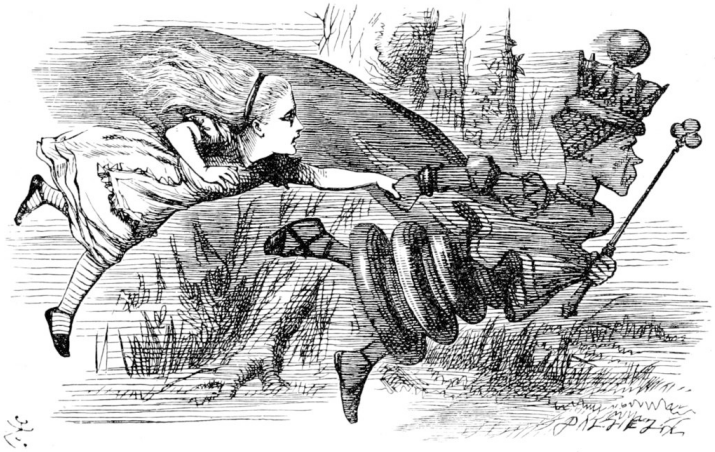
Appalachian
Landscape Conservation Cooperative

Landscape Dynamics Assessment Tool (LanDAT)

LanDAT delivers monitoring information in a way that helps users interpret landscape-change and resilience



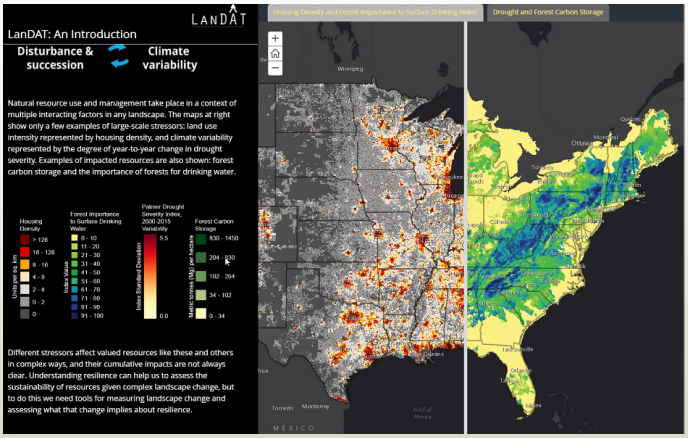
What is LanDAT?

From the back-end, LanDAT is a set of analytical methods, but from the user 'front-end' LanDAT is a series of online spatial data products – maps, graphs, values of key metrics, and more—which can be used to assess and visualize vegetation change and landscape dynamics. LanDAT offers key resources for assessing and interpreting landscape change and resilience to aid natural resource managers, planners, and analysts in integrating assessments of ecosystem services and stressors in their efforts both locally and regionally.

For example, how do the annual cycles of "greenness" in a normal year vary from the years following damaging wind-throw (due to hurricanes or pest infestations) and the slow die-off of trees? As a regional or landscape conservation planner identifies areas to invest limited conservation dollars, how do they know the area or region is stable, rebounding, or declining? Trends in these sorts of measures of forest dynamics help to indicate such larger trends, and thus inform conservation investments as well as actions.

Was the Red Queen right?

In Lewis Carroll's classic tale *Through The Looking Glass,* the Red Queen explains to Alice that, *"it takes all the running you can do to keep in the same place."* For decades, ecologists and evolutionary biologists have used this idea—that change may be required to stay the same—to explain the dynamics of coevolution and ecosystem dynamics. It's the perfect way to express the dynamic nature of healthy, and thus resilient, ecosystems. Natural systems wax-and-wane, but rebound as they face dynamic changes due to natural disasters, periods of pest outbreaks, changes in species composition due to migration, or in response to changing climate patterns. But with this constant change, how are natural resource and land conservation planners to manage natural systems— especially those at large landscape-scale, which are also influenced by more rapid and dramatic human land-use changes? There is now a new tool called ***"LanDAT"*** (Landscape Dynamics Assessment Tool) to help.

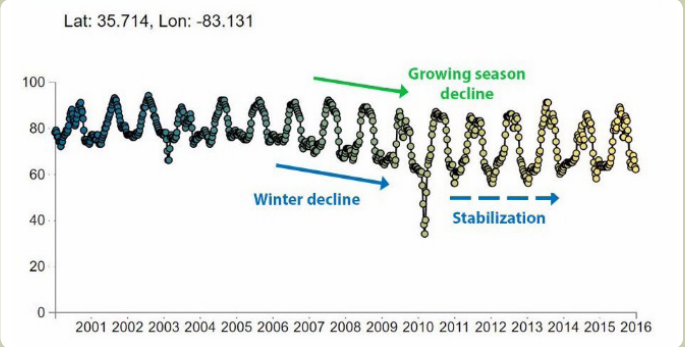


LanDAT can help users monitor landscapes through more than 15 years of satellite observations, including metrics, such as the long-term trend in vegetation greenness (top), and the degree of inter-annual variability (bottom). Map layers can be used for evaluating any land unit in the continental United States.

Why is that important?

The capacity of landscapes to provide various kinds of ecosystem services is sensitive to the dynamics of ecosystem stressors, uses, productivity, and management. Although land management objectives, social values, and ecological realities differ from place to place—all lands face threats stemming from disturbances such as urbanization, climate change, and wildland fire. Consequently, many treasured places are changing, or can expect to change noticeably over the coming decades. Multiple initiatives at state, regional, and national levels strive to restore and maintain resilient landscapes and adaptable communities. However, judging progress towards goals requires a rigorous way to assess and monitor landscape resilience through time, and assess its consequences for ecosystem service sustainability (e.g., forest carbon storage, wildlife

habitat, clean water). Because of this, environmental decision-making is aided by understanding landscape-level ecosystem change, impacts of large-scale stressors, and ecosystem resilience. The goal of large-scale and long-term conservation planning is to *'stay ahead of the game'.*



The impact of the invasive Hemlock Woolly Adelgid, which has caused widespread mortality in evergreen Hemlock trees, is shown by a gradual decline in NDVI (measures mean growing season greenness), particularly in winter months when the evergreen NDVI component prevails.

How do we 'stay ahead of the game' …

or in terms of the Red Queen hypothesis, how can we "run ahead" to regain stability? Monitoring forests, grasslands and other natural landscapes is a way to stay ahead of threats and assess progress towards conservation goals. LanDAT offers a unique glimpse into the trends of regional areas based on satellite-data assembled over the past 15-years. The 'signature' of natural systems recovering following disturbance is already visible, as are those in decline.

A suite of decision-support tools

LanDAT is one of a suite of tools now available to help conservationists, land managers, stewards of natural and cultural importance. The goal: to identify and invest in, areas rich in resources or serving as critical in connecting and creating an integrated and connected landscape. Investment represents both financial as well as action. For those in the Appalachians, LanDAT was a jointly funded effort that compliments the other science investments.

FUTURE

NatureScape
Prioritization tool to achieve future landscape conservation

CURRENT

Report Card
Current assessment of ecological health

PAST

Landscape Dynamic Assessment Tool: LanDAT
Focuses on historical change and trends

NatureScape offers a possible ***future*** design – one that balances the competing interests and demands due to human land-use that represent major stressors to sustainable investments such as urbanization, energy development, and change in climate. It helps direct the conversation to engage local stakeholder and potential partners to safeguard resources and ensure healthy ecosystems, given competing needs to meet future human demands.

"Where's the 'best bet' to invest"?

LanDAT helps to identify ***past*** disturbance and change events and the response trends (i.e., is the recovery, decline, or stable) as one indicator of health and resilience of natural forested systems across the region. More than 62% of the Appalachian geography is forested. In fact, the design of this tool by Forest Service researchers has been part of a National-level assessment, thus offering an even broader predictor.

"Given the patterns of change…are trends favorable for that investment?"

Report Card captures ***present*** status, but represents not only the natural terrestrial and aquatic habitats, but also represents the sort of things people value such as access to clean water, natural scenic area, and recreational opportunities and associated economic benefits.
But moving forward to apply the science will require a focal area approach. To refrain the adage, as in politics, all decisions are local. Thus, the Appalachian partners chose to invest in developing a local Report Card for the Tennessee River Basin. The question LanDAT can support is: Given targeted investment, is an area or system stable or on a recovery trajectory, or is it likely to decline over time given the stressors and frequency of insults? In essence, is it a wise investment?

"How can our work reflect the values of local communities?"

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