J3.2 Operational Evaluation of BlueSkyRAINS

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1. INTRODUCTION

The BlueSky modeling framework brings together the latest state of the science in modeling for smoke prediction. It includes data from the MM5 mesoscale meteorological model, emissions, fuel consumption, atmospheric dispersion and trajectories. BlueSkyRAINS is an ArcIMS interface which allows users to interactively display model predictions together with a variety of reference map layers.

Users frequently contact the development team with questions about specific cases and how the model performed or should be applied. We have collected a number of these cases for use in preliminary evaluation of the modeling framework's performance. This presentation will bring together several of these real world cases to provide a qualitative evaluation of the usefulness of the BlueSky modeling system in solving operational problems and planning for smoke management.

2. CENTRAL WASHINGTON, SEPTEMBER 2004

During a 10 day period at the end of September 2004 burning was severely restricted in Central Washington due to high pressure causing stagnant weather conditions over the Pacific Northwest. The question was raised as to whether using BlueSky predictions would have facilitated burn approvals during this period.

In order to answer this question each day's synoptic conditions and ventilation index were analyzed to determine if it was a burn day or a restrict day. Then each proposed burn was analyzed using BlueSky RAINS to determine whether, given the trajectory and smoke concentrations predicted and in light of the ventilation index in the areas likely to be impacted by smoke, it would be reasonable to the burn on that day.

A total of 56 proposed burns in the Naches and Methow Ranger Districts were considered over the 10 day period. Based on meteorology alone 37 burns would have been allowed with 19 restrictions. After looking at BlueSkyRAINS only 15 burns were allowed with 41 restrictions. The increase in restrictions was based partly on additional information about potential impacts to Class 1 areas and PM2.5 non-attainment areas which could be assessed using map layers available in BlueSkyRAINS but was also influenced by low predicted trajectory heights in spite of apparently good ventilation conditions.

Only two burns among the original 19 restrictions would have been approved after assessment in BlueSkyRAINS, while 23 that were originally marked for approval would have been restricted using BlueSky predictions.

Although this is a very subjective analysis based on limited experience with air quality and BlueSky performance in this area, it shows that BlueSky allows fire managers and air quality regulators to be more strategic about planning for impacts of individual burns. Figure 1 shows an example of a day when a burn that otherwise would have been restricted looked favorable due to fairly good ventilation conditions, a prediction of elevated trajectory, and an opportunity to avoid impact to a Class 1 area.

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3. LOG SPRINGS WILDFIRE, July 26-29, 2004

Smoke was observed in Pendleton on July 26, 2004. Users expressed concern that smoke in Pendleton might be coming from fires in Washington or from the Log Springs Fire in Central Oregon which was not yet registered in BlueSky. Wildfires must be greater than 100 acres and a 209 report must have been filed by ???? before a wildfire will show up in BlueSky .

A close look at wind fields and PM2.5 concentrations shows that BlueSky was carrying smoke from Washington fires away from Pendleton. Wind fields also indicate smoke from Log Springs was likely getting to Pendleton. Figure 2 shows the BlueSkyRAINS output for July 26 at 4am. Here the smoke from the wildfires is clearly moving away from Pendleton. MM5 winds are consistent with synoptic analysis on this day.

4. July 7-9 Oregon Elevated nephalometer readings were observed around noon on July 8 in Bend and early in the morning on July 9 in Pendleton, Oregon (Figure 3). Smoke was also observed over Mt. Adams from The Dalles with a slight smoke odor noted. The 449 Fire in North Central Oregon shows up in the 209 reports on July 10 but is assigned a start date of July 9. BlueSky runs from 00z July 7 show PM 2.5 concentrations moving over Pendleton from fires in Washington early on the 8th but then moving east by noon. Runs from 00z July 8 show smoke moving north and east from the Washington fires and not impacting Oregon. The most logical explanation for the higher readings is that the 449 fire actually started on July 8. Wind fields were consistent with smoke from that fire being carried in both directions to Bend and Pendleton. If the fire started on the 9th it gained 880 acres in one day. It is also possible there were other local small fires near Bend and Pendleton that did not make the large fire reports. It is also not inconceivable that smoke from the Washington fires was responsible and BlueSky did not capture the elevated concentrations at the times indicated by the nephalometer readings. Nevertheless, this underscores the importance of getting accurate and timely burn information into the BlueSky system in order to maximize its usefulness.

5. THE DUTCHLER BURN

On September 28 a 1000 acre prescribed burn was ignited by the Forest Service Northwest of Salmon, Idaho. Overnight smoke settled into the Salmon valley causing numerous complaints from citizens and public officials.

The area was experiencing moderate to good dispersion conditions with high pressure forecast to build into the area for deteriorating ventilation.

Although BlueSky did not show any elevated concentrations of PM2.5 from this burn it did show trajectories directly over the city of Salmon at low elevations (Figure 4) and poor ventilation conditions developing in the evening and overnight. Consideration of BlueSky predictions may have led burners to reduce the size of the project, delay the burn, or take other mitigating steps that would have allowed them to avoid smoke impacts to the community.

5. REFERENCES

Ferguson, S.A., J. Peterson, A. Acheson. 2001. Automated, real-time predictions of cumulative smoke impacts from prescribed forest and agricultural fires. *Proceedings of the American Meteorological Society 4th Symposium on Fire and Forest Meteorology, November 13-15, 2001, Reno, NV*. 168-175.

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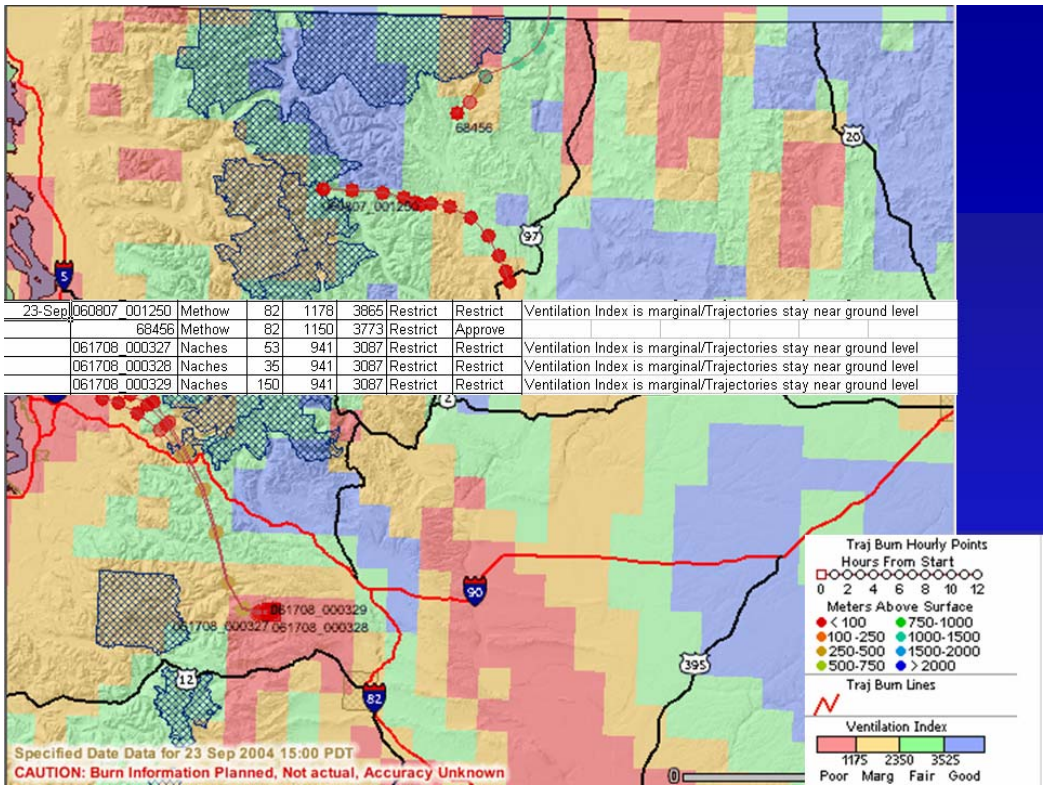
Figure 1. BlueSky RAINS shows a window of opportunity to burn 68456 on a day when overall synoptic conditions appear unfavorable to burning.



23-Sep	060807_001250	Methow	82	1178	3865	Restrict	Restrict	Ventilation Index is marginal/Trajectories stay near ground level
	68456	Methow	82	1150	3773	Restrict	Approve	
	061708_000327	Naches	53	941	3087	Restrict	Restrict	Ventilation Index is marginal/Trajectories stay near ground level
	061708_000328	Naches	35	941	3087	Restrict	Restrict	Ventilation Index is marginal/Trajectories stay near ground level
	061708_000329	Naches	150	941	3087	Restrict	Restrict	Ventilation Index is marginal/Trajectories stay near ground level

Figure 2. BlueSkyRAINS shows smoke from Washington fires moving away from Pendleton with winds showing a favorable direction for smoke from the Log Spring Fire to move into the area.

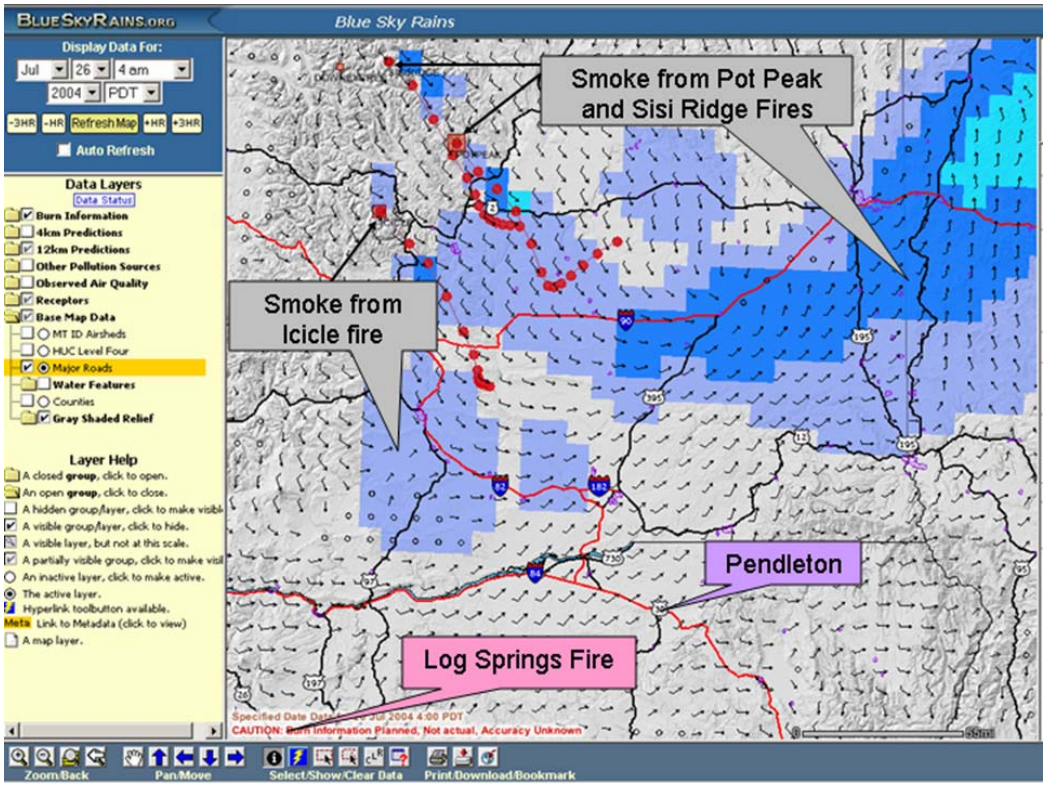


Figure 3. Elevated Nephalometer readings at Bend and Pendleton July 7-9, 2004.

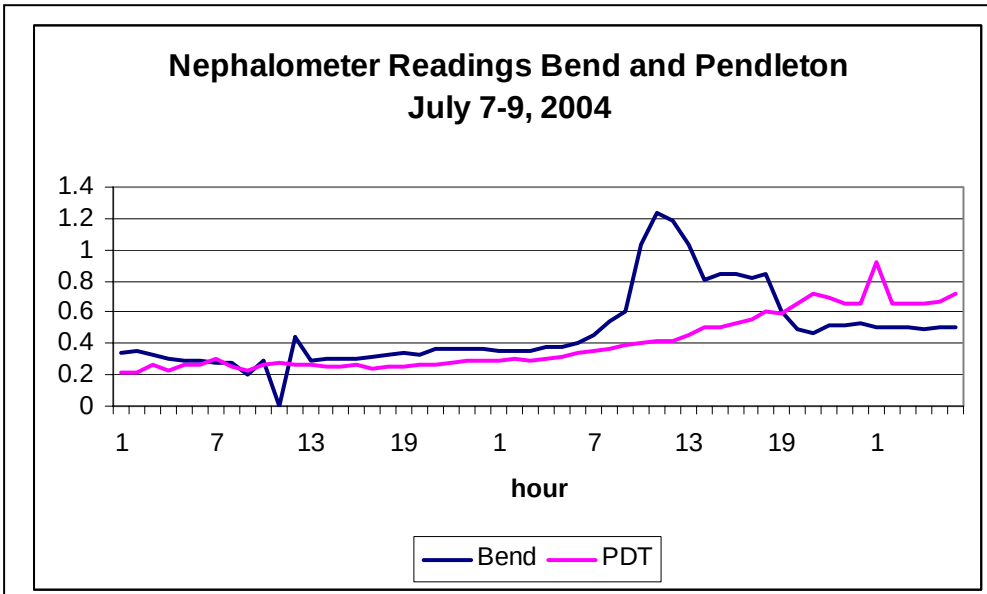


Figure 4. Trajectory forecast shows smoke from the Dutchler burn moving over the city of Salmon.