	-91.6055	218	Jack pine -2, also figured practically complete, was found on the Brule river in	It appears that jack pine prefers deep soil, but can survive in shallow
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Hill overlooking	deciduous broad-leaf	tree	Tamarack	*Larix Americana*	0.10	excavation	drawings							deep, thawed soil						56.0480	-96.9086	184	in its root habit, essentially like black spruce and like the spruce does not appear	
Pulling, 1918	Minitoba (Canada) and	Boreal forest	shore of Witchai lake	deciduous broad-leaf	tree	Canoe birch	*Betula papyrifera*	0.30	excavation	drawings							fairly deep soil with the frost						55.9148	-96.8379	183	is apparently another shallow rooted plant. The one figured was found on the shore of	lat-lon moved closer to the lake
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Split Lake island, a	evergreen needle-leaf	tree	white spruce	*Picea Canadensis*	0.45	excavation	drawings							deep soil on a slope						56.1075	-96.4951	168	has apparently a more flexible root habit. The plant figured as (1) was found in the	this is tree 2 in figure 1...
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Island at entrance of	evergreen needle-leaf	tree	balsam poplar	*Populus balsamifera*	0.42	excavation	drawings				well drained slope with a			frozen at 170cm depth						56.0859	-96.4886	176	maintains several trees on the same general root system... These roots	location not given, assumed to be at the Nelson river island site
Pulling, 1918	Minitoba (Canada) and	Boreal forest	Brule River Site	evergreen needle-leaf	tree	white pine	*Pinus strobus*	0.40	excavation	drawings							deep sandy soil						46.6986	-91.6055	218	is essentially a deep rooted form. Its tap root penetrates vertically with few far-	
Putz & Holbrook,	N Venezuela	seasonally flooded	evergreen broad-leaf	liana	strangler fig	*Ficus pertusa, Ficus*	>2	excavation	no	1450	mostly in wet season (May-			seasonally flooded,	1.5 - 2.5		poorly drained mixture of clay						8.5868	-67.5847	73	During the 6 month dry season soil cracks commonly penetrate to a depth of 50 cm	
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Kampepén	semi-deciduous	tree		*Cordia dodecandra*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer		highly permeable		mixed agroforests	20.8333	-89.6528	11	Meteoric precipitation infiltrates quickly into the porous, permeable limestone	
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Kampepén	deciduous broad-leaf	tree		*Enterolobium cyclocarpum*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer					20.8333	-89.6528	11	Soil-Wlled cracks, crevices and cavities (from a few centimeters up to 50 cm in	
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Kampepén	evergreen broad-leaf	tree		*Brosimum alicastrum*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer					20.8333	-89.6528	11	tree roots were mostly concentrated in the upper soil and bedrock layers and were	
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Kampepén	evergreen broad-leaf	tree		*Talisia olivaeformis*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer					20.8333	-89.6528	11	Dense mats of roots were found growing along cracks in the bedrock. Sascab	
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Kampepén	evergreen broad-leaf	tree		*Ficus cotinifolia*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer					20.8333	-89.6528	11	Root access to greater depths appeared to be strongly hampered by the thick	
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Santa Cruz	deciduous broad-leaf	tree		*Enterolobium cyclocarpum*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer		highly permeable		mixed agroforests	20.8792	-89.6533	14	the tree species investigated used little or no groundwater (0–11% on average) during	
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Santa Cruz	evergreen broad-leaf	tree		*Brosimum alicastrum*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer					20.8792	-89.6533	14		
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Santa Cruz	evergreen broad-leaf	tree		*Ficus cotinifolia*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				9	shallow, rocky, high OM	hard calcite layer					20.8792	-89.6533	14		
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Hocabá	deciduous broad-leaf	tree		*Enterolobium cyclocarpum*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				20	shallow, rocky, high OM	hard calcite layer		highly permeable		mixed agroforests	20.8156	-89.2450	14		
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Hocabá	deciduous broad-leaf	tree		*Spondias purpurea*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				20	shallow, rocky, high OM	hard calcite layer					20.8156	-89.2450	14		
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Hocabá	semi-deciduous	tree		*Cordia dodecandra*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				20	shallow, rocky, high OM	hard calcite layer					20.8156	-89.2450	14		
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Hocabá	evergreen broad-leaf	tree		*Brosimum alicastrum*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				20	shallow, rocky, high OM	hard calcite layer					20.8156	-89.2450	14		
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Hocabá	evergreen broad-leaf	tree		*Talisia olivaeformis*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				20	shallow, rocky, high OM	hard calcite layer					20.8156	-89.2450	14		
Querejeta et al., 2007	Northern Yucatan,	subtropical dry forest	Hocabá	evergreen broad-leaf	tree		*Ficus cotinifolia*	2.0 - 3.0	soil/rock pits +	no, some photos	1000	mostly fall in May-Oct				20	shallow, rocky, high OM	hard calcite layer					20.8156	-89.2450	14		
Ram et al., 2007	NE India	plantation	Plantation-1	deciduous broad-leaf	tree	Mysure gum	*Eucalyptus tereticornis*	4.40	hand-dug well	photo	500	80% in Jul-Sep		flat alluvial plain		4.95	alluvial sandy loam, with					plantation	28.8807	76.5249	231	To see the depth up to which Eucalyptus roots have penetrated in the soil profile, an	plantations easily found on Google Earth with exact layout as Fig.2.
Rastin, 1991	Rhineland-Palatinate,	temperate forest	site IX	evergreen needle-leaf	tree	Norway spruce	*Picea abies*	1.5	trench wall	chart of root count				periodic water	0.7-1.5	1	silty loam						50.5537	7.2672	56	The three sites investigated are approximately 80 year old spruce forests (Picea abies (L.) Karst) growing on soils (silty loam) which developed from the same parent material (devonian clay stone	locations guessed to be in the lowland area of Rhineland-
Rastin, 1991	Rhineland-Palatinate,	temperate forest	site VIII	evergreen needle-leaf	tree	Norway spruce	*Picea abies*	1.20	trench wall	chart of root count				periodic water	0.6-1.2	0.9	silty loam						50.5531	7.2652	59		Sd horizon is the "stagnant" or water-logged, taken as water table
Rastin, 1991	Rhineland-Palatinate,	temperate forest	site III	evergreen needle-leaf	tree	Norway spruce	*Picea abies*	1.38	trench wall	chart of root count				no water logging	> 1.5	> 1.5	silty loam						50.5543	7.2623	62		all depths include the 10cm Humic horizon
Ray and Schweizer	Scotland	temperate mixed forest	site 3	evergreen needle-leaf	tree	Sitka spruce	*Picea sitchensis*	0.25	peat coring	yes	900			flat and level		0.45	deep blanket peat					plantation	58.4304	-3.4262	94	The maximum rooting depth at each site was often considerably less than the borehole water level, and was probably influenced by shallow water levels during	Bad a Chèo, experimental plantation planted in 1968 on deep blanket peat within Rumster
Ray and Schweizer	Scotland	temperate mixed forest	site 10	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.45	peat coring	yes	900			flat and level		0.5	deep blanket peat					plantation	58.4296	-3.4267	94		Forest, Caithness, Scotland
Ray and Nicoll, 1998	NE Cumbria, UK	temperate mixed forest	deep-phase peaty glay site	evergreen needle-leaf	tree	Sitka spruce	*Picea sitchensis*	0.48	excavation by	no				artificial ditches-mounds, trees planted on mounds;		0.4	peaty glay on glacial till						55.1000	-2.7833	212	The experiment was located at Crookburn in Kershope forest, north-east Cumbria, UK... Rooting depth corresponded with, but was slightly deeper than, the winter water table... (other studies by the same authors have noted that winter water table is	lat-lon not right: "(200-245 m altitude, latitude 55°66'N, longitude 2°47'W). On Google, "Kershope Forest" is at ~55°06'N=55.1N, 2.7833W
Ray and Nicoll, 1998	NE Cumbria, UK	temperate mixed forest	shallow-phase peaty gley site	evergreen needle-leaf	tree	Sitka spruce	*Picea sitchensis*	0.58	excavation by	no						0.43	peaty glay on glacial till						55.1000	-2.7833	212		
Ray and Nicoll, 1998	NE Cumbria, UK	temperate mixed forest	surface water gley site	evergreen needle-leaf	tree	Sitka spruce	*Picea sitchensis*	0.63	excavation by	no						0.47	peaty glay on glacial till						55.1000	-2.7833	212		
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		evergreen broad-leaf	small tree		*Andira humilis*	18.00	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599	Since it was necessary to know the water-content in the different layers we opened three wells reaching the ground water-table at 17-18 m. As the wells were drilled at the highest levels of the rolling land, ground-water here could not be conducted from Isewhere and must have been derived from the excess or the summer rains in situ. The ground-water table is continuous, and the many wells that exist in the region for household purposes indicate, in comparable cases, similar depths of the same continuous ground-water. From this ground-water there drains off throughout the year, even at the end of the driest periods, water that feeds springs	a legume; details in Fig.11 and soil profiles in Fig.9
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		evergreen broad-leaf	shrub		*Aristolochia Giberti*	1.80	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		Fig.13
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		semi-deciduous	tree		*Stryphnodendron*	4.00	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		a legume; Fig.22 - truncated at 2m but it is so strong that I would
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		perennial	grass		*Echinolaena sp.*	1.50	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		Fig.22
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		perennial	herb		*Craniolaria integrifolia*	0.35	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		Fig.23
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		perennial	herb		*Vernonia grandiflora*	0.45	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		Fig. 24
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		evergreen broad-leaf	small tree		*Cochlospermum insigne*	1.40	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		Fig.26
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		evergreen broad-leaf	tree		*Attalea exigua Drude*	0.60	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		Fig. 27
Rawitscher, 1948	Emas (Pirassununga	Campo Cerrado (tree		evergreen broad-leaf	tree		*Acanthococos sp.*	0.55	deep wells (shafts)	drawings	1440	May-Sept		on a plateau	17-18	18	deep, homogeneous						-21.9479	-47.4338	599		Fig. 28
Rawitscher et al. 1952	near Queimadas	Caatinga (dry bush)		evergreen broad-leaf?	small tree	in the caper family	*Capparis yco Mart.*	5.00	road cut	no	475	mostly in May-Sept		near a stream									-10.9736	-39.6354	271	We collect leaves of Capparis YCO 12 noon on 12 December, a place not extremely	translated from Portugues; location guessed based on author
Raz-Yaseef et al., 2013	near Sacramento,	Chaparral		deciduous broad-leaf	tree	blue oak	*Quercus douglasii*	0.53	excavation + GPR	yes	562	most rain in winter		foothills of Sierra	3.0 - 10.5		silty loam			slate and schist	0.45		38.4314	-120.9669	171	Water uptake from groundwater helps explain the incongruity of tree growth with	GPR: lat-lon given is wrong - should coarse roots only, detected with

van Rees & Comerford	7km NE of Gainsville, FL	subtropical mixed forest		evergreen needle-leaf	tree	slash pine	*Pinus elliottii Engelm. var.*	3.30	coring, trench,	yes	1330			on flat coastal plain			sandy spodosol, poorly drained	argillic horizon	0.8-1.3			20yr old plantation	29.7046	-82.2546	53	Slash pine taproots extended between 200 and 330 cm below the surface. (i.e., 1-2 3	Comparing the vertical root distribution of pine and palmetto showed that both were deep, extensive rooting species. It was
van Rees & Comerford	7km NE of Gainsville, FL	subtropical mixed forest		evergreen broad-leaf	small palm	saw palmetto	*Serenoa repens*	2.05	coring, trench,	yes	1330			on flat coastal plain			sandy spodosol, poorly drained	argillic horizon	0.8-1.3			20yr old plantation	29.7046	-82.2546	53	Pine roots frequently grew inside large diameter (3-5 mm), dead roots of	
Reynolds, 1970	near Oxford, UK, Bagley	temperate mixed forest		evergreen needle-leaf	tree	Douglas fir	*Pseudotsuga taxifolia*	1.40	coring	yes to 1.07m				SE facing 1/18 slope			coarse sand to sandy loam 2m						51.711	-1.2534	99	Vertical soil profiles showed that these latter horizons usually prevent Douglas fir	
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	undistrubed site	evergreen needle-leaf	shrub	big sagebrush	*Artemesia tridentata*	2.50	32P radio tracer	yes	224	35% in Apr-Jun					clayey silt						43.8194	-112.8235	1465	Root depth and lateral spread were determined for five plant species using radiotracer techniques. Depth data only were collected from two additional species. Big sagebrush (Artemisia tridentata), the deepest rooted species examined, had roots extending to a depth of 225 cm. Roots of Great Basin wildrye (Leymus cinereus), the deepest rooted grass, were detected to 200 cm. The maximum lateral spread of both of these species was 100 cm and occurred at a depth of 40 cm.	locations guessed to be within the INEL faciliaties/lands, one at a distrubed site (Test Area North), the other at an undistrubed site to the south at a comparable elevation
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	disturbed site	evergreen needle-leaf	shrub	big sagebrush	*Artemesia tridentata*	2.25	32P radio tracer	yes	224	35% in Apr-Jun					aeolian sandy loam and loess						43.8542	-112.7309	1459		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	undistrubed site	perennial	shrub	yellow rabbitbrush	*Chrysothamous vicidiflorus*	1.90	32P radio tracer	yes	224	35% in Apr-Jun					clayey silt						43.8194	-112.8235	1465		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	disturbed site	perennial	shrub	yellow rabbitbrush	*Chrysothamous vicidiflorus*	2.00	32P radio tracer	yes	224	35% in Apr-Jun					aeolian sandy loam and loess						43.8542	-112.7309	1459		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	undistrubed site	perennial	grass	basin wildrye	*Leymus cinerus*	> 1.6	32P radio tracer	yes	224	35% in Apr-Jun					clayey silt						43.8194	-112.8235	1465		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	disturbed site	perennial	grass	basin wildrye	*Leymus cinerus*	> 2.0	32P radio tracer	yes	224	35% in Apr-Jun					aeolian sandy loam and loess						43.8542	-112.7309	1459		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	undistrubed site	perennial	grass	squirreltail	*Elymus elymoides*	> 1.0	32P radio tracer	yes	224	35% in Apr-Jun					clayey silt						43.8194	-112.8235	1465		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	undistrubed site	annual	forb	bushy bird's beak	*Cordylanthus ramosus*	1.60	32P radio tracer	yes	224	35% in Apr-Jun					clayey silt						43.8194	-112.8235	1465		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	disturbed site	perennial	grass	indian rice grass	*Oryzopsis hymenoides*	> 1.5	32P radio tracer	yes	224	35% in Apr-Jun					aeolian sandy loam and loess						43.8542	-112.7309	1459		
Reynolds & Fraley, 1989	E of Idaho Falls, ID	semi-arid shrub-steppe	disturbed site	perennial	grass	crested wheatgrass	*Agropyron cristatum*	> 1.5	32P radio tracer	yes	224	35% in Apr-Jun					aeolian sandy loam and loess						43.8542	-112.7309	1459		
Restom & Nagstad,	Paragominas, Para, Brazil	Tropical		evergreen broad-leaf	liana		*Davilla kunthii*	10.00	excavation	no	1800	dry in June-Nov		upland		>40	Oxisol: 70–80% clay, 10–20%					secondary forest from	-2.9837	-47.4153	132	The deepest individual excavated had roots as deep as 10 m. Deep rooting was shown	moved from given lat-lon to a forested area 7km NE of
Richards & Caldwell 1987	Logan, Utah	semi-arid shrub-steppe		evergreen needle-leaf	shrub	big sagebrush	*Artemeisia tridentata*	2.50	excavation	yes	468			sandy loam developed			gravelly loam to sandy loam						41.7536	-123.8000	1460	The soil water potential data and experimental results suggest that at night	mas rooting depth taken as 2.5 because the profile excludeed
Richter and Markewitz,	piedmont-coastal plains	restored forest	Calhoun Experimental	evergreen needle-leaf	tree	loblolly pine	*Pinus taeda*	4.00	soil sampling	no	1250			on well drained			O and A on sandy E on						34.6374	-81.6630	150	deeply rooted, with pine roots observed at 4-meter depths. The hydrologic rooting	lat-lon determined from Google Earth search for Calhoune
Riestenberg, 1994	near Cincinnati,	temperate deciduous	Delhi Site, Sugar maple-1	deciduous broad-leaf	tree	sugar maple	*Acer saccharum*	1.00	excavation + trench	drawings				on 30-degree			silty-clay colluvium			limeston and shale	0.5		39.1012	-84.6650	227		From Fig 11
Riestenberg, 1994	near Cincinnati,	temperate deciduous	Delhi Site	deciduous broad-leaf	tree	white ash	*Fraxinus americana L.*	> 2.0	excavation + trench	drawings				on 30-degree			silty-clay colluvium			limeston and shale	0.5		39.1012	-84.6650	227	Few roots larger than 1 cm in diameter extend through soil 2 m below the ground	from Fig 18
Riestenberg, 1994	near Cincinnati,	temperate deciduous	Delhi Site	evergreen needle-leaf	tree	juniper	*Juniperus sp.*	1.00	excavation + trench	drawings				on 30-degree			silty-clay colluvium			limeston and shale	0.5		39.1012	-84.6650	227		from Fig 18
Riestenberg, 1994	near Cincinnati,	temperate deciduous	Spring Grove Site, Sugar	deciduous broad-leaf	tree	sugar maple	*Acer saccharum*	> 0.6	excavation	drawings				on a 8-degree			silty-clay colluvium			limeston and shale	1.5		39.1854	-84.5305	203	has a similar shallow rooting habit, even though it grew in deeper colluvium than	from Fig 12 and author notes
Riestenberg, 1994	near Cincinnati,	temperate deciduous	Spring Grove Site	deciduous broad-leaf	tree	white ash	*Fraxinus americana L.*	> 1.1	excavation	drawings				on a 8-degree			silty-clay colluvium			limeston and shale	1.5		39.1854	-84.5305	203	The branches extend to a depth of 1 m below the ground surface and then	from Fig 13 and auther notes
Roberts & Herty, 1934	near Poughkeepsie	temperate broadleaf		perennial	forb (rhizomatous)	ground pine, groundceda	*Lycopodium complanatum*	0.13	excavation	drawing of rhizome-													41.6730	-73.9358	42	The root system is extensive, one main root and its branches occupying an area	Lab study - no site. The authors are from VASSAR COLLEGE,
Robinson et al., 2006	south-west Western	Mediterranean	Kalannie upper slop	evergreen broad-leaf	tree	Blue mallee	*Eucalyptus polybractea*	8.00	soil drying inferred	no	311	summer drought	2542	upper slope			uniform sand over silcrete	silcrete hardpan	8			tree belts to reduce	-30.1680	117.3701	343	depth of drilling 8m	rooting depth inferred from soil depth dried to wilting point;
Robinson et al., 2006	south-west Western	Mediterranean	Kalannie middle slope	evergreen broad-leaf	tree	Blue mallee	*Eucalyptus polybractea*	2.00	soil drying inferred	no	311	summer drought	2542	middle slope			uniform sand over silcrete	silcrete hardpan	2			tree belts to reduce	-30.1851	117.3679	320	depth of drilling 2m	rooting depth inferred from soil depth dried to wilting point;
Robinson et al., 2006	south-west Western	Mediterranean	Narembeen north	evergreen broad-leaf	tree	Blue mallee	*Eucalyptus polybractea*	5.00	soil drying inferred	no	334	summer drought	2169				1m gravelly sandy loam, on			granite	4	tree belts to reduce	-31.9535	118.5244	362	depth of drilling 5m	rooting depth inferred from soil depth dried to wilting point
Robinson et al., 2006	south-west Western	Mediterranean	Narembeen east	evergreen broad-leaf	tree	York gum	*Eucalyptus loxophleba*	2.00	soil drying inferred	no	334	summer drought	2169				1m gravelly sandy loam, on			granite	4	tree belts to reduce	-32.0963	118.5539	300	depth of drilling 2m	rooting depth inferred from soil depth dried to wilting point
Robinson et al., 2006	south-west Western	Mediterranean	Narrogin south	evergreen broad-leaf	tree	oil mallee	*Eucalyptus kochii ssp.*	9.00	soil drying inferred	no	507	summer drought	1590				0.25-0.6m sandy ferricrete gravel,	pallid zone	1.0-2.0			tree belts to reduce	-32.9998	117.1760	364	depth of drilling 10m	rooting depth inferred from soil depth dried to wilting point
Robinson et al., 2006	south-west Western	Mediterranean	Narrogin north	evergreen broad-leaf	tree	brown mallee	*Eucalyptus astringens*	4.00	soil drying inferred	no	507	summer drought	1590				0.5m gravelly sandy on clay at					tree belts to reduce	-32.9932	117.1696	336	depth of drilling 6m	rooting depth inferred from soil depth dried to wilting point
Robinson et al., 2006	south-west Western	Mediterranean	Wickepin	evergreen broad-leaf	tree	York gum	*Eucalyptus horistes*	10.00	soil drying inferred	no	411	summer drought	1826				0.25-0.6m sandy ferricrete gravel,	pallid zone	1.0-2.0			tree belts to reduce	-32.8787	117.5699	336	depth of drilling 10m	rooting depth inferred from soil depth dried to wilting point
Robinson et al., 2006	south-west Western	Mediterranean	Woodanilling	evergreen broad-leaf	tree	oil mallee	*Eucalyptus kochii ssp.*	8.00	soil drying inferred	no	490	summer drought	1608				0.25-0.6m sandy ferricrete gravel,	pallid zone	1.0-2.0			tree belts to reduce	-33.6175	117.2206	290	depth of drilling 8m	rooting depth inferred from soil depth dried to wilting point
Robinson et al., 2006	south-west Western	Mediterranean	Newdegate	evergreen broad-leaf	tree	oil mallee	*Eucalyptus kochii ssp.*	7.75	soil drying inferred	no	356	summer drought	1933				0.15m clay sand on 0.5-0.7m					tree belts to reduce	-33.1028	118.7969	358	depth of drilling 10m	rooting depth inferred from soil depth dried to wilting point
Roering et al., 2002	S. Island, New Zealand	Subtropical moist forest		evergreen broad-leaf	tree	soutern beech	*Nothofagus*	0.50	soil sampling	no				slope of alluvial			tephra on loess						-42.4508	173.3584	360	The transition from a thin, highly concentrated tephra layer at depth to less concentrated, widely distributed tephra in the upper soil may result from soil mixing	Fig3a indicates site elevation of 397 .392m, but the map given suggests a location at the 360m elevation range
Roering et al., 2002	S. Island, New Zealand	Subtropical moist forest		evergreen needle-leaf	tree	podocarp	*Podocarpaceae*	0.50	soil sampling	no				slope of alluvial			tephra on loess						-42.4508	173.3584	360		
Rood et al., 2011	British Columbia and	riparian forest	Elk River	deciduous broad-leaf	tree	black cottonwood	*Populus trichocarpa*	0.65	river-cut banks	yes + photos				eastern slope of		1.5							49.5617	-114.9858	1134	The floodplain forests were dominated by cottonwoods and from mountain to prairie	
Rood et al., 2011	British Columbia and	riparian forest	St. Mary River	deciduous broad-leaf	tree	prairie cottonwood	*Populus deltoides*	1.35	river-cut banks	yes + photos				out on the Priare in		1.55							49.6158	-112.9014	840		
Rood et al., 2011	British Columbia and	riparian forest	Bow River	deciduous broad-leaf	tree	balsam poplar	*Populus balsamifera*	1.25	river-cut banks	yes + photos				in the Potholes									50.8103	-113.5206	921		lat-lon very pricise - pinpoint river banks; water table location (or stream surface) was only give for 2 sites in Fig.1; Great data and photos showing shallow rooting with shallow WTD and dimorphic rooting with deep WTD - water table serves to confine or entice deeper roots.
Rood et al., 2011	British Columbia and	riparian forest	Bow River	deciduous broad-leaf	tree	balsam poplar	*Populus balsamifera*	0.90	river-cut banks	yes + photos				in the Potholes									50.8103	-113.5206	921		
Rood et al., 2011	British Columbia and	riparian forest	Elk River	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.40	river-cut banks	yes + photos				eastern slope of		1.5							49.5617	-114.9858	1134		
Rood et al., 2011	British Columbia and	riparian forest	Bow River	deciduous broad-leaf	tree	trembling aspen	*Populus tremuloides*	0.30	river-cut banks	yes + photos				in the Potholes									50.8103	-113.5206	921		
Rood et al., 2011	British Columbia and	riparian forest	Oldman	deciduous broad-leaf	tree	narrowleaf cottonwood	*Populus angustifolia*	1.40	river-cut banks	yes + photos				out on the Priare in									49.6767	-112.8528	441		
Rood et al., 2011	British Columbia and	riparian forest	Waterton	deciduous broad-leaf	tree	narrowleaf cottonwood	*Populus angustifolia*	0.75	river-cut banks	yes + photos				out on the Priare in									49.5047	-113.3228	980		
Rood et al., 2011	British Columbia and	riparian forest	Castle River	deciduous broad-leaf	tree	narrowleaf cottonwood	*Populus angustifolia / ?*	1.15	river-cut banks	yes + photos				just out of the									49.5025	-114.0506	1148		
Rose et al., 2003	Southern Sierras, CA	Mediterranean woodland	Sequoia National	evergreen needle-leaf	tree	Jeffrey pine	*Pinus jeffreyi*	3.75	soil/rock sampling +	no	760	mostly as snow in Nov-		NE-facing footslope			coarse loamy			granite, fractured	0.75		35.9690	-118.6296	157		same site as Hubbert et al 2001
Rose et al., 2003	Southern Sierras, CA	Mediterranean woodland	Sequoia National	evergreen broad-leaf	shrub	greenleaf manzanita	*Arctostaphylos patula*	2.00	soil/rock sampling +	no	760	mostly as snow in Nov-		NE-facing footslope			coarse loamy			granite, fractured	0.75		35.9690	-118.6296	157		isotope data shows root uptake above 2m
Roupsard et al., 1999	Burkina Faso, west Africa	tree savanna, Sahel	The parkland of Dossi	deciduous broad-leaf	tree	Acacia albida	*Faidherbia albida*	7.25	trench wall	yes	924	<50mm/mon Oct-Mar	2100	flat hilltop	7.5 - 11		clay sand, on clay silt, on silt,			volcano-sedimentary,	4.5		11.4336	-3.4006	354	Roots were distributed through the weathered rock, down to a depth of 7 m,	
Roux et al., 2009	Kamiesberg, N Cape, South	woody scrub, classified as		perennial	forb		*Isoetes eludens*	0.03	excavation	drawing	353	mostly in May-Sep		ephemeral pool on						granite			-30.4336	18.1061	1284	The I. eludens population in the pool consists of approximately 250 to 300 plants	lat-lon approx.
Rutherford, 1983	northern Transvaal,	tree savanna	the Nylsvley Nature	deciduous broad-leaf	small tree	Lekkerbreek	*Ochna pulchra*	2.2	excavation	no	630	mainly in summer		well-drained			sand, well drained			sandstone with	2.2	light summer	-24.6667	28.7167	1100	Biomass and distribution of 55 Ochna pulchra root systems were determined	
Rutherford, 1983	northern Transvaal,	tree savanna	the Nylsvley Nature	deciduous broad-leaf	tree	Wild syringa	*Burkea africana*	2.2	excavation	no	630	mainly in summer		well-drained			sand, well drained			sandstone with	2.2	light summer	-24.6667	28.7167	1100	Root distribution of Burkea africana was studied to one side of a typical	sand over bedrock; sand promotes deep roots, but shallow bedrock stops roots
Rutherford, 1983	northern Transvaal,	tree savanna	the Nylsvley Nature	deciduous broad-leaf	tree	clusterleaf, silver cluster	*Terminalia sericea*	2.2	excavation	no	630	mainly in summer		well-drained			sand, well drained			sandstone with	2.2	light summer	-24.6667	28.7167	1100	Root distribution of the characteristic superficial lateral root systems of three	
Sainju & Good, 1993	C. New Jersey	Temperate mixed forest	oak-pine uplands	deciduous broad-leaf	tree	chestnut oak	*Quercus prinus, Q.*	2.00	soil pit to 1.5m deep	yes	1143	evenly thru the year		upland		> 1.5	sand						39.6677	-74.6454	11	Higher root density in the E horizon of oak-pine uplands as compared to the other	rooting depth extrapolated
Sainju & Good, 1993	C. New Jersey	Temperate mixed forest	pine-oak lowland	evergreen needle-leaf	tree	pitch pine	*Pinus rigida, Acer rubrum,*	0.70	soil pit to 1.5m deep	yes	1143	evenly thru the year		lowland		0.67	sand						39.6654	-74.6764	6	Shallow depth to the water table and the compact layer limit the soil volume	the first 3 sites are within 5km of each,
Sainju & Good, 1993	C. New Jersey	Temperate mixed forest	pine-oak upland	evergreen needle-leaf	tree	pitch pine	*Pinus rigida, Q. velutina,*	3	soil pit to 1.5m deep	yes	1143	evenly thru the year		upland		> 1.5	sand						39.6705	-74.7336	16		rooting depth extrapolated
Sainju & Good, 1993	C. New Jersey	Temperate mixed forest	pine-oak plains	evergreen needle-leaf	tree	pitch pine	*Pinus rigida, Q.*	1.5	soil pit to 1.5m deep	yes	1143	evenly thru the year		lowland		> 1.5	sand, firm clay layer in C						39.7278	-74.5718	15	because of the presence of a firm clay layer in the B horizon of pine-oak plains, lower	rooting depth extrapolated; this site is 13km from the other 3 sites
Sanford, 1989	San Carlos, Venezuela	tropical rainforest	tierra-firme	evergreen broad-leaf	tierra-firme			0.65	excavation	yes	3500			top of hills			Oxisols	plinthite concretion	15-30cm to saprolite				1.8986	-67.0510	95	This topographic and pedologic diversity supports three distinct forest types and	
Sanford, 1989	San Carlos, Venezuela	tropical rainforest	tierra-firme / caatinga	evergreen broad-leaf	tierra-firme / caatinga			0.55	excavation	yes	3500			transition			Oxisols	plinthite concretion	15-30cm to saprolite				1.8989	-67.0504	92	Tierra firme, caatinga, and bana forest types have 95, 95 and 85%, respectively, of	

Sanford, 1989	San Carlos, Venezuela	tropical rainforest	caatinga (white sand)	evergreen broad-leaf	caatinga (white sand)			0.6	excavation	yes	3500			swales between			deep Spodosols						1.8992	-67.0501	90	Drainage may be important in developing superficial root systems.	
Sanford, 1989	San Carlos, Venezuela	tropical rainforest	caatinga / bana	evergreen broad-leaf	caatinga / bana			0.6	excavation	yes	3500			transition			deep Spodosols						1.8993	-67.0497	89	Productivity, species diversity, and canopy height are lowest for bana compared to the	
Sanford, 1989	San Carlos, Venezuela	tropical rainforest	bana	evergreen broad-leaf	bana			0.6	excavation	yes	3500			sandy domes			excessively well-drained						1.8994	-67.0492	90	The distribution of fine roots throughout the soil profile in bana forest is probably a	
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	deciduous broad-leaf	subshrub		*Annona dioica A.St.-*	0.7+-0.2	excavation	drawings	1180	mostly Oct-Apr		below the highest	1.0 - 2.5		sandy Spodosols, 94-						-19.0119	-56.6415	103	The root systems of woody species in savanna physiognomies in the Pantanal are shorter and lighter than those observed in other savannas, due to the singular effect of the higher water table level in relation to the soil surface. Most species in the Pantanal are typical of savanna vegetation occurring in Brazil's central-western plateau, such as..., which were described by Rawitscher (1948) as having deep roots (3 to 8 m). In these same species, we observed shorter roots (<1.4 m) in two savanna physiognomies in the Pantanal wetland. This characteristic had already been observed by Dubs (1992) in savanna forest of the Pantanal in eight savanna tree species displaying root depths no greater than 1.2 m. This ''shortness'' of roots found in savanna physiognomies of the Pantanal can be explained by the fact that the water table is closer to ground level. According to Gradella et al. (2009), the water table can reach 1.5 m below the soil surface in areas of semideciduous forest in the Pantanal, which probably limits the growth of plant roots... The physiognomies of savanna woodland and open woody savanna occur slightly below the topographic level of the forested areas; hence, these landscapes can be more influenced by the water table. We believe that the water table in the	mean of 10 samples
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	evergreen broad-leaf	tree		*Casearia sylvestris Sw.*	1	excavation	no	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	evergreen broad-leaf	tree		*Cecropia pachystachya*	1.2	excavation	drawings	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	evergreen broad-leaf	tree		*Curatella americana L.*	0.8 +/- 0.3	excavation	drawings	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103	mean of 10 samples	
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	semi-deciduous	tree		*Dipteryx alata Vogel*	1	excavation	drawings	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	evergreen broad-leaf	tree		*Mouriri elliptica*	0.7 +/- 0.2	excavation	no	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	evergreen broad-leaf	tree		*Sapium haematosper*	1	excavation	no	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	semi-deciduous	tree		*Simarouba versicolorA.St*	1	excavation	no	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	deciduous broad-leaf	tree		*Tabebuia aurea Benth.*	1.2	excavation	no	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	savanna woodland,	deciduous broad-leaf	tree		*Zanthoxylum rigidum*	1.4 (1.1 +/- 0.3)	excavation	drawings	1180	mostly Oct-Apr		below the highest	1.0 - 2.5	1.75	sandy Spodosols, 94-						-19.0119	-56.6415	103	mean of 4 samples, max=1.4m (''The deepest recorded root	
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	deciduous broad-leaf	subshrub		*Annona dioica*	0.8 +/- 0.1	excavation	no	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102	mean of 15 samples	
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	deciduous broad-leaf	tree		*Bowdichia virgilioides*	1	excavation	no	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	evergreen broad-leaf	subshrub		*Byrsonima cydoniifolia*	0.6 +/- 0.1	excavation	drawings	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102	mean of 10 samples	
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	deciduous broad-leaf	tree		*Caryocar brasiliense*	0.7	excavation	no	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102	This study shows how small differences in WTD leads clear zonations of vegetation. It also has other data such as root biomass and lateral extend. It nicely shows plasticity of roots to WTD - same species with different rooting depth depending on WTD.	
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	deciduous broad-leaf	tree		*Diospyros hispida A.DC.*	0.5	excavation	no	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	evergreen broad-leaf	tree		*Mouriri elliptica*	0.6	excavation	drawings	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	deciduous broad-leaf	tree		*Stryphnodendron*	0.7	excavation	no	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102		
Salis et al., 2014	Nhecolândia Pantanal,	Tropical savanna	open woody savanna,	deciduous broad-leaf	tree		*Tabebuia aurea*	1.1	excavation	no	1180	mostly Oct-Apr		below the above zone,	0.5 - 2.0	1.25	sandy Spodosols, 94-						-18.9958	-56.6622	102		
Satterlund, 1960	Upper P., Michigan	swamp forest	Cedar Creek Type-II	evergreen needle-leaf	tree	white ceder, black	*Thuja occidentalis /*	0.27	excavation	yes				swamp near Cedar Creek		0.30	organic soils						46.2387	-89.0780	508	The results indicate that variations in site quality and species composition of swamp	Type-I swamps have nearly stable water table, occuring on low
Satterlund, 1960	Upper P., Michigan	swamp forest	Cedar Creek Type-II	evergreen needle-leaf	tree	white ceder, balsam fir,	*Thuja occidentalis /*	0.54	excavation	yes				higher swamp		0.55	less developed organic soil						46.2408	-89.0770	515	The major action of groundwater upon swamp forests is exerted directly upon tree	Type-II swamps have water table rise and fall, with or without delay.
Schmid & Kazda, 2001	near Wilhelmsburg	temperate broad-leaf	mixed stand	deciduous broad-leaf	tree	European beech	*Fagus sylvatica*	1	trench profile	Yes	843	333 in May-Sep		mean slope of 10% with		periodic saturation	4cm O, clay loam, 40-60%	compact stagnic	0.6				48.0975	15.6633	480	Water saturation as indicated by signs of gleyic influence may periodically occur	same site as the 2005 study by the same author, but in mixed stand; compitition makes spruce roots shallower than beech.
Schmid & Kazda, 2001	near Wilhelmsburg	temperate broad-leaf	mixed stand	evergreen needle-leaf	tree	Norway spruce	*Picea abies*	0.80	trench profile	Yes	843	333 in May-Sep		mean slope of 10% with		periodic saturation	4cm O, clay loam, 40-60%	compact stagnic	0.6				48.0975	15.6633	480	However, the root system of spruce was shallower in the mixture with beech. Beech	
Schmid & Kazda, 2005	near Wilhelmsburg	temperate broad-leaf	pure stand	deciduous broad-leaf	tree	European beech	*Fagus sylvatica*	1.00	trench profile	Yes	843	333 in May-Sep		mean slope of 10% with		periodic saturation	4cm O, nutrient rich Cambisol	compact stagnic	0.6				48.0972	15.6639	500	Maximum root density is reached in 10–20 cm depth in the beech stand. Roots were	Max rooting depth from Fig.2; periodic saturation below 0.6m
Schmid & Kazda, 2005	near Wilhelmsburg	temperate broad-leaf	pure stand	evergreen needle-leaf	tree	Norway Spruce	*Picea abies*	1.00	trench profile	Yes	843	333 in May-Sep		mean slope of 10% with		periodic saturation	4cm O, nutrient rich Cambisol	compact stagnic	0.5				48.1001	15.6673	469	maximum abundance for the roots between 2 mm and 5 mm diameter (small	Max rooting depth from Fig.2; periodic saturation below 0.6m
Schultz, 1969	Michigan	Boreal forest	N-1	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.12	excavation	drawings				Gravelly ridge			0-6" sandy loam, 6-24"						46.0240	-88.0241	392	white spruce tend to have prominent tap roots and numerous sinker roots that	The free software Earth Point allows overlaying section, range
Schultz, 1969	Michigan	Boreal forest	N-1	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.35	excavation	drawings				Gravelly ridge			0-6" sandy loam, 6-24"						46.0240	-88.0241	392	like white spruce, balam fir has strong tap roots and sinker roots and penetrate deep	Sec. 23, T42N, R30W Dickinson County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-2	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.53	excavation	drawings				Sandy ridge between			0-6" sandy loam, 6-24"						45.7172	-87.7553	280	black spruce has feeble tap and sinker roots, regardless of soil texture and bulk	Sec. 3, T38N, R28W Menominee County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-2	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.56	excavation	drawings				Sandy ridge between			0-6" sandy loam, 6-24"						45.7148	-87.7469	291		Sec. 3, T38N, R28W Menominee County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-2	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.56	excavation	drawings				Sandy ridge between			0-6" sandy loam, 6-24"						45.7127	-87.7391	298	In the greenhouse experiment, only the seedlings in the sand survived	Sec. 3, T38N, R28W Menominee County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-3	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.71	excavation	drawings				Sandy till with many			0-6" loam, 6-24" sandy loam						46.0071	-88.0234	373		Sec. 26, T42N, R30W Dickinson County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-3	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.50	excavation	drawings				Sandy till with many			0-6" loam, 6-24" sandy loam						46.0071	-88.0234	373	In all greenhouse experiments, only hardpan seems to have a significant effect	Sec. 26, T42N, R30W Dickinson County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-4	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.84	excavation	drawings				Sandy moraine			0-6" sandy loam, 6-24"						46.1092	-87.6476	351		Sec. 23, T43N, R27W Dickinson County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-4	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.97	excavation	drawings				Sandy moraine			0-6" sandy loam, 6-24"						46.1092	-87.6476	351		Sec. 23, T43N, R27W Dickinson County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-5	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.84	excavation	drawings				Till plain with			0-6" sandy loam, 6-24"						46.4744	-89.4915	427	Balsam fir is found on a wider range of conditions than the others in the Lake	Sec. 13, T47N, R42W Gogebic County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-6	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.94	excavation	drawings				Till plain with			0-6" sandy loam, 6-24"						46.4635	-89.5097	430		Sec. 13, T47N, R42W Gogebic County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-7	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.84	excavation	drawings				Till plain			0-6" sandy loam, 6-24"						46.4615	-89.5099	431		Sec. 24, T47N, R42W Gogebic County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-7	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.97	excavation	drawings				Till plain			0-6" sandy loam, 6-24"						46.4491	-89.4920	431		Sec. 24, T47N, R42W Gogebic County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-8	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.02	excavation	drawings				Sandy outwash			0-6" sandy loam, 6-24"						46.5506	-88.2632	528		Sec. 14, T48N, R32W Baraga County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-8	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.32	excavation	drawings				Sandy outwash			0-6" sandy loam, 6-24"						46.5502	-88.2749	528		Sec. 14, T48N, R32W Baraga County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-9	evergreen needle-leaf	tree	black spruce	*Picea mariana*	1.22	excavation	drawings				Sandy outwash			0-6" sandy loam, 6-24"						46.5633	-88.2761	500		Sec. 14, T48N, R32W Baraga County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-10	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.91	excavation	drawings				Sandy outwash			0-6" sandy loam, 6-24"						46.5554	-88.2818	504		Sec. 14, T48N, R32W Baraga County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-10	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.94	excavation	drawings				Sandy outwash			0-6" sandy loam, 6-24"						46.5563	-88.2630	531		Sec. 14, T48N, R32W Baraga County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-11	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.51	excavation	drawings				Sandy outwash		0.76	0-6" sandy loam, 6-24"						46.6444	-88.5212	392	Jack pine poles and saplings with black sprunce samplings. High water table at 30-	Water table data is given in Appendix Table-1; Sec. 14, T49N,
Schultz, 1969	Michigan	Boreal forest	N-12	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.64	excavation	drawings				Thin glacial drift over			0-6" loam, 6-24" sandy loam						46.6001	-88.4393	492		Sec. 33, T49N, R33W Baraga County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-13	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	2.41	excavation	drawings				Sandy, well-developed			0-6" sand, 6-24" sand						46.2203	-86.6014	248		Sec. 7, T44N, R18W Schoolcraft County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-14	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.66	excavation	drawings				Sandy former lake			0-6" sand, 6-24" sand						46.6292	-86.2092	222		Sec. 20, T49N, R15W Alger County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-15	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.99	excavation	drawings				Sandy ridge surrounded			0-6" sand, 6-24" sand						46.4551	-85.4197	238		Sec. 22, T47N, R9W Luce County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-16	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.51	excavation	drawings				Ice-contact ridge			0-6" sandy loam, 6-24"						46.3583	-88.8471	496		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-17	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.43	excavation	drawings				Ice-contact ridge			0-6"loamy sand, 6-24" loamy						46.3600	-88.8556	498		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-17	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.89	excavation	drawings				Ice-contact ridge			0-6"loamy sand, 6-24" loamy						46.3571	-88.8522	501		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-18	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.36	excavation	drawings				Ice-contact ridge			0-6"loamy sand, 6-24" loamy						46.3499	-88.8639	498		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-18	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.61	excavation	drawings				Ice-contact ridge			0-6"loamy sand, 6-24" loamy						46.3533	-88.8606	510		Sec. 30, T46N, R36W Iron County, Michgan

Schultz, 1969	Michigan	Boreal forest	N-19	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.41	excavation	drawings				Ice-contact ridge			0-6"loamy sand, 6-24" loamy						46.3521	-88.8499	497		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-19	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.88	excavation	drawings				Ice-contact ridge			0-6"loamy sand, 6-24" loamy						46.3603	-88.8640	504		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-19	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	3.00	excavation	drawings				Ice-contact ridge			0-6"loamy sand, 6-24" loamy						46.3573	-88.8578	500		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-20	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.02	excavation	drawings				Stoney and gravelly			0-6" sandy loam, 6-24" loamy						46.2365	-88.8782	492		Sec. 1, T44N, R37W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-20	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.69	excavation	drawings				Stoney and gravelly			0-6" sandy loam, 6-24" loamy						46.2380	-88.8844	500		Sec. 1, T44N, R37W Iron County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-21	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.71	excavation	drawings				Morainic ridge			0-6"loamy sand, 6-24" loamy	indurated layer	0.15				46.2356	-89.0430	520	Sandy soils with indurated hardpan beginning 6 inches down and about 6	Sec. 3, T44N, R38W Gogebic County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-22	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.33	excavation	drawings			0.61	Sandy transition			0-6" sandy loam, 6-24"						46.1943	-89.0025	539	High water table probably impeded vertical root growth below 24 inches (caption of	Sec. 3, T44N, R38W Gogebic County, Michgan
Schultz, 1969	Michigan	Boreal forest	N-22	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	0.69	excavation	drawings			0.61	Sandy transition			0-6" sandy loam, 6-24"						46.1900	-89.0420	538	High water table probably impeded vertical root growth below 24 inches (caption of	Sec. 3, T44N, R38W Gogebic County, Michgan
Schultz, 1969	Minnesota	Boreal forest	N-23	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.76	excavation	drawings				Former lake bed			0-6" clay loam, 6-24" clay						48.3007	-92.7276	404		Sec. 12, T67N, R19W St. Louis County, Minnesota
Schultz, 1969	Ontario, CA	Boreal forest	N-24	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.66	excavation	drawings				Former lake bed			0-6" silty clay loam, 6-24" silt						49.7603	-85.4142	224		Approx. 49 miles east of town of Longlac, Ontario, along paved
Schultz, 1969	Ontario, CA	Boreal forest	N-24	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.47	excavation	drawings				Former lake bed			0-6" silty clay loam, 6-24" silt						49.7615	-85.4302	240		Approx. 49 miles east of town of Longlac, Ontario, along paved
Schultz, 1969	Ontario, CA	Boreal forest	N-24	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.40	excavation	drawings				Former lake bed			0-6" silty clay loam, 6-24" silt						49.7635	-85.4458	235		Approx. 49 miles east of town of Longlac, Ontario, along paved
Schultz, 1969	Ontario, CA	Boreal forest	N-25	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.56	excavation	drawings				Till plain			0-6" silt loam, 6-24" sand						49.5397	-86.5524	351		Approx. 16 miles south of Longlac, Ontario, near McLeod Lake
Schultz, 1969	Ontario, CA	Boreal forest	N-25	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.73	excavation	drawings				Till plain			0-6" silt loam, 6-24" sand						49.5413	-86.5650	360		Approx. 16 miles south of Longlac, Ontario, near McLeod Lake
Schultz, 1969	Ontario, CA	Boreal forest	N-25	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.07	excavation	drawings				Till plain			0-6" silt loam, 6-24" sand						49.5379	-86.5761	362		Approx. 16 miles south of Longlac, Ontario, near McLeod Lake
Schultz, 1969	Ontario, CA	Boreal forest	N-26	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.53	excavation	drawings				Till plain			0-6" silt loam, 6-24" loam						49.2418	-87.1557	439		Approx. 48 miles southwest of Longlac, Ontario, near Chorus Lake
Schultz, 1969	Ontario, CA	Boreal forest	N-27	evergreen needle-leaf	tree	black spruce	*Picea mariana*	1.19	excavation	drawings				Till plain			0-6" silt loam, 6-24" loam						49.4409	-87.2404	401		Approx. 37 miles south of Longlac, Ontairo, between Wintering Lake
Schultz, 1969	Ontario, CA	Boreal forest	N-27	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.78	excavation	drawings				Till plain			0-6" silt loam, 6-24" loam						49.4607	-87.2000	411		Approx. 37 miles south of Longlac, Ontairo, between Wintering Lake
Schultz, 1969	Ontario, CA	Boreal forest	N-27	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.02	excavation	drawings				Till plain			0-6" silt loam, 6-24" loam						49.4520	-87.2206	418		Approx. 37 miles south of Longlac, Ontairo, between Wintering Lake
Schultz, 1969	Michigan	Boreal forest	N-18	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.41	excavation	drawings				Sandy transition			0-6" loamy sand, 6-24" loamy						46.3592	-88.8578	501		Sec. 30, T46N, R36W Iron County, Michgan
Schultz, 1972	NE Florida	plantation	an airlayer	evergreen needle-leaf	tree	slash pine	*Pinus elliottii*	2.3	excavation + core +	yes + photos	1320				1 - 2.2	2	fine sand (92%) for 2m, cap rise					plantation, some	30.1337	-81.4710	6	Maximum depth of rooting was 2.6 m for airlayers (7 trees of 11-12yr age) and 3.1 m	location guessed, NE Florida, S of Jacksonvil, where it looked like
Schultz, 1972	NE Florida	plantation	a seedling from seed	evergreen needle-leaf	tree	slash pine	*Pinus elliottii*	2.6	excavation + core +	yes + photos	1320				1 - 2.2	2	fine sand (92%) for 2m, cap rise					plantation, some	30.1270	-81.4738	6	All had moderate to extensive fan-shaped roots from the capillary zone to below the	location guessed, NE Florida, S of Jacksonvil, where it looked like
Schulze et al., 1996	Patagonia	Deciduous forest	1	deciduous broad-leaf	tree or shrub	lenga beech	*Nothofagus pumila (tree*	1.75	excavation	yes	770					2	Glacial moraine & volcanic;						-44.8342	-71.7225	1080		
Schulze et al., 1996	Patagonia	Deciduous scrub	2	deciduous broad-leaf	tree or shrub	Antarctic Beech	*Nothofagus antarctica (T:*	2.15	excavation	yes	520					2.2	Alluvial; +0.03-0 m humus; 0-						-44.8547	-71.5819	960		
Schulze et al., 1996	Patagonia	Festuca grassland	3	perennial	bunch grass, cushion shrub		*Festuca pallescens*	1.80	excavation	yes	290					2.1	Alluvial & Moraine; +0.05-						-44.8775	-71.3267	1160		
Schulze et al., 1996	Patagonia	Stipa grassland	4	perennial	grass		*Stipa speciosa (G:*	2.80	excavation	yes	160					2.7	Alluvial; +0. -0m shrub & tussock;						-45.4050	-70.2919	700		
Schulze et al., 1996	Patagonia	Desert grass/dwarf	5	perennial	herb, subshrub	Piche's tail	*Nassauvia glomerulosa*	2.80	excavation	yes	125					2.8	Alluvial; 0 -0.3 m clay with stones;						-45.4511	-69.8256	540		
Schwarz, 1938	Judaean Desert, Israel	arid desert		annual	forb		*Linaria hgelava*	0.05		drawings													31.7431	35.4638	-369	annuals have a small root-system by comparison with their shoot development	location guessed to be in small vegetation
Schwarz, 1938	Judaean Desert, Israel	arid desert		annual	forb		*Erucaria boyeana*	0.07		drawings													31.7431	35.4638	-369		location guessed
Schwarz, 1938	Judaean Desert, Israel	arid desert		annual	leaf succulent forb		*Aizoon hispanicum*	0.03		drawings													31.7431	35.4638	-369		location guessed
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	leaf succulent forb	seepweed	*Suaeda asphaltica*	0.09		drawings				found on saline soil									31.7431	35.4638	-369	The whole root-form of Suaeda is similar to that of the Cacti as described by Cannon	location guessed
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	shrub		*Zygophyllum dumosum*	1.68		drawings				on the bank of a Wadi									31.7417	36.4473	-127	This has the most extensive root-system of the plants here described. The bush	location guessed to be on Wadi
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	shrub		*Haplophyllum tuberculatum*	0.30		drawings													31.7357	35.4676	-391	Haplophyllum, Heliotropium, Reseda, and Erodium (figs. 6, 7, & 8). These plants have the same type of root-system. The main root penetrates more or less deeply into the soil, curves through a right angle to continue growing horizontally, in most	location guessed to be in shrubery vegetation
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	shrub		*Heliotropium rotundifolium*	0.30		drawings													31.7357	35.4676	-391		location guessed to be in shrubery vegetation
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	forb	Showla	*Reseda muricata*	0.20		drawings													31.7357	35.4676	-391		location guessed to be in shrubery vegetation
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	shrub		*Salsola rigida*	0.35		drawings													31.7357	35.4676	-391	The root-system is similar to those of the last plants described, except that the root	location guessed to be in shrubery vegetation
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	shrub		*Retama Retam*	1.20		drawings				found in deep soil									31.7462	35.4955	-411	This plant has a somewhat different root-system from that described above. From	location guessed to be closer to Dead Sea with deeper soils
Schwarz, 1938	Judaean Desert, Israel	arid desert		perennial	shrub	Mediterranean saltbush	*Atriplex Halimus*	0.54		drawings				foumd in deep saline									31.7462	35.4955	-411	This is the only desert perennial examined by me which shows vegetative	location guessed to be closer to Dead Sea with deeper soils
Scully, 1942	E. Wisconsin	temperate hardwood	1	deciduous broad-leaf	tree	sugar maple	*Acer saccharum,*	1.22	trench wall,	yes	798	66mm/mon Apr-Sep		SE slope, 2.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.22		42.5858	-88.4543	293	The investigation was conducted during the summers of I938, I939, and I940 at	Whychwood farm is easily located on GE
Scully, 1942	E. Wisconsin	temperate hardwood	5	deciduous broad-leaf	tree, shrub	northern red oak	*Quercus borealis*	1.24	trench wall,	yes	798	66mm/mon Apr-Sep		S slope, 4.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.24		42.5823	-88.4648	311	Sixteen station types were investigated by the trench method of root-dis- tribution	depth to bedrock estimated from the depth to C horizon (Table-6) +
Scully, 1942	E. Wisconsin	temperate hardwood	7	deciduous broad-leaf	tree, vine	sugar maple	*Acer saccharum,*	1.12	trench wall,	yes	798	66mm/mon Apr-Sep		SE slope, 7.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.12		42.5826	-88.4694	310	Root systems of herbaceous and woody seedlings in the various station types were	Only the stations in Table-6 are recorded here because the land
Scully, 1942	E. Wisconsin	temperate hardwood	8	deciduous broad-leaf	tree	northern red oak	*Quercus borealis*	1.17	trench wall,	yes	798	66mm/mon Apr-Sep		S slope, 4.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.17		42.5742	-88.4745	277	Greatest concentration of the smallest roots, o.i-i.o mm. in diameter, was in the A.	Max rooting depth from Table-2 which gives number of roots in
Scully, 1942	E. Wisconsin	temperate hardwood	11	deciduous broad-leaf	tree	sugar maple,	*Acer saccharum,*	1.07	trench wall,	yes	798	66mm/mon Apr-Sep		N slope, 3.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.07		42.5874	-88.4986	308	On root number and percentage root-area basis, horizons A, A2, B, B2, and C	Lack of O2 is thought to be the main reason that little roots are
Scully, 1942	E. Wisconsin	temperate hardwood	12	deciduous broad-leaf	tree	sugar maple,	*Acer saccharum,*	1.17	trench wall,	yes	798	66mm/mon Apr-Sep		NW slope, 2.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.17		42.5918	-88.4885	293	Stations with more abundant ground cover were char- acterized by larger root	
Scully, 1942	E. Wisconsin	temperate hardwood	13	deciduous broad-leaf	tree, vine	sugar maple, red	*Acer saccharum,*	0.91	trench wall,	yes	798	66mm/mon Apr-Sep		NW slope, 13 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	0.91		42.5975	-88.4595	308	Earthworm and cicada activities, particularly the former, were important	
Scully, 1942	E. Wisconsin	temperate hardwood	14	deciduous broad-leaf	tree	sugar maple,	*Acer saccharum,*	0.99	trench wall,	yes	798	66mm/mon Apr-Sep		NE slope, 4.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	0.99		42.5946	-88.4534	304		
Scully, 1942	E. Wisconsin	temperate hardwood	15	deciduous broad-leaf	tree	sugar maple,	*Acer saccharum,*	1.04	trench wall,	yes	798	66mm/mon Apr-Sep		S slope, 2.5 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.04		42.5811	-88.4990	296		
Scully, 1942	E. Wisconsin	temperate hardwood	16	deciduous broad-leaf	tree	sugar maple	*Acer saccharum,*	1.04	trench wall,	yes	798	66mm/mon Apr-Sep		SE slope, 7 deg			A1: dark gray silt loam 4"; A2:			Niagara limestone	1.04		42.5748	-88.5187	290		
Seghieri, 1995	Maroua, extreme N	Sudano-Sahelian	typical vertisol site	deciduous broad-leaf	legumous tree	Red acacia	*Acacia seyal*	1.5	excavation to 1.5m	yes	600-800	all in May-Oct		lower slope			clay, 40-45% smectite, dry-						10.3081	14.4134	419	A. seyal had a double underground system: superficial lateral roots and a taproot	"Sites were located in a small watershed, 30 km south of Maroua
Seghieri, 1995	Maroua, extreme N	Sudano-Sahelian	typical vertisol site	annual	grass		*annual grass*	0.33	excavation to 1.5m	yes	600-800	all in May-Oct		lower slope			clay, 40-45% smectite, dry-						10.3081	14.4134	419	As the rains fell, the drainage from the top horizons was fast and important and the	this study tests the Walter 2-layer hypothesis
Seghieri, 1995	Maroua, extreme N	Sudano-Sahelian	degrated vertisol site	deciduous broad-leaf	shrub		*Lannea humilis*	0.60	excavation to 1.5m	yes	600-800	all in May-Oct		lower slope			sandy-silt, but surface					anthropic degradatio	10.3161	14.3991	419	the root system of Lannea humilis was not more than 20 em deep. Just below the tree	a site in the village, with a few scattered plants, is assumed
Seghieri, 1995	Maroua, extreme N	Sudano-Sahelian	degrated vertisol site	annual	grass		*annual grass*	0.20	excavation to 1.5m	yes	600-800	all in May-Oct		lower slope			sandy-silt, but surface					anthropic degradatio	10.3161	14.3991	419	In this region, a high spatial variability of soil water properties exists and free	
Seghieri, 1995	Maroua, extreme N	Sudano-Sahelian	sandy-clay ferrugeinous	deciduous broad-leaf	legumous tree	white thorn acacia	*Acacia hockii*	2.00	excavation to 1.5m	yes	600-800	all in May-Oct		upper slope			sandy (0.4m), sandy-clay deep						10.2909	14.3978	431	for Acacia hockii, surface roots (down to 50 em depth) were more abundant than deep	max depth extrapolated from Fig.1
Seghieri, 1995	Maroua, extreme N	Sudano-Sahelian	sandy-clay ferrugeinous	annual	grass		*annual grass*	0.30	excavation to 1.5m	yes	600-800	all in May-Oct		upper slope			sandy (0.4m), sandy-clay deep						10.2909	14.3978	431	A phenological study has shown previously, on all three stations used in this study, that	
Shafroth et al., 2000	Sonoran Desert,	Desert grass/dwarf	BW1	deciduous broad-leaf	tree	Fremont cottonwood	*Populus fremontii*	1.40	excavation	drawings	130			Riparian		1.5	stratas of coarse and medium						34.2800	-114.0563	145	where a flare of roots spread atop a soil layer rich in organic material and silt	Bill Williams River in Western Arizona; lat-lon approximate, from

Shafroth et al., 2000	Sonoran Desert,	Desert grass/dwarf	BW5	deciduous broad-leaf	tree	Fremont cottonwood	*Populus fremontii*	0.65	excavation	drawings	175			Riparian		0.8	sands and gravel						34.2233	-113.8329	219	Root architecture has been shown to be a function of soil moisture conditions and	Fig.1 of the 1998 paper by the same authors; Ppt interpolated
Shafroth et al., 2000	Sonoran Desert,	Desert grass/dwarf	BW7	deciduous broad-leaf	tree	Fremont cottonwood	*Populus fremontii*	0.20	excavation	drawings	220			Riparian		0.4	half gravel half sand, coarsest						34.2113	-113.7050	261		from gradient given. Water table in 1995 is used here, however, the
Shaver & Billlings, 1975	Barrow, N. costal Alaska	wet tundra	Tundra Biome Site-2	perennial, rhizomatous	grass	Fisher's tundragrass	*Dupontia fisheri*	0.27	root obs box (like	yes				wet meadow,									71.2945	-156.6850	7	The growing season extends from mid-June to late August, the maximum depth of soil thaw averaging about 30 cm. E.	"Apparently, Dupontia tillers depend almost entirely on roots
Shaver & Billlings, 1975	Barrow, N. costal Alaska	wet tundra	Tundra Biome Site-2	perennial, rhizomatous	sedge	water sedge	*Carex aquatilis*	0.25	root obs box (like	drawings				wet meadow,									71.2945	-156.6850	7	angustifolium produces many more roots than does C. aquatilis or D. fischeri, and	site is located from: http://www.arlis.org/docs/vol1/B/
Shaver & Billlings, 1975	Barrow, N. costal Alaska	wet tundra	Tundra Biome Site-2	perennial, rhizomatous	grass	tall cottongrass	*Eriophorum angustifolium*	0.33	root obs box (like	yes				wet meadow,									71.2945	-156.6850	7	that new roots are continually added to its	"Roots of Eriophorum are annual, and an entirely new root system is
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	rhizomatous perennial	reed	giant bur-reed	*Sparganium eurycarpum*	0.12	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190	The depth of the water table in the reed swamp and the swamp meadow was	In the rest of the reed swamp and in the swamp meadow the water
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	perennial	herb	smartweed	*Polygonum muhlenbergii*	0.10	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190	the rhizomes of Polygonum Muhlenbergiiw are usually at or near the surface of the	A study of the subterranean organs of the reed swamp plants showed
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	tuberous perennial	herb	broadleaf arrowhead,	*Sagittaria latifolia*	0.15	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190		And since the depth of the water table may influence the depth of
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	rhizomatous perennial	reed	common reed	*Phragmites communis*	0.25	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190	the rhizomes of Phragmites(fig.5) shows another fact which probably is more	the above are more author notes
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	stolonous perennial	herb	Monkshood	*Ranunculus delphinifoliu*	0.03	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190	In many places the soil surface itself is occupied by the stolons of Ranunculus	this study reveals vertical stratification of roots; with shallow
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	perennial	herb	water parsnip	*Sium ciculaefolium*	0.07	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190		beautiful scaled drawings of many species; but only where the
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	rhizomatous perennial	herb	yellow pond-lily	*Nymphaea advena*	0.25	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190	The rhizomes of Nymphaea advena (fig. 6) are usually 5-10cm thick and lie mostly at a	
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	rhizomatous perennial	herb	American hite water	*Castalia odorata,*	0.25	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190	The rhizomes of Castalia odorata, while smaller, lie at a similar depth (to	
Sherff, 1912	N. Illinoise near Lake	temperate riparian	reed swamp	perennial	herb	Clayton's Bedstraw	*Galium claytoni*	0.02	excavation	drawings				along Skokie Stream	0 - 1.0	0.25	black muck or partially						41.1247	-87.7753	190	The creeping stems of Galium root upon the soil surface, the rhizomes of Acorus lie	
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow swamp	stolonous perennial	herb	White doll's daisy	*Boltonia asteroides*	0.06	excavation	drawings				transition from reed	0 - 1.75	0.25	black muck or partially					harvested and burned	42.1215	-87.7790	191		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow swamp	perennial	herb	Ditch Stonecrop	*Penthorum sedoides*	0.01	excavation	drawings				transition from reed	0 - 1.75	0.25	black muck or partially					harvested and burned	42.1215	-87.7790	191		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow swamp	perennial	herb	marsh mermaidwe	*Proserpinaca palustris*	0.02	excavation	drawings				transition from reed	0 - 1.75	0.25	black muck or partially					harvested and burned	42.1215	-87.7790	191		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow swamp	semiaquatic perennial	herb	marsh seedbox,	*Ludwigia palustris*	0.01	excavation	drawings				transition from reed	0 - 1.75	0.25	black muck or partially					harvested and burned	42.1215	-87.7790	191		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow swamp	semiaquatic perennial	herb	water-starworts	*Callitriche palustris*	0.01	excavation	drawings				transition from reed	0 - 1.75	0.25	black muck or partially					harvested and burned	42.1215	-87.7790	191		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow	perennial	herb	Canada lily, wild yellow-	*Lilium canadense*	0.10	excavation	drawings				slight slope away from	0 - 1.75	0.25	black muck or partially						42.1297	-87.7711	192	As has already been stated, the flora of the meadow is highly diversified	
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow	perennial	herb	swamp milkweed,	*Asclepia incarnata*	0.08	excavation	drawings				slight slope away from	0 - 1.75	0.25	black muck or partially						42.1297	-87.7711	192		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow	perennial	grass	Kentucky bluegrass,	*Poa pratensis*	0.07	excavation	drawings				slight slope away from	0 - 1.75	0.25	black muck or partially						42.1297	-87.7711	192		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow	perennial	grass	redtop?	*Agrostis alba*	0.04	excavation	drawings				slight slope away from	0 - 1.75	0.25	black muck or partially						42.1297	-87.7711	192		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow	annual	herb	Virginia threeseed	*Acalypha virginica*	0.02	excavation	drawings				slight slope away from	0 - 1.75	0.25	black muck or partially						42.1297	-87.7711	192		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow	perennial	grass	common spike-rush,	*Eleocharis palustris*	0.03	excavation	drawings				slight slope away from	0 - 1.75	0.25	black muck or partially						42.1297	-87.7711	192		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow depressions	perennial	herb	Water horehound,	*Lycopus americanus*	0.03	excavation	drawings				depressions on meadow	0 - 1.75	0.25	black muck or partially						42.1065	-87.7665	189	Small, apparently open depressions are numerous in the moist parts of the	
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow depressions	perennial	herb	dog violet	*Viola conspersa*	0.07	excavation	drawings				depressions on meadow	0 - 1.75	0.25	black muck or partially						42.1065	-87.7665	189		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow depressions	perennial	herb	Hooded Blue Violet,	*Viola cucullata*	0.06	excavation	drawings				depressions on meadow	0 - 1.75	0.25	black muck or partially						42.1065	-87.7665	189		
Sherff, 1912	N. Illinoise near Lake	temperate riparian	meadow depressions	rhizomatous perennial	herb	Blue Flag, Harlequin	*Iris versicolor*	0.10	excavation	drawings				depressions on meadow	0 - 1.75	0.25	black muck or partially						42.1065	-87.7665	189		
Shiponeni et al., 2011	N. Cape Province, W.	ecotone: xeric shrub	Kougoedvlakte	perennial	C4 grass		*Stipagrostis brevifolia*	0.95	excavation	yes + drawings	116	rain mostly in winter as					freely drained sandy soil with	hardpan	0.7				-30.2492	18.4183	921	The top 10 cm of the root system of S. brevifolia was made up of a dense tuft of	extending the root ball in Fig. 5b suggests max depth of 0.95m;
Shiponeni et al., 2011	N. Cape Province, W.	ecotone: xeric shrub	Kougoedvlakte	perennial	leaf succulent		*Ruschia robusta*	0.55	excavation	yes + drawings	116	rain mostly in winter as					freely drained sandy soil with	hardpan	0.7				-30.2492	18.4183	921	had a taproot, recorded as deep as 55 cm... were primarily coarse, with ~ 70% of the	from Fig. 6b; location by searching
Shiponeni et al., 2011	N. Cape Province, W.	ecotone: xeric shrub	Goegap Nature	perennial	leaf succulent		*Leipoldtia pauciflora*	0.2	excavation	yes + drawings	150	rain mostly in winter as					freely drained sandy soil with	hardpan	0.7				-29.7008	17.9806	935	had shallowest root system and only 3% of the total root mass was found below 10	De Riet on GE
Sierra et al., 2007	near Guacabe,	Tropical moist pre-		evergreen broad-leaf	tree		*Anacardium excelsum,*	> 4.3	excavation	no	2078						sandy, low fertility, acidic						6.7603	-75.1078	925	Additionally, six plots in each forest type were randomly selected to measure soil C	from Fig. 7b; given lat-lon moved slightly to where there is no max rooting depth or root mass or SOC profiles were given to
Silva & Rego, 2003	Central Portugal	Mediterranean shrubland	Tapada Nacional de	perennial	herb	common bracken,	*Pteridium aquilinum*	0.7	trench wall +	yes	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		The same site as in their 2004 paper but reported 2 more species
Silva & Rego, 2003	Central Portugal	Mediterranean shrubland	Tapada Nacional de	perennial	shrub	elmleaf blackberry	*Rubus ulmifolius*	1.1	trench wall +	yes	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		recorded here. Data also used to refine rooting depth of Ulex in their
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	small shrub		*Cistus crispus*	0.44	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		site moved slightly onto the natural preserve/park "Tapada Nacional de
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	small shrub		*Cistus salvifolius*	0.47	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		mean of 3 specimen
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	deciduous broad-leaf	small tree	common hawthorn,	*Crataegus monogyna*	0.73	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		mean of 3 specimen
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	shrub	flax-leaved daphne	*Daphne gnidium*	1.52	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		mean of 3 specimen
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	shrub	Spanish and Portuguese	*Erica lusitanica*	1.5	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	shrub		*Erica scoparia*	0.9	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		mean of 2 specimen
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	shrub	French lavender,	*Lavandula luisieri*	0.31	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		mean of 4 specimen
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	shrub	common myrtle	*Myrtus communis*	1.1	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	evergreen broad-leaf	shrub or small tree	mastic	*Pistacia lentiscus*	0.5	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Tapada Nacional de	perennial	thorny shrub		*Ulex jussiaei*	1.5	excavation	no	798	Jun-Aug only 3.1%					humic cambissols						38.9538	-9.2853	234		0.7 here but deeper in their 2004 study
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	evergreen broad-leaf	shrub or small tree	strawberry tree	*Arbutus unedo*	0.3	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		mean of 2 specimen
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	perennial	green-stem leaf-less shrub		*Chamaespartium*	0.4	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	evergreen broad-leaf	shrub	gum rockrose	*Cistus ladanifer*	0.1	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	perennial	shrub	white Spanish	*Cytisus multiflorus*	0.6	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		legume
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	perennial	shrub	Portuguese broom	*Cytisus striatus*	0.35	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		legume
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	evergreen broad-leaf	shrub		*Erica australis*	0.35	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	evergreen broad-leaf	shrub		*Erica umbellata*	0.2	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		
Silva & Rego, 2004	Central Portugal	Mediterranean shrubland	Serra da Malcata	deciduous broad-leaf	tree	Pyrenean oak	*Quercus pyrenaica*	0.6	excavation	no	812	Jun-Aug only 3.1%					schist lithossols						40.2781	-7.0283	1005		
Simonovic, 1991	Bab, near Nitra, W	temperate forest		deciduous broad-leaf	tree	Oak-hornbeam	*Carpinus betulus L.,*	> 1.3	soil monolith	no	550-650			moderate NE-facing			brown soil on carbonate loess						48.3032	17.8943	195	Twenty soil monoliths were dug out to a depth of 130 cm and vertically divided into	80yr old forest stand
Slavich et al., 1999	S. NSW, SE Astralia	temperate steppe	Plantation H	evergreen broad-leaf	shrub	old man saltbush,	*Atriplex nummularia*	> 0.5	H isotopes in stem	no				elevated field	1.6 - 2.2	1.9	loamy clay 1m, sandy clay at 2m					plantation, likely	-35.4654	144.4247	88	This species is deep rooted (Jones and Hodgkinson, 1970) and is native to the clay	authors think that the roots reach capillary rise 0.5m depth; authors

Slavich et al., 1999	S. NSW, SE Astralia	temperate steppe	Plantation M-1 (depression	evergreen broad-leaf	shrub	old man saltbush,	*Atriplex nummularia*	0.5	H isotopes in stem	no				gully edge	1.0 - 2.0		0.3m sandy loam A, light					plantation, likely	-35.4350	144.4359	84	The deuterium/hydrogen ratios of the sap were similar to the water in the 0-0.5 m	also state "This suggested that the percentage of sap water derived
Slavich et al., 1999	S. NSW, SE Astralia	temperate steppe	Plantation M-2 (depression	evergreen broad-leaf	shrub	old man saltbush,	*Atriplex nummularia*	0.5	H isotopes in stem	no				gully slope	0.3 - 1.2		0.2m sandy loam A, light					plantation, likely	-35.4350	144.4339	83	isotope studies at both the sites indicated that the root system was most active at	from below 0.5 m, was 9, 51, 0 and
Slavich et al., 1999	S. NSW, SE Astralia	temperate steppe	Plantation M-3 (depression	evergreen broad-leaf	shrub	old man saltbush,	*Atriplex nummularia*	0.5	H isotopes in stem	no				gully bottom	0 - 1.0		0.1m sandy loam A, light					plantation, likely	-35.4355	144.4318	80	depths above the capillary fringe which occurred at approximately 0.5 m, and that	0% in January, March, June and August, respectively. Hence, given
Sobotik, 1996	Pannonic area of NW of	mountain forest		perennial	subshrub	forage kochia	*Kochia prostrata*	6.36	excavation	drawings	<500			S slope, 45degree, in			loess and molasse					semi-ruderal	48.2308	16.3010	250	The plant of the pannonic area shows a more erect shoot, very few roots at the	location guessed to match info given, esp elevation
Sobotik, 1996	Aosta valley, Italy	mountain forest		perennial	subshrub	forage kochia	*Kochia prostrata*	4.1	excavation	drawings	<500			S slope, 35 degree, on			haplic-phaeozom (rich						45.7063	7.2065	780	The plant of the Aosta valley shows a more creeping growth form with many roots	location guessed to match info given, esp elevation
Soethe et al., 2006	Podocarpus Nat Park, S	tropical elfin forest	3000m elevation site	evergreen broad-leaf	small tree		*Clusia sp.*	0.45	excavation	yes				soil often water-		0.6	0.3m O, on 0.4m mineral soil				0.7		-4.1017	-79.1658	3000	Clusia sp. (at 3000 m) was characterized by the development of stilt roots up to 1 m	the study focuses on structural roots for anchorage in this windy
Soethe et al., 2006	Podocarpus Nat Park, S	tropical elfin forest	3000m elevation site	evergreen broad-leaf	small tree		*Weinmannia loxensis*	0.65	excavation	yes				soil often water-		0.6	0.3m O, on 0.4m mineral soil				0.7		-4.1017	-79.1658	3000	W. loxensis (at 3000 m) was the only species that had the ability to propagate by	perched saturation inferred from mentioned water-logging above the
Soethe et al., 2006	Podocarpus Nat Park, S	tropical elfin forest	3000m elevation site	evergreen broad-leaf	small tree		*Styrax foveolaria*	0.55	excavation	yes				soil often water-		0.6	0.3m O, on 0.4m mineral soil				0.7		-4.1017	-79.1658	3000		
Soethe et al., 2006	Podocarpus Nat Park, S	tropical montane	1900m elevation site	evergreen broad-leaf	small tree		*Graffenrieda emarginata*	0.9	excavation	yes				steep slope at 25-50			0.15m O, on > 0.9m mineral				1.05		-3.9713	-79.0597	1900	Root systems of G. emarginata growing at 1900 m were characterized by vertically	all max rooting depth inferred from Fig. 5 and text such that tap roots
Soethe et al., 2006	Podocarpus Nat Park, S	tropical montane	1900m elevation site	evergreen broad-leaf	small tree		*Clethra revoluta*	1	excavation	yes				steep slope at 25-50			0.15m O, on > 0.9m mineral				1.05		-3.9713	-79.0597	1900		
Soethe et al., 2006	Podocarpus Nat Park, S	tropical montane	1900m elevation site	evergreen broad-leaf	small tree		*Vismia tomentosa*	1.05	excavation	yes				steep slope at 25-50			0.15m O, on > 0.9m mineral				1.05		-3.9713	-79.0597	1900	Clusia sp. (3000 m) and V. tomentosa (1900 m) were the only species forming tap roots.	
Sommer et al., 2000	NE Para, Brazil		site-8, 21mon cropping, 9yr	annual	grass, shrubs	rice, cotton, cassava	*Oryza, Gossypium,*	6	soil coring to 6m	yes	1700 - 2400	dry season Sept-Dec					loamy sand over sandy loam, low					21mon cropping,	-1.1799	-47.5052	34	Roots in slash-and-primary fields and secondary vegetation as well as under	cropping sequence: rice-cotton-cassava
Sommer et al., 2000	NE Para, Brazil		site-4, secondary	evergreen broad-leaf	tree		*secondary tropical*	7	soil coring to 6m	yes	1700 - 2400	dry season Sept-Dec					loamy sand over sandy loam, low					secondary vegetation,	-1.1781	-47.3202	29	fields in traditional slashand- burn agriculture were found down to 6m in	3–4 m high
Sommer et al., 2000	NE Para, Brazil		site-1, primary forest	evergreen broad-leaf	tree		*primary tropical rain*	7	soil coring to 6m	yes	1700 - 2400	dry season Sept-Dec		along rivers			loamy sand over sandy loam, low						-1.1116	-47.4278	42	depth. There were almost no differences in	Emergents higher than 40 m were present, intensive root system in
Sommer et al., 2000	NE Para, Brazil		site-9, passion fruit	evergreen broad-leaf	woody vine	passoin fruit	*Passiflora edulis*	2.5	soil coring to 6m	yes	1700 - 2400	dry season Sept-Dec					loamy sand over sandy loam, low					passion fruit	-1.2617	-47.3630	49	The rooting pattern was different under passion fruit and black pepper, where root	2.5-year-old, planted 3 m by 6 m, sampling within a row in mid of two
Sommer et al., 2000	NE Para, Brazil		site-11, black pepper	evergreen broad-leaf	woody vine	black pepper	*Piper nigrum*	2.5	soil coring to 6m	yes	1700 - 2400	dry season Sept-Dec					loamy sand over sandy loam, low	laterire	4			black pepper	-1.2481	-47.3363	46	mass density was extremely low and roots of passion fruit were not found below 2.5	5-year-old, planted 3 m by 3 m neighboured to the oil palm site.
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area south	perennial	forb	arrowleaf balsamroot	*Balsamorhiza sagittata*	1.8	trench wall	drawings				45% slope, S exposure			loose coarse granite, very						43.6063	-115.9716	1372		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb	western yarrow	*Achillea lanulosa*	1.07	trench wall	drawings				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area south	annual / biennial	forb	prickly lettuce, milk	*Lactuca scariola*	0.8	trench wall	drawings				45% slope, S exposure			loose coarse granite, very						43.6063	-115.9716	1372		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Elk Creek area	perennial	grass	Sandberg bluegrass	*Poa secunda*	0.46	trench wall	drawings				37% slope, SW facing			Granitic clay, thin humus						46.8215	-116.0990	1341		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Cow Creek area north	perennial	grass	beardless wheatgrass	*Agropyron inerme*	1.05	trench wall	no				72% slope, N facing			lsoose coarse granite, fair						46.6047	-115.8971	1219		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	grass	Geyer's sedge	*Carex geyeri*	1.6	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Cow Creek area north	perennial	grass	Idaho fescue	*Festuca idahoensis*	0.4	trench wall	no				72% slope, N facing			lsoose coarse granite, fair						46.6047	-115.8971	1219		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Trinity Ridge area	perennial	grass	Letterman's needlegrass	*Stipa lettermanii*	0.8	trench wall	no				45% slope, E facing			loose coarse granite, low						43.6425	-115.4252	2370		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Wood Creek area	annual	bunch grass	cheatgrass	*Bromus tectorum*	0.3	trench wall	no				48% slope, S facing			loose coarse granite, low						45.2016	-113.9144	1218		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb / subshrub	sawsepal penstemon	*Pentstemon glabra*	1.6	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb	Scouler's woollyweed	*Hieracium scouleri*	1.9	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb	aster	*Aster spp.*	1.4	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb / vine (rhizomatous)	American vetch	*Vicia americana*	1.4	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb / subshrub	longleaf phlox	*Phlox longifolia*	0.5	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		site guessed by plant abunance list
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb	slender cinquefoil,	*Potentilla blaschkeana*	0.75	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		at each site; locations gussed from
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area south	perennial	forb / subshrub	parsnipflower	*Eriogonum heracleoides*	2.35	trench wall	no				45% slope, S exposure			loose coarse granite, very						43.6063	-115.9716	1372		first searching the name of the area
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Fall Creek area	perennial	forb	lupine, lupin	*Lupinus spp*	2.4	trench wall	no				36% slope, S facing			glacial drift of granitic origin,						45.6099	-115.6881	2373		on GE, then by data in Table 1
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Lester Creek area	perennial	forb	arrowleaf balsamroot	*Balsamorhiza sagittata*	2.7	trench wall	no				37% slope, SE facing			granitic clay, thin humus						43.4147	-115.3467	1358		giving slope, exposure and
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb	western stoneseed	*Lithospermum ruderale*	3	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		elevation, looking for the nerest
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Elk Creek area	perennial	forb / subshrub	hairy clematis	*Clematis hirsutissima*	1.0 - 1.4	trench wall	no				37% slope, SW facing			Granitic clay, thin humus						46.8215	-116.0990	1341		point that satisfy the data. This
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Elk Creek area	perennial	forb	manyflower stickseed	*Lappula floribunda*	1.0 - 1.4	trench wall	no				37% slope, SW facing			Granitic clay, thin humus						46.8215	-116.0990	1341		study shows that NE fascing slopes
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Elk Creek area	perennial	forb	woollypod milkvetch	*Astragalus purshii*	1.0 - 1.4	trench wall	no				37% slope, SW facing			Granitic clay, thin humus						46.8215	-116.0990	1341		have shallower roots than SW
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb / subshrub	woolly mock goldenweed	*Aplopappus lanuginosus*	> 2.0	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		facing. N-facing slopes have much
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb	hawksbeard	*Crepis spp*	> 2.0	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		higher plant cover (43% vs 12% at
Spence 1937	Boise, Idaho	semi-arid shrub-steppe	Long Gulch area north	perennial	forb	goosefoot violet	*Viola purpurea*	> 2.0	trench wall	no				67% slope, N exposure			loose coarse granite, high						43.5671	-115.9644	1355		Long gulch)
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	prairie cone-flower	*Lepachys pinnata*	1.45	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220	grew in nearly all directions from the base of the plant and reached a maximum depth	The authors compared the common species with Weaver's
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	wild quinine,	*Parthenium integrifolium*	1.8	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220	the maximum depth, 180 cm., was the greatest depth recorded at any of the five	Author mentioned that water-logging is a key factor, citing others
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	wild petunias	*Rueillia ciliosa*	1.49	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220	A radial spread of 25 cm. was found,a nd an absorbinger egiona nd maximum depth	"DISCUSSION AND CONCLUSIONS -
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	sunflowers	*Helianthus scaberrimus*	0.88	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220	unsatisfactoryd,u e to the poor locationo f the plant examined. Numerousr atherb	One of the most important factors affecting root configuration and
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	purple cone-flower	*Brauneria pallida*	1.33	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220	had an extensive root system; twisted and crooked tap roots which were 10-12mm in	penetration is that of oxygen content of the soil. This factor has
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	flowering spurge	*Euphorbia corollata*	1.51	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220		been studied by Cannon ('24, '25), Howard ('18), Clements ('21), Elliott
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	Prairie dock	*Silphium terebinthinac*	1.4	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220	incompletely examined. The upper part resembled that of the compass plant, but	large tap root truncated, by extension of diameter it is
Sperry, 1935	Illinoise	temperate deciduous	The Champaign	perennial	herb	whole-leaf rosinweed,	*Silphium integrifolium*	0.82	excavation	yes				near the crest of an			brown silt loam, well drained and					now farmland	40.0758	-88.2359	220	a mat of many tuberous, slow-growing " rhizomes," an upright stalk being produced	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	grass	porcupine grass	*Stipa spartea*	1.17	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	The thin light colored roots were produced on very short rhizomes and had two types	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	herb	compass plant	*Silphium laciniatum*	1.79	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	had a large fleshy tap root... The entire root system was crooked and extensive. The	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	herb	whole-leaf rosinweed,	*Silphium integrifolium*	1.71	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	The roots were well branched and clearly extensive in nature. The radial extent,	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	herb	prairie spiderwort	*Tradescantia reflexa*	1.56	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	The greatest radial spread measured was 35 cm., while the greatest depth recorded	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	sedge	early flowering	*Carex varia*	1.03	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	had no unusual peculiarities. The maximum depth found was 83 cm. and the absorbing	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	grass	big bluestem	*Andropogon furcatus*	1.18	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	At the Rantoul station, the absorbing region occurred between the 2 and 10 dm	

Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	herb	prairie golden-rod	*Solidago rigida*	1.02	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	penetrate obliquely for several (20-50) cm. from the rhizome before penetrating	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	herb	dense flowered	*Aster multiflorus*	0.72	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	The roots resembled those of the Solidago but both the rhizomes and the roots were	
Sperry, 1935	Illinoise	temperate deciduous	The Rantoul station	perennial	herb	wild petunias	*Rueillia ciliosa*	1.1	excavation	yes				Early Wisconsin	0.55 - 1.9	1.25	brown silt loam					now farmland	40.3323	-88.1438	223	corresponding measurements at the Rantoul station were 20 cm., 10-100 cm.,	
Sperry, 1935	Illinoise	temperate deciduous	The Kansas station	perennial	herb	mountain mint	*Pycnanthemum*	1.17	excavation	yes				Early Wisconsini			brown Silt Loam on Drift, well					now farmland	29.5559	-87.9797	214	The extensive absorbing region was found between the 20 and 100 cm. levels and a	
Sperry, 1935	Illinoise	temperate deciduous	The Kansas station	perennial	grass	big bluestem	*Andropogon furcatus*	1.13	excavation	yes				Early Wisconsini			brown Silt Loam on Drift, well					now farmland	29.5559	-87.9797	214		
Sperry, 1935	Illinoise	temperate deciduous	The Kansas station	perennial	grass	blue-eyed grass	*Sisyrinchium albidum*	0.17	excavation	yes				Early Wisconsini			brown Silt Loam on Drift, well					now farmland	29.5559	-87.9797	214	was small and short-lived, and had a correspondingly small root system. Twenty	
Sperry, 1935	Illinoise	temperate deciduous	The Kansas station	perennial	herb	blazing star	*Liatris scariosa*	0.93	excavation	yes				Early Wisconsini			brown Silt Loam on Drift, well					now farmland	29.5559	-87.9797	214	At the Kansas station a maximum depth of 93 cm. was found while the absorbing	
Sperry, 1935	Illinoise	temperate deciduous	The Kansas station	perennial	herb	purple prairie	*Petalostcmum purpureum*	1.3	excavation	yes				Early Wisconsini			brown Silt Loam on Drift, well					now farmland	29.5559	-87.9797	214		
Sperry, 1935	Illinoise	temperate deciduous	The Kansas station	perennial	herb	prairie golden-rod	*Solidago rigida*	1.4	excavation	yes				Early Wisconsini			brown Silt Loam on Drift, well					now farmland	29.5559	-87.9797	214	The maximum depth and absorbing regions were 140 cm. and 30-140 cm. at the Kansas	
Sperry, 1935	Illinoise	temperate deciduous	The Warrensburg	perennial	grass	slough grass	*Spartina michauxiana*	1.59	excavation	yes				a Middle Illinoisan			black clay loam, high lime					now farmland	39.9490	-89.0745	189	was the dominant species at the Warrensburg station. Its numerous long,	
Sperry, 1935	Illinoise	temperate deciduous	The Warrensburg	perennial	herb	prairie cone-flower	*Lepachys pinnata*	0.75	excavation	yes				a Middle Illinoisan			black clay loam, high lime					now farmland	39.9490	-89.0745	189		
Sperry, 1935	Illinoise	temperate deciduous	The Warrensburg	perennial	grass	big bluestem	*Andropogon furcatus*	1.77	excavation	yes				a Middle Illinoisan			black clay loam, high lime					now farmland	39.9490	-89.0745	189		
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	herb	purple prairie	*Petalostcmum purpureum*	1.75	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162		
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	grass	western drop-seed	*Sporobolus brevifolius*	0.49	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162	was found only at the Peterville station, in common with other western species. The	
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	grass	little bluestem,	*Andropogon scoparius*	1.12	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162	From 5 to 15 (or more) roots originated from the base of each plant and either ran	
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	grass	big bluestem	*Andropogon furcatus*	1.08	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162	The tops of the plants at the Peterville station were taller (16-22 dm.) and showed	
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	herb	western ragweed	*Ambrosia psilostachya*	0.99	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162	a long thin (1 mm. in diameter) rhizome which was traced for 40 cm. in one case	
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	herb	blue aster	*Aster oblongifolius*	0.73	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162	found along the Illinois river which produces numerous brittle fibrous roots	
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	herb	blazing star	*Liatris scariosa*	0.35	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162		
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	shrub	Carolina Rose, Sand	*Rosa humilis*	0.8	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162	This very irregular growth resulted in an extensive root system which had a radial	
Sperry, 1935	Illinoise	temperate deciduous	The Petervill station	perennial	succulent	prickly pear cactus	*Opuntia rafinesquii*	0.12	excavation	yes				near the crest of a		3.3	coarse yellow sand					now farmland	40.2233	-89.9816	162	have shallow lateral roots which were traced as much as 30 cm. before becoming	
Sperry & Hacke, 2002	Great Basin, C Utah	arid desert	Sand site (Skull Valley)	perennial	shrub		*Chrysothamnus nauseosus,*	> 1.55 (2m to guess)	soil pits, inferred	no	194	mostly in winter		flat valley floor			Sand (87% sand, 6% silt, 7% clay),						40.2556	-112.7279	1463	The depth index was positive for all species at both sites, indicating that roots	Great study of soil texture on plant-water relations. No direct root obs,
Sperry & Hacke, 2002	Great Basin, C Utah	arid desert	Loam site (Rush Valley)	perennial	shrub		*Chrysothamnus nauseosus,*	> 1.55	soil pits, inferred	no	273	mostly in winter		slightly undulating			Sandy loam (59% sand, 29%						40.2022	-112.3019	1547	extended below 1.55 m at both sites and in all species, species. There was a strong	but infered from rooting depth index: has a maximum of 1 for the
Sprackling and Read,	E. Nebraska	Prarie with planted and	Richardson County	deciduous broad-leaf	tree	bur oak	*Quercus macrocarpa*	4.0	excavation	drawings						21.3	Knox silt loam						40.2589	-95.5683	348	This sapling bur oak had a root depth of 13 feet and spread of 11.5feet. Compare that	on ridge top, left bank of Missouri River
Sprackling and Read,	E. Nebraska	Prarie with planted and	Nance County	deciduous broad-leaf	tree	bur oak	*Quercus macrocarpa*	4.9	excavation	drawings						15.2	Peorian and Loveland loess						41.4706	-98.1729	550	The rate of lateral root growth in older trees is greater than the rate of depth	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Merrick County	evergreen needle-leaf	tree	Eastern Redcedar	*Juniperus virginiana*	2.7	excavation	drawings						3.4	Cass sandy loam						40.9856	-98.1765	543	No tap root is apparnet, but roots on left side (sinker) have edtended 9 feet	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Merrick County	evergreen needle-leaf	tree	Eastern Redcedar	*Juniperus virginiana*	2.7	excavation	drawings						3.4	Waukesha fine sandy loam						41.0569	-98.0564	528	Strong development of a lateral system has been followed by downward penetration	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Nance County	deciduous broad-leaf	tree	Hackberry	*Celtis occidentalis*	2.7	excavation	drawings						13.7	Wabash silt loam						41.3520	-97.8079	489	The rapid penetration in root depth of young seedlings (fig 9) has stabilized at 9	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Honey locust	*Gleditsia triacanthos*	3.1	excavation	drawings						6.1	Wabash silt loam						40.1981	-96.1504	350	Development of the lateral root system at depths of 1 to 3 feet is extensive. A	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	black locust	*Robinia pseudoacacia*	2.4	excavation	drawings						4.9	Cass silty clay loam						42.3017	-96.6926	423	Black locust, like honey locust, has good drought-resistance. The relatively deep	the county soil map show no Cass soil series so WTD is used to pick a
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Osage-orange	*Maclura pomifera*	2.4	excavation	drawings						19.8	Sogn silty clay laom						40.0808	-96.3333	447	This species is well knon for drought resistance. In addition to a strong taproot,	fence like tree line
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Hawthorn	*Crataegus mollis*	1.5	excavation	drawings						6.7	Carrington silt loam						40.0850	-96.1601	351	Roots of this tree were deep in relation to its height; this charactersistic may be	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Smooth sumac	*Rhus glabra*	2.1	excavation	drawings						24.7	Bartlett silty clay loam						40.0311	-96.3407	456	Smooth sumac reproduces vegetatively from root suckers, illustrated above.	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	Black walnut	*Juglans nigra*	3.4	excavation	drawings						4.3	Cass silty clay loam						42.3798	-96.5368	347	Although this species grows best on moist bottomlands, it has fair drought-resistance	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Richardson County	deciduous broad-leaf	tree	Shagbark hickory	*Carya ovata*	2.2	excavation	drawings						21.3	Knox silt loam						40.2364	-95.5345	350	This species, which grows only in extreme eastern Nebraska on deep, moist soils,	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Bitternut hickory	*Carya cordiformis*	3.0	excavation	drawings						6.1	Wabash silt loam						40.2138	-96.1621	350	A very strong taproot characterized the root system of this species. The root	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Red mulberry	*Morus rubra*	2.4	excavation	drawings						6.1	Wabash silt loam						40.2494	-96.1393	349	No distinct taproot has developed, but a well developed network of fine lateral	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Russian mulberry	*Morus alba*	2.3	excavation	drawings						15.2	Pawnee silty clay loam						40.1574	-96.3512	429	Introduced into the United States by Russian Mennonites in 1875, this species	in a homestead
Sprackling and Read,	E. Nebraska	Prarie with planted and	Nance County	deciduous broad-leaf	tree	Plains cottonwood	*Populus deltoides*	0.8	excavation	drawings						0.8	Cass loam						41.3838	-97.8965	488	In this instance, a tree 60 feet high has roots only 2.5 feet deep. A water table very	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	Plains cottonwood	*Populus deltoides*	3.8	excavation	drawings						4.3	Cass silty clay loam						42.4337	-96.4298	335	Roots of this tree have grown downward to 12 feet, just above the water table level.	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	Plains cottonwood	*Populus deltoides*	3.7	excavation	drawings						18.3	Marshall silt loam						42.3733	-96.6230	374	Roots of this older cottonwood, on an upland site where the water table is out of	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Green Ash	*Fraxinus pennsylvanic*	2.7	excavation	drawings						8.5	Carrington silty clay loam						40.0642	-96.1608	352	A fine network of lateral roots of medium depth characterizes green ash.	in a homestead
Sprackling and Read,	E. Nebraska	Prarie with planted and	Merrick County	deciduous broad-leaf	tree	Green Ash	*Fraxinus pennsylvanic*	2.7	excavation	drawings						3.0	Cass loamy sand						40.9456	-98.2649	556	Roots penetrated to 9 feet, the same depth as the 25-year-oldgreen ash in figure 32.	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Richardson County	deciduous broad-leaf	tree	white ash	*Fraxinus americana*	1.8	excavation	drawings						21.3	Knox silt loam						40.2292	-95.5565	345	The root system of white ash, a native of upland sites along the Missouri River in	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	Siberian elm	*Ulmus pumila*	2.9	excavation	drawings						3.7	Cass silty clay loam						42.4304	-96.6780	370	A fast-growing introduction from eastern Asia, Siberian elm is well adapted to a	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Merrick County	deciduous broad-leaf	tree	Siberian elm	*Ulmus pumila*	2.0	excavation	drawings						2.0	Cass sandy loam						41.2485	-97.7653	487	The high water table typically results in a shallow but very wide-spreading root	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	Siberian elm	*Ulmus pumila*	4.9	excavation	drawings						4.9	Sarpy very fine sandy loam						42.3198	-96.7078	417	Roots penetrated directly to the water table at 16 feet; lateral development was	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	Northern catalpa	*Catalpa speciosa*	3.1	excavation	drawings						6.1	Sarpy very fine sandy loam						42.3045	-96.7075	421	Catalpa was introduced in Nebraska from the southern states as a commercial fence	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	American sycamore	*Platanus occidentalis*	2.7	excavation	drawings						6.1	Wabash silt loam						40.1052	-96.1542	350	The tree shown here was growing in a swamp that had filled with alluvium.	in Pawnee City
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Silver maple	*Acer saccharinum*	3.4	excavation	drawings						3.7	Wabash silt loam						40.1815	-96.0729	309	A fast-growing, shallow-rooted native species that prefers bottomland sites, silver	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	apple	*Malus domestica*	3.4	excavation	drawings						16.8	Butler silt loam						40.0211	-96.2929	432	Growing on a dry upland site, this apple tree had relatively deep roots.	in a homestead
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Prickly-ash	*Zanthoxylum americanum*	1.6	excavation	drawings						24.7	Sogn stony loam						40.0311	-96.3407	456	The above illustration represents a deep and widespread root system for such a	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Merrick County	deciduous broad-leaf	tree	American elm	*Ulmus americana*	2.2	excavation	drawings						2.4	Cass sandy loam						41.1137	-97.9986	518	This tree was growing on bottomland with the water table fairly close to the surface.	in downtown Central City
Sprackling and Read,	E. Nebraska	Prarie with planted and	Richardson County	deciduous broad-leaf	tree	American elm	*Ulmus americana*	1.8	excavation	drawings						9.1	Wabash silt loam						40.1739	-95.9656	315	This tree had a well defined taproot system, which was fairly shallow for a tree	western part of county
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Slippery elm	*Ulmus rubra*	2.1	excavation	drawings						4.3	Wabash silt loam						40.2110	-96.0940	310	Preferring bottomland sites, this slippery (red) elm developed a strong lateral root	bottom land

Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Boxelder	*Acer negundo*	3.7	excavation	drawings						4.4	Wabash silt loam						40.2267	-96.0897	315	Growing on bottom land, this tree had a dense network of lateral roots but lacked a	bottom land
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	Boxelder	*Acer negundo*	2.0	excavation	drawings						5.8	Wabash clay						42.4706	-96.6173	355	This species has a fairly sparse lateral system in relation to tree size. Boxelder has	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Lancaster County	deciduous broad-leaf	tree	Peachleaf willow	*Salix amygdaloides*	4.3	excavation	drawings						4.9	Wabash silt loam						40.7175	-96.7020	360	Growing on a stream bank 8 feet above the creek bed, this willow probably exceeds all	a site 8' above a creek bed picked
Sprackling and Read,	E. Nebraska	Prarie with planted and	Nance County	deciduous broad-leaf	tree	Peachleaf willow	*Salix amygdaloides*	0.8	excavation	drawings						0.8	Cass fine sandy loam						41.2863	-98.1502	513	A comparison of this root system with that in figure 51 shows its relative plasticity as	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Nance County	deciduous broad-leaf	tree	black willow	*Salix nigra*	2.4	excavation	drawings						2.4	Cass loamy sand						41.3397	-97.9801	497	This willow growing along a stream bottom survived the gradual deposition of 5 feet of	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	redbud	*Cercis canadensis*	1.8	excavation	drawings						6.1	Wabash silt loam						40.1494	-96.1263	350	A native of southeaster Nebraska woodlands and an understory tree on	in a woodland
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	American basswood	*Tilia americana*	1.7	excavation	drawings						4.3	Wabash silt loam						40.2022	-96.0837	315	Basswood commonly sprouts at the base, resulting in clumps of trees. The roots are	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Ohio buckeye	*Aesculus glabra*	1.3	excavation	drawings						4.3	Wabash silt loam						40.1392	-96.0330	309	This tree developed a short, forked taproot. The species grows in extreme	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Merrick County	deciduous broad-leaf	tree	American (wild) plum	*Prunus americana*	1.5	excavation	drawings						2.4	Cass sandy loam						41.2482	-98.1570	525	Plum grows throughout Nebraska on moist sites besides roads, streams and lakes. Its	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Richardson County	deciduous broad-leaf	tree	Choke cherry	*Prunus virginiana*	1.5	excavation	drawings						6.1	Wabash silt loam						40.1563	-95.9834	299	Roots of chokecherry, like those of American plum, are shallow and wide-	western part of county
Sprackling and Read,	E. Nebraska	Prarie with planted and	Pawnee County	deciduous broad-leaf	tree	Approcot	*Prunus armeniaca*	2.3	excavation	drawings						16.8	Marshall (heavy subsoil phase)						40.0520	-96.2953	431	Apricot was introduced to Nebraska for fruit production. This tree, located on a dry	in a homestead
Sprackling and Read,	E. Nebraska	Prarie with planted and	Richardson County	deciduous broad-leaf	tree	black cherry	*Prunus sarotina*	1.2	excavation	drawings						21.3	Knox silt loam						40.2166	-95.5093	332	This species has about the same site requirements (moist bottomlands) and	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Dakota County	deciduous broad-leaf	tree	eastern hophornbea	*Ostrya virginiana*	0.9	excavation	drawings						24.4	Marshall silt loam						42.3675	-96.6588	412	This native understory species of eastern Nebraska prefers moist sites and has a very	
Sprackling and Read,	E. Nebraska	Prarie with planted and	Nance County	deciduous broad-leaf	tree	Dogwood	*Cornus alternifolia*	0.9	excavation	drawings						1.2	Cass fine sandy loam						41.4431	-97.7298	477	Dogwood, like sumac (see figure 18), reproduces vegetatively from roots. A high	ornomantle tree, in suburbs of Genoa
Srivastava et al., 1986	Varanasi, N India	Tropical mixed	Rajdari	deciduous broad-leaf	tree	teak	*Tectona grandis*	0.60	excavation	yes	992	90% in Jul-Oct					sandy loam, well drained				0.3-0.75	plantation	24.8987	83.1356	252	Fine root growth in our teak forest was characterized by a peak late in the rainy	max depth extrapolated from data in Tab-4; site moved from given lat-
Stoeckeler, 1938	NC North Dokota	temperate steppe		perennial	herb	lead plant	*Amorpha canescen*	1.98	hydraulic excavatio	no					1.83 - 3.05	2.45	deep dune sand						48.3157	-100.5877	461	Since a considerable portion of this area lies within the confines of old glacial Lake	Too bad that results of only 4 plants are given
Stoeckeler, 1938	NC North Dokota	temperate steppe		perennial	reed	sand reedgrass	*Calamovilfa longifolia*	2.04	hydraulic excavatio	no					1.83 - 3.05	2.45	deep dune sand						48.3157	-100.5877	461	In almost all cases the roots of the various plants were found to end from 1 to 6	But it mentioned that in nearly all cases roots end in the cap-fringe
Stoeckeler, 1938	NC North Dokota	temperate steppe		perennial	rush	water horsetail,	*Equisetum fluviatile*	2.24	hydraulic excavatio	no					1.83 - 3.05	2.45	deep dune sand						48.3157	-100.5877	461	If the roots were found to penetrate the water table they were followed down by	the root is 16" below the WT
Stoeckeler, 1938	NC North Dokota	temperate steppe		deciduous broad-leaf	tree	narrow-leaved	*Salix tristis*	2.24	hydraulic excavatio	no					1.83 - 3.05	2.45	deep dune sand						48.3157	-100.5877	461	It was observed that there were many rotten or non-functioning roots below the	the root is 16" below the WT
Stringer et al., 1989	NE Kentucky	temperate deciduous	row-2	deciduous broad-leaf	tree	white oak	*Quercus alba*	3.0	tritium uptake	no				gentle slope (15 deg)			loamy colluvium over clayey			fractured sandstone	3		38.2500	-83.5667	227	Direct evidence of prolific rooting directly on the LSS (lower sandstone bed) was	lat-lon switched by author
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 7	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.10	trench wall	yes						0.1	organic (Terrie Mesisol)						55.0417	-114.0538	613	Once terminated just above the water table; large roots (>20 mm) were most commonly found in hummocks; to summarize, the root system of black spruce consists of several horizontally spreading, near-surface lateral roots which form a disk	SE of Lesser Slave Lake, Central Alberta, Canada; lat and lon not given, but the topography and vegetation are similar over a very large area (40% of the province). Lat and Lon are read from another paper by the same author, Strong
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 7	evergreen needle-leaf	tree	black spruce	*Picea mariana*	0.30	trench wall	yes						0.3	organic (Terrie Mesisol)						55.0417	-114.0538	613		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 8	evergreen needle-leaf	tree	black spruce / feather	*Picea mariana*	0.10	trench wall	yes						< 0.1	organic sand (Humic Gleysols,						55.1118	-114.1620	593		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 7	deciduous needle-leaf	tree	larch	*Larix occidentalis*	0.30	trench wall	yes						0.3	organic (Terrie Mesisol)						55.0417	-114.0538	613	The larch root system was similar to that of black spruce, shallow and spreading; fine	
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 3	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.35	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.1021	-114.1504	594	Although the two harvested trees came from very different sites (sandy vs. clay soils), they had a similar rooting pattern and allocation of biomass	water table data not given; but in 1983a, author notes "A soil pit was dug in the center of each of the seven subplots to a minimum depth of 1.25 m. Owing to a high water table in stands 7 and 8, it was necessary to remove intact sections of soil profiles from the pits rather than attempt to work in the hole as was done in other stands." It appears safe to assume that the water table is > 1.25m deep at other stands.
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 5	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.50	trench wall	yes						>1.25	shallow sandy outwash						55.1740	-114.3460	625		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 5	deciduous broad-leaf	tree	aspen	*Populus tremuloides*	0.50	trench wall	yes						>1.25	outwash/moraine (sandy loam /						55.1740	-114.3460	625	In sharp contrast with white spruce, the general rootsystem morphology of aspen was distinctly different in sand compared with clay loam substrates.	
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 11	deciduous broad-leaf	tree	aspen	*Populus tremuloides*	0.50	trench wall	yes						>1.25	outwash/moraine (sandy loam /						55.1747	-114.3143	611		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 9	deciduous broad-leaf	tree	aspen	*Populus tremuloides*	1.50	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.0993	-114.1444	595		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 10	deciduous broad-leaf	tree	aspen	*Populus tremuloides*	1.50	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.0894	-114.0997	579		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 2	evergreen needle-leaf	tree	jack pine	*Pinus banksiana*	0.30	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.0847	-114.1210	589	Three distinctive type of vertical roots were found: taproot, sinker, and herring bone; Large taproots were the principal vertical roots on all jack pines (Fig. 2A), and extended to a maximum depth of 2 m, although 1.3 m was more common. (but table-2 gives max as 1.5m)	
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 1	evergreen needle-leaf	tree	jack pine	*Pinus banksiana*	1.20	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.0760	-114.1227	594		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 1	evergreen needle-leaf	tree	jack pine	*Pinus banksiana*	1.10	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.0760	-114.1227	594		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 2	evergreen needle-leaf	tree	jack pine	*Pinus banksiana*	1.50	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.0847	-114.1210	589		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 2	evergreen needle-leaf	tree	jack pine	*Pinus banksiana*	2.00	trench wall	yes						>1.25	eolian sand (Eutric Brunisol)						55.0847	-114.1210	589		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 4	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.30	trench wall	yes						>1.25	eolian sand (Eutric Brunisol,						55.1477	-114.1981	592		
Strong & La Roi, 1983a,	SE of Lesser Slave Lake,	boreal mixed forest	Stand 5	evergreen needle-leaf	tree	balsam fir	*Abies balsamea*	1.30	trench wall	yes						>1.25	Gray Luvisol						55.1740	-114.3460	625	Sinker, tap-, and oblique lateral roots were confined to the upper 40 cm of the mineral	
Sturges & Trlica, 1978	SC Wyoming	temperate steppe	Ridge top	evergreen broad-leaf	shrub	mountain big	*Artemisia tridentata*	2.43	excavation	yes	500	2/3 as snow, 114mm Jun-		just below the ridge			fine loamy						41.4440	-107.1587	2450	Soil water recharge characteristics had a strong influence on development of the big	max depth extrapolated to max trench size
Sturges & Trlica, 1978	SC Wyoming	temperate steppe	mid slope	evergreen broad-leaf	shrub	mountain big	*Artemisia tridentata*	2.13	excavation	yes	500	2/3 as snow, 114mm Jun-		mid-slope			Loamy-skeletal						41.4471	-107.1562	2435	Roots extended downward into the 183-213 cm sampling zone at lower and	with infiltration/recharge data (2.44m in lower positions, 0.910 on
Sturges & Trlica, 1978	SC Wyoming	temperate steppe	bottom slope	evergreen broad-leaf	shrub	Wyoming big	*Artemisia tridentata*	1.52	excavation	yes	500	2/3 as snow, 114mm Jun-		near slope bottom			Loamy-skeletal						41.4484	-107.1587	2396		
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-1	evergreen broad-leaf	tree	Tasmanian blue gum	*Eucalyptus globulus*	3	trench profile	yes	525	2/3 falling in May-Oct					deep sand					planted; root	-33.6700	122.2492	122	In the deeper sands, the distribution of roots was relatively uniform down the soil	all rooting depth extrapolated from the root density figures; a 15m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-2	evergreen broad-leaf	tree	Tasmanian blue gum	*Eucalyptus globulus*	1.5	trench profile	yes	600	2/3 falling in May-Oct					duplex soil, or sand over clay at					planted	-33.7953	121.8800	29	In duplex soils, tree roots were concentrated in the sandy A horizons, with	16m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-3	evergreen broad-leaf	tree	Tasmanian blue gum	*Eucalyptus globulus*	3	trench profile	yes	475	2/3 falling in May-Oct					deep sand					planted	-33.5481	121.7539	172	Lateral roots were confined to the sandy soil horizons at all sites and for all species	10–15m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-4	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	5	trench profile	yes	490	2/3 falling in May-Oct					deep sand					planted	-33.5650	121.8544	171		17m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-5	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	2.5	trench profile	yes	490	2/3 falling in May-Oct					deep sand					planted; root	-33.5644	121.8794	171		17m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-6	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	2.5	trench profile	yes	500	2/3 falling in May-Oct					duplex soil, or sand over clay at					planted	-33.6161	122.0483	117	In the clay subsoil, vertical roots were generally confined to the faces between	12m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-7	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	1.5	trench profile	yes	522	2/3 falling in May-Oct					duplex soil, or sand over clay					planted	-33.6331	122.8883	133		12m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-8	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	3	trench profile	yes	522	2/3 falling in May-Oct					deep sand					planted	-33.6381	122.8794	126		16m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-9	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	1.5	trench profile	yes	522	2/3 falling in May-Oct					duplex soil, or sand over clay at					planted; root	-33.6294	122.8961	144		14m
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-10	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	2.5	trench profile	yes	522	2/3 falling in May-Oct					duplex soil, or sand over clay at					planted	-33.6294	122.8961	144		9.5m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-11	evergreen needle-leaf	tree	maritime pine	*Pinus pinaster*	2	trench profile	yes	491	2/3 falling in May-Oct					duplex soil, or sand over clay at					planted	-33.5533	121.7064	161		17.5m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-12	evergreen broad-leaf	tree	Koch's mallee	*Eucalyptus kochii*	2.00	trench profile	yes	386	2/3 falling in May-Oct					duplex soil, or sand over clay at					planted	-33.4381	122.0661	164		2.0–3.0m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-13	evergreen broad-leaf	tree	Koch's mallee	*Eucalyptus kochii*	2.00	trench profile	yes	386	2/3 falling in May-Oct					duplex soil, or sand over clay at					planted	-33.4381	122.0661	164		~2m tall
Sudmeyer et al., 2004	Esperance, Wesern	Mediterranean shrubland	Site-14	evergreen broad-leaf	tree	Koch's mallee	*Eucalyptus kochii*	5.00	trench profile	yes	386	2/3 falling in May-Oct					deep sand					planted	-33.4381	122.0661	164		3.5m tall
Svejcar & Wright, 1995	N Sierra Nevada, near	riparian meadow		perennial	sedge	Nebraska sedge	*Carex nebrascensi*	0.65	minirhizotron tube	Yes						0.40							39.9249	-120.5441	1765	However, below 40 cm there was relatively little activity during any of the	reporting seasonal root growth; max depth of root activites

Sweet, 1933	W NY	apple tree orchards		deciduous broad-leaf	tree	Baldwin apple tree	*Malus domestica*	3.05	excavation	yes + photos	813			broad ridges,			Petoskey loamy fine sand; Group						43.2787	-77.7590	89	a considerable portion of this apple-growing district occupies an old, nearly	in what looks like healthy stand of orchard, on high ground, east of
Sweet, 1933	W NY	apple tree orchards		deciduous broad-leaf	tree	Baldwin apple tree	*Malus domestica*	1.83	excavation	yes + photos	813			parts of ridges,			Collamer silt loam; Group-2;						43.3098	-77.8668	92	level lake plain with poor natural drainage... Dark-colored soils occupying slight	in what looks like a glacial till ridge, with exposed dry soil (clay?) and on
Sweet, 1933	W NY	apple tree orchards		deciduous broad-leaf	tree	Baldwin apple tree	*Malus domestica*	1.52	excavation	yes + photos	813			depressions that		1.52	Granby loam; Group-3; Dark-						43.3294	-77.7858	81	depressions and flat areas were found to have the highest water table, from ground	in what looks like an abandoned orchard, with scattered ponds,
Syahrinudin, 2005	N. and S. Sumatra,	near Jambi, S. Sumatra		perennial	rhizomatous grass	blady grass, cogon grass,	*Imperata cylindrica*	1.80	soil coring t 3m	yes	2087	no dry season		well drained			deeply weathered SL-					deforested, abandoned	-1.5062	102.4093	50	Root biomass of I. cylindrica grasslands was distributed to a maximum depth of 180 cm.	16 soil cores to 3m, sometimes hitting "less-whethered parent
Syahrinudin, 2005	East Kalemantan,	near Kenangan,		perennial	rhizomatous grass	blady grass, cogon grass,	*Imperata cylindrica*	1.80	soil coring t 3m	yes	2281	no dry season		well drained			deeply weathered SL-					deforested, abandoned	-1.5205	116.2018	60	However, most of the roots were confined to the top soil layer: 88.4% of the roots was	All fations for this study are vague;
Syahrinudin, 2005	East Kalemantan	near Kenangan,		evergreen broad-leaf	legume tree	Black Wattle	*Acacia mangium*	5	soil coring t 3m	yes	2281	no dry season		well drained			deeply weathered SL-					9yr old Acacia	-1.2032	116.5578	55	Twenty trees were harvested and uprooted (for coarse roots); Fine root and soil	the climate chart gives the city and elevation. Sites chosen to be close,
Syahrinudin, 2005	N. and S. Sumatra,	near Jambi, S. Sumatra,		evergreen broad-leaf	palm	African oil palm or	*Elaeis guineensis*	> 5	soil coring t 5m	yes	2087	no dry season		well drained			deeply weathered SL-					30yr old palm	-1.5400	102.3016	50	root biomass was sampled and collected at 16 drilling points in each subplot (three	2nd site near the timber crop
Syahrinudin, 2005	East Kalemantan,	near Kenangan,		evergreen broad-leaf	palm	African oil palm or	*Elaeis guineensis*	> 5	soil coring t 5m	yes	2281	no dry season		well drained			deeply weathered SL-					10yr old palm	-1.5308	116.1913	61	subplots / plot) to a depth of 5 m; In the 5-m deep soil profile, more than 50% of the	the author states: "root biomass in both sites was higher than that of I. cylindrica in the neighborhood of the respective sites..." suggesting
Tabler, 1964	NW Wyoming	mountain forest	East exposure	evergreen broad-leaf	shrub	big sage brush	*Artemisia tridentata*	1.63	excavation	drawings				E-facing slope, 8 deg			clay-loam to 0.91m, over						43.7038	-109.4148	2894	Four sites were selected: east- and west-facing slopes (of about So/a), a ridge top,	all max rooting depth is mean of 3 plants
Tabler, 1964	NW Wyoming	mountain forest	West exposure	evergreen broad-leaf	shrub	big sage brush	*Artemisia tridentata*	1.65	excavation	drawings				W-facing slope, 8 deg			clay-loam to 0.91m, over						43.7043	-109.4137	2899	All plants studied were characterized by a	
Tabler, 1964	NW Wyoming	mountain forest	Ridge top	evergreen broad-leaf	shrub	big sage brush	*Artemisia tridentata*	1.83	excavation	drawings				ridge top			clay-loam to 0.91m, over						43.7045	-109.4158	2914	woody taproot which rapidly tapered to a diameter of 2 or 3 mm within the first 6 dm of soil and a dense well-developed system of lateral roots. About 62% of the total root	
Tabler, 1964	NW Wyoming	mountain forest	Valley bottom	evergreen broad-leaf	shrub	big sage brush	*Artemisia tridentata*	1.47	excavation	drawings				valley bottom			clay-loam to 0.91m, over						43.7035	-109.4139	2873	length was concentrated in the upper 6 dm	
Teskey & Hinckley,	Ashland Wildlife Area,	temperate decidous		deciduous broad-leaf	tree	white oak	*Quercus alba*	1.50	excavation +	no				10 deg SE-facing slope			silt loam, thin O, increasing clay						38.7530	-92.1992	245	...roots were found at all soil depths... soil T determines first root growth and leaf	Seasonal root growth rates correlated with T and SM...
Thomas, 2000	NW Germany	temperate decidous	Neuenburg site	deciduous broad-leaf	tree	English oak	*Quercus robur*	1.05	trench profile	Yes	801			flat but well drained			Quaternary clay under glacial						53.3833	8.1333	10	None of the stands was affected by groundwater; both oak species are able to root very deeply, but not intensively; The vertical root distribution did not correspond with soil water availability. Comparisons of the rooting patterns with soil water relations and soil chemistry lead	185 yr old tree
Thomas, 2000	NW Germany	temperate decidous	Sprakensehl site	deciduous broad-leaf	tree	sessile oak, Cornish oak,	*Quercus petraea*	1.00	trench profile	Yes	618			flat but well drained			Glacial sand						52.7833	10.4167	115		104 yr old tree
Thomas, 2000	NW Germany	temperate decidous	Lappwald site	deciduous broad-leaf	tree	sessile oak, Cornish oak,	*Quercus petraea*	1.00	trench profile	Yes	624			flat but well drained			Jurassic clay under glacial						52.2667	11.0000	162		136 yr old tree
Thomas, 2000	NE Germany	temperate decidous	Hakel site	deciduous broad-leaf	tree	sessile oak, Cornish oak,	*Quercus petraea*	0.60	trench profile	Yes	508			flat but well drained			Limestone under loess						51.8973	11.3270	200		c 175 yr old; moved 1.7km NE to be at 200m elevation
Timberlake & Calvert, 1993	near Secheke, SW Zambia	subtropical dry forest	Masese no. 29-32	deciduous broad-leaf	tree	Rhodesian Teak,	*Baikiaea plurijuga*	3.30	excavation	drawings	650						Kalahari sand						-17.3097	24.8923	959	56km N-E of Secheke, legume, tree height 3m, 4m, 10m, 14m	mean of 4 profiles (no. 29, 30, 31, 32, 33) of depth (3.0, 3.0, 3.4, 3.9)
Timberlake & Calvert, 1993	near Secheke, SW Zambia	subtropical dry forest	Masese no. 33	deciduous broad-leaf	tree	Rhodesian Teak,	*Baikiaea plurijuga*	4.10	excavation	drawings	650						Karoo sand						-17.3063	24.9035	954	56km N-E of Secheke, legume, tree height 18m	strong, deep tap root; all site locations from this atlas are
Timberlake & Calvert, 1993	near Secheke, SW Zambia	subtropical dry forest	Masese no. 237	deciduous broad-leaf	tree	barwood	*Pterocarpus lucens*	5.30	excavation	drawings	650						Kalahari sand						-17.0689	24.8407	986	56km N-E of Secheke, pan-tropic, tree height 13m	1 thin, very deep tap root
Timberlake & Calvert, 1993	near Secheke, SW Zambia	subtropical dry forest	Masese no. 238	deciduous broad-leaf	tree	barwood	*Pterocarpus lucens*	4.10	excavation	drawings	650						Karoo sand						-17.1524	25.0360	961	56km N-E of Secheke, pan-tropic, tree height 13m	1 thin, very deep tap root
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Reserve no.	deciduous broad-leaf	tree	Jasmine pea, Sand	*Baphia massaiensis*	2.00	excavation	drawings	1000						sand						-12.8246	28.0420	1260	Chati Forest Reserve, 19km west of Kitwe, legume, tree height 9m	
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Reserve no.	deciduous broad-leaf	tree	Jasmine pea, Sand	*Baphia massaiensis*	3.00	excavation	drawings	1000						deep sand						-12.8222	28.0483	1273	Chati Forest Reserve, 19km west of Kitwe, legume, tree height 12m	
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Reserve no.	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	3.30	excavation	drawings	1000						deep sandy clay						-12.8057	28.0427	1256	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 17m and 19m	mean of 2 profiles (no. 46, 48) of depth (2.5, 4.1), group by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Reserve no.	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	2.20	excavation	drawings	1000						shallow sandy clay						-12.8109	28.0138	1242	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 18m and 20m	mean of 2 profiles (no. 47, 49) of depth (2.5, 2.0), grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 64, 67	deciduous broad-leaf	tree		*Brachystegia floribunda*	3.10	excavation	drawings	1000						deep sandy clay						-12.5012	28.0423	1255	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 14m and 17m	mean of 2 profiles (no. 64, 67) of depth (2.5, 3.7), grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 65, 68	deciduous broad-leaf	tree		*Brachystegia floribunda*	2.90	excavation	drawings	1000						shallow sandy clay						-12.8166	28.0104	1247	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 16m and 19m	mean of 2 profiles (no. 65, 68) of depth (3.0, 2.7), grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 66	deciduous broad-leaf	tree		*Brachystegia floribunda*	2.00	excavation	drawings	1000			pooly drained		2.00	shallow sandy clay, pooly						-12.7718	28.0446	1223	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 17m	grouped by soil and drainage; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 69	deciduous broad-leaf	tree		*Brachystegia floribunda*	3.40	excavation	drawings	1000						clay						-12.7759	28.0540	1256	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 21m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 70	deciduous broad-leaf	tree		*Brachystegia longifolia*	2.95	excavation	drawings	1000			imperfectly drained		2.80	sand, imperfectly						-12.7524	28.0281	1214	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 15m	grouped by soil and drainage; water table position shown in
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 71, 72, 76	deciduous broad-leaf	tree		*Brachystegia longifolia*	3.20	excavation	drawings	1000						deep sandy clay						-12.8073	28.0456	1259	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 17m, 18m, 23m	mean of 3 profiles (no. 71, 72, 76) of depth (2.4, 3.5, 3.8), grouped by
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 73, 77	deciduous broad-leaf	tree		*Brachystegia longifolia*	2.40	excavation	drawings	1000						shallow sandy clay						-12.8158	28.0201	1245	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 18m and 24m	mean of 2 profiles (no. 73, 77) of depth (2.4, 2.4), grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 74	deciduous broad-leaf	tree		*Brachystegia longifolia*	3.20	excavation	drawings	1000						sand						-12.8177	28.0411	1263	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 20m	grounded by soil; roots turn horizontal
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 75	deciduous broad-leaf	tree		*Brachystegia longifolia*	2.30	excavation	drawings	1000			imperfectly drained		2.30	sand, imperfectly						-12.7791	28.0399	1218	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 20m	grouped by soil and drainage; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 78	deciduous broad-leaf	tree		*Brachystegia longifolia*	3.70	excavation	drawings	1000						deep sand						-12.8187	28.0564	1276	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 25m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 91, 93, 95	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	3.70	excavation	drawings	1000						deep sandy clay						-12.8078	28.0468	1264	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 17m, 19m, 19m	mean of 3 profiles (no. 91, 93, 95) of depth (3.6, 3.3, 4.3), grouped by
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 92	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	2.00	excavation	drawings	1000						shallow sandy clay						-12.8165	28.0189	1246	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 18m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 94	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	2.90	excavation	drawings	1000						deep sandy clay, with laterite at	laterite	2.1				-12.8088	28.0429	1261	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 19m	grouped by soil with barrier; 1 small root penetrated into the
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 96	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	4.30	excavation	drawings	1000						clay						-12.7790	28.0587	1254	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 19m	grouped by soil; roots turn horizontal at end
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 97	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	3.80	excavation	drawings	1000						sand						-12.8185	28.0491	1280	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 20m	grouped by soil; roots turn horizontal at end
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 98	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	5.50	excavation	drawings	1000						deep sand						-12.8200	28.0598	1280	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 26m	grouped by soil; roots turn horizontal at end
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 99	deciduous broad-leaf	tree		*Brachystegia utilis*	1.80	excavation	drawings	1000						shallow sandy clay						-12.8102	28.0028	1243	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 18m	grouped by soil; roots turn horizontal at end
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 100	deciduous broad-leaf	tree		*Brachystegia utilis*	2.20	excavation	drawings	1000						deep sandy clay						-12.8060	28.0378	1249	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 20m	separated from 101: roots here turn horizontal at very shallow
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 101	deciduous broad-leaf	tree		*Brachystegia utilis*	4.00	excavation	drawings	1000						deep sandy clay						-12.8100	28.0426	1264	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 26m	grouped by soil but separated from profile 100
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 142	deciduous broad-leaf	tree	Kalahari podberry	*Dialium engleranum*	2.00	excavation	drawings	1000			imperfectly drained		2.00	sand imperfectly drained						-12.7754	28.0262	1217	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 11m	imperfectly drained; roots turn horizontal; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 155	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	1.50	excavation	drawings	1000						shallow sandy clay						-12.8082	28.0110	1236	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 14m	grouped by soil; roots turn horizonal at end
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 156, 157, 160	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	1.70	excavation	drawings	1000						deep sandy clay						-12.8002	28.0355	1242	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 15m, 15m, 18m	mean of 3 profiles (no. 156, 157, 160) of depth (2.0, 1.9, 1.3),
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 158	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	2.40	excavation	drawings	1000			imperfectly drained		2.40	sand imperfectly drained						-12.7649	28.0328	1218	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 15m	separated from 159: roots here turn horizontal at very shallow
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 159	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	1.90	excavation	drawings	1000			imperfectly drained		1.90	sand imperfectly drained						-12.7707	28.0271	1217	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 17m	grouped by soil but separated from profile 158
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 161	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	3.10	excavation	drawings	1000						deep sand						-12.8194	28.0532	1278	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 18m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 164	semi-deciduous	tree	African Bean,	*Faurea saligna*	1.50	excavation	drawings	1000						shallow sandy clay						-12.8045	28.0202	1236	Chati Forest Reserve, 19km west of Kitwe, tree hight 14m	imperfectly drained; roots turn horizontal; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 173, 174	evergreen broad-leaf	small tree		*Hymenocardia acida*	1.20	excavation	drawings	1000			imperfectly drained			sand imperfectly drained, shallwo						-12.7726	28.0347	1213	Chati Forest Reserve, 19km west of Kitwe, tree hight 6m, 9m	mean of 2 profiels (no. 173, 174) with root depth identical
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res 175, 180	semi-deciduous	tree		*Isoberlinia angolensis*	1.60	excavation	drawings	1000						shallow sandy clay						-12.8094	28.0205	1239	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 14m and 19m	mean of 2 profiles (no. 175, 180) with root depth (1.5, 1.7)
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 176	semi-deciduous	tree		*Isoberlinia angolensis*	3.40	excavation	drawings	1000			imperfectly drained		3.40	sand imperfectly drained						-12.7494	28.0345	1222	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 15m	imperfectly drained; water table inferred.; grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 177	deciduous broad-leaf	tree		*Isoberlinia angolensis*	3.40	excavation	drawings	1000						clay						-12.7799	28.0624	1257	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 16m	grouped by soil

Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 178, 179	semi-deciduous	tree		*Isoberlinia angolensis*	2.70	excavation	drawings	1000						deep sandy clay						-12.8130	28.0395	1263	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 17m, 18m	mean of 2 profiles (no. 178, 179) with root depth (3.4, 2.1)
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 181	semi-deciduous	tree		*Isoberlinia angolensis*	3.70	excavation	drawings	1000						deep sand						-12.8230	28.0467	1271	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 20m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 185	evergreen broad-leaf	tree	muchesa	*Julbernardia paniculata*	1.30	excavation	drawings	1000			poorly drained		1.30	shallow sandy clay, poorly						-12.7849	28.0415	1222	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 14m	poorly drained; grouped by soil; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 186, 188, 190	evergreen broad-leaf	tree	muchesa	*Julbernardia paniculata*	2.00	excavation	drawings	1000						shallow sandy clay						-12.8160	28.0152	1246	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 15m, 19m, 20m	mean of 3 profiles (no. 186, 188, 190) with root depth (1.7, 2.5, 1.8)
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 187, 189, 191	evergreen broad-leaf	tree	muchesa	*Julbernardia paniculata*	3.70	excavation	drawings	1000						deep sandy clay						-12.8083	28.0498	1265	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 15m, 19m, 21m, 22m	mean of 4 profiles (no. 187, 189, 191, 192) with root depth (3.3, 4.6,
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 193	evergreen broad-leaf	tree	muchesa	*Julbernardia paniculata*	4.60	excavation	drawings	1000						deep sand						-12.8217	28.0495	1274	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 22m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 194	evergreen broad-leaf	tree	muchesa	*Julbernardia paniculata*	3.70	excavation	drawings	1000						clay						-12.7791	28.0605	1256	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 24m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 201, 202	evergreen broad-leaf	tree		*Marquesia macroura*	1.40	excavation	drawings	1000						deep sandy clay						-12.8024	28.0338	1244	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 13m, 16m	mean of 2 profiles (no. 201, 202) with root depth (1.0, 1.8)
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 203, 204	evergreen broad-leaf	tree		*Marquesia macroura*	3.80	excavation	drawings	1000						deep sand						-12.8254	28.0459	1270	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 16m, 19m	mean of 2 profiles (no. 203, 204) with root depth (4.6, 3.0)
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 205, 207	semi evergreen	tree		*Monotes africanus*	2.30	excavation	drawings	1000						deep sandy clay						-12.8073	28.0370	1249	Chati Forest Reserve, 19km west of Kitwe, tree hight 11m, 12m	mean of 2 profiles (no. 205, 207) with root depth (1.8, 2.8)
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 206	semi evergreen	tree		*Monotes africanus*	1.80	excavation	drawings	1000						shallow sandy clay						-12.8099	28.0988	1243	Chati Forest Reserve, 19km west of Kitwe, tree hight 11m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 208	semi evergreen	tree		*Monotes africanus*	2.70	excavation	drawings	1000						deep sand						-12.8144	28.0435	1269	Chati Forest Reserve, 19km west of Kitwe, tree hight 13m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res. 209	semi evergreen	tree		*Monotes africanus*	1.10	excavation	drawings	1000			poorly drained		1.10	shallow sandy clay, poorly						-12.7823	28.0385	1219	Chati Forest Reserve, 19km west of Kitwe, tree hight 14m	poorly drained; grouped by soil; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 212, 215	evergreen broad-leaf	tree	Mupundu, Mobola	*Parinari curatellifolia*	2.90	excavation	drawings	1000						deep sandy clay						-12.8053	28.0384	1251	Chati Forest Reserve, 19km west of Kitwe, tree hight 11m and 12m	mean of 2 profiles (no. 212, 215) with root depth (3.1, 2.7); common
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 213, 216	evergreen broad-leaf	tree	Mupundu, Mobola	*Parinari curatellifolia*	1.80	excavation	drawings	1000						shallow sandy clay						-12.8064	28.0051	1236	Chati Forest Reserve, 19km west of Kitwe, tree hight 12m and 14m	mean of 2 profiles (no. 213, 216) with root depth (1.8, 1.8); common
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 214	evergreen broad-leaf	tree	Mupundu, Mobola	*Parinari curatellifolia*	2.00	excavation	drawings	1000			imperfectly drained		2.00	sand, imperfectly						-12.7721	28.0261	1218	Chati Forest Reserve, 19km west of Kitwe, tree hight 12m	imperfectly drained; grouped by soil; water table inferred; common
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For. Res 217	evergreen broad-leaf	tree	Mupundu, Mobola	*Parinari curatellifolia*	1.80	excavation	drawings	1000			poorly drained		1.80	shallow sandy clay, poorly						-12.7861	28.0422	1223	Chati Forest Reserve, 19km west of Kitwe, tree hight 15m	poorly drained; grouped by soil; water table inferred; common in
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 221	deciduous broad-leaf	tree		*Pericopsis angolensis*	1.50	excavation	drawings	1000			imperfectly drained		1.50	sand, imperfectly						-12.7644	28.0241	1215	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 12m	imperfectly drained; grouped by soil; water table inferred; common
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 222	deciduous broad-leaf	tree		*Pericopsis angolensis*	2.00	excavation	drawings	1000			poorly drained		2.00	shallow sandy clay, poorly						-12.7869	28.0387	1227	Chati Forest Reserve, 19km west of Kitwe, legume, tree hight 16m	poorly drained; grouped by soil; water table inferred; common in
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 231	deciduous broad-leaf	small tree	Duiker-berry, Kudu-	*Pseudolachno stylis*	1.20	excavation	drawings	1000						shallow sandy clay						-12.8004	28.0344	1241	Chati Forest Reserve, 19km west of Kitwe, tree hight 5m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 232	deciduous broad-leaf	small tree	Duiker-berry, Kudu-	*Pseudolachno stylis*	1.40	excavation	drawings	1000			imperfectly drained		1.40	sand, imperfectly						-12.7696	28.0300	1214	Chati Forest Reserve, 19km west of Kitwe, tree hight 6m	imperfectly drained; grouped by soil; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 233	deciduous broad-leaf	small tree	Duiker-berry, Kudu-	*Pseudolachno stylis*	1.90	excavation	drawings	1000						deep sand						-12.8189	28.0382	1255	Chati Forest Reserve, 19km west of Kitwe, tree hight 7m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 234	deciduous broad-leaf	small tree	Duiker-berry, Kudu-	*Pseudolachno stylis*	2.00	excavation	drawings	1000			imperfectly drained		2.00	sand, imperfectly						-12.7763	28.0393	1217	Chati Forest Reserve, 19km west of Kitwe, tree hight 11m	imperfectly drained; grouped by soil; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 246	evergreen broad-leaf	small tree	monkey orange,dull-	*Strychnos innocua*	2.50	excavation	drawings	1000			imperfectly drained		2.50	sand, imperfectly						-12.7756	28.0407	1220	Chati Forest Reserve, 19km west of Kitwe, tree hight 8m	imperfectly drained; grouped by soil; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 247	evergreen broad-leaf	small tree	monkey orange,dull-	*Strychnos innocua*	0.90	excavation	drawings	1000						shallow sandy clay						-12.7995	28.0135	1230	Chati Forest Reserve, 19km west of Kitwe, tree hight 10m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 248	evergreen broad-leaf	small tree	monkey orange,dull-	*Strychnos innocua*	2.50	excavation	drawings	1000						deep sandy clay						-12.8077	28.0340	1245	Chati Forest Reserve, 19km west of Kitwe, tree hight 10m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 251	evergreen broad-leaf	small tree		*Strychnos pungens*	1.30	excavation	drawings	1000			imperfectly drained			sand, imperfectly			quartzite	1.3		-12.8454	28.0700	1328	Chati Forest Reserve, 19km west of Kitwe, tree hight 5m	sloping bedrock is shown in the drawing; selected the highest point
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 252	evergreen broad-leaf	tree	Forest waterberry	*Syzygium guineense*	1.90	excavation	drawings	1000						deep sandy clay						-12.8070	28.0311	1239	Chati Forest Reserve, 19km west of Kitwe, tree hight 14m	A main constituent in montane evergreen forest; grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 253	evergreen broad-leaf	tree	Forest waterberry	*Syzygium guineense*	3.10	excavation	drawings	1000			imperfectly drained		3.10	sand, imperfectly						-12.7593	28.0337	1221	Chati Forest Reserve, 19km west of Kitwe, tree hight 15m	A main constituent in montane evergreen forest; imperfectly
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 254	evergreen broad-leaf	small tree	waterberry	*Syzygium guineense*	1.60	excavation	drawings	1000						shallow sandy clay						-12.8161	28.0239	1243	Chati Forest Reserve, 19km west of Kitwe, tree hight 4m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 255, 257	evergreen broad-leaf	small tree	waterberry	*Syzygium guineense*	1.80	excavation	drawings	1000			imperfectly drained		1.80	sand, imperfectly						-12.7706	28.0269	1216	Chati Forest Reserve, 19km west of Kitwe, tree hight 5m and 9m	mean of 2 profiles (no. 255, 257) with root depth (1.9, 1.7);
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 256	evergreen broad-leaf	small tree	waterberry	*Syzygium guineense*	1.40	excavation	drawings	1000						sand						-12.8230	28.0350	1252	Chati Forest Reserve, 19km west of Kitwe, tree hight 6m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 271	deciduous broad-leaf	tree	sugar plum	*Uapaca kirkiana*	0.80	excavation	drawings	1000			poorly drained		0.80	shallow sandy clay, poorly						-12.7809	28.0367	1217	Chati Forest Reserve, 19km west of Kitwe, tree hight 9m	grouped by soil; poorly drained; water table inferred
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 272	deciduous broad-leaf	tree	sugar plum	*Uapaca kirkiana*	1.40	excavation	drawings	1000						deep sandy clay						-12.8028	28.0310	1236	Chati Forest Reserve, 19km west of Kitwe, tree hight 11m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 273	deciduous broad-leaf	tree	sugar plum	*Uapaca kirkiana*	1.40	excavation	drawings	1000						shallow sandy clay						-12.8101	28.0025	1243	Chati Forest Reserve, 19km west of Kitwe, tree hight 13m	grouped by soil
Timberlake & Calvert, 1993	near Kitwe, N. Zambia	subtropical dry forest	Chati For Res 274, 275	evergreen broad-leaf	tree	Narrow-leaved	*Uapaca nitida*	1.50	excavation	drawings	1000						shallow sandy clay						-12.8140	27.9963	1244	Chati Forest Reserve, 19km west of Kitwe, tree hight 12m and 12m	mean of 2 profiles (no. 274, 275) with root depth (1.9, 1.0)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 1, 2	deciduous broad-leaf	tree	Large-leaved	*Acacia amythethoph*	3.30	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5241	28.2077	1232	Mount Makulu Agricultural Research Station, legume, shrub hight 1.2m and	mean of 2 profiles (no. 1, 2) with root depth (3.3, 3.2); often on
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 4, 5	deciduous broad-leaf	tree	Grey-haired acacia	*Acacia gerrardii*	3.30	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5199	28.2044	1236	Mount Makulu Agricultural Research Station, legume, shrub hight 1.4m and	mean of 2 profiles (no. 4, 5) with root depth (3.8, 2.8); From
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 7	deciduous broad-leaf	tree		*Acacia goetzei ssp.*	1.70	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5213	28.2128	1245	Mount Makulu Agricultural Research Station, legume, shrub hight 1.2m	grouped by soil
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 8	deciduous broad-leaf	tree		*Acacia goetzei ssp.*	2.50	excavation	drawings	800						clay					coppice	-15.5237	28.2228	1235	Mount Makulu Agricultural Research Station, legume, shrub hight 1.6m	grouped by soil
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 14	deciduous broad-leaf	tree	white thorn	*Acacia polyacantha*	2.90	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5233	28.2111	1238	Mount Makulu Agricultural Research Station, legume, shrub hight 1m, 0.9m	mean of 3 profiles (no. 14, 15, 16) with root depth (2.1, 3.2, 3.3)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 18	deciduous broad-leaf	tree	Paperbark Thorn	*Acacia sieberiana*	3.60	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5247	28.2051	1230	Mount Makulu Agricultural Research Station, legume, shrub hight 0.9m	
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 20, 21	deciduous broad-leaf	tree	silk plants, silk trees,	*Albizia amara*	2.10	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5158	28.2103	1241	Mount Makulu Agricultural Research Station, legume, shrub hight 0.5m, 1.1m	mean of 2 profiles (no. 20, 21) with root depth (1.8, 2.4)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 22, 23	deciduous broad-leaf	tree	Poison-pod albizia	*Albizia versicolor*	2.80	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5200	28.2105	1238	Mount Makulu Agricultural Research Station, legume, shrub hight 1.5m, 1.7m	mean of 2 profiles (no. 22, 23) with root depth (3.3, 2.3); prefers well-
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 24, 25	deciduous broad-leaf	small tree	azanza, tree hibiscus,	*Azanza garckeana*	2.30	excavation	drawings	800						loam over limestone			limestone	0.7-1.2	coppice	-15.5167	28.2091	1241	Mount Makulu Agricultural Research Station, shrub hight 0.7m, ??m	mean of 2 profiles (no. 24, 25) with root depth (1.6, 3.0)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 115,	deciduous broad-leaf	small tree	Four-leaved bushwillow	*Combretum adenogonium*	1.50	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5191	28.2139	1247	Mount Makulu Agricultural Research Station, shrub hight ?2m, 0.5m	mean of 2 profiles (no. 115, 116) with root depth (1.3, 1.7)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 145,	deciduous broad-leaf	small tree	sicklebush, Bell	*Dichrostachys cinerea*	4.00	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5250	28.2036	1227	Mount Makulu Agricultural Research Station, legume, shrub hight 1m, 1.3m	mean of 2 profiles (no. 145, 146) with root depth (4.2, 3.7)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 147	deciduous broad-leaf	small tree	bluebush, star-apple,	*Diospyros lycioides*	2.80	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5225	28.2118	1238	Mount Makulu Agricultural Research Station, shrub hight 1.3m	can be evergreen
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 150	deciduous broad-leaf	shrub		*Dombeya sp.*	2.80	excavation	drawings	800						loam over limestone			limestone	0.7-1.2	coppice	-15.5342	28.1983	1222	Mount Makulu Agricultural Research Station, shrub hight 1.5m	
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 162	deciduous broad-leaf	tree	Apple-ring Acacia, Ana	*Faidherbia albida*	3.30	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5213	28.2031	1235	Mount Makulu Agricultural Research Station, legume, shrub hight not given	grouped by soil; deep-penetrating tap root makes it highly resistant to
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 163	deciduous broad-leaf	tree	Apple-ring Acacia, Ana	*Faidherbia albida*	2.90	excavation	drawings	800						clay					coppice	-15.5210	28.2224	1236	Mount Makulu Agricultural Research Station, legume, shrub hight not given	grouped by soil; deep-penetrating tap root makes it highly resistant to
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 165	deciduous broad-leaf	shrub	white berry-bush	*Flueggea virosa*	2.90	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5186	28.2079	1238	Mount Makulu Agricultural Research Station, shrub hight not given	grouped by soil
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 166	deciduous broad-leaf	shrub	white berry-bush	*Flueggea virosa*	1.50	excavation	drawings	800						loam over limestone			limestone	0.7-1.2		-15.5309	28.2028	1229	Mount Makulu Agricultural Research Station, shrub hight 1.5m	grouped by soil
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 196	deciduous broad-leaf	shrub	big sage, wild sage,	*Lantana camara*	1.90	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice, native to	-15.5156	28.2124	1247	Mount Makulu Agricultural Research Station, shrub hight 1.5m	invasive but shade intolerant
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 198,	semi-deciduous	tree	Apple Leaf, Rain Tree	*Lonchocarpus capassa*	3.40	excavation	drawings	800						loam over limestone			limestone	0.7-1.2	coppice in 199	-15.5340	28.1979	1221	Mount Makulu Agricultural Research Station, legume, shrub hight 0.8m and not	mean of 2 profiles (no. 198, 199) with root depth (3.3, 3.5)

Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 200	deciduous broad-leaf	small tree		*Markhamia obtusifolia*	0.80	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice	-15.5219	28.2148	1249	Mount Makulu Agricultural Research Station, shrub hight not given	roots shallow and extremely wide - 4.5m
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 223	deciduous broad-leaf	shrub		*Phyllanthus muellerianus*	0.70	excavation	drawings	800						loam						-15.5505	28.2261	1203	Mount Makulu Agricultural Research Station, shrub hight not given	growth form uncertain
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 224	deciduous broad-leaf	shrub		*Phyllanthus muellerianus*	2.40	excavation	drawings	800						loam over limestone			limestone	0.7-1.2		-15.5319	28.1981	1222	Mount Makulu Agricultural Research Station, shrub hight not given	growth form uncertain
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 227	deciduous broad-leaf	tree	Camel's foot tree,	*Piliostigma thonningii*	2.50	excavation	drawings	800						clay over limestone			limestone	0.7-1.2	coppice in 227	-15.5178	28.2105	1239	Mount Makulu Agricultural Research Station, legume, shrub hight 0.4m, 0.5m	mean of 2 profiles (no. 227, 228) with root depth (2.6, 2.4)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 242	deciduous broad-leaf	small tree	Carrot-tree	*Steganotaenia araliacea*	1.60	excavation	drawings	800						loam over limestone			limestone	0.7-1.2		-15.5311	28.2003	1224	Mount Makulu Agricultural Research Station, shrub hight 2.4m, 2.6m	mean of 2 profiles (no. 242, 243) with root depth (1.8, 1.4)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 260	deciduous broad-leaf	tree	Large-leaved	*Terminalia mollis*	2.10	excavation	drawings	800						loam over limestone			limestone	0.7-1.2	coppice	-15.5328	28.1995	1225	Mount Makulu Agricultural Research Station, shrub hight 0.8m, 1.2m	mean of 2 profiles (no. 260, 261) with root depth (1.8, 2.4)
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 269	deciduous broad-leaf	shrub		*Triumfetta amuletum*	1.90	excavation	drawings	800						loam over limestone			limestone	0.7-1.2	coppice in 270	-15.5335	28.2013	1225	Mount Makulu Agricultural Research Station, shrub hight 0.9m, 1.2m	mean of 2 profiles (no. 269, 270) with root depth (2.0, 1.8); habitat:
Timberlake & Calvert, 1993	Chilanga, S. Zambia	subtropical dry forest	Mt Makulu Ag Res Stn 276,	deciduous broad-leaf	shrub	Large jujube	*Ziziphus abyssinica*	2.20	excavation	drawings	800						sandy loam over linestone			limestone	0.7-1.2	coppice	-15.5279	28.2079	1238	Mount Makulu Agricultural Research Station, shrub hight 0.9m, ??m	mean of 2 profiles (no. 276, 277) with root depth (2.5, 1.9)
Timberlake & Calvert, 1993	near West Nicholson, S.	subtropical dry forest	Tuli Breeding Stn 113, 114	deciduous broad-leaf	small tree	mopane, mopani,	*Colophospermum mopane*	1.60	excavation	drawings	460						coarse granite sand						-21.3503	29.0195	817	Tuli Breeding Station, 52km southwest of Nicholson, legume, tree height 7.5m, 8.5m	mean of 2 profiles (no. 113, 114) with root depth (1.7, 1.5); found
Timberlake & Calvert, 1993	near West Nicholson, S.	subtropical dry forest	Tuli Breeding Stn 120, 121	semi-deciduous	small tree	red bushwillow	*Combretum apiculatum*	1.10	excavation	drawings	460						coarse granite sand, over			granite	>1.0		-21.3500	29.0262	823	Tuli Breeding Station, 52km southwest of Nicholson, tree height 4m, 8m	mean of 2 profiles (no. 120, 121) with root depth (1.2, 1.0)
Timberlake & Calvert, 1993	near West Nicholson, S.	subtropical dry forest	Tuli Breeding Stn 138	deciduous broad-leaf	small tree	Velvet-Leaved	*Commiphora mollis*	0.90	excavation	drawings	460						coarse granite sand						-21.3390	29.0058	818	Tuli Breeding Station, 52km southwest of Nicholson, tree height 6m	Tuli station quite easy to find: regular grids of forests among small
Timberlake & Calvert, 1993	near West Nicholson, S.	subtropical dry forest	Tuli Breeding Stn 140	deciduous broad-leaf	small tree	Pepper-leaved	*Commiphora mossambicensis*	0.70	excavation	drawings	460						coarse granite sand, over			granite	>1.0		-21.3451	29.0303	829	Tuli Breeding Station, 52km southwest of Nicholson, tree height 5m	
Timberlake & Calvert, 1993	near West Nicholson, S.	subtropical dry forest	Tuli Breeding Stn 168	deciduous broad-leaf	small tree	Grey raisin, silver raisin	*Grewia monticola*	1.10	excavation	drawings	460						coarse granite sand						-21.3359	29.0185	822	Tuli Breeding Station, 52km southwest of Nicholson, tree height 3m	
Timberlake & Calvert, 1993	near West Nicholson, S.	subtropical dry forest	Tuli Breeding Stn 195	deciduous broad-leaf	tree	white seringa	*Kirkia acuminata*	1.10	excavation	drawings	460						coarse granite sand						-21.3421	29.0092	817	Tuli Breeding Station, 52km southwest of Nicholson, tree height 10.5m	
Timberlake & Calvert, 1993	near West Nicholson, S.	subtropical dry forest	Tuli Breeding Stn 268	deciduous broad-leaf	tree	silver cluster leaf, silver	*Terminalia sericea*	2.00	excavation	drawings	460						coarse granite sand						-21.3534	29.0108	808	Tuli Breeding Station, 52km southwest of Nicholson, tree height 6m	
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	shrub	Kalahari bauhinia,	*Bauhinia petersiana*	1.00	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9469	28.1772	1209	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	tree	Wild syringa	*Burkea africana*	0.95	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9511	28.1868	1226	Nyamandhlovu Experimental Station, Bobgolo Farm, 15km southwest of	mean of 4 profiles (no. 104, 105, 106, 107) with root depth (1, 0.9,
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	semi-deciduous	small tree	red bushwillow	*Combretum apiculatum*	1.30	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9504	28.1826	1219	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	mean of 2 profiles (no. 118, 119) with root depth (1.2, 1.4)
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	semi-deciduous	small tree	variable combretum,	*Combretum collinum*	2.60	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9720	28.1669	1202	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	mean of 3 profiles (no. 125, 126, 127) with root depth (2.7, 2.7, 2.5)
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	semi-deciduous	tree	Large-Fruited	*Combretum zeyheri*	1.20	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9560	28.1774	1224	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous	tree	Tall firethorn	*Commiphora glandulosa*	0.70	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9583	28.1865	1242	Nyamandhlovu Experimental Station,Bongolo Farm, 15km southwest of	prefer well-drained sandy soils
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	tree	Kalahari podberry	*Dichrostachys cinerea*	0.90	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9671	28.1703	1210	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	mean of 2 profiles (no. 143, 144) with root depth (1.2, 2.6)
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	small tree	South African wild	*Dombeya rotundifolia*	1.10	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9547	28.1805	1227	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	small tree	Grey raisin, silver raisin	*Grawia monticola*	0.90	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9573	28.1818	1235	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	small tree	raisin bush	*Grawia sp.*	0.80	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9555	28.1854	1237	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	mean of 3 profiles (no. 169, 170, 171) with root depth (0.6, 0.6, 1.1)
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	small tree	Lekkerbreek	*Ochna pulchra*	1.20	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9496	28.1883	1223	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	mean of 2 profiles (no. 210, 211) with root depth (1.4, 1.0); found on
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	small tree	Duiker-berry, Kudu-berry	*Pseudolachnostylis*	1.60	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9603	28.1755	1220	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	tree	mongongo tree	*Ricinodendron rautanenii*	1.40	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9661	28.1767	1219	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	very thick tap root; found on wooded hills and amongst sand
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	evergreen broad-leaf	tree	corky-bark monkey-	*Strychnos cocculoides*	2.00	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9673	28.1695	1209	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	mean of 2 profiles (no. 244, 245) with root depth (1.5, 2.5)
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	evergreen broad-leaf	small tree		*Strychnos pungens*	3.10	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9685	28.1600	1199	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	max of 2 profiles (no. 249, 250) with root depth (1.3, 3.1); the first
Timberlake & Calvert, 1993	Nyamandhlovu, W.	subtropical dry forest	Nya Exp Stn Bongolo Frm	deciduous broad-leaf	tree	silver cluster leaf, silver	*Terminalia sericea*	1.60	excavation	drawings	580						kalahari sand, over sandy-clay						-19.9571	28.1689	1215	Nyamandhlovu Experimental Station, Bongolo Farm, 15km southwest of	mean of 3 profiles (no. 265, 266, 267) with root depth (1.0, 1.7, 2.2)
Timberlake & Calvert, 1993	near Harare, N-E	subtropical dry forest	Herderson Res Stn 50-63	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	1.60	excavation	drawings	910						clay loam over gravel					coppice	-17.5578	31.0393	1342	Henderson Research Station, 28km north of Harare, coppice height 2.3, 4.5, 2.5, 2.5,	mean of 14 profiles (no. 50-63) with root depth (1.5, 1.8 ,0.9, 1.4,
Timberlake & Calvert, 1993	near Harare, N-E	subtropical dry forest	Herderson Res Stn 79-85	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	1.90	excavation	drawings	910						clay loam over gravel					coppice	-17.5653	31.0403	1335	Henderson Research Station, 28km north of Harare, coppice height 1.3, 1.6, 1.6, 1.6,	mean of 7 profiles (no. 79-85) with root depth (2.8, 2.1, 1.5, 1.3, 1.6,
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	deciduous broad-leaf	tree	Rhodesian Teak,	*Baikiaea plurijuga*	1.40	excavation	drawings	630-820						kalahari sand					coppice	-18.2187	26.0325	876	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, coppice height	nearest village to Fuller Forest Area is chosen
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	deciduous broad-leaf	shrub	Kalahari bauhinia,	*Bauhinia petersiana*	1.40	excavation	drawings	630-820						kalahari sand						-18.2152	26.0325	878	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, shrub height	
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	semi-deciduous	tree	Tall firethorn	*Commiphora glandulosa*	1.30	excavation	drawings	630-820						kalahari sand						-18.2226	26.0325	875	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, tree height 3m	
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	deciduous broad-leaf	small tree	Pepper-leaved	*Commiphora mossambicensis*	0.70	excavation	drawings	630-820						kalahari sand						-18.2265	26.0370	865	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, tree height 2m	
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	1.80	excavation	drawings	630-820						kalahari sand					coppice	-18.2088	26.0189	909	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, coppice height	
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	evergreen broad-leaf	tree	African Rosewood,	*Guibourtia coleosperma*	1.60	excavation	drawings	630-820						kalahari sand						-18.2050	26.0398	896	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, legume, tree	Occurring almost exclusively on Kalahari sand in open woodland
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	deciduous broad-leaf	tree	Wild teak	*Pterocarpus angolensis*	1.40	excavation	drawings	630-820						kalahari sand					coppice	-18.2208	26.0389	879	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, coppice height	
Timberlake & Calvert, 1993	Fuller For. Hwange, W.	subtropical dry forest	Hwange Siwela Village	deciduous broad-leaf	tree	mongongo tree	*Ricinodendron rautanenii*	1.70	excavation	drawings	630-820						kalahari sand					coppice	-18.2124	26.0231	903	Siwela Village, near Fuller Forest, N.W. Hwange Communal Land, coppice height	
Timberlake & Calvert, 1993	NW Hwange, W. Zimbabwe	subtropical dry forest	Mtopi 132	deciduous broad-leaf	shrub	Mouse-eared	*Combretum hereroense*	0.80	excavation	drawings	630-820						vertisol						-18.1847	25.8769	988	Mtopi, N.W. Hwange Communal Land, shrub height 3.5m	vertisol - high shinking clay content, deep cracks and vertical mixing
Timberlake & Calvert, 1993	NW Hwange, W. Zimbabwe	subtropical dry forest	Mtopi 226	deciduous broad-leaf	tree	Camel's foot tree,	*Piliostigma thonningii*	1.50	excavation	drawings	630-820						vertisol						-18.1885	25.8750	972	Mtopi, N.W. Hwange Communal Land, shrub height 5m	site located by searching fo Hwange Communal Land which
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 9	deciduous broad-leaf	tree	Knobthorn	*Acacia nigrescens*	1.20	excavation	drawings	630-820		gully				consolidated karoo sands						-18.9326	27.7514	959	Benzies Bridge, C. Lupane Communal Land, legume, tree height 1.7m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 86, 87,	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	2.90	excavation	drawings	630-820		gully				consolidated karoo sands						-18.9337	27.7505	961	Benzies Bridge, C. Lupane Communal Land, legume, tree height 2.5m, 4m, 9m	max of 3 profiles (no. 86, 87, 88) with root depth (1.9, 2.8, 2.9) for
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 102	deciduous broad-leaf	tree	Wild syringa	*Burkea africana*	0.70	excavation	drawings	630-820		gully				consolidated karoo sands						-18.9307	27.7516	957	Benzies Bridge, C. Lupane Communal Land, tree height 3m	It is assumed to be the bridge just south of Lupane; there are indeed
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 110	deciduous broad-leaf	small tree	mopane, mopani,	*Colophospermum mopane*	2.80	excavation	drawings	630-820		riverine				consolidated sandy loam						-18.9407	27.7702	962	Benzies Bridge, C. Lupane Communal Land, legume, tree height 5m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 117	semi-deciduous	small tree	red bushwillow	*Combretum apiculatum*	1.70	excavation	drawings	630-820		river bank				consolidated sands (rive						-18.9375	27.7627	959	Benzies Bridge, C. Lupane Communal Land, tree height 2m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 131	deciduous broad-leaf	shrub	Mouse-eared	*Combretum hereroense*	1.90	excavation	drawings	630-820		gully				consolidated karoo sands						-18.9320	27.7501	960	Benzies Bridge, C. Lupane Communal Land, tree height 3.5m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 133	semi-deciduous	tree	Leadwood	*Combretum imberbe*	2.50	excavation	drawings	630-820		river bank				consolidated sands (rive						-18.9375	27.7559	960	Benzies Bridge, C. Lupane Communal Land, tree height 3m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 136	semi-deciduous	tree	Tall firethorn	*Commiphora glandulosa*	1.30	excavation	drawings	630-820		gully				consolidated karoo sands						-18.9316	27.7539	961	Benzies Bridge, C. Lupane Communal Land, tree height 7m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 154	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	1.40	excavation	drawings	630-820						consolidated sands						-18.9297	27.7486	958	Benzies Bridge, C. Lupane Communal Land, legume, tree height 7m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 218	semi-deciduous	tree	Weeping wattle,	*Peltophorum africanum*	1.60	excavation	drawings	630-820		river bank				consolidated sands (rive						-18.9386	27.7674	962	Benzies Bridge, C. Lupane Communal Land, tree height 4m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 225	deciduous broad-leaf	tree	Camel's foot tree,	*Piliostigma thonningii*	2.00	excavation	drawings	630-820		gully				consolidated karoo sands						-18.9316	27.7539	960	Benzies Bridge, C. Lupane Communal Land, legume, tree height 4m	tap root truncated at 1.3m but dash lines suggests much deeper
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 262	deciduous broad-leaf	tree	silver cluster leaf, silver	*Terminalia sericea*	2.00	excavation	drawings	630-820		poorly-drained			2.00	consolidates sands (poorly						-18.9282	27.7455	964	Benzies Bridge, C. Lupane Communal Land, tree height 2m	poorly drained; water table inferred; there is indeed a swampy-

Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 263	deciduous broad-leaf	tree	silver cluster leaf, silver	*Terminalia sericea*	1.50	excavation	drawings	630-820			gully			consolidated karoo sands						-18.9356	27.7541	958	Benzies Bridge, C. Lupane Communal Land, tree height 3.5m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Benzies Bridge 264	deciduous broad-leaf	tree	silver cluster leaf, silver	*Terminalia sericea*	1.50	excavation	drawings	630-820			gully			consolidated loamy sand						-18.9338	27.7557	959	Benzies Bridge, C. Lupane Communal Land, tree height 5m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Lupane-26	deciduous broad-leaf	tree	Rhodesian Teak,	*Baikiaea plurijuga*	1.10	excavation	drawings	630-820						kalahari sand						-18.8768	27.8205	1028	Lupane (7km north-east), Lupane Communal Land, tree height 3.5m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Lupane-89	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	1.10	excavation	drawings	630-820						kalahari sand						-18.8737	27.8272	1033	Lupane (7km north-east), Lupane Communal Land, legume, tree height 8m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Lupane-103	deciduous broad-leaf	tree	Wild syringa	*Burkea africana*	1.20	excavation	drawings	630-820						kalahari sand						-18.8739	27.8319	1034	Lupane (7km north-east), Lupane Communal Land, legume, tree height 6m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Lupane-148	deciduous broad-leaf	shrub	Horn-pod tree, Wild	*Diplorhynchus*	0.80	excavation	drawings	630-820						kalahari sand						-18.8761	27.8172	1024	Lupane (7km north-east), Lupane Communal Land, tree height 2.5m	
Timberlake & Calvert, 1993	C. Lupane, W. Zimbabwe	subtropical dry forest	Lupane-153	deciduous broad-leaf	tree	African blackwood	*Erythrophleum africanum*	0.90	excavation	drawings	630-820						kalahari sand						-18.8756	27.8106	1024	Lupane (7km north-east), Lupane Communal Land, legume, tree height 4m	
Timberlake & Calvert, 1993	C. Gokwe, N. Zimbabwe	subtropical dry forest	S. Gokwe Bus. Ctr-28	deciduous broad-leaf	tree	Rhodesian Teak,	*Baikiaea plurijuga*	1.50	excavation	drawings	630-820						kalahari sand						-18.2203	28.9282	1292	South Gokwe Business Center, Gokwe Communal Land, tree height 5.5m	rotting tap root noted
Timberlake & Calvert, 1993	C. Gokwe, N. Zimbabwe	subtropical dry forest	S. Gokwe Bus. Ctr-90	deciduous broad-leaf	tree	Msasa	*Brachystegia spiciformis*	3.00	excavation	drawings	630-820						kalahari sand						-18.2173	28.9264	1292	South Gokwe Business Center, Gokwe Communal Land, legume, tree height 12m	tap root truncated at 2.3m, but dashed line indicates much deeper
Timberlake & Calvert, 1993	C. Gokwe, N. Zimbabwe	subtropical dry forest	S. Gokwe Bus. Ctr-184	deciduous broad-leaf	tree	Mnondo	*Julbernardia globiflora*	1.70	excavation	drawings	630-820						kalahari sand						-18.2183	28.9277	1291	South Gokwe Business Center, Gokwe Communal Land, legume, tree height 8m	It prefers a hot dry resting season and plenty of rain in the summer
Timberlake & Calvert, 1993	C. Gokwe, N. Zimbabwe	subtropical dry forest	S. Gokwe Bus. Ctr-236	deciduous broad-leaf	tree	Wild teak	*Pterocarpus angolensis*	1.80	excavation	drawings	630-820						kalahari sand						-18.2194	28.9292	1292	South Gokwe Business Center, Gokwe Communal Land, tree height 7m	location for this site is picked in the woodland at the center of the city
Timberlake & Calvert, 1993	C. Gokwe, N. Zimbabwe	subtropical dry forest	S. Gokwe Bus. Ctr-241	deciduous broad-leaf	tree	mongongo tree	*Ricinodendron rautanenii*	1.50	excavation	drawings	630-820						kalahari sand						-18.2189	28.9351	1295	Gokwe Business Center, Gokwe Communal Land, tree height 6m	
Timberlake & Calvert, 1993	C. Dagamela, Nkayi, W.	subtropical dry forest	Mtshabi School-45	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	1.10	excavation	drawings	630-820						loamy sand						-18.8568	28.8192	1118	Mtshabi School, 15km east of Dagamela, C. Nkayi Communal Land, legume, tree height	in what looks like a school ground, with rectangular buildings and
Timberlake & Calvert, 1993	C. Dagamela, Nkayi, W.	subtropical dry forest	Mtshabi School-111	deciduous broad-leaf	small tree	mopane, mopani,	*Colophospermum mopane*	1.30	excavation	drawings	630-820						sandy loam						-18.8552	28.8192	1117	Mtshabi School, 15km east of Dagamela, C. Nkayi Communal Land, legume, tree height	tap root truncated at 1.1m but dsh lines show deeper roots
Timberlake & Calvert, 1993	C. Dagamela, Nkayi, W.	subtropical dry forest	Mtshabi School-112	deciduous broad-leaf	small tree	mopane, mopani,	*Colophospermum mopane*	1.10	excavation	drawings	630-820						sandy clay						-18.8541	28.8205	1120	Mtshabi School, 15km east of Dagamela, C. Nkayi Communal Land, legume, tree height	
Timberlake & Calvert, 1993	Sasame Riv, N. Gokwe, N.	subtropical dry forest	Madziwadzido 11	deciduous broad-leaf	tree	Knobthorn	*Acacia nigrescens*	0.70	excavation	drawings	630-820			alluvial plain			clay loam (alluvium)						-17.6337	28.4997	680	Madziwadzido, asame river, N. Gokwe Communal Land, legume, tree height 6m	on Google it is spelled Madziyadzido, just NW of Sasame
Timberlake & Calvert, 1993	Sasame Riv, N. Gokwe, N.	subtropical dry forest	Madziwadzido 17	evergreen broad-leaf	tree	Splendid thorn	*Acacia robusta ssp*	0.90	excavation	drawings	630-820			alluvial plain			clay loam (alluvium)						-17.6346	28.4995	683	Madziwadzido, asame river, N. Gokwe Communal Land, legume, tree height 7m	
Timberlake & Calvert, 1993	Sasame Riv, N. Gokwe, N.	subtropical dry forest	Madziwadzido 34	semi-deciduous	tree	desert date, soap berry	*Balanites aegyptiaca*	1.10	excavation	drawings	630-820			alluvial plain			clay loam (alluvium)						-17.6388	28.4981	682	Madziwadzido, asame river, N. Gokwe Communal Land, tree height 3.5m	
Timberlake & Calvert, 1993	Sasame Riv, N. Gokwe, N.	subtropical dry forest	Madziwadzido 108, 109	deciduous broad-leaf	small tree	mopane, mopani,	*Colophospermum mopane*	0.60	excavation	drawings	630-820			alluvial plain			clay loam (alluvium)						-17.6353	28.4994	683	Madziwadzido, asame river, N. Gokwe Communal Land, tree height 5m and 5.5m	Mean of 2 profiles (no. 108, 109) with rooting depths (0.7, 0.5); roots
Timberlake & Calvert, 1993	Sasame Riv, N. Gokwe, N.	subtropical dry forest	Madziwadzido 122, 123	deciduous broad-leaf	shrub	Jesse-bush bushwillow,	*Combretum celastroides*	0.40	excavation	drawings	630-820						coarse sand						-17.6198	28.5046	681	Madziwadzido, asame river, N. Gokwe Communal Land, tree height 4m and 5m	Mean of 2 profiles (no. 122,123) with rooting depths (0.6, 0.2); roots
Timberlake & Calvert, 1993	Sasame Riv, N. Gokwe, N.	subtropical dry forest	Madziwadzido 129, 130	deciduous broad-leaf	small tree	Large-fruited jesse-	*Combretum elaeagnoides*	0.60	excavation	drawings	630-820						sand, coarse sand						-17.6322	28.5010	686	Madziwadzido, asame river, N. Gokwe Communal Land, tree height 4m and 4m	Mean of 2 profiles (no. 129,130) with rooting depths (0.5, 0.7); roots
Timberlake & Calvert, 1993	Sasame Riv, N. Gokwe, N.	subtropical dry forest	Madziwadzido 151	deciduous broad-leaf	tree	Mountain Mahogany	*Entandrophragma*	0.50	excavation	drawings	630-820						coarse sand						-17.6364	28.5004	684	Madziwadzido, asame river, N. Gokwe Communal Land, tree height 14m	root profile incomplete? found at low altitudes in river valleys
Timberlake & Calvert, 1993	C. Omay Com Ld, N.	subtropical dry forest	Omay Siakobvu-41	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	0.70	excavation	drawings	630-820						shallow loamy sand						-17.4682	28.2034	643	Siakobvu (15km east), C. Omay Communal Land, tree height 4m	roots grow upward; not grouped with no. 43, because no. 42 is at a
Timberlake & Calvert, 1993	C. Omay Com Ld, N.	subtropical dry forest	Omay Siakobvu-43	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	2.00	excavation	drawings	630-820						shallow loamy sand						-17.4794	28.2014	658	Siakobvu (15km east), C. Omay Communal Land, legume, tree height 5m	tap root truncated at 1.1m but dash lines show much deeper roots
Timberlake & Calvert, 1993	C. Omay Com Ld, N.	subtropical dry forest	Omay Siakobvu-182,	deciduous broad-leaf	tree	Mnondo	*Julbernardia globiflora*	0.60	excavation	drawings	630-820						shallow loamy sand						-17.4655	28.2028	639	Siakobvu (15km east), C. Omay Communal Land, legume, tree height 5m and 9m	Mean of 2 profiles (no. 182, 183) with rooting depths (0.4, 0.8); roots
Timberlake & Calvert, 1993	C. Omay Com Ld, N.	subtropical dry forest	Omay Siakobvu-220	deciduous broad-leaf	tree		*Pericopsis angolensis*	2.00	excavation	drawings	630-820						shallow loamy sand						-17.4700	28.1924	651	Siakobvu (15km east), C. Omay Communal Land, legume, tree height 12m	tap root truncated at 1.2m but dash lines show much deeper roots
Timberlake & Calvert, 1993	C. Omay Com Ld, N.	subtropical dry forest	Omay Siakobvu-230	deciduous broad-leaf	small tree	Duiker-berry, Kudu-	*Pseudolachnostylis*	0.90	excavation	drawings	630-820						shallow loamy sand						-17.4725	28.1982	650	Siakobvu (15km east), C. Omay Communal Land, tree height 5m	location cannot be found by Siakobvu or Omay; closest spelling
Timberlake & Calvert, 1993	C. Hurungwe Com Ld, N.	subtropical dry forest	Hurungwe Maguuge-6	deciduous broad-leaf	tree		*Acacia goetzei ssp.*	1.00	excavation	drawings	630-820			poorly drained		1.00	loamy sand (poorly drained)						-16.1141	29.4049	490	Maguenge (12km south), C. Hurungwe Communal Land, legume, tree height 3.5m	poorly drained; roots horizontal; water table inferred: a poorly
Timberlake & Calvert, 1993	C. Hurungwe Com Ld, N.	subtropical dry forest	Hurungwe Maguuge-42	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	1.10	excavation	drawings	630-820			poorly drained		1.10	loamy sand (poorly drained)						-16.1059	29.4105	491	Maguenge (12km south), C. Hurungwe Communal Land, legume, tree height 6m	poorly drained; roots horizontal; water table inferred
Timberlake & Calvert, 1993	C. Hurungwe Com Ld, N.	subtropical dry forest	Hurungwe Maguuge-44	deciduous broad-leaf	tree	Prince of Wales	*Brachystegia boehmii*	1.20	excavation	drawings	630-820			poorly drained		1.20	loamy sand (poorly drained)						-16.1125	29.4116	494	Maguenge (12km south), C. Hurungwe Communal Land, legume, tree height 7m	poorly drained; roots horizontal; water table inferred; not combined
Timberlake & Calvert, 1993	C. Hurungwe Com Ld, N.	subtropical dry forest	Hurungwe Maguuge-219	deciduous broad-leaf	tree		*Pericopsis angolensis*	0.70	excavation	drawings	630-820			poorly drained		0.70	loamy sand (poorly drained)						-16.1210	29.4070	488	Maguenge (12km south), C. Hurungwe Communal Land, legume, tree height 4m	poorly drained; roots horizontal; water table inferred; not combined
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Gonono-3	deciduous broad-leaf	small tree	Woolly-pod acacia	*Acacia eriocarpa*	0.50	excavation	drawings	630-820						sand						-16.2487	30.624	401	Gonono (7km west), N. Dande Communal Land, legume, shrub height 3.5m	http://allafrica.com/stories/200301270661.html: Gonono is a
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Gonono-35,	semi-deciduous	tree	desert date, soap berry	*Baphia massaiensis*	0.65	excavation	drawings	630-820						sand						-16.2533	30.6214	405	Gonono (7km west), N. Dande Communal Land, tree height 3m, 4m	Mean of 2 profiles (no. 35, 36) with rooting depths (0.8, 0.5); roots very
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Gonono-124	deciduous broad-leaf	small tree	Jesse-bush bushwillow,	*Combretum collinum*	0.90	excavation	drawings	630-820						sand						-16.2554	30.6237	405	Gonono (7km west), N. Dande Communal Land, tree height 3.5m	
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Gonono-128	deciduous broad-leaf	small tree	Large-fruited jesse-	*Combretum elaeagnoides*	0.60	excavation	drawings	630-820						coarse sand						-16.2512	30.6250	404	Gonono (7km west), N. Dande Communal Land, tree height 4m	
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Gonono-141	deciduous broad-leaf	tree	River corkwood	*Commiphora ugogensis*	1.20	excavation	drawings	630-820						sand						-16.2575	30.6224	407	Gonono (7km west), N. Dande Communal Land, tree height 10m	On alluvial soils along rivers, sometimes forming thickets
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Gonono-258,	semi-deciduous	tree	Kalahari cluster-leaf	*Terminalia brachystemma*	0.60	excavation	drawings	630-820						sand						-16.2473	30.6174	404	Gonono (7km west), N. Dande Communal Land, tree height 5m, 8m	Mean of 2 profiles (no. 258, 259) with rooting depths (0.6, 0.6); in
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Mushumbi	deciduous broad-leaf	tree	Knobthorn	*Acacia nigrescens*	0.80	excavation	drawings	630-820			alluvial			sandy loam (alluvium)						-16.1811	30.5482	377	Mushumbi Pools, N. Dande Communal Land, legume, tree height 4m	
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Mushumbi	deciduous broad-leaf	tree	Umbrella thorn	*Acacia tortillis ssp*	1.50	excavation	drawings	630-820			alluvial			sandy loam (alluvium)						-16.1625	30.5562	378	Mushumbi Pools, N. Dande Communal Land, legume, tree height 5m	tap root truncated at 1m but dash lines show much deeper roots
Timberlake & Calvert, 1993	N. Dande Com Ld, N	subtropical dry forest	Dande Mushumbi	semi-deciduous	tree	Apple Leaf, Rain Tree	*Lantana camara*	1.00	excavation	drawings	630-820			alluvial			sandy loam (alluvium)						-16.1728	30.5518	380	Mushumbi Pools, N. Dande Communal Land, tree height 6m	tap root truncated at 0.7m but dash lines show much deeper roots
Turekhanova, 1996	Alma-Ata, SE Kazakhstan	dry steppe		deciduous	rhizomatous, shrub	common sea-	*Hippophae rhamnoides*	2.05	excavation	drawing				deep foothill			dark chestnut leached soil with					planted	43.2153	76.9349	920	The depth penetration of the root system of the 8-year old plant remained (see Fig. 1	location guessed to be in the higher part of the Botanical Garden near
Turner, 1936	Arkansas, US	temperate mixed forest	Caddo silt-loam site,	evergreen needle-leaf	tree	southern short-leaf	*Pinus echinata*	1.12	trench wall	yes	1372	evenly distributed		poorly drained,			silty loam						33.1209	-91.6542	40	Caddo silt loam is " flatwood"s type of soil of the lower coastal plain region; This soil is	County of sites found in TAB 1 ofTurner 1936a; Site location selected on Google Earth to be in the right county and land slope, and in evergreen forests; rooting depth extrapolated by plotting all
Turner, 1936	Arkansas, US	temperate mixed forest	Henceville fine sandy-	evergreen needle-leaf	tree	southern short-leaf	*Pinus echinata*	1.27	trench wall	yes	1270	evenly distributed		slope 25%			fine sandy-loam						34.2869	-94.1800	234	Henceville fine sandy loam is a soil of the Ouachita mountain r egion;	
Turner, 1936	Arkansas, US	temperate mixed forest	Sesquehana fine sandy-	evergreen needle-leaf	tree	southern short-leaf	*Pinus echinata*	1.19	trench wall	yes	1118	evenly distributed		slope 9%			fine sandy-loam						33.1565	-93.2694	87	Susquehanna fine sandy loam is a soil of the upper coastal plain region of the state	
Vance & Nadkarni,	WC Costa Rica,	moist tropical		evergreen broad-leaf	tree		*Beilschmeidia sp., Ficus*	1.85	excavation	no	2000			W slope near			loam, on sandy-loam, on clay-						10.3007	-84.8000	1550	About 5% of the below-ground fine roots and 13% of the below-ground total root	this study also reports root biomass in the canopy, which is small by
Verzunov, 1980	North Kazakhstan	forest steppe	test plot 64	deciduous needle-leaf	tree	Siberia larch	*Larix sibirica*	1.85	trench + cores	yes + drawings	310-340					5	normal meadow chernozem						54.9773	69.6901	146	The soils in the studied plantings were normal (test plot 64), deep weakly saline (test plots 66-68), deep highly saline (test plot 65'), medium-thick medium-loamy, and weakly alkaline and saline clay-loamy (test plot 65) meadow and meadow-chernozems. Ground waters occurred at a depth of 3-5.0 m and their capillary edge was noted at 1.0-1.3 m... The root system	Rooting depth obtained from Figure 1 for the 3 site types
Verzunov, 1980	North Kazakhstan	forest steppe	test plots 66-68	deciduous needle-leaf	tree	Siberia larch	*Larix sibirica*	1.36	trench + cores	yes + drawings	310-340					4	deep weakly saline meadow-						54.9483	69.7065	138		water table is assumed to vary 3-5m as stated acorss the sites, not
Verzunov, 1980	North Kazakhstan	forest steppe	test plots 66-68	evergreen	tree	Scots pine	*Pinus sylvestris*	1.00	trench + cores	yes + drawings	310-340					4	deep weakly saline meadow-						54.9483	69.7065	138		Author notes capillary rise only 1-1.3m deep
Verzunov, 1980	North Kazakhstan	forest steppe	test plots 66-68	deciduous broad-leaf	tree	Silver birch	*Betula pendula*	0.80	trench + cores	yes + drawings	310-340					4	deep weakly saline meadow-						54.9483	69.7065	138		Study area is in "Northern Kazakhstan", on the "Ishim ravine-
Verzunov, 1980	North Kazakhstan	forest steppe	test plot 65	deciduous needle-leaf	tree	Siberia larch	*Larix sibirica*	0.80	trench + cores	yes + drawings	310-340					3	weakly alkaline and saline clay-						54.9243	69.7739	133		An area with rectangular tree plots, on a land with ridges and bogs in N
Veste & Breckle, 1996	Israel, Negev desert, duns	arid desert		Evergeen	shrub (salt-tolerant		*Anabasis articulata*	> 3.5	excavation	drawing	90			dune valley			dune sand						30.9129	34.4478	229	The root system of various shrubs (e.g. Anabasis articulata, Cornulaca	report dimorphic roots: 10-30cm and 3-4m (Fig.2)
Veste & Breckle, 1996	Israel, Negev desert, duns	arid desert		Evergeen	spiny shrub (not saline		*Cornulaca monacantha*	> 2.4	excavation	no	90			dune valley			dune sand						30.9789	34.4093	205	The tap roots of Cornulaca in the sandy area of Nizzana could be excavated down	mention water table
Veste & Breckle, 1996	Israel, Negev desert, duns	arid desert		Evergeen	shrub		*Thymelaea hirsuta*	3.50	excavation	no	90			in a loess wadi bed			dune sand						31.1004	34.5586	201	For Thymelaea hirsuta growing in a loess wadi bed a rooting depth of 3.5 m has	"But under desert conditions and especially under the specific
Veste & Breckle, 1996	Israel, Negev desert, duns	arid desert		summer deciduous	shrub		*Moltkiopsis ciliata*	0.60	minirhizotron	yes	90			N slope			dune sand						30.9955	34.4472	248	During the first year of the experiments fine roots of Moltkiopsis could be observed	observed to 75cm depth only
Vonlanthen et al., 2010	Takalamakan, W. China	desert	the field site (not glass	deciduous broad-leaf	shrub	cameltthorns or manna	*Alhagi sparsifolia*	1.70	in-growth tubes	yes	33	hot dry summer	2570	foreland of oasis		6.5m in the river valley	pure silt						37.0167	80.8000	1365	After 16 weeks of growth in the field roots of K. caspia and A. sparsifolia reached	seedings only; mature species can have deeper roots

Vonlanthen et al., 2010	Takalamakan, W. China	desert	the field site (not glass	perennial	herb		*Karelinia caspia*	2.20	in-growth tubes	yes	33	hot dry summer	2570	foreland of oasis		6.5m in the river valley	pure silt						37.0167	80.8000	1365	Both species are able to reach the groundwater table in the river valleys (6.5	same site as Arndt, et al., 2004, but include a new species
Wagg, 1967	Brule Lake , Alberta CA	Boreal forest	Tree I	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.04	excavation	drawings				sandy slope above lake			well-drained, near uniform						53.2977	-117.8632	1019	Tree I: Elongated taproot-form from well-drained sands with large primary lateral	west of the lake, in primary forest
Wagg, 1967	Waskahigan River, Alberta	Boreal forest	Tree II	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.40	excavation	drawings				sandy slope beside the			well-drained Regosolic (Mor						55.5236	-118.4343	658	Tree II: Restricted taproot-form caused by a gravel layer with large primary and	Waskahigan drains into Little Smokey river; the latter was found
Wagg, 1967	near Grande Prairie,	Boreal forest	Tree III	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.88	excavation	drawings							imperfectly-drained						55.0746	-118.9532	582	Tree III: Restricted proximal roots from compacted Solonetzic soil with large	south of a river bend, in what looks like virgin forest
Wagg, 1967	E of Kakisa Lake,	Boreal forest	Tree IV	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.24	excavation	drawings				in a small depression			poorly drained Gleysolic			calcareous rock	0.23		60.9390	-116.9178	223	Tree IV: Monolayered (partially bilayered) root-form with large primary and	on what lookes like banded outcrops east of the lake, with
Wagg, 1967	near Entrance,	Boreal forest	Tree V	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.52	excavation	drawings						0.38	imperfectly-drained Podzolic						53.3555	-117.5677	1214	Tree V: Monolayered root-form with large primary and secondary lateral roots which	east of town, in what looks like primary forest; depth to gley layer
Wagg, 1967	near Grande Prairie,	Boreal forest	Tree VI	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.18	excavation	drawings						0.2	very poorly-drained						55.0713	-118.7865	619	Tree VI: Monolayered root-form with large secondary lateral roots	south of the cisty, south side of the river, in a dense stand
Wagg, 1967	near Fox Creek,	Boreal forest	Tree VII	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.18	excavation	drawings						0.25	very poorly-drained						54.4074	-116.7596	819	Tree VII: Multilayered root-form with large primary and seoondary lateral roots and	east of town; depth to gley layer used as indicator of water table
Wagg, 1967	mouth of Hay River,	Boreal forest	Tree VIII	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.21	excavation	drawings				near river mouth		0	waterlogged Gleysolic (Rego						60.8179	-115.7665	162	Tree VIII: Multilayered root-form with large secondary lateral roots which developed	east of river on a high bank, 5m above river
Wagg, 1967	near Hay River,	Boreal forest	Tree IX	evergreen needle-leaf	tree	white spruce	*Picea glauca*	1.01	excavation	drawings				on a levee, on the			well-drained Regosolic						60.8540	-115.7632	159	Tree IX: Multilayered root-fonm with small primary roots and large secondary roots	Vale Island is at the mouth of the Hay River, not really an island if not
Wagg, 1967	south of Valleyview,	Boreal forest	Tree X	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.27	excavation	drawings				on the Simonette			well-drained Podzolic						54.9709	-117.2232	638	Tree X: Retarded variation of multilayered root-form with large secondary roots in	on floodplain, near dry oxbow lake
Wagg, 1967	near Goodwin,	Boreal forest	Tree XI	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.30	excavation	drawings						0.25	very poorly-drained						55.2205	-118.1643	641	Tree XI: Elevated variation of mono layered root-form with partiaLLy bilayered primary	NE of town, in a sparse stand; depth to gley layer used as
Wagg, 1967	N. of Fort Providence,	Boreal forest	Tree XII	evergreen needle-leaf	tree	white spruce	*Picea glauca*	0.24	excavation	drawings				in an abandoned		0.36	imperfectly drained Organic						61.3747	-117.6564	155	Tree XII: Complex variation of root-form with multilayered primary and secondary	north of town, on an old channel; depth to gley layer used as
Wallace et al., 1980	Mojave desert,	Arid desert	Rock Valley site	perennial	subshrub	goldenheads	*Acamptopappus shockleyi*	0.40	excavation	yes	100												36.4675	-116.3576	671	The surface soils of the northern Mojave Desert are low in both large and fine roots.	Rock valley site is assumed unless there are indications of otherwise
Wallace et al., 1980	Mojave desert,	Arid desert	Frenchman Flat site	evergreen broad-leaf	shrub	creosote bush,	*Larrea tridentata*	0.50	excavation	yes	100												36.8108	-115.9669	945		This is another paper suggesting that rainfall penetration depth
Wallace et al., 1980	Mojave desert,	Arid desert	Mercury Valley site	evergreen broad-leaf	shrub	water-jacket,	*Lycium andersonii*	0.50	excavation	yes	100												236.6641	-116.0057	1141	Lycium andersonii roots were more uniformly distributed throughout the root	It grows from a large fibrous root system which can extend over 9
Wallace et al., 1980	Mojave desert,	Arid desert	Rock Valley site	evergreen broad-leaf	shrub	pale wolfberry,	*Lycium pallidum*	0.50	excavation	yes	100												36.4675	-116.3576	671		
Wallace et al., 1980	Mojave desert,	Arid desert	Rock Valley site	photosynthetic stems - no	shrub	Nevada ephedra	*Ephedra nevadensis*	0.50	excavation	yes	100												36.4675	-116.3576	671		male plants growing in dryer areas and female plants growing in
Wallace et al., 1980	Mojave desert,	Arid desert	Frenchman Flat site	drought-deciduous	shrub	burroweed, white	*Ambrosia dumosa*	0.50	excavation	yes	100												36.8108	-115.9669	945		
Wallace et al., 1980	Mojave desert,	Arid desert	Rock Valley site	drought-deciduous	shrub	range ratany,	*Krameria parvifolia*	0.40	excavation	yes	100												36.4675	-116.3576	671	Lower stems of K. parvifolia were usually covered with about 10 cm of blow sand	
Wallace et al., 1980	Mojave desert,	Arid desert	Rock Valley site	evergreen broad-leaf	shrub	chamiso, chamiza,	*Atriplex canescens*	0.60	excavation	yes	100												36.4675	-116.3576	671		
Wallace et al., 1980	Mojave desert,	Arid desert	Rock Valley site	evergreen broad-leaf	shrub	shadscale	*Atriplex confertifolia*	0.60	excavation	yes	100												36.4675	-116.3576	671		
Wang et al., 2016	N. Siberia, Russia	Tundra (tussock-		perennial	tussock-sedge		*Eriophorum vaginatum L / Salix*	0.34	soil coring	yes	196	76mm in summer		drained thermokarst				frost table	0.34				70.8244	147.4897	11		roothing depth restricked by frost table depth
Wang et al., 2016	N. Siberia, Russia	Tundra (tussock-		deciduous broad-leaf	drawf shrub		*Betula nana L. / Salix*	0.23	soil coring	yes	196	76mm in summer		drained thermokarst				frost table	0.23				70.8244	147.4897	11		roothing depth restricked by frost table depth
Watson & Tumbleson,	near New Plymouth,	subtropical moist forest	bare root plot (vs. direct sow	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	1.73	excavation	no		cool wet winters		NE-facing slope 15°			coarse sandy loam with						-39.1030	174.3002	120	one of the windiest regions in NZ...The characteristics of the soil appeared to	location moved from given lat-lon to a NE-facing slope at 120m
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	ornate lupine	*Lupinus ornatus*	3.35	excavation	photos	549	67% in winter		NW slope			fine silt-loam, can be very						46.8208	-117.1902	765	Twenty-four root-systems were examined. Several reached a depth of over 10 feet...	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	velvet lupine	*Lupinus leucophyllus*	1.65	excavation	photos	549	67% in winter		base of N-facing slope			fine silt-loam, can be very						46.8304	-117.2209	700	Only two species of lupines occur widely distributed on the high prairies of eastern	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	Palouse milkvetch	*Astragalus (Phaca)*	1.78	excavation	photos	549	67% in winter		on a southwest			fine silt-loam, can be very						46.7747	-117.1110	786	Six plants were examined on a southwest slope with an average root depth of 4 feet	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	bunch grass	Bluebunch Wheatgrass	*Agropyron spicatum*	1.46	excavation	photos	549	67% in winter		on rim rocks SW of			fine silt-loam, can be very			basalt with vertical			46.6262	-117.3208	619	the most common bunchgrass... The plant blossoms in June and dries out in early July.	Here is one case of grass roots penetrating deeply into fractures of
Weaver, 1915	near Pullman, SE	High Prairie		perennial	bunch grass		*Festuca ovina ingrata*	0.99	excavation	photos	549	67% in winter		on a southwest			fine silt-loam, can be very						46.6573	-117.2535	781	Festuca ovina has a great mass of jet black roots which occupy the soil thoroughly	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	bunch grass	Sandberg's Poa	*Poa sandbergii*	0.33	excavation	photos	549	67% in winter		on rim rocks SW of			fine silt-loam, can be very						46.6519	-117.3568	654	The creamy-white roots spread laterally 3 to 5 inches and occupy thoroughly the first	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	bunch grass	June grass	*Koeleria cristata*	0.71	excavation	photos	549	67% in winter		rim rock			fine silt-loam, can be very						46.6386	-117.3374	713	The roots resemble those of Agropyron but taper down faster, and have finer laterals	No location hints... The association with Agropyron and Poa suggests
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	arrowleaf balsamroot	*Balsamorhiza sagittata*	2.69	excavation	photos	549	67% in winter		on a northwest			fine silt-loam, can be very						46.7706	-117.3329	741	Twenty-five root-systems were excavated and examined. Balsamorhiza has a tap root	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	sticky purple geranium	*Geranium viscosissimum*	2.90	excavation	photos	549	67% in winter		bottom of a northwest			fine silt-loam, can be very						46.7557	-117.3260	721	Just as Balsamorhiza is characteristic of dry slopes, so Geranium is found most	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	mule-ears (black	*Wyethia amplexicaulis*	1.96	excavation	photos	549	67% in winter		on a northeast			fine silt-loam, can be very						46.7095	-117.2742	754	The black sunflower, at home in the moist meadows, also often occurs on rather dry	a wetland plant according to wiki
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	beautiful alumroot	*Heuchera glabella*	1.80	excavation	photos	549	67% in winter		moist rim-rock			fine silt-loam, can be very						46.5939	-117.2716	699	This plant, so characteristic of the rim-rock crevices especially on the more moist	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	bitter head	*Leptotaenia multifida*	1.70	excavation	photos	549	67% in winter		on a northeast			fine silt-loam, can be very						46.6271	-117.2489	782	Fourteen root-systems were examined, mainly incidentally while excavating other	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	Douglas' helianthella	*Helianthella douglasii*	1.65	excavation	photos	549	67% in winter		on a northeast			fine silt-loam, can be very						46.8042	-117.1128	798	They occur typically on dry hillsides... Helianthella has a tap root with a diameter	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb		*Hoorebekia (Aplopappus)*	3.35	excavation	photos	549	67% in winter		on a northwest			fine silt-loam, can be very						46.8440	-117.1852	766	Thirty-four plants were examined. The deepest roots reached 7 feet and 7 inches	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	western stoneseed	*Lithospermum ruderale*	1.91	excavation	photos	549	67% in winter		rim rock, northwest			fine silt-loam, can be very						46.7126	-117.3998	641	conspicuous objects in the bunchgrass association of the rim-rock as well as in the	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	Prairie-Smoke	*Sieversia ciliata*	1.68	excavation	photos	549	67% in winter		on a northeast			fine silt-loam, can be very						46.6665	-117.0912	792	This is a common, abundant, and cosmopolitan prairie species... Few roots of	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	Oregon checkerbloo	*Sidalcea oregana*	1.24	excavation	photos	549	67% in winter		north hillside near			fine silt-loam, can be very						46.7602	-117.1374	763	This mallow is confined to north hillsides and low ground...Only two root-systems	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	Scouler's woollyweed	*Hieracium scouleri*	2.36	excavation	photos	549	67% in winter		on a northwest			fine silt-loam, can be very						46.7564	-117.2079	757	Twenty-six root-systems were examined. They gave an average depth of 5 feet and	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb		*Potentilla blaschkeana*	2.26	excavation	photos	549	67% in winter		on a northwest			fine silt-loam, can be very						46.7714	-117.2894	720	This very common prairie plant occurs in all situations, but shows a decided preference	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	Parsnipflower	*Eriogonum heracleoides*	1.00	excavation	photos	549	67% in winter		south facing rim rock			fine silt-loam, can be very						46.6209	-117.2967	756	This plant seldom occurs except on the very driest ridges of high basaltic prairies,	this plant grows on high ridge tops with extensive lateral roots some
Weaver, 1915	near Pullman, SE	High Prairie		perennial	shrub / herb	Rosa nutkana /	*Rosa nutkana /*	2.44	excavation	photos	549	67% in winter		south facing slope			fine silt-loam, can be very						46.6773	-117.3108	782	Some examinations were also made of the roots of Rosa nutkana, and Symphoricarpos	Rosa nutkana is a sun-loving bush so a south facing slope is assumed
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	western blue	*Iris missouriensis*	1.17	excavation	photos	549	67% in winter		valley location			fine silt-loam, can be very						46.9099	-117.0549	746	Iris missouriensis roots penetrated the soils of dry hillsides to 3 feet and 10 inches...	Iris prefers wet meadows so a valley location is assumed
Weaver, 1915	near Pullman, SE	High Prairie		perennial	shrub	Creeping Barberry	*Berberis repens*	3.05	excavation	photos	549	67% in winter		rim rock			fine silt-loam, can be very						46.5888	-117.2617	775	Roots of Berberis repens penetrated the soils to a depth of over 10 feet. The orange-	
Weaver, 1915	near Pullman, SE	High Prairie		perennial	herb	Gray's biscuitroot,	*Lomatium grayi /*	1.52	excavation	photos	549	67% in winter		rim rock			fine silt-loam, can be very						46.6096	-117.2866	758	two species of Lomatium, L. grayi andL. macrocarpum, both abundant on thin soils,	
Weaver, 1915	near Pullman, SE	High Prairie		annual	herb	Wiry Knotweed	*Polygonum majus*	0.17	excavation	photos	549	67% in winter		rim rock			fine silt-loam, can be very						46.6707	-117.3789	674	Polygonum majus, growing with Poa on thin stony soil, has a shallow but well	an example of shallow but laterally extensive root system to help the
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	switchgrass	*Panicum virgatum*	2.74	excavation	drawings	711	510mm in growing					loess									it often holds the rank of a dominant species ... This grass has the longest root	This note pertains to the entire cummnity (Prairies of E. Nebraska).
Weaver, 1919	Prairies of E. Nebraska	prairie	near Lincoln	perennial	bunch grass	bluestem	*Andropogon furcatus*	2.08	excavation	drawings	711	510mm in growing					loess						40.8176	-96.6919	352	The very abundant roots grow both vertically and obliquely downward, a few	P18-24 gives detailed data and discussions on climate (P regimes),
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	little bluestem	*Andropogon scoparius*	0.71	excavation	drawings	711	510mm in growing					gravelly mixed with sand			fractured sandstone	0.91					Roots are so abundant as to form a dense sod, completely filling the soil to a depth of	soil properties (SY=0.25, wilting point=13.5), and soil moisture
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	little bluestem	*Andropogon scoparius*	1.65	excavation	drawings	711	510mm in growing					clay loam over clay									Roots are so abundant as to form a dense sod, completely filling the soil to a depth of	profiles in this community. .. It
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	glodstem	*Andropogon nutans*	1.50	excavation	drawings	711	510mm in growing					clay loam for 1.07m over pure									a dominant in the subclimax prairie... Like the other andropogons and Panicum	seems that the conditions are perfect for deep and extensive

Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	porcupine grass	*Stipa spartea*	0.66	excavation	drawings	711	510mm in growing					loess									one of the dominants in the prairies, being especially conspicuous during the month of	rooting: (1) 80% rain in growing season, (2) decent storms, deep penetration, (3) often >30days no rain, (4) deep loess soil with perfect K and cap rise. Author notes "**These findings of great root depths, which are correlated with**
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	June grass	*Koeleria cristata*	0.53	excavation	drawings	711	510mm in growing					loess									As in the case of Stipa spartea, which also makes a rapid growth and blossoms early,	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	Canada wild rye	*Elymus canadensis*	0.56	excavation	drawings	711	510mm in growing					loess									an important prairie species of wide distribution. Like Koeleria, it is	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	couch grass	*Agropyrum repen*	2.44	excavation	drawings	711	510mm in growing					loess									From the extensive rhizomes of this perennial, which are often 2 to 3 feet long,	
Weaver, 1919	Prairies of E. Nebraska	prairie	near Lincoln	perennial	bunch grass	seashore saltgrass.	*Distichlis spicata*	0.61	excavation	drawings	711	510mm in growing		alluvial flood-plain.		1.83	loess						40.8181	-96.7197	349	This low, direcious perennial of seacoasts and alkaline soils is still quite abundant on	salt tolant species... alkalinity related to poor drainage... salt
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass		*Sporobolus longifolius*	1.02	excavation	drawings	711	510mm in growing					loess									The rather coarse, fibrous roots penetrate the soil to an average maximum depth of	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	prairie threeawn	*Aristida oligantha*	1.02	excavation	drawings	711	510mm in growing					clay-loam									abundant on prairies, especially in drier soils. It frequently dominates areas where	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	bunch grass	buffalo grass	*Bulbilis dactyloide*	1.85	excavation	drawings	711	510mm in growing		bottom land		1.85	alluvial soil						40.9369	-96.5350	338	many roots occurred at 4.5 feet; and numerous others continued vertically	
Weaver, 1919	Prairies of E. Nebraska	prairie	near Lincoln	perennial	bunch grass	blue grama grass	*Bouteloua gracilis*	1.17	excavation	drawings	711	510mm in growing		a ridge at Belmont			porous coarse sandy - gravelly						40.8509	-96.7022	381	often in fairly pure stands on the lighter soils of gravelly ridges and it is also	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	dotted gayfeather,	*Liatris punctata*	4.80	excavation	drawings	711	510mm in growing					clay with sandy sub soil									Its xerophytic nature and its extensive range far into the drier regions westward	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	dotted gayfeather,	*Liatris punctata*	2.03	excavation	drawings	711	510mm in growing					clay loam with clay subsoil									while three growing in clay-loam with a clay subsoil penetrated only to a depth of	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	stiff goldenrod	*Solidago rigida*	1.52	excavation	drawings	711	510mm in growing					loess									its presence, together with certain other species. invariably indicates rather	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	Canada goldenrod	*Solidago canadensis*	3.35	excavation	drawings	711	510mm in growing					loess									propagates by means of strong woody rhizomes... the roots are fibrous... They	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	compass plant	*Silphium laciniatum*	4.17	excavation	drawings	711	510mm in growing					loess									It has a large, fleshy, deep tap-root...It pursues this general vertical direction to a	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	leadplant	*Amorpha canescens*	2.29	excavation	drawings	711	510mm in growing					loess									This perennial legume has a very extensive, woody root system which reaches depths	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	stiff sunflower	*Helianthus rigidus*	1.27	excavation	drawings	711	510mm in growing					loess									This sunflower, common on Nebraska prairies, propagates by strong rhizomes...	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	coneflower	*Brauneria pallida*	1.68	excavation	drawings	711	510mm in growing					loess									2 plants were exaniined. Both had strong, vertically descending tap-roots which	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	white prairie	*Petalostemon candidus*	1.73	excavation	drawings	711	510mm in growing					loess									Like Brauneria, it has a strong, deep, rather poorly branched tap-root... The larger was	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	Vernonia baldwinii	*Vernonia baldwinii*	3.51	excavation	drawings	711	510mm in growing					loess									propagates by strong rhizomes... The roots, which are very abundant (20 or 30 arising	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb		*Kuhnia glutinosa*	5.26	excavation	drawings	711	510mm in growing					loess									has deeper roots than most other species examined. The maximum depths of 4	Fig.3, p10, has a beautiful drawing showing denser roots in clay soils
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	Hoary verbena	*Verbena stricta*	1.22	excavation	drawings	711	510mm in growing					loess									weed, very common in old pastures, has a strong tap-root from 1 to 2 cm. in	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	curly-top gumweed,	*Grindelia squarrosa*	1.85	excavation	drawings	711	510mm in growing					loess									This weed has a strong tap-root abundantly supplied with well-developed laterals...	note plasticity
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	American Licorice	*Glycyrrhiza lepidota*	4.57	excavation	drawings	711	510mm in growing					loess									This characteristic legume has much-branche rhyzomes several feet long and a	
Weaver, 1919	Prairies of E. Nebraska	prairie	on a west hillside at	perennial	herb	ground plum	*Astragalus crassicarpus*	1.83	excavation	drawings	711	510mm in growing		on a west hillside, 45		2.13	1ft loam on 3ft exceedingly						40.8335	-96.7086	350	The surface ft of good loam soil gave way to about 3 ft of exceedingly hard joint clay,	near a wetland, roots follow clay joints, soils wetter and softer
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	Slimflower scurfpea	*Psoralea tenuiflora*	1.83	excavation	drawings	711	510mm in growing					loess									This very abundant legume forms societies over large areas of prairie during June...	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	Silverleaf indian	*Psoralea argophylla*	1.83	excavation	drawings	711	510mm in growing				1.83	loess									had a tap (with a diameter of 8 mm.) which tapered so rapidly that at 2 feet it was less	
Weaver, 1919	Prairies of E. Nebraska	prairie		perennial	herb	Longbract wild indigo	*Baptisia bracteata*	2.03	excavation	drawings	711	510mm in growing				2.03	loess									The main roots are poorly branched and there are scarcely any absorbing laterals in	water table noted as preventing roots from going deeper
Weaver, 1919	Subclimax Prairies, near	prairie-chaparral		perennial	bunch grass	bluestem	*Andropogon furcatus*	2.82	excavation	drawings	higher rainfall	rain mostly in growing		on crest of exposed SE			mellow loess						40.4628	-95.7508	341	Andropogon furcatus extends to the very crest of the ridge. Here the stems reach	More from Author: "near Peru, Nebraska, at a station about 60 miles southeast of Lincoln...As pointed out by Clements, this type of prairie, lying in a region of somewhat higher rainfall, is probably sub climax... thickets of Corylus, Rhus, and Symphoricarpos are very frequent in this grassland. It is not uncommon also to find seedlings of elm and oak near the
Weaver, 1919	Subclimax Prairies, near	prairie-chaparral		perennial	herb	coneflower	*Brauneria pallida*	2.44	excavation	drawings	higher rainfall	rain mostly in growing		near the hill top			mellow loess						40.4633	-95.7519	339	Two plants were examined. The smaller had a tap-root 5 mmn. in diameter and	
Weaver, 1919	Subclimax Prairies, near	prairie-chaparral		perennial	herb	Rush skeletonpla	*Lygodesmia juncea*	6.40	excavation	drawings	higher rainfall	rain mostly in growing		near the hill top			mellow loess						40.4599	-95.7481	337	This perennial stem-xerophyte is common in prairies throughout Nebraska and is	
Weaver, 1919	Subclimax Prairies, near	prairie-chaparral		perennial	herb	roundhead bushclover	*Lespedeza capitata*	2.39	excavation	drawings	higher rainfall	rain mostly in growing		near the foot of the			more adundance of						40.4618	-95.7529	331	It is very abundant on the lower slopes of the loess hill, where 6 or more plants were	
Weaver, 1919	Subclimax Prairies, near	prairie-chaparral		perennial	herb	leadplant	*Amorpha canescens*	3.91	excavation	drawings	higher rainfall	rain mostly in growing		near the foot of the			more adundance of						40.4606	-95.7516	331	7-year-old specimen, which is very representative of others examined, was	
Weaver, 1919	Subclimax Prairies, near	prairie-chaparral		deciduous	shrub	redroot	*Ceanothus ovatus*	4.42	excavation	drawings	higher rainfall	rain mostly in growing		near the foot of the			more adundance of						40.4605	-95.7521	328	low shrub, with its many stems 1.5 to 3 feet high...also occurs widely throughout	
Weaver, 1919	near Peru, E. Nebraska	chaparral	loess hills along	deciduous	shrub	snowberry	*Symphoricarpos vulgaris*	1.65	excavation	drawings	higher rainfall	rain mostly in growing					loess						40.4680	-95.7092	344	Growing in clumps to a height of only 2 to 4 feet, its shade is frequently so dense as to	Author: "the members of the chaparral community of the tension zone are all supplied with splendid absorbing systems, which are somewhat variable as to depth, but all of which are deep-seated. In addition, all have excellent methods of vegetative propagation... The role played by
Weaver, 1919	near Peru, E. Nebraska	chaparral	loess hills along	deciduous	mediem to large shrub	smooth sumac	*Rhus glabra*	2.29	excavation	drawings	higher rainfall	rain mostly in growing					loess						40.4672	-95.7081	347	Practically all herbaceous species had disappeared except Poa pratensis... the soil	
Weaver, 1919	near Peru, E. Nebraska	chaparral	loess hills along	deciduous	mediem to large shrub	American hazelnut	*Corylus americana*	3.51	excavation	drawings	higher rainfall	rain mostly in growing		flat hilltop			loess						40.4660	-95.7067	349	spreads by means of large woody underground parts... These run at a	
Weaver, 1919	near Peru, E. Nebraska	chaparral	loess hills along	deciduous	woody vine	frost grape	*Vitis vulpina*	4.11	excavation	drawings	higher rainfall	rain mostly in growing					loess						40.4680	-95.7079	352	In the Corylus thicket, roots of grape were traced to depths of 13 feet 3 inches and 13	
Weaver, 1919	near Peru, E. Nebraska	chaparral	loess hills along	deciduous	shrub	Prairie Rose	*Rosa arkansana*	6.45	excavation	drawings	higher rainfall	rain mostly in growing		midway up a southeast			loess, more compact below						40.4862	-95.7377	316	widely distributed throughout the scrub and prairie areas... propagates by	
Weaver, 1919	near Colorado Springs,	shortgrass prairie	25 miles southeast of	perennial	C4 short grass	Blue grama grass	*Bouteloua gracilis*	1.22	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.6085	-104.4400	1644	well-known and important grass is a dominant over the plains... The soil is well	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	bunch grass	purple three awn	*Aristida purpurea*	1.30	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.5947	-104.4395	1630	The surface of the soil below the clump is completely filled with these cord-like roots	"Fissures occur in the soil, extending to a depth of 2 or 3 feet.
Weaver, 1919	near Colorado Springs,	shortgrass prairie	25 miles southeast of	perennial	short grass		*Muhlenbergia gracillima*	1.40	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.5948	-104.4253	1630	run in all directions... abundantly supplied with short, much rebranched laterals	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	half shrub	broom snakeweed	*Gutierrezia sarothrae*	1.98	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.6020	-104.4236	1636	half-shrub occurs throughout the plains region... a strong tap-root... 5 to 9 large	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	Slimflower scurfpea	*Psoralea tenuiflora*	3.71	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.6079	-104.4439	1636	one of the important legumes throughout the plains... all had strong tap-roots...	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	small shrub	fringed sagebrush,	*Artemisia frigida*	2.36	excavation	drawings	381	rain mostly in growing		Near the mountains.			very compact and hard, light-						38.6673	-104.5036	1710	Mountain sage is a competitor of the plains grasses... Near the mountains, in rocky or	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	prickly poppy	*Argemone platyceras*	3.66	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.6536	-104.4168	1678	wild poppy... it is more abundant in disturbed areas, often becoming ruderal...	Is it possible that the water table is not far below 12ft?
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	evergreen, herb	soapweed yucca	*Yucca glauca*	2.13	excavation	drawings	381	rain mostly in growing		dry, sandy, rocky slopes			very compact and hard, light-						38.6774	-104.5031	1728	widely distributed species, being especially abundant on dry, sandy, rocky slopes...	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	grass	Wheat grass	*Agropyron glaucum*	2.13	excavation	drawings	381	rain mostly in growing		in low ground near			very compact and hard, light-						38.6729	-104.4924	1710	If at all abundant, is an indicator of favorable deep soil-moisture conditions...	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	sedge	Pennsylvania sedge	*Carex pennsylvanic*	0.91	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.5542	-104.6290	1597	The tufts are connected by coarse rhizomes, 2 to 10 inches long, at a depth of	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	bunch grass	Little Bluestem	*Andropogon scoparius*	1.82	excavation	drawings	381	rain mostly in growing		rough topography			very compact and hard, light-						38.5319	-104.6080	1606	often confined to slopes with a rough topography and greater water penetration	This note pertains to the entire cummnity - the Plains plants, or shortgrass prairie near Colorado Springs. Key features are (1) annual rainfall = 15", much drier than the tallgrass Prairies in E. Nebraska (16"), (2) most of the rain falls in the growing season, (3) compact and hard soil facvors high surface runoff and shallow rain penetration, (4) a profusion of shallow absorbing roots that capture the summer showers. (5)
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	grass	Needle and thread grass	*Stipa comata*	1.52	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.8197	-104.5594	1957	Beginning at the very surface of the soil, the main roots are clothed with relatively	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	narrowleaf stoneseed	*Lithospermum*	3.03	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.8157	-104.5607	1957	tap divide to two, and again, and again, one of these branches again branched and	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	Rush skeletonpla	*Lygodesmia juncea*	1.73	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.8231	-104.5650	1954	interesting because of its xeroid-shoot habit... Each had a tap-root about 7mm. in	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb		*Aragallus lambertii*	2.44	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.8181	-104.5662	1943	characteristic of most legumes, Aragallus has a strong tap-root. At the top this was 9	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	Purple Prairie	*Petalostemon purpureus*	1.98	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.8248	-104.5655	1961	Their presence in the plains association is indicative of at least fairly good soil-	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	white prairie	*Petalostemon candidus*	1.68	excavation	drawings	381	rain mostly in growing					very compact and hard, light-						38.8254	-104.5646	1964	A group of more than 8 stems, all in blossom, arose from a woody tap-root 17	

Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	James' buckwheat	*Eriogonum jamesii*	3.66	excavation	drawings	381	rain mostly in growing				very compact and hard, light-						38.8234	-104.5621	1958	the thick woody root, 3 cm. in diameter, gave rise to a large number of prostrate	capture the summer showers, (5) fewer plants penetrate to >5" but some do reach 12', and (6) deep moist sand layers are reported in some places - is it possible that the water table is the cause?
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	upright prairie	*Ratibida columnaris*	0.64	excavation	drawings	381	rain mostly in growing				very compact and hard, light-						38.8267	-104.5680	1957	a strong tap-root… The first 4 or 5 inches is marked by an extraordinary number of	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	golden ragwort	*Senecio aureus*	0.94	excavation	drawings	381	rain mostly in growing				very compact and hard, light-						38.8272	-104.5654	1964	The multiple roots are so finely divided as to be almost fibrous. The number	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	herb	dwarf milkweed	*Asclepias verticillata*	1.21	excavation	drawings	381	rain mostly in growing				very compact and hard, light-						38.8282	-104.5710	1964	generally distributed throughout the hard lands of the plains… stems are connected	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	cactus	tulip prickly pear	*Opuntia camanchica*	0.89	excavation	drawings	381	rain mostly in growing				very compact and hard, light-						38.8017	-104.5798	1887	As is characteristic of the cacti in general, the root system consists of two distinct	
Weaver, 1919	near Colorado Springs,	shortgrass prairie		perennial	cactus	brittle prickly pear	*Opuntia fragilis*	0.38	excavation	drawings	381	rain mostly in growing				very compact and hard, light-						38.8021	-104.5786	1898	This cactus has a distinctively shallow root system. On all sides roots extended out	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	grass	blowout grass	*Redfieldia flexuosa*	1.42	excavation	drawings	381	rain mostly in growing				dune sand						38.5085	-104.4174	1560	at home in the sandhills… most abundant and controlling species of blowout	this pertains to the Sandhills community north of Puebalo. USDA soil texture map is used to locate the area of sandy-loam 40mi SE of Colorado Springs; A photo in the area on Google Earth show sand dunes with sparse vegetation.
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	grass	prairie sandreed	*Calamovilfa longifolia*	1.52	excavation	drawings	381	rain mostly in growing		on a small dune		dune sand						38.5037	-104.4101	1556	The sand-reed is also an efficient sand-binder… forms a veritable mat of roots and	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	bunch grass	sand bluestem,	*Andropogon hallii*	0.69	excavation	drawings	381	rain mostly in growing		on a partially		dune sand						38.5025	-104.4106	1555	Successionally it occurs somewhat later than the preceding sandhill grasses…	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	bunch grass	Sandhill muhly,	*Muhlenbergia pungens*	0.84	excavation	drawings	381	rain mostly in growing				dune sand						38.5029	-104.4112	1556	Clusters of roots arise from short rootstocks… While some of the wirelike	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	bunch grass	sand dropseed	*Sporobolus cryptandrus*	0.56	excavation	drawings	381	rain mostly in growing		on a half-captured		dune sand						38.5025	-104.4093	1555	characterized by an extremely fine fibrous root system… On a single rhizome 40 of	this pertains to the Sandhills community: Author notes: As soon as the storm passes, evaporation dries out the surface sand with great rapidity, but to a slight depth only. This surface layer of dry sand
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	shrub	slender buckwheat	*Eriogonum microthecum*	3.66	excavation	drawings	381	rain mostly in growing				dune sand						38.5042	-104.4114	1557	has a multicipital stem, which at a depth of 4 to 8 inches merges into a strong tap-root	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	shrub	sand sagebrush,	*Artemisia filifolia*	3.35	excavation	drawings	381	rain mostly in growing		a stabilized area near		dune sand						38.5041	-104.4121	1557	one of the most conspicuous plant… It is indicative of a light type of soil with	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	herb	Virginia spiderwort	*Tradescantia virginiana*	0.48	excavation	drawings	381	rain mostly in growing		on a partially		dune sand						38.5068	-104.4079	1558	a rather fleshy root system. As many as 18 of these fleshy roots were found arising	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	annual	herb	Phlox heliotrope	*Heliotropium convolvulace*	0.64	excavation	drawings	381	rain mostly in growing		on rims of blowouts		dune sand						38.5052	-104.4059	1556	characterized by a small tap-root, seldom over 2 or 3 mm. in diameter, which	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	herb		*Petalostemon villosus*	1.52	excavation	drawings	381	rain mostly in growing		blowouts		dune sand						38.5017	-104.4082	1554	a pioneer in the blowouts… all had strong tap-roots, about 1 cm. in diameter, a much-	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	annual	herb	white-flowered	*Gilia longiflora*	1.27	excavation	drawings	381	rain mostly in growing		on a well-covered		dune sand						38.5039	-104.4144	1557	started with a strong tap-root, penetrates almost vertically downward, tapering	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	annual	herb		*Euphorbia petaloidea*	0.686	excavation	drawings	381	rain mostly in growing				dune sand						38.5030	-104.4134	1556	a sandhill pioneer… root system begins with a strong, smooth taproot… penetrates	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	perennial	herb	lemon scurfpea,	*Psoralea lanceolata*	3.05	excavation	drawings	381	rain mostly in growing				dune sand						38.5039	-104.4116	1556	Its underground parts eminently fit it to succeed in a habitat where the ground-line	
Weaver, 1919	Near Pueblo, Colorado	Sandhills Subclimax	40mi SE Colorado	annual	herb	bush morning	*Ipomoea leptophylla*	3.05	excavation	drawings	381	rain mostly in growing				dune sand						38.5039	-104.4101	1556	a common plant in the sandhills… The multicipital stem arose from strong tap-	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	Virgate mountain	*Krynitzkia virgata*	0.76	excavation	drawings	254mm Jun-Aug	frequent summer		steep gravel slope (30^0)		gravel			decomposed granite			38.8437	-104.9510	2610	a principal species of the gravel-slide community… a tap-root 4 to 9 mm. in	water storing root
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	James' nailwort	*Paronychia jamesii*	0.76	excavation	drawings	254mm Jun-Aug	frequent summer		steep gravel slope (30^0)		gravel			decomposed granite			38.8434	-104.9511	2607	a tap-root about 5 mm. in diameter… breaks up into several larger laterals,	this pertains to the gravel-slide community: at an altitude of about 8,000 feet in the Pike's Peak region of the Rocky Mountains… a shallow, widely spreading root system confined largely to the first 18"… The lack of depth is compensated by a remarkably wide lateral extent combined with a profound system of branching… The gravel-slide soils consist of a superficial layer of coarse angular rock fragments varying in size from over an inch to a few milimeters in diameter. Except during rains this surface layer is very dry. The slope
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	Stemless indian	*Aletes acaulis*	0.76	excavation	drawings	254mm Jun-Aug	frequent summer		on gravelly slope		gravel			decomposed granite			38.8439	-104.9511	2599	more abundant and conspicuous than all	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	Fly-trap dogbane,	*Apocynum androsremifol*	1.22	excavation	drawings	254mm Jun-Aug	frequent summer		steep gravel slope (45^0)		gravel			decomposed granite			38.8442	-104.9524	2540	often forming families… The vertical portions arising from the horizontal	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	star-flowered (or	*Smilacina stellata*	1.12	excavation	drawings	254mm Jun-Aug	frequent summer		steep gravel slopes		gravel			decomposed granite			38.8437	-104.9525	2543	Stout stems arise at intervals from the stout horizontal rhizomes, some at depth	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb		*Pachylophus caespitosus*	1.14	excavation	drawings	254mm Jun-Aug	frequent summer		steep gravel slope (45^0)		gravel			decomposed granite			38.8434	-104.9526	2545	connected by rhizomes… from which arise roots none reach a depth greater than 45	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	Alpine Pennycress,	*Thlaspi alpestre*	0.38	excavation	drawings	254mm Jun-Aug	frequent summer		steep gravel slope (45^0)		gravel			decomposed granite			38.8433	-104.9510	2618	abundant but rather inconspicuous, being low… tap root branches below 2" in	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	Adonis blazingstar	*Mentzelia multiflora*	0.56	excavation	drawings	254mm Jun-Aug	frequent summer		on gravelly slope		gravel			decomposed granite			38.8438	-104.9515	2584	a dominant, tap roots penetrate 2.5" before sending out large laterals, shallow,	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 8000ft	perennial	herb	alpine golden	*Eriogonum flavum*	0.99	excavation	drawings	254mm Jun-Aug	frequent summer		steep gravel slope (30^0)		gravel			decomposed granite			38.8436	-104.9522	2556	a strong woody tap-root, tapered within a length of 6 inches to only 3 mm. here it	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	grass	creeping wild rye,	*Elymus triticoides*	1.17	excavation	drawings	254mm Jun-Aug	frequent summer				coarse, rocky soil, more			decomposed granite			38.8537	-104.9363	2100	The roots were densely matted… soil to a depth of 15 or 18 inches was completely	This pertains to the entire Half Graval-slide community: The soils of the half-gravel-slide are much more favorable for plant growth, although from one-third to one-half of the surface may still be unoccupied… Although there is considerable variation, the rock is decayed to a greater depth, due undoubtedly in part to the excretions of plant roots and the resultant porosity of the soil, and to the above statement points to plants as a biologic force in
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	herb	Mountain Goldenrod	*Solidago oreophila*	0.97	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8533	-104.9369	2102	clusters of stems connected by short rhizomes, thus forming a clump… From the	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	deciduous	shrub	boulder raspberry,	*Rubus deliciosus*	0.91	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8540	-104.9382	2168	it forms the transition stage to for… a tap-root 15 mm. ill diameter… large laterals…	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	herb	White river coraldrops	*Besseya plantaginea*	0.76	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8540	-104.9368	2134	base of the plant and rhizomes are densely covered with fleshy roots about 2 mm. in	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	herb	purple cluster	*Geranium caespitosum*	0.94	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8553	-104.9366	2169	none of the branches reaching depths of more than 37 inches… root habit of	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	grass	purple reedgrass,	*Calamagrostis*	0.81	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8538	-104.9377	2145	From the base of the clumps almost countless numbers of rather tough fibrous	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	grass	prairie Junegrass	*Koeleria cristata*	0.41	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8553	-104.9374	2174	an extremely fibrous root system… At a depth of 1 to 4 inches many of these run	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	herb	scarlet gilia, scarlet	*Gilia aggregata*	0.71	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8569	-104.9366	2139	large tap-root… The laterals are mostly wide-spreading… Like most plants of this	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	herb		*Potentilla arguta*	1.37	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8570	-104.9378	2175	The complexity of the rootstocks is such that they are hard to describe… clumps are	Data for the forest community is not recorded because only the understory herbaceous plants are sampled which likely have shallow roots than the trees and do not represent the seasonally active
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	herb	monument plant,	*Frasera speciosa*	0.76	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8527	-104.9382	2115	a strong, rather fleshy, glistening white tap-root… to a depth of 9 inches, where it	
Weaver, 1919	near Pike's Peak,	Half Gravel-slide	Pike's Peak area, 7000ft	perennial	herb	Smooth white aster	*Aster porteri*	0.76	excavation	drawings	254mm Jun-Aug	frequent summer				gravel, sand, more humus			decomposed granite			38.8553	-104.9361	2154	stem clusters connected by short rhizomes… base of the stems arise a	
Weaver, 1919	near Pike's Peak,	Forest community	Pike's Peak area, 7000ft	perennial	herb	star-flowered (or	*Smilacina stellata*	0.56	excavation	drawings	254mm Jun-Aug	frequent summer		in a spruce-fir forest	1.07	0.5" humus on humus-sand on			decomposed granite			38.8573	-104.9269	1969	fewer and shorter roots compared to	comparisons were made among same species but different habitats (ecads); the first 2 are included here which involves the water table
Weaver, 1919	near Pike's Peak,	Forest community	Pike's Peak area, 7000ft	perennial	herb	fireweed	*Chamrenerium*	0.46	excavation	drawings	254mm Jun-Aug	frequent summer		foot of a slope near a	1.37	1-2"humus on rich black			decomposed granite			38.8575	-104.9216	1966	Gravel-slide; mush shallower roots than in Gravel-slide; large laterals run parallel to surface at 1.5ft	
Weaver, 1919	near Pike's Peak,	Gravel-slide community	Pike's Peak area, 7000ft	perennial	herb	fireweed	*Chamrenerium*	1.22	excavation	drawings	254mm Jun-Aug	frequent summer		on a steep slide		gravel			decomposed granite			38.8400	-104.9495	2706	A comparison of the two root systems emphasized the paucity of small laterals in	This gravel slide speciman is decribed in Fig.51, under Ecad
Weaver & Cramer, 1932	E. Nebraska	Riparian corridor	along Weeping	deciduous	broad-leaf	tree	bur oak	*Quercus macrocarpa*	4.57	excavation	photos	838	80% in growing		river terrace		Carrington silt loam						40.8866	-96.2058	343	Although the root habits of a tree are governed, first of all, by the hereditary	
Wei et al., 2013	Inner Mongolia, NE	dry steppe	Naiman Research	evergreen	needle-leaf	tree	Mongolian pine	*Pinus sylvestris var.*	4.70	soil sample +	no	366	90% in May-Sept	1935	dune top	4.7 - 5.7	5.2	sandy						42.9226	120.7198	361	18O isotope composition of the xylem water exhibited little seasonality,	rooting depth inferred from xylem isotope, which is similar to GW
Wei et al., 2013	Inner Mongolia, NE	dry steppe	Naiman Research	evergreen	needle-leaf	tree	Mongolian pine	*Pinus sylvestris var.*	2.70	soil sample +	no	366	90% in May-Sept	1935	dune valley	2.7 - 3.7	3.2	sandy, with more silt and						42.9271	120.7096	358	there was not much difference in water sources used by the pine trees grown at	water table declined after 2000 due to pumping (and pine diaback
Werner & Murphy, 2001	N. Northern Territory,	tropical dry forest		evergreen	broad-leaf	tree	Darwin	*Eucalyptus tetrodonta, E.*	0.70	excavation	no	1400	95% in Oct-Apr					gravely-sandy, underlain by	ferricrete	0.6				-12.6784	132.4786	15	Gross morphology of roots was bimorphic, with 70% of biomass at <20-cm soil depth,	location gussed to be near a facility because of use of backhole for the
Westman & Rogers, 1977	North Stradbroke	subtropical eucalypt		evergreen	broad-leaf	tree	Broad-leaved	*Eucalyptus umbra*	10.00	soil pit + samples	no	1650		1522	lies on a dune			tan-colored sands of ~40k	iron pan					-27.4988	153.4976	100	Below the coffee-rock B2b layer (1.5m) virtually only tap roots and sinker roots are	roots penetrating iron pan. "in a Eucalyptus sigana dominated
White & Wood, 1958	Upper Hudson	temperate broadleaf		evergreeen	needle-leaf	tree	red pine	*Pinus resinosa*	2.74	excavation of deep	no				river terrace on glacial			coarse sandy, excessively				sandstone		plantation	43.5285	-73.8133	355	Differences in growth were found to be closely related to a deep-lying silty fine	No lat-lon give. Pack forest and river terrace found on GoogleEarth;
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	evergreen	broad-leaf	subshrub (w. stolons)	twinflower	*Linnaea borealis L.*	> 0.03 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	rhizome primarily in the organic layer	All species studied here are the undergrowth in a jack pine forest after burn; all rooting depths recorded here are depths of the reproductive rhizomes from which new shoots arise, not the
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	perennial		grass (rhizomatous)	Houghton's sedge	*Carex houghtonii*	> 0.07 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	For each of the fifteen plant species examined, ten underground rooting	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	evergreen	broad-leaf	shrub (long rhizomes)	eastern teaberry,	*Gaultheria procumbens L*	> 0.08 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	systems were manually exposed from the forest floor using hand tools. Each plant system was excavated up to distance of 5 m horizontally from the original plant and	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	perennial		herb (rhizomatous)	Canadian may-lily,	*Maianthemum canadense*	> 0.10 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220		The reported mean depth + the 1 std given is used here (87% for all cases of rhizome in the mineral soil, depth in the mineral soil is given, which is added with 5cm, the mean depth of the
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	deciduous	broad-leaf	shrub (clonal)	shadbush, shadwood	*Amelanchier sp.*	> 0.3 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	All other vegetatively reproducing species examined, with the exception of Rubus	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	perennial		forb (rapid spreading by	fly-trap dogbane or	*Apocynum androsaemifo*	> 0.3 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220		

Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	deciduous broad-leaf	shrub (suckering)	sweetfern, sweet-fern	*Comptonia peregrina L.*	> 0.3 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	alleghaniensis Porter, had rhizomes buried deeper than 25 cm into mineral soil.	organic layer obtained from the 3
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	evergreen broad-leaf	shrub (rhizomes)	sheep laurel,	*Kalmia angustifolia*	> 0.3 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220		
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	evergreen scale-leaf	forb (creeping)	groundcedar, running	*Lycopodium cornplanatur*	> 0.11 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	Lycopodium cornplanaturn, Lycopodium obscurum and Pteridiurn aquilinum were predominately rooted within the mineral soil at depths less than 10 cm	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	evergreen scale-leaf	forb (creeping rhizomes)	rare clubmoss,	*Lycopodium obscurum L.*	> 0.12 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220		
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	deciduous broad-leaf	shrub (clonal)	sand cherry	*Prunus pumila L.*	> 0.3 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	rhizome primarily in the mineral soils	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	perennial	forb (rhizomatous)	bracken fern, eagle	*Pteridium aquilinum L.*	> 0.17 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	Lycopodium cornplanaturn, Lycopodium obscurum and Pteridiurn aquilinum were	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	deciduous broad-leaf	shrub (clonal)	lowbush blueberry	*Vaccinium angustifolium*	> 0.3 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	rhizome primarily in the mineral soils	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	deciduous broad-leaf	shrub (clonal)	common blueberry,	*Vaccinium myrtilloides*	> 0.3 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	rhizome primarily in the mineral soils	
Whittle et al., 1998	eastern Ontario,	Boreal forest	a Jack Pine ecosystem	deciduous broad-leaf	shrub (clonal)	Allegheny blackberry,	*Rubus allegheniensi*	> 0.4 (rhizome)	excavation	no				flat, near a lake			humo-ferric podzol in fine						46.0000	-77.5500	220	Rubus ullegheniensis (reproductive roots) had no discrete area of burial and were	
Wittmann & Parolin, 2005	Central Amazon, near	Tropical floodplain	Lower Varzea site (I, II)	evergreen broad-leaf	tree		*Buchenavia and*	1.00	fallen	no	3000	no strong dry season		lower Varzea,			sandy clay (clay 55-88%)						-2.8574	-64.9106	39	In fallen individuals of Buchenavia and Symmeria, we observed that primary and	This study focuses on above-ground roots, so little info given for below-
Wright et al., 1992	Barro Colorado	tropical moist forest	not irrigated	evergreen broad-leaf	shrub		*Psychotria chagrensis*	0.51	excavation	no	2600	Dec-Apr (84mm)											9.1905	-79.8502	52	Root systems were excavated for three large individuals of each species taking	rooting depthis mean of 3 large individuals
Wright et al., 1992	Barro Colorado	tropical moist forest	not irrigated	evergreen broad-leaf	shrub		*Psychotria horizontalis*	0.33	excavation	no	2600	Dec-Apr (84mm)											9.1905	-79.8502	52		location gussed, on mainland to the north of BCI, near a clearing (for
Wright et al., 1992	Barro Colorado	tropical moist forest	not irrigated	evergreen broad-leaf	shrub		*Psychotria limonensis*	0.92	excavation	no	2600	Dec-Apr (84mm)											9.1905	-79.8502	52	P. limonensis was buffered against drought by the lowest dry-season conductances and	
Wright et al., 1992	Barro Colorado	tropical moist forest	not irrigated	evergreen broad-leaf	shrub		*Psychotria marginata*	0.38	excavation	no	2600	Dec-Apr (84mm)											9.1905	-79.8502	52		
Wright et al., 1992	Barro Colorado	tropical moist forest	not irrigated	evergreen broad-leaf	shrub		*Psychotria furcata*	0.29	excavation	no	2600	Dec-Apr (84mm)											9.1905	-79.8502	52		
van Wyk, 1963	Natal, E. South Africa	subtropical dry forest	Lowveld, Lululand	evergreen broad-leaf	tree	sycamore fig	*Ficus sycomorus /*	24.38	deep well bores	no	600						Redis - Brown sandy soils						-27.8037	32.0492	200	In Zululand the roots of certain Lowveld trees, e.g. Ficussycomorus, Acacia robusta	The caption says: "PLATE IX.-Fishing roots from a bore-hole equipped
van Wyk, 1963	Natal, E. South Africa	subtropical dry forest	Northern Natal	evergreen broad-leaf	tree	Mugga, Red Ironbark or	*Eucalyptus sideroxylon*	27.43	deep well bores	no	900			flat land			soils are poor, shallow and						-27.3033	31.3193	864	At least four cases have been encountered in Northern Natal where the roots of	Fig. 1 is used to locate a cluster of bore holes in the norhtern most
Xu & Li, 2008	southern periphery	xeric shrubland	sandy soil site at edge of	deciduous broad-leaf	small tree	saxaul, black saxaul	*Haloxylon ammodendro*	10.00	excavation	yes	160	evenly distributed		edge of sand dune			sandy (85% sand)						44.3747	88.0141	470	The most contrasting feature of the root distributions for the two sites was that in	the locations are 7km apart with mean elevation 475m as indicated
Xu & Li, 2008	southern periphery	xeric shrubland	heavy soil site on alluvial	deciduous broad-leaf	small tree	saxaul, black saxaul	*Haloxylon ammodendro*	3.00	excavation	yes	160	evenly distributed		om fluvial plain to S			heavier (23% sand)						44.3188	88.0251	480	sandy soil, roots penetrated 10m below the soil surface; but at the heavy site, they only	
Xu et al., 2011	western Sichuan	subalpine coniferous		evergreen needle-leaf	tree, overstory	Farges' fir	*Abies faxoniana*	1.40	20cm soil blocks to	yes	884	81% in Jul-Sep	772	north facing slope		1.5							30.9451	103.0777	2849	the deep-rooted A. faxoniana has abilities to take advantage of deep water sources	No soil information is given; not certain if reported ET is PET; sampling stopped at 80cm, but the profiles suggest deeper roots for all 3 species (Fig.5)
Xu et al., 2011	western Sichuan	subalpine coniferous		deciduous broad-leaf	tree, midstory	Himalayan birch	*Betula utilis*	1.00	20cm soil blocks to	yes	884	81% in Jul-Sep	772	north facing slope		1.5							30.9451	103.0777	2849	B. utilis and B. fangiana were shallow rooted with 84 and 91% of their fine roots	
Xu et al., 2011	western Sichuan	subalpine coniferous		perennial	grass, understory	Wind Break Bamboo	*Bashania fangiana*	1.00	20cm soil blocks to	yes	884	81% in Jul-Sep	772	north facing slope		1.5							30.9451	103.0777	2849	in the upper soil layers (0-40 cm and litter layer), where 40% or more of soil water	
Yeager, 1935	North Dakota	Prairie	Agricultural experiment	deciduous broad-leaf	tree	Hibernal apple	*Malus sylvestris*	3.12	trench wall	yes + drawings	567					> 4.5	Fargo clay, calcareous,						46.8729	-96.7879	270	Most of the studies here recorded were made on the grounds of the North Dakota	Since site locations are poorly described, it is difficult to locate the
Yeatman, 1955	England and Scotland	plantation on upland	Wykehan, hand	deciduous needle-leaf	tree	Japanese larch	*Larix kaempferi*	1.52	excavation	no	699						strongly developed					plantation	54.2859	-0.5656	218	Japanese larch has a somewhat similar root system to spruce, but tends to form a short	only data on sites without soil disturbance (shallow and deep ploughing, drainage) are recorded; near the town Hykehan, in a place that looks like experimental tree lots
Yeatman, 1955	England and Scotland	plantation on upland	Wykehan, hand	evergreen needle-leaf	tree	Scots pine	*Pinus sylvestris*	0.98	excavation	no	699						strongly developed					plantation	54.2864	-0.5394	207	The pines (Scots, Corsican, and lodgepole) typically have pronounced carrot-like tap	
Yeatman, 1955	England and Scotland	plantation on upland	Wykehan, hand	evergreen needle-leaf	tree	lodgepole pine	*Pinus contorta*	0.89	excavation	no	699						strongly developed					plantation	54.2881	-0.5286	195	roots with may reain their identity to some depth, although they commonly divide into	
Yeatman, 1955	England and Scotland	plantation on upland	Wykehan, hand	evergreen needle-leaf	tree	Corsican pine	*Pinus nigra*	0.81	excavation	no	699						strongly developed					plantation	54.2818	-0.5239	178	two or more descending roots.The lateral	
Yeatman, 1955	England and Scotland	plantation on upland	Findlay's Seat, hand	evergreen needle-leaf	tree	Scots pine	*Pinus sylvestris*	0.08	excavation	no	826						peaty gley podzols with					plantation	57.5855	-3.1798	151	roots are seldomly confined to the surface, but normally expend within several inches	near Findlay's seat, in a tree experiment lot near a pond
Yeatman, 1955	England and Scotland	plantation on upland	Drumfergue, hand	deciduous needle-leaf	tree	Japanese larch	*Larix kaempferi*	0.56	excavation	no	889						podzolized silty loam frin slate					plantation	57.3733	-2.8596	283		near the town of Clashindarroch, on neat tree lots
Yeatman, 1955	England and Scotland	plantation on upland	Drumfergue, hand	evergreen needle-leaf	tree	Sitka spruce	*Picea sitchensis*	0.08	excavation	no	889						podzolized silty loam frin slate					plantation	57.3767	-2.8333	230	Sitka spruce develops near-surface lateral roots, which form the principle support of	
Yuen et al., 2013	Chiang Mai, Tailand	tropical rain forest		evergreen broad-leaf	tree		*secondary evergreen*	2.00	soil coring and pits	yes												secondary forest	18.9000	98.8000	1032	a demonstration study at the Pong Khrai Royal Forest Department Research station,	insufficient info to separate the 4 types of forest so only the deepest
Zerihun & Montagu,	Newnes Plateau, New	sub-tropical dry forest	control plot (not P	evergreen needle-leaf	tree	Monterey pine	*Pinus radiata*	1.25	coring and excavation	yes	860	20% in winter		lower slope			sandy-clay, highly					plantation	-33.3678	150.2426	1063	Prior to the establishment of the trial, the site supported native vegetation	exact location determined on GoogleEarth in a plantation amist
Zerihun et al., 2006	Queens Land, NE Australia		Oakvale, open woodland	evergreen broad-leaf	tree	Poplar box, Bimble box	*Eucalyptus populnea*	5.00	excavation	yes	367		2146				red loamy A, light-medium	"hardpan"	0.75-0.8				-30.9200	146.5000	171	2 steps for coarse and fine roots (1) for each of the ten sample trees from each site, their coarse roots were fully excavated, cleaned, and size-classed (15–30, 30–50, 50–100, more than 100 mm diameter), then 40 soil core samples (to 1	the most detailed study of roots along MAP gradient, same species; site moved from given lat-lon to be in an open woodland as described
Zerihun et al., 2006	Queens Land, NE Australia		Roma, open woodland	evergreen broad-leaf	tree	Poplar box, Bimble box	*Eucalyptus populnea, E.*	1.20	excavation	yes	602		1955				uniform medium loam or						-25.7478	148.4087	440		
Zerihun et al., 2006	Queens Land, NE Australia		Rockhampton, open	evergreen broad-leaf	tree	Poplar box, Bimble box	*Eucalyptus populnea, E.*	1.60	excavation	yes	1103		1925				sand to clay loam on yellow						-23.1726	150.5648	29		site moved from given lat-lon to be in an open woodland as described
Zhang et al., 1999	Reading, England	temporate broad-leaf	Sonning Farm of Reading	deciduous broad-leaf	tree	hybrid poplar	*Populus trichocarpa*	1.25	soil coring to 1.5m	no				floodplain of the River	1.2 - 1.3	1.25	sandy loam					experimental farm	51.4628	-0.9328	35	The seasonal pattern of tree water loss followed potential evaporation with a peak	site moved off street to a row of trees; rooting profile not given
Zhang et al., 2014	Gansu Province, C.	dry steppe	University	deciduous broad-leaf	tree	black locust	*Robinia pseudoacacia*	1.00	excavation	yes	534	80% in May-Oct		on steep slopes (19°)			loess with low porosity					plantation	34.6283	105.6745	1444	Generally, most roots of black locust and Chinese pine were found in the soil layer of	
Zhang et al., 2014	Gansu Province, C.	dry steppe	University	evergreen needle-leaf	tree	Chinese pine	*Pinus tabulaeformi*	1.00	excavation	yes	534	80% in May-Oct		on steep slopes (19°)			loess with low porosity					plantation	34.6295	105.6755	1480	0–100 cm (Liu et al., 2007). Thus, the depth of root excavation in our study also	
Zhaparova, 1996	Ugham (Tianshan)	dry steppe	Makbalsai ravine	perennial	geophyte (tuberous		*Ostrowskia magnifica*	1.05	excavation	drawings				in a ravine									43.2424	77.2190	1300	Observations of the population distribution of O. magnifica were carried out in the	location guessed - could not locate the river, nor map of species
Zhou et al., 2015	Guerbantunggute desert	arid desert		perennial	shrub	white thorn, desert	*Nitraria sibirica*	4.50	excavation	yes + photo	160	mostly as snow	2000		4.65-5.82	5	sandy, saline						44.3027	87.9410	475	N. sibirica has a dimorphic root system with horizontal roots extending to 4–6 m and a	site moved 2km in natural vegetation (shrubs not crops) and
Zhou et al., 2017	Inner Mongolia,	desert oasis	20yr plantation	evergreen needle-leaf	shrub	saxaul, black saxaul,	*Haloxylon ammodendro*	4.65 +/- 0.58	trench wall	no	110	>75% in summer		foothill oasis	4.4 +/-0.44	4.4	sand (90%), silt (6%), clay (4%)					20yr old plantation	39.3786	100.1475	1388	the main water source for 5-year-old shrubs was shallow soil water. Water sources of 10-year-old shrubs shifted depending on the soil water conditions	precip this year only; rooting and WT depths as mean from 3
Zhou et al., 2017	Inner Mongolia,	desert oasis	40yr old plantation	evergreen needle-leaf	shrub	saxaul, black saxaul,	*Haloxylon ammodendro*	4.88 +/- 0.57	trench wall	no	110	>75% in summer		foothill oasis	4.56+/-0.52	4.56	sand (90%), silt (6%), clay (4%)					40yr old lantation	39.3495	100.1328	1386		precip this year only; rooting and WT depths as mean from 3