



Europa Biodiversity Observation Network

Identifying Essential Biodiversity & Ecosystem Service Variables

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1st Stakeholder Workshop



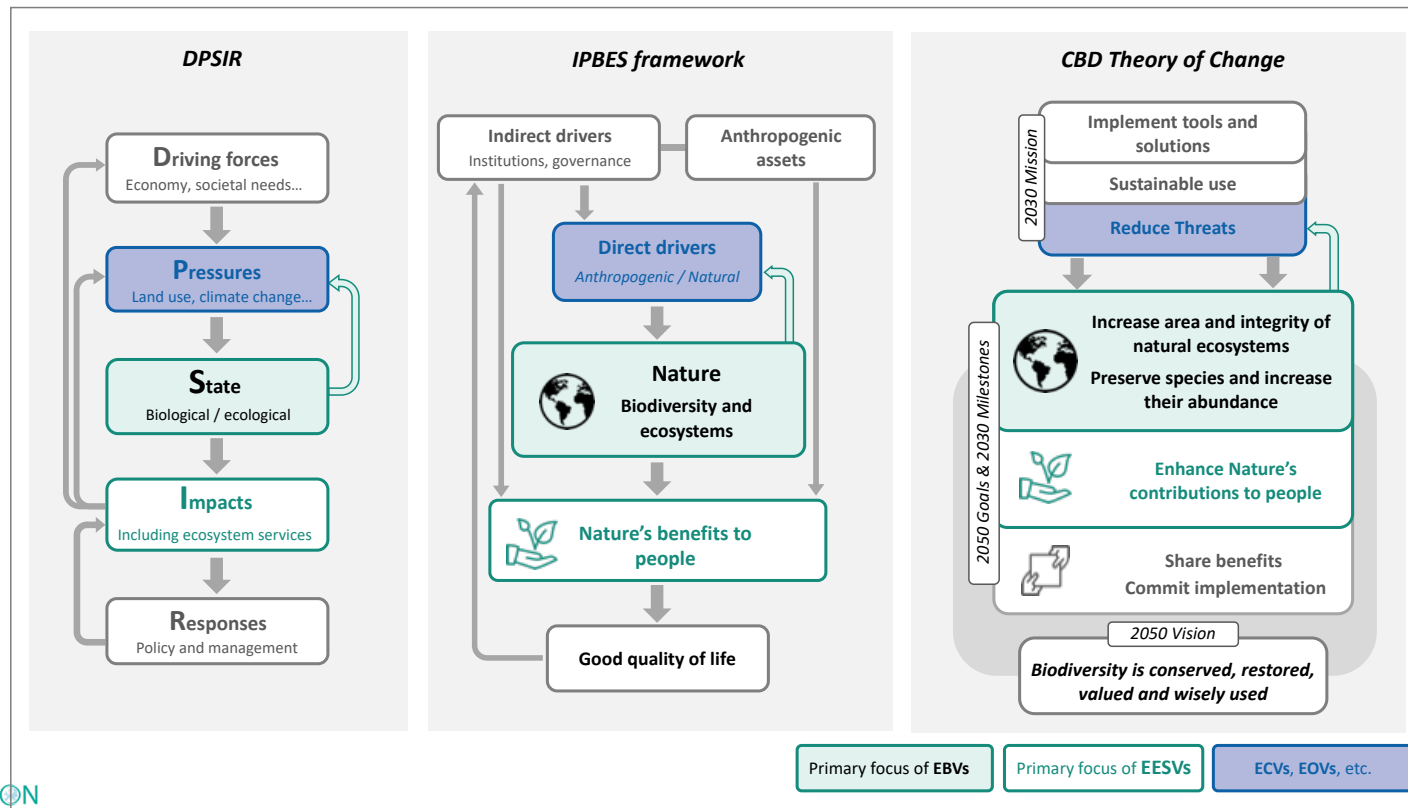
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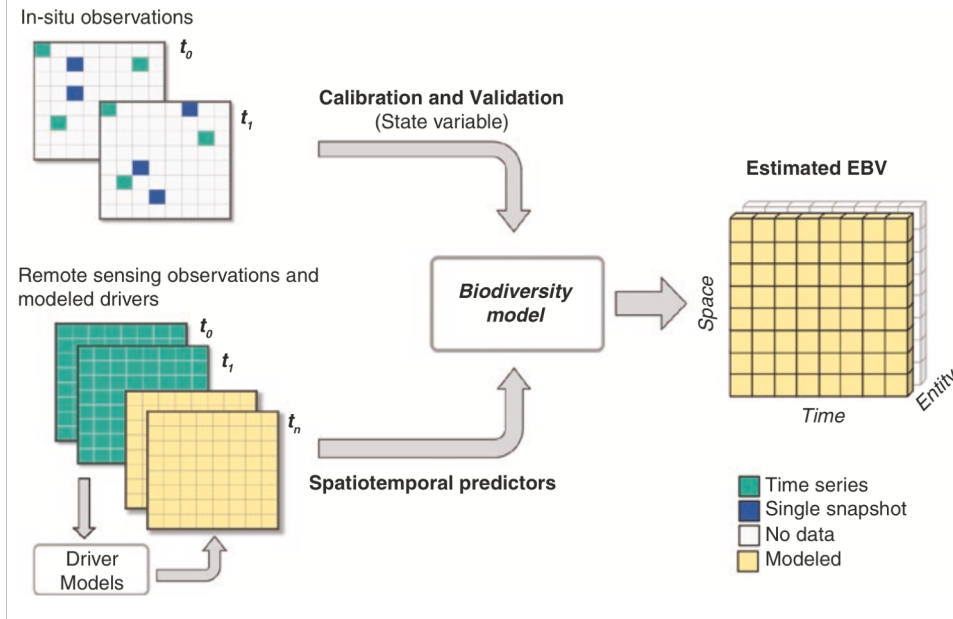
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EBVs and other frameworks



Essential Biodiversity Variables as data-model fusion



What are the Essential Biodiversity Variables (EBVs)?

EXAMPLES OF CANDIDATE ESSENTIAL BIODIVERSITY VARIABLES

EBV class	EBV examples	Measurement and scalability	Temporal sensitivity	Feasibility	Relevance for CBD targets and indicators (1,9)
Genetic composition	Allelic diversity	Genotypes of selected species (e.g., endangered, domesticated) at representative locations.	Generation time	Data available for many species and for several locations, but little global systematic sampling.	Targets: 12, 13. Indicators: Trends in genetic diversity of selected species and of domesticated animals and cultivated plants; RLI.
Species populations	Abundances and distributions	Counts or presence surveys for groups of species easy to monitor or important for ES, over an extensive network of sites, complemented with incidental data.	1 to >10 years	Standardized counts under way for some taxa but geographically restricted. Presence data collected for more taxa. Ongoing data integration efforts (Global Biodiversity Information Facility, Map of Life).	Targets: 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15. Indicators: LPI; WBI; RLI; population and extinction risk trends of target species, forest specialists in forests under restoration, and species that provide ES; trends in invasive alien species; trends in climatic impacts on populations.
Species traits	Phenology	Timing of leaf coloration by RS, with in situ validation.	1 year	Several ongoing initiatives (Phenological Eyes Network, PhenoCam, etc.)	Targets: 10, 15. Indicators: Trends in extent and rate of shifts of boundaries of vulnerable ecosystems.
Community composition	Taxonomic diversity	Consistent multitaxa surveys and metagenomics at select locations.	5 to >10 years	Ongoing at intensive monitoring sites (opportunities for expansion). Metagenomics and hyperspectral RS emerging.	Targets: 8, 10, 14. Indicators: Trends in condition and vulnerability of ecosystems; trends in climatic impacts on community composition.
Ecosystem structure	Habitat structure	RS of cover (or biomass) by height (or depth) globally or regionally.	1 to 5 years	Global terrestrial maps available with RS (e.g., Light Detection and Ranging). Marine and freshwater habitats mapped by combining RS and in situ data.	Targets: 5, 11, 14, 15. Indicators: Extent of forest and forest types; mangrove extent; seagrass extent; extent of habitats that provide carbon storage.
Ecosystem function	Nutrient retention	Nutrient output/input ratios measured at select locations. Combine with RS to model regionally.	1 year	Intensive monitoring sites exist for N saturation in acid-deposition areas and P retention in affected rivers.	Targets: 5, 8, 14. Indicators: Trends in delivery of multiple ES; trends in condition and vulnerability of ecosystems.

Taxa/Biological Entities:

All birds
Endangered birds
Farmland birds

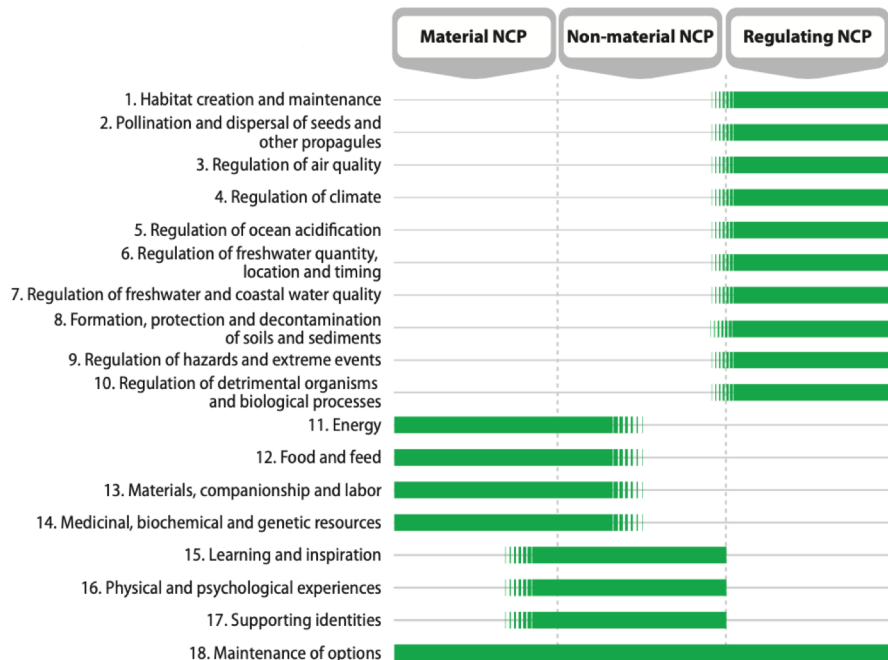
All ecosystems
Habitats in Habitats Directive
Forests
Wetlands

What are the Essential Ecosystem Service Variables (EESVs)?



Essential Ecosystem Service Variable Classes (EESV classes)	EESV class definition
Ecological supply	The ecosystem structure and functions that underlie the potential capacity of ecosystems to provide ecosystem services.
Anthropogenic contribution	The efforts that humans invest to enhance ecological supply and to make use of ecosystem services. Anthropogenic contributions and ecological supply interact through the process of co-production.
Demand	Explicitly or implicitly expressed human desire or need for an ecosystem service, in terms of its quantity or quality, irrespective of whether awareness exists about such need.
Use	Active or passive appropriation of an ecosystem service by people.
Instrumental values	The importance of an ecosystem service to societies or individuals as a means to achieve a specific end (e.g. some dimension of human well-being).
Relational values	The importance ascribed to how ecosystems contribute to desirable and meaningful interactions between humans and nature and between humans in relation to nature.

Entities



Balvanera et al (in prep)

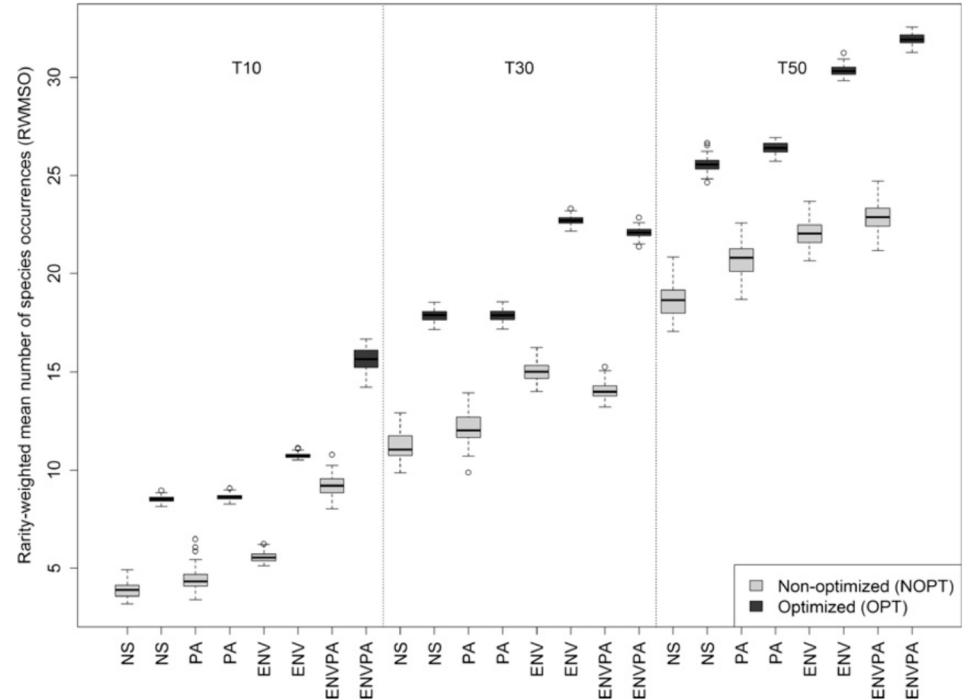
EBV monitoring design choices

- Surveillance versus targeted monitoring
- Spatial and temporal resolution
- Biological entities and metrics

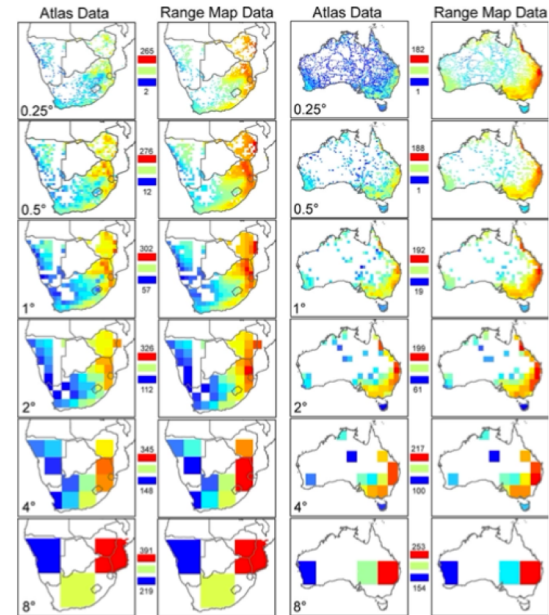
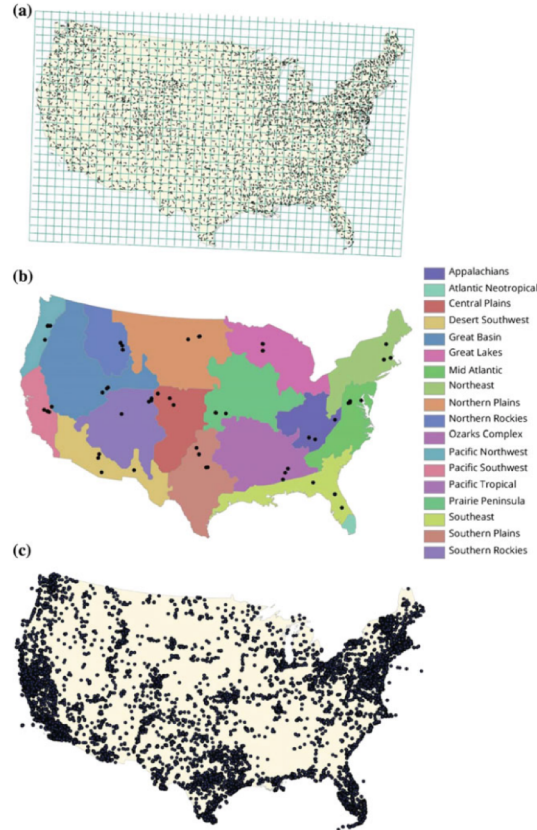


Surveillance versus targeted monitoring

	Optimized	Non-optimized
No stratification	OPT-NS Optimized for species occurrences	NOPT-NS Simple-random sampling (not stratified)
Protection stratification	OPT-PA Optimized for species occurrences and protection	NOPT-PA Random sampling stratified by protection status
Environmental stratification	OPT-ENV Optimized for species occurrences and environment	NOPT-ENV Random sampling stratified by environment
Environmental and protection stratification	OPT-ENVPA Optimized for species occurrences, environment and protection	NOPT-ENVPA Random sampling stratified by environment and protection status



Spatial sampling schemes and spatial model output



Hurlbert and Jetz (2007) PNAS

What taxa/biological entities?

- All species on Earth?
- All mammals?
- Rare mammals?
- Large mammals?
- Threatened mammals?



- Depends on policy question and on feasibility

What metrics need to be monitored?

Essential biodiversity class	Essential biodiversity variable	Main design choice	Metrics or taxa groups (examples)
Species populations	Species abundance	How many taxa to monitor?	Common versus rare species
	Species distribution		
	Species age structure		
Species traits	Phenology	Which metrics and how many taxa to monitor?	Metrics are taxon-dependent: flowering time, migration time
	Body mass		Harvested versus non-harvested species
Community composition	Species interactions	Which metrics to monitor?	Connectedness, length of trophic chain, interaction strength
	Taxonomic diversity		Species richness, species α and β diversity, phylogenetic diversity, etc.

A shopping list for EBVs

	Species Populations			Community Composition			Ecosystem Structure		Regulating Services
Variable Name	Species Distribution	Species Population	Species Distribution	Community abundance	Community abundance	Community abundance	Ecosystem distribution	Ecosystem distribution	Insect Pollinators?
Entity scope	Mammals	All birds	Endangered plants	Insects	Freshwater invertebrate	Plants	All habitats in habitats directive	Forest	Agricultural landscapes
Metric	Presence/absence	Population density	Presence/absence	Total biomass	Taxonomic diversity	Taxonomic diversity	Area of coverage	Relative magnitude of fragmentation	Abundance
Spatial resolution of the modelled EBV	10x10km	10x10km	10x10km	1kmx1km	5kmx5km	300x300m	1x1km	30x30m	1kmx1km
Spatial resolution of the observations									No coverage at the moment
Temporal resolution	Yearly	Yearly	Every 5 years	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly
Derived policy support tools		Spatially Explicit Farmland and Forest Bird Indicator							
Policy question	Status of species (e.g. Birds and Habitats Directive)	Status of species (e.g. Birds and Habitats Directive)	Status of species (e.g. Birds and Habitats Directive)	Status of habitats; Status of insect populations	Status of freshwater habitats	Status of habitats	Status of habitats	Status of habitats	Upcoming CAP requirement
Data sources	Atlas of mammals	Citizen science, comon farmland monitoring, atlas							
Models	Habitat distribution models	Habitat distribution models							
Novel technologies									



THANK YOU!



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