LTER ASM 2015 – Working Group Final Report
Trajectories of change in long-term experimental controls
August 31, 2015

This working group included a single, 2-hour session. Since this was the initial gathering on the topic, the primary goal was information exchange. The 41 participants came from a 12 LTER sites, plus the Swedish SITES (see participant list).

WG description: Scientists are accustomed to thinking about time trajectories in monitoring studies, but directional change in the control plots within experiments is often masked in analysis & presentation. There may be a potential pitfall of equating a control with steady-state, whereas succession, natural disturbances, and global change all conspire to shift the frame of reference over time. Are these controls out-of-control? How can we more effectively incorporate these dynamics into interpretation of long-term experiments? In this information exchange working group, examples will be presented from different types of experiments & LTER sites.

Organizer: Audrey Barker Plotkin
Co-organizer(s): Julia Jones; Alan Knapp; Melinda Smith

The session featured four, 15-minute presentations, followed by an open discussion.
4-4:10 Welcome & Introduce the goals of the session (Audrey)
4:10-4:30 Julia Jones – "out of control" controls in long-term paired watershed experiments (focus on AND)
4:30-4:50 Jesse Nippert – the control in disturbance-dependent ecosystems (focus on KNZ)
4:50-5:10 Donie Bret-Harte – increasing biomass in control plots at Toolik (focus on ARC)
5:10-5:30 Audrey Barker Plotkin – dynamics of the control in long-term forest disturbance simulations (focus on HFR)
5:30-6:00 Discussion

Highlights of the Discussion
Other examples:

- LUQ canopy trimming experiment (Zimmerman et al. 2014, FEM 332:64-74.
- CWT. Chelcy Ford Miniat. Coweeta. 1 – rates of change. 2. Timeseries analysis, get out of anova mode (e.g., Ford, C.R., Elliott, K.J., Clinton, B.D., Kloeppel, B.D., Vose, J.M., 2012. Forest dynamics following eastern hemlock mortality in the southern Appalachians. Oikos 121: 523-536)
- Streamflow/climate/land-use cross-site synthesis (e.g., Jones, J.A., Creed, I.F., Hatcher, K.L., Warren, R.J., Adams, M.B., Benson, M.H. Boose, E., Brown, W.A. Campbell, J.L., Covich, A., Clow, D.W., Dahm , C.N., Elder, K., Ford, C.R., Grimm , N.B., Henshaw, D.L., Larson, K.L., Miles, E.S., Miles, K.M., Sebestyen, S.D., Spargo, A.T., Stone, A.B., Vose, J.M., Williams, M.W., 2012. Ecosystem Processes and Human Influences Regulate Streamflow Response to Climate Change at LTER Sites. BioScience. Vol. 62)
- HBR - John Campbell notes there are many good examples (e.g. 1998 ice storm, watershed trajectories)

Discussion of better analysis techniques: With non-stationary controls or long-running experiments, better options than traditional ANOVA might include

- Before-After-Control-Impact (last publication on its use in ecology was in 2001)
- Use state space modeling , which have an underlying process model (e.g. set of equations for what succession looks like)
- Time-series analysis
- Is change per year always the best denominator? What about comparison among sites with 'lifespan of dominant species' as the time demoninator?

Possible follow-ups

Synthesis paper with examples highlighting

- Constructive guidance – change in controls is not a problem; rather, it is an opportunity (e.g., in paired watershed studies or other experiments, don't shut down when there is a disturbance in the control/reference site)
- Showcase analytical tools

Follow-up phone discussion 11 September (Barker Plotkin, Bret-Harte, Jones, Knapp, Nippert, Smith)

We are considering writing a paper on the theme of:
'Long-term studies & the shifting baseline: coming out of the closet' (working title!)

Highlight how long-term ecological data allow us to detect shifting baseline. Detecting change in baselines a core piece of what LTER is meant to do, but in wider ecological world, it is under-appreciated.

Central question: how do we detect change? What is the baseline/reference/control against which change is measured? This can encompass experimental and observational designs.

Shifting baseline can include: climate, disturbance regime, forest succession, 'catastrophic' events that occur in long-term studies (chances of disturbance increase with study longevity) - We all have encountered this and transformed challenge into opportunity.

We decided to develop a short survey to send to all LTER sites, to get a broad idea of what is viewed as a control. We'd like to engage terrestrial, coastal/marine, and urban sites. To get all LTER sites to play, begin with the broad question, '**how do we detect change?'** b/c some sites have experiments, but at others experiments are virtually impossible.

Survey logistics: 1) use Survey Monkey; 2) send to PIs and ask them to forward to at least one terrestrial ecologist & one aquatic ecologist at the site who is suited to answer.

As part of a paper, we discussed including also some classic textbook examples that sidestep shifting baselines (e.g. lynx/hare data used to illustrate population dynamics). A broad literature survey would be interesting, but difficult to focus.

A focus on analytic techniques is less the central interest of this group, though this could be another direction for a group that includes ecologists who focus on stats techniques.