

## HAZARDOUS RATING SCALE OF THE SRC

### Introduction

The SRC was asked by Alameda County to rate hazardous wind turbines as part of an effort to meet the goal of reducing avian mortality in the Altamont Pass Wind Resource Area (APWRA). From 29 November to 1 December 2007, and on 10 December 2007 the SRC visited the APWRA to identify and rate turbines on the basis of hazard. Methods for the SRC Selection of Dangerous Wind Turbines are described in detail in SRC document P-67.

The purpose of this report is to describe qualitatively our Rating Scale, to report the number of turbines with each rating, and to make recommendations about removal to help the County and Wind Farm companies meet the 50 % decline in mortality in target raptors (Golden Eagle, Red-tailed Hawk, American Kestrel, and Burrowing Owl). The Monitoring Team initially selected turbines or turbine clusters with high raptor mortality for SRC evaluation, and while in the field, the SRC evaluated additional turbines that appeared hazardous.

Our hazardous rating scale went from one (least) to ten (the most dangerous). Ratings involved the **professional judgment** of the SRC, based on our combined experience with wind farms and raptor behavior, the fatality clusters, physical situations or settings that were viewed as dangerous by the SRC, and by a suite of variables (see P-67). Below is a qualitative description of each category. No turbines were rated less than 2 because the Monitoring Team only selected turbine clusters that had fatality clusters or appeared hazardous by physical features. During the field visits, the SRC added additional turbines that appeared hazardous.

The protocol was to evaluate the turbines in the field (see P-67), and then to re-evaluate all the ratings in a meeting in which all SRC members used the contour maps, the number of surveys (their dates and census frequency), the field sheets to refine the hazard ratings, and professional judgment. The professional judgment of the SRC also included the timing of the fatalities, as well as taking into account turbine configuration. If all but one of the turbines in a string were given a high rating initially, the last was given a similar rating on the assumption that it would become hazardous. Thus, the SRC did not generally leave one turbine standing in a string. Appendix A provides examples of documentation comments from the rating forms.

### QUALITATIVE DESCRIPTION OF THE HAZARDOUS RATINGS

10. This hazardous rating had both the most notable fatality clusters at one or two turbines, and very dangerous physical settings. A notable fatality cluster was 1) a high number of raptors mortalities, 2) a relatively high number of Golden Eagle fatalities (3 or more), or 3) a lesser number of mortalities from turbines that were searched less often or only had incidental fatality finds. Dangerous physical settings included turbines that

were located adjacent to steep slopes, were in saddles or gaps where raptors would use for flight paths, and/or were on slopes that resulted in the blades being at “raptor flight height.” Turbines rated a 10 often had all of these conditions: they were in a saddle, with steep slopes or canyons on one or both sides, and were in a raptor flight path.

8 -9. Turbine strings with many fatalities scattered along the string (but may have had one or more small fatality clusters), and had obvious hazardous settings such as draws, saddles or were adjacent to steep slopes. These also included long strings of turbines where it appeared the hawks required a place to cross the long string, and the scattered mortality resulted from no obvious crossing points. Fatality clusters included 1) few number of raptors for turbines searched frequently (or by several studies), 2) a lesser number of raptors from sites with fewer surveys, or 3) sites with a Golden Eagle fatality as well as other raptors. Hazardous conditions included turbines that were adjacent to a deep canyon, steep slope, or were in a saddle.

6-7. Turbine strings with fatalities, but they were often scattered along the turbine string such that there was no obvious hazardous turbine (i.e. no notable clusters), and there less obvious physical features accounting for the mortality (such as deep saddles, draws, or steep slopes or canyons). This category was also used for places where there were fatality clusters at gaps between turbines, and to reduce mortality it was essential to widen the gap. Such dangerous gaps were sometimes in slight draws or saddles. These were often situations where there was no clear way to make them less hazardous.

4-5. Turbines that had low numbers of fatalities (that might have been surveyed less often), but had no physical conditions that appeared hazardous (no clear saddles, steep slopes, adjacent canyons). Some of these turbine strings had few fatalities scattered along them, or had a small cluster of raptor fatalities in one place, with few obvious hazardous situations (no obvious saddles, very steep slopes, or features that attract flying raptors).

2-3. The least hazardous rating, was given to turbines or turbine clusters that had low numbers of fatalities (that were surveyed frequently), and no physical conditions that appeared hazardous. This included turbines on the tops of hills that were not adjacent to steep slopes, part of saddles or draws, and those that were on relatively flat areas in valleys.

## **SUMMARY OF FINDINGS**

The SRC rated 609 turbines during our visits, including both vacant towers and active turbines. We rated the vacant turbines (bladeless towers) because we want to be sure that those in very dangerous positions did not receive blades in the future.

| RATING | Number of Active Turbines | Number of Towers Only |
|--------|---------------------------|-----------------------|
| 10     | 55                        | 12                    |
| 9.5    | 37                        | 2                     |
| 9      | 55                        | 7                     |
| 8.5    | 89                        | 10                    |
| 8      | 68                        | 11                    |
| 7.5    | 62                        | 6                     |
| 7      | 40                        | 3                     |
| 6.5    | 16                        | 5                     |
| 6      | 13                        | 2                     |
| 5.5    | 30                        | 0                     |
| 5      | 11                        | 1                     |
| 4.5    | 8                         | 0                     |
| 4.     | 2                         | 0                     |
| 3.5    | 0                         | 0                     |
| 3      | 3                         | 0                     |
| 2.5    | 56                        | 16                    |
| 2      | 0                         | 0                     |

### RECOMMENDATIONS OF SRC

1. All tower and turbines assigned Ratings 8-10 are recommended for removal (P69).
2. If the winter shutdown is not extended to at least three full search cycles (usually about 3 months), towers and turbines assigned Ratings 7 and 7.5 are recommended for removal.
3. The SRC recommends that it will consider re-evaluating turbines and towers not previously evaluated for hazard and removal.

**APPENDIX A: EXAMPLES OF COMMENTS FROM RATING SHEETS.** These are meant to be examples only of the types of comments on the sheets. Overall rating was based on professional judgment, guided by fatalities, physical conditions, and raptor behavior and presence.

Rating of 10:

\*Site 50: Mortality cluster for 6 turbines with 5 Red-tailed Hawks and 5 Golden Eagles. Fairly isolated, many of the turbines were on small saddles, edge of the wind farm. Saddles, where hawks would fly through were in middle and both ends.

\*Site 63: One turbine with a mortality of 2 Redtails, 2 Golden Eagles, and 2 Burrowing Owls. End turbine on a moderate to steep slope, with a SW facing draw bringing raptors into the turbine. Transmission lines also present.

\*No site number (this means it is one the SRC identified from the site visit). One turbine with a Redtail and one Golden Eagle. In the saddle, facing a ravine that raptors regularly sail through on the wind. Steep slope.

\*Site 12: Two turbines with mortality of 5 Redtails and one Golden Eagle in an area of high turbine density. Crown of a saddle near a canyon. Steep slope with rocky outcrops.

#### Rating of 8-9:

Site 68: 4 turbines with mortality of 4 Redtails, 1 Golden Eagle, 1 Burrowing Owl and 1 Kestrel. Slight saddle in the middle, need to create a gap where they can fly through the saddle.

\*Redtail Area (selected by SRC): Two turbines at the end of a string that had 1 Redtail and 1 Golden Eagle. There are declivity wind conditions that bring the birds up a canyon to the ends of the turbine string. The canyon goes through and by several turbine strings.

Site 29: Two middle turbines with 2 Redtails and one Golden Eagle., located in a saddle in the middle of a string, attracting raptors to fly through the saddle to get by the string. Need to remove two to create wide enough gap to allow passage. Transmission lines nearby.

\*Site 115: Three turbines with 4 Redtails. Part of a windwall by a gully that forms a major fly artery for raptors. Turbines on a ridge, need to create a gap.

\*Site 87: Two turbines (one an end) with two Golden Eagle mortalities; steep slopes on each side, edge of the windfarm, with a NW slope aspect.

\*Site 9: Three turbines with 2 Redtails, 1 Golden Eagle and 1 Kestrel; located in a saddle, turning north.

#### Rating of 6-7

\*Site 119: String of 8 turbines with 4 Redtails and one Golden Eagle spread out over the string. Steep slope on one side with a steep canyon along the string. Middle ones in a saddle, with slight saddles near end.

\*Redtail area (SRC selected). Two turbines in received a 7, while end one received an 8. 2 Redtails by the turbines rated 7, turbines next to a steep slope at the top of a hill.

\*Site 14: Three turbines with 3 Redtail and 1 Kestrel, part of a whole string. On the edge of the turbine field, in moderate winds. Power lines.

\*Site 17: String of 7 turbines with 7 Redtails, but no clear physical features. Not a strong slope, moderate SW facing, scattered mortality, not clear how to reduce it.

\*Site selected by SRC (turbines 221 and 222). Two turbines with mortality of 1 Redtail and 1 Kestrel in a non-monitored site. North facing and so dangerous from raptor-flight perspective, a saddle at the edge of a ravine. The one at the edge of the ravine rated an 8 or 9, next one rated 6.5.

\*Site 113: Two turbines in the middle of a string with 2 Redtails and 1 Golden Eagle. Middle two turbines out of six. Ridge line with a steep canyon on both sides.

\*Site 34: Two mortalities for two turbines, at the edge of a turbine field on the top of a ridge. Declivity winds.

Rating of 4-5

\*Site 15. Three turbines with mortality of 2 Kestrels and 1 Redtail. Fairly isolated, slope aspect of north facing, by a saddle, Turbines on the crown of a saddle.

\*Site 18. Windwall with over 10 turbines, with three Redtails, 1 Kestrel and 1 Eagle. In a very gentle slope, with no saddles or gaps. No obvious evidence of flight path, but moderate mortality.

Rating of 2-3

\*Site 3: Three turbines with 2 Redtails and 2 Kestrels, steep slope but no other obvious features. End turbine already removed. No obvious action required.

\*Site 27: Several turbines with mortality of 2 Eagles and 1 Redtail. Low slope, turning north, very small saddle, little evidence of being attractive or in a flight path