

# Luyssaert Reading Support

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1

## NOTATION

$$GPP = NPP + R_a \text{ (always a sink)}$$

$$NPP = fNPP + wNPP + rNPP + mNPP = \text{biomass}$$

$$NEP = NPP - R_h$$

$$GPP = NEP + R_e \text{ (eddy covariance)}$$

$$R_e = R_a + R_h; \quad R_s = R_a + R_h \text{ (below ground part)}$$

Respiration: autotrophic (plants) or heterotrophic (microbial)

fNPP = foliage component of NPP;

GPP = gross primary production (GPP > 0 denotes photosynthetic uptake);

mNPP = missing component of NPP;

NBP = net biome production (NBP > 0 denotes biome uptake);

NECB = net ecosystem carbon balance (NECB > 0 denotes ecosystem uptake);

NEE = net ecosystem exchange (NEE > 0 denotes ecosystem uptake);

NEP = net ecosystem production (NEP > 0 denotes ecosystem uptake);

NPP = net primary production (NPP > 0 denotes ecosystem uptake);

$R_a$  = autotrophic respiration ( $R_a > 0$  denotes respiratory losses);

$R_e$  = ecosystem respiration ( $R_e > 0$  denotes respiratory losses);

$R_h$  = heterotrophic respiration ( $R_h > 0$  denotes respiratory losses);

rNPP = root component of NPP;

$R_s$  = soil respiration ( $R_s > 0$  denotes respiratory losses);

VOC = volatile organic compounds;

wNPP = wood component of NPP

after Luyssaert, et al, GCB, 2007

## How much is there?

Terrestrial Ecosystems – Net primary Production

Can be factor of 2 uncertainty in rates!

August 2009 GLOBAL NPP PATTERNS 347

TABLE 1. Historic (Ajtay et al. 1979, WBGU 1988) and current (Roy et al. 2001 [RSM]) estimates of total biomass (carbon density) and total net primary production (NPP; above- and belowground) in major biomes of the Earth.

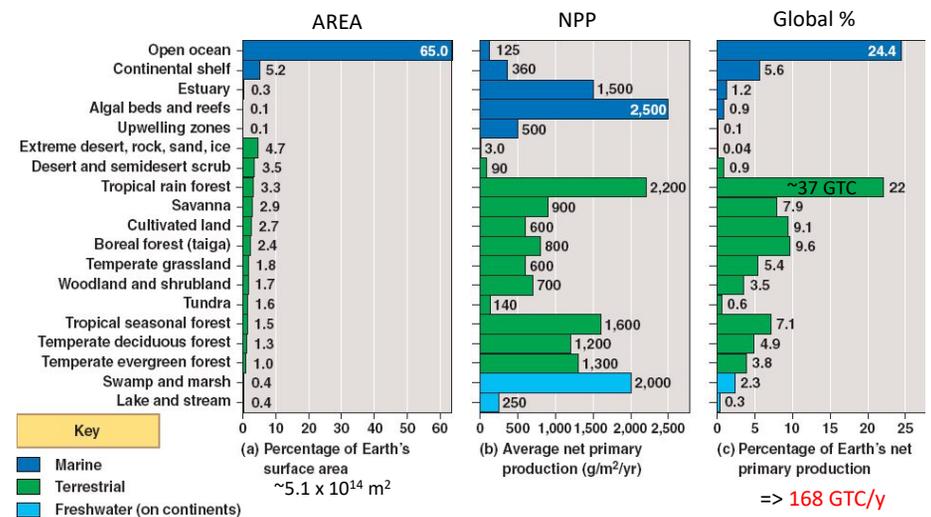
Biome	Area (10 <sup>9</sup> ha)		Carbon density (Mg C/ha)		NPP (g C·m <sup>-2</sup> ·yr <sup>-1</sup> )		Global NPP (Pg C/yr)	
	WBGU	RSM	WBGU	RSM	Ajtay	RSM	Ajtay	RSM
Tropical forests	1.76	1.75	120	194	783	1251	13.70	21.90
Temperate forests	1.04	1.04	57	134	625	779	6.50	8.10
Boreal forests	1.37	1.37	64	42	234	190	3.20	2.60
Tropical savannas and grasslands	2.25	2.76	29	29	641	540	17.70	14.90
Temperate grasslands and shrub lands	1.25	1.78	7	13	298	393	5.30	7.00
Deserts and semi-deserts	4.55	2.77	2	4	51	126	1.40	3.50
Tundra	0.95	0.56	6	4	179	89	1.00	0.50
Croplands	1.6	1.35	2	3	504	304	6.80	4.10
Wetlands	0.35		43		1229		4.30	
Total	15.12	14.93					59.90	62.60

Notes: WBGU is the German Advisory Council on Climate Change (1988), with forest data from Dixon et al. (1994). This table is based on Table 3.2 of IPCC (2001), which included values from Table 23-1 of Saugier et al. (2001) that had been converted from dry matter (DM) to carbon (C), assuming that 50% of dry matter is carbon. Values of NPP as g C·m<sup>-2</sup>·yr<sup>-1</sup> were derived by dividing global NPP by the global area of each biome (RMS area [10<sup>9</sup> g/ha<sup>-1</sup>]).

Huston & Wolverton, Ecol. Mono., 79(3), 2009  
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3

## How much is there? Global Ecosystems – Gross Primary Production



Data after RH Whitaker as found on Wiki/Primary\_production

4