Ecosystem conversions

The condition of an ecosystem asset can change to the degree that results in a conversion of all or part of the area of the asset from one ecosystem type to another between the beginning and end of an accounting period.

Defining and identifying a conversion depends on:

- the criteria used to define ecosystem types
- characteristics and indicators that describe ecosystem types
- thresholds applied to these characteristics and indicators

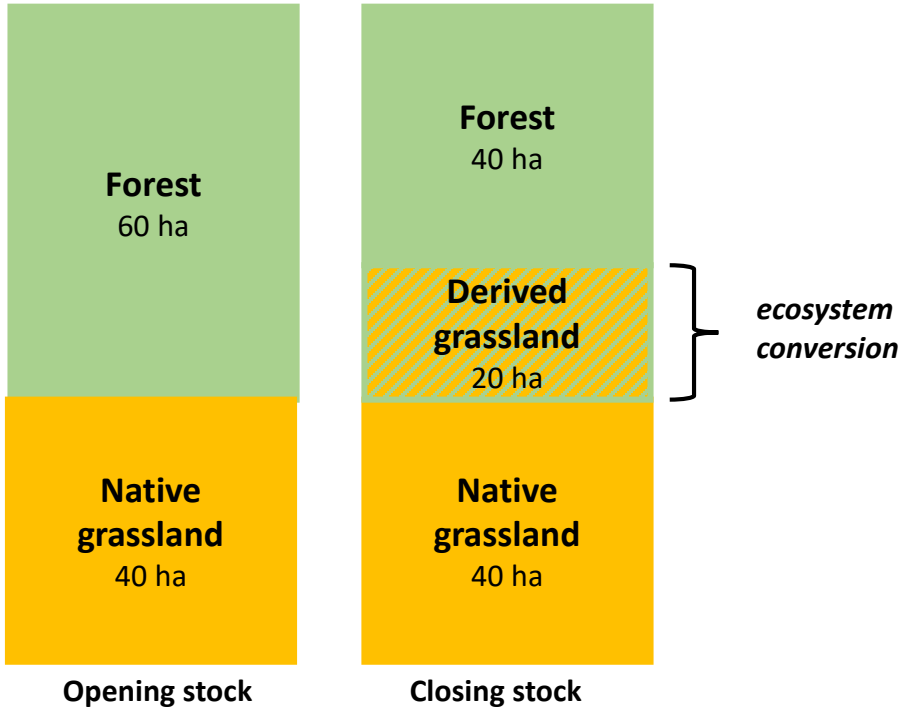
Discussion questions:

1. How can the combined presentation of extent and condition accounts provide insights in changes in condition due to conversions?
2. What are the challenges?
3. From a policy perspective, what information would be useful about conversions?

Description of ecosystem conversions

1. Conversions can occur theoretically between any combination of natural, semi-natural and human-modified **ecosystem types**.
2. Classification of ecosystem types and their condition are based on **physical characteristics** that relate to ecosystem integrity.
3. **Thresholds** in these characteristics are required to define change in ecosystem type resulting in re-classification.
4. **Factors** causing conversions can be natural disturbance regimes, climate change or human activities.
5. Ecosystem conversions can occur **rapidly** with a large change in condition over a short time, or **gradually** with incremental changes in condition over a long time.
6. The **timeframe** and permanence of the change is important for defining a conversion, as distinct from temporal variability. Rules are needed to specify a time period over which the change must remain in order to be re-classified.

Example 1:
Conversion of forest to grassland



Steps in accounting:

1. Identification and classification of spatial units and their aggregation into an ecosystem extent account opening stock
   60 ha forest, 40 ha native grassland

2. Time series of ecosystem condition indicators measured for each ecosystem type
   indicator of overstorey canopy cover

3. A condition indicator crosses a threshold that defines a different ecosystem type
   threshold of 0% canopy cover

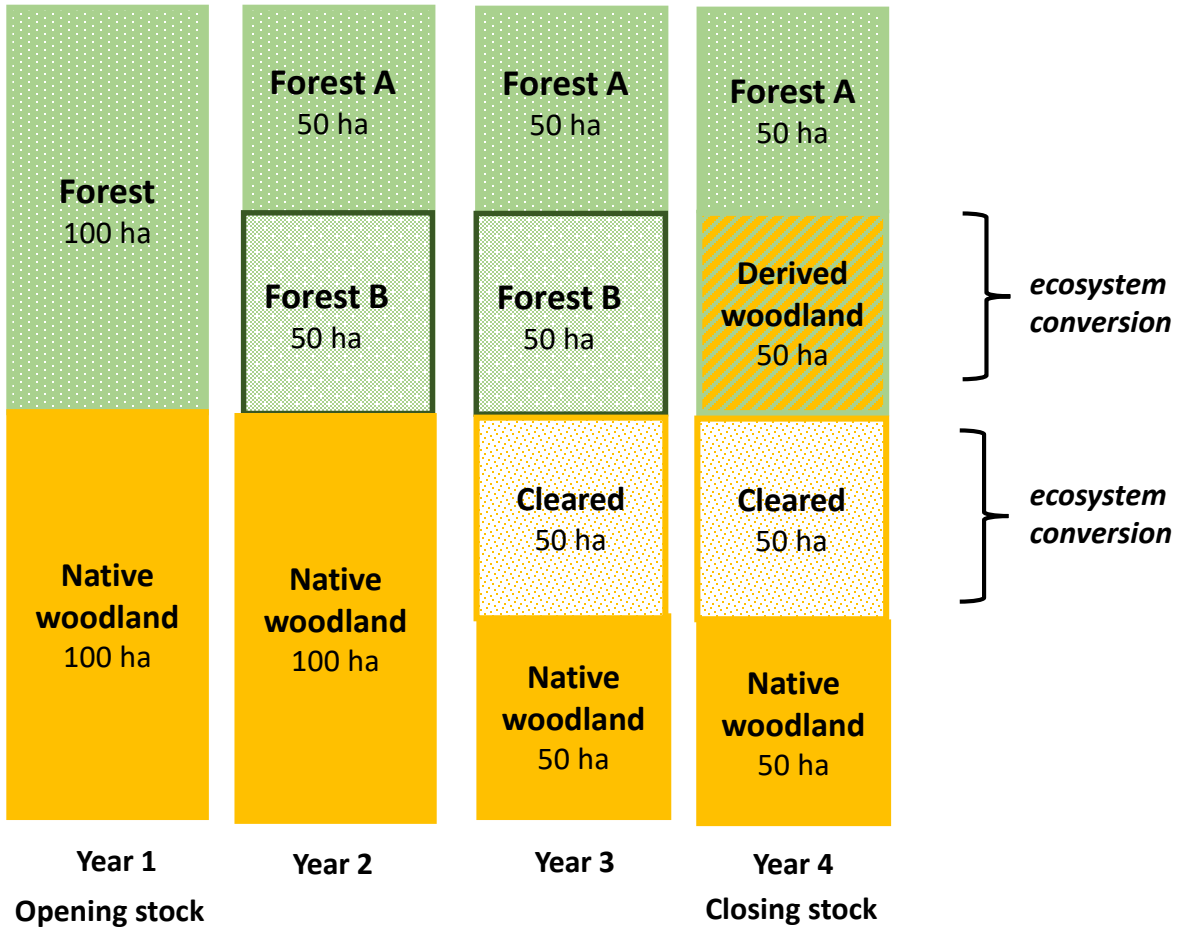
4. The spatial unit is reclassified, and the new ecosystem type is recorded in the ecosystem extent account, gain in derived grassland and loss in forest
   ecosystem type of derived grassland 20 ha

5. Assign new indicators and reference levels to the new ecosystem type
   indicator of % ground cover

6. The process is iterative in reconciling changes in extent and condition

Extent and Condition Indicators	Reference level	Opening value	Closing value
Ecosystem Type 1: Forest	Natural Reference Condition = natural forest ecosystem		
Extent (ha)		60	40
Condition Indicators			
Tree canopy cover (%)	70% cover = 1	0.7	0.7
Tree species richness	5 species = 1	0.8	0.8
Soil N concentration (%)	1% conc. = 1	0.8	0.8
Condition Sub-index		0.77	0.77
Ecosystem Type 2: Native grassland	Natural Reference Condition = natural grassland ecosystem		
Extent (ha)		40	40
Condition Indicators			
Ground cover (%)	100% cover = 1	0.7	0.7
Grass & forbs species richness	20 species = 1	0.8	0.8
Soil N concentration (%)	2% conc. = 1	0.8	0.8
Condition Sub-index		0.77	0.77
Ecosystem Type 3: Derived grassland	Anthropogenic-derived Reference Condition = productive pasture		
Extent (ha)			20
Condition Indicators			
Ground cover (%)	100% cover = 1		0.5
Grass species richness	1 species = 1		1
Soil N concentration (%)	5% conc. = 1		0.8
Condition Sub-index			0.77

Example 2:
Conversion of forest to woodland



Process of ecosystem conversion:

- Ecosystem types defined by canopy cover:
  - forest 30 – 70% cover,
  - woodland 10 – 30% cover
- Reduction in canopy cover could be due to:
  - land use change with removal of trees - permanent
  - loss of leaves during drought – reversible
- When a threshold is crossed a change occurs to new ecosystem type:
  < 30% becomes woodland
  < 10% becomes cleared
- Change needs to be stable over a certain time period

Extent and Condition Indicators	Reference level	Opening value Year 1	Year 2	Year 3	Closing value Year 4
Ecosystem Type 1: Forest	Natural Reference Condition = natural forest ecosystem				
Extent (ha)		100	100	100	50
Condition Indicators					
Canopy cover (%)	70% cover = 1	1.0	0.75	0.75	1.0
Ecosystem Type 2: Derived woodland	Natural Reference Condition = natural forest ecosystem Anthropogenic Reference Condition = grassland with scattered trees				
Extent (ha)		0	0	0	50
Condition Indicators					
Canopy cover (%)	N: 70% cover = 1				0.28
	A: 30% cover = 1				0.66
Ecosystem Type 3: Native woodland	Natural Reference Condition = natural woodland ecosystem				
Extent (ha)		100	100	50	50
Condition Indicators					
Canopy cover (%)	30% cover = 1	0.6	0.6	0.6	0.6
Ecosystem Type 4: Cleared	Natural Reference Condition = natural woodland ecosystem				
Extent (ha)		0	0	50	50
Condition Indicators					
Canopy cover (%)	30% cover = 1			0	0
Condition index (area weighted)		1.6	1.35	1.05	0.94
					1.13

Application of accounting for ecosystem conversions

1. Classification of the spatial units and characteristics describing condition will influence how conversions are linked to ecosystem services, and economic and institutional units.

2. Assigning appropriate **reference conditions** to the initial and new ecosystem types may require a change from ‘natural’ to ‘anthropogenic’ reference condition. Future reporting of the new ecosystem type may require different indicators and reference levels.

3. **Gross gains and losses** in extent of ecosystem types should be reported to preserve information about cumulative change from the reference condition.

4. **Aggregate indices** of ecosystem condition should maintain separation of natural and anthropogenic ecosystem types.

5. Assessment of **overall change** in ecosystem condition across an ecosystem accounting area must include changes in both extent of ecosystem types and their condition.

Ecosystem conversions – key points

1. **Conceptual points**
   - Importance of concept of permanence of change in identifying conversions

     (an appropriate timeframe needs to be defined for detecting a change in ET)
   - Common to measure observed changes in land cover rather than focus on detailed thresholds for changes in ecosystem types – need work on combining extent and condition measurement
   - Need to clarify links to ecosystems services and valuation

     (condition is described in terms of physical characteristics and there may or may not be direct links to the future flow of ecosystem services)
   - Consider potential for different measurement options at different scales (EA vs landscape)
   - No clear answer on natural vs anthropogenic reference condition choice for a converted EA

     (but there is a desire and applications for retaining information about long terms changes and distance from naturalness, even if anthropogenic reference levels are introduced. This may result in showing more than one aggregation of condition indices.)
2. **Policy use**
   - Conversions relevant in many contexts including urbanisation, climate change, biodiversity
   - Tracking change in condition as well as extent is useful
   - A link to changes in mix of ecosystem services would be very useful
   - Careful on assumptions of which conversions are “good” or “bad” and how they relate to provision of services.