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Servicios Ecosistémicos

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Antecedentes

- El concepto "servicio ecosistémico" se origina junto con los movimientos ambientalistas a finales de la década de los 60's (Mooney y Ehrlich 1987).

Antecedentes

- Surge como una necesidad de comunicar a los tomadores de decisiones y a la sociedad en general el estrecho vínculo entre bienestar humano y mantención de las funciones básicas del planeta.

Antecedentes

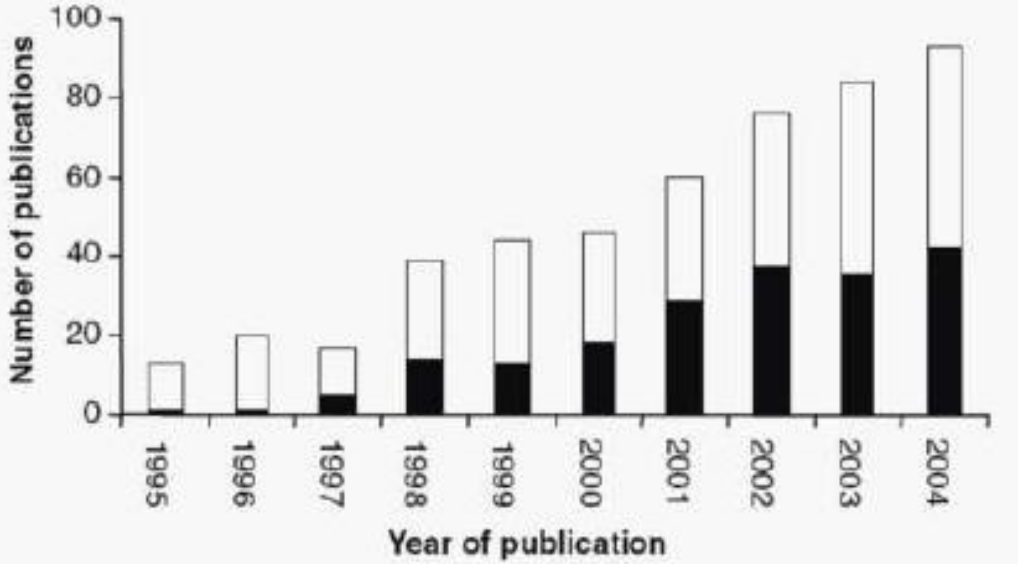


Figure 1 The number of biodiversity–ecosystem functioning articles published during the last decade is steadily growing (ISI Web of Science). Experimental work (filled section) has contributed around 40% of the total number of articles (total bar) since the beginning of this century.

Antecedentes

- Constanza *et al.* 1997, calcula el valor económico de los servicios ecosistémicos. Su valor corresponde al doble del producto bruto del planeta.

- Evaluación Ecosistémica del Milenio (2000 – 2005), iniciativa que reúne a científicos y tomadores de decisiones de 85 países para la evaluación del estado de los ecosistemas y los servicios ecosistémicos.

Definición de Servicios Ecosistémicos

- Beneficios que proveen los ecosistemas a los seres humanos y le permiten alcanzar su bienestar (Millenium Ecosystem Assessment 2003).

- Procesos ecológicos que participan en la generación de bienes y servicios para el ser humano (Boyd & Banzhaf 2007).

Definición de Servicios Ecosistémicos

- Los bienes o insumos pueden ser consuntivo (madera, combustible, alimento, etc.) ó no consuntivos (valor estético y cultural).



Definición de Servicios Ecosistémicos

- Los servicios, son funciones a favor del ser humano (captura del CO_2 atmosférico, purificación del agua, polinización, etc.).


Algunos ejemplos de S. Ecosistémicos

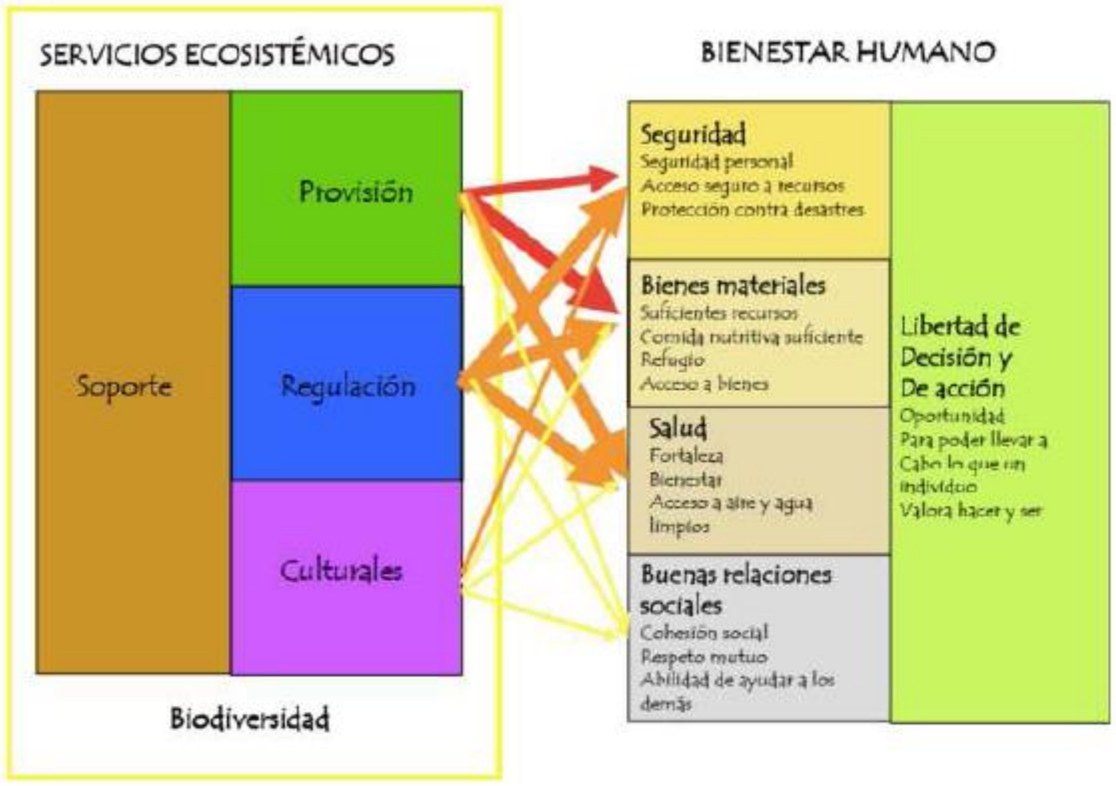
Table 1 Ecosystem services and functions used in this study

Number	Ecosystem service*	Ecosystem functions	Examples
1	Gas regulation	Regulation of atmospheric chemical composition.	CO_2/O_2 balance, O_3 for UVB protection, and SO_x levels.
2	Climate regulation	Regulation of global temperature, precipitation, and other biologically mediated climatic processes at global or local levels.	Greenhouse gas regulation, DMS production affecting cloud formation.
3	Disturbance regulation	Capacitance, damping and integrity of ecosystem response to environmental fluctuations.	Storm protection, flood control, drought recovery and other aspects of habitat response to environmental variability mainly controlled by vegetation structure.
4	Water regulation	Regulation of hydrological flows.	Provisioning of water for agricultural (such as irrigation) or industrial (such as milling) processes or transportation.
5	Water supply	Storage and retention of water.	Provisioning of water by watersheds, reservoirs and aquifers.
6	Erosion control and sediment retention	Retention of soil within an ecosystem.	Prevention of loss of soil by wind, runoff, or other removal processes, storage of stilt in lakes and wetlands.
7	Soil formation	Soil formation processes.	Weathering of rock and the accumulation of organic material.
8	Nutrient cycling	Storage, internal cycling, processing and acquisition of nutrients.	Nitrogen fixation, N, P and other elemental or nutrient cycles.
9	Waste treatment	Recovery of mobile nutrients and removal or breakdown of excess or xenic nutrients and compounds.	Waste treatment, pollution control, detoxification.

Algunos ejemplos de S. Ecosistémicos

10	Pollination	Movement of floral gametes.	Provisioning of pollinators for the reproduction of plant populations.
11	Biological control	Trophic-dynamic regulations of populations.	Keystone predator control of prey species, reduction of herbivory by top predators.
12	Refugia	Habitat for resident and transient populations.	Nurseries, habitat for migratory species, regional habitats for locally harvested species, or overwintering grounds.
13	Food production	That portion of gross primary production extractable as food.	Production of fish, game, crops, nuts, fruits by hunting, gathering, subsistence farming or fishing.
14	Raw materials	That portion of gross primary production extractable as raw materials.	The production of lumber, fuel or fodder.
15	Genetic resources	Sources of unique biological materials and products.	Medicine, products for materials science, genes for resistance to plant pathogens and crop pests, ornamental species (pets and horticultural varieties of plants).
16	Recreation	Providing opportunities for recreational activities.	Eco-tourism, sport fishing, and other outdoor recreational activities.
17	Cultural	Providing opportunities for non-commercial uses.	Aesthetic, artistic, educational, spiritual, and/or scientific values of ecosystems.

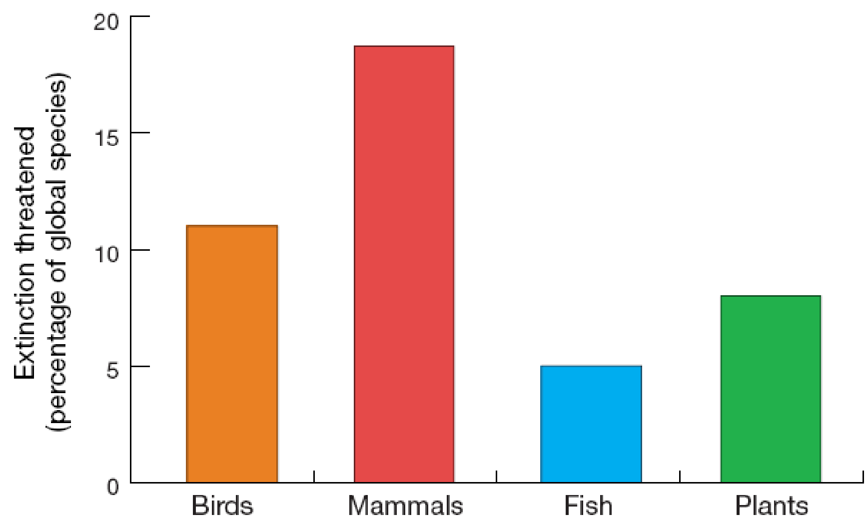
Clasificación de los S. Ecosistémicos



Millennium Ecosystem Assessment (2005)

Efectos de la pérdida de biodiversidad

- Producto de la actividad humana se ha producido la extinción de entre un 5 – 20% de varios grupos de organismos.



Chapin III *et al.* 2000

Efectos de la pérdida de biodiversidad

- La diversidad de especies influye en la tasa de transferencia de nutrientes y energía.
- Determinan la resiliencia y resistencia de los ecosistemas frente a una perturbación.
- Producen alteraciones en el funcionamiento de un ecosistema y, por lo tanto, generan impactos en la provisión de bienes y servicios.

Efectos de la pérdida de biodiversidad

Fig. 1. Recent experimental studies of the effects of the number of plant species on ecosystem productivity (3–6) have supported Darwin's assertion that greater diversity leads to greater productivity. Shown is the Cedar Creek biodiversity experiment, located in east-central Minnesota (5).

Efectos de la pérdida de biodiversidad

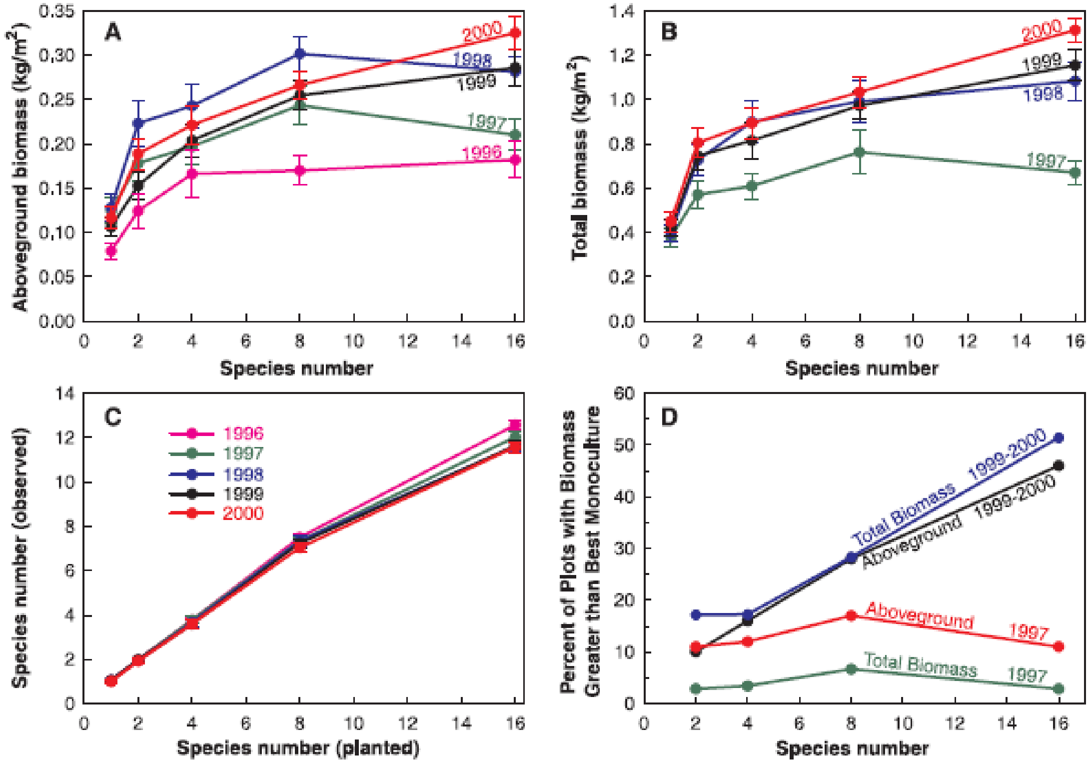


Fig. 1. The dependence of (**A**) plant aboveground biomass and (**B**) total biomass (aboveground plus belowground living plant mass) on the number of planted species. Data are shown as the mean ± SE. (**C**) The relation between the number of species planted in a plot and the actual number (mean ± SE) of planted species visually observed in a 2 m^{-2} area of each plot. (**D**) The percentage of all plots of a given planted diversity level, on average for 1999 and 2000 combined, or on average for 1997, that had greater biomass than the single monoculture plot with the greatest biomass.

Tilman *et al.* 2001

Efectos de la pérdida de biodiversidad

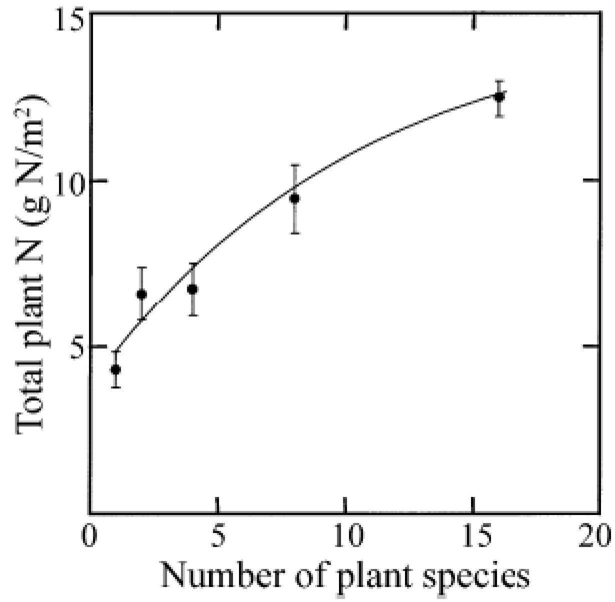


FIG. 6. The relationship between the amount of N contained in plant biomass and species richness. The amount of N contained in above- plus belowground plant biomass averaged 4.29 + 0.456 g N/m² in the one-species treatment, and this value increases significantly to 12.5 + 0.493 g N/m² in the 16-species treatment (ANOVA, F = 25.10, df = 4, 115, $P < 0.001$). This relationship was described by the following equation: $g\ N/m^2 = 12.07(1 - e^{-0.077\ \mathrm{species}}) + 3.954$; $n = 5$, $R^2 = 0.967$, $P < 0.001$. Error bars indicate ±1 SE.

Zac *et al.* 2003

Efectos de la pérdida de biodiversidad

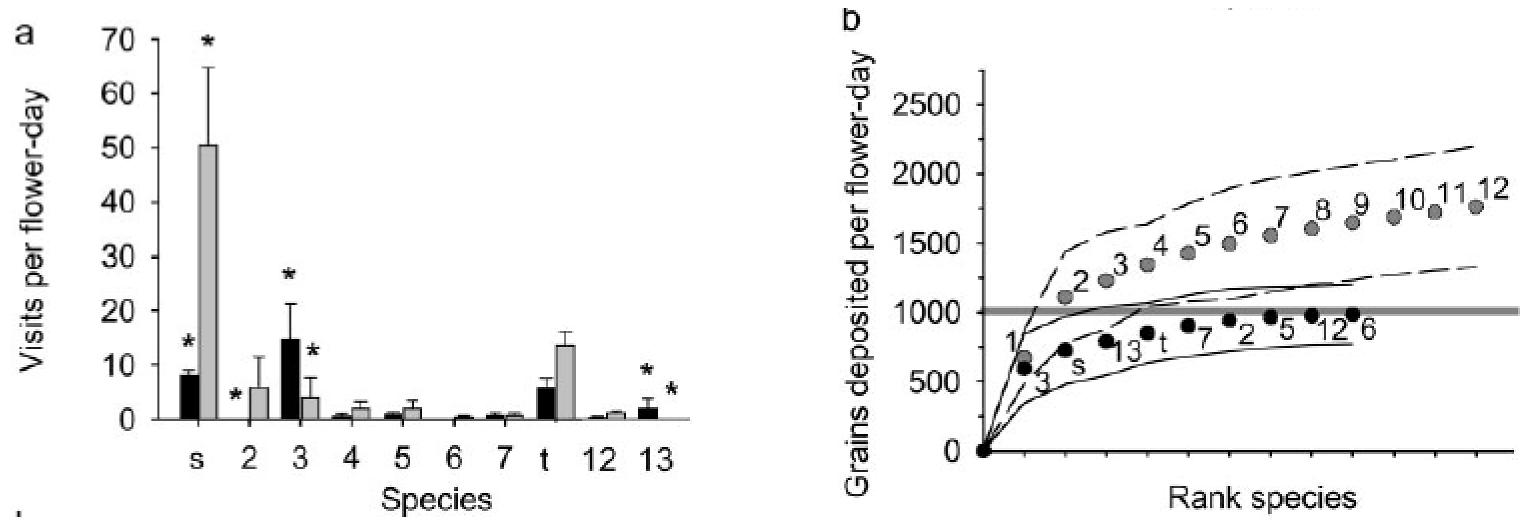
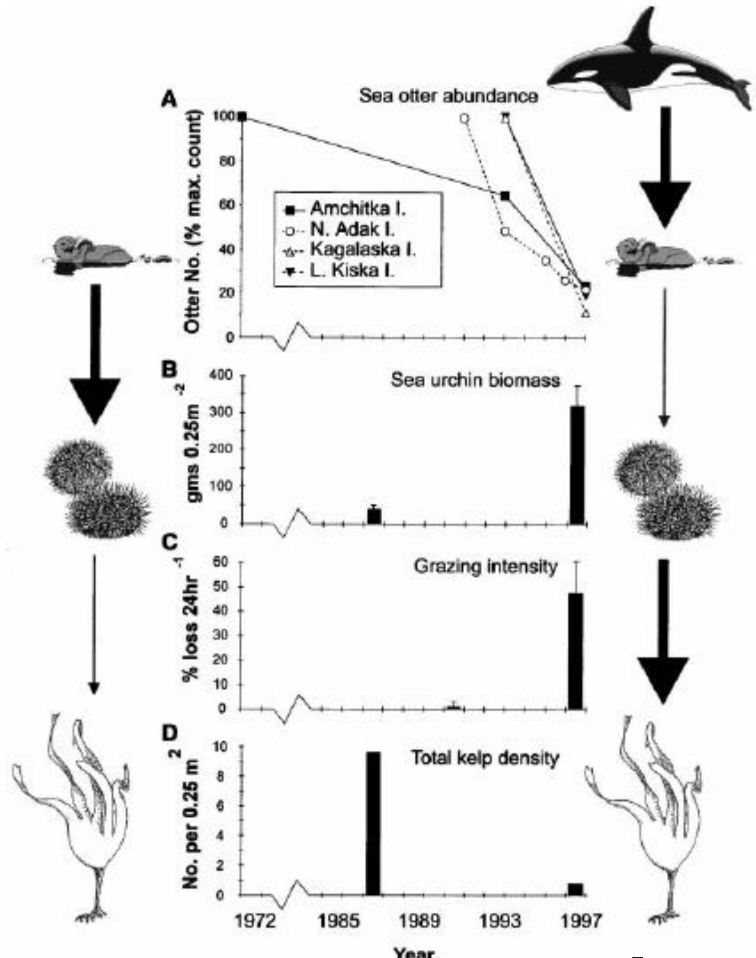


Fig. 3. (*a*) Abundance of each bee species at watermelon during 2000 (black bars) and 2001 (gray bars). Stars indicate significant differences from expectation (Freeman–Tukey deviates). Species are in rank order of contribution to pollination service in 2001 (see Fig. 2 legend); because selected groups were lumped in 2000, s (small striped) includes 1, 9, and 10, and t (tiny black) includes 8, 11, and *C. nanula* (not observed in 2001). *Anthophora urbana* (13) was also observed only in 2000. (*b*) Means ± SE of cumulative pollen deposition for ON farms in 2000 (black with solid line) and 2001 (gray with dashed line). Numbers and letters refer to species identity as above.

Kremen *et al.* 2002

Cambios en la estructura de una comunidad



Estes *et al.* 1998

Valoración de los S. Ecosistémicos

- Los ecosistemas proveen a la sociedad una pluralidad de beneficios, que involucran una valor ecológico, social, cultural y monetario.
- La valoración provee a los tomadores de decisiones la capacidad de evaluar el impacto en la biodiversidad y en los ecosistemas.

Valoración de los S. Ecosistémicos

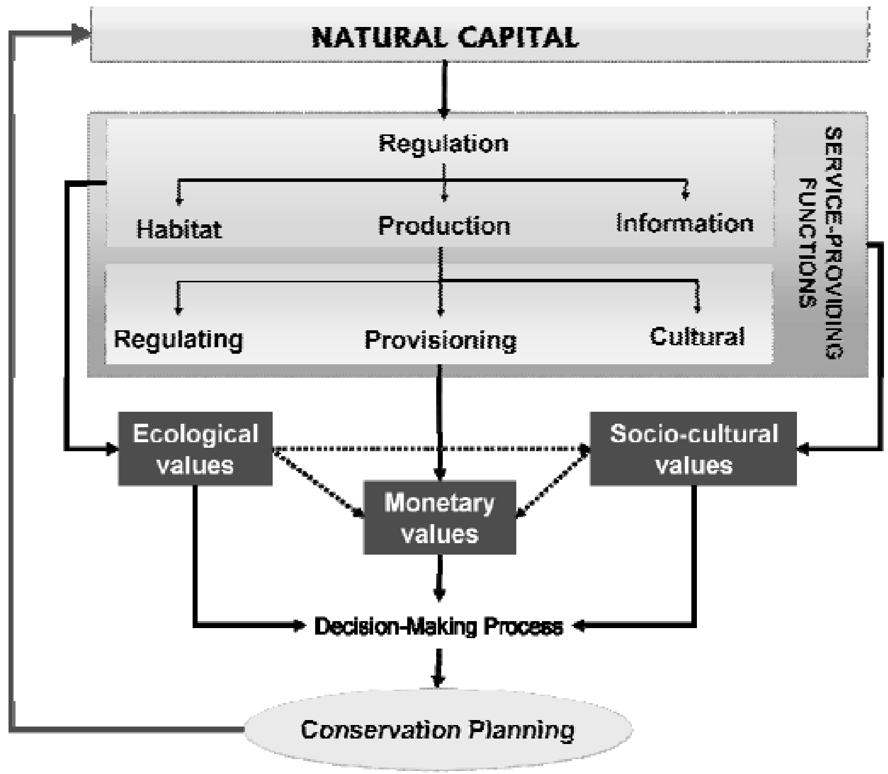


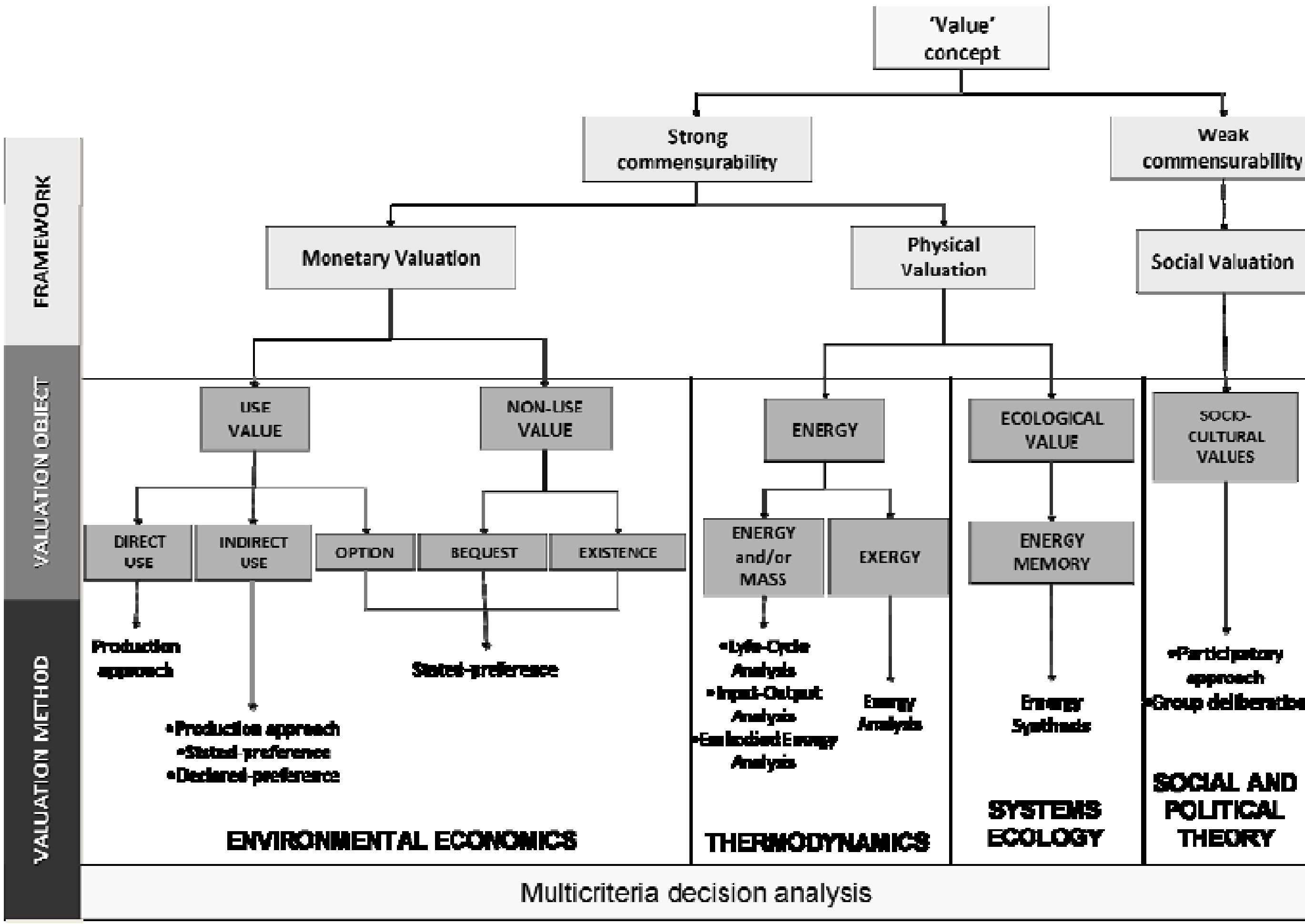
Figure 4. A multi-dimensional framework for incorporating the values of natural capital into conservation planning within an adaptive management process. Discontinuous rows indicate that ecological values partially influence socio-cultural and monetary values; as well as socio-cultural values influence monetary values.

Martín-López *et al.* 2009

Valoración de los S. Ecosistémicos

- El valor monetario nos permite saber si el servicio es o no percibido por la sociedad.
- Sin embargo, no es posible determinar el valor social y cultural bajo el método ya que no responden a criterios unitarios.

Aproximaciones para la valoración



Martín-López *et al.* 2009

Conclusiones

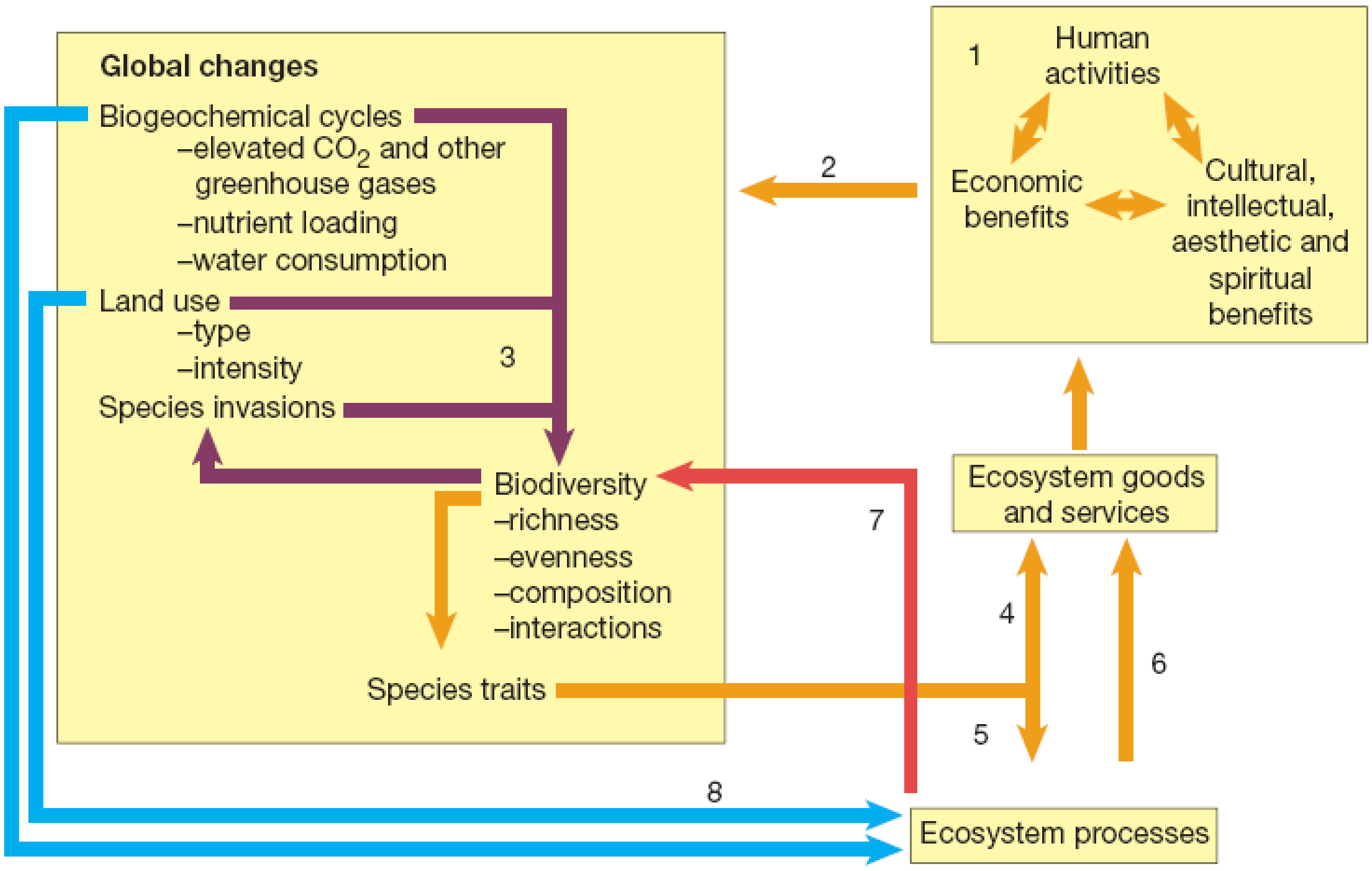
- El concepto “servicio ecosistémico” nos permite reconocer el vínculo entre bienestar humano y mantención del funcionamiento de los ecosistemas.
- El reconocimiento de estos servicios y su valoración nos entrega información sobre el estado de la biodiversidad y nuestros ecosistemas.
- Cambios en la biodiversidad pueden generar alteraciones en los servicios ecosistémicos.

Conclusiones

- La valoración de los servicios ecosistémicos requiere de trabajo transdisciplinario.

- Para el desarrollo de políticas es necesario el análisis multi-criterio que nos permita entender e integrar el valor de los servicios ambientales en los distintos ámbitos (ecológico, socio-cultural y monetario).

Resumen



Chapin III *et al.* 2000