

Conceptual Model

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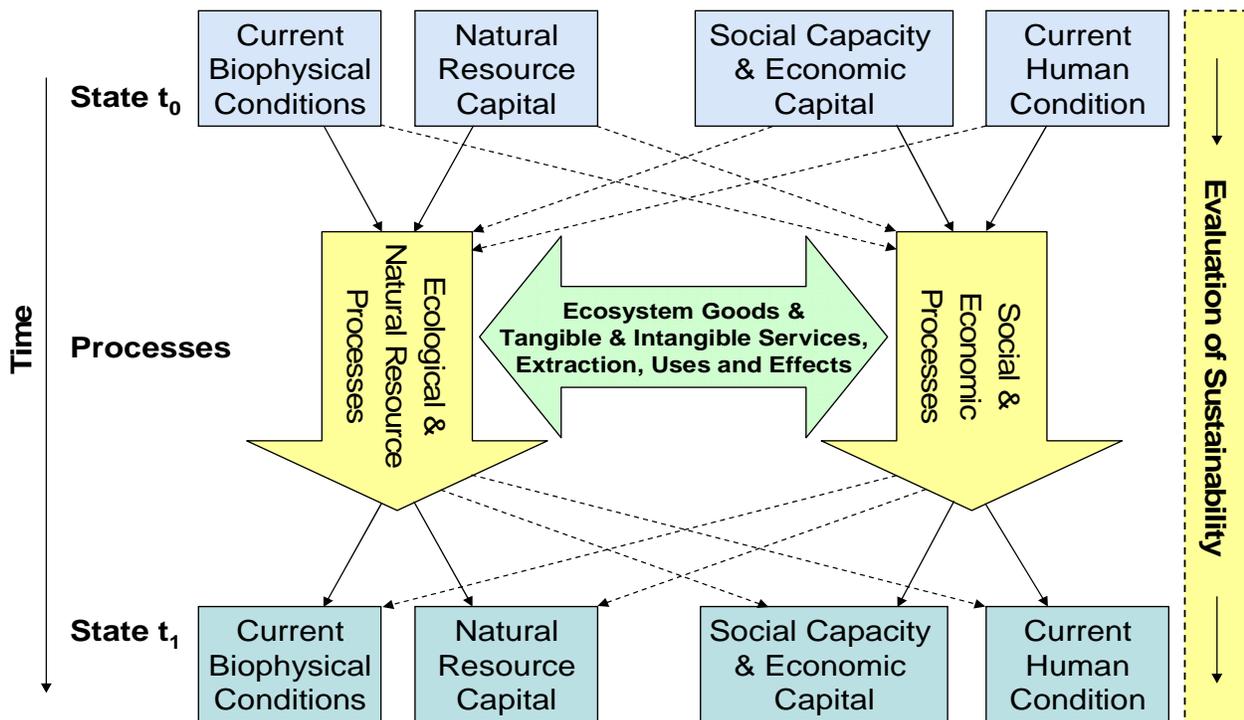


Figure 1. Tier 1 Rangeland Sustainability Evaluation Framework

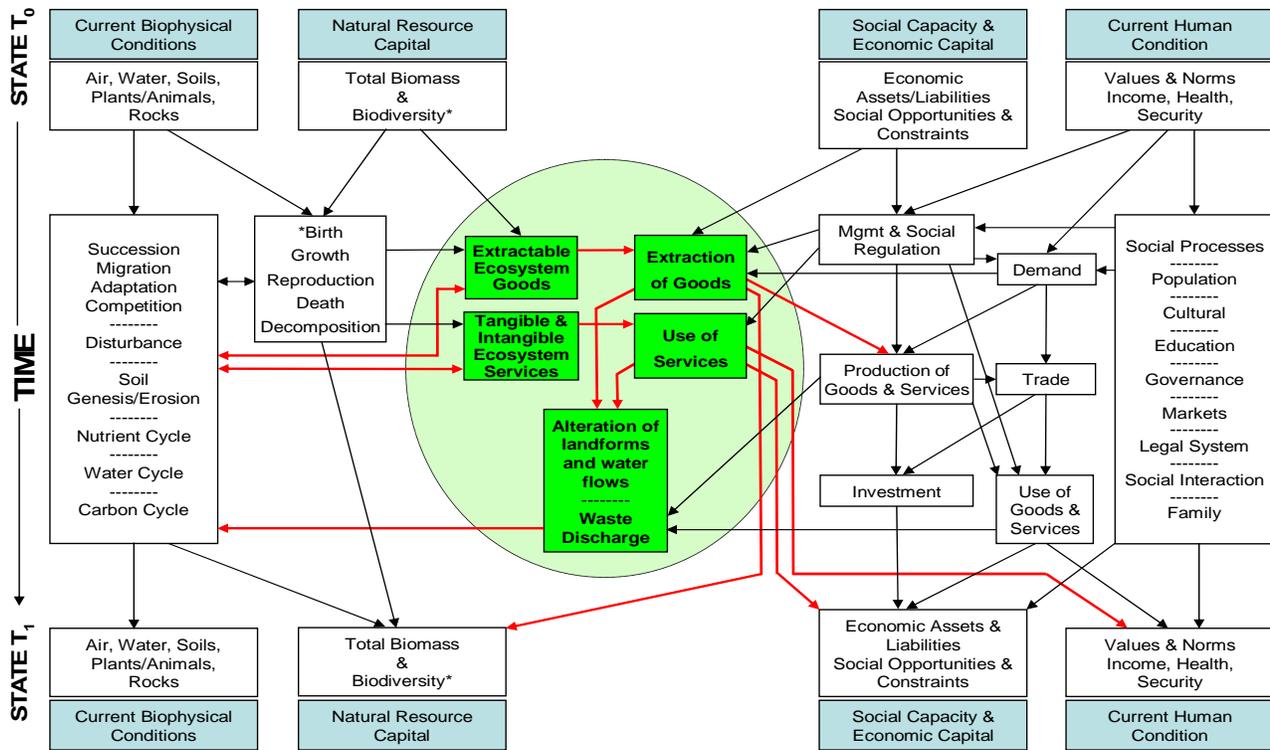
SRR CONCEPTUAL MODEL

Ecosystem services serve as the primary bridge between the ecological and social/economic sides of SRR's conceptual model. SRR participants developed the model as a framework for testing whether their indicators for rangeland monitoring and assessment adequately tracked interactions among rangeland resources and human communities that depend upon rangelands for their well-being.

Humans extract and use natural resources, affecting biophysical conditions and natural resource stocks. In the process of extracting, processing, and using those resources, wastes are generated and discharged. Other, sometimes less apparent, ecosystem goods and services are used by humans to support and sustain life at many

levels. One set of such ecosystem services involves detoxifying and decomposing waste discharges. Other ecosystem services include: climate regulation, soil formation, and biodiversity, among many others.

Integration of ecological and social/economic factors is introduced into the model as the horizontal arrow linking "ecological & natural resource processes" and "social & economic processes." This recognizes that ecological and natural resource processes affect and are affected by social and economic capital stocks, capacities, conditions, and processes. As indicated in Figure 1, the model assumes that those interactions occur by way of extraction of resources and resource services, waste discharge, and ecosystem services.



*Indicates both Plant & Animal

Figure 2. Tier 2 Framework – Rangeland Example

Ecological systems and processes provide the biological interactions underlying ecosystem health and viability. Social and economic infrastructures and processes provide the framework or context in which rangeland use and management occurs and rangeland health improves or deteriorates. These systems and processes interact and feedback on one another over time and space. Focusing on just one aspect of rangeland use, management, and sustainability gives an incomplete picture. To adequately assess and monitor rangeland sustainability, an integration of ecologic, economic, and social perspectives is needed.

The challenge of viewing “whole” ecosystems is seldom fully addressed and requires the integration of bio-physical and socio-economic factors. How do they affect one another? Are assumptions of interrelatedness valid and can a suite(s) of indicators be developed to meet those assumptions? Issues associated with the complexity of sustainable development are not singularly constrained within ecological, economic or social paradigms, but instead must be integrated across all three. Interacting human and ecological systems are complex with multiple feedback loops. Traditionally, attempts to integrate disciplinary paradigms have ended with one or more being shortchanged. Development of a conceptual model to integrate across such systems must provide the flexibility to address change through both spatial and temporal scales.

With these considerations in mind, the Sustainable Rangelands Roundtable developed their conceptual model to depict social, economic, and ecological interactions associated with sustainability of rangeland ecosystem goods and services. In the broader view, Tier 1, (Figure 1), the ecosystem is categorized into: (1) Current Biophysical Conditions, (2) Natural Resource Capital, (3) Social Capacity & Economic Capital, and (4) Current Human Condition. The four types of states or conditions are acted upon by processes, represented by the large downward arrows. On the left side, there are ecological and natural resource processes including reproduction, growth, death, decomposition; and include water cycles, nutrient cycles, carbon cycles, succession, migration, adaptation, etc. On the right side are social and economic processes including, but not limited to demand, production, consumption, investment, depreciation, management, social regulation, social interaction, institutional processes, etc.

As diagramed in Tier 2 (Figure 2), the processes change the conditions and capitals existing at time t₀ and result in a new set of conditions and capitals at time t₁. Similarly, when the status of ecosystem goods and services is altered, potential uses and associated values of these services also change, subsequently modifying the status of socio-economic indicators. Use of ecosystem services, in turn, impacts both current human condition and social capacity/economic capital at time t₁.