The Andrews Forest is a 16,000 acre, single watershed within the Willamette National Forest in the Oregon Cascades, old-growth PNW forest, also USFS experimental forest (est. 1948), so different forest management regimes and legacies as well.

Our one bit of burning news is that we had a large disturbance event in late Feb., where a lot of really wet snow fell quickly and brought down thousands of trees – mainly second growth.

LTER and the ecology of surprise

A dominant feature of our long-term work falls under the heading of surprise which seem to come in 2 types: Type 1 are surprises or amazement about how our system works, and Type 2 are surprises where we thought something was X and it turned out to be Y, or that theory suggests one thing and over time we see quite another..

<u>Just a few examples of surprises in the past 10 years:</u>
The legacy of human impact. The conversion of old forests to plantations produced summer low flow deficits that have lasted from 25-45+ years. This was type 2 because prior work and “theory" predicted so-called “hydrologic recovery,” i.e., the system should return to its prior state which underpinned justifications for harvesting old forests in certain ways. This finding was only possible because we maintained long-term experiments established in the 1950s.

A warming world. The air temperature warming signal under the old-growth forest is largely limited to daytime in summer. This was a surprise because theory (and observations elsewhere) predicts that temperature would warm at night and during winter. The explanation appears to be cold air drainage and pooling, not previously considered to influence long-term temperature. We know this because we have long-term air temperature measurements in old-growth forest stands.

Challenging dogma. The belief that larger trees grow more slowly than smaller trees underpins the belief that converting older stands to younger stands increases growth – that old forest are decadent. Data from long-term measurements shows, however, that as trees become larger, they grow faster and faster on average. We see this pattern only because we have long-term data.

Just a few examples of surprises in the past 40 years:
Response to disturbance. Fish populations increased after a major flood disturbance in 1996. It was expected that disturbance would reduce populations. At the same time, we are seeing diminishing body size of fish and salamanders over decades: in fact, all sizes are shrinking, but larger (older) animals are experiencing this at faster rates.

Fire regime. Theory and practice presumed that high-severity, stand-replacement fire was the dominant fire regime in the PNW. But instead, the fire regime turns out to be mixed-severity, responding to variation in the landscape. In short, there's far more complexity in this part of the Cascades than previously believed. This work also helped illustrate why clearcutting is not a good emulation of natural disturbance processes as some had suggested.

Governance and influence. We had the opportunity to make a big impact on regional forest policy during the "old-growth wars" of the 1980s and 90s. We hadn't expected this or set up studies with this in mind, and we certainly hadn't expected that that policy would change so dramatically. The science we were doing collided with changing public values to create dramatic change. Without our long-term research and research community there's little reason to think we would have had influence.

Surprise, amazement, wonder are not only powerful scientific discoveries, but they are normatively loaded as well, and in 2 ways. First, surprise, amazement, wonder evoke the response "wow"; which is deeply positively value laden. We seldom go from "wow, that's amazing" to "we should destroy that."

Second, in general what we often see in our work are theories that assume or predict more homogeneity in time and space than is really there, or that is seen over the long haul – the result of this should not only be surprise, but also humility – an ethical response, a virtue, a character trait, and it is the opposite of humility which arguably sits at the core of our environmental problems. LTER's ability to contribute humility to a humility-limited system though its science might arguably be one of its greatest contributions.