

# **Jefferson County Smoke Management Pilot Balloon Observations, 2006**

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## **Abstract**

Pilot balloon (Piball) observations are a major component of the daily decision-making process used in allowing open field burning of grass seed fields in Jefferson County. Piballs are used to track local wind direction and speed. Piballs are released daily from the Central Oregon Agricultural Research Center at 11:00 a.m. and 1:00 p.m. Piball releases at potential burn sites allow for more accurate decisions under marginal conditions when errors are most likely to occur. The piball is essential in minimizing adverse smoke impacts on local communities.

## **Introduction**

The 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, was used in interpreting piball data which was then transmitted 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 software program, Piball Analyzer, developed by the Oregon Department of Agriculture (ODA) to aid in the analyzing of the piball information, includes 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 second is the hodograph, which charts the wind direction. The Profile page, the third component, graphs wind speed. The Piball soundings are entered into the Piball Analyzer and transmitted to the Jefferson County Smoke Management website for the smoke management program coordinator, who then uses 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 are 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 the balloon is in the air corresponds with the following elevations above ground level 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, and surface wind direction and speed are documented for each day at the time of the piball releases using the AgriMet weather station at the Central Oregon Agricultural Research Center (COARC).

## Results

The open field burning season was 43 days long in 2006. Daily balloon releases in the late morning were used to refine the weather forecast to minimize adverse smoke impacts on local communities.

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 above ground level (agl) on 46 percent of the mornings, as indicated by the temperature readings provided by the airplane flights. A counter clockwise direction of travel by the piball indicates an inversion or stable air layer. There is no way to detect these stable air layers without the piball. The stable air layer was still in evidence 32 percent of the time as indicated by the morning piballs and 16 percent of the time for the afternoon piball sounding. Morning piballs indicated that 16 percent of the time the transport wind direction was different from that predicted, while 12 percent of the time the afternoon piball release indicated transport wind direction to be different than predicted.

The piball program is a necessary tool for the determination of real-time, on-site wind conditions. However, it is 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, when the conditions are unclear, that the most risk for smoke intrusion into populated areas exists. 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.