Using science for agricultural adaptation in the Pacific Northwest

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The mission of REACCH is "climate science Pacific Northwest farmers can use." However, extending climate change research to farmers and land managers in order to support meaningful action is a serious challenge. Unlike many traditional problems addressed in agricultural research, where experiments and analysis lead to tangible management recommendations or technologies, climate change research generally delivers much more abstract insights about an uncertain future. For instance, although a breeder can easily recommend a wheat variety that shows disease resistance, our climate change studies report that Pacific Northwest (PNW) winter wheat yields may change by between 20% and 80% under future climate scenarios. How can a farmer use this kind of information?

IMPACT

Research into climate change often provides abstract insights into an uncertain future. A unique collaboration between scientists involved in climate change research through REACCH and other projects and the Washington State Department of Natural Resources is extending complex climate change science to support future land management decision making. Insights gained from this process are already being used in the development of resource materials that support the REACCH mission of providing "climate science Pacific Northwest farmers can use."

The Washington State Department of Natural Resources (DNR) is the largest, most geographically distributed, and most diverse agricultural landowner and manager in the state of Washington, leasing approximately 1.1 million acres of state trust cropland and rangeland to Washington farmers and ranchers (Figures 1 and 2). DNR's trust land management mission is driven first by a statutory fiduciary responsibility to generate revenue, primarily for school construction, and second by consideration for conservation and the sustainability of the trust lands. Although DNR is a public agency, its unique mission means that it is managing challenges similar to those of private land managers and farmers. Furthermore, DNR's distributed lands portfolio means that it will experience some of the same climate-induced challenges faced by farmers in the state.

Public Lands Commissioner Peter Goldmark, who is also a wheat farmer in the REACCH region, has spent considerable time pondering the question of what climate change means for agricultural land management. In 2014, Commissioner Goldmark established an Expert Council on Climate and Environmental Change to provide guidance to DNR regarding climate change vulnerability assessment and adaptation planning for state trust lands.

Scientists involved in agriculture and climate change research through the REACCH, BioEarth, and WISDM projects are working with DNR's agricultural lands management group to develop and conduct a climate change vulnerability assessment for DNR lands. The goal is to identify key resource risks and vulnerabilities as well as opportunities for strategic investment that will position DNR to improve sustainability and profitability under future climate change. This assessment will suggest approaches for climate adaptation in diverse settings and illustrate how other agricultural landowners and managers in the inland PNW can use abstract scientific results from REACCH and other climate change research to inform specific risk reduction actions and investment strategies. In short, the assessment provides PNW farmers with a helpful connection between climate research and their own management decisions.

The process is straightforward. Scientists provide general and specific information regarding regional climate change projections and the implications for agriculture in the region. DNR's agricultural management team informs the scientists of the portfolio of DNR managed agricultural lands as well as the suite of management decisions that they must make. Scientists and DNR managers discuss at length the potential climate sensitivity of specific types of land resources and management decisions and prioritize those lands and decisions that are most vulnerable or that offer the most opportunity as areas that need additional investigation.

This assessment project is not yet complete, but several lessons have already emerged:

1. There is a difference between the "science questions" and the "management questions" when it comes to the implica-

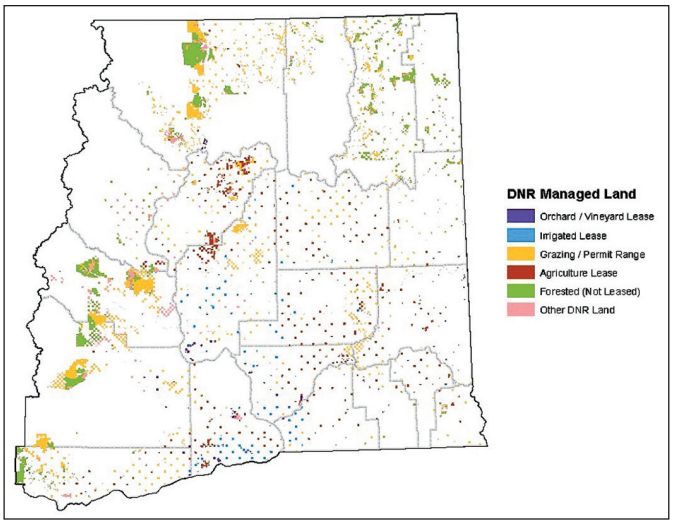

Figure 1. *Lands in eastern WA managed by the Washington State Department of Natural Resources.*

tions of climate change for agriculture. To date, most of the published research has focused on science questions, which are mostly exploratory investigations into what climate change might mean for agriculture at an aggregate level. Very little research has focused on what management decisions or adaptations may be effective for a given commodity or location. Managers would benefit from more precision in evaluating a suite of management strategies under future climate scenarios.

2. In-depth explanation by DNR of the nature, processes, and constraints of management decisions has provided valuable context for identifying and translating relevant insights from available research. Understanding why and how a particular management decision is made is crucial to determining how climate-sensitive that decision might be and what research-based insights are currently available.

3. The availability of good data is a limiting factor. It is much easier to apply insights based on published research when good data are available to translate abstract research findings into specific and actionable management strategies. For instance, research indicates that climate change is likely to have significant impacts on water supplies in the region, but those impacts are highly dependent on location and existing water rights. Management and investment options abound for addressing irrigation issues, but it was DNR's robust dataset on water rights that enabled us to quickly identify climate-sensitive vulnerabilities and opportunities for water resource development. In many instances, however, insufficient data precludes current and possibly future assessment of vulnerabilities and management opportunities. Data are costly to collect and manage, but scientific insight into and assessment of adaptation effectiveness requires investment. Seeking out and exploiting cost-effective data collection opportunities can facilitate the adaptation process.

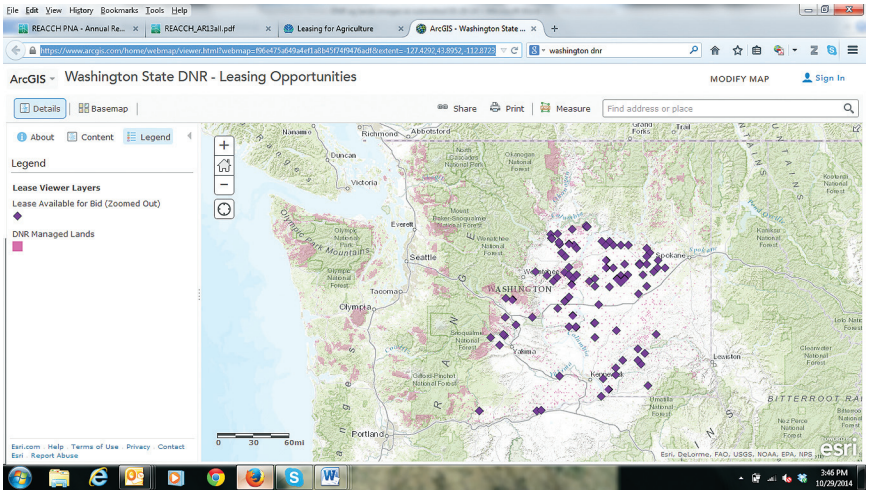

Figure 2. *Crop and grazing lease bids available from the Department of Natural Resources.*

It simply isn't cost-efficient to follow this process for every farmer or landowner in the region. However, this model proved quite helpful as the architecture for designing decision support information that more farmers and land managers can use, as well as for refining a more precise set of management questions that research can inform. Insights gained from this process are already being used in the development of resource materials that support the REACCH mission of providing "climate science Pacific Northwest farmers can use."

Photo by Nita Robinson.