

Wildfire GPT



Hi there! I'm WildfireGPT, your friendly wildfire risk consultant. With access to comprehensive wildfire datasets, I'm here to help you understand and prepare for potential risks in your area.

To provide the most relevant information, I'll start by working through a checklist of questions about your background and concerns prior to our consultation session. Your responses will help me tailor my recommendations to your unique situation. If you're unsure about any question, feel free to say "I don't know."

Once I have a clear understanding of your needs, I'll summarize our discussion and create a plan to address your concerns. This will include the datasets we'll analyze and the types of recommendations I can provide.

When you're happy with the plan, we'll proceed according to the agreed-upon steps. Feel free to ask questions at any point in the process.

I'm looking forward to working with you to help you better understand and prepare for wildfire risks. Let's get started with our first question: What is the location you're concerned about regarding wildfire risks?



Ask me anything?





Mount Bigelow, AZ



Thank you for providing the location. To ensure accuracy, can you confirm if the latitude and longitude for Mount Bigelow, AZ are approximately 32.4169° N, 110.7311° W? If this is correct, I can proceed with verifying this location on a map for you.



Click to provide feedback



Let's verify that



Please go ahead and confirm the location by clicking the 'Confirm Location' button on the map provided. Once you confirm, we can proceed with the next question.



Click to provide feedback



The location has been confirmed: latitude 32.4169, longitude -110.7311.



Great! Next, could you share your primary concerns or questions about wildfires in the Mount Bigelow, AZ area?



Click to provide feedback



Frequency, intensity and impact of wildfires in the area



Thank you for sharing that. Now, could you specify the time frame you are interested in for assessing wildfire risks? Here are some options to consider:

- **Short-term (1-10 years):** Immediate mitigation strategies after a recent fire or for areas at high risk.
- **Medium-term (10-30 years):** Strategies for ongoing risk management and resilience building.
- **Long-term (30-80+ years):** Considerations for long-term planning, such as urban development, land use, and climate change adaptation.
- **Recent (1-10 years):** Recent fire events in the area.
- **Past (10-50 years):** Historical fire risks in the area.
- **Long-term (50+ years):** Long-term trends in fire patterns in the area.

Please let me know which time frame aligns with your interests.



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Long-term (50+ years)



Thank you for specifying the time frame. Could you please describe your professional background and expertise? This will help tailor the information to your needs.



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I'm an engineer



Thank you for sharing your professional background. Lastly, could you specify the aspects of wildfire risks you are particularly interested in exploring further? For example, are you looking at specific mitigation strategies, ecological impacts, economic effects, or something else? If you're unsure, I can provide more examples to help define your scope.



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mitigation strategies, ecological impacts, economic effects



Thank you for providing all the necessary details. Here is the summary of our conversation:

- **Location:** Mount Bigelow, AZ, latitude 32.4169, longitude -110.7311
- **Concern:** Frequency, intensity, and impact of wildfires in the area
- **Time:** Long-term (50+ years)
- **Profession:** Engineer
- **Scope:** Interested in exploring mitigation strategies, ecological impacts, and economic effects of wildfires

Please confirm if all the information is accurate, and then I will proceed to update our records.



Click to provide feedback



Yes



The checklist has been successfully updated. I have a few follow-up questions to further refine the scope of our session. Are you ready to proceed with these additional questions?



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Sure



Great! Let's start with the existing infrastructure and projects. Could you provide details about any specific infrastructure or engineering projects currently in place in the Mount Bigelow, AZ area for wildfire detection, suppression, and post-fire recovery? If you're not sure, we can include this in the scope of today's session to explore further.



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Let's explore further



Understood, we'll include that in the scope for today's session.

Next, could you describe how recent wildfires have influenced the local ecosystems in the Mount Bigelow area? Are there any particular ecological changes that need to be considered when planning engineering interventions? If you're unsure, we can also look into this together today.



Click to provide feedback



Let's explore this too



Absolutely, we'll add this to our agenda as well.

Finally, can you provide an estimate of economic losses due to past wildfires in this region, or should we include an analysis of the projected economic impacts of future fires given current climate change models in our discussion today? If you don't have this information, we can explore it together.



Click to provide feedback



Same thing. Let's explore



While I am working diligently creating a comprehensive plan, I want to touch base and let you know that I can leverage three powerful datasets that each offer unique insights into wildfire risks within a 36km radius of the area of interest we discussed earlier:

- Fire Weather Index (FWI) from [ClimRR](#) allows us to assess potential trends in fire danger from the historical period (1995-2004) through the mid-century (2045-2054) and up to the end of the century (2085-2094). This dataset is ideal if you're interested in understanding how fire risks may evolve over time.
- Long term fire history records from [International Multiproxy Paleofire Database \(IMPD\)](#), specifically the metadata from the North American Tree-ring Fire Scar Synthesis (NAFSS) provides a rich dataset including scientific studies derived from tree-ring records across North America, capturing centuries of wildfire occurrences. This dataset can be instrumental in analyzing wildfire risk by providing historical context and identifying patterns or cycles in wildfire activity in the long term. If analyzing long-term wildfire trends is a priority for you, this dataset is a fantastic resource.
- Recent fire incident data reported to the [IRWIN system](#): Wildland Fire Interagency Geospatial Services (WFIGS) Group wildfire incidents record allows you to retrieve yearly and monthly wildfire incident counts between 2015 and 2023. This dataset is perfect if you want to focus on recent fire incidents in your area.

Currently, these are the datasets I can access. If I mistakenly suggest analyzing types of data that are beyond my current access, please kindly point them out to me so I can adjust our plan accordingly.

In addition to these datasets, the related academic papers are compiled by the Argonne National Laboratory's [Community and Infrastructure Adaptation to Climate Change \(CIACC\) tool](#). For each retrieval, I can extract abstracts from 3 relevant published papers within the corpus and provide you with a summary of the findings.

I am currently working on creating a comprehensive, personalized wildfire risk analysis plan for you. As I work on your plan, I kindly ask for your patience. Please refrain from typing anything until I have shared the completed plan with you for your review ...

Once I have completed the plan, I will share it with you for your feedback. At that time, please let me know if you have any specific preferences or areas of focus you'd like me to prioritize in future revisions or updates to the plan.



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Here's the plan for addressing your concerns about wildfire risks in Mount Bigelow, AZ:

Step 1: Analyze Long-term Fire History Records

- I will review the long-term fire history records to assess the frequency and intensity of past wildfires over the last 50+ years. This analysis will help identify any recurring patterns or significant changes in wildfire activity, providing a historical context for your concerns.

Step 2: Examine the Fire Weather Index (FWI)

- I will analyze the Fire Weather Index to understand the current and projected fire danger levels based on weather conditions. This step will include looking at trends in the index over time, particularly focusing on how changes in climate might affect fire behavior and risks.

Step 3: Literature Search

- I will conduct a literature search to find scientific papers and studies relevant to wildfire risks in areas with similar geographical and climatic conditions as Mount Bigelow. This will include looking into effective mitigation strategies, ecological impacts, and economic effects of wildfires.

Step 4: Develop Recommendations

- Based on the analysis of the datasets and the findings from the literature search, I will provide recommendations tailored to your needs. These will focus on engineering solutions for mitigation, adaptation strategies for ecological conservation, and approaches to minimize economic losses.

Do you have any questions about this plan, or is there any other dataset or information you would like to include?



Click to provide feedback



Looks good. Continue



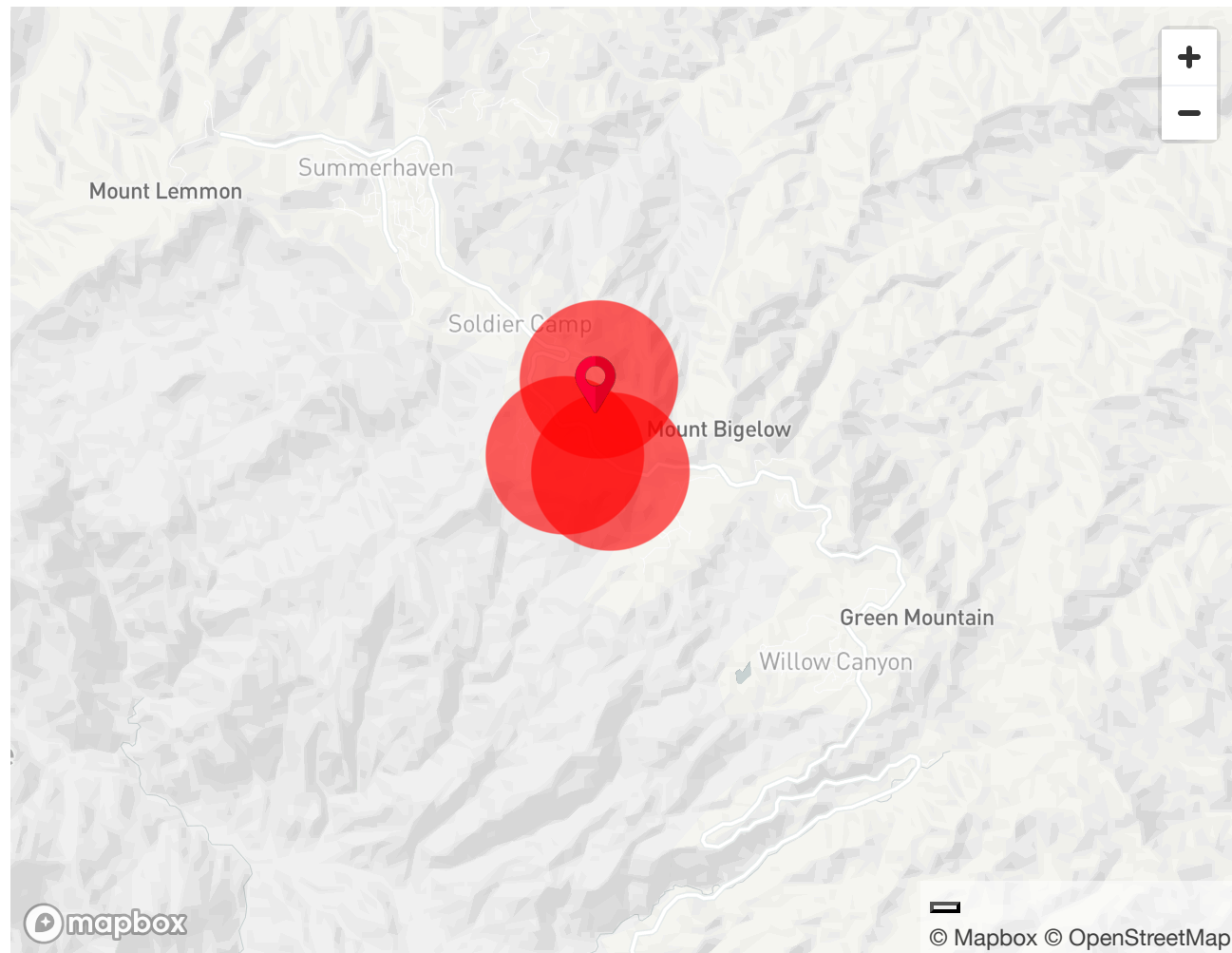
While I am preparing the analysis, I'd like to let you know that I can also report some census data. Specifically, I can analyze the following demographic information reported at the census block level within a 36 km radius of the location of interest:

- Total population
- Number of Housing Units
- Number of People Below Poverty Level

If you need to assess the potential impact of a wildfire on the local community, you can ask me to provide this demographic information by asking questions like: "who will be affected by the wildfire?"

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The three closest fire history records found within 36 km of the location (lat: 32.4169, lon: -110.7311)



The fire history data from three sites near Mount Bigelow, AZ, reflects the influence of moisture and fire on the age structure of ponderosa pines and how topography affects fire patterns. Data from these sites show that reduced fire frequency aligns with tree age peaks and that regional climate variability influences fire activity. Furthermore, differences in landscape topography significantly affect fire sizes and intervals, with gentler landscapes experiencing more frequent and larger fires compared to steeper areas.

Data and Metadata Links:

- [Catalina Rose Canyon CRC03 Data](#)
- [Catalina Rose Canyon CRC01 Data](#)
- [Catalina Rose Canyon CRC22 Data](#)
- [CRC03 Metadata](#)
- [CRC01 Metadata](#)
- [CRC22 Metadata](#)

References:

- Iniguez et al., (2016). Fire history and moisture influences on historical forest age structure in the sky islands of southern Arizona, USA. *Journal of Biogeography*, 43(1), 85-95. DOI: 10.1111/jbi.12626
- Iniguez et al., (2008). Topography affected landscape fire history patterns in southern Arizona, USA. *Forest Ecology and Management*, 256(3), 295-303. DOI: 10.1016/j.foreco.2008.04.023



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Can we explore what the future might look like?



Fire Weather Index (FWI) Data for Location (lat: 32.4169, lon: -110.7311) within a 36 km radius, shown at a grid cell level. Select the season and period to view the FWI data.

Select Season

summer

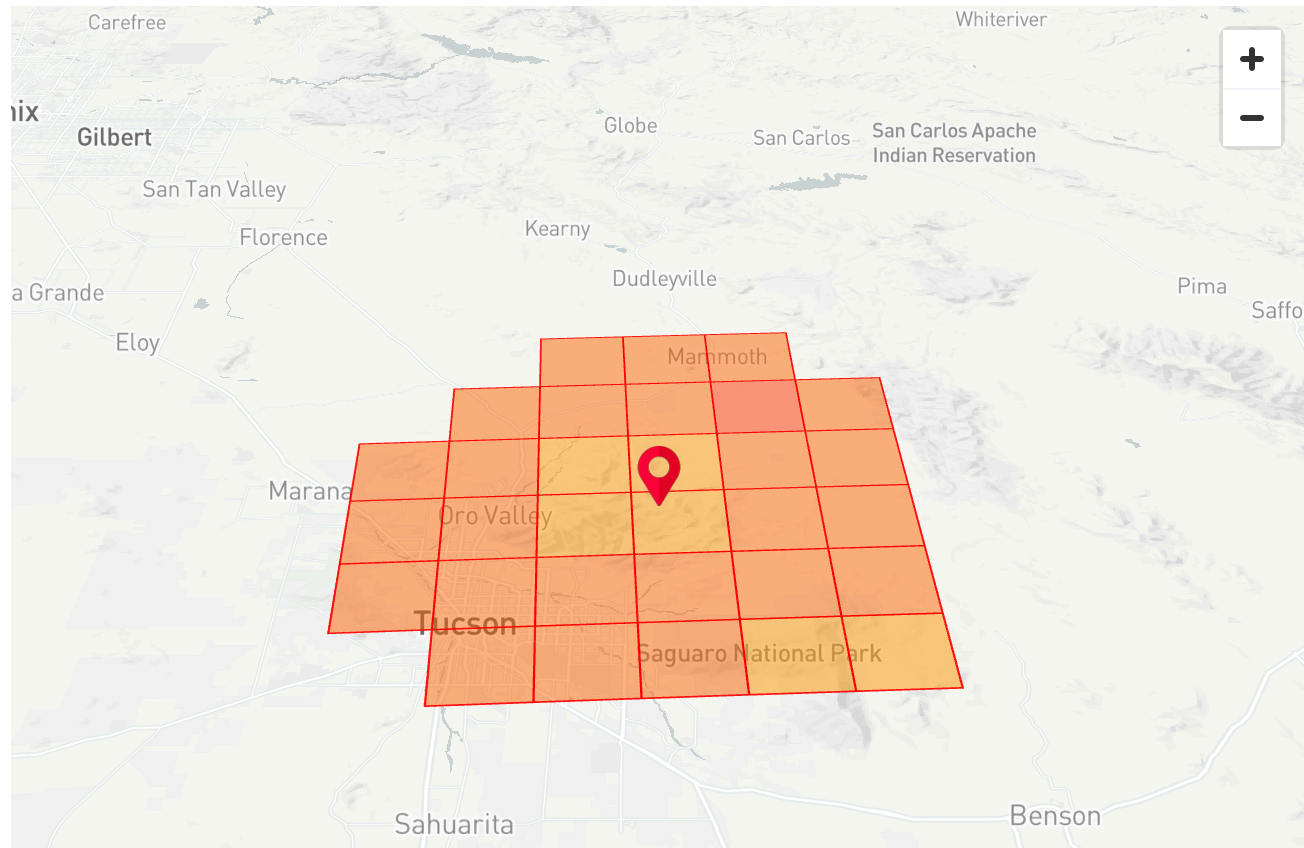


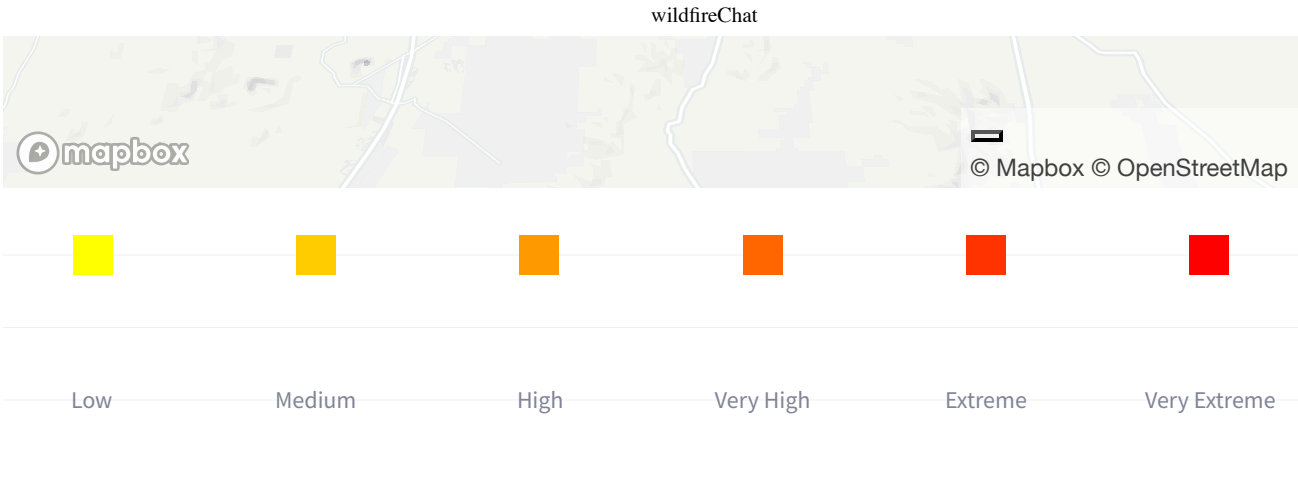
Select Period

Endc



Display Map





FWI Class	FWI Values in Class
Low	0-9 FWI
Medium	9-21 FWI
High	21-34 FWI
Very High	34-39 FWI
Extreme	39-53 FWI
Very Extreme	Above 53 FWI

Fire Weather Index (FWI) Data for Location (lat: 32.4169, lon: -110.7311) with standard error.

Category	Spring	Summer	Autumn	Winter

wildfireChat				
Historical(1995 - 2004)	27.85 (se: ± 3.15) High	31.45 (se: ± 2.82) High	29.26 (se: ± 4.98) High	14.26 (se: ± 2.52) Medium
Mid-Century(2045 - 2054)	34.4 (se: ± 2.62) Very High	34.33 (se: ± 2.85) Very High	27.25 (se: ± 4.32) High	16.56 (se: ± 2.25) Medium
End-of-Century(2085 - 2094)	38.77 (se: ± 2.57) Very High	35.53 (se: ± 3.06) Very High	29.61 (se: ± 4.62) High	20.16 (se: ± 2.61) Medium

The Fire Weather Index (FWI) projections for Mount Bigelow, AZ, indicate an increasing trend in fire danger over the coming decades. Historically, the FWI values were already high, especially in spring, summer, and autumn. By mid-century, these values are expected to rise further, with spring and summer reaching "Very High" levels, indicating a significant increase in wildfire risk. By the end of the century, this trend continues, with spring FWI values approaching 38.77, suggesting even greater fire potential.

This escalation in FWI suggests that your region will face heightened wildfire risks, emphasizing the need for robust fire management and mitigation strategies. As an engineer, you could consider integrating advanced fire-resistant materials in construction, enhancing early warning systems, and implementing sustainable land management practices to mitigate these risks. These steps could help safeguard lives, properties, and the surrounding ecosystems against the increasing threat of wildfires.

For detailed FWI data and projections, you can visit the [Climate Risk & Resilience Portal](#).

Would you like to discuss specific mitigation strategies further, or is there another aspect of wildfire impact you wish to explore?



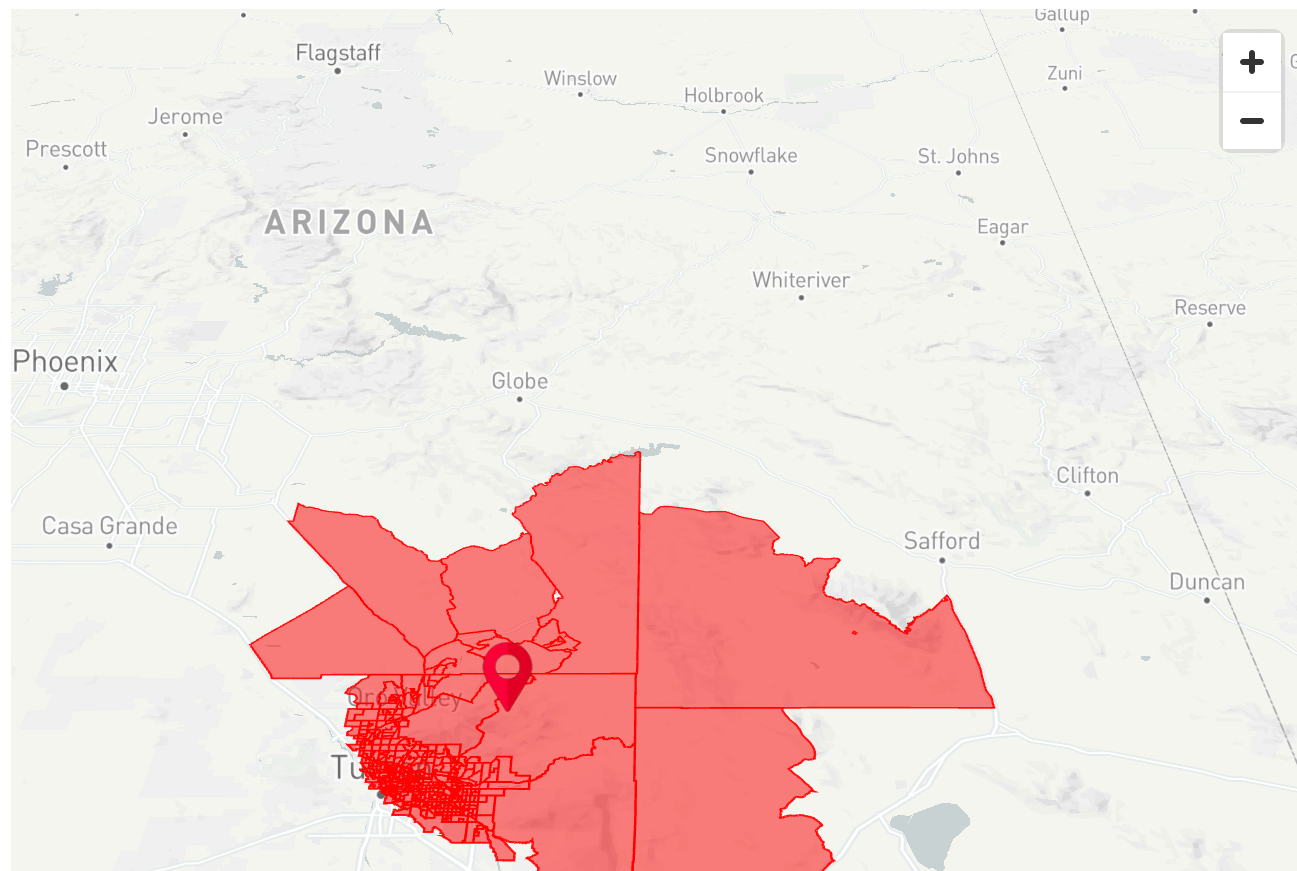
Click to provide feedback

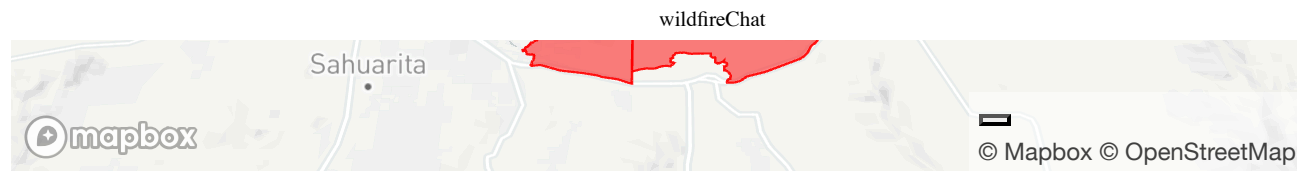


Show me the population information in the area



The census block groups overlapping with the area within 36 km of the location (lat: 32.4169, lon: -110.7311)



**Census Data within 36km surrounding location (lat: 32.4169, lon: -110.7311)**

Population	Below Poverty	Below Half Poverty	Housing Units
588192	81774	42634	290847

The area around Mount Bigelow, AZ, has a total population of approximately 588,192 as of 2022. Of this population, 81,774 individuals are living below the poverty line, with 42,634 of these individuals earning less than half of the minimum income needed to meet basic living expenses. The region also has about 290,847 housing units.

This population data is crucial for understanding the scale of potential impact from wildfires in the area. With a substantial number of individuals living under challenging economic conditions,

the community's ability to respond to and recover from wildfires could be compromised. As an engineer, you might consider focusing on community-based mitigation strategies that not only address the physical aspects of wildfire defense but also support socio-economic resilience.

For more detailed demographic and economic data, you can visit the [U.S. Census Bureau's Data API](#).

Would you like to explore specific community resilience strategies or another related topic?



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I'm also a carpenter



As a carpenter and engineer in the Mount Bigelow area, you have a unique opportunity to combine your skills to address wildfire risks. Here are a few strategies you might consider:

1. **Fire-Resistant Building Materials:** Utilize your carpentry skills to promote and use fire-resistant materials in construction projects. Materials such as fire-resistant roofing, siding, and decking can significantly reduce the vulnerability of structures to wildfires.
2. **Community Workshops:** Offer workshops to teach local homeowners and builders about fire-resistant construction techniques. This could include proper installation of ember-resistant vents, the use of non-combustible materials for fencing, and the importance of maintaining defensible space around properties.

3. **Innovative Building Designs:** As an engineer, you can design buildings that incorporate fire safety features, such as buffer zones using non-flammable materials, and landscaping that includes fire-resistant plants.
4. **Restoration and Recovery:** Post-wildfire, your carpentry skills could be invaluable in restoration efforts, helping to rebuild homes and community structures with enhanced fire-resistant features.
5. **Collaboration with Local Authorities:** Work with fire departments and forest management teams to develop community-wide strategies for reducing wildfire risks, such as creating and maintaining firebreaks.

These approaches not only leverage your professional skills but also contribute to the community's resilience against wildfires. Would you like more detailed information on any of these strategies, or is there another aspect of wildfire mitigation you're interested in exploring?



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What does the science say?



Recent scientific studies provide valuable insights into wildfire risk mitigation, ecological impacts, and economic effects relevant to areas like Mount Bigelow, AZ.

1. **Ecological Importance of Mixed-Severity Fires:** DellaSala et al. (2015) discuss the ecological benefits of mixed-severity wildfires, which have shaped fire-dependent ecosystems for

millennia. The study emphasizes the need for improved fire management and public perception to accommodate beneficial wildfires, suggesting that historical fire regimes should be considered in current management practices (DellaSala et al., 2015).

2. **Mapping Wildfire Hazards and Risks:** Sampson, Atkinson, and Lewis (2000) explore methodologies for mapping wildfire hazards and assessing risks on landscapes, including potential effects on forest ecosystems and human communities. This comprehensive approach helps in understanding and preparing for the spatial variability and potential impacts of wildfires, which is crucial for effective resource management and community planning (Sampson et al., 2000).
3. **Wildfire Exposure Analysis in Forested Regions:** Ager et al. (2013) analyze wildfire exposure for various social and ecological features in the Pacific Northwest, demonstrating the use of wildfire simulation for risk assessment. This study highlights the importance of characterizing potential wildfire behavior to prioritize fuel management and preparedness activities, which could be similarly applied to the Mount Bigelow area (Ager et al., 2013).

These studies underscore the complexity of wildfire management and the necessity of integrating ecological understanding with community safety and resource management strategies.

References:

- DellaSala, D. et al. (2015). Flight of the Phoenix: Coexisting with Mixed-Severity Fires. DOI: [10.5849/forsci.16-999](https://doi.org/10.5849/forsci.16-999)
- Sampson, R., Atkinson, R., & Lewis, W. (2000). Mapping Wildfire Hazards and Risks. DOI: [10.1016/c2012-0-03331-5](https://doi.org/10.1016/c2012-0-03331-5)
- Ager, A. A. et al. (2013). Wildfire Exposure Analysis on the National Forests in the Pacific Northwest, USA. DOI: [10.1111/j.1539-6924.2012.01911.x](https://doi.org/10.1111/j.1539-6924.2012.01911.x)

Would you like to delve deeper into any of these studies or explore additional mitigation strategies based on these findings?



Click to provide feedback



Are there newer literature?



Here are some recent studies that address wildfire mitigation strategies, ecological impacts, and economic effects in forested areas similar to Mount Bigelow, AZ:

1. **Economic Impacts of Wildfire:**

- **Author:** John Diaz (2012)
- **Abstract:** This study emphasizes the need for a comprehensive understanding of the economic impacts of wildfires, which extend beyond immediate suppression costs and property damage. It suggests that wildfires also significantly affect the broader economic base of rural communities, which rely heavily on natural resources (Diaz, 2012).

2. **Changes in Potential Wildland Fire Suppression Costs Due to Restoration Treatments in Northern Arizona Ponderosa Pine Forests:**

- **Authors:** Ryan Fitch et al. (2018)
- **Abstract:** This research evaluates the effectiveness of forest restoration treatments in reducing wildfire suppression costs in Northern Arizona. It finds that more aggressive restoration treatments can significantly lower these costs, except in extreme wind and weather conditions, highlighting the importance of strategic forest management in reducing economic burdens from wildfires (Fitch et al., 2018).

These studies provide valuable insights into the multifaceted impact of wildfires and the benefits of proactive management strategies. They underscore the importance of integrating ecological and economic considerations into wildfire management to mitigate risks effectively and sustainably.

References:

- Diaz, J. (2012). Economic Impacts of Wildfire. Retrieved from [link to the publication]
- Fitch, R. et al. (2018). Changes in potential wildland fire suppression costs due to restoration treatments in Northern Arizona Ponderosa pine forests. Forest Policy and Economics, 87, 101-114. DOI: [10.1016/j.forpol.2017.11.006](https://doi.org/10.1016/j.forpol.2017.11.006)

Would you like to delve deeper into any specific study or explore further topics related to wildfire management?



Click to provide feedback



This is good. Let's wrap it up. Can you give me a comprehensive set of recommendations?



Certainly! Based on the analysis of historical and projected wildfire data, ecological impacts, and economic considerations for the Mount Bigelow, AZ area, here is a comprehensive set of recommendations:

1. Enhance Fire-Resistant Infrastructure:

- Utilize fire-resistant materials in construction and retrofitting projects to improve the resilience of buildings against wildfires.
- Implement firebreaks and clear defensible spaces around properties to reduce fire spread.

2. Community Education and Engagement:

- Conduct workshops and training sessions for local residents on fire preparedness and mitigation techniques.
- Develop community-based programs that encourage participation in fire safety practices and environmental stewardship.

3. Adopt Advanced Fire Detection and Management Technologies:

- Invest in advanced fire detection systems, such as satellite monitoring and drones, to enhance early detection capabilities.
- Use simulation models to plan and execute controlled burns and other mitigation strategies effectively.

4. Ecological Conservation and Restoration:

- Implement forest management practices that maintain ecological balance, such as selective logging, controlled burns, and reforestation.
- Monitor and protect biodiversity to ensure that ecological functions that can mitigate wildfire risks are preserved.

5. Economic Strategies and Insurance:

- Encourage local businesses and homeowners to invest in wildfire insurance to mitigate potential economic losses.
- Support economic diversification in the community to reduce dependency on natural resources that might be affected by wildfires.

6. Policy and Regulation:

- Work with local and state governments to update building codes and land-use planning to incorporate wildfire risk reduction measures.
- Advocate for policies that support sustainable land management and fire mitigation funding.

7. Research and Continuous Learning:

- Engage with academic and research institutions to stay updated on the latest findings in fire ecology and management.
- Continuously evaluate the effectiveness of implemented strategies and adapt based on new research and changing conditions.

By integrating these strategies, you can help build a resilient community that is better prepared to face and recover from wildfire events. If you need further assistance or specific details on implementing these recommendations, feel free to reach out.



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