

## **Wickland's Comments for Media Event How Ecosystems are Changing**

### **Introduction**

Hello to everyone – and thank you for joining us today in conjunction with a workshop focused on NASA's carbon cycle and ecosystems research. It is a pleasure to be with you this afternoon to throw a spotlight on significant, recent research developments concerning ecosystem change.

NASA's remote sensing research has documented and explained many types of changes on planet Earth. The agency has informed the public of compelling evidence for global climate change through past media activities. Today, we are joined by several distinguished researchers who will describe how they are using remote sensing tools and data to evaluate the responses of Earth's ecosystems, and the communities of plants and animals that are part of these ecosystems, to climatic change and other changes brought about by human activities. Today's panel will highlight, for example, how changes in temperature, land use and management, and the addition of non-native, "invasive" species are changing ecosystems around the world.

Over a decade ago NASA researchers first documented a lengthening growing season for plants at latitudes above 45 degrees in the Northern Hemisphere using measurements of the green color of vegetation from weather satellites. Soon thereafter, researchers observing the color of the ocean with the SeaWiFS sensor began to discover and document great variability in the ocean's plant communities across seasons, years and regions of the world.

Today, we are extending these satellite observational records and deriving ever more quantitative information from them. We are also investigating other types of changes and consequences using satellites capable of measuring additional properties of the Earth's surface (beyond the simple measures of the color of the ocean and the "greenness" of vegetation). We are also exploring the potential of new types of observations using experimental airborne sensors.

Results from four research projects will be presented during today's briefing. They illustrate the types of ecosystem studies currently being conducted using remote sensing technologies and are examples of some of our more exciting and important results.

I now would like to introduce our four Panelists:

Kevin Arrigo, associate professor and director, Graduate Program in Earth, Energy, and Environmental Sciences, Stanford University, Stanford, Calif.

Alfredo Huete, professor, Department of Soil, Water and Environmental Science, University of Arizona, Tucson

Jorge L. Sarmiento, professor of geosciences and director, Atmospheric and Oceanic Sciences Program, Princeton University, Princeton, N.J.

Gregory Asner, assistant professor, Department of Global Ecology, Carnegie Institution, Stanford University, Stanford, Calif. who is presently in southern Africa leading an airborne remote sensing campaign and is joining us via satellite phone.

## **Summary**

It is evident in all of these studies that Earth's ecosystems are being impacted by climate change and related human activities. Ecosystem responses include changes in the composition and health of their plants and animals and where they reside on Planet Earth. Some of these changes impact an ecosystems' ability to provide goods and services for people, for example fishery and agricultural productivity and climatic regulation.

NASA satellite observations have revealed global patterns of ecosystem change and further analysis of the observations has yielded surprises regarding the timing, locations, and types of responses. Often, changes in productivity and carbon storage lead to changes in species which then cause changes in ecosystem function that lead to further change and that can "feedback" to affect climate. Future research will need to focus on including these multiple and interacting factors of change and response. Planned new satellite observations of vegetation 3-dimensional structure and indicators of physiological function, to be discussed at our workshop, will enable such approaches.

For your reference, we have prepared 1-page summaries of these projects as well as 3 other projects working on related issues of ecosystem change that will not be presented by today's panel.