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SUPPLEMENTARY INFORMATION
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The impact of global land-cover change on the terrestrial water cycle

The Supplementary Information included in our paper comprises:

1. Supplementary Table 1. Estimates of average annual terrestrial evapotranspiration, separated by land cover type;
2. Supplementary Table 2. For MGIS, land cover classes, map data sources, number of ET point estimates and kriged global mean;
3. Supplementary Figure 1. Maps of global land cover change for land surface model applications; and
4. Supplementary Methods.

SUPPLEMENTARY TABLE 1 FOR “THE IMPACT OF GLOBAL LAND COVER CHANGE ON THE TERRESTRIAL WATER CYCLE”

Supplementary Tables S1.1 to S1.19. Estimates of average annual terrestrial evapotranspiration, separated by land cover type.

Table S1.1. Annual evapotranspiration of non-irrigated croplands

Source	ET	Method	Notes
Arnold & Allen, 1996	608, 617 mm/yr	multicomponent water budget model SWAT, using data from the 1950s, of the hydrologic budget	Illinois watersheds: Panther creek basin, 80% corn, oats, and soy beans, 20% pasture, woodland, and farm lots, 246 km^2; Goose Creek basin, 86% agriculture, 14% woodland, pasture and farm lots, 122 km^2
Akinremi *et al.,* 1996	163, 161, 174, 235, 157, 164, 135, 226, 248, 226, 233, 207, 157, 126, 144, 214, 143, 153, 135, 225, 212, 217, 203, 180 mm/yr	soil water balance model	various crop rotations of wheat
Aslyng, 1960 Kristensen, 1959 Aslyng & Kristensen, 1958(Aslyng and Kristensen, 1958; Lincare, 1997) Aslyng & Nielsen, 1960	392 mm/yr		grass plot near Copenhagen
Bastiaanssen & Bandara, 2001	1321 mm/yr	remote sensing	homesteads with coconuts, papayas, bananas, and mangos, in Sri Lanka
Brye *et al.,* 2000	511, 372, 484, 355 mm/yr	soil water balance	for maize ecosystems; treated by no tillage and by chisel plough
Choudhury *et al*., 1998	639 mm/yr	biophysical process-based model with satellite & ancillary data	cropland
Choudhury *et al*., 1998	467 mm/yr	biophysical process-based model with satellite & ancillary data	cropland
Choudhury *et al*., 1998	672 mm/yr	biophysical process-based model with satellite & ancillary data	cropland
Choudhury *et al*., 1998	312 mm/yr	biophysical process-based model with satellite & ancillary data	cropland
Choudhury *et al*., 1998	620 mm/yr	biophysical process-based model with satellite & ancillary data	cropland

Choudhury *et al*., 1998	692 mm/yr	biophysical process-based model with satellite & ancillary data	cropland
Choudhury *et al*., 1998	507 mm/yr	biophysical process-based model with satellite & ancillary data	cropland
Dunn & Mackay, 1995	554 (SD = 36.5) mm/yr	model, based on Penman-Monteith with Rutter interception	arable land in the Tyne Basin in North East England
Gervois *et al.,* 2004	0.41 m/yr	ORCHIDEE model	soya in France
Gervois *et al.,* 2004	0.39 m/yr	ORCHIDEE model	winter wheat in Grigon, France
Giambelluca, 1986	265, 307, 283 mm/yr	model, pan, Penman	pineapple, not irrigated
Haise & Viets, 1957	19.4, 19.7, 20.3, 21.6, 24.2, 23.9, 22.9, 24.8, 28.3, 23.6, 30.4, 30.2 inches/year	n/a	Amarillo experiment station, USDA, Bushland, Texas
Krestovsky, 1969b Shiklomanov & Krestovsky, 1988	522 (SD 173) mm/yr		crops and fallow in southern taiga subzone of European former USSR
Lincare, 1997	535 mm/yr	eddy covariance	cultivation field (wheat) in Zhangye oasis, China
Liu & Kotoda, 1998	554.6 mm/yr	Kotoda 1986 and Advection-Aridity (Brutsaert and Stricket, 1979) models, eddy correlation	ploughed land in Heihi River, NW China, middle part of Hexi corridor
L'vovich, 1979	173 mm/yr		spring wheat, Kamennaya Steppe
Mahmood & Hubbard, 2002	462 mm/yr	soil water balance model	rainfed maize in tall grass - short grass transition in Nebraska, USA
Makino et al., 1999	784.25 mm/yr	modified Penman method	agriculture in Doki river Basin in Shikoku Island, Japan
Mika *et al*., 2001	286-296 mm/yr	micrometeorological measurements, Antal model	watershed in Hungary that is 74% cultivated, basin of the Tisza river
Molchanov, 1973	435 mm/yr	water balance	field in Lugansk district of steppe zone of European Russia, may be underestimated (Gidromet, 1976)
Morton, 1983a	420 mm/yr	CRAE model	agricultural land around the Edmonton International Airport
Pattey, 2004, pers comm	715.14 mm/yr		grain corn at Greenbelt Farm
Roberts, 1998	306-409 mm/yr	empirical relations from other studies	arable land in England
Scott & Sudmeyer, 1993	471, 458, 430, 420, 346 mm/yr	ventilated chamber technique	crops (lupins, oats, rape, barley, and wheat) near Collie in the southwest of Western Australia.
Sene, 1996	261 mm/yr	soil water balance	sparse vine crop in southern Spain (dry region), using a two-component energy combination model

Shiklomanov & Krestovsky, 1988	520, 460, 440, 400 mm/yr		winter crops, summer crops, row crops, and bare fallow in southern taiga subzone of European former USSR
Szilagyi *et al*., 2001	1.7 mm/day	micrometeorological measurements	Altamaha river basin near Doctortown GA; a mix of urban, forest, and agriculture areas; average from 1948-1996

Table S1.2. Annual evapotranspiration of irrigated croplands

Source	ET	Method	Notes
Abtew & Khanal, 1994	102.4 cm/yr	catchment water balance	Everglades Agricultural Area in South Florida; sugarcane, vegetables, sod, rice, ornamental nursery plants
Allen, R.G., 2000	730-800 mm/yr	range ET(reference ET)$_0$ from the FAO-56-PM equation and the 1985 Hargreaves equation (both applied hourly)	cotton near Menemen, Turkey
Allen, R.G., 2000	790-880 mm/yr	range ET_o from the FAO-56-PM equation and the 1985 Hargreaves equation (both applied hourly)	grapes near Gediz River, Turkey
Allen, R.G., 2000	690-770 mm/yr	range ET_o from the FAO-56-PM equation and the 1985 Hargreaves equation (both applied hourly)	cotton near Gediz River, Turkey
Allen, R.G., 2000	1020-1160 mm/yr	range ET_o from the FAO-56-PM equation and the 1985 Hargreaves equation (both applied hourly)	orchard near Gediz River, Turkey
Anac *et al*., 1999	834-899 mm/yr		cotton in Turkey
Ayars *et al*., 1999	549, 691, 437, 645 mm/yr	soil water balance	cotton in San Joaquin Valley
Ayars *et al*., 2003	1.034 m/yr	lysimeter and water balance	assuming minimal winter ET. For mature O'Henry Peaches, California
Bastiaanssen *et al*., 2002	580, 410, 360, 970, 1400 mm/yr	SEBAL algorithm for NOAA-AVHRR satellite data	cotton, rice, wheat, sugarcane, and mangroves in Indus River basin, Pakistan
Bastiaanssen & Bandara, 2001	1405 mm/yr	remote sensing	rice paddy in Kirindi Oya, Sri Lanka
Batchelor, 1984	2333 mm/yr	Penman estimation	for rice paddy , calculated using the Penman 1963 equation
Batchelor, 1984	1896 mm/yr	Penman estimation	for rice paddy , calculated using the Modified Penman equation.
Baumhardt & Lascano, 1999	420 mm/yr	soil water balance	cotton in Wellman, Texas
Cohen *et al*., 2002	1302 +/- 48 mm/yr	Penman-Monteith equation (reference crop ET)	Bet Dagan, Israel
Conley *et al*., 2001	293, 559, 429, 664 mm/yr	eddy covariance	sorghum (C4) at Maricopa Agricultural Centre, Arizona, for control dry and control wet treatments
Davis, 1983	700 mm/yr		cotton in San Joaquin Valley
Flohn, 1972	168 cm/yr		average for three oases in Southern Tunisia with manifold, multi-layered horticulture
Gervois et al., 2004	0.46 m/yr	ORCHIDEE model	corn and wheat

Giambelluca, 1986	1067 (SD = 627) mm/yr	Potential ET conversion by vegetation cover. Potential ET measured by PAN, P48, M(SREA)	sugarcane and pineapple in Oahu, Hawaii
Giambelluca, 1986	1458 (SD = 27	model, pan, Penman	sugarcane irrigated
Grimes, 1982	760 mm/yr		cotton in San Joaquin Valley
Hauser & Gimon, 2004	1514 mm/yr	Lysimeter	irrigated Alfalfa in Amarillo station
Hauser & Gimon, 2004	809 mm/yr	Lysimeter	irrigated corn in Amarillo station
Hoffman, 1985	230-580 mm/yr	soil water balance	3 crop rotations with high frequency irrigation: wheat, grain sorghum, lettuce, then oat, tomato and cauliflower, then barley, cowpea and celery; at US Salinity Laboratory in Riverside, California
Hoffman, 1985	1350-1750 mm/yr	soil water balance	variable irrigation frequency, with tall fescue; at US Salinity Laboratory in Riverside, California
Hunsaker *et al*., 1998	852-867, 88-894, 932-939 mm/yr	model, based on AZSCHED and Kincaid & Heermann	cotton in Arizona
Hutmacher *et al*., 2002	1900 mm/yr	n/a	alfalfa in arid areas
Jin *et a*l., 1999	537-353 mm/yr	evaluated from field experiments in the area	cotton in Wangtong experimental station, Heilonggang region in the East Hebei Plain of north China
Kergoat *et al*., 2002	883, 933, 891, 956, 923 mm/yr	global vegetation model	grass / crops using CLIM, RAD, STOM, FERT, and MAX simulations
Kutywayo, 2004	1546 mm/yr	eddy covariance	Coffee Resarch Station, Chipinge, Zimbabwe
Liu *et al*., 2002	423.5-453.0 mm/yr	lysimeter	irrigated winter wheat and maize, using a large-scale weighing lysimeter, at Luancheng Station in the North China Plain
Liu, Hunsaker *et al*., 2002	403-512 mm/yr	soil water balance, 3 m soil depth	maize grown in loess tableland at Shaanxi, China
L'vovich, 1979	397 mm/yr		irrigated wheat, southern Trans-Volga
Machado, 2004	1080.8	n/a	wheat and rotational crops
Mahmood & Hubbard, 2002	694 mm/yr	soil water balance model	irrigated maize in tall grass - short grass transition in Nebraska, USA
Mierau, 1974	1018 mm/yr		Everglades Agricultural Area
Mo *et al*., 2004	636-1525 mm/yr	process-based distributed model	arid farmland and irrigated crop, Lushi basin, China
Olivier, 1961	1729 mm/yr	Olivier method	Shambe Swamps, Sudan, papyrus

Olivier, 1961, Shahin, 1985	1265, 964, 1842 mm/yr	Olivier method, Heargreaves formula and Blaney-Criddle formula	Wad-Medani, Sudan, cotton (assuming minimal ET during summer (left dry)
Pereira, 1964	880 mm/yr	catchment water balance	maize in Kimakia catchment
Preito & Angueria, 1999	736, 495, 631 mm/yr		cotton in Argentina
Raymond & Rezin, 1989	0.902-0.917 m/yr	remote sensing, water use rates	agriculture in Parker Valley, Southern Arizona
Saranga *et al*., 1998	491-566, 349-390 mm/yr	pan, soil water content, budget	cotton in Israel
Sarwar & Bastiaanssen, 2001	610-720, 380-400 mm/yr	SWAP model, soil water balance model	cotton and wheat in Indus River basin, Pakistan
Shih & Gascho, 1980	1546, 1824, 1291, 1463 mm/yr		sugarcane grown in the Everglades Agricultural Area
Shih, 1983	1084-1418 mm/yr		Everglades Agricultural Area
Soppe, 2000 Ayars & Soppe, 2001	710, 845, 567, 561, 561 mm/yr		cotton in San Joaquin Valley
Sternitzke & Elliott, 1986	0.47, 0.55, 0	n/a	for well-watered alfalfa, corn, sorghum, soybe
Styles & Bernasconi, 1994	713-805 mm/yr		cotton in San Joaquin Valley
Sweeten & Jordan, 1987	710-810 mm/yr		peak ET yields when irrigation available
TEN, 2004	60.61 in/yr	Potential Evapotranspiration (PET) Estimation	where PET represents ET for irrigated crops
TEN, 2004	63.96 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	62.69 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	61.66 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	62.66 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	61.84 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	61.17 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	63.62 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	66.05 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	44.28 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	61.26 in/yr	PET Estimation	where PET represents ET for irrigated crops

TEN, 2004	63.12 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	64.98 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	58.49 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	63.62 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	62.78 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	61.27 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	62.73 in/yr	PET Estimation	where PET represents ET for irrigated crops
TEN, 2004	60.15 in/yr	PET Estimation	where PET represents ET for irrigated crops
Unland *et al*., 1998	1.462 m/yr	micrometeorological measurements, Bowen-Ratio Energy Balance	irrigated crop in Santa Cruz River in southern Arizona
Urassa & Raphael, 2004	1300 mm/yr	n/a	rice Farm, Morogoro, Tanzania
USDA, 2004	800 mm/yr	PET Estimation	for irrigated agriculture in Texas high plains
Van Dijk *et al*., 2001	800, 850, 1500 mm/yr	water balance, micrometeorological measurements, literature	irrigated rice fields, rainfed mixed crops, and fallow land in Ciumutuk river catchment, West Java, Indonesia
Wanjura *et al*., 1996	620, 477, 605 mm/yr		cotton in San Joaquin Valley
Zhang *et al*., 2004	370.5 (stdev)	soil water balance	irrigated winter what and maize (rotated)

Table S1.3. Annual evapotranspiration of human built-up areas

Source	ET	Method	Description
Aston, 1977	1128 mm/yr	pan	Hong Kong
Baumgartner, 1972 Gohre, 1949	356 - 706 mm/yr	lysimeter	short lawn, range from normal to high water level; assumed per year; Eberswalde, Germany
Bell, 1972	736 mm/yr	modeled (Penman basis)	Sidney, Australia
Campbell, 1982	451 mm/yr	not stated	71% of precipitation, annual average precipitation is 635 mm (International Station Meteorological Climate Summary, Version 4.0, 110 years charted; Mexico City, Mexico
Christen & Vogt, 2004	300 mm/yr	energy balance	Basel, Switzerland
Dennehy & McMahon, 1987	951, 953 mm/yr	Bowen Ratio-Energy Balance	low-level radioactive waste burial site, continuous hourly measurements of meteorological variables; near Barnwell, South Carolina

Dow & DeWalle, 2000	75 cm/yr (SD 8.7)	catchment water balance	varying levels of development, watersheds range from 5% developed to 88%; 21 watersheds in Eastern USA
Dunn & Mackay, 1995	438 (SD 24.1) mm/yr	model, based on Penman-Monteith with Rutter interception	"conurbations" in the Tyne Basin in North East England
Giambelluca, 1986	689 (SD 336) mm/yr	Potential ET conversion by vegetation cover. PET measured by PAN, P48, M(SREA)	parks, low, medium, and high density urban in Oahu, HI
Gohre, 1949	178 mm/yr	lysimeter	for bare soil
Grimmond & Oke, 1986	577.7 mm/yr	water balance model	32% of precipitation; using water balance model; input data derived from measurements conducted at 3 sites, Vancouver BC
Hauser & Gimon, 2004	767, 764 mm/yr	lysimeter	Simulated Landfill in Coshocton Ohio
Healy *et al*., 1989	626, 648, 728 mm/yr	Bowen Ratio-Energy Balance, water budget, aerodynamic profile	low-level radioactive-waste disposal site near Sheffield, Illinois
Jia *et al*., 2002	381-471 mm/yr	distributed watershed model	present conditions and for future development scenarios; Chiba Prefecture, Japan
Klohn-Crippen, 1999	264, 355 mm/yr	catchment water balance	40% impervious urban watersheds
Lamourne *et al*, 1994	373 mm/yr	water budget	55% of precipitation, precipitation 679 mm; Johannesburg, South Africa
Lindh, 1978	360 mm/yr	n/a	Stockholm, Sweden
Liu & Kotoda, 1998	432.6 mm/yr	Kotoda 1986 & Advection-Aridity (Brutsaert and Stricket, 1979) models, eddy correlation	urban areas, NW China, middle part of Hexi corridor; coarse sand and small pebbles with sparse scrub vegetation
L'Vovich & Chernogayeva, 1977	400 mm/yr	model	Moscow, Russia
Morton, 1983a	358 mm/yr	CRAE model	urban land around the Edmonton Airport, Alberta, Canada
Stephenson, 1994	457 mm/yr	catchment water balance	suburban catchments near Johannesburg, South Africa
Szilagyi *et al*., 2001	1.7 mm/day	micrometeorological measurements	2 precipitation stations in the 35,224 km^2 Altamaha river basin near Doctortown GA; average from 1948-1996
Thornthwaite & Mather, 1955	509 mm/yr	soil water budget	300 mm depth of water stored in a soil layer at field capacity; Berkeley, California
Thornthwaite & Mather, 1955	730 mm/yr	soil water budget	300 mm depth of water stored in a soil layer at field capacity; Seabrook, New Jersey
Thornthwaite & Mather, 1955	21.02 in/yr	assume soil water budget	median value of actual ET for 25 year period, Hays, Kansas
Thornthwaite & Mather, 1955	23.19 in/yr	assume soil water budget	median value of actual ET for 25 year period; Charles City, Iowa

Thornthwaite & Mather, 1955	23.82 in/yr	assume soil water budget	median value of actual ET for 25 year period, Wooster, Ohio
Thornthwaite & Mather, 1955	33.07 in/yr	assume soil water budget	median value of actual ET for 25 year period; Auburn, Alabama
Thornthwaite & Mather, 1955	31.4 in/yr	assume soil water budget	annual average; Marked Tree, Arkansas
Van der Ven, 1988	179 mm/yr	water balance	23% of annual average precipitation [779.5 mm (WMO)]; Lelystad, Netherlands
Van der Ven, 1988	119 mm/yr	water balance	for Lund, Sweden

Table S1.4. Annual evapotranspiration of impounded areas (reservoirs) (ET_i)

Source	ET	Method	Notes
Afansyev & Leksakova, 1973	341, 296 mm/yr	lake water balance	Lake Baikal
Ahmad, 1982	50-110 maf/yr	n/a	annual lake evaporation over Pakistan
Antal *et al*., 1973	860 mm/yr	energy balance and water balance	Lake Balaton, Hungary
Ballinger & Thornton, 1982	1541 mm/yr	class A evaporation pan	Lake McIlwaine, Rhodesia
Bastiaanssen & Bandara, 2001	1773 mm/yr	remote sensing	Tank in Kirindi Oya, Sri Lanka
Berger, 2001	63.64 in/yr	Bowen Ratio-Energy Balance, eddy correlation	over open water Ruby Lake National Wildlife Refuge Area, Ruby Valley, Northeastern Nevada
Braslavskii & Vikulina, 1963	605-619 mm/yr	water balance	forest zone, former USSR
Braslavskii & Vikulina, 1963	593-610 mm/yr	water balance	forest-steppe zone (eastern half), former USSR
Braslavskii & Vikulina, 1963	724-792 mm/yr	water balance	forest-steppe zone (western half), former USSR
Braslavskii & Vikulina, 1963	888-956 mm/yr	water balance	steppe zone (western half), former USSR
Braslavskii & Vikulina, 1963	865-938 mm/yr	water balance	steppe zone (eastern half), former USSR
Braslavskii & Vikulina, 1963	991-1130 mm/yr	water balance	zone of dry steppes and semi-deserts, former USSR
Braslavskii & Vikulina, 1963	1252-1363 mm/yr	water balance	desert zone, former USSR
Braslavskii & Vikulina, 1963	1505-1666 mm/yr	water balance	extreme south of central Asia, former USSR
Cherkasov *et al*., 1973	520 mm/yr	lake water balance	Lake Khubsugul (Kosogol), northern Mongolian People's Republic

Cleverly *et al*., 2002	74 cm/yr	3-d eddy covariance	Tamarix ramosissima; site on Sevilleta National Wildlife Refuge outside of San Acacia NM, no annual flooding, Rio Grande riparian areas, New Mexico
Cleverly *et al*., 2002	122 cm/yr	3-d eddy covariance	Bosque del apache NWR, flooded site; Rio Grande riparian areas, New Mexico
Cohen *et al*., 2002	1729 +/- 64 mm/yr	Penman-Monteith	for Bet Dagan, Israel
Farnsworth *et al*., 1982	0.6-0.8 m/yr	field data using the Bowen method	northeastern United States
German, 2000	57.4, 53.1 in/yr	Bowen Ratio-Energy Balance	two open water sites in Florida Everglades
German, E.R., unpublished	53.22-55.54 in/yr	Bowen Ratio-Energy Balance	two open water sites in Florida Everglades
Griffiths, 1972	2087, 2160 mm/yr	CRLE model	Lake Nasser, at Wadi Halfa
Hirota, 2001	760-815 mm/yr	heat balance model and Force-Restore method	open water near lawn from routine meteorological data at Chiang Mai in the Chao Phraya river basin in Thailand
Hirota, 2001	1080-1140 mm/yr	heat balance model and Force-Restore method	open water near bare areas in Bangkok from routine meteorological data in the Chao Phraya river basin in Thailand
Hurst & Philips, 1931	1.9 mm/day	atmometer	Sakha
Hurst & Philips, 1931	2.3 mm/day	atmometer	Cairo (Ezbekiya)
Hurst & Philips, 1931	2.8 mm/day	atmometer	Giza
Hurst & Philips, 1931	5.4 mm/day	atmometer	Helwan
Hurst & Philips, 1931	4.2 mm/day	atmometer	Tor
Hurst & Philips, 1931	4.1 mm/day	atmometer	Qasr el-Gebali
Hurst & Philips, 1931	3.3 mm/day	atmometer	Minya
Hurst & Philips, 1931	7.5 mm/day	atmometer	Aswan
Hurst & Philips, 1931	8.6 mm/day	atmometer	Atbara oasis
Hurst & Philips, 1931	4.9 mm/day	atmometer	Port Sudan oasis
Hurst & Philips, 1931	7.5 mm/day	atmometer	Kartoum
Hurst & Philips, 1931	5.4 mm/day	atmometer	Kassala
Hurst & Philips, 1931	5.1 mm/day	atmometer	Gallabat
Hurst & Philips, 1931	6.5 mm/day	atmometer	Wad Medani
Hurst & Philips, 1931	5.3 mm/day	atmometer	Roseires
Hurst & Philips, 1931	6.9 mm/day	atmometer	Dueim
Hurst & Philips, 1931	6.7 mm/day	atmometer	El-Obeid
Hurst & Philips, 1931	5.8 mm/day	atmometer	El Fasher
Hurst & Philips, 1931	4.5 mm/day	atmometer	Malakal
Hurst & Philips, 1931	3.7 mm/day	atmometer	Wau
Hurst & Philips, 1931	3.0 mm/day	atmometer	Mongalla
Hurst & Philips, 1931	3.6 mm/day	lake water balance	Lake Victoria
Hurst & Philips, 1931	2.2 mm/day	atmometer	Quarahiya
Hurst & Philips, 1931, Shahin, 1985	4.5, 5.5, 7.9 mm/day	atmometer, Penman, Hargreaves	The Nile near Assiut

Hurst & Philips, 1931, Shahin, 1985	7.9 mm/day	atmometer	Wadi-Halfa oasis
Hurst & Philips, 1931, Shahin, 1985	8.4 mm/day	atmometer	Merol oasis
Hurst & Philips, 1931, Shahin, 1985	3.0-3.5 mm/day	atmometer	Lake Tana
Hurst, 1952	2.3 mm/day	atmometer	Nile Delta
Hurst, 1952	2.8 mm/day	atmometer	Cairo and neighbourhood
Hurst, 1952	4.0 mm/day	atmometer	Fayum
Hurst, 1952	4.5 mm/day	atmometer	Upper Egypt
Hurst, 1952	7.8 mm/day	atmometer	Kartoum
Hurst, 1952	3.9 mm/day	atmometer	Lake Albert
Hurst, 1952	3.9 mm/day	atmometer	Lake Edward
Hurst, 1952	3.8 mm/day	lake water balance	Lake Victoria
Keig *et al*., 1979	1545 (SD 186) mm/yr	Penman Evaporation	17 stations in Papua New Guinea, based on data from US Class A pan evaporimeters; Papua New Guinea
Knox & Nordenson, undated, from Wood, 1978	883000 m2	water balance	West Canada Lake
Kobayashi, 1973	1099, 964, 1062, 982, 1468, 1326, 1399 mm/yr	Pan, Penman, Fitzpatrick, Swinbank	open water evaporation for Tateno, Japan
Kobayashi, 1973	1319, 1510, 1976, 1906 mm/yr	Pan, Penman, Fitzpatrick, Swinbank	open water evaporation for Pleiku, Vietnam
Kobayashi, 1973	1997, 1915, 2296, 2186 mm/yr	Pan, Penman, Fitzpatrick, Swinbank	open water evaporation for Qui-Nhon Vietnam
Kobayashi, 1973	1660, 1589, 2045, 1957 mm/yr	Pan, Penman, Fitzpatrick, Swinbank	open water evaporation for Lien-Khuong, Dalat, Vietnam
Kobayashi, 1973	1778, 1968, 2372, 2267 mm/yr	Pan, Penman, Fitzpatrick, Swinbank	open water evaporation for Saigon, Tansonnhut, Vietnam
Kohler, Nordenson & Baker, 1959	33 inches	n/a	average annual lake evaporation
Kotwicki & Clark, 1991	1899 mm/yr	field measurements from lake surface	arid climate lake; Lake Eyre, Australia
Kotoda & Mizuyama, 1984	700-800 mm/yr	heat balance, aerodynamic method	Lake Biwa, in the centre of Honshu Island
Krishnamurthy & Ibrahim, 1973	3.65-4.5 mm/day	lake water balance	Lake Victoria
Kullus, 1973	570 mm/yr	lake water balance	Lake Peipsi-Pihkva, Estonia
Laczniak *et al*., 1999	8.6 feet	Walker and Eakin (1963)	Peterson Reservoir, Ash Meadows Area, Nye County, Nevada
Lapworth, 1965	662 mm/yr	n/a	reservoir near London
Liu & Kotoda, 1998	786.3 mm/yr	Kotoda 1986 and Advection-Aridity (Brutsaert and Stricket, 1979) models, eddy correlation	water surface, NW China, middle part of Hexi corridor

Marsh & Bigrass, 1988 Marsh, 1991	339, 388 mm/yr	Priestley-Taylor, micrometeorological, lake water balance, model	NRC lake, Mackenzie Delta
Meyer, 1942	14-100 inches per year	n/a	mean annual evaporation from shallow lakes and reservoirs, computed from 50 years of weather bureau records for USA
Morton, 1983	691, 712 mm/yr	water budget	Last Mountain Lake, Saskatchewan, Canada
Morton, 1983	673 mm/yr	CRLE model	Dauphin Lake
Morton, 1983	1580 mm/yr	CRLE model	Lake Victoria
Morton, 1983	720 mm/yr	CRLE model	Last Mountain Lake, Saskatchewan, Canada
Morton, 1983	1805 mm/yr	CRLE model	Salton Sea
Morton, 1983	740 mm/yr	CRLE model	Lake Ontario
Morton, 1983	2022 mm/yr	CRLE model	Silver Lake
Morton, 1983	1195 mm/yr	CRLE model	Utah Lake
Morton, 1983	1245 mm/yr	CRLE model	Lake Hefner
Morton, 1983	1290 mm/yr	CRLE model	Winnemucca Lake
Morton, 1983	1280 mm/yr	CRLE model	Pyramid Lake
Movahed-Danech, 1973	1382, 1394 mm/yr	from lake surface	Lac de Rezeieh, northwest Iran
Nehaichik, 1973	420 mm/yr	assume lake water balance	Lake Ilmen, Russia
Nehaichik, 1973	490 mm/yr	assume lake water balance	Lake Khanka, China / Russia
Nehaichik, 1973	710 mm/yr	assume lake water balance	Lake Kulundinskoye, Russia
Nijssen & Lettenmaier, 2002	599, 585, 617 mm/yr	water balance	White Gull Creek Basin, England
Omar & El Bakry, 1981	2689 mm/yr	water balance	Lake Nasser, Egypt
Prata, 1989	2190 +/- 100 mm	Remote Sensing	arid climate lake
Richter, 1985	633-843 mm/yr	evaporation pans, empirical relations	Lake Stechlin
Richter, 1973	712 mm/yr	energy balance method	Lake Muritz, Germany
Riehl, 1979	280 cm/yr	n/a	annual evaporation loss for Lake Nasser, in Egypt
Sacks *et al*., 1994	151 cm/yr	energy budget	Lake Barco in North Central Florida
Sacks *et al*., 1994	128 cm/yr	energy budget	Lake Five-O in Florida Pan Handle
Shahin, 1985	6.6 mm/day	pan conversion	Lake Victoria at Kisumu

Shahin, 1985	3.4 mm/day	pan conversion	Lake Victoria
Shahin, 1985	5.4, 6.3, 9.0 mm/day	Penman, Hargreaves, Piche	Malakal
Shahin, 1985	5.8, 6.2, 7.6 mm/day	Penman, Hargreaves, Piche	Wau
Shahin, 1985	5.5, 5.0, 7.0 mm/day	Penman, Hargreaves, Piche	Mongalla, Juba
Shahin, 1985	8.04 mm/day	pan, Panman, Piche, Kohler	The Nile at Khartoum
Shahin, 1985	4.3 mm/day	pan, Panman, Piche, Kohler	The Nile at Gambeila
Shahin, 1985	5.3 mm/day	pan, Panman, Piche, Kohler	The Nile at Akobo
Shahin, 1985	5.0, 7.1 mm/day	pan, Panman, Piche, Kohler	The Nile near Addis Abbaba
Shahin, 1985	6.3, 7.9 mm/day	pan, Panman, Piche, Kohler	The Nile near Roseires
Shahin, 1985	7.0, 9.2 mm/day	pan, Panman, Piche, Kohler	The Nile near Wad Medani
Shahin, 1985	7.0 mm/day	pan, Panman, Piche, Kohler	The Nile near Singa
Shahin, 1985	7.4 mm/day	pan, Panman, Piche, Kohler	The Nile near Sennar
Shahin, 1985	5.3 mm/day	pan, Panman, Piche, Kohler	The Nile near Kurmuk
Shahin, 1985	8.0 mm/day	pan, Panman, Piche, Kohler	The Nile near Atbara
Shahin, 1985	5.8, 8.7, 7.7 mm/day	pan, Panman, Piche, Hargreaves	The nile at Qena
Shahin, 1985	6.1, 8.6, 14.7 mm/day	pan, Panman, Piche, Hargreaves	open water at Kharga oasis
Shahin, 1985	4.9, 7.0, 9.8 mm/day	pan, Panman, Piche, Hargreaves	the Nile near Almaza (airport)
Shahin, 1985	5.2, 6.7, 9.3 mm/day	pan, Panman, Piche, Hargreaves	Suez Canal
Shahin, 1985	4.4, 6.2, 3.7 mm/day	pan, Panman, Piche, Hargreaves	the Nile near Zagazig
Shahin, 1985	3.8, 5.3, 4.5 mm/day	pan, Panman, Piche, Hargreaves	the Nile near Tanta
Shahin, 1985	4.0, 4.2, 5.1 mm/day	pan, Panman, Piche, Hargreaves	the Nile near Edfina
Shahin, 1985	4.6, 4.0, 8.0 mm/day	pan, Panman, Piche, Hargreaves	the Nile near Port Said (airport)
Shahin, 1985	4.4, 4.0, 5.0 mm/day	pan, Panman, Piche, Hargreaves	the Nile near Alexandria
Shahin, 1985	4.9, 4.7, 7.9 mm/day	pan, Panman, Piche, Hargreaves	the Nile near Sallum (observatory)
Shahin, 1985	2033 mm/yr	Penman	open water evaporation for Shambe in the Sudd region
Shahin, 1985	4.7, 3.8, 7.8 mm/day	pan, Panman, Piche, Hargreaves	the Nile near El Kasr
Shahin, 1985	4.5, 4.2, 4.6 mm/day	pan, Panman, Piche, Hargreaves	the Nile near El Sirw

Shahin, 1985	4.3, 5.2, 7.7 mm/day	pan, Panman, Piche, Hargreaves	the Nile near El Tahrir
Shnitnikov, 1973	970 mm/yr	n/a	Lake Aral, desert location
Shnitnikov, 1973	950-1047 mm/yr	n/a	Lake Balkhash, arid steppe , semi-desert
Shnitnikov, 1973	702 mm/yr	n/a	Lake Issyk-kul, intermountain location
Solantie, 1973	390-610 mm/yr	empirical Dalton formula	Finland
Stewart & Rouse, 1976		n/a	
Tattari & Ikonen, 1997	400 mm/yr	ASTIM model	for open water surface in Hietajärvi, Finland
Tetzlaff & Adams, 1983	2150-2640 mm/yr	water balance	n/a
Tyler *et al*., 1997	2.7 (SD 0.68) mm/day	eddy correlation, microlysimeters	seasonally adjusted evaporation rate for open water at Owens Lake, California
Unland *et al*., 1998	1.705 m/yr	micrometeorological measurements, Bowen Ratio-Energy Balance	open water surfaces
USGS, 1958 Morton, 1983	1855-2163 mm/yr	energy budget, CRLE model	Lake Mead on the Colorado River
Vali-Khodjeini, 1991 Patkovich, 1986 Prival'skii, 1981 ; Shiklomanov & Geogievskii, 1981	745 mm/yr	water budget	Caspian Sea
Van Dijk *et al*., 2001	1300 mm/yr	water balance, micrometeorological measurements, literature	open water in Ciumutuk river catchment, West Java, Indonesia
Vallet-Coulomb *et al*., 2001	1780, 1870, 1730, 1740 mm/yr	lake energy balance, Penman method, CRLE model, chloride budget	Lake Ziway, Ethiopia
Verburg & Hecky, 2002	115-173 W/m2/yr	energy balance	poster at AGU, for Lake Tanganyika in Central Africa (between Tanzania and Congo), Energy balance
Visher & Hughes, 1978	120 cm/yr	n/a	Florida Lakes
Zamanov, 1973	300 mm/yr	lake water balance	Great Alagel Lake
Zubenok, 1976	160 cm/yr	energy balance	30°N to 30°S
Zubenok, 1976	100 cm/yr	energy balance	30-60 degrees latitude, potential ET

Table S1.5. Annual evapotranspiration of grazing areas (ET_{gz})

Source	ET	Method	Description
Allen, 2000	870-940 mm/yr	using FAO56-PM equation and the 1985 Hargreaves equation	pasture in Gediz River, Turkey

Beljaars & Bosveld, 1997	523 mm/yr	micrometeorological measurements, tower	grass plot at Cabauw, Netherlands
Ben Wu et al., 2001	482.7 mm/yr	water balance	originally grassland, after grazing now is covered with woody vegetation: Ashe, redberry juniper, live oak, vasey shin oak, and herbaceous plants; · Cusenbary Draw Basin 209 km^2,
Bethune & Wang, 2004	1230 mm/yr	lysimeter, model	irrigated pasture
Billesbach *et al*., 2002	550-680 mm/yr	Bowen Ratio - Energy Balance, micrometeorological measurements	temperate grasslands, savannas, and shrublands; range for dry valley (550 mm/yr) to wet meadow (680 mm/yr), for Nebraska Sand Hills; free-range grazing.
Calder, 2003	460, 486 mm/yr	HYLUC model	Greenwood Community Forest, grassland in sandy & loam soil
Choudhury & DiGirolamo, 1998 Delfs, 1967	520 mm/yr	n/a	Harz Mountain
Clarke & Newson, 1978	421 mm/yr	water budget	Wye catchment in England, rough hill pasture
Clifton & Taylor, 1994	395, 435, 525 mm/yr	n/a	annual and perennial pastures with medium cutting height
Cox & Pitman, 2002	752, 755, 826, 800, 785, 872, 878, 877, 870 mm/yr	water balance	different pasture and slope treatments
Dirnbock & Grabner, 2000	180-270 mm/yr	compilation of literature, modelling according to Turc-Wendling, an energy balance model	alpine pastures in Austrian alps
Dunin, 1965	440 mm/yr	catchment water balance	pasture in Parwan Creek, Australia
Dunn & Mackay, 1995	475 (SD 26.4) mm/yr	model based on Penman-Monteith with Rutter interception	pasture, rough grazing and grassland in the Tyne Basin in northeast England
Greenwood *et al*., 1985	390 mm/yr	ventilated chamber technique	pasture in North Bannister, Western Australia
Harr & Price, 1972	21-25 cm/yr	soil water balance	two greasewood-cheatgrass communities in south central Washington; heavily grazed prior to 1943, grazed intermittently from 1943-1960, and ungrazed since 1960; study area located near Rattlesnake Spring
Hibbert, 1971	510 mm/yr	catchment water balance	pasture in Three Bar (B) catchment
Hibbert, 1971	456 mm/yr	catchment water balance	pasture in Three Bar (C) catchment
Hicks et al., 2001	1027 mm/yr	micrometeorological measurements	Kaitaia Airfield meteorological site, from meteorological data collected
Hodnett *et al.,* 1995	1.2 mm/day	soil water balance	pasture

Hoffman & Jackson, 2000	987 mm/yr	simulated with NCAR CCM3 general circulation model	for Cerrado, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	1023 mm/yr	simulated with NCAR CCM3 general circulation model	for Llanos, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	823 mm/yr	simulated with NCAR CCM3 general circulation model	for Northern Africa, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	804 mm/yr	simulated with NCAR CCM3 general circulation model	for Southern Africa, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	719 mm/yr	simulated with NCAR CCM3 general circulation model	for Australia, converted savannah to grassland, using GCM
Hoover, 1944	878 mm/yr	catchment water balance	pasture in Coweeta (17) catchment, NC
Hoyt & Troxell, 1934	477 mm/yr	catchment water balance	pasture in San Gabriel catchment
Hudson & Gilman, 1993	471 mm/yr	catchment water balance	sheep pasture in grassland Wye catchment, Plynlimon Mid Wales
Jipp *et al*., 1998	3.76 mm/day	micrometeorological measurements, soil water balance	pasture in a cattle ranch 6 km north of Paragominas in northern Brazilian state of Para; pastures originally cleared in the 1960s; invasive weedy vegetation is controlled with manual clearing and burning
Joffre & Rambal, 1993	400-590	soil water balance, Penman Monteith	Dehesa ecosystems savanna, grassland
Jolly *et al.,* 1997	589 mm/yr	catchment water balance	pasture in Border catchment in Murray-Darling basin, Australia
Jolly *et al*., 1997	703 mm/yr	catchment water balance	pasture in Dumarasq catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	697 mm/yr	catchment water balance	pasture in Gwyder 1 catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	669 mm/yr	catchment water balance	pasture in Gwyder 2 catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	628 mm/yr	catchment water balance	pasture in Jugiong Creek catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	667 mm/yr	catchment water balance	pasture in Mehi catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	585 mm/yr	catchment water balance	pasture in Wallurnburrawang Creek catchment in Murray-Darling basin, Australia
Leopoldo *et al*., 1993	2.1-3.8 mm/day	n/a	pasture in ABRACOS project near Manaus
Leppanen, 1980	377 mm/yr	Bowen Ratio-Energy Balance	flood plain that had been cleared of all tall vegetation by chaining, raking and burning about 6 months before measurements began; groundcover is sparse volunteer Bermuda grass and scattered seep willow; Gila River Valley, AZ; 1971-1972

Leppanen, 1981	989 mm/yr	Bowen Ratio-Energy Balance	planted forage grass; original cover of halophytic vegetation, consisting largely of seepweed, and iodine bush, and salt cedar; Gila River Valley, AZ; 1969-1970
Lewis *et al.*, 2000	368 mm/yr (SD 89)	catchment water balance	partially harvested and grazed oak forest watershed in California; oak trees removed from 14% of land area
Lodge *et al.,* 2002	589 mm/yr	evaporation dome	native pastures (89% of annual rainfall)
Lodge *et al.,* 2001	514, 587, 572, 552, 637, 625 mm/yr	biophysical model	different pasture and grazing treatments
Malek *et al.,* 1990	638 mm/yr	Bowen Ratio-Energy Balance, micrometeorological measurements	for Ranch in the middle of western, grass and shrub-covered margin of the playa
Moerlen *et al*., 1999	373.42 mm/yr	catchment water balance, Penman Monteith	25 km northwest of Cork, agricultural grassland, pasture and meadow, perennial ryegrass
Molchanov, 1973	300-370 mm/yr	water balance	meadow and clover
Molchanov, 1973	375-400 mm/yr	water balance	meadows in Sareevo (in Vologda district)
Morton, 1971	568 mm/yr	catchment water balance	pasture in Ausable catchment
Morton, 1971	464 mm/yr	catchment water balance	pasture in Pembina catchment
Morton, 1971	356 mm/yr	catchment water balance	pasture in Wascana catchment
Morton, 1971	578 mm/yr	catchment water balance	pasture in West Humber catchment
Morton, 1971	388 mm/yr	catchment water balance	pasture in Yorkton catchment
Morton, 1971	409 mm/yr	catchment water balance	pasture in Ribstone catchment
Morton, 1971	333 mm/yr	catchment water balance	pasture in Swift Current catchment
Morton, 1971	573 mm/yr	catchment water balance	pasture in Fish catchment
Morton, 1971	610 mm/yr	catchment water balance	pasture in Lynn catchment
Morton, 1983a	516 mm/yr	catchment water balance	pasture in Castor watershed, Canada
Morton, 1994	437 mm/yr	catchment water balance	Pasture in Whitemud watershed, Canada
Morton, 1994	392 mm/yr	catchment water balance	pasture in Magnusson watershed, Canada
Murphy et al, 2004	607, 641 mm/yr	evaporation dome	for continuous and rotational grazing
Nanni, 1970	750 mm/yr	catchment water balance	pasture in Cathedral catchment
Ni-Lar-Win, 1994	454 mm/yr	catchment water balance	pasture in Molenbeek 43 catchment
Ni-Lar-Win, 1994	510 mm/yr	catchment water balance	pasture in Molenbeek 44 catchment
Ni-Lar-Win, 1994	598 mm/yr	catchment water balance	pasture in Mark catchment

Ni-Lar-Win, 1994	480 mm/yr	catchment water balance	pasture in Ede catchment
Ni-Lar-Win, 1994	522 mm/yr	catchment water balance	pasture in Gr. Molenbeek catchment
Ni-Lar-Win, 1994	459 mm/yr	catchment water balance	pasture in Grote Nete catchment
Ni-Lar-Win, 1994	545 mm/yr	catchment water balance	pasture in Demer catchment
Ni-Lar-Win, 1994	572 mm/yr	catchment water balance	pasture in Gete catchment
Ni-Lar-Win, 1994	617 mm/yr	catchment water balance	pasture in Grote Gete catchment
Ni-Lar-Win, 1994	495 mm/yr	catchment water balance	pasture in Mandel catchment
Ni-Lar-Win, 1994	641 mm/yr	catchment water balance	pasture in Yin catchment
Nouvellon *et al*., 2000	289, 341, 459 mm/yr	soil water budget	Kendall site in Walnut Gulch experimental watershed
Novick *et al*., 2004	568 mm/yr	eddy covariance	grass-covered field, burned and mowed for hay
Olivier, 1961	1517 mm/yr	Olivier method	Malakal, Sudan, grass
Paz *et al*., 1996	510 mm/yr	soil water balance	Gayoso-Castro farm in Castro de Ribeira de Lea (Lugo Province), Spain, grazed by sheep
Ridley *et al.,* 1997	642, 619, 606 mm/yr	water balance	for phalaris, cocksfoot and ryegrass pastures
Roberts, 1998	329, 487, 240, 334 mm/yr	empirical relations from other studies	grazing land in England
Rosset *et al*., 2001	410 mm/yr	n/a	wet grassland in Swiss pre-alpine region, between 1273 and 1628 m above sea level, grazed and mown once a year
Scott & Sudmeyer, 1993	339 mm/yr	ventilated chamber technique	two perennial pastures (lucerne and phalaris) at a site near Collie in the southwest of Western Australia.
Sims, Singh & Laurenroth, 1978	200, 158 mm/yr	water balance	ALE (Washington) site, Northwest bunchgrass
Sims, Singh & Laurenroth, 1978	400 mm/yr	water balance	Bison (Montana) site, mountain grassland; moderate grazing intensity
Sims, Singh & Laurenroth, 1978	570, 280 mm/yr	water balance	Bridger (Montana) site, mountain grassland
Sims, Singh & Laurenroth, 1978	400, 620, 420 mm/yr	water balance	Cottonwood (South Dakota) site; mixed prairie; heavy grazing intensity
Sims, Singh & Laurenroth, 1978	460 mm/yr	water balance	Dickinson (North Dakota) site; mixed prairie; heavy grazing intensity
Sims, Singh & Laurenroth, 1978	450 mm/yr	water balance	Hays (Kansas) site; mixed prairie; moderate grazing intensity

Sims, Singh & Laurenroth, 1978	166, 200, 350 mm/yr	water balance	Jornada (New Mexico) site; desert grassland; lightly grazed
Sims, Singh & Laurenroth, 1978	500, 729, 670 mm/yr	water balance	Osage (Oklahoma) site; Tallgrass prairie; moderate grazing intensity
Sims, Singh & Laurenroth, 1978	250, 600, 400 mm/yr	water balance	Pantex (Texas) site; Shortgrass prairie; moderate grazing intensity
Sims, Singh & Laurenroth, 1978	250, 270, 320 mm/yr	water balance	Pawnee (Colorado) site; Shortgrass prairie; moderate grazing intensity
Shih & Snyder, 1985	1281-1424 mm/yr	n/a	Pasture
Silbertein *et al.,* 1999	757 mm/yr	model	Wights catchment, within Collie River catchment, in southwest of Western Australia
Simpson *et al.,* 1998	659 mm/yr	soil water budget	wallaby grass, subterranean clover pasture at Tamworth
Swift & Swank, 1980	1011 mm/yr	catchment water balance	pasture in Coweeta (13) catchment, NC
Vertessy, 1999	582 mm/yr	n/a	grasslands / pastures in south-eastern Australia
Waterloo *et al*., 1999	746 mm/yr	n/a	Fiji, converted from forest 100 years ago
Waterloo *et al*., 1999	860-980 mm/yr	n/a	typical grassland catchment in Fiji
Weltz & Blackburn, 1995	566-606 mm/yr	lysimeter	Prosopis – Acacia – Andropogon-Setaria Savannah; La Copita Research Area, eastern Rio Grande plain of Texas
Wohlfahrt *et al.,* 2004	477.2, 490.4, 452.8 mm/yr	eddy covariance	this is a hay meadow - it is cut between two and three times a year, the hay is then used to feed the cows during winter when they're in the stable; cows graze at high elevation sites during summer
Wu *et al*., 2001	482.7 mm/yr	water balance model	originally grassland, after grazing now is covered with woody vegetation: Ashe, redberry juniper, live oak, vasey shin oak, and herbaceous plants; Cusenbary Draw Basin 209 km^2, Edwards Plateau, TX
Xu, 1992	774 mm/yr	catchment water balance	pasture in Leie catchment
Zubenok, 1976	300-350 mm/yr	n/a	treeless plains within the northern taiga subzone in Russia
Zubenok, 1976	500-550 mm/yr	n/a	treeless plains in the mixed forests and forest steppe zones of European former USSR
Zubenok, 1976	475 (range 450-500 mm/yr)	n/a	treeless areas in the southern taiga subzone of the European former USSR; this estimate is supported by numerous water-balance investigations

Table S1.6. Annual evapotranspiration of Burned Areas

Source	ET	Method	Description
Klinge *et al.,* 2001	97,147,147 mm/yr	soil water model, micrometeorological measurements	for cleared and burned rainforest in eastern Amazonia
Santos *et al*., 2003	861.9 mm	eddy covariance	campo sujo savannah in central Brazil
Sumner, 2001	993 mm/yr	energy budget variation of eddy correlation	Tiger Bay watershed Volusia County, Florida, natural fires on pine flatwood uplands and cypress wetlands; ET increased after burning, logging followed burning

Table S1.7. Annual evapotranspiration of tree plantations (ET_{tp})

Source	ET	Method	Description
Bailly *et al*., 1974	1610 mm/yr	soil water balance	Manankazo, Madagascar, pinus patula plantation, 4-10 yrs
Blackie, 1979	1160 mm/yr	catchment water balance	Kimakia, Kenya, Pinus Patula plantation., 10-16 yrs
Bruijnzeel, 1988	1070 mm/yr	catchment water balance	11-35 year old plantation forest of Agathis dammara Warb in central Java
Bruijnzeel, 1988	900 mm/yr	water balance	29 year old plantation, Pinus merkussi plantation, Genteng, West Java
Bubb & Croton, 2002	1082-1124 mm/yr	catchment water balance	exotic pine plantation in previously mixed area
Buttle & Metcalfe, 2000	358-525 mm/yr	catchment water balance	partially clear-cut forests; total area is about 40,000 km^2. obtained from residual of water balance; for six watersheds in Ontario; equal to average of 6 watersheds (441 mm)
Calder, 1992	3400 mm/yr	n/a	young Eucalyptus forests, 8 m deep soils
Cornish & Vertessy, 2001	1100 mm/yr (SD 78)	catchment water balance	8 different catchments in Karuah Research Area, of Eucalypt forests in New South Wales, Australia
Dunin & Aston, 1984	766-933 mm/yr	model: corroborated by weighing lysimeter data	Eucalypt regrowth in Kioloa State Forest in Australia.
Dunn & Mackay, 1995	338 (SD = 16.0) mm/yr	model, based on Penman-Monteith with Rutter interception	felled forest in the Tyne Basin in North East England
El-Nokrashy, 1963	1121.10, 1085.80 mm/yr	n/a	citrus trees in Delta Barrage, Egypt
Ewel & Gholz, 1991	74-111 cm/yr	simulated ET	pine plantation range from dry to wet year

Gholz & Clark, 2002	959, 951, 1110 mm/yr	eddy covariance	along chronosequence of slash pine plantation in Florida: recent clear-cut, mid-rotation, and 24-yr old rotation stand
Greenwood *et al.,* 1985	2300, 2700 mm/yr	Vapour Compression (VC)	for young Eucalyptus plantation, 3 sites,
Holscher *et al*., 1997	1364 mm/yr	micrometeorological measurements	plot in a 2.5 year old plot in Eastern Amazonia.
Jaeger & Kessler, 1997	622 mm/yr	micrometeorological measurements, water balance	33 year old pine plantation in upper Rhine watershed, Southern Germany, subject to thinning
Jordan & Fischer, 1977	38.3+2.4 in/yr	"hydrologic means"	Turpentine Run, St. Thomas Virgin Islands
Klinge *et al.,* 2001	130.333	soil water balance, model, Pman	Federal Cacao Research Institute, for tropical lowland rainforest, ET for forests year of and year after clearcutting
Krestovsky, 1969b	530, 580, 540, 570 mm/yr	n/a	40 & 60 year old pine and spruce forest in southern taiga subzone of European former USSR
Krestovsky, 1969b	310, 350, 445, 550, 590 mm/yr	n/a	5, 10, 20, 40, 60 year old deciduous forest in southern taiga subzone of European former USSR
Krestovsky, 1980	305-380 mm/yr	n/a	regrowth areas, aged 1-5 and 10-15 years, in the southern taiga subzone in the European former USSR
Lane et al., 2004	1118, 1150, 969, 1024 mm/yr	soil water balance	Eucalyptus plantation, south-eastern China
Law, 1957	711 mm	lysimeter	0.045 ha plantation of Sitka spruce in Hodder catchment,
Le Maitre & Versfeld, 1997	1180.9, 1031.0, 1176.5, 941.2, 1133.0, 1119.0, 1108.1 mm/yr	water balance, meteorological data	catchments afforested with Pinus patula and Pinus radiata; each number represents a different catchment
Liu *et al*., 1998	795 (+/- 20) mm/yr	ET model with micrometeorological measurements, eddy correlation, class A pans,	pine plantations in industrial forest lands of the Georgia-Pacific Corporation15 km NE of Gainesville FL
Löfgren, 2004a,b	520, 531, 552, 570, 544, 629 mm/yr	micrometeorological measurements	Station SE04 - Gardsjon, Norway Spruce Forest. Probably grazed woodland for centuries before clear-felling 1900-1910 and subsequent forest tree planting and thinning (1968). Grazing was suspended around 1950. In 1980 roughly a half hectare was clear-felled
Löfgren, 2004a,b	400, 452, 453, 522, 471, 537 mm/yr	micrometeorological measurements	Station SE14 Aneboda, Norway Spruce. Grazed woodland for centuries. Probably clear-felled in the 1860´s, then abandoned and overgrown. Grazing suspended in the 1930´s. Light thinning in the 1940´s and in 1950.

McMahon *et al.,* 1996	871, 794, 682, 650 mm/yr	model	Eucalyptus globulus research plots, long-term mean climate factors, derived from Esoclim model, planted 1983, at Esperance (sites 1-4)
McMahon *et al.,* 1996	1627 mm/yr	model	Eucalyptus globulus research plots, long-term mean climate factors, derived from Esoclim model, planted 1984, at Darkan
McMahon *et al*., 1996	1247 mm/yr	model	Eucalyptus globulus research plots, long-term mean climate factors, derived from Esoclim model, planted 1984, at Manjimup
McMahon *et al.,* 1996	1262 mm/yr	model	Eucalyptus globulus research plots, long-term mean climate factors, derived from Esoclim model, planted 1986, at Northcliffe
McMahon *et al.,* 1996	962 mm/yr	model	Eucalyptus globulus research plots, long-term mean climate factors, derived from Esoclim model, planted 1990 at Forcett
Moran & O'Shaughnessy, 1984	1189 mm/yr	catchment water balance	34 year old Eucalypt tree plantation forest in Monda 1-3 catchments, Australia
Murai, 1980 Tsukamoto, 1992	532 mm/yr	water balance	New Cypress Plantation
Murakami *et al*., 2000	389 mm/yr (SD 75.4)	catchment water balance	immature Japanese cypress and cedar forests
Nijssen & Lettenmaier, 2002	279, 287, 292 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and Leaf Area Index (LAI) weighted versions of multiple regression models	medium-age regeneration conifer forest in the White Gull Creek Basin, Saskatchewan, Canada.
Nijssen & Lettenmaier, 2002	212, 226, 229 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models	new regeneration conifer forest in the White Gull Creek Basin, Saskatchewan, Canada.
Nijssen & Lettenmaier, 2002	345, 360, 381 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models	medium-age regeneration deciduous forest in the White Gull Creek Basin, Saskatchewan, Canada.
Nijssen & Lettenmaier, 2003	337, 356, 376 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models	new regeneration deciduous forest in the White Gull Creek Basin, Saskatchewan, Canada.
Pilgrim *et al*., 1982	655 mm/yr	catchment water balance	pine plantation
Pudjiharta, 1986a	1655, 1978 mm/yr	lysimeter	Ciwidey West Java, Pinus merkusii plantation, 1-8 year, 9-17 year

Richardson, 1982	2000 mm/yr	catchment water balance	Pinus caribaea plantation, 18 yrs, Blue Mountains, Jamaica (leaky catchment)
Richardson, 1982	1849, 1365, 485 mm/yr	catchment water balance	19 year old stand of pinus caribaea in Jamaica; comparison of the water balance of two but predominantly impermeable catchments, one covered with pine plantation, the other with lower montane rainforest
Riekerk, 1985	77-118 cm/yr	n/a	watersheds dominated by pine plantations in north Florida
Rosenzweig, 1968	log 3.09 mm/yr	Thornthwaite method	secondary tropical forest, Kade, Ghana
Running *et al*., 1989	35-39 cm/yr	simulation model (FOREST-BGC)	predominantly coniferous forests in western Montana, the part of the study area that was heavily clearcut
Rutter, 1964	1.02 mm/yr	soil water balance	plantation of Pinus sulvestris at Crowthorne Berks.
Schafer *et al*., 2002	537.1, 575, 614.3 mm/yr	sap flux, hydrological balance, eddy covariance	Duke Forest Loblolly pine plantation (15 yr old)
Shahin, 1959	977.79-964.45 mm/yr	n/a	Citrus trees in Giza, Egypt
Shahin, 1985	1215 mm/yr	micrometeorological, Doorenbos & Pruitt 1977 method	citrus trees for Cairo, Egypt
Shimizu *et al*., 2003	902, 875 mm/yr	eddy covariance and water balance	Kahoku experimental watershed, cypress plantation
Sommer *et al*., 2002	1421 mm/yr	Bowen Ratio-Energy Balance	secondary woody vegetation in Brazilian Amazon - a 3.5 year old vegetation
Sun *et al.*, 1998	901 mm/yr	model	typical flatwoods sites ; Gator National Forest, and Bradford Forest
Sun *et al.*, 2002	1077 (SD 98) mm/yr	water balance	140 ha Florida watershed - unmanaged mature cypress-plantation
Sun *et al*., 2002	1054 (SD 96) mm/yr	water balance	mature loblolly pine plantation in coastal North Carolina
Thornton *et al*., 2002 Law *et al*., 2002	0.686, 0.664 m/yr	coupled water-carbon-nitrogen model, canopy-scale flux observations	Blodgett forest, California; clearcut 1990
Thornton *et al*., 2002; Law *et al*., 2002	0.528, 0.482 m/yr	coupled water-carbon-nitrogen model, canopy-scale flux observations	Duke Forest, North Carolina, 1983 clear cut
Thornton *et al*., 2002; Law *et al*., 2002	0.988 m/yr	coupled water-carbon-nitrogen model, canopy-scale flux observations	slash pine plantation, Gainesville, Florida, clearcut 1990

Tiktak & Bouten, 1994	712 mm/yr	micrometeorological measurements model	stand 29 years old at 1988; last thinning carried out 5 years before measurements
Van Dijk et al., 2001	1250 mm/yr	water balance, micrometeorological measurements, literature	for Paraserianthes plantation in Cikumutuk river catchment,
Vertessy *et al*., 1996	798 mm/yr	ecohydrological water balance model (Topog-IRM)	mountain ash Picaninny (0.53 km^2) forest catchment, Victoria, Australia; clear-felled and seeded with mountain ash
Vertessy *et al*., 1998	1220, 1280, 1340 mm/yr	Sapwood Area Index (SAI), microlysimeter, humidity dome, stemflow	15, 30 and 60 year old mountain ash forest in Maroonda Catchments, New South Wales, Australia
Vertessy *et al*., 2001	1371 mm/yr	Sapwood Area Index (SAI), lysimeter	15-year old ash / eucalyptus forest in Victoria, Australia
Vorosmarty & Wilmott, 1996	1194, 1210, 1260, 1263, 1180 mm/yr	Water Balance/Water Transport Model (WBM/WTM) computed water balance	Amazon basin, upriver of Obidos, Brazil; water-year begins in September
Waterloo *et al*., 1999	1926, 1717 mm/yr	micrometeorological measurements, Temperature Variance-Energy Balance (TVEB)	6 and 15 year old pinus caribaea plantations on former grassland soils under maritime tropical conditions; from model, former grassland soils
Waterloo, 1994	1772 mm/yr	n/a	vigorously growing young pine plantation in Fiji
Whitehead & Kelliher, 1991	796-997 mm/yr	Penman-Monteith, catchment water balance, soil water balance, Rainfall Index (RI), RAU	11-year old pinus radiata stand before and after thinning, at Longmile Rotorua, New Zealand
Wilson *et al*., 2000	1340 MJ/m^2	eddy covariance	mixed deciduous stand over 50 years old, having regenerated from agricultural land; temperate deciduous forest in Oak Ridge TN
Yunusa *et al*., 2010	303, 564, 753 mm/yr	Catchment water balance method	2-year-old juvenile plantation block of mixed woody species near a waste management site, Australia
Yunusa *et al*., 2010	207, 393, 565 mm/yr	Catchment water balance method	Newly planted block of mixed tree species near a waste management site, Australia
Yunusa *et al*., 2010	278, 461, 722 mm/yr	Catchment water balance method	Grassy pasture seeded in 1994, near a waste management site, Australia
Yunusa *et al*., 2010	271, 579, 762 mm/yr	Catchment water balance method	Mature woodland near a waste management site, Australia

Zakia, 1987	615 mm/yr	soil water balance	Minas Gerais, Brazil, Pinus caribaea plantations, 4-6 yrs
Zakia, 1987	785 mm/yr	soil water balance	Minas Gerais, Brazil, eucalyptus grandis plantations, 4-6 yrs

Table S1.8. Annual evapotranspiration of evergreen broadleaf forest area

Source	ET	Method	Description
Abdul Rahim & Baharuddin, 1986	1555 mm/yr	catchment water balance	lowland and hilldipterocarp rain forests on granitic substrates in Peninsular Malaysia
Amin *et al*., 1997	1523 mm/yr	weather data satellite imagery	one watershed for one year in a tropical rainforest in Malaysia; Trolak watershed, in the north-east part of the Bernam River basin in the state of Perak
Baconguis, 1980	1232 mm/yr	water balance for a watertight area of 3.8 ha	Angat, Philippines, lowland rain forest; dipterocarp rain forest
Bailly *et al*., 1974	1295 mm/yr	water balance for 101 ha basin	Perinet, Madagascar; montane seasonal forest
Bastiaanssen & Bandara, 2001	1312 mm/yr	energy balance	mountain forest in Kirindi Oya, Sri Lanka
Batini *et al.,* 1980	910 mm/yr	forests in Wungong Brook catchment, Australia	
Baumgartner & Reichel, 1975	1185 mm/yr	catchment water budget	Amazon basin
Bernhard-Reversat *et al*., 1978	1425 mm/yr	n/a	rainforest in Yapo
Bernhard-Reversat *et al*., 1978	1196 mm/yr	n/a	rainforest in Banco (valley)
Bernhard-Reversat *et al*., 1978	1145 mm/yr	n/a	rainforest in Vanco (plateau)
Blackie, 1979a	1337 mm/yr	water balance for 544 ha Lagan catchment	Kericho, Kenya, montane rainforest
Blackie, 1979a	1240 mm/yr	water balance for 186 ha Sambret headwater area	Kericho, Kenya, Montane rain forest plus bamboo
Blackie, 1979b	1156 mm/yr	water balance for 65.9 ha catchment	Kimakia Kenya, Montane rain forest dominated by bamboo
Bosch & Hewlett, 1982	1016 mm/yr	catchment water balance	mixed hardwoods in Coweeta (6) catchment, NC

Bowden, 1968	1090 mm/yr	converted from pan estimate	six stations in St. Croix, Virgin Islands, utilizing all available historical rainfall, temperature, and pan-evaporation data
Bruijnzeel & Proctor, 1995	1265 mm/yr	catchment and site water balance studies	equatorial lower montane forest with negligible fog incidence
Bruijnzeel & Proctor, 1995	310-390 mm/yr	catchment and site water balance studies	upper montane cloud forest with high fog incidence
Bruijnzeel & Proctor, 1995; Steinhardt, 1979	980 mm/yr	energy balance	lower montane cloud forest with moderate fog incidence; tall forest in Venezuela
Bruijnzeel & Veneklaas, 1998	450-700 mm/yr	n/a	tropical montane cloud forest
Bruijnzeel *et al*., 1993	695 mm/yr	site water balance	for a stunted lower montane forest on a coastal mountain; may be a transition to low-elevation upper montane cloud forest on the basis of its mossiness and low stature
Bruijnzeel, 1999	275-1380 mm/yr	n/a	for Tropical Montane Cloud Forests; the frequent presence of clouds reduces ET, further reducing potential water stress; range for dwarf cloud forests, to cloud-free lower montane rainforest; estimates based on indirect estimate; Bruijnzeel cautions again
Bruijnzeel *et al*., 1993	695 mm/yr	short-term site water budget measurements conducted during a dry period	stunted lower montane forest on a coastal mountain in East Malaysia, may be a transition to low-elevation upper montane cloud forest
Calder *et al*., 1986	1481 mm/yr	Penman-Monteith model	mature secondary rainforest in Janlappa, West Java, Indonesia
Calvo, 1986	366 mm/yr	water balance for 4740 ha basin (water tight)	cloud forest, Rio Macho, Costa Rica
Cheng *et al*., 2002	1039-1195 mm/yr	catchment water balance	LHC-3 and LHC-5 catchment in Taiwan; dense forests of mixed evergreen hardwood species
Cheng *et al*., 2002	1539 mm/yr	catchment water balance	Fu-Shan No 1 watershed
Choudhury & DeGirolamo, 1998	1191 mm/yr	biophysical process-based model with satellite & ancillary data	rainforest
Choudhury & DeGirolamo, 1998	1200 mm/yr	biophysical process-based model with satellite & ancillary data	rainforest

Collinet *et al*, 1984	1465 mm/yr	water balance for 120 ha basin	Tai 1, Ivory Coast; moist semi-deciduous forest
Collinet *et al*, 1984	1363 mm/yr	water balance for 140 ha basin	Tai 2, Ivory Coast; moist semi-deciduous forest
Cornish & Vertessy, 2001	1075 mm/yr (SD 67.3)	catchment water balance	8 different catchments in Karuah Research Area, of Eucalypt forests in New South Wales, Australia
Cornish, 1993	1190 mm/yr	catchment water balance	Eucalypt forest in Crabapple catchment, Karuah in central New South Wales
Costa & Foley, 1997	3.7 mm/day	land surface model	Amazon basin
Costa & Foley, 1999	1384 mm/yr (SD 60.3)	n/a	Amazon basin
de los Santos, 1981	392 mm/yr	water balance for 7.2 ha basin	mossy montane cloud rain forest; Mt. Data, Philippines
DID, 1986	1498 mm/yr	water balance for 56 ha basin	Dipterocarp rain forest, basin "C"; Sungai Tekam C, Malaya
DID, 1986	1606 mm/yr	water balance for 38 ha basin	Dipterocarp rain forest, basin "B"; Sungai Tekam B, Malaya
Dietrich *et al*., 1982	1440 mm/yr	water balance for 10-ha basin	mature semi-deciduous moist tropical forest, Barro Colorado, Panama
Dietrich *et al*., 1982	886 mm/yr	water balance for 10-ha basin	dry year in mature semi-deciduous moist tropical forest, Barro Colorado, Panama
Edwards, 1979	1381 mm/yr	water balance for 16.3 ha catchment	montane evergreen forest (67%), scrub and grasses (33%); Mbeya, Tanzania
Elsenbeer *et al*., 1994	1535 mm/yr	n/a	Western Amazonia, Peru
Eltahir & Bras, 1994	3.1 mm/day	ECMWF assimilated data	Amazon basin
Feller, 1981	620 mm/yr	catchment water balance	south Australia higher elevation mountain ash catchment
Focan & Fripiat, 1953	1433 mm/yr	site water balance, tensiometers for soil moisture	secondary seasonal evergreen forest; Yangambi, Congo
Foster, 2001 Bruijnzeel, 1999	275-1380 mm/yr	based on indirect evidence	Tropical Montane Cloud Forests; range for dwarf cloud forests, to cloud-free lower mountain rainforest
Frangi & Lugo, 1985	845 mm/yr	site water balance (catchment leaking)	alluvial palm forest within lower montane forest in Luquillo experimental forest

Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Lambarene, Gabon
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Makokou, Gabon
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Warri, Nigeria
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Gasco, Philipine
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Malacca, Malaysi
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Sandakan, Malays
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Zamboanga, Phili
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Iquitos, Peru
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Manaus, Brazil,
Frank & Inouye, 1994	1363 mm/yr	model (Thornthwaite)	wet tropical forest, Zanderj, Surinam
Franken & Leopoldo, 1984	1641 mm/yr	catchment water balance	annual water budget for Amazon basin
Friend & Cox, 1995	3.12 mm/day	coupled SCM-vegetation model	forest
Garcia-Martino *et al*., 1996	1707 mm/yr	GIS, catchment water balance	the entire elevation range in the Luquillo experimental forest in Puerto Rico
Gatewood *et al*., 1950	1.829 m/yr	water budget	lower Gila River valley, annual cottonwood water use estimates (riparian); Lower Safford Valley, Arizona
Gilmour, 1975; 1977	1420 mm/yr	water balance for 25.7 ha	South Creek, Babinda, Queensland, Australia; mesophyll vine rainforest
Gonggrijp, 1941b	1170 mm/yr	water balance for 19.2 ha basin	lower montane rain forest, Ciwidey, Indonesia
Hafkenscheid, 2000	890-1050 mm/yr	micro-meteorological measurements	Blue Mountains of Jamaica
Hermann 1970	1265 mm/yr	water balance for "small catchments"	Sierra Nevada, Colombia, lower montane rain forest
Hermann 1970	308 mm/yr	water balance for "small catchments"	Sierra Nevada, Colombia, cloud forest
Hewlett & Hibbert, 1961	793 mm/yr	catchment water balance	mixed hardwoods in Coweeta (22) catchment, NC
Hewlett & Hibbert, 1961	1019 mm/yr	catchment water balance	mixed hardwoods in Coweeta (2) catchment, NC
Hodnett *et al*., 1995	3.5 mm/day	soil water balance	near Manaus Brazil

Holwerda, 1997 Schellekens *et al*., 1998	435 mm/yr	micro-meteorological measurements	low elevation dwarf cloud forest in Puerto Rico
Hoover, 1944	1059 mm/yr	catchment water balance	mixed hardwoods in Coweeta (17) catchment, NC
Hsia & Lin, 1981	850-1200 mm/yr	n/a	forested watersheds in Taiwan
Hutjes *et al*., 1990	1415 mm/yr	model	Tai, Ivory Coast
Hutley *et al*., 1997	1260 mm/yr	soil water budget	tall lower montane forest subject to frequent, low intensity rainfall associated with low cloud in Queensland, Australia
Huttel, 1975	1145 mm/yr	site water balance, ET derived from soil water balance (neutron probe), and from ET Turc minus Ei	moist semi-deciduous forest; Banco 1 basin, Ivory Coast; located on hill crest; dry year
Huttel, 1975	1195 mm/yr	site water balance, ET derived from soil water balance (neutron probe), and from ET Turc minus Ei	moist semi-deciduous forest; Banco 2 basin, Ivory Coast; located on valley bottom
Huttel, 1975	1425 mm/yr	site water balance, ET derived from soil water balance (neutron probe), and from ET Turc minus Ei	moist semi-deciduous forest; Yapo basin, Ivory Coast, located on hill crest
Jetten, 1994	1485 mm/yr	water balance	Guyana
Jipp *et al*., 1998	4.15 mm/day	soil water balance, micrometeorological measurements	mature rainforest 6 km north of Paragominas in the northern Brazilian state of Para
Johnson & Kovner, 1956	779 mm/yr	catchment water balance	mixed hardwoods in Coweeta (19) catchment, NC
Johnson & Kovner, 1956	1207 mm/yr	catchment water balance	mixed hardwoods in Coweeta (3) catchment, NC
Jolly *et al*., 1997	683 mm/yr	catchment water balance	forests in Castlereagh catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	939 mm/yr	catchment water balance	forests in Goodradigbee catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	879 mm/yr	catchment water balance	forests in Mitta catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	701 mm/yr	catchment water balance	forests in Murrumbidgee 18 catchment in Murray-Darling basin, Australia
Jolly *et al.,* 1997	714 mm/yr	catchment water balance	forests in Murrumbidgee 21 catchment in Murray-Darling basin, Australia

Jolly *et al.,* 1997	696 mm/yr	catchment water balance	forests in Namoi 8 catchment in Murray-Darling basin, Australia
Jordan & Heuveldop, 1981	1904 mm/yr	catchment water balance	for tropical rain forest
Jordan, 1989	1778 mm/yr	n/a	rainforest in San Calos
Kenworthy ,1969	1750 mm/yr	water balance	dipterocarp rainforest in Ulu Gombak
Klinge *et al*., 2001	1368 (SD 17) mm/yr	soil water balance, model, Penman	rainforest in eastern Amazonia
Kumagai *et al.,* 2004	945.7+357.3 mm/yr	water cycling model and measured climatic data	tropical rain forest, Lambir Hills National Park, Sarawak, Indonesia
Kumagai *et al.,* 2004	1545 mm/yr	eddy covariance	tropical rain forest, Lambir Hills National Park, Sarawak, Indonesia
Kuraji, 1996	1450.5 mm/yr	catchment water balance	Sapulut Watershed, East Malaysia
Langford *et al*., 1982	620 mm/yr	catchment water balance	Picaninny catchment mountain ash old growth
Langford, 1976	610 mm/yr	catchment water balance	Eucalyptus forest in Graceburn catchment, Australia
Larsen & Concepcion, 1998	2134-2337 mm/yr	n/a	for the entire Rio Mameyes watershed; error at a max is estimated to be 12% (Schellekends et al., 2000, p. 2191).
Ledger, 1975	1146 mm/yr	water balance for a 870 ha basin	seasonal evergreen forest; dry season of 5 months; 13% occupied by artificial lake; Guma, Sierra Leone
Leopoldo *et al*., 1981a	1548 mm/yr	catchment water balance for a basin of 2350 ha	Bacio Modelo, Brazil; ET may be too high [Bruijnzeel 1990]
Leopoldo *et al*., 1982b	1675 mm/yr	water balance for 130 ha basin; P determined with one gauge; change in soil water storage neglected; probable catchment leakage	"terra-firma" Amazonian primary forest; using catchment water budget technique; Ducke reserve, Brazil
Leopoldo *et al*., 1993	2.3-4.6 mm/day	n/a	mature forest in ABRACOS project near Manaus, Amazonia
Leopoldo *et al*., 1995	1493.1 (CV 2.08%) mm/yr	catchment water balance, modified Penman method	Amazonian rainforest near Manaus
Lesack, 1993	1120 mm/yr	catchment water budget	central Amazonian primary forest
Lloyd & Marques-Filho, 1988	1120 mm/yr (16-25% uncertainty)	water balance for undisturbed rainforest in central Amazon over 1 year	Central Amazonia, Brazil

Lockwood, 1976	1750 mm/yr	catchment water balance	Sungai Gombak, Malay Peninsula
Low & Goh, 1972	1516 mm/yr	water balance for an area of 6810 ha	for lowland and hilldipterocarp rain forests on granitic substrates in Peninsular Malaysia; Sungai Lui, Malaya (13% rubber plantations)
Major, 1963	1132 mm/yr	model (Thornthwaite)	Calcutta, India, monsoon deciduous forest
Major, 1963	1156 mm/yr	model (Thornthwaite)	Rangoon, Myanmar, mangrove forest
Major, 1963	860 mm/yr	model (Thornthwaite)	Haiti forests
Major, 1963	774 mm/yr	model (Thornthwaite)	Bombay forests
Major, 1963	1665 mm/yr	model (Thornthwaite)	tropical forests near Singapore
Malmer, 1993	1835 mm/yr	n/a	Sipitang, East Malaysia
Marengo *et al*., 1994	1616 mm/yr	annual water budget	Amazon Basin
Marengo *et al*., 2001a	1581 mm/yr	annual water budget	Amazon Basin
Marques *et al*., 1977	1000 mm/yr	micrometeorological measurements, model (Thornthwaite, Penman 48)	Amazon basin, for stretch between Belem and Manaus
Marques *et al*., 1980	1261 mm/yr	micrometeorological measurements, model (Thornthwaite, Penman 48)	annual water budget for Amazon basin
Matsuyama, 1992	3.1 mm/day	water balance	Amazon basin
Molion, 1975	3.1 mm/day	climatonomical	Amazon basin
Moran & O'Shaughnessy, 1984	841 mm/yr	catchment water balance	34 year old Eucalypt tree plantation forest in Monda 1-3 catchments, Australia
Morton, 1983a	956 mm/yr	catchment water balance	forests in Sanguere, Cameroon
Morton, 1983a	1328 mm/yr	catchment water balance	forests in Lagan catchment
Morton, 1983a	1291 mm/yr	catchment water balance	forests in Sambret catchment
Ni-Lar-Win, 1994	1204 mm/yr	catchment water balance	Niger catchment
Ni-Lar-Win, 1994	1200 mm/yr	catchment water balance	Feredougouba catchment
Ni-Lar-Win, 1994	1127 mm/yr	catchment water balance	Boa catchment

Ni-Lar-Win, 1994	1199 mm/yr	catchment water balance	Bafing catchment
Ni-Lar-Win, 1994	1295 mm/yr	catchment water balance	N'zo catchment
Ni-Lar-Win, 1994	898 mm/yr	catchment water balance	Falerne catchment
Ni-Lar-Win, 1994	1483 mm/yr	catchment water balance	YenI catchment
Nizhizawa & Koike, 1992	1451 mm/yr	annual water budget	Amazon Basin
Odum *et al*., 1970b	1860-2154 mm/yr	n/a	Tabonuco forest at El Verde, in the Luquillo Experimental Forest
Oki *et al*., 1999	1023 mm/yr	annual water budget	Amazon Basin
Oyebande, 1988	945 mm/yr	n/a(*al.*, 2007)	Loweo Catchment in the Yangambi Forest Reserve in Zaire
Pereira, 1964	1154 mm/yr	catchment water balance	bamboo forest in Kimakia catchment
Pike, 1964	814 mm/yr	catchment water balance	LilongI catchment
Pike, 1964	1107 mm/yr	catchment water balance	Luweya catchment
Pike, 1964	807 mm/yr	catchment water balance	Rivi Rivi catchment
Pilgrim *et al*., 1982	600 mm/yr	catchment water balance	native eucalypt forest at Lidsdale, Australia
Pinol *et al.,* 1991	502 mm/yr	catchment water balance	dense holm oak (Quercus ilex L.) forest in L'Avic catchment, Prades, northeast Spain
Pinol *et al.,* 1991	515 mm/yr	catchment water balance	dense holm oak (Quercus ilex L.) forests in La Teula catchment, Prades, northeast Spain
Poels, 1987	1630 mm/yr	catchment water balance for a 295 ha basin;	clearcutting just outside basin; leakage via earthen dam with sharp-rested weir quantified by that via sandy valley bottom assumed negligible, possibly overestimate (Bruijnzeel., 1990); Tonka, Surinam
Post & Jones, 2001	1825, 1802, 1788 mm/yr	catchment water balance	Luquillo Bisley Catchment 1, 2, 3
Rao *et al*., 1996	4.5 mm/day	water balance	ECMWF assimilate data, Amazon basin
Ribeiro & Villa Nova, 1979	1508 mm/yr	Thornthwaite and Mather's method	Ducke Forest Reserve, Amazonia
Richardson, 1982	2000 mm/yr	Catchment Water Balance (CWB)	submontane forest on the leeward side of Jamaica (leaky catchment)
Roche, 1982	1528 mm/yr	catchment water balance for 840 ha basin	Gregoire 1, French Guyana
Roche, 1982	1437 mm/yr	catchment water balance for 1240 ha basin	Gregoire 2, French Guyana

Roche, 1982	1444 mm/yr	catchment water balance for 320 ha basin	Gregoire 3, French Guyana
Rosenzweig, 1968	log 3.12 mm/yr	model (Thornthwaite)	tropical forest ,Yangambi, Congo (Leopoldville
Russell & Miller, 1990	1620 mm/yr	annual water budget	Amazon Basin
Schellekens *et al.,* 2000	6.6-6 mm/day	micrometeorological measurements, Penman Monteith, catchment water balance	for lower tropical rainforest, below 600 m; a recent detailed measurement; 6.6 mm/d in 1996 and 6.0 mm/d in 1997; average ET for forest ; using combination of micrometeorological and hydrological methods
Scott & Lesch, 1997	1168 mm/yr	catchment water balance	Eucalyptus in Mokobulaan (A) catchment
Scott & Lesch, 1997	1122 mm/yr	catchment water balance	Eucalyptus in Mokobulaan (B) catchment
Sharma, 1984	923 (+/- 57) mm/yr	water balance method	Eucalypt forest in southwestern Australia
Shuttleworth, 1988	1315 mm/yr	Bowen Ratio Energy Balance (BREB); intensive field campaigns, combined Penman-Monteith-Rutter model using continuous above-canopy climatic data	Manaus rainforest; based on micrometeorology model coupling measurements of available net energy with continuous measurements of rainfall interception loss at Reserva Ducke near Barro Branco catchment
Shuttleworth, 1988	1274-1344 mm/yr	micrometeorological measurements, soil water balance	primary Amazonian rainforest near Manaus
Silbertein et al., 1999	1115 mm/yr	forests in Salmon catchment, within Collie River catchment, in southwest of Western Australia	
Steinhardt, 1979	980 mm/yr	energy balance	mossy lower montane rain forest (transition to cloud forest), San Eusebio, Venezuela
Vertessy & Bessard, 1999	678 mm/yr	n/a	forest in New South Wales
Vertessy *et al*., 1996	635 mm/yr	ecohydrological water balance model (Topog-IRM)	mountain ash Picaninny (0.53 km^2) forest catchment, Victoria, Australia; old growth mountain ash forest (about 200 years old); doesn't include interception losses
Vertessy *et al*., 2001	911 mm/yr	sap flow, lysimeter	240 yr old Ash / Eucalypt forest in Victoria, Australia
Villa Nova *et al*., 1976	1168 mm/yr	micrometeorological measurements	Amazon basin
Villa Nova *et al*., 1976	1080 mm/yr	annual water budget	Amazon basin
Vorosmarty & Wilmott, 1999	1221 mm/yr	Water balance/Water Transport Model (WBM/WTM) computed water balance	Amazon basin, upriver of Obidos
Vorosmarty *et al*., 1989	1250 mm/yr	annual water budget	Amazon basin
Vorosmarty *et al*., 1996	3.3 mm/d	model (Thornthwaite)	Amazon basin

Vourlitis *et al*., 2002	6.91(+/- 0.80) MJ/m²/day	eddy covariance	extensive mature, intact forest, north of Sinop, Mato Grosso, Brazil
White *et al.,* 2002	595 mm	Catchment water balance	eucalyptus tree belts in pasture area
Williams *et al*., 1998	818 mm/yr	eddy covariance, soil plant atmosphere model	virgin terra firme forest in Reserva Biologica do Cuieiras
Zeng, 1999	1879 mm/yr	catchment water balance	annual water budget for Amazon basin

Table S1.9. Annual evapotranspiration of evergreen needleleaf forest areas

Source	ET	Method	Description
Amoriello & Constantini, 1999	509.3 mm/yr	micrometeorological measurements	Spruce Forest, Tarvisio, 08-FRI2-IP
Amoriello & Constantini, 1999	420.6 mm/yr	micrometeorological measurements	Spruce Forest, Passo Lavaze, 17-TRE1-IP
Amthor *et al*., 2001	304 +/- 20%, 278 +/- 22%; 280 +/- 19% mm/yr	nine ecosystem process models	150 year old black spruce forest in central Canada
Anthoni *et al*., 1999	430 +/- 70, 400+/- 60 mm/yr	eddy covariance and Penman-Monteith model	two years, ponderosa pine forest
Arkley, 1967	17.1 in/yr	model, assumed soil moisture capacity of 6 inches	Williams, Josephine County, Oregon
Barr *et al*., 2000	390 mm/yr	eddy correlation and deep groundwater piezometer	boreal aspen forest
Bidlake *et al*., 1996	1060 mm/yr	Bowen-Ratio Energy Balance	pine flatwood in west-central Florida
Bosch & Hewlett, 1982	1180 mm/yr	catchment water balance	pine forest in Alum Creek (WS2)
Bosch & Hewlett, 1982	975 mm/yr	catchment water balance	pine forest in Alum Creek (WS3)
Brown, 1971 Clay et al., 1974	437 mm/yr	catchment water balance	Juniper-pinyon forest, Beaver Creek (1) catchment
Brown, 1971; Clay et al., 1974	439 mm/yr	catchment water balance	Juniper-pinyon forest, Beaver Creek (3) catchment
Calder, 1976	1090 mm/yr	"natural" lysimeter	Hafren forest of central Wales, at the headwaters of the River Severn, Plynlimon, Powys; contains 26 Norway Spruce trees
Calder, 1982	400 mm/yr	catchment water balance	six year average, forest biome

Calder, 2003	571, 603 mm/yr	HYLUC model	Greenwood Community Forest, conifers in sand & loam soil
Choudhury & DeGirolamo, 1998	488 mm/yr	biophysical process-based model with satellite & ancillary data	taiga forests
Choudhury & DeGirolamo, 1998	460 mm/yr	biophysical process-based model with satellite & ancillary data	taiga forests
Choudhury & DeGirolamo, 1998	360 mm/yr	biophysical process-based model with satellite & ancillary data	taiga forests
Choudhury & DeGirolamo, 1998	359 mm/yr	biophysical process-based model with satellite & ancillary data	taiga forests
Clarke & McCullogh, 1979	717 mm/yr	2/3 is coniferous forest, 1/3 Japanese larch	
Delfs, 1967	579 mm/yr	n/a	spruce forest in Harz Mt.
Dirnbock & Grabherr, 2000	270-450 mm/yr	compilation of literature, modelling according to Turc-Wendling, an energy balance model	sub-alpine spruce forest on steep slope and pine tree forest in Alpine Austria
Dunn & Mackay, 1995	766 (SD 45.3) mm/yr	model, based on Penman-Monteith with Rutter interception	evergreen needleleaf forest in the Tyne Basin in North East England
Federov, 1977	480 mm/yr	energy balance, micrometeorological measurements, lysimeter	tall spruce forest at Valdai station, Russia; Monthly measurements of evaporation were taken during the warmer months, May to October, using lysimeters. For the remaining months (November to April), an estimate of evaporation was calculated using the Budyko (1956) algorithm for potential evaporation
Franco-Vizcaino *et al*., 2002	390 +/- 122 mm/yr	soil water balance, lysimeter	Jeffry pine forest in Baja Mexico - very arid
Franco-Vizcaino *et al*., 2002	478+/-87 mm/yr	soil water balance, lysimeter	mixed conifer forest in Baja Mexico - very arid
Franco-Vizcaino *et al*., 2002	446 +/- 122 mm/yr	soil water balance, lysimeter	mixed conifer forest in Baja Mexico - very arid
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Arkhangelsk, Russia
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Minusinsk, Russia
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Murmansk, Russia
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Petrozavodsk, Russia
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Jyvaskyla, Finland
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Ostersund, Sweden
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Fort Smith, Canada

Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Moosonee, Canada
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Norman Wells Canada
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Schefferville, Quebec, Canada
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, The Pas, Canada
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	taiga, Arkhangelsk Russia
Galoux *et al.*, 1981	546-617 mm/yr	n/a	pine forest in Berlin
Galoux *et al.*, 1981	610 mm/yr	n/a	pine forest in Crowthorne
Gash & Stewart, 1977	566 mm/yr	n/a	pine forest in Thetford
Grünwald, 2004	474, 488, 504, 522, 470, 395, 378 mm/yr	eddy covariance	measured above an old spruce forest, filled using mean diurnal courses with a 14-day window
Helvey, 1973, 1980	442 mm/yr	catchment water balance	forest, Burns catchment, north-central Washington USA
Helvey, 1973, 1980	467 mm/yr	catchment water balance	forest, McCree catchment, north-central Washington USA
Hudson, 1988	771 mm/yr	n/a	spruce forest in Severn
Humphreys et al., 2003	432, 435 mm/yr	eddy covariance	50-year old 33 m tall coastal Douglas Fir forest
Krestovsky, 1969b	430, 440, 490, 450 mm/yr	n/a	100-140 year old pine and spruce forest in southern taiga subzone of European former USSR
Krestovsky, 1980	450-490 mm/yr	n/a	spruce and pine forests, aged 100-120 year, in the southern taiga subzone in the European former USSR
Launiainen, 2005	329 mm/yr	eddy covariance	coniferous forest at Hyytiala site, Finland
Law *et al*., 2000	418 +/- 62.5 mm/yr	eddy covariance, micrometeorological measurements	Metolius site in a Research Natural Area, east side of Cascade Mountains; Ponderosa pine forest, 250 yr and some young, 45 year old
Lieth & Solomon, 1985	100.73 mm/yr	GOES digital imagery, Turc 1954 model	Arrow Creek near Creston BC, unlogged
Löfgren, 2004a,b	409, 414, 463, 501, 412, 522 mm/yr	micrometeorological measurements	Station SE15 Kindla, Norway Spruce. Trees have been felled for charcoal to be used in the neighbouring furnace since the 16th century. At the IM site eight “charcoal bottoms” have been traced, several of them with remnants of cabins.

Löfgren, 2004a,b	385, 440, 439, 510, 444, 268 mm/yr	micrometeorological measurements	Station SE16, Gammtratten, Norway Spruce, Biggest trees felled around 1900. Light grazing by cattle up to the 1950´s
Major, 1963	388 mm/yr	model (Thornthwaite)	Arkangelsk, former USSR forest, northern taiga forest
Major, 1963	322 mm/yr	model (Thornthwaite)	Crater Lake, Oregon (1974 m elevation); assuming 100 mm available soil moisture storage capacity
Major, 1963	436 mm/yr	model (Thornthwaite)	Paradise Mountain, Rainier, Washington USA (1690 m elevation); assuming 100 mm available soil moisture storage capacity
Major, 1963	248 mm/yr	model (Thornthwaite)	Gem Lake, California, USA (2780 m elevation); assuming 100 mm available soil moisture storage capacity
Major, 1963	236 mm/yr	model (Thornthwaite)	Ellery L, California, USA (2930 m elevation); assuming 100 mm available soil moisture storage capacity
Mo *et al*., 2004	593 mm/yr	process-based distributed model	Coniferous forest, Lushi basin, China
Molchanov, 1963	295 mm/yr	n/a	pine forest in Volgograd
Molchanov, 1963	596 mm/yr	n/a	pine / spruce forest in Minsk
Molchanov, 1963	329 mm/yr	n/a	spruce / pine forest in Vologda
Molchanov, 1963	448 mm/yr	n/a	pine spruce forest in Orekhovo
Murakami *et al*., 2000	546 mm/yr (SD 75.2)	catchment water balance	mature Japanese cypress and cedar forests
Nakano, 1967	859 mm/yr	catchment water balance	pinus densiflora in Minanmitani catchment
Nakano, 1967	823 mm/yr	catchment water balance	pinus densiflora in Kitatani catchment
Nijssen & Lettenmaier, 2002	250, 240, 243 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models	mature jack pine in the White Gull Creek Basin, Saskatchewan, Canada
Nijssen & Lettenmaier, 2002	315, 320, 324 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models	mature black spruce in the White Gull Creek Basin, Saskatchewan, Canada
Pavlov, 1976	200-240 mm/yr	n/a	boreal forest

Post & Jones, 2001	968, 981, 1007 mm/yr	catchment water balance	Andrews 2,8,9 long term control basins, in Andrews Experimental LTER
Rauner, 1966	400-450 mm/yr	it has been suggested [Zubenok, 1976, Rakhmanov, 1981, Gidromet, 1976, Fedorov, 1977] that Rauner overestimated forest ET by approximately 5 to 15%	calculated the evaporation from forests of the European former USSR and plotted isoline maps
Rauner, 1966	500 mm/yr	it has been suggested [Zubenok, 1976, Rakhmanov, 1981, Gidromet, 1976, Fedorov, 1977] that Rauner overestimated forest ET by approximately 5 to 15%	calculated the evaporation from forests of the European former USSR and plotted isoline maps
Rauner, 1966	575 mm/yr	it has been suggested [Zubenok, 1976, Rakhmanov, 1981, Gidromet, 1976, Fedorov, 1977] that Rauner overestimated forest ET by approximately 5 to 15%	calculated the evaporation from forests of the European former USSR and plotted isoline maps
Rauner, 1966	525-550 mm/yr	it has been suggested [Zubenok, 1976, Rakhmanov, 1981, Gidromet, 1976, Fedorov, 1977] that Rauner overestimated forest ET by approximately 5 to 15%	calculated the evaporation from forests of the European former USSR and plotted isoline maps
Rauner, 1966	576-600 mm/yr	it has been suggested [Zubenok, 1976, Rakhmanov, 1981, Gidromet, 1976, Fedorov, 1977] that Rauner overestimated forest ET by approximately 5 to 15%	calculated the evaporation from forests of the European former USSR and plotted isoline maps
Rich *et al*., 1961	727 mm/yr	catchment water balance	conifer forest, North Fork, Workman experimental watershed
Rich *et al*., 1961	726 mm/yr	catchment water balance	conifer forest, South Fork, Workman experimental watershed
Rich, 1968	568 mm/yr	catchment water balance	Castle Creek catchment, conifer forest, Arizona
Rosenzweig, 1968	log 2.61, 2.64, 2.68 mm/yr	model (Thornthwaite)	fraser fir and spruce fir forest Gt. Smky Mts, TN
Running *et al*., 1989	40-60 cm/yr	simulation model (FOREST-BGC)	predominantly coniferous forests in western Montana, the part of the study area that was not heavily clearcut
Sharpe, 1970	341 (44 SD) mm/yr	measured at site, Thornthwaite method	station C-1, Niwot Ridge, Front Range, Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest
Sharpe, 1970	330 (45 SD) mm/yr	measured at site, Thornthwaite method	Berthoud Pass, Front Range, Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest

Sharpe, 1970	321 (63 SD) mm/yr	measured at site, Thornthwaite method	Leadville, Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest
Sharpe, 1970	321 (46 SD) mm/yr	measured at site, Thornthwaite method	Climax, 2NW Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest
Sharpe, 1970	381 (29 SD) mm/yr	measured at site, Thornthwaite method	Lake Moraine, Pike's Peak Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest
Sharpe, 1970	369 (32 SD) mm/yr	measured at site, Thornthwaite method	Wolf Creek Pass 1 East, Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest
Sharpe, 1970	326 (34 SD) mm/yr	measured at site, Thornthwaite method	Summitville, Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest
Sharpe, 1970	334 (51 SD) mm/yr	measured at site, Thornthwaite method	Wagon Wheel Gap Expt. Station, Colorado; assumed 100 mm of available soil moisture storage capacity; upper Montane forest
Sharpe, 1970	300 (50 SD) mm/yr	measured at site, Thornthwaite method	Wagon Wheel Gap Expt. Station, near Timberline, Colorado; assumed 100 mm of available soil moisture storage capacity; subalpine forest
Sumner, 2001	993 mm/yr	energy budget variation of eddy correlation	Tiger Bay watershed Volusia County, Florida, pine flatwood tree plantation
Sun *et al*., 1998	1002.7 mm/yr	FLATWOODS model	"control" sites in North central Florida: Gator National forest and Bradford forest; two sites simulated for a dry, normal, wet year
Tattari & Ikonen, 1997	600, 620, 605 mm/yr	ASTIM model	Pine and spruce forests on moraine, and pine swamps
Thornton *et al*., 2002 Law *et al*., 2002	357, 339 mm/yr	coupled water-carbon-nitrogen model, canopy-scale flux observations	Howland forest, ME, select cut 1910
Thornton *et al*., 2002; Law *et al*., 2002	521, 444 mm/yr	coupled water-carbon-nitrogen model, canopy-scale flux observations	Metolius, OR; fire disturbance in 1750, 1850, 1950
Thornton *et al*., 2002; Law *et al*., 2002	640, 537 mm/yr	coupled water-carbon-nitrogen model, canopy-scale flux observations	Nitwot ridge CO (harvested 1905, assume returned to equilibrium after 95 years)
Thornton *et al*., 2002; Law *et al*., 2002	542, 443 mm/yr	coupled water-carbon-nitrogen model, canopy-scale flux observations	Wind river Washington State
Tiktak & Bouten, 1994	712 mm/yr	model `SWIF'	Douglas Fir Stand in the Netherlands

TVA, 1961	720 mm/yr	Catchment water balance	Douglas Fir forests in White Hollow Catchment, TN
Vesala & Launiainen, 2004	329 mm/yr	Eddy covariance	coniferous forest at Hyytiala site
Waterloo, 1994	1512 mm/yr	n/a	mature pine stand in Fiji
Williams *et al.,* 2001	436 +/- 65, 400 +/- 60 mm/yr	Metolius ponderosa pine site, eastern Cascades; mixed age	

Table S1.10. Annual evapotranspiration of deciduous broadleaf forest areas

Source	ET	Method	Description
ADWR, 1991	1271-1198 mm/yr	Blaney-Criddle	riparian cottonwoods and willow in the San Pedro River Basin, Sierra Vista sub watershed
Amoriello & Constantini, 1999	248.7, 313.3 mm/yr	micrometeorological measurements	Beech Forest, Selva Piana 01-ABR1-IP
Amoriello & Constantini, 1999	353.0, 382.1 mm/yr	micrometeorological measurements	Oak Forest, Carrega 05-EMI1-IP
Amoriello & Constantini, 1999	421.8 mm/yr	micrometeorological measurements	Beech Forest, Brasimone 06-EMI2-IP
Amoriello & Constantini, 1999	388.0, 361.3 mm/yr	micrometeorological measurements	Oak Forest, Monte Rufino, 09-LAZ1-IP
Amoriello & Constantini, 1999	420.3, 407.9, 339.4, 421.4 mm/yr	micrometeorological measurements	Oak Forest, Colognole, 16-TOS1
Baldocchi, pers comm.	600-620 mm/yr	eddy covariance	oak forest
Barr *et al*., 2000	360 mm/yr	eddy correlation and deep groundwater piezometer	mature boreal aspen forest in Saskatchewan
Black *et al*., 1996	403 mm/yr	eddy covariance	deciduous aspen stand in Canada during 1994
Blanken *et al*., 2001	401.1, 412.1, 422.8 mm/yr	eddy covariance	even-aged stand of trembling aspen near Prince Albert, Saskatchewan
Calder, 2003	553, 594 mm/yr	HYLUC model	Greenwood Community Forest, broadleaf in sand and loam soil
Dirnbock & Grabherr, 2000	270-360 mm/yr	compilation of literature; modelling according to Turc-Wendling, an energy balance model	montane beech forest in Austria

Dunn & Mackay, 1995	633 (SD 30.7) mm/yr	model, based on Penman-Monteith with Rutter interception	deciduous forest in the Tyne Basin in North East England
Flerchinger *et al*., 1996	570 (+/- 3), 456 (+/- 51) mm/yr	Simultaneous Heat and Water Model (SHAW), detailed physical process model applied to 2 years of data	southwestern Idaho, Aspen, using SHAW model and meteorological measurements
Frank & Inouye, 1994	588 mm/yr	model (Thornthwaite)	broadleaf forest, Hopkinsville, KY
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest,Mansfield Hollow, CN
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, New Castle, PN
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, Bourges, France
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, Gatwick, GB
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, Gorlitz, Germany
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, Opole, Poland
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, Thorshaun, Denmark
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, Battle Creek, Michigan
Frank & Inouye,	588 mm/yr	model (Thornthwaite)	broadleaf forest, Columbus, OH
Friend *et al*., 1997	841, 1319,1387 $MJ/m^2/yr$	simulated lE from Hybrid v3.0.	simulated lE from Hybrid v3.0. Values are the means of 10 plots over the last 100 years of a 500 year simulation
Granier, 2004	314.2, 317.3, 346.5, 404.3, 440.3, 366.4, 368, 298 mm/yr	eddy covariance	Hesse Beech Forest
Granier, 2004	314.2, 317.3, 346.5, 404.3, 440.3, 366.4, 368, 298 mm/yr	eddy covariance	Hesse Beech Forest
Hoover, 1944	1072 mm/yr	n/a	Oak / Hickory forest in Coweeta
Johnston 1970	21.00 in/yr	soil water balance	plot: scrubby aspen clones, located near head of Parrish Canyon on the Davis County Experimental Watershed near Bountiful, Utah, elevation 8400 feet asl
Kostin, 1970	541 mm/yr	from energy and water balance estimates	coniferous broad-leaved and broad-leaved forest province (Orel, Mtsensk, Russia). SW of Moscow, in Central Chernozem belt
Kostner, 2001	370-600 mm/yr	sap flow, eddy covariance	beech forests, according to literature reviewed by Peck & Mayer (1996)

Krestovsky, 1980	585 mm/yr	catchment water balance, Bowen-Ratio Energy-Balance, Micrometeorological measurements	birch and aspen, aged 50-60 years, in the southern taiga subzone in the European former USSR
Law, 1957	421 mm	lysimeter	woodland in Hodder catchment
Lewis, 1968	490 mm/yr	catchment water balance	Oak woodland forest, Placer county catchment
Li *et al*., 2010			
Luxmoore, 1983	655 mm/yr		oak forest
Major, 1963	618 mm/yr	model (Thornthwaite)	forest in Great Smoky Mountains, TN, USA
Major, 1963	1003mm/yr	model (Thornthwaite)	tropical and subtropical dry broadleaf forests near Acapulco, Mexico
Mo *et al*., 2004	567 mm/yr	process-based distributed model	Broadleaf forest, Lushi basin, China
Molchanov, 1963	431 mm/yr	n/a	oak forest in Lugansk
Mulholland, pers. comm.	620 mm/yr	catchment water balance	oak forest
Murai, 1980 Tsukamoto, 1992	801 mm/yr	n/a	Fagus Natural Forest Site in Shizuoka County, Central Japan
Nijssen & Lettenmaier, 2002	422, 437, 458 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models	mature aspen in the White Gull Creek Basin, Saskatchewan, Canada
Oliphant, *et al*., 2002	1600 MJ	n/a	midwestern deciduous hardwood forest; transition zone, mixed species, selectively logged, Morgan Monroe State Forest (MMSF), extensive secondary successional broadleaf forest, in the maple-beech to oak-hickory transition zone
Pilgrim *et al*., 1982	600 mm/yr	catchment water balance	native eucalypt forest at Lidsdale, Australia
Post & Jones, 2001	497, 497, 525, 496, 530 mm/yr	catchment water balance	Hubbard Brook 1, 3, 6, 7, 8 basins in Hubbard Brook experimental forest
Roberts, 1998	384-445 mm/yr	empirical relations	lowland and upland coniferous forests
Rosenzweig, 1968	log 2.75 mm/yr	model (Thornthwaite)	climax beech-maple forest Toronto ON, Canada
Rosenzweig, 1968	log 2.92 mm/yr	model (Thornthwaite)	oak-hickory forest, Oak Ridge, TN

Rosenzweig, 1968	log 2.69 mm/yr	model (Thornthwaite)	grey beech forest, Gt. Smky Mts, TN
Rosenzweig, 1968	log 2.85 mm/yr	model (Thornthwaite)	deciduous cove forest, Gt. Smky Mts, TN
Sun *et al*., 2002	779 mm/yr	model	mature deciduous oak hardwoods in mountainous North Carolina
Tajchman *et al*., 1997	817 mm/yr	water balance	oaks and maple in Appalachians
Unland *et al*., 1998	1.697 m/yr	micrometeorological measurements, soil water balance	cottonwood in riparian area of Santa Cruz River in southern Arizona
White *et al*., 1999	57.5 (SD 0.9) cm/yr	ecosystem model (BIOME-BGC)	Burlington Vt. site in deciduous broadleaf forest
White *et al*., 1999	49.9 (SD 0.6) cm/yr	ecosystem model (BIOME-BGC)	Portland Me. site in deciduous broadleaf forest
White *et al*., 1999	56.7 (SD 0.9) cm/yr	ecosystem model (BIOME-BGC)	Albany, NY site in deciduous broadleaf forest
White *et al*., 1999	54.6 (SD 0.9) cm/yr	ecosystem model (BIOME-BGC)	Blue Hill, Mass. site in deciduous broadleaf forest
White *et al*., 1999	55.9 (SD 0.9) cm/yr	ecosystem model (BIOME-BGC)	Ann Arbor, Mich. site in deciduous broadleaf forest
White *et al*., 1999	62.1 (SD 0.9) cm/yr	ecosystem model (BIOME-BGC)	Wooster Ohio site in deciduous broadleaf forest
White *et al*., 1999	62.7 (SD 1.0) cm/yr	ecosystem model (BIOME-BGC)	Monmouth, Ill. site in deciduous broadleaf forest
White *et al*., 1999	59.8 (SD 1.1) cm/yr	ecosystem model (BIOME-BGC)	New Brunswick, NJ site in deciduous broadleaf forest
White *et al*., 1999	63.1 (SD 1.1) cm/yr	ecosystem model (BIOME-BGC)	Washington, Ind. site in deciduous broadleaf forest
White *et al*., 1999	69.6 (SD 1.0) cm/yr	ecosystem model (BIOME-BGC)	Rogersville, Tenn. site in deciduous broadleaf forest
White *et al*., 1999	69.7 (SD 0.8) cm/yr	ecosystem model (BIOME-BGC)	Monroe N.C. site in deciduous broadleaf forest
White *et al*., 1999	66.0 (SD 0.6) cm/yr	ecosystem model (BIOME-BGC)	Charleston, S.C. site in deciduous broadleaf forest
Wilson & Baldocchi, 2000	567.2 mm/yr	eddy covariance, micrometeorological measurements	estimated evaporation (sum of measured evaporation and the estimated evaporation when data was missing. For NA temperate deciduous forest
Wilson *et al*., 2001	645 (+/- 20) mm/yr	catchment water balance	uneven-aged mixed deciduous forest in southeastern USA
Wilson *et al*., 2001	571 (+/- 16) mm/yr	eddy covariance	uneven-aged mixed deciduous forest in southeastern USA

Table S1.11. Annual evapotranspiration of mixed forest area

Source	ET	Method	Description
Allen, 2000	1300-1470 mm/yr	FAO56-PM equation and the 1985 Hargreaves equation	forest in Gediz River, Turkey
Baumgartner, 1972	450 mm/yr	lysimeter	pines & oaks; assumed per year
Calder, 2003	554, 594 mm/yr	HYLUC model	Greenwood Community Forest, mixed forest in sand & loam soil
Cheng *et al*., 2002	1198 mm/yr	catchment water balance	PL-11 watershed in Taiwan Taiwanese forests; dense forests of coniferous species on slopes and hardwood species in valley bottoms
Dirnbock and Grabherr, 2000	270-360 mm/yr	compilation of literature, modelling according to Turc-Wendling, an energy balance model	montane spruce / fir tree / beech forest in alpine Austria
Frank & Inouye, 1994	543 mm/yr	model (Thornthwaite)	broadleaf-needleleaf forest, Jonkopings, Sweden
Frank & Inouye, 1994	543 mm/yr	model (Thornthwaite)	broadleaf-needleleaf forest, Burlington, VT
Frank & Inouye, 1994	543 mm/yr	model (Thornthwaite)	broadleaf-needleleaf forest, Concord, NH
Frank & Inouye, 1994	543 mm/yr	model (Thornthwaite)	broadleaf-needleleaf forest, Green Bay, WS
Frank & Inouye, 1994	543 mm/yr	model (Thornthwaite)	broadleaf-needleleaf forest, Lewiston Massac
Frank & Inouye, 1994	543 mm/yr	model (Thornthwaite)	broadleaf-needleleaf forest, Syracuse, NY
Frank & Inouye, 1994	543 mm/yr	model (Thornthwaite)	broadleaf-needleleaf forest, Jonkopings, Sweden
Frank & Inouye, 1994	821 mm/yr	model (Thornthwaite)	coniferous-deciduous forest, Camden, SC
Frank & Inouye, 1994	821 mm/yr	model (Thornthwaite)	coniferous-deciduous forest, Durham, NC
Frank & Inouye, 1994	821 mm/yr	model (Thornthwaite)	coniferous-deciduous forest, Lakeland, FL
Frank & Inouye, 1994	821 mm/yr	model (Thornthwaite)	coniferous-deciduous forest, Macon, GA
Frank & Inouye, 1994	821 mm/yr	model (Thornthwaite)	coniferous-deciduous forest, Montomery, AB
Hoover, 1944	878 mm/yr	catchment water balance	mixed forests in Coweeta (17) catchment, NC
Molchanov, 1963	410 mm/yr	n/a	oak / pine forest in Voronezh
Molchanov, 1963	401 mm/yr	n/a	spruce / birch forest in Sareevo (in Vologda district)

Molchanov, 1963	406 mm/yr	n/a	spruce birch forest in Istra
Molchanov, 1963	378 mm/yr	n/a	spruce elm forest in Kalinin
Molchanov, 1963	286 mm/yr	n/a	pine birch forest in Arkhangelsk
National Park Service, 1982	1061 mm/yr	n/a	moist (assumed mixed) forest in Big Thicket National Preserve, Texas
Nijssen & Lettenmaier, 2002	387, 398, 411 mm/yr	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models	mixed forest in the White Gull Creek Basin, Saskatchewan, Canada
Pearce & Rowe, 1979 Rowe, 1979	1100 mm/yr	n/a	experimental mixed forest for Maimai catchment, South Island, New Zealand
Pearce *et al.,* 1976	1100 mm/yr	catchment water balance	mixed beech forest in Maimai (M7) catchment
Pearce *et al.,* 1976	1100 mm/yr	catchment water balance	mixed beech forest in Maimai (M9) catchment
Post & Jones, 2001	954, 866, 916, 719, 834, 831, 528 mm/yr	catchment water balance	Coweeta 2, 14, 18, 27, 32, 34, 36 basins in Coweeta experimental forest
Rosenzweig, 1968	log 2.82 mm/yr	model (Thornthwaite)	hemlock – mixed forest, Gt. Smky Mts TN
Rosenzweig, 1968	log 2.75 mm/yr	model (Thornthwaite)	hemlock – rhododendron forest, Gt. Smky Mts TN
Walter & Hedin, 2002	430 mm/yr	watershed mass balance	remote unpolluted Chilean old growth forests

Table S1.12. Annual evapotranspiration of Savannah

Source	ET	Method	Description
Balek & Perry, 1973	1000-1350	n/a	Brachystegia woodland, Luano catchment, Zambia
Bernard, 1948	95-100 cm /yr	direct measurements	savannah country in Belgian Congo, central basin
Bosch & Hewlett, 1982	800 mm/yr	catchment water balance	Fynbos in Biesievlei catchment
Bosch & Hewlett, 1982	800 mm/yr	catchment water balance	Fynbos in Bosboukloof catchment
Bosch & Hewlett, 1982	837 mm/yr	catchment water balance	Fynbos in Lambrerchtsbos (A) catchment
Bosch & Hewlett, 1982	991 mm/yr	catchment water balance	Fynbos in Lambrerchtsbos (B) catchment
Bosch & Hewlett, 1982	709 mm/yr	catchment water balance	Fynbos in Tierkloof catchment

Choudhury *et al*., 1998	1000 mm/yr	biophysical process-based model with satellite & ancillary data	savannah
Choudhury *et al*., 1998	894 mm/yr	biophysical process-based model with satellite & ancillary data	savannah
Choudhury *et al*., 1998	900 mm/yr	biophysical process-based model with satellite & ancillary data	savannah
Cook *et al*., 1998	1110 mm/yr	eddy covariance / energy balance	Howard River, NT, Australia; assuming wet season evaporation in this region scales with radiation, and use monthly global irradiation values to constrain annual ET estimate; open eucalypt woodland
Dye, 1996	548 mm/yr	catchment water balance	scrub forest in Westfalia catchment
Everson, 2001	695.5 mm/yr	Bowen Ratio Energy Balance, Penman Monteith, Equilibrium equation	Cathedral Peak Forestry Research Station, northern Natal Drakensberg Park, South Africa, received biennial spring burning treatment
Frank & Inouye, 1994	894 mm/yr	model (Thornthwaite)	savannah in Brasilia, Brazil
Frank & Inouye, 1994	894 mm/yr	model (Thornthwaite)	savannah in Cuiba, Brazil
Frank & Inouye, 1994	894 mm/yr	model (Thornthwaite)	savannah in San Fernando, Venezuela
Hoffman & Jackson, 2000	1142 mm/yr	simulation with land surface model	llanos, from GCM model
Hoffman & Jackson, 2000	896 mm/yr	simulation with land surface model	southern Africa, from GCM model
Hoffman & Jackson, 2000	894 mm/yr	simulation with land surface model	northern Africa, from GCM model
Hoffman & Jackson, 2000	1080 mm/yr	simulation with land surface model	cerrado; from GCM model
Hoffman & Jackson, 2000	789 mm/yr	simulation with land surface model	Australia, from GCM model
Hutley *et al*., 2000	958 mm/yr	eddy covariance, heat pulse and open top chambers	eucalypt open-forest in Howard Springs, Northern Territory, Australia
L'vovitch, 1979	280 mm/yr	n/a	subtropical and tropical desertic savannah
L'vovitch, 1979	870 mm/yr	n/a	subtropical and tropical dry savannah
L'vovitch, 1979	1200 mm/yr	n/a	subtropical and tropical wet savannah
L'vovitch, 1979	530 mm/yr	n/a	temperate wooded steppes and prairies
Rockstrom *et al*., 1999	882 mm/yr (range of 870-894 mm/yr)	compilation of literature	savannah / woodland, dry
Rockstrom *et al*., 1999	1267 mm/yr (range of 1100-1500 mm/yr)	compilation of literature	savannah/woodland, wet

Rockstrom *et al*., 1999	416 mm/yr (range of 300-530 mm/yr)	compilation of literature	woodland/ woody savannah
Roose, 1979 Hutley *et al*., 2000	1064 mm/yr	water balance	savannah, Ivory Coast
San Jose & Montes, 1992, 1995	783 mm/yr	water balance	Orinoco Savanna, Venezuela
Scholes & Walker, 1993	445-717 mm/yr	simulation model, climatological data, soil water balance	water budget for broad-leafed savannah at Nylsvley
Smith-Carrington, 1983	700-750 mm/yr	n/a	Bua catchment, woodland interfleuve and fallow interfleuve, Malawi
Vardavas, 1988	935 mm/yr	Priestly & Taylor, 1972	Magela Creek NT, Australia
Vertessy & Bessard, 1999	0.666 m/yr	n/a	woodland in New South Wales, Australia

Table S1.13. Annual evapotranspiration of Grassland

Source	ET	Method	Description
ADWR, 1991	954 mm/yr	Blaney-Criddle	cienega / dense grass in riparian area of the San Pedro River Basin, Sierra Vista sub watershed
Bailly *et al*., 1974	1425 mm/yr	soil water balance	Manankazo, Madagascar, pinus patula plantation, 4-10 yrs
Balek & Perry, 1973	500 mm/yr	n/a	dambo grassland Luano catchment, Zambia
Berger, 2001	4.07 - 5.73 ft/yr	Bowen-Ratio Energy-Balance, eddy correlation	meadow and grassland in Ruby Lake National Wildlife Refuge Area, Ruby Valley, northeastern Nevada
Bidlake *et al*., 1996	1010 mm/yr	Bowen-Ratio Energy-Balance	dry prairie vegetation in west-central Florida
Brye et al., 2000	515, 486 mm/yr	soil water balance	for prairie plot, restored from an agricultural field in 1976, and burned every three years, except no burning for 5 years before the study
Calder, 1982	799 mm/yr		Wye catchment
Caldwell *et al*., 1977	225 mm/yr		shrub in cool grassland in Curlew Valley
Campbell & Murray, 1990	622 mm/yr		grassland in Otago, New Zealand
Campbell & Murray, 1990	536 mm/yr	lysimeter	narrow-leaved snow tussock, in a broad tussock covered ridge 570 m above sea level, in the upper Waipori catchment in eastern Otago, NZ.
Chen *et al*., 1997	526 mm/yr	meteorological observations	short grass vegetation, Cabauw, Netherlands

Choudhury *et al*., 1998	894-1090 mm/yr	biophysical process-based model with satellite & ancillary data	range for annual average values for 3 regions: N. Africa, S. Africa and S. America
Christen & Vogt, 2004	700 mm/yr	lysimeter	for grassland near Basel, Switzerland
Dirnbock & Grabner, 2000	180-270 mm/yr	energy balance, model	Carex firma and Sesleria-Carex sempervirens grassland
Dunin *et al*., 1978	11 mm/yr	resistance model	Themeda Grassland in the Southern Tablelands region of New South Wales, Australia
Federov, 1977	469 mm/yr (SD 28)	micrometeorological measurements, energy balance, lysimeters	grassland at Usadievskiy Valdai station, Russia
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Nairobi Kenya
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, El Obeid, Sudan
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Kimberley, South Africa
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Mopti, Mali
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass priairie, Pietersburg, South Africa
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass priairie, Oktiabrskii, Ukraine
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Orenburg, Russia
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass priairie, Rostov-na-donu, Russia
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Cheynne, WY
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Havre, MT
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Lubbock, TX
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Hobbs, NM
Frank & Inouye, 1994	413 mm/yr	model (Thornthwaite)	shortgrass prairie, Rocky Ford, CO
Frank & Inouye, 1994	571 mm/yr	model (Thornthwaite)	tallgrass prairie, 5 sites: 1) Clinton OK, 2) Crete NB, 3) Great Bend KS, 4) Lamberton MN, 5) Waterton SD
Frank & Inouye, 1994	571 mm/yr	model (Thornthwaite)	tallgrass prairie, Waterton SD
Frank & Inouye, 1994	571 mm/yr	model (Thornthwaite)	tallgrass prairie, Clinton, OK
Frank & Inouye, 1994	571 mm/yr	model (Thornthwaite)	tallgrass prairie, Crete, NB
Frank & Inouye, 1994	571 mm/yr	model (Thornthwaite)	tallgrass prairie, Great Bend, KS

Frank & Inouye, 1994	571 mm/yy	model (Thornthwaite)	Tallgrass prairie, Lamberton, MN
Gray, *et al*., 1998	1360 mm/yr	n/a	Konza Prairie, eastern Kansas; unplowed
Gutowski *et al*., 2002	1.84 mm/day	model	coupled Land-Atmosphere Simulation Program at the FIFE Konza Prairie site; C4 tallgrass prairie
Hall & Harding, 1993	484, 460, 398, 395 mm/yr	model; M(AZ11), Penman-Monteith	two catchments in the Balquidder watershed
Hargreaves & Samani, 1986	1927 mm/yr	n/a	for grassland in Mali, 1960-1985
Hoffman & Jackson, 2000	987 mm/yr	simulation with land surface model	cerrado, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	1023 mm/yr	simulation with land surface model	llanos, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	823 mm/yr	simulation with land surface model	northern Africa, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	804 mm/yr	simulation with land surface model	southern Africa, converted savannah to grassland, using GCM
Hoffman & Jackson, 2000	719 mm/yr	simulation with land surface model	Australia, converted savannah to grassland, using GCM
Jackson *et al*., 1998	230-358 mm/yr	simulated with water balance model based on 10 year weather data	annual C3 grasslands at Jasper Ridge Biological Preserve in Palo Alto, California
Kergoat *et al*., 2002	883, 933, 891, 956, 923 mm/yr	global vegetation model	grass / crops using CLIM, RAD, STOM, FERT, and MAX simulations
Lewis, 1968	378 mm/yr	water balance	grassland in Sierra Nevada foothills of California
L'vovitch, 1979	360.0-361.0 mm/yr	n/a	mowed virgin steppe, and for virgin steppe not mowed (observations during a 3-year period)
L'vovitch, 1979	450 mm/yr	n/a	temperate steppes
Mahmood & Hubbard, 2002	694 mm/yr	soil water balance model	pre-agricultural natural grass vegetation in tall grass - short grass transition in Nebraska, USA
Major, 1963	101 mm/yr	Thornthwaite, soil water balance	Ulan Bator, Mongolia, in the cold desert
Miyazaki et al., 2004	117, 103 mm/yr	badpass-covariance method, using gap-filled data	on grass field in old airport at Avraikheer; winter ET assumed to be 0

Mocko & Sud, 1998	78.2, 75.1, 47.1, 60.3 W/m2	by energy balance methods (Penman, Priestley-Taylor, Mintz-Thornthwaite) and by SSiB (simplified simple biosphere model)	for globe, Wooded C4 grassland
Mocko & Sud, 1998	39.7, 38.4, 22.2, 33.5 W/m2	by energy balance methods (Penman, Priestley-Taylor, Mintz-Thornthwaite) and by SSiB (simplified simple biosphere model)	for globe, grassland
Mo *et al*., 2004	635 mm/yr	process-based distributed model	grass, Lushi basin, China
Parton, Lauenroth & Smith, 1981	33.8 cm/yr	weighing lysimeter	Pawnee site in northeastern Colorado; shortgrass steppe
Riou, 1984	1070 mm/yr	n/a	Brazzaville, Congo, paspalum grass
Rockstrom *et al*., 1999	410 mm/yr (range of 130-633 mm/yr)	compilation of literature	mostly temperate cool grassland
Rockstrom *et al*., 1999	655 mm/yr (range of 430-951 mm/yr)	compilation of literature	temperate mountainous grassland
Rockstrom *et al*., 1999	599 mm/yr (range of 403-862 mm/yr)	compilation of literature	mostly tropical warm and hot grassland
Rockstrom *et al*., 1999	600 mm/yr (range of 402-798 mm/yr)	compilation of literature	tropical mountainous grassland
Rockstrom *et al*., 1999	416 mm/yr (range of 300-530 mm/yr)	compilation of literature	woodland/ woody savannah
Rockstrom *et al*., 1999	270 mm/yr (range of 225-315 mm/yr)	compilation of literature	tropical dry shrubland
Rosenzweig, 1968	log 2.79 mm/yr	model (Thornthwaite)	tall grass prairie Norman OK, USA, Penfound, 1964
Scott *et al*., 2000	272 mm/yr	Bowen-Ratio Energy Balance, micrometeorological measurements, eddy covariance	sacaton grass site in the semiarid riparian area of San Pedro River in southeastern Arizona
Sims, Singh & Laurenroth, 1978	158-729 mm/yr	n/a	10 US Grasslands
Smith-Carrington, 1983	640 mm/yr	n/a	Bua catchment, dambo grassland
Sumner, 1996	680 mm/yr	eddy correlation, Penman Monteith	several methods, eddy correlation, penman Monteith, for grassland in central Florida, that was previously forested
Tattari & Ikonen, 1997	500 mm/yr	ASTIM model	fields and treeless areas on moraine, Hietajärvi, Finland
Thompson *et al*., 1981	430 mm/yr	n/a	grassland
Tomlinson, 1996	260 mm/yr	Bowen-Ratio Energy Balance, lysimeter, Penman-Monteith	full canopy grassland site (Snively Basin), Spokane and Yakima County, Washington State, USA

Tomlinson, 1996	233 mm/yr	Bowen-Ratio Energy Balance, lysimeter, Penman-Monteith	full canopy grassland site (Turnbull Meadow), Spokane and Yakima County, Washington State, USA
Tomlinson, 1996	234 mm/yr	Bowen-Ratio Energy Balance, lysimeter, Penman-Monteith	sagebrush grassland (Black Rock Valley site) , Spokane and Yakima County, Washington State, USA
Tomlinson, 1997	417 mm/yr	Bowen-Ratio Energy Balance, micrometeorological measurements	grassland, Bird Canyon, Washington State
Tuvedendorzh & Myagmarzhav, 1985	190 mm/yr	Budyko's method	at Avraikheer
Vertessy & Bessard, 1999	0.603 m/yr	n/a	grassland in New South Wales, Australia
Wever *et al*., 2002	215, 250, 265 mm/yr	eddy covariance, energy balance, Priestley Taylor	three grassland plots in southern Alberta; for northern temperate grassland; has not been grazed for over 20 years
Wright & Harding 1993	395-397 mm/yr	weighting lysimeter	Balquidder catchments in Wales, natural grassland, assuming minimal ET during snow season
Zakia, 1987	480 mm/yr	soil water balance	Minas Gerais, Brazil, grassland
Zhang *et al*., 1999	607 mm/yr	n/a	grasslands in Australia

Table S1.14. Annual evapotranspiration of closed shrubland

Source	ET	Method	Description
Flerchinger *et al*., 1996 , Flerchinger *et al*., 2000	569 (+/- 3 mm), 505 (+/- 51 mm), 492 mm	Simultaneous Heat and Water Model (SHAW), detailed physical process model applied to 2 years of data	southwestern Idaho, mountain big sagebrush, using SHAW model and meteorological measurements
Hibbert, 1971	418 mm/yr	catchment water balance	chaparral in Natural Drainage (A) catchment
Hibbert, 1971	645 mm/yr	catchment water balance	chaparral in Three Bar (F) catchment
Hibbert, 1971	515 mm/yr	catchment water balance	chaparral in White Spar catchment
Hibbert, 1971	631 mm/yr	catchment water balance	chaparral in Three Bar (D) catchment
Hibbert, 1971; Hibbert, 1979	409 mm/yr	catchment water balance	chaparral in Natural Drainage (C) catchment
Lewis, 1968	510 mm/yr	water balance	oak woodland in Sierra Nevada foothills of California
Major, 1963	414 mm/yr	Thornthwaite, soil water balance	Cloverdale California, chaparral and woodland
Poole *et al*., 1981	395 mm/yr	n/a	chemise Chaparral, Echo Valley CA

Poole *et al*., 1981	475 mm/yr	n/a	mixed Chaparral, Echo Valley, CA
Rockstrom *et al*., 1999	270 mm/yr (range of 225-315 mm/yr)	compilation of literature	tropical dry shrubland
Rosenzweig, 1968	log 2.58 mm/yr	model (Thornthwaite)	heath bald (leiophyllum) Great Smky Mtns TN, USA
Rosenzweig, 1968	log 2.72, 2.69 mm/yr	model (Thornthwaite)	mixed heath, Great Smky Mtns TN, USA
Rowe, 1963	584 mm/yr	catchment water balance	chaparral in Monroe Canyon catchment

Table S1.15. Annual evapotranspiration of open shrubland

Source	ET	Method	Description
Addison, 1977	75 mm/yr		arctic semi-desert dominated by cushion plants, lichens and mosses, total plant cover 70-90 %
ADWR, 1991	486, 756 mm/yr	Blaney-Criddle	dense and medium-dense mesquite, Sierra Vista sub watershed of the San Pedro River Basin, Arizona
Arkley, 1967	7.7 in/yr	model (Thornthwaite)	assumed soil moisture capacity of 6 inches
Bastiaanssen & Bandara, 2001	1,232 mm/yr	remote sensing	scrubland in Kirindi Oya, Sri Lanka
Bellot *et al*., 1999	265.6 mm/yr	hydrological model, negative exponential approach	semi-arid Mediterranean area of Ventos (Alicante, Spain)
Bellot *et al*., 1999	325.1 mm/yr	hydrological model, negative exponential approach	semi-arid Mediterranean area of Ventos (Alicante, Spain)
Berger, 2001	4.07 - 5.73 ft/yr	Bowen-Ratio Energy-Balance, eddy correlation	meadow and grassland in Ruby Lake National Wildlife Refuge Area, Ruby Valley, northeastern Nevada
Carlson *et al*., 1990	654 mm/yr	lysimeter	shrub and shrub with Mesquite; eastern ridge of Rolling Plains resource region, within a 16 ha livestock enclosure, TX
Dunn & Mackay, 1995	411-473 (SD 25.5) mm/yr	model, based on Penman-Monteith with Rutter interception	bracken (heaths and moorlands) in Tyne Basin in North East England
Flerchinger *et al*., 1996 Flerchinger *et al*., 2000	376 (+/- 3 mm), 338 (+/- 51 mm), 360 mm	Simultaneous Heat and Water Model (SHAW), detailed physical process model applied to 2 years of data	southwestern Idaho, low sagebrush, using SHAW model and meteorological measurements
Franco-Vizcaino *et al*., 2002	446 +/- 122 mm/yr	soil water balance, neutron prove, mini-lysimeters	wet meadow site

Goetz & Shelton, 1990	33.9 in/yr	Bowen-ratio Energy Balance, micrometeorological measurements, and portable field chamber	clover and weeds in Albuquerque, NM
Johnston, 1970	15.27 in/yr	soil water balance	plot: 49% veg, 21% litter, 30% bare, located near head of Parrish Canyon on the Davis County Experimental Watershed near Bountiful, Utah, elevation 8400 feet asl
Kergoat *et al*., 2002	237, 246, 253, 246, 253 mm/yr	global vegetation model	Mediterranean vegetation / shrublands using CLIM, RAD, STOM, FERT, and MAX simulations
Laczniak *et al*., 1999	1.88 feet/yr	Walker & Eakin (1963)	has a high concentration of springs; mixed grassland and shrubland vegetation in the North-Central Mojave Desert
Laczniak *et al*., 1999	1.92 feet/yr	Walker & Eakin (1963)	has a high concentration of springs; mixed grassland and shrubland vegetation in the North-Central Mojave Desert
Laczniak *et al*., 1999	0.62 feet/yr	Walker & Eakin (1963)	has a high concentration of springs; mixed grassland and shrubland vegetation in the North-Central Mojave Desert
Lane *et al*., 1984	158 mm (SD 52 mm)/yr	continuous simulation model, micrometeorological measurements	perennial vegetation in the northern Mojave Desert
Major, 1963	123 mm/yr	Thornthwaite, soil water balance	Yeringon, Nevada, USA, Great Basin shrub steppe
Major, 1963	250 mm/yr	Thornthwaite, soil water balance	Ellery Lake, California, USA at timberline (3230 m elevation); assuming 100 mm available soil moisture storage capacity
Major, 1963	226 mm/yr	Thornthwaite, soil water balance	Ellery Lake, California, USA at Dana Plateau (3770 m elevation); assuming 100 mm available soil moisture storage capacity
Major, 1963	180 mm/yr	Thornthwaite, soil water balance	White Mountains, California, USA (3800 m elevation); assuming 100 mm available soil moisture storage capacity
Major, 1963	273 mm/yr	Thornthwaite, soil water balance	xeric scrublands near Alice Springs, Australia
Mocko & Sud, 1998	19.1, 19, 7.7, 17.7, 17.4, 14.2, 10.5, 7.3 W/m2	by energy balance methods (Penman, Priestley-Taylor, Mintz-Thornthwaite) and by SSiB (simplified simple biosphere model)	for globe, Broadleaf shrubs with bare soil, Broadleaf shrubs with groundcover
Mo *et al*., 2004	640 mm/yr	process-based distributed model	dwarf shrublands, Lushi basin, China
Nichols, 2000	0.577 feet, 0.690 feet/yr	Bowen Ratio Energy Balance	barren land, shrubs and saltgrass, 12 Great Basin study sites, Nevada, USA

Poole *et al*., 1981	530 mm/yr	n/a	matorral in Funda Santa
Raymond & Rezin, 1989	2.36 feet/yr	remote sensing, water use rates	phreatophytes in southern Arizona
Roberts, 1998	377-482 mm/yr	empirical relations	dry moorland
Rockstrom *et al*., 1999	270 mm/yr (range of 225-315 mm/yr)	compilation of literature	tropical dry shrubland
Rosenzweig, 1968	log 2.37 mm/yr	model (Thornthwaite)	alpine moist tundra Mt. Washington NH, USA
Rosenzweig, 1968	log 2.25 mm/yr	model (Thornthwaite)	cheatgrass Hanford Reservation, WA
Scott *et al*., 2000	375 mm/yr	Bowen-Ratio Energy Balance, micrometeorological measurements	mesquite site in the semiarid riparian area of San Pedro River in southeastern Arizona
Sharpe, 1970	343.54 (1910), 384 mm/yr (avg for 1911-1920)	measured at site, and model (Thornthwaite)	Sill Mine, Colorado, 3510 metres at lower end of plateau, 1/2 mile from foot of high mountains, and just at the edge of timberline, in Clear Creek County, Colorado. For plot, PE is counted as zero when mean temperature is below 0oC. For catchment estimate, assumed 100 mm of available soil moisture storage capacity, and includes snow evaporation estimate of 50 mm.
Sharpe, 1970	268 (SD 26) mm/yr	measured at site, and model (Thornthwaite)	station D-1, Nitwot Ridge, Front Range, Colorado; assumed 100 mm of available soil moisture storage capacity; alpine tundra
Sharpe, 1970	275 (SD 45) mm/yr	measured at site, and model (Thornthwaite)	Corona Pass, Front Range, Colorado; assumed 100 mm of available soil moisture storage capacity; alpine tundra
Sharpe, 1970	335 (SD 30) mm/yr	measured at site, and model (Thornthwaite)	Pike's Peak Timberline, Colorado; assumed 100 mm of available soil moisture storage capacity; timberline
Sharpe, 1970	317 (SD 41) mm/yr	measured at site, and model (Thornthwaite)	average alpine timberline climate based on six high elevation weather station-pairs in Colorado USA
Tomlinson, 1997	352, 372, 199, 469 mm/yr	Bowen-ratio Energy Balance, micrometeorological measurements, Penman Monteith, lysimeter	sagebrush, Black Rock Valley, Washington State
Unland *et al*., 1998	0.848 m/yr	Bowen-ratio Energy Balance, micrometeorological measurements	medium / high density vegetation of medium height (primarily facultative phreatophytes, especially mesquite bosque) in Santa Cruz River in southern Arizona

Table S1.16. Annual evapotranspiration of Tundra

Source	ET	Method	Description
Choudhury *et al*., 1998	220 mm/yr	biophysical process-based model with satellite & ancillary data	tundra
Choudhury *et al*., 1998	171 mm/yr	biophysical process-based model with satellite & ancillary data	tundra
Choudhury *et al*., 1998	262 mm/yr	biophysical process-based model with satellite & ancillary data	tundra
Choudhury *et al*., 1998	193 mm/yr	biophysical process-based model with satellite & ancillary data	tundra
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Baker Lake Canada
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Hall Beach Canada
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Mould Bay Canada
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Resolute Canada
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Sachs Harbour, Canada
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Barrow, AK
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Bethel AK
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in King Salmon AK
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Kotzebue AK
Frank & Inouye, 1994	202 mm/yr	model (Thornthwaite)	tundra in Nome AK
Hinzman, 1990 Kane *et al*., 1990	153, 130, 219, 240 mm/yr	water balance method; pan evaporation, energy balance and Priestley Taylor	2.2 km^2 Imnavait watershed, Alaska; tussock sedges and mosses, lichens and shrubs (willows, alder and dwarf birch)

Kane, *et al*. 1990	153, 130, 219, 240 mm/yr	site water balance, pan, energy balance, Priestley-Taylor	no ET estimate for winter; Arctic North slope of Alaska. vegetation is primarily water tolerant plants such as sedge tussocks and mosses, but they are accompanied by lichens and shrubs such as willow, alder and dwarf birch; Imnavait Creek, 2.2 km2 watershed
Kergoat *et al*., 2002	97, 121, 106, 141, 126 mm/yr	global vegetation model	tundra using CLIM, RAD, STOM, FERT, and MAX simulations
Major, 1963	104 mm/yr	Thornthwaite, soil water balance	Barrow Alaska, USA, coastal tundra
Mather & Yoshioka, 1966	380 mm/yr	n/a	along timberline in Canada
Maykut & Church, 1973	72 mm/yr	water balance	tundra in Point Barrow
Miller, 1983	175 mm/yr	n/a	low arctic shrub
Miller, 1983	200 mm/yr	n/a	tall arctic shrubland
Ohmura, 1982	140 mm/yr	aerodynamic Methods, snow lysimeter, Bowen Ratio Energy Balance	arctic tundra on Axel Heiberg Island
Petrone *et al*., 2000	168 mm/yr	Bowen-Ratio Energy Balance, eddy correlation using a vertical propeller anemometer	western subarctic dry site on tundra plateau 56 km northeast of Inuvik, NWT, Canada; assume no ET during winter months in subarctic
Rosenzweig, 1968	log 2.30 mm/yr	model (Thornthwaite)	arctic moist tundra Cape Thompson AK, USA
Stuart *et al*., 1982	125 mm/yr	n/a	tussock tundra, common in AK and former USSR, infrequent in Canada

Table S1.17. Annual evapotranspiration of barren or sparsely vegetated lands

Source	ET	Method	Description
Allison & Barnes, 1983	63 mm/yr	DT	Lake Fromme, a normally dry salt lake
Allison & Barnes, 1985	63-170 mm/yr	isotopic and chloride profiles in sediments, and deuterium	Lake Fromme, a normally dry salt lake in Central Australia
Bellot *et al*., 1999	262.1 mm/yr	hydrological model, negative exponential approach	semi-arid Mediterranean area of Ventos (Alicante, Spain)
Berger *et al*., 2001	0.95 feet/yr	Bowen Ratio energy balance, eddy correlation	playa and bare soil in Ruby Lake National Wildlife Refuge Area, Ruby Valley, North-eastern Nevada
Carlson *et al*., 1990	576 mm/yr	lysimeter	bare land on eastern ridge of Rolling Plains resource region, within a 16 ha livestock enclosure, Texas

Cochran *et al*., 1988	10 mm/yr	lysimeter	Owens (Dry) lake playa evaporation
Dirnbock & Grabherr, 2000	0-180 mm/yr	compilation of literature, modelling according to Turc-Wendling energy balance model	vegetation on rocky slopes and initial alpine vegetation in Austrian Alps
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Parker, Arizona
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Victorville, Callifornia
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Helwan, Egypt
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Wadi Halfa, Sudan
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Alice Springs, Australia
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Meekatharra, Australia
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, El Paso Texas
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Imperial California
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Mendoza Argentina
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Pheonix, Arizona
Frank & Inouye, 1994	164 mm/yr	Thornthwaite model	Hot desert, Chihuahua Mexico
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Astrahan, Russia
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Yan'an, China
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Elko, Nevada
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Ephrata, Washington, USA
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Idaho Falls, Idaho
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Milton Freewater, Oregon
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Nyssa, Oregon
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Cipoletti, Argentina
Frank & Inouye, 1994	256 mm/yr	Thornthwaite model	Cold desert, Sarmiento, Argentina
Gohre, 1949	178 mm/yr	lysimeter	bare soil in Eberswalde, Germany
Henning, 1989	5 cm/yr	energy balance	desert area value from atlas
Johnston *et al*., 1969	270 mm/yr		barren land in Utah, 1950-1953
Johnston, 1970	11.28 in/yr	soil water balance	bare soil plot located near head of Parrish Canyon on the Davis County Experimental Watershed near Bountiful, Utah, elevation 8400 feet asl, 1962-1966

Kane *et al*., 1990	153, 130, 219, 240 mm/yr	water balance over the water year, checked by energy balance, Priestly Taylor	Imnavait Creek, a 2.2 km^2 watershed underlain by continuous permafrost in the Arctic North Slope of Alaska, assume minimal evaporation during winter
Liu & Kotoda, 1998	99.4 mm/yr	Kotoda 1986 and Advection-Aridity (Brutsaert and Stricket, 1979) models, eddy correlation	Gobi Desert, NW China, middle part of Hexi corridor; coarse sand and small pebbles with sparse scrub vegetation
Lopes 1986	10 mm/yr	lysimeter	Owens (Dry) lake playa evaporation
Major, 1963	101 mm/yr	Thornthwaite model	Blythe California, in the hot Sonoran desert
Major, 1963	69 mm/yr	Thornthwaite model	Dzamyn-Ude, Mongolia, in desert
Major, 1963	89 mm/yr	Thornthwaite model	hot desert near Jacobabad, Pakistan
Malek *et al*., 1990	229 mm/yr	micrometeorological measurements, Bowen-Ratio energy balance	margin and moist playa in eastern Utah
Miller, 1983	75 mm/yr		Polar Desert: plant cover 1-2% of surface
Mocko & Sud, 1998	6.9, 6.8, 2.3, 6.2 W/m2	by energy balance methods (Penman, Priestley-Taylor, Mintz-Thornthwaite) and by SSiB (simplified simple biosphere model)	for globe, bare soil
Reynolds *et al*., 2000	22.8 cm/yr	Patch arid land simulator (PALS-FT)	Chihuahuan Desert, Jordana LTER, New Mexico
Rosenzweig, 1968	log 2.10 mm/yr	Thornthwaite model	Creosote bush desert Nye Co, NV, USA
Rosenzweig, 1968	log 2.34 mm/yr	Thornthwaite model	Cool desert sand dunes, near Rexburg, ID
Sammis & Gay, 1979	259, 231, 242 mm/yr	weighing lysimeter	three sites in the Sonoran desert near Tuscon AZ: a large creosote bush, an adjacent stand of creosote bush, and bare soil plots.
Tyler *et al*., 1997	88 (+/- 22) mm/yr	eddy correlation, microlysimeters, solute profiling methods	salt cemented sand on abandoned lake bed, groundwater near surface
Ullman, 1985	9-28 mm/yr	solute profiling methods	salt-crusted surface of Lake Eyre in south-central Australia, in a dry period; low rate of evaporation was attributed to the reduced albedo of the salt surface
Unland *et al*., 1996	230, 262 mm/yr	micrometeorological measurements, eddy correlation, BATS model	Sonoran desert near Tuscon, Arizona
Unland *et al*., 1996	0.157 m/yr	micrometeorological measurements, Bowen-Ratio energy balance	cottonwood in riparian area of Santa Cruz River in southern Arizona
Weltz & Blackburn, 1995	645 mm/yr	lysimeter	bare soil La Copita Research Area, eastern Rio Grande plain of Texas

Table S1.18. Annual Evapotranspiration of Wetlands (ET_w)

Source	ET	Method	Notes
Abtew, 1996	3.6 mm/day	water balance, lysimeter	constructed wetlands; cattaill, mixed marsh vegetation, open water
ADWR, 1991	1271-1198 mm/yr	Blaney-Criddle	riparian area in the San Pedro River Basin, Sierra Vista sub watershed
Balek, 1977	2180 mm/yr	n/a	Bangweulu swamp in Luapula catchment of the Upper Congo (Zaire)
Balek, 1977	1005 mm/yr	n/a	Kafue Flats, in Zambezi river, in Zambia
Bawazir *et al*., 2004	3222 MJ/m2/yr	eddy covariance	riparian saltcedar, along Rio Grande River
Berger, 2001	50.24 in/yr	Bowen Ratio - Energy Balance, eddy covariance	moderate to dense cover of bulrush marsh Ruby Lake National Wildlife Refuge Area, Ruby Valley, Northeastern Nevada
Bidlake *et al*., 1996	970-990 mm/yr	Bowen Ratio - Energy Balance	cypress swamp and marsh in west-central Florida
Cleverly *et al*., 2002	122 cm/yr	eddy covariance	Tamarix ramosissima; for site at Bosque del apache National Wildlife Refuge, flooded site; Rio Grande riparian areas, New Mexico
Culler *et al*., 1982	1090 mm/yr	soil water balance	phreatophytes
Dolan *et al*., 1984	131.7 cm/yr	using diurnal water-table fluctuation method	Palatkaha watershed swamp, Florida; mixed emergent aquatic macrophyte community
Eaton & Rouse, 2001	198 mm	soil water balance, energy balance	Assuming minimal ET in winter. For a subarctic sedge fen
Ewel & Smith, 1992	38, 60, 86 cm/yr	water balance	range 38 - 86 cm/yr
Fieldler & Sommer, 2004	500-800 mm/yr	micrometeorological measurements	natural wetlands in the Allgau region of southwest Germany
Finnish Environmental Institute, 2004	300-350 mm/yr	n/a	wetland forest in River Simojoki basin, Northern Boreal zone in Finland
Gatewood *et al.,* 1950	1.829 m/yr	water balance	in lower Gila River valley, riparian water use estimates
German & Sumner, 2001	43.5 and 55.7 in/yr	micrometeorological measurements	meteorological methods, one for a blue cypress marsh and one for everglades national park

German, 2000	45.7, 45.4, 47.9, 48.5, 50.4, 42.1, 42.5 in/yr	Bowen Ratio - Energy Balance	7 sites in the Everglades, ranging from cattails to sawgrass and rushes
German, ER, unpublished	43.73, 45.68, 50.05, 46.0, 50.50, 43.44, 42.78 in/yr	Bowen Ratio - Energy Balance	7 sites in the Everglades, ranging from cattails to sawgrass and rushes
Hicks *et al.,* 2001	350-500 mm/yr	estimate from other ET estimates	paper states that there are no known ETw measurements in NZ
Hughes *et al*., 2001	700 mm/yr	eddy covariance, Pan Evaporation, Penman-Monteith	small eddy correlation dataset, for Kikuyu grass wetlands
Hurst, 1952	6.5 mm/day	atmometer	oases
Hurst, 1952	6.1 mm/day	water balance	swamps near Lake Kyoga
Knowles, 1996	37.9 and 37.6 in/yr	regional water budget, modified Priestley Taylor model, Eddy Correlation	Rainbow Springs and Silver Springs basins in North Central Florida
Koranda *et al*., 1978	185 mm/yr	n/a	wet meadow: sedge moss, dominates coastal plain of Alaska and former USSR, limited presence in sub arctic
Krestovsky, 1969b	490 mm/yr	n/a	marshy areas in southern Taiga subzone of former USSR
Laczniak *et al.,* 1999	2.6 feet	Walker and Eakin (1963)	Bole Spring, Ash Meadows Area, Nye County, Nevada
Laczniak *et al.,* 1999	3.44 feet	Walker and Eakin (1963)	Carson Meadow, dense wetland vegetation, Ash Meadows Area, Nye County, Nevada
Laczniak *et al*., 1999	3.73 feet	Walker and Eakin (1963)	Fairbanks meadow, dense grassland, intermittently flooded, Ash Meadows Area, Nye County, Nevada; based on less than one year of data
Laczniak *et al.,* 1999	3.91 feet	Walker and Eakin (1963)	Fairbanks swamp dense wetland vegetation, Ash Meadows Area, Nye County, Nevada
Laczniak *et al*., 1999	2.58 feet	Walker and Eakin (1963)	Lower Crystal Flat, flooded bare soils with some grass, Ash Meadows Area, Nye County, Nevada
Laczniak *et al*., 1999	3.23 feet	Walker and Eakin (1963)	flooded grassland, Rogers Spring, Ash Meadows Area, Nye County, Nevada
Liu *et al*., 1998	974 (+/- 86) mm/yr	model with field micrometeorological measurements, eddy correlation, class A pans,	cypress wetlands in industrial forest lands of the Georgia-Pacific Corporation

Mao, 2002	3.21, 3.25, 3.66, 3.53 mm/day	lysimeter, pan, micrometeorological measurements, Penman Monteith, Priestley Taylor	areas dominated by wetland vegetation; St. Johns River Basin
Miller, 1983	240 mm/yr	n/a	peatlands in arctic areas
Nature Consultants, 2004	437 mm/yr	n/a	average wetland ET for Ireland
Nijssen & Lettenmaier, 2002	489, 502, 496 mm/yr	eddy covariance, Bowen-Ratio Energy Balance, Penman Monteith	extrapolation of eddy correlation and bowen ratio methods to basin using Penman-Monteith combination equation and LAI weighted versions of multiple regression models; for fen
Olivier, 1961	4.7 mm/day	n/a	swamp around Soroti near the northern shore of Lake Kyoga
Oyebande & Balek, 1989	1075 mm/yr	n/a	dambo wetland in Zambia
Petrone *et al*., 2000	218 mm/yr	Bowen Ratio Energy Balance, eddy correlation using a vertical propeller anemometer	northern Canada, high subarctic wetland tundra region near the shores of Hudson Bay, in central subarctic 26 km east of Churchill, Manitoba; assume no ET during winter months in subarctic
Petrone *et al*., 2000	216 mm/yr	Bowen Ratio Energy Balance, eddy correlation using a vertical propeller anemometer	northern Canada, western subarctic wetland tundra 56 km northeast of Inuvik, NWT; assume no ET during winter months in subarctic
Porcher, 1981	1011 mm/yr	n/a	Francis-Beidler Forest, Four Holes Swamp in Coastal Plain of South Carolina
Roberts, 1998	320-407 mm/yr	empirical relations	wet moorland
Rockstrom *et al*., 1999	221 (range 200-260) mm/yr	compilation of secondary	3 literature sources; for "boreal bog"
Rockstrom *et al*., 1999	674 (range 456-1020) mm/yr	compilation of secondary	4 literature sources; for "temperate bog"
Rockstrom *et al*., 1999	843 (range 670-720) mm/yr	compilation of secondary	3 literature sources; for "temperate swamp"
Rockstrom *et al*., 1999	1127 (range 930-1277) mm/yr	compilation of secondary	5 literature sources; for "subtropical swamp"
Rockstrom *et al*., 1999	1656 (range 1408-1904) mm/yr	compilation of secondary	1 literature source; for "tropical swamp" (low / high values are based on the mean +/- 15%)
Romanov, 1968	331 mm/yr	thermal balance method	sphagnum bogs with dwarf shrubs
Romanov, 1968	410 mm/yr	thermal balance method	entire bog catchment area

Romanov, 1968	411 (SD 29 mm) mm/yr	thermal balance method	lowmoor bogs
Roulet & Woo, 1986	217 mm/yr	n/a	wetland in Baker Lake, NWT; assuming no evaporation during snow period
Rouse, 2000	400 mm/yr	energy balance	
Shahin, 1985	4.1 mm/day	n/a	Machar Swamps in the Sobat Basin, Ethiopia
Sharma, 1988	1800 mm/yr	n/a	Lukanga swamp, Zambia
Stewart, 1989	3.5 mm/day	remote sensing and micrometeorological measurements	Chizengeni dambo, in the Nyatsime catchment
Sumner, 2002	1314-1416 mm/yr	eddy covariance	2 year period, sawgrass peat marsh marshes in Florida, measured before, during and after two droughts, sites were burned at one point
Tomlinson, 1996	434.1 (+ 11) mm/yr	Bowen-Ratio Energy Balance, Penman Monteith, lysimeter	missing one month data, added min monthly value as estimate; meadow site Turnbull Meadow, Spokane and Yakima County, Washington State, USA
UNEP, 1992	2400mm/yr	n/a	wetlands of the river Niger
Unland et al., 1998	1.697 m/yr	Bowen-Ratio Energy Balance, micrometeorological measurements	for riparian area of Santa Cruz River in southern Arizona

Table S1.19. Global annual terrestrial evapotranspiration (*TET*)

Source	TET	Notes
Arora & Boer, 2002	461 mm/yr	GCM based analysis of temperature variation in soil moisture
Arora, 2001	73,000 km^3/yr	AMIPII Run of 3rd Generation General Circulation Model of the Canadian Centre for Climate Modelling and Analysis
Baumgartner & Reichel, 1975	71,000 km^3/yr	distribution maps of actual ET according to Thornthwaite, and on determined difference between runoff and precipitation for individual river basins (hydrographic method). The former provides a relative distribution picture of ET. original data set
Berner & Berner, 1987	72,900 km^3/yr	water balance methods; estimates of precipitation on land are from L'Vovich, 1973, and runoff from land from Baumgartner and Reichel, 1975 and groundwater discharge from Meybeck, 1986
Desborough *et al*., 2001	40.0 mm/month	GCM simulation (SLAM model); may not be independent with other 4 measures; assuming terrestrial area is 140×10^{12} m^2; for 60^oS to 90^oN
Desborough *et al*., 2001	41.9 mm / month	GCM simulation (SLAM-IT model); may not be independent with other 4 measures; assuming terrestrial area is 140×10^{12} m^2; for 60^oS to 90^oN
Desborough *et al*., 2001	42.1 mm / month	GCM simulation; assumed surface resistance of 150 s/m (RS-GI model); may not be independent with other 4 measures; assuming terrestrial area is 140×10^{12} m^2; for 60^oS to 90^oN

Desborough *et al*., 2001	39.0 mm/ month	GCM simulation; assumed surface resistance of 150 s/m (RS-I model); may not be independent with other 4 measures; assuming terrestrial area is $140x10^{12}$ m^2; for 60ºS to 90ºN
Desborough *et al*., 2001	38.6 mm/month	GCM simulation; assumed surface resistance of 25 s/m (RS model); may not be independent with other 4 measures; assuming terrestrial area is $140x10^{12}$ m^2; for 60ºS to 90ºN
Haddeland et al., 2011	60,000 to 85,000 km^2/yr	Multimodel estimate
Korzoun (ed). UNESCO, 1974/78	72,000 km^3/yr	original data set; monthly values of ET from land were computed with help of Budyko complex method that is based on the combined solution of the heat and water balance equations and empirical relation between ET rate and soil moisture content
L'Vovich, 1973b	71,745 km^3/yr	cited in Mather, 1992, Berner & Berner, 1987; Brutsaert, 1982
Legates & Mather, 1992	553 mm/yr	precipitation data from Legates, 1987, accounting method
L'Vovich, 1972	72,100 km^3/yr	based on L'Vovitch, 1954 (river runoff) and on precipitation from Drosdov, 1939
L'Vovich, 1974/ 1979	72,500 km^3/yr	cited by Gleick, 1993; Falkenmark & Chapman 1989; Rogers, 1985
L'Vovich, 1979	71,475 km^3/yr	total land excluding Antarctica, Greenland, and the Canadian archipelago
Lvovitch, 1970	470 mm/yr and 70,250 km^3/yr	water balance estimation of water resources for the whole land
Mather, 1970	69,000 km^3/yr	cited by Baumgartner & Reichel, 1975
Matsuda 1988b	152 mm/yr	European Centre for Medium-range Weather Forecasts (ECMWF)
Matsuda 1988b	260 mm/yr	Geophysical Fluid Dynamics Laboratory (GFDL)
Mu, Zhao & Running, 2011	62,800 km^3/yr	Improved MODIS global ET estimate.
Nijssen *et al*., 2001a	459 mm/yr	based on modelling
Nijssen *et al*., 2001b	483 mm/yr	
NRC, 1986	71,000 km^3/yr	Cited in Shiklomanov, 1997
Oki *et al*., 1995	165 mm/yr	global water balance
Oki, 1999	75,000 km^3/yr	water vapour data by the European Centre for Medium-range Weather Forecasts (ECMWF), data from Korzoun, 1978, and precipitation data from Zie and Arkin, 1996 for 1989-1992
Piexoto & Kettani, 1973	62x10^12 m^3/yr	
Repetto, 1985	72,500 km^3/yr	

Rockstrom *et al*., 1999	70,000 km³/yr	range: 56,000 to 84,000 km³/yr; bottom-up estimate
Shiklomanov, 1993	72,000 km³/yr (485 mm)	
Shiklomanov, 1997	72,000 km³/yr	World Water Balance and Water Resources of the Earth, 1974
Shiklomanov, 2000c	74,200 km³/yr	new data set from analysis of world hydrological stations; Estimates terrestrial ET based on "observations" form the world's hydrological network, but he does not explain the exact source of the ET data.
WRI, 1988	63,000-73,000 km³/yr	compilation of data from several primary and secondary sources

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Supplementary Table 2 for "The impact of global land cover change on the terrestrial water cycle"

Supplementary Table 2. For M_{GIS}, land cover classes, map data sources, number of ET point estimates and kriged global mean.To obtain the global kriged fields, the point estimates are constrained to follow global trends in precipitation[1], soil moisture[2], potential evapotranspiration, topography[3], relative humidity[1], and an estimate of global annual ET, not divided into land cover type[2]. In cases where the kriged field does not capture global trends in areas, estimates of annual actual ET were added, based upon other ET point-estimates from the database from similar land covers in similar climatic[4], continental, land cover, topographic and latitudinal environments. For example, ET for open shrubland in the Middle East (dry climate, with precipitation in a cool winter, Bsk climate in the Koppen classification[4]) was estimated from open shrubland data from central USA (also Bsk climate). Sources are referenced below.

Land Cover	Class	# of ET point estimations	Kriged Global ET Mean (m/yr)	Map Resolution	Source	Source Map Land Cover Class
Non-Irrigated Cropland	anthropogenic	79	0.49	5 min	5	Percentage cover of cropland
Irrigated Cropland	anthropogenic	109	1	5 min	6	Percentage cover or irrigated cropland
Built-Up Lands	anthropogenic	36	0.54	5 min	7	Percentage cover of urban areas
Reservoirs / Inundated Lands	anthropogenic	211	0.99	½ min	9	Presence / absence of cells containing reservoirs
Grazing Land	anthropogenic	140	0.65	5 min	8	Percentage cover of grazing land
Burned Areas	anthropogenic	5	0.66	not mapped	n/a	not mapped because no global map available
Tree Plantations	anthropogenic	124	0.86	not mapped	n/a	not mapped because no global map available
Evergreen Broadleaf Forests	potential	171	1.2	5 min	5	Tropical evergreen forest / woodland, temperate broadleaf evergreen forest / woodland
Evergreen Needleleaf Forests	potential	140	0.5	5 min	5	Temperate needleleaf evergreen forest / woodland, boreal evergreen forest / woodland
Deciduous Needleleaf Forests	potential	0	n/a	5 min	5	Deciduous needleleaf forests
Deciduous Broadleaf Forests	potential	90	0.77	5 min	5	Tropical and temperate deciduous forest / woodland
Mixed Forests	potential	41	0.44	5 min	5	Mixed forest
Savannah	potential	35	0.74	5 min	5	Savannah
Grasslands	potential	97	0.45	5 min	5	Grassland, steppe
Closed Shrubland	potential	16	0.59	5 min	5	Dense shrub
Open Shrubland	potential	54	0.34	5 min	5	Open shrub
Tundra	potential	36	0.19	5 min	5	Tundra
Barren Lands	potential	58	0.17	5 min	5	Desert, polar desert, rock, ice
Wetlands	potential	71	0.94	½ min	9	Presence of wetlands
TOTAL		**1513**				

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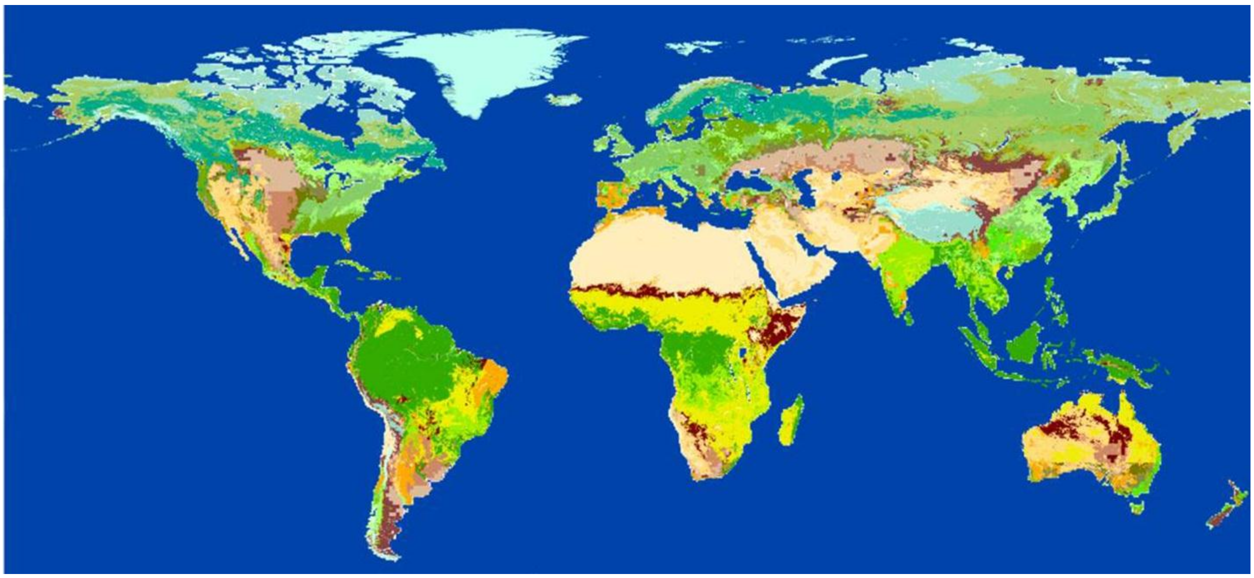
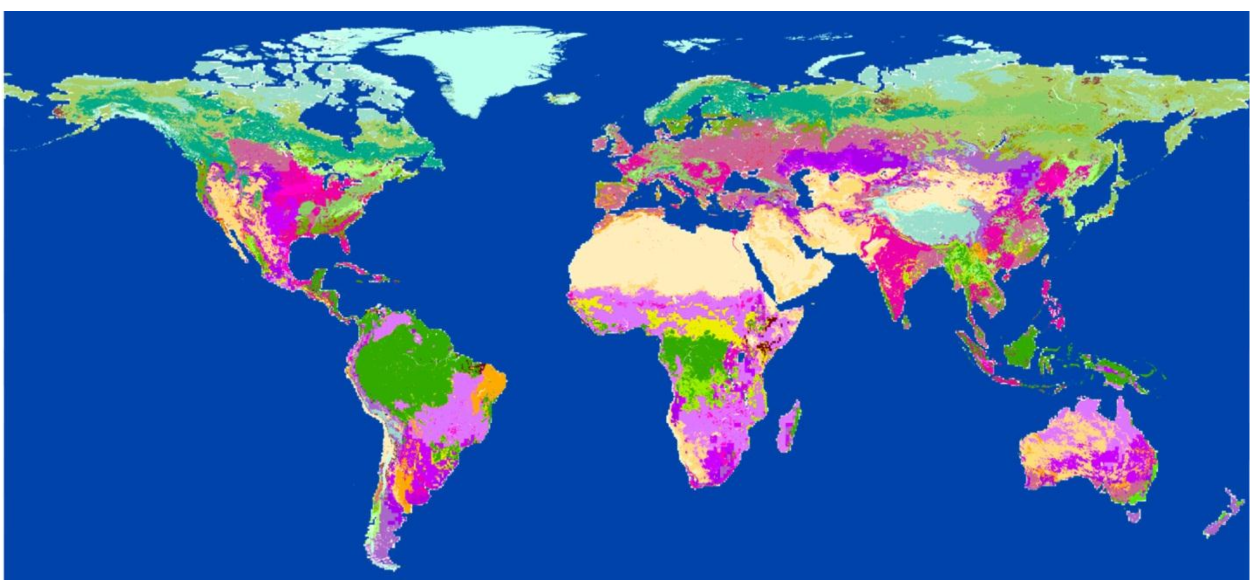
SUPPLEMENTARY FIGURE 1 FOR "THE IMPACT OF GLOBAL LAND COVER CHANGE ON THE TERRESTRIAL WATER CYCLE"

a)



b)



c)

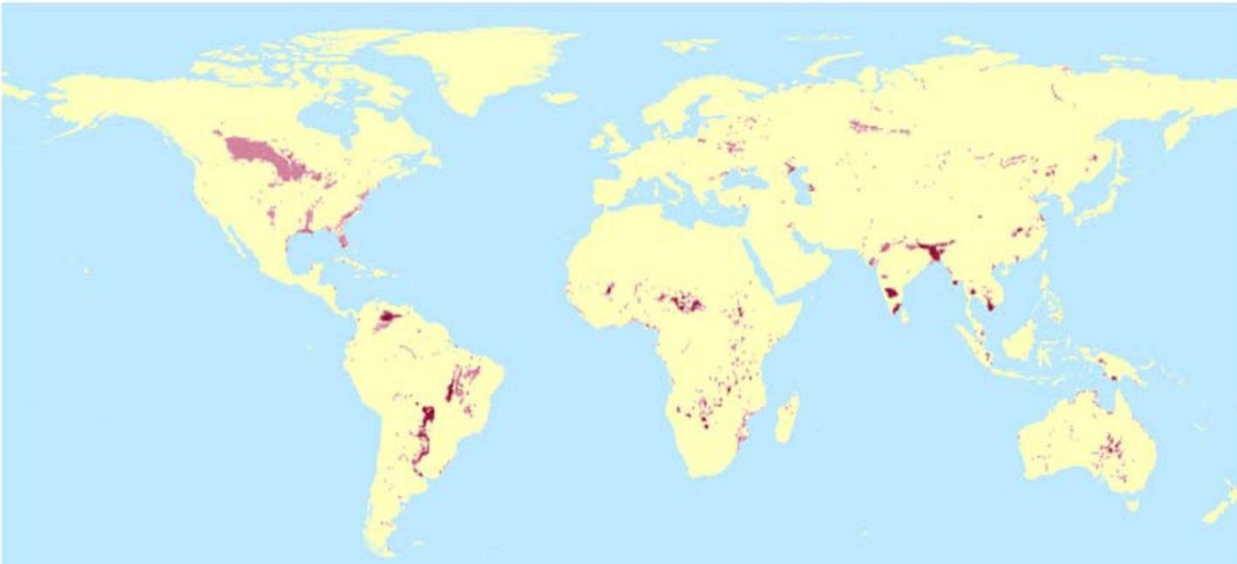


Figure 1. Maps of global land cover change for land surface model applications. (a) Potential land cover (PLC). Five-minute resolution, modified from Ramankutty and Foley (1998). C3/C4 divisions are based upon the work of Winslow et al. [2003]. Antarctica, Greenland, and Spitzbergen added from 5-min USGS GLCC. (b) Current land cover (CLC), where grazing has been censored. Dominant cover at a 5-min resolution. (c) Estimated wetland loss, defined at the 1-min resolution as wetland cells (as estimated by WELAREM [Lehner and Doll, 2004]) that coincide with anthropogenic land cells (as estimated from Figure 1b and scaled to 1-min resolution). The number of cells of wetland loss at the 1-min resolution has been aggregated to percentage of 1-min wetland loss cells in each 30-min cell for the purposes of Figure 1c only, to improve visibility of individual wetlands.

These figure panels are from Sterling, S., and A. Ducharne (2008), Comprehensive data set of global land cover change for land surface model applications, *Global Biogeochem. Cycles*, 22, GB3017, doi:10.1029/2007GB002959.

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SUPPLEMENTARY METHODS FOR "THE IMPACT OF GLOBAL LAND COVER CHANGE ON THE TERRESTRIAL WATER CYCLE"

1. ADDITIONAL NOTES TO GENERAL METHODS

To convert units of m/yr or mm/yr to km^3/yr, or to calculate percentage aerial change, we use a terrestrial area of 1.34e+14 m^2.

The two methods of estimating change to evapotranspiration (ET) are independent calculations from essentially the same land cover data and have differing strengths and sources of uncertainty. The GIS-based estimate is based on observations and plot scale modelling studies, and provides an independent check on global land surface model and satellite-based estimates of ET, and also allows for a transparent examination of the components driving total cumulative ET flux ($m^3 * yr^{-1}$) (TET) change. The land surface model (LSM) method uses a validated, process-based numerical experiment that provides a measure of statistical confidence. We preserve area altered in calculations of land cover change, in both the geographic information system (GIS) and LSM methods.

Independent lines of evidence, such as comparison with the GIS method in Figure 2a, in comparison with other studies (Figure 3) indicate that the offline LSM is behaving realistically on the first order. However, the coupled approach is necessary to estimate second order effects, particularly in areas of strong land-atmosphere coupling.

The definition of appropriation used in this study is not a measure of change in the water cycle but one of how close humans are approaching planetary limits. For example, if land cover 1 (LC1) is converted to a land cover 2 (LC2), the ET from LC2 is appropriated, even if the flux did not change; appropriation is a measure of land cover conversions, but it is not directly relevant to the water cycle.

2. METHODS AND ASSUMPTIONS IN THE CALCULATIONS FOR LSM ESTIMATES FOR FIGURE 2A

Calculation of LSM estimate of change in ET for discrete land cover conversions in Figure 2a

While possible in the GIS method, in the LSM method, direct cell to cell comparisons of change in ET from change from individual land cover types is not possible. This is because in the ORCHIDEE LSM each cell is a mosaic of one or more land cover types, and the water fluxes that come from a cell is a weighted average by area of each land cover ET. The LSM converts finer resolution land cover maps into a percent land cover composition mosaic for each LSM cell, which is then converted into a percentage plant functional type (PFT) composition mosaic, based on the correlation matrix between the land cover and PFT (Sterling & Ducharne, 2008). The LSM calculations of water and energy flows are weighted by the PFT percent composition in each cell. To create the LSM projections of change in Figure 2a, we calculate the statistical global average of each PFT, reconverted it back to a land cover type, based on the land cover correlation matrix, and then, to obtain ET change, compared the difference in average global ET for the second land cover type. Thus, in the LSM method, direct before-after land cover change comparisons for individual land cover changes that preserve spatial location is not possible, and the comparison will contain spatial bias.

In this way, the LSMs estimate of change in ET for individual types of land cover changes is not the same as the spatially unbiased GIS estimate which calculates each ET change on a cell by cell basis, and then takes the global average for each combination of land cover change (thus taking into account the location of each land cover change). Further, the LSM estimate of change in land cover is was not possible for some land covers, such as for wetlands, which was not available as a land cover parameterization, or for a comparison of built up land and bare soil, as the two land cover types have the same PFT parameterization in the LSM.

To calculate the change in ET with conversion from forests and from grasslands to non-irrigated croplands in Figure 2a, we used the estimate of C3 non-irrigated cropland. To calculate the change in ET with conversion from forests to grazing land in Figure 2a, we averaged the global mean ET estimate of C3 and C4 grazing land. For the comparison of irrigated cropland from barren land in Figure 2a, we used a non-irrigated bare soil ET for 15% of the estimate, instead of an irrigated bare soil ET, and used the C3 crop ET value.

3. METHODS AND ASSUMPTIONS IN CALCULATIONS FOR FIGURE 3

In Figure 3 we synthesize order of magnitude effects of anthropogenic drivers on runoff changes, in studies of change that is applicable to approximately the end of the 20th century. The anthropogenic drivers are land cover change at the end of the 20th century, changes in meteorological forcing during the 20th century, direct CO_{2atm} effects on plants during the 20th century, and water withdrawals at the end of the 20th century.

Land cover change

Studies included are:

- Gerten *et al.* (2008)
- Gordon *et al.*, (2005) (both versions, with and without irrigation)
- Piao *et al.* (2007)
- Rost *et al.* (2008a)
- Rost *et al.* (2008b)
- Sterling *et al.* (this study) LSM method, irrigation included.
- Sterling *et al.* (this study) GIS method, here assuming no net change in surface storage, where change in ET volume is equal to change in annual runoff volume.

We include both equilibrium studies and 20th century transient simulations studies. For the latter, we estimate anthropogenic impact on global runoff by multiplying the average trend (e.g., in $mm \cdot yr^{-2}$) by the simulation length (yr), with the assumption that most of the anthropogenic impact occurred during the 20th century. Because large areas of land were converted previous to 1900, these 20th century transient studies will underestimate the total anthropogenic impact from land cover change on runoff.

We did not include Gedney *et al.* (2006) or Findell *et al.* (2007) because the simulations had a considerably smaller area of land cover change. Studies used in this data set varied in the type of land cover changes used; some studies include irrigation.

Direct CO_{2atm} effects on plants during the 20th century

These studies include estimates of the direct effect of $CO_{2\,atm}$ on plant physiology through changes in stomatal conductivity and leaf area.

Studies included are:

- Gerten *et al.* (2008)
- Alkama *et al.*, (2010)
- Piao *et al.*, (2007)

Changes in 20th century meteorological forcing, predominantly induced by anthropogenic increases in greenhouse gases

To estimate of the impact of anthropogenically increased radiative forcing of the atmosphere via increases in greenhouse gases on global average runoff, we use the proxy driver of evolution of meteorological forcing in 20th century, as predominantly induced by human activities (Solomon et al., 2007). In recent studies of anthropogenic change on the global water cycle, the 20th century is a common time period used to examine the impact on global runoff. However, because change during the 20th century is not fully anthropogenic, these projections may overestimate the role of anthropogenic radiative forcing of the atmosphere to change global average runoff.

Here we include studies that, over the 20th century, isolate radiative forcing as the sum of anthropogenic radiative effect and natural climate variation. These studies generally do not include direct atmospheric CO_2 effects on plant transpiration and leaf area. Thus, these studies consider the effect on runoff of the changes in climate variables (for example, precipitation, temperature, and wind) that can be attributed to the direct effect of radiative forcing over the 20th century; the radiative effects of solar dimming from aerosols are included in these estimates. The studies included are:

- Gerten *et al.* (2008). We use the sum of the two values referred to as “PRE” and “TMP”, which form the part of the total change in runoff that is not explained by direct atmospheric CO_2 effects, land cover change and irrigation. This value includes the change in runoff from solar dimming as caused by aerosols.
- Alkama *et al.* (2010). We use the value referred to as “climate change” in this study, which is the part of the total change that is not explained by direct atmospheric CO_2 effects on plant transpiration and leaf area and comprises the radiative effects of greenhouse gases, natural climate variations, and aerosols.
- Gedney *et al.* (2006). We use the sum of the values referred to as “climate change” and “aerosols” in this study. This change in annual runoff over 100 years is the part of the total change that is not explained by deforestation and direct atmospheric carbon dioxide (CO_2) effects on plant transpiration. This value is the radiative effects of greenhouse gases on 20th century climate plus natural climate variations, and the impact of solar dimming from increased aerosols. This value does not include direct CO_2 effects on leaf area index.
- Piao *et al.* (2007). We use the value referred to as “climate change” in this study, which is the part of the total change that is not explained by the other factors considered in this study (land cover change, and direct atmospheric carbon dioxide (CO_2) effects on plant transpiration and leaf area. This value is the radiative effects of greenhouse gases on 20th century climate plus natural climate variations, plus aerosols.

Water withdrawals and water consumption

Estimates of annual water withdrawals include use for livestock, households, thermal power plants, manufacturing and irrigation.

Studies included are:

- Hanasaki *et al.* (2008)
- Döll and Siebert (2002)
- FAO (2007)
- Shiklomanov (2000)
- Wada *et al.* (2011)
- Shen *et al.* (2010)
- AQUASTAT (2002) (in Shen *et al.* (2008)
- Alcamo *et al.* (2007)
- Shiklomanov and Rodda (2003)

We estimate water consumption as the expected portion of global water withdrawals not returned to runoff, approximately 52% (Shiklomanov, 1999).

Estimate of total net change in global annual runoff

An estimate of the total net anthropogenic forcing on global annual runoff is made by taking the sum of the average change in runoff for land cover change, $CO_{2\ atm}$ plant effects, radiative forcing, and water consumption. We calculate the standard deviation of the net change to be the square root of the sum of the squared individual standard deviations, following the assumption that the different drivers are independent.

Detailed comparisons among the studies are not supported because of differences in experimental design (equilibrium vs. transient experiments, or coupled vs. off-line simulations), magnitude, location and duration of the forcing (e.g., different areas of land cover change altered (Sterling & Ducharne, 2008), different resolutions, time periods and duration of transient forcing experiments, and in assumptions about annual storage.

Despite these limitations, synthesizing the results of these studies provides an insight into the potential of drivers to alter the land surface hydrology, and provides a beginning for comparison and future refinement, with an eventual goal of being able to estimate a total net anthropogenic forcing on the annual runoff.

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