



Wildland Fire Azure AI

Solution Type: Azure ML Studio

Jasper Fire Recovery Project

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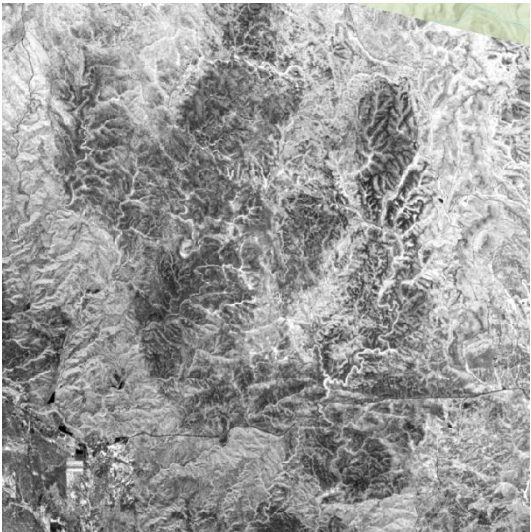
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The Opportunity: Jasper Fire Recovery and Resilience



• **Jasper Fire of 2000:** The wildfire burned over **83,000 acres** in the Black Hills, devastated ecosystems, and significantly impacted **Jewel Cave National Monument**. Sparked by a discarded cigarette, the fire remains the largest wildfire in South Dakota's history.

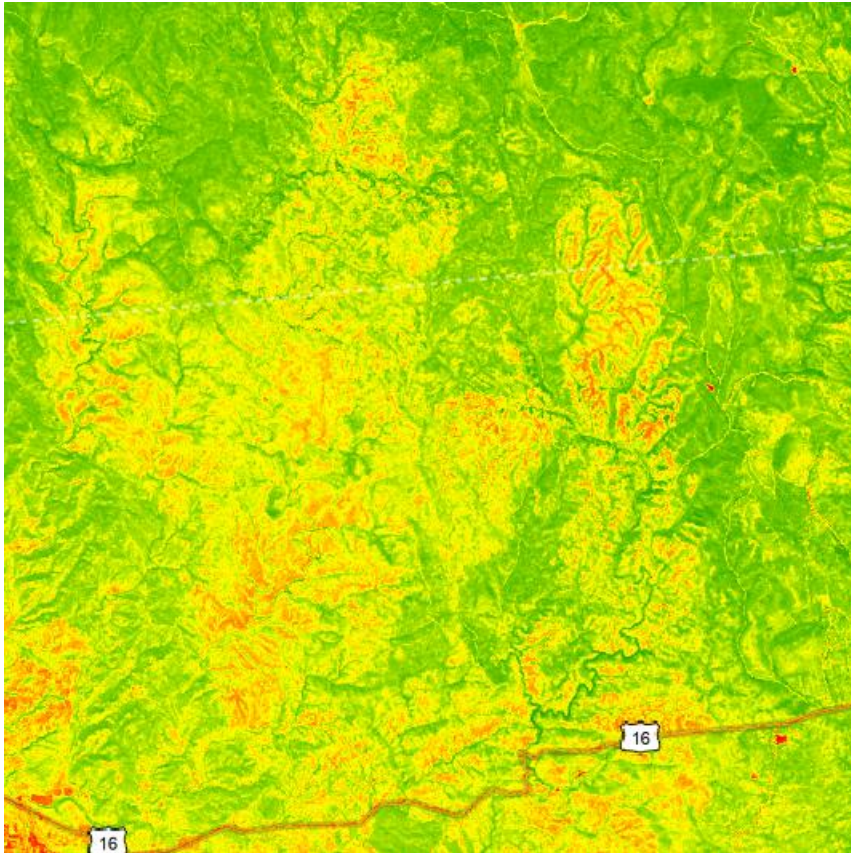
• **Challenges of Recovery:** Nearly two decades of recovery efforts have focused on **restoring ecosystems** and mitigating future fire risks. Despite these efforts, challenges remain, particularly due to **increased wildfire frequency** caused by **climate change**.

• **Manual Intervention:** Manual replanting of forests can only occur in a limited **2-week window** each year, using **native Ponderosa Pine** to replant **400 acres** at a time.

• **The Opportunity:** The opportunity lies in utilizing **geospatial technologies** and **AI-driven analysis** to:

- **Monitor Vegetation Recovery:** Track regrowth and ecosystem restoration.
- **Evaluate Land Use:** Identify areas requiring further intervention.
- **Enhance Fire Resilience:** Predict fire-prone areas and mitigate risks.
- **Support Long-Term Health:** Guide sustainable land management strategies.

Solution: Remote Sensing & AI/ML for Wildfire Recovery



To support recovery from the Jasper Fire, we developed a **prototype solution** using **geospatial analysis** and **AI/ML tools** within **Azure ML Studio**. This solution enabled us to track **vegetation recovery**, assess **land use changes**, and help guide **future fire resilience efforts**. The solution has the potential to provide actionable insights for **forest restoration** and long-term strategies for **fire resilience**.

Details of the Solution:

- Geospatial Analysis:** Leveraged high-resolution satellite imagery, such as **Landsat data**, to monitor vegetation recovery and land use changes over time.
- AI/ML Models:** Developed and trained models within **Azure ML Studio** to predict fire-prone areas, assess land use patterns, and track vegetation health.
- Python Notebooks:** Utilized to automate data analysis, visualization, and reporting for easy decision-making.
- Data Storage and Access:** Integrated with **Azure Storage Blob** for scalable, cloud-based data storage and easy access to geospatial data.

What This Achieves:

- Provides actionable insights for ongoing **forest restoration**.
- Enhances **fire resilience** efforts by identifying high-risk areas.
- Guides sustainable **land management** and **recovery strategies**.

Jasper Fire Recovery – AI and Geospatial Demo

The screenshot displays the Azure AI Machine Learning Studio interface. The top navigation bar shows 'Azure AI | Machine Learning Studio' and the user 'jasper'. The left sidebar contains a navigation menu with sections: 'All workspaces', 'Home', 'Model catalog', 'Authoring' (with sub-items: 'Notebooks', 'Automated ML', 'Designer', 'Prompt flow'), 'Assets' (with sub-items: 'Data', 'Jobs', 'Components', 'Pipelines', 'Environments', 'Models', 'Endpoints'), and 'Files'. The main workspace area shows the 'University of Southern California > jasper > Notebooks' breadcrumb. A Jupyter Notebook titled 'jasper.ipynb' is open. The notebook's toolbar includes icons for running, saving, and editing, along with a 'Compute:' dropdown set to 'wildlandfire - Running' and a kernel selector set to 'Python 3.8 - AzureML'. The notebook content includes a title 'Team: Wildland Fire Azure AI', a subtitle 'Project: Jasper Fire Recovery - Briding Technology and Disaster Recover', an 'Introduction' section, and a 'Project Overview:' section.

Team: Wildland Fire Azure AI

Project: Jasper Fire Recovery - Briding Technology and Disaster Recover

Introduction

In this project, we explore how technology, specifically geospatial data and automated workflows, can be used to support disaster recovery efforts. The Jasper Fire serves as a real-world case study for testing our approach. The goal is to show how leveraging code and spatial data can enhance situational awareness, optimize resource allocation, and ultimately learn how natural environments can be restored to their pre-disaster states.

Project Overview:

This project investigates the recovery of the 2000 Jasper Fire in the Black Hills of South Dakota. Leveraging Landsat satellite imagery, machine learning models, and Azure Machine Learning Studio, we analyze the ecological recovery and explore actionable insights for forest management and wildfire resilience.

Takeaways: Key Insights for the Jasper Fire Recovery



- **Approaching 25th Anniversary:** As we mark 25 years since the Jasper Fire, understanding the long-term recovery process highlights the need for continued innovation in restoration and resilience planning.
- **Geospatial Tools & AI:** Satellite imagery and AI-driven analysis enable real-time tracking of vegetation regrowth, land use changes, and fire-prone areas, accelerating wildfire recovery.
- **Manual Intervention:** Despite natural recovery, manual replanting is essential for forest restoration, constrained by time (2-week window) and resource limits (400 acres/year).
- **Climate Change Escalates Risk:** Increasing wildfire frequency and intensity, driven by climate change, emphasizes the need for data-driven solutions to enhance fire resilience.
- **Sustainable Strategies:** Focus must shift from short-term recovery to long-term sustainable forest management to ensure resilience against future fires.
- **Global Application:** The Jasper Fire recovery model offers a scalable framework for ecosystem restoration and fire resilience, applicable to future global disaster recovery efforts.