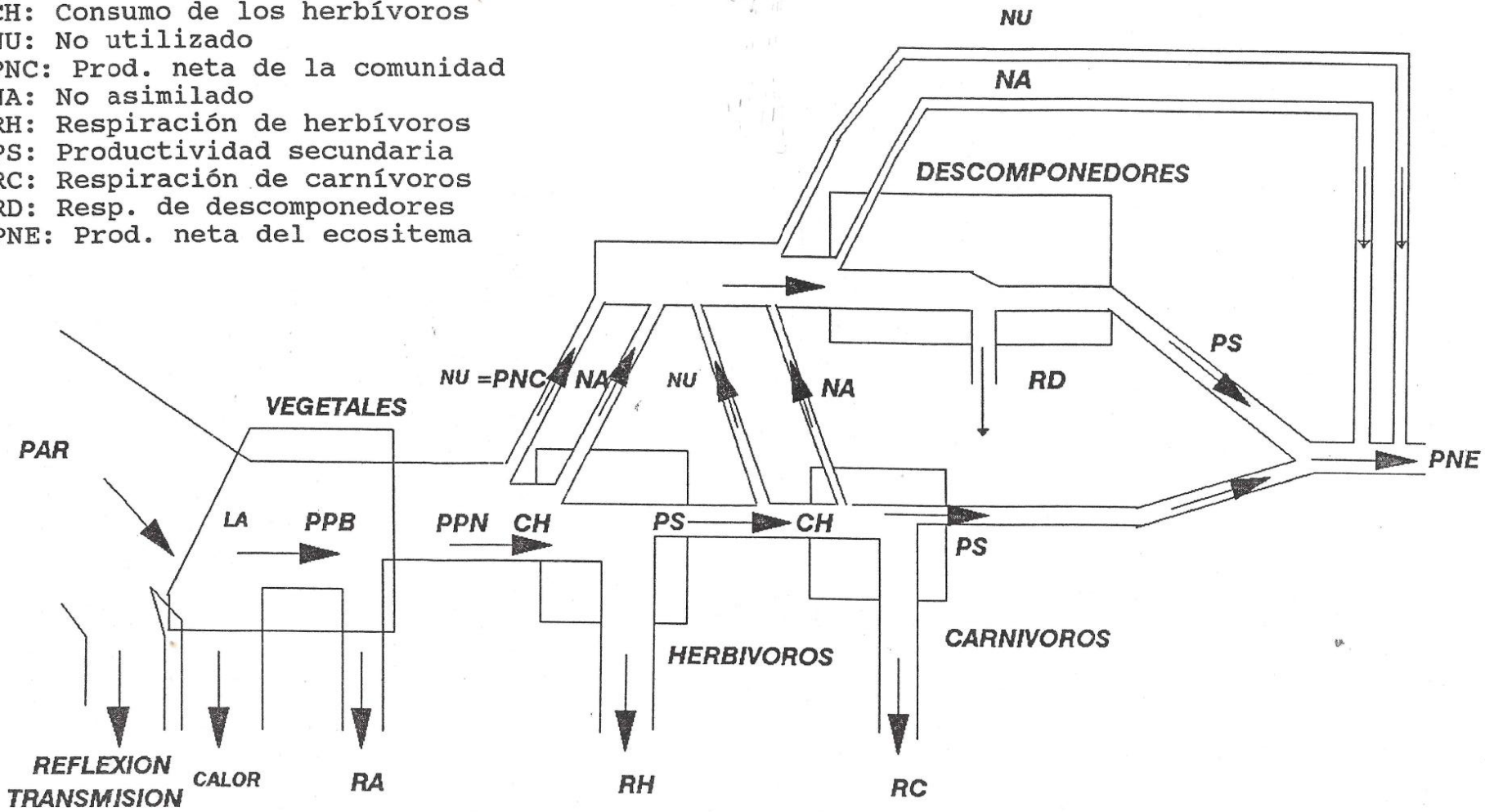
Eficiencia energética
Ciclos biogeoquímicos

PAR: Luz fotosinteticamente activa
LA: Luz absorbida
RA: Respiración de autótrofos
PPN: Productividad primaria neta
CH: Consumo de los herbívoros
NU: No utilizado
PNC: Prod. neta de la comunidad
NA: No asimilado
RH: Respiración de herbívoros
PS: Productividad secundaria
RC: Respiración de carnívoros
RD: Resp. de descomponedores
PNE: Prod. neta del ecositema



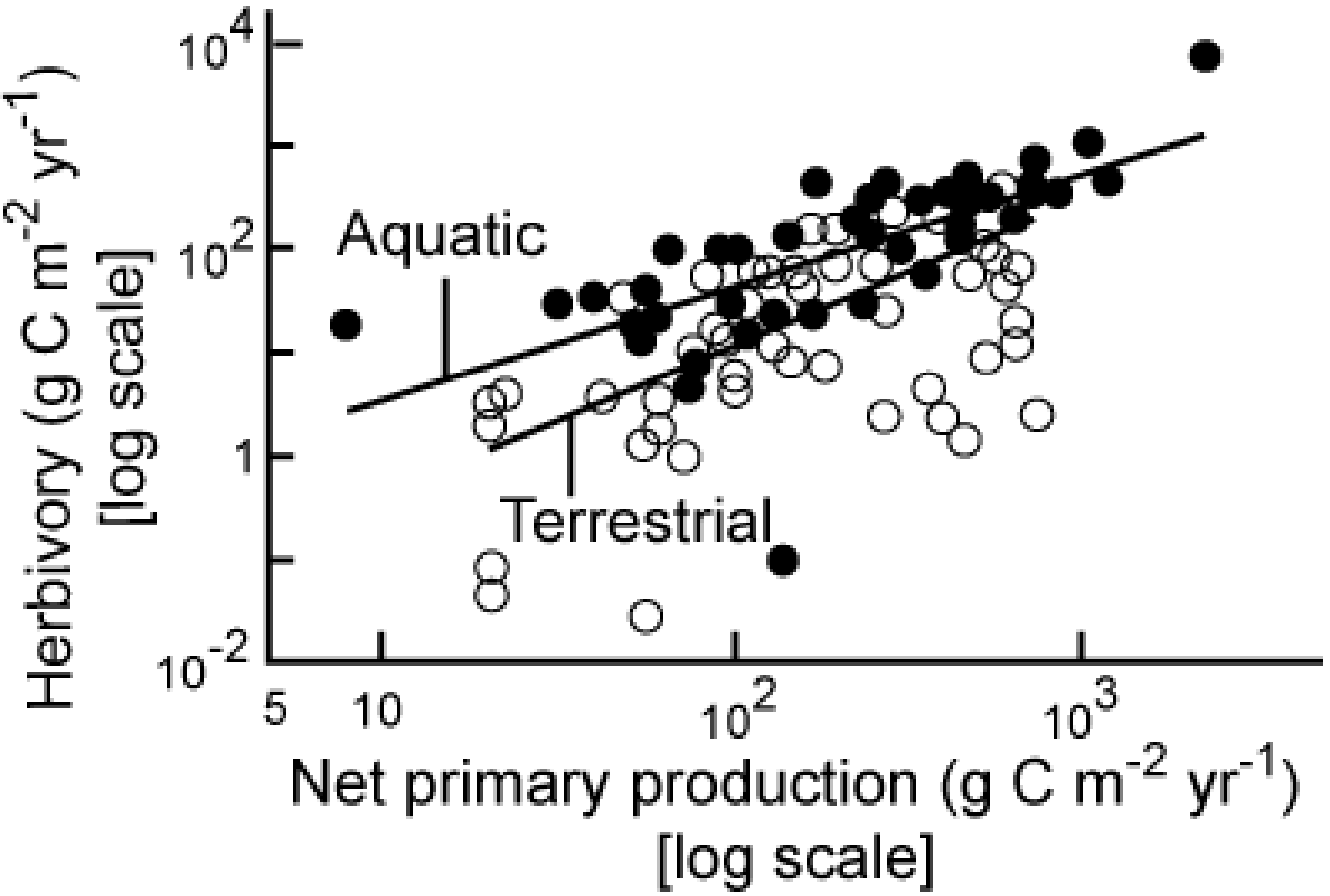
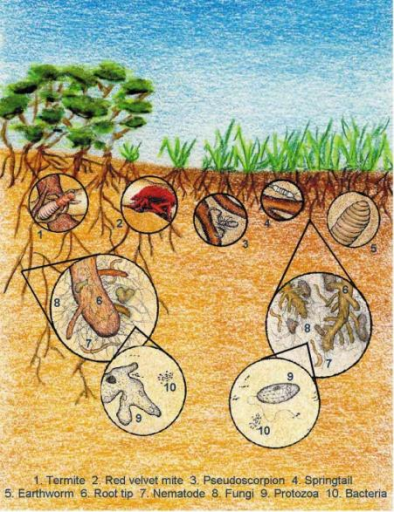
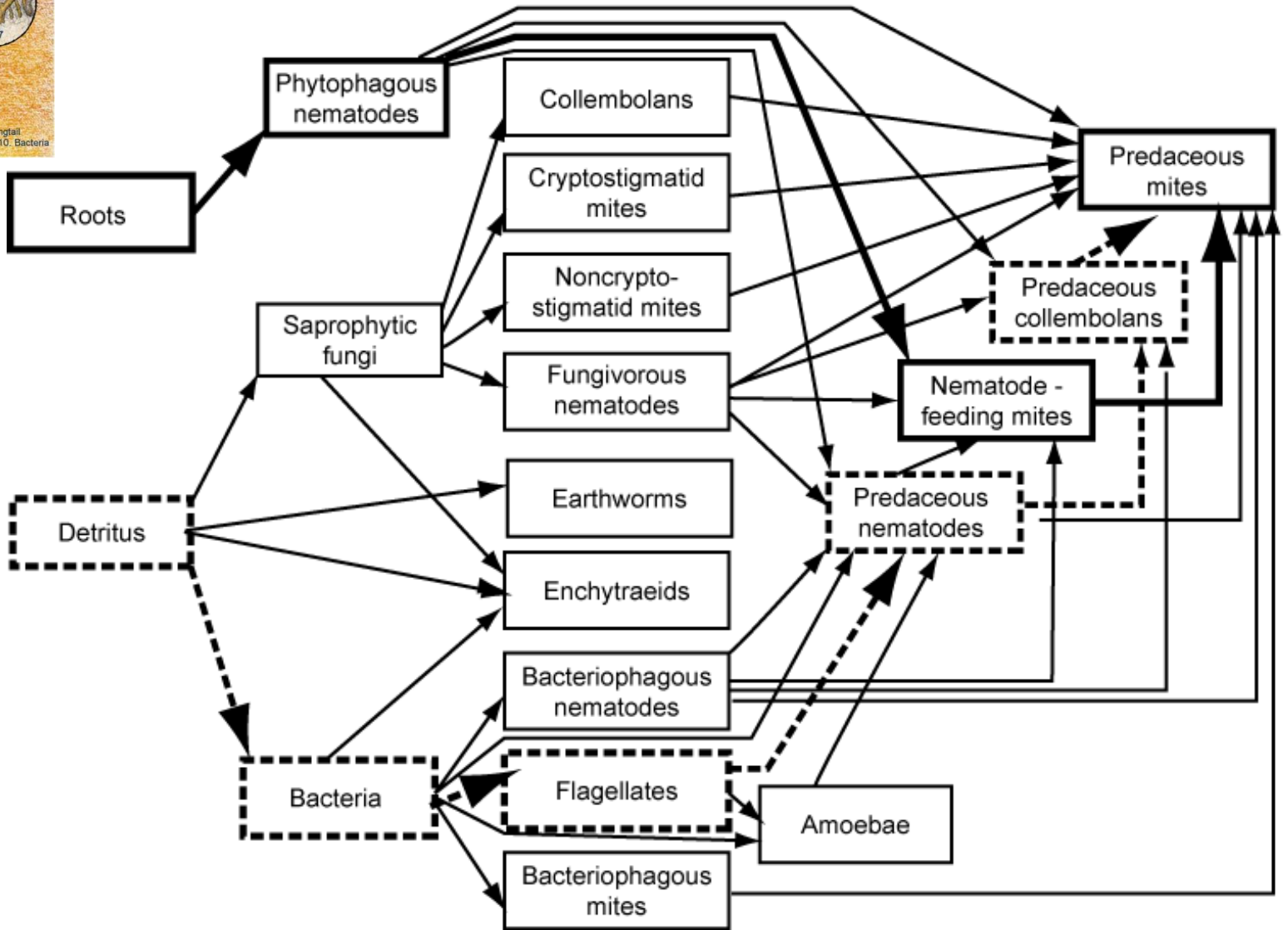


Fig. 10.1

Chapin et al., 2011

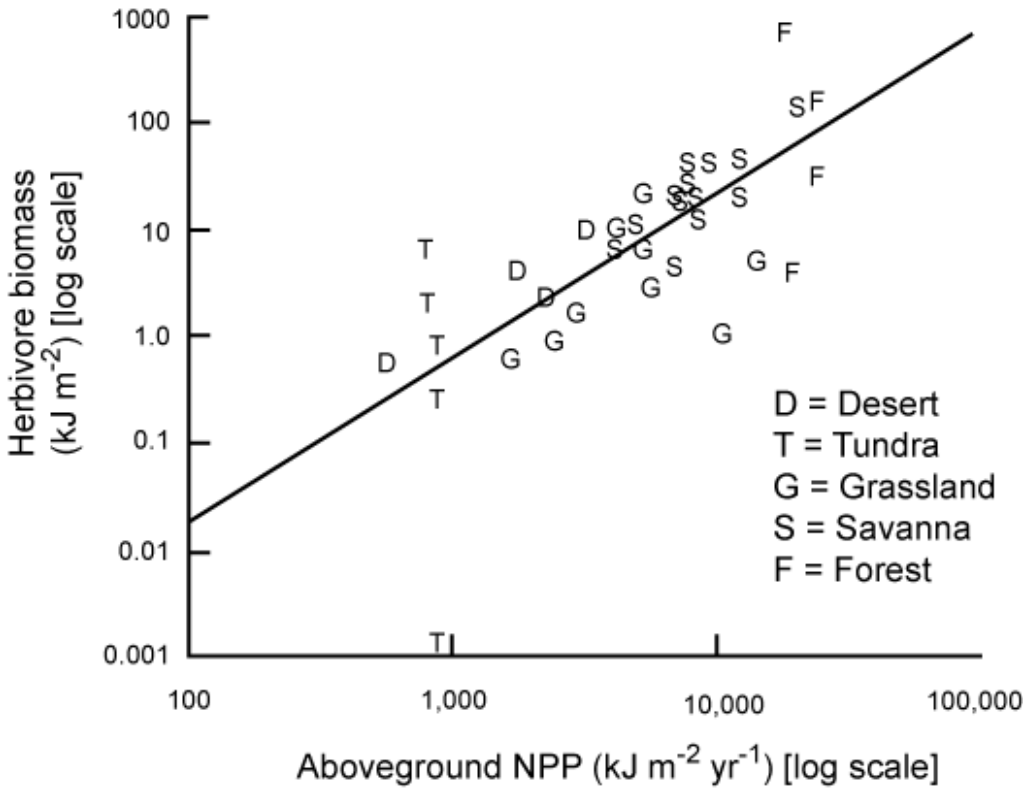
plant-based (solid line) and a detritus-based (dashed line) food chain



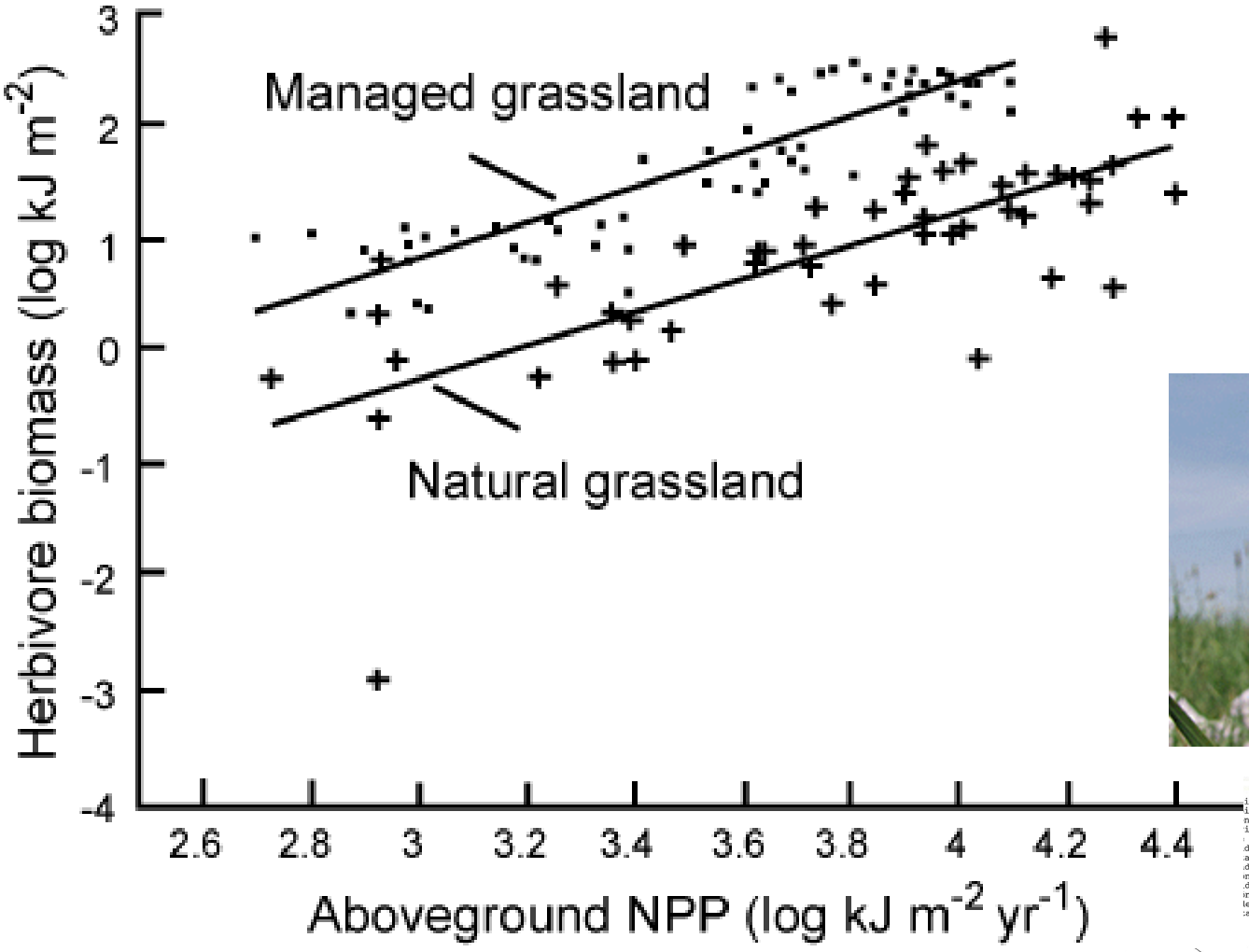


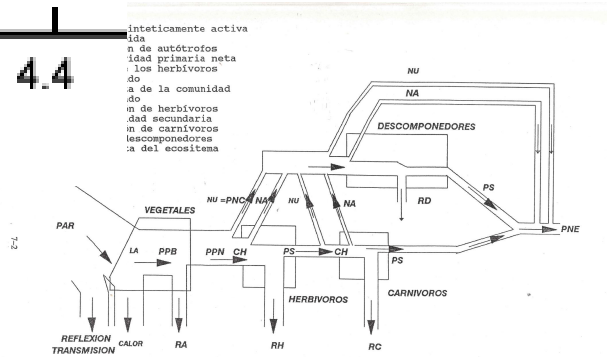
Bottom up

- La productividad de autótrofos limita la productividad de los niveles superiores tanto en tramas basadas en plantas como en detritus

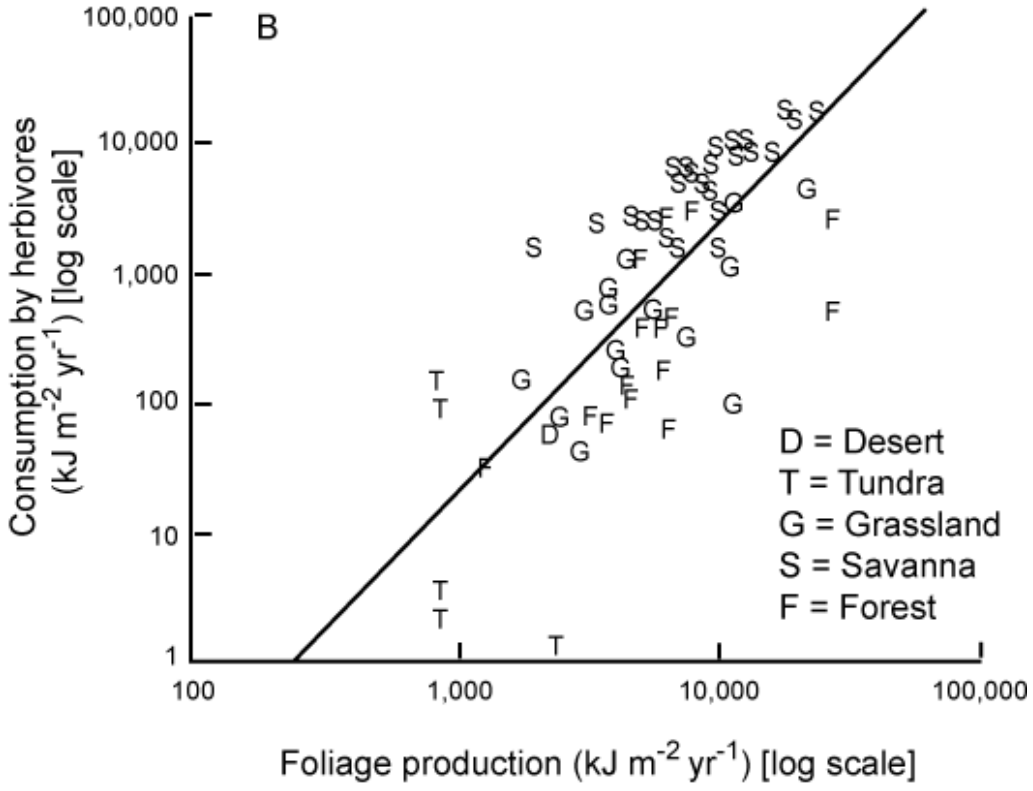


Ecosistemas manejados





Diferencias entre biomas



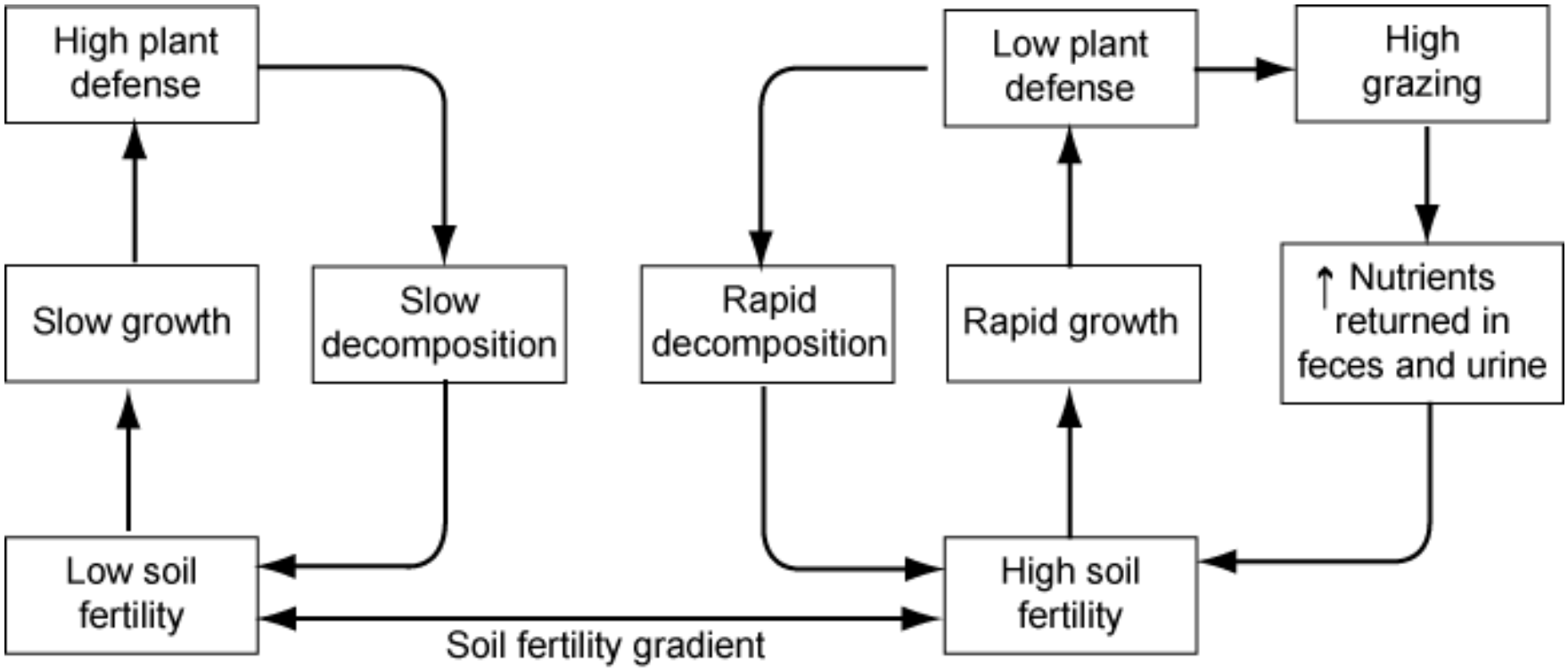
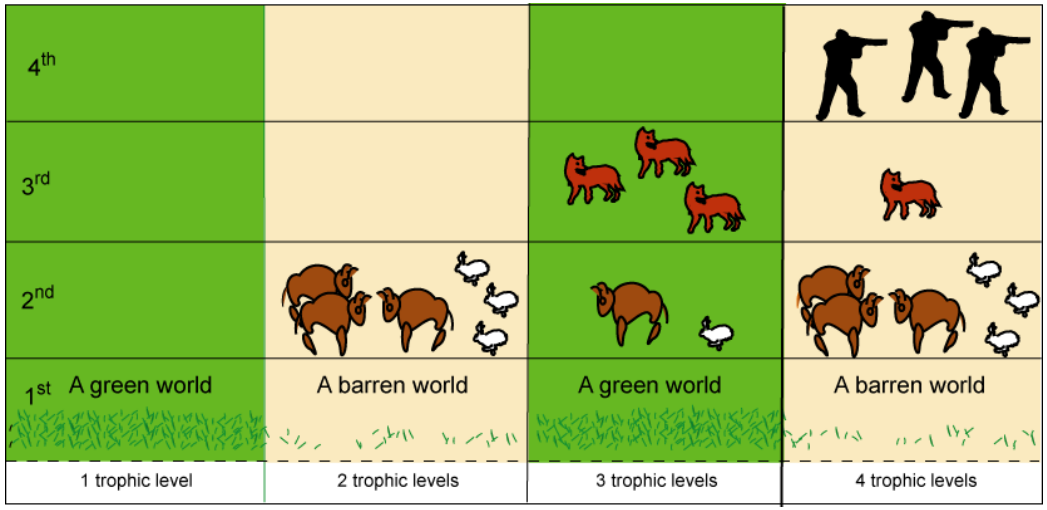

High plant defense
Slow growth
Slow decomposition
Low soil fertility
Low plant defense
High grazing
Rapid decomposition
Rapid growth
↑ Nutrients returned in feces and urine
High soil fertility
Soil fertility gradient

Fig. 10.9

Top down

- El consumo de los predadores altera la abundancia de los organismos a través de más de un nivel trófico



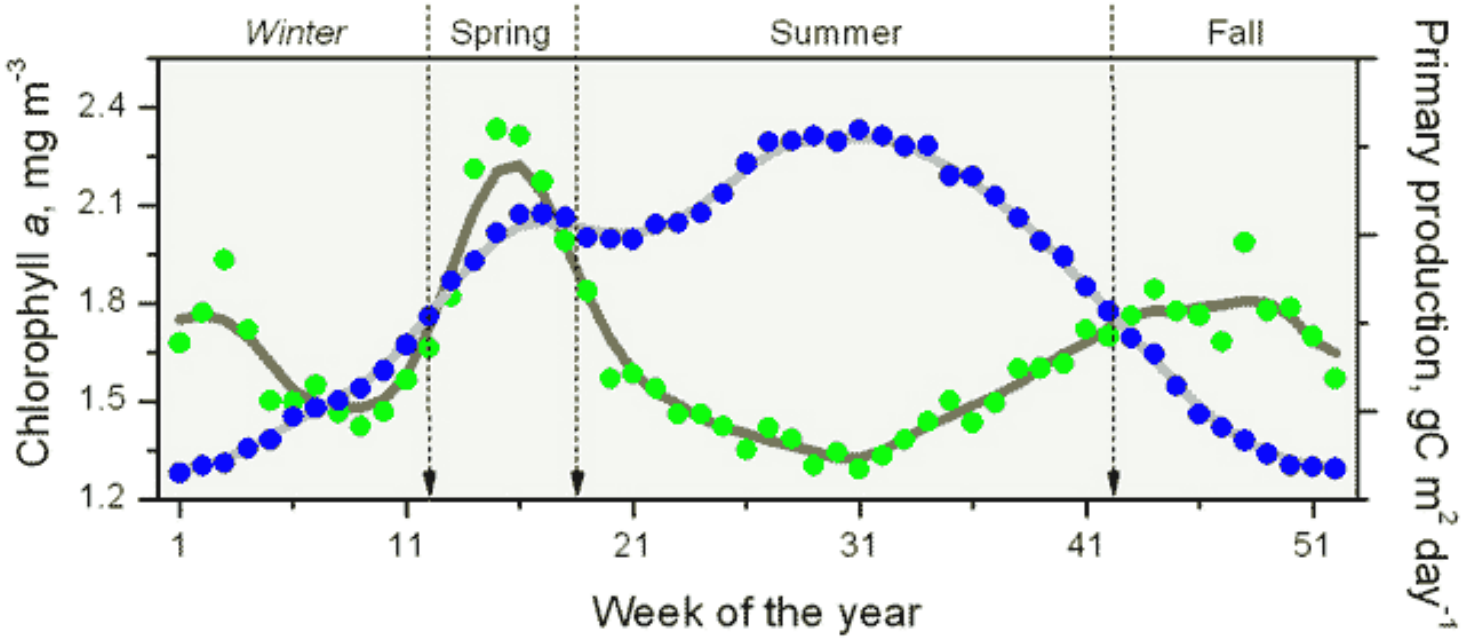


Figure 4.3 Annual chlorophyll biomass (green symbols) and primary production (blue symbols) seasonal cycles for the Northeast Shelf Large Marine Ecosystem.

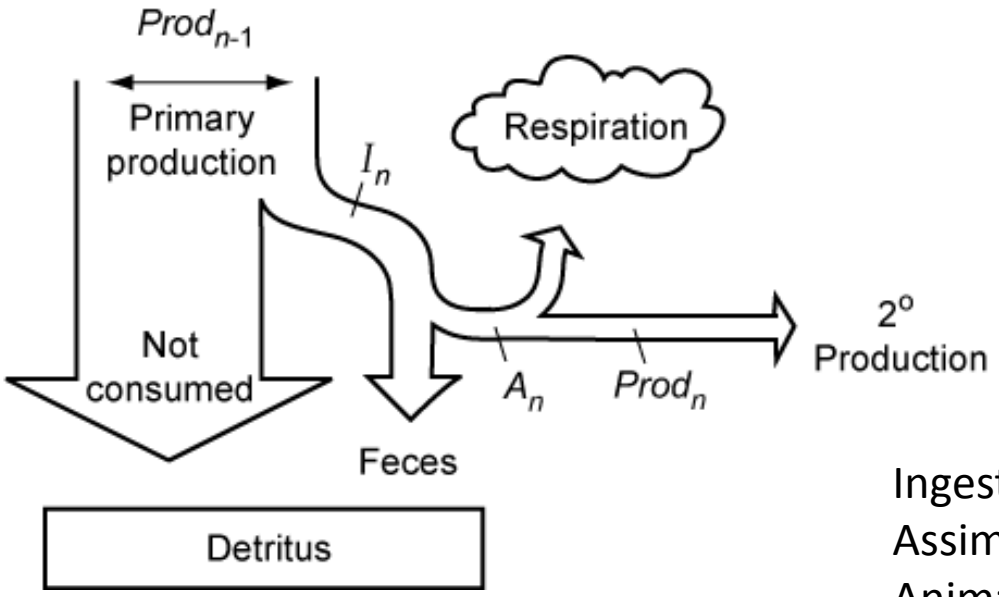
Eficiencia energética

$$\text{Consumption efficiency } (E_{\text{consump}}) = \frac{I_n}{Prod_{n-1}}$$

$$\text{Assimilation efficiency } (E_{\text{assim}}) = \frac{A_n}{I_n}$$

$$\text{Production efficiency } (E_{\text{prod}}) = \frac{Prod_n}{A_n}$$

$$\text{Trophic efficiency } (E_{\text{troph}}) = (E_{\text{consump}}) \times (E_{\text{assim}}) \times (E_{\text{prod}}) = \frac{Prod_n}{Prod_{n-1}}$$



Ingested by animals (I_n)
Assimilated into the blood stream (A_n)
Animal production ($Prod_n$)

TABLE 11.1. Consumption efficiency of the herbivore trophic level in selected ecosystem types.

Ecosystem type	Consumption efficiency[a] (% of aboveground NPP)
Oceans	60–99
Managed rangelands	30–45
African grasslands	28–60
Herbaceous old fields (1–7 yr)	5–15
Herbaceous old fields (30 yr)	1.1
Mature deciduous forests	1.5–2.5

[a] Terrestrial estimates emphasize consumption by aboveground herbivores and may not accurately reflect the total ecosystem-scale consumption efficiency.
Data from Wiegert and Owen (1971) and Detling (1988).

Chapin et al., 2011

Pirámides de biomasa y energía

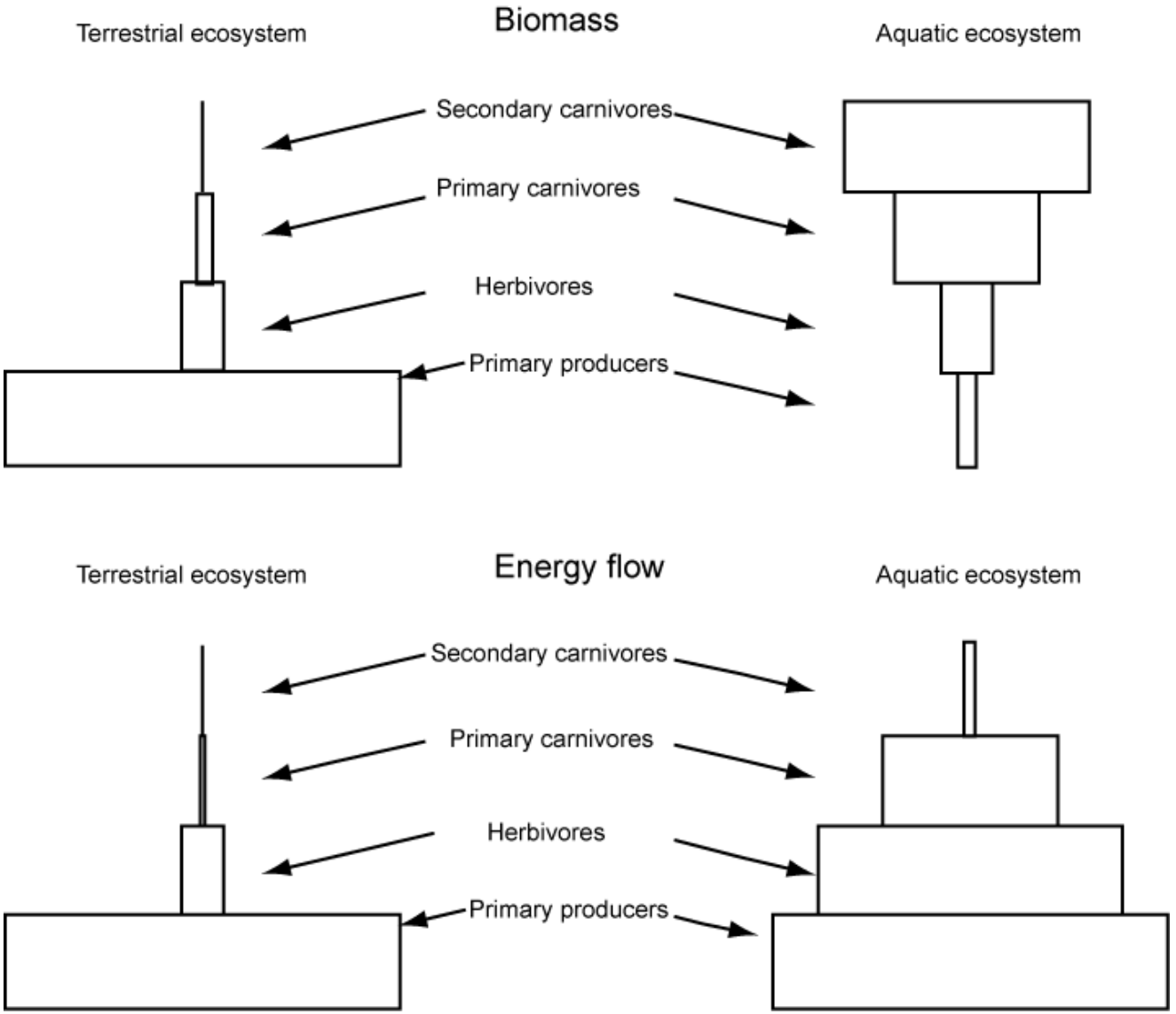


Fig. 10.11

herbivores (H)
primary carnivores (C_1)
secondary carnivores (C_2)
bacteria (B)
fungi (F)
microbivores (M)
carnivores (C),

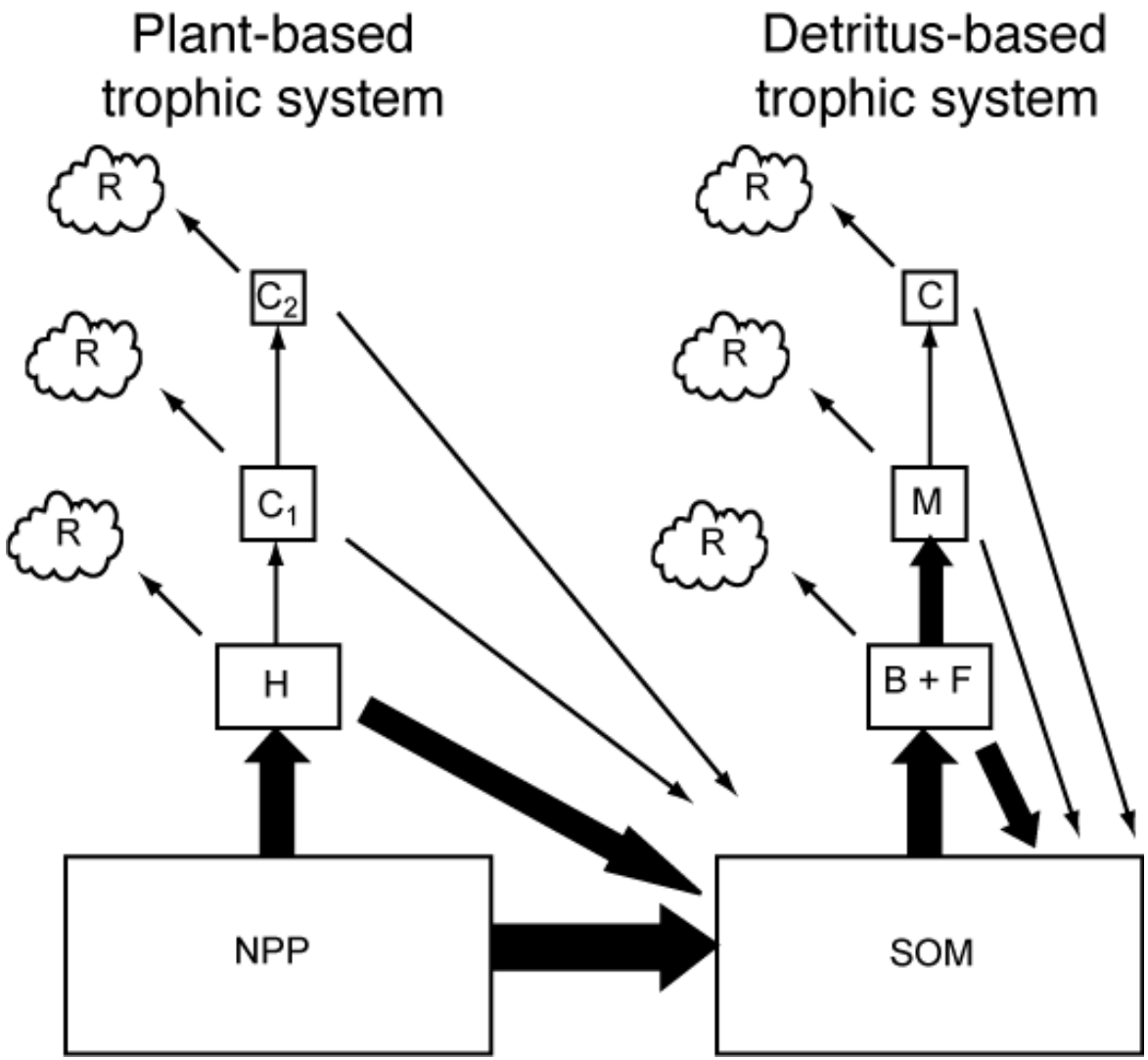
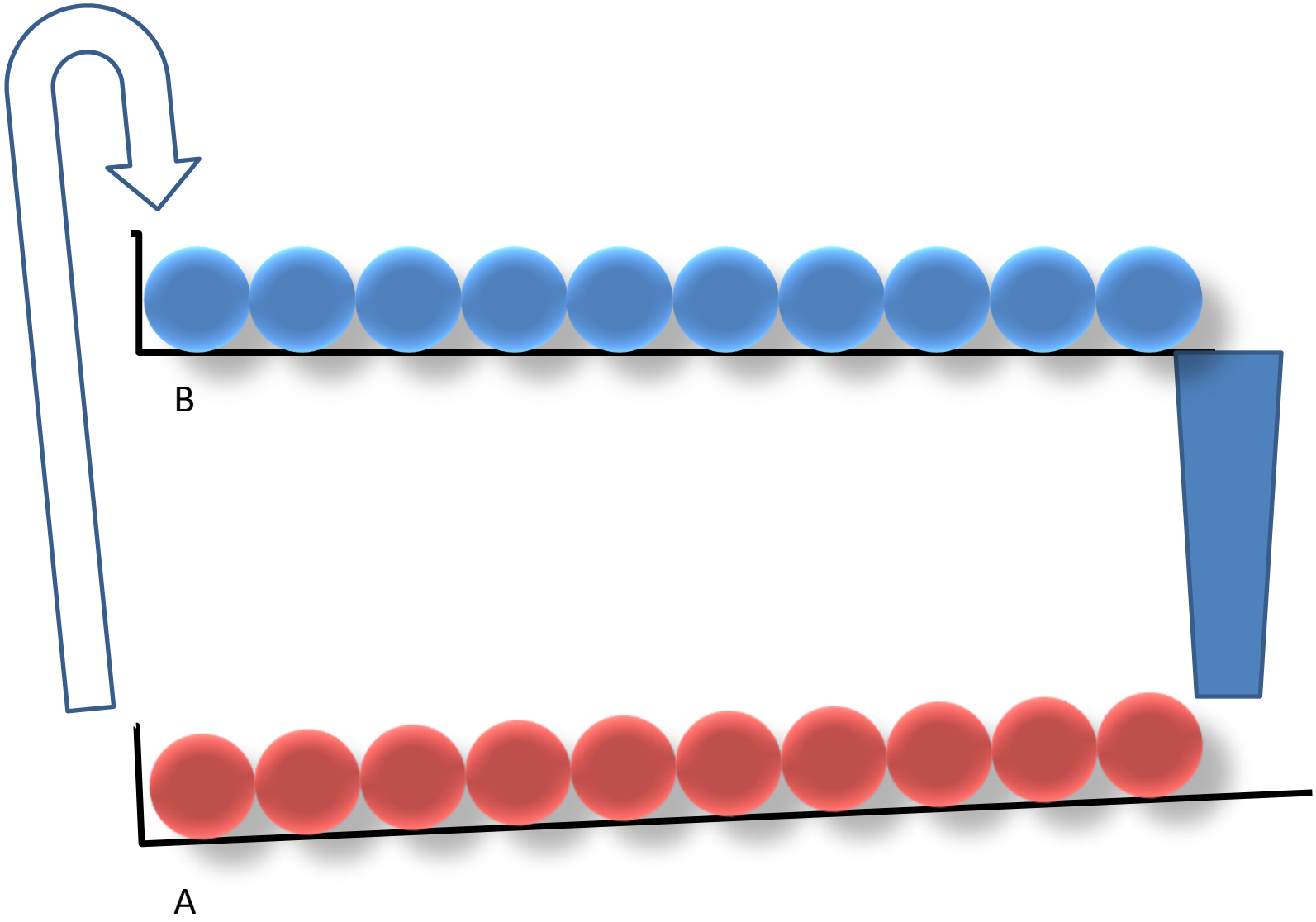


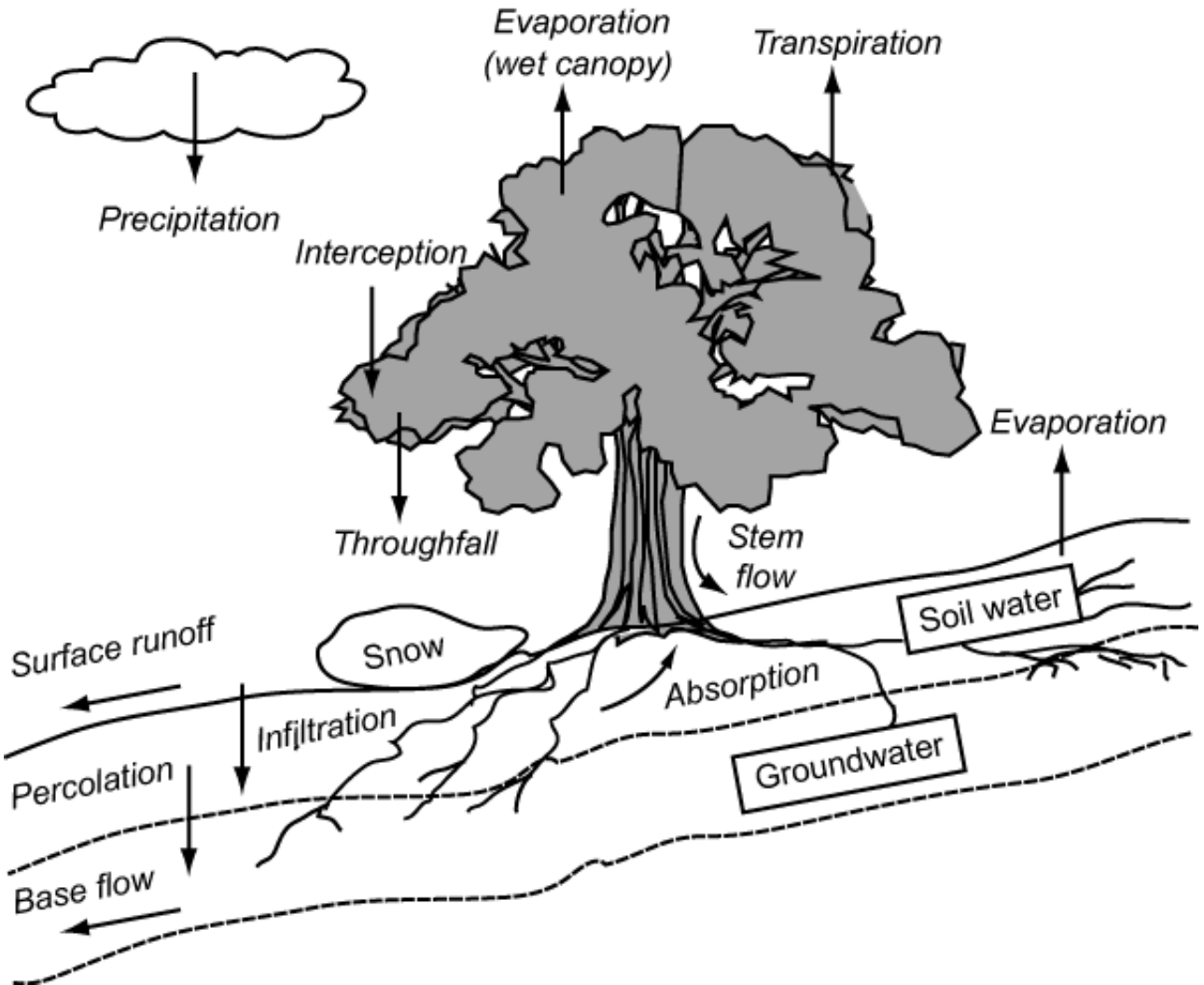
Fig. 10.15


B
A

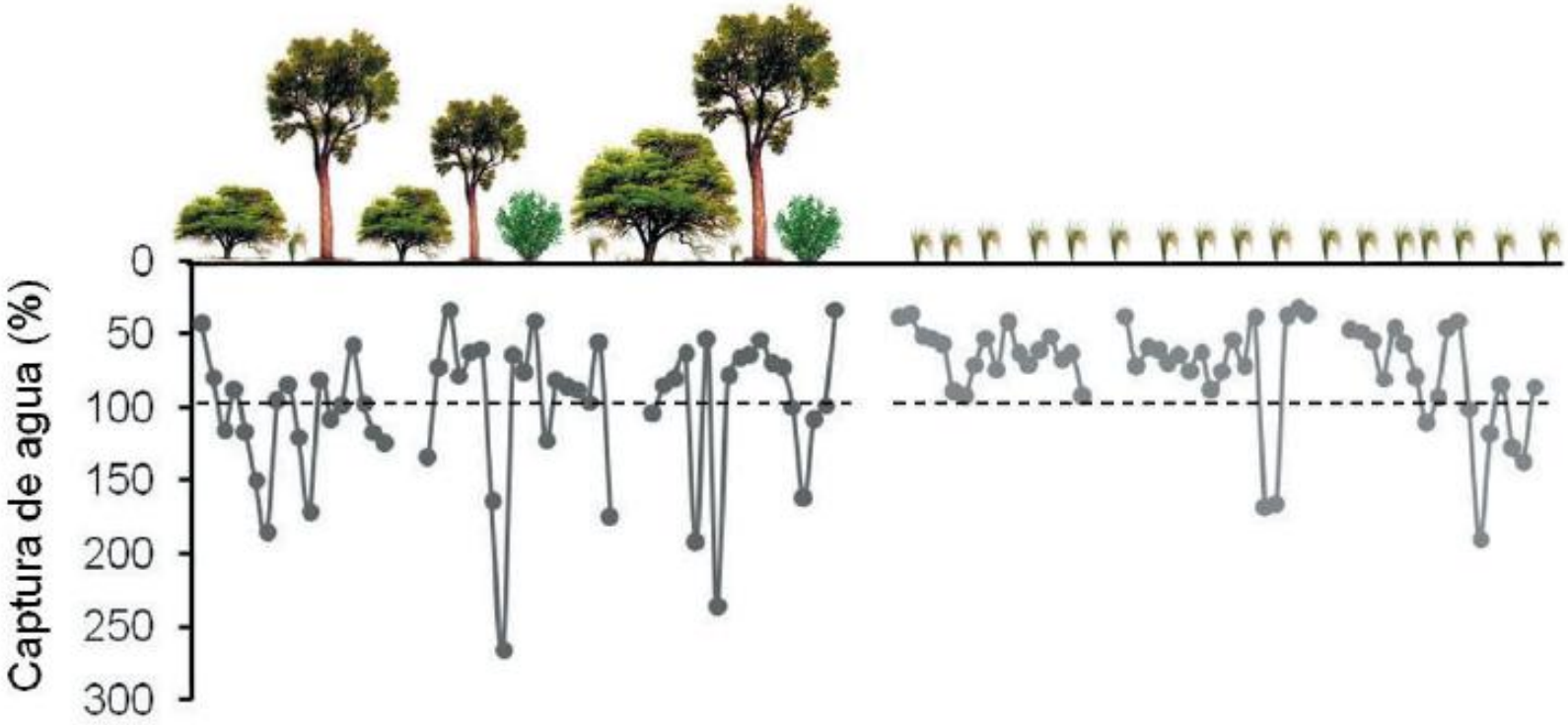
Ciclos biogeoquímicos

- Describen el flujo de materia entre componentes bióticos y abióticos de un ecosistema
- En un ciclo, los elementos circulan entre distintos componentes volviendo al punto de partida y repitiéndose en el tiempo
- Algunos ciclos de importancia biológica
  - Agua
  - Carbono
  - Macro nutrientes (N, P)

El ciclo del agua en un ecosistema



Vegetación y ciclo de agua



Transporte lateral de agua

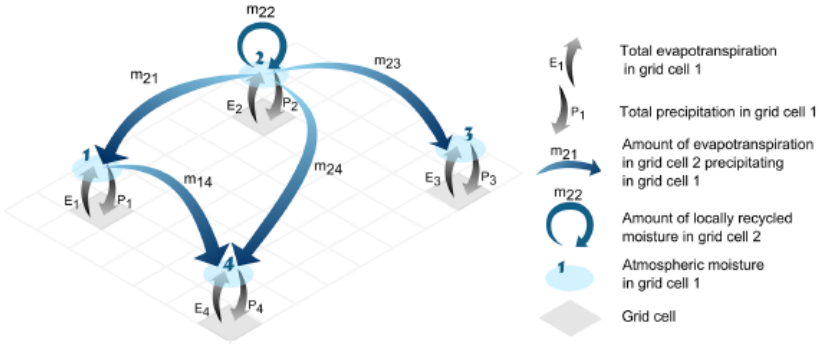


Figure 3. Schematic representation of the moisture recycling network. The exchange of moisture from 2 to 4 uses two alternative pathways: the direct one (m_{24}) and the cascading pathway ($m_{21}m_{14}$). The grid cell 1 is an intermediary on an alternative pathway to the direct transport of moisture between 2 and 4. Thus, grid cell 1 forms a Middleman motif with grid cells 2 and 4.

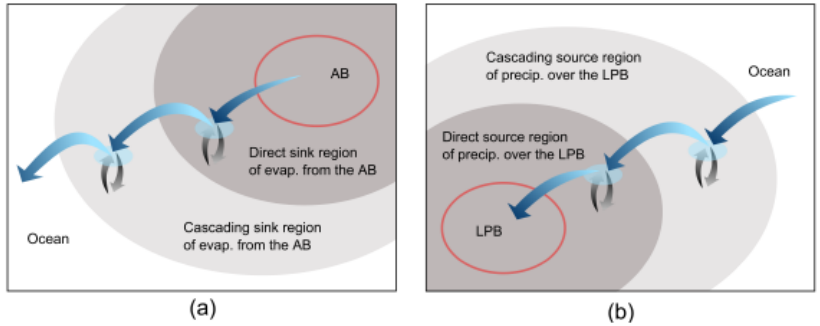
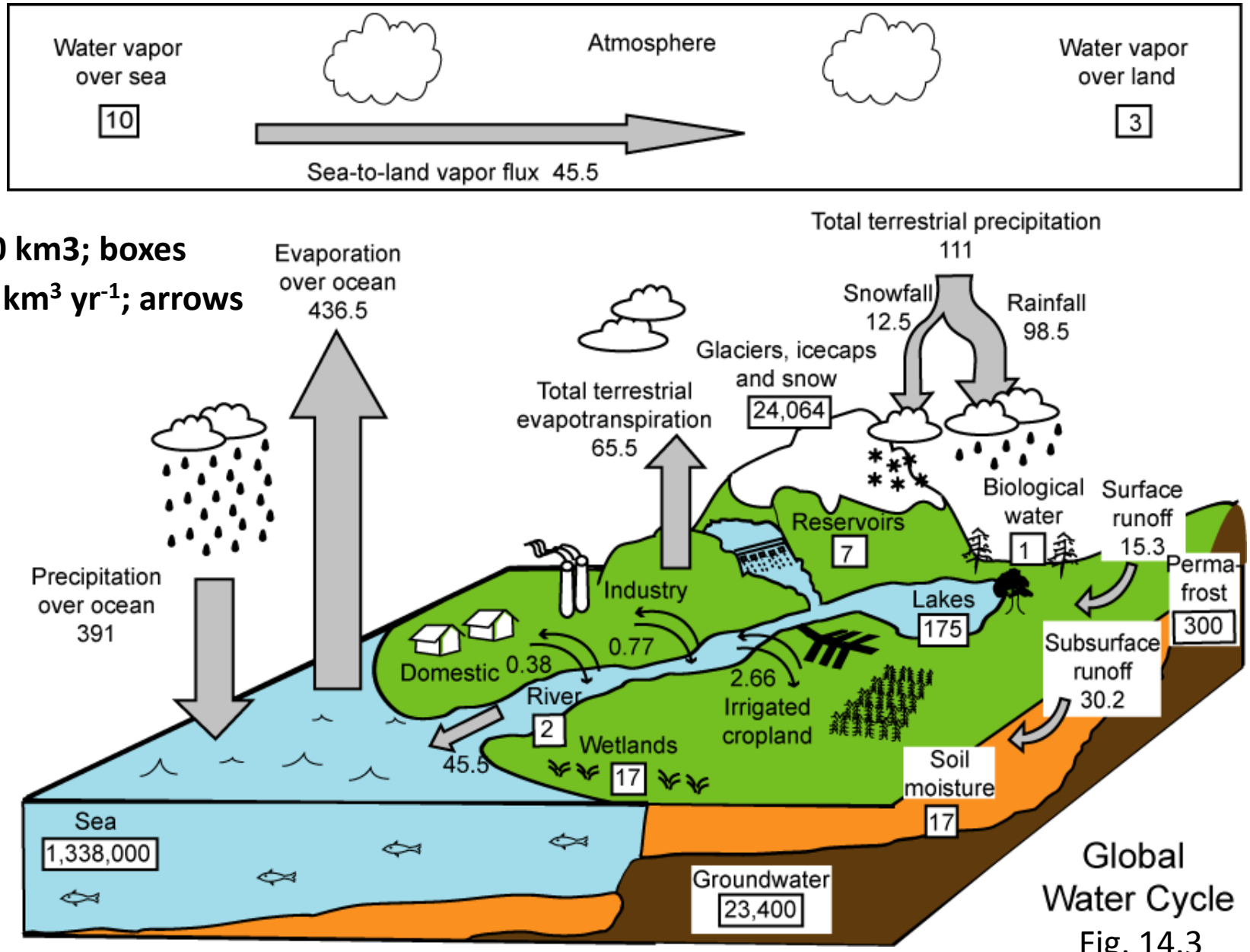


Figure 4. Schematic representation of the sink and source regions as quantified by the moisture recycling ratios. In addition to the direct source and sink regions identified using DMR ratios (dark gray), the cascading source and sink regions identified using CMR ratios (light gray) are highlighted. Of specific interest for this study are: direct and cascading sink regions of evapotranspiration (evap.) from the Amazon basin (AB) (a) and direct and cascading source regions of precipitation (precip.) over the La Plata basin (LPB) (b).

24-29% de lo que llueve en la Cuenca del Plata viene del Amazonas



Chapin et al., 2011

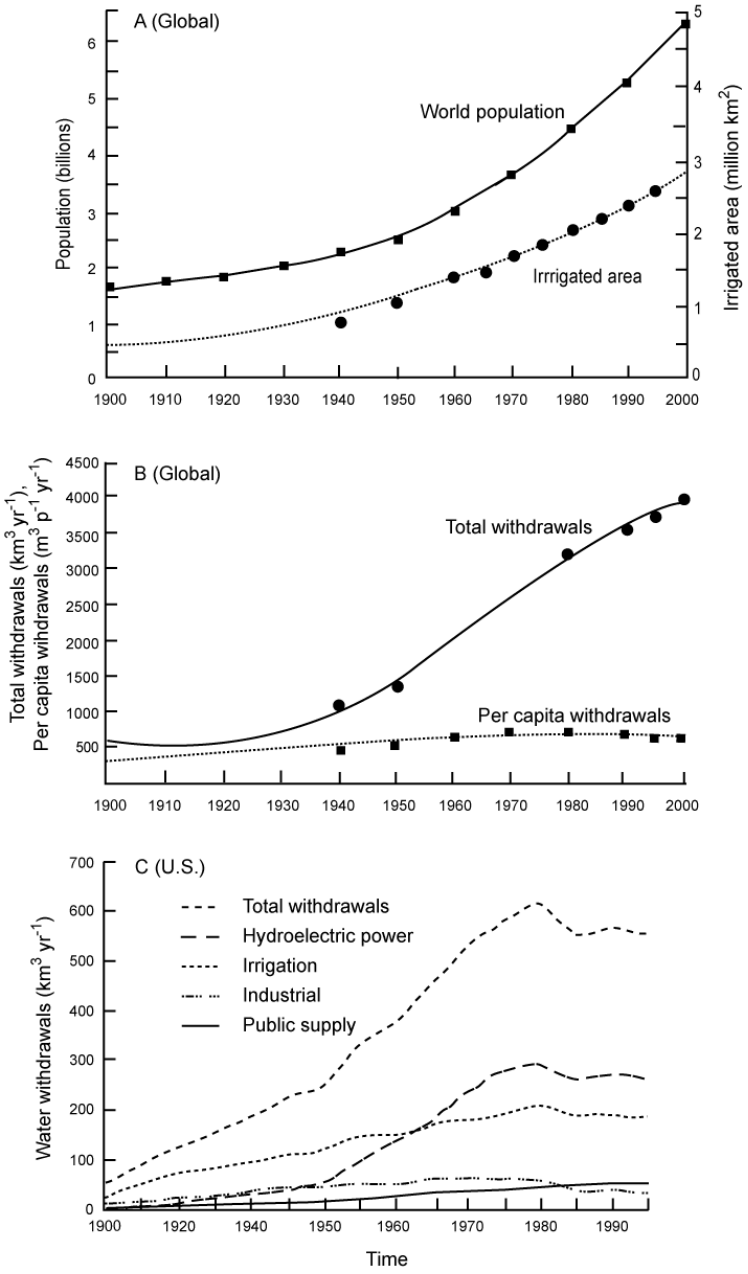
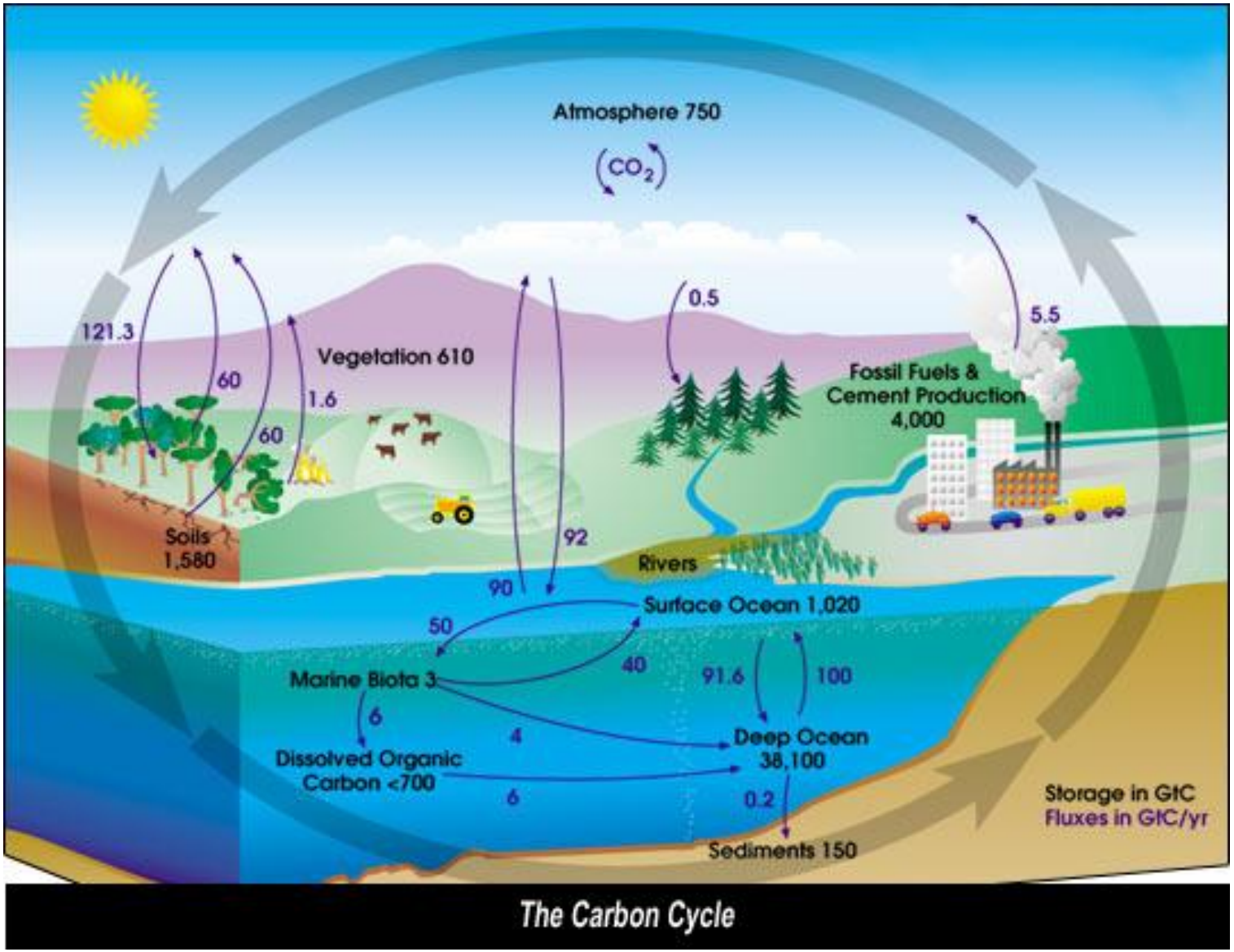


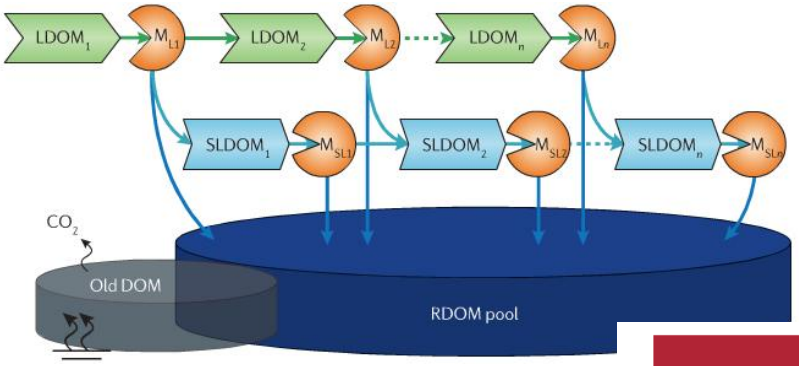
Fig. 14.4

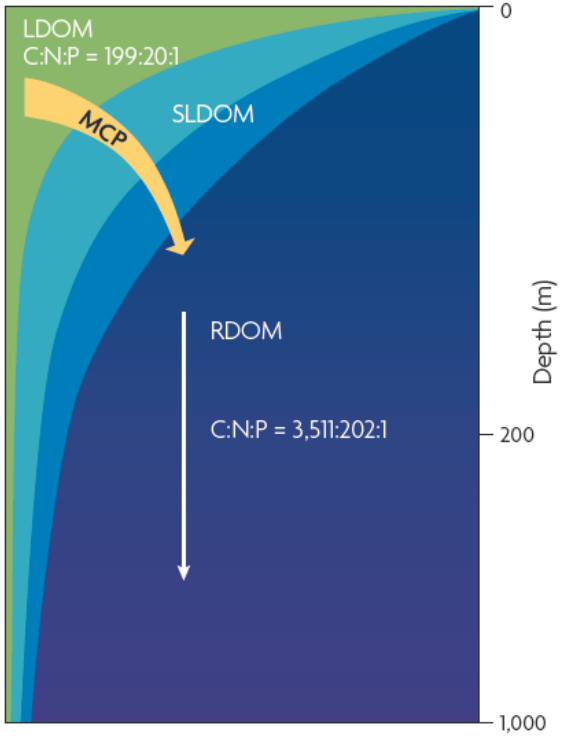
Chapin et al., 2011

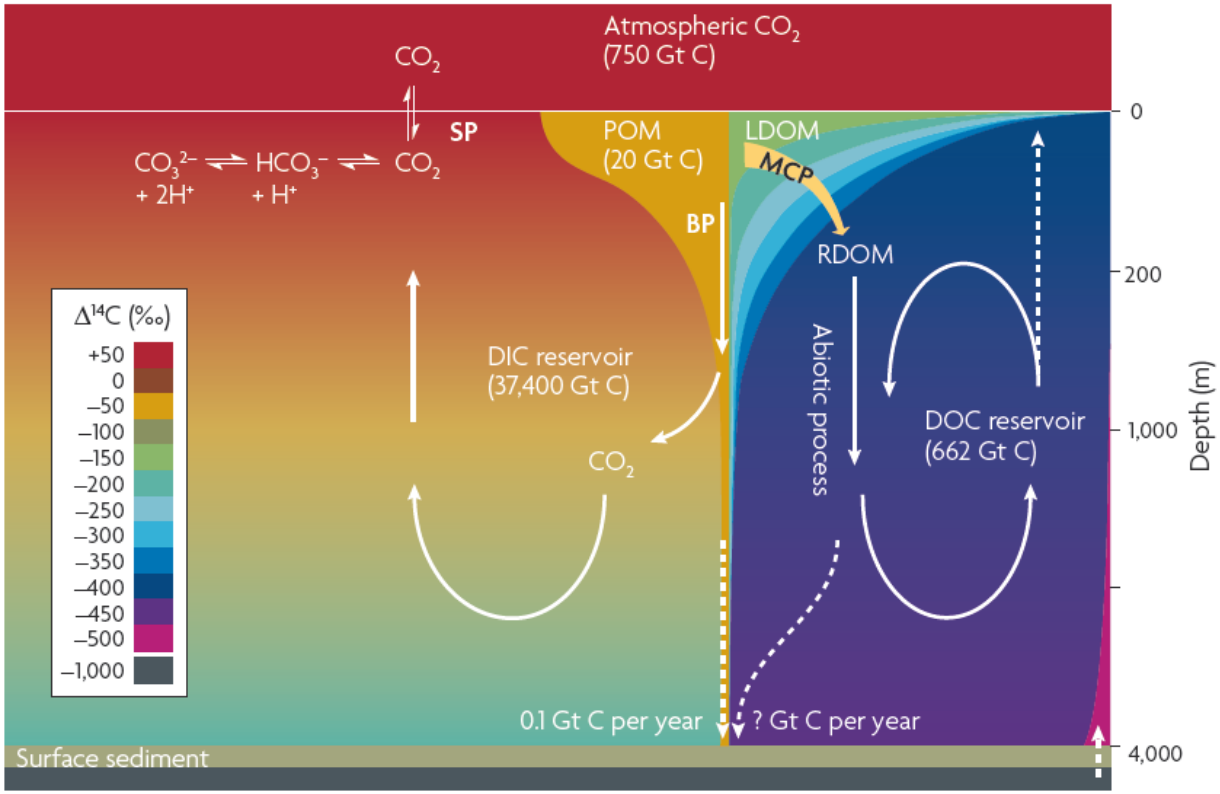
Ciclo del Carbono



Calidad del DOM y la Bomba Microbiana de Carbono (MCP)







Jiao et al 11 y 10

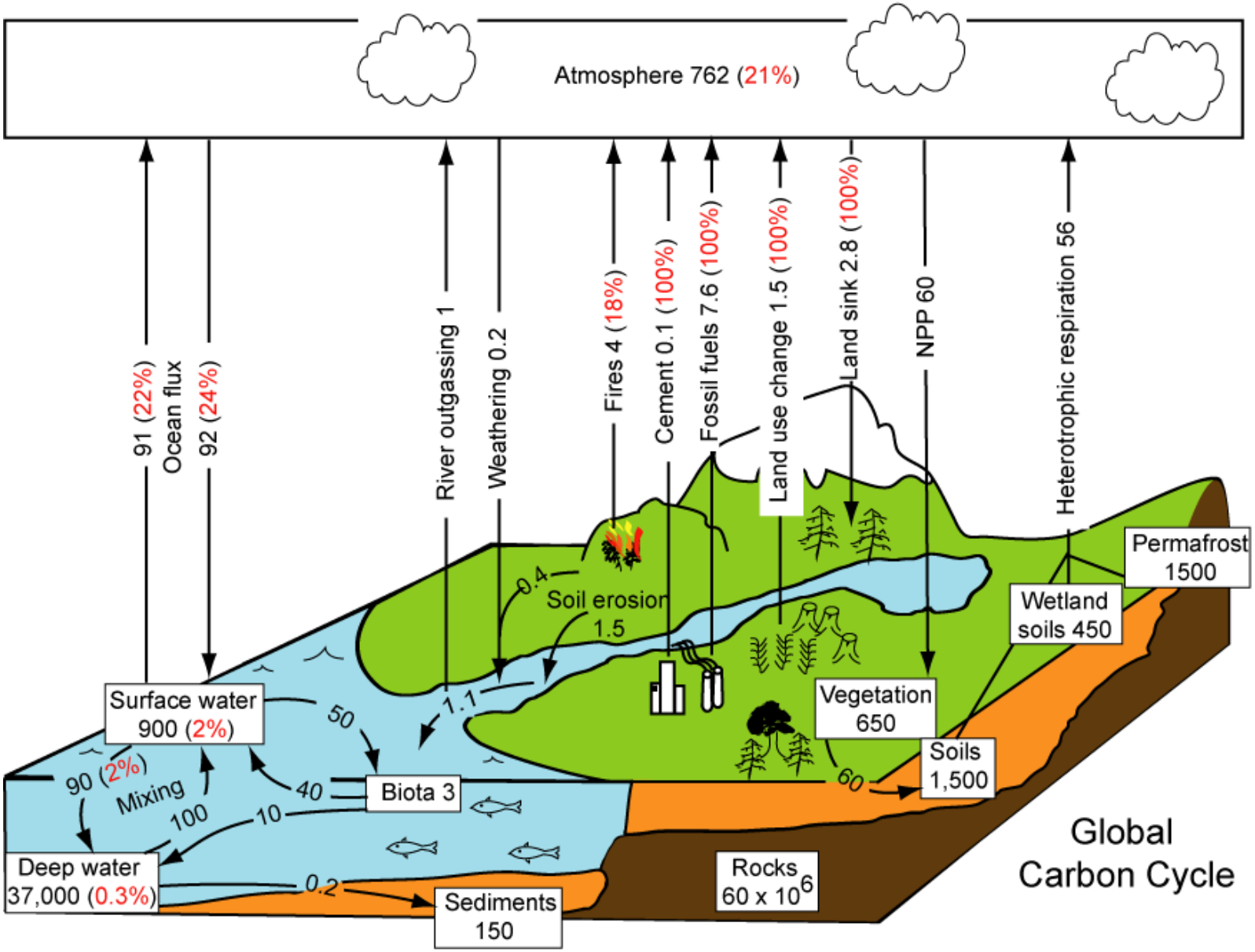
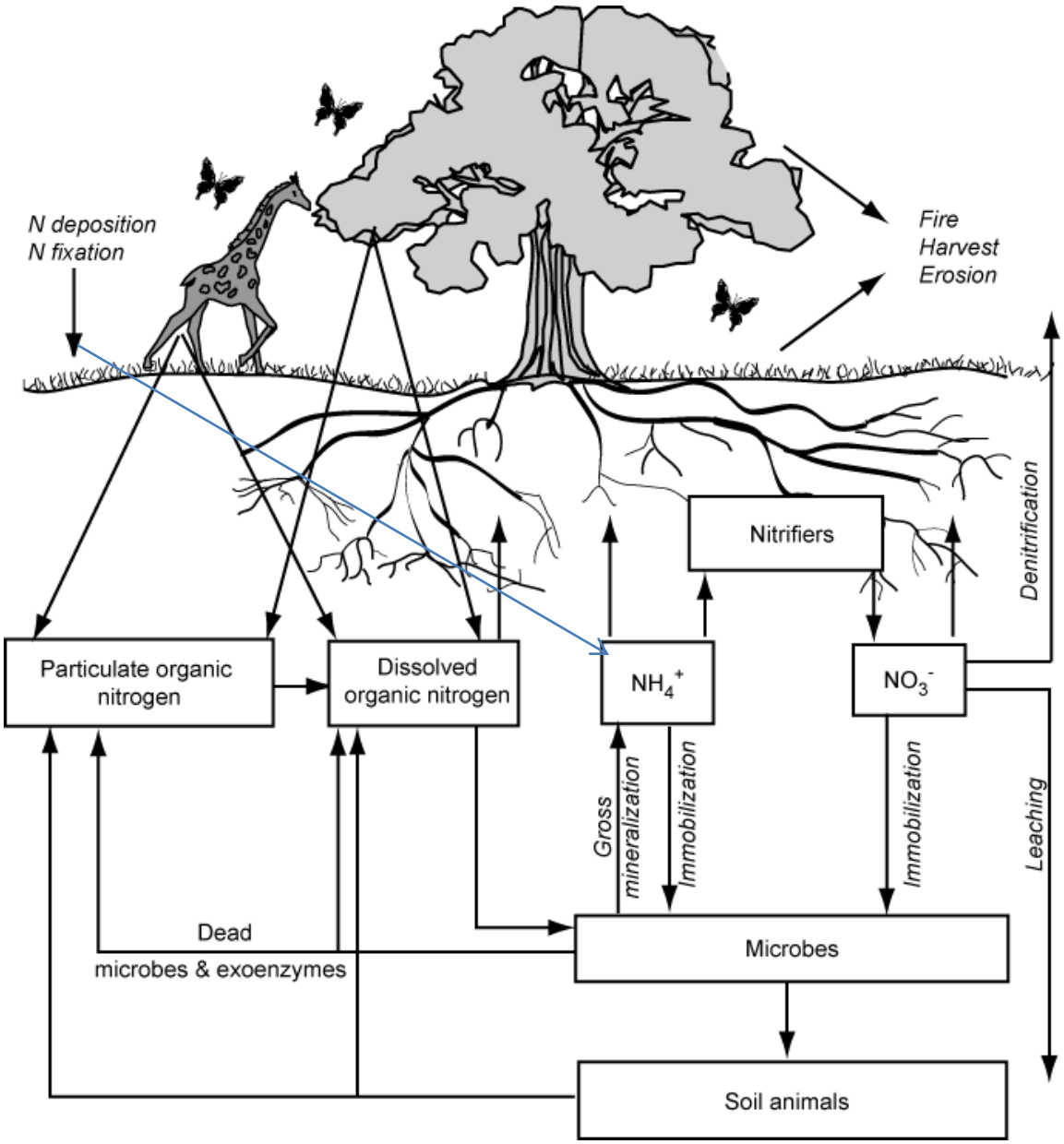

Atmosphere 762 (21%)
91 (22%)
Ocean flux
92 (24%)
River outgassing 1
Weathering 0.2
Fires 4 (18%)
Cement 0.1 (100%)
Fossil fuels 7.6 (100%)
Land use change 1.5 (100%)
Land sink 2.8 (100%)
NPP 60
Heterotrophic respiration 56
Permafrost 1500
Wetland soils 450
0.4
Soil erosion 1.5
1.1
Surface water 900 (2%)
50
Vegetation 650
Soils 1,500
60
90 (2%)
Mixing
100
40
Biota 3
10
Deep water 37,000 (0.3%)
0.2
Sediments 150
Rocks 60 x 10^6
Global Carbon Cycle

Fig. 14.5

Ciclo del nitrógeno en un ecosistema



Nitrato NO3
AMONIO NH4
Oxido Nitroso N2O
Amoníaco NH3

conifer forests (C)
temperate deciduous forests (D)
tropical evergreen forests (T)
mediterranean ecosystems (M)
temperate forests dominated by nitrogen fixers (N).

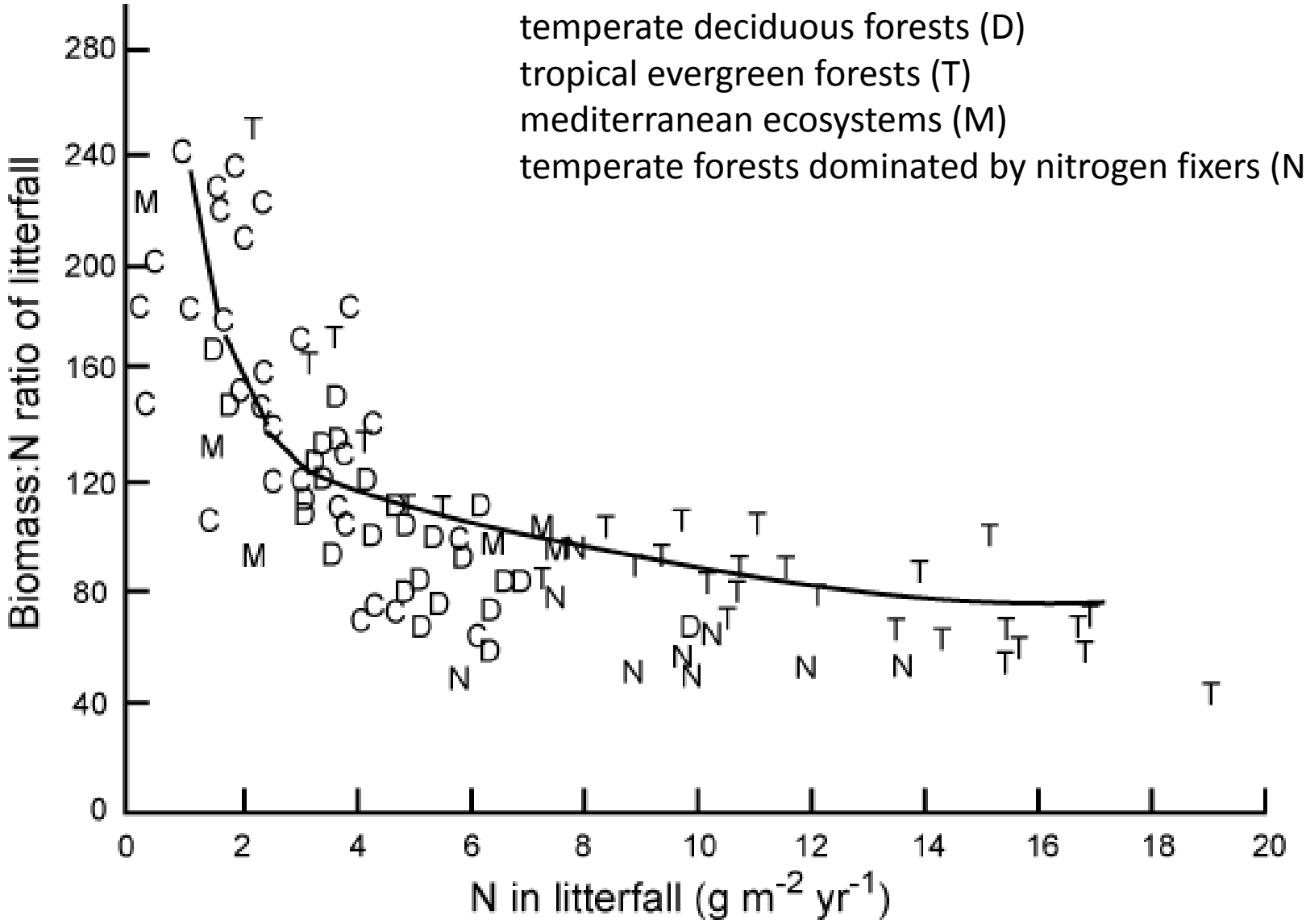


Fig. 8.10

Chapin et al., 2011

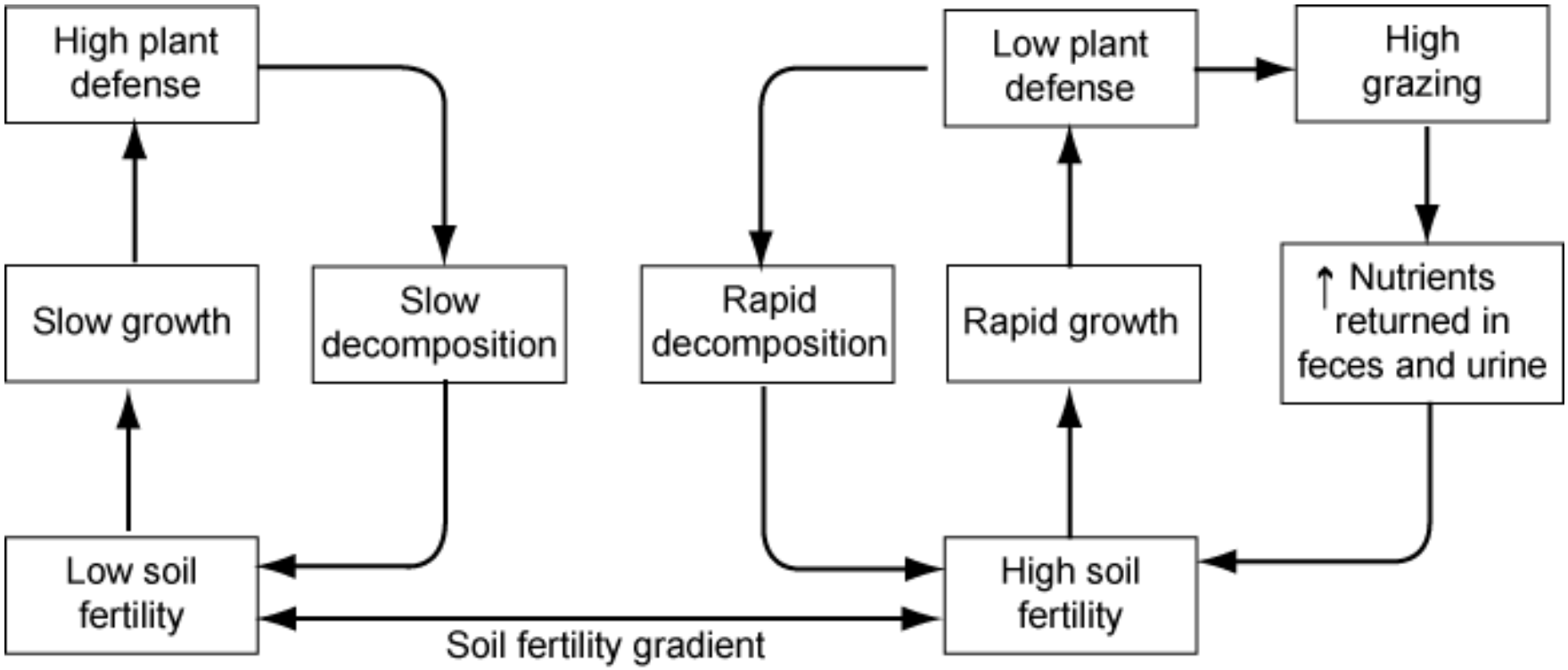
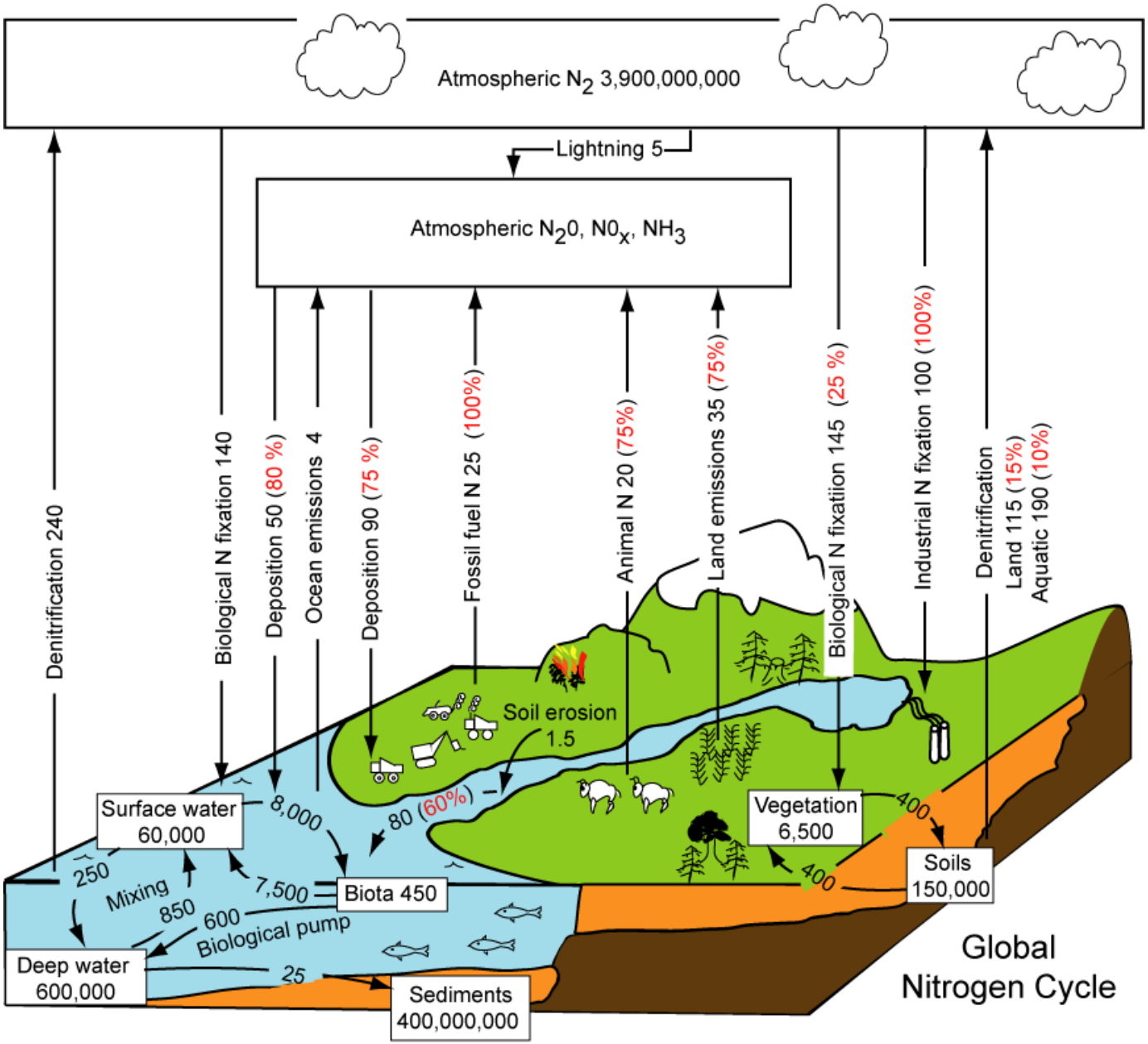
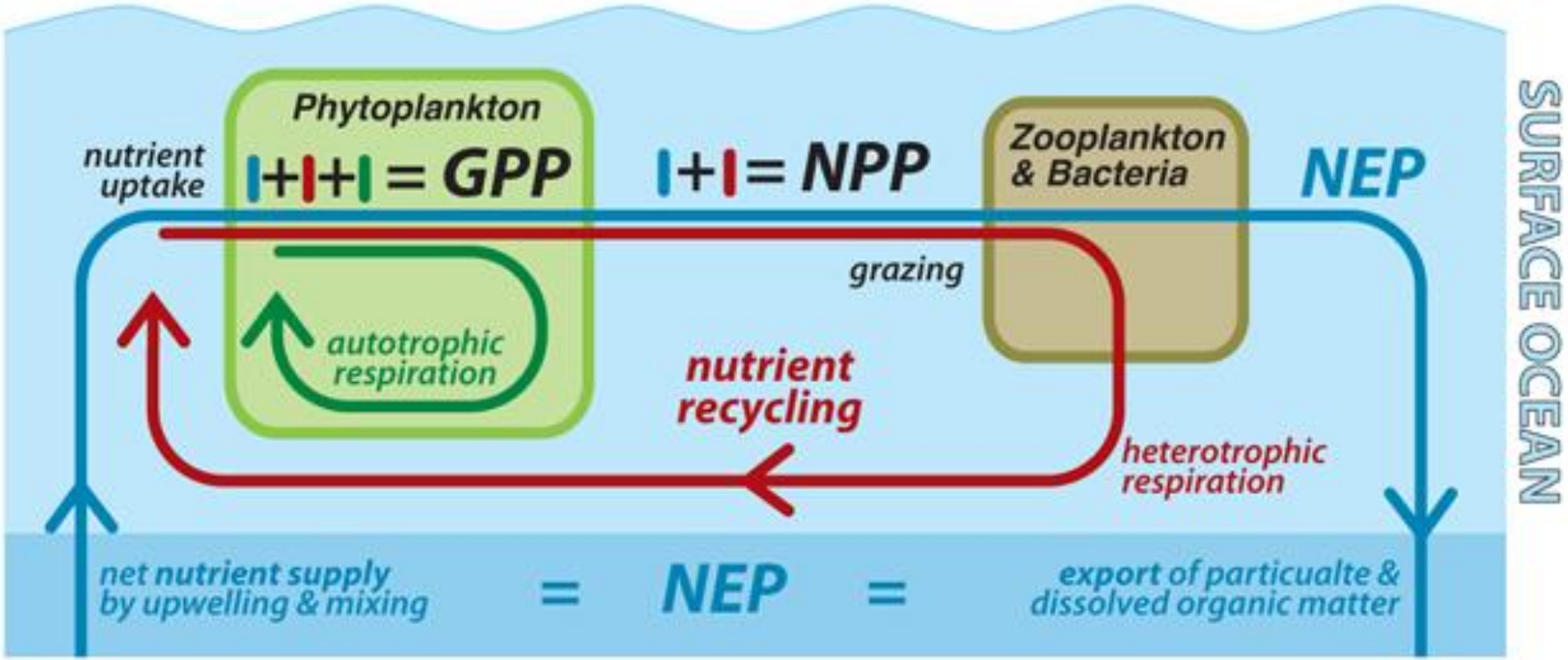

High plant defense
Slow growth
Slow decomposition
Low soil fertility
Low plant defense
High grazing
Rapid decomposition
Rapid growth
↑ Nutrients returned in feces and urine
High soil fertility
Soil fertility gradient

Fig. 10.9



Nitrato NO3
AMONIO NH4
Oxido Nitroso N2O
Amoníaco NH3

Reservorios (cajas) Tg y flujos (flechas) Tg yr^{-1}



Sigman & Hain 12

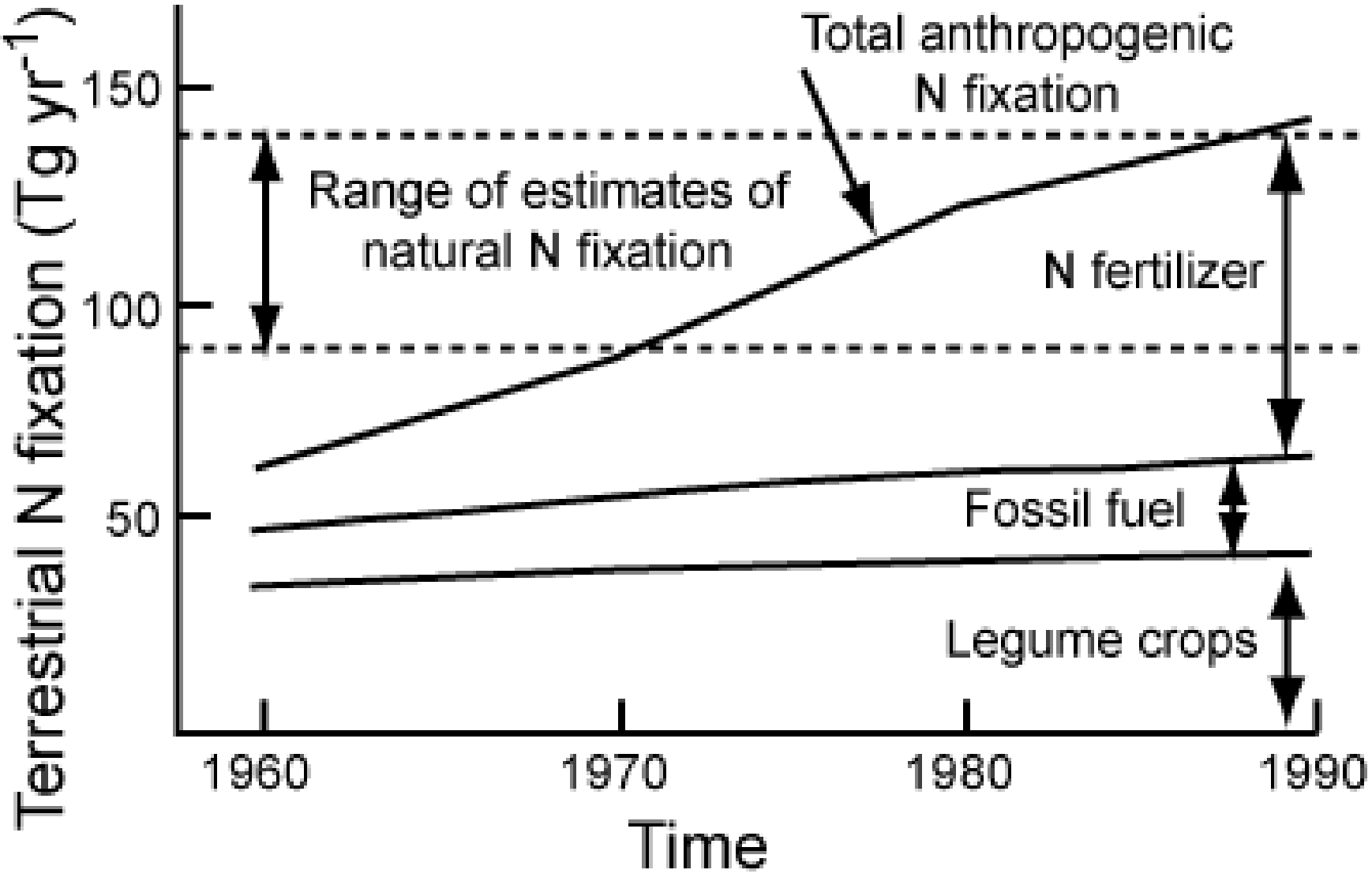

Terrestrial N fixation (Tg yr-1)
150
100
50
Total anthropogenic
N fixation
Range of estimates of
natural N fixation
N fertilizer
Fossil fuel
Legume crops
1960
1970
1980
1990
Time

Fig. 14.9

Ciclos gaseosos y sedimentarios

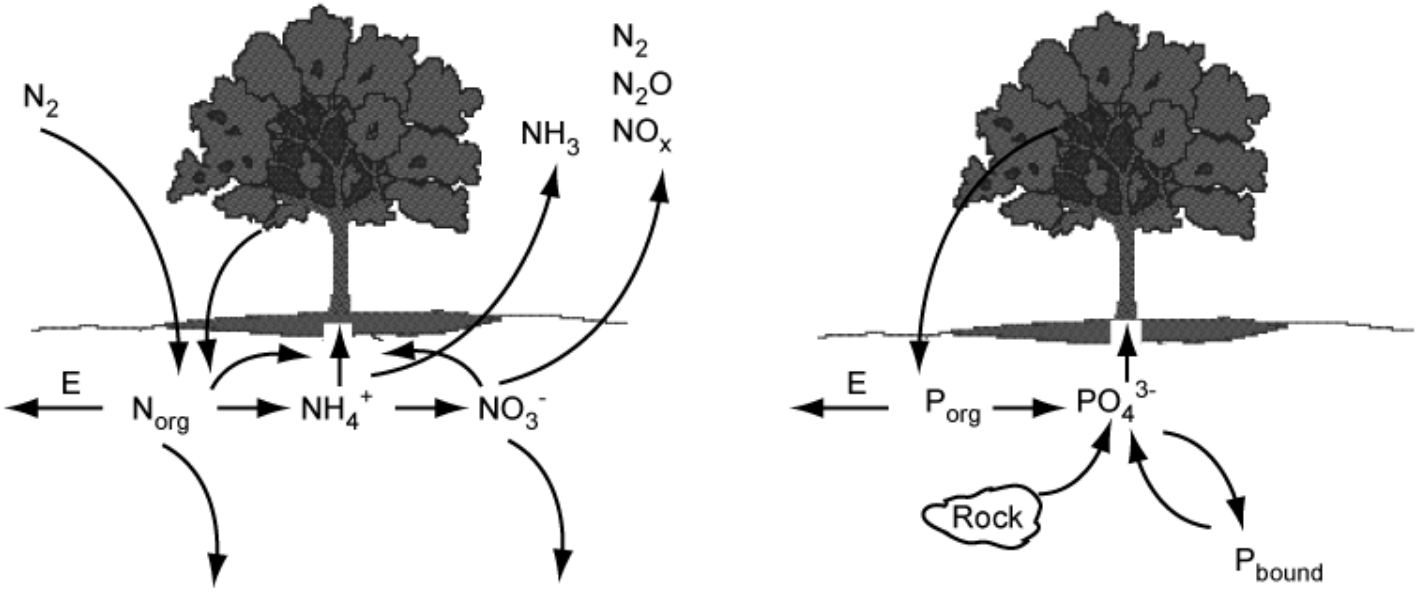


Fig. 9.17

Chapin et al., 2011

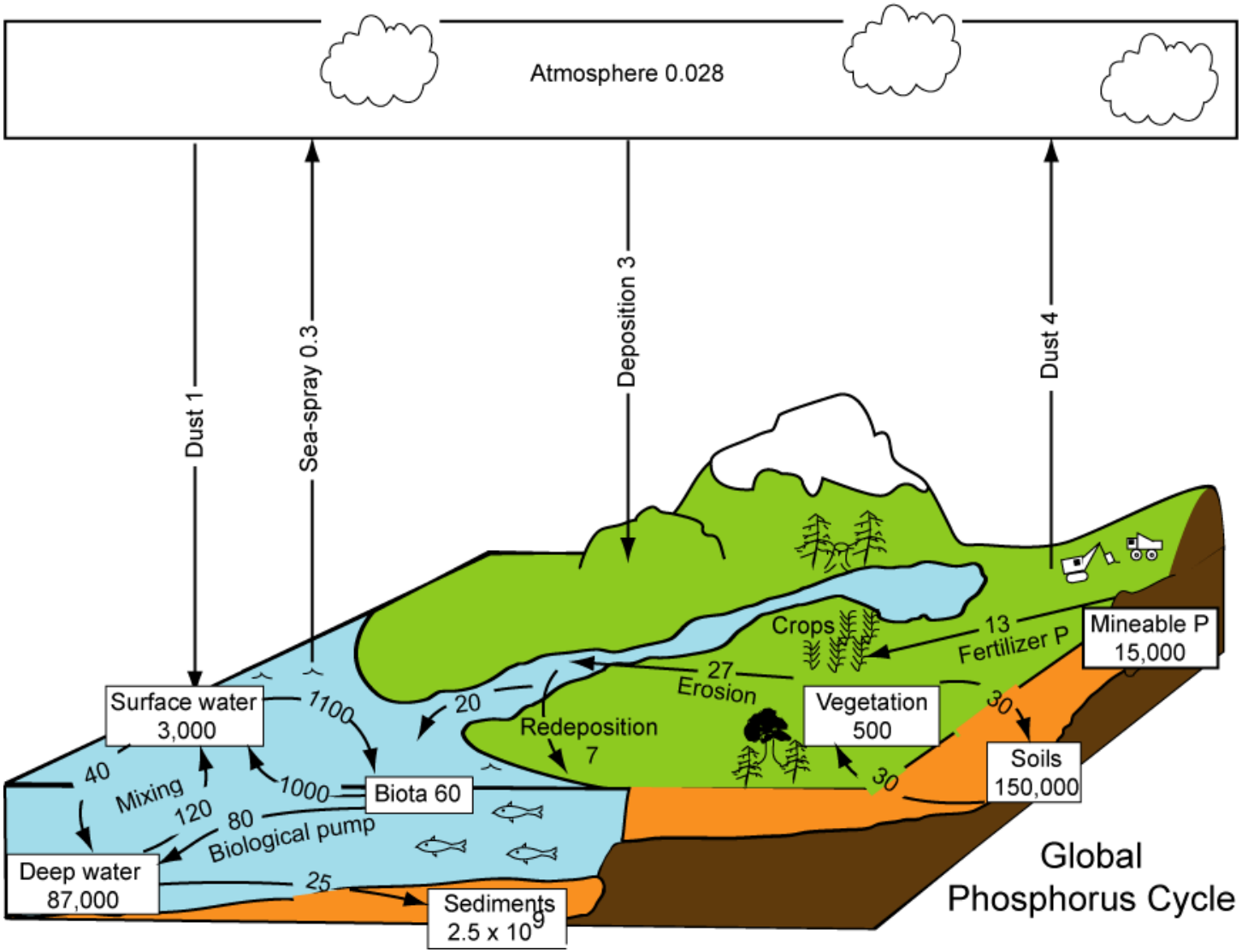


Fig. 14.10

Chapin et al., 2011

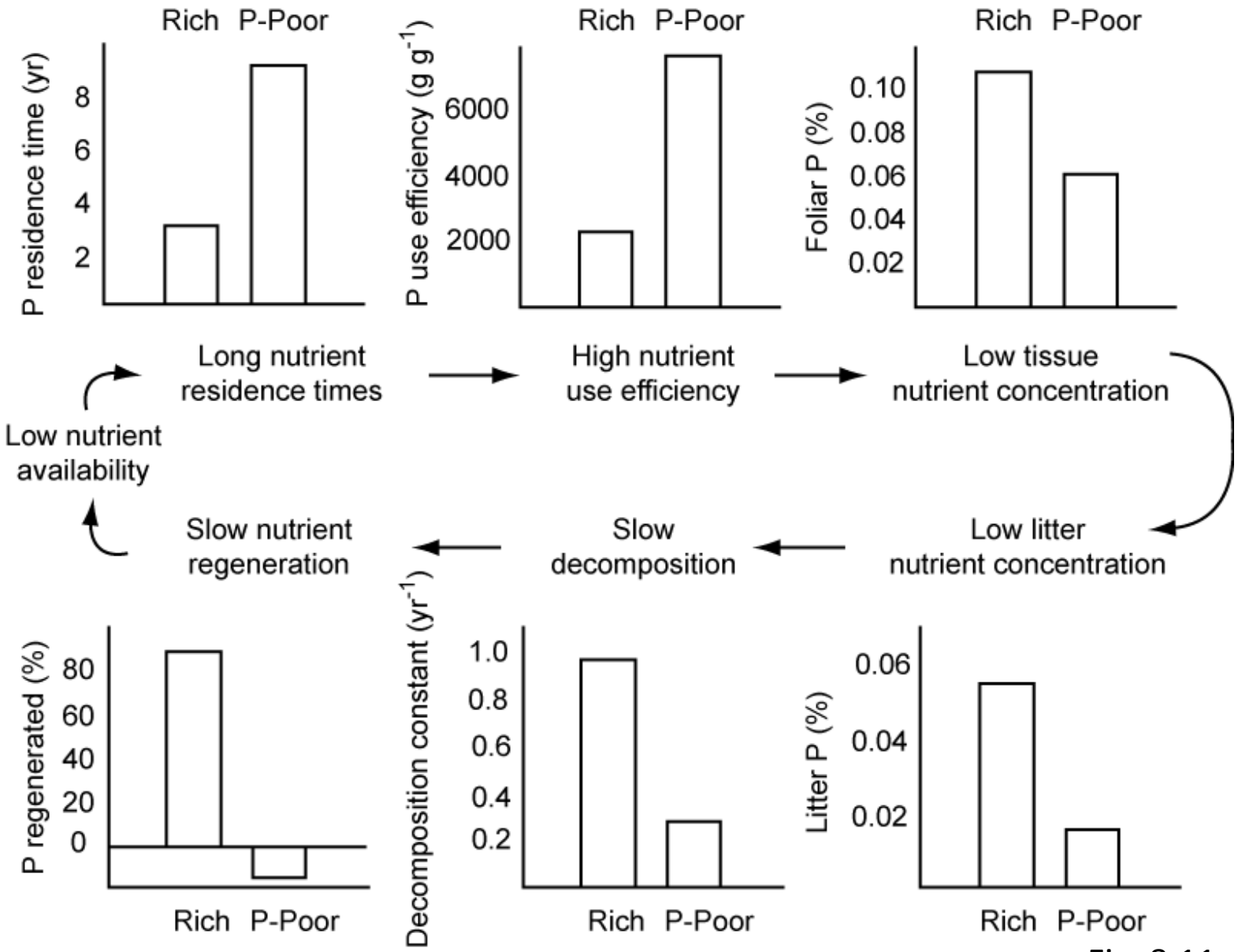


Fig. 8.11

Chapin et al., 2011