Lesson Week 7 – Probing the Boundaries Question

Attention to the boundaries of our thinking about a situation is central to how systems thinking (ST) differs from, and improves on, conventional thinking. As such, the issue of boundaries merits another look, and is the object of this lesson. The importance of boundaries in developing mental models of situations rests on two principles.

First, the rationale for trying to see the 'big picture' stems from the premise that we inhabit a world of nested systems – that is – a world of systemic connections at increasing levels of scale. From that perspective, it seems important to explore larger wholes in our search for causes of problems. The relevant model building procedure in exploring larger wholes is to follow the rule of Occam's Razor: build a model that is big enough to capture all the variables that you think are most relevant to the situation, but no bigger.

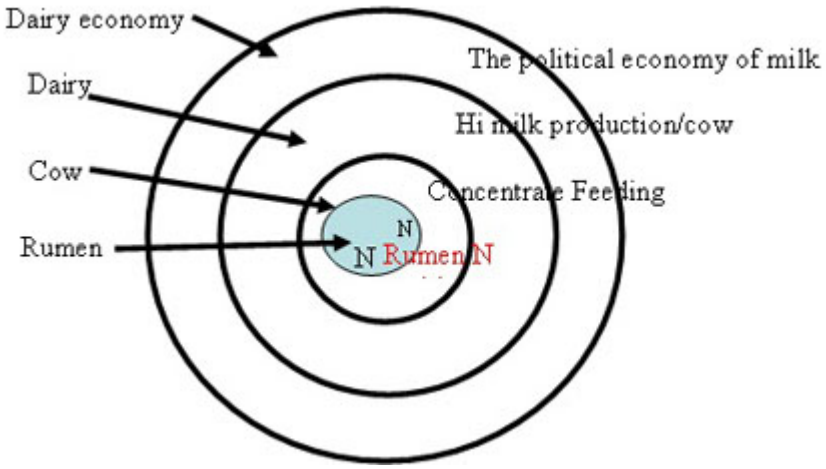
Second, the ST approach is often described as a 'system-as-cause' worldview, as expressed in Pogo's maxim, "We have met the enemy and he is us." In my reading, that slogan tells us that although people may be responsible for creating a system that is causing problems, it is the system structure that must be the objective of intervention or change, rather than merely laying blame. It is not enough to simply change the players, as in a palace revolution or a new administration in a two party system in which both parties are loyal to the system as it is, or beholden to the same vested interests.

The focus on system structure does not mean that human responsibility is unimportant. Usually the way a system is structured serves the interest of specific groups. We need to ask "who benefits" from a particular system structure, using an analytical tool that has stood the test of time so well that it is often expressed in the original latin – "cui bono". If a change in system structure is necessary to solve a problem, it is important to identify those groups who have a vested interest in keeping things the way they are. That is part of the process of tracing back to root causes.

Pushing the Boundaries Meets Policy Resistance

In week 3 you saw many examples of the characteristic of complex systems to resist change. This so-called policy resistance is greater the larger the whole that is affected. Here is an example of built-in institutional resistance to expanding the boundaries of a problem to consider larger wholes.

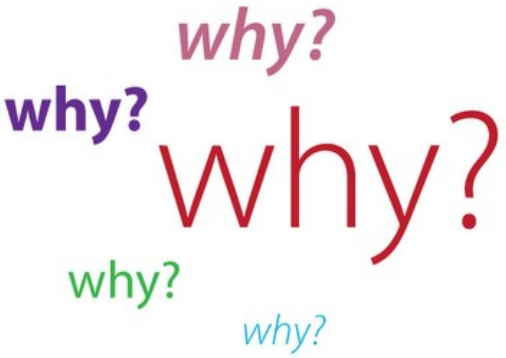
In the lesson in week 5 I described a research project in a large agricultural school to find a solution to the excess nitrogen excretion problem in the high production dairy cow. It is a problem because the inability of the cow to absorb the nitrogen and convert it to protein wastes the expensive cattle feed. Worse, the excreted nitrogen becomes a major agricultural pollutant of waterways. The scientists focused only on the cow's stomach, experimenting to find ways to increase N absorption. The way this project was done may provide an example of potential hidden vested interests that might explain why the research project did not explore causality in larger wholes.



In a state whose main agricultural product is milk, breeding a cow that doubled milk production was viewed as a crowning achievement of the school's agricultural research program. Hence few dared to ask why it was important to breed such a cow. This taboo was enforced despite the fact that excess nitrogen excretion was only one of a constellation of ancillary problems to the cow's health created as a consequence of genetically altering a cow for enormous milk production. In the language of conventional thinking problems like these are typically dismissed as "side effects". As a result of all these effects, the life span of this monster cow breed averages less than two lactations.

Moreover, the widespread use of the cow did not achieve its proclaimed goal of keeping dairy farmers in business. Attrition and consolidation in the dairy industry proceeds apace. A focus on an even larger whole – the dairy industry structure – reveals that the main beneficiary of the high production milk cow is the agribusiness monopolies that control the industry. But since the agricultural school relies heavily on big agribusiness corporations for research funding, this avenue of inquiry was taboo as well.

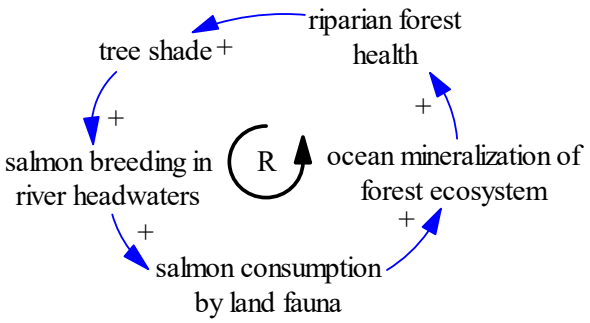
It should be clear from this example that the ST method of looking for causes in larger wholes can yield subversive revelations. Because human decision making now impacts most all environments on the planet, the Senge method of repeatedly asking "Why is that?" often leads to scrutiny of the structures of interlocking economic and political power that govern decision making in social systems. A field of science formally known as political economy, this area of inquiry makes regular use of the question "cui bono".



The Ecosystem as Model Boundary

In the northwest coastal forest of North America, a wet climate insures strongly flowing rivers. To meet growing demand for electricity, developers built dams to capture the energy in the rivers as hydro-electric power. In their mental model the main function of the rivers was to provide energy. However, as the Northwest ecosystem evolved, it had self-organized over thousands of millennia so that rivers serve numerous functions. These functions involve a number of players/stakeholders.

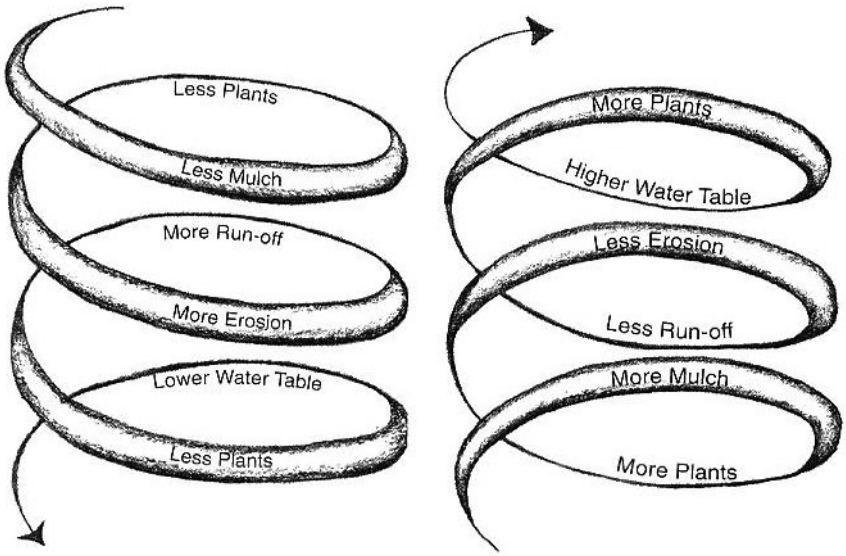
The world's rivers are the conduit for the constant loss of minerals from the land to the sea. In the case of the Northwest, the heavy rainfall increases mineral loss. Nevertheless the rivers perform an ingenious mineral recycling function, but only if the salmon can swim to the headwaters to spawn. For the salmon are the carriers of the minerals back to the land. All along the way, bears and other animals feed on the salmon and distribute its mineral content throughout the forest land. Riverside trees in particular benefit; their shade improves salmon breeding. We can model the resultant reinforcing feedback as a causal loop diagram.



Because the dam developers failed to expand the boundary of their understanding of river functions, the whole Northwest forest suffers as the mineral cycle, an essential ecosystem process, is weakened. Because of the river dams a decline in salmon breeding leads to a downward spiral of decline in all the variables in the feedback loop. If something were to cause an increase in salmon breeding (or in any variable in the loop) the effect would be an upward spiral of growth in all variables, another characteristic of reinforcing feedback. While this model explains only one driver of behavior in the Northwest forest ecosystem, it may well be a significant one because of its ripple effects.

Conclusion

Systems thinking's approach to boundaries in the search for understanding inevitably leads one across disciplinary boundaries. We need to keep asking the classic questions - "And What Causes That?" and "Who Benefits?" (cui bono), to expand the boundaries of inquiry. Too much concentration on specialist training vs. general, transdisciplinary knowledge is therefore a handicap to good systems thinking. Its 'macroscopic' approach to boundaries reveals reinforcing feedback loops in all complex systems. They come in many forms.



The downward spiral of erosion can reverse to become an upward spiral of healing.

Assigned Video

http://insightmaker.com/insight/3365

This presentation introduces **The Essence of And?**. Like Senge's tool, **The Five Whys?**, it is another way of questioning the boundaries when building a model of a situation.