



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**Office of Air Quality Planning and Standards (OAQPS)**  
**Research Triangle Park, North Carolina 27711**

**February 23, 2006**

**MEMORANDUM**

**SUBJECT:** Analyses of Event-Flagged Criteria Pollutant Data

**FROM:** Mark Schmidt, OAQPS

**TO:** file

**General**

This memorandum documents the analyses of ambient pollution data flagged for exceptional events. Analyses were conducted in support of the exceptional events rule proposal. The analyses were conducted for illustrative purposes only using conveniently available databases. The main focus of the analyses was particulate matter (PM) data, mainly PM<sub>2.5</sub> and to a lesser degree estimated PM<sub>10-2.5</sub>, however, summaries were produced for all the criteria pollutants. The analyses utilized PM<sub>2.5</sub> data for the years 1999-2004; estimated PM<sub>10-2.5</sub> data for the years 2001-2003; and CO, SO<sub>2</sub>, NO<sub>2</sub>, Pb, O<sub>3</sub>, and PM<sub>10</sub> data for the years 2002-2004.

**Source Data**

PM<sub>2.5</sub> data were extracted from the Air Quality System (AQS) in two separate queries; 1999-2001 data were extracted on April 18, 2005 and 2002-2004 data were extracted on October 12, 2005. In most analyses (unless otherwise specified), the six years of data were evaluated together. Only Federal Reference Method (FRM) or Federal Equivalent Method (FEM) PM<sub>2.5</sub> data were used for the analyses. The PM<sub>2.5</sub> raw data files used were produced as a byproduct of design value processing software; this software creates site-based data files in which the primary monitor data is augmented with data from collocated monitors. Unless otherwise specified, analyses utilized all available data in these files whether or not the site met NAAQS completeness requirements. The raw data files utilized included all flag fields and the EPA concurrence indicator. States can flag a single data value with up to 10 informational and/or event flags; see Attachment for the complete list of AQS qualifiers. The EPA concurrence indicator is used by EPA regional staff to approve or reject the State flag(s) after a review of submitted documentation. If the Region agrees with the flag they will concur by entering a 'Y' (yes) in the indicator field. If they reject the flag, they are supposed to enter an 'N' (no) into the field. For most flagged data points, the concurrence indicator is blank. Usually it is blank because the State did not submit the required documentation. States often only submit documentation if the flagged data point makes a difference in attainment status. The concurrence field may also be blank if the documentation was

submitted but the Region has not yet completed its review. Some of the flag analyses evaluated the concurrence field and some did not; if so, it is documented.

Currently, there is no FRM or FEM for PM<sub>10-2.5</sub>. PM<sub>10-2.5</sub> data have been estimated for projects such as the recent PM NAAQS Review by differencing same day collocated or nearby FRM / FEM measurements of PM<sub>10</sub> and PM<sub>2.5</sub>. The flag analyses conducted for PM<sub>10-2.5</sub> data utilized the 2001-2003 PM Staff Paper (SP) database. For this database, all available pairs of collocated or nearby (FRM/FEM) PM<sub>10</sub> and PM<sub>2.5</sub> measurements were used. The PM<sub>10</sub> data, which are reported in standard conditions, were converted to local conditions using collocated (AQS) or nearby (National Weather Service) meteorological information. The paired PM<sub>10</sub> and PM<sub>2.5</sub> differences were then aggregated by site-day. The SP analyses required sites to have at least 11 or more samples per calendar quarter for 12, 8, or 4 consecutive quarters. Extraneous data (for sites that didn't meet the completeness criterion, or for sites that met it but for quarters outside of the consecutive 4-, 8-, or 12-quarter period) were not used in analyses. Flags were assigned to the PM<sub>10-2.5</sub> data using several different methods: 1) A PM<sub>10-2.5</sub> data point was considered flagged if any of the constituent pieces (PM<sub>10</sub> or PM<sub>2.5</sub>) were flagged; 2) Flags were assigned solely on the basis of the PM<sub>10</sub> data flag (ignoring any PM<sub>2.5</sub> flags); and 3) Flags were assigned if the PM<sub>10</sub> data were flagged but the PM<sub>2.5</sub> data were not flagged. There are pros and cons for all three methods. The AQS concurrence field was not considered for the PM<sub>10-2.5</sub> flag analyses.

CO, SO<sub>2</sub>, NO<sub>2</sub>, Pb, O<sub>3</sub>, and PM<sub>10</sub> data were extracted from the AQS on February 13, 2006. Regional concurrence was not considered in the corresponding analyses.

### List of Analyses

Analyses outputs are attached to this memo in the order listed below. Pertinent details such as processing methodology description and important caveats are noted within the attachments. Relevant findings are noted below. [E.g., Output 1 below (with notes *a* through *d*) corresponds to Output 1; the notes are general and not page-specific.]

#### Output 1 - PM<sub>2.5</sub> flag counts by year.

- a) PM<sub>2.5</sub> data were flagged for 16 distinct types of events.
- b) Less than a half percent (~.44 %) of all PM<sub>2.5</sub> data are flagged for events
- c) The flag rate varied by year, from a low of 0.25% in 2001 to a high of 0.58% in 2004.
- d) The most abundant event flags are for forest fire (32% of total flags), construction/demolition (20%), highway construction (19%), and Sahara dust (16%). These four types accounted for 87% of the flags.

#### Output 2 - PM<sub>2.5</sub> flag sites by year.

- a) Over 400 of the 1362 sites that operated between 1999 and 2004 (30%) had at least one event flag.
- b) The percentage of sites that had flags varied by year, from a low of 6% in 1999 to a high of 20% in 2002; on average, 10% of sites per year have at least one event flag.
- c) The events that were flagged by the most sites on average were forest fire (70% of total flag sites), Sahara dust (8%), high winds (6%), and construction/demolition (6%).

Output 3 - PM<sub>2.5</sub> flag rates by State.

- a) The States/Territories with the highest flag rates were PR (15% of all their PM<sub>2.5</sub> data were flagged), VI (9%), AZ (3%), and MT (2%).
- b) 17 States didn't flag any of their data for events: ID, WY, NM, ND, SD, OK, KS, MN, IA, MO, AR, LA, MS, IL, IN, NH, and ME.

Output 4 - PM<sub>2.5</sub> flag type by State.

- a) Most of the States that had no event flags are located in the Midwest.
- b) Many States had only event flags for forest fires (red).
- c) The 2 eastern territories (PR and VI) had the highest predominance of Sahara dust flags.
- d) Several States had 5 or more different types of event flags: CA (8 event types), TX (6), AZ (5), and PR (5).

Output 5 - PM<sub>2.5</sub> flag type by State, excluding Quebec fire event of July, 2002.

- a) Several States (mostly in the Northeast) only had flags for the Quebec fire event: PA, DE, NJ, VT, CT, MA, and RI.
- b) Ignoring the Quebec event, most fire events seem to be regionalized in the West and Southeast.

Output 6 - PM<sub>2.5</sub> forest fire flag rate by State by year.

- a) The 2002 bars in the Northeastern States shows the wide effect of the Quebec fires. As noted above, many of the affected States only had event flags for this one specific event.
- b) CA had forest fire flags each of the six years. AK and SC had forest fire flags in 5 of the 6 years.
- c) High fire flag rates (indicating severe and/or numerous fires) are seen in 2004 for AK, and in 2000 and 2003 for MT.

Output 7 - Maps of PM<sub>2.5</sub> flag rates by site – all flags and specific types.

- a) All sites in PR had flag rates exceeding 5% (over the entire 6-year period and all individual years except 2000)
- b) Except for 1999, many sites in SC had high (relative) flag rates.
- c) Most sites with high wind flags are located in the Southwest.

Output 8 - Table of concurred PM<sub>2.5</sub> flag counts/rates, by year

- a) 3712 total values over the 6-year period were flagged for events.
  - i) The number of flagged values for which States have submitted supporting documentation is unknown.
  - ii) Only 14% of all flagged data points have been regionally concurred.
  - iii) 505 total concurred data points were regionally concurred.
  - iv) 0.06% of all data points were regionally concurred.
- b) 95% (479) of concurred flags are for forest fires.
  - i) 3% (15) of all concurred flags are for construction/demolition and less than 1% for clean-up after major disaster (hurricane burn), highway construction, structural fires, and infrequent large gatherings (July 4<sup>th</sup>).
  - ii) There are no concurred flags for other events (high winds, volcanic eruptions, Sahara dust, etc.)

Output 9 - Maps of concurred PM<sub>2.5</sub> flag counts/rates

Output 10 - Comparisons of 95<sup>th</sup> percentile to mean plus 2 standard deviations for PM<sub>2.5</sub>

[95<sup>th</sup> percentiles were calculated two ways: 1) using all available data for the 6-year period (1999-2004) for the same site-quarter (subsequently termed, 'using all data'), and 2) using all data except for those with event flags (concurrent or not) for the 6-year period for the same site-quarter (subsequently termed, 'minus flagged data' or 'excluding flagged data').]

- a) The site-quarter '95<sup>th</sup> percentile' metric compares quite well with the metric 'mean plus 2 standard deviations'.
  - i) Over 85% of all 95<sup>th</sup> percentiles are within 10% of the corresponding Mean+2SD.
  - ii) R<sup>2</sup> for model (P95=Mean+2SD) is 0.96 (using 'minus flagged data').
- b) Mean+2SD is (slightly) higher than 95<sup>th</sup> percentile for more site-quarters than vice versa. Hence, more values would pass the 95<sup>th</sup> percentile test than a mean+2SD test.

Output 11 - Statistics for PM<sub>2.5</sub> data points and sites – comparison to historic site-quarter metrics

[Bullets reference the 'excluding flagged data' approach]

- a) 32% of all flagged data are greater than or equal to corresponding historic site-quarter 95<sup>th</sup> percentiles. Thus, States are flagging many low values.
- b) 84% of all concurrent flagged data are greater than or equal to corresponding historic site-quarter 95<sup>th</sup> percentiles. Thus, either 1) States are only submitting documentation for high values (ones that impact attainment decisions), and/or 2) Regions are only approving the events requests for high values.
- c) For 76% (134) of the sites that had at least one concurrent flag (176), all concurrent flagged data at the site were greater or equal the 95<sup>th</sup> percentiles.
- d) On average, over 6,000 PM<sub>2.5</sub> samples per year are  $\geq$  95<sup>th</sup> percentiles. On average, over 36,000 PM<sub>2.5</sub> samples per year are  $\geq$  75<sup>th</sup> percentiles.

Output 12 - PM<sub>2.5</sub> stacked bar charts (by State and Region) and maps (of sites) showing various combinations of counts/rates of flagged and/or concurrent flagged values by  $<$  or  $\geq$  95<sup>th</sup> and 75<sup>th</sup> percentiles.

[Bullets reference the 'excluding flagged data' approach]

- a) The State average for the percentage of flagged data  $\geq$  95<sup>th</sup> percentiles is 67% (for States with flagged data). For ten States (SC, DC, TX, OH, VI, AL, PR, AZ, CA, MI), less than half of their flagged data are  $\geq$  95<sup>th</sup> percentiles. For nine States (OR, CO, NE, WI, DE, NJ, VT, CT, RI), all of their flagged data are  $\geq$  95<sup>th</sup> percentiles.
- b) 14 States with data flags had none concurrent ... due to either 1) States have not submitted required documentation or 2) Regions have reviewed/concurred on documentation. Eight States with flags had 100% concurrent.
- c) The nationwide 16% of concurrent flagged data that were less than the site-quarter 95<sup>th</sup> percentiles are not geographically distributed. Seven of the 10 EPA regions had one or more concurrent flagged PM<sub>2.5</sub> values during 1999-2004. For three of these seven regions, all of the concurrent flag values met the 95<sup>th</sup> percentile check and for several other regions most of the concurrent values met the test. Regions VIII (17/17), IX (5/5), and V (2/2) all had 100% of their concurrent values equal to or greater than the historic site-quarter 95<sup>th</sup> percentile; Region 10 had 99% (106/107); Region 1 had 92% (45/49); and Region 3 had 84% (56/67). However,

for Region IV, only 110 out of the 167 (63%) concurred flag values were 'exceptional' as defined by the 95<sup>th</sup> percentile test.

- d) Over half (58%) of the concurred PM<sub>2.5</sub> values less than the 95<sup>th</sup> percentiles are  $\geq$  75<sup>th</sup> percentile.
- e) 93% of concurred values are  $\geq$  the historic site-quarter 75<sup>th</sup> percentiles.
- f) For 4 recent well-known major fire events, a high percentage of flagged data exceeded the corresponding historic site-quarter 95<sup>th</sup> percentiles: 95% for the July 2002 Quebec fire event; 100% for the 2003 Montana fires; 100% for the October 2003 San Diego fires; and 95% for the 2003 Alaskan fires.

Output 13 - Utah PM<sub>2.5</sub> flags.

- a) Region 8 is the only Region to utilize AQS's 'non-concurrence' feature. They have rejected 12 of Utah's 17 event flags.
- b) The 12 Utah flags were rejected because of either insufficient documentation and/or the event was not a valid flag-able event (e.g., fireworks celebration)
- c) No documentation was submitted for the other 5 event flags.
- d) 15 of Utah's 17 event flags exceeded the historic site-quarter 95<sup>th</sup> percentiles. The 2 events that were  $< 95^{\text{th}}$ , were disapproved.

Output 14 - Sites with the same PM<sub>2.5</sub> event flags for multiple years

- a) 27 sites had data flagged for the same type of event four or more years 1999-2004. This could indicate a geographic location susceptible to natural events; a location with ongoing (large-scale, multiple year) or annual-basis anthropogenic activity; and/or a monitoring agency that flags more than others.
  - i) Two sites in HI had 'infrequent large gatherings' flags all six years, presumably for fireworks. (Flagged days were New Year 's Eve and New Year 's Day.)
  - ii) Two sites in DC had 'prescribed burning' flags four of the six years, presumably for fireworks. (Flagged days were July 4<sup>th</sup>).
  - iii) Several sites in PR had 'Sahara dust' flags multiple (4 or 5) years.
  - iv) Multiple sites in SC had 'forest fire' flags for four or five of the six years.

Output 15 - PM<sub>2.5</sub> fireworks (July 4<sup>th</sup>) analysis

- a) Some very high PM<sub>2.5</sub> concentrations are logged for July 4<sup>th</sup>. [Note that July 4<sup>th</sup> is not a scheduled sample day every year for most sites (i.e., those not on an every-day sampling regime.)] The highest 20 July 4<sup>th</sup> values for 1999-2004 ranged from 61.2  $\mu\text{g}/\text{m}^3$  to 108.3  $\mu\text{g}/\text{m}^3$ .
- b) There is considerable national inconsistency in the flagging/treatment of July 4<sup>th</sup> fireworks events: Only five of the top 20 July 4<sup>th</sup> values were flagged; these five values were flagged for two different types of events; and one of the flags was rejected (concur='N') by the corresponding EPA region but another was accepted (concur='Y') by the region.
- c) 20% (336) of the 1679 site-year July 4<sup>th</sup> PM<sub>2.5</sub> concentration values were in the top 5% of the corresponding historic ('99-'04) site-year data ( $\geq$  overall 95<sup>th</sup> percentile).
- d) The ratio of July 4<sup>th</sup> concentrations to 'typical' same-site, same time-frame concentrations (defined as July 1, 2, 3, 6, 7, and 8) ranged up to almost 20.

Output 16 - Effect of concurred flagged data on PM<sub>2.5</sub> DV's and attainment status

[The effect on design values and attainment status was evaluated strictly on the two distinct 3-year periods, 1999-2001 and 2002-2004, so as to avoid overlap.]

- a) The 505 concurred values (1999-2004) were located at 176 different sites. 165 sites had concurred values  $\geq 95^{\text{th}}$  percentiles and 42 sites had concurred values  $< 95^{\text{th}}$  percentiles; thus, 31 sites had both.
- b) Taking all concurred flags into account, 149 (85%) of the 176 sites had different (revised) annual DV's and 121 (69%) had different 24-hour DV's. The average effect on the annual DV's was a reduction of  $-0.3 \mu\text{g}/\text{m}^3$ , the median change was a  $-0.2 \mu\text{g}/\text{m}^3$ , and the maximum effect was  $-13.0 \mu\text{g}/\text{m}^3$ . The average effect on the 24-hour DV's was a reduction of  $-3 \mu\text{g}/\text{m}^3$ , the median change was a  $-1 \mu\text{g}/\text{m}^3$ , and the maximum effect was  $-141 \mu\text{g}/\text{m}^3$ .
- c) Five sites met the current NAAQS levels (for the evaluated periods 1999-2001 and 2002-2004) only because concurred flagged event data were ignored from the computations. [Note: An area's attainment status was not changed due to elimination of concurred event flags; all five sites mentioned were not the high site (DV site) in their respective area.]
- d) Most of the site DV differences (discussed in note b above) were due solely to the removal of the large 'exceptional' ( $\geq 95^{\text{th}}$  percentile) concurred values. The 16% of concurred flagged data (82 observations) that were less than the site-quarter  $95^{\text{th}}$  percentiles were essentially unimportant to regulatory NAAQS comparisons. The impact of removing these low flagged values from NAAQS metric computations was negligible. Only 2 of the 41 sites had different  $98^{\text{th}}$  percentile design values by removing these values (compared to not removing them), one with a  $-1 \mu\text{g}/\text{m}^3$  net impact and the other with a  $-2 \mu\text{g}/\text{m}^3$  impact. 10 of the 41 sites had different annual mean design values. The greatest reduction seen at those ten sites in annual DV's was  $-0.2 \mu\text{g}/\text{m}^3$  (at 1 one site); 8 sites had a reduction of only  $-0.1 \mu\text{g}/\text{m}^3$ ; and the other 2 sites actually had higher annual DV's when the low concurred values were removed (one increased by  $0.1 \mu\text{g}/\text{m}^3$  and the other increased by  $0.4 \mu\text{g}/\text{m}^3$ ). None of the differences (caused by removing the concurred flagged data less than the  $95^{\text{th}}$  percentiles) affected a crossing of the current NAAQS thresholds ( $15.0 / 65 \mu\text{g}/\text{m}^3$ ). The statistics noted for the 41 sites with concurred flagged values less than the  $95^{\text{th}}$  percentiles can be contrasted with similar statistics for the 165 sites with concurred values greater than or equal to the  $95^{\text{th}}$  percentile values. Of these 165 sites (with 423 total readings over the historic site-quarter  $95^{\text{th}}$  percentiles), 144 (87%) had annual design values that were different because 'exceptional' concurred flagged values were ignored; 120 of the 165 sites (73%) had different (lower) 24-hour design values. The net effect on the design values due to elimination of the ' $\geq 95^{\text{th}}$  percentiles' concurred data points was essentially the same as noted for removing all of the concurred flags (note b); see output 16. The five sites that met the current NAAQS levels due to removal of all the concurred values would also have met the NAAQS by just removing the large ( $\geq 95^{\text{th}}$  percentile) concurred values.

Output 17 - PM<sub>10-2.5</sub> flag counts and flag site counts, 2001-2003

- a) Flag assigned to PM<sub>10-2.5</sub> if PM<sub>10</sub> flagged or PM<sub>2.5</sub> flagged (i.e., set to PM<sub>10</sub> flag if present, else PM<sub>2.5</sub> flag):

- i) About 1% (~ 0.9%) of all PM<sub>10-2.5</sub> observations are ‘flagged’. There are 14 different types of flags. The most numerous flags were for forest fires (228 total, 24% of all flags); highway construction (208, 22%); Sahara dust (189, 20%); construction/demolition (107, 11%), and high winds (90, 10%). These five flag types accounted for 88% of all flags.
- ii) About 30% of all PM<sub>10-2.5</sub> sites had at least one flag for the period 2001-2003. 102 sites (70% of the flag sites total) had forest fire flags; 34 sites (23%) had high winds flags; and 14 sites (10%) had construction/demolition flags. Only three sites had highway construction flags and only six sites had Sahara dust flags; thus, those sites had extremely high numbers of those flags on average (per site, relative to the other noted flag types).
- iii) This method of assigning flags (of the three evaluated) produces the most flags (and most number of flag sites)
- b) Flag assigned to PM<sub>10-2.5</sub> if PM<sub>10</sub> flagged and PM<sub>2.5</sub> not flagged:
  - i) Less than ½ % (~ 0.4%) of all PM<sub>10-2.5</sub> observations were ‘flagged’. There are nine different types of flags. The most numerous flags were for highway construction (142 total, 39% of all flags); high winds (81, 22%); construction/demolition (66, 18%), and forest fires (52, 14%). These four flag types accounted for 93% of all flags.
  - ii) About 14% of all PM<sub>10-2.5</sub> sites had at least one flag for the period 2001-2003. 33 sites (49% of the flag sites total) had high winds flags; 32 sites (48%) had forest fire flags; and 11 sites (10%) had construction/demolition flags. Only one site had highway construction flags; thus, that site had a huge number of those flags (all 142).
  - iii) This method of assigning flags (of the three evaluated) produces the least flags (and least number of flag sites)
- c) Flag assigned to PM<sub>10-2.5</sub> if PM<sub>10</sub> flagged (PM<sub>2.5</sub> flags ignored):
  - i) 0.8% of all PM<sub>10-2.5</sub> observations were ‘flagged’. There are 10 different types of flags. The most numerous flags were for highway construction (205 total, 26% of all flags); Sahara dust (184, 23%); forest fires (121, 15%); construction/demolition (103, 13%), and high winds (91, 11%). These five flag types accounted for 88% of all flags.
  - ii) About 21% of all PM<sub>10-2.5</sub> sites had at least one flag for the period 2001-2003. 64 sites (63% of the flag sites total) had forest fire flags; 33 sites (32%) had high wind flags; and 13 sites (13%) had construction/demolition flags. Only one site had highway construction flags; thus, that site had a large number of those flags (all 205).
  - iii) This method of assigning flags (of the three evaluated) produces the ‘middle’ results.

Output 18 - Concentration distributions of ‘flagged’ PM<sub>10-2.5</sub> data by flag type, 2001-2003.

[Bullets reference the flag assignment method of ‘PM<sub>10-2.5</sub> flag set to PM<sub>10</sub> flag if PM<sub>2.5</sub> flag blank’.]

- a) More than 95% of all ‘flagged’ PM<sub>10-2.5</sub> data are less than 70 µg/m<sup>3</sup> for the following flag types: agricultural tilling, construction/demolition, highway construction, infrequent large gatherings, Sahara dust, and volcanic eruptions.

- b) More than 75% of all assigned PM<sub>10-2.5</sub> forest fire flags are less than 70 µg/m<sup>3</sup>.
- c) The single assigned sandblasting PM<sub>10-2.5</sub> flag is just over 70 µg/m<sup>3</sup>.
- d) More than half of all assigned high winds PM<sub>10-2.5</sub> flags are above 70 µg/m<sup>3</sup>.

Output 19 - Maps of PM<sub>10-2.5</sub> flag rates

- a) Sites in PR, VI, and Southern CA have the highest flag rates for 2001-2003. El Paso, NM sites also have relatively high flag rates.
- b) When considering only flagged PM<sub>10-2.5</sub> values over the proposed NAAQS level of 70 µg/m<sup>3</sup>, PM<sub>10-2.5</sub> exceptional events are concentrated in the Southwest and Southern CA and are predominately for high winds.

Output 20 - Summary of CO data flagged for exceptional events, 2002-2004:

- a) Less than one hundredth of one percent (~0.006%) of all hourly CO observations are flagged for events.
- b) The most abundant event flags are for forest fire (342 total, 53% of all flags), unusual traffic congestion (174, 27%), and volcanic eruptions (116, 18%). Two other flag types accounted for about one percent each of the remaining flags (structural fire and construction/demolition)
- c) Only 10 CO sites (of the 538 total) had event flags over the 3-year period. Six sites had forest fire flags; four different sites accounted for the other four flag types.

Output 21 - Summary of SO<sub>2</sub> data flagged for exceptional events, 2002-2004:

- a) Less than one hundredth of one percent (~0.008%) of all hourly SO<sub>2</sub> observations are flagged for events.
- b) The most abundant event flags are for volcanic eruptions (1134 total, 99% of all flags). The remaining one percent of flags are for structural fire (9 flags), sandblasting (1), and chemical spills (1)
- c) Only nine SO<sub>2</sub> sites (of the 639 total) had event flags over the 3-year period. Six sites had volcanic eruption flags; three different sites accounted for the other three flag types.

Output 22 - Summary of NO<sub>2</sub> data flagged for exceptional events, 2002-2004:

- a) Less than one thousandth of one percent (~0.0009%) of all hourly NO<sub>2</sub> observations are flagged for events. Only 93 data points out of almost ten million total (2002-2004) have flags: 60 data points are flagged for volcanic eruptions, 24 for high winds, and 9 for structural fire.
- b) Only three NO<sub>2</sub> sites (of the 502 total) had event flags over the 3-year period, one each for three event types.

Output 23 - Summary of Pb data flagged for exceptional events, 2002-2004:

- a) 24-hour Pb data:
  - i) About one quarter of one percent of all 24-hour Pb data are flagged for events.
  - ii) Of the 93 total flagged events, 78 (84%) are for construction/demolition and 15 (14%) are for high winds.
  - iii) Three sites (out of 253 that operated 2002-2004) have the 93 event flags; two sites have construction/demolition flags and one site has high winds flags.
- b) Composite Pb data:
  - i) None of the 875 Pb composite data records (from 34 sites) for 2002-2004 have event flags.

Output 24 - Summary of O<sub>3</sub> data flagged for exceptional events, 2002-2004:



- a) Three hundredths of a percent of all hourly ozone data for 2002-2004 have event flags.
- b) Most of the ozone event flags are for forest fire (98%), about 2% are for prescribed burns, and three data points (0%) are flagged in 2002 for a structural fire.
- c) 76 sites (out of the 1292 total that operated 2002-2004) have event flags. Only two sites had flags in 2004, 18 sites had flags in 2003, but 59 sites had flags in 2002.
- d) Of the 76 sites with flags, 72 had forest fires flags, three had prescribed burn flags, and only one had the three structural fire flags.

Output 25 - Summary of PM<sub>10</sub> data flagged for exceptional events, 2002-2004:

- a) 24-hour PM<sub>10</sub> data:
  - i) 24-hour PM<sub>10</sub> data: for 2002-2004 were flagged for 13 different types of exceptional events. However, all the flags account for less than 1% (0.8%) of all data points.
  - ii) The most common event flags are for Sahara dust (655 flags, 31% of all flags), high winds (624, 29%), forest fire (329, 15%), construction/demolition (229, 11%) and volcanic eruptions (168, 8%). These five flag types, plus infrequent large gatherings (32, 2%) are present each of the three years; the other seven flag types are only present one or two years each.
  - iii) 239 sites (out of the 1148 total that operated 2002-2004) have at least one event flag. 127 sites (53% of the 239) have forest fire flags, 97 (41%) have high winds flags, and 23 sites (10%) have Sahara dust flags. Only one site (each) has flags for sandblasting, high pollen count, highway construction, sanding/salting of streets, rerouting of traffic, and clean-up after major disaster.
- b) 1-hour PM<sub>10</sub> data:
  - i) Of the more than four million hourly PM<sub>10</sub> data points for 2002-2004, less than 0.4 percent are flagged for events.
  - ii) The most common event flags are for forest fire (53% of the total flagged points), high winds (32%), and Sahara dust (12%).
  - iii) Of the 55 sites with flags, 28 (51%) have forest fire flags, 24 (44%) have high winds flags, and only 1 site (each) has flags for volcanic eruptions, Sahara dust, sandblasting, chemical spills and industrial accidents, and agricultural tilling.

Inquiries

For additional information on the analyses documented in the attachments, please contact Mark Schmidt at (919) 541-2416.

### Qualifier Codes and Descriptions - from epa.gov/TTN

Qualifier Type	Qualifier Type Desc	Qualifier Code	Qualifier Desc
EX	Exceptional Event Qualifier	D	SANDBLASTING
		F	STRUCTURAL FIRE
		H	CHEMICAL SPILLS & INDUST. ACCIDENTS
		I	UNUSUAL TRAFFIC CONGESTION
		J	CONSTRUCTION/DEMOLITION
		K	AGRICULTURAL TILLING
		L	HIGHWAY CONSTRUCTION
		M	REROUTING OF TRAFFIC
		N	SANDING/SALTING OF STREETS
		O	INFREQUENT LARGE GATHERINGS
		P	ROOFING OPERATIONS
		Q	PRESCRIBED BURNING
		R	CLEAN UP AFTER A MAJOR DISASTER
NAT	Natural Event Qualifier	A	HIGH WINDS
		B	STRATOSPHERIC OZONE INTRUSION
		C	VOLCANIC ERUPTIONS
		E	FOREST FIRE
		G	HIGH POLLEN COUNT
		S	SEISMIC ACTIVITY
		U	SAHARA DUST
NULL	Null Data Qualifier	AA	SAMPLE PRESSURE OUT OF LIMITS
		AB	TECHNICIAN UNAVAILABLE
		AC	CONSTRUCTION/REPAIRS IN AREA
		AD	SHELTER STORM DAMAGE
		AE	SHELTER TEMPERATURE OUTSIDE LIMITS
		AF	SCHEDULED BUT NOT COLLECTED
		AG	SAMPLE TIME OUT OF LIMITS
		AH	SAMPLE FLOW RATE OUT OF LIMITS
		AI	INSUFFICIENT DATA (CANNOT CALCULATE)
		AJ	FILTER DAMAGE

		AK	FILTER LEAK
		AL	VOIDED BY OPERATOR
		AM	MISCELLANEOUS VOID
		AN	MACHINE MALFUNCTION
		AO	BAD WEATHER
		AP	VANDALISM
		AQ	COLLECTION ERROR
		AR	LAB ERROR
		AS	POOR QUALITY ASSURANCE RESULTS
		AT	CALIBRATION
		AU	MONITORING WAIVED
		AV	POWER FAILURE (POWR)
		AW	WILDLIFE DAMAGE
		AX	PRECISION CHECK (PREC)
		AY	Q C CONTROL POINTS (ZERO/SPAN)
		AZ	Q C AUDIT (AUDT)
		BA	MAINTENANCE/ROUTINE REPAIRS
		BB	UNABLE TO REACH SITE
		BC	MULTI-POINT CALIBRATION
		BD	AUTO CALIBRATION
		BE	BUILDING/SITE REPAIR
		BF	PRECISION/ZERO/SPAN
		BG	Missing ozone data not likely to exceed level of standard
		BH	Interference/co-elution
		BI	Lost or damaged in transit
		BJ	Operator Error
		BK	Site computer/data logger down
QA	Quality Assurance Qualifier	1	Deviation from a CFR/Critical Criteria Requirement
		2	Operational Deviation
		3	Field Issue
		4	Lab Issue
		5	Outlier
		6	QAPP Issue
		7	Below Lowest Calibration Level
		9	Negative value detected - zero reported

	V	VALIDATED VALUE
	W	FLOW RATE AVERAGE OUT OF SPEC.
	X	FILTER TEMPERATURE DIFFERENCE OUT OF SPEC.
	Y	ELAPSED SAMPLE TIME OUT OF SPEC.

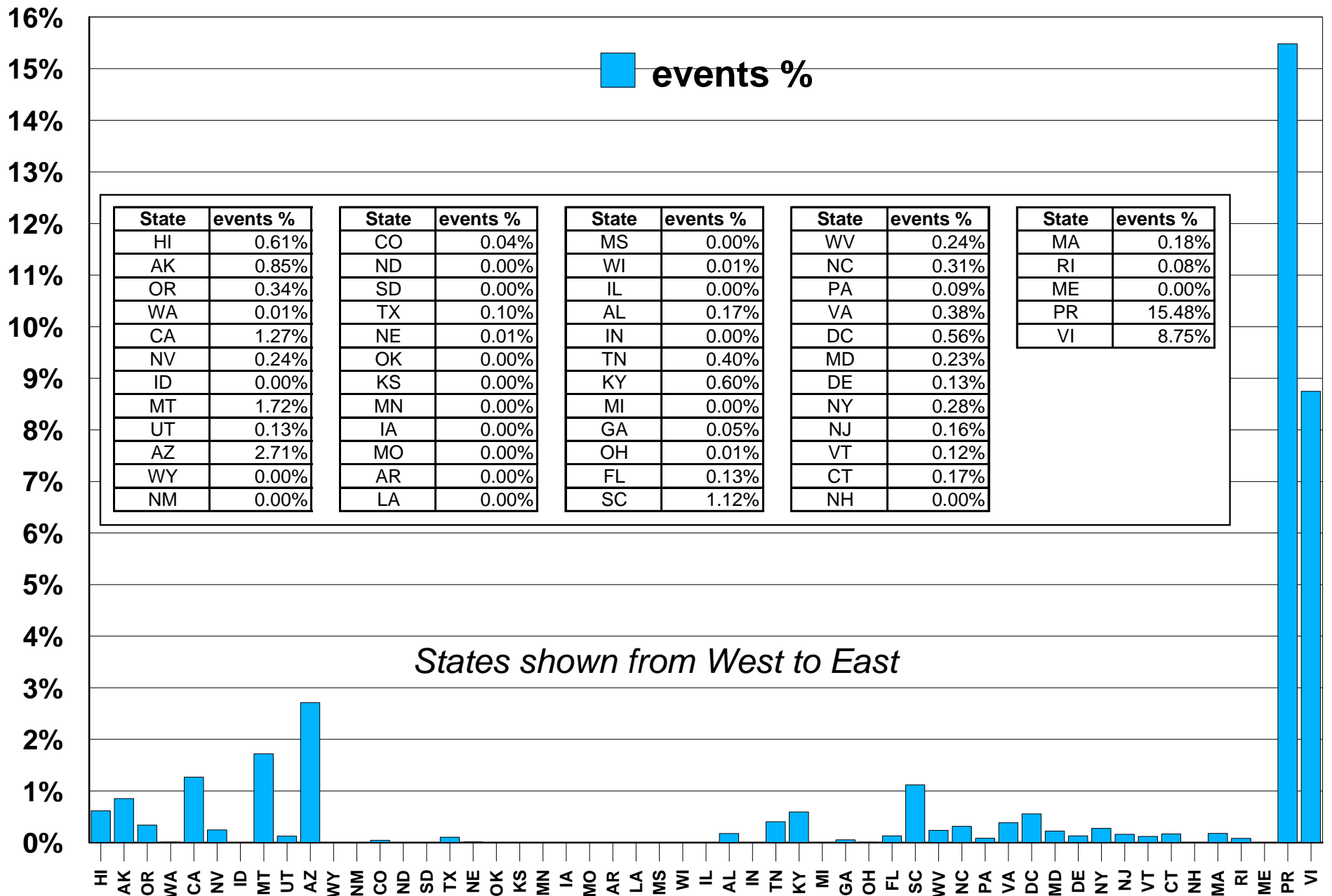
## PM2.5 flag counts, 1999-2004

Event	AQS flag	1999	2000	2001	2002	2003	2004	total	percent of flag total	percent of obs total
high winds	A	20	21	4	6	14	28	93	2.5%	0.01%
volcanic eruptions	C			8	8	85	39	140	3.7%	0.02%
forest fire	E	110	212	177	388	199	110	1,196	31.9%	0.14%
structural fire	F	1	1	29				31	0.8%	0.00%
chemical spills & indust. accidents	H						1	1	0.0%	0.00%
construction/demolition	J	152	41	62	9	191	306	761	20.3%	0.09%
agricultural tilling	K	9		1		7		17	0.5%	0.00%
highway construction	L	225	296	5	131	30	18	705	18.8%	0.08%
rerouting of traffic	M					27		27	0.7%	0.00%
sanding/salting of streets	N		1					1	0.0%	0.00%
infrequent large gatherings	O	3	4	4	8	6	8	33	0.9%	0.00%
roofing operations	P	3			2	48	2	55	1.5%	0.01%
prescribed burning	Q	10	4	9	2	7	5	37	1.0%	0.00%
clean up after a major disaster	R				29		21	50	1.3%	0.01%
seismic activity	S				1			1	0.0%	0.00%
sahara dust	U	8	7	104	122	80	286	607	16.2%	0.07%
Total Event Flags		541	587	403	706	694	824	3,755	100.0%	0.44%
minus flagged for 2 events					6	37		43		
Total Flagged Values		541	587	403	700	657	824	3,712		
Total Values Not Flagged		98,726	146,003	157,952	159,191	143,061	140,311	845,244		
Total Obs		99,267	146,590	158,355	159,891	143,718	141,135	848,956		
Flag rate by year		0.54%	0.40%	0.25%	0.44%	0.46%	0.58%	0.44%		

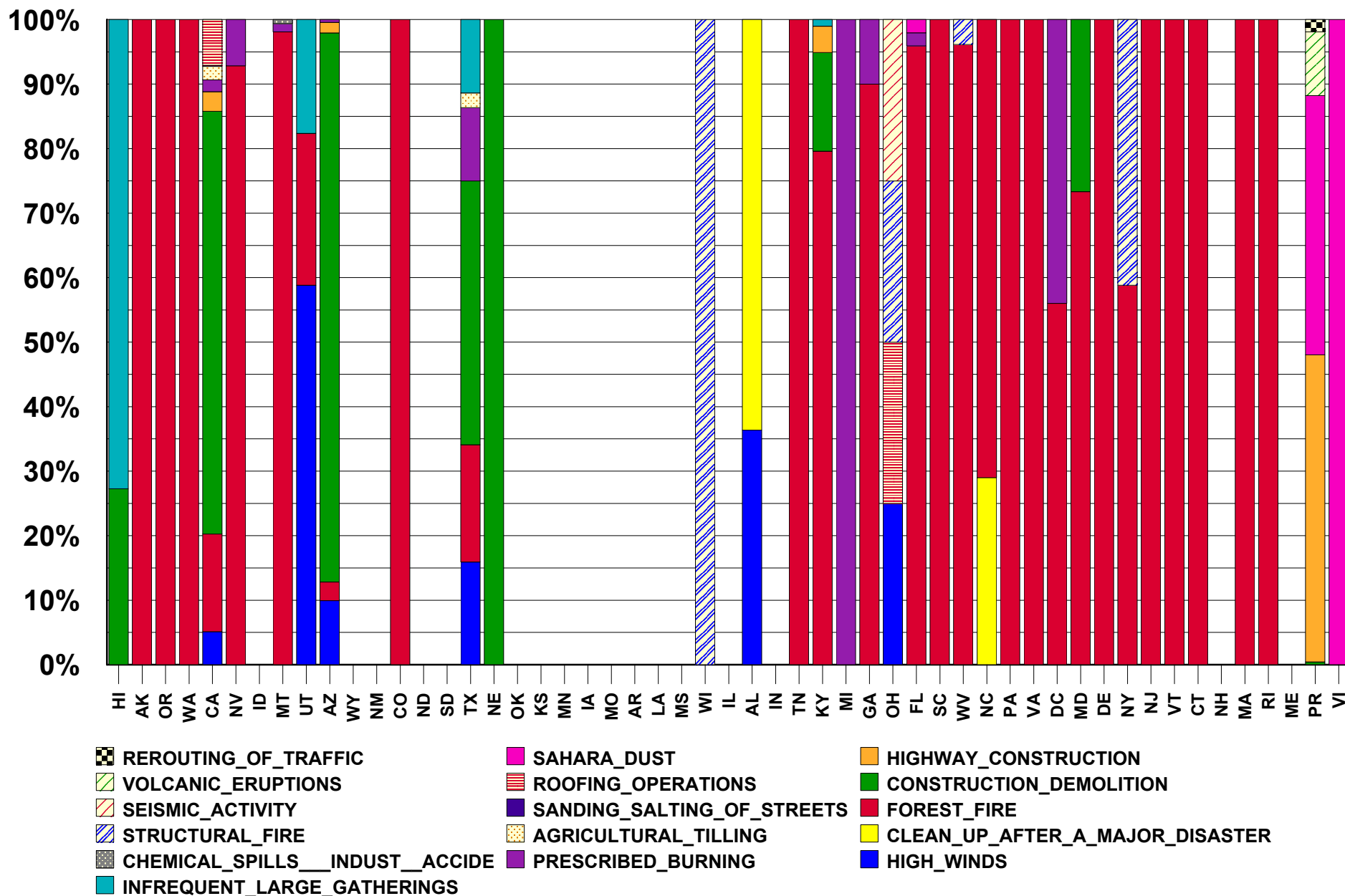
## PM2.5 flag site counts, 1999-2004

Event	AQS flag	1999	2000	2001	2002	2003	2004	average	percent of flag sites (using avg)	percent of all sites (using avg)	overall number of flag sites
high winds	A	8	9	3	4	6	10	7	6.3%	0.6%	32
volcanic eruptions	C	0	0	8	3	10	9	5	4.7%	0.5%	10
forest fire	E	30	87	62	185	54	31	75	70.3%	6.9%	335
structural fire	F	1	1	4	0	0	0	1	0.9%	0.1%	6
chemical spills & indust. accidents	H	0	0	0	0	0	1	0	0.2%	0.0%	1
construction/demolition	J	6	6	8	2	6	10	6	5.9%	0.6%	24
agricultural tilling	K	1	0	1	0	3	0	1	0.8%	0.1%	5
highway construction	L	2	2	2	2	1	1	2	1.6%	0.2%	7
rerouting of traffic	M	0	0	0	0	1	0	0	0.2%	0.0%	1
sanding/salting of streets	N	0	1	0	0	0	0	0	0.2%	0.0%	1
infrequent large gatherings	O	2	2	2	6	4	5	4	3.3%	0.3%	9
roofing operations	P	1	0	0	2	3	2	1	1.3%	0.1%	6
prescribed burning	Q	7	4	7	1	7	3	5	4.5%	0.4%	19
clean up after a major disaster	R	0	0	0	24	0	4	5	4.4%	0.4%	28
seismic activity	S	0	0	0	1	0	0	0	0.2%	0.0%	1
sahara dust	U	6	2	10	10	12	13	9	8.3%	0.8%	14
Total Sites w/ Flags (at least 1)		55	104	93	231	83	73	107	100.0%	9.8%	402
Total Sites w/out Flags (not 1)		908	1,015	1,052	910	1,047	979	985			
Total Sites		963	1,119	1,145	1,141	1,130	1,052	1,092			1,362
Site rate by year		5.71%	9.29%	8.12%	20.25%	7.35%	6.94%	9.76%			29.52%

# Percent of data flagged for events by state, 1999-2004

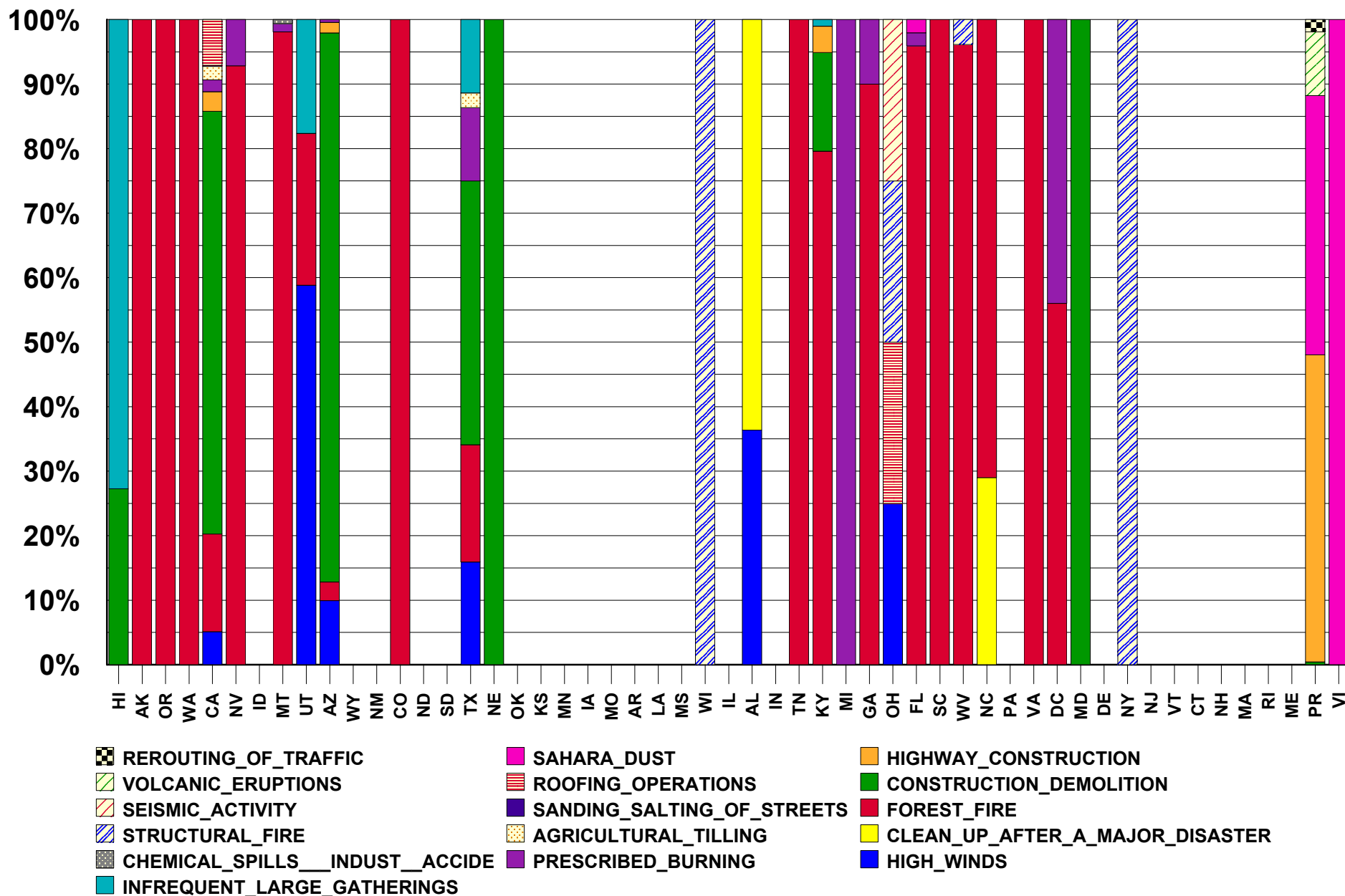


# Flag type by state, 1999-2004

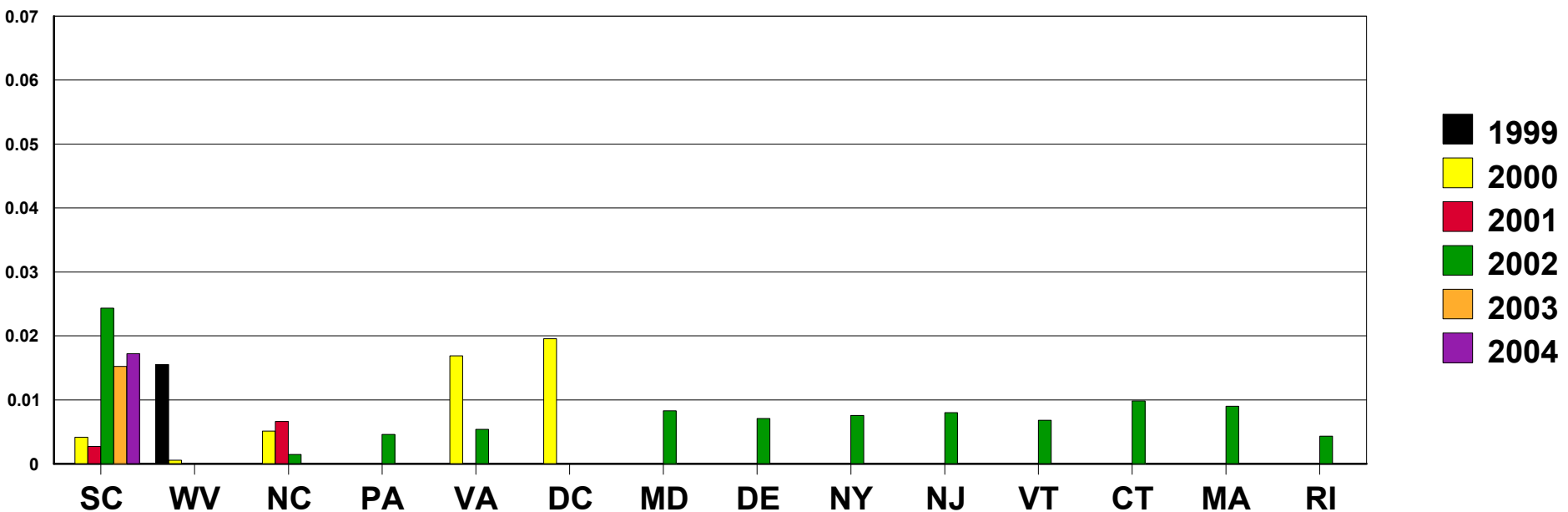
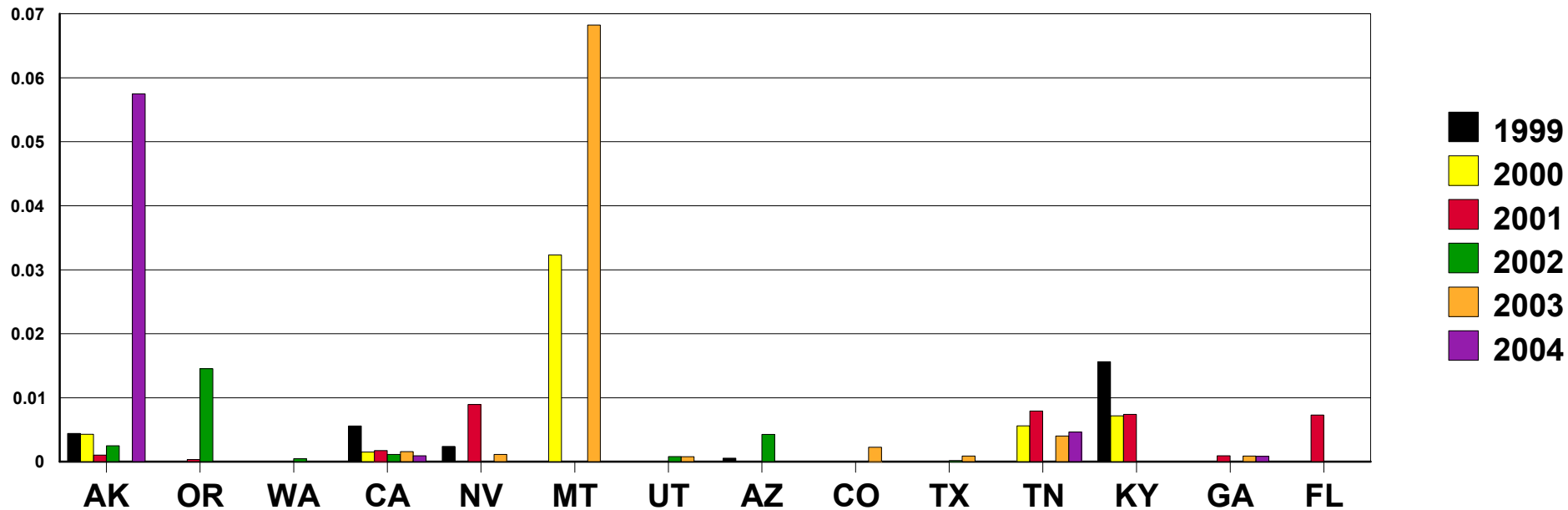




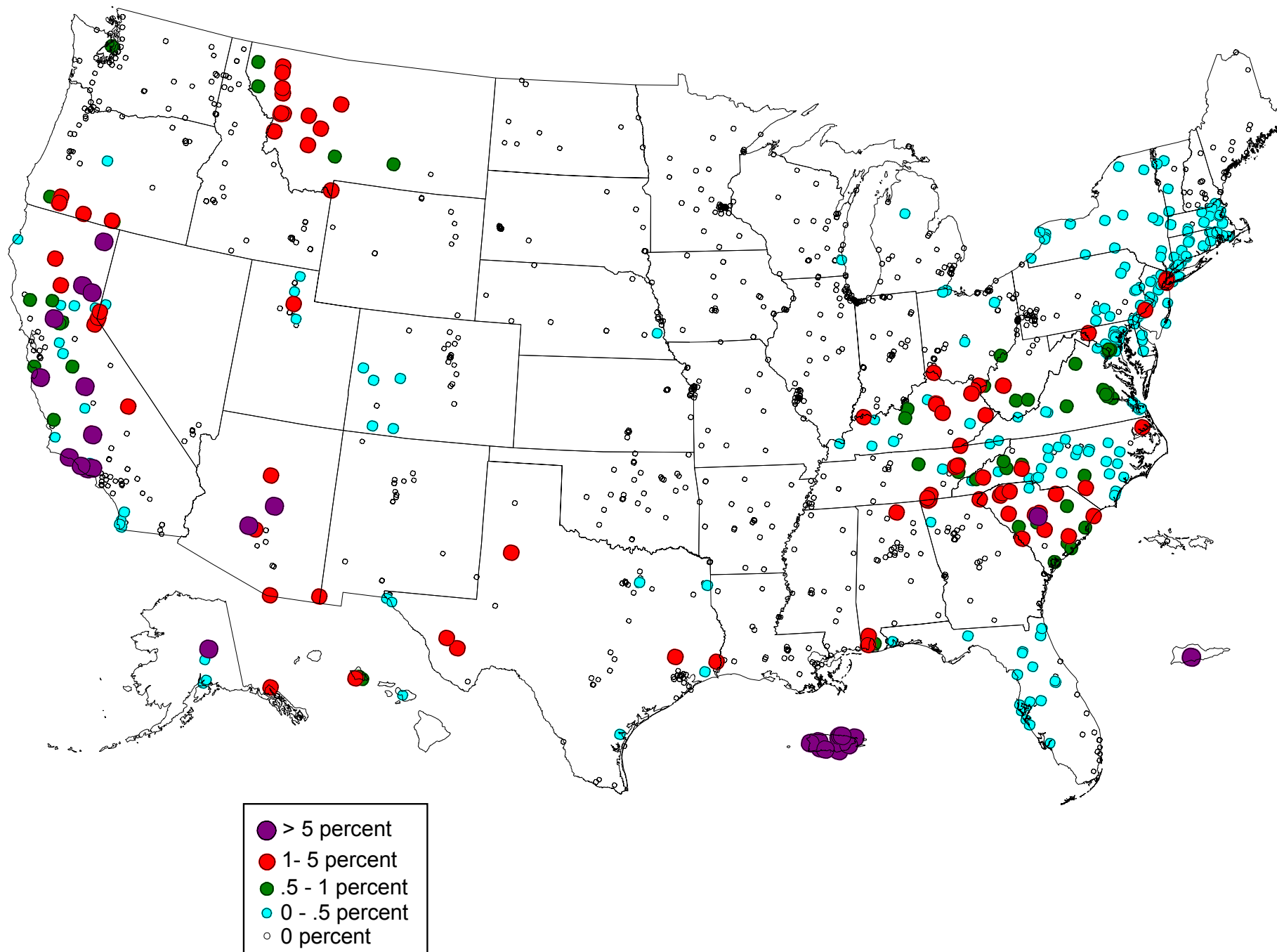
# Flag type by state, 1999-2004 excluding Quebec '02



# Fire flag rate by state by year, 1999-2004 (for states with at least one fire flag)

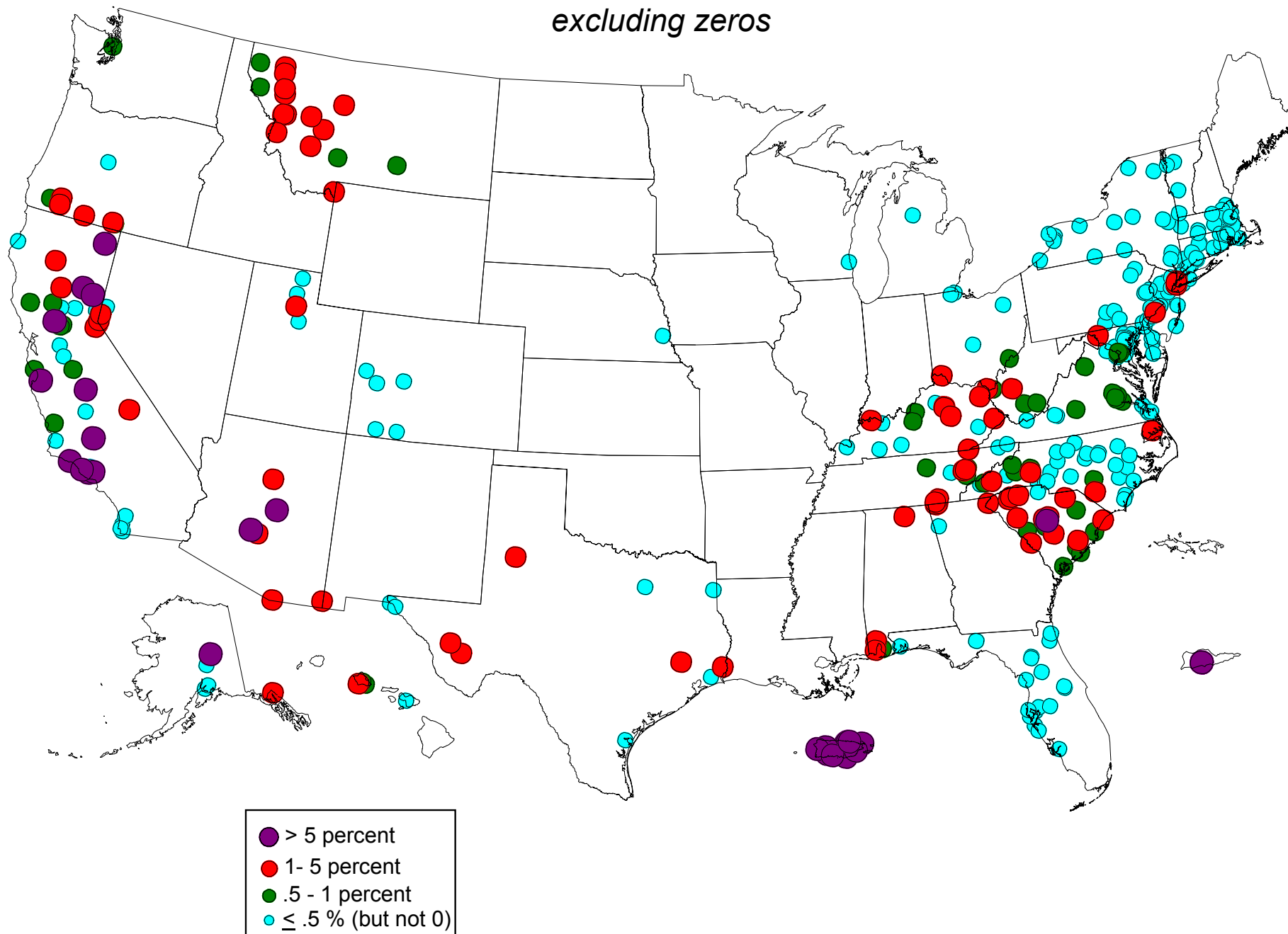


# Percent of data flagged for events by site, 1999-2004



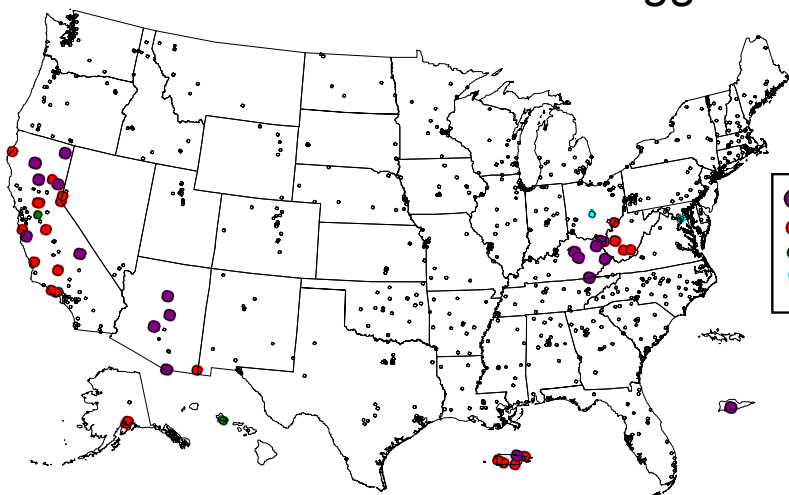
# Percent of data flagged for events by site, 1999-2004

*excluding zeros*

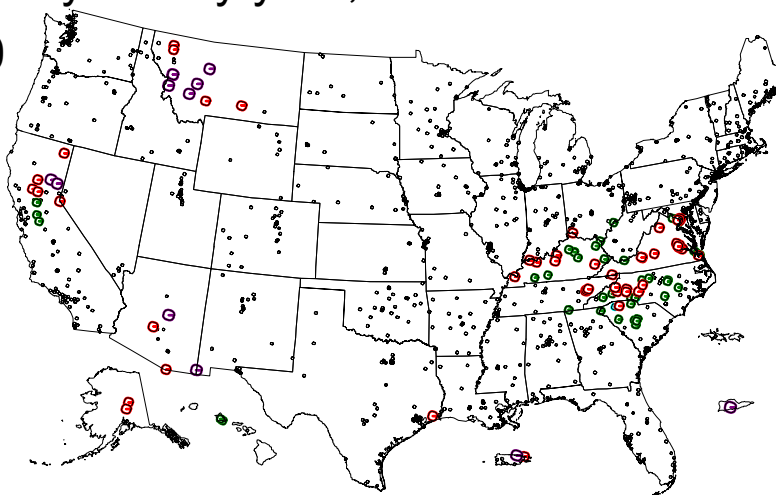


# Percent of data flagged for events by site by year, 1999-2004

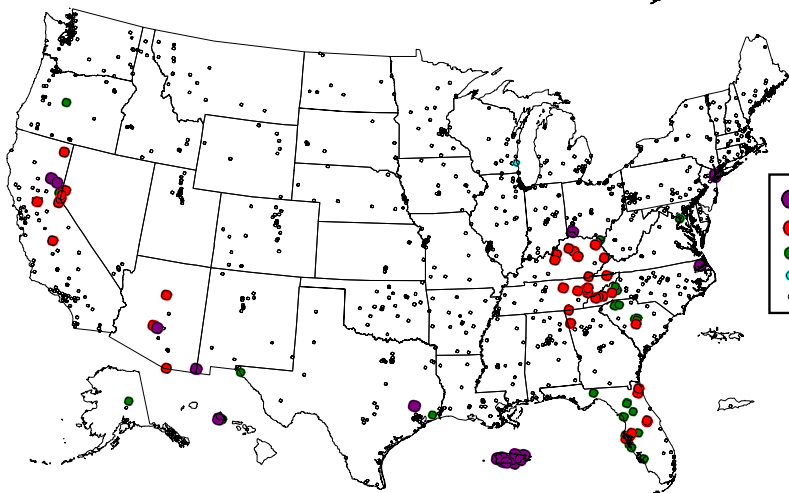
1999



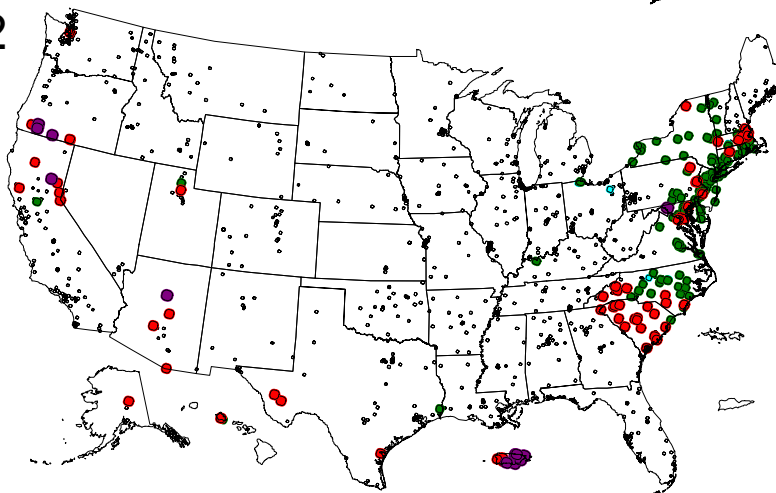
2000



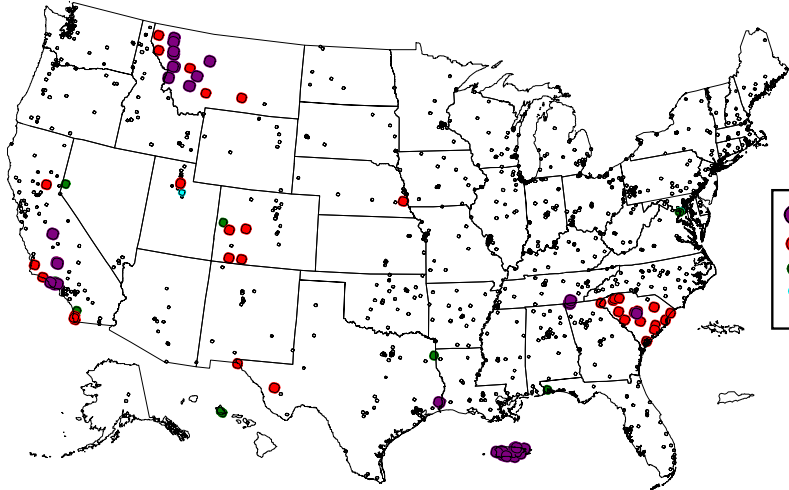
2001



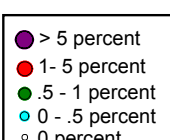
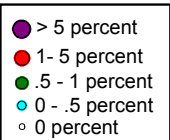
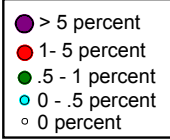
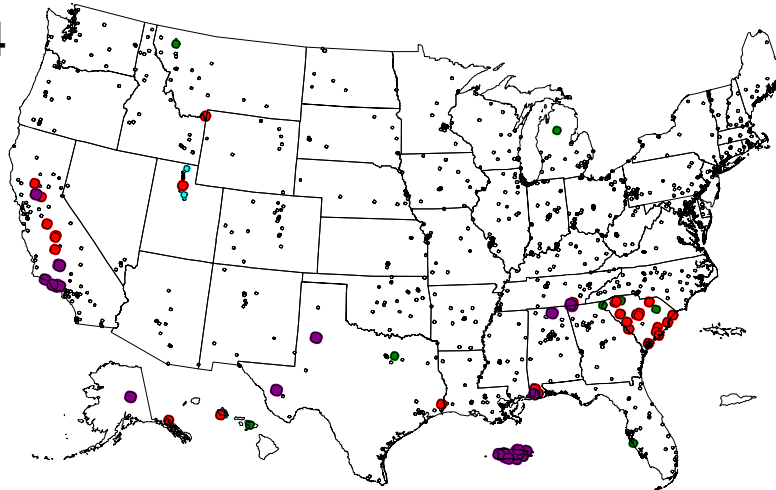
2002



2003



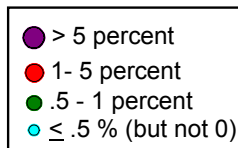
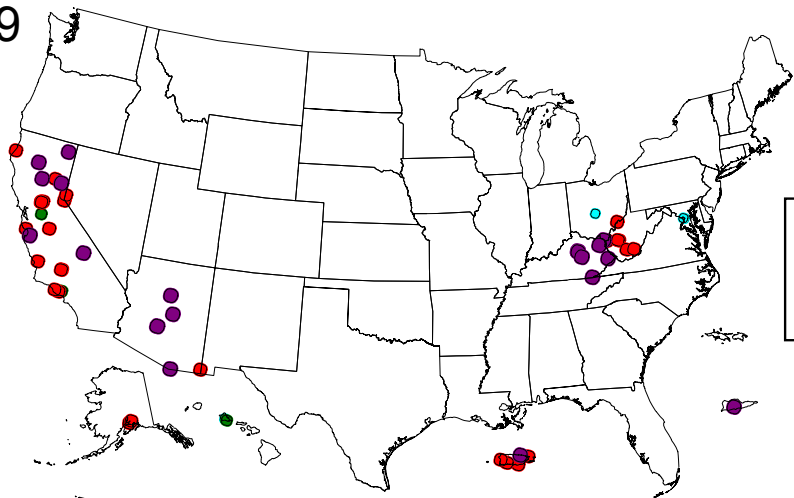
2004



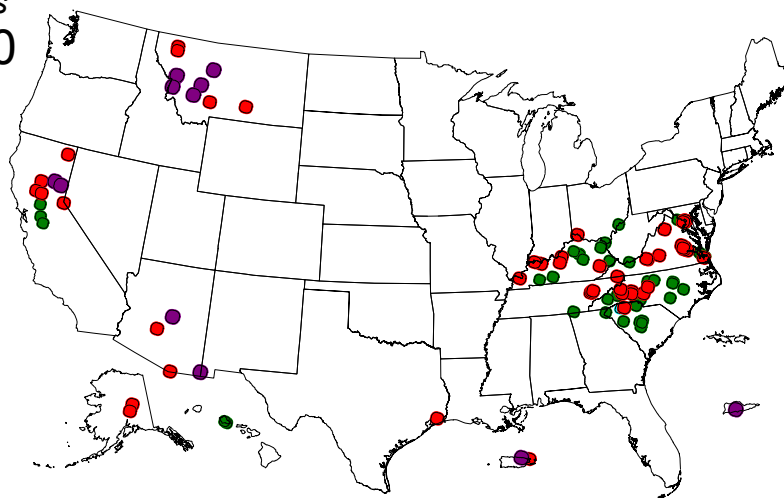
# Percent of data flagged for events by site by year, 1999-2004

*excluding zeros*

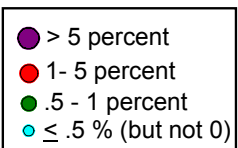
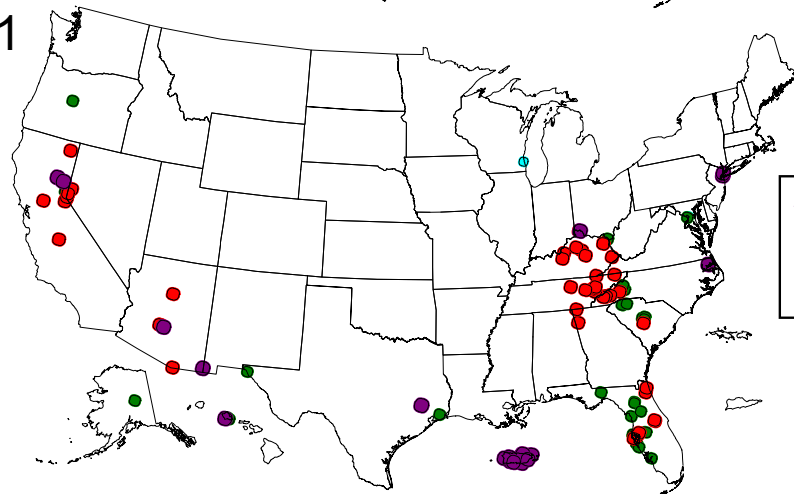
1999



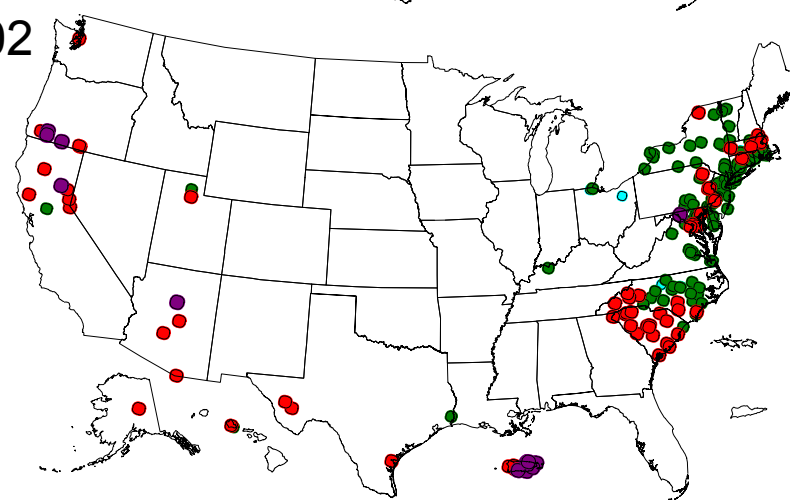
2000



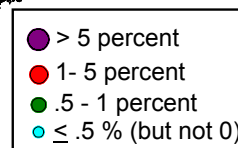
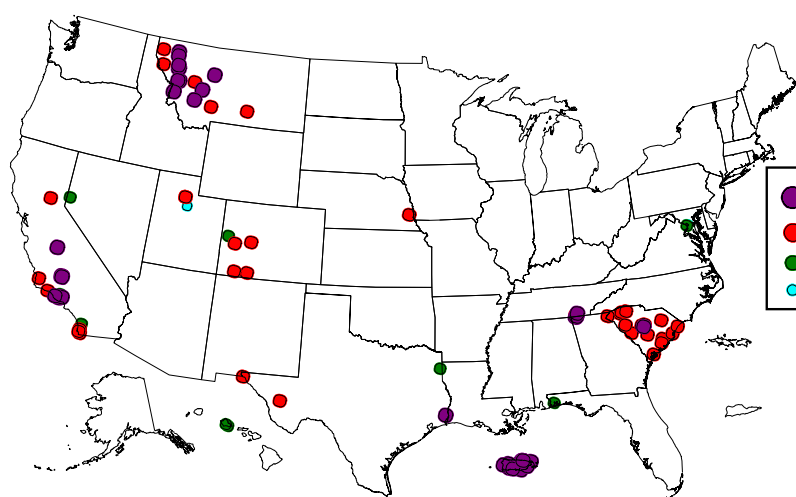
2001



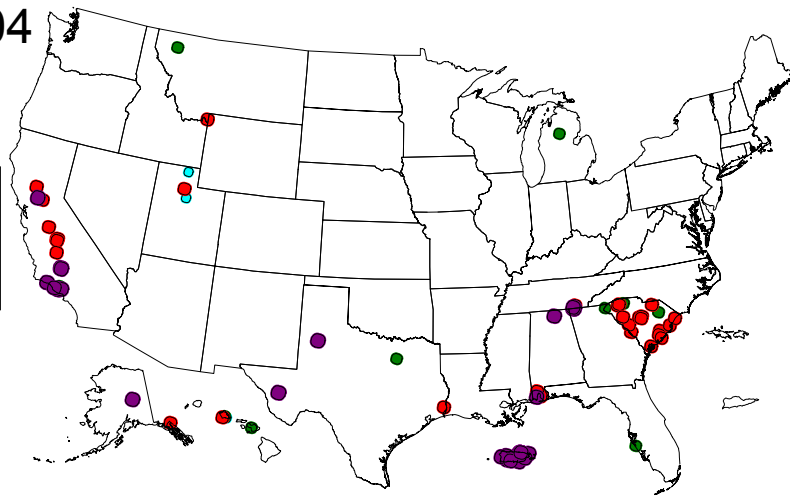
2002



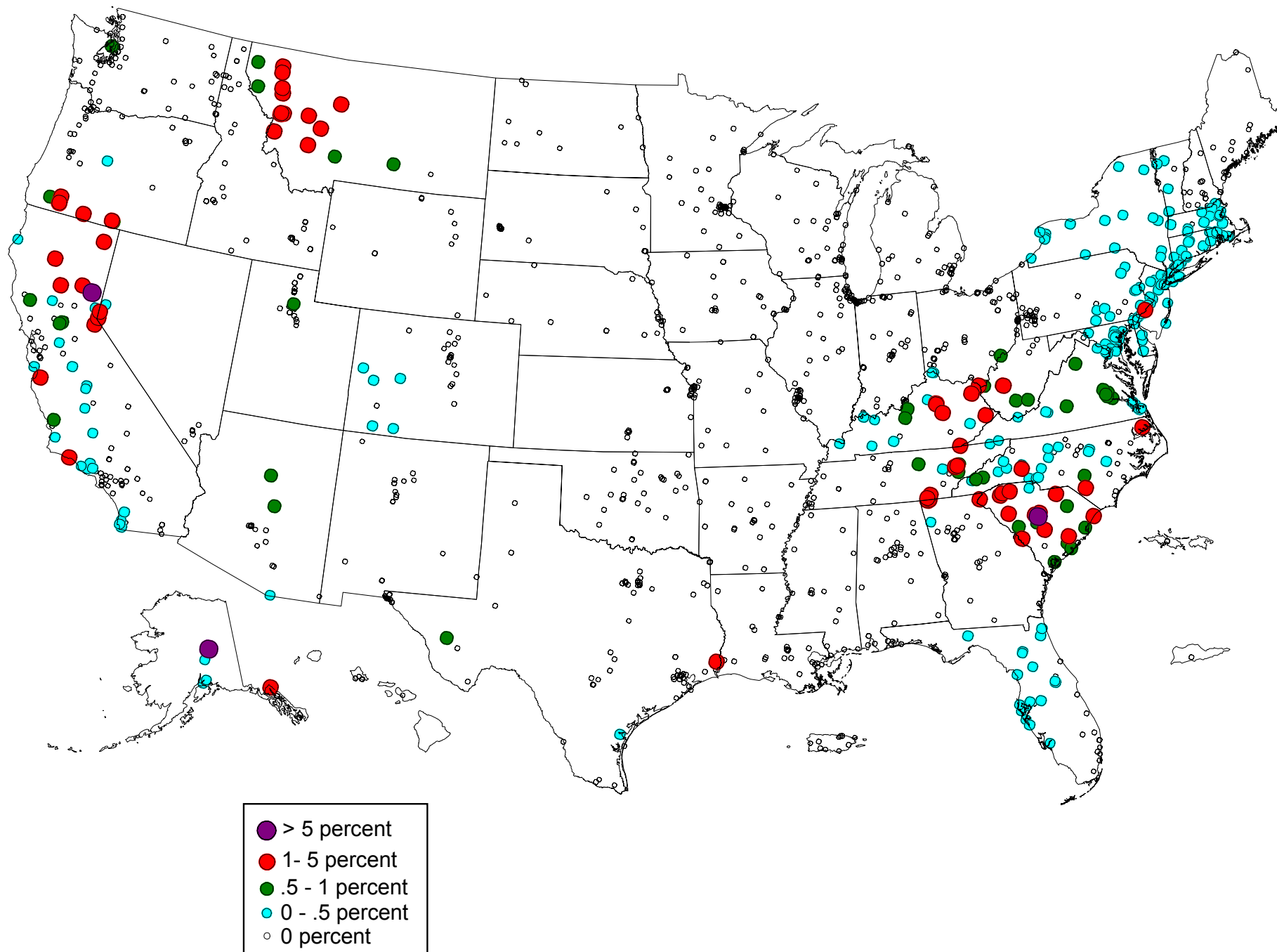
2003



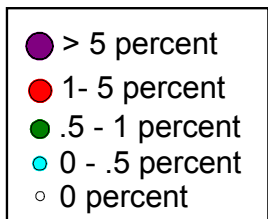
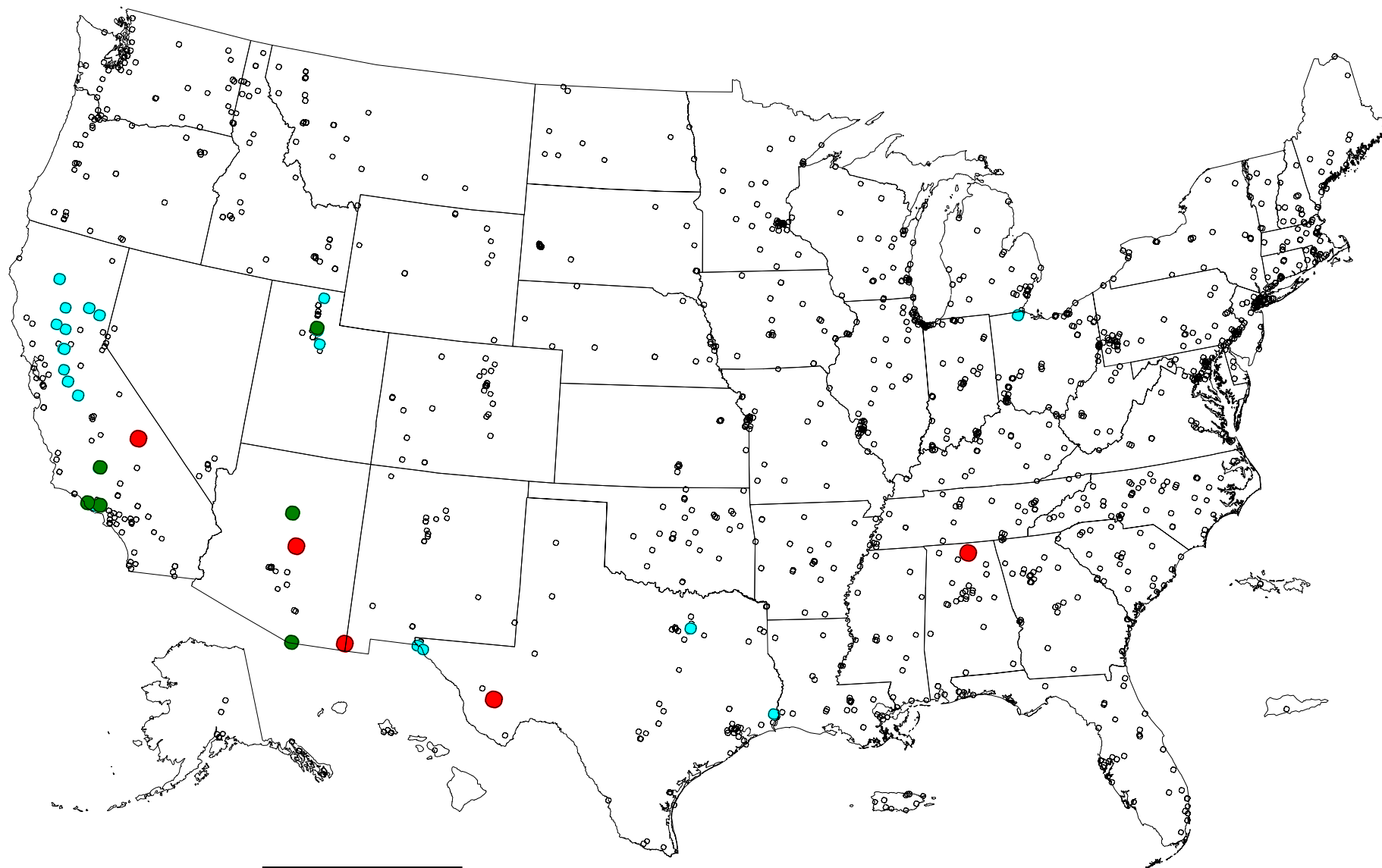
2004



# Percent of data flagged for 'fires' by site, 1999-2004

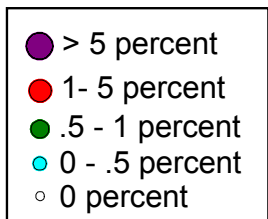
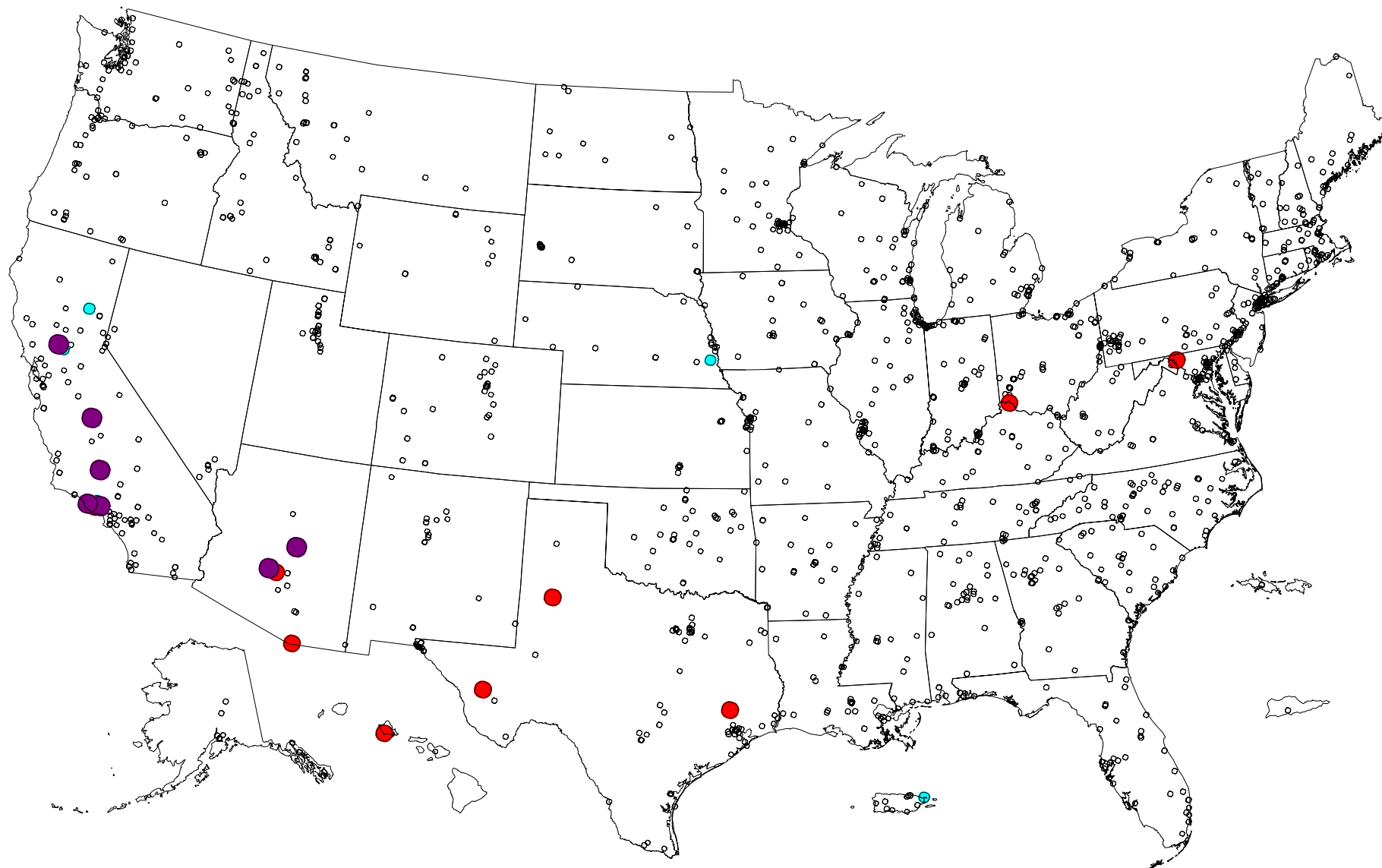


# Percent of data flagged for 'high winds' by site, 1999-2004

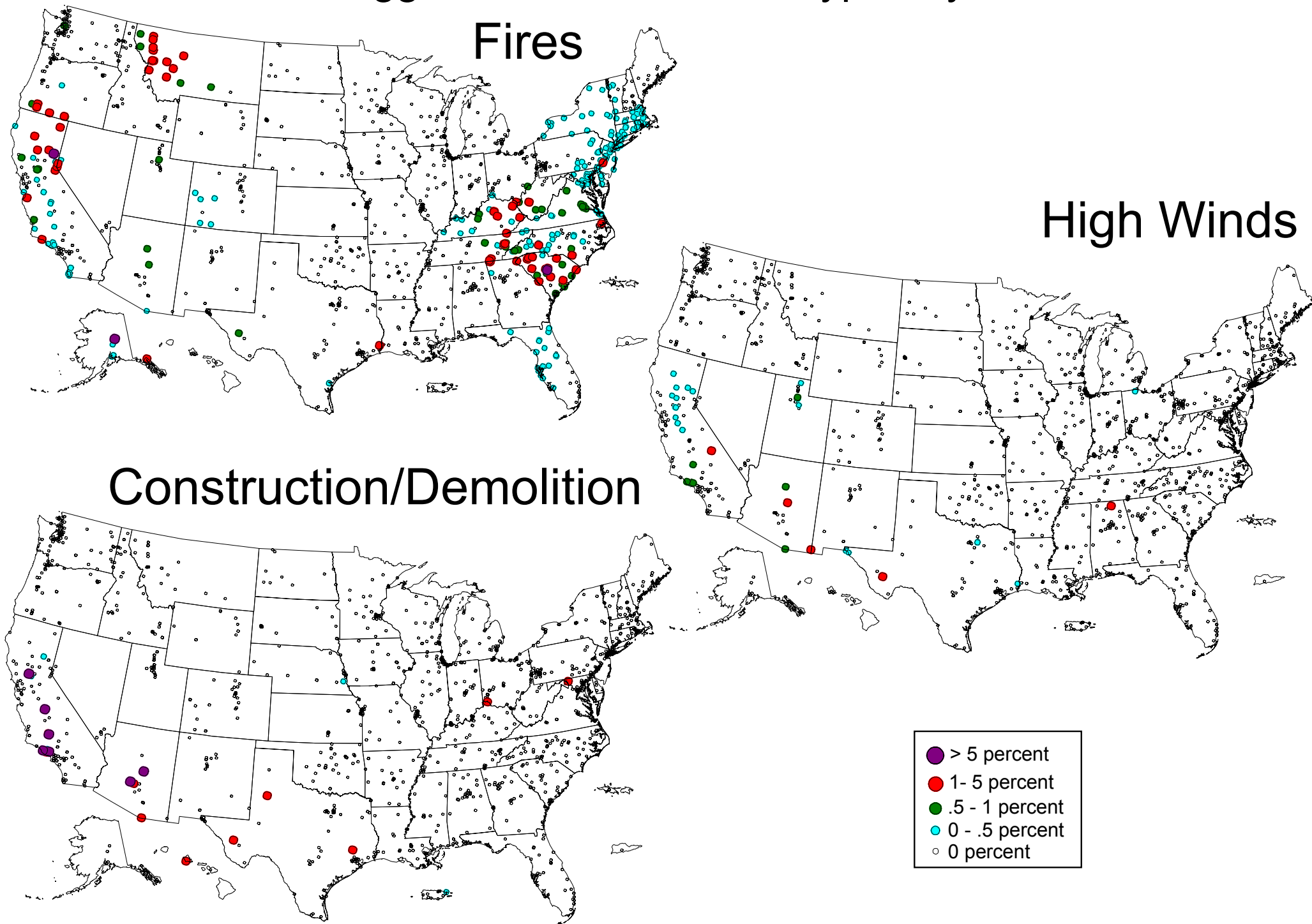




# Percent of data flagged for 'construction/demolition' by site, 1999-2004



# Percent of data flagged for various event types by site, 1999-2004



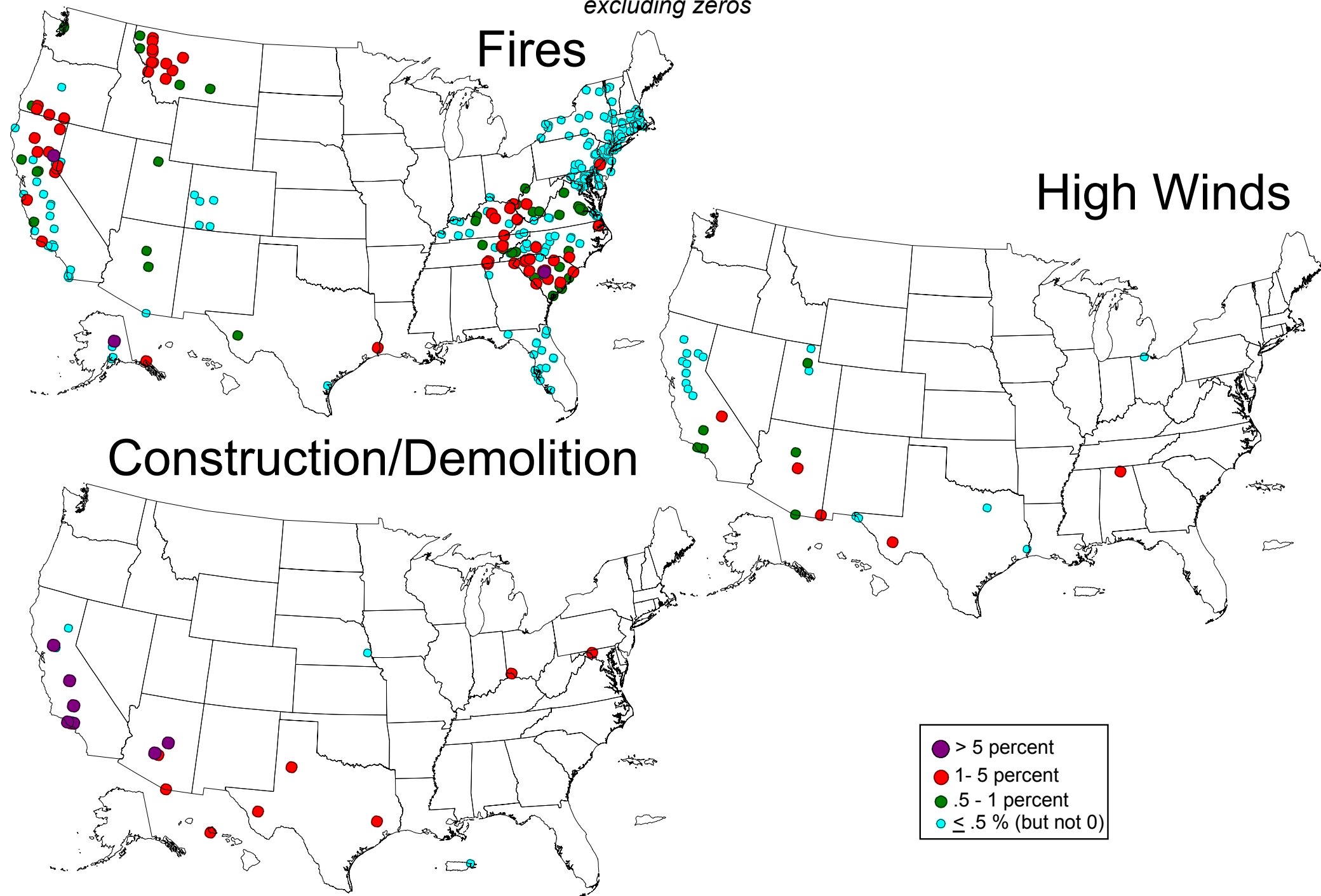
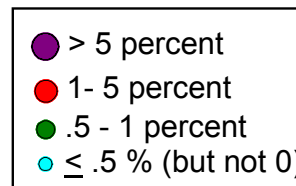
# Percent of data flagged for various event types by site, 1999-2004

*excluding zeros*

## Fires

## High Winds

## Construction/Demolition

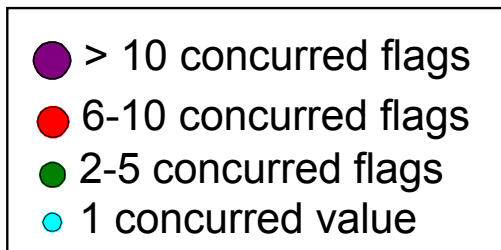
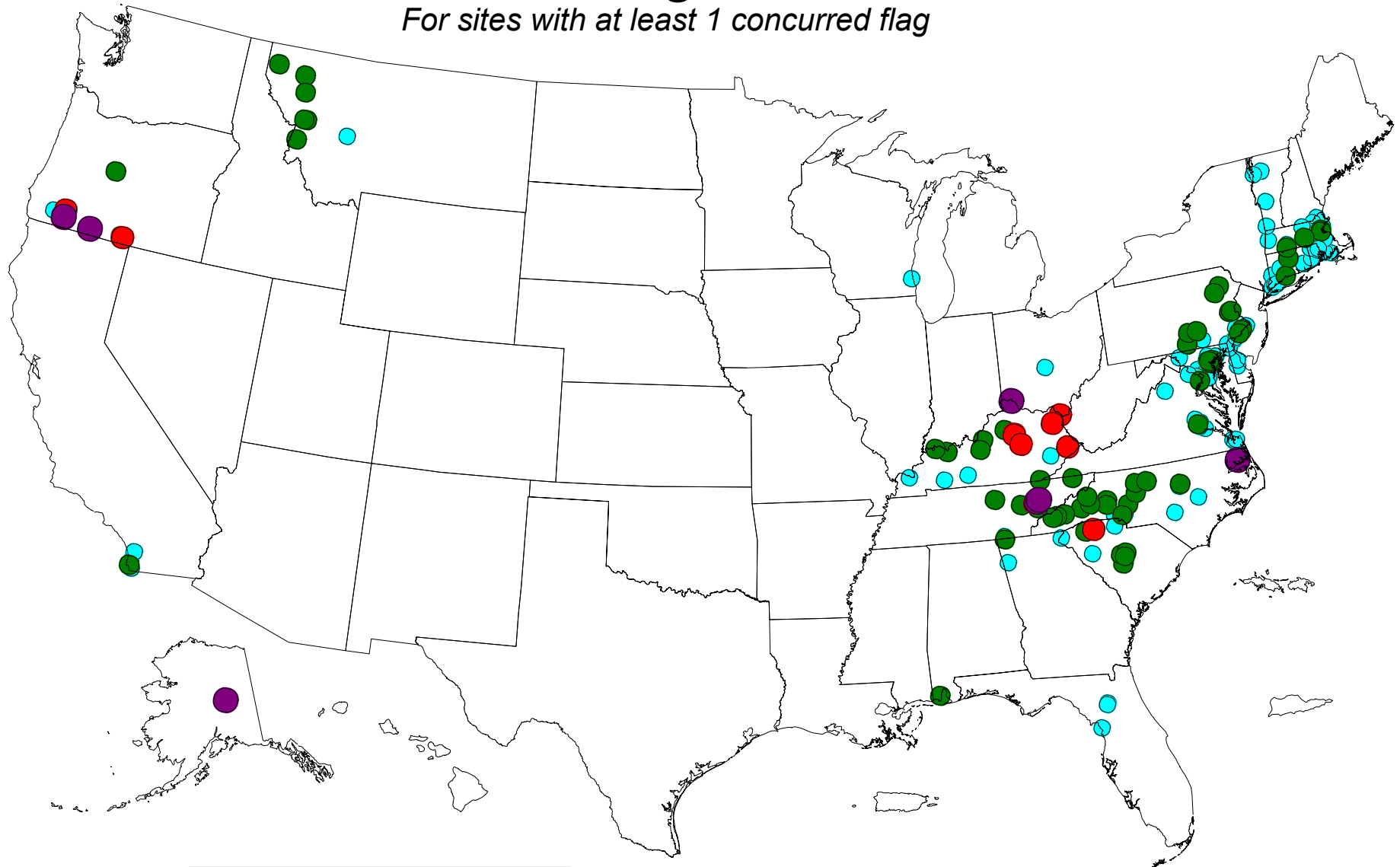


## Concurred PM2.5 flag counts/rates, by year

flag	AQS flag	1999	2000	2001	2002	2003	2004	total	percent of concurrent total	percent of flag total	percent of obs total
high winds	A							0	0.0%	0.0%	0.00%
volcanic eruptions	C							0	0.0%	0.0%	0.00%
forest fire	E	38	78	104	216	22	21	479	94.9%	12.9%	0.06%
structural fire	F	1		1				2	0.4%	0.1%	0.00%
chemical spills & indust. accidents	H							0	0.0%	0.0%	0.00%
construction/demolition	J		1	14				15	3.0%	0.4%	0.00%
agricultural tilling	K							0	0.0%	0.0%	0.00%
highway construction	L		4					4	0.8%	0.1%	0.00%
rerouting of traffic	M							0	0.0%	0.0%	0.00%
sanding/salting of streets	N							0	0.0%	0.0%	0.00%
infrequent large gatherings	O				1			1	0.2%	0.0%	0.00%
roofing operations	P							0	0.0%	0.0%	0.00%
prescribed burning	Q							0	0.0%	0.0%	0.00%
clean up after a major disaster	R						4	4	0.8%	0.1%	0.00%
seismic activity	S							0	0.0%	0.0%	0.00%
sahara dust	U							0	0.0%	0.0%	0.00%
Total Values Concurred		39	83	119	217	22	25	505	100.0%	13.6%	0.06%
Total Values Flagged		541	587	403	700	657	824	3,712			
Total Values Not Concurred (flagged or not)		98,726	146,003	157,952	159,191	143,061	140,311	845,244			
Total Obs		99,267	146,590	158,355	159,891	143,718	141,135	848,956			
Concurrence Rate (values concurred / vales flagged)		7.21%	14.14%	29.53%	31.00%	3.35%	3.03%	13.60%			

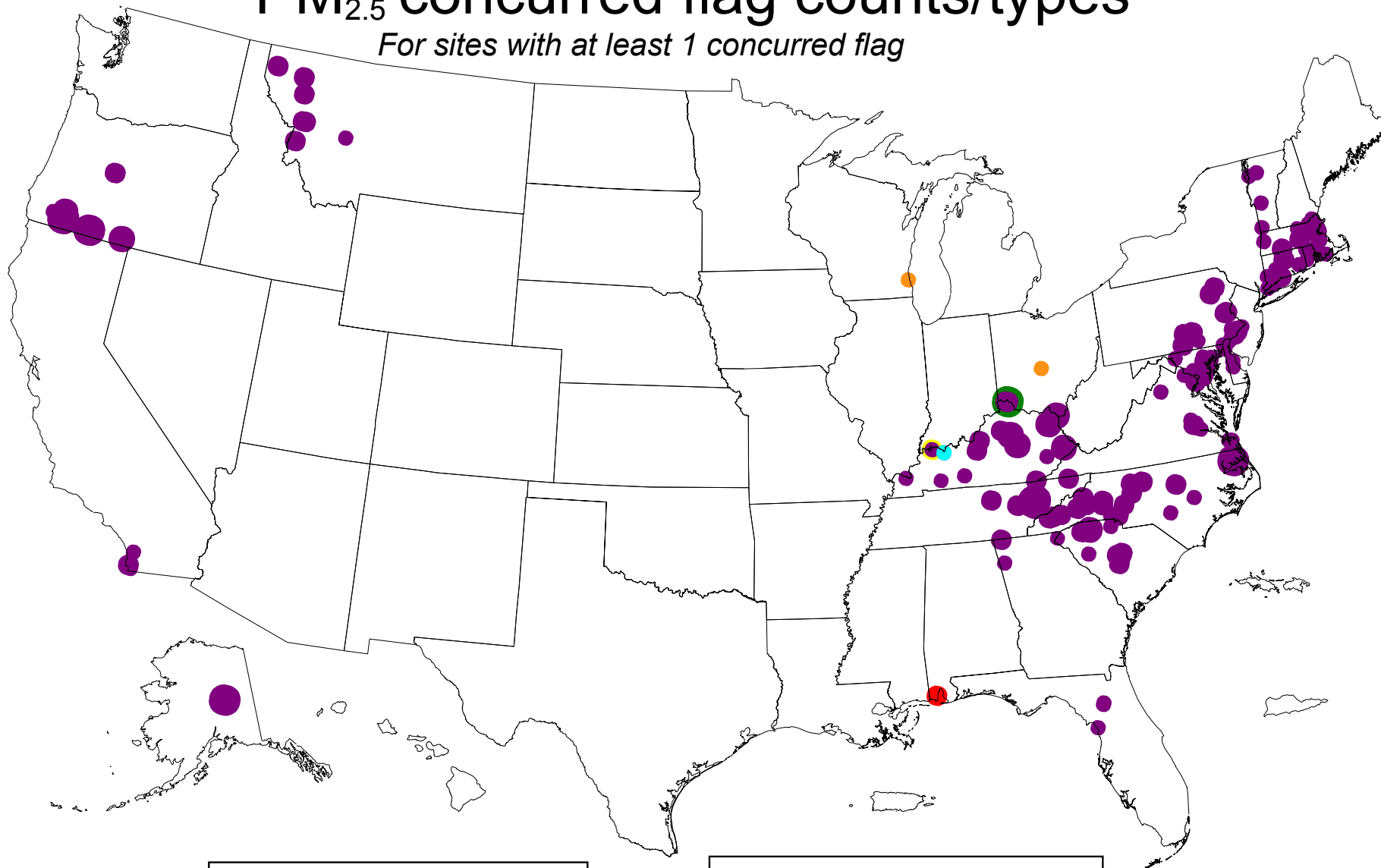
# PM<sub>2.5</sub> concurred flag counts, 1999-2004

*For sites with at least 1 concurred flag*



# PM<sub>2.5</sub> concurred flag counts/types

*For sites with at least 1 concurred flag*



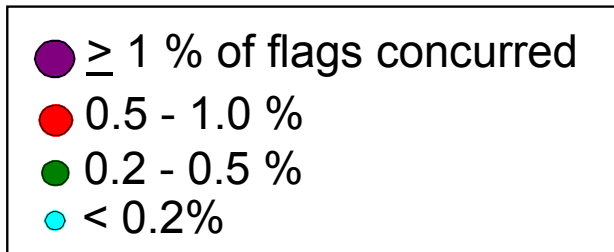
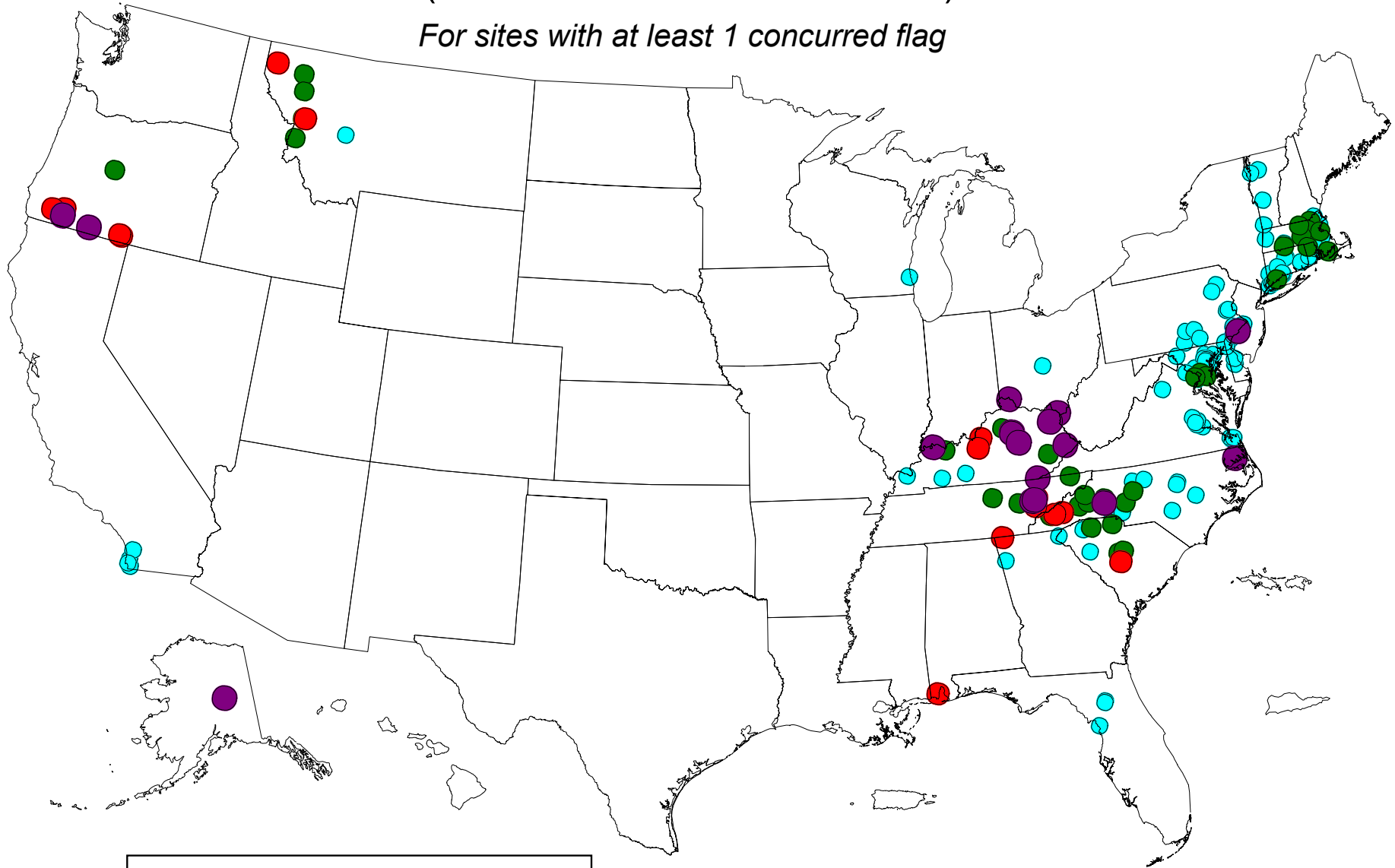
- > 10 concurred flags
- 6-10 concurred flags
- 2-5 concurred flags
- 1 concurred value

- forest fire
- cleanup after major disaster (AL)
- construction/demolition (KY)
- highway construction (KY)
- infrequent large gatherings (KY)
- structural fire (WI, OH)

# PM<sub>2.5</sub> concurred flag rates

(concurrred values/total values)

*For sites with at least 1 concurred flag*



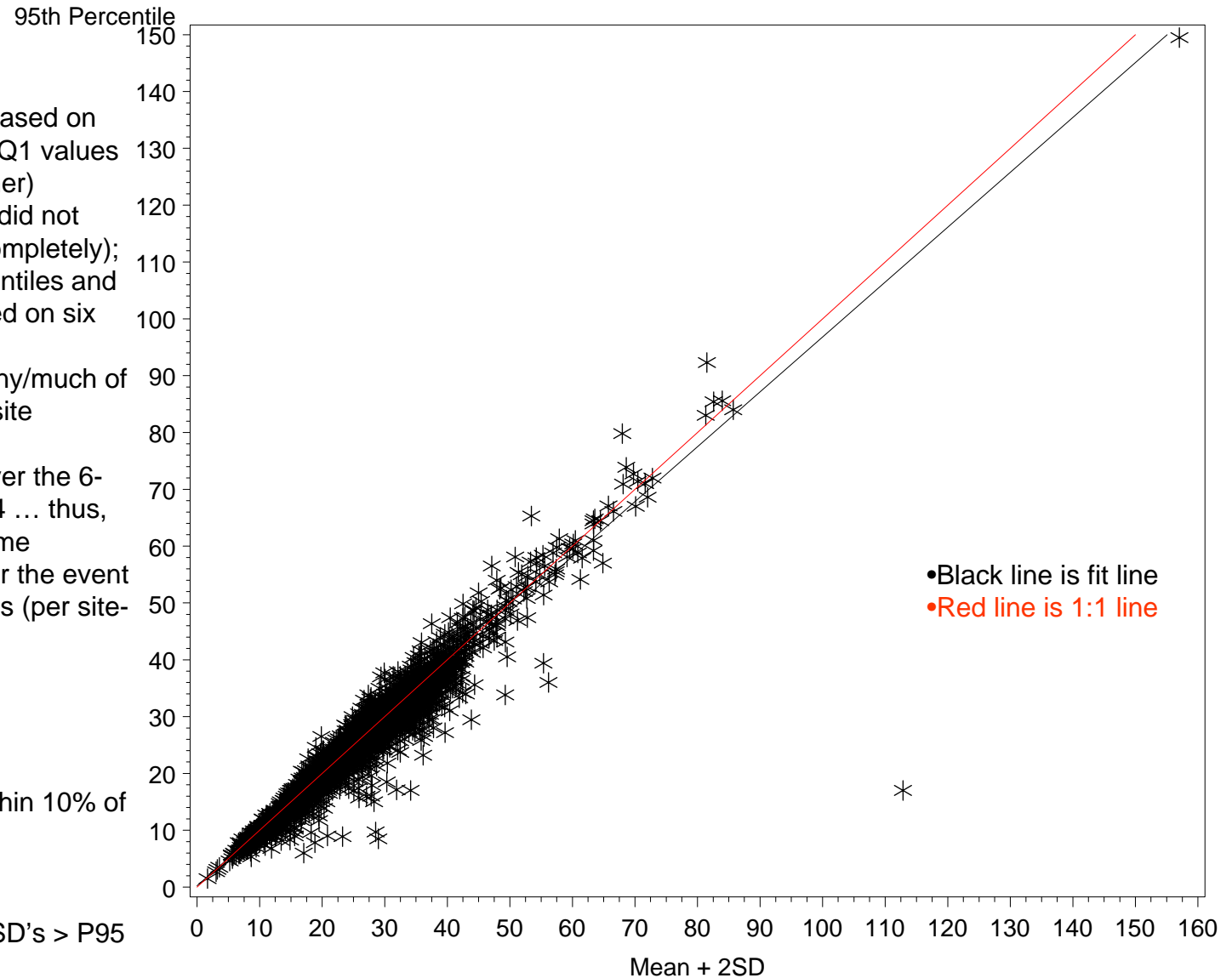
## Comparison of 95<sup>th</sup> percentile to Mean+2SD – Using ‘All Data’

### Processing

- All computations were based on Site by Quarter (e.g., all Q1 values for '99-'04 lumped together)
  - Note that many sites did not operate all 6 years (completely); thus, not all 95<sup>th</sup> percentiles and mean+2SD's are based on six full quarters of data. (Encompasses as many/much of the 6 quarters as the site operated.)
  - Retrospective look over the 6-year period 1999-2004 ... thus, includes values (in same quarter) occurring after the event
  - Required 30+ samples (per site-quarter)
- Units in  $\mu\text{g}/\text{m}^3$

### Results

- 4872 Site-Q's
- 4168 (86%) of P95's within 10% of Mean+2SD's
- 1633 (34%) of P95's > Mean+2SD's
- 3239 (66%) of Mean+2SD's > P95
- Reg model:
  - $P95 = 0.24 + 0.97 * \text{Mean}+2\text{SD}$
  - $R\text{square} = .93$





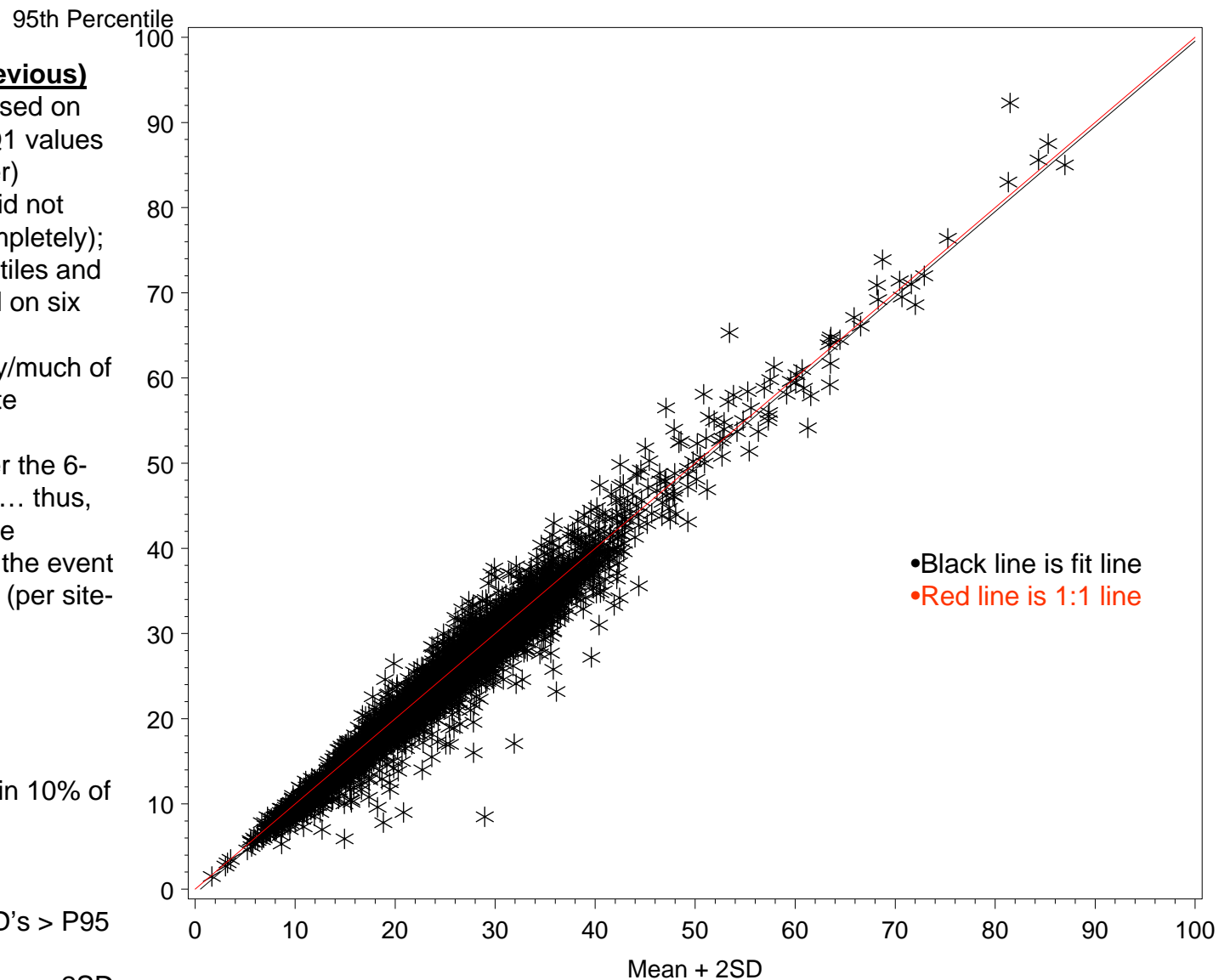
## Comparison of 95<sup>th</sup> percentile to Mean+2SD – Using ‘Minus Flagged Data’

### Processing (same as previous)

- All computations were based on Site by Quarter (e.g., all Q1 values for '99-'04 lumped together)
  - Note that many sites did not operate all 6 years (completely); thus, not all 95<sup>th</sup> percentiles and mean+2SD's are based on six full quarters of data. (Encompasses as many/much of the 6 quarters as the site operated.)
  - Retrospective look over the 6-year period 1999-2004 ... thus, includes values (in same quarter) occurring after the event
  - Required 30+ samples (per site-quarter)
- Units in  $\mu\text{g}/\text{m}^3$

### Results

- 4865 Site-Q's
- 4242 (87%) of P95's within 10% of Mean+2SD's
- 1646 (34%) of P95's > Mean+2SD's
- 3219 (66%) of Mean+2SD's > P95
- Reg model:
  - $P95 = -0.53 + 1.00 * \text{Mean}+2\text{SD}$
  - $R\text{square} = .96$



# Stats for Data Points & Sites re 95<sup>th</sup> Comparison

- Flagged data (and concurred flagged data) were compared to historic site-level quarter-specific 95<sup>th</sup> percentiles as an evaluation diagnostic of terms 'exceptional', 'significant impact/contribution', and/or 'not likely to recur'.
- 95<sup>th</sup> percentiles were computed 3 ways: using all data, excluding flagged data, and excluding concurred flagged data.

## 'All data' used to compute 95<sup>th</sup>

		Percent of all values	Percent of flagged	Percent of concurrent
Total number of data points (all sites '99-'04)	848,956	100.00%		
Total number of flagged data points	3,712	0.44%	100%	
Total number of flagged data points ge P95	994	0.12%	27%	
Total number of concurrent ('Y') data points	505	0.06%	14%	100%
Total number of concurrent data points ge P95	376	0.04%	10%	74%

- **27% of flagged data are  $\geq$  95<sup>th</sup>**
- **74% of concurrent flagged data are  $\geq$  95<sup>th</sup>**

Number of sites w/ flags ('99-'04)	402
Number of sites where all flagged data ge P95	206
Number of sites where 75%+ of flagged data ge P95	216
Number of sites where 50%+ of flagged data ge P95	264
Number of sites where 25%+ of flagged data ge P95	318
Number of sites where some (>0%) flagged data ge P95	368
Number of sites where no flagged data ge P95	34

Number of sites w/ concurrent flags ('99-'04)	176
Number of sites where all concurrent data ge P95	124
Number of sites where 75%+ of concurrent data ge P95	128
Number of sites where 50%+ of concurrent data ge P95	147
Number of sites where 25%+ of concurrent data ge P95	163
Number of sites where some (>0%) concurrent data ge P95	164
Number of sites where no concurrent data ge P95	12

# Stats for Data Points & Sites re 95<sup>th</sup> Comparison

## 'Excluding flagged data' used to compute 95<sup>th</sup>

		Percent of all values	Percent of flagged	Percent of concurred
Total number of data points (all sites '99-'04)	848,956	100.00%		
Total number of flagged data points	3,712	0.44%	100%	
Total number of flagged data points ge P95	1,197	0.14%	32%	
Total number of concurred ('Y') data points	505	0.06%	14%	100%
Total number of concurred data points ge P95	423	0.05%	11%	84%

- 32% of flagged data are  $\geq 95^{\text{th}}$
- 84% of concurred flagged data are  $\geq 95^{\text{th}}$

Number of sites w/ flags ('99-'04)	402
Number of sites where all flagged data ge P95	224
Number of sites where 75%+ of flagged data ge P95	236
Number of sites where 50%+ of flagged data ge P95	277
Number of sites where 25%+ of flagged data ge P95	324
Number of sites where some (>0%) flagged data ge P95	367
Number of sites where no flagged data ge P95	35

Number of sites w/ concurred flags ('99-'04)	176
Number of sites where all concurred data ge P95	134
Number of sites where 75%+ of concurred data ge P95	137
Number of sites where 50%+ of concurred data ge P95	156
Number of sites where 25%+ of concurred data ge P95	165
Number of sites where some (>0%) concurred data ge P95	165
Number of sites where no concurred data ge P95	11

## 'Excluding concurred flag data' used to compute 95<sup>th</sup>

		Percent of all values	Percent of flagged	Percent of concurred
Total number of data points (all sites '99-'04)	848,956	100.00%		
Total number of flagged data points	3,712	0.44%	100%	
Total number of flagged data points ge P95	1,048	0.12%	28%	
Total number of concurred ('Y') data points	505	0.06%	14%	100%
Total number of concurred data points ge P95	416	0.05%	11%	82%

- 28% of flagged data are  $\geq 95^{\text{th}}$
- 82% of concurred flagged data are  $\geq 95^{\text{th}}$

Number of sites w/ flags ('99-'04)	402
Number of sites where all flagged data ge P95	213
Number of sites where 75%+ of flagged data ge P95	223
Number of sites where 50%+ of flagged data ge P95	270
Number of sites where 25%+ of flagged data ge P95	319
Number of sites where some (>0%) flagged data ge P95	368
Number of sites where no flagged data ge P95	34

Number of sites w/ concurred flags ('99-'04)	176
Number of sites where all concurred data ge P95	130
Number of sites where 75%+ of concurred data ge P95	134
Number of sites where 50%+ of concurred data ge P95	153
Number of sites where 25%+ of concurred data ge P95	164
Number of sites where some (>0%) concurred data ge P95	164
Number of sites where no concurred data ge P95	12

National summary of number of PM2.5 data values greater or equal historic site-quarter metrics, 1999-2004

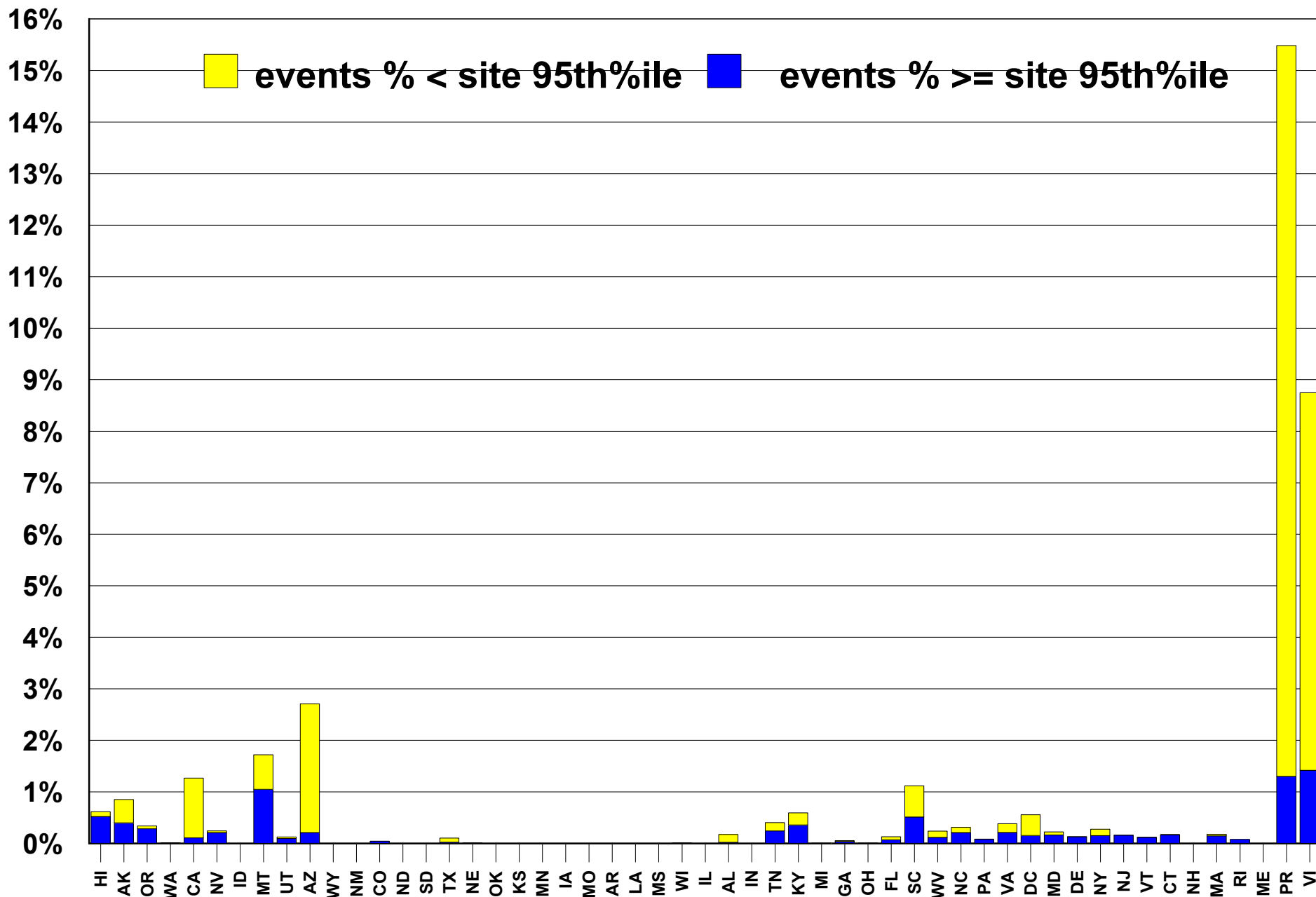
(Metrics calculated 'excluding flagged data')

	Total 1999 2004	avg per year	percent of total	percent of flagged	percent of concurrent
# observations	848,956	141,493	100.0%		
# ≥ Mean+2SD	38,829	6,472	4.6%		
# ≥ P95th	46,555	7,759	5.5%		
# ≥ P90th	89,519	14,920	10.5%		
# ≥ P75th	217,927	36,321	25.7%		
# flagged	3,712	619	0.4%	100.0%	
# flagged ≥ Mean+2SD	1,113	186	0.1%	30.0%	
# flagged ≥ P95th	1,197	200	0.1%	32.2%	
# flagged ≥ P90th	1,463	244	0.2%	39.4%	
# flagged ≥ P75th	2,068	345	0.2%	55.7%	
# concurrent	505	84	0.1%	13.6%	100.0%
# concurrent > Mean+2SD	411	69	0.0%	11.1%	81.4%
# concurrent > P95th	423	71	0.0%	11.4%	83.8%
# concurrent > P90th	448	75	0.1%	12.1%	88.7%
# concurrent > P75th	471	79	0.1%	12.7%	93.3%

# Percent of data flagged for events by state, 1999-2004

Breakout of events  $\geq$  and  $<$  site 95th%ile's

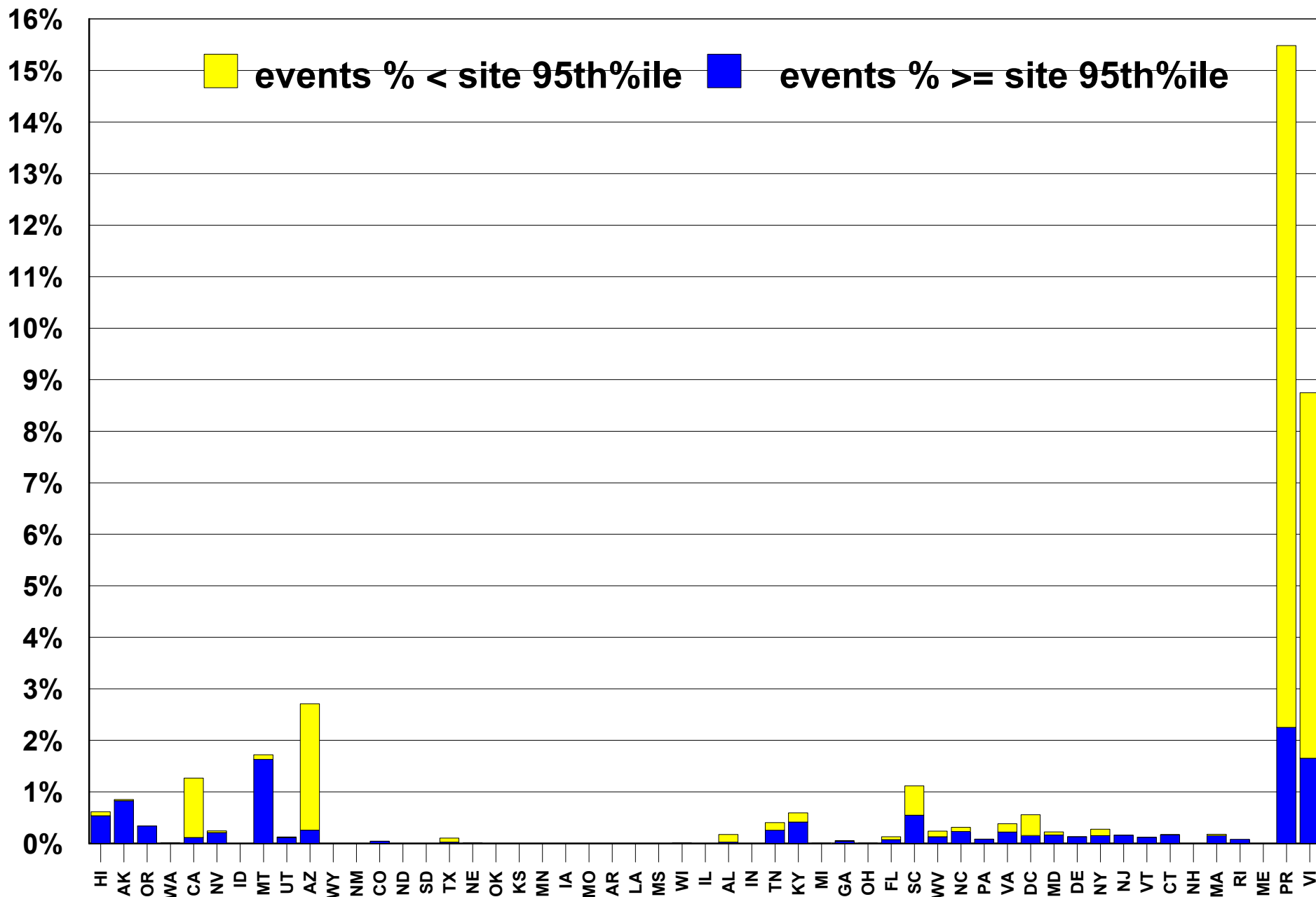
95th%ile's based on 'all data'



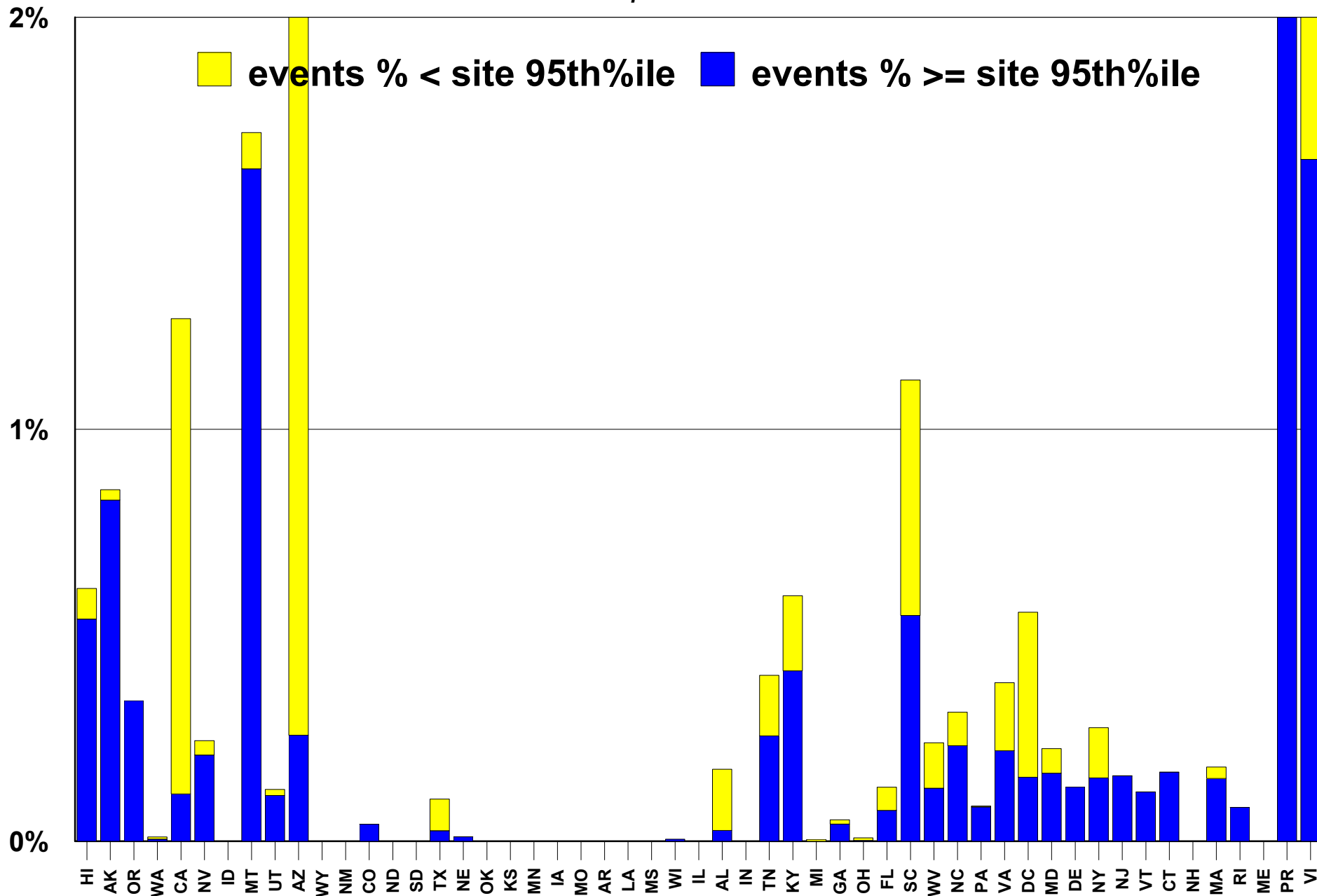
### Percent of data flagged for events by state, 1999-2004

Breakout of events  $\geq$  and  $<$  site 95th%ile's

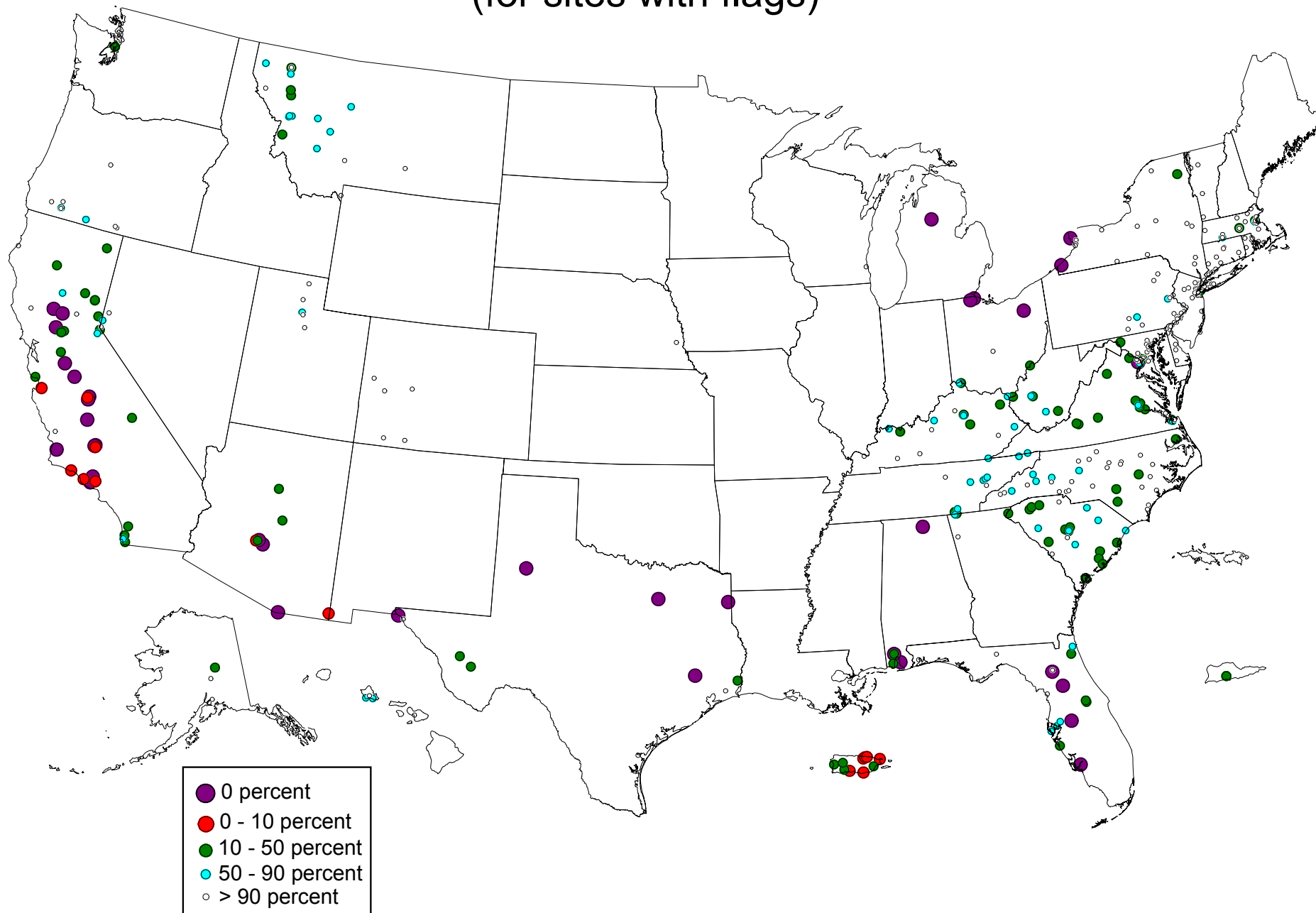
95th%ile's based on 'minus flagged data'



Breakout of events  $\geq$  and  $<$  site 95th%ile's  
 95th%ile's based on 'minus flagged data'  
*blow-up of low end*

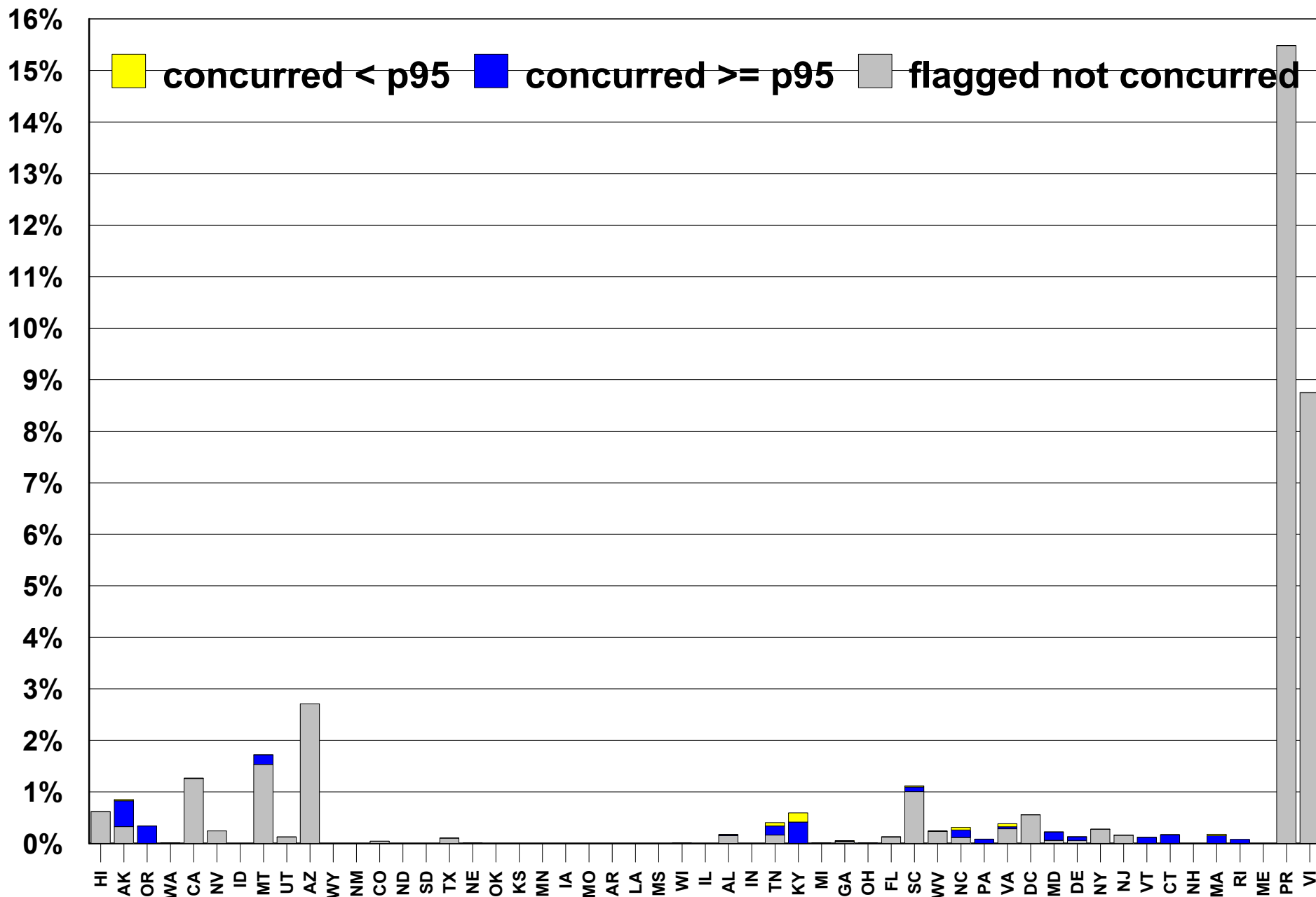


## Percent of flagged data $\geq$ site 95th%ile, 1999-2004 (for sites with flags)





Percent of data flagged for events by state, 1999-2004  
 Breakout of not concurred, concurred  $\geq$  P95, and concurred  $<$  P95  
 95th%ile's based on 'minus flagged data'

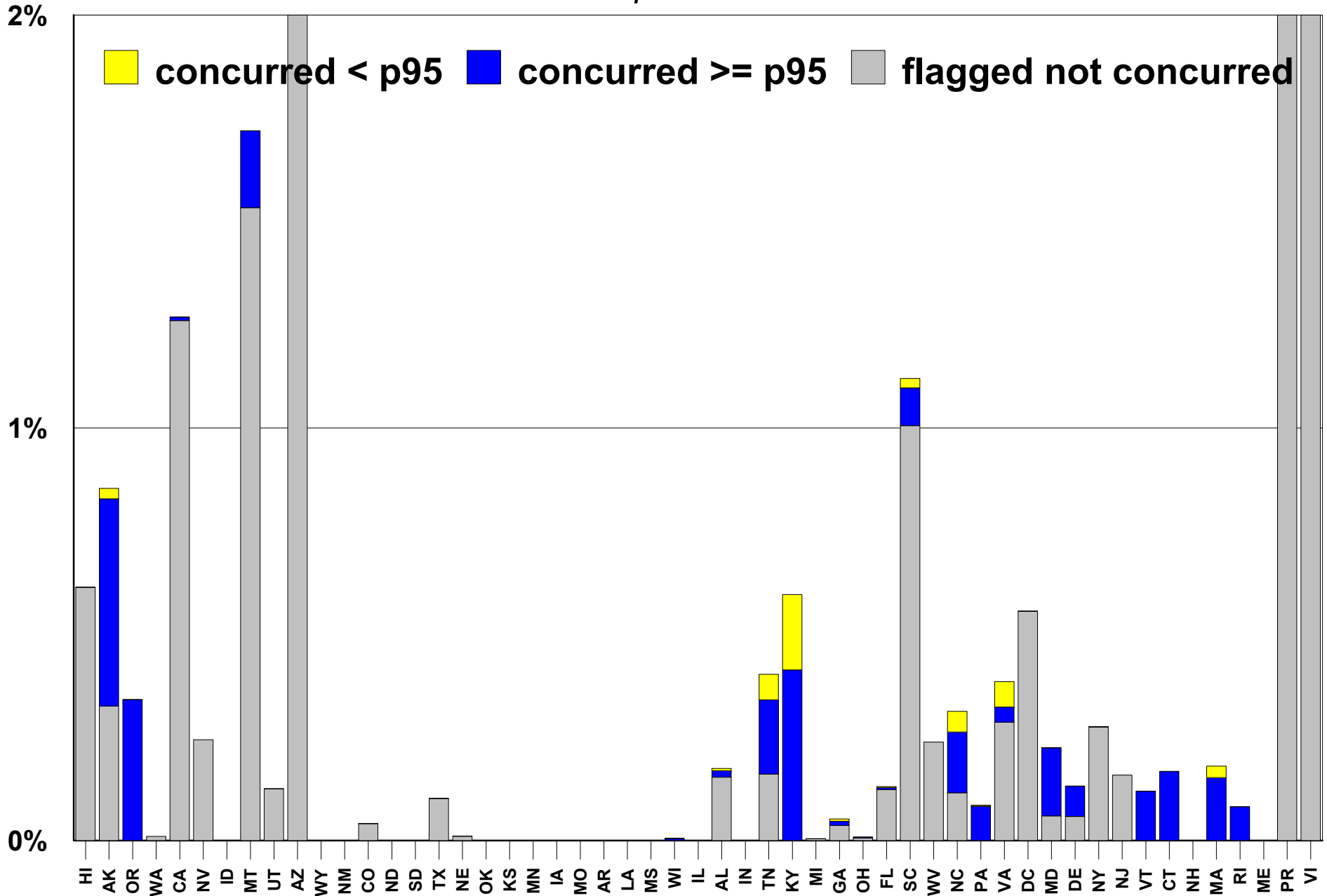


### Percent of data flagged for events by state, 1999-2004

Breakout of: not concurred, concurred  $\geq$  P95, and concurred  $<$  P95

95th%ile's based on 'minus flagged data'

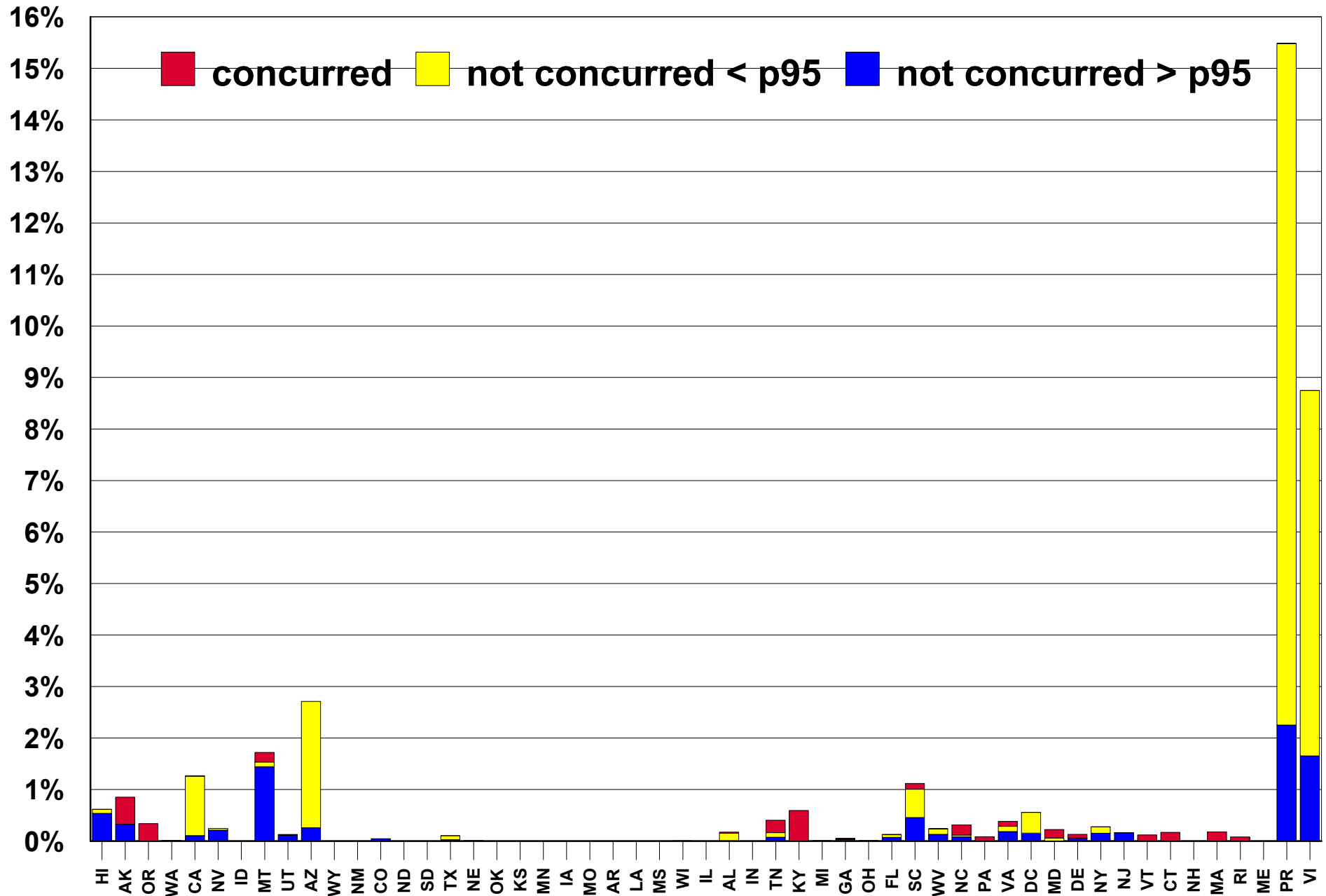
*blow-up of low end*



### Percent of data flagged for events by state, 1999-2004

Breakout of concurred, not concurred  $\geq$  P95, and not concurred  $<$  P95

95th%ile's based on 'minus flagged data'

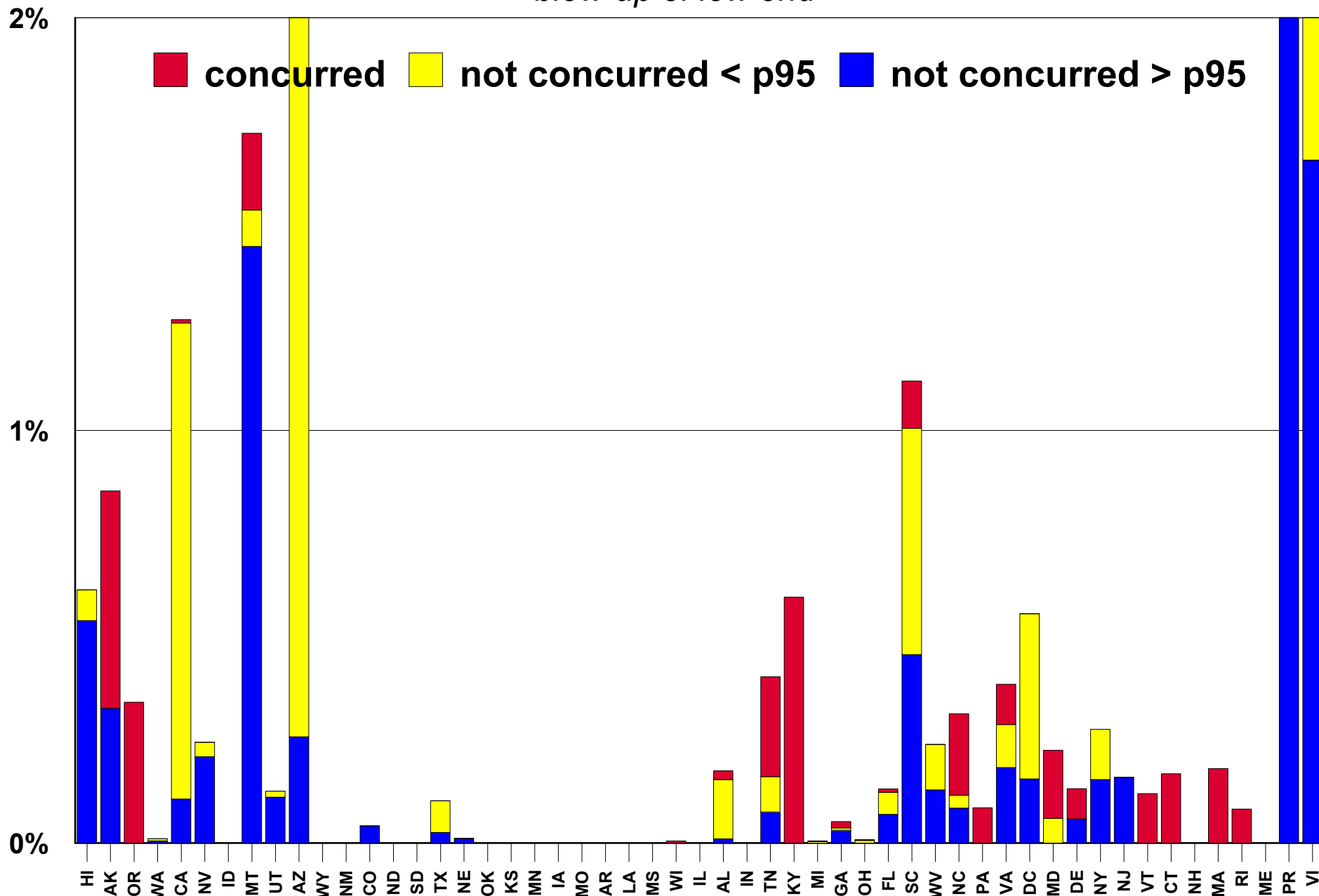


### Percent of data flagged for events by state, 1999-2004

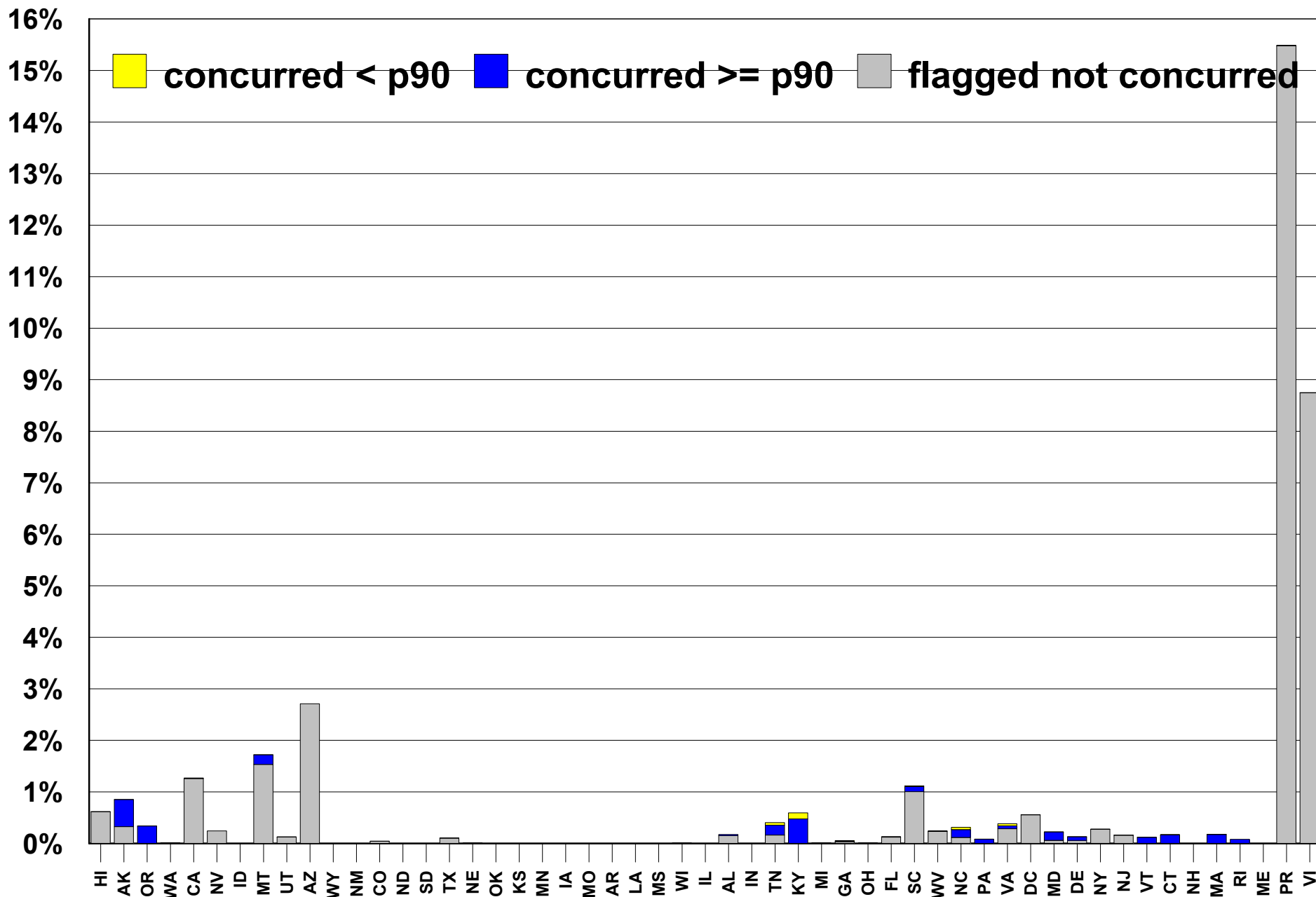
Breakout of concurred, not concurred  $\geq$  P95, and not concurred  $<$  P95

95th%ile's based on 'minus flagged data'

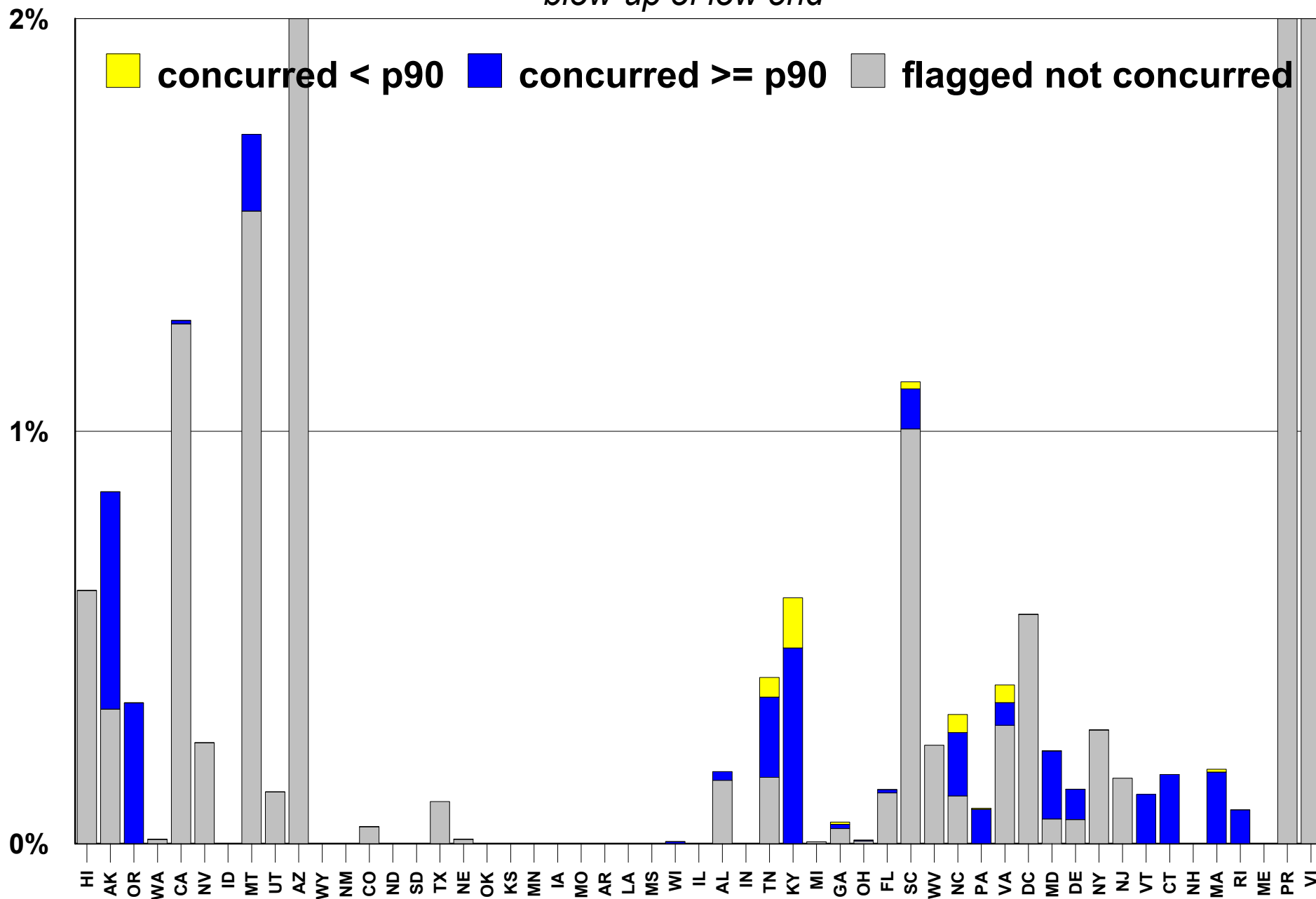
*blow-up of low end*



Percent of data flagged for events by state, 1999-2004  
 Breakout of not concurred, concurred  $\geq$  P90, and concurred  $<$  P90  
 90th%ile's based on 'minus flagged data'

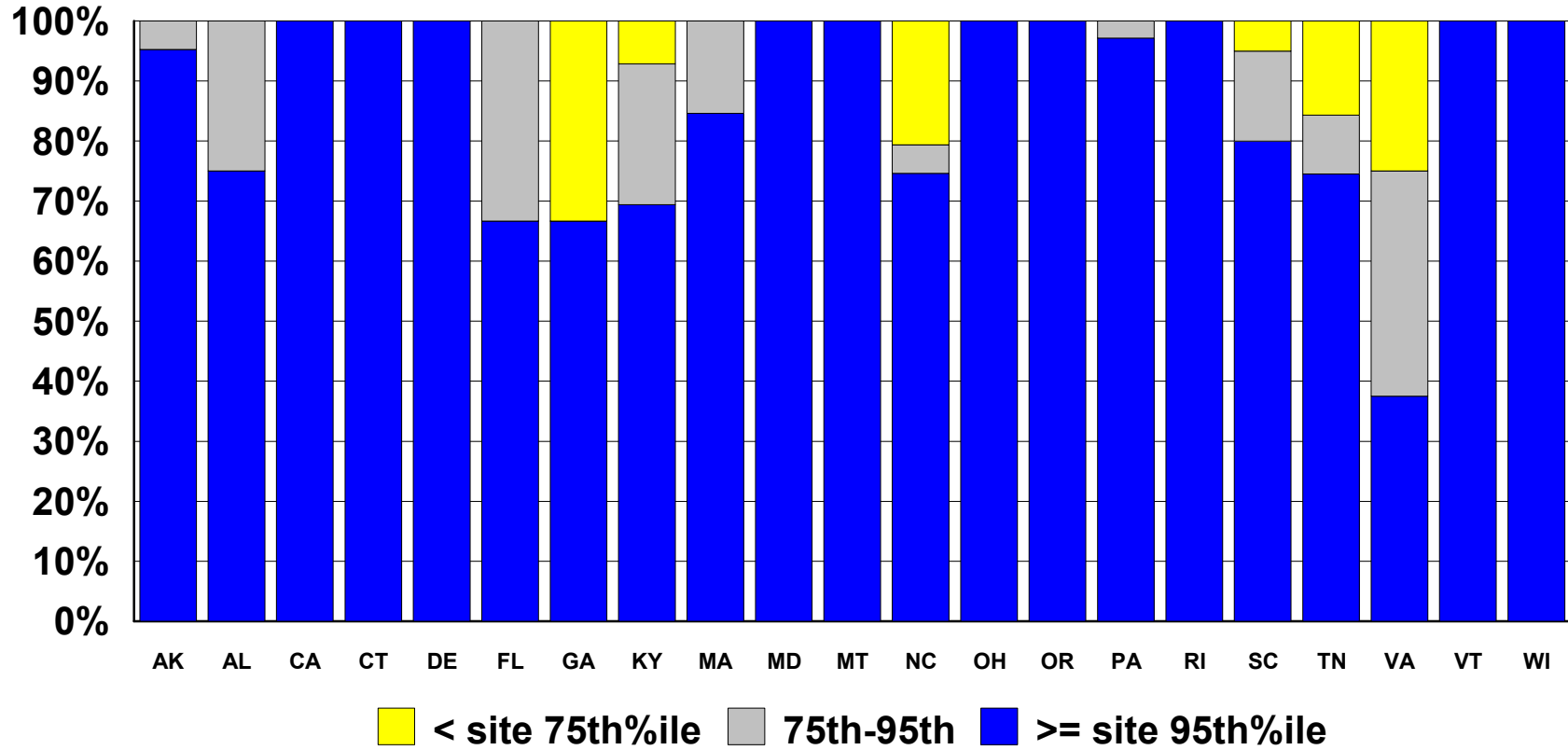


Percent of data flagged for events by state, 1999-2004  
 Breakout of not concurred, concurred  $\geq$  P90, and concurred  $<$  P90  
 90th%ile's based on 'minus flagged data'  
*blow-up of low end*

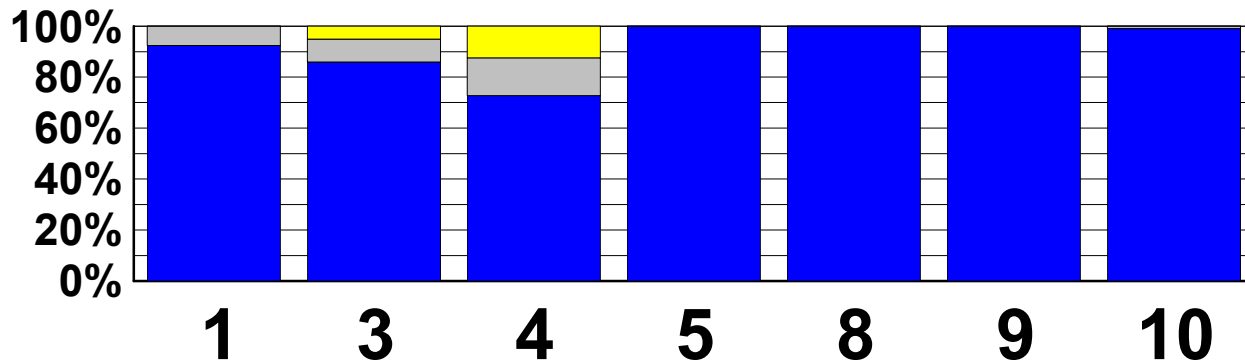


# Concurred flag data compared to site 75th & 95th percentiles

## By State

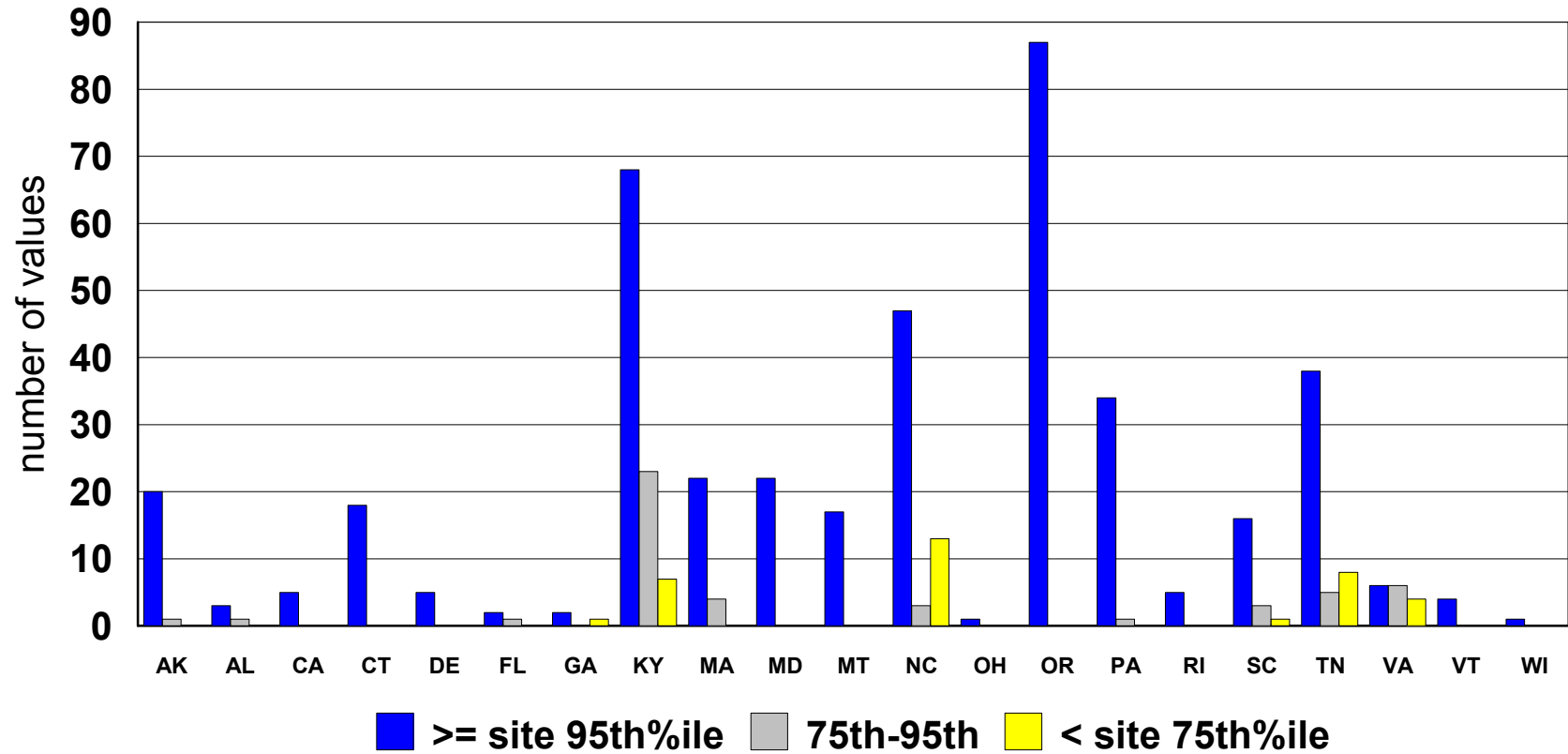


## By Region

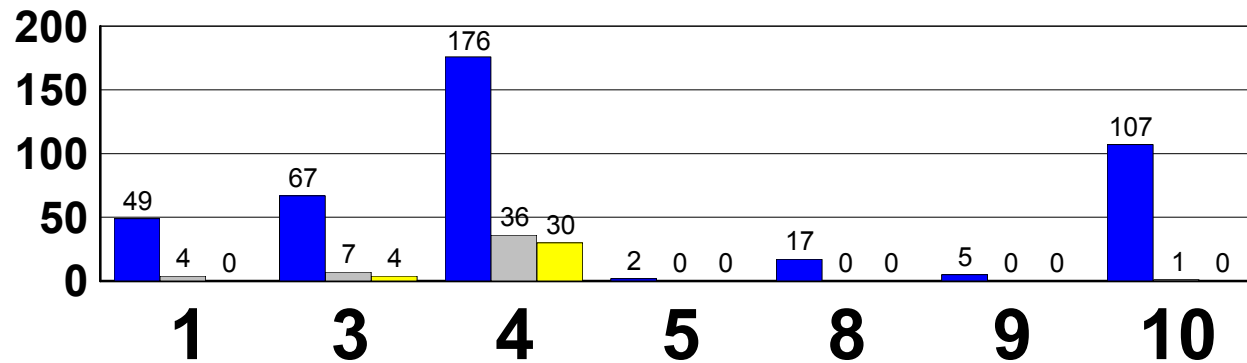


# Concurred flag data compared to site 75th & 95th percentiles

## By State

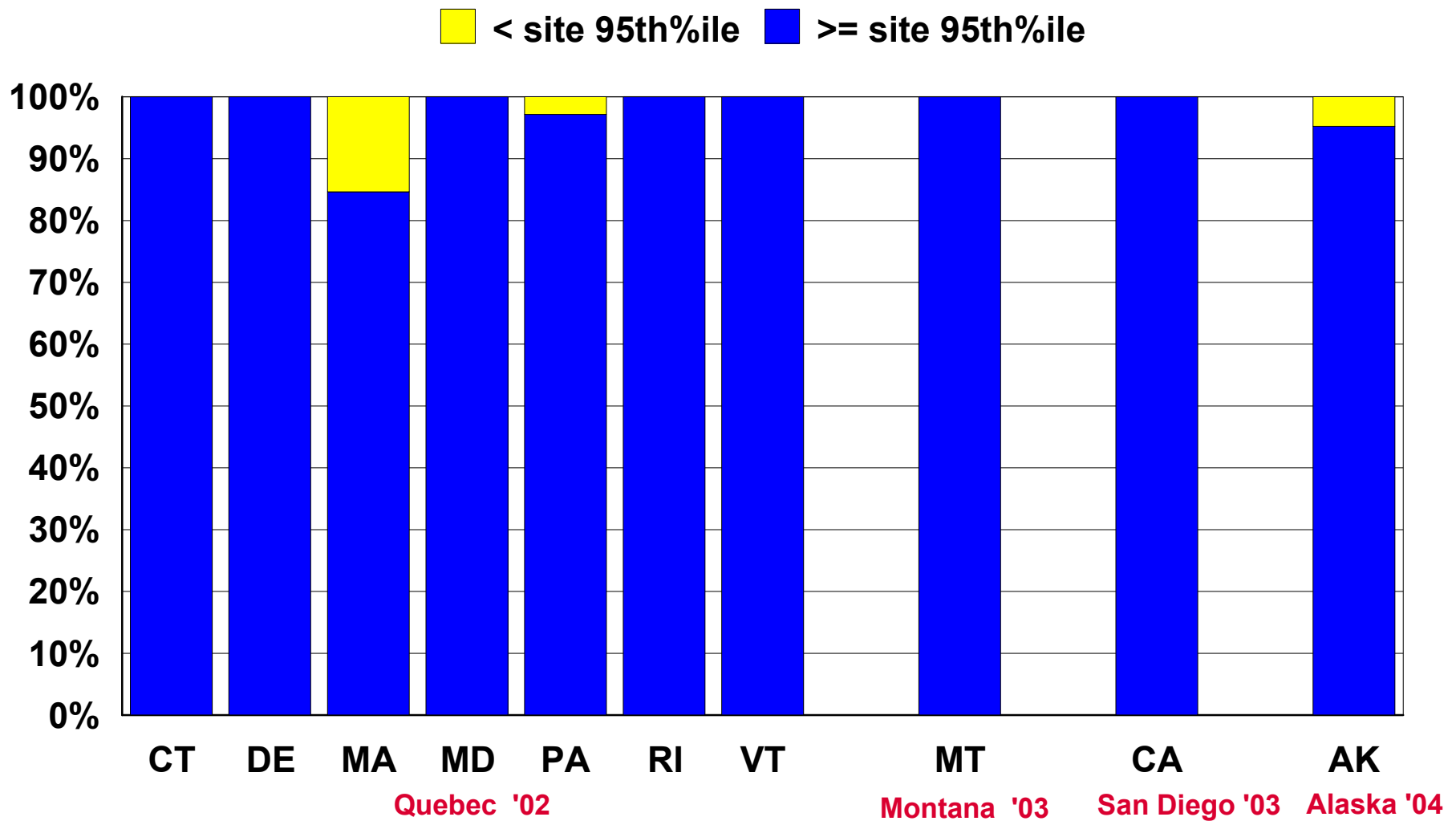


## By Region

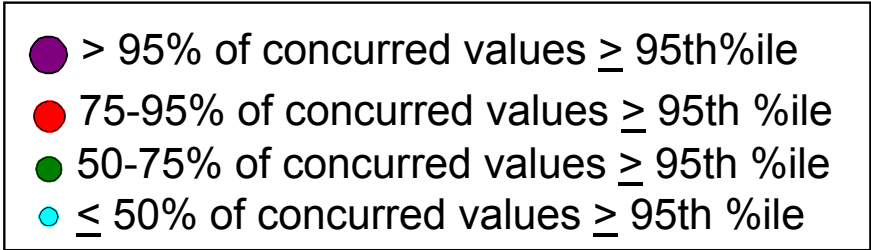
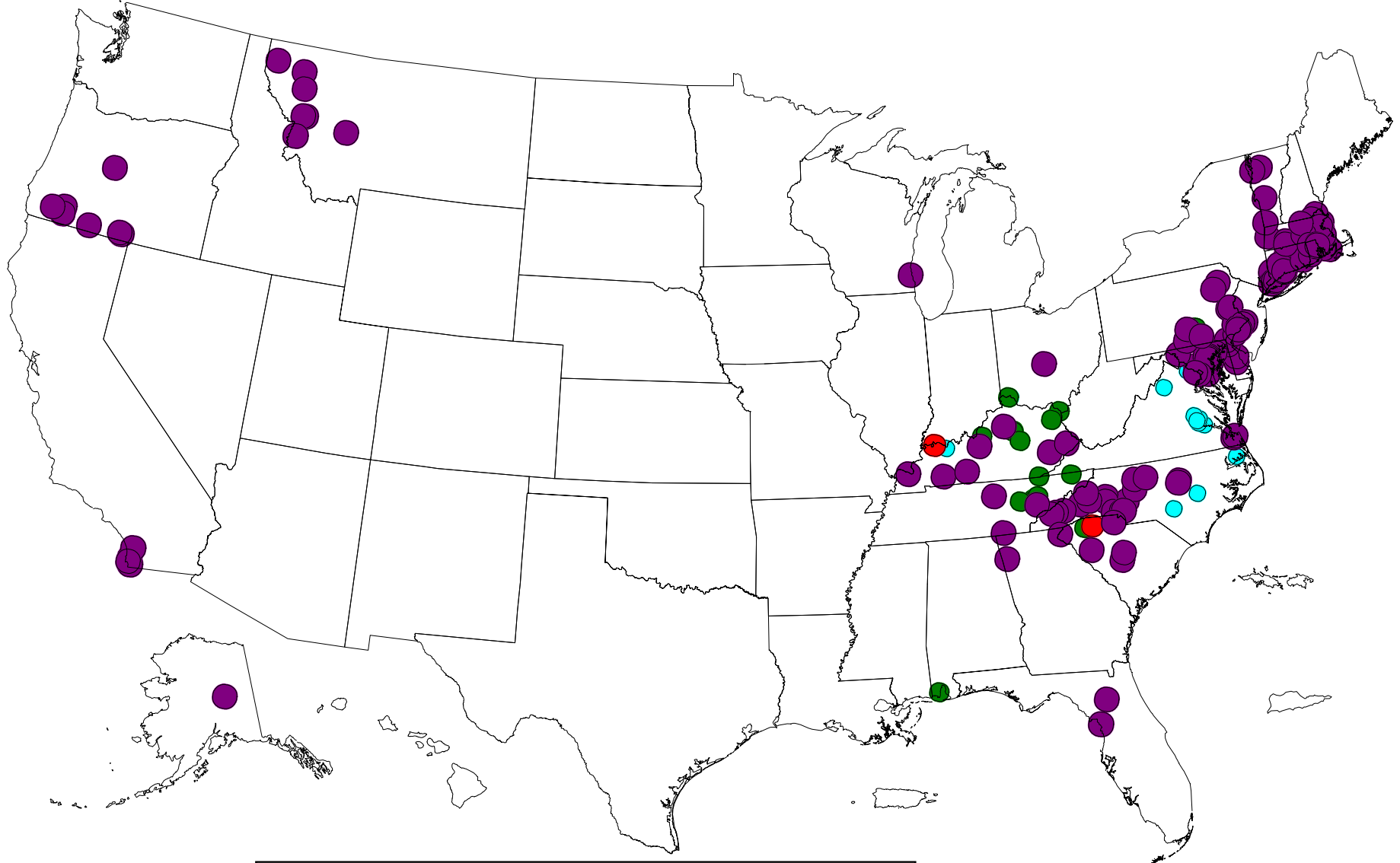




# Concurred flag data compared to site 95th percentiles for 4 fire major events

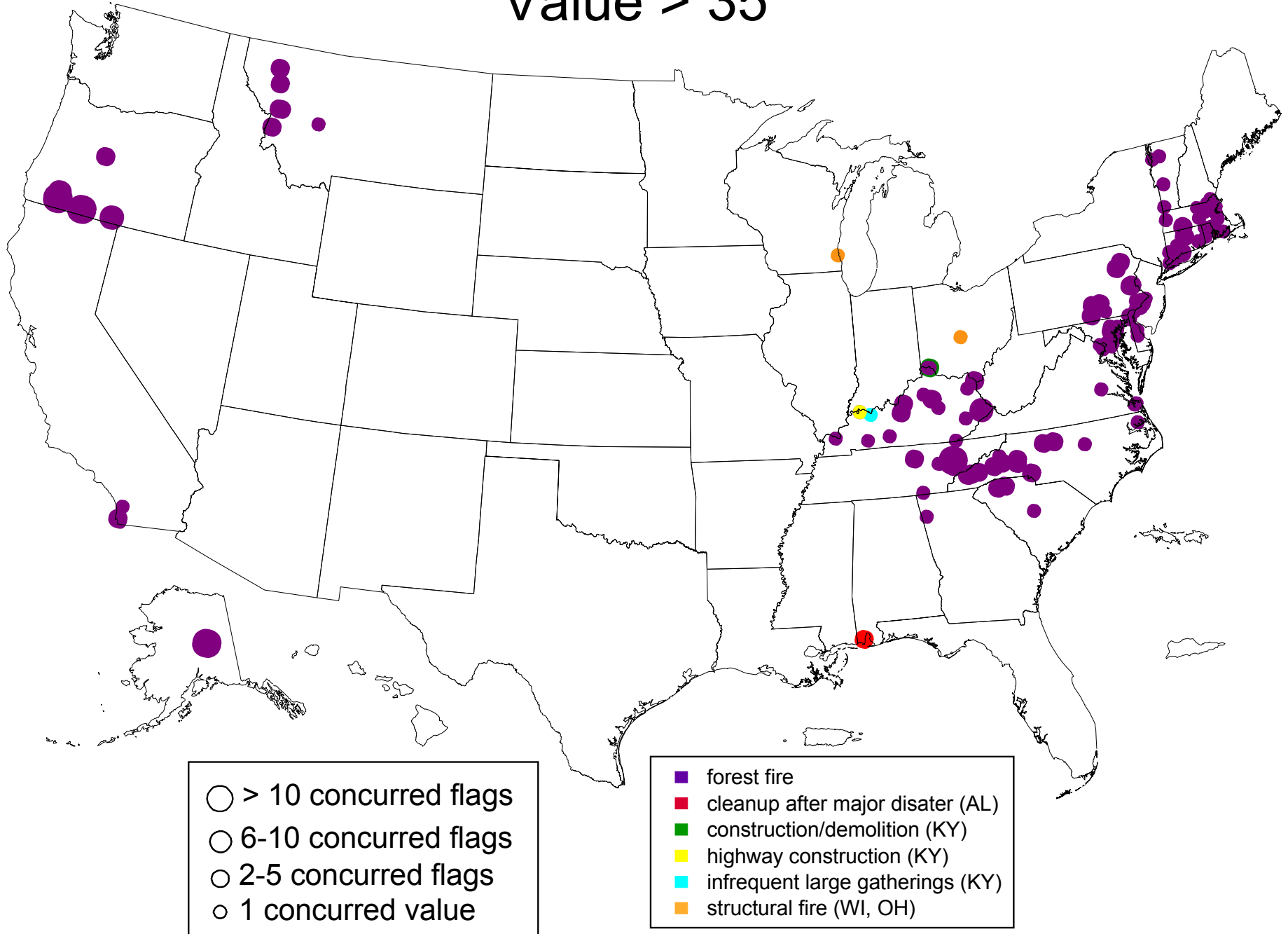


# Concurred flag data compared to site 95th percentiles



# PMf concurred flag counts/types

## Value > 35



## Utah PM<sub>2.5</sub> flags

site	V	> p95?	concurr	date	qtr	flag
490050004	20.1	yes		5/10/2004	2	HIGH WINDS
490350012	29.4	yes	N	7/4/2002	3	INFREQUENT LARGE GATHERINGS
490350012	19.3	yes	N	8/18/2002	3	FOREST FIRE
490350012	15.3	no	N	8/21/2002	3	FOREST FIRE
490350012	23.0	yes	N	8/19/2003	3	FOREST FIRE
490350012	23.1	yes	N	9/24/2003	3	FOREST FIRE
490350012	15.7	yes	N	5/21/2004	2	HIGH WINDS
490350012	19.7	yes	N	6/8/2004	2	HIGH WINDS
490350012	20.8	yes	N	7/2/2004	3	HIGH WINDS
490350012	16.2	no	N	7/29/2004	3	HIGH WINDS
490350012	28.0	yes	N	9/18/2004	3	HIGH WINDS
490350012	23.7	yes	N	9/27/2004	3	HIGH WINDS
490353006	36.3	yes		4/1/2003	2	HIGH WINDS
490353006	27.8	yes		5/10/2004	2	HIGH WINDS
490494001	44.4	yes		7/4/2003	3	INFREQUENT LARGE GATHERINGS
490494001	26.4	yes		5/10/2004	2	HIGH WINDS
490570002	108.3	yes	N	7/4/2002	3	INFREQUENT LARGE GATHERINGS

- 12 of 17 flags rejected (concurr='N')
  - Documentation was insufficient or event not 'flag-able' (fireworks)
- State did not submit documentation for 5 events

# Individual monitoring sites flagged multiple years for same type of event

Site	flag	# years flagged ('99-'04)	state_name	cbsa_name
150031001	INFREQUENT LARGE GATHERINGS	6	Hawaii	Honolulu, HI
150032004	INFREQUENT LARGE GATHERINGS	6	Hawaii	Honolulu, HI
720530003	SAHARA DUST	6	Puerto Rico	Fajardo, PR
450450009	FOREST FIRE	5	South Carolina	Greenville, SC
450630008	FOREST FIRE	5	South Carolina	Columbia, SC
450790007	FOREST FIRE	5	South Carolina	Columbia, SC
450790019	FOREST FIRE	5	South Carolina	Columbia, SC
450830010	FOREST FIRE	5	South Carolina	Spartanburg, SC
720570008	SAHARA DUST	5	Puerto Rico	Guayama, PR
720590016	SAHARA DUST	5	Puerto Rico	Yauco, PR
720610005	SAHARA DUST	5	Puerto Rico	San Juan-Caguas-Guaynabo, PR
720970003	SAHARA DUST	5	Puerto Rico	Mayagüez, PR
020900010	FOREST FIRE	4	Alaska	Fairbanks, AK
040139992	CONSTRUCTION/DEMOLITION	4	Arizona	Phoenix-Mesa-Scottsdale, AZ
060631006	FOREST FIRE	4	California	
110010041	PRESCRIBED BURNING	4	District Of Columb	Washington-Arlington-Alexandria, DC-VA-MD-WV
110010043	PRESCRIBED BURNING	4	District Of Columb	Washington-Arlington-Alexandria, DC-VA-MD-WV
450470003	FOREST FIRE	4	South Carolina	Greenwood, SC
450730001	FOREST FIRE	4	South Carolina	Seneca, SC
720210009	SAHARA DUST	4	Puerto Rico	San Juan-Caguas-Guaynabo, PR
720530003	VOLCANIC ERUPTIONS	4	Puerto Rico	Fajardo, PR
720690001	SAHARA DUST	4	Puerto Rico	San Juan-Caguas-Guaynabo, PR
720810001	SAHARA DUST	4	Puerto Rico	Aguadilla-Isabela-San Sebastián, PR
721130004	SAHARA DUST	4	Puerto Rico	Ponce, PR
721270003	VOLCANIC ERUPTIONS	4	Puerto Rico	San Juan-Caguas-Guaynabo, PR
721270003	HIGHWAY CONSTRUCTION	4	Puerto Rico	San Juan-Caguas-Guaynabo, PR
721270003	SAHARA DUST	4	Puerto Rico	San Juan-Caguas-Guaynabo, PR

Fireworks – Top 20 July 4<sup>th</sup> PM2.5 concentrations, 1999-2004

	site	year	jul4conc	flag	concurr	state_name	county_name	cbsa_name	csa_name
1	490570002	2002	108.3	infrequent large gatherings	N	Utah	Weber	Ogden-Clearfield, UT	Salt Lake City-Ogden- Clearfield, UT
2	410510080	2000	103.7			Oregon	Multnomah	Portland-Vancouver- Beaverton, OR-WA	
3	211110044	2002	100.6			Kentucky	Jefferson	Louisville, KY-IN	Louisville-Elizabethtown- Scottsburg, KY-IN
4	110010041	2000	100.2	prescribed burn		District Of Columbia	Washington	Washington-Arlington- Alexandria, DC-VA-MD-WV	Washington-Baltimore- Northern Virginia, DC-MD-VA- WV
5	171630010	2002	88.8			Illinois	St Clair	St. Louis, MO-IL	St. Louis-St. Charles- Farmington, MO-IL
6	320030560	2003	84.6			Nevada	Clark	Las Vegas-Paradise, NV	Las Vegas-Paradise-Pahrump, NV
7	171634001	2002	73.8			Illinois	St Clair	St. Louis, MO-IL	St. Louis-St. Charles- Farmington, MO-IL
8	295100086	2002	73.5			Missouri	St Louis (City)	St. Louis, MO-IL	St. Louis-St. Charles- Farmington, MO-IL
9	110010041	1999	72.1	prescribed burn		District Of Columbia	Washington	Washington-Arlington- Alexandria, DC-VA-MD-WV	Washington-Baltimore- Northern Virginia, DC-MD-VA- WV
10	060371103	2003	69.6			California	Los Angeles	Los Angeles-Long Beach- Santa Ana, CA	Los Angeles-Long Beach- Riverside, CA
11	420791101	2003	69.6			Pennsylvania	Luzerne	Scranton--Wilkes-Barre, PA	
12	120112004	2002	66.8			Florida	Broward	Miami-Fort Lauderdale-Miami Beach, FL	
13	210590014	2002	65.9	infrequent large gatherings	Y	Kentucky	Daviess	Owensboro, KY	
14	180970078	2002	65.7			Indiana	Marion	Indianapolis, IN	Indianapolis-Anderson- Columbus, IN
15	290990012	2002	64.8			Missouri	Jefferson	St. Louis, MO-IL	St. Louis-St. Charles- Farmington, MO-IL
16	110010041	2003	63.4	prescribed burn		District Of Columbia	Washington	Washington-Arlington- Alexandria, DC-VA-MD-WV	Washington-Baltimore- Northern Virginia, DC-MD-VA- WV
17	180970083	2002	63.4			Indiana	Marion	Indianapolis, IN	Indianapolis-Anderson- Columbus, IN
18	060290014	2004	63.1			California	Kern	Bakersfield, CA	
19	120113002	2002	61.9			Florida	Broward	Miami-Fort Lauderdale-Miami Beach, FL	
20	180970042	2002	61.2			Indiana	Marion	Indianapolis, IN	Indianapolis-Anderson- Columbus, IN

## Fireworks – Top 100 ratios of July 4<sup>th</sup> PM2.5 concentrations to ‘typical’ same-site, similar timeframe concentrations, 1999-2004

- ‘Typical’ concentrations defined as average of those occurring July 1, 2, 3, 6, 7, & 8
- Ranks (for July 4<sup>th</sup> and July 1,2,3,6,7,8) were computed based on the entire site data record 1999-2004.

site	year	jul4conc	jul4rank	jul123678conc	jul123678rank	conc_ratio	site	year	jul4conc	jul4rank	jul123678conc	jul123678rank	conc_ratio
410510080	2000	103.7	99	5.4	29.8	19.1	100010003	2000	20.5	83	5.3	10.0	3.9
490570002	2002	108.3	99	7.9	42.0	13.7	121150013	2002	19.7	95	5.2	23.0	3.8
320030560	2003	84.6	99	6.3	27.3	13.5	490494001	2000	20.9	89	5.6	29.5	3.8
410292129	2000	44.4	97	4.8	14.8	9.3	350171002	2001	17.9	98	4.8	40.7	3.7
120112004	2002	66.8	99	8.0	55.3	8.3	310550052	2001	31.3	98	8.5	45.0	3.7
530670013	2002	49.1	99	6.5	42.0	7.6	211110044	2002	100.6	99	27.5	80.2	3.7
530531018	2002	32.7	96	4.3	21.0	7.6	530330021	1999	17.4	87	4.8	19.5	3.6
410670111	1999	30	98	4.1	33.7	7.4	060674001	2002	18	78	5.0	21.0	3.6
120113002	2002	61.9	99	8.5	68.0	7.3	340310005	2001	12.6	56	3.5	8.0	3.6
410671003	2002	37.7	97	5.3	31.5	7.2	530610005	2002	27	94	7.5	44.0	3.6
410290133	2002	31.3	91	4.6	16.7	6.8	410510246	2001	24.7	98	7.0	40.7	3.5
120866001	2002	49.3	99	7.5	52.6	6.6	490350003	2002	32.7	88	9.3	54.0	3.5
560131003	2002	25.6	92	4.0	28.0	6.5	120090007	2002	23.6	99	6.7	50.0	3.5
490353007	2002	51.8	96	8.1	48.5	6.4	490353006	2001	27.7	90	8.0	50.4	3.5
410510246	2000	46	99	7.2	44.3	6.4	120571075	2002	33.1	99	9.6	42.7	3.4
530530029	2000	32	91	5.2	22.2	6.1	120330025	2004	29.7	97	8.7	27.2	3.4
410292129	2002	30.5	90	5.1	18.7	6.0	410510246	2002	19.8	93	5.9	34.0	3.4
110010041	2000	100.2	99	18.0	45.2	5.6	320030560	1999	29.3	95	8.7	40.7	3.4
490494001	2001	38.1	94	6.8	44.4	5.6	060670010	2003	27	91	8.0	44.0	3.4
530531018	1999	22.9	94	4.2	20.7	5.5	060290014	2000	28.1	78	8.4	14.5	3.4
060290014	2004	63.1	98	11.5	34.3	5.5	490350012	2002	29.4	86	8.8	37.5	3.4
410290133	2000	23.3	90	4.3	15.0	5.5	181670023	2002	36.4	96	10.9	42.0	3.3
410290133	1999	23.5	88	4.4	16.4	5.3	490353006	2000	17.4	83	5.3	27.3	3.3
410392013	2003	24.3	88	4.6	17.0	5.3	121030018	2003	30.5	99	9.2	52.8	3.3
121171002	2002	28.1	99	5.4	24.5	5.2	410030013	2002	13.5	86	4.1	31.5	3.3
180891016	2001	57.3	99	11.6	33.2	5.0	110010041	1999	72.1	99	21.9	72.3	3.3
530611007	2002	43.4	97	9.1	46.0	4.8	410390060	2002	13.8	79	4.2	22.8	3.3
410330107	2002	12.8	68	2.7	11.0	4.7	410170113	2000	12.1	86	3.8	23.8	3.2
121056006	2002	30	99	6.4	22.5	4.7	300470028	2002	15.8	90	4.9	35.5	3.2
530330021	2000	28.7	94	6.1	23.3	4.7	420791101	2003	69.6	99	21.6	83.5	3.2
120111002	2001	29.1	99	6.3	34.5	4.6	120952002	2002	24.5	99	7.7	35.8	3.2
490494001	2003	44.4	99	9.9	71.8	4.5	060190008	2001	43	89	13.5	48.5	3.2
171630010	2002	88.8	99	19.9	72.0	4.5	060370002	2004	46.9	96	14.8	42.8	3.2
160190010	2002	18.9	97	4.3	28.0	4.4	120866001	2004	27.1	98	8.5	52.5	3.2
120111002	2002	33.6	99	7.7	56.0	4.4	060371103	2003	69.6	99	22.0	63.2	3.2
350010024	2004	46.8	99	10.7	78.8	4.4	290950034	2004	23	94	7.4	20.8	3.1
410510080	1999	21.6	96	5.0	29.7	4.3	320030561	2004	24.7	96	8.0	52.5	3.1
110010041	2003	63.4	99	14.8	55.8	4.3	121111002	2002	15.7	94	5.1	26.0	3.1
150032004	1999	10.6	96	2.5	20.2	4.2	060590007	2003	46.8	96	15.3	54.2	3.1
410392013	2004	20.6	84	4.9	23.7	4.2	121275002	2002	18.6	95	6.1	30.5	3.0
120112004	2001	25.5	99	6.1	32.8	4.2	290950041	2001	39.4	99	13.0	57.0	3.0
410391061	2000	15.5	87	3.8	14.0	4.1	490494001	2002	28.3	93	9.4	61.5	3.0
482010058	2002	37	98	9.0	41.0	4.1	300810001	2002	8.9	74	3.0	16.5	3.0
120951004	2002	30.1	99	7.4	32.8	4.1	060590007	2004	35.2	93	11.7	34.0	3.0
060670006	2002	20	75	5.0	16.0	4.0	060111002	2002	9	51	3.0	7.0	3.0
060670010	1999	35	88	8.8	39.3	4.0	300131026	2002	10.2	91	3.4	33.5	3.0
180890006	2001	42.5	98	10.8	32.2	3.9	410390060	1999	12.2	82	4.2	25.5	2.9
160790017	2002	15.6	65	4.0	15.0	3.9	295100086	2002	73.5	99	25.1	87.3	2.9
310550019	2004	26.6	97	6.8	38.0	3.9	120990009	2004	21.2	97	7.3	47.8	2.9
490570007	2002	35.4	93	9.1	62.5	3.9	171634001	2002	73.8	99	25.4	85.0	2.9

Sites with concurred flagged values 1999-2004 and the effect of removing them on design values: all concurred values, concurred values  $\geq$  95th percentiles, and concurred value < 95th percentiles

SITE	All Data			
	DV a 9901	DV a 0204	DV d 9901	DV d 0204
010972005	14.8	12.6	34	29
020900010	11.5	24.6	41	182
060730001	14.6	13.5	32	35
060730006	13.4	11.9	29	27
060731002	17.1	14.7	45	37
060731007	16.6	14.9	44	39
090010010	13.6	12.9	38	36
090010113	12.3	12.9	36	37
090011123	12.8	12.6	33	33
090012124	12.4	12.9	34	36
090013005	13.0	12.9	36	38
090019003	12.9	11.7	34	37
090031003	11.2	11.5	32	35
090031018	12.3	12.2	33	36
090090018	16.8	16.2	40	40
090091123	14.1	13.6	36	39
090092123	13.6	12.8	36	34
090099005	11.6	12.0	32	37
090113002	11.5	11.4	29	33
100010002	12.9	12.8	32	36
100010003	13.4	12.7	34	36
100031003	15.1	14.5	37	36
100031007	14.1	13.5	35	36
100031012	15.5	14.8	38	36
120010023	10.9	9.5	26	21
120010024	10.8	9.7	23	21
120170005	10.5	8.8	27	21
131150005	18.5	15.5	48	35
132950002	17.2	15.2	41	32
210130002	16.8	14.0	37	29
210190017	15.5	14.3	35	35
210290006	16.0	14.2	37	33
210370003	15.5	13.7	36	33
210430500	12.9	11.6	28	27
210470006	14.8	12.9	32	31
210590014	15.8	14.0	35	33
210670012	16.0	14.1	36	33
210670014	16.8	15.0	37	33
210730006	14.5	13.2	34	31
210930006	15.7	13.2	35	31
211010006	14.9	13.7	36	35
211170007	15.9	14.3	37	33
211451004	15.1	12.7	34	29
211510003	14.9	13.1	31	30
211930003	16.8	12.8	54	26
211950002	16.1	13.0	44	29
212270007	15.4	13.2	34	30
240030014	13.3	12.1	33	37
240030019	14.7	12.8	37	38
240031003	15.9	15.3	36	41
240032002	14.8	14.2	36	39
240051007	14.9	13.9	35	38
240053001	16.0	15.0	39	40
240251001	14.5	12.8	35	38

Minus concurred flagged data > site-quarter 95th percentiles									
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact
3		11.6		27		1.0		2	
20		11.6		41		13.0		141	1
1		12.9		34		0.6		1	
1		11.4		27		0.5		0	
1		14.7		37		0.0		0	
2		14.7		38		0.2		1	
1		12.7		36		0.2		0	
1		12.6		37		0.3		0	
1		12.4		32		0.2		1	
1		12.7		36		0.2		0	
1		12.7		37		0.2		1	
1		11.4		35		0.3		2	
4		11.3		32		0.2		3	
1		12.0		35		0.2		1	
3		16.0		40		0.2		0	
1		13.4		38		0.2		1	
1		12.6		34		0.2		0	
1		11.7		37		0.3		0	
1		11.2		32		0.2		1	
1		12.6		33		0.2		3	
1		12.4		33		0.3		3	
1		14.2		34		0.3		2	
1		13.2		33		0.3		3	
1		14.7		36		0.1		0	
1	10.8		25		0.1		1		
1	10.5		27		0.0		1		
1	18.3		46		0.2		2		
1	17.0		40		0.2		1		
3	16.0		32		0.8		5		
5	15.1		35		0.4		0		
3	15.8		35		0.2		2		
8	14.9		32		0.6		4		1
5	12.6		28		0.3		0		
1	14.7		32		0.1		0		
1		13.9	31		0.1		0	2	
6	15.7		36		0.3		0		
6	16.4		36		0.4		1		
3	14.4		33		0.1		1		
4	15.1		33		0.6		2		
4	14.7		35		0.2		1		
2	15.8		37		0.1		0		
1	15.0		33		0.1		1		1
5	14.5		31		0.4		0		
1	16.1		31		0.7		23		
9	15.0		33		1.1		11		1
1	15.3		34		0.1		0		
1		12.1	34		0.0		3		
1		12.8	35		0.0		3		
1		15.2	40		0.1		1		
1		14.1	38		0.1		2		
1		13.8	34		0.1		4		
3		14.9	38		0.1		2		
1		12.5	32		0.3		6		

Minus concurred flagged data < site-quarter 95th percentiles									
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact
1		12.6		29		0.0		0	
1		25.0		182		-0.4		0	
1	10.8		23		0.0		0		
1	17.2		41		0.0		0		
1	16.8		37		0.0		0		
3	15.4		35		0.1		0		
1	16.0		37		0.0		0		
10	15.3		36		0.2		1		
3	12.9		28		0.0		0		
1	15.8		35		0.0		0		
2	16.0		36		0.0		0		
3	16.8		37		0.0		0		
1	14.9		36		0.0		0		
1	15.8		37		0.1		0		
4	14.9		31		0.0		0		

Minus all concurred flagged data									
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact
4		11.5		27		1.1		2	
21		11.6		41		13.0		141	1
1		12.9		34		0.6		1	
1		11.4		27		0.5		0	
1		14.7		37		0.0		0	
2		14.7		38		0.2		1	
1		12.7		36		0.2		0	
1		12.6		37		0.3		0	
1		12.4		32		0.2		1	
1		12.7		36		0.2		0	
1		12.7		37		0.2		1	
1		11.4		37		0.3		0	
4		11.3		32		0.2		3	
1		12.0		35		0.2		1	
3		16.0		40		0.2		0	
1		13.4		38		0.2		1	
1		12.6		34		0.2		0	
1		11.7		37		0.3		0	
1		11.2		32		0.2		1	
1		12.6		33		0.2		3	
1		12.4		33		0.3		3	
1		14.2		34		0.3		2	
1		13.2		33		0.3		3	
1		14.7		36		0.1		0	
1	10.8		25		0.1		1		
1	10.8		23		0.0		0		
1	10.5		27		0.0		0		
1	18.3		46		0.2		2		
2	17.0		40		0.2		1		
4	15.8		32		1.0		5		
8	15.1		35		0.4		0		
4	15.8		35		0.2		2		
18	14.6		32		0.9		4		1
8	12.5		28		0.4		0		
1	14.7		32		0.1		0		
2	15.8	13.9	35	31	0.0	0.1	0	2	
8	15.6		36		0.4		0		
9	16.4		36		0.4		1		
3	14.4		33		0.1		1		
4	15.1		33		0.6		2		
5	14.6		35		0.3		1		
3	15.7		37		0.2		0		
1	15.0		33		0.1		1		1
9	14.5		31		0.4		0		
1	16.1		31		0.7		23		
9	15.0		33		1.1		11		1
1	15.3		34		0.1		0		
1		12.1	34		0.0		3		
1		12.8	35		0.0		3		
1		15.2	40		0.1		1		
1		14.1	38		0.1		1		
1		13.8	34		0.1		4		
3		14.9	37		0.1		3		
1		12.5	32		0.3		6		





Sites with concurred flagged values 1999-2004 and the effect of removing them on design values: all concurred values, concurred values  $\geq$  95th percentiles, and concurred value < 95th percentiles

SITE	All Data			
	DV a 9901	DV a 0204	DV d 9901	DV d 0204
371910005	15.3	13.1	35	27
390490025	17.2	15.3	40	38
410170120	6.9	7.0	21	22
410290133	11.3	11.9	41	37
410291001	5.7	6.7	17	28
410292129	12.5	11.0	42	37
410330114		11.6		31
410350004	9.7	12.8	39	55
410370001	7.6	7.5	34	34
410370003	3.5	5.3	10	46
420010001	13.4	13.4	36	38
420170012	13.4	14.1	37	37
420410101	14.3	15.0	36	42
420430401	15.5	15.5	44	40
420450002	15.0	15.3	37	36
420692006	11.8	12.3	33	37
420770004	13.8	14.2	38	38
420791101	13.0	12.5	34	34
420910013	13.8	13.4	37	35
420950025	14.0	14.2	37	39
421010004	15.3	14.5	40	38
421010020	14.5	14.0	33	36
421010024	14.1	13.4	36	39
421010047	16.6	15.6	37	38
421010052		13.7		51
421010136	15.3	13.7	40	36
421330008	16.3	17.2	39	45
440030002	9.2	8.5	32	29
440070022	11.5	11.2	31	31
440070023	9.5	9.5	21	25
440070026	12.1	12.8	32	33
440071010	11.1	10.4	32	30
450450009	17.0	14.3	35	31
450470003	14.9	13.0	31	30
450630005	14.3		31	
450630008	15.6	13.6	32	32
450730001	12.3	10.3	31	26
450790007	14.7	12.8	31	30
450790019	15.4	13.6	32	31
450830010	15.4	13.6	34	31
450910006	14.5		31	
470090011	16.6	13.9	45	32
470654002	17.6	14.7	39	33
470930028	18.3	14.5	41	31
470931017	20.4	15.7	45	34
470931020	17.7	15.1	39	32
471410001	13.9	12.9	33	30
471450004	17.0	13.6	42	28
471631007	17.0	13.8	39	31
500030005	9.9	11.0	26	32
500070007	6.8	8.1	20	37
500070012	9.1	9.6	26	32
500210002	11.3	11.5	30	35
510130020	14.5	14.5	36	37

Minus concurred flagged data > site-quarter 95th percentiles										
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact	
1	17.1		40		0.1		0			
2	6.5		18		0.4		3			
21		11.4		36		0.5		1		
7		5.9		19		0.8		9		
21		10.5		33		0.5		4		
1		11.5		31		0.1		0		
25		11.3		41		1.5		14		
8		7.0		21		0.5		13		
2		3.9		19		1.4		27		
3		13.3		37		0.1		1		
1		13.9		36		0.2		1		
3		14.9		41		0.1		1		
2		15.5		40		0.0		0		
1		15.1		33		0.2		3		
4		12.2		36		0.1		1		
4		14.1		37		0.1		1		
2		12.4		31		0.1		3		
1		13.2		34		0.2		1		
4		14.0		38		0.2		1		
2		14.4		38		0.1		0		
1		13.8		34		0.2		2		
1		13.2		35		0.2		4		
1		15.4		37		0.2		1		
1		13.1		37		0.6		14		
2		13.6		34		0.1		2		
1		16.9		43		0.3		2		
1		8.3		28		0.2		1		
1		11.2		31		0.0		0		
1		9.0		24		0.5		1		
1		12.6		33		0.2		0		
1		10.4		29		0.0		1		
2	16.9		35		0.1		0			
1	14.8		30		0.1		1			
2	14.2		29		0.1		2			
1	15.6		31		0.0		1			
1	12.2		31		0.1		0			
1	14.6		30		0.1		1			
2	15.3		32		0.1		0			
5	15.2		32		0.2		2			
1	14.4		30		0.1		1			
3	16.1		38		0.5		7			
1	17.5		38		0.1		1			
5	17.8		39		0.5		2			
14	20.0		42		0.4		3			
8	17.4		36		0.3		3			
3	13.7		31		0.2		2			
2	16.9		39		0.1		3			
2	16.9		39		0.1		0			
1		10.5		31		0.5		1		
1		7.6		35		0.5		2		
1		9.4		31		0.2		1		
1		11.4		35		0.1		0		
1		14.5		37		0.0		0		

Minus concurred flagged data < site-quarter 95th percentiles										
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact	
1	15.3		35		0.0		0			
1		15.5		40		0.0		0		
1		17.0		35		0.0		0		
1		15.6		32		0.0		0		
1		14.7		31		0.0		0		
1		15.4		34		0.0		0		
2	18.3		41		0.0		0			
5	20.4		45		0.0		0			
4	17.7		39		0.0		0			
1	17.0		42		0.0		0			
1	17.0		39		0.0		0			

Minus all concurred flagged data										
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact	
1	15.3		35		0.0		0			
1	17.1		40		0.1		0			
2	6.5		18		0.4		3			
21		11.4		36		0.5		1		
7		5.9		19		0.8		9		
21		10.5		33		0.5		4		
1		11.5		31		0.1		0		
25		11.3		41		1.5		14		
8		7.0		29		0.5		5		
2		3.9		19		1.4		27		
3		13.3		37		0.1		1		
1		13.9		36		0.2		1		
3		14.9		41		0.1		1		
3		15.4		39		0.1		1		
1		15.1		33		0.2		3		
4		12.2		36		0.1		1		
4		14.1		37		0.1		1		
2		12.4		31		0.1		3		
1		13.2		34		0.2		1		
4		14.0		38		0.2		1		
2		14.4		38		0.1		0		
1		13.8		34		0.2		2		
1		13.2		37		0.2		2		
1		15.4		37		0.2		1		
1		13.1		37		0.6		14		
2		13.6		34		0.1		2		
1		16.9		43		0.3		2		
1		8.3		28		0.2		1		
1		11.2		31		0.0		0		
1		9.0		24		0.5		1		
1		12.6		33		0.2		0		
1		10.4		29		0.0		1		
3	16.9		35		0.1		0			
1	14.8		30		0.1		1			
2	14.2		29		0.1		2			
2	15.6		31		0.0		1			
1	12.2		31		0.1		0			
2	14.6		30		0.1		1			
2	15.3		32		0.1		0			
6	15.2		32		0.2		2			
1	14.4		30		0.1		1			
3	16.1		38		0.5		7			
1	17.5		38		0.1		1			
7	17.9		39		0.4		2			
19	20.0		42		0.4		3			
12	17.4		36		0.3		3			
3	13.7		31		0.2		2			
3	16.8		39		0.2		3			
3	16.9		39		0.1		0			
1		10.5		31		0.5		1		
1		7.6		35		0.5		2		
1		9.4		31		0.2		1		
1		11.4		35		0.1		0		
1		14.5		37		0.0		0		

Sites with concurred flagged values 1999-2004 and the effect of removing them on design values: all concurred values, concurred values  $\geq$  95th percentiles, and concurred value < 95th percentiles

SITE	All Data			
	DV a 9901	DV a 0204	DV d 9901	DV d 0204
510360002	13.9	12.4	34	31
510410003	14.3	13.4	34	33
510590030	14.0	13.4	34	35
510591005		13.6		35
510595001	14.6	13.9	38	34
510870014	14.1	13.8	34	32
510870015	13.6	12.8	33	30
511071005	13.6	13.6	36	34
511390004	11.8	12.6	25	32
515500012	13.4	12.1	32	31
517100024	13.7	12.7	32	31
517600020	14.9	13.9	34	32
518100008	13.2	12.5	32	32
550790010	14.0	12.5	37	36

Minus concurred flagged data > site-quarter 95th percentiles									
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact
1		13.4		35		0.0			0
1		13.9		33		0.0			1
1		12.1		30		0.0			1
1		13.9		31		0.0			1
1		12.5		29		0.0			3
1	14.0		36		0.0				1

<b>423</b>			<b>avg</b>	<b>0.3</b>		<b>3</b>		<b>5</b>
			<b>med</b>	<b>0.2</b>		<b>1</b>		
			<b>min</b>	<b>0.0</b>		<b>0</b>		
			<b>max</b>	<b>13.0</b>		<b>141</b>		

Minus concurred flagged data < site-quarter 95th percentiles									
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact
1		12.3		31		0.1			0
1		13.4		33		0.0			0
1		13.4		35		0.0			0
1		13.5		35		0.1			0
1		13.7		32		0.1			0
1		12.8		30		0.0			0
1		13.5		34		0.1			0
1		12.6		32		0.0			0
1		12.7		29		0.0			2
1		13.9		32		0.0			0

<b>82</b>			<b>avg</b>	<b>0.0</b>		<b>0</b>		<b>0</b>
			<b>med</b>	<b>0.0</b>		<b>0</b>		
			<b>min</b>	<b>-0.4</b>		<b>0</b>		
			<b>max</b>	<b>0.2</b>		<b>2</b>		

Minus all concurred flagged data									
# obs	DV a 9901	DV a 0204	DV d 9901	DV d 0204	Diff DV a 9901	Diff DV a 0204	Diff d DV 9901	Diff d DV 0204	DV impact
1		12.3		31		0.1			0
1		13.4		33		0.0			0
2		13.4		35		0.0			0
1		13.5		35		0.1			0
1		13.9		33		0.0			1
1		13.7		32		0.1			0
1		12.8		30		0.0			0
1		13.5		34		0.1			0
1		12.6		32		0.0			0
1		12.1		30		0.0			1
1		12.7		29		0.0			2
2		13.9		31		0.0			1
1		12.5		29		0.0			3
1	14.0		36		0.0				1

<b>505</b>			<b>avg</b>	<b>0.3</b>		<b>3</b>		<b>5</b>
			<b>med</b>	<b>0.2</b>		<b>1</b>		
			<b>min</b>	<b>0.0</b>		<b>0</b>		
			<b>max</b>	<b>13.0</b>		<b>141</b>		

**Flag assigned to PMc if PMt flagged or PMf flagged (set to PMt flag if present, else PMf flag)**

event	AQS flag	flag count	percent of flag total	percent of obs total	site count	percent of flag site total	percent of site total
FOREST FIRE	E	228	24.3%	0.2%	102	69.9%	20.9%
HIGHWAY CONSTRUCTION	L	208	22.2%	0.2%	3	2.1%	0.6%
SAHARA DUST	U	189	20.1%	0.2%	6	4.1%	1.2%
CONSTRUCTION/DEMOLITION	J	107	11.4%	0.1%	14	9.6%	2.9%
HIGH WINDS	A	90	9.6%	0.1%	34	23.3%	7.0%
VOLCANIC ERUPTIONS	C	60	6.4%	0.1%	6	4.1%	1.2%
ROOFING OPERATIONS	P	15	1.6%	0.0%	3	2.1%	0.6%
INFREQUENT LARGE GATHERINGS	O	14	1.5%	0.0%	7	4.8%	1.4%
REROUTING OF TRAFFIC	M	13	1.4%	0.0%	1	0.7%	0.2%
AGRICULTURAL TILLING	K	7	0.7%	0.0%	3	2.1%	0.6%
CLEAN UP AFTER A MAJOR DISASTER	R	4	0.4%	0.0%	4	2.7%	0.8%
SANDBLASTING	D	1	0.1%	0.0%	1	0.7%	0.2%
PRESCRIBED BURNING	Q	1	0.1%	0.0%	1	0.7%	0.2%
SEISMIC ACTIVITY	S	1	0.1%	0.0%	1	0.7%	0.2%
Total		938	100.0%	0.9%	146	100.0%	29.9%
Total observations in PMc database		99,635		100.0%			
Total sites in PMc database					489		100.0%

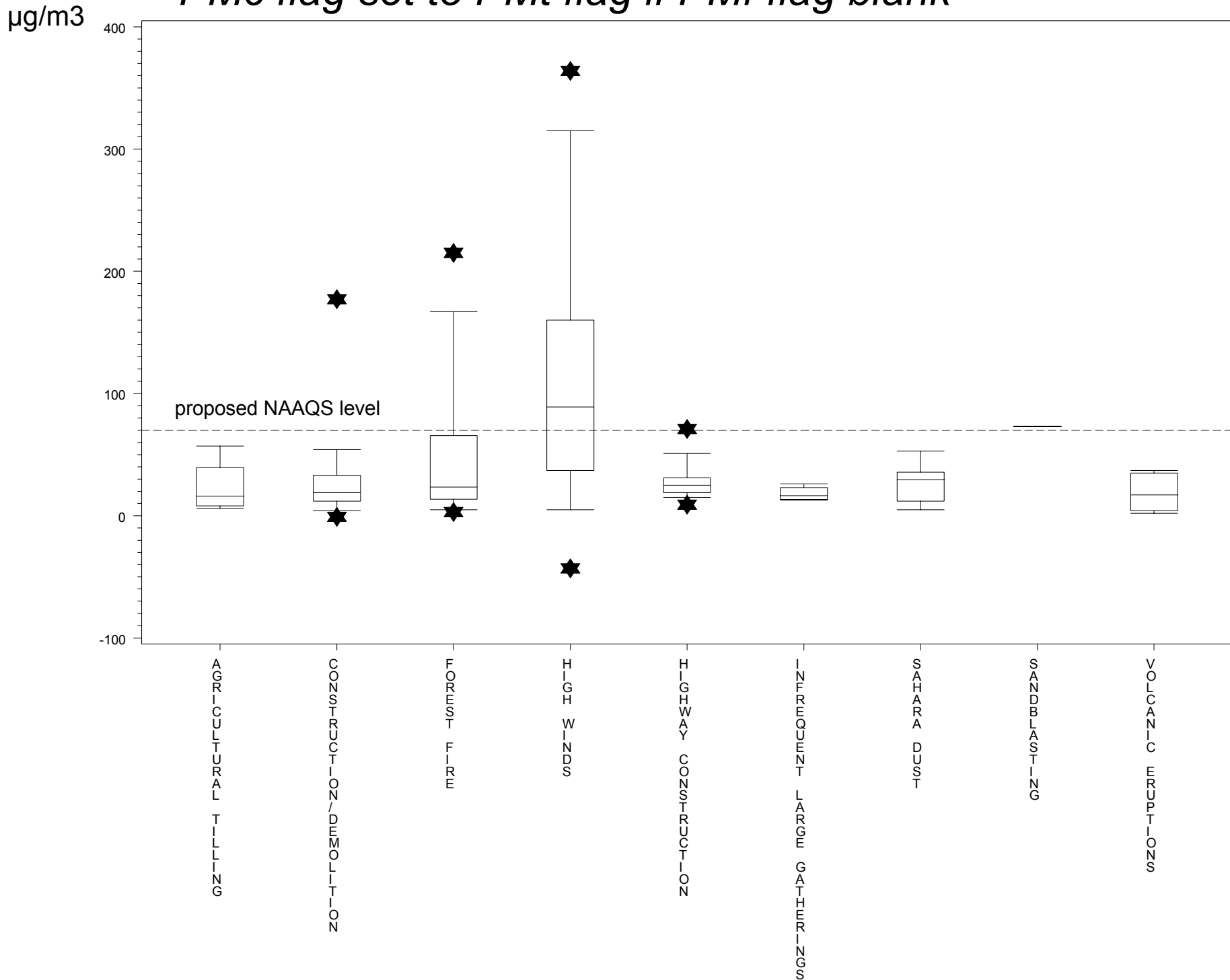
**Flag assigned to PMc if PMt flagged and PMf not flagged**

event	AQS flag	flag count	percent of flag total	percent of obs total	site count	percent of flag site total	percent of site total
HIGHWAY CONSTRUCTION	L	142	38.6%	0.1%	1	1.5%	0.2%
HIGH WINDS	A	81	22.0%	0.1%	33	49.3%	6.7%
CONSTRUCTION/DEMOLITION	J	66	17.9%	0.1%	11	16.4%	2.2%
FOREST FIRE	E	52	14.1%	0.1%	32	47.8%	6.5%
SAHARA DUST	U	12	3.3%	0.0%	4	6.0%	0.8%
VOLCANIC ERUPTIONS	C	6	1.6%	0.0%	4	6.0%	0.8%
AGRICULTURAL TILLING	K	4	1.1%	0.0%	2	3.0%	0.4%
INFREQUENT LARGE GATHERINGS	O	4	1.1%	0.0%	3	4.5%	0.6%
SANDBLASTING	D	1	0.3%	0.0%	1	1.5%	0.2%
Total		368	100.0%	0.4%	67	100.0%	13.7%
Total observations in PMc database		99,635		100.0%			
Total sites in PMc database					489		100.0%

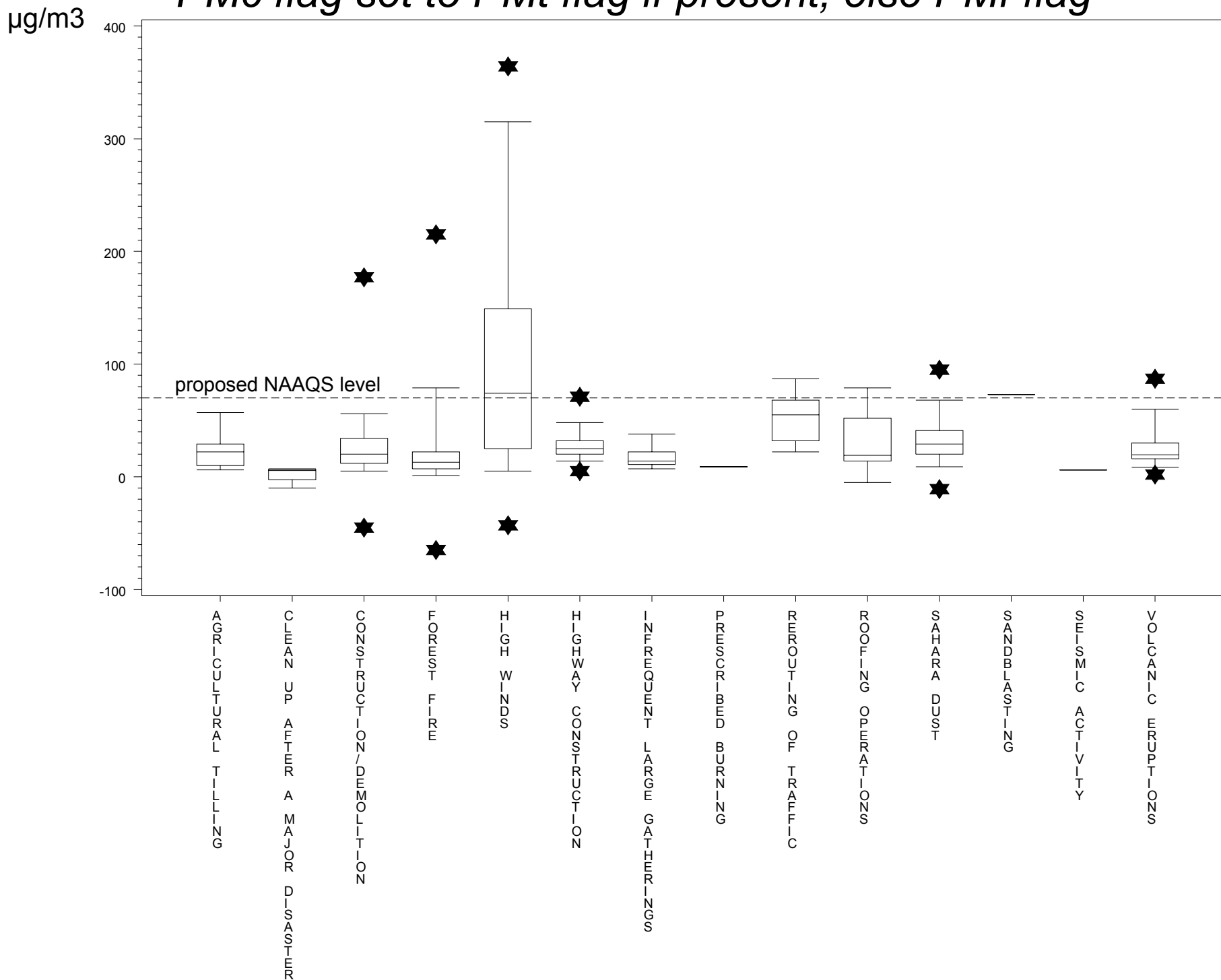
**Flag assigned to PMc if PMt flagged (PMf flags ignored)**

event	AQS flag	flag count	percent of flag total	percent of obs total	site count	percent of flag site total	percent of site total
HIGHWAY CONSTRUCTION	L	205	25.8%	0.2%	1	1.0%	0.2%
SAHARA DUST	U	184	23.1%	0.2%	6	5.9%	1.2%
FOREST FIRE	E	121	15.2%	0.1%	64	62.7%	13.1%
CONSTRUCTION/DEMOLITION	J	103	12.9%	0.1%	13	12.7%	2.7%
HIGH WINDS	A	91	11.4%	0.1%	33	32.4%	6.7%
VOLCANIC ERUPTIONS	C	60	7.5%	0.1%	6	5.9%	1.2%
REROUTING OF TRAFFIC	M	13	1.6%	0.0%	1	1.0%	0.2%
INFREQUENT LARGE GATHERINGS	O	13	1.6%	0.0%	6	5.9%	1.2%
AGRICULTURAL TILLING	K	5	0.6%	0.0%	2	2.0%	0.4%
SANDBLASTING	D	1	0.1%	0.0%	1	1.0%	0.2%
Total		796	100.0%	0.8%	102	100.0%	20.9%
Total observations in PMc database		99,635		100.0%			
Total sites in PMc database					489		100.0%

# *PMc flag set to PMt flag if PMf flag blank*



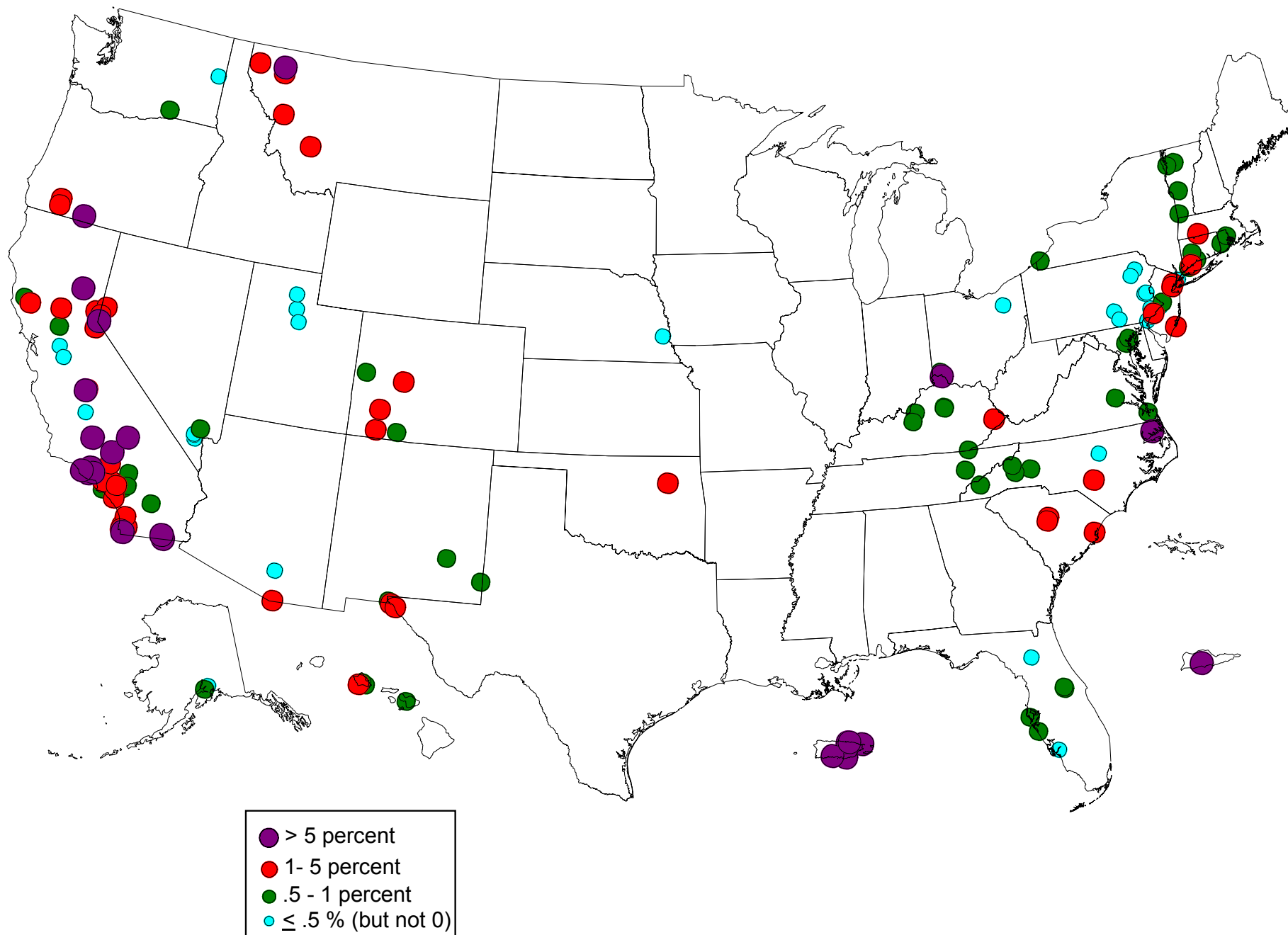
*PMc flag set to PMt flag if present, else PMf flag*





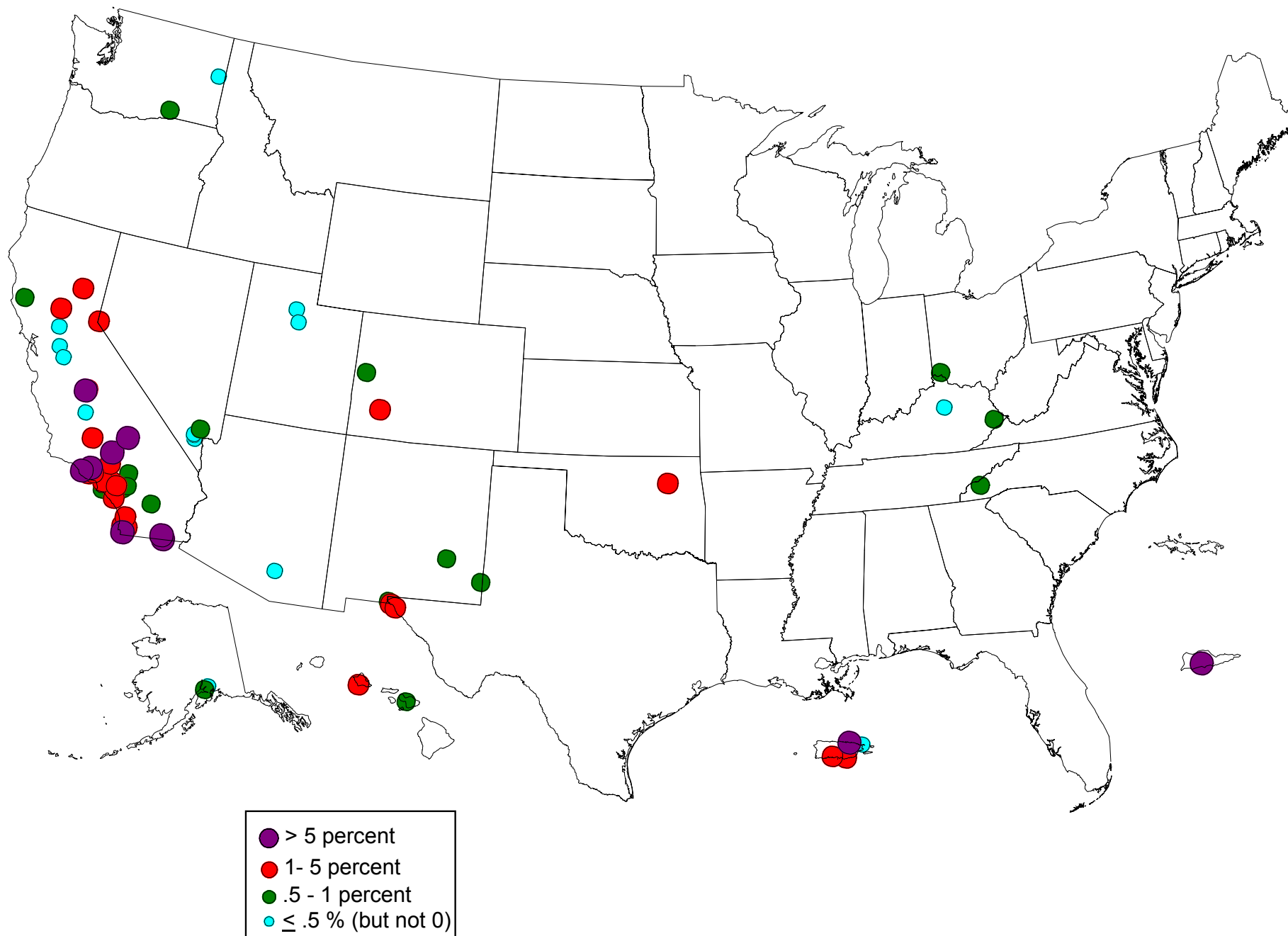
# PMc: Percent of data flagged for events by site, 2001-2003

*PMc flag set to PMt flag if present, else PMf flag*



# PMc: Percent of data flagged for events by site, 2001-2003

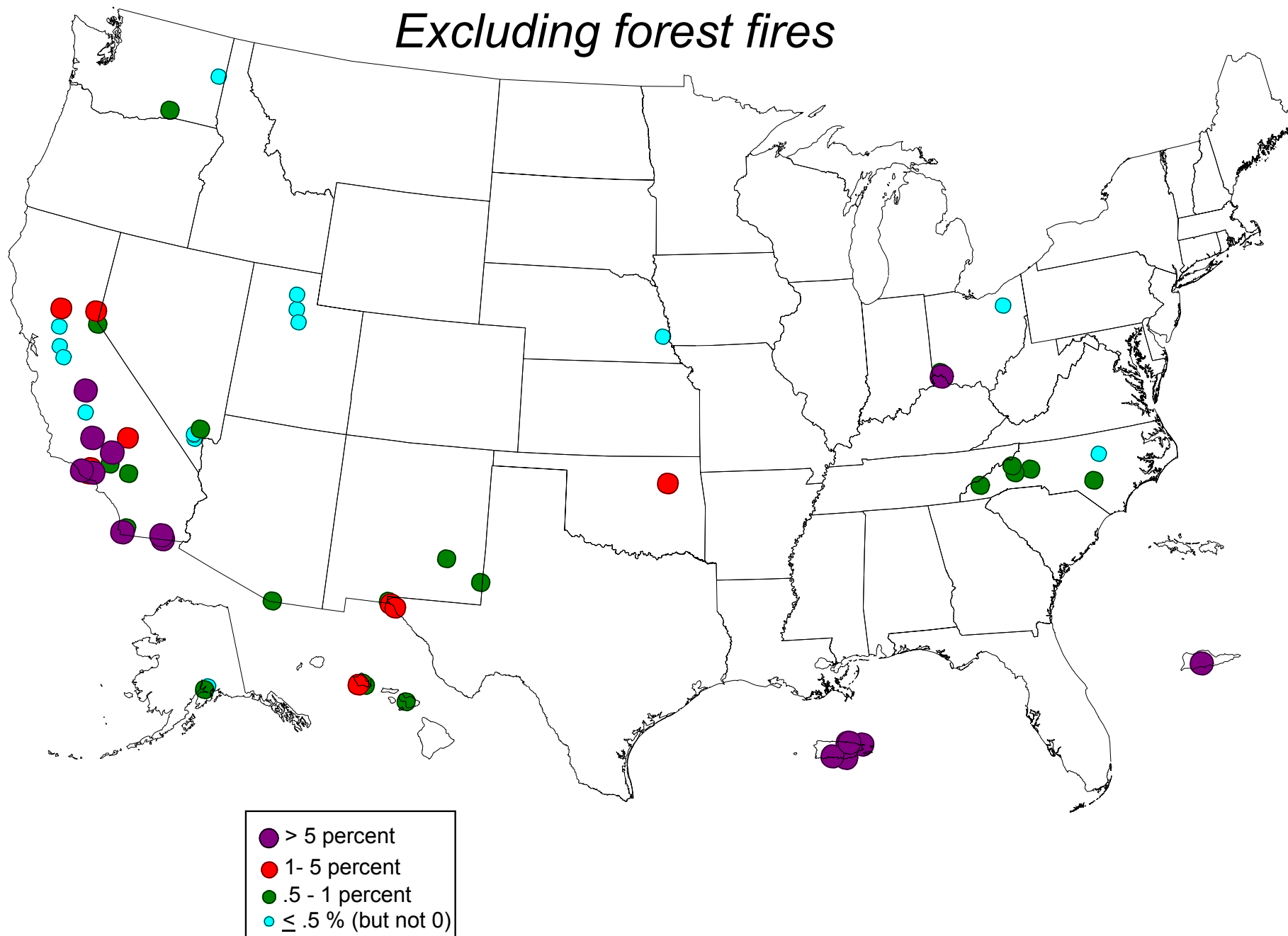
*PMc flag set to PMt flag if PMf flag blank*



# PMc: Percent of data flagged for events by site, 2001-2003

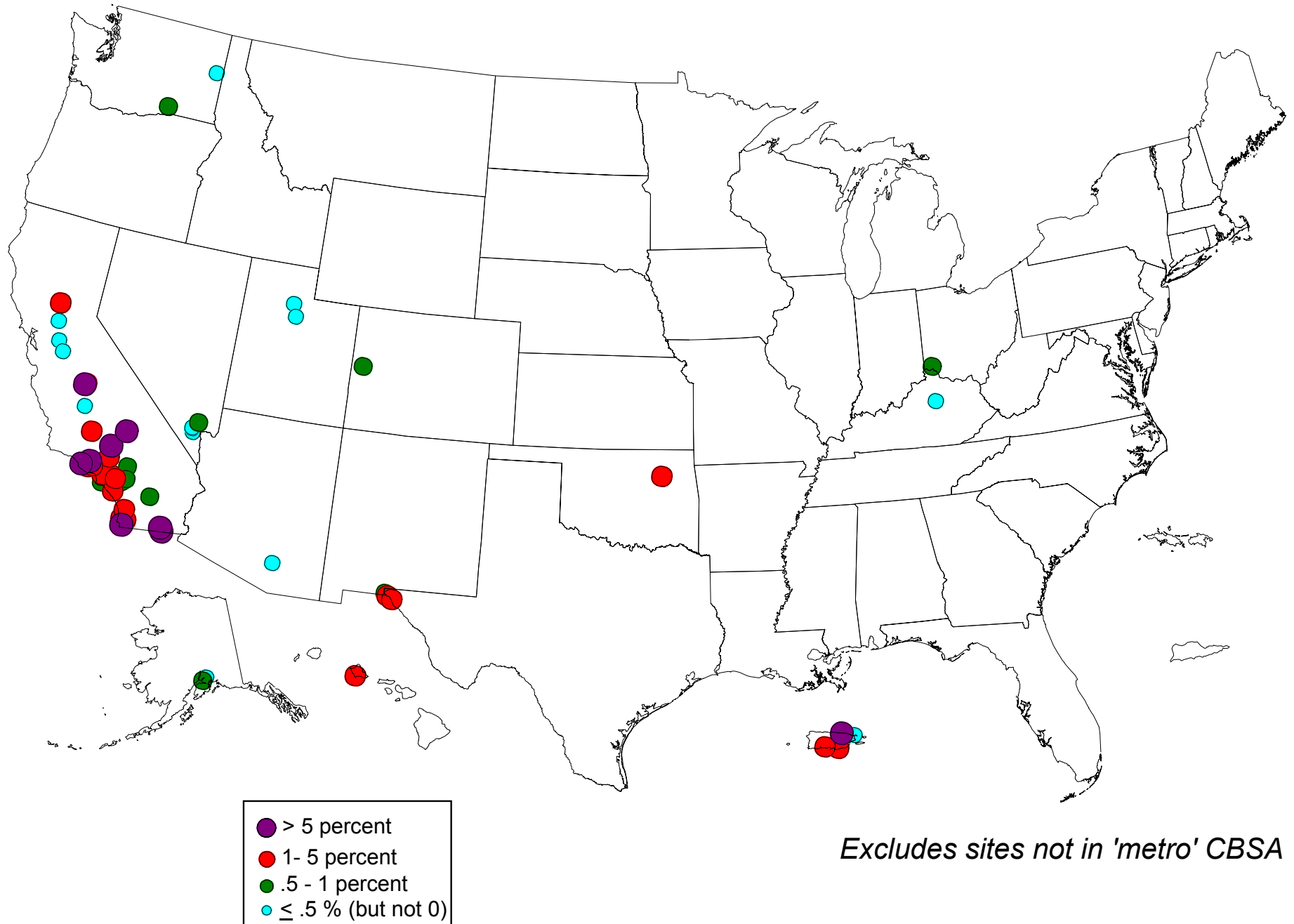
*PMc flag set to PMt flag if present, else PMf flag*

*Excluding forest fires*



# PMc: Percent of data flagged for events by site, 2001-2003

*PMc flag set to PMt flag if PMf flag blank*





CO

	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>3-year total</u>	<u>% of total</u>	<u>% of flagged</u>
<u>Observations</u>						
total number	3,697,608	3,493,156	3,419,615	10,610,379	100.000%	
flagged	183	342	123	648	0.006%	100.0%
unusual traffic congestion	174			174	0.002%	26.9%
structural fire	9			9	0.000%	1.4%
forest fire		342		342	0.003%	52.8%
volcanic eruptions			116	116	0.001%	17.9%
construction / demolition			7	7	0.000%	1.1%
<u>Sites</u>						
total number	496	480	451	538		
with flags	2	6	2	10		100.0%
unusual traffic congestion	1			1		10.0%
structural fire	1			1		10.0%
forest fire		6		6		60.0%
volcanic eruptions			1	1		10.0%
construction / demolition			1	1		10.0%

SO<sub>2</sub>

	2002	2003	2004	3-year total	% of total	% of flagged
<u>Observations</u>						
total number	4,679,317	4,442,511	4,352,908	13,474,736	100.000%	
flagged	9	2	1,134	1,145	0.008%	100.0%
structural fire	9			9	0.000%	0.8%
sandblasting		1		1	0.000%	0.1%
chemical spills		1		1	0.000%	0.1%
volcanic eruptions			1,134	1,134	0.008%	99.0%
<u>Sites</u>						
total number	575	557	555	639		
with flags	1	2	6	9		100.0%
structural fire	1			1		11.1%
sandblasting		1		1		11.1%
chemical spills		1		1		11.1%
volcanic eruptions			6	6		66.7%

NO<sub>2</sub>

	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>3-year total</u>	<u>% of total</u>	<u>% of flagged</u>
<u>Observations</u>						
total number	3,341,014	3,274,631	3,308,236	9,923,881	100.0000%	
flagged	33	0	0	93	0.0009%	100.0%
high winds	24			24	0.0002%	25.8%
structural fire	9			9	0.0001%	9.7%
volcanic eruptions			60	60	0.0006%	64.5%
<u>Sites</u>						
total number	442	442	442	502		
with flags	2	0	1	3		100.0%
high winds	1			1		33.3%
structural fire	1			1		33.3%
volcanic eruptions			1	1		33.3%



Pb

	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>3-year total</u>	<u>% of total</u>	<u>% of flagged</u>
<b><u>24-hour</u></b>						
<u>Observations</u>						
total number	13,383	12,781	11,690	37,854	100.000%	
flagged	54	37	2	93	0.246%	100.0%
high winds	3	10	2	15	0.040%	16.1%
construction/demolition	51	27		78	0.206%	83.9%
<u>Sites</u>						
total number	212	210	175	253		
with flags	2	3	1	3		100.0%
high winds	1	1	1	1		33.3%
construction/demolition	1	2		2		66.7%
<b><u>composite</u></b>						
<u>Observations</u>						
total number	293	301	281	875		
flagged	0	0	0	0		
<u>Sites</u>						
total number	30	26	24	34		
with flags	0	0	0	0		

O<sub>3</sub>

	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>3-year total</u>	<u>% of total</u>	<u>% of flagged</u>
<u>Observations</u>						
total number	7,579,646	7,686,984	7,707,420	22,974,050	100.000%	
flagged	2,624	4,229	14	6,867	0.030%	100.0%
forest fire	2,621	4,085	14	6,720	0.029%	97.9%
structural fire	3			3	0.000%	0.0%
prescribed burn		144		144	0.001%	2.1%
<u>Sites</u>						
total number	1,187	1,204	1,203	1,292		
with flags	59	18	2	76		100.0%
forest fire	58	15	2	72		94.7%
structural fire	1			1		1.3%
prescribed burn		3		3		3.9%

PM<sub>10</sub>

	2002	2003	2004	3-year total	% of total	% of flagged
<b>24-hour</b>						
<u>Observations</u>						
total number	93,358	87,069	86,675	267,102	100.000%	
flagged	705	767	676	2,148	0.804%	100.0%
high winds	203	247	174	624	0.234%	29.1%
volcanic eruptions	7	117	44	168	0.063%	7.8%
sandblasting	1			1	0.000%	0.0%
forest fire	131	175	23	329	0.123%	15.3%
high pollen count	2			2	0.001%	0.1%
construction / demolition	29	81	119	229	0.086%	10.7%
agricultural tilling	2	2		4	0.001%	0.2%
highway construction	76	13		89	0.033%	4.1%
sanding/salting of streets	1			1	0.000%	0.0%
infrequent large gatherings	11	11	10	32	0.012%	1.5%
Sahara dust	242	108	305	655	0.245%	30.5%
rerouting of traffic		13		13	0.005%	0.6%
cleanup after major disaster			1	1	0.000%	0.0%
<u>Sites</u>						
total number	1,063	969	916	1,148		
flagged	146	158	83	239		100.0%
high winds	64	57	35	97		40.6%
volcanic eruptions	3	19	15	19		7.9%
sandblasting	1			1		0.4%
forest fire	59	85	17	127		53.1%
high pollen count	1			1		0.4%
construction / demolition	4	7	9	17		7.1%
agricultural tilling	1	2		2		0.8%
highway construction	1	1		1		0.4%
sanding/salting of streets	1			1		0.4%
infrequent large gatherings	6	6	5	6		2.5%
Sahara dust	23	22	20	23		9.6%
rerouting of traffic		1		1		0.4%
cleanup after major disaster			1	1		0.4%
<b>1-hour</b>						
<u>Observations</u>						
total number	1,273,532	1,385,258	1,465,802	4,124,592	100.000%	
flagged	3,555	7,915	3,698	15,168	0.368%	100.0%
high winds	1,319	2,316	1,200	4,835	0.117%	31.9%
volcanic eruptions	24	105	190	319	0.008%	2.1%
forest fire	2,002	5,111	972	8,085	0.196%	53.3%
Sahara dust	210	383	1,235	1,828	0.044%	12.1%
sandblasting			69	69	0.002%	0.5%
chemical spills & indust. accidents			8	8	0.000%	0.1%
agricultural tilling			24	24	0.001%	0.2%
<u>Sites</u>						
total number	170	186	198	225		
flagged	28	32	21	55		100.0%
high winds	9	16	11	24		43.6%
volcanic eruptions	1	1	1	1		1.8%
forest fire	18	15	6	28		50.9%
Sahara dust	1	1	1	1		1.8%
sandblasting			1	1		1.8%
chemical spills & indust. accidents			1	1		1.8%
agricultural tilling			1	1		1.8%