

The Vandal Theory: Episode 2

How is climate change affecting farming, ranching and aquaculture in Idaho?

Leigh Cooper: Hello, everyone, and welcome to “The Vandal Theory,” a podcast about science and research from the University of Idaho in Moscow. My name is Leigh Cooper and I’m a science writer here at U of I. This podcast is part two of a series investigating how climate change is affecting Idaho. We know climate change is altering Idaho’s landscapes. For example, our summers are generally becoming warmer and drier. Since temperature and precipitation can influence the growth and health of plants and animals, it’s easy to think climate change may affect agriculture, ranching and commercial aquaculture, industries intrinsic to Idaho’s economy. To answer some of my questions about the crossover between climate change and these industries, I’ve called up three U of I faculty members with expertise in these fields. Before we dive in, can you all introduce yourselves?

Jodi Johnson-Maynard: Hi, I’m Jodi Johnson-Maynard. I am a professor of soil and water management and current department head for Soil and Water Systems.

Ron Hardy: Hi, I’m Ron Hardy. I’m the director of the Aquaculture Research Institute and a professor in animal and veterinary science.

John Hall: Hi, I’m John Hall. I’m a professor in animal veterinary science and an Extension beef cattle specialist.

Cooper: Thanks for talking with me today. As I said earlier, we know that, in general, summers in Idaho are getting hotter and drier. In our previous podcast, we touched on how these factors have led to a longer fire season and how, in the driest forests, trees are having trouble regenerating after fires. Now I want to turn to your areas of expertise. How are these climate conditions affecting the health and productivity of the crops and livestock raised in Idaho?

Johnson-Maynard: The increase in summer temperatures can have direct effects on many of the crops grown in the state of Idaho. In general, drought stress can affect overall yields as well as the quality of crops. So, it is something that we are concerned about, for sure. Most crops have an optimum range of production and if you start to exceed that range you can have problems. I’d say for crop production we are also concerned about warmer winters. If you have less severe winter temperatures, you may have increased fitness of disease-causing organisms and pests.

Hardy: OK, well, in aquaculture, the Idaho trout growers primarily rely on spring water — underground water — and the direct effects of climate change are unlikely to be very severe. In fact, there’ll be very mild if they have any effect on the temperature of water that goes through fish farms.

Hall: For the cattle industry, the primary effect of the general increase in summer temperature and drier conditions is the increase possibility of range fires, which then would reduce the amount of feed availability for cattle and grazing operations. Certainly, the longer the fire season goes on, the greater the possibility for increased range fires.

Cooper: Now, U of I scientists have found that during the late summer, our rivers are at lower levels than they have been historically. Is this or other issues of water availability influencing farming, ranching and aquaculture?

Hardy: The limiting factor to Idaho's aquaculture industry is water supply and anything that would lower the spring flows that flow through fish farms will lower the carrying capacity of the water. Water flows through from the springs to the fish farms and into the Snake River. If weather changes and snowpacks decrease and there's more rain, for example, this could affect the spring flows. This could affect underground aquifer volume. New technologies are being explored now to clean up some of the water and use it again. So, that's really one of the things that will allow the Idaho aquaculture industry to expand even if spring flows remain what they are.

Cooper: And, John, do problems with water availability arise with ranching?

Hall: Certainly, I think there's a few examples already in Idaho that relate to water availability, but a lot of times it's not as much as a result of potential climate change issues as it has been just water rights and water distribution of existing water that's in Idaho. But if we have decreasing snowpack over time and we see a lower level of water, especially late season water, then we're going to have more issues with hay production in the late season in those areas where irrigation is required for hay production.

Cooper: Now, if that happens, would Idaho ranchers likely have to ship in hay — cause that's obviously an expense they would rather not have?

Hall: No, actually Idaho has quite a large hay industry. Depending on the year, alfalfa ranks about number five in terms of ag income in the state. By in large, hay is produced in Idaho for all the livestock commodities that utilize hay and then we export some high-quality hay as well.

Cooper: And lastly, Jodi, how does water availability come into play with growers?

Johnson-Maynard: I'd say for crop production water availability, especially in the irrigated areas of the state, is a concern. And I know the state is actively trying to do very detailed forecasting of water resources.

Cooper: On the Palouse, we're now seeing a larger proportion of our precipitation falling as rain as opposed to snow. And that can result in wet springs. So what effect does that have?

Johnson-Maynard: You know we rely heavily on soil moisture, of course that's stored in the soil. Because our crops are dryland our crops are grown without irrigation, and so the timing of precipitation is important to us. With wetter springs and less snowpack, we see late planting dates, for example. That can be problematic. So, farmers can't get into their fields sometimes just because the fields are literally too wet for them to plant. And in really wet springs, we have seen actually an increase in fallowed ground, and that's, of course, something a soil scientist never wants to see because when we have fallow, we have increased erosion and soil loss.

Cooper: As our climate shifts, is Idaho's ability to host grazing animals changing at all?

Hall: At this point, we haven't seen any changes with where cattle are being raised within the state. And I guess one of those positive aspects of climate change is, if as some have predicted, winters become a little more mild and falls and springs become wetter, then we might have a chance to increase the amount of time that we graze especially beef cattle and sheep. Certainly, grazing is much more cost-effective than bringing feed to the animals.

Cooper: Jodi, one more thing, I want to follow up on whether the types of crops we grow in Idaho are changing as a result of climate change.

Johnson-Maynard: Certainly, at this point in time, I would say at least from a northern Idaho perspective, we haven't seen shifts to the degree where we would have to consider completely moving the crops that we grow here. Now, if you look at the long-term climate projections going forward there is a lot of uncertainty regarding those values. If the climate models are correct, then we may get to that point. Right now, we're talking about other types of modifications that may help increase resiliency to climate variability. We can consider adding new crops, but that's a long process to consider. You know there may be crops that we could introduce that could grow well, but they may require new equipment that a farmer here wouldn't have. Certainly, there is that generation of knowledge about how to grow that crop, how to manage the pests and weeds associated with that crop, diseases that that crop may be susceptible to. And we need to have a market available for that crop.

Cooper: What about in aquaculture? Is the cost of fish food changing because of climate change?

Hardy: The fish feeds are made of commodities similar that to those used in swine and poultry feed. Byproducts from animal and chicken processing go into fish foods. They're high protein ingredients. And then protein concentrates from oilseeds, soybeans, canola, and also from grains, so that would be wheat gluten for example. Any changes in climate that affects production of any of these commodities, at least the plant commodities, will increase the cost of fish feeds. Now, you have to superimpose that with...there are many other market forces, particularly at the moment with the tariff situation with China.

Cooper: Sure, any political or commercial factors that increase something like oil prices could easily dwarf any direct effect climate change has on fish food production. That makes sense. Jodi, what factors contribute to a rising cost of doing business when it comes to climate change's influence on the ag sector?

Johnson-Maynard: One potential impact is, of course, the cost of irrigation water itself. And then there are multiple policy-type actions that could have effects on inputs for agricultural systems too that could be related to climate change. For example, the cost of nitrogen fertilizer.

Cooper: And just to clarify, nitrogen from fertilizer can enter the air and act as a greenhouse gas, so limitations on nitrogen fertilizers could easily increase fertilizer prices.

Hall: Anything that increases the cost of crop production or the cost of water or availability of water is going to have an impact on the livestock side of agriculture in Idaho. In both beef and dairy industries, we're a little buffered by the fact that there's a lot of byproducts that are used in feedings. For example, distillers' grains, which are a byproduct of ethanol production for fuel or

brewers' grain which are a byproduct of the beer and malt barley industries in the state, as well as the potato byproducts are used quite heavily by the livestock feeding industries.

Cooper: I know we've talked a bunch about how the climate affects agribusiness, but let's flip the conversation for a moment. Does agribusiness affect our climate?

Hardy: I don't see any way trout production could have any effect on climate change. At least any direct effect. It's just too small. And the quality of feed and the scale of production is puny compared to the scale of production of dairy or beef or some other animal production.

Johnson-Maynard: Crop production definitely has a relationship to climate change in terms of greenhouse gas production. There is no way around that. Soils can be sources of greenhouse gases to the atmosphere. And, historically, as soils were cultivated, they lost organic matter, which was converted to CO₂ and went into the atmosphere. So, agriculture has contributed, of course, to greenhouse gas production, but there are multiple things that we are doing to try to reduce those. For example, anything that we can do to increase nitrogen use efficiency could decrease greenhouse gas emissions both directly from the farm but also through the reduction and use of synthetic nitrogen fertilizers. There's a lot of greenhouse gas emissions revolving just around the production of those nitrogen fertilizers.

Hall: Obviously cattle and sheep — all ruminants — do produce methane, which is a greenhouse gas. I think one of the things to be noted, for example in the beef industry, in the last 20 years, we're producing about 4 or 5 percent less beef with about 20 percent less animals than we've had in the past. If you look at it from that point of view, we've decreased the number of greenhouse gas emitting units per unit of protein for human consumption.

Cooper: Jodi, how are farmers dealing with changes in climate or climate variability? What kind of behind-the-scenes discussions are you hearing?

Johnson-Maynard: What I've seen with the farmers I work with in northern Idaho, they're less interested in maximizing yield for this year and more interested in, "How can I make sure that my operation is sustainable for the next 20 years, 30 years, 50 years?" They're very interested in pathways that might build more resilient agricultural systems and farms. An example of what that might look like is a farmer who doesn't use irrigation in northern Idaho might say, "How can I build soil organic matter and increased water holding capacity in my soils, so that if we do encounter drought conditions, the system will be better able to deal with those conditions?" That might include the idea of alternative crops that give them a little bit more flexibility in responding to climate. For example, if they can get a reliable forecast and they know they're going to have better moisture in the fall than typical, they may change their rotation on the fly. So, they're interested in a few alternative crops, perhaps. They're interested in using new technologies. For example, web-based decision support tools that may include things like better weather forecasting. I feel, probably for the first time in my career, that the researchers are really being pushed by farmers and growers to come up with new ideas.

Cooper: John, are ranchers having similar types of conversations?

Hall: Well, I think with ranchers in general, we don't hear as much direct conversation related to climate change as perhaps some of the other ag sectors. Obviously, ranchers are used to an

extremely variable climate and rainfall and moisture patterns that are indicative of the cold desert, which is much of the Idaho range country. And, so, they are use to dealing with that variability from year to year. I think one of the things that we hear the most of is that ranchers are continually interested in — because they utilize a lot of public lands in Idaho — is creating opportunities with the agency partners to have greater flexibility in management of those grazing lands. Much of our grazing in Idaho is what we call prescriptive so fairly rigid times of grazing, when you're going to graze this area, how long you're going to graze it, how many animals are going to be on it. One of the things ranchers are looking for in the future is more flexibility in that because then they can match up the management of that resource with the year to year and probably decade to decade changes in climate and rainfall and even micro-weather patterns that occur within the area. If the growing season starts at an earlier time, it may be beneficial to put those animals out a little earlier, or it may be more beneficial to the range to utilize that area in the fall when it's dormant, which may not be what is on the permit at this particular time.

Cooper: I could see that being a conversation ranchers want to have, especially if seasonal variability becomes more dramatic in the future. Now, Ron, I want to take a small step away from aquaculture with this question. Instead of talking about fish raised for food, can we talk about wild and hatchery fish in the river systems? Idaho has a large recreational fishery, which includes salmon and steelhead from our fish hatcheries. How are these fish affected by climate change?

Hardy: Changes in whether precipitation falls as rain or snowpack has great implications for the runoff of water into the watersheds and rivers of Idaho and Washington, which are migratory pathways for salmon and steelhead that return to Idaho to spawn. The young migrate out as juveniles to the sea where they grow up. Anything that changes the dates or the time periods in which these flows occur fish are migrating can really affect their survival. They have evolved basically to enter the ocean estuary areas when their food sources start to really bloom. Anything that causes the synchronization to be off — they get there too early or they get there too late — can cause problems for their early survival and later return as adults to the fisheries, both recreational, commercial and tribal. But probably the biggest concern for migratory fish is the adult-return situation. Now the adults return to spawn in late summer-early fall and in recent years, with low water flows and higher temperatures, we've seen increased mortality and lower of adult fish returning up to spawn. And that is really a big worry for the fisheries agencies, the state, federal and tribal, that are responsible for trying to maintain and enhance returns.

Cooper: Despite a few areas of concern like the adult-fish return rates, I'm not really getting a gloom-and-doom vibe from any of you when it comes to climate change.

Johnson-Maynard: You know, it's a little daunting to think about all of these aspects of climate change. But it is sort of an exciting time right now in terms of the technology that are being developed to help us address this need for increased agricultural production at a time when inputs and natural resources may be becoming more limited, especially in terms of water availability. So it's not all gloom and doom. And the other thing I think that's important to keep an eye on is what's happening elsewhere. You know, we are connected. And of course, what's going on with climate change in other regions will have an impact on the demand for crops, for example, as well as the cost of inputs and the cost of the products that we produce here. So I think it's important to keep an eye not just on what's happening in Idaho, although that's definitely of interest, but what's going on around the world as well.

Hardy: That's a really good answer, Jodi.

Cooper: Ron, do you want to add anything?

Hardy: Now that I heard hers, I've got some good ideas. I would say that the aquaculture industry is facing a lot of challenges being a relatively new industry in animal production, particularly in how to wisely use freshwater resources. As is the case with crops and other forms of food production, Idaho aquaculture doesn't exist in a vacuum. It's part of interconnected links with all kinds of other industries and food chains and other countries. One of the interesting things for Idaho is that we have the potential to work toward solutions that can be applied elsewhere throughout the world to increase food production from aquaculture and not only help satisfy the demand for high-quality food, but also alleviate food insecurity in many less developed countries.

Cooper: John, will you round us out for the day?

Hall: So, Leigh, just a couple things to leave you with. First, when we look at the challenges that we face in the U.S., we've had the land-grant university system. And that system has provided research and education and outreach to the farmers and ranchers of the U.S. and the world and has come up with solutions and answers to a variety of questions that have plagued agriculture for all that time. I guess I'd like to leave with a positive note that I think we have the opportunity, and the drive and the system put together to try and face these challenges and come up with new solutions for everyone.

Cooper: Well, I want to really thank you all for talking with me today. I certainly was able to answer a bunch of my questions about the overlap between climate change and a number of Idaho's most important industries.

Johnson-Maynard: OK, thank you for the opportunity to speak about this important topic.

Hardy: And thank you for letting me talk about fish.

Hall: Leigh, thank you for letting me be a part of this podcast and bringing in the rancher perspective.

Cooper: And thanks to our listeners. If you want to learn more about how climate change affects Idaho's natural landscapes, please check out our climate change page at uidaho.edu/climate. There, you can read stories about our researchers, learn how the agriculture industry is being affected by climate change, find additional resources and listen to archives of the podcast. And if you want to learn about Idaho's premier research university, check out our website at www.uidaho.edu. I'm Leigh Cooper, U of I science writer, and thanks for joining us.

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