Establishing classes for ecosystem types – is there a minimum number of classes to support measurement and decision support?

Trond Larsen, Conservation International
Francois Soulard, Statistics Canada
Ecosystem accounts in Canada

POLICY USES

- Informs public policy issues, for instance, the loss of the best agricultural land for urban land uses.
- Helps provide answers to local issues, such as urban sprawl.
- Contributes to the development of laws and policies aiming to frame spatial planning, namely metropolitan areas.
Urban ecosystem assets accounts
HAE 2015 : The changing landscape of CMAs

Ecosystem asset account, Toronto census metropolitan area-ecosystem , 1971 to 2011

<table>
<thead>
<tr>
<th></th>
<th>Total built-up area</th>
<th>Arable</th>
<th>Natural and semi-natural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Settled</td>
<td>Roads</td>
<td></td>
</tr>
<tr>
<td>Opening stock 1971</td>
<td>850</td>
<td>418</td>
<td>4 930</td>
</tr>
<tr>
<td>Land lost to settled area</td>
<td>...</td>
<td>...</td>
<td>-961</td>
</tr>
<tr>
<td>Balance of change</td>
<td>1 409</td>
<td>403</td>
<td>-102</td>
</tr>
<tr>
<td>Closing stock 2011</td>
<td>2 260</td>
<td>821</td>
<td>3 867</td>
</tr>
</tbody>
</table>

square kilometres
HAE 2015 : The changing landscape of CMAs


square kilometres

<table>
<thead>
<tr>
<th>Year</th>
<th>Built-up area</th>
<th>Arable land</th>
<th>Natural and semi-natural land</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>1100</td>
<td>4000</td>
<td>2100</td>
</tr>
<tr>
<td>1991</td>
<td>1500</td>
<td>4500</td>
<td>2200</td>
</tr>
<tr>
<td>2001</td>
<td>2100</td>
<td>4500</td>
<td>1700</td>
</tr>
<tr>
<td>2011</td>
<td>2700</td>
<td>4500</td>
<td>1500</td>
</tr>
</tbody>
</table>

- Forest
- Water
- Other
Hierarchical classification

<table>
<thead>
<tr>
<th>Forest</th>
<th>Land cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical Forest</td>
<td>Biome</td>
</tr>
<tr>
<td>Cloud Forest</td>
<td>Ecosystem</td>
</tr>
<tr>
<td>Elfin Forest</td>
<td>Distinct structure, fx and composition, provides specific services, e.g. carbon, fog interception</td>
</tr>
<tr>
<td>Moist Lowland Forest</td>
<td>Ecosystem</td>
</tr>
<tr>
<td>Riparian Forest</td>
<td>Distinct structure, fx and composition, provides erosion and flood control, regulates water quality, etc.</td>
</tr>
</tbody>
</table>
Selecting # Ecosystem Classes

- Ecosystem classes distinguish sources of benefits and can determine management approaches.

- Trade-off between feasibility/effort and applicability to a wider range of benefits, decision-making and policies.

- Is # classes determined by ecological/biophysical differences or by services/decisions/policies? If latter not considered or not known, measure as many as possible.
  - Ecosystem classes are foundation for all future accounts – desired outcomes/policies change.

![Graph showing the relationship between number of ecosystem classes and services/decisions vs. feasibility.](image-url)
Forest (land cover) mapping led to tripling of protected areas in Madagascar
Hyperspectral ecosystem classification for Peru
Ecosystem classification for San Martin, Peru

Pre-colonization

Current

Boques
- Bosque Humedo de Colina Alta
- Bosque Humedo de Colina Baja y Lomada
- Bosque Humedo de Montana
- Bosque Humedo de Terraza Alta
- Bosque Humedo de Terraza Baja y Media

Herbazal
- Matorral Arbustivo
- Herbazal Hidrotrico

Pastizal
- Paramo y Pajonal Altoandino

Bosques Inundables y Cuerpos del Agua
- Bofedal
- Aguajale
- Cuerpos del Agua

Ecosistemas Modificados
- Ecosistemas Modificados
Economic values of palm swamp

- Water provisioning
- Bushmeat
- Firewood
- Fruits
- Biodiversity
Questions

• How does # classes influence applicability to high level policies, e.g., SDGs?

• How does # classes affect ability to monitor change in classes over time?

• Which variables are most important for classification? Vegetation?

• Bottom up vs top down? Should biology or ecosystem services determine classification?

• How does spatial scale affect # classes? More classes at smaller spatial scales?

• How does # classes affect aggregation for condition and services? After accounts completed, can always aggregate classes and services later, but to disaggregate, have to redo spatial analyses of services