Testimony of Clay Pope,

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Chairman Merkley, Ranking Member Wicker and members of the Committee,
Thank you for the opportunity to come before you today and speak about the current challenges facing agriculture on the southern plains due to the changing climate, the additional difficulties we anticipate seeing in the future, and what steps need to be taken to adapt these current problems and possibly mitigate some of their causes.

First the bad news…….

It's clear that climate change is having an impact on southern plains agriculture. From drought, to late freezes, wildfires and heavy rain events, we are seeing the effects of the changing climate and the challenges it is creating for those tasked with producing food and fiber in this region of the country. The southern plains has always has its fair share of wild weather. Oklahoma Native Will Rogers best summed this up in the 1930's when he famously said "If you don't like the weather in Oklahoma, wait a minute and it'll change." Wild weather swings are nothing new in tornado alley. We have always had droughts and we have always had floods; many times in the very same year. What is different, however, is the frequency and strength of these weather extremes.

Let's start with the most current example of these challenges; the prolonged drought now affecting my region of the country.

It's almost impossible to read any newspaper from Oklahoma, Texas, Western Kansas, Eastern New Mexico or South East Colorado without seeing a story about the ongoing drought that continues to hold this region in its grip. For nearly five years, much of the Southern Plains has suffered from below normal precipitation and above average temperatures. In Southwest Oklahoma especially, many areas have received well below 70% of their average rainfall over this time period and communities are suffering from critical water shortages. For agriculture, this low level of precipitation has resulted in a reduction of crop yields and the liquidation of livestock herds due to both the lack of forage and to the loss of water for animal consumption.

In Oklahoma alone we have seen a reduction in the cattle herd of over 10%. In Texas this number is over 20%. From 2011 to 2012 the total number of beef cattle in these two states shrank by close to 1 million head. This reduction is still declining. As of January 1 of this year, the total cattle inventory in

the United States has shrunk to its lowest level since 1951 with over 80% of these reductions happening in Oklahoma and Texas.

With this drop in the cattle herd there has been a corresponding impact on other parts of the beef industry in this region as well. In February, 2013, Cargill announced that it was closing its Plainview, Texas beef processing plant due to the shrinking number of cattle in the area and the increasing cost of feed. In October of that same year, the company announced that they would be shuttering their Lockney, Texas feedlot for the same reasons. Just this month Cargill has put forward a plan to lay off roughly 300 workers from its Dodge City, Kansas beef processing facility due to the tight supply of cattle. All of these actions have an impact not only on the beef industry, but on the local economy as well. The Plainview plant alone is estimated to contribute roughly $1.1 billion in the economy of the county in which it is located. As one observer wryly commented "I wouldn't want to own a house in Plainview right now."

The effects of the drought are not just limited to the livestock industry however. Crop production in this region of the country is also suffering from this extreme weather. In Oklahoma alone, we may well be looking at the fourth year in a row where at least 50% of the state's cotton acres will be abandoned. This could also be the fourth year in a row where not enough surface and ground water is available to irrigate cotton in Southwest Oklahoma. This would effect not just cotton production but the service industries that are supported by the cotton harvest as well. Several cotton gins that have been temporarily closed for at least 3 years now will probably never re-open. Machinery dealerships, parts stores, car dealerships, feed and chemical dealers all will feel the impact of this drought and many jobs will be lost.

As bad as the cotton situation is however, the real story is the coming wheat harvest. Oklahoma is currently expecting to harvest the lowest wheat crop since at least 1957. It is estimated that in 2014, 62.7 million bushels of wheat will be harvested in my home state. That's a reduction of over 40% from the amount of wheat harvested in 2013. It should also be noted that the 2013 harvest was 30% below that of 2012.

In 2013, Oklahoma accounted for roughly 5% of the nation's wheat crop with 115.5 million bushels harvested at a value of around $727 million. This year roughly half of that wheat will be gone. The impact of this will reverberate throughout the economy of rural Oklahoma and will add to an increase in the price of food in the grocery store, especially if we see problems develop with the wheat crop in other countries.

It should be pointed out that this drop in wheat production was not due to drought alone. A late season freeze also took its toll on the wheat crop in Oklahoma. While late freezes, like droughts and floods, are

nothing new on the southern plains, what is new is the frequency with which these events are happening. This will be the third time in five years that a late season freeze has drastically impacted the Oklahoma wheat crop. Timely rains in 2013 helped insure that the wheat would better weather the drought, but a late freeze that spring at least in part accounted for the 25% reduction in bushels harvested when compared to the previous year.

Flooding is another fact of life in my part of the world that seems to have become more violent with climate change. Droughts and floods have a tendency to come together in Oklahoma and a look at my state's history should give us concern for what the near future may hold in store. Most people don't realize what was at that time the worst flood in Oklahoma's history actually happened in the middle of the Dust Bowl of the 1930's. The Hammon flood of 1934, named for the small Western Oklahoma town where 17 people lost their lives during a late April flash flood, actually helped spring board our nation into taking action in the construction of small watershed dams to help protect farm ground from massive erosion and to help guard human life and personal property. This was a wise move on the part of the Federal government because climate change is making sure more damage is on the way. Clearly, climate change is causing problems for southern plains agriculture. The question is, what can we do about it?

That's where we get to the good news……

Agriculture, I believe, has the potential not only to adapt to the challenges brought on by climate change, but in doing so can also help mitigate a goodly portion of the causes of the greenhouse effect while at the same time increasing yields to feed an ever growing world, protecting our farmland and our citizens from flash flooding and providing many communities with additional drinking water supplies…..and the United States Department of Agriculture through the Conservation Title of the Farm Bill, the authorizing legislation of The Watershed Protection and Flood Prevention Act (PL-566) and through the recent creation of the Agricultural Research Service (ARS) regional Climate Hub already has the tools necessary to make much of this happen.

But the true secret it seems is in the soil.

Improving the health of our soils in the United States is the key to helping agriculture both mitigate and adapt to climate change. From the first cut of the plow until today, our farm ground has lost between 60% to 80% of the organic matter that was present at the time of settlement. This is important because its organic matter that feeds the microbial community under the soil and it is this community of bugs, bacteria and fungus that bind soil together, allows for the transfer of water through the soil structure, sequesters carbon dioxide into the ground and that makes nutrients more available to growing crops. Every teaspoon of soil contains over 1 billion life forms, most of which we didn't even know existed less

than a decade ago and it's these life forms that constitute agricultures first and best defense against climate change.

According to research from Kansas State University, every one percent increase in organic matter in the soil can triple that soils water holding capacity. That equals, on average, an additional 25,000 gallons of available water per acre for growing crops. Oklahoma State University has estimated that this increase in the water holding capacity of the soil in my state alone is the equivalent of a 3 inch rain. All this from increasing the ability of the soil to hold water when it does rain and by reducing the amount of water lost to evaporation during the summer months. Through the conversion of conventional tilled crop production to no-till cropping systems that also incorporate cover crops, we can greatly increase the infiltration rate of water in our farm ground while at the same time we reduce the amount of moisture lost to evaporation when the land is tilled and when the summer sun shines on bare crop land. By holding on to more moisture when it does rain and by reducing the amount of water we lose to heat, we can help our cropping systems better weather the cycles of drought that are being exacerbated by climate change while providing more moisture for growing crops in summer months. This increase in soil moisture also helps to restore balance to the overall water cycle which in turn has been shown to increase average stream flow, thus making more water available for human use and wildlife habitat. The same practices we would undertake on the land to accomplish this increase in soil moisture also have the added benefit of reducing the amount of soil erosion lost during heavy rain events-another challenge that is growing due to climate change. By reducing or eliminating tillage through minimum till and no-till crop production and by incorporating cover crops in rotation with traditional crops like winter wheat, we can greatly reduce the impact of sheet, gully and rill erosion to our farm ground while at the same time reducing the amount of run-off from agricultural land, thus not only protecting our soil, but also reducing non-point source pollution in our streams, rivers and lakes. According to information from the Environmental Protection Agency (EPA) every dollar spent implementing good conservation practices in a watershed saves cities and towns downstream, on average, $20 in water treatment costs. By improving the health of the soil we can help address both erosion and water quality concerns at the same time—challenges both made worse by climate change.

In addition, this same one percent increase in organic matter can, on average, make available up to $700 worth of additional nutrients per acre for growing crops according to information from Ohio State University. That's free fertilizer that is available to agriculture producers when they undertake the very practices necessary to adapt to climate change. Over the millennia, the microbial community in our soil has evolved in concert with the plant and animal community that occupies the space above ground. Through this cycle nature has created a system where the life both above and below ground has a symbiotic relationship with each other. The bugs, bacteria and fungus that live in healthy soil interact with the root systems of growing plants, helping them more effectively utilize the nutrients made available in the soil. It's been estimated that as much as 60% of the fertilizer applied to farm land today is wasted due to the lack of a healthy microbial soil community. By improving the health of the soil we can help plants more effectively absorb the nutrients available in the ground while reducing the need for

chemical fertilizer, especially through the incorporation of legume cover crops that restore nitrogen to the soil naturally and through the inclusion of additional plant species in cover crop mixes that mine other available nutrients such as phosphorus from the soil and make them more available for the plants that follow the cover crops in rotation. This increase in turn can help us maintain existing yields and holds the potential to help us increase yields in the future to help feed an ever growing world population.

Clearly the practice of converting from conventional till farming to no-till and the incorporation of cover crops in rotation with traditional crops such as winter wheat hold great promise in helping our agriculture system adapt to climate change. The truly exciting part is that these same practices designed to help better prepare farm ground for droughts and floods also have the potential to help reduce overall carbon dioxide levels in the atmosphere.

According to research conducted by Kansas State University, no-till crop production on the southern plains can sequester, on average, roughly .5 metric tons of carbon per acre per year. A study released by the Worldwatch Institute in 2009 estimated that by better managing our agricultural land we could potentially sequester close to 25% of the world's carbon dioxide emission every year. While the size of this potential carbon sink is unclear, what is clear is that a change in farming practices to include greater use of no-till and cover crops can reduce carbon dioxide levels while improving the health of the soil while helping us adapt to wild weather extremes.

We all know that plants breathe in carbon dioxide and breathe out oxygen through photosynthesis. This carbon dioxide is then stored or "sequestered" in the soil through the root system of the plant and through the residue that breaks down on the surface of the ground when the plant dies in the form of organic carbon. Organic carbon makes up roughly 60% of soil organic matter. As you increase organic matter in the soil, you restore soil health. As you restore soil health you help agriculture adapt to climate change. As you help agriculture adapt to climate change you help improve water quality, improve wildlife habitat and you help increase the fertility of the soil to potentially increase yields while at the same time helping to reduce the level of excess carbon dioxide in the atmosphere.

This is clearly something we need to do. The great thing is we already have the tools to do it with. Through Farm Bill Conservation Title programs such as the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP), the USDA Natural Resources Conservation Service (NRCS) has the ability to help farmers and ranchers convert to no-till agriculture and to incorporate cover crops in their farming operations. By sharing the cost of adopting this technology with agriculture producers, NRCS can help bring about many of the changes necessary to assist southern plains agriculture in adapting to the extreme weather events brought about by climate change. The challenge, however, is that as federal budgets continue to tighten, the availability of assistance funding through programs such as EQIP, and more importantly the funding for the technical assistance necessary to help agriculture producers determine what kind of cover crop mixes and technological changes best fit their operations continues to diminish.

Currently, less than 20% of all the crop land in Oklahoma is farmed using no-till methods, a percentage far below that of the states in the upper Midwest. Even fewer acres are planted in cover crops. There are many reasons for this—cost of equipment, the comparatively low value of winter wheat when

compared to crops such corn and soybeans, the lack of knowledge concerning viable cover crop options that can grow in the hot summers of the southern plains, the fear of losing winter grazing for beef cattle if ground is rotated out of winter wheat production, and the general cultural bias toward conventional till farming. The only way to overcome these challenges in my opinion is through financial and technical assistance targeted to the improvement of soil health in the same manner resources were targeted toward the reduction of soil erosion during the days of the Dust Bowl.

In the 1930's the Federal Government determined it was in the public's interest to keep the farm ground of the southern plains in production. For this reason the original soil conservation act was passed, model legislation was sent to the states for the formation of local conservation districts and state governments were encouraged to create state conservation agencies. Through this partnership, the tide of dust was turned back and the land stayed in production. Even today, during a drought that is now worse than the one which caused the Dust Bowl, we have yet to see the return of dust storms on par with what our country experienced in the 1930's—dust storms that would originate in Oklahoma and Texas but that would eventually cover cities like Washington D.C. and New York with the soil of the southern great plains. The partnership of the Soil Conservation Service (now NRCS), local conservation districts and state conservation agencies helped bring about the changes that tamed the Dust Bowl. I believe this partnership and the conservation programs in the farm bill have the ability to help address climate change in the same manner we addressed the Dust Bowl if we are wise enough to use them and if we are willing to give them the resources necessary to accomplish the job.

Even with these initiatives, however, research has to be conducted to determine what kinds of cover crops and what farming technologies are best suited to help southern plains agriculture adapt to the new climate realities we are facing. Again, USDA has started the process of providing this research through the formation of the Agricultural Research Service Regional Climate Hubs. These Hubs are charged with the delivery of information to farmers and ranchers that will help them adapt to climate change and weather variability. The Hubs also are tasked with building capacity within USDA to provide information and guidance on technologies and risk management practices at regional and local scales. If our efforts to adapt to climate change are to be successful, these facilities must be give the tools they need and the freedom necessary to determine what farming practices will work and what ones won't. Facilities like the Southern Plains Regional Climate Hub in El Reno, Oklahoma hold great promise in helping agriculture producers determine what cover crop mixes will work during hot Oklahoma summers and how to incorporate livestock management into their use on crop land. This promise, however, will go unrealized if they are not provided with the necessary resources.

As we focus today on drought however, we cannot lose sight of the fact that the rains will come again, and when they do, they likely will come with a vengeance. We must maintain and expand on the system of upstream flood control structures we currently have in the southern plains if we are to protect both our farm land and our communities from the ravages these future flash floods will cause. As I stated earlier, the Federal Government first began building upstream flood control projects through the USDA

small watershed program in response to the Hammon Flood of 1934. Today Oklahoma alone has over 2,100 upstream flood control structures that each year save our state over $80 million in flood damage that does not happen because of the protection they provide. Most of these structures were built with a 50 year design life and today are in need of rehabilitation. When this rehabilitation takes place, many of these structures could be expanded to become reservoirs for nearby towns and rural water districts. Again, the Conservation Title of the Farm Bill has provided the Federal Government with the authority to undertake this activity. Through the passage of this act, over $600 million was authorized to match local and state funding at the rate of 65% to 35% for the rehabilitation of these aging structures.

Unfortunately, rules currently in place at NRCS state that these federal funds can only be used to repair existing structures at their current size. If a dam is to be enlarged to provide water for nearby communities, state or local governments must cover 100% of the cost of this expansion. This does not have to be the case. Under the original language of PL-566 (the authorization statute of The Watershed Protection and Flood Prevention Act) NRCS has the legal authority to cost-share for the full expansion to make an existing structure into a reservoir. A simple change in the rules for this helpful program would make it a much better tool to help with climate change adaptation by potentially supplying several of our communities with new water supplies.

In addition, the flexibility and opportunity to build resilience to climate change on a watershed scale within the watershed program at USDA is almost unlimited. Planning and implementation guidelines for The Watershed Protection and Flood Prevention program set watershed boundaries as areas up to 250,000 acres. While smaller in scale than other well know watershed based boundaries such as the Chesapeake Bay or Mississippi River Basin initiatives, the benefits that that are provided in these smaller watersheds are significant and can be expanded upon. When you look at the purposes outlined in the original act, purposes such as watershed protection, flood mitigation, water quality improvements, soil erosion reduction, municipal and industrial water supply, irrigation, water management, fish and wildlife enhancement, hydropower, and sediment control, you quickly see that this program is yet another tool that USDA has ready access to that can help my region of the country better adapt to the challenges created by climate change.

In closing, I would reiterate that agriculture in the southern plains is on the front lines of the effects of a changing climate. The drought we have suffered through for almost 5 years now is but one example of the weather extremes that will only be exacerbated as we move forward into the future. We have much work to do if we are to insure that this region of the country will have the ability to continue to be a major provider of food and fiber for the United States and beyond.

There is good news, however. Through the efforts of NRCS to help improve the health of our soil, through the use of the research hubs created by ARS to determine what cropping systems and technology can best help us adapt to climate change, and through proper utilization of the existing small watershed program at USDA, we have tools that can help us better adapt to the problems this new reality is creating and will continue to create into the future. The challenge for you and your colleges is

to do your part to make sure these initiatives and others like them have the resources they need to accomplish their goals. There is a path forward. The question is will we take it.

Thank you for allowing me the chance to speak to you today. I would be happy to answer any questions.