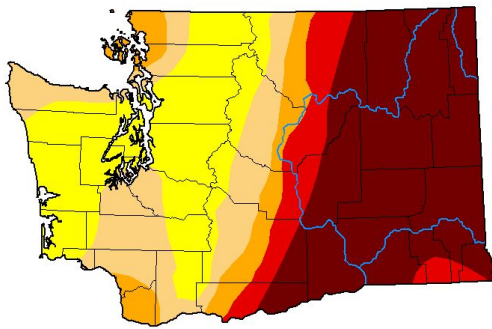
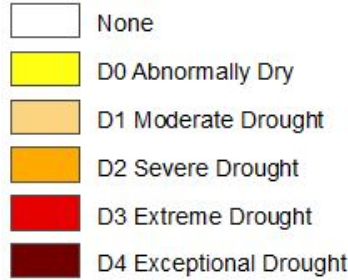


Essential Question: How does climate change affect Washington wheat farms?

Background



Intensity:



Vocabulary

climate: weather patterns and average conditions over a long time period.

susceptible: able to be harmed by something.

trend: the overall or average direction over time.

yield: the amount of wheat seeds that can be harvested and sold.

variety: a type of wheat plant or seed that has specific traits.

bushel: volume measure for harvested wheat.

pest: insect that harms the health or growth of the wheat plant.

Figures 1-3: [Left] Drought map for Washington state August 2021 from Tinker, Richard. *U.S. Drought Monitor Washington August 3, 2021*, CPC/NOAA/NWS/NCEP, August 2021, droughtmonitor.unl.edu [Right, top] Heat-stressed wheat from Berg, Nicole. *'Early and Fast' wheat harvest due to drought*, Capital Press, June 2021, capitalpress.com/ag_sectors/grains/early-and-fast-wheat-harvest-in-washington-due-to-drought/article_394eed38-d83c-11eb-bd4d-cb0440f58b21.html [Right, bottom] Hessian fly, a wheat plant pest from Bauer, Scott. *Hessian fly, Mayetiola destructor*, Agricultural Research Service USDA, August 2013, en.wikipedia.org/wiki/Hessian_fly#/media/File:Hessian_Fly.jpg

In the 2021 growing season, extreme drought in Washington state means that soils are very dry. Farmers are concerned about sufficient **yield** this year - about harvesting and selling enough wheat to make a profit.

Over much of Washington's wheat fields, farmers rely completely on precipitation (snow and rain) to provide enough moisture for their wheat plants (no sprinklers or irrigation on these fields!). Many, especially in areas where the **climate** is already dry, use a summer fallow rotation, which means that they leave empty, or fallow, half of their acres each year in order to build up moisture before planting more wheat. After a field is harvested (July-August) it will sit fallow until the following September when it will be planted with winter wheat. With enough precipitation the fallow field will accumulate moisture for the next year's crop. It's a long-term commitment that drought can quickly spoil.

In addition, the overall warming of temperatures in Washington state means wheat farms may become more **susceptible** to certain pests, wheat diseases, and even weeds. So, **how does climate change affect Washington wheat farms?**

1. MARK THE TEXT

Underline claims the author makes and any pieces of information and evidence that are relevant to the Essential Question. A claim is the idea (or ideas) the author will show you or try to convince you of.

Circle the vocabulary words listed in the box above if you find them in the text. These words might clue you into places where there is evidence in the text.

Put a question mark [?] above any other word you need to look up to help you best understand what the author is saying.

2. CONNECT AND RESPOND

Use these symbols to mark sentences or paragraphs in the article. Explain your connections or responses in the **margin**. Include at least two of the following:

- Something you have a connection to (Do you know something else about the point the author is making? Did you learn this information in another place?)
- + Something you agree with
- × Something you disagree with or have a counterclaim for
- △ Something that changes what you thought at first
- ~ Something you have a question about or don't understand yet

Essential Question: How does climate change affect Washington wheat farms?



Scan this QR code to listen to the podcast. The expert starts at 17:08.

Excerpt from The Washington Grain Commission Wheat all About It podcast Episode 57: Better Wet and Cold than Hot and Dry

1 *In this episode of the WGC's podcast, the host presents a recording from Bryce Anderson's presentation to the Tri-State Grain Growers Convention in 2017. Anderson is a meteorologist with DNT, a data company that advises farmers. In this excerpt from the podcast, Anderson responds to a question from the audience about how climate change may affect weather and Washington wheat farms.*

2 [Audience member] With this warming trend, global warming, do you feel like it's man made or a natural trend?

3 [Bryce Anderson] Well there is a growing amount of evidence that human activity has been pretty highly involved in the trends that we are seeing. And that does have to do with carbon dioxide emissions.

4 There has been some study done that shows that without the human component, temperatures since the late 1940s would have been steady or even maybe a little bit cooler because solar activity, as we all know, as we have heard, has been basically flat.

5 We haven't seen a great increase in solar activity for that period of time. So if you remove the element of temperature, the pattern would not have been as pronounced to the warmer side, as we have [recorded the temperatures to be currently]. The evidence continues to mount up in that vein and in that conclusion.

6 How about warming in terms of what it means to what we do - which is raise crops? Well, by the end of the twenty-first century with the the trends going the way they are (and this is of course, you know, kind of doing the very dangerous thing of assuming, but it it does offer an illustration) by the end of the twenty-first century we could see the number of frost-free days in the Northwest move to 70 plus.

7 We could have 70 plus frost-free days in the Northwest by the end of the twenty-first century. Now that's not necessarily a bad thing because it does mean that we would have a longer growing season.

8 So there's not just, like I say, a harbinger of Doom type thing going on here. Longer growing seasons offer obviously a chance to, you know, to have crop decisions that require a little bit of a longer timeframe.

9 On the other side of that, there are a couple of effects there.

10 With a longer growing season you also have warmer temperatures that lead to more evaporation of soil moisture out of the soil profile. So this is a little bit of a trade-off as it goes on and and it's maybe a little bit of a caveat in terms of what the impact of warmth might be.

- 11 | If you ask me, “Okay Bryce, you know you're showing us this information, what is your biggest takeaway from from what we are looking at? How it could affect agriculture not just here in the Northwest, but in the Midwest and in the Plains and what not?”
- 12 | My biggest takeaway is that the water supply is going to be challenged the most with what we're seeing. Now it doesn't mean that we can't be successful in what we do, but it does mean that the water supply is maybe not going to be as dependable as we think about.
- 13 | Another feature that, again by the end of the 2000s, so with the conditions showing the types of increases that we are seeing, is that hot nights are likely to increase to between 50 and 70 in terms of their number in the Northwest.
- 14 | And by hot nights I'm meaning this is research that's been put together by Dr. Jerry Hatfield at the USDA research facility in Ames, Iowa.
- 15 | With a hot night, those are nights when the minimum temperature is higher than 98% of the minimum temperatures between 1971 and 2000. So, that's a pretty high benchmark, but again, between 50 and 70 hot nights, and you can see that over much of the continental US that type of feature is a possibility by the end of the century.
- 16 | [Host]: Anderson's observations about the warming planet and man's contributions to it may be settled in his mind, but I think there's still a lot of farmers who questioned that particular detail.
- 17 | They can see the weather is changing, they just believe the climate is going to do what it's going to do regardless.
- 18 | Myself, I think it's better to be safe than sorry.
- 19 | That's all the time we have. I hope you enjoyed Episode 57, or what I called Better Wet and Cold then Hot and Dry about Bryce Anderson's presentation at the Tri-State Grain Growers convention on November 11th at the Grand Hotel in downtown Spokane.
- 20 | I hope you'll join me again next time for another episode of *Wheat All About It*.

Adapted from Yates, Scott. "Better Wet and Cold than Hot and Dry." *Wheat All About It from Washington Grain Commission*, Washington Grain Commission, 23 January 2018, wagrains.org/podcast/episode-57-better-wet-and-cold-than-hot-and-dry/.

Summary: Review the essential question and your annotations. Answer at least two of the following questions in the space below. What claim(s) does the author make about the essential question? Do you agree with the claims? Are they well supported by evidence from the article? What connections did you make that help you evaluate the author's claim?

Essential Question: How does climate change affect Washington wheat farms?

Discussion Use the information on this page to help guide your discussion to answer the essential question. Remember to say just enough to make your point while leaving **room for others to speak**. It is okay for there to be **periods of silence** while you and your classmates think. (If it's quiet - **go back to your article** annotations and try a sentence starter below!) Make sure you respond to or question each other's ideas while you talk. Look out for times when you can clarify with evidence, ask questions about relevancy or accuracy of information, or identify a counterclaim.

Near the beginning

Give (and analyze) claims and evidence

My author claims...

My article says...but I think...

My article says...and I think...

In the middle

Evaluate information and look for connections and/or counterclaims

From what I know...because...

What does your article say about...

A counterclaim would be that...

Does anyone have more information about...

Does...depend on having...point of view?

Near the end

Answer the essential question

When you said...I thought...

Does the group agree that...?

Even though my article claims...I now think...

My article claims...and I think it is right because...

After listening to everyone's thoughts, I think...

Discussion Checklist

→ Share information by stating (at least 1)

- My article's claim, quoted directly from article**
- My analysis of the claim
- Relevant connection or background information**
- Evidence, quotes directly from article

→ Respond to others ideas by (at least 1)

- Pointing out a counterclaim
- Asking for examples
- Asking for evidence
- Saying more about others' ideas**
- Prompting someone else to respond

→ Show respect for others' ideas by (at least 1)

- Paying attention to people who are talking**
- Staying on-topic
- Re-engaging the group after a period of silence or if you go off-topic
- Monitoring time

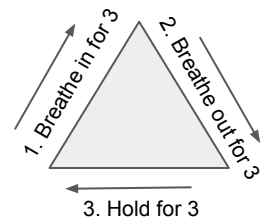
→ Answer the essential question by (at least 2)

- Saying my ideas about the essential question**
- Using evidence to back up my ideas**
- Providing a different answer or idea
- Giving OR asking for a summary

Nervous about speaking? It's normal.

Here are some things that might help:

Breathe. Use a triangle breath to regulate your nerves and prepare yourself to speak.



Go back to your article and look for where you noted **personal connections** to the text. Speaking about something you have experience with may be easier in the group discussion.

Look at the sentence starters above. Write out what you are going to say by filling in the blanks and be on the lookout for when to add your thoughts.

Essential Question: How does climate change affect Washington wheat farms?

Reflection Think about what you read and what others said in the group discussion to answer the following questions.

1. What did you get out of this activity?
- | | | | |
|---------------------|--------------------------------|-----------------------------------|-------------------------------------|
| I learned | <input type="checkbox"/> a lot | <input type="checkbox"/> a little | <input type="checkbox"/> nothing |
| I participated | <input type="checkbox"/> a lot | <input type="checkbox"/> a little | <input type="checkbox"/> not at all |
| My thinking changed | <input type="checkbox"/> a lot | <input type="checkbox"/> a little | <input type="checkbox"/> not at all |
| I enjoyed it | <input type="checkbox"/> a lot | <input type="checkbox"/> a little | <input type="checkbox"/> not at all |

2. Choose a stem from above and say more. For example, *I participated a lot because the article I read had good evidence for the essential question or My thinking changed not at all because I agreed with the article's claim and we did not find any credible counterclaims during our discussion.*

3. How would you answer the essential question in 3-5 sentences? Consider the claims and evidence from your article, along with connections, background information, and counterclaims and evidence brought up during the discussion.