

February 16, 2001
ES 10 Lecture J. Bartolome

Topic: Landscapes, Ecosystems, and Communities

Lecture Outline:

1. Levels of organization in the biosphere
2. Descriptive and quantitative ecosystem models
3. Energy flux in terrestrial and aquatic ecosystems

Figures: Allaby figure 2.10, Begon, Harper and Townsend figure 18.1 and table 18.1

Table 18.1. Net annual primary productivity and standing crop biomass estimates for contrasting communities of the world. (After Whittaker, 1975.)

Ecosystem type	Area (10 ⁶ km ²)	Net primary productivity, per unit area (g m ⁻² or t km ⁻²)		World net primary production (10 ⁹ t)	Biomass per unit area (kg m ⁻²)		World biomass (10 ⁹ t)
		Normal range	Mean		Normal range	Mean	
Tropical rainforest	17.0	1000–3500	2200	37.4	6–80	45	765
Tropical seasonal forest	7.5	1000–2500	1600	12.0	6–60	35	260
Temperate evergreen forest	5.0	600–2500	1300	6.5	6–200	35	175
Temperate deciduous forest	7.0	600–2500	1200	8.4	6–60	30	210
Boreal forest	12.0	400–2000	800	9.6	6–40	20	240
Woodland and shrubland	8.5	250–1200	700	6.0	2–20	6	50
Savanna	15.0	200–2000	900	13.5	0.2–15	4	60
Temperate grassland	9.0	200–1500	600	5.4	0.2–5	1.6	14
Tundra and alpine	8.0	10–400	140	1.1	0.1–3	0.6	5
Desert and semidesert shrub	18.0	10–250	90	1.6	0.1–4	0.7	13
Extreme desert, rock, sand and ice	24.0	0–10	3	0.07	0–0.2	0.02	0.5
Cultivated land	14.0	100–3500	650	9.1	0.4–12	1	14
Swamp and marsh	2.0	800–3500	2000	4.0	3–50	15	30
Lake and stream	2.0	100–1500	250	0.5	0–0.1	0.02	0.05
Total continental	149		773	115		12.3	1837
Open ocean	332.0	2–400	125	41.5	0–0.005	0.003	1.0
Upwelling zones	0.4	400–1000	500	0.2	0.005–0.1	0.02	0.008
Continental shelf	26.6	200–600	360	9.6	0.001–0.04	0.01	0.27
Algal beds and reefs	0.6	500–4000	2500	1.6	0.04–4	2	1.2
Estuaries	1.4	200–3500	1500	2.1	0.01–6	1	1.4
Total marine	361		152	55.0		0.01	3.9
Full total	510		333	170		3.6	1841

2d

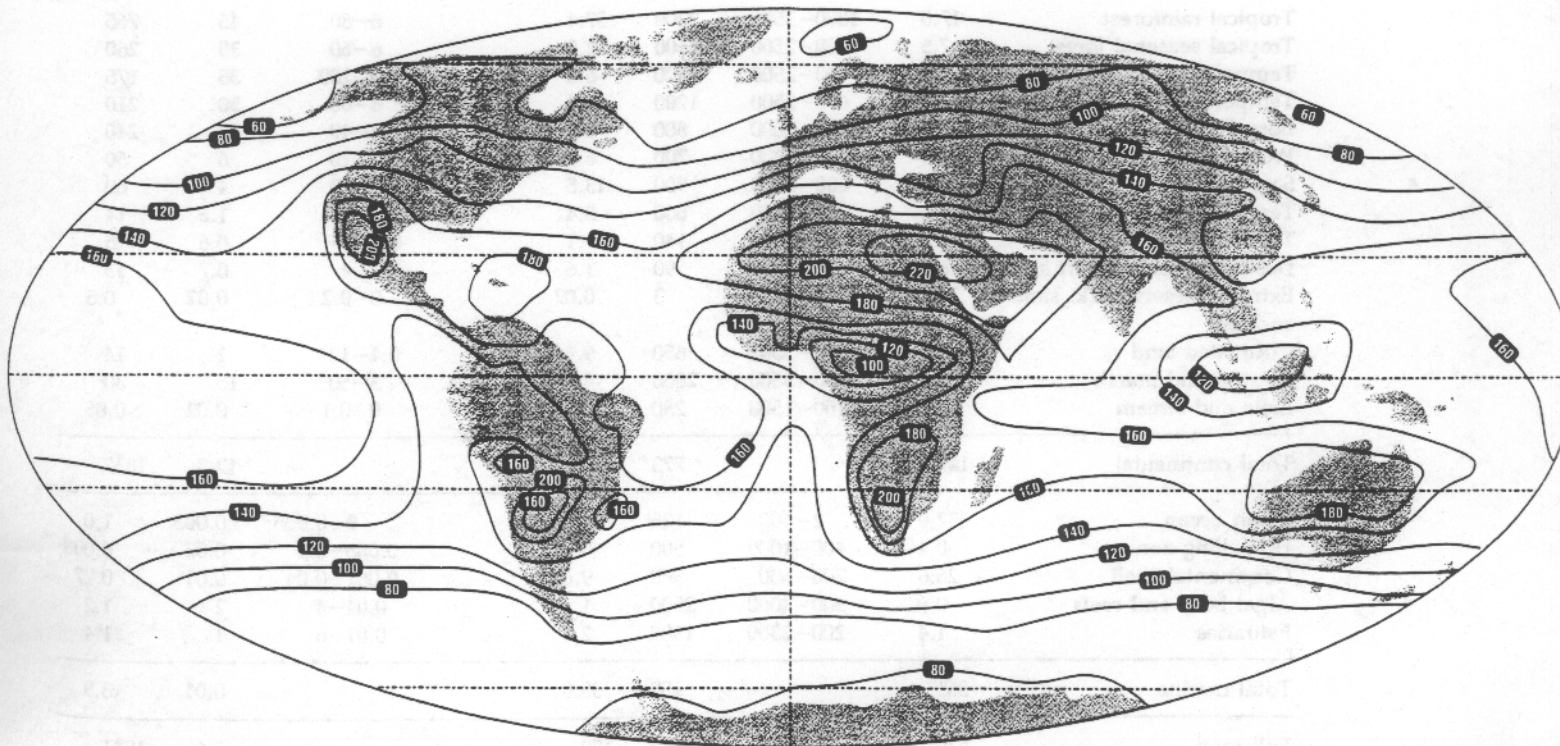


Figure 2.10 Average amount of solar radiation reaching the ground surface, in $\text{kcal cm}^{-2} \text{yr}^{-1}$ (1 $\text{kcal} = 4186.8 \text{ J}$)

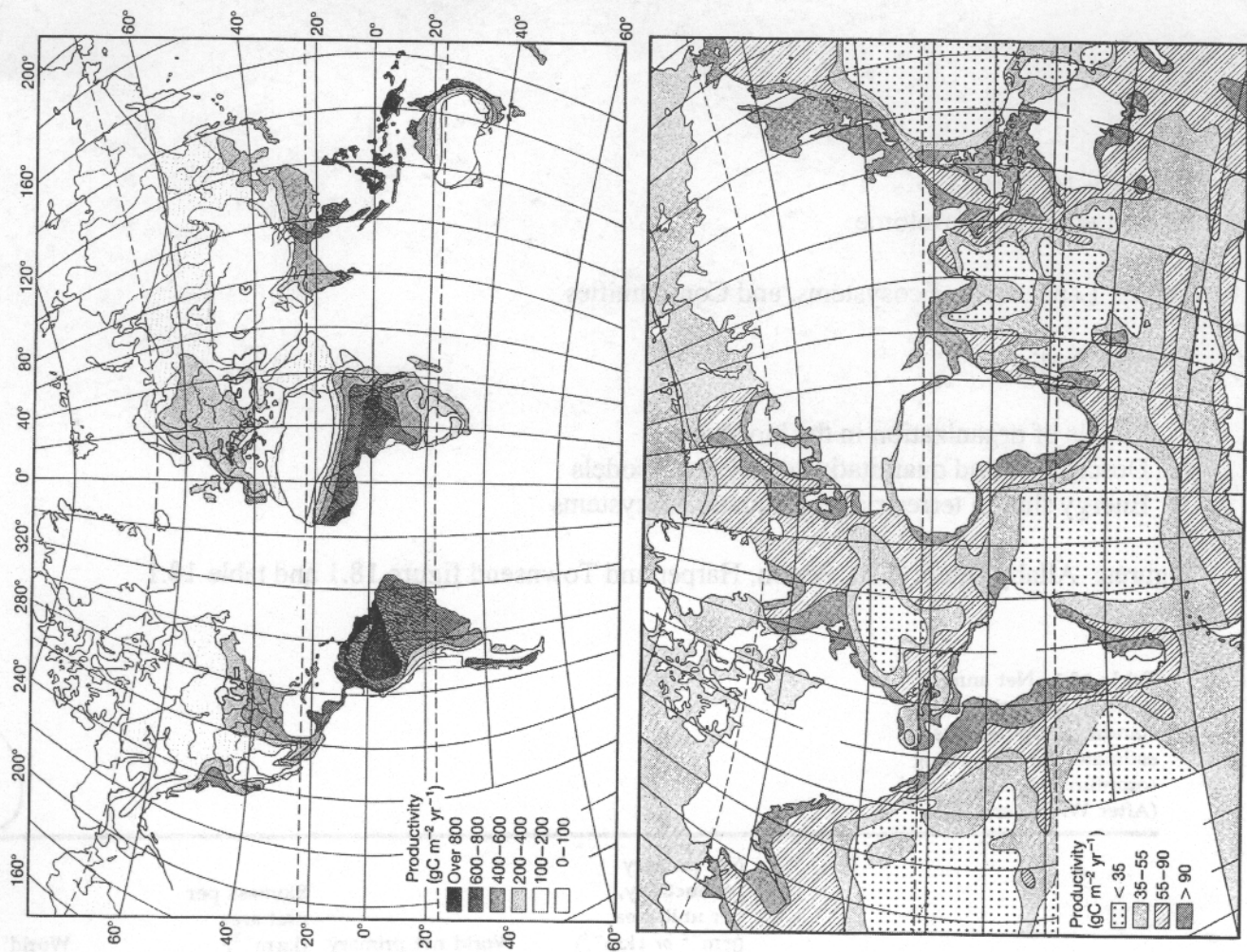


Figure 18.1. Top: World-wide pattern of net primary productivity on land. (After Reichle, 1970.) Bottom: World-wide pattern of net primary productivity in the oceans. (After Koblentz-Mishke *et al.*, 1970.)