Systems Thinking

a few notes by Jean MacGregor, Curriculum for the Bioregion Initiative

Some Questions that Ask Us to Consider the Relationships among Systems

- What are the main leverage points for affecting Puget Sound's wellbeing?
- What are ethical foods to eat in the Puget Sound bioregion?
- How can Puget Sound area residents prepare for more expensive gasoline?
- What are the ramifications of selling U.S. coal to China and India? What could be the benefits and the losses to peoples, cultures, landscapes, and the biosphere?

Why Systems Thinking?

In the recent decades of focus on thinking skills in education, systems thinking has only recently begun to be mentioned. Rather, the emphasis has been on rationalistic, analytical, and scientific thinking. That is beginning to change, …for example in AACU's "LEAP" Report (http://www.aacu.org/leap/) where the learning outcome of "integrative thinking" is given prominence.

Sustainability educators argue that systems thinking (a.k.a. relational thinking, integrative thinking, or ecological thinking) is essential for understanding and addressing the highly complex and interconnected problems of the 21st century.

Systems Thinking Standards are a Key Component of the Washington State K12 Environmental and Sustainability Education Standards

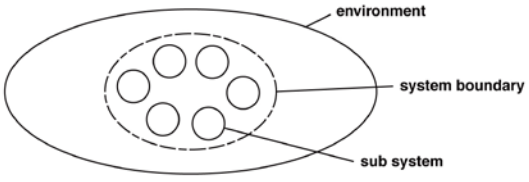
- Standard 1: "An essential element of sustainability is the interconnected nature of ecological, economic, and social systems."
- Standard 2: "'Systems thinking' is an approach to problem-solving that facilitates the analysis and understanding of complex phenomena. This approach considers the component parts of a system in the context of relationships with each other and other systems, rather than in isolation."

Systems Thinking asks Us…

- to look for *connections* between things
- to look at the '*big picture*'
- to look for *consequences* of actions or plans
- to think about the *long term*, as well as the *short term*
- to examine the nature and consequences of *relationships*
- to expect *non-linear* behavior of variables.

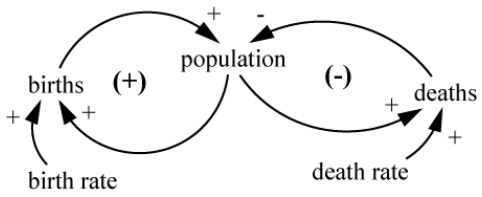
Some Systems Thinking Concepts (drawn from Meadows' *Thinking In Systems,* cited on the following page)

A *system* is an interconnected set of elements that is coherently organized in a way that achieves something. A system has elements, interconnections, and a function or purpose.



Dynamics: the behavior over time of a system or any of its components.

Feedback Loop: A link whereby an effect is fed back to a system and influences the behavior of the system. These loops are often characterized as either "positive" or "negative" feedback loops. Negative feedback loops are inherently stabilizing for a system; positive feedback loops are inherently destabilizing for a system.



Nonlinear relationship: a relationship between two elements in a system where the cause does not produce a proportional (straight-line) effect.

Resilience: the ability of a system to recover from perturbation; the ability to restore or repair or bounce back after a change due to an outside force.

Stock: An accumulation of material or information that has built up in a system over time.
And, *Flow:* Material or information that enters or leaves a stock over a period of time.

Synergy: The interaction of two or more components to produce an effect which is greater than the sum of the parts. Resulting synergies may be "positive" (healthy), neutral, or "negative" (dysfunctional).

Systems citizen: a term coined by Barry Richmond. Systems citizens view themselves as members of a global community. They strive to understand the complexities of today's worldly systems and have the ability to tackle problems with an informed capacity to make a positive difference. (Richmond et al, 2010)

Some Systems Thinking Resources

Ford, Andrew. *Modeling the Environment.* Island Press, 2009.

Meadows, Donella H. Ed. By Diana Wright. *Thinking in Systems: A Primer.* Sustainability Institute, 2008.

Richmond, Joy, and Lees Stuntz, Kathy Richmond, and Joanne Egner, Eds. *Tracing Connections: Voices of Systems Thinkers.* isee systems, inc. and The Creative Learning Exchange, 2010.

Senge, Peter et al. *The Necessary Revolution: How Individuals and Organizations are Working Together to Create a Sustainable World.* Doubleday, 2008.

Sterling, Stephen, et al. *LinkingThinking: New Perspectives on Thinking and Learning for Sustainability.* World Wildlife Fund Scotland. This can easily be found online. Search on the term, "linkingthinking."