**Appendix 1.**

Hourly weather observations for the years 2006-2015 were collected from Remote Automated Weather Stations (RAWS) at Round Mountain, Tumalo Ridge, and Lava Butte, located in the Deschutes National Forest. Most RAWS units are owned by wildland fire agencies and placed in locations where they can monitor fire danger (http://raws.fam.nwcg.gov, accessed 5 April 2016). Weather observations were also measured from mid-October, 2014 to through most of June 2015 at four locations: Sisters, Bridges Boys Academy, Cascade Academy, and Miller Elementary School.

To help understand the diurnal weather patterns around Bend, Oregon, we created wind roses from these observed winds, following the Northwest Coordination Center (NWCC) format. The wind roses show the frequency of winds blowing from a particular direction, with the length of each spoke around the circle representing the frequency of observations from that direction (http://www.wcc.nrcs.usda.gov/climate/windrose.html, accessed 21 April 2016). Time periods for "daytime" winds include the interval from 1100 – 1800 PST, and nighttime windows include the interval from 0100 – 0700 PST.   These time periods capture the general wind patterns during the day and night and attempt to reduce the inclusion of transitions associated with sunrise and sunset. Additionally, the times generally cover daytime and nighttime hours throughout the year and minimize the difference between winter and summer.

We used meteorological seasons to categorize the data, grouping the twelve calendar months into four 3-month periods. Winter includes the months of December, January, and February; spring includes March, April, and May; Summer includes June, July, and August except for the temporary stations (Sisters Ranger Station, Bridges Boys Academy, and Miller Elementary) which were operating only through June 22; and autumn includes September, October, and November. This grouping aligns calendar dates more closely with temperatures during that period, as well as allowing easier comparison of weather patterns from one season to another.
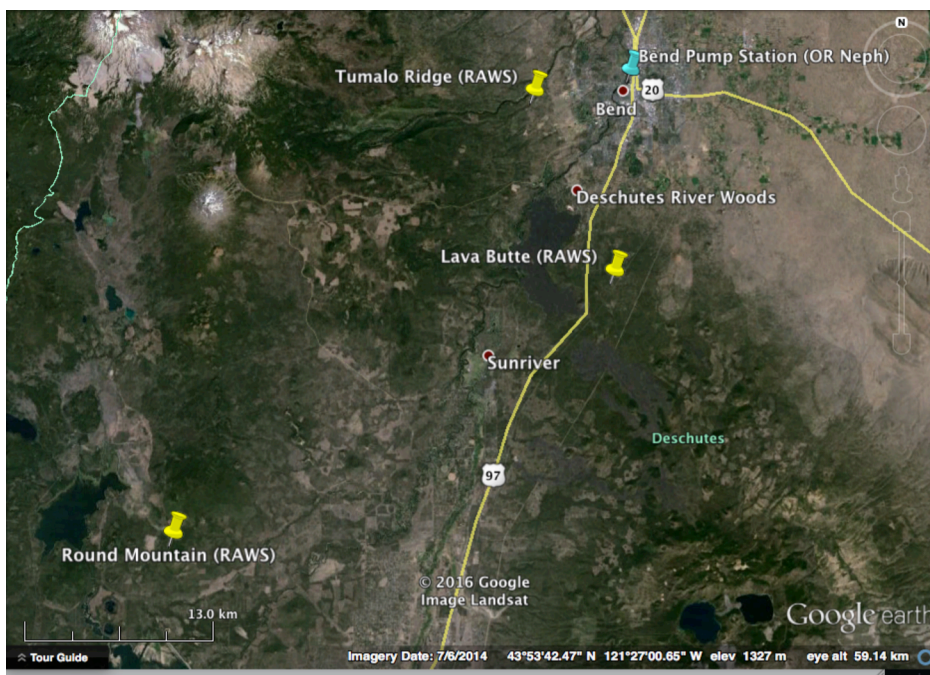
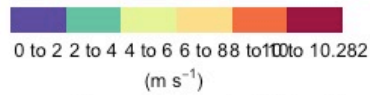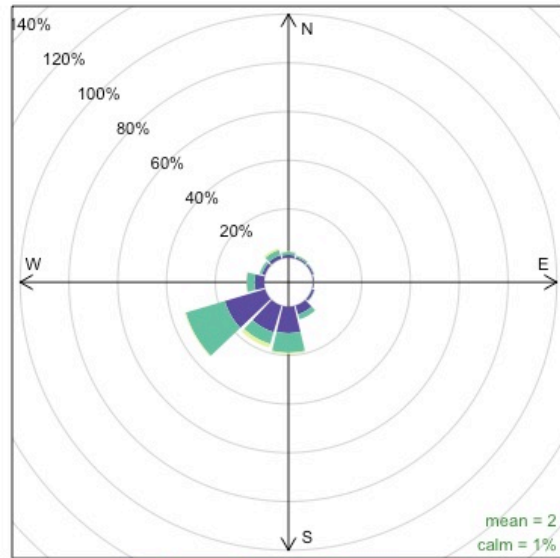The wind roses for all RAWS and all seasons are shown below.

Figure. RAWS station locations near Bend, Oregon.

Tumalo Ridge Spring Daytime

140%
120%
100%
80%
60%
40%
20%

N
E
W
S

mean = 3.18
calm = 0%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)
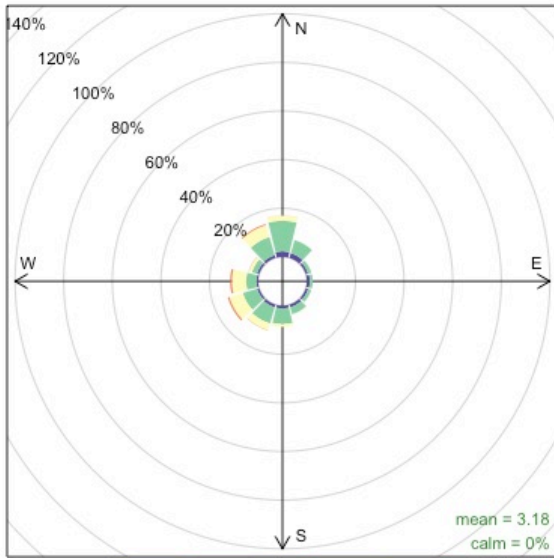
Frequency of counts by wind direction (%)

Tumalo Ridge Spring Nighttime

140%
120%
100%
80%
60%
40%
20%

N
E
W
S

mean = 2
calm = 1%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 10.282
(m s⁻¹)

Frequency of counts by wind direction (%)

Tumalo Ridge Summer Daytime

140%
120%
100%
80%
60%
40%
20%

N
E
W
S

mean = 3.02
calm = 0%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Tumalo Ridge Summer Nighttime

140%
120%
100%
80%
60%
40%
20%

N
E
W
S

mean = 2.02
calm = 1.3%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 10.282
(m s⁻¹)
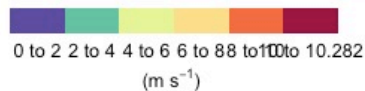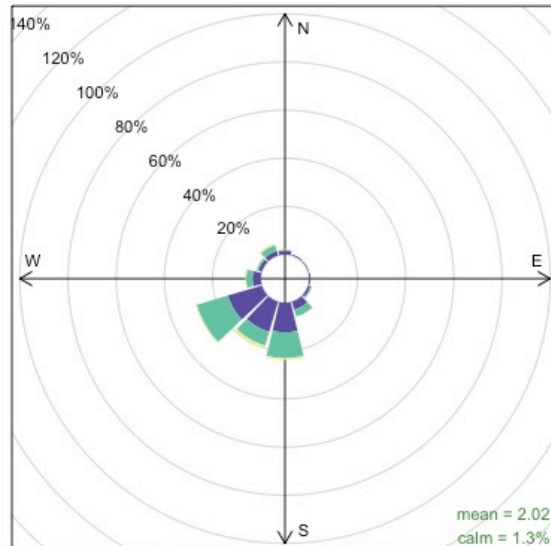
Frequency of counts by wind direction (%)

Tumalo Ridge Autumn Daytime

40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 2.63
calm = 0.4%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)
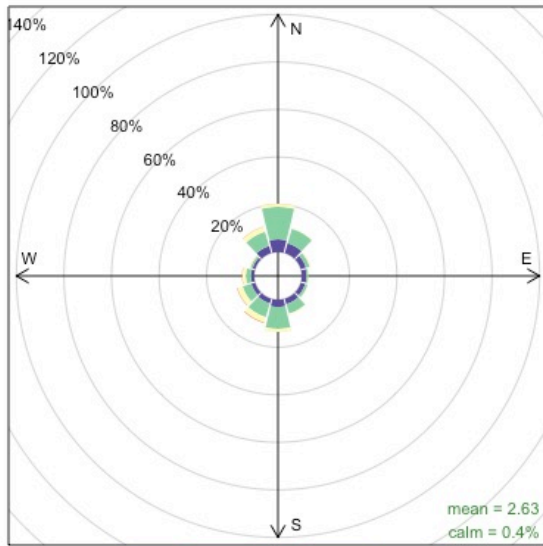
Frequency of counts by wind direction (%)

Tumalo Ridge Autumn Nighttime

40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 2.1
calm = 1.5%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)
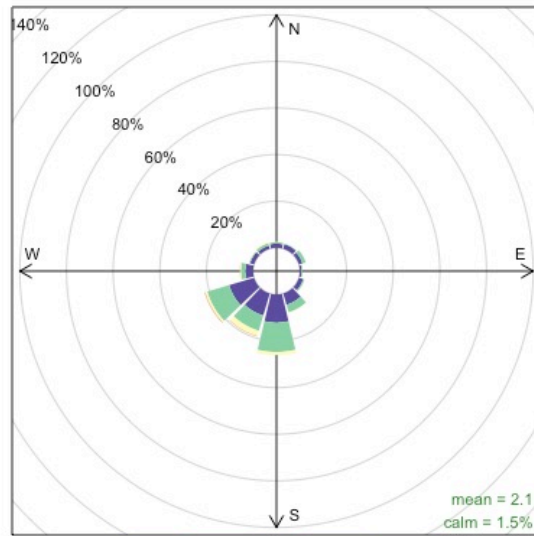
Frequency of counts by wind direction (%)

Tumalo Ridge Winter Daytime

40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 2.51
calm = 1%

0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10to 15.646
(m s⁻¹)
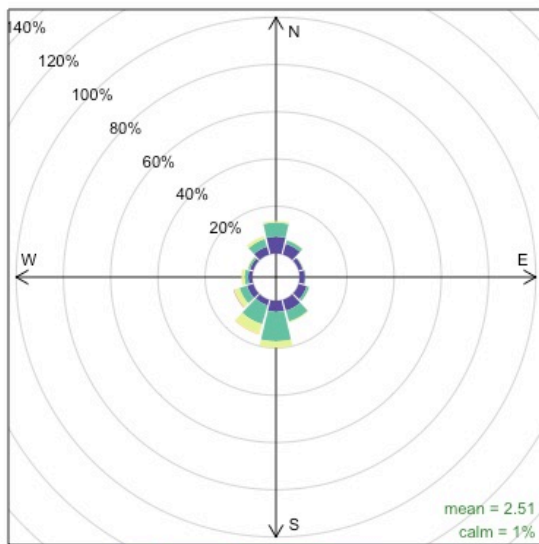
Frequency of counts by wind direction (%)

Tumalo Ridge Winter Nighttime

40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 2.02
calm = 1%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)
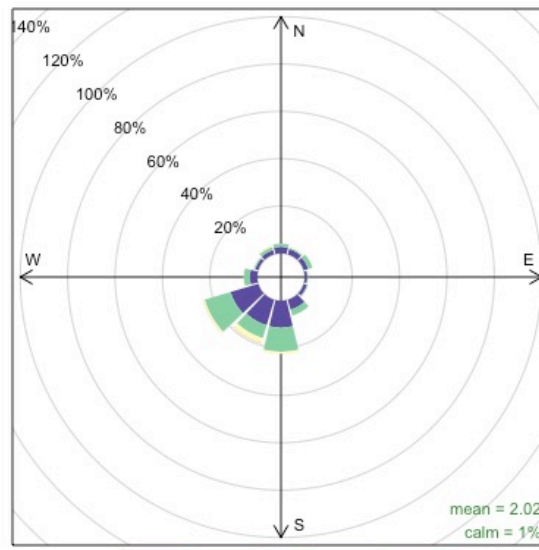
Frequency of counts by wind direction (%)

Round Mountain Spring Daytime
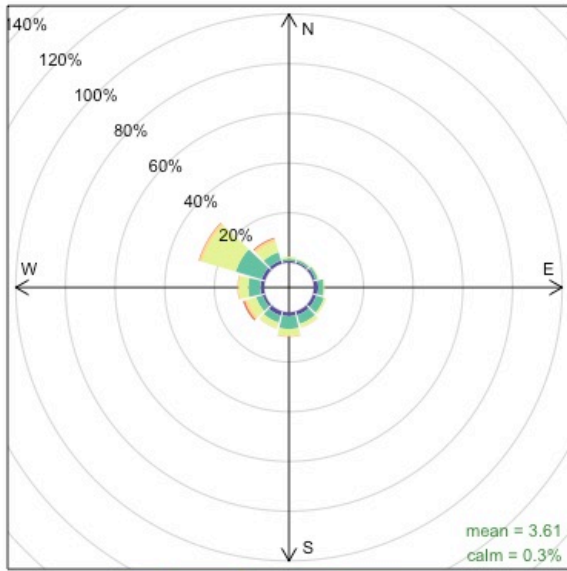
40%
120%
100%
80%
60%
40%
20%

W

N

E

S

mean = 3.61
calm = 0.3%

0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10 to 12.964
(m s⁻¹)

Frequency of counts by wind direction (%)

Round Mountain Spring Nighttime
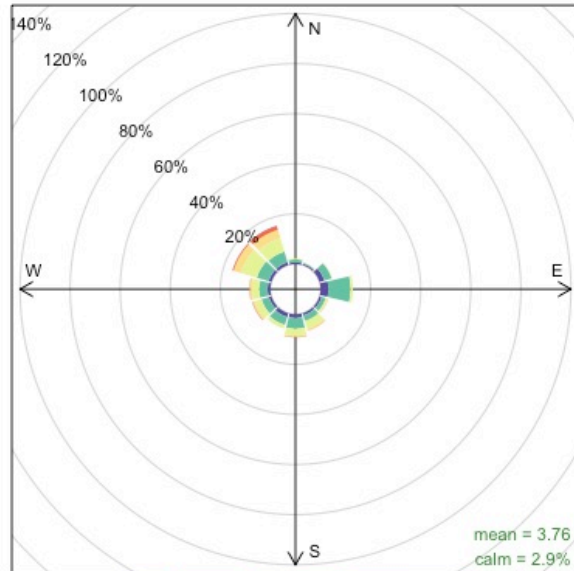
40%
120%
100%
80%
60%
40%
20%

W

N

E

S

mean = 3.76
calm = 2.9%

0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10 to 11.623
(m s⁻¹)

Frequency of counts by wind direction (%)

Round Mountain Summer Daytime

40%
120%
100%
80%
60%
40%
20%

W

N

E

S

mean = 3.36
calm = 0.2%

0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10 to 10.729
(m s⁻¹)

Frequency of counts by wind direction (%)

Round Mountain Summer Nighttime
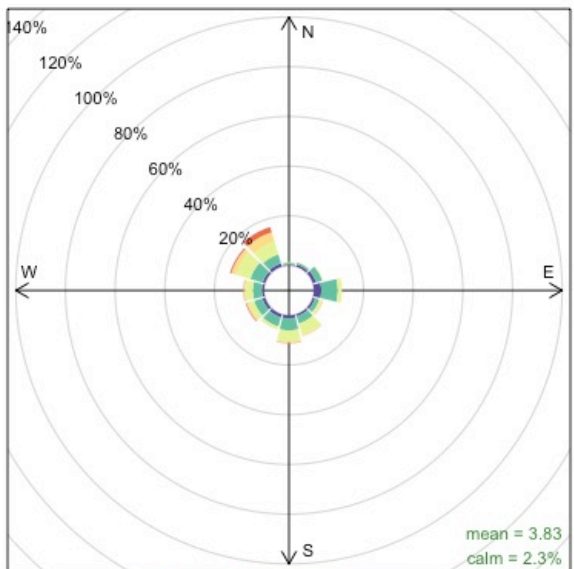
40%
120%
100%
80%
60%
40%
20%

W

N

E

S

mean = 3.83
calm = 2.3%

0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10 to 14.305
(m s⁻¹)

Frequency of counts by wind direction (%)

Round Mountain Autumn Daytime
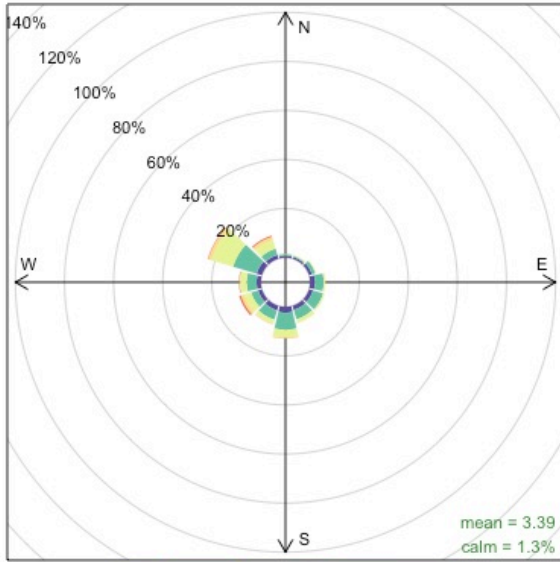
140%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 3.39
calm = 1.3%

0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10 to 11.623
(m s⁻¹)

Frequency of counts by wind direction (%)

Round Mountain Autumn Nighttime
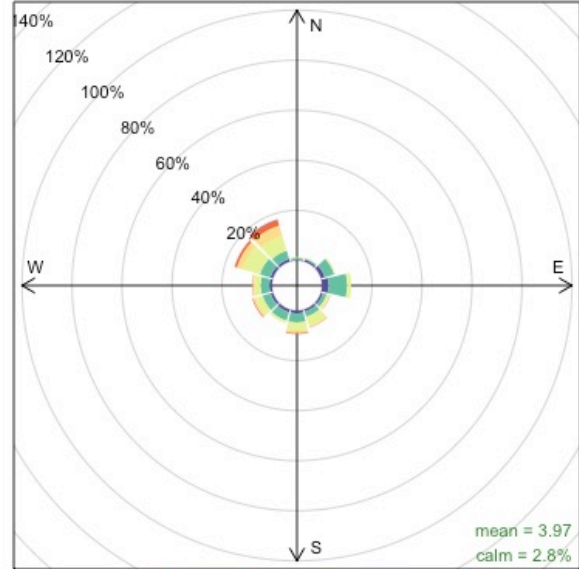
140%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 3.97
calm = 2.8%

0 to 2 2 to 4 4 to 6 6 to 8 8 to **10** 10 to 12.07
(m s⁻¹)

Frequency of counts by wind direction (%)

Round Mountain Winter Daytime
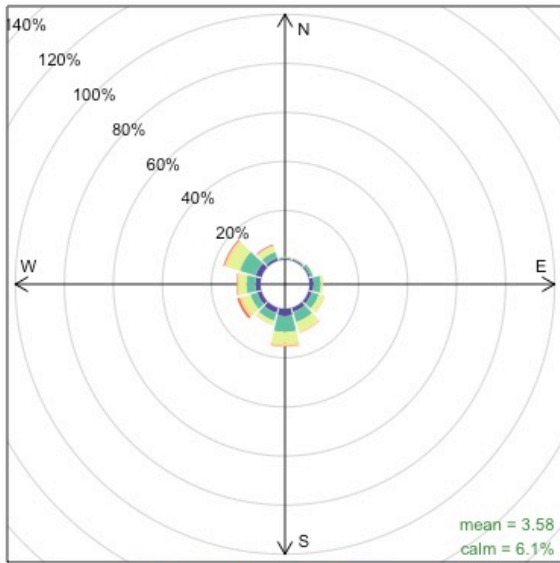
140%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 3.58
calm = 6.1%
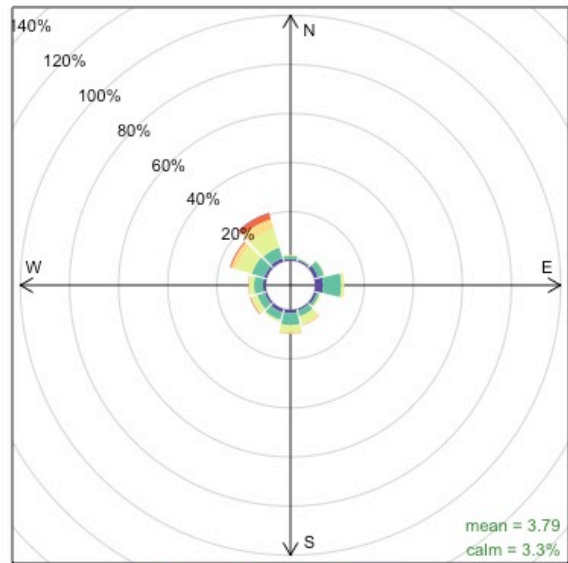
0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10 to 13.858
(m s⁻¹)

Frequency of counts by wind direction (%)

Round Mountain Winter Nighttime

140%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 3.79
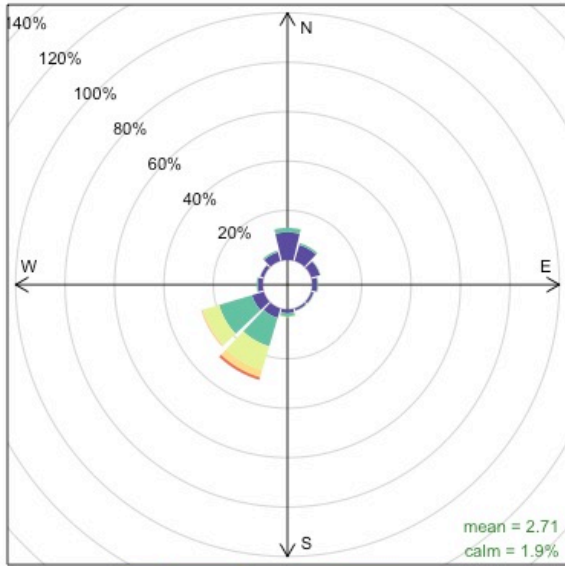calm = 3.3%

0 to 2 2 to 4 4 to 6 6 to 8 8 to10 10 to 12.964
(m s⁻¹)

Frequency of counts by wind direction (%)

Lava Butte Spring Daytime

140%
120%
100%
80%
60%
40%
20%

N
W — E
S

mean = 2.71
calm = 1.9%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 10.729
(m s^{-1})

Frequency of counts by wind direction (%)

Lava Butte Spring Nighttime
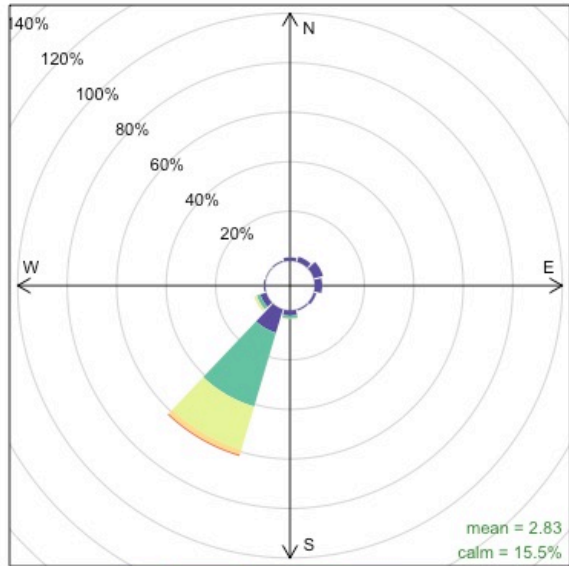
140%
120%
100%
80%
60%
40%
20%

N
W — E
S

mean = 2.83
calm = 15.5%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 11.176
(m s^{-1})

Frequency of counts by wind direction (%)

Lava Butte Summer Daytime

140%
120%
100%
80%
60%
40%
20%

N
W — E
S

mean = 2.02
calm = 1.2%
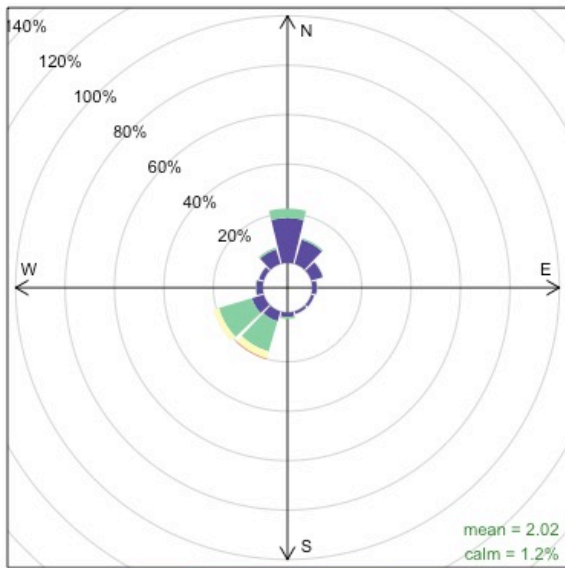
0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s^{-1})

Frequency of counts by wind direction (%)

Lava Butte Summer Nighttime
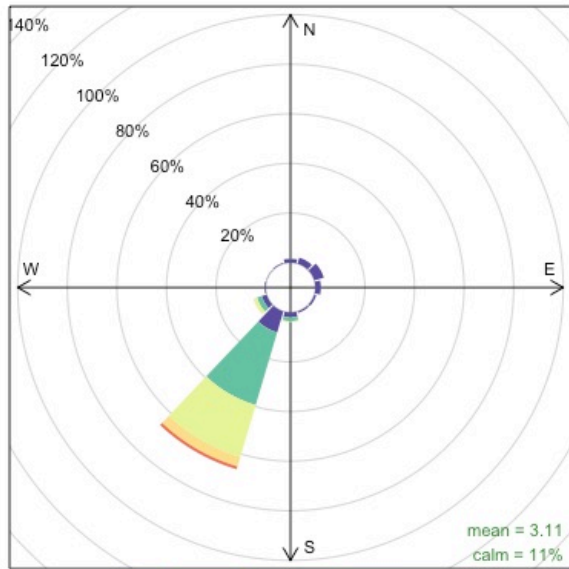
140%
120%
100%
80%
60%
40%
20%

N
W — E
S

mean = 3.11
calm = 11%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 13.858
(m s^{-1})

Frequency of counts by wind direction (%)
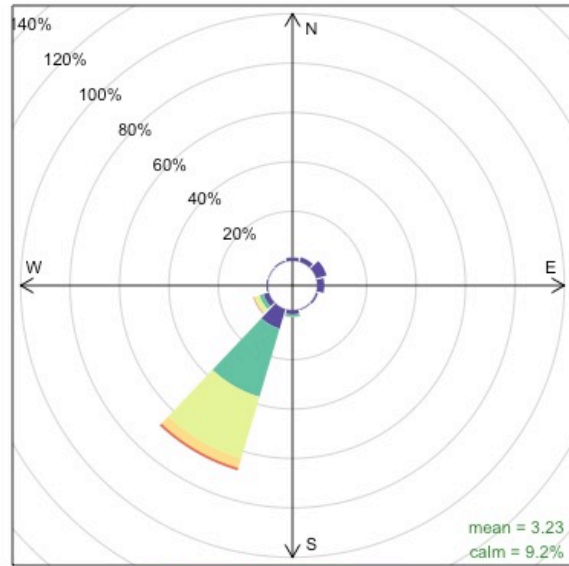
Lava Butte Autumn Daytime
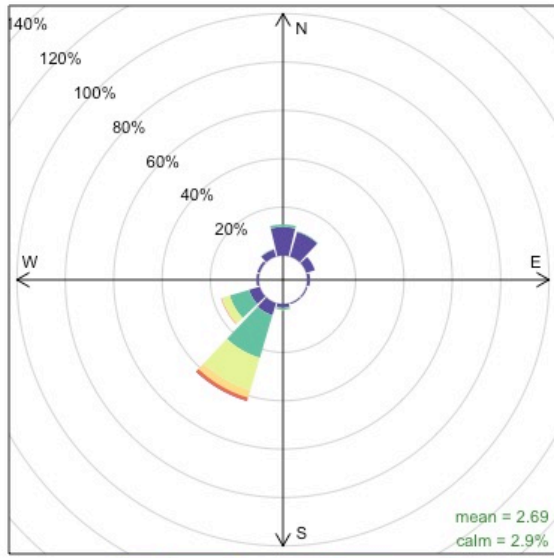
mean = 2.69
calm = 2.9%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 12.964
(m s⁻¹)

Frequency of counts by wind direction (%)
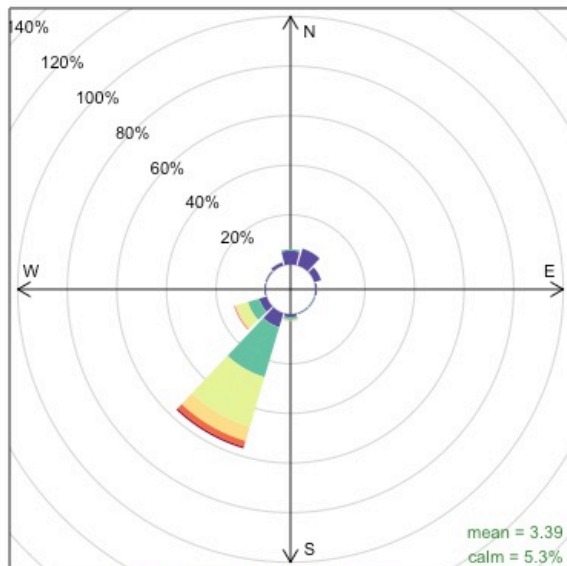
Lava Butte Autumn Nighttime

mean = 3.23
calm = 9.2%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 11.623
(m s⁻¹)

Frequency of counts by wind direction (%)
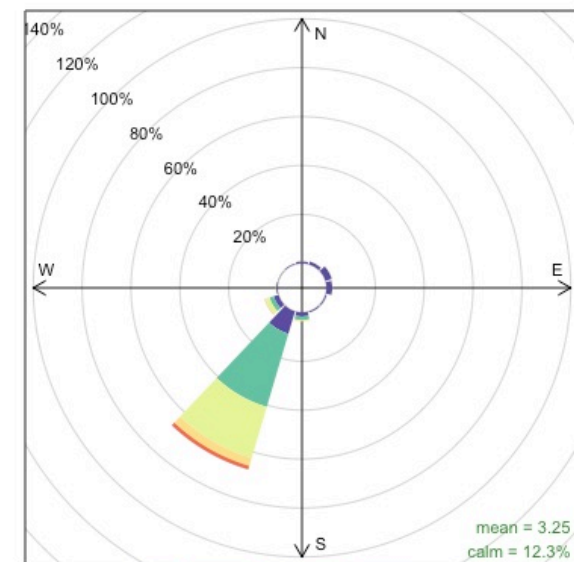
Lava Butte Winter Daytime

mean = 3.39
calm = 5.3%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 14.305
(m s⁻¹)

Frequency of counts by wind direction (%)

Lava Butte Winter Nighttime

mean = 3.25
calm = 12.3%
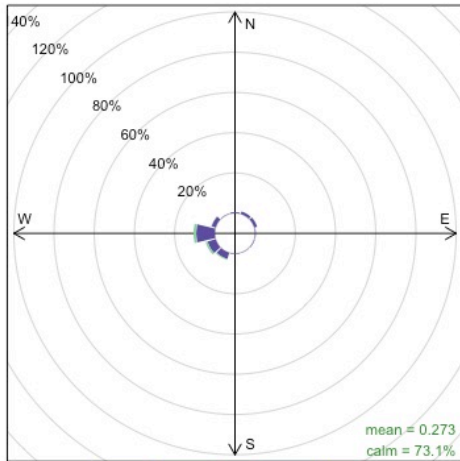
0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 11.176
(m s⁻¹)

Frequency of counts by wind direction (%)

Sisters Ranger Station Autumn Daytime 2014

40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.273
calm = 73.1%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Sisters Ranger Station Autumn Nighttime 2014
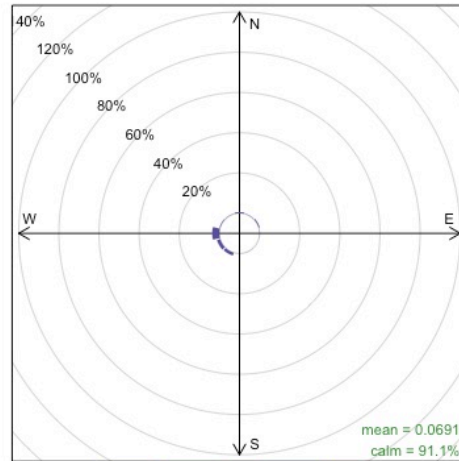
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.0691
calm = 91.1%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Sisters Ranger Station Winter Daytime 2014-2015
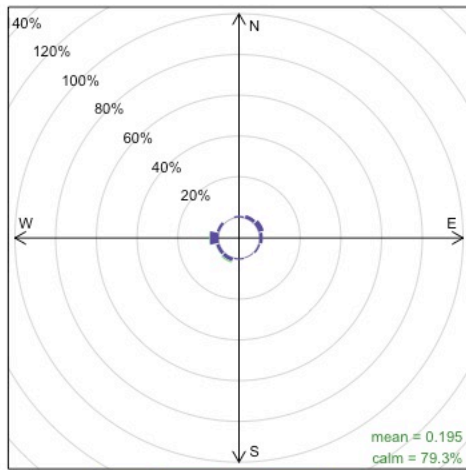
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.195
calm = 79.3%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Sisters Ranger Station Winter Nighttime 2014-2015
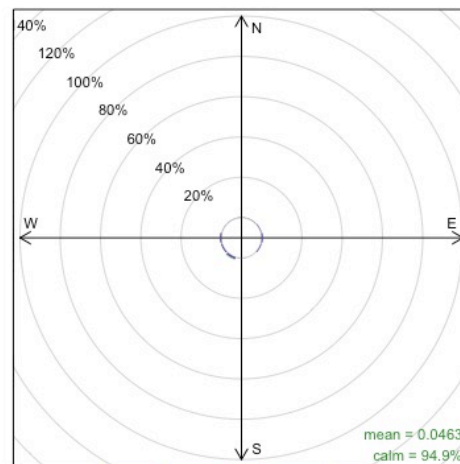
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.0463
calm = 94.9%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Sisters Ranger Station Spring Daytime 2015

40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 0.361
calm = 56.2%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)
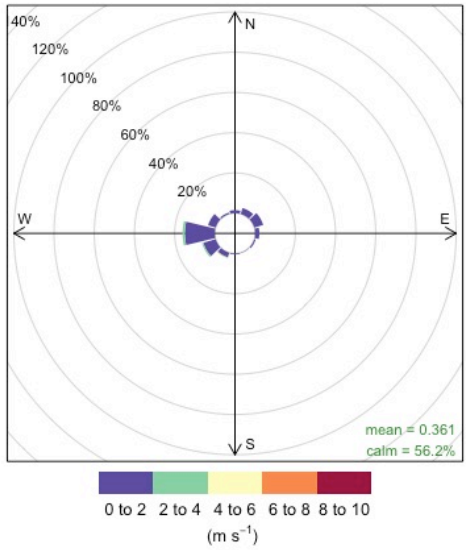
Frequency of counts by wind direction (%)

Sisters Ranger Station Spring Nighttime 2015

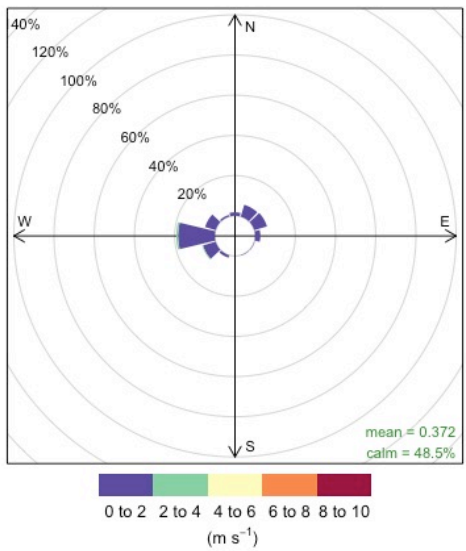40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 0.0372
calm = 94.8%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)
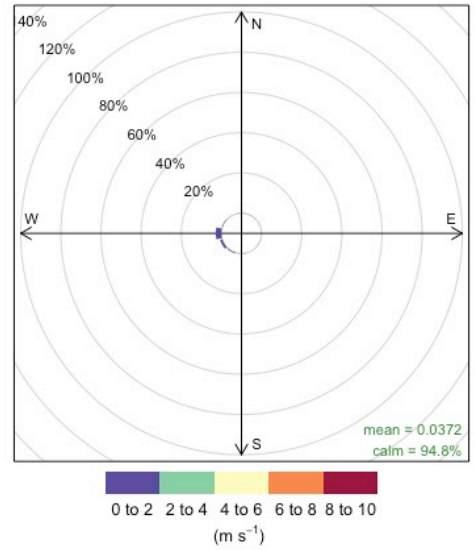
Frequency of counts by wind direction (%)

Sisters Ranger Station Summer Daytime 2015

40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 0.372
calm = 48.5%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Sisters Ranger Station Summer Nighttime 2015

40%
120%
100%
80%
60%
40%
20%

N
W   E
S

mean = 0.034
calm = 94.9%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)
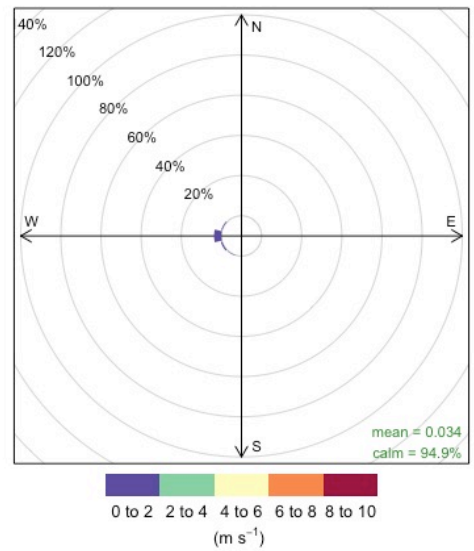
Frequency of counts by wind direction (%)

Bridges Boys Academy Autumn Daytime 2014
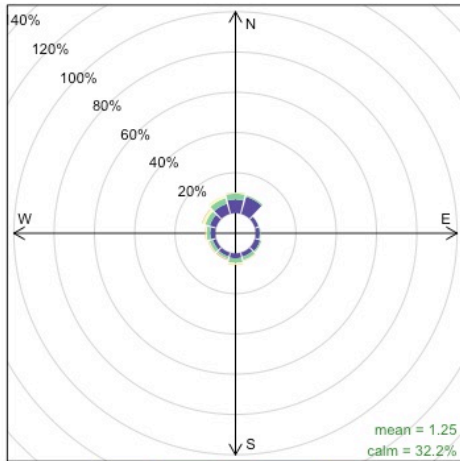
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 1.25
calm = 32.2%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Bridges Boys Academy Autumn Nighttime 2014
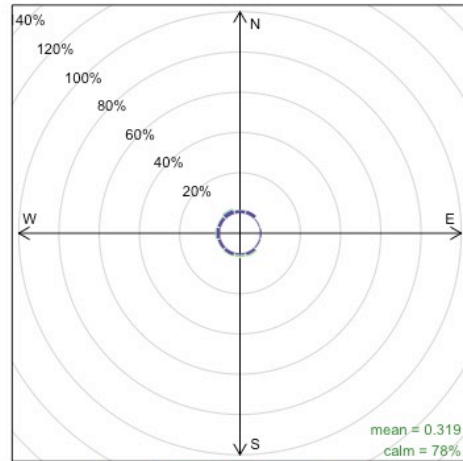
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.319
calm = 78%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Bridges Boys Academy Winter Daytime 2014-2015
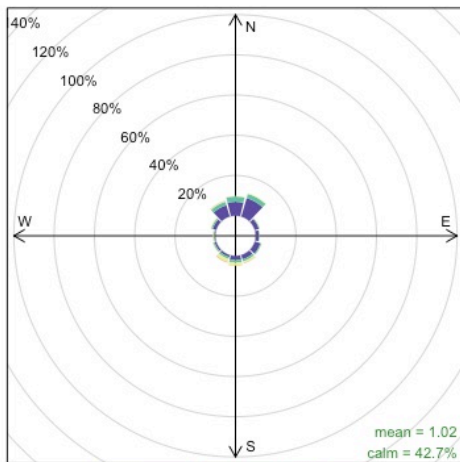
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 1.02
calm = 42.7%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10.729
(m s⁻¹)

Frequency of counts by wind direction (%)

Bridges Boys Academy Winter Nighttime 2014-2015
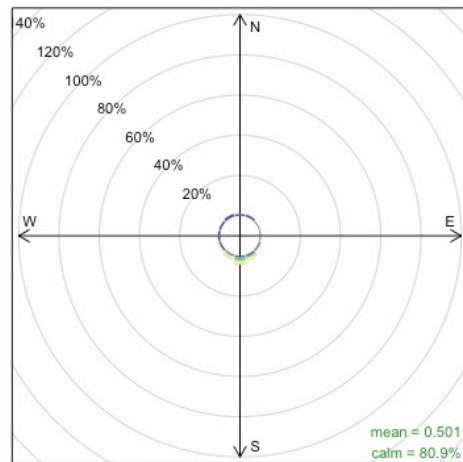
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.501
calm = 80.9%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 11.176
(m s⁻¹)

Frequency of counts by wind direction (%)

Bridges Boys Academy Spring Daytime 2015
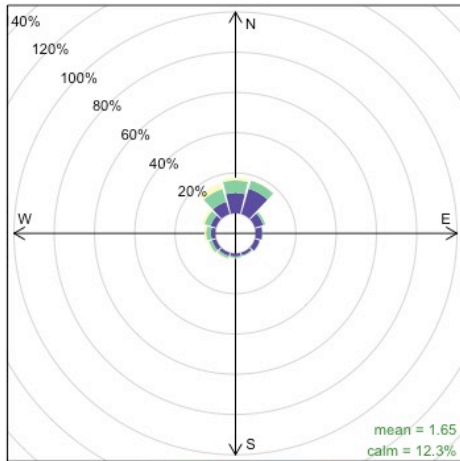
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 1.65
calm = 12.3%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Bridges Boys Academy Spring Nighttime 2015
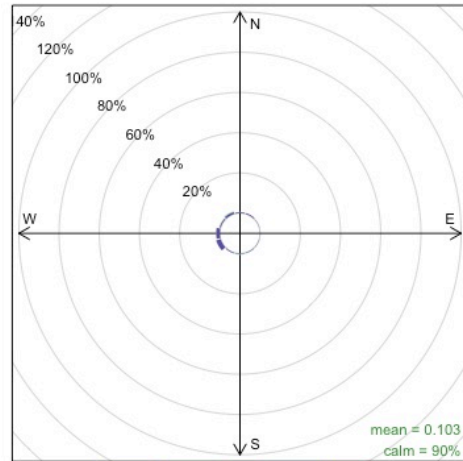
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.103
calm = 90%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Bridges Boys Academy Summer Daytime 2015
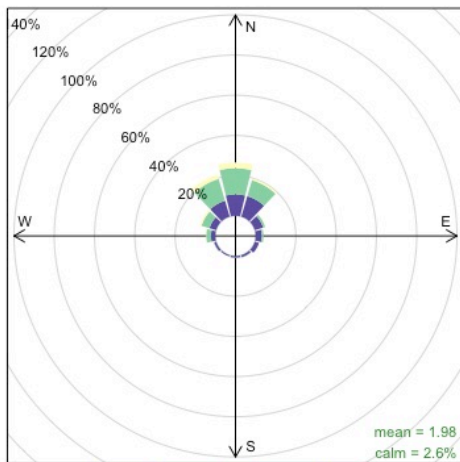
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 1.98
calm = 2.6%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Bridges Boys Academy Summer Nighttime 2015
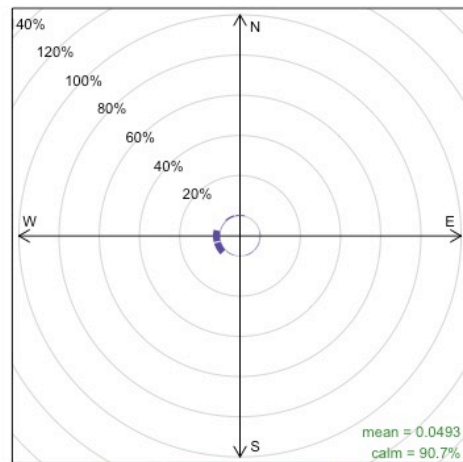
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.0493
calm = 90.7%

0 to 2   2 to 4   4 to 6   6 to 8   8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Miller Elementary Autumn Daytime 2014
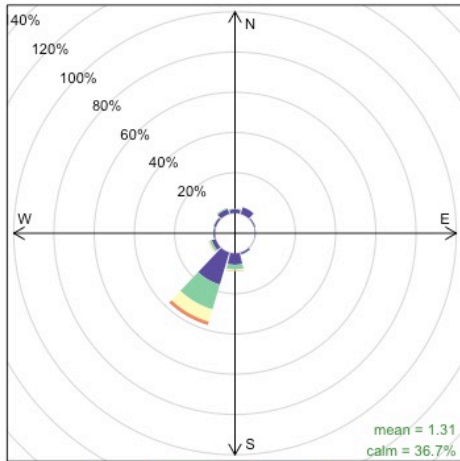
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 1.31
calm = 36.7%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Miller Elementary Autumn Nighttime 2014
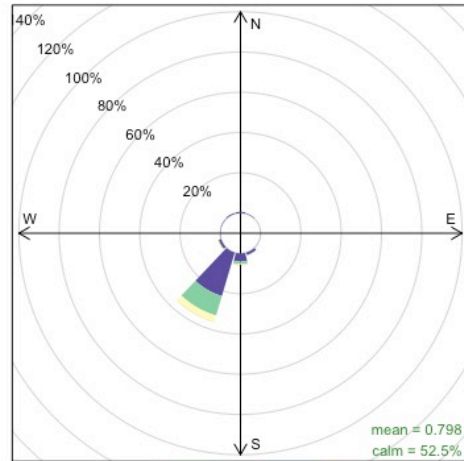
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.798
calm = 52.5%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s⁻¹)

Frequency of counts by wind direction (%)

Miller Elementary Winter Daytime 2014-2015

40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 1.13
calm = 40%
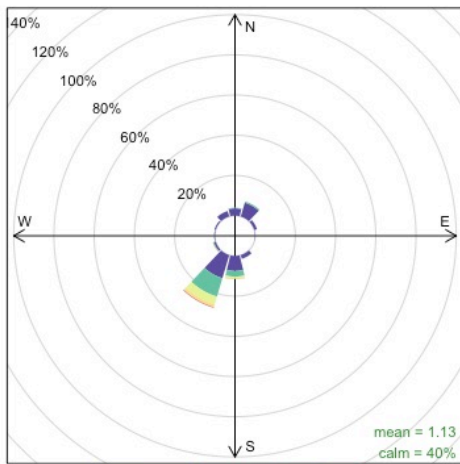
0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 12.517
(m s⁻¹)

Frequency of counts by wind direction (%)

Miller Elementary Winter Nighttime 2014-2015
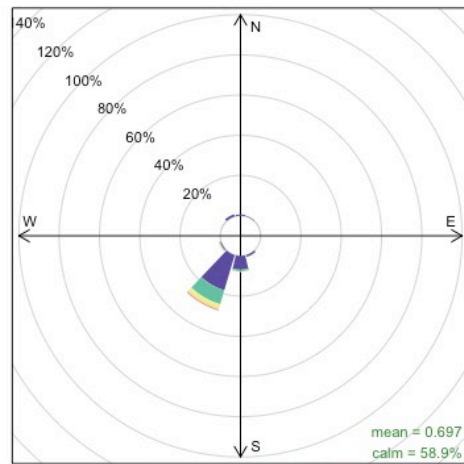
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.697
calm = 58.9%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 10.729
(m s⁻¹)

Frequency of counts by wind direction (%)

Miller Elementary Spring Daytime 2015
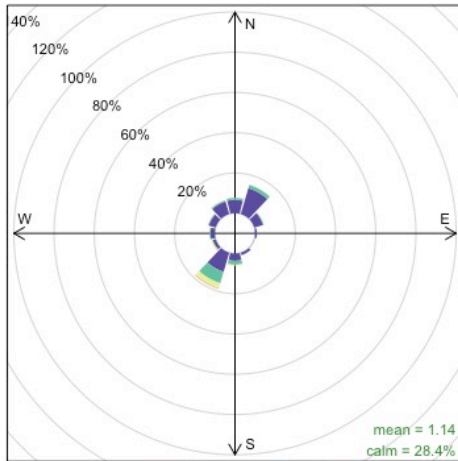
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 1.14
calm = 28.4%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 10 to 12.07
(m s^{-1})

Frequency of counts by wind direction (%)

Miller Elementary Spring Nighttime 2015
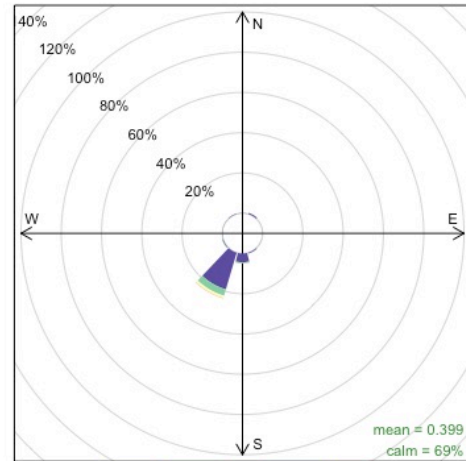
40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.399
calm = 69%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s^{-1})

Frequency of counts by wind direction (%)

Miller Elementary Summer Daytime 2015

40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.855
calm = 20.5%

0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s^{-1})

Frequency of counts by wind direction (%)

Miller Elementary Summer Nighttime 2015

40%
120%
100%
80%
60%
40%
20%

N
W
E
S

mean = 0.0993
calm = 86.3%
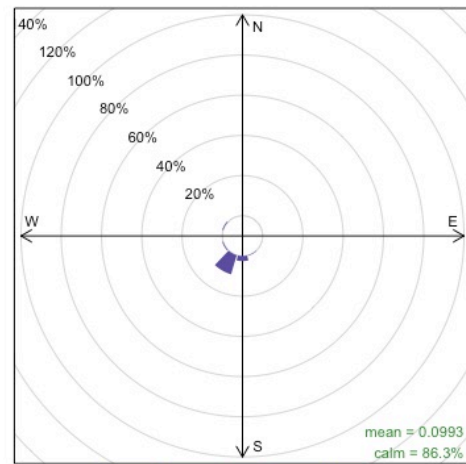
0 to 2 2 to 4 4 to 6 6 to 8 8 to 10
(m s^{-1})

Frequency of counts by wind direction (%)

Cascade Academy – all seasons

FERAWX3: Daylight vs Nighttime

Frequency of counts by wind direction (%)