# Inductive Inquiry in Our Terabyte Playground

Part 1: Inductive Inquiry

➤ Pick a "continental scale driver" of ecosystem level response of interest to you (see page 2 for further explanation),

➤ Form an hypothesis: "driver X causes measurable response Y" (see template in Ebert-May 2004 on page 2),

➤ Select a site or set of sites from among those with data (see dots and web sites of date sets in figure),

➤ Go to the web and get the data,

➤ Plot the data (X, Y) in at least two different ways (coarse to fine) and ask if your hypothesis can reasonably explain any pattern(s) you see – include at least a first pass at a statistical test.

➤ Are there any other explanations?

Part 2: Process Reflection Questions

➤ Describe the process of actually getting the data you wanted to find. Did you easily find what you were looking for? If looking among different sites, what were some of the issues in getting to the relevant and comparable data among sites or across time?

➤ Did you find yourself modifying your hypothesis because even after searching you "settled" for what data you could find?

➤ Exactly, what navigational utilities, search engines, or summary "field guides" and tutorials would have been useful in facilitating your access and resolution of the pattern you sought to reveal?
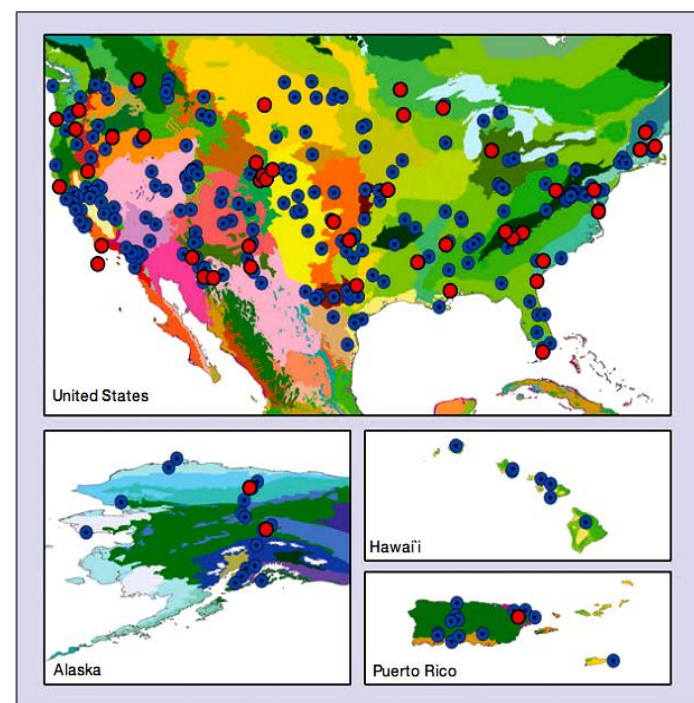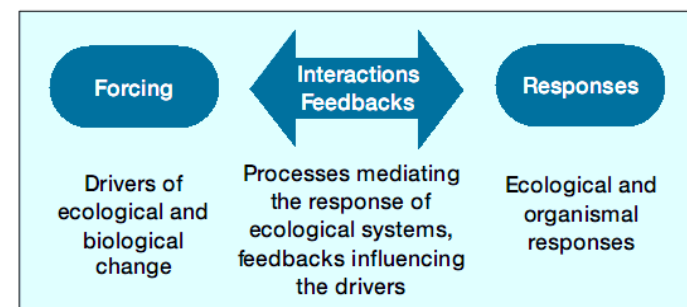

Figure 5. Location of > 250 existing ecological research sites in the continental US, Alaska, Hawai'i, and Puerto Rico on a map of ecoregions. Red dots indicate sites in the EcoTrends project of long-term data (www.ecotrends.info); blue and red dots indicate sites in the Pole-to-Pole Ecological Lattice of Sites project (www.p2erls.net). See www.worldwildlife.org for ecoregion legend. Underlying ecoregions map downloaded from www.worldwildlife.org/science/data/terreco.cfm.

Additional Notes:

Q – What is a "continental scale driver" of ecosystem level response?
A – According to Peters et al 2004,
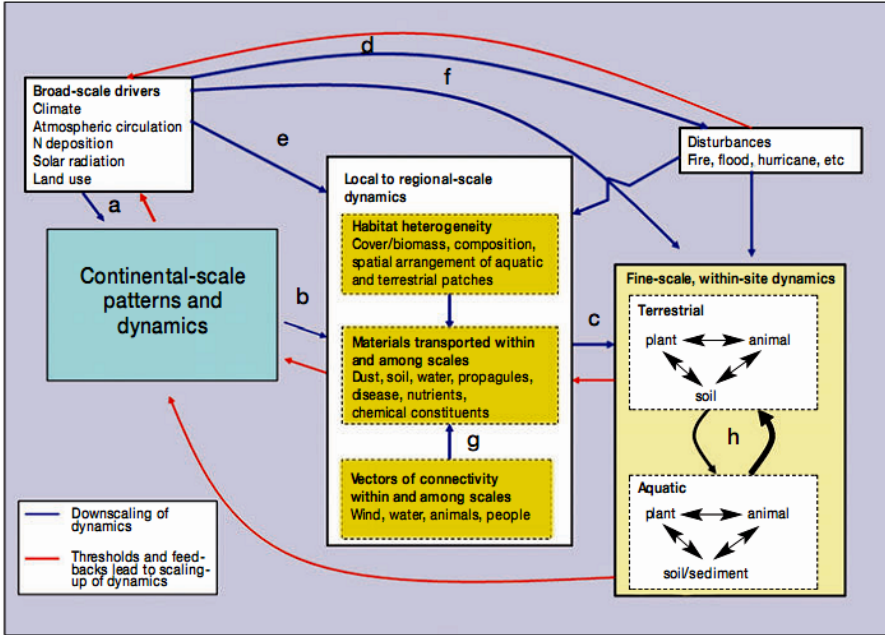
Figure 2. *Continental-scale patterns and dynamics result from climate and people as broad-scale drivers interacting with finer-scale vectors that redistribute materials within and among linked terrestrial and aquatic systems. Climate and land-use change interact with patterns and processes at multiple, finer scales (blue arrows). (a) These drivers can influence broad-scale patterns directly, and these constraints may act to overwhelm heterogeneity and processes at (b) meso-scales and at (c) the finer scale of local sites. Broad-scale drivers can also exert an indirect impact on broad-scale patterns through their interactions with disturbances, including (d) the spread of invasive species, (e) pattern–process relationships at meso-scales, or (f) at finer scales within a site. Connectivity imparted by the transfer of materials occurs both at (g) the meso-scale and at (h) finer scales within sites where terrestrial and aquatic systems are connected. These dynamics at fine scales can propagate to influence larger spatial extents (red arrows). Feedbacks occur throughout the system. The term "drivers" refers to both forcing functions that are part of the system and to external drivers.*
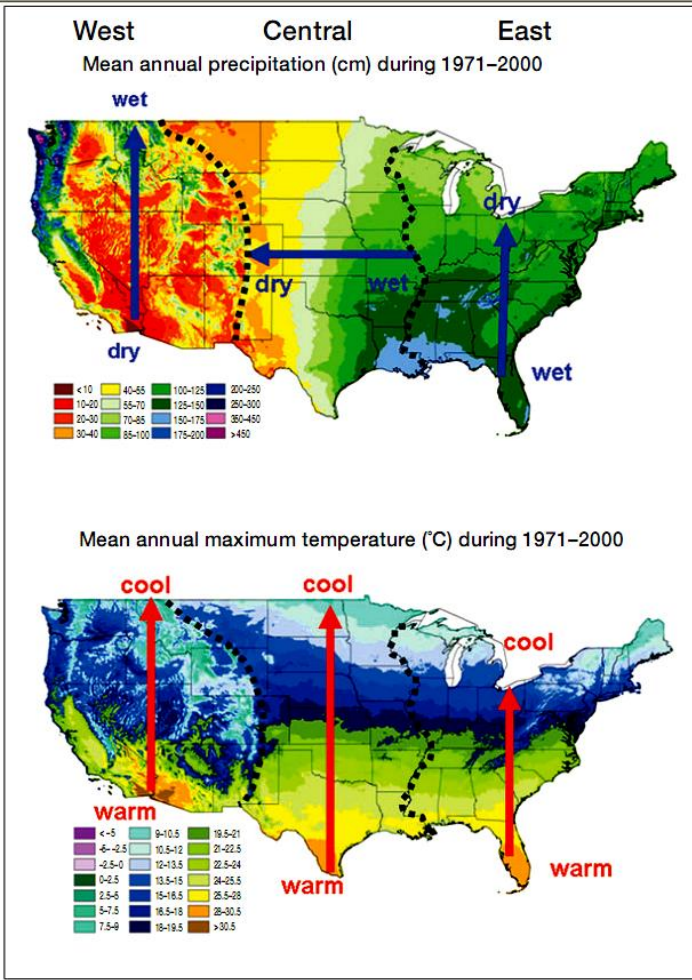
Figure 3. *The US can be divided into three general regions based on a combination of broad-scale patterns in (a) precipitation (annual total) and (b) annual maximum daily temperature. Shown are average annual values (1971–2000) from the PRISM model (http://prismclimate.org). Gradients for each climatic variable are shown in blue (precipitation) or red (temperature).*

For a nice template for this type of activity see

Diane Ebert-May, Kathy S Williams, Everett P Weber, Janet Hodder, and Douglas Luckie. November 2004. Practicing scientific inquiry: what are the rules? *Frontiers in Ecology and the Environment* 2(9): 492–493.