CHAPTER 18

LAND COVER AND ECOSYSTEM CONDITION BREAKOUT SESSION REPORT

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Ecosystems are frequently defined as integrated systems of organisms interacting with their physical environment. They are also frequently characterized as scaleless, ranging in size from a particle of dirt (or smaller) to a boreal forest biome (or larger). Ecosystems provide goods (food, fuel, fiber, forage, etc.) and services (flood control, soil fertility, etc.) that are critical to human welfare. To ensure that these goods and services continue to benefit humankind, ecosystems must be managed so that they persist on the landscape and in the seascape. Ecosystem-based management has emerged as an increasingly important paradigm for sustainable development and is increasingly practiced in many government agencies throughout the world. Ecosystem-based management requires a knowledge of the types and distributions of ecosystems within the management area. It further requires a fundamental understanding of how these ecosystems are affected by changes in land cover and land use.

The Land Cover and Ecosystem Condition breakout group discussed the relationship between land cover and ecosystem condition. This discussion necessarily began with an attempt to distinguish between ecosystems, land cover, and vegetation, and an exploration of the spatial scale and classification resolution dimensions associated with defining ecosystems. The group reviewed a process for developing abiotic ecosystem footprints and combining these with land cover to develop unique physical environments and associated land cover as ecosystem occurrences. From

this discussion, the group developed a multi-tiered conceptual framework which characterizes the vegetation/land cover/ecosystems continuum at different spatial scales.

The group then discussed land cover monitoring as an indicator of ecosystem condition, and concluded with an assessment of the potential for developing a tri-national ecosystems and land cover assessment and monitoring initiative. The major conclusions from this working group effort are summarized, and subsequently elaborated, as follows:

1. Standardization of ecosystem concepts, e.g. ecosystem condition, is necessary.
2. A multi-tiered classification approach would best describe and distinguish differing levels of ecological classification.
3. A tri-national ecosystem classification and mapping initiative is needed and recommended.
4. Moreover, a tri-national initiative aimed at assessing these ecosystems, once mapped, is important from a monitoring perspective.
5. Ecosystem goods and services values are a societal priority, and should be developed as attributes of the ecosystem occurrences.

1. Clarification of key ecosystems concepts is necessary for both ecosystem science and ecosystem management.

There is a strong need to come to a common understanding about what is meant by ecosystems, ecosystem condition, ecosystem processes, and ecosystem goods and services. Ecosystems are increasingly advocated as a holistic approach to sustainable development, and are increasingly described in the popular press. Ecosystems, and threats to ecosystems in particular, are rapidly becoming a mainstream societal concern. As such, there is a strong need for the scientific and resource management communities to come to a clear, shared understanding of key ecosystem concepts. Moreover, there is a need for standardized, robust, practical ecosystem classifications and maps.

2. Ecosystems are appropriately conceptualized as meso-scale landscape and seascape entities, intermediate between relatively macro-scaled land cover types, and relatively micro-scaled vegetation units.

Land cover, the (bio)physical cover of the earth's surface, is commonly identified from remotely-sensed imagery, and is generally described globally with fewer than 20 classes. These classes describe biome-level entities such as tropical moist forests, dry grasslands, deserts and xeric shrublands, etc. Vegetation, on the other hand, is often defined at a much finer spatial and classification resolution, using knowledge of the structure and composition of plant communities, usually at local (site) scales. Ecosystem scientists have been historically reluctant to classify and map ecosystems at intermediate scales, primarily because ecosystems are widely recognized as "scaleless" (multi-scaled). We propose that ecosystems be classified and mapped at an intermediate, meso-scale, and placed in a multi-tiered conceptual framework between coarse scale land cover, and fine scale vegetation:

Coarse scales: Land Cover, Ecoregions

Medium scales: Ecosystems

Fine scales: Vegetation

3. We propose a collaboration between Mexican, Canadian, and US federal agencies, NGOs and scientific communities to develop a tri-national, standardized classification and map of meso-scale ecosystems.

The lack of standardized, consistent, management-appropriate scale ecosystem classifications and maps for any of the three countries is problematic. We recognize that there are several ecoregionalizations of North America, and that these all subdivide the continent into very-large, ecologically meaningful planning areas. These ecoregions tend to be very useful for regional-scale planning and assessments, but are generally too coarse for local management applications. We advocate the development of a robust, standardized, practical, meso-scale North American

Ecosystems Classification and Map, seamless and consistent across borders.

4. We propose that this tri-national map of ecosystems be used as the basis for a standardized, continental ecosystem monitoring effort.

Once mapped, we advocate the use of this standardized North America Ecosystems product as the basis for a continental effort to regularly assess ecosystem condition. Many of the physical features that define ecosystems on-the-ground (lithology, elevation, and landform) are enduring physical features of the environment which are not expected to change dramatically. The components of ecosystems that are likely to change are the biota (vegetation and species), and the climate. Changes in vegetation can be characterized using remotely-sensed imagery, highlighting an important monitoring relationship between land cover and ecosystem condition. A tri-national land cover and ecosystems monitoring effort, using standardized classifications, maps, source imagery, and methodological approaches, would represent a highly advanced and societally relevant collaboration between the three nations.

5. Ecosystem goods and services values are a societal priority, and should be developed as attributes of the ecosystem occurrences.

Finally, ecosystems are critical to maintaining human societies because of the value of the ecosystem goods and services they produce. While the science and practice of economic and societal valuation of ecosystem goods and services is still in its infancy, there is little question that these values should be attributed to the ecosystem polygon occurrences in a spatially explicit framework. This level of detail will permit assessments of ecosystem goods and services for any geography of interest at scales ranging from local areas to the entire continent.

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