From:	Norman, Kate
To:	Kevin Doherty
Subject:	Fwd: USGS news release: Climate Change May Pose Substantial Future Risk to Sagebrush Habitat in Southwestern Wyoming
Date:	Tuesday, March 31, 2015 12:26:40 PM
Attachments:	SG and CC pr draft abjc edits final draft to DOI.docx SG and Climate FAQ_V5 3-30-15.docx

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---------- Forwarded message ----------
From: **Stein, Theodore** <theodore_stein@fws.gov>
Date: Tue, Mar 31, 2015 at 12:25 PM
Subject: Fwd: USGS news release: Climate Change May Pose Substantial Future Risk to Sagebrush Habitat in Southwestern Wyoming
To: Kate Norman <kate_norman@fws.gov>

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---------- Forwarded message ----------
From: **Kelly, Katherine** <kate_kelly@ios.doi.gov>
Date: Mon, Mar 30, 2015 at 5:05 PM
Subject: Fwd: USGS news release: Climate Change May Pose Substantial Future Risk to Sagebrush Habitat in Southwestern Wyoming
To: Theodore Stein <theodore_stein@fws.gov>, Marla_Trollan <Marla_Trollan@fws.gov>, "Hires, Brian" <brian_hires@fws.gov>, Gavin Shire <gavin_shire@fws.gov>, Karl Snow <ksnow@blm.gov>, Jeff Krauss <JKrauss@blm.gov>
Cc: Jessica Kershaw <jessica_kershaw@ios.doi.gov>, sarah greenberger <Sarah_Greenberger@ios.doi.gov>

Here's that upcoming USGS study that Mitch mentioned on the call.

It'd be great if we could coordinate on what BLM and FWS would say if asked to comment.

Could the respective teams huddle and send around your draft statements by Wednesday morning?

Thanks a lot.

---------- Forwarded message ----------
From: **Wade, Anne-Berry** <abwade@usgs.gov>
Date: Mon, Mar 30, 2015 at 3:32 PM
Subject: USGS news release: Climate Change May Pose Substantial Future Risk to Sagebrush Habitat in Southwestern Wyoming
To: GS-DO-OCAP-COLT <gs-do-ocap-colt@usgs.gov>, Joan Moody <joan_moody@ios.doi.gov>, Lori Caramanian <lori_caramanian@ios.doi.gov>, Suzette M Kimball <suzette_kimball@usgs.gov>, Emily Beyer <emily_beyer@ios.doi.gov>, Jessica Kershaw <jessica_kershaw@ios.doi.gov>
Cc: william lukas <wlukas@usgs.gov>, Joanne C Taylor <jctaylor@usgs.gov>, Judy Nowakowski <jnowakowski@usgs.gov>, Anne Kinsinger <akinsinger@usgs.gov>, Carol Schuler <carol_schuler@usgs.gov>, Catherine Puckett <cpuckett@usgs.gov>, Gavin Shire <gavin_shire@fws.gov>, Celia Boddington <cbodding@blm.gov>, Jeff Krauss <jkrauss@blm.gov>, Katherine Kelly <kate_kelly@ios.doi.gov>, Sarah Ryker <sryker@usgs.gov>, "Lellis, William" <wlellis@usgs.gov>, Steve Hanser <shanser@usgs.gov>

All, attached is a USGS news release and FAQs on our newest sage grouse/ sagebrush study. We expect this study to get published within the next week so I wanted you to have an opportunity to review this release and the FAQs.

BLM and FWS - the FAQs should be useful for any talking points your agencies want to develop.

Please let me know if there are questions.

A.B. Wade
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News Release

April XX, 2015	Catherine Puckett	352-377-2469	cpuckett@usgs.gov
	Carol Schuler	541-750-1031	cschuler@usgs.gov

Climate Change May Pose Substantial Future Risk to Sagebrush Habitat in Southwestern Wyoming

Sioux Falls, SD. — Climate change may pose a substantial future risk for sagebrush habitat in southwestern Wyoming, and thus adversely affect the regional summer habitat and nesting areas of sage-grouse, according to a USGS study.

For the study, scientists used nearly 30 years of Earth observation data to analyze past climate patterns in 3,216 square miles (8,330square kilometers) of southwestern Wyoming to forecast sagebrush abundance in 2050. Wyoming is a stronghold for populations of greater sage-grouse, a species being considered for listing as threatened or endangered by the U.S. Fish and Wildlife Service. The species is dependent upon sagebrush habitat.

“Historic disturbances of fire, development and invasive species have altered the sagebrush landscape, but climate change may represent the habitat’s greatest future risk,” said Collin Homer, the USGS scientist who led the study. “Warming temperatures, combined with less snow and rain, will favor species other than sagebrush, as well as increase sagebrush habitat’s vulnerability to fire, insects, disease and invasive species.”

The authors noted that intact, healthy sagebrush systems increase sage-grouse resilience to negative effects of climate change whereas less intact and more marginal habitats decrease the species’ resilience.

Homer and his colleagues examined the impact of historical precipitation change on key components of sagebrush ecosystems from 1984 to 2011. These historical patterns, discerned from long-term records of the Landsat satellite series (a joint effort of USGS and NASA), were then combined with IPCC (Intergovernmental Panel on Climate Change) precipitation scenarios to model and forecast the most likely changes in sagebrush habitat from 2006 to 2050.

Researchers found that projected precipitation patterns for 2050 resulted in decreasing amounts of sagebrush and other shrubs, grasses, and flowering plants (forbs), while increasing the amount of bare ground. When these changes were translated to sage grouse habitat, researchers found this resulted in a potential loss of 12 percent of sage-grouse nesting habitat and about 4 percent of sage-grouse summer habitat by 2050. Results also demonstrate the vulnerability of semi-arid lands, such as sagebrush habitat, to precipitation changes because of their already low soil moisture content.

This new research explores how to bring climate change results to a more localized scale, in this case units as small as a quarter of an acre. “Using Landsat and downscaled climate scenarios to enable future

forecasts of greater sage-grouse habitat can provide critical information on a more local or regional scale for managers to help them better plan now for the future," said Homer.

Greater sage-grouse occur in parts of 11 U.S. states and two Canadian provinces in western North America. These birds rely on sagebrush ecosystems, which constitute the largest single North American shrub ecosystem and provide vital ecological, hydrological, biological, agricultural, and recreational ecosystem services. The U.S. Fish and Wildlife Service is formally reviewing the status of greater sage-grouse to determine if the species is warranted for listing under the Endangered Species Act.

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March 26, 2015

Proposed FAQs

Journal: Ecological Indicators

Title of Paper: Forecasting Sagebrush Ecosystem Components and Greater Sage-Grouse Habitat for 2050: Learning from Past Climate Patterns and Landsat Imagery to Predict the Future

Authors: (All are USGS affiliated) Collin G. Homer, George Xian, Cameron Aldridge, Debra Meyer, Thomas Loveland, and Michael S. O'Donnell

Q: What is this research about and who requested it?

A: This research is part of the Wyoming Landscape Conservation Initiative (https://www.wlci.gov/), which is a collaborative venture among federal, state, and local partners to assess and enhance terrestrial habitats in southwest Wyoming. **This study is part of the research focused on developing a long-term monitoring approach for this region.**

This research was USGS-funded as part of the WLCI, and it was conducted by a USGS team of researchers who are experts in remote sensing, climate change, and greater sage-grouse.

The research examined patterns of sagebrush ecosystem change in the past to understand potential change in the future. Researchers wanted to examine the potential of climate change effects on a core sage-grouse habitat zone/region.

Q. What was unique about this study?

A. This study is done at a much finer scale than past research has been done (patch or local scale versus regional scale) in a sagebrush ecosystem. This study developed a method to measure the gradual change that sagebrush ecosystem components experience as precipitation changes, and then modeled changes in sagebrush components into the future based on future climate projections.

B. This work was enabled by having Landsat measurements of different components of the sagebrush ecosystem over every 100 feet sq. area “pixel” annually back to 1984 to compare with corresponding historical precipitation measurements. Models of the historical relationship between sagebrush component change and precipitation could then be developed for every pixel. This could then be used to quantify changes in sage-grouse habitat needs for nesting and late summer resources, from the current time to 2050, using spatial models the authors have previously developed and published.

C. This study demonstrates the utility of this approach for long-term monitoring of the sagebrush ecosystem for many management applications. The long-term impact of this study is that the authors developed a method using Landsat remote sensing to capture gradual climate-driven change. This is the first time Landsat remote sensing was used in this way in a shrub ecosystem.

Q: Where was the study conducted? Why did you pick this area?

The study was done in southwestern Wyoming, 22 miles north of the city of Rock Springs.

The study area covered 3,216-square miles (8,330-square kilometers) in this region; the study area is composed of a variety of sagebrush habitats.

The researchers chose this area because of its variety of sagebrush habitats, and because of its key location as part of a long-term study where permanent vegetation monitoring plots have been in place, with both on the ground and satellite measurements, annually, since 2006. This general area is also a stronghold for greater sage-grouse populations with existing climate projections forecasting modest change. Researchers wanted to examine the potential of climate change effects on a core sage-grouse region.

Q: How did you conduct the research?

A: USGS researchers examined the impact of historical precipitation change on key components of sagebrush ecosystems from 1984 to 2011 using 28 years of Landsat remote-sensing data. These historical patterns were then used with IPCC (Intergovernmental Panel on Climate Change) precipitation scenarios to model and forecast the most likely changes in sagebrush habitat from 2006 to 2050.

These changes were then incorporated into rigorously developed sage-grouse nesting and summer habitat models to quantify how potential changes in sagebrush components would affect habitat for sage-grouse impact.

Note: The two IPCC scenarios used were A1B (assumes current economic growth with balanced energy development) and A2 (assumes higher population growth).

Q: What were the main findings of the study?

- Twenty-eight years of Landsat analysis in the sagebrush ecosystem show changes in these sagebrush components: cover of bare ground increased whereas shrub, sagebrush, litter, and herbaceous vegetation decreased.
- Vegetation and bare ground change is correlated to declining precipitation (rain and snow) that has occurred over the same (past) 28-year period.
- The historical relationship of sagebrush component change and precipitation change can be developed into a linear model to forecast ecosystem component change (see components listed in first bullet) for 2050 using IPCC precipitation scenarios.
- The authors converted the 2050 sagebrush components to 2050 sage-grouse habitat, which resulted in a forecasted 12% loss in sage-grouse nesting habitat and about a 4% loss in sage-grouse summer habitat compared to habitat identified in 2006.

Q. How significant are these findings?

A. In general, increasing bare ground is usually an indicator of a stressed ecosystem, and any projection of increased bare ground and reduced vegetation from climate response is not good.

B. **In terms of the sage-grouse modeling, considering all the current disturbances already affecting sage-grouse habitat, any additional disturbance from climate change may compound future threats to the species' habitat, even if it occurs in relatively modest amounts**. **This is especially a concern for this study area since it was completed in a portion of sage-grouse habitat assumed to be a relatively stable region for climate effects, as compared to other parts of the species' range.** More broadly, loss of habitat for sage-grouse is a great concern, but generally, managers are only able to track large losses due to land-cover conversations, energy development, and fires. **This is the first study of its kind to show direct losses of habitat across life stages for sage-grouse,**

solely due to climate–induced changes in vegetation (sagebrush components).

C. The long-term impact of this study is that the authors developed a method using Landsat remote sensing to capture gradual climate-driven change. Gradual change is very hard to quantify and capture successfully in semi-arid shrublands, especially in a repeatable, measurable way. Consequently, this study demonstrates the utility of this approach for long-term monitoring of the sagebrush ecosystem to sustain a variety of management applications.

Q. What are the next steps?

Now that this research has demonstrated the applicability of this process to sagebrush habitat, the same authors are further applying the methodology across an even larger region in Southwest Wyoming. In addition, a new study has been started in northern Nevada in an entirely different part of the sagebrush ecosystem. The authors will continue to improve methods for advancing the modeling and climate data processing.

Q. How is this information being used?

The remote sensing characterization portion of this work is already being implemented across the Western United States in collaboration with the Bureau of Land Management Analysis Inventory and Monitoring Program. The goal is that future work such as this will be able to be completed across much larger landscapes.

Q: How does the USGS ensure scientific objectivity?

The USGS is committed to providing unbiased, objective scientific information upon which other entities may base judgments. USGS scientific information is subject to a high degree of transparency about data and methods to facilitate the reproducibility of such information by other qualified scientists. To ensure objectivity, independent scientific review is required of every USGS publication. Peer reviewers are selected from experts with no conflict of interest with the authors. Standards require a minimum of two reviews, after which the USGS authors must provide a detailed response to each review that explicitly states how the comments on the document were addressed. Adequacy of the authors' responses to reviews is assessed by both research managers and independent scientists within the USGS.