Ecological Land Classification (ELC) in Ontario
Outline

• Evolving Business needs for Ecological Information
• What is ELC / concepts
• Old vs new classification system
• Orientation to the main components - Ecosites, Substrates, and Vegetation Types
• Other work and collaborations
• Inventory
• Applications and Decision Making
Role of classification

• Ontology (Classification of ecosystem states)
  – A vocabulary for a shared domain of discourse - definitions of classes, relations, functions and processes ---- Language

• Ontologies are the basis for knowledge integration
  – Facilitates development of data dictionaries and data models for data management and integration.
  – Provides Legend for inventory
  – Provides a framework for interpretation
Ecosystem Classification Then

- Each region had its own approach
Ecosystem Classification Then

• Each resource area had its own approach
  – FRI, NHIC, Parks, Wildlife, SAR, Wetlands, Regional FECs
• Comprehensive corporate tools were often single-purpose resource inventories (FRI)
• Many unclassified areas
• Information could not be linked
Why bother changing?

• Ecosystems under increasing pressure at many scales – better ecological information required

• Lack of ecosystem-based knowledge hinders comprehensive landscape planning and monitoring

• Common language for training, research, planning, implementation, and monitoring
Business Needs

- Provincial User needs assessment
- Guided design process
- Development by ELC working group
- Presented to Provincial Users in 2000
- Approved to proceed by Management Steering Committee 2004-05
- Ongoing development and review by users
- Collaboration and correlation with outside agencies across Canada and N.Am
Business Needs

- Evolution beyond single-resource inventory or special purpose classification
- Better Ecological Information Required for all aspects of resource management (habitat, G+Y, SARs, Parks, succession)
- Requirement for information on the entire land-base – all ecosystem conditions, no white spots
Scales of Major Planning and Management Applications

Ecoregions
Ecodistricts
- State of forest reporting
- Protected areas / parks
- Landscape guides

Ecosections
Landtypes
- Prime land analysis
- Landscape model fabric
- Silviculture guides
- Silvicultural ground rules - SEM
- Habitat capability
- Forest modelling
- Forest Inventory

Ecosites
- Basic building block of ELC
- Ecological sampling unit
- Special purpose inventory
- assess suitability and capability

• V-type
• S-Type
What is Ecological Land Classification?

ELC is an information framework that organizes the natural environment into ecologically distinct areas (ecosystems) that differ in structure, composition, and function.
ELC Core Concepts

- Ecosystems are hierarchical
- Ecosystems can be characterized at different scales
- Ecosystem distribution is predictable
ELC in Ontario: Ecologically and Spatially nested set of tools.
ELC Core Concepts

• Ecosystems are hierarchical

Key environmental forces influencing development and distribution are used to efficiently and objectively structure the classification of:

• Ecosites

• Vegetation and substrate types
Ecosystem Classification Now

- Designed to classify the entire provincial landbase
- Treed and non-treed ecosites
- Wider range of materials addressed - Organic (peat & folic), mineral, rock, and water substrates
- One ecosite key for the province
- One substrate key for the province
- Vegetation type classification evolving for eco-climatic zones
- Range of revised products in development
ELC Tools and Components

Ecozones and Ecoregions

The Ecosystems on Ontario, Part 1: Ecozones and Ecoregions (2009)

• Describes characteristic features of the ecozones and their ecoregions

Ecodistricts

The Ecosystems on Ontario, Part 2: Ecodistricts (Draft)

• Describes characteristic features of each ecodistrict
Challenge - Managing Product Transitions

- Incorporation of ELC into FRI (multi-year rollout)
- Major emphasis in training, transfer and communication
- Cross-walks and product transitions
  - Yellowbook
  - FRI
  - Crosswalks by Dech et al and regional tech notes
Distribution of the higher levels of the ecosystem classification controlled by broad-scale trends in climate and geology –

Ecozones
Ecoregions
Ecodistricts

Revised Ecoregions of Ontario released in spring 2010
Natural Gradients

Energy

Topography

Nutrients

Moisture

Climate

From: Racey
High Energy

- high energy levels trump everything
- Inhibition level of energy, eliminates all or nearly all vegetation; nearly always unvegetated
- Natural and human processes
- Gravity, wind, water, ice scour
High Energy

- excessive flooding or saturation levels - hydric soil conditions
- terrestrial vs wetland conditions next most important driver in community assembly
Shallow substrates - environmental limitation by substrate depth
- shallow substrates lead to many secondary limitations; anchorage, drought, richness, temperature extremes
- last level of influence is the very nature of the substrate and hydrology
- slopes
- substrate texture and moisture regime and nutrient gradients
Hierarchy of Influence

Key environmental forces influencing development and distribution are used to structure the classification of ecosites, vegetation types, and substrate types.
Provincial Ecosites
Provincial Ecosites

What is an ecosite?

Ecosites are landscape areas consisting of typical, recurring associations of v-types and s-types

Why look at ecosites?

Integrates vegetation and substrate/landform attributes that influence composition, structure, productivity, and biological legacy (for example succession)

Permits inventory, spatial extrapolation, and interpretation

Ecosites capture specific information beyond that provided by plots and plot groupings alone
Ecosite are composed of VTypes \times STypes combination in a recurring spatial association.

Designed for application at 1:8000 - 1:30000
A substrate is:

any exposed mineral, bedrock, coarse fragment, or organic materials available for the establishment of ecological communities
Why look at substrates?

- Basic medium for growth, determines occurrence and structure of ecosystems - primary ecological driver
- Observed patterns of ecosystems affected by substrate type, quantity, fertility, and distribution
- Relative stability over time, provides evidence of expected biological responses – a foundation even if vegetation is disturbed or lacking
Why look at substrates?

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Ministry of Natural Resources
Vegetation Types

• Vegetation Type development currently underway
• Occurring in association with the Canadian National Vegetation Classification (CNVC) exercise – inter-provincial correlation
• Boreal analysis complete >> treed vtypes
• GLSL/Southern >> treed vtypes in draft and for review shortly
• Far North/NBI – just getting underway
Vegetation Types (further development)

- Vegetation Type development for non-treed vegetation conditions currently underway
- Non-treed vegetation type information from many sources
  - Life science inventory (Parks, NHIC, Ontario Wetlands Evaluation)
  - Information from historical studies/literature
  - Further sampling (Far North, OPIAM)
  - Data from non-MNR sources (university + other agencies)
- Also envisioned as part of overall national effort
Classify Ecosystems at Different Scales

Regional Level

Local Level

Chronological Level

regeneration stage
immature stage
mature stage
time gradient
Ecosites are landscape areas consisting of typical, recurring associations of V-type and S-type combinations at a given scale.
Soils and landforms provide the foundation for observed patterns.
Ecosites are the defined level of spatial association in the ELC hierarchy for corporate inventory and planning. Ecological unit mapping construct related to potentials, constraints, and legacy.
QUANTITY AND SPATIAL ARRANGEMENT ARE CRITICAL FOR CONSERVATION AND PLANNING

ELC is not a Map but provides the LEGEND and facilitates the process of mapping/inventory.
Implementation of ELC as legend of Ontario’s Enhanced Inventory

- Powerful high resolution imagery
- Multi-layer and zoomable interpretation
- Extensive ground validation
- Enhanced array of FRI attributes plus ELC
Mapping Concepts

- Generally top-down
- Mapping is both science and interpretation
- Repeated subdivision into more and more uniform units
- Classification provides the objects and rules for legend development
- Classification also must be designed to facilitate inventory capture at specific scales
Mapping Concepts

- Scale dependent (level of precision dependent upon scale and purpose)
- Technology dependent (types of units which may be mapped are often limited by the technology used (for example satellite vs photo-interp))
- Spatially explicit
- Generally seamless (no holes)
Information content of new enhanced Forest Resource Inventory

Traditional FRI stand composition attributes plus soil

MR 2, SifS, Deep

MR 3, SifS, Deep

MR 2, fSL, 30 cm deep
Inventory now also includes Ecosite attributes and all of the ecological information associated.
ELC facilitates Predictive Approaches to Ecosystem Mapping and Modeling.
Interpretations/Applications

• Now that I know what it is and where it is what do I do with it?

• Primary Ecosite Applications
  – Fundamental units for corporate inventory
  – Unit for development of silviculture and operational guides
  – Growth and Yield
  – Base unit for wildlife habitat
Interpretations/Applications

- Provincial reporting
- Primary fabric for modeling (e.g. succession, fire, effectiveness and impacts)
- Primary V-type and S-type Applications
  - More detailed and/or Special purpose characterization and inventory (for example SAR habitats, special wetlands)
Beyond the Primary Classification -- Once classified and mapped numerous interpretations are possible for management or evaluation.

All purposes are not served at a single scale or with same classification unit.
Next Steps

• Completion and distribution of eco-districts
• Finalization and distribution of boreal and great lakes ecosites plus graphics
• Continuation of work into Far North and South
• Completion and distribution of treed vegetation types for boreal, great lakes and south
• Further development of Far North data base, analysis and classification development
Next Steps (2)

• Ongoing inventory and spatial studies
  • FRI
  • PSM/PEM
  • CBVM
• Ongoing work on integrated data base and archive
• Ongoing training and transfer
For further information, materials, questions or comments – please contact me. . . .

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