

Issue 2: Classifying ecosystem services

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System of
Environmental
Economic
Accounting

What are ecosystem services?

- Benefits people receive from ecosystems (MA)
- Shift over time to delineate/distinguish between ecosystem functions, final ecosystem services, benefits

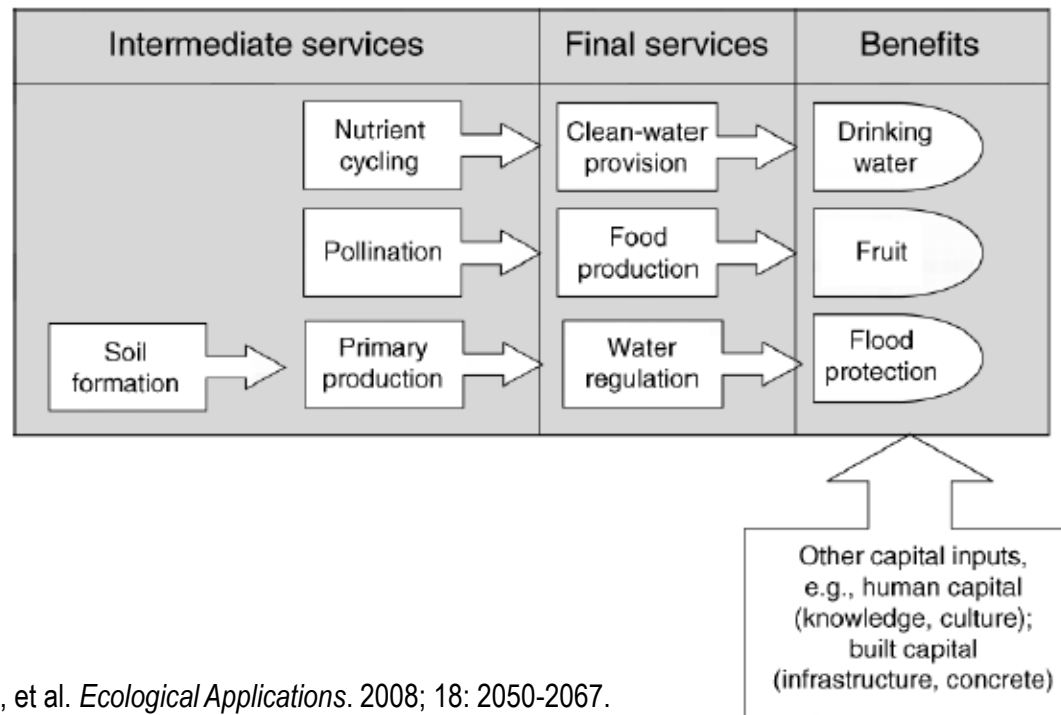


Figure from: Fisher B, et al. *Ecological Applications*. 2008; 18: 2050-2067.

How have ecosystem services been classified?

- Millennium Ecosystem Assessment
- CICES
- FECS-CS
- NESCS-S and NESCS-D
- Others

Millennium Assessment

Provisioning Services

Products obtained from ecosystems

- Food
- Fresh water
- Fuelwood
- Fiber
- Biochemicals
- Genetic resources

Regulating Services

Benefits obtained from regulation of ecosystem processes

- Climate regulation
- Disease regulation
- Water regulation
- Water purification
- Pollination

Cultural Services

Nonmaterial benefits obtained from ecosystems

- Spiritual and religious
- Recreation and ecotourism
- Aesthetic
- Inspirational
- Educational
- Sense of place
- Cultural heritage

Supporting Services

Services necessary for the production of all other ecosystem services

- Soil formation
- Nutrient cycling
- Primary production

MA Ecosystem Service Trends

Table 1. GLOBAL STATUS OF PROVISIONING, REGULATING, AND CULTURAL ECOSYSTEM SERVICES EVALUATED IN THE MA

Status indicates whether the condition of the service globally has been enhanced (if the productive capacity of the service has been increased, for example) or degraded in the recent past. Definitions of “enhanced” and “degraded” are provided in the note below. A fourth category, supporting services, is not included here as they are not used directly by people.

Service	Sub-category	Status	Notes
Provisioning Services			
Food	crops	▲	substantial production increase
	livestock	▲	substantial production increase
	capture fisheries	▼	declining production due to overharvest
	aquaculture	▲	substantial production increase
	wild foods	▼	declining production
Fiber	timber	+/-	forest loss in some regions, growth in others
	cotton, hemp, silk	+/-	declining production of some fibers, growth in others
	wood fuel	▼	declining production
Genetic resources		▼	lost through extinction and crop genetic resource loss
Biochemicals, natural medicines, pharmaceuticals		▼	lost through extinction, overharvest
Fresh water		▼	unsustainable use for drinking, industry, and irrigation; amount of hydro energy unchanged, but dams increase ability to use that energy

MA Ecosystem Service Trends (cont'd)

Regulating Services

Air quality regulation		▼	decline in ability of atmosphere to cleanse itself
Climate regulation	global	▲	net source of carbon sequestration since mid-century
	regional and local	▼	preponderance of negative impacts
Water regulation		+/-	varies depending on ecosystem change and location
Erosion regulation		▼	increased soil degradation
Water purification and waste treatment		▼	declining water quality
Disease regulation		+/-	varies depending on ecosystem change
Pest regulation		▼	natural control degraded through pesticide use
Pollination		▼ ^a	apparent global decline in abundance of pollinators
Natural hazard regulation		▼	loss of natural buffers (wetlands, mangroves)

Cultural Services

Spiritual and religious values		▼	rapid decline in sacred groves and species
Aesthetic values		▼	decline in quantity and quality of natural lands
Recreation and ecotourism		+/-	more areas accessible but many degraded

The Economics of Ecosystems and Biodiversity (TEEB)

- Country studies implementing TEEB
- Draws from MA
- Not hierarchical in its approach

	TEEB classification
	PROVISIONING
1	Food
2	Water (2)
3	Raw materials
4	Genetic resources
5	Medicinal resources
6	Ornamental resources
	REGULATING
7	Air purification
8	Climate regulation (incl. C-sequestration)
9	Disturbance prevention or moderation
10	Regulation of water flows
11	Waste treatment (esp. water purification)
12	Erosion prevention
13	Maintaining soil fertility
14	Pollination
15	Biological control
	HABITAT
16	Lifecycle maintenance
17	Gene pool protection
	CULTURAL & Amenity
18	Aesthetic information
19	Recreation & tourism
20	Inspiration for culture, art and design
21	Spiritual experience
22	Information for cognitive development



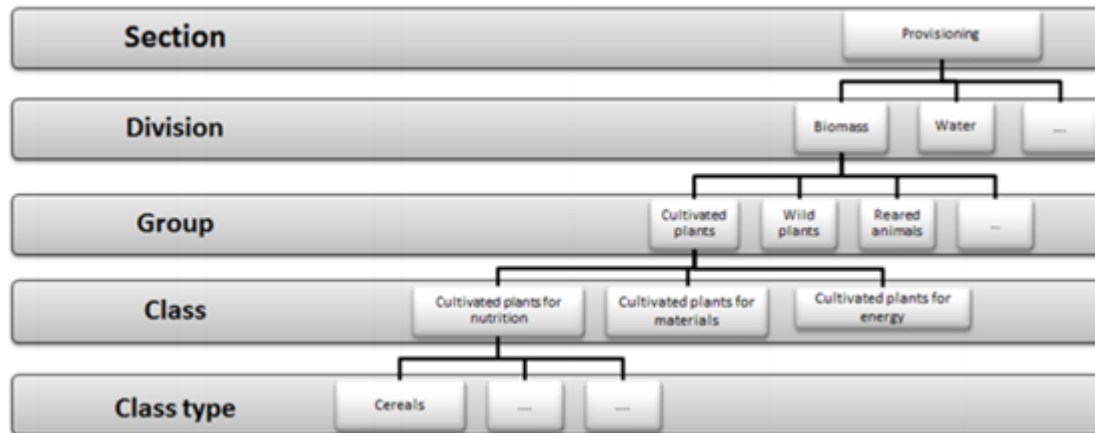
Beneficiaries and Ecosystem Services

- Ecosystem services analysis requires understanding of beneficiaries/uses
 - Who? What? For what purpose?
- Same resource used different ways by different people
- Understand values/potential conflict between desired uses



CICES

- Latest version – 5.1
- Includes a flagging of Marine ES

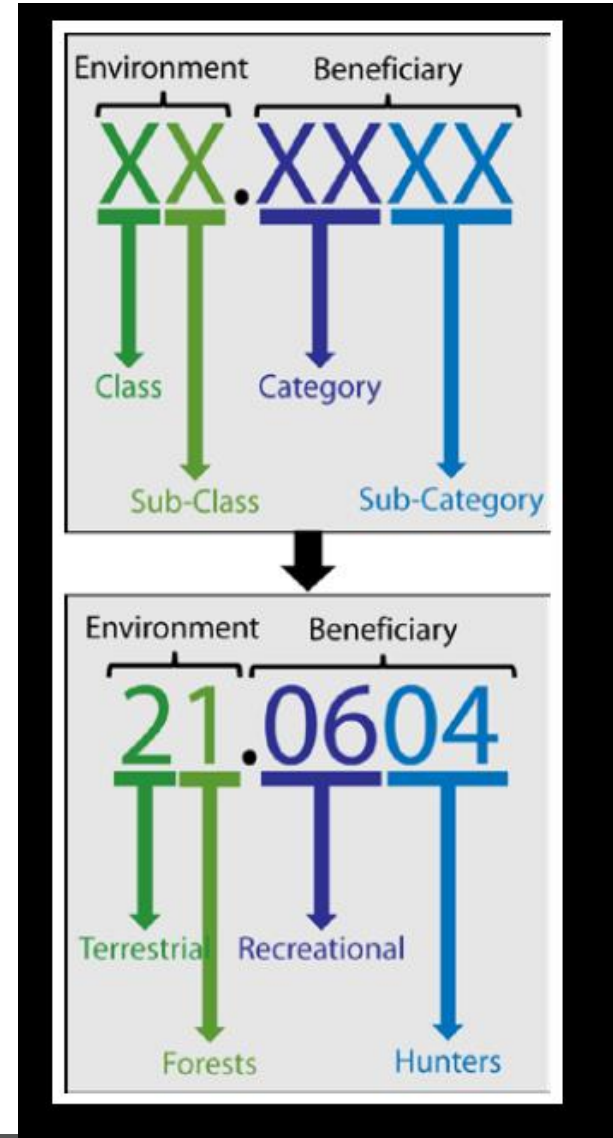


CICES and Benefits

- Code provided at class level for type of benefit
- For example:
 - Wild animals for nutritional purposes (1.1.6.1)
 - Wild animals for direct use or processing (1.1.6.2)
- Provides examples services and benefits

EPA FECS

- Recreational users
 - Experiencers and Viewers
 - Anglers
 - Waders, Swimmers, and Divers
 - Boaters
- Residential property owners
- Commercial users
 - Food extractors
 - Resource-Dependent Businesses



EPA FEGS (cont'd)

1. AQUATIC

- 11. Rivers and Streams
- 12. Wetlands
- 13. Lakes and Ponds
- 14. Estuaries and Near Coastal and Marine
- 15. Open Oceans and Seas
- 16. Groundwater

2. TERRESTRIAL

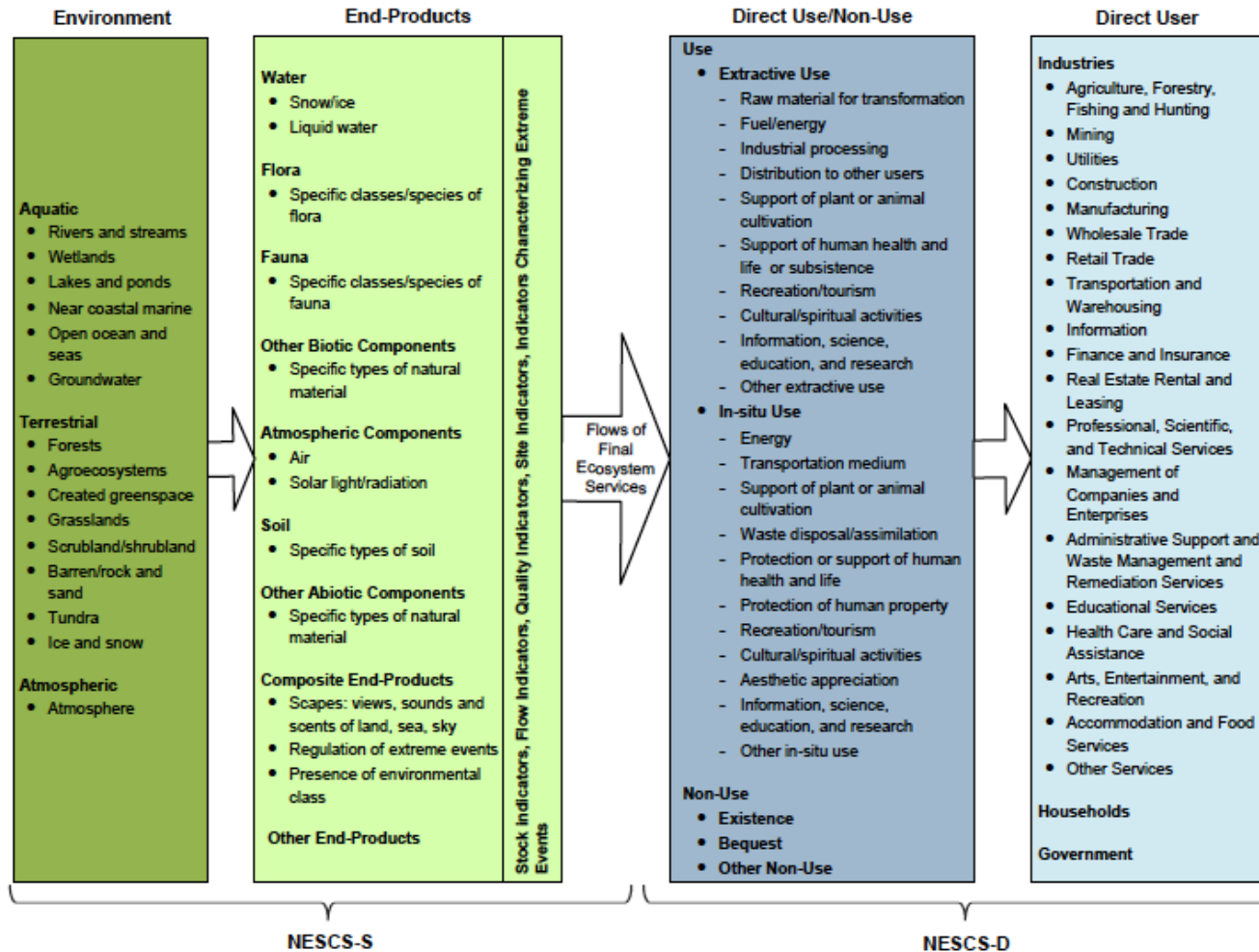
- 21. Forests
- 22. Agroecosystems
- 23. Created Greenspace
- 24. Grasslands
- 25. Scrubland / Shrubland
- 26. Barren / Rock and Sand
- 27. Tundra
- 28. Ice and Snow

3. ATMOSPHERIC

- 31. Atmosphere

XX.XX Beneficiary Categories				
00.01 Agricultural	00.02 Commercial / Industrial	00.03 Government, Municipal, and Residential	00.04 Commercial / Military Transportation	00.05 Subsistence
XX.XXXX Beneficiary Subcategories				
00.0101 Irrigators	00.0201 Food Extractors	00.0301 Municipal Drinking Water Plant Operators	00.0401 Transporters of Goods	00.0501 Water Subsisters
00.0102 CAFO Operators	00.0202 Timber, Fiber, and Ornamental Extractors	00.0302 Waste Water Treatment Plant Operators	00.0402 Transporters of People	00.0502 Food Subsisters
00.0103 Livestock Grazers	00.0203 Industrial Processors	00.0303 Residential Property Owners		00.0503 Timber, Fiber, and Fur / Hide Subsisters
00.0104 Agricultural Processors	00.0204 Industrial Dischargers	00.0304 Military / Coast Guard		00.0504 Building Material Subsisters
00.0105 Aquaculturists	00.0205 Electric and other Energy Generators			
00.0106 Farmers	00.0206 Resource-Dependent Businesses			
00.0107 Foresters	00.0207 Pharmaceutical and Food Supplement Suppliers			
	00.0208 Fur / Hide Trappers and Hunters			
XX.XX Beneficiary Categories				
00.06 Recreational	00.07 Inspirational	00.08 Learning	00.09 Non-Use	00.10 Humanity
XX.XXXX Beneficiary Subcategories				
00.0601 Experiencers and Viewers	00.0701 Spiritual and Ceremonial Participants and Participants of Celebration	00.0801 Educators and Students	00.0901 People Who Care (Existence)	00.1001 All Humans
00.0602 Food Pickers and Gatherers	00.0702 Artists	00.0802 Researchers	00.0902 People Who Care (Option / Bequest)	
00.0603 Hunters				
00.0604 Anglers				
00.0605 Waders, Swimmers, and Divers				
00.0606 Boaters				

NESCS Structure



NESCS-S and NESCS-D

Group	NESCS-S		NESCS-D	
	Environment	End-Product	Direct Use/Non-Use	Direct User
Definition	Spatial units with similar biophysical characteristics that are located on or near the Earth's surface and that contain or produce "end-products"	Biophysical components of nature that are directly used or appreciated by humans	Different ways in which end-products are used or appreciated by humans	Entities that directly use or appreciate the end-products
Hierarchy and Coding System				
NESCS Code for FFES*: WW.XX.YYYY.ZZZZZZ				
Class	W	WW.X	WW.XX.Y	WW.XX.YYYY.Z
Subclass	WW	WW.XX	WW.XX.YY	WW.XX.YYYY.ZZZ
Detail			WW.XX.YYYY	WW.XX.YYYY.ZZZZZZ
Example 1: Water in the ocean being used as a medium for freight transportation				
NESCS Code for FFES: 15.12.1202.1483111				
Class	Aquatic: 1	Water: 1	Direct Use: 1	Industry: 1
Subclass	Open Ocean and Seas: 15	Liquid Water: 12	In-Situ Use: 12	Transportation and Warehousing: 148
Detail			Transportation medium: 1202	Deep Sea Freight Transportation: 1483111
Example 2: Water in rivers being extracted for household gardening purposes				
NESCS Code for FFES: 11.12.1105.201				
Class	Aquatic: 1	Water: 1	Direct Use: 1	Households: 2
Subclass	Rivers and Streams: 11	Liquid Water: 12	Extractive Use: 11	Households: 201
Detail			Support of plant or animal cultivation: 1105	

Some key challenges for accounting purposes

- Level of detail needed in a hierarchical system
 - Services distinct in each place
 - BUT want comparable accounting approach
- Boundary question
 - What is included in the accounts as an ecosystem service?
 - Which benefits are already incorporated in SNA?
- How to maintain awareness of intermediate ecosystem services/ecosystem functions?

Recommendations for ocean accounting technical guidance?

- Likely none of existing approaches perfect
- CICES has benefits in familiarity and use
- NESCS-D,S benefits in more explicit linkage to beneficiaries
- Need to start conducting pilots using these—will learn from there

Acknowledgements

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 - <https://www.unescap.org/events/asia-and-pacific-regional-expert-workshop-ocean-accounts>
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