

JEFFERSON COUNTY SMOKE MANAGEMENT PIBALL OBSERVATIONS, 2004

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Abstract

Pilot balloon observations are a major component of the daily decision-making process used in allowing open-field burning. Piballs are used to track local wind direction and speed. Piball releases at potential burn sites allow for more accurate decisions under marginal conditions when errors are most likely to occur.

Introduction

The Pilot Balloon (piball) program, started in 1998, incorporates the weather balloon information into the daily routine of the Jefferson County Smoke Management Program. The software program, Piball Analyzer, developed by the Oregon Department of Agriculture was used in interpreting piball wind data and transmitting it to the smoke management coordinator. Emphasis was put on burning more acres on the better burn days (as determined by smoke dispersion) and not allowing burning on the marginal days.

Materials and Methods

Daily balloon releases occurred in the morning between 11:00 and 12:00 and, at the request of the smoke management coordinator, in the afternoon generally between 1:00 and 2:00. The piball was used to verify the burn forecast for upper level wind direction and speed and provide an indication of the mixing height. The Oregon Department of Agriculture developed a software program to aid in the analyzing of the piball information. The software is comprised of three components. The first is the Piball Sounding, a spreadsheet translating the azimuth and elevation readings from the piball into wind direction and average speed. The hodograph visually charts the wind direction and the Profile page graphs wind speed. The Piball soundings were entered into the Piball Analyzer and transmitted to the Jefferson County Smoke Management website for the smoke management program coordinator, who then used this data in conjunction with the aircraft soundings and the ODA burn forecast to determine the field burning status for the day.

Wind directions and speeds were determined at one-minute intervals for a period of 10 minutes during each balloon release using an observation Theodolite System and 26 inch diameter helium-filled balloons. Each minute corresponds with the following above ground level elevations in feet: 709, 1358, 2008, 2628, 3248, 3839, 4429, 5020, 5610, and 6201. Air temperature, relative humidity, surface wind direction and speed were documented for each day at the time of the balloon releases using the Agrimet weather station at the Central Oregon Agricultural Research Center (COARC).

Results

The open field burning season was 43 days in length. Daily balloon releases in the late morning were used to refine the weather forecast which minimized adverse smoke impacts on local communities. In addition to the daily balloon releases at the COARC, balloon releases were made on 7 days, at the request of the program coordinator in the Culver area in an attempt to prevent smoke intrusion to the Crooked River Ranch and yet allow growers to burn their fields in a timely manner.

The piball was also a valuable tool for determining the mixing height for smoke during the optimal burn times. There was surface inversion extending from the surface up to as high as 5000' on 81% of the mornings, as indicated by the temperature readings provided by the airplane flights. A counter clockwise direction of travel by the piball would indicate an inversion or stable air layer. The stable air layer was still in evidence 44% of the time as indicated by the morning piballs and 34% for the time of the afternoon piball sounding. On three days the morning piball indicated that there was no inversion layer present, however the afternoon piballs showed that an inversion layer developed at about 1000 ft agl. Morning piballs indicated the transport wind direction was significantly different from the predicted 49% of the time. While 35% of the time the afternoon piball release indicated transport wind and or speed to be different than predicted. Actual surface wind directions were significantly different than predicted 63% of the time at 11:00 am and 52% of the time at 2:00 pm.

The piball program was useful as a daily indicator of real-time, on-site conditions and complimented the weather forecast provided by the ODA meteorologist in Salem. However, it was particularly helpful on marginal burn days to assist the program coordinator in making the decision whether to allow burning when conditions were either changing or hard to discern. It is on these marginal days, where the conditions are unclear, that create the most risk for smoke intrusion into populated areas. To have the piball available for release at the site of the potential burn prior to making a final decision has proved to be a valuable tool.