



# Defining ecosystem capacity first requires criteria from the definition of extent of ecosystem types

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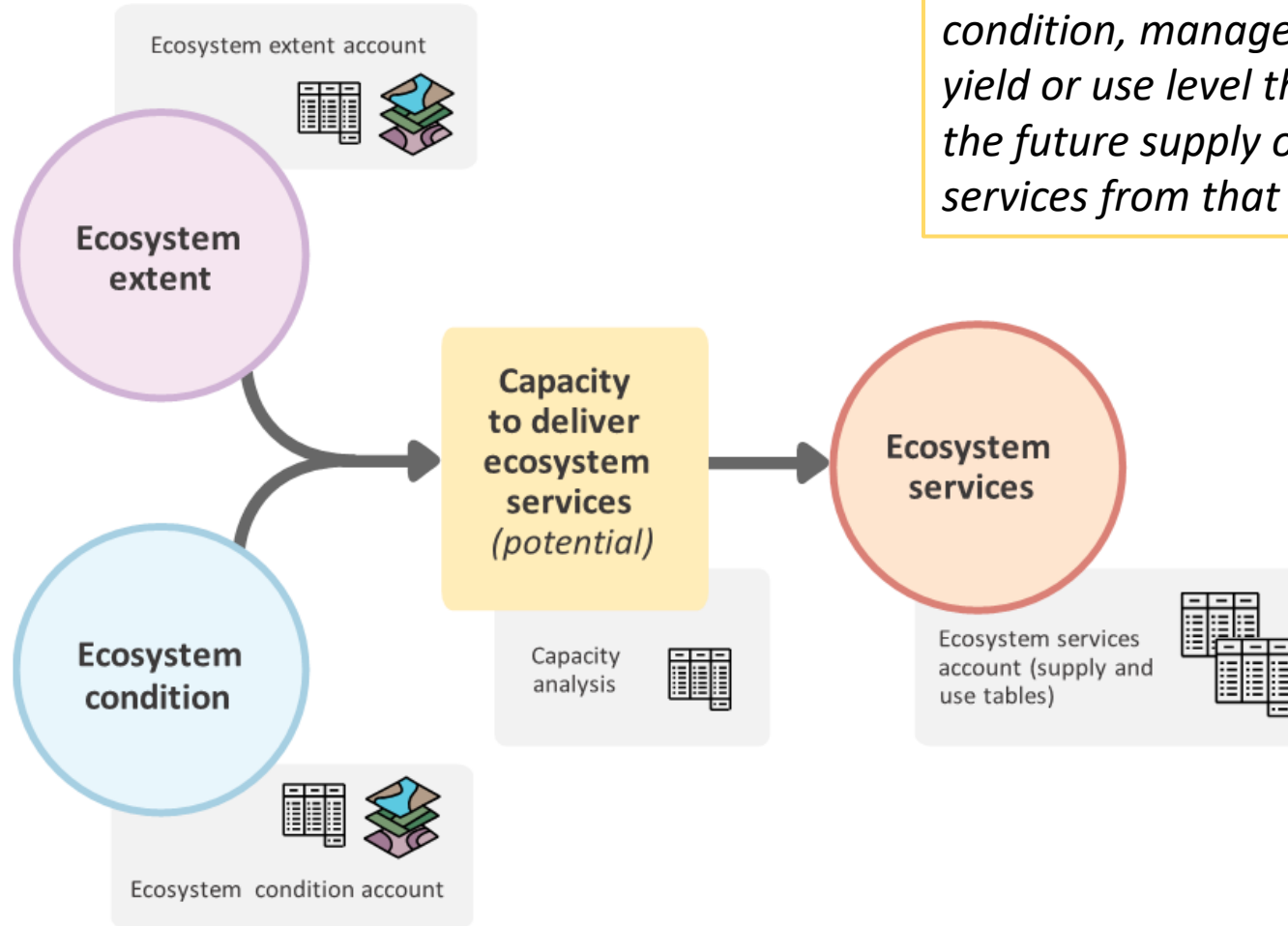
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28<sup>th</sup> Meeting of the London Group 2022



# Ecosystem capacity

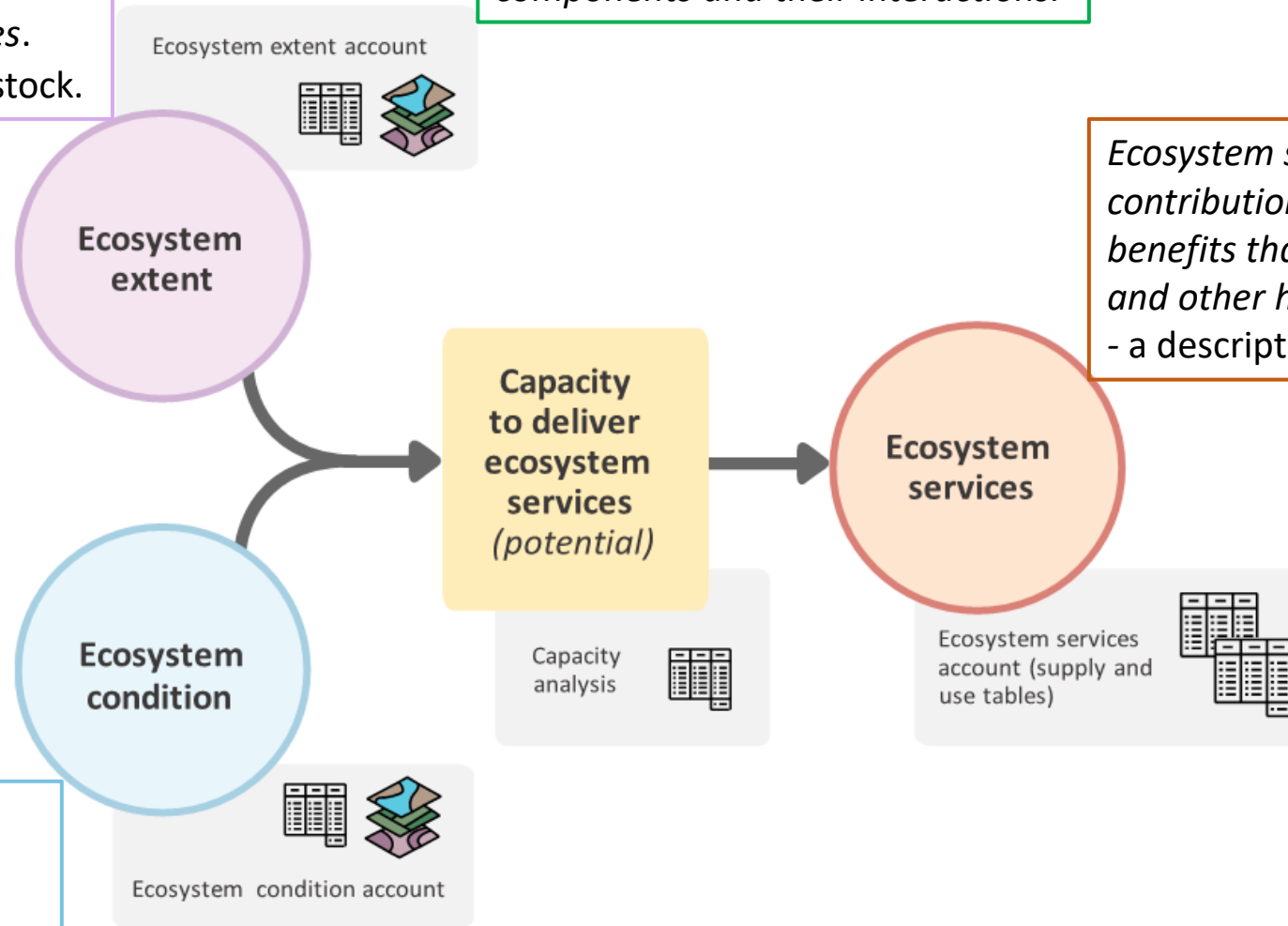
*“the ability of an ecosystem to generate an ecosystem service under current ecosystem condition, management and uses, at the highest yield or use level that does not negatively affect the future supply of the same or other ecosystem services from that ecosystem.”*



# Interrelationships between components of ecosystem accounts

*Ecosystem extent is the size of an ecosystem asset in terms of the spatial area of ecosystem types.  
- a quantity descriptor of the stock.*

*Ecosystem type reflects a distinct set of abiotic and biotic components and their interactions.*

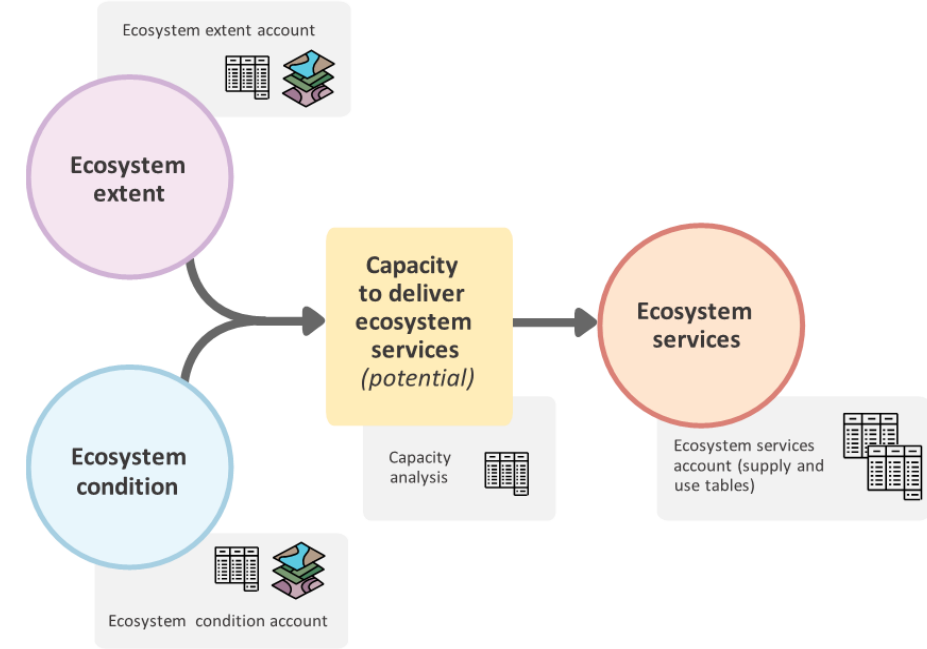


*Ecosystem services are the contributions of ecosystems to the benefits that are used in economic and other human activity.  
- a descriptor of flows*

*Ecosystem condition is the quality of an ecosystem measured in terms of abiotic and biotic characteristics.  
– a quality descriptor of the stock*

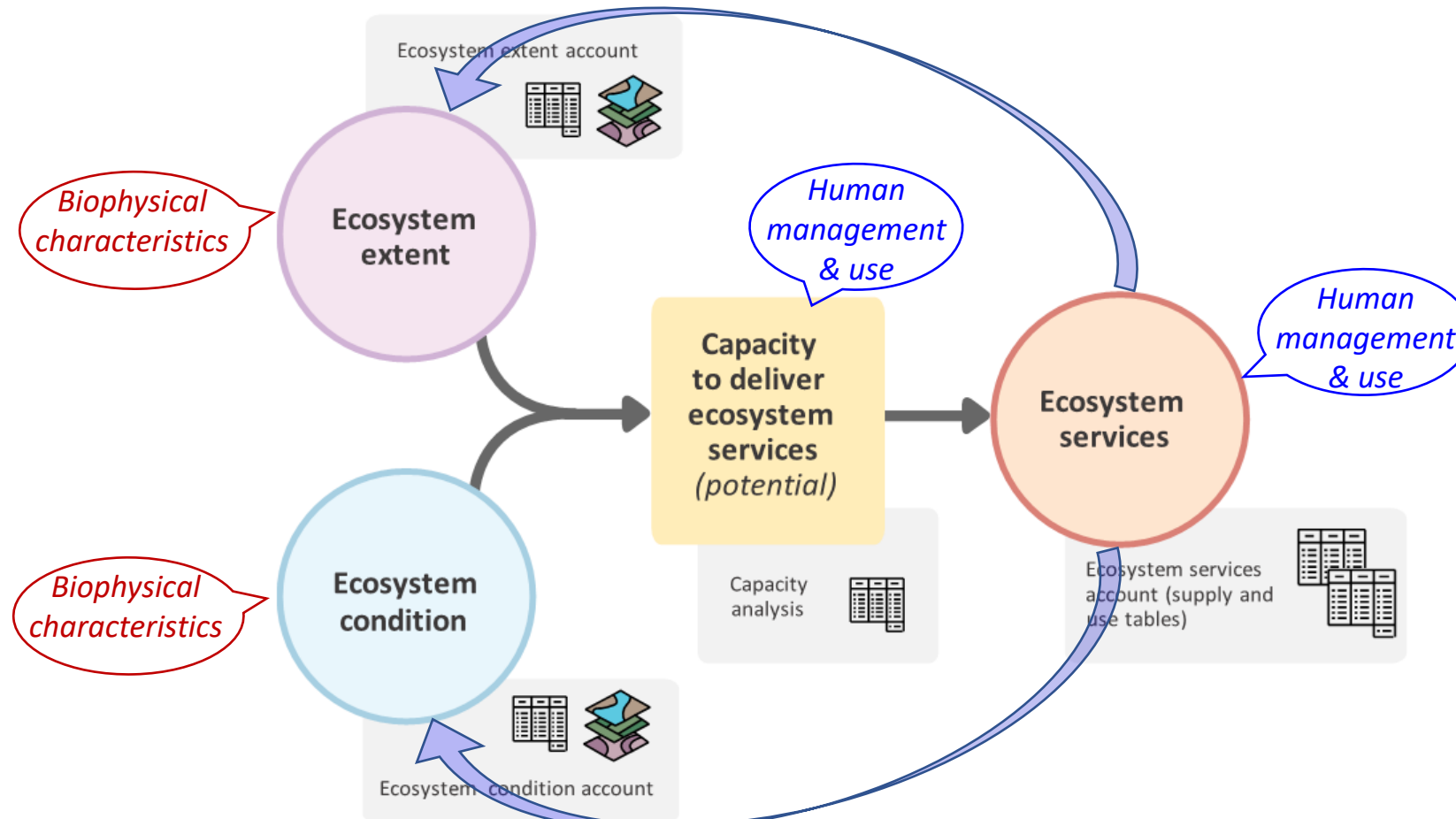
# Capacity embodies all components of ecosystem accounts

- refers to an ecosystem asset
- refers to the supply of a single ecosystem service
- relates to the flows of other ecosystem services
- relates to the balance between supply and use of ecosystem services
- measures of capacity use the same units as flows of ecosystem services
- measurement of capacity requires consideration of the management of the ecosystem asset as a whole
- can refer to the current ecosystem asset inclusive of variability due to disturbance regimes, or to expected future changes in the asset
- change in ecosystem condition may or may not be directly or positively related to change in capacity and may vary for different ecosystem services.



# Role of ecosystem capacity in ecosystem accounts

- Ecosystem capacity is the link between the extent and condition of ecosystem assets with the flow of ecosystem services
- Definitions of accounts shift from physical characteristics to inclusion of human management and use
- Use of ecosystem services creates a two-way feedback with impacts of ecosystem extent and condition

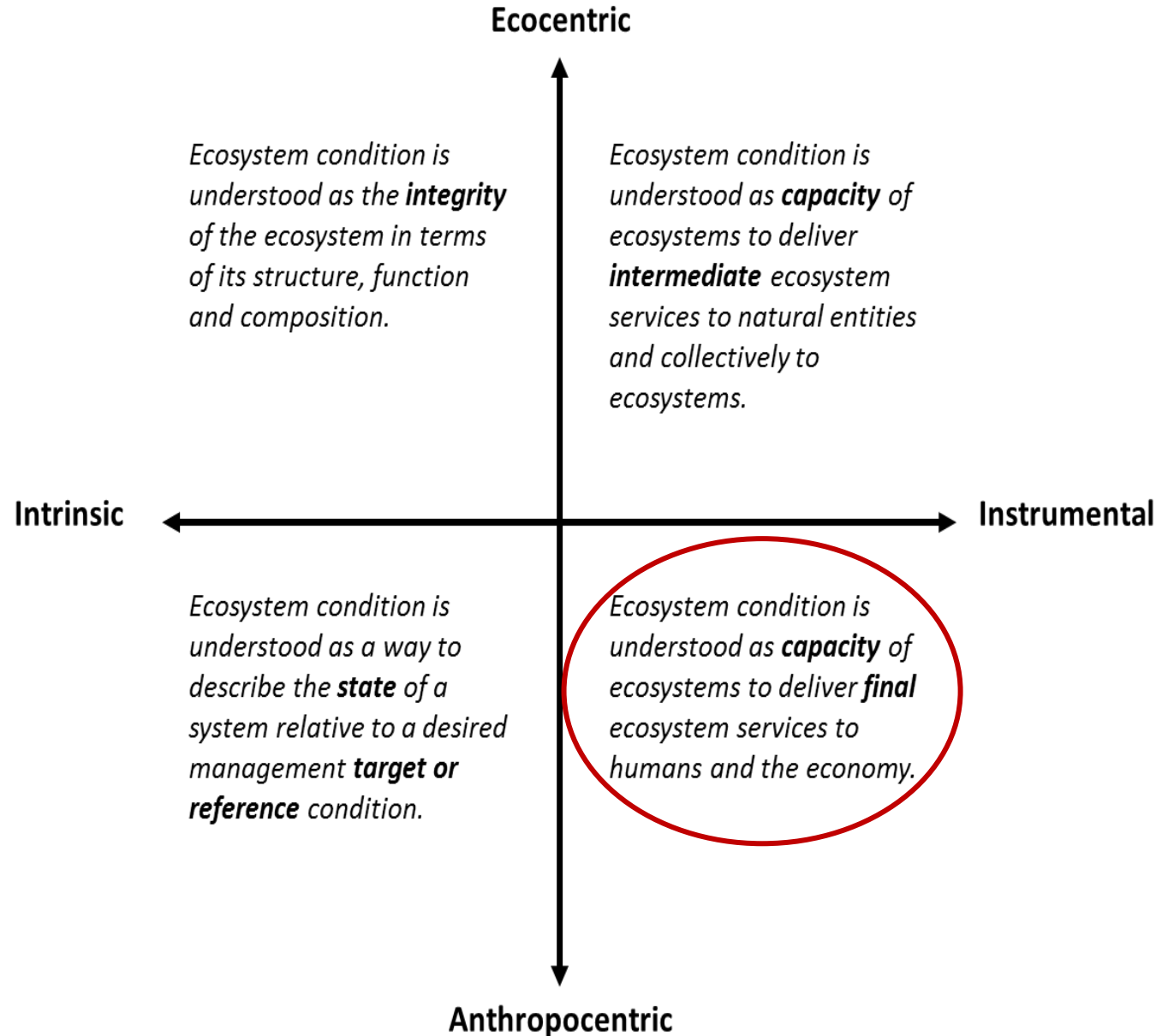


# Conceptual and practical issues for ecosystem capacity

- 1) purpose of developing the ecosystem accounts
- 2) definition of extent of ecosystem types
- 3) relationships between individual and multiple ecosystem services
- 4) relationship between capacity and the ecosystem reference condition



# Purposes for ecosystem accounts reflect multiple values



- The purpose of ecosystem condition accounts encompasses the continuum from intrinsic to instrumental values and from ecocentric to anthropocentric worldviews.
- Ecosystem condition is assessed with respect to ecosystem integrity in reference to natural ecosystems.
- The link between ecosystem condition, capacity and services is necessarily instrumental and anthropocentric.

# Definition of ecosystem types

Practical implementation of the definition of ecosystem types needs to:

- define the spatial distribution of the ecosystem,
- detect change over time based on measurement of variables,
- identify variables that are feasible to measure at appropriate spatial and temporal scales,
- use variables that can link information on extent, condition, capacity and services of ecosystems



The capacity of the ecosystem to supply a flow of ecosystem services is fundamentally linked to how the ecosystem type is defined, measured and managed.

Therefore, defining the types and criteria for their classification has implications throughout the system of ecosystem accounting.

# Selecting variables to define ecosystem types

- What are the intrinsic characteristics that define one ecosystem type as distinct from another?
- What are the characteristics that would define a conversion of an ecosystem asset resulting in a reclassification of the ecosystem type?
- Does the change need to be in one or more variables? Is there a hierarchy or order of priority?
- Are thresholds of the measured variables set for these characteristics?
- Is there a time period over which the change needs to be maintained, or that can be considered permanent?



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Classification system:

SEEA EA:

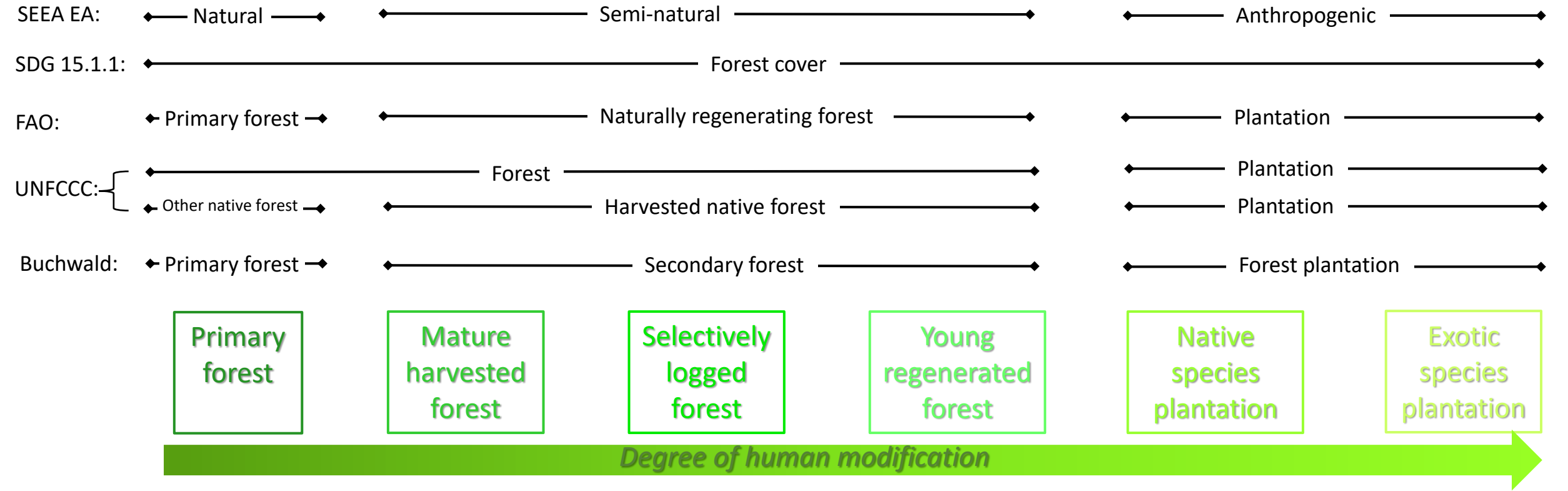
SDG 15.1.1:

FAO:

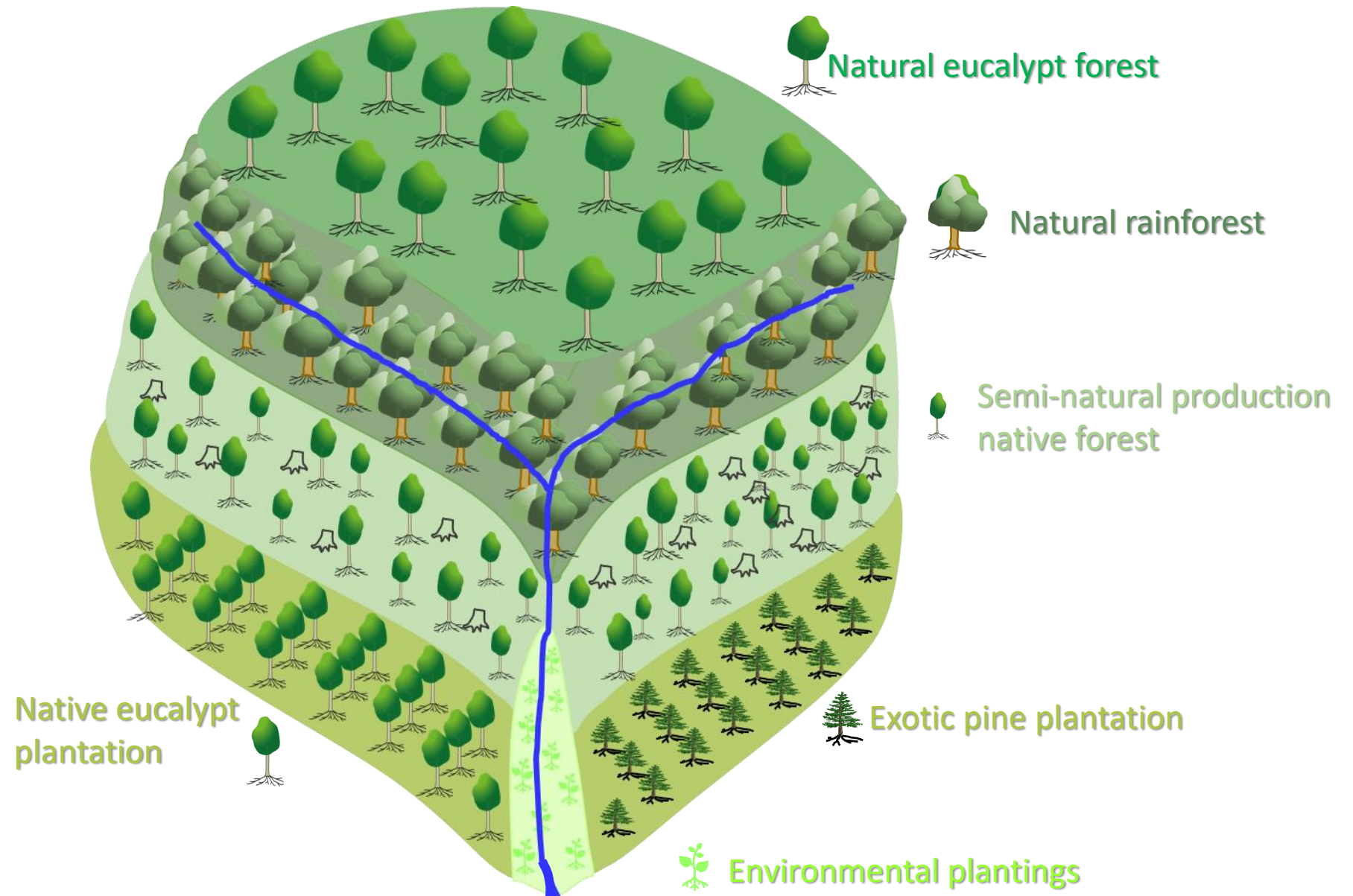
UNFCCC:

Buchwald:

Classification of forest ecosystem types



# Accounting for all forest ecosystem types within an ecosystem accounting area



# Rules for defining change in ecosystem types

## 1. Spatial extent:

- Change from trees to shrubs due to fire frequency
- Clearfell logging that leaves bare ground
- Clearing forest to produce grassland
- Reduction in canopy cover due to drought
- Selective logging of trees

## 2. Time period of change:

- Permanent means irreversible change
- Observed change may be related to climatic variability
- Recording short term changes in accounts can be informative
- Temporal variability may also reflect trends

## 3. Spatial scale of change:

- Scales of data used for the basic spatial unit
- Variable scale of reporting of ecosystem assets



## Ecosystem extent account A

Change from the original extent of natural ecosystem types to the current extent with some human-modified ecosystem types

| Units of area             | Ecosystem type           |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
|---------------------------|--------------------------|----------------------------|-----------------------------------|----------------------------------|------------------------------|------------------------------------|--------------------------|------------------------------|------------|----------|-------|
|                           | Temperate montane forest | Deciduous temperate forest | Oceanic cool temperate rainforest | Warm temperate laurophyll forest | Temperate pyric humid forest | Temperate pyric sclerophyll forest | Cool temperate heathland | Derived semi-natural pasture | Plantation | Cropland | Total |
| Opening extent - original | 100                      | 100                        | 100                               | 100                              | 100                          | 100                                |                          |                              |            |          | 600   |
| Additions to extent       |                          |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
| Managed expansion         |                          |                            |                                   |                                  |                              |                                    |                          | 50                           | 50         | 75       |       |
| Unmanaged expansion       |                          |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
| Reductions in extent      |                          |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
| Managed reduction         |                          |                            | 50                                | 50                               | 75                           |                                    |                          |                              |            |          |       |
| Unmanaged reduction       |                          |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
| Net change in extent      | 0                        | 0                          | -50                               | -50                              | -75                          | 0                                  | 0                        | +50                          | +50        | +75      | 0     |
| Closing extent - current  | 100                      | 100                        | 50                                | 50                               | 25                           | 100                                | 0                        | 50                           | 50         | 75       | 600   |

## Ecosystem extent account B

Change in extent during the accounting period which begins with both natural and human-modified ecosystems.

| Units of area        | Ecosystem type           |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
|----------------------|--------------------------|----------------------------|-----------------------------------|----------------------------------|------------------------------|------------------------------------|--------------------------|------------------------------|------------|----------|-------|
|                      | Temperate montane forest | Deciduous temperate forest | Oceanic cool temperate rainforest | Warm temperate laurophyll forest | Temperate pyric humid forest | Temperate pyric sclerophyll forest | Cool temperate heathland | Derived semi-natural pasture | Plantation | Cropland | Total |
| Opening extent       | 100                      | 100                        | 50                                | 50                               | 25                           | 100                                |                          | 50                           | 50         | 75       | 600   |
| Additions to extent  |                          |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
| Managed expansion    |                          |                            |                                   |                                  |                              |                                    |                          | 25                           | 50         |          |       |
| Unmanaged expansion  |                          |                            |                                   |                                  |                              |                                    | 50                       |                              |            |          |       |
| Reductions in extent |                          |                            |                                   |                                  |                              |                                    |                          |                              |            |          |       |
| Managed reduction    | 50                       | 25                         |                                   |                                  |                              |                                    |                          |                              |            |          |       |
| Unmanaged reduction  |                          |                            |                                   |                                  |                              | 50                                 |                          |                              |            |          |       |
| Net change in extent | -50                      | -25                        |                                   |                                  |                              | -50                                | +50                      | +25                          | +50        |          | 0     |
| Closing extent       | 50                       | 75                         | 50                                | 50                               | 25                           | 50                                 | 50                       | 75                           | 100        | 75       | 600   |

# Woodland ecosystem types

Characteristic of canopy cover



Single paddock tree



Scattered trees in paddock

Multi-layered continuous canopy cover



# Canopy cover depends on the spatial scale



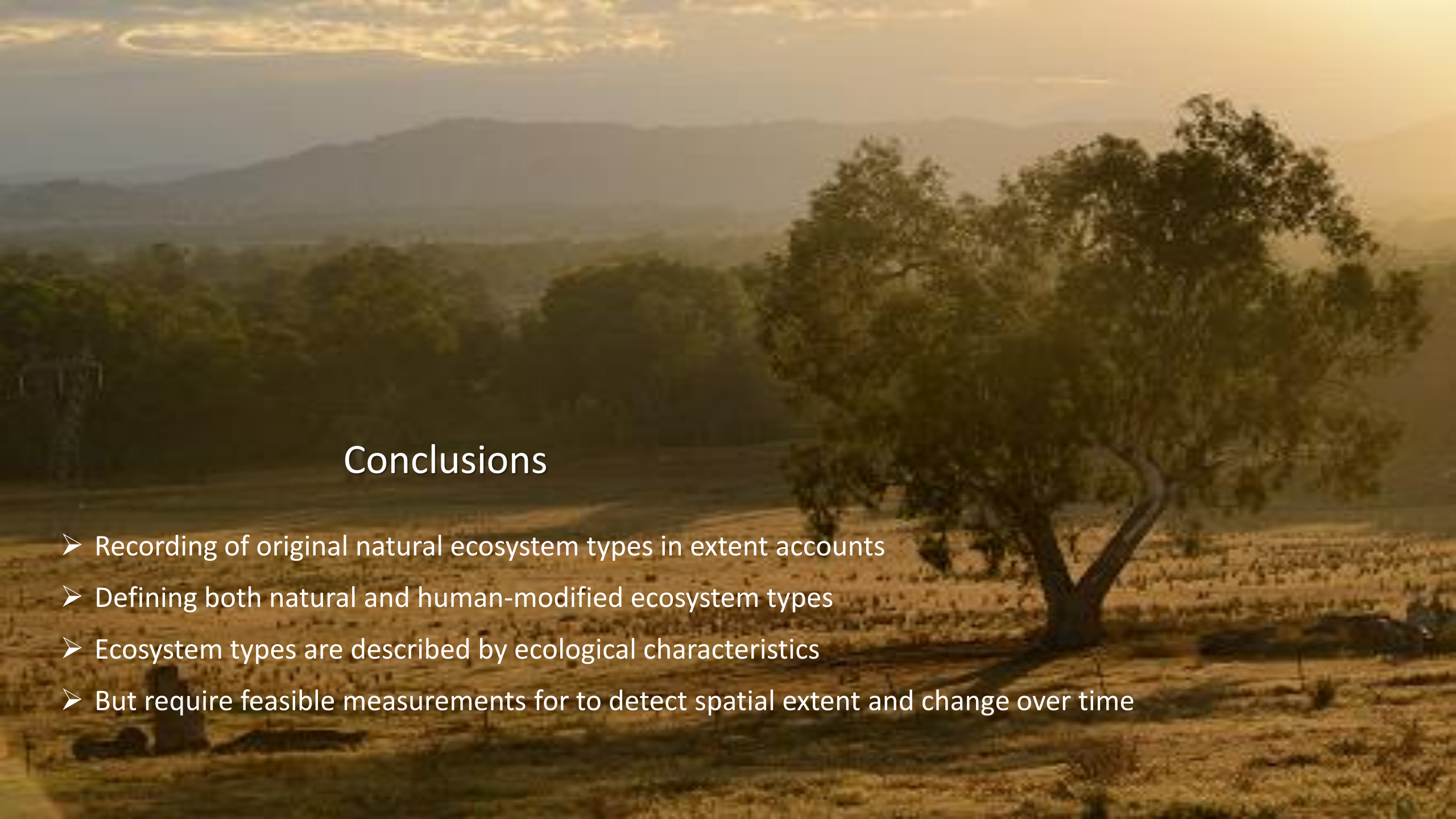
# Land use and management used in defining ecosystem types



Grazing by native species in an natural ecosystem

Grazing by exotic species in a human-modified ecosystem





## Conclusions

- Recording of original natural ecosystem types in extent accounts
- Defining both natural and human-modified ecosystem types
- Ecosystem types are described by ecological characteristics
- But require feasible measurements for to detect spatial extent and change over time