ÆKOS: A new paradigm for discovery and access to complex observation data

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Our Goal

To enable the preservation and appropriate re-use of rich ecological information
Needs and expectations of users

Data discovery
Access
Comprehension
A common information platform
  • Easy manipulation
Familiar tools and or intuitive interface
Cater for individuality
  • Each user will have different data requirements
Characteristics of ecological data

Complexity:
Data usually needs explanation and context before it can be accurately used.

Fragmentation:
Many different ways of measuring/observing/expressing similar ecological concepts
* Rapidly evolving

Diversity:
Ecological Data covers a wide range of topics

Dispersal:
Data is stored in many storage locations and formats
Preservation?

"Data Entropy" Michener et al. 1997, Ecological Monographs

- Time of publication
- Specific details
- General details
- Accident
- Retirement or career change
- Death

Information content vs. Time
Traditional data management

Observation data

- Time
- Method drift + additional scope
- Additional data

Data storage

- Comments
- Method drift + additional scope
The ecological data delivery paradox

IT solutions require rigid models to process data hence tend to force things into narrow structure – BUT flexible models are required to preserve the full richness of data and context

• Software is not intelligent and requires fixed structures and fixed rules (logic)
• Understanding data involves many subtleties which are complex to model
• Models and processing dependent on the question
Towards the new paradigm

Accept that flexible data needs flexible information models

• A sparse semi-structured graph oriented knowledge model (not a data model)
• Model must be extensible (ontology based)

Create descriptive artifacts for consumers

• provide the understanding of context (express subtleties) and avoid the significant complexity of modelling

By capturing the full richness, we enable informed re-use for the broadest range of questions

• the user can assess suitability for their purpose and can obtain complete information
ÆKOS Approach
The user experience

Key features

Access and licensing

Build complex queries

From simple blocks
Information model

Select site → Site

Visit site → Establish site

Define sampling area → Sample

Measure features → Sample

Process view

Activity

Study location establishment method

Study location selection method

Study location assessment method

Landform assessment method

Landscape context assessment method

Study location visit method

Observation view

Activity (SG)

Study location

Spatial location

Landscape context

Visit (SG)

Landform
Concept alignment

Uniform Taxonomy

- known taxa
- unknown/unpublished

National Species Lists
- Current taxon concepts
- All historical concepts & revisions
- Catalogue of Life (International)

ÆKOS Portal
- National Species List
- Local Concept Lists
- Unresolved names
- Hybrids/Intergrades

Local Concept Lists
- Local concept list per dataset
- Includes:
  - unpublished concepts
  - underspecified observations
  - cultivars & others
Descriptive artefacts

Context represents a communication challenge not a modelling problem

- Standard structure
- Bite sized chunks
- Direct linkage between data and description
- Authored synthesis based on information derived from multiple sources (published and unpublished)
Outcome

Integration of ecological datasets at a national level

ÆKOS is Nationally Consistent

- Forestry
- NRM
- Biodiversity
- Research
- Indigenous, NGOs
Thank you

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ÆKOS Roadmap

- **Alpha Portal**
  - Datasets ingested for SA, WA, QLD
  - Data licenses signed for SA, NT, WA, QLD

- **Beta Portal**
  - Beta Portal
  - Further data ingested
  - Additional licenses

- **ÆKOS System demonstrator complete**
  - Open-source code & documentation
  - Contingency arrangements

2011

- Start Researcher Data Submission
- Start Soils-2-Satellites
- Complete Mobile Field App
- Start MSPN data ingestion

2012

- Complete Soils-2-Satellites

2013

- Complete Researcher Data Submission

2014

- Complete MSPN data ingestion
ÆKOS Data Coverage

- Agency State-wide
- Agency Regional
- AUSPLOTS (Rangelands and Forests)
- LTERN (Plots)
- LTERN (Transects)
- SuperSites
- University Research
Data ingestion DSL
Environmental Information
Landscape for Australia

- Terrestrial ecology – ÅKOS
- Biodiversity – ALA
- Marine environments – IMOS
- Coastal environments – ACEF
- Soils - Soil and Landscape Grid
- Geoscience - AuScope
- Remote sensing – AusCover
- Atmospheric exchange – Ozflux
- Water – BOM
- Climate – BOM

Multi-Scale Plot Network
State Agency Data