Regional Approaches to Climate Change
for Pacific Northwest Agriculture
Climate Science Northwest Farmers Can Use

Producer perceptions on climate change and agriculture: A statistical atlas

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REACCH
Regional Approaches
to Climate Change –
PACIFIC NORTHWEST AGRICULTURE

www.reacchpna.org

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A survey of inland Pacific Northwest wheat and cereal grain producers was conducted in partnership with the USDA-NIFA Cropping Systems Coordinated Agricultural Project (CAP): Regional Approaches to Climate Change in Pacific Northwest Agriculture (Award No. number 2011-68002-30191). The survey was administered by the University of Idaho's Social Science Research Unit (SSRU).

The REACCH project is an interdisciplinary research effort that was developed across three states (Oregon, Washington, and Idaho), between four institutions; the University of Idaho, Oregon State University, Washington State University, as well as the USDA Agricultural Research Service (USDA ARS).

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REACCH project overview

The mission of the REACCH project, which was funded from 2011-2016, was to enhance the sustainability of Pacific Northwest cereal agricultural production and to contribute to the identification of climate change adaptation and mitigation strategies for cereal production in the region. The goals of the project were fourfold:

a. Implement sustainable practices for cereal production
b. Reduce greenhouse gas emissions from agriculture in the region
c. Collaborate with stakeholders and policy makers
d. Prepare professionals to address climate change in agriculture

The REACCH project brought together a diverse set of interdisciplinary scientists who explored climate change impacts, agronomic solutions, socioeconomic processes, and outreach and education opportunities for the region. As part of this project, two comprehensive surveys were conducted, one in 2012-2013 and one in 2015-2016. The primary target audience was wheat producers. The survey included a wide range of questions regarding production practices, climate change beliefs, and attitudes towards climate change adaptation and mitigation. This statistical atlas visualizes some respondents' answers to select questions of the 2012-2013 survey. The collected responses are spatially depicted across identified agroecological classes (AEC) that correspond with dryland cropping systems.

Throughout the inland Pacific Northwest where the survey was administered, researchers identified four major AEC's based on the cropping systems that are most common in the region. The four AECs are identified as:

1) Irrigated;
2) Grain-fallow (e.g., two-year rotation, > 40% fallow);
3) Annual crop-fallow transition (e.g., three-year rotations with fallow every third year, between 10-40% fallow); and
4) Dryland annual cropping (e.g., limited annual fallow, < 10% fallow).

In general, climate change is predicted to result in geospatial changes in the type of AEC/cropping systems that are currently identified for the region. For example, some farmers in the region are likely to see wetter and milder winters and hotter and drier summers.

Photo by Nita Robinson

Survey methods overview

In November 2012, the Social Science Research Unit (SSRU) of the University of Idaho administered a mail survey "Inland Pacific Northwest Wheat Producers: Past, Present and Future" to small-grain cereal producers in the Inland Northwest (northern Idaho, north-central Oregon, and eastern Washington), which mirrored the study area of the REACCH Project. Before administration of this survey, the study was approved by the University of Idaho Institutional Review Board, protocol number 10-139. Any county that was contained wholly or partially within the REACCH study area was included in the sampling frame of farm operations (17 counties in Washington, 7 counties in Idaho, and 9 counties in Oregon). An individual farm, as defined for this study, could consist of owned and/or leased land managed by a single farm owner/operator or more than one owner/operator working in a collaborative fashion (e.g., under a single farm management plan, even if specific management practices might be adjusted to account for agro-climatic variation across the farm parcels).

The National Agricultural Statistical Services (NASS) drew a sample of producers who grew 50 or more acres of wheat in 2009, 2010, or 2011 in counties throughout the Inland Northwest. The simple random sample consisted of 2,000 separate entries, and was drawn from all eligible farm operations described above. The list was cleared of duplicate operators (i.e., all name and mailing information identical). At that point, a new sample was drawn in an attempt to get the initial sample as close to 2,000 as possible. After duplicates were removed again, the frame contained 1,988 unique operations.

The full Dillman survey method was employed, which included four mailings and a postcard. The survey covered questions about producers' uses and trust of information sources, perceptions of climate change, farm management practices, and demographics. The first survey mailing, consisting of a survey, introductory letter, three maps, and self-addressed stamped envelope (SASE), was mailed on December 10, 2012. A reminder postcard was sent one week later on December 17, 2012 to all 1,988 operators. A second survey, maps, letter, and SASE were sent on January 18, 2013, to 1,312 operations. Finally, on March 3, 2013, a fourth mailing (survey, SASE, letter, and maps) was sent to the remaining 986 non-respondents.

A total of 900 completed and eligible surveys were collected, with an overall response rate of 46.2% (AAPOR 2011). The margin of sampling error was +/- 3 percentage points at a 95% confidence level. Of the 900 respondent locations, only 518 fell within one of the four agro-ecological classification regions. For the purpose of this atlas, we eliminated the remaining 382 respondents who fell outside of these regions. Of those 518 respondents, we aggregated survey responses into one the four delineated agro-ecological classifications for the year in question. (Annual Crop, Crop Fallow Transition, Crop Fallow, and Irrigated). We then summarized results for each survey question by region, generating a map for each. By combining survey question results geospatially with expected agricultural land-use, we get a general sense of how climate perceptions align with commodity development. Because the frame information was proprietary, the SSRU contacted NASS to collect summary information on the frame and the number of responses within each county. SSRU explored weighting the data based on probability of selection and probability of nonresponse for each county and found the calculated base weights very close to one. This helped confirm that NASS was successful in identifying a representative sample. Therefore, the decision was made to not use weighting adjustments in the data analyses.

The survey can be viewed at https://www.reacchpna.org/social-dynamics

A note on interpreting the maps

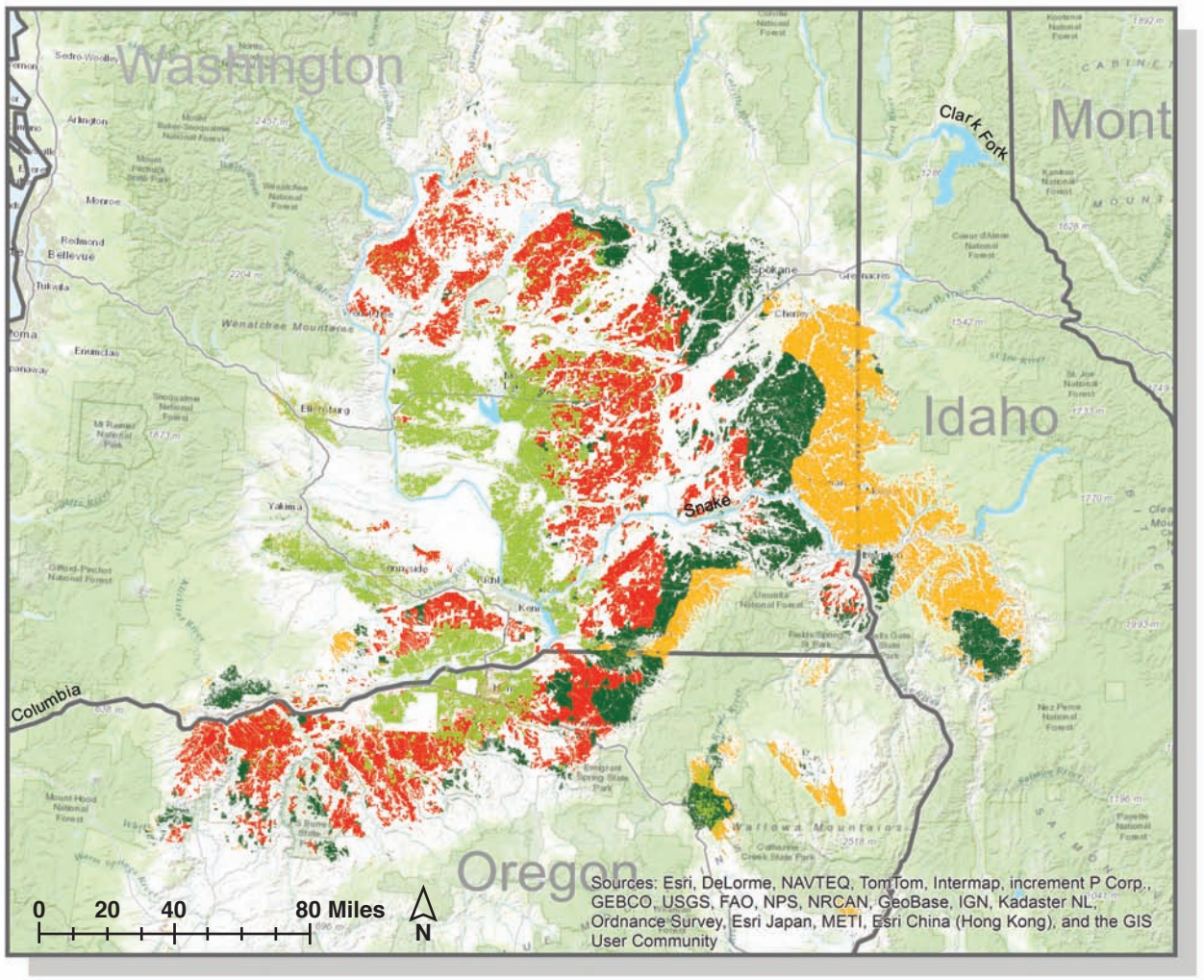
Each map illustrates the percentage of respondents for selected questions within the survey and are designed in such a way to stand alone in their interpretation. The colors and color scale for the maps remain consistent across each map. For example, the **dark green** always represents the lowest percentage while the **red** bar will always represent the highest percentage of respondents. The **light green** is the second lowest percentage while the **gold** is the second highest percentage of total respondents. The extent and location of the colors will change within each agro-ecological classification (AEC) as responses to each question vary for each map.

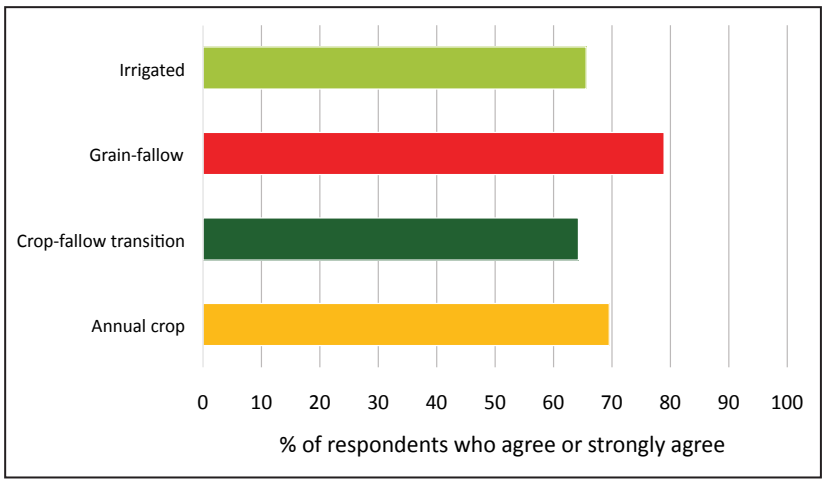
Lowest to highest percentage of respondents

Photo by Brad Stokes

Map 1: Survey responses by AEC

I consider myself to be an aggressive adopter of conservation practices.





Values charted are the percentage of respondents within each agro-ecological class with the indicated response. Colors on the bars and on the map indicate the ranking in percentages among classes in this order (from highest to lowest): **red** – **yellow** – **pale green** – **dark green**.

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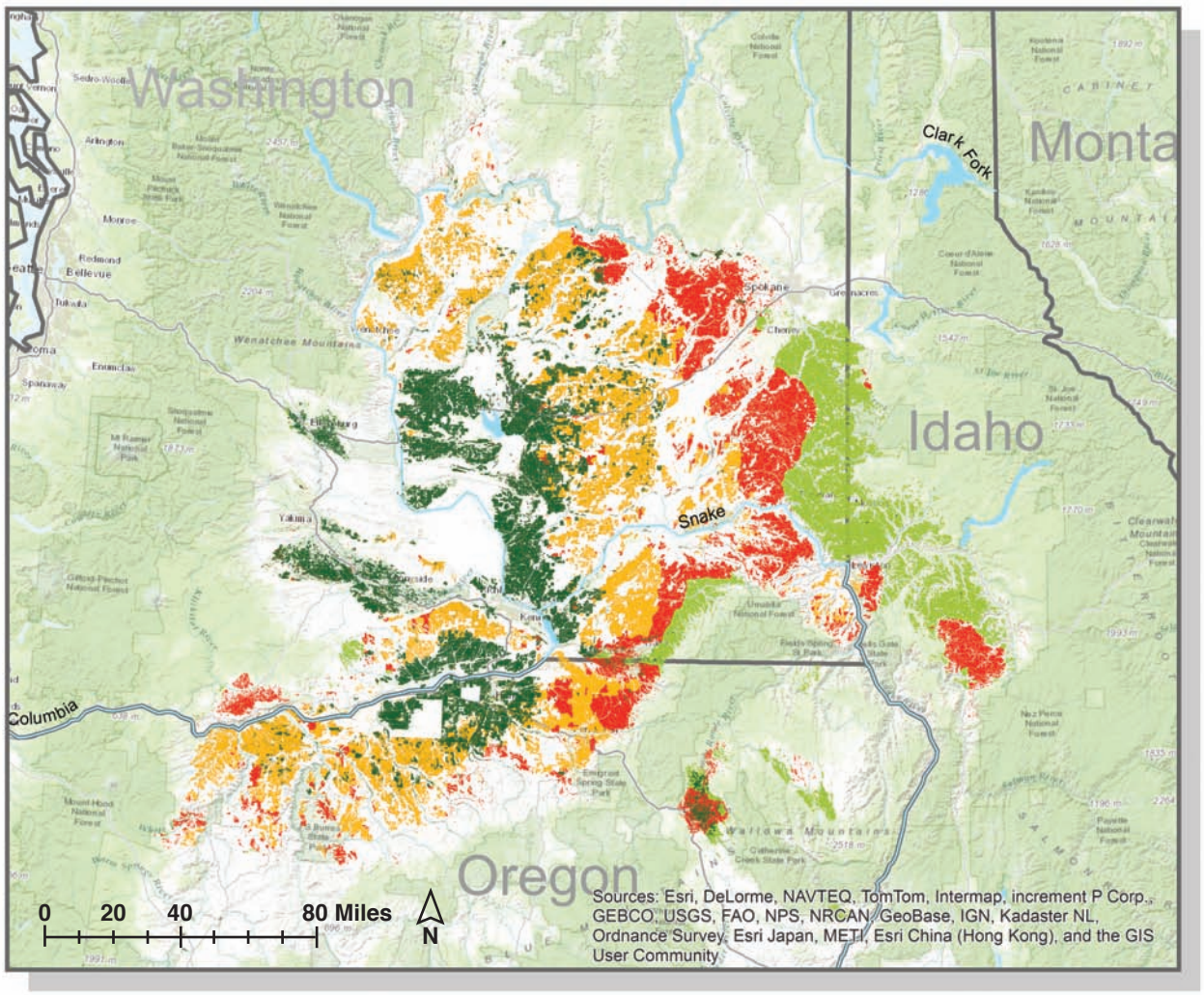
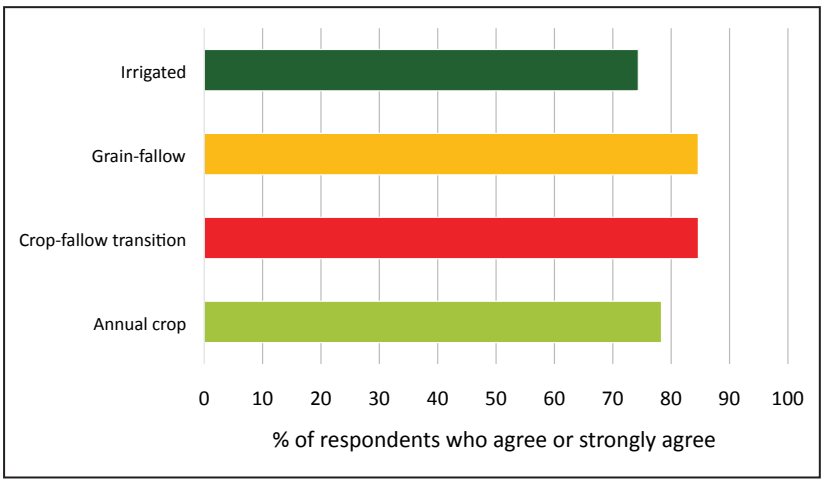
Map 2: Survey responses by AEC

The timing of management practices has changed since I started farming.





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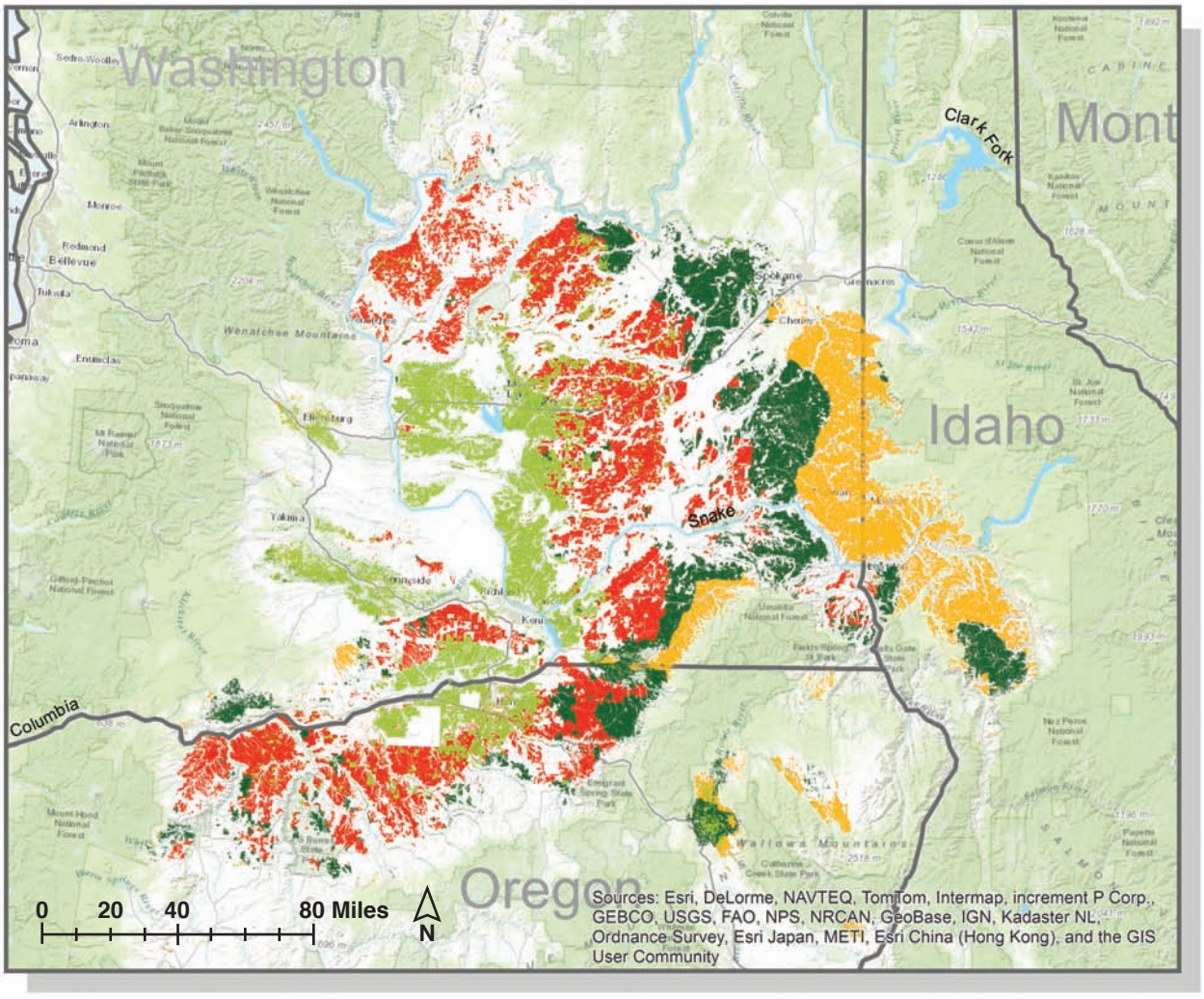
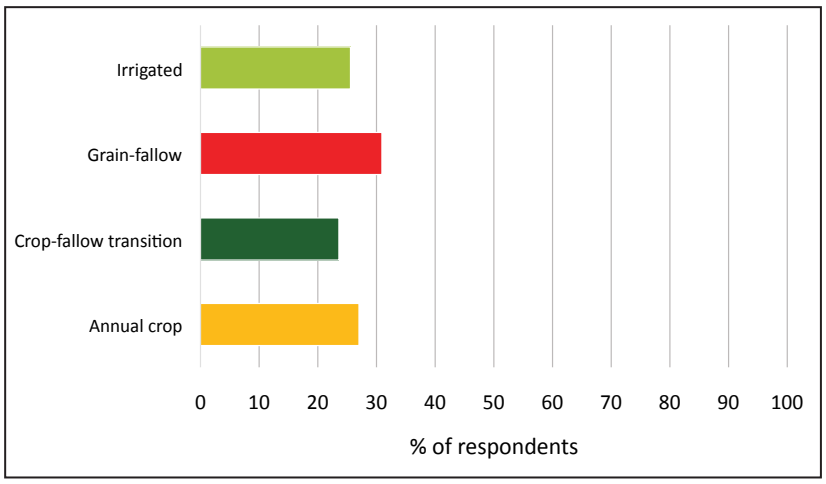
Map 3: Survey responses by AEC

I have and use precision ag software.





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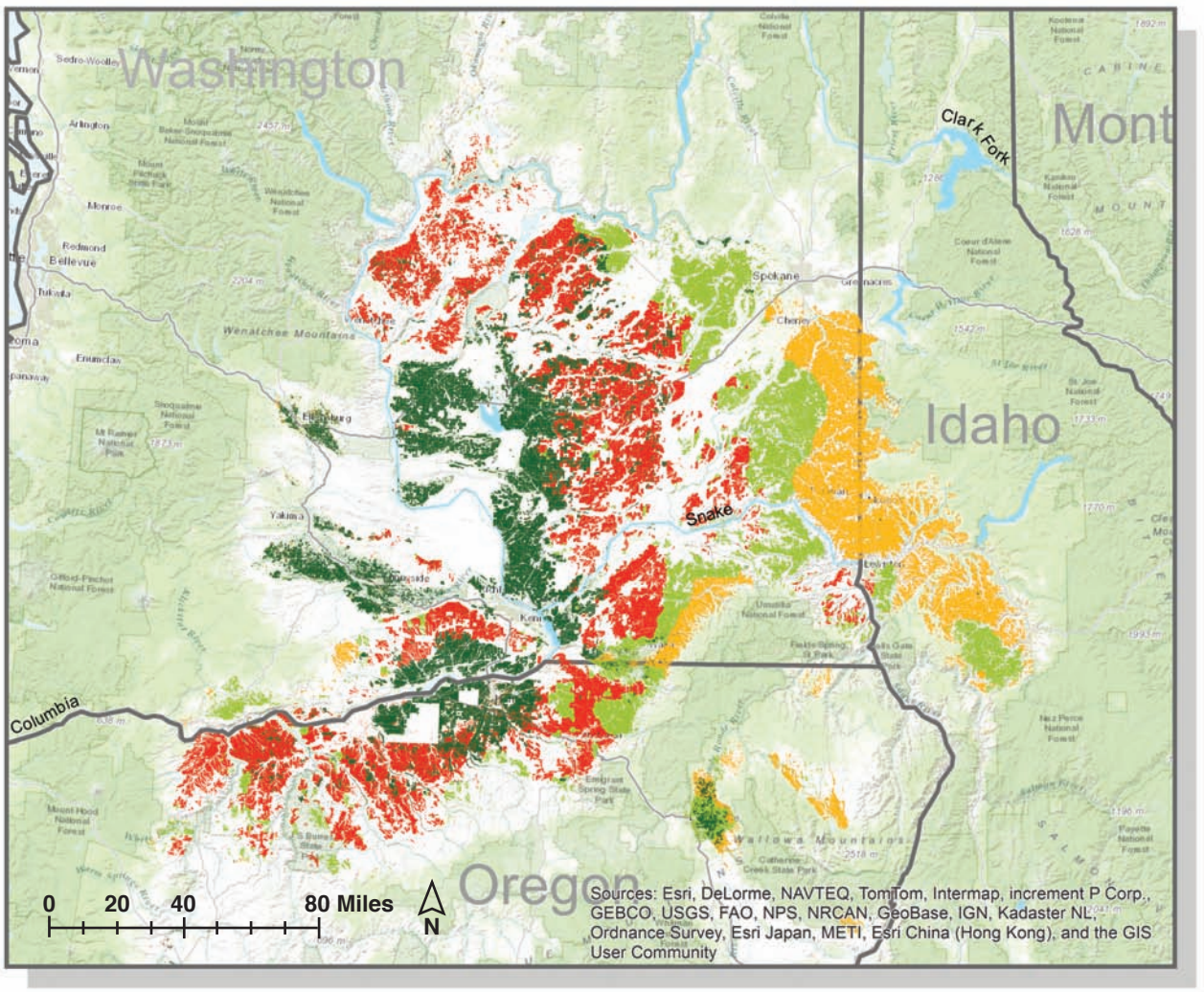
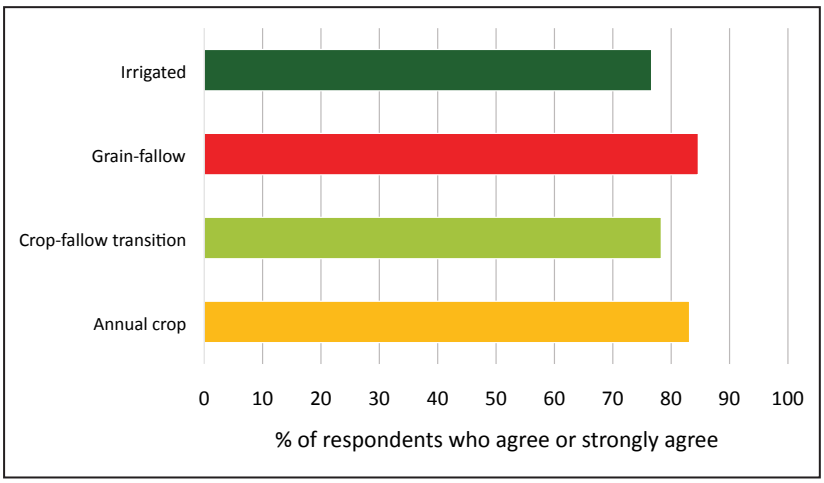
Map 4: Survey responses by AEC

I have observed changes in weather patterns over my lifetime.





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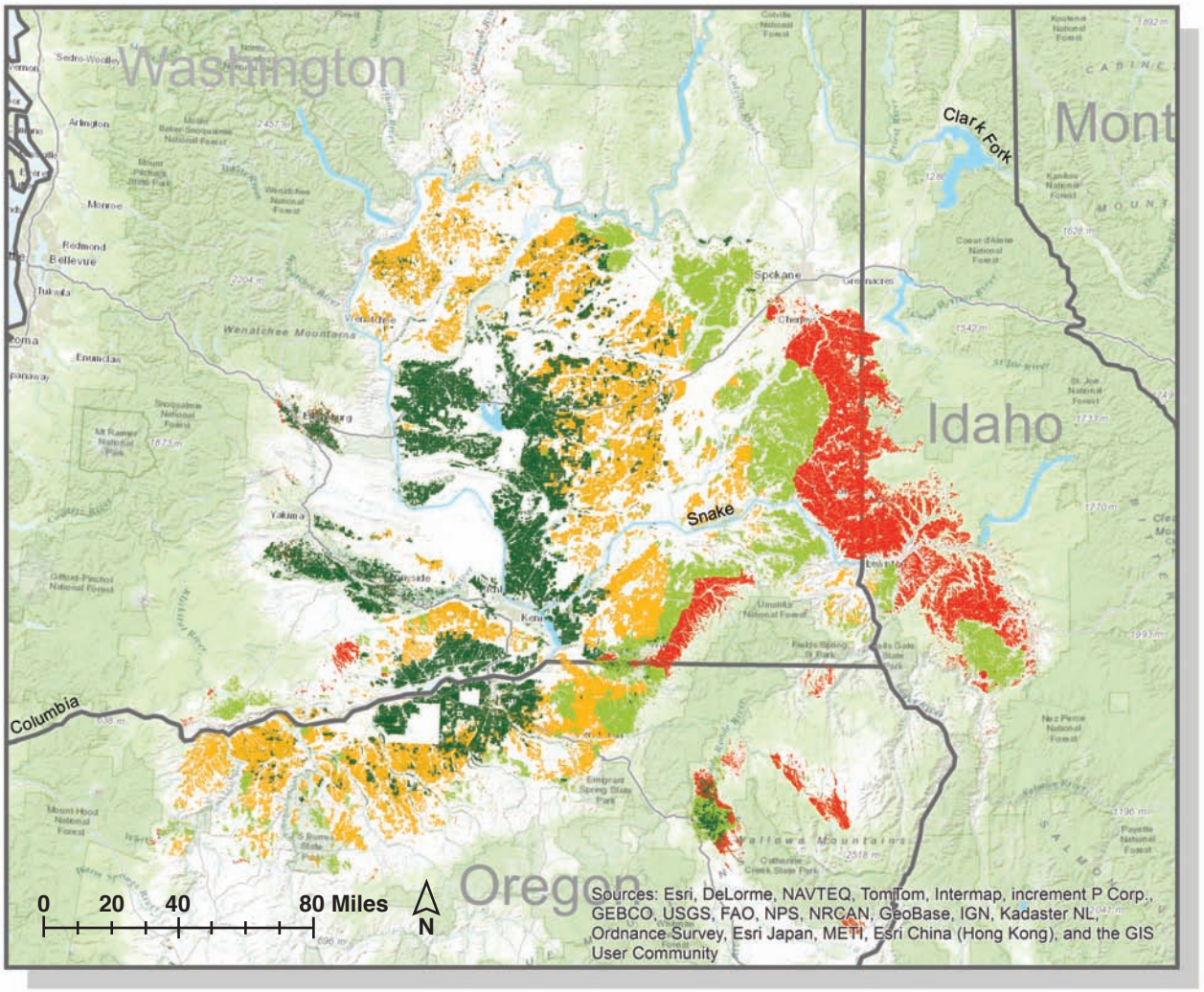
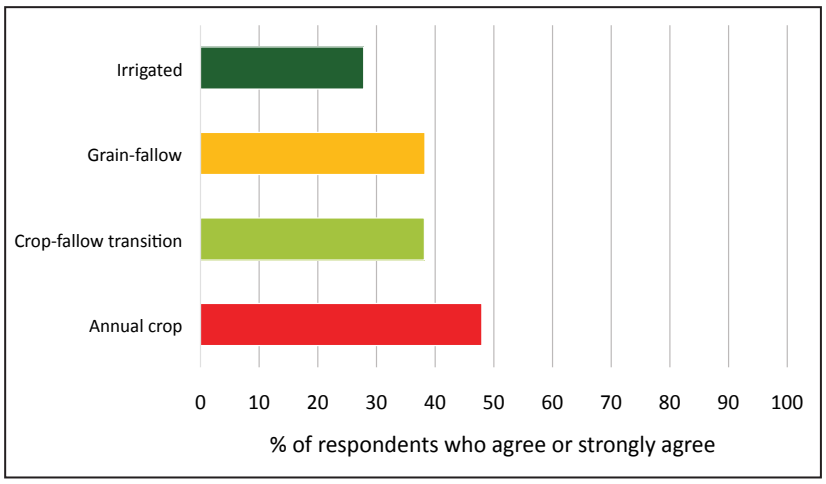
Map 5: Survey responses by AEC

Average global temperatures are increasing.





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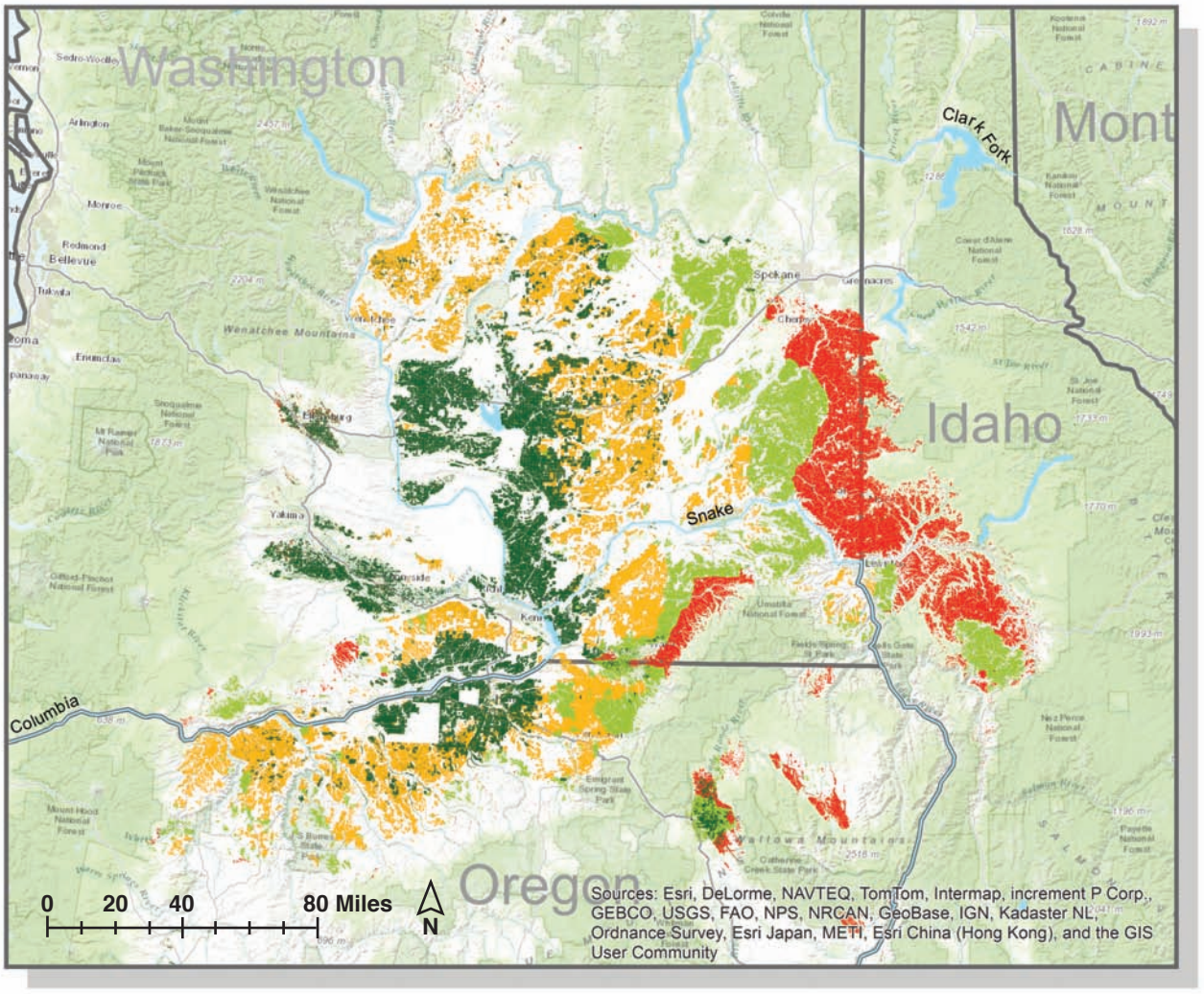
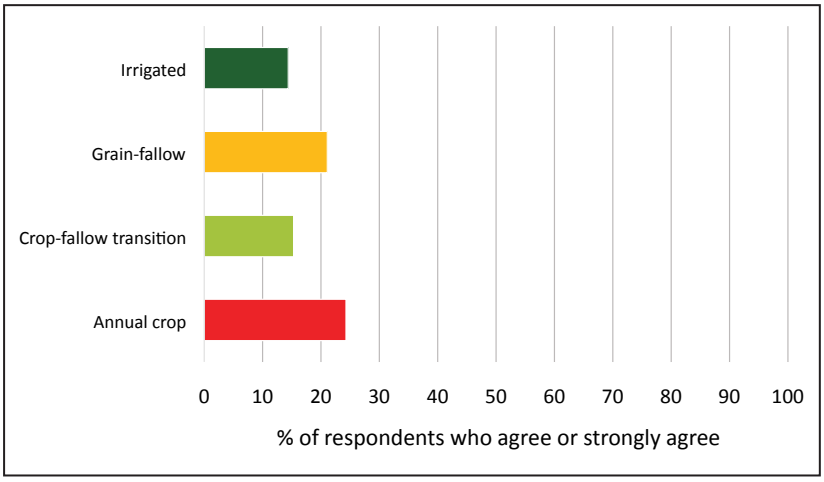
Map 6: Survey responses by AEC

Human activities are the primary cause of climate change.





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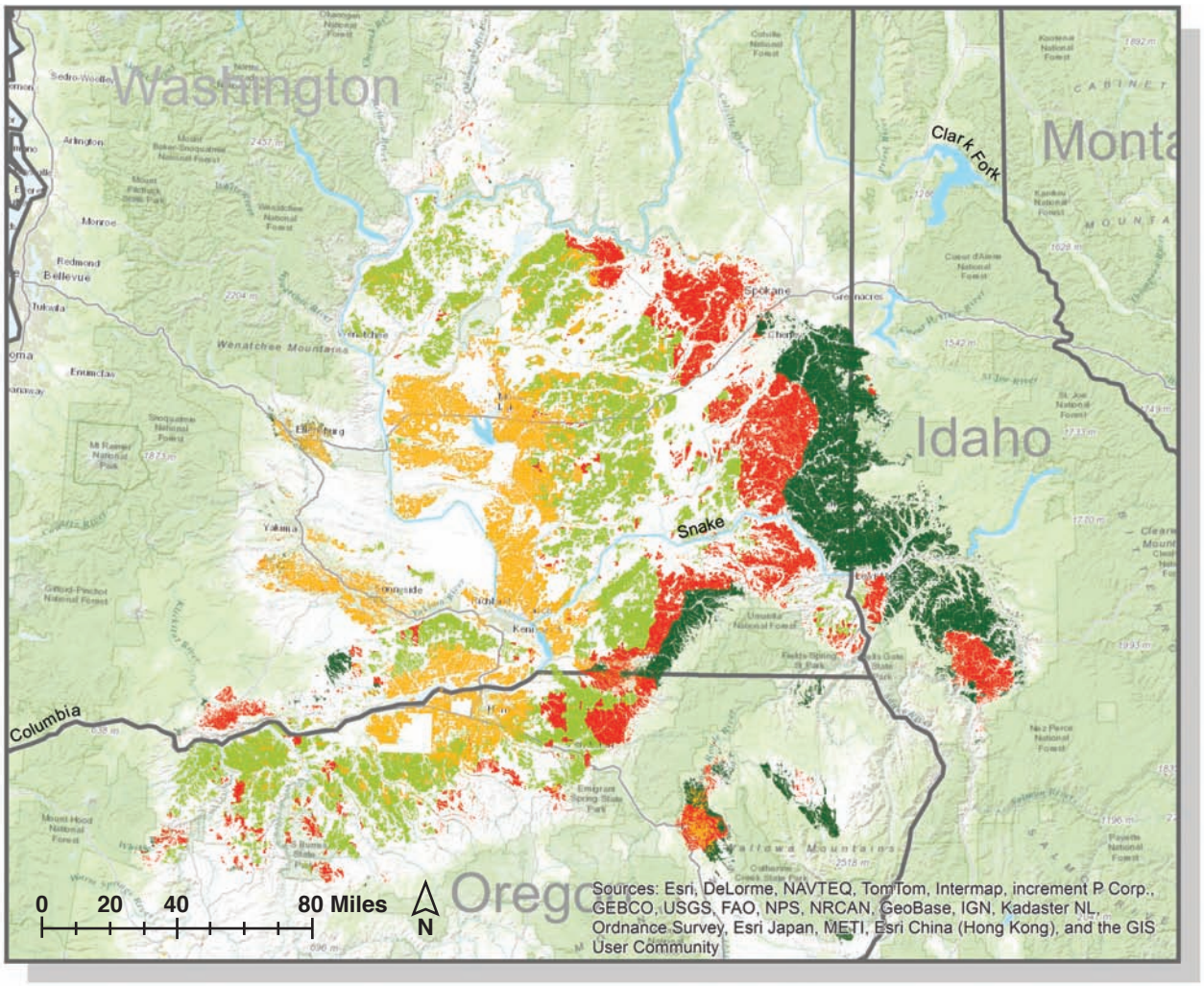
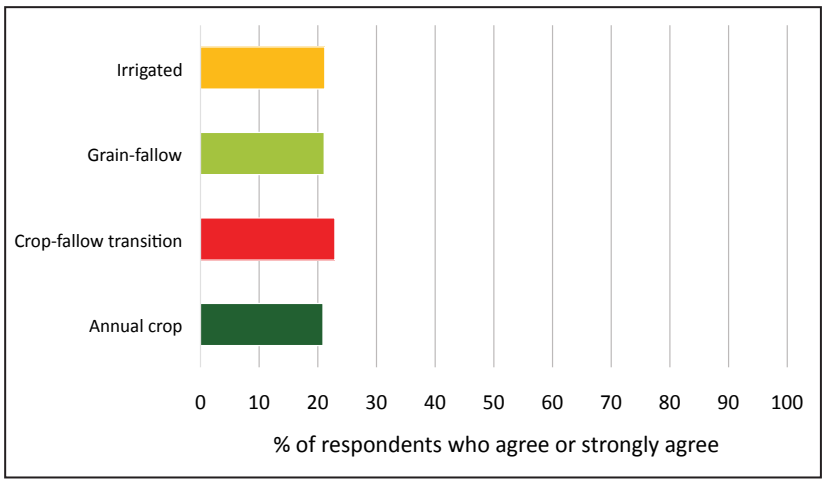
Map 7: Survey responses by AEC

I will have to make serious changes to my farming operation to adjust to climate change.





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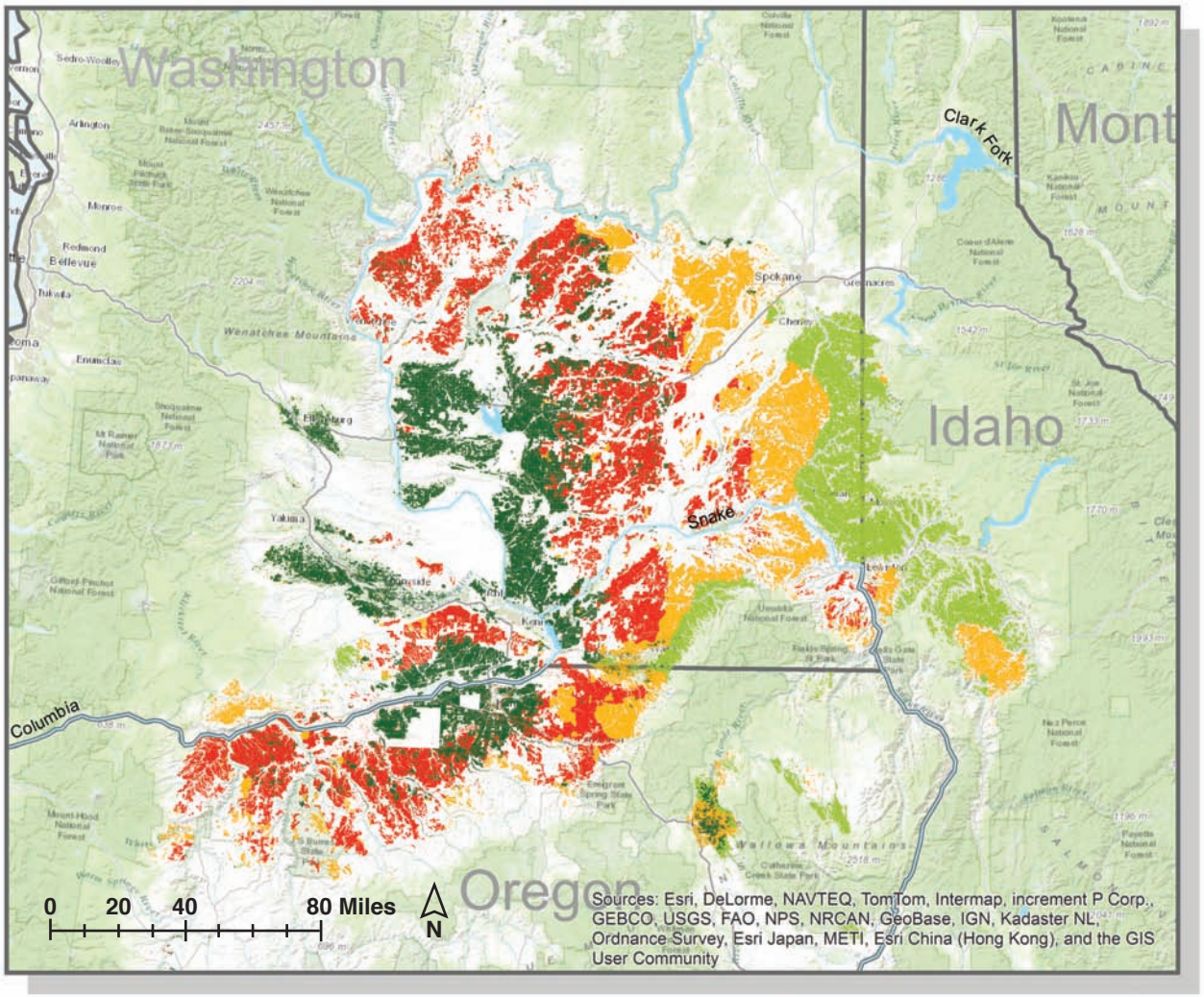
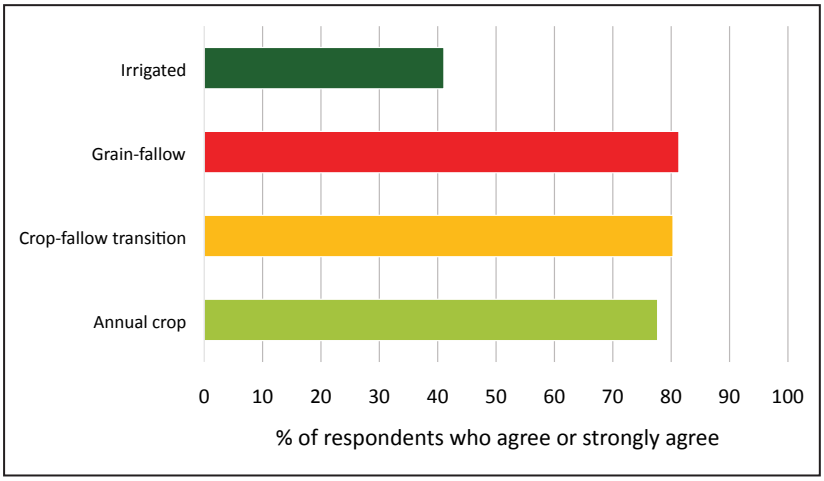
Map 8: Survey responses by AEC

Increasing intensity of precipitation is a moderate to high risk to my farm operation.





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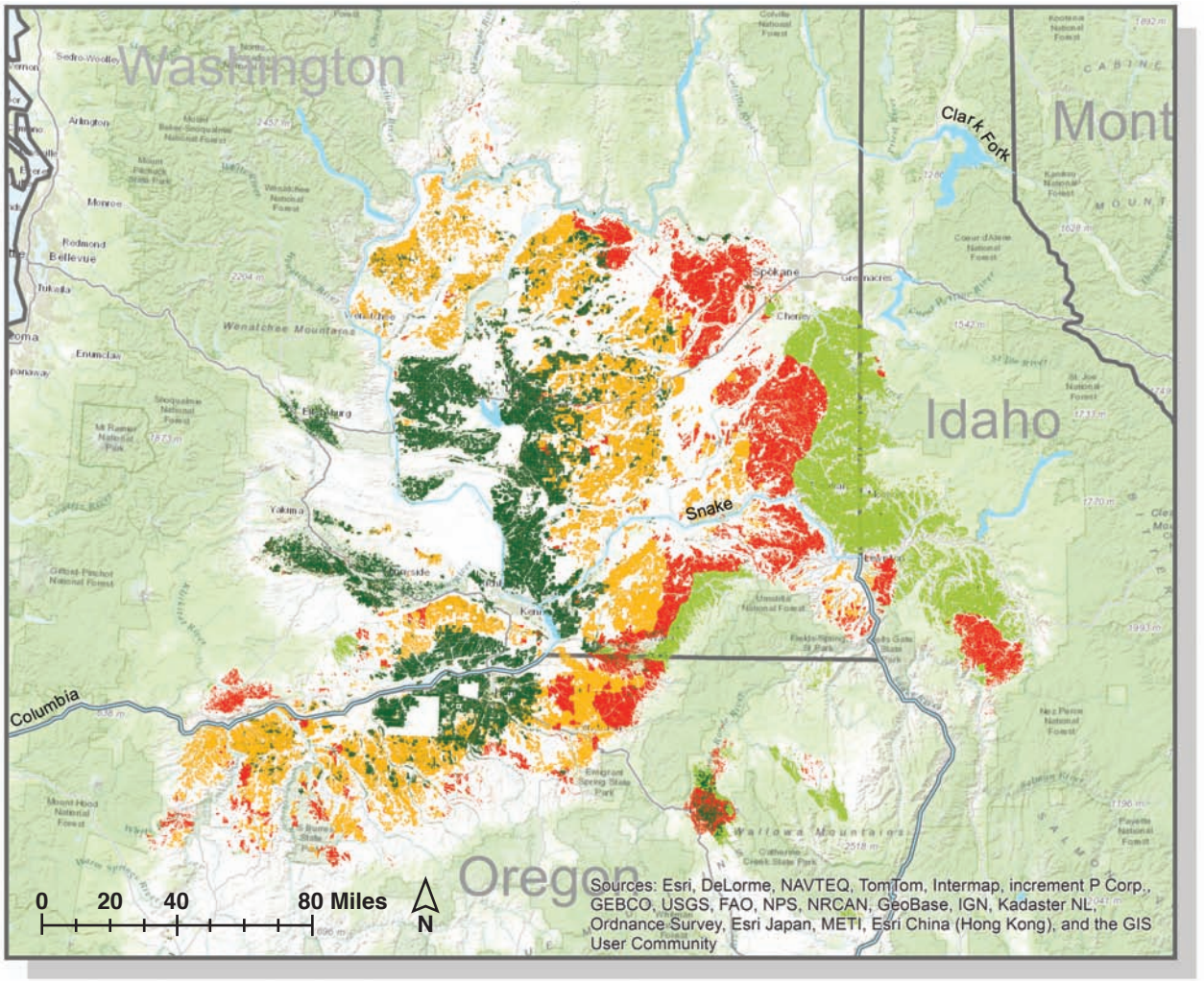
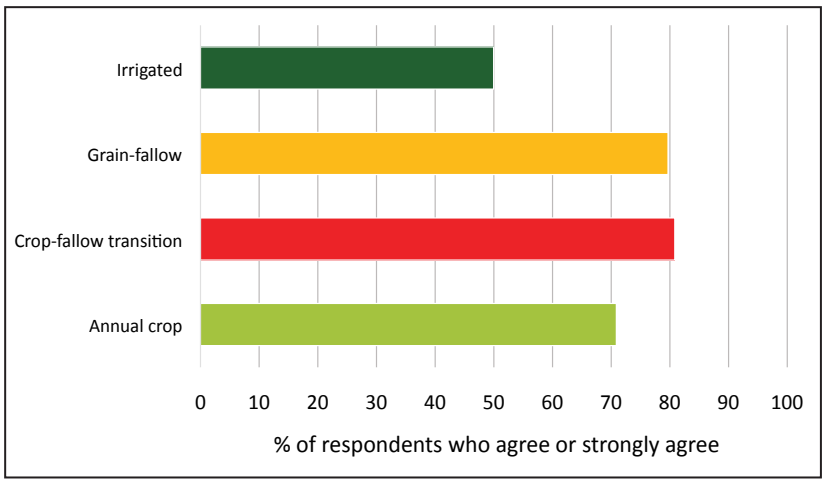
Map 9: Survey responses by AEC

Long-term drought is a moderate to high risk to my farm operation.





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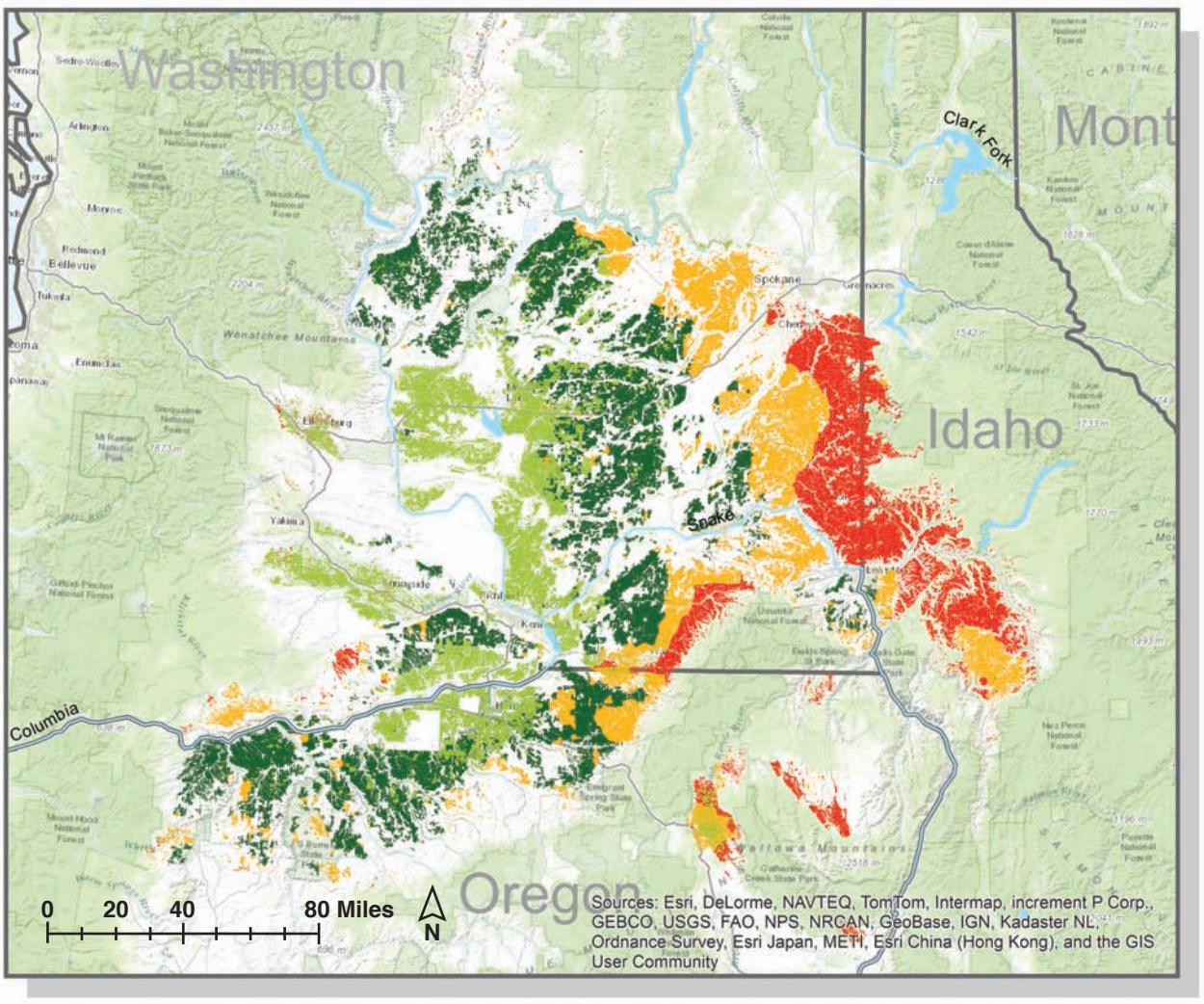
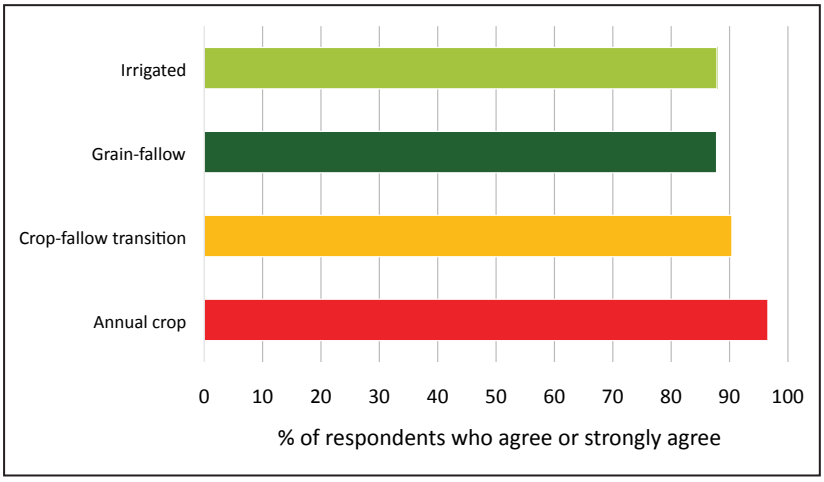
Map 10: Survey responses by AEC

The costs of inputs are a moderate to high risk to my farm operation.





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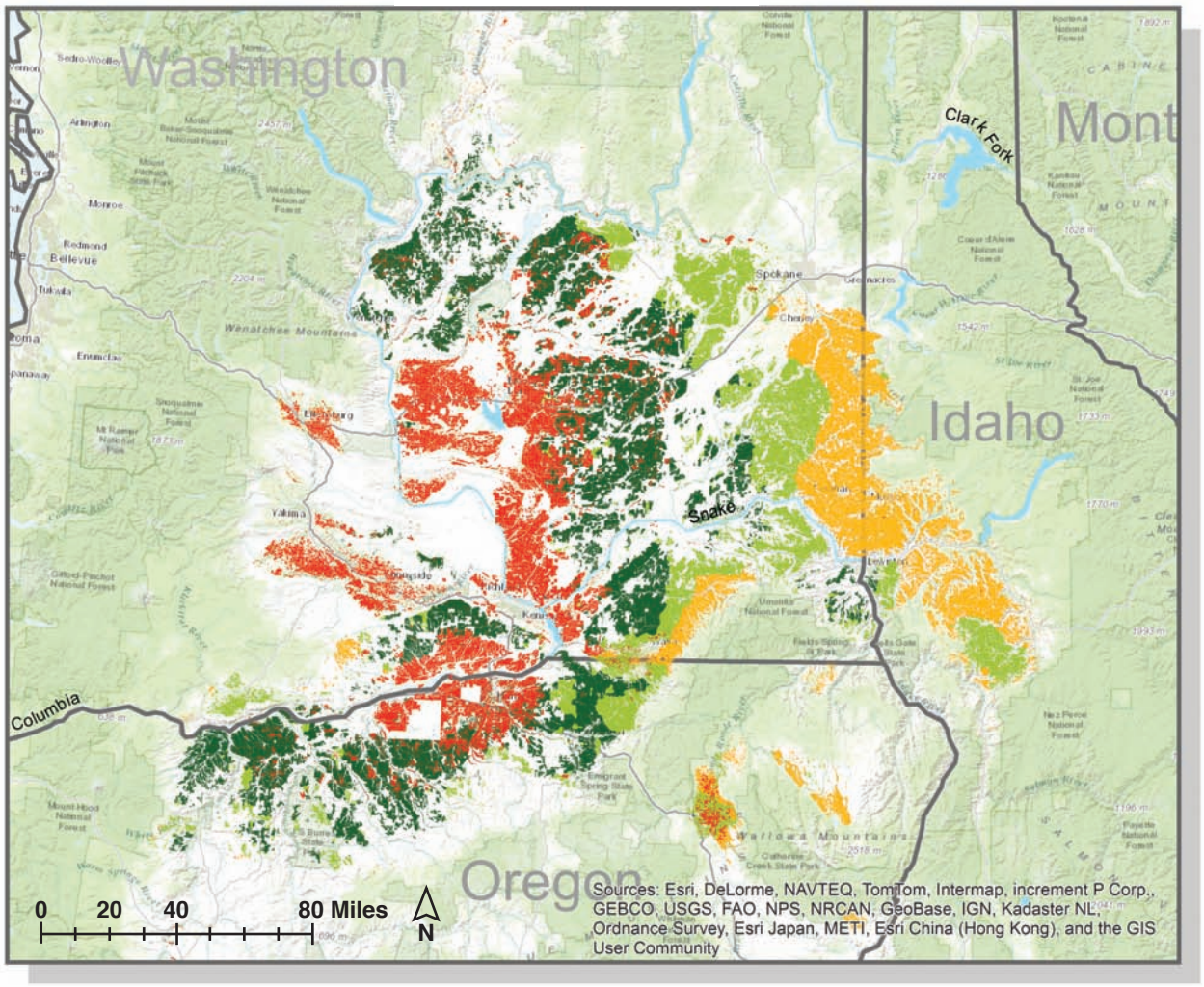
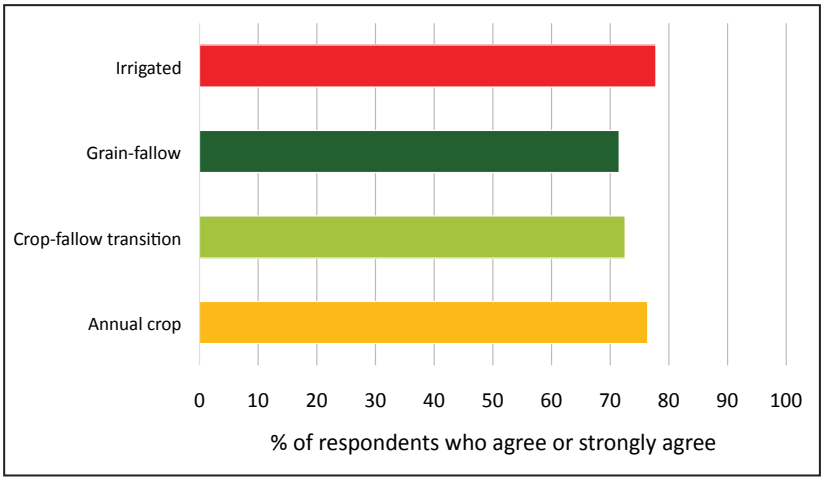
Map 11: Survey responses by AEC

Climate change poses a moderate to high risk to my farm operation.





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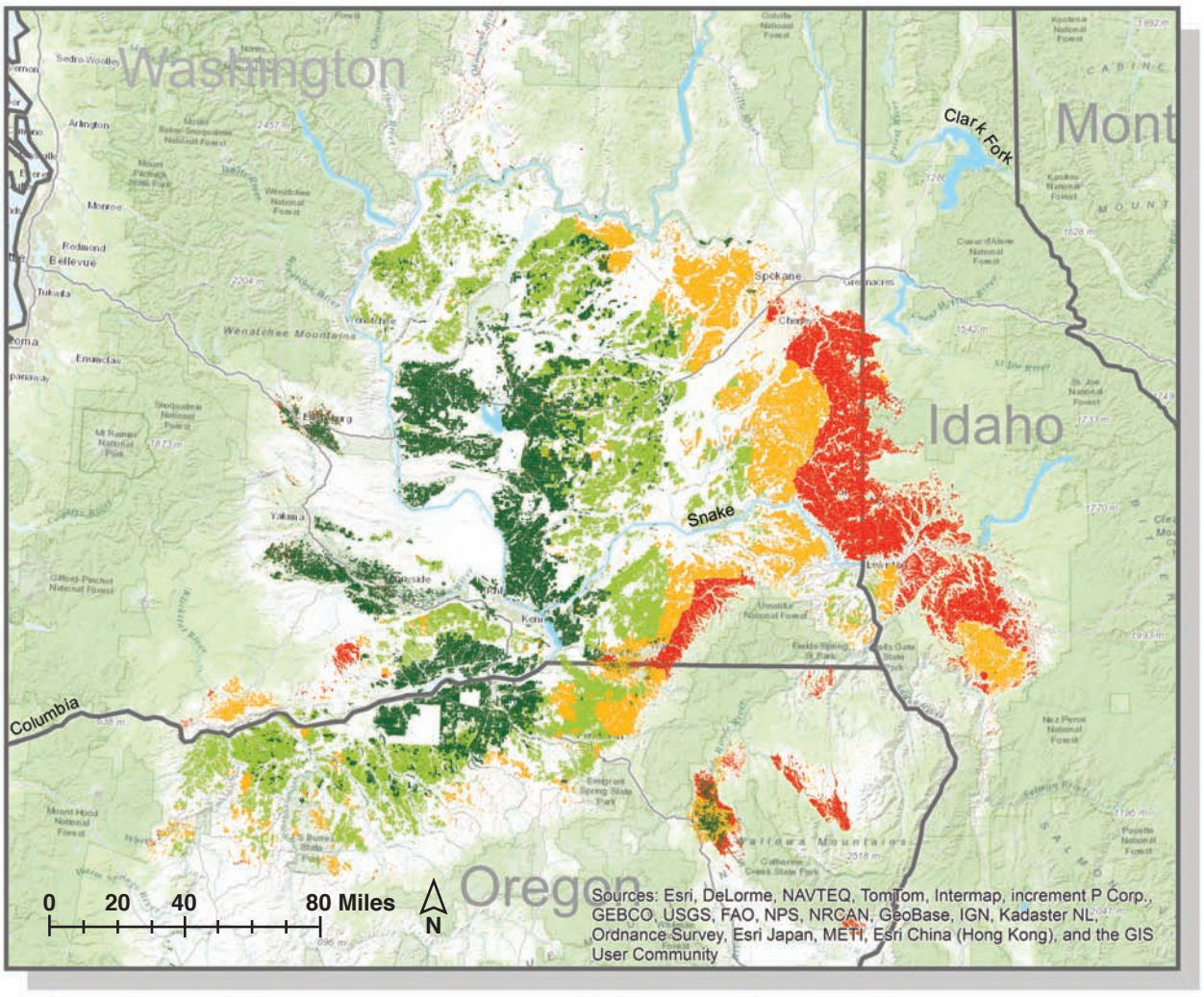
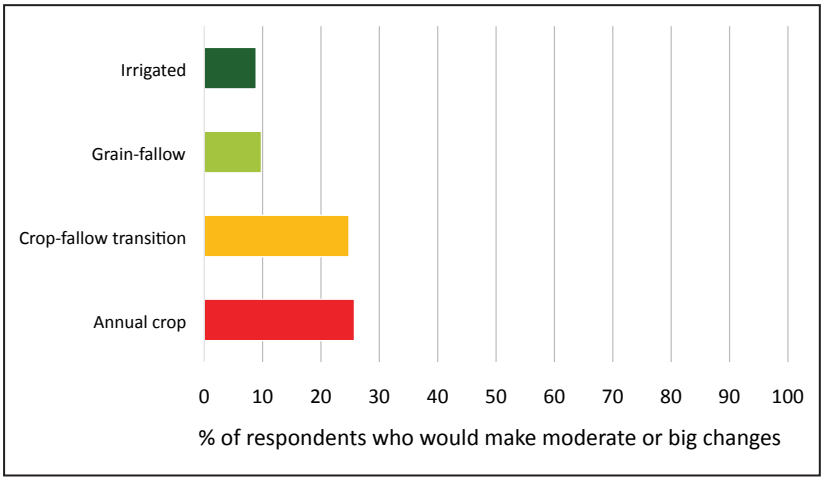
Map 12: Survey responses by AEC

Given expected climate change over the next forty years, what amount of change would you make to your current crop rotation?





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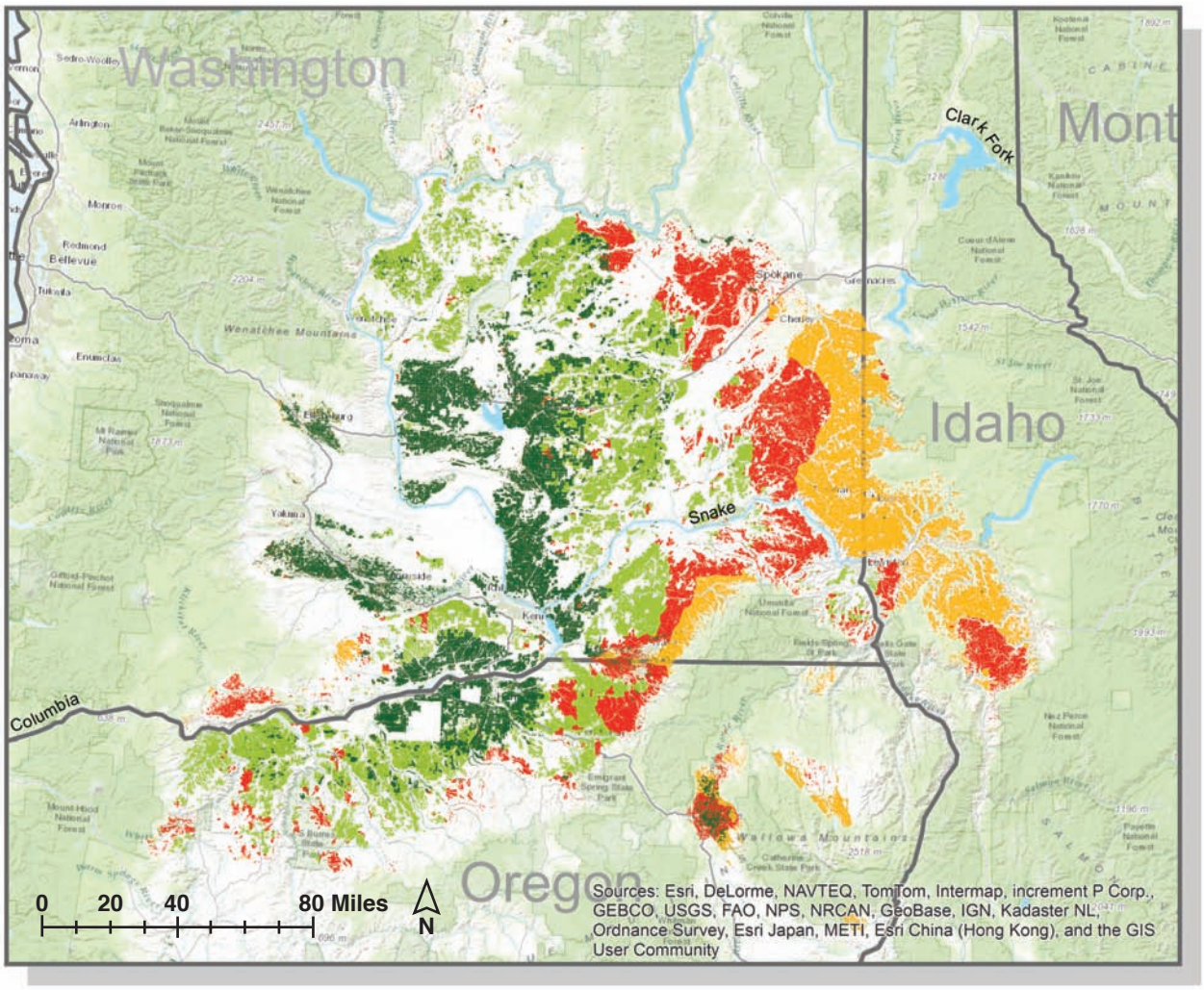
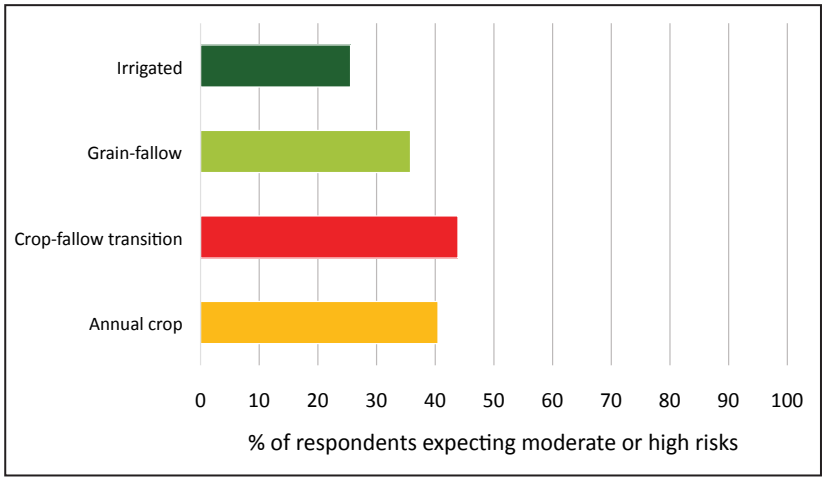
Map 13: Survey responses by AEC

What degree of environmental risk do you perceive to farm production in your growing area given expected climate change over the next forty years?





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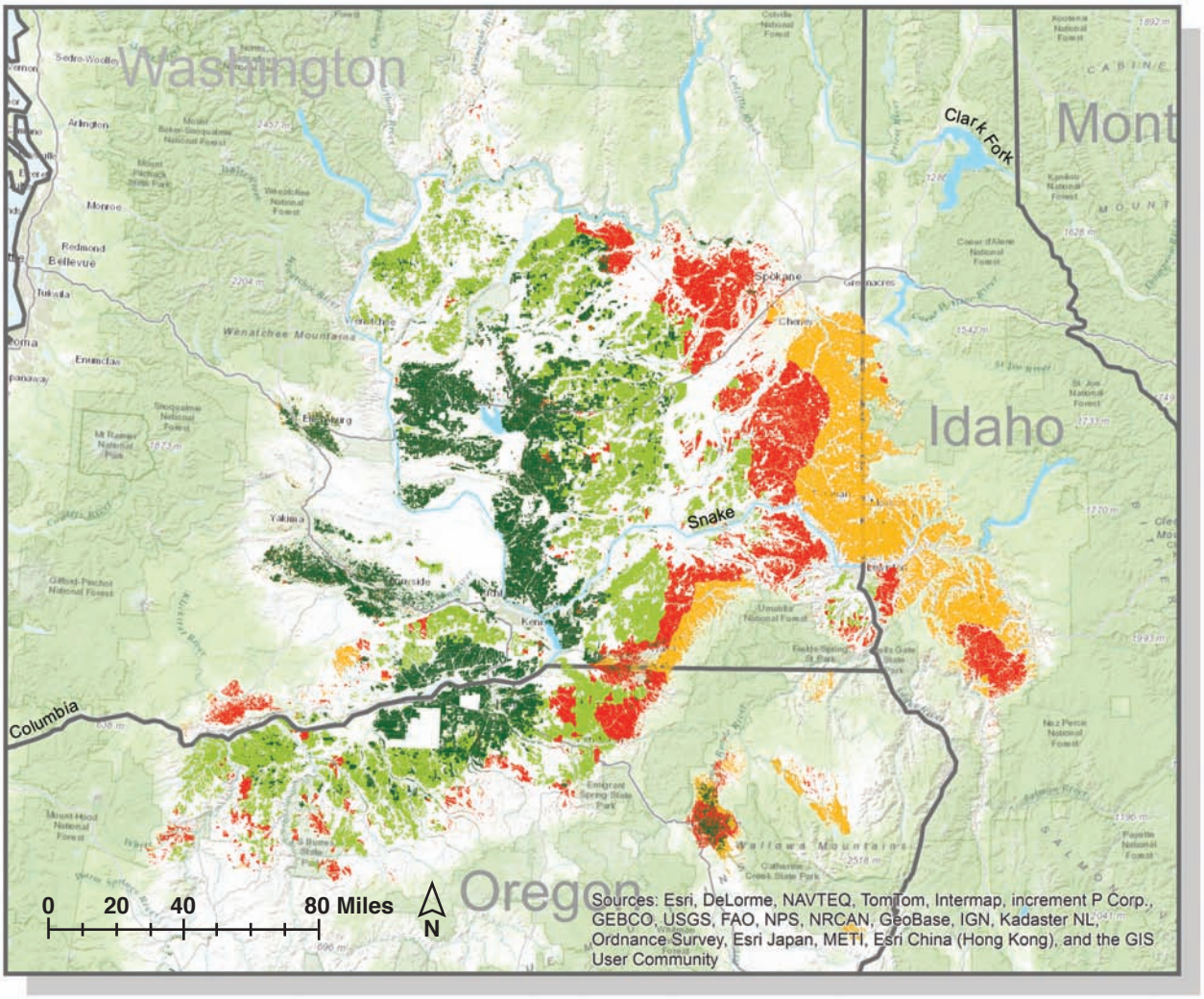
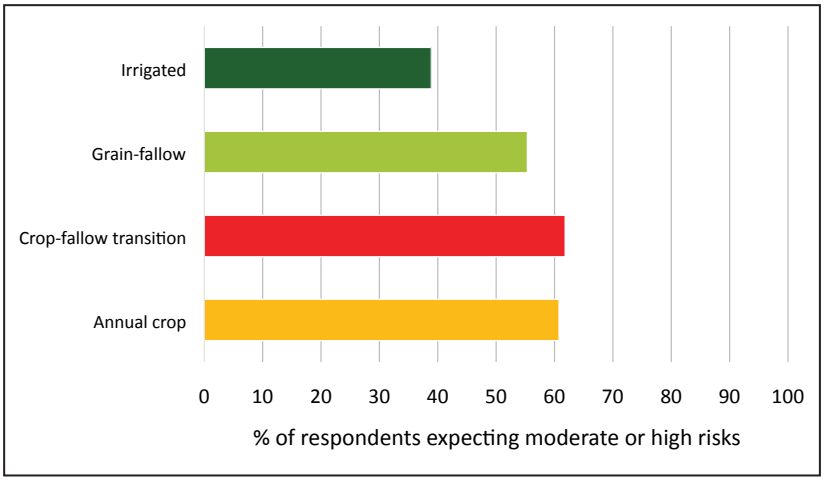
Map 14: Survey responses by AEC

What degree of economic risk do you perceive to farm production in your growing area given expected climate change over the next forty years?





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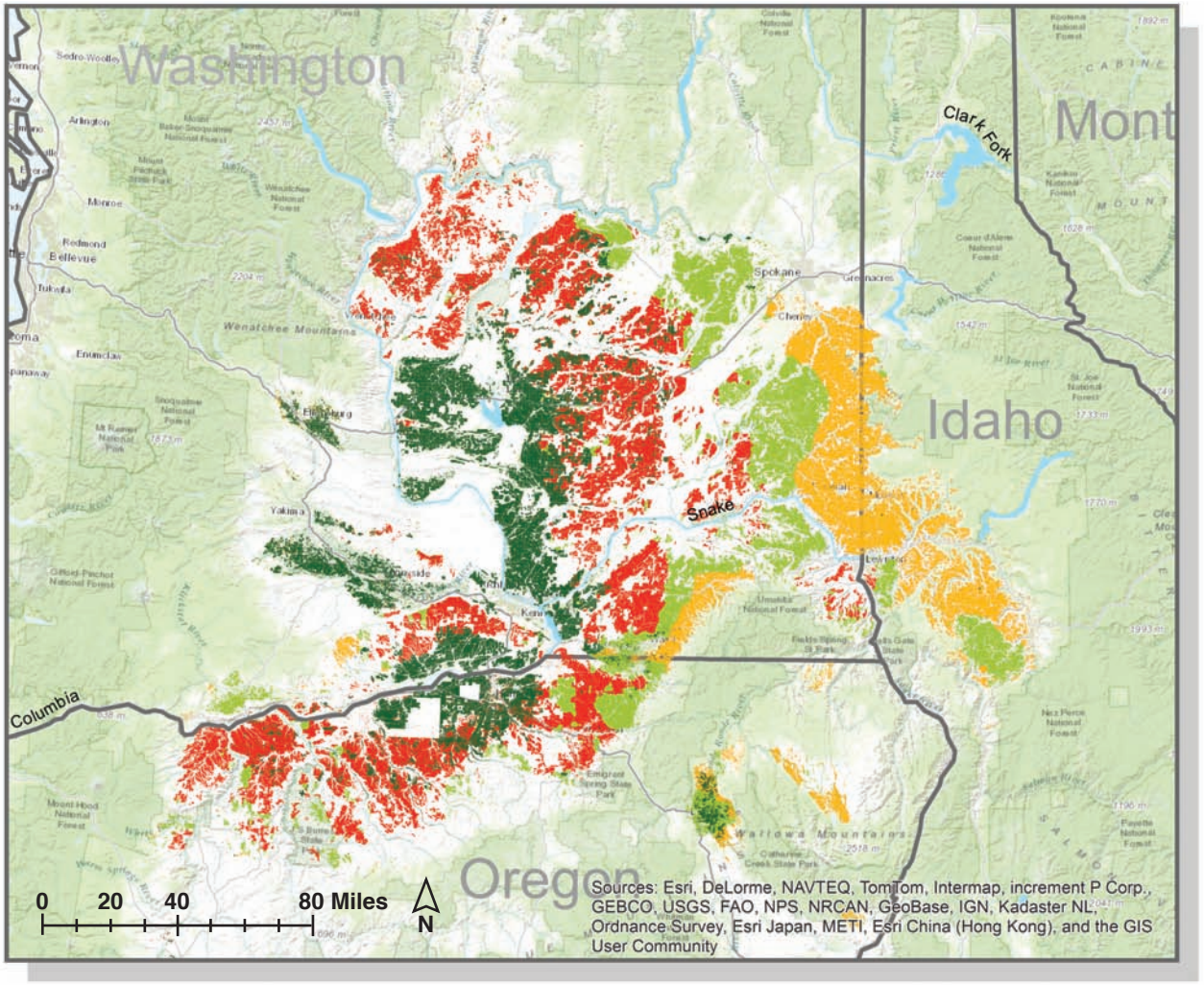
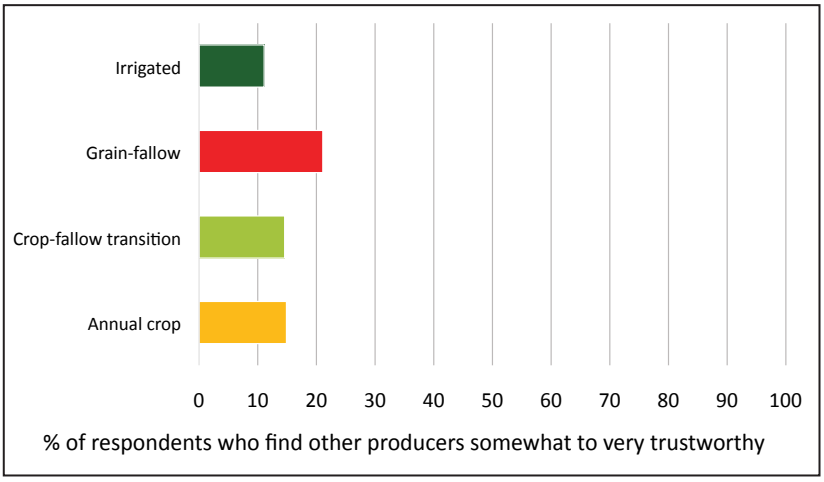
Map 15: Survey responses by AEC

With respect to climate change information, how trustworthy do you find information from other producers in your county?





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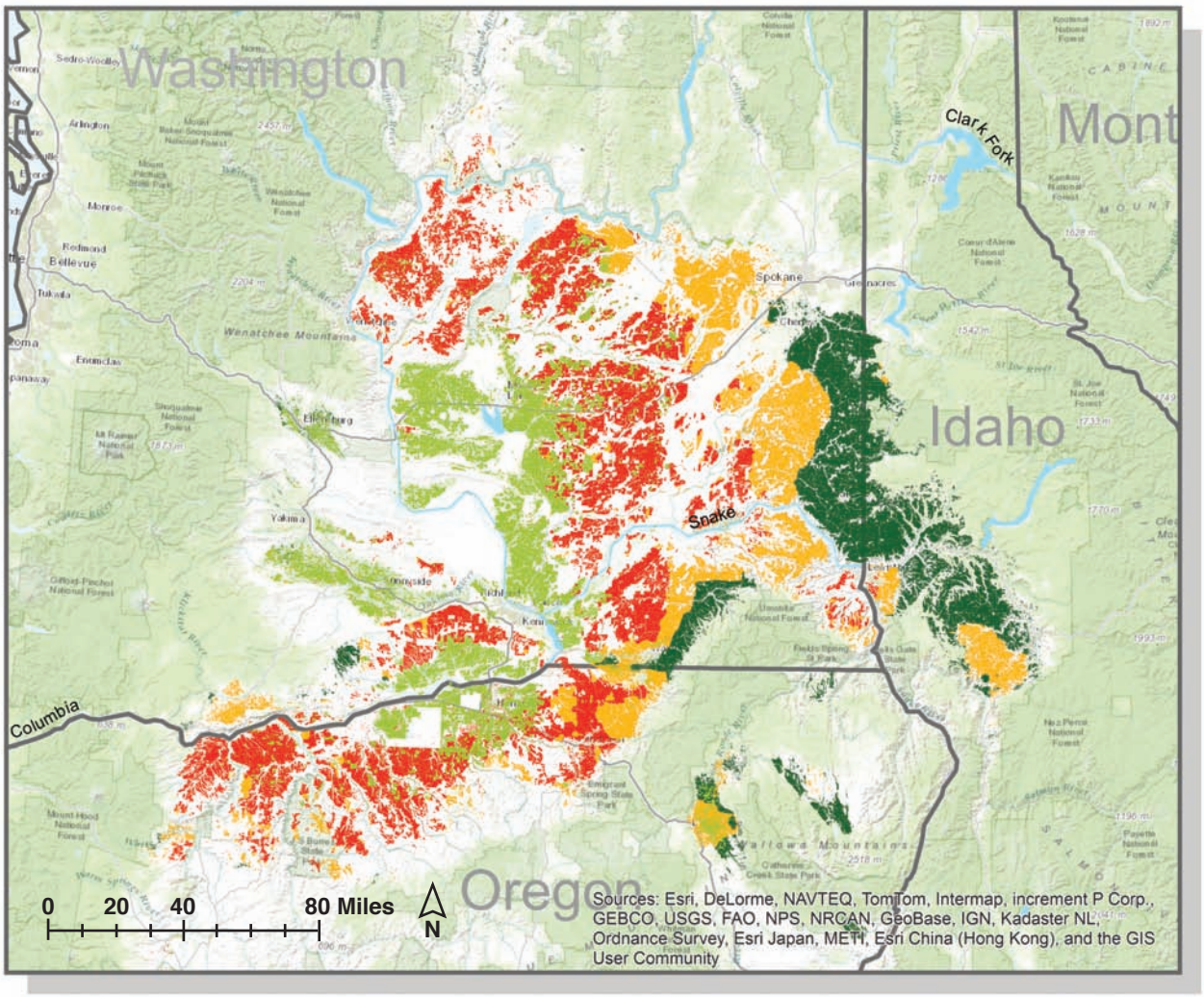
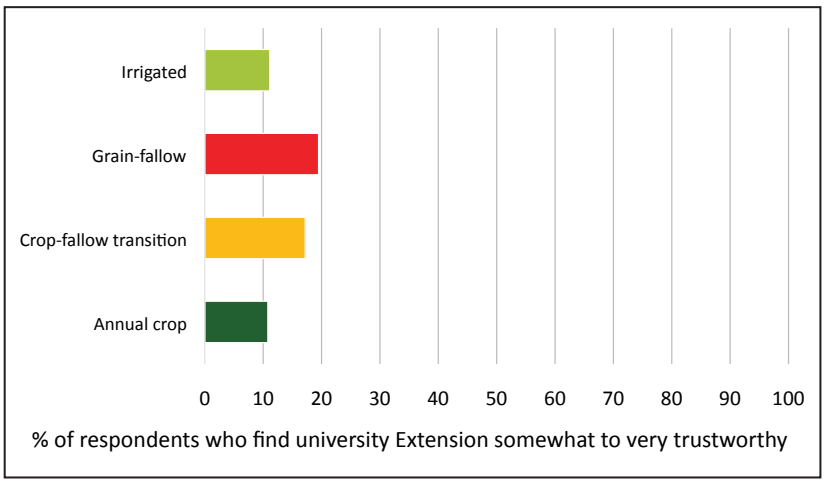
Map 16: Survey responses by AEC

With respect to climate change information, how trustworthy do you find information from university Extension?





Values charted are the percentage of respondents within each agro-ecological class with the indicated response. Colors on the bars and on the map indicate the ranking in percentages among classes in this order (from highest to lowest): **red** – **yellow** – **pale green** – **dark green**.

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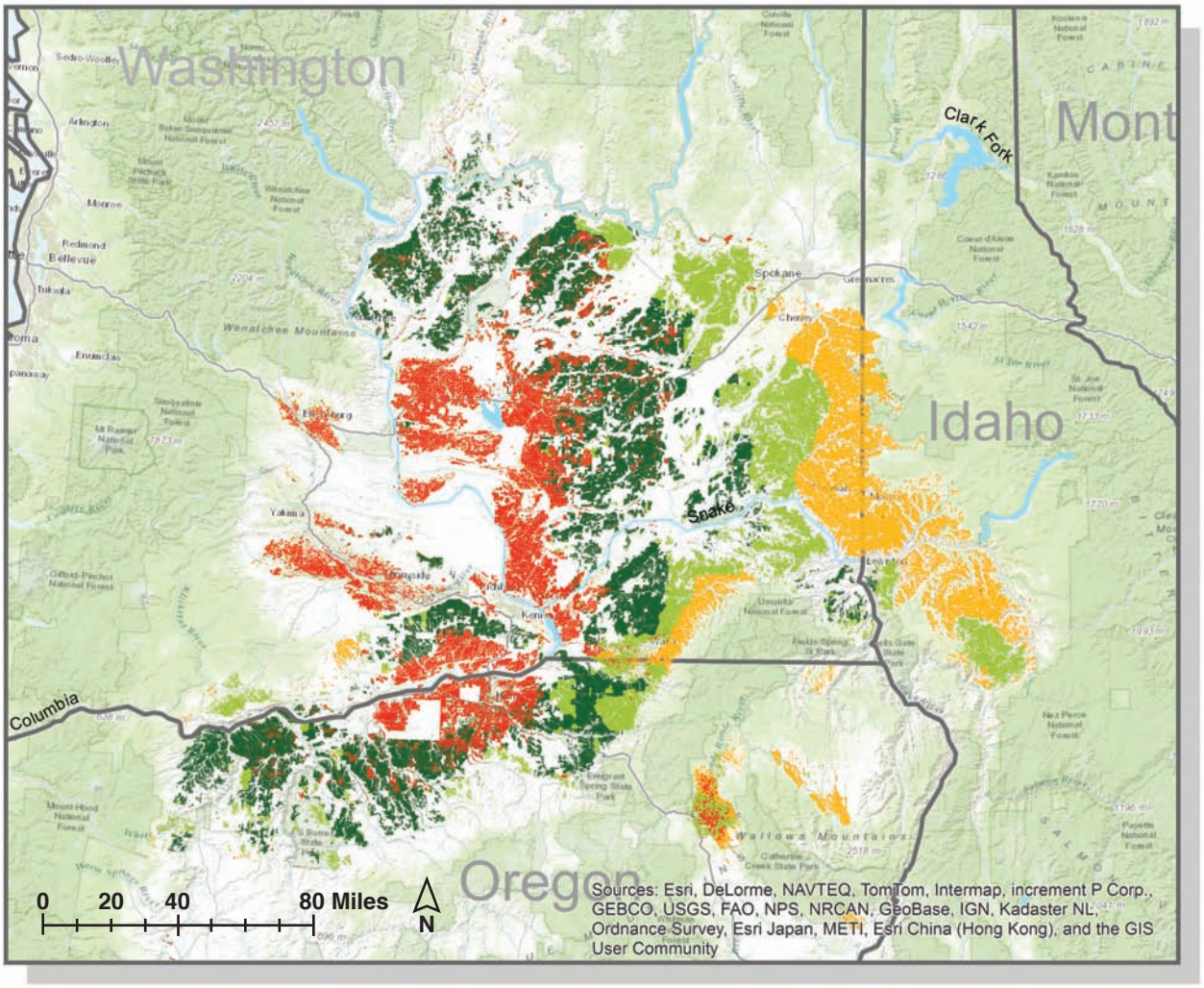
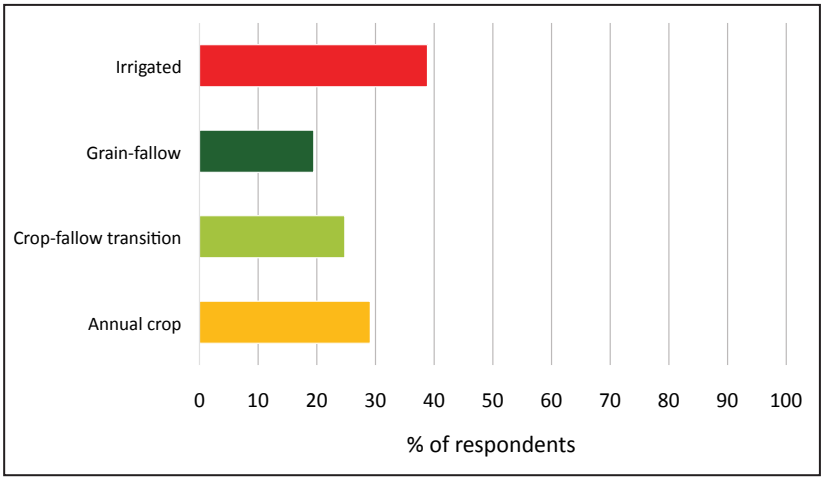
Map 17: Survey responses by AEC

I have observed, treated or controlled Cereal leaf beetle on my farm.





Values charted are the percentage of respondents within each agro-ecological class with the indicated response. Colors on the bars and on the map indicate the ranking in percentages among classes in this order (from highest to lowest): **red** – **yellow** – **pale green** – **dark green**.

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Photo by Alex Garland

The REACCH project is designed to enhance the sustainability of cereal production systems in the inland Pacific Northwest under ongoing and projected climate change, while contributing to climate change mitigation by reducing emissions of greenhouse gases.

REACCH partners:

University of Idaho

Washington State University

Oregon State University OSU

USDA United States Department of Agriculture
Agricultural Research Service
National Institute of Food and Agriculture

USDA United States Department of Agriculture
Northwest Climate Hub

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