

Jefferson County Smoke Management Piball Observations, 2003

Claudia Campbell and Marvin Butler

Abstract

Piball observations used to track local wind direction and speed have become a standard practice component in the daily decision-making process to allow open-field burning. Piball releases at potential burn sites were increased during 2003, allowing for more accurate decisions under marginal conditions when errors are most likely to occur.

Introduction

The Pilot Balloon (piball) program incorporates the weather balloon information into the daily routine of the Jefferson County Smoke Management Program. A new software program, Piball Analyzer, developed by the Oregon Department of Agriculture (ODA) was used to interpret piball wind data and transmit them to the smoke management coordinator. Emphasis was put on burning more acres on the better burn days 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 ODA developed a three-part software program to aid in the analyzing of the piball information. The first component 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 these 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 1-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, 1,358, 2,008, 2,628, 3,248, 3,839, 4,429, 5,020, 5,610, and 6,201. 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 40 days long. Timing daily balloon releases for the late morning worked well in refining the weather forecast and minimizing 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 5,000 ft on 70 percent 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. At the time of the morning piballs, the stable air layer was still in evidence 57 percent of the time. Afternoon piballs showed the stable air layer to be in effect 50 percent of the time. Morning piballs indicated the transport wind direction was significantly different from that predicted 35 percent of the time, whereas 33 percent 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 42 percent of the time at 11:00 am and 38 percent 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 days to assist the program coordinator in making the decision whether or not to allow burning when conditions were changing or hard to discern. These marginal days, where the conditions are unclear, 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.