11861 ART—Supplemental Material on Treatment of Data Below MDL

In this study, many of the reported measurements were at levels below the Method Detection Limit (MDL). Across all hazardous air pollutants (HAPs), about 60% of reported measurements in the data set were below the MDL. Data below MDL are reported to the Air Quality System (AQS) in a variety of ways, including values of zero, MDL, MDL/2, MDL/3, or the measured value. Using reported values can introduce systematic jurisdictional biases for data below MDL. However, the large fraction of data below the MDL did not preclude their use in this analysis. When even a small fraction of reported data is above MDL, techniques are available to calculate annual averages with reasonably small uncertainties such as substitution, Kaplan-Meier, and Regression on Order statistics. Explanations of the differences in methods for substitution of data below MDL to better estimate summary statistics such as the mean concentration have been the subject of much recent work (Helsel 2005a,b; Antweiler and Taylor 2008). Here we present background material on how we determined that substituting 85% of data below MDL was a reasonable limit for estimating annual mean concentrations.

Methods

A subset of the ambient monitoring database was used to develop a test of the various below MDL substitution methods. Measurements of 1,3-butadiene (25 monitoring sites), 1,4-dichlorobenzene (22 monitoring sites), and tetrachloroethylene (19 monitoring sites) from 2003 to 2005 were taken from the larger database. Measurements of the pollutants at each of the monitoring sites were reported with better than 90% of data above the MDL. True mean concentrations were calculated based on these reported values for each of the individual pollutants.

After calculating the true mean concentrations at each sites, we censored the values at each sites so that a specified percentage of data would, in effect, mimic being reported below the MDL. For example, if the median concentration reported at a site was 0.5 $\mu g/m^3$, we censored data below 0.5 $\mu g/m^3$ to mimic the effect of having 50% of reported data below the MDL. After censoring the data set at intervals of 10%, we used four below-MDL substitution techniques and calculated the annual mean concentration for each of the methods. Absolute percentage differences between the true mean concentration and the substituted method were calculated for each of the sites and pollutants. We then took the mean percentage bias for each of the sites and pollutants along with the standard deviation across all sites.

The four techniques used to investigate substitution of data below the MDL are listed in Supplemental Table 1. For more information on the more sophisticated treatments, the interested reader is referred to Antweiler and Taylor (2008).

Results

Supplemental Figure 1 illustrates the results from the MDL substitution analysis. All methods are essentially comparable at 50% or less of data below MDL, although Kaplan-Meier does have a higher mean bias than the other three methods. At 80% of data reported below MDL, the mean percentage bias is still below 20% for maximum-likelihood estimation, regression-on-order statistics, and MDL/2 substitution. While there are certainly some outliers, the pattern of increasing percentage bias does not go exponential until the 80-90% range. At this point, the bias starts to become large relative to the concentration regardless of method. These results are qualitatively similar to the results of Antweiler and Taylor (2008). In contrast to our results, they found that the bias in the mean concentration “exploded” at a value of 70% of reported samples below detection. We found that the bias “exploded” at a percentage above

80%. It is possible that our method arbitrarily chose one MDL for each mean value, which would reduce the bias relative to a data set with multiple reported MDLs. However, more than 95% of all reported HAPs measurements have only a single MDL reported at a monitoring site over the course of a year.

Discussion

Air toxics monitoring data typically display a log-normal distribution of concentrations. In other words, most reported samples have low concentrations, but a few samples have much higher concentrations. When calculating an annual mean concentration, the value is predominantly reflective of these high outlier concentrations and their frequency relative to the lower concentrations. In data sets where even a small fraction of these high outlier concentrations are above the MDL, the mean concentration will predominantly reflect the influence of the high concentrations. Our results in Supplemental Figure 1 and the results from Antweiler and Taylor (2008) provide a reasonable certainty that the relative bias in the mean concentration will be small. Our estimates show that the average bias is on the order of 20% and that most substituted mean concentrations will be within 50% of the true mean concentration when up to 85% of the data is below MDL.

Biases in mean concentrations of 50% are small relative to our estimates of the national distribution of observed concentrations for all air toxics. Most of the observed pollutant concentration distributions vary by a factor of 6 to 20 nationally. A bias in mean concentrations of 50% is small relative to the national distributions, and the conclusions are not based on quantifying concentrations to within a factor of 2. Moreover, in Tables 1 and 2 of the manuscript, we only use the fraction of data reported below MDL as a measure of confidence in our mean concentrations. Those sites and pollutants with more than 85% of data below the MDL

are not considered to have quantifiable mean concentrations. Comparisons are only made between the reported mean MDL value and the health benchmark to determine whether the concentration could potentially exceed the health benchmark value.

Supplemental Table 2 provides the national percentage of data reported below MDL for each pollutant examined in this study for the years 2003-2005.

References

Antweiler RC, Taylor HE. 2008. Evaluation of statistical treatments of left-censored environmental data using coincident uncensored data sets: I. summary statistics. Environ Sci Technol 42(10.1021/es071301c): 3732-3738.

Helsel DR. 2005a. Nondetects and data analysis: statistics for censored environmental data. Hoboken, NJ: John Wiley & Sons, Inc.

Helsel DR. 2005b. More than obvious: better methods for interpreting nondetect data. Environ Sci Technol: 419A-423A.

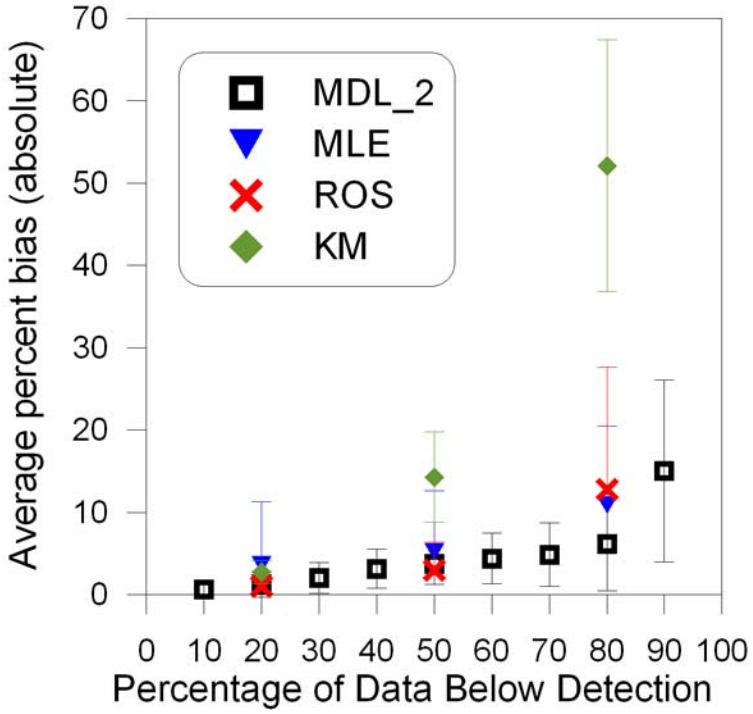
Supplemental Table 1. Description of substitution methods investigated.

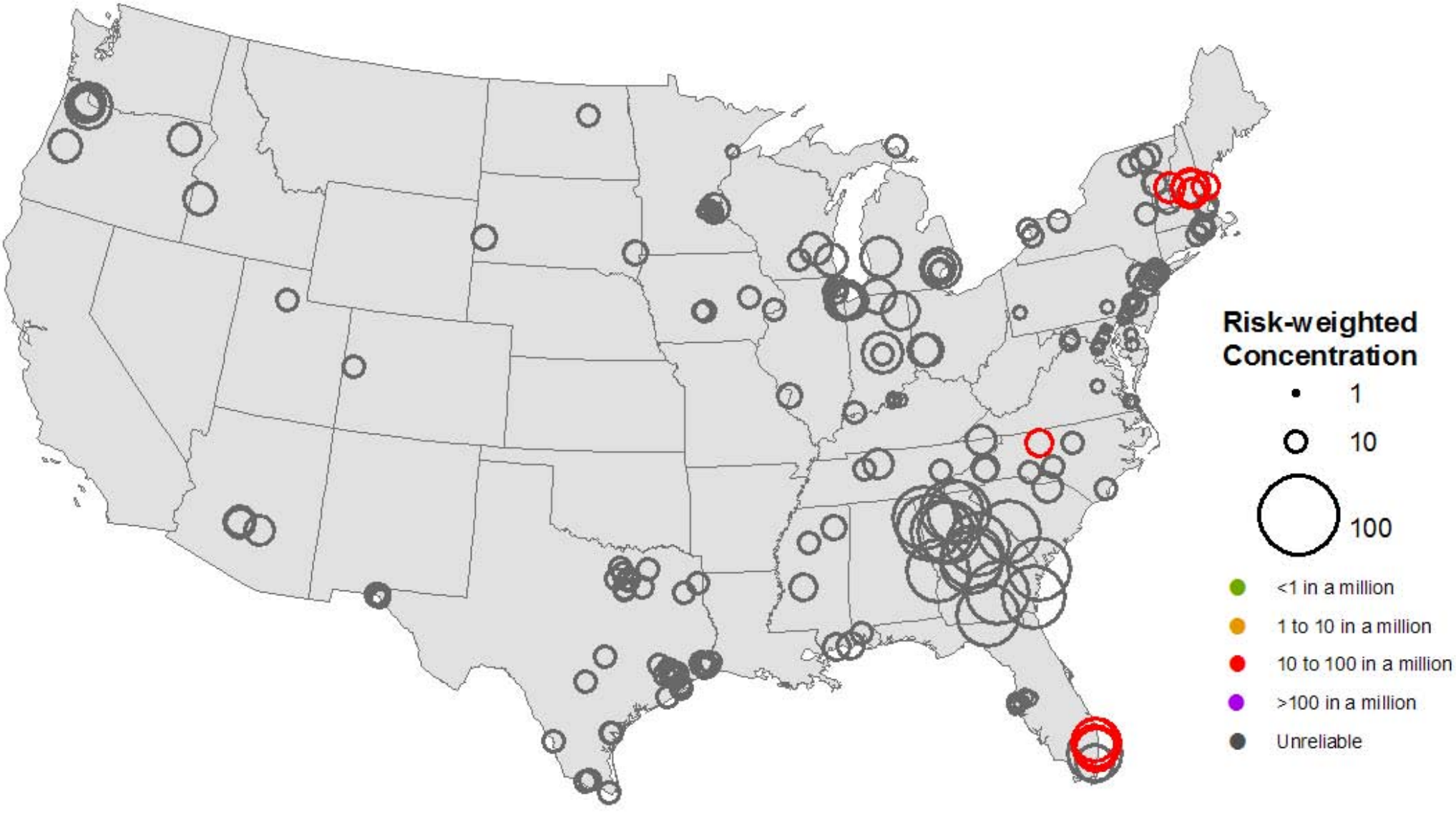
MDL substitution method	Method description
MDL/2	MDL value is divided by two and substituted for all measurements below the MDL.
Kaplan-Meier Survival Analysis	Produces estimates of the survival function. The fit to the survival function is used to calculate summary statistics.
Regression-on-Order Statistics	Estimates distribution of data by fitting observations. The fit to the observed data is used to extrapolate the censored data concentrations and calculate summary statistics.
Maximum Likelihood Estimation	Assumes a distribution of data to solve a likelihood function based on data above and below censored values.

Supplemenal Table 2. Percent of samples reported below the MDL for the U.S. from 2003-2005.

PARAMETER	Percent below MDL	PARAMETER	Percent below MDL
1,1,2,2-Tetrachloroethane	96.6	Chloroprene	99.2
1,1,2-Trichloroethane	98.4	Chromium VI	54.9
1,1-Dichloroethane	97.4	Chrysene	86.8
1,1-Dichloroethylene	97.9	Cobalt	96.2
1,2,4-Trichlorobenzene	90.0	Dibenzo[A,H]Anthracene	97.9
1,2-Dichloropropane	96.1	Dichloromethane	52.6
1,3-Butadiene	25.7	Ethylbenzene	9.5
1,3-Dichloropropene (sum)	95.8	Ethylene Dibromide	98.0
1,4-Dichlorobenzene	64.2	Ethylene Dichloride	95.2
1,4-Dioxane	93.5	Ethylene Oxide	37.6
3-Chloropropene	99.8	Formaldehyde	34.9
Acetaldehyde	4.0	Hexachlorobutadiene	95.1
Acetonitrile	58.0	Hydrogen Sulfide	91.1
Acrolein	43.0	Indeno[1,2,3-Cd]Pyrene	92.4
Acrylonitrile	70.4	Isopropylbenzene	61.0
Arsenic	60.4	Lead	37.2
Benzene	2.2	Manganese	34.8
Benzo[A]Anthracene	90.4	Mercury	87.2
Benzo[A]Pyrene	93.8	Methyl Chloroform	72.1
Benzo[B]Fluoranthene	89.9	Methyl Isobutyl Ketone	87.1
Benzo[K]Fluoranthene	93.0	Methyl Methacrylate	97.9
Benzyl Chloride	94.7	Methyl Tert-Butyl Ether	57.5
Beryllium	82.4	Naphthalene	51.5
Bromoform	99.9	n-Hexane	2.1
Bromomethane	92.0	Nickel	56.7
Cadmium	92.8	Selenium	54.6
Carbon Disulfide	73.4	Styrene	51.2
Carbon Tetrachloride	41.9	Tetrachloroethylene	68.9
Chlorobenzene	83.5	Toluene	0.8
Chloroethane	92.5	Trichloroethylene	86.7
Chloroform	74.4	Vinyl Acetate	17.5
Chloromethane	5.5	Vinyl Chloride	96.3

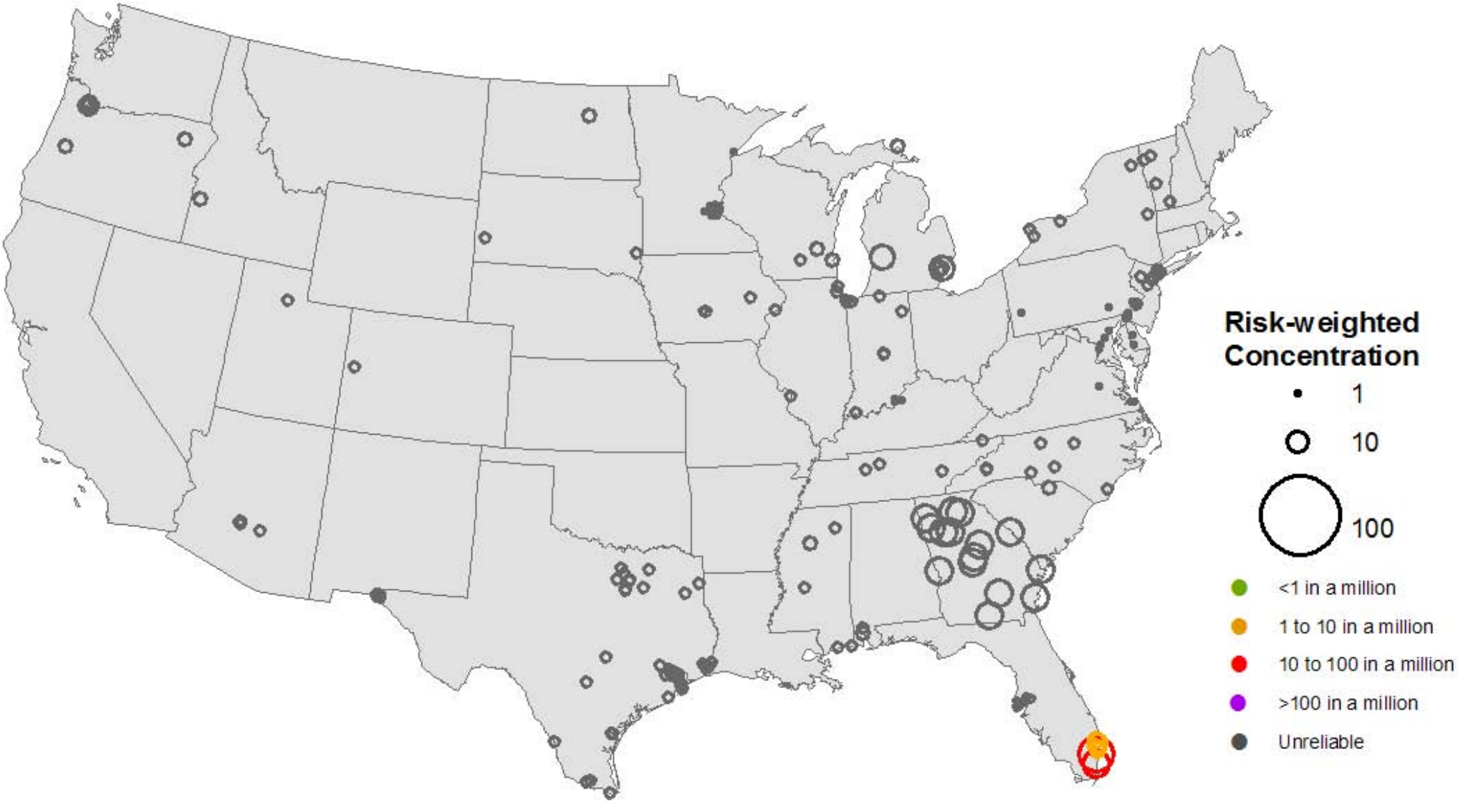
Supplemental Figure 1. Average percent bias in the mean concentration as a function of the percentage of data below detection for four substitution methods. Error bars indicate the standard deviation.





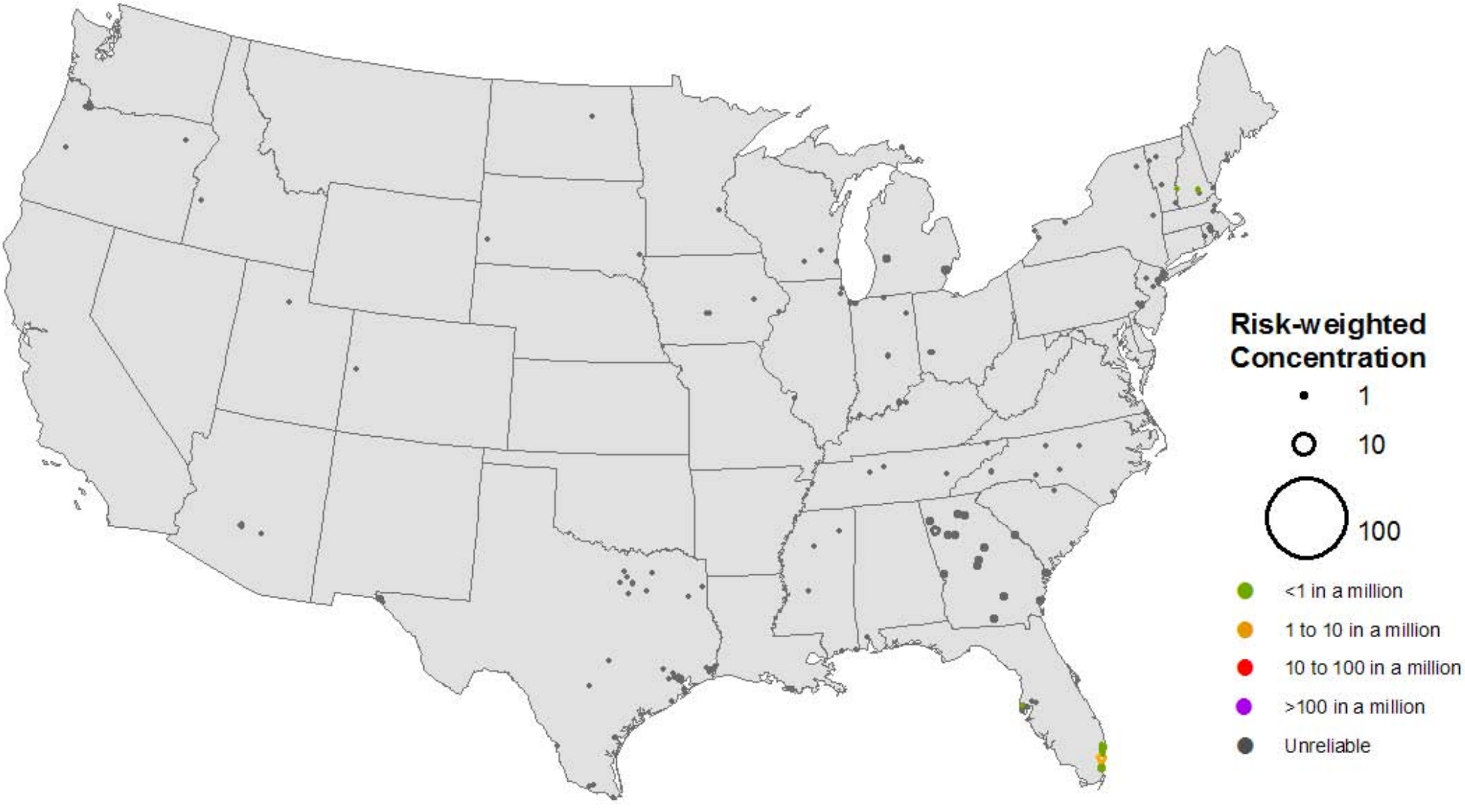
PARAMETER = '1,1,2,2-Tetrachloroethane'

Supplemental Figure 2. Chronic cancer risk (per million) for site averages, 2003-2005.



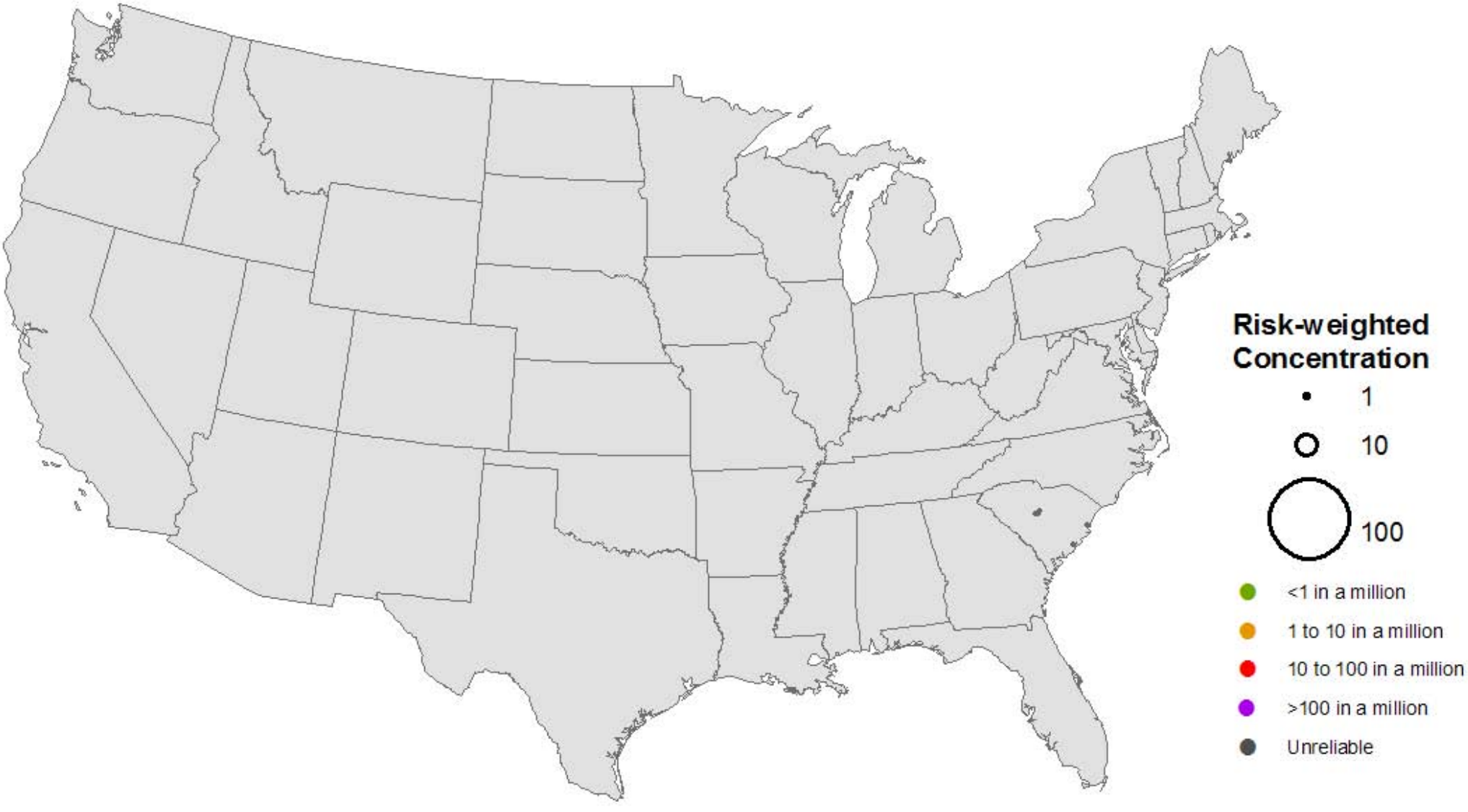
PARAMETER = '1,1,2-Trichloroethane'

Supplemental Figure 3. Chronic cancer risk (per million) for site averages, 2003-2005.



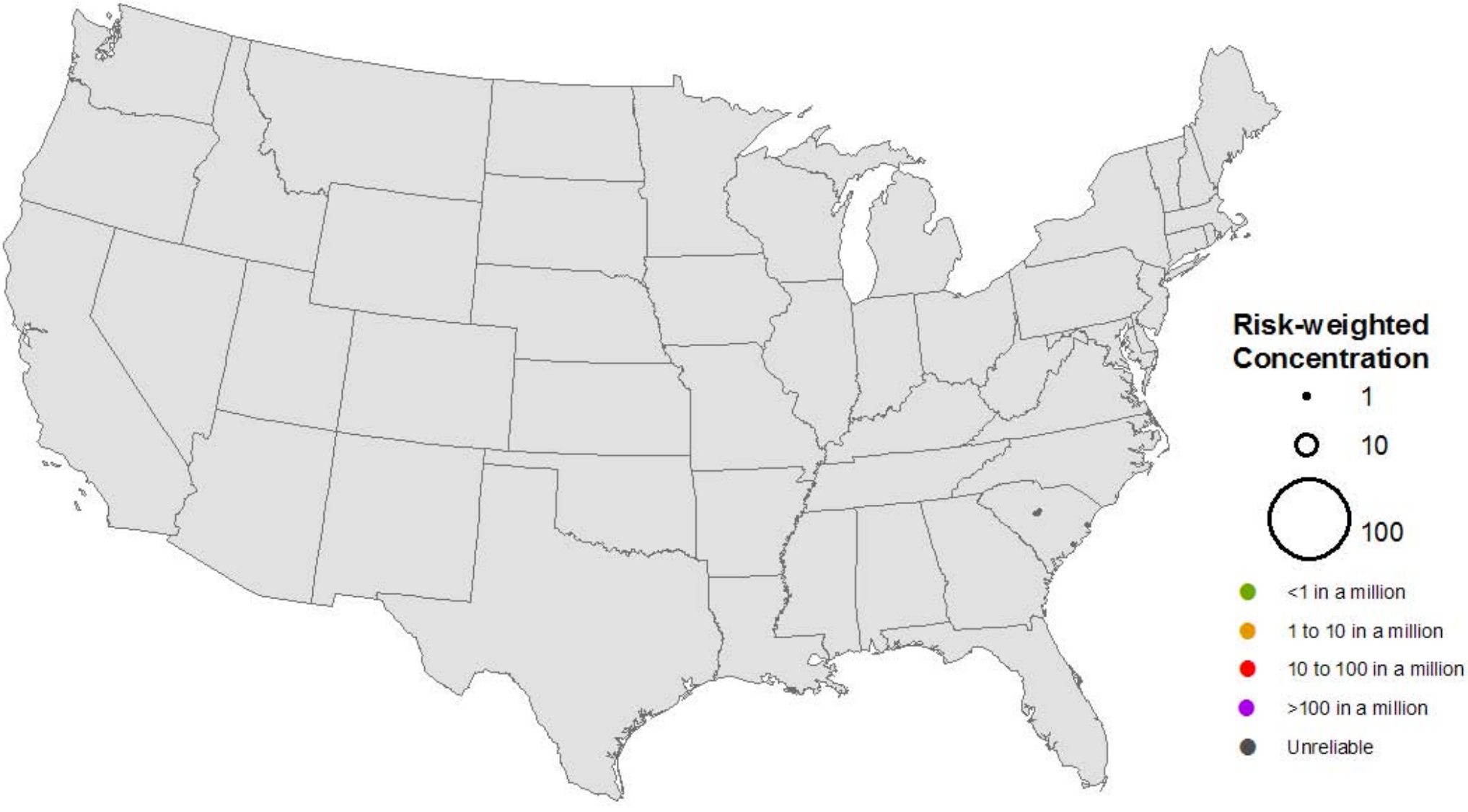
PARAMETER = '1,1-Dichloroethane'

Supplemental Figure 4. Chronic cancer risk (per million) for site averages, 2003-2005.



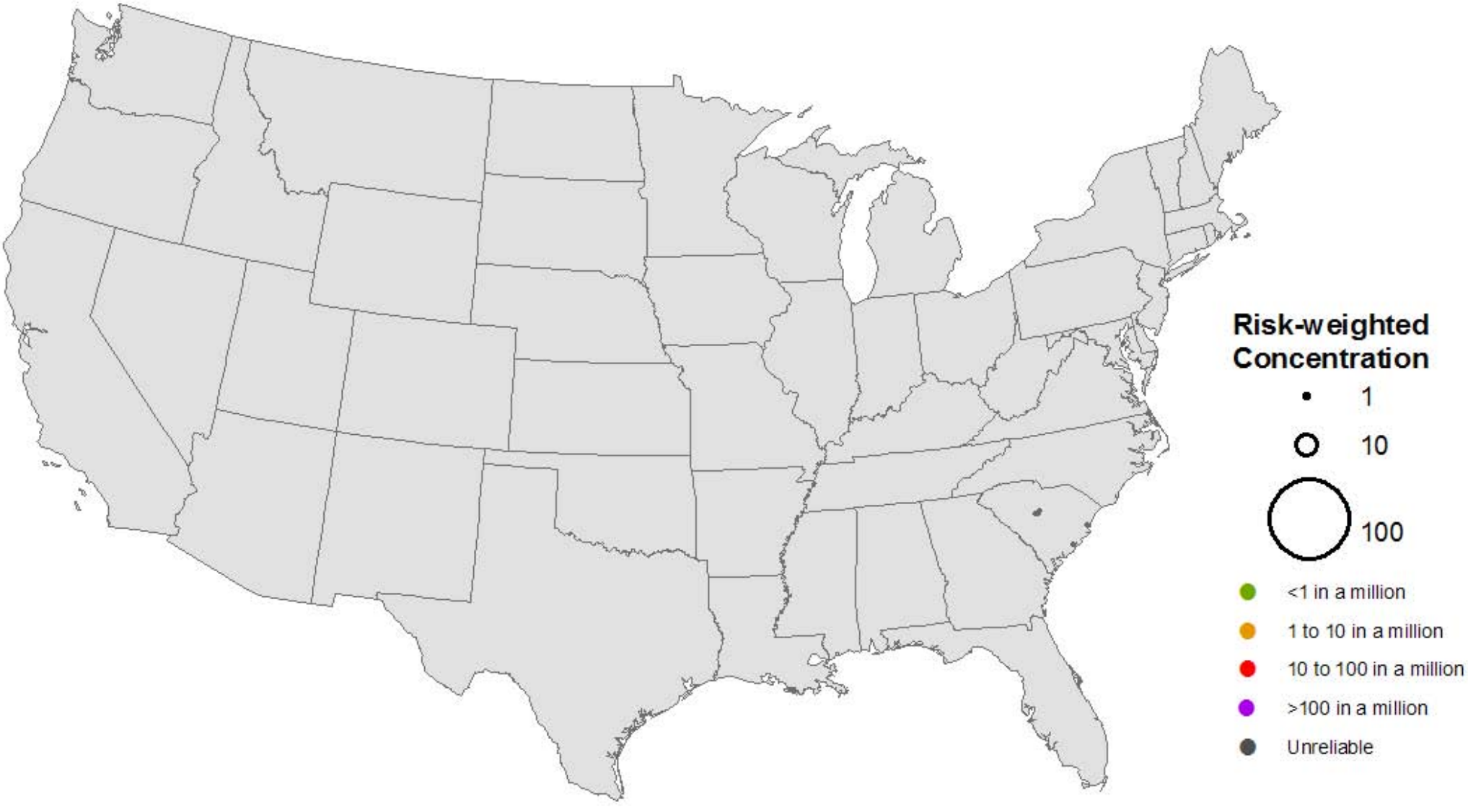
PARAMETER = '1,1-Dichloroethylididene Bis (4-Chlorobenzene)'

Supplemental Figure 5. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = '1,2,3,4,5,6- Hexachlolocyclohexane, .Beta.-'

Supplemental Figure 6. Chronic cancer risk (per million) for site averages, 2003-2005.

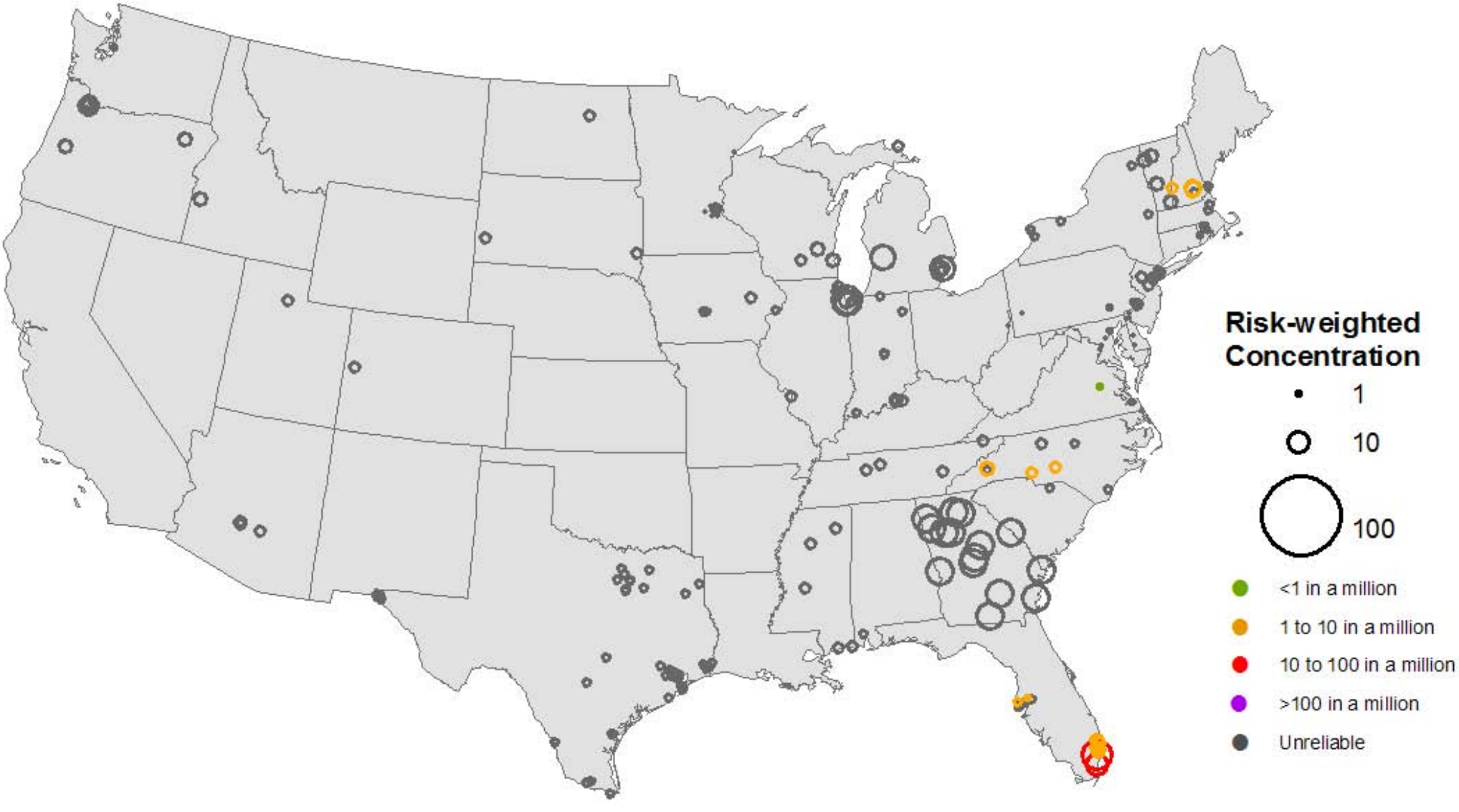


PARAMETER = '1,2,3,4,5,6- Hexachlorocyclohexane'

Supplemental Figure 7. Chronic cancer risk (per million) for site averages, 2003-2005.

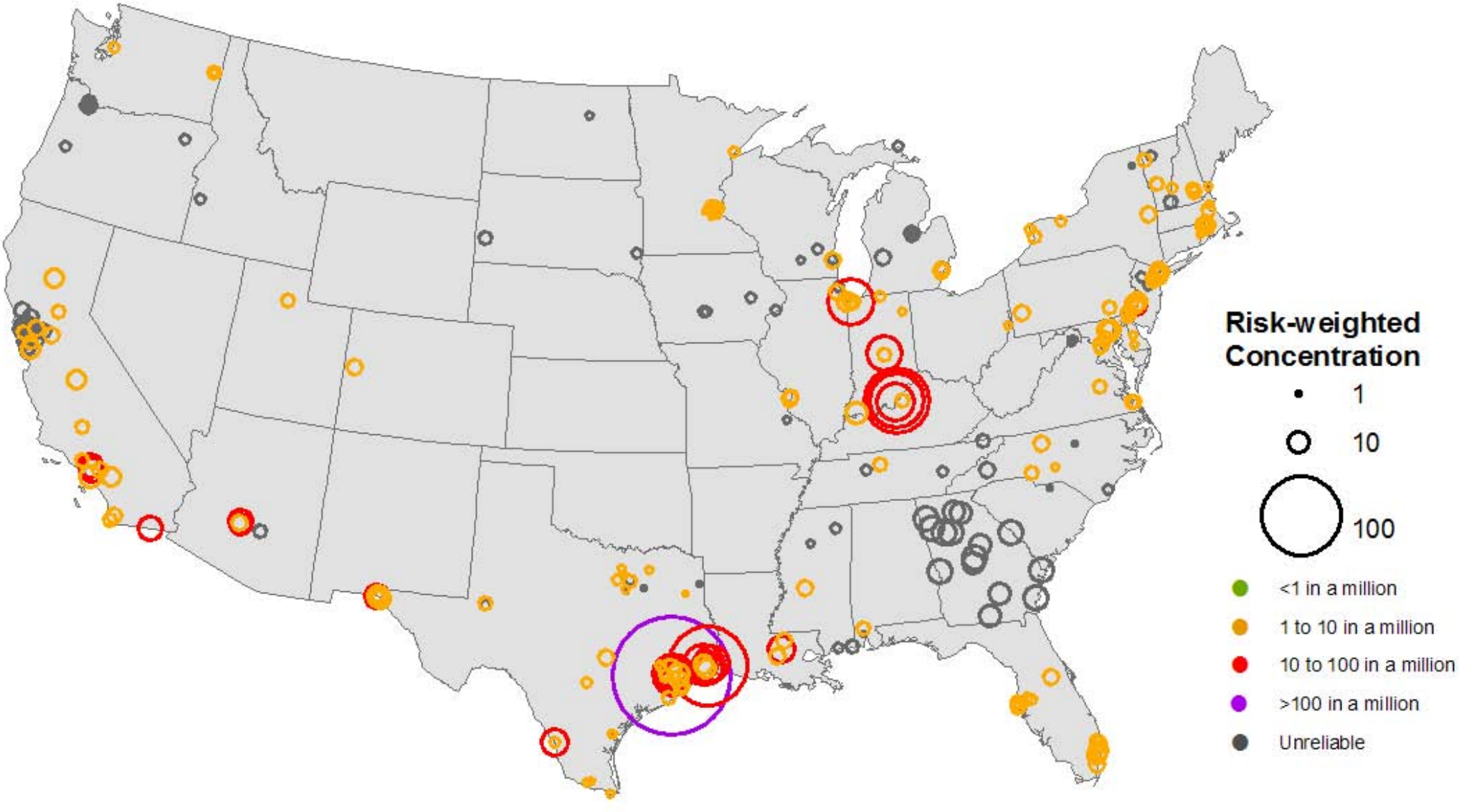
PARAMETER = '1,2-Dibromo-3-Chloropropane'

Supplemental Figure 8. Chronic cancer risk (per million) for site averages, 2003-2005.



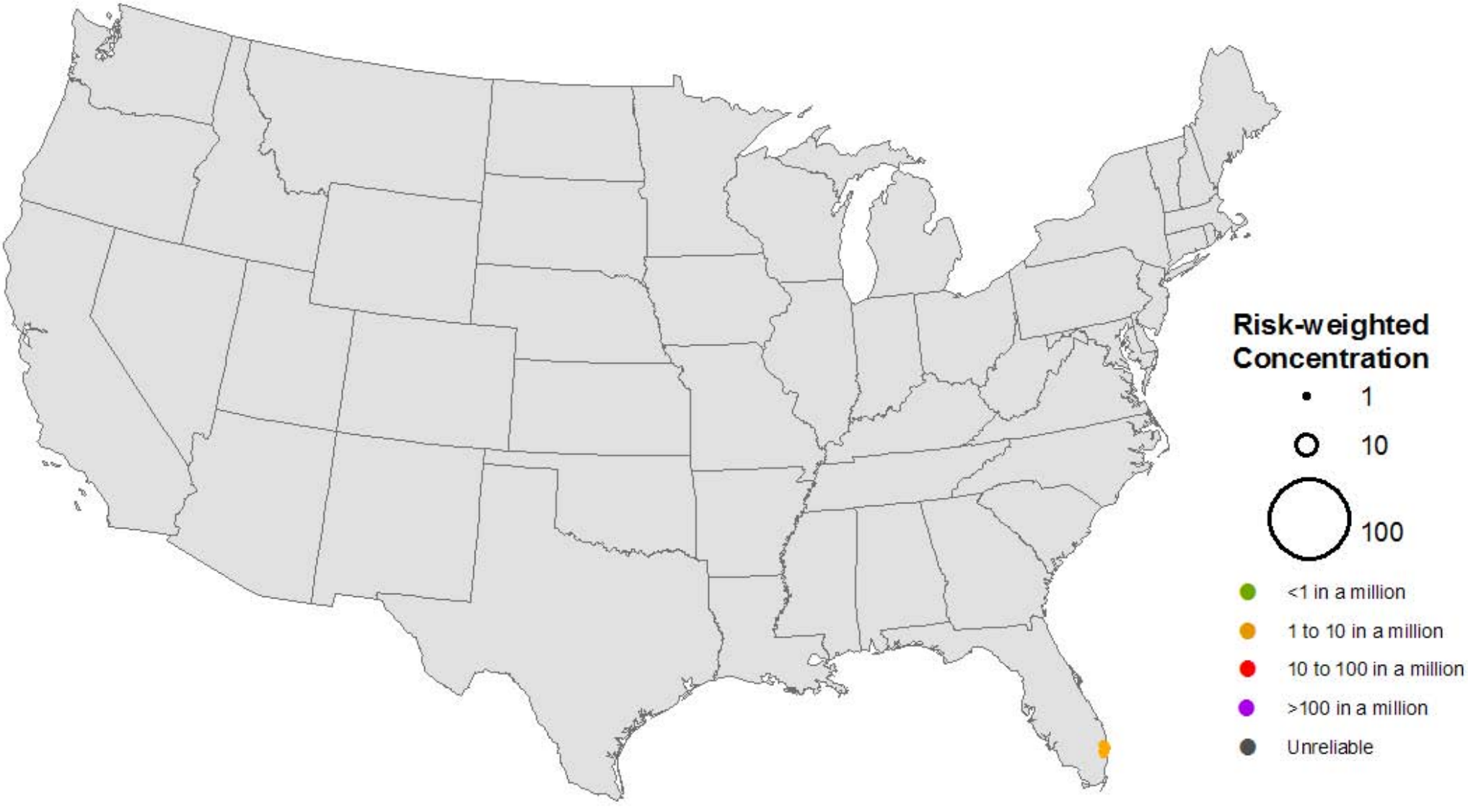
PARAMETER = '1,2-Dichloropropane'

Supplemental Figure 9. Chronic cancer risk (per million) for site averages, 2003-2005.



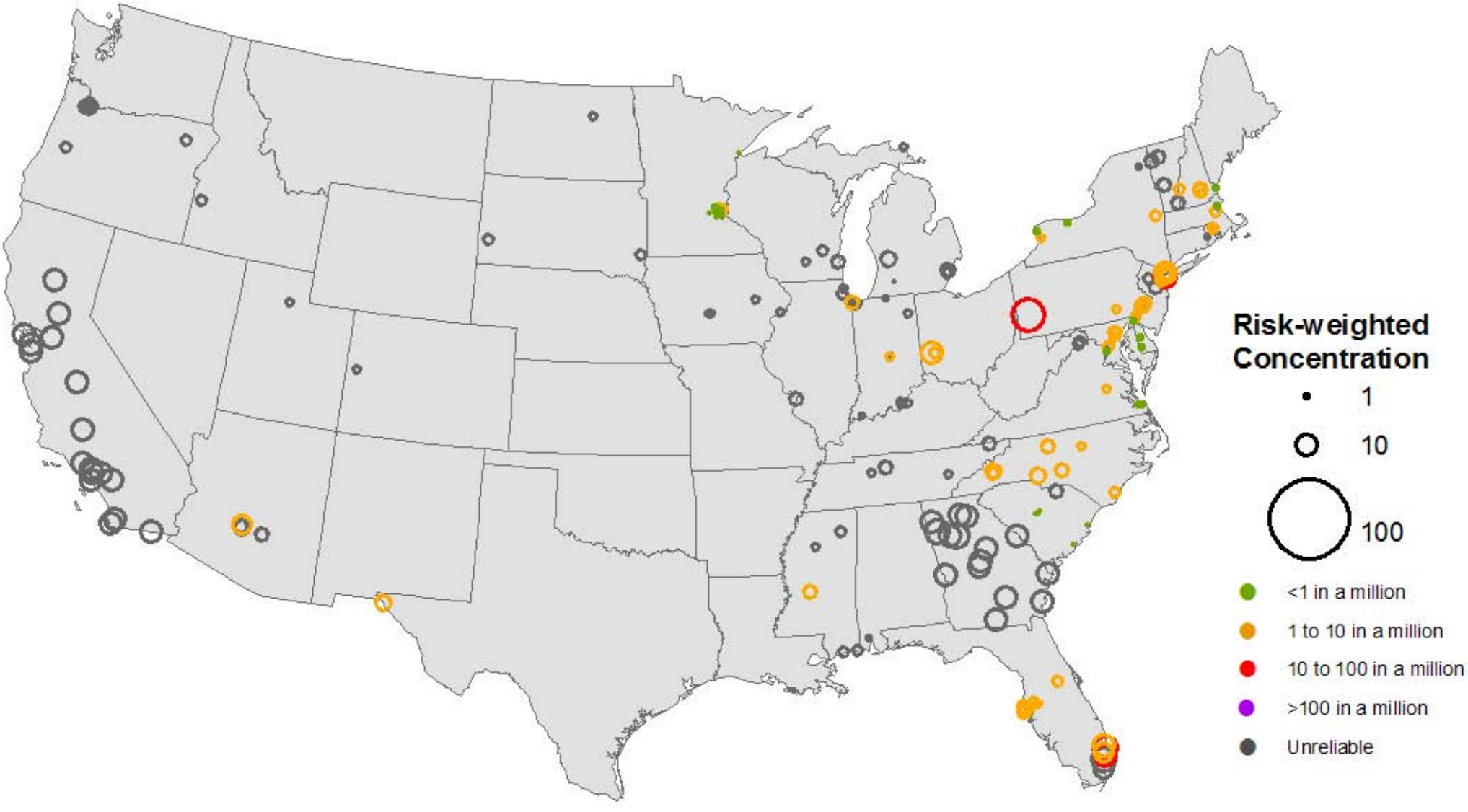
PARAMETER = '1,3-Butadiene'

Supplemental Figure 10. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = '1,3-Dichloropropene(Total)'

Supplemental Figure 11. Chronic cancer risk (per million) for site averages, 2003-2005.

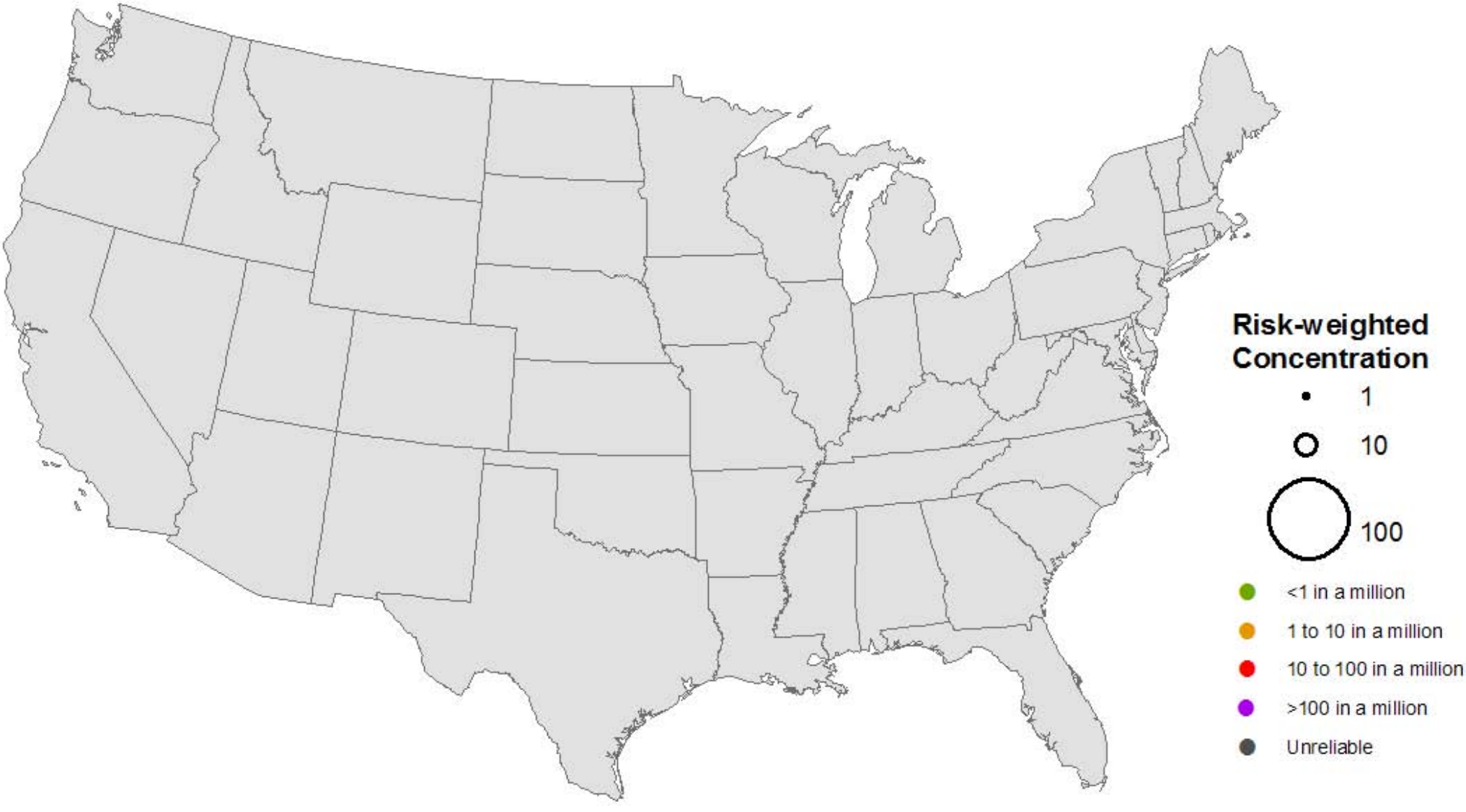


PARAMETER = '1,4-Dichlorobenzene'

Supplemental Figure 12. Chronic cancer risk (per million) for site averages, 2003-2005.

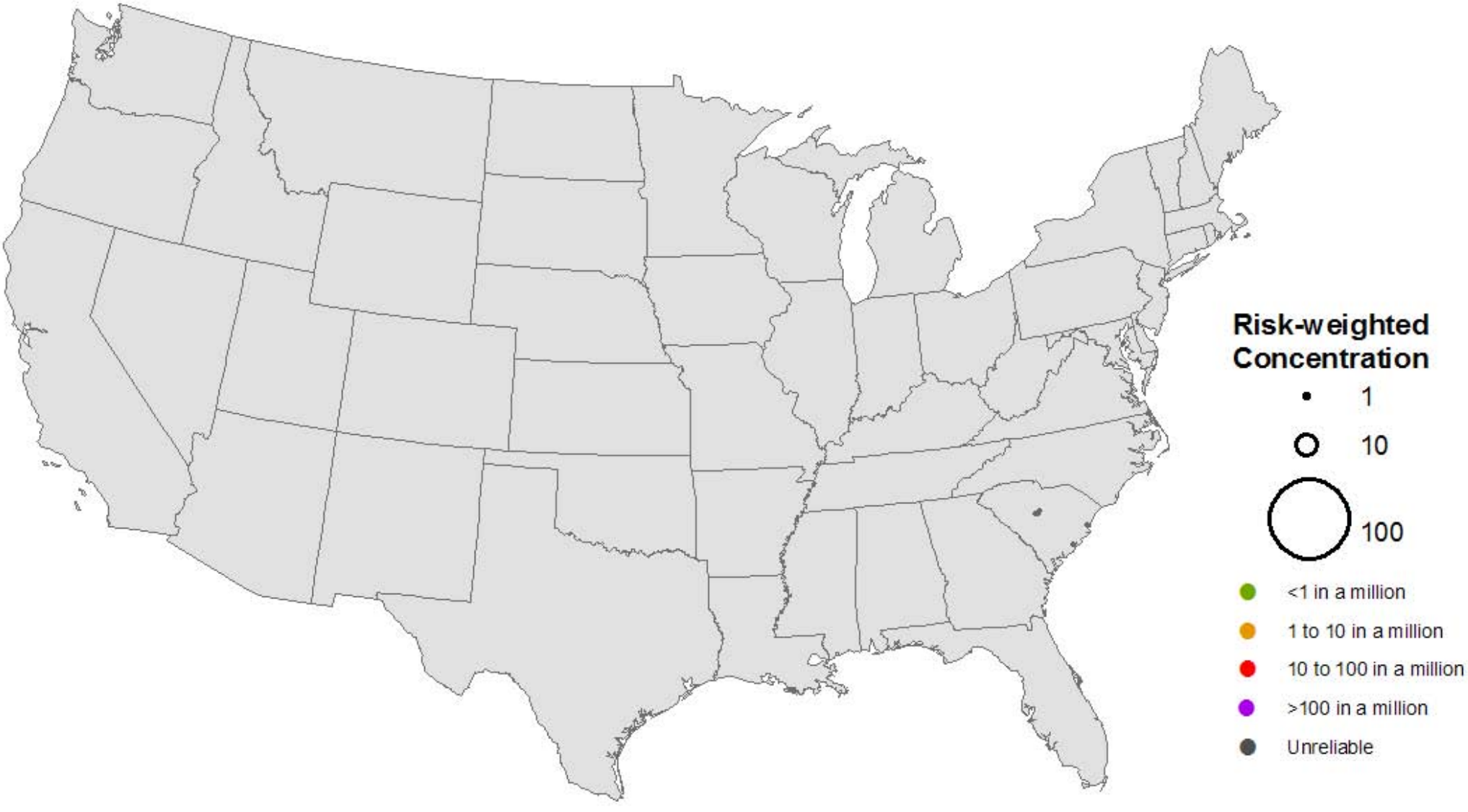
PARAMETER = '1,4-Dioxane'

Supplemental Figure 13. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = '2,4,6-Trichlorophenol'

Supplemental Figure 14. Chronic cancer risk (per million) for site averages, 2003-2005.

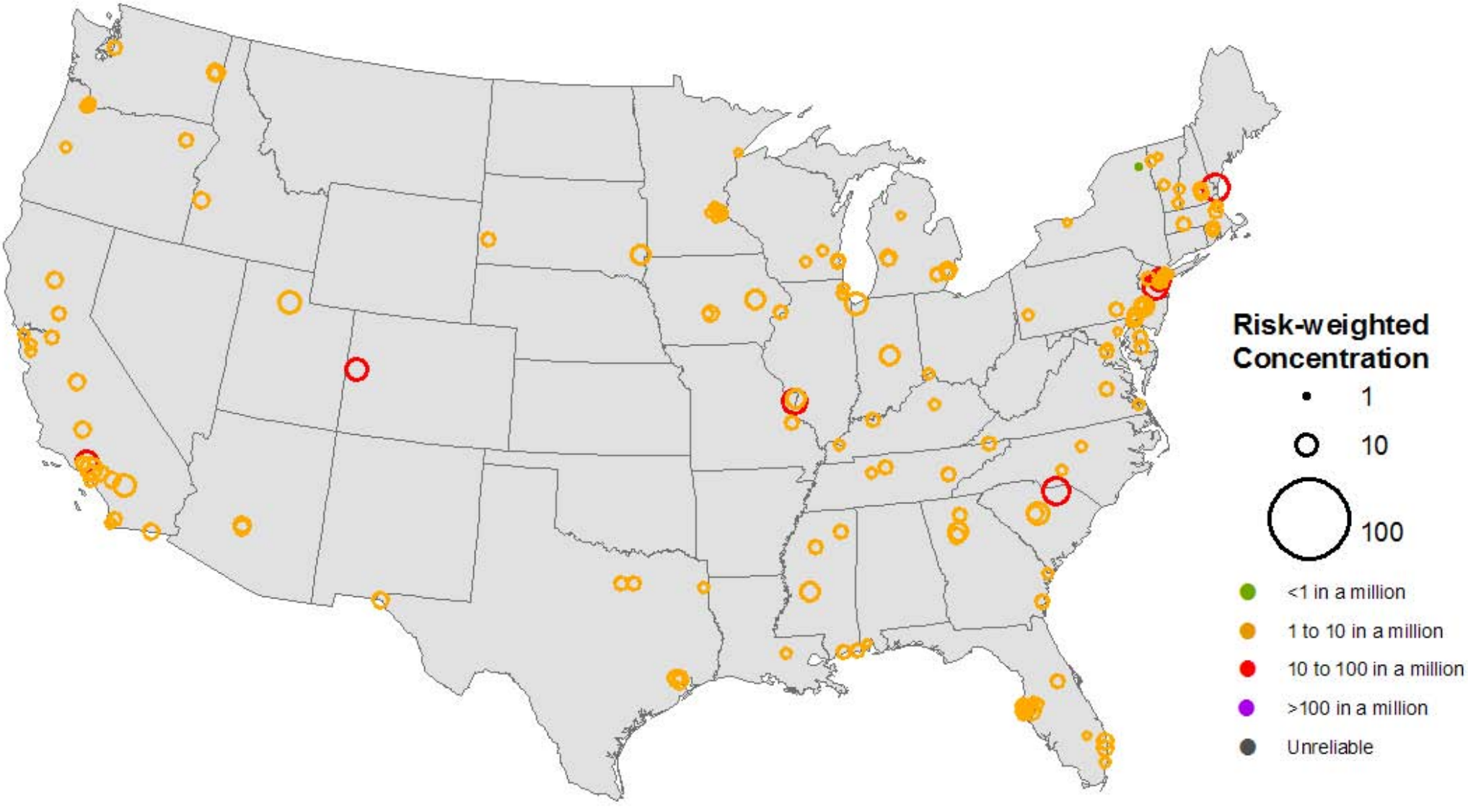


PARAMETER = '2,4-Dinitrotoluene'

Supplemental Figure 15. Chronic cancer risk (per million) for site averages, 2003-2005.

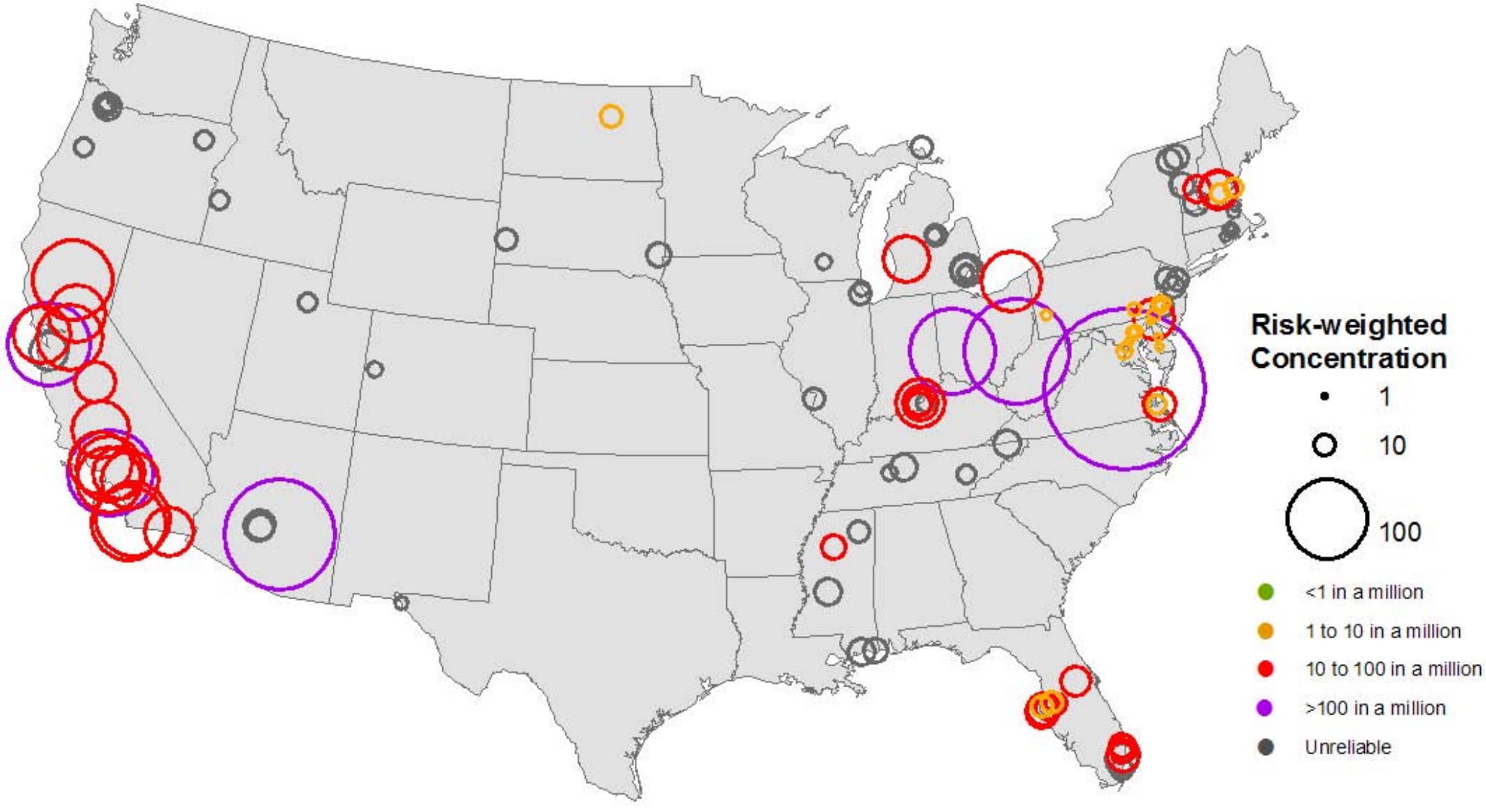
PARAMETER = '3-Chloropropene'

Supplemental Figure 16. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Acetaldehyde'

Supplemental Figure 17. Chronic cancer risk (per million) for site averages, 2003-2005.

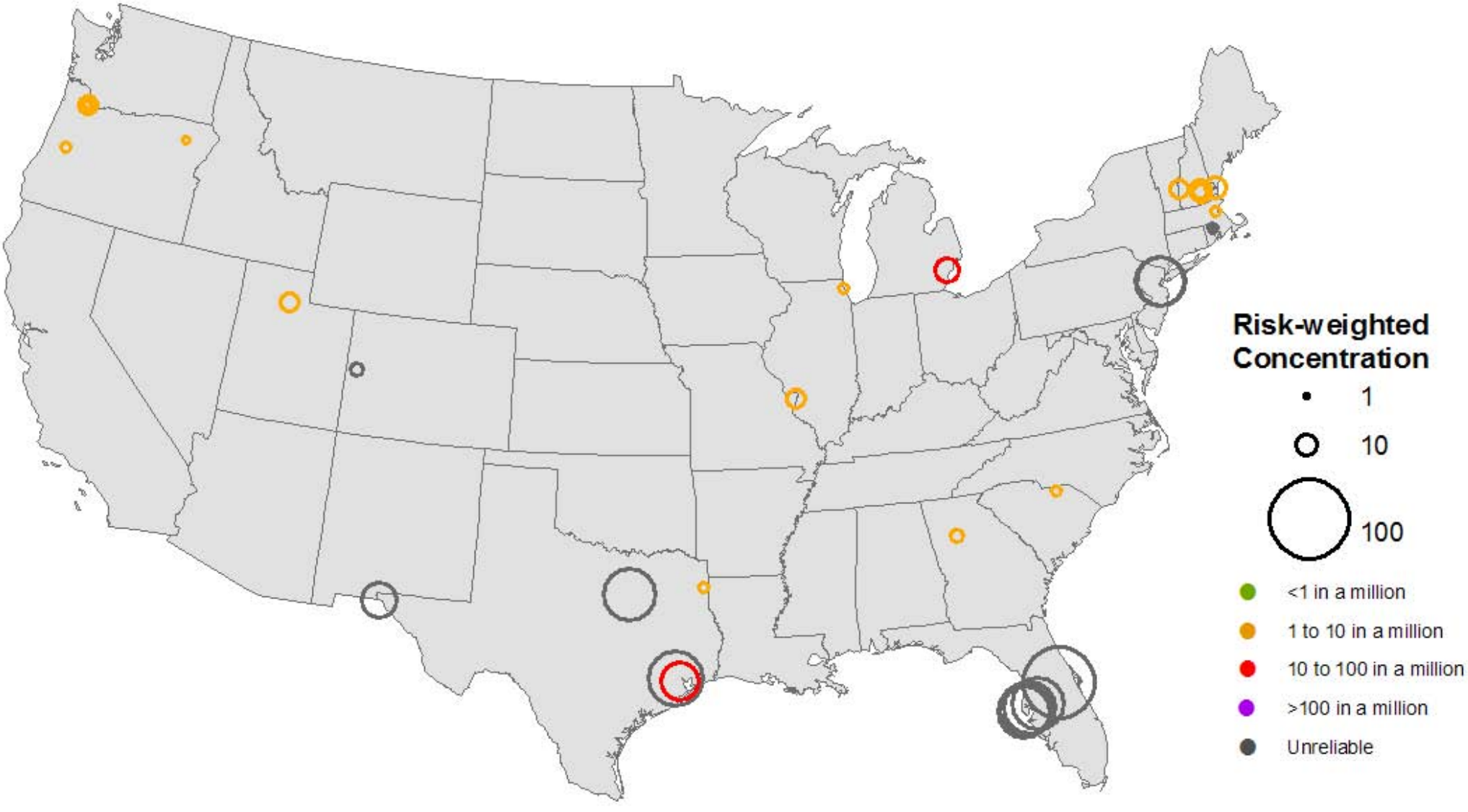


PARAMETER = 'Acrylonitrile'

Supplemental Figure 18. Chronic cancer risk (per million) for site averages, 2003-2005.

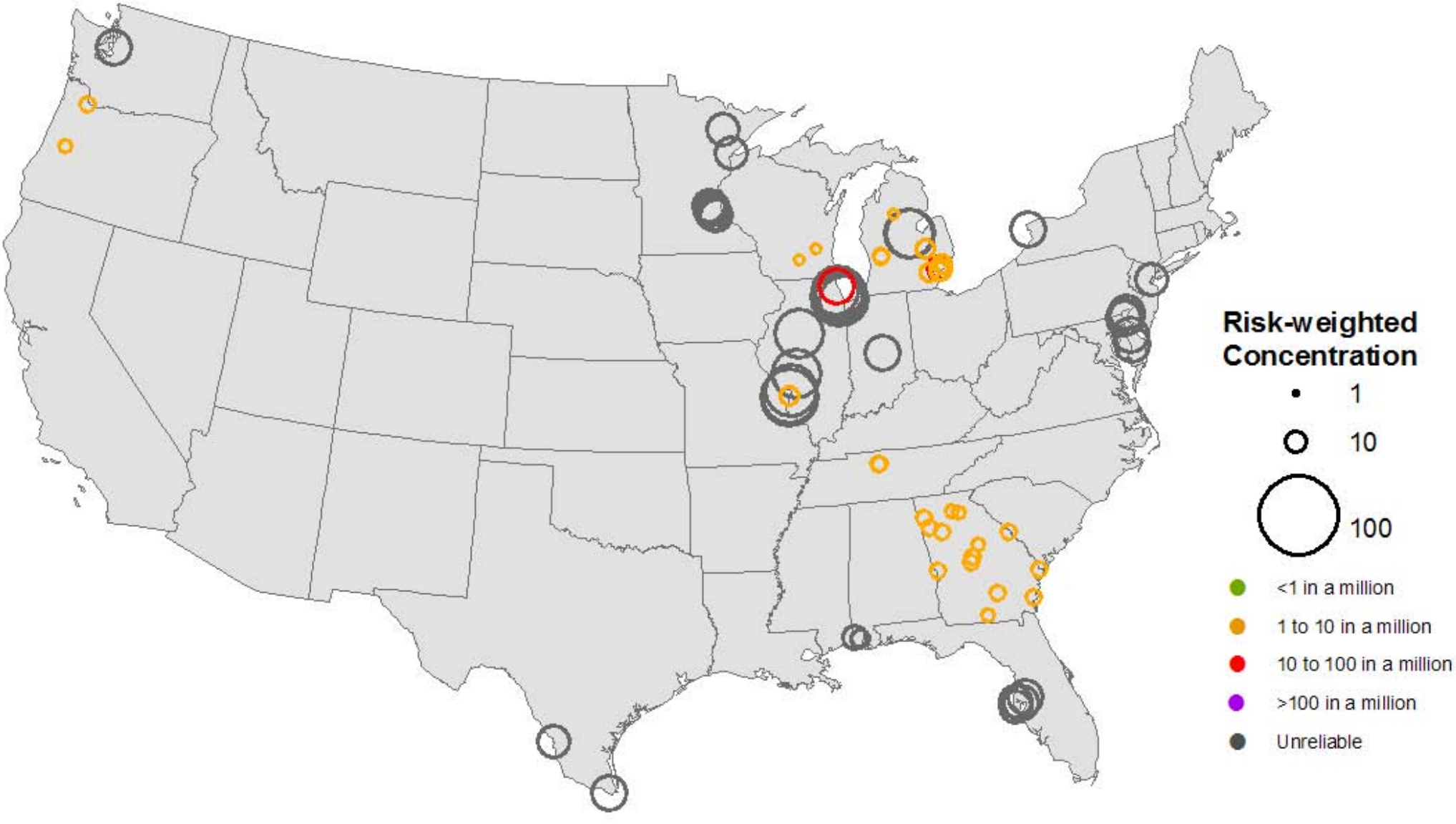
PARAMETER = 'Aniline'

Supplemental Figure 19. Chronic cancer risk (per million) for site averages, 2003-2005.



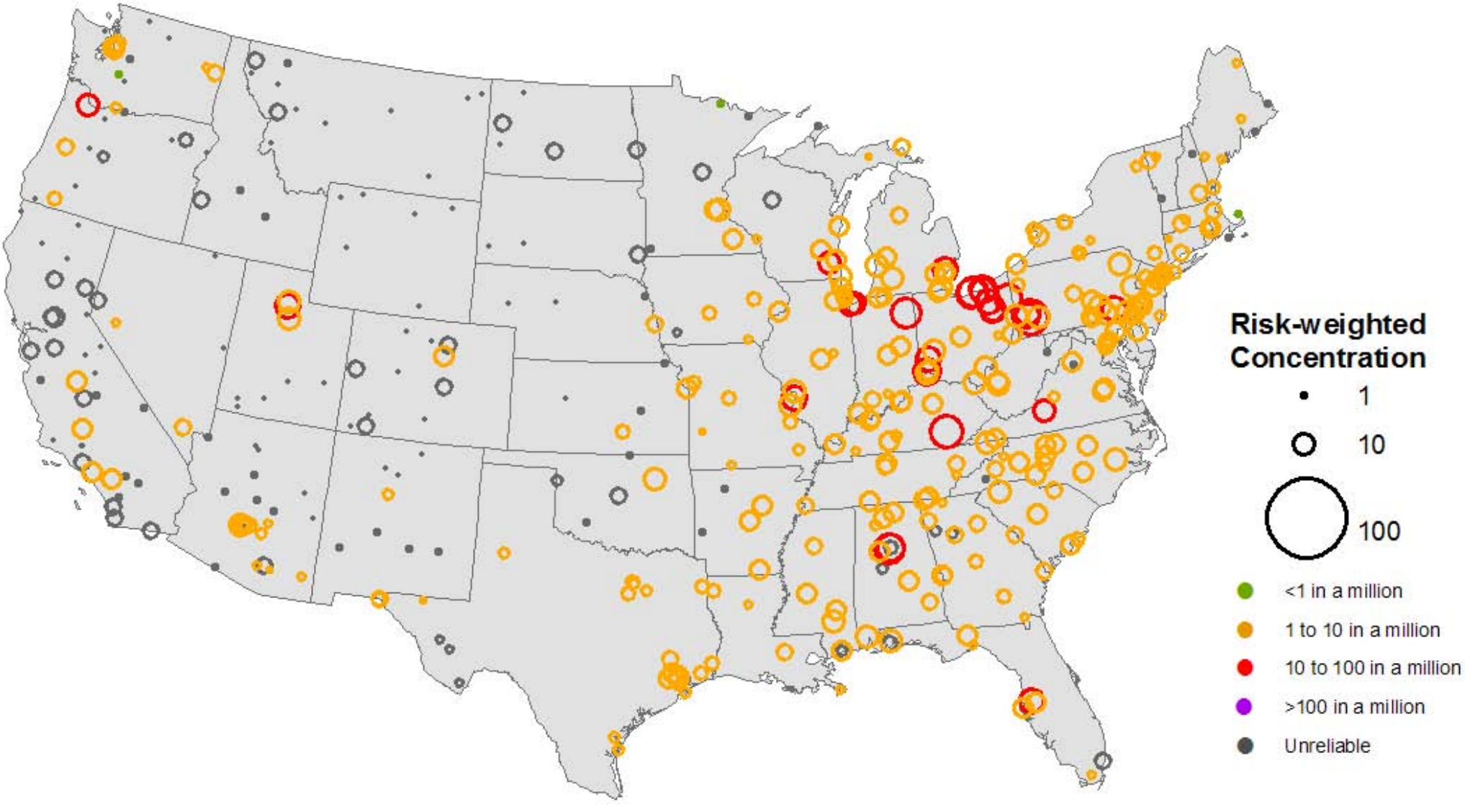
PARAMETER = 'Arsenic (Pm10) Stp'

Supplemental Figure 20. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Arsenic (Tsp)'

Supplemental Figure 21. Chronic cancer risk (per million) for site averages, 2003-2005.

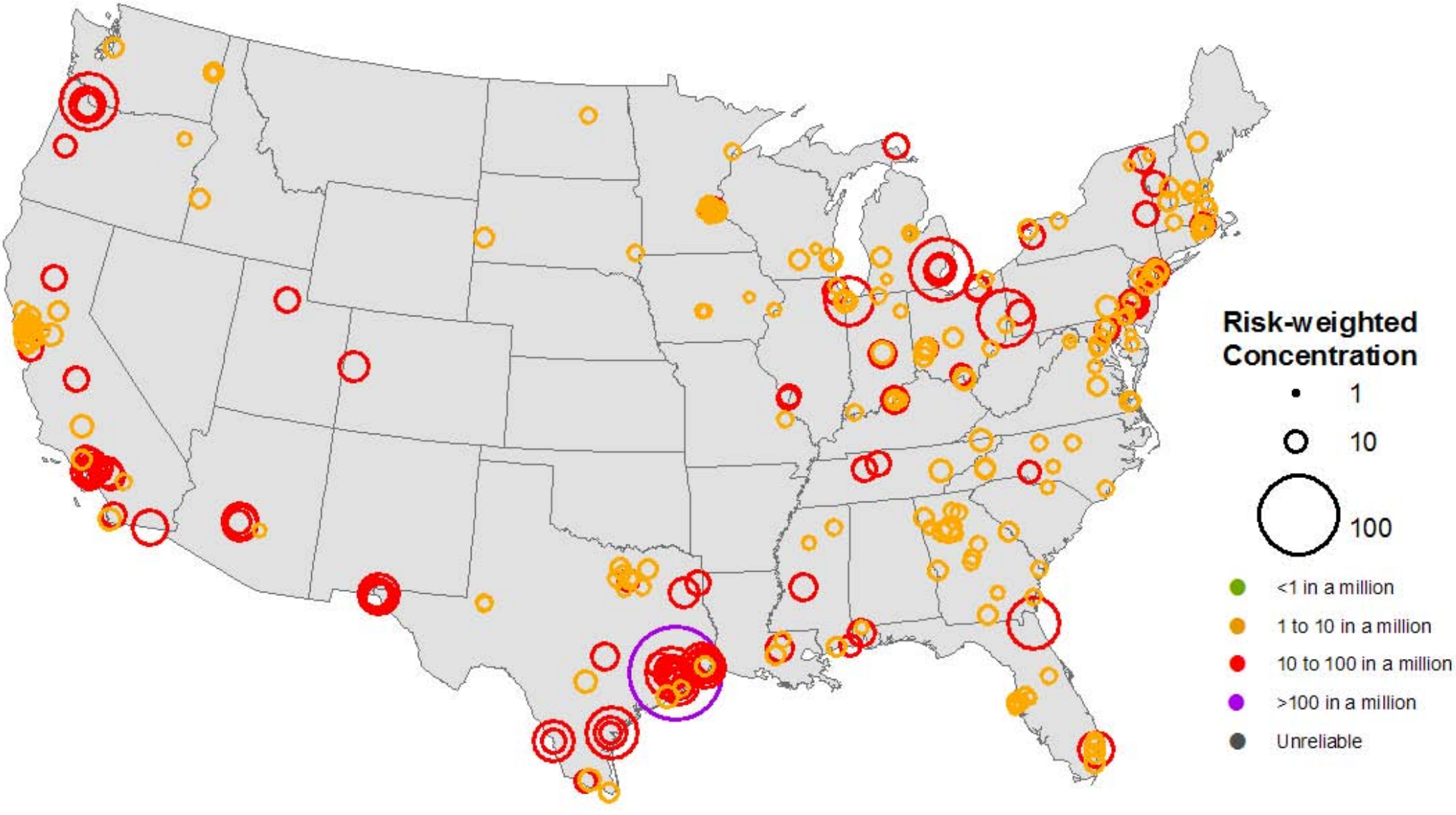


PARAMETER = 'Arsenic Pm2.5 Lc'

Supplemental Figure 22. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Arsenic Pm10 Lc'

Supplemental Figure 23. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Benzene'

Supplemental Figure 24. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Benzo(A)Pyrene (Pm10) Stp'

Supplemental Figure 25. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Benzo(B)Fluranthene (Pm10) Stp'

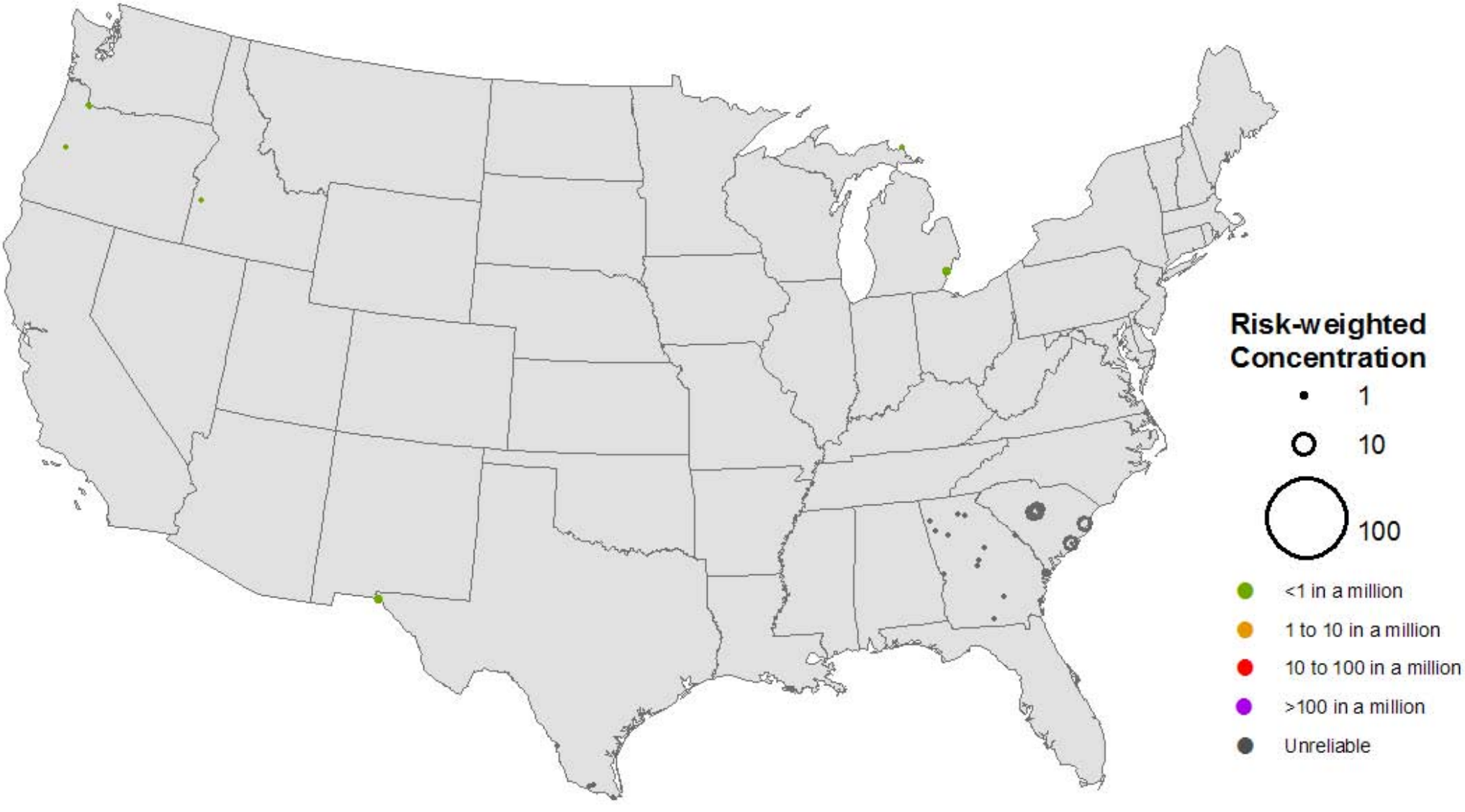
Supplemental Figure 26. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Benzo(K)Fluoranthene (Pm10) Stp'

Supplemental Figure 27. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Benzo[A]Anthracene'

Supplemental Figure 28. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Benzo[A]Pyrene'

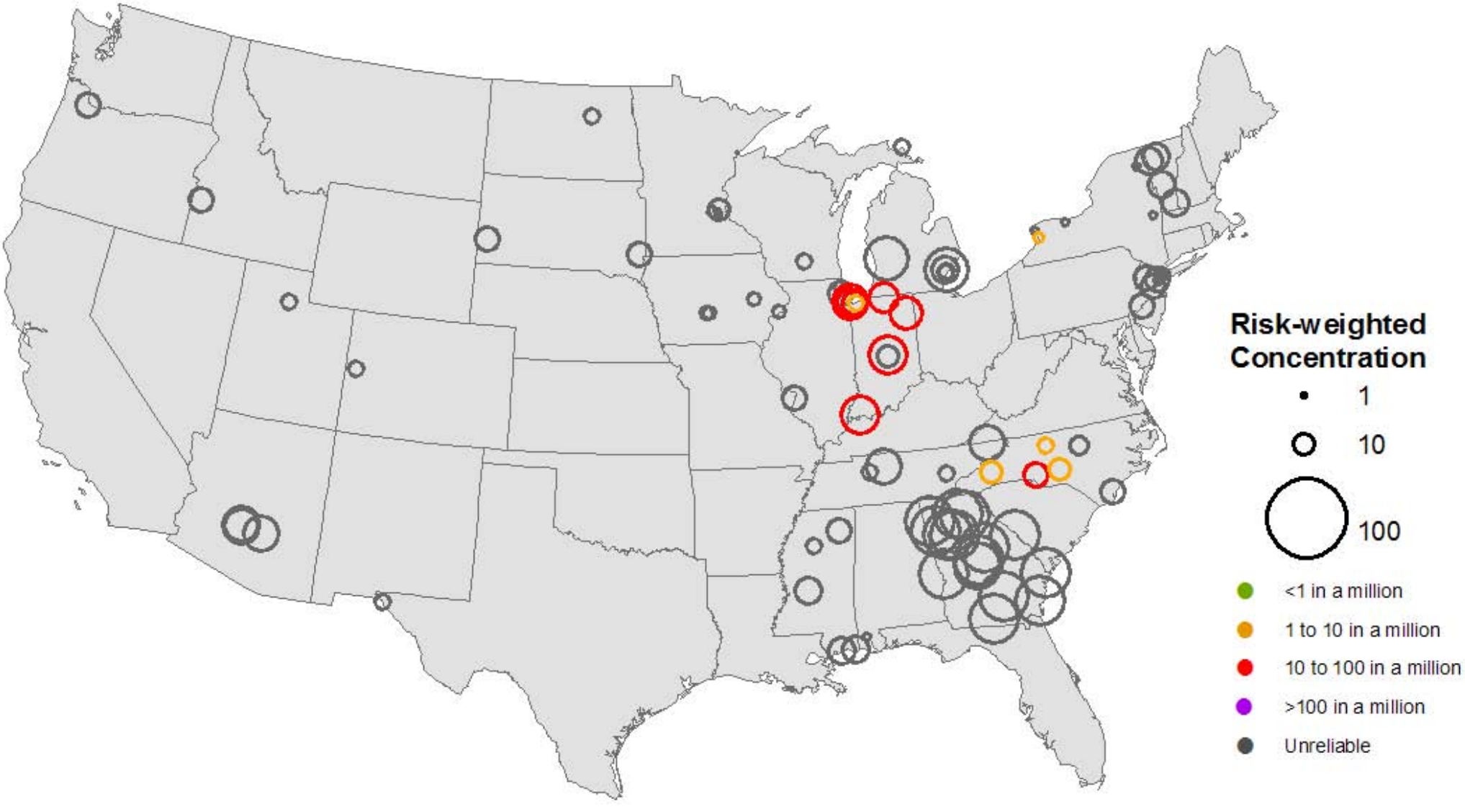
Supplemental Figure 29. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Benzo[B]Fluoranthene'

Supplemental Figure 30. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Benzo[K]Fluoranthene'

Supplemental Figure 31. Chronic cancer risk (per million) for site averages, 2003-2005.

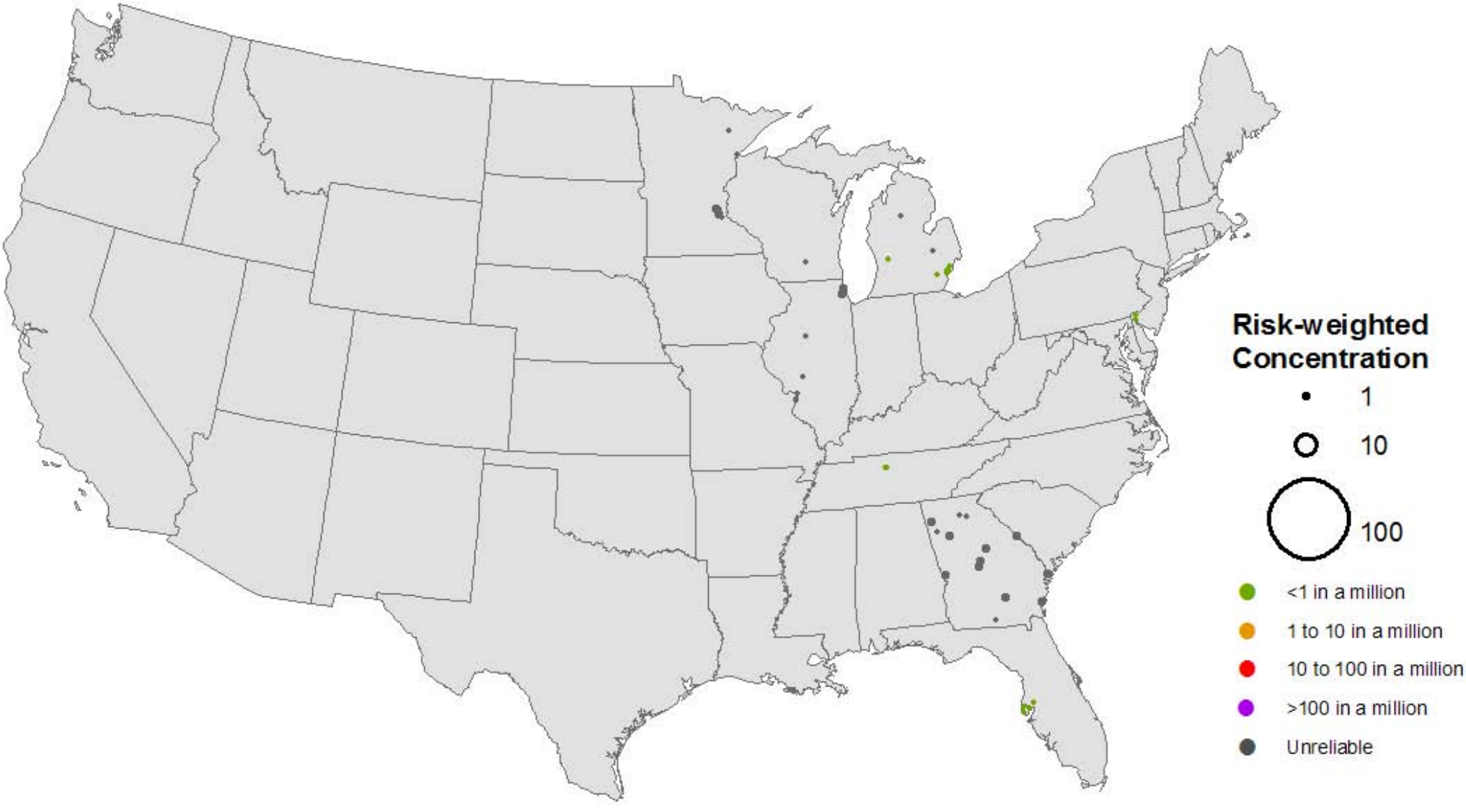


PARAMETER = 'Benzyl Chloride'

Supplemental Figure 32. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Beryllium (Pm10) Stp'

Supplemental Figure 33. Chronic cancer risk (per million) for site averages, 2003-2005.

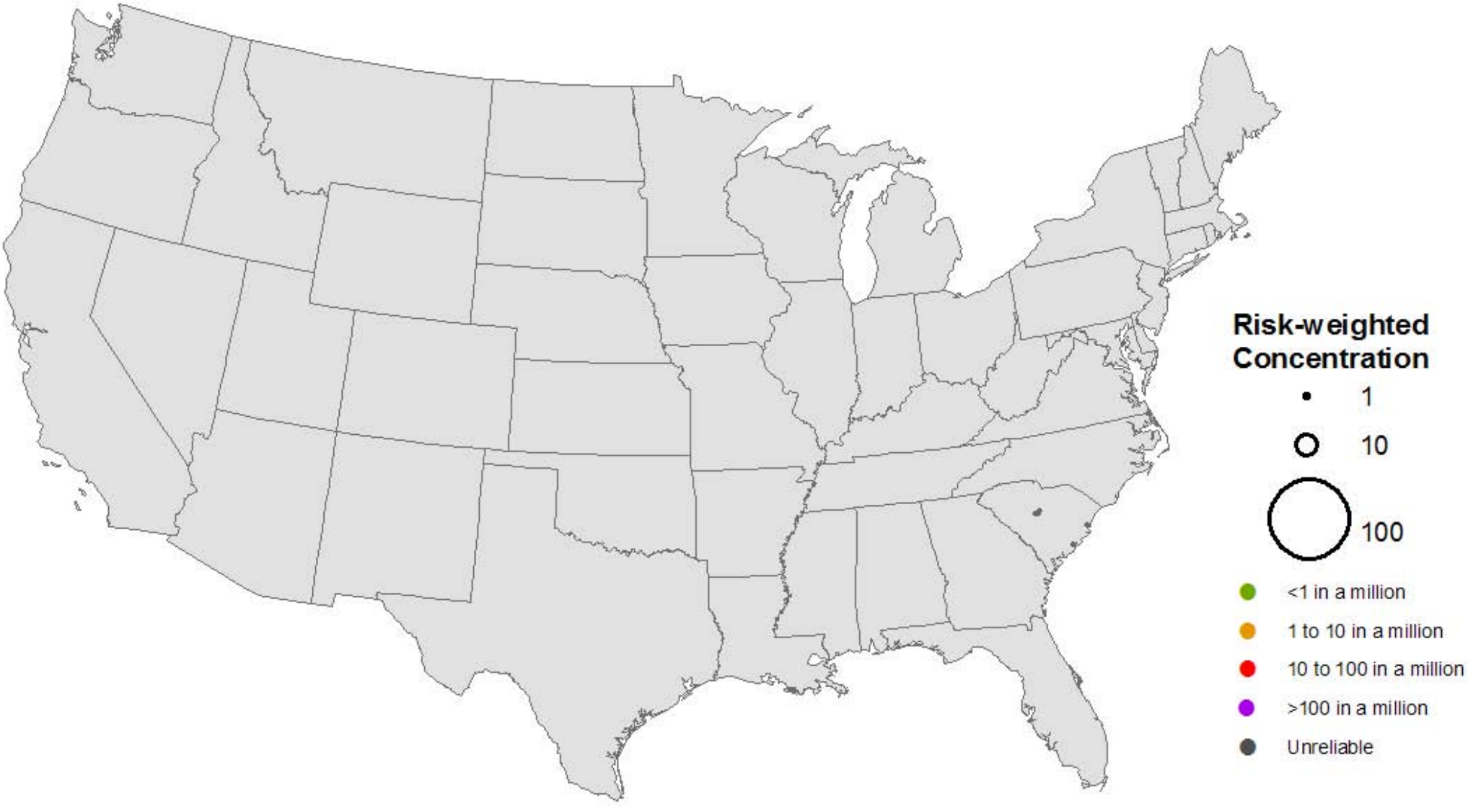


PARAMETER = 'Beryllium (Tsp)'

Supplemental Figure 34. Chronic cancer risk (per million) for site averages, 2003-2005.

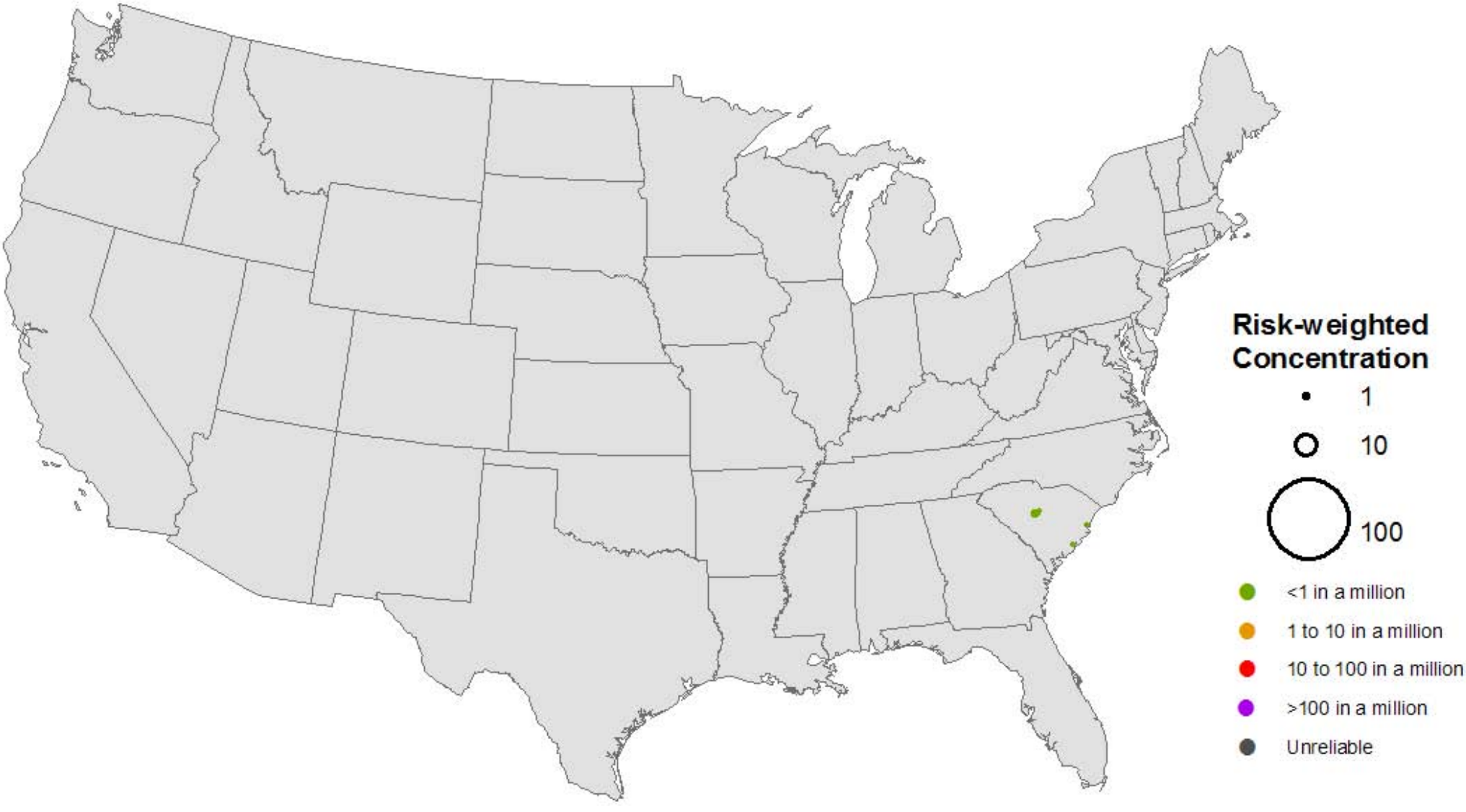
PARAMETER = 'Beryllium Pm10 Lc'

Supplemental Figure 35. Chronic cancer risk (per million) for site averages, 2003-2005.



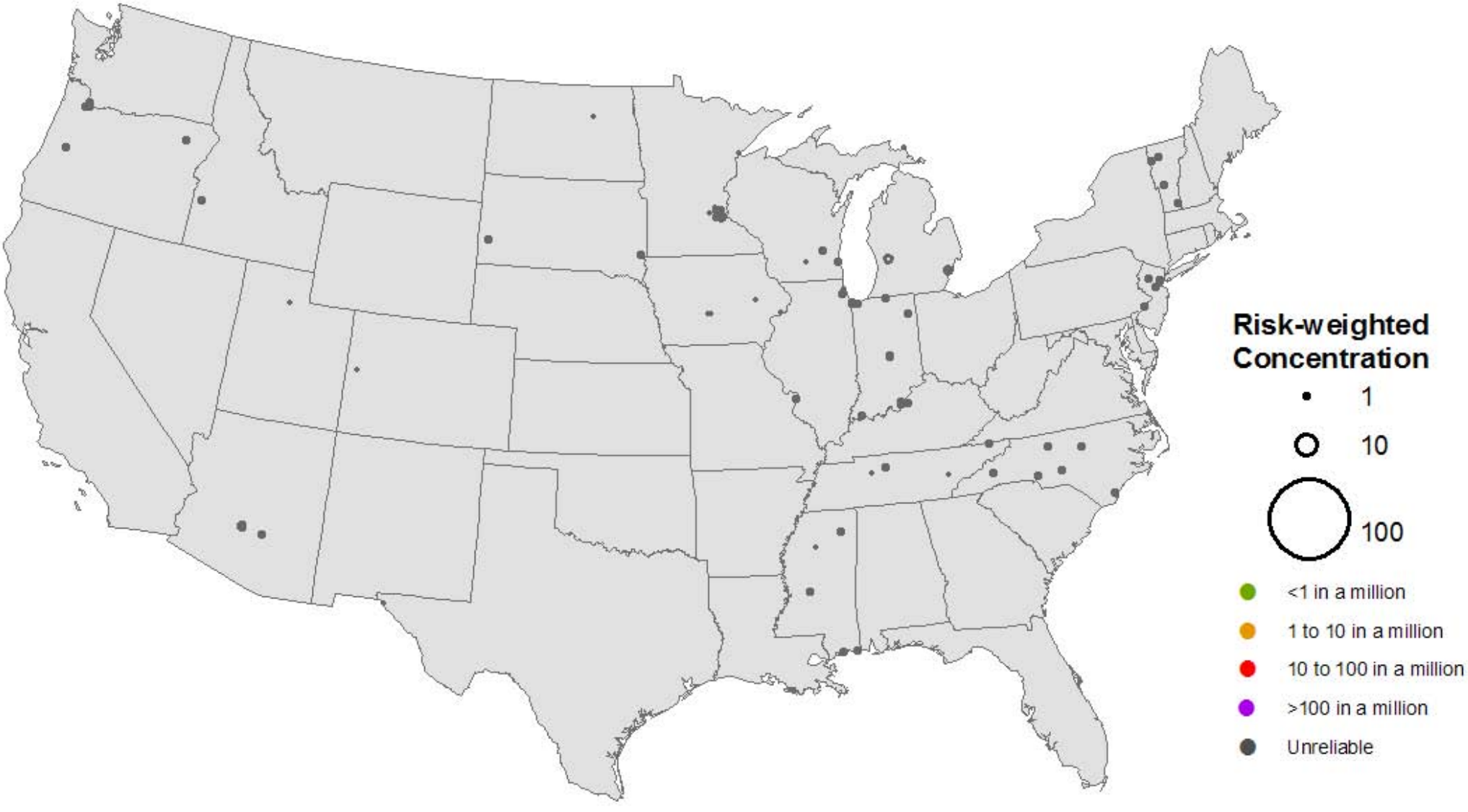
PARAMETER = 'Bis (2-Chloroethyl)Ether'

Supplemental Figure 36. Chronic cancer risk (per million) for site averages, 2003-2005.



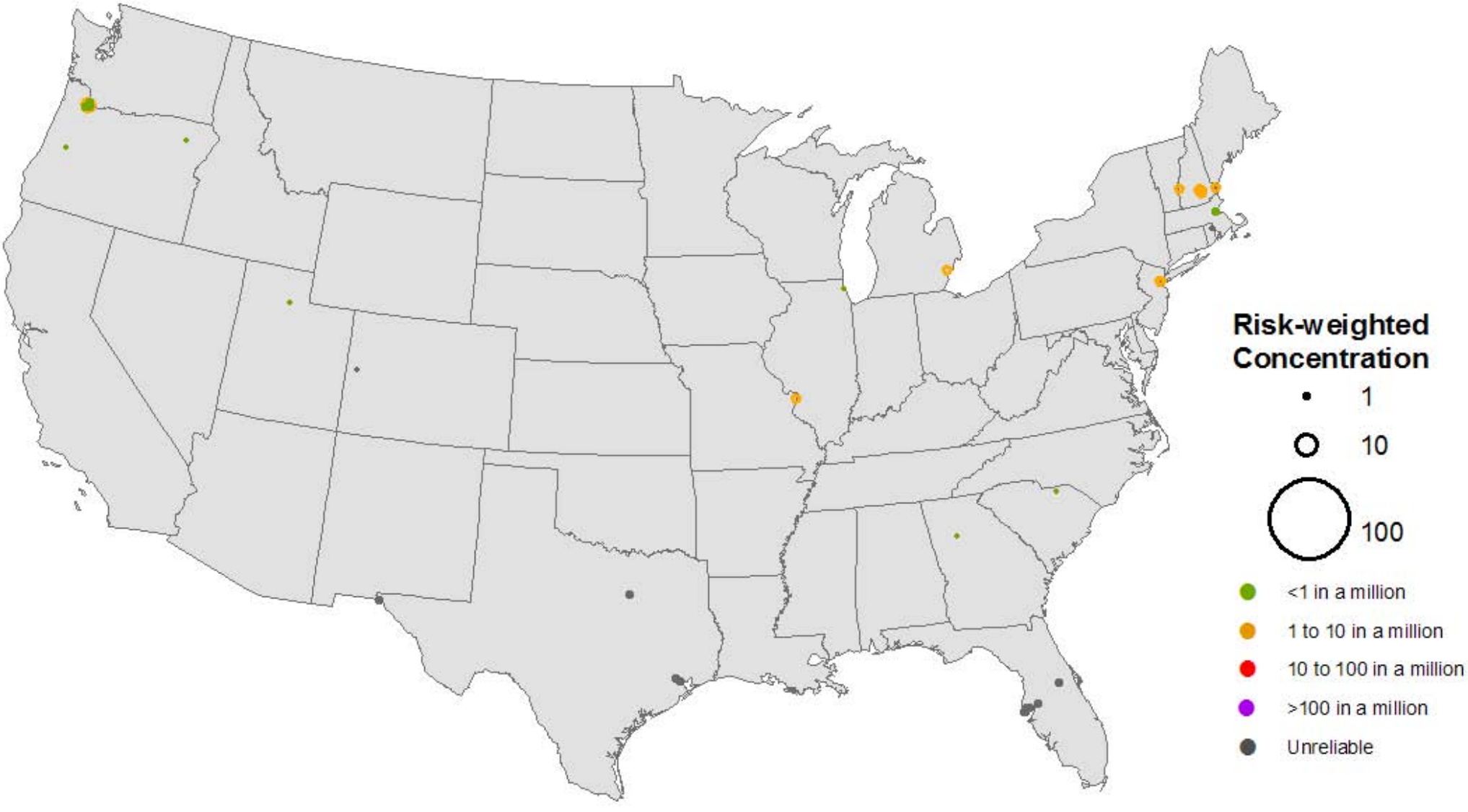
PARAMETER = 'Bis(2-Ethylhexyl)Phthalate'

Supplemental Figure 37. Chronic cancer risk (per million) for site averages, 2003-2005.



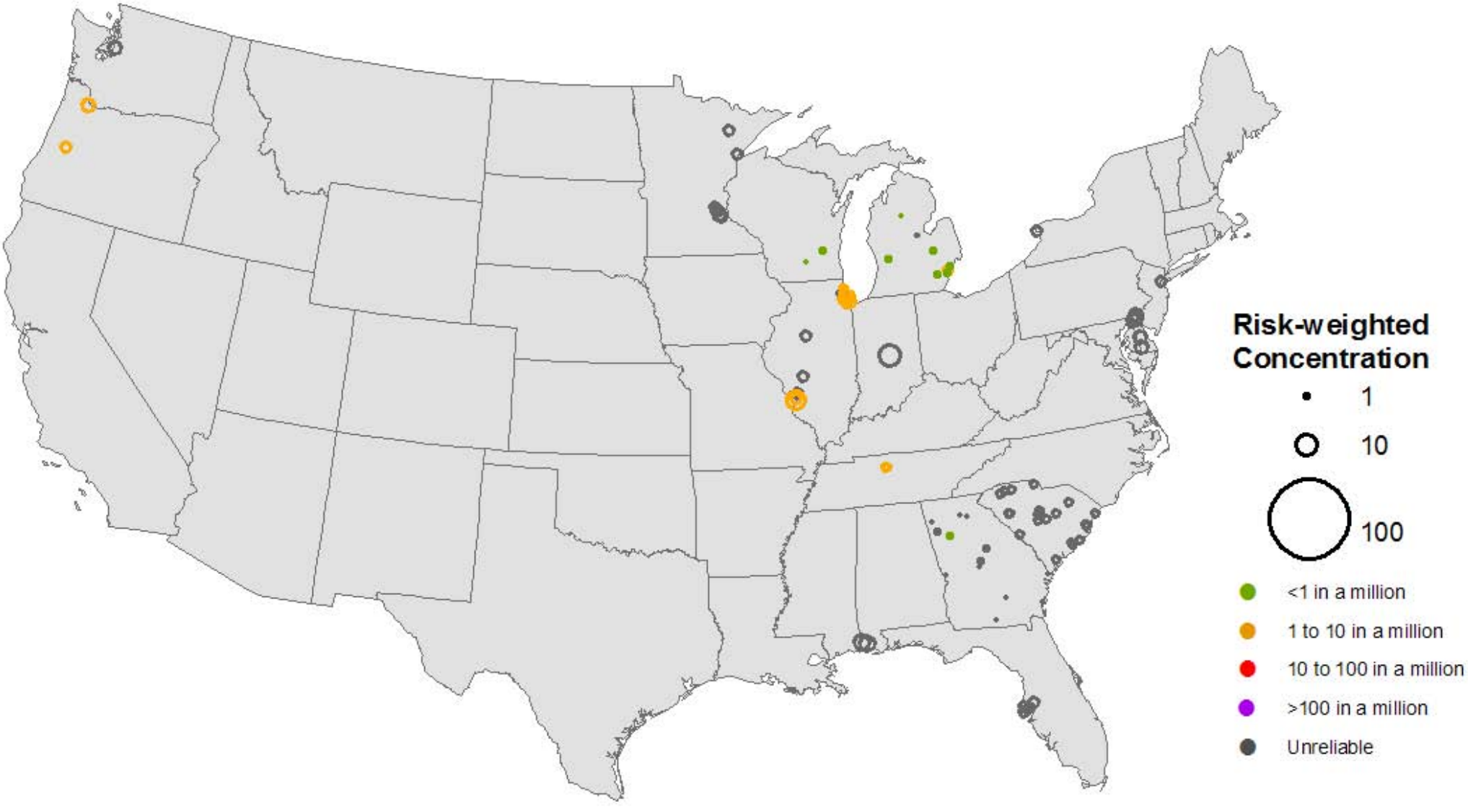
PARAMETER = 'Bromoform'

Supplemental Figure 38. Chronic cancer risk (per million) for site averages, 2003-2005.



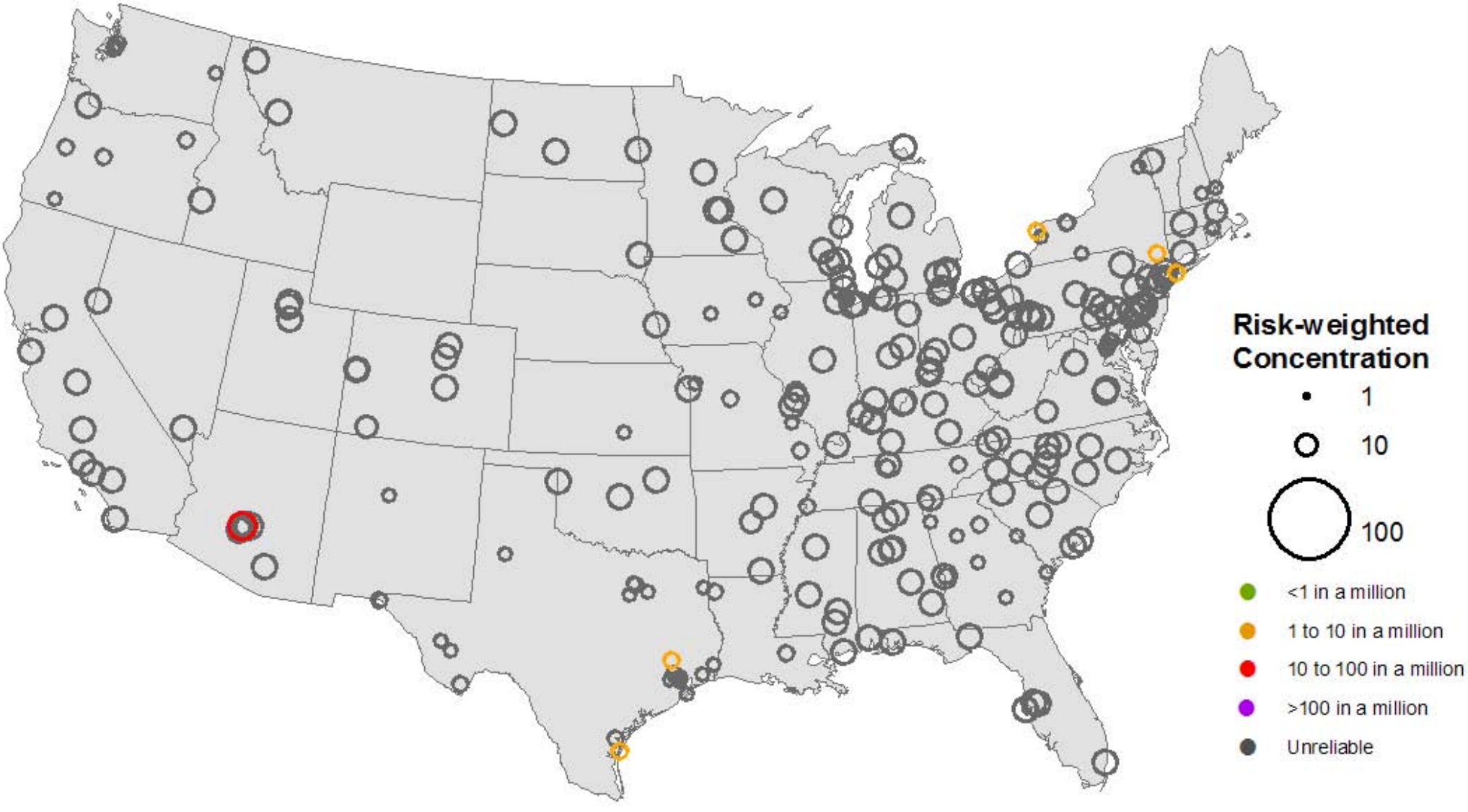
PARAMETER = 'Cadmium (Pm10) Stp'

Supplemental Figure 39. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Cadmium (Tsp)'

Supplemental Figure 40. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Cadmium Pm2.5 Lc'

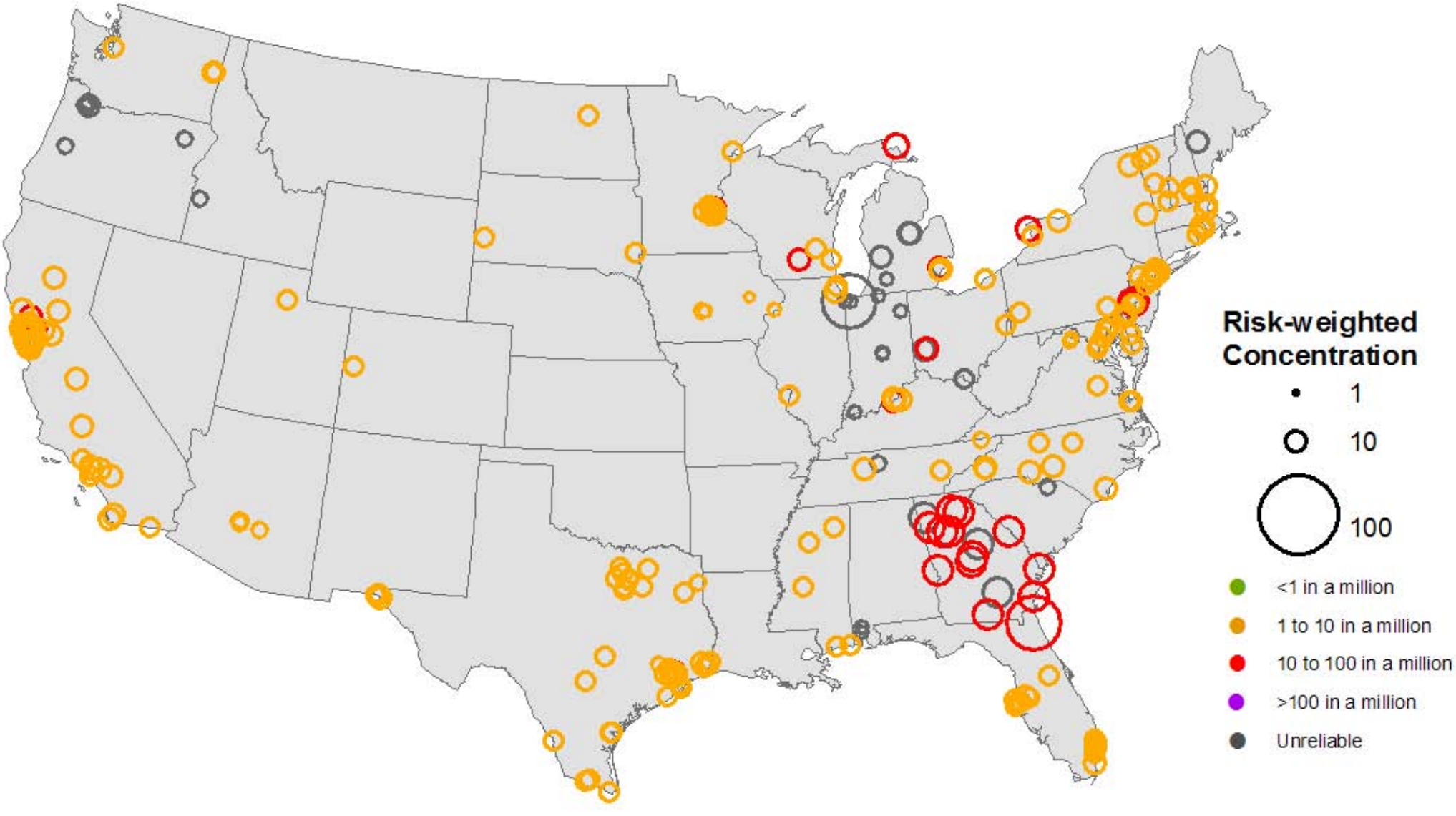
Supplemental Figure 41. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Cadmium Pm10 Lc'

Supplemental Figure 42. Chronic cancer risk (per million) for site averages, 2003-2005.

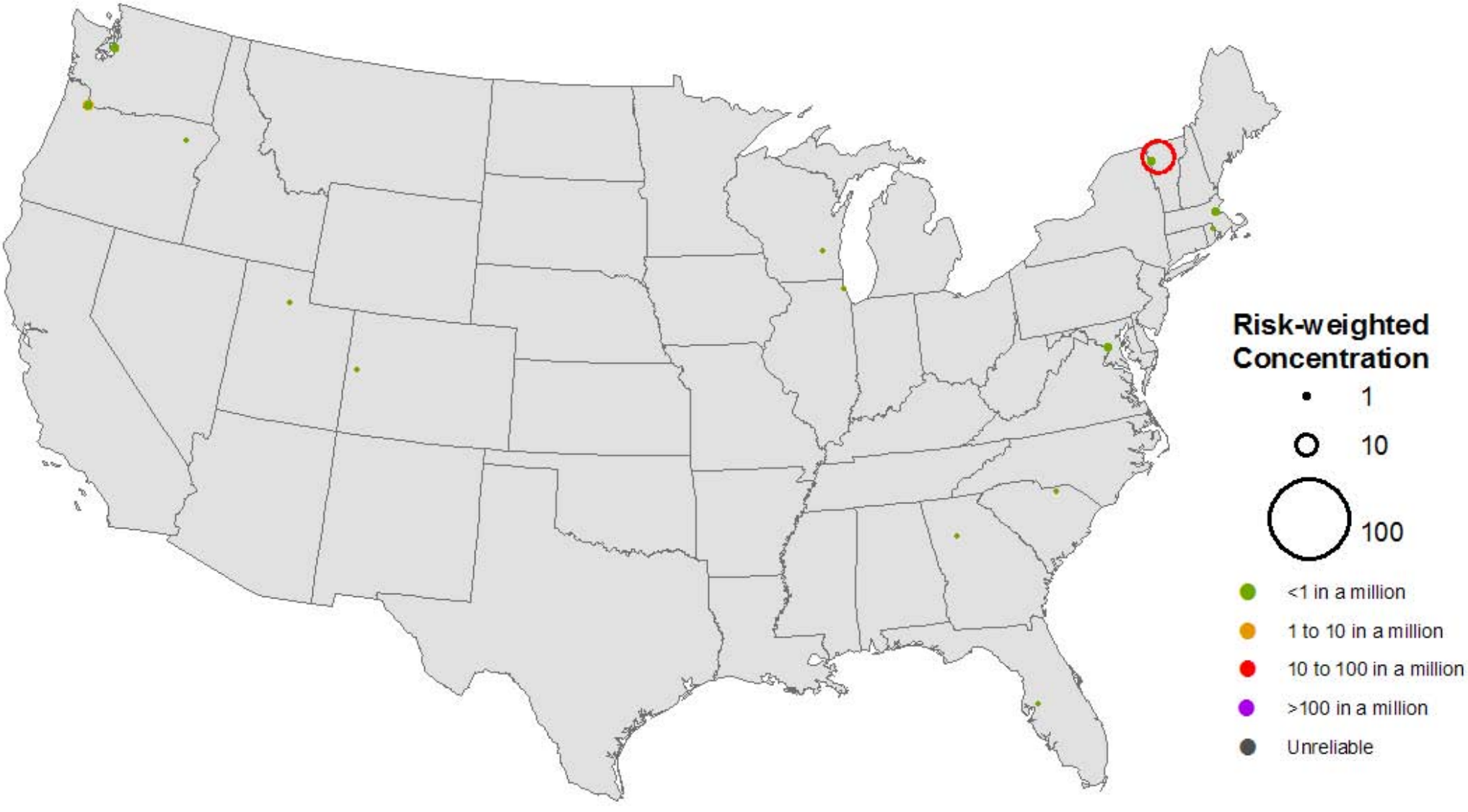
PARAMETER = 'Carbazole'

Supplemental Figure 43. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Carbon Tetrachloride'

Supplemental Figure 44. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Chromium Vi(Tsp)'

Supplemental Figure 45. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Chrysene'

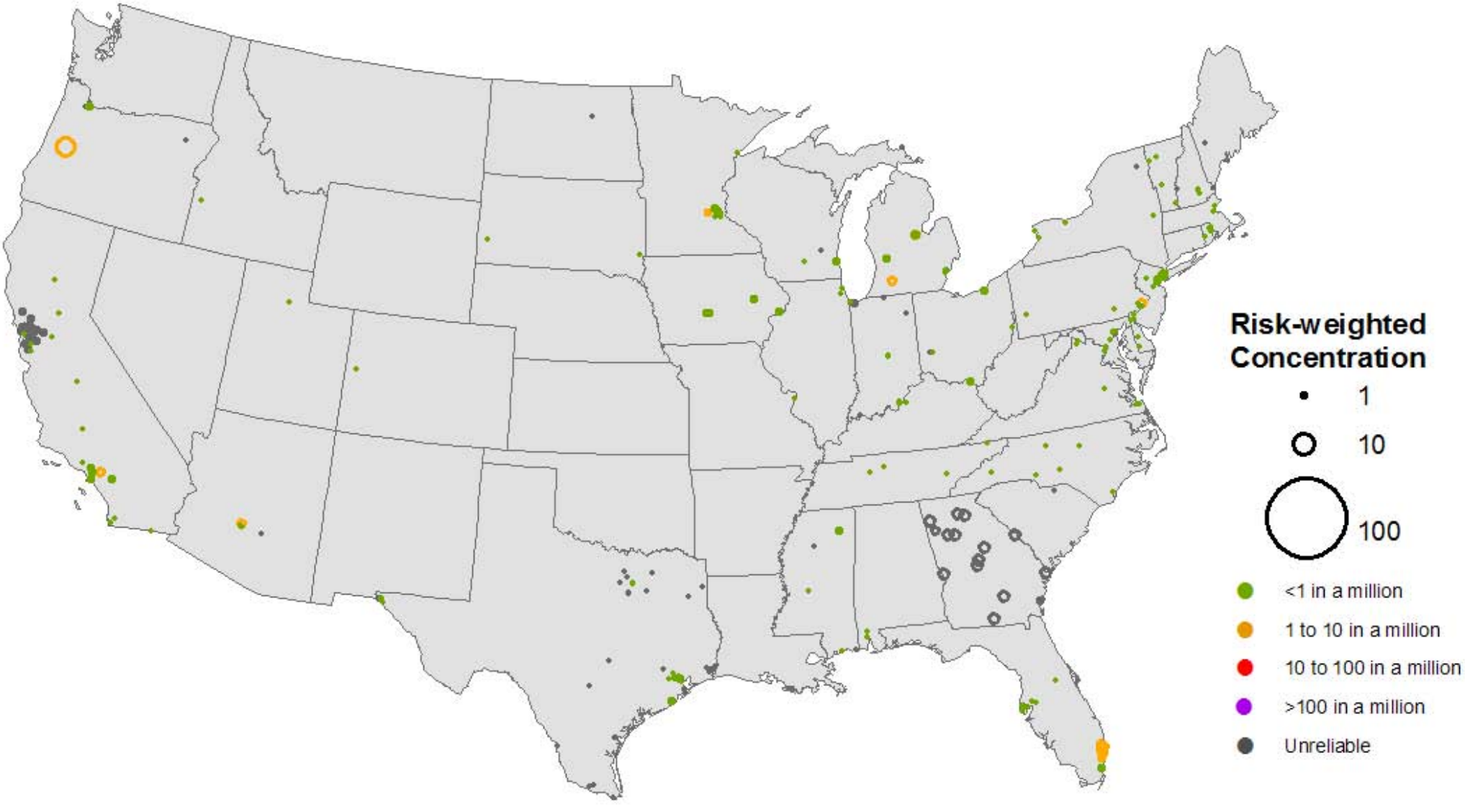
Supplemental Figure 46. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Dibenz(A-H)Anthracene (Pm10) Stp'

Supplemental Figure 47. Chronic cancer risk (per million) for site averages, 2003-2005.

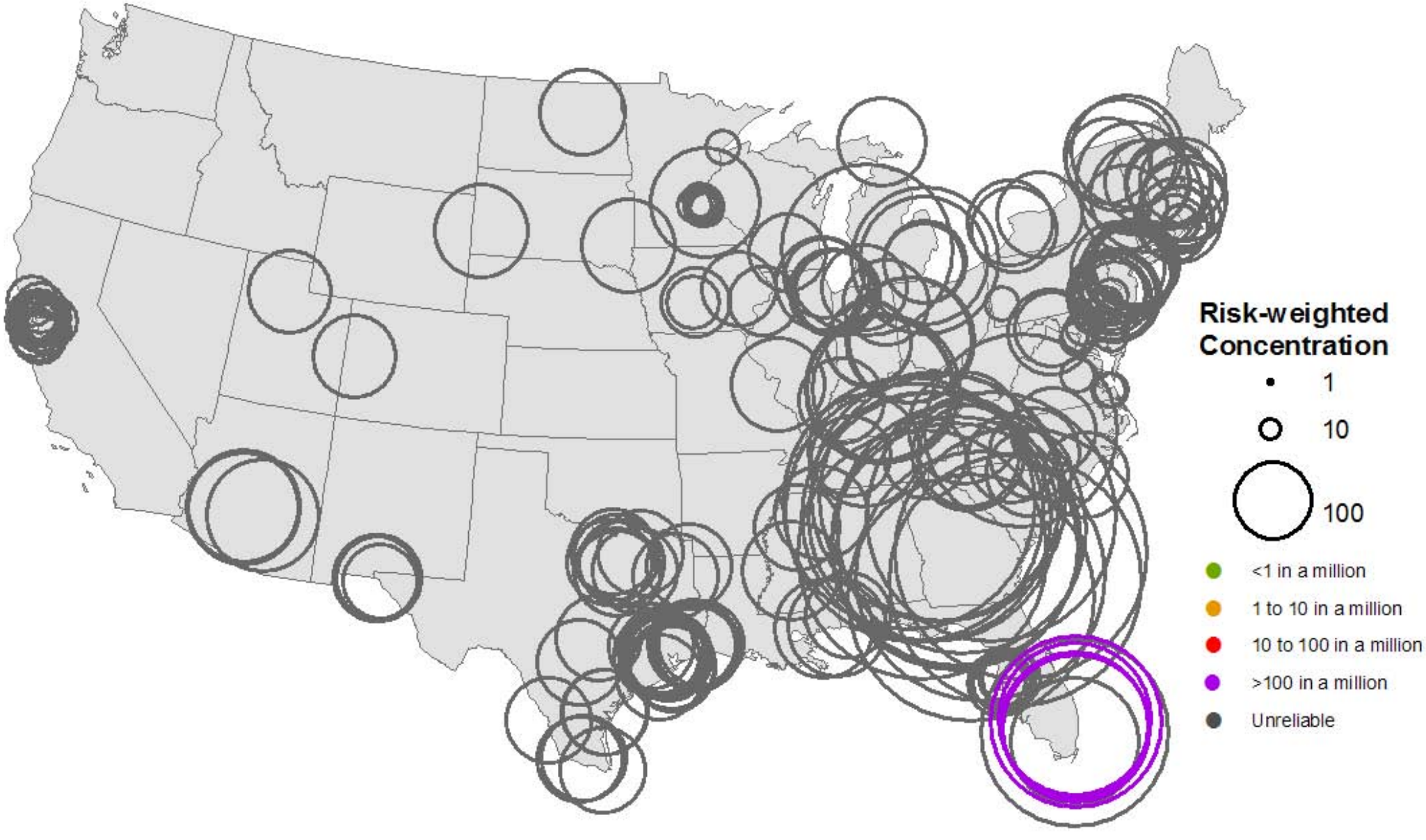
PARAMETER = 'Dibenzo[A,H]Anthracene'

Supplemental Figure 48. Chronic cancer risk (per million) for site averages, 2003-2005.



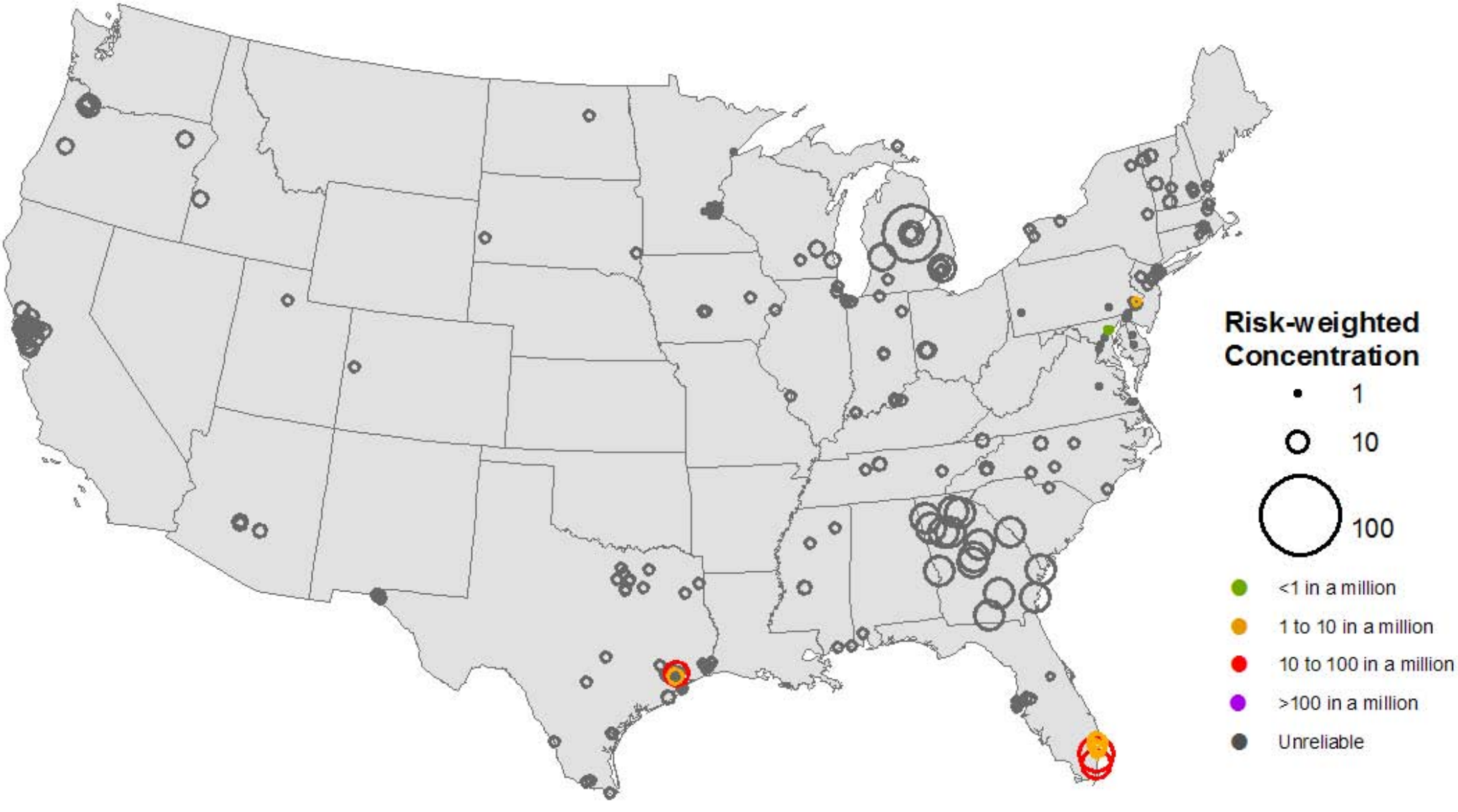
PARAMETER = 'Dichloromethane'

Supplemental Figure 49. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Ethylene Dibromide'

Supplemental Figure 50. Chronic cancer risk (per million) for site averages, 2003-2005.

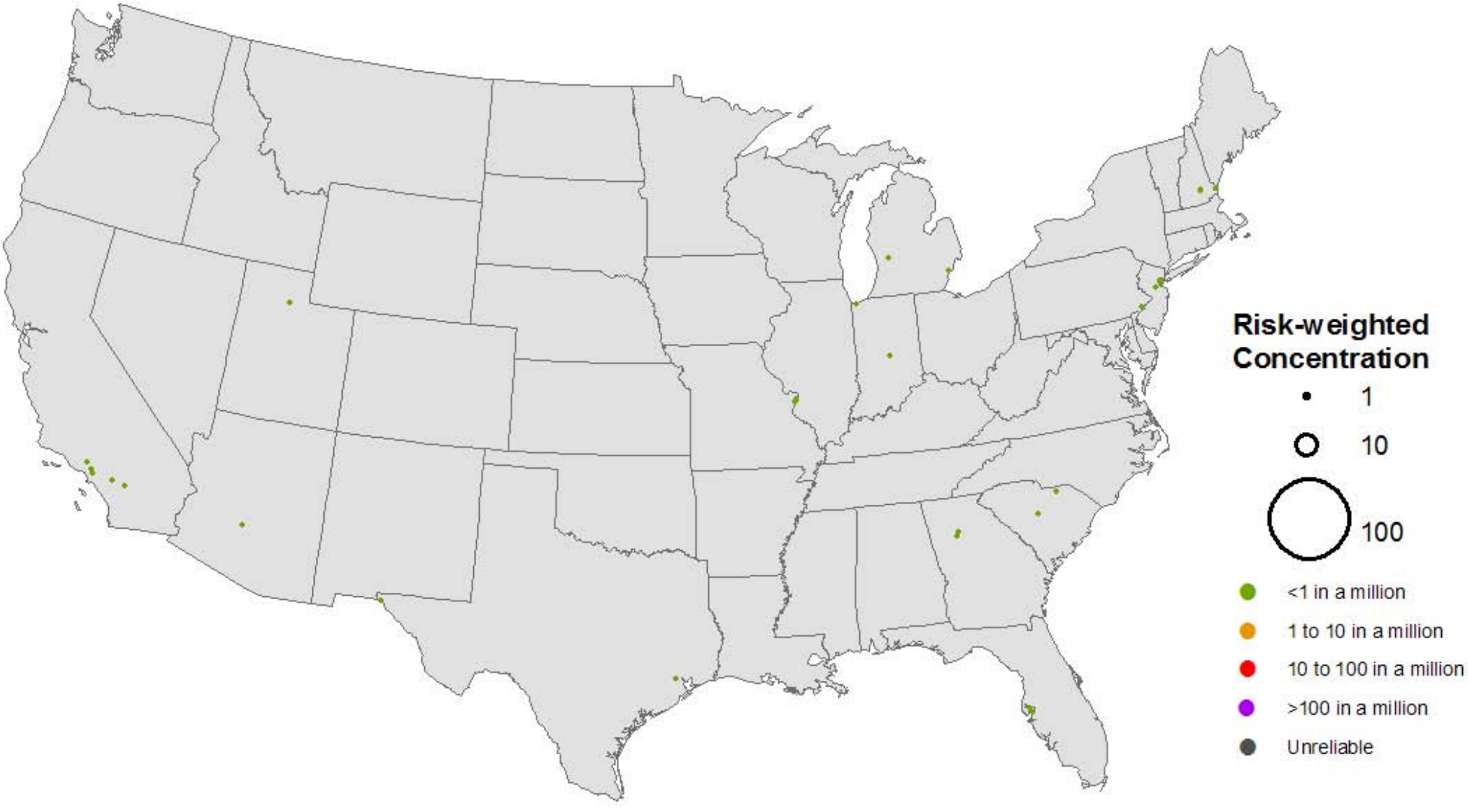


PARAMETER = 'Ethylene Dichloride'

Supplemental Figure 51. Chronic cancer risk (per million) for site averages, 2003-2005.

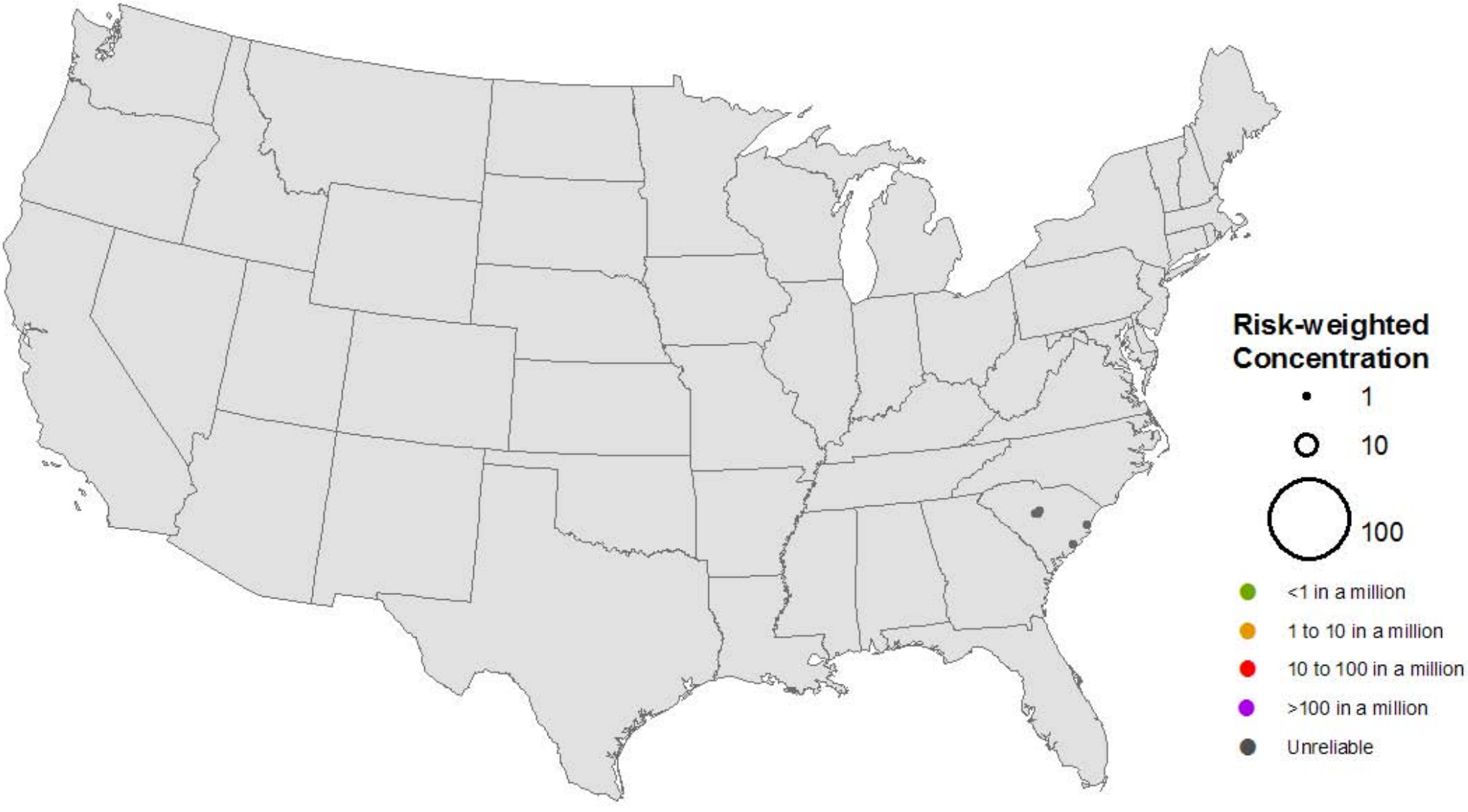
PARAMETER = 'Ethylene Oxide'

Supplemental Figure 52. Chronic cancer risk (per million) for site averages, 2003-2005.



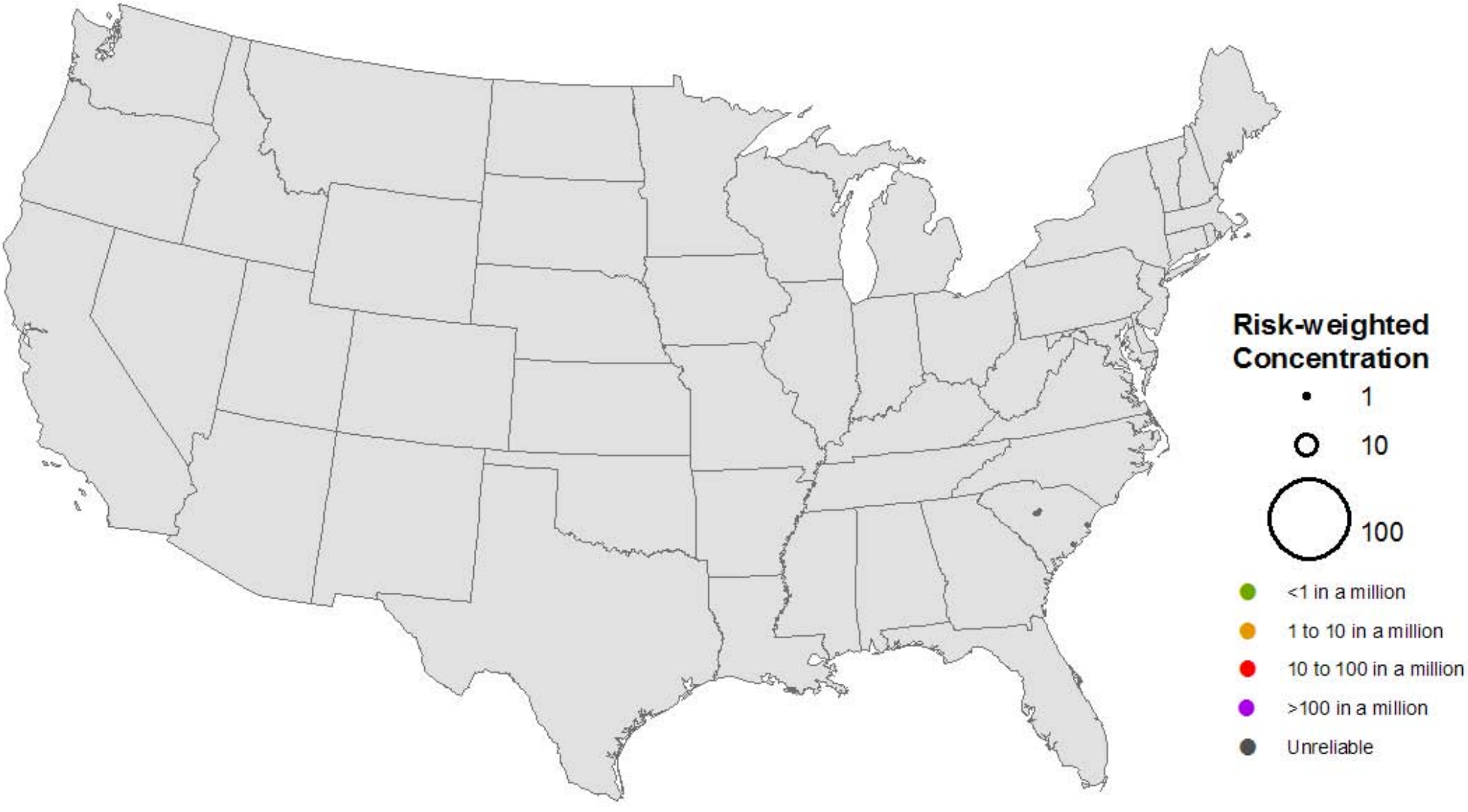
PARAMETER = 'Formaldehyde'

Supplemental Figure 53. Chronic cancer risk (per million) for site averages, 2003-2005.



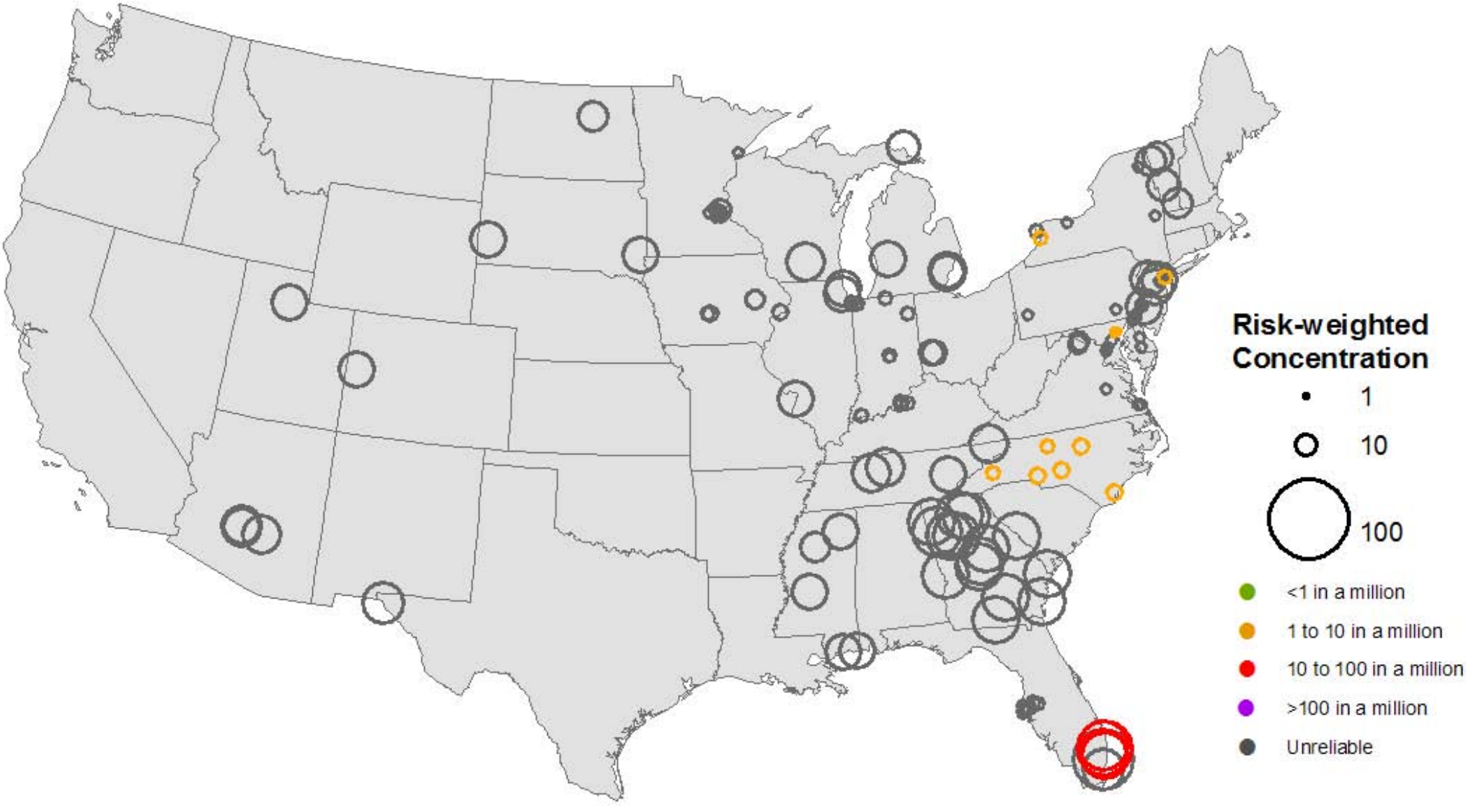
PARAMETER = 'Heptachlor'

Supplemental Figure 54. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Hexachlorobenzene'

Supplemental Figure 55. Chronic cancer risk (per million) for site averages, 2003-2005.

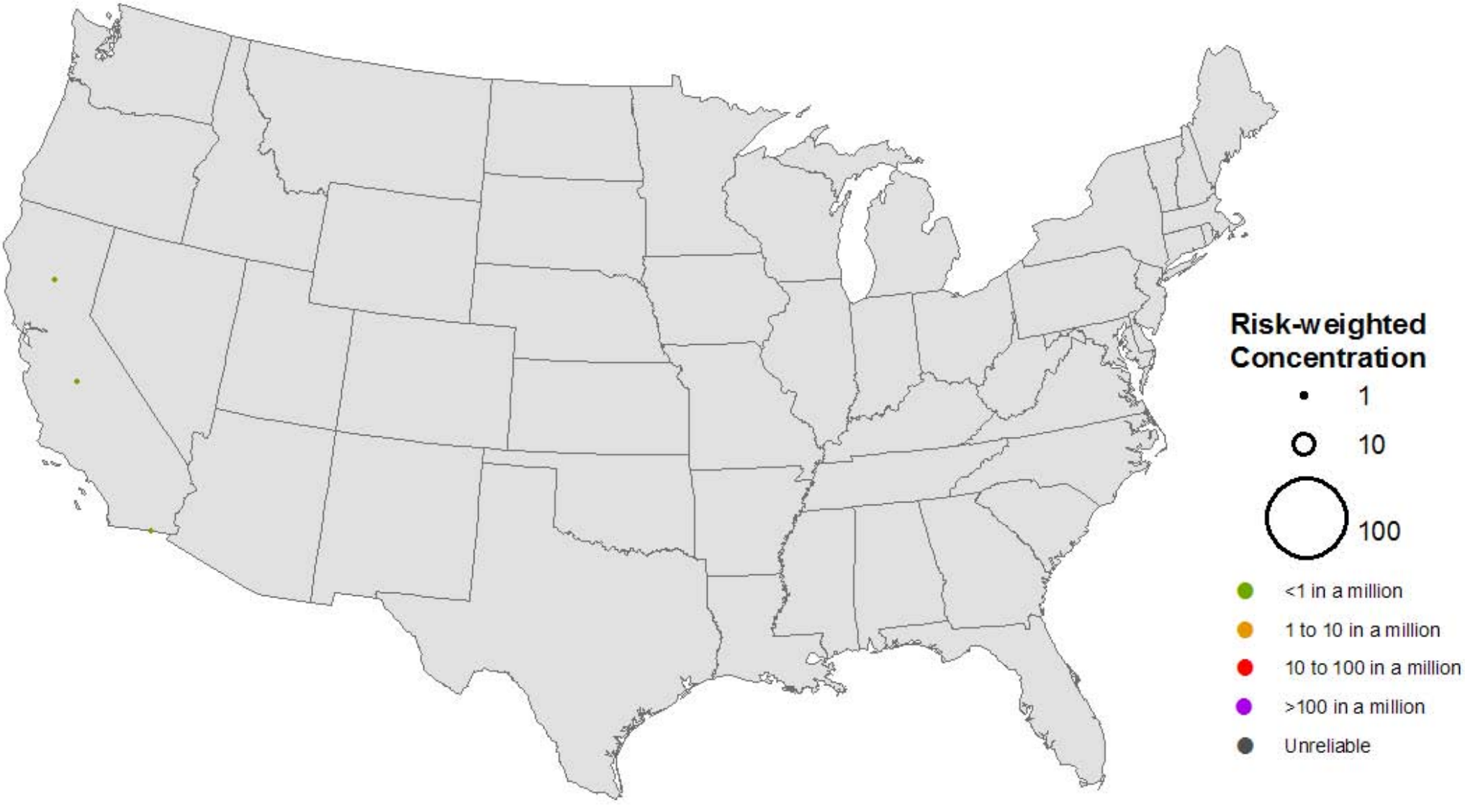


PARAMETER = 'Hexachlorobutadiene'

Supplemental Figure 56. Chronic cancer risk (per million) for site averages, 2003-2005.

PARAMETER = 'Hexachloroethane'

Supplemental Figure 57. Chronic cancer risk (per million) for site averages, 2003-2005.

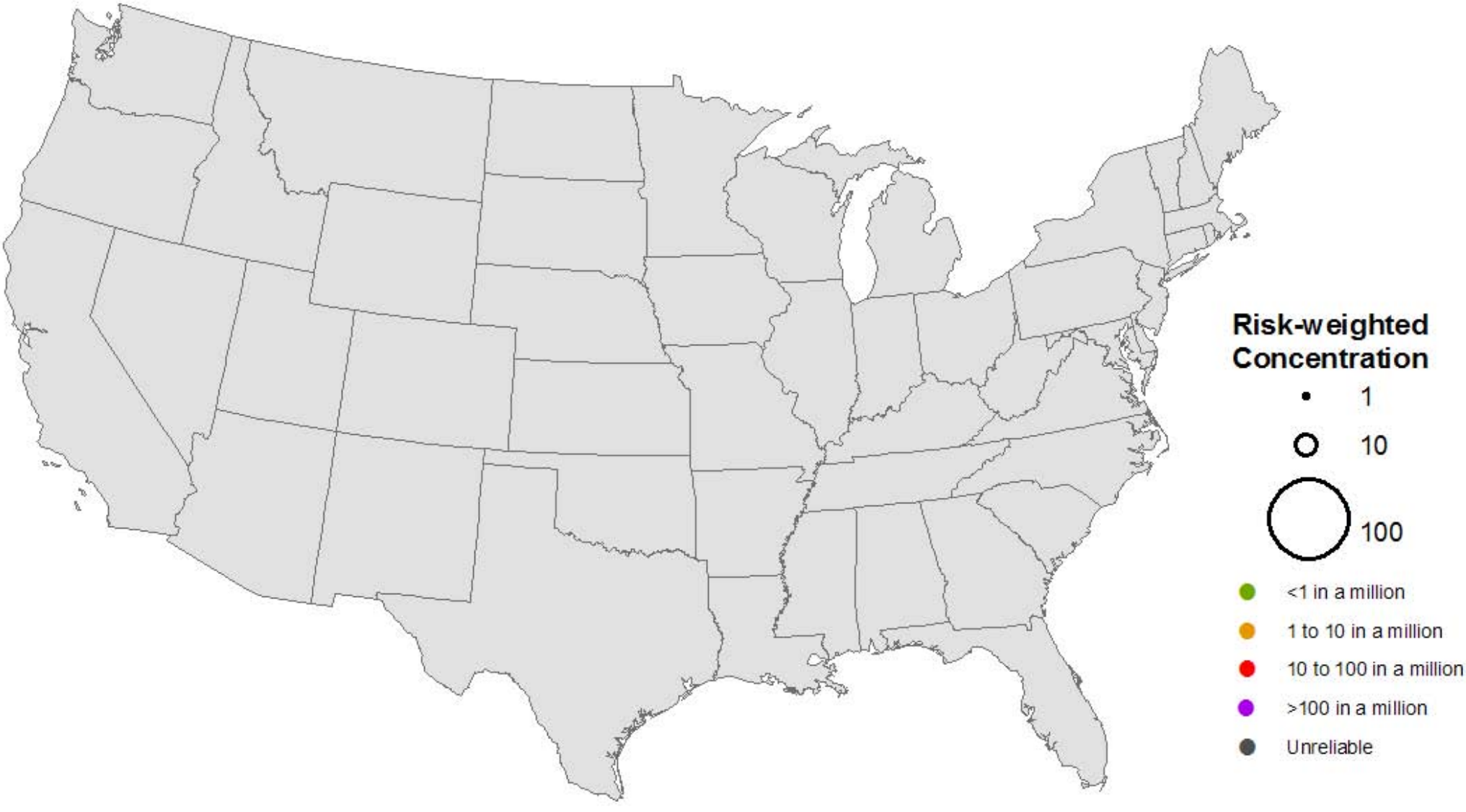


PARAMETER = 'Indeno[1,2,3-Cd] Pyrene (Pm10) Stp'

Supplemental Figure 58. Chronic cancer risk (per million) for site averages, 2003-2005.

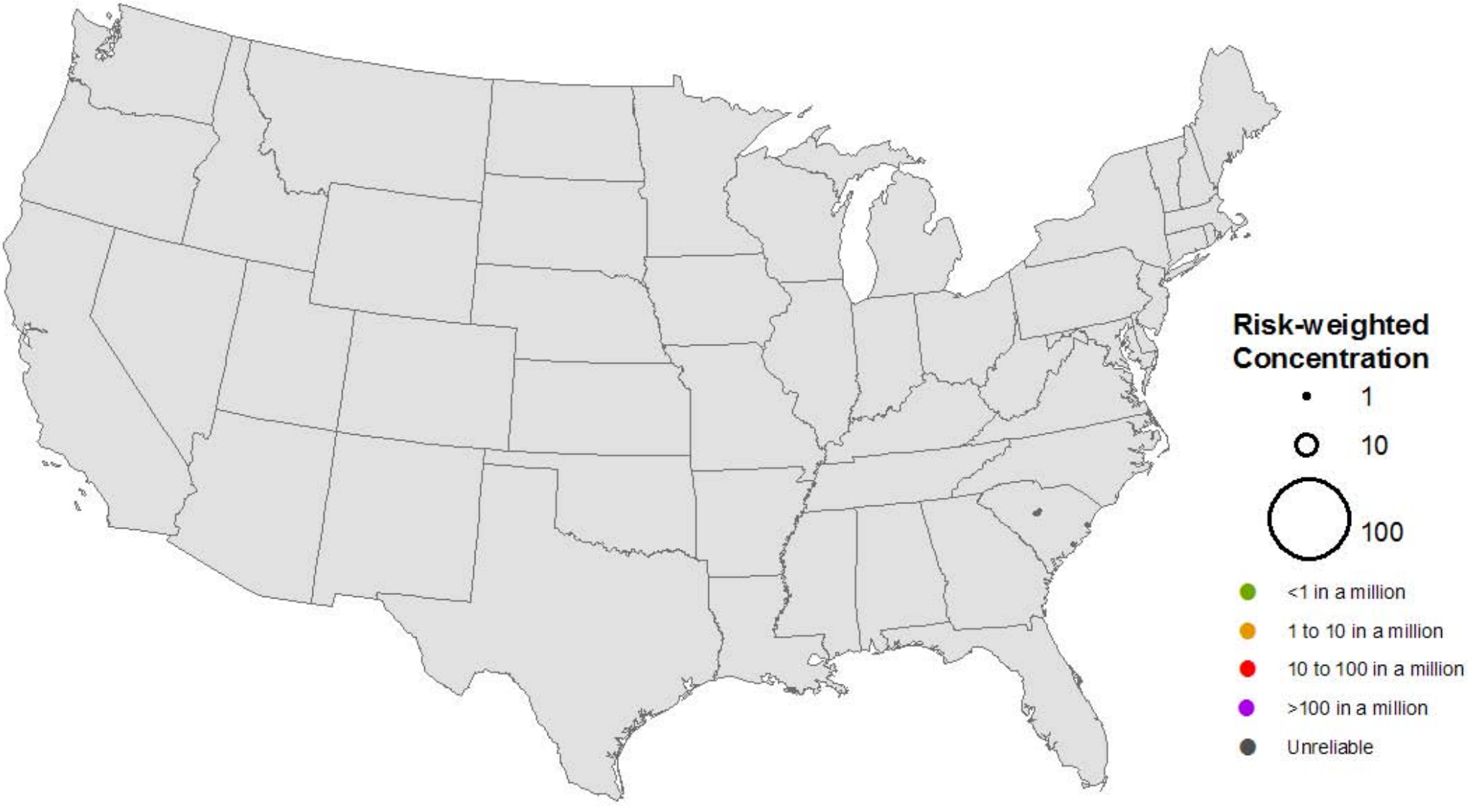
PARAMETER = 'Indeno[1,2,3-Cd]Pyrene'

Supplemental Figure 59. Chronic cancer risk (per million) for site averages, 2003-2005.



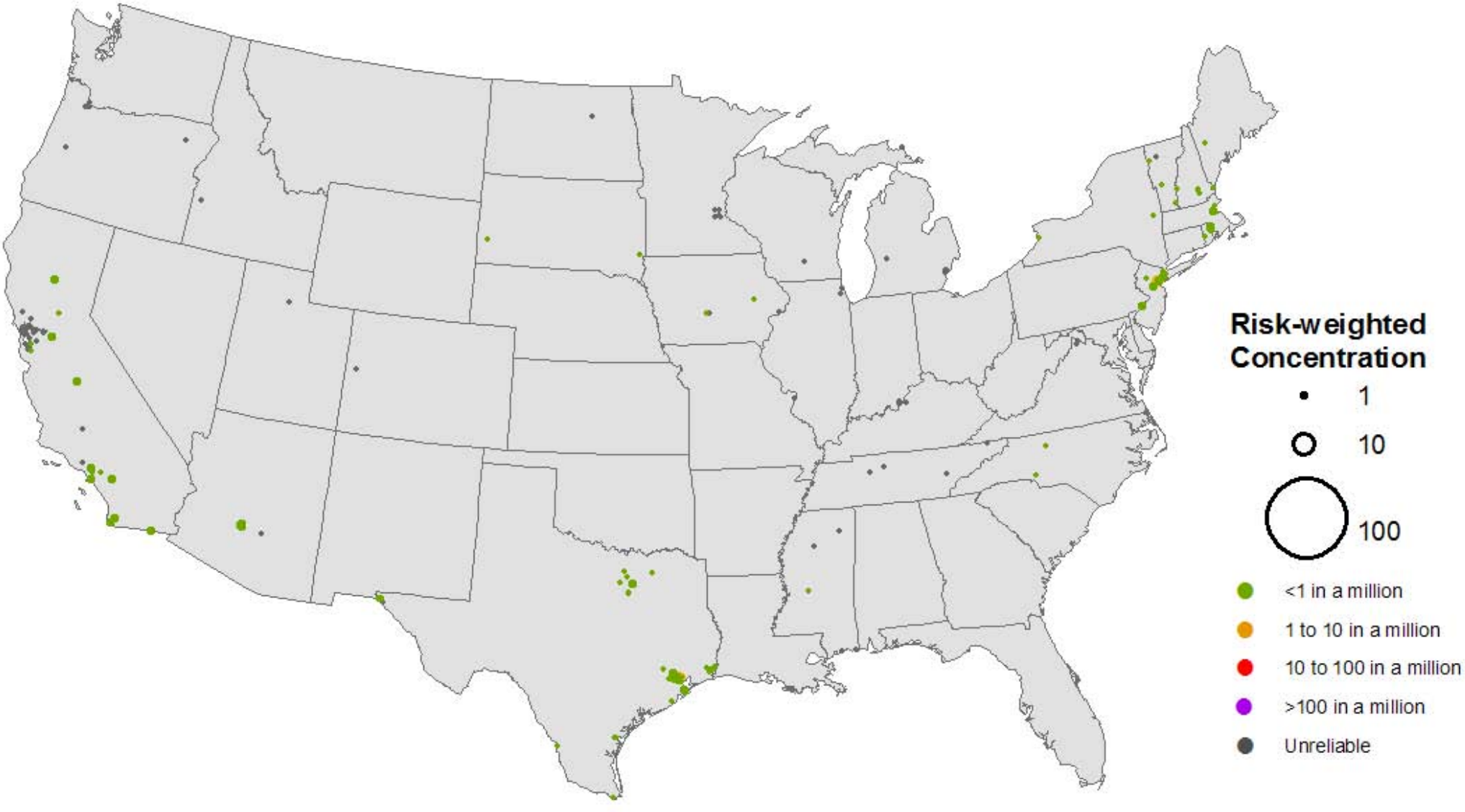
PARAMETER = 'Isophorone'

Supplemental Figure 60. Chronic cancer risk (per million) for site averages, 2003-2005.



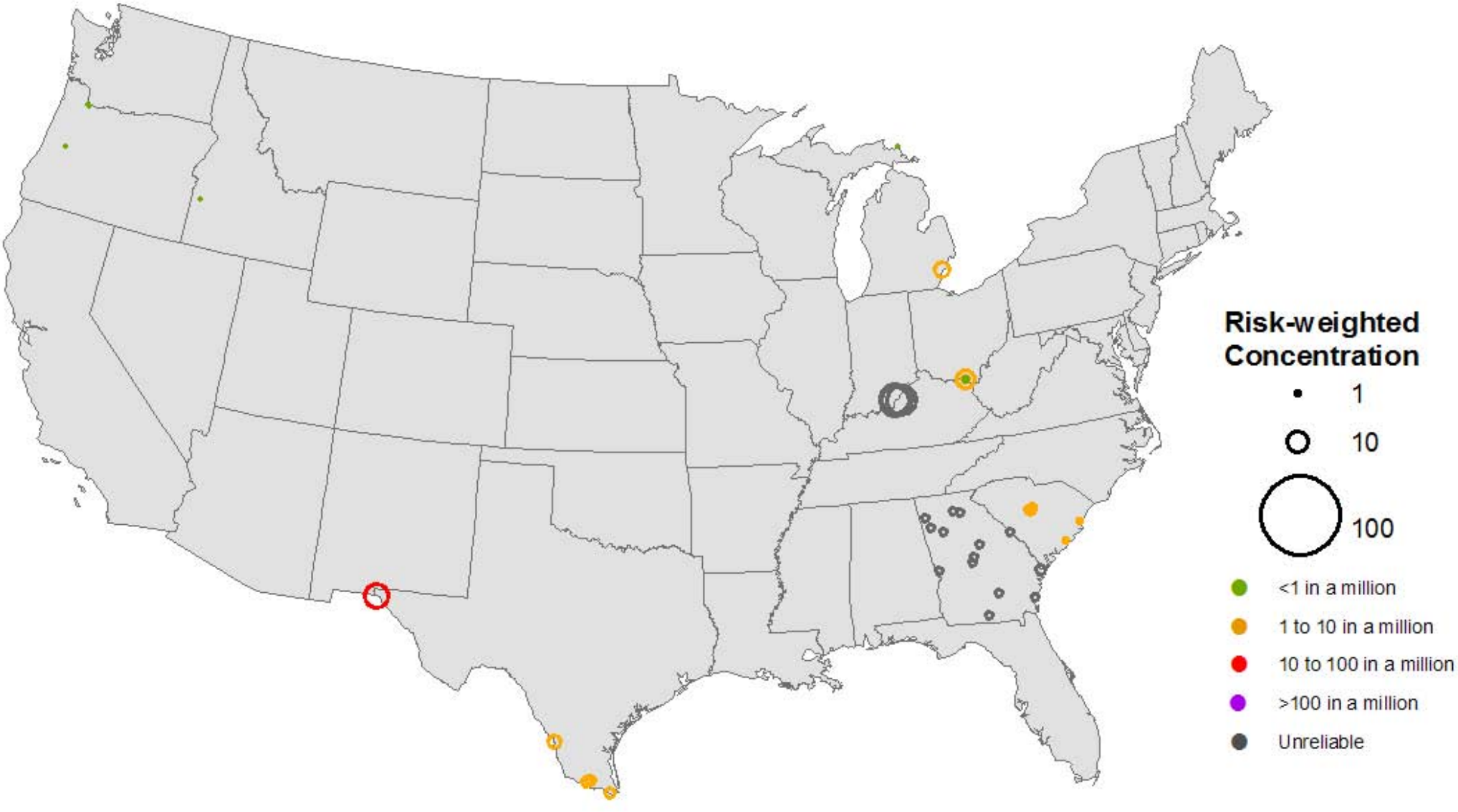
PARAMETER = 'Lindane'

Supplemental Figure 61. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Methyl Tert-Butyl Ether'

Supplemental Figure 62. Chronic cancer risk (per million) for site averages, 2003-2005.

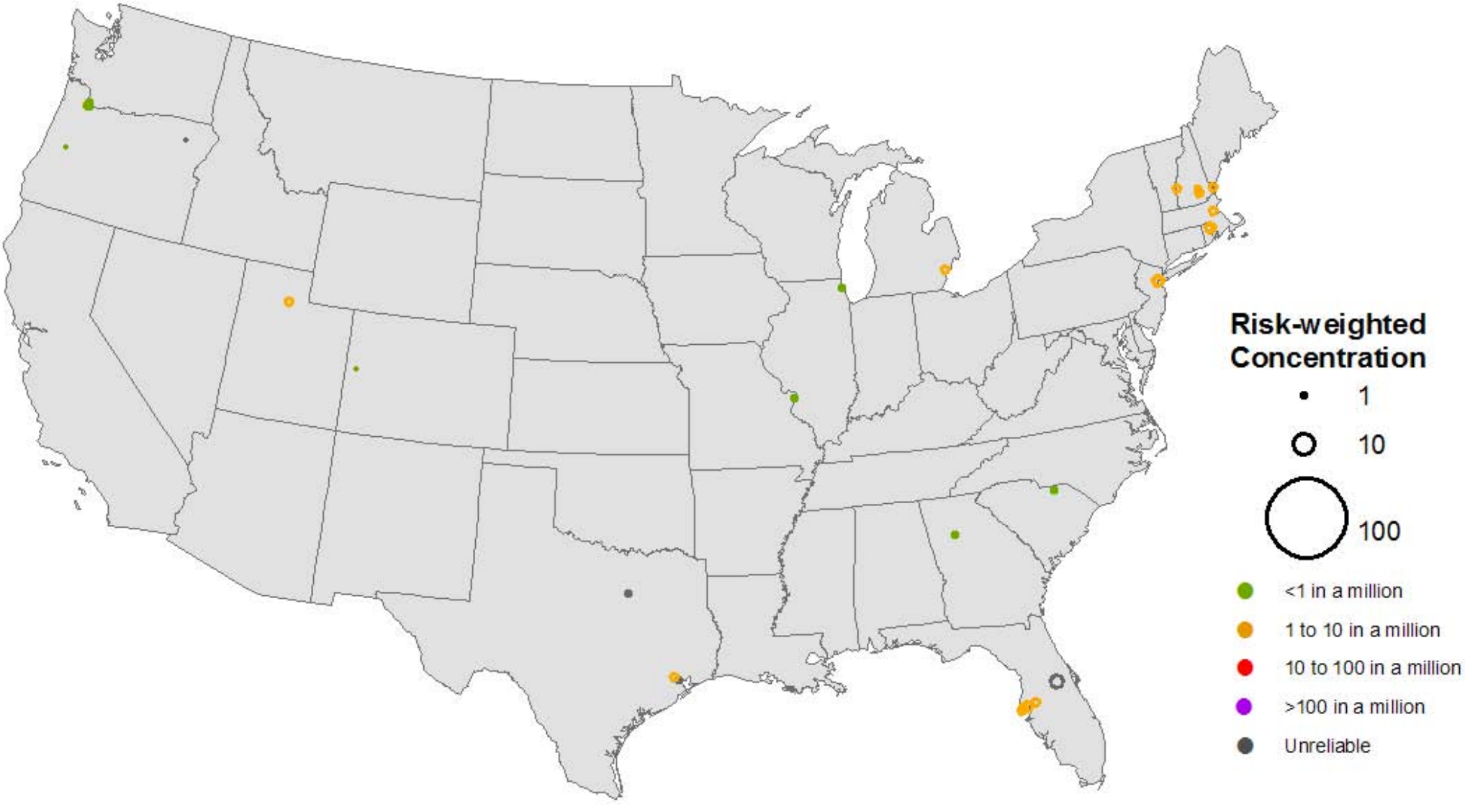


PARAMETER = 'Naphthalene'

Supplemental Figure 63. Chronic cancer risk (per million) for site averages, 2003-2005.

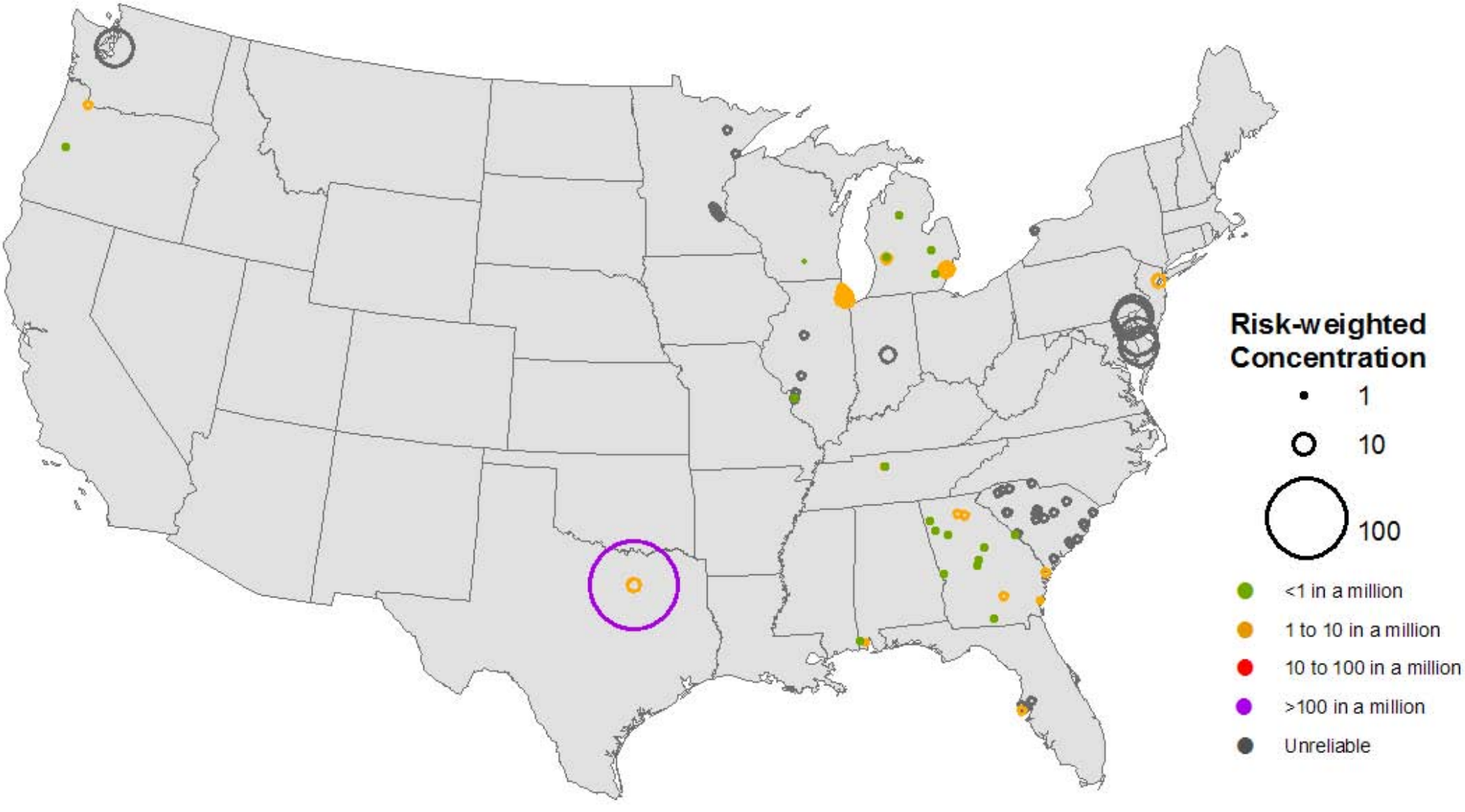
PARAMETER = 'Nickel (Coarse Particulate)'

Supplemental Figure 64. Chronic cancer risk (per million) for site averages, 2003-2005.



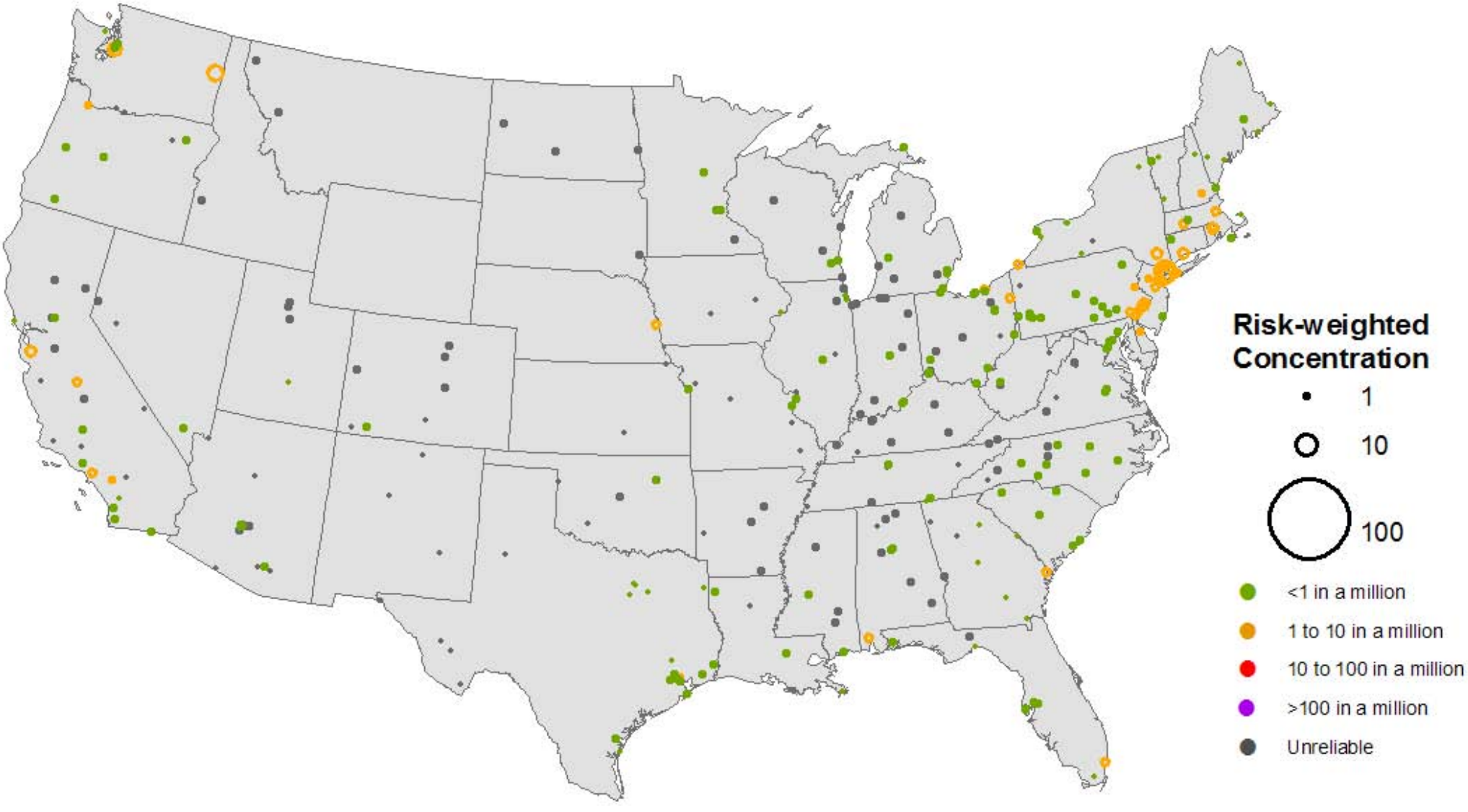
PARAMETER = 'Nickel (Pm10) Stp'

Supplemental Figure 65. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Nickel (Tsp)'

Supplemental Figure 66. Chronic cancer risk (per million) for site averages, 2003-2005.

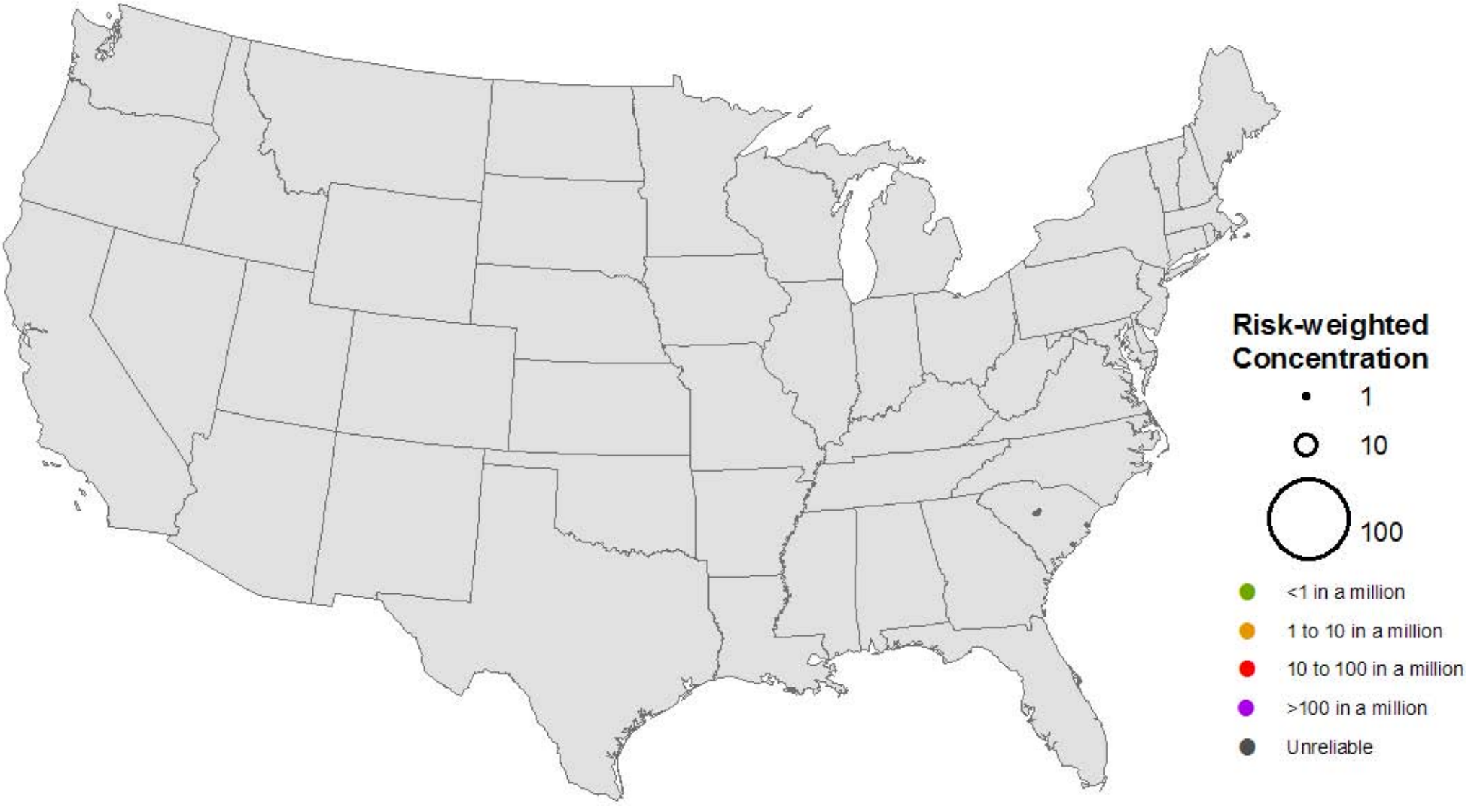


PARAMETER = 'Nickel Pm2.5 Lc'

Supplemental Figure 67. Chronic cancer risk (per million) for site averages, 2003-2005.

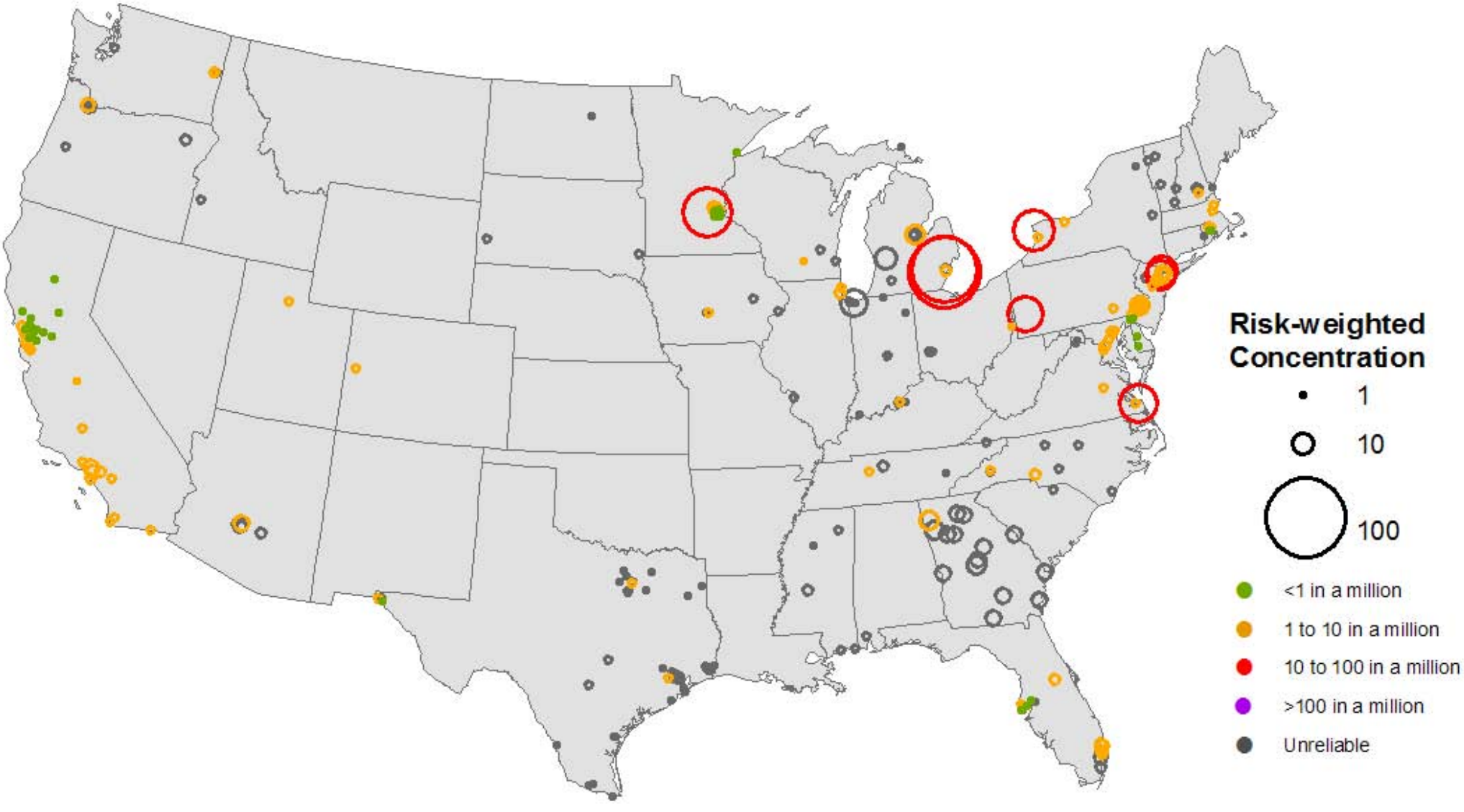
PARAMETER = 'Nickel Pm10 Lc'

Supplemental Figure 68. Chronic cancer risk (per million) for site averages, 2003-2005.



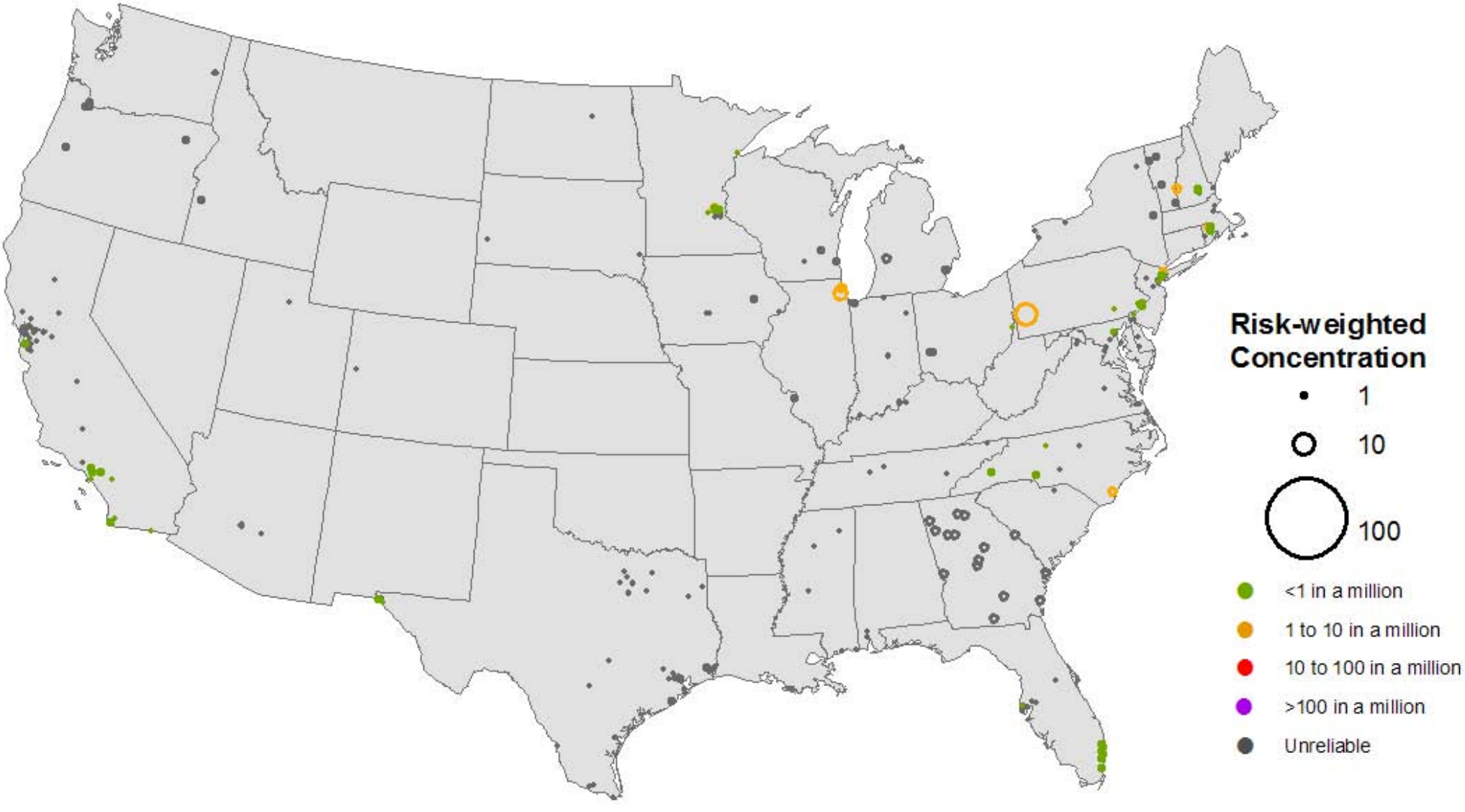
PARAMETER = 'Pentachlorophenol'

Supplemental Figure 69. Chronic cancer risk (per million) for site averages, 2003-2005.



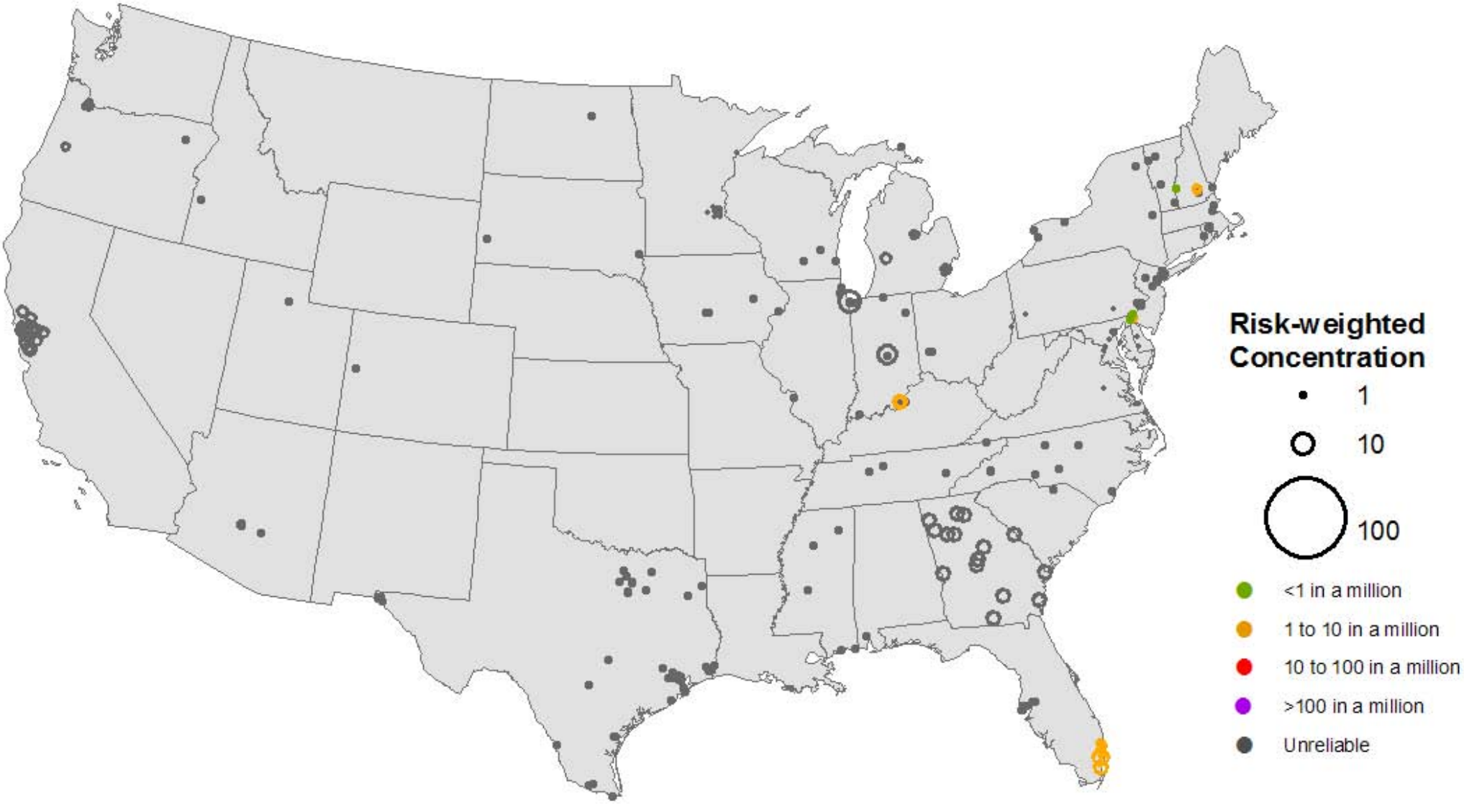
PARAMETER = 'Tetrachloroethylene'

Supplemental Figure 70. Chronic cancer risk (per million) for site averages, 2003-2005.



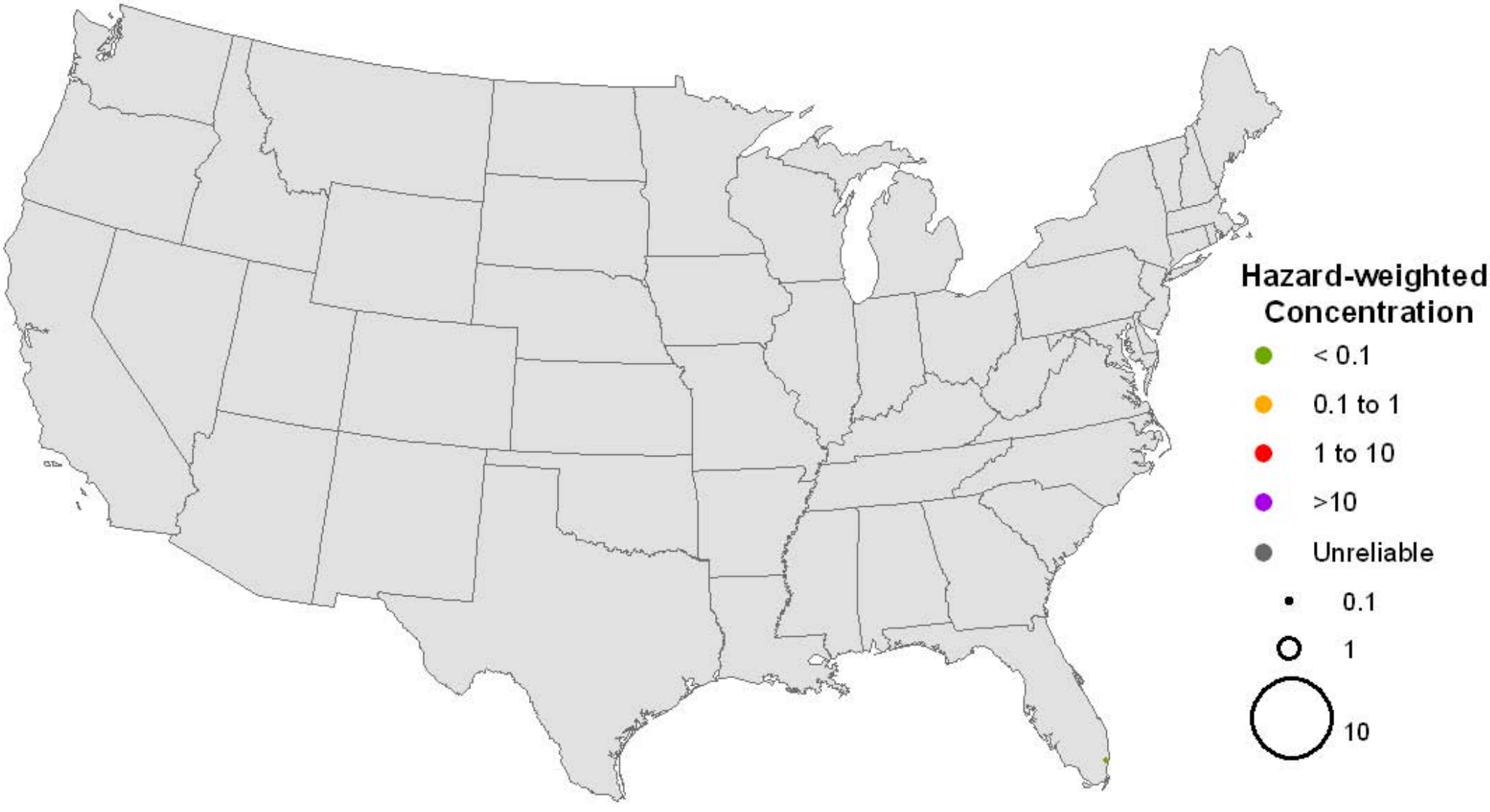
PARAMETER = 'Trichloroethylene'

Supplemental Figure 71. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = 'Vinyl Chloride'

Supplemental Figure 72. Chronic cancer risk (per million) for site averages, 2003-2005.



PARAMETER = '1,1,2-Trichloroethane'

Supplemental Figure 73. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = '1,1-Dichloroethane'

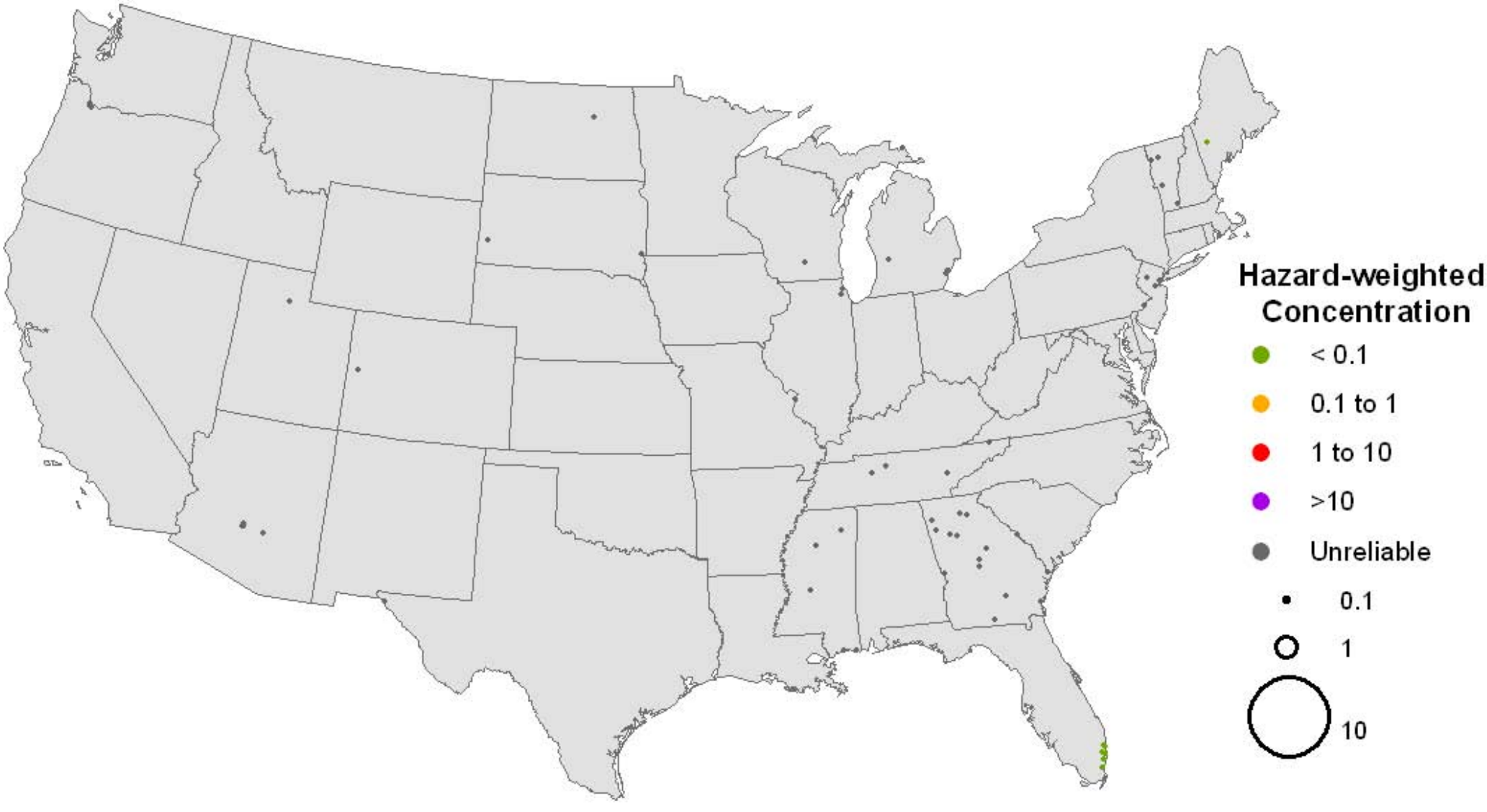
Supplemental Figure 74. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = '1,1-Dichloroethylene'

Supplemental Figure 75. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = '1,2,3,4,5,6- Hexachlolocyclohexane, .Beta.-'

Supplemental Figure 76. Chronic noncancer risk for site averages, 2003-2005.

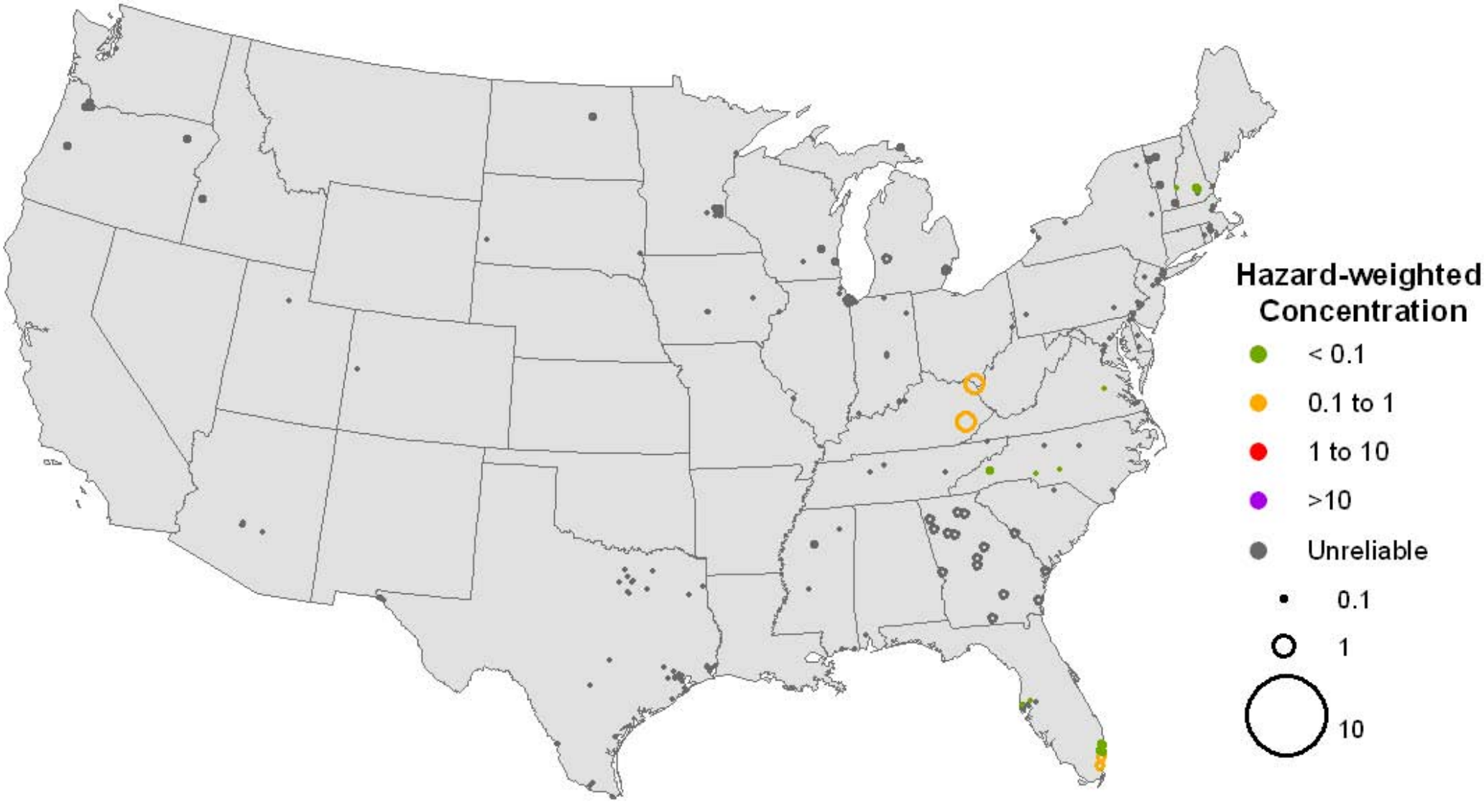


PARAMETER = '1,2,4-Trichlorobenzene'

Supplemental Figure 77. Chronic noncancer risk for site averages, 2003-2005.

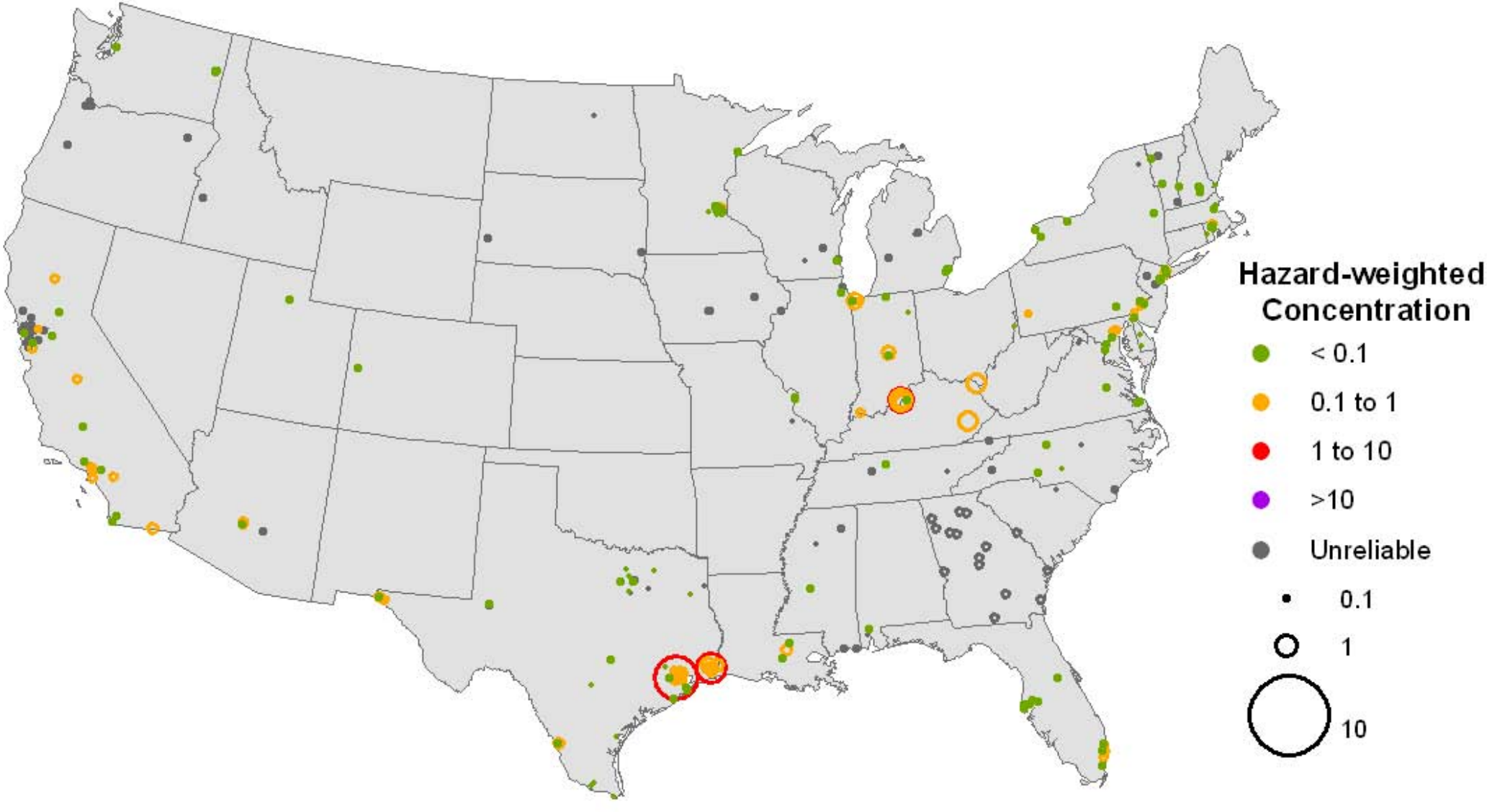
PARAMETER = '1,2-Dibromo-3-Chloropropane'

Supplemental Figure 78. Chronic noncancer risk for site averages, 2003-2005.



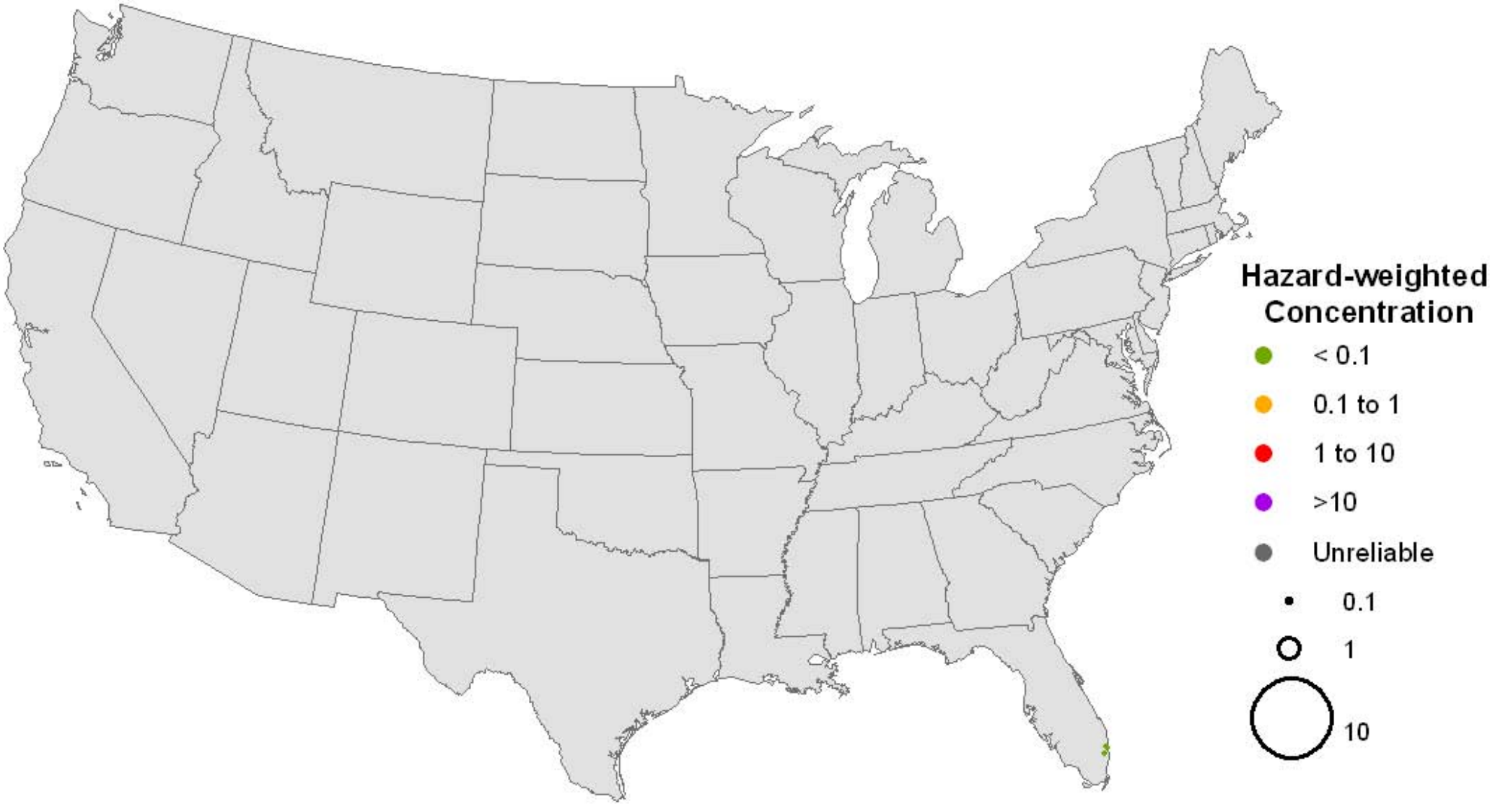
PARAMETER = '1,2-Dichloropropane'

Supplemental Figure 79. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = '1,3-Butadiene'

Supplemental Figure 80. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = '1,3-Dichloropropene(Total)'

Supplemental Figure 81. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = '1,4-Dichlorobenzene'

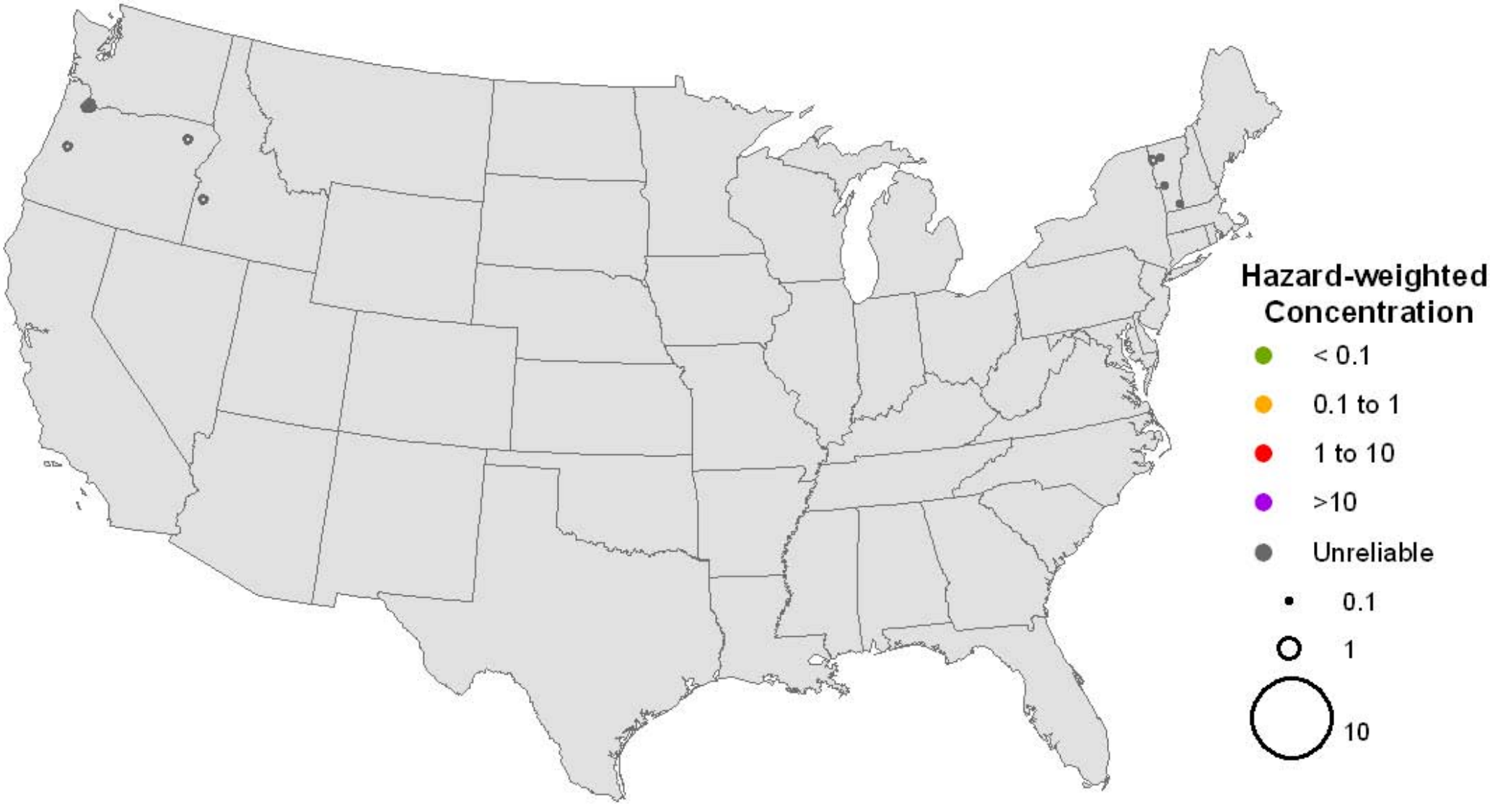
Supplemental Figure 82. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = '1,4-Dioxane'

Supplemental Figure 83. Chronic noncancer risk for site averages, 2003-2005.

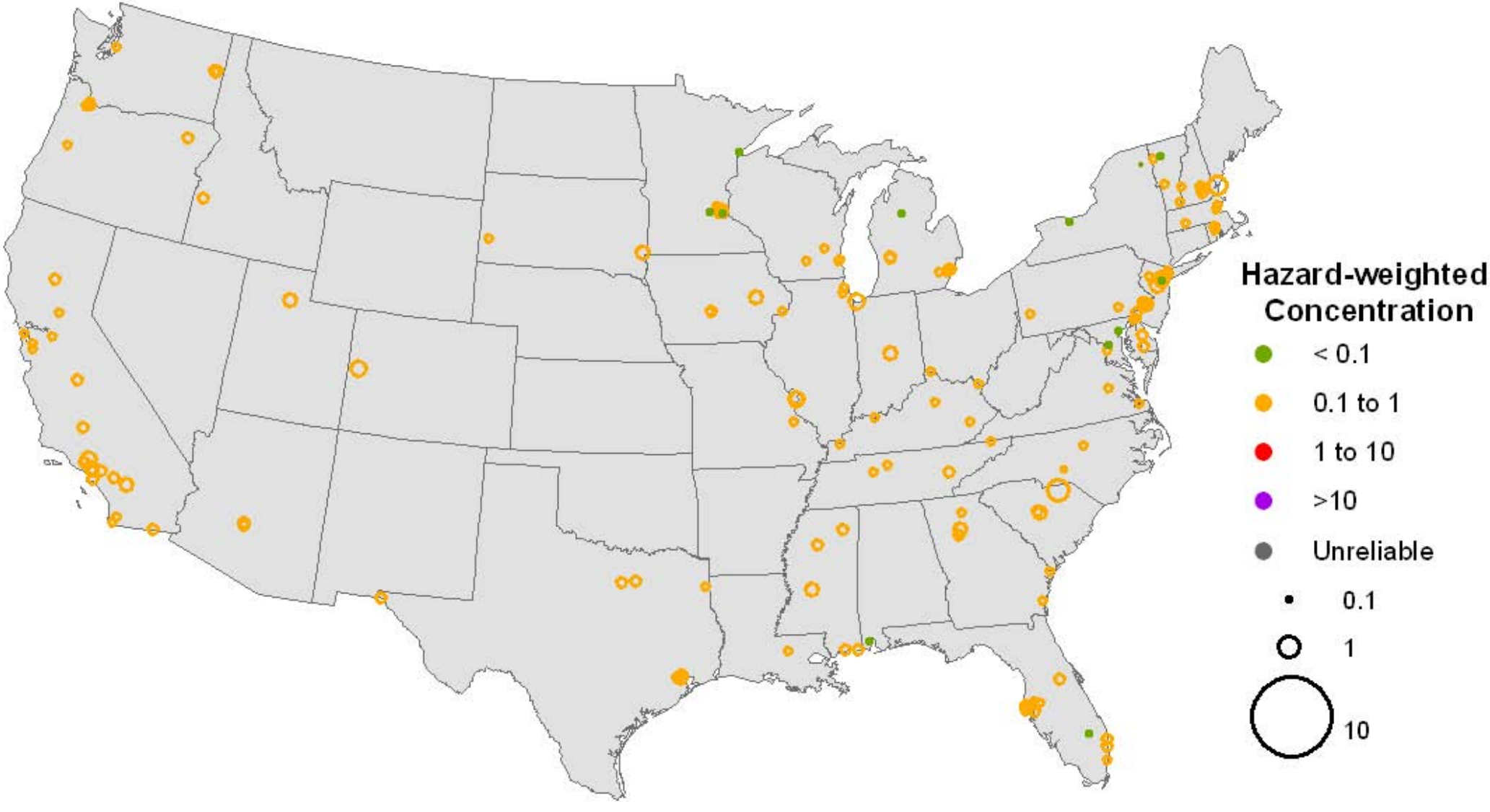
PARAMETER = '2,4-Dinitrotoluene'

Supplemental Figure 84. Chronic noncancer risk for site averages, 2003-2005.



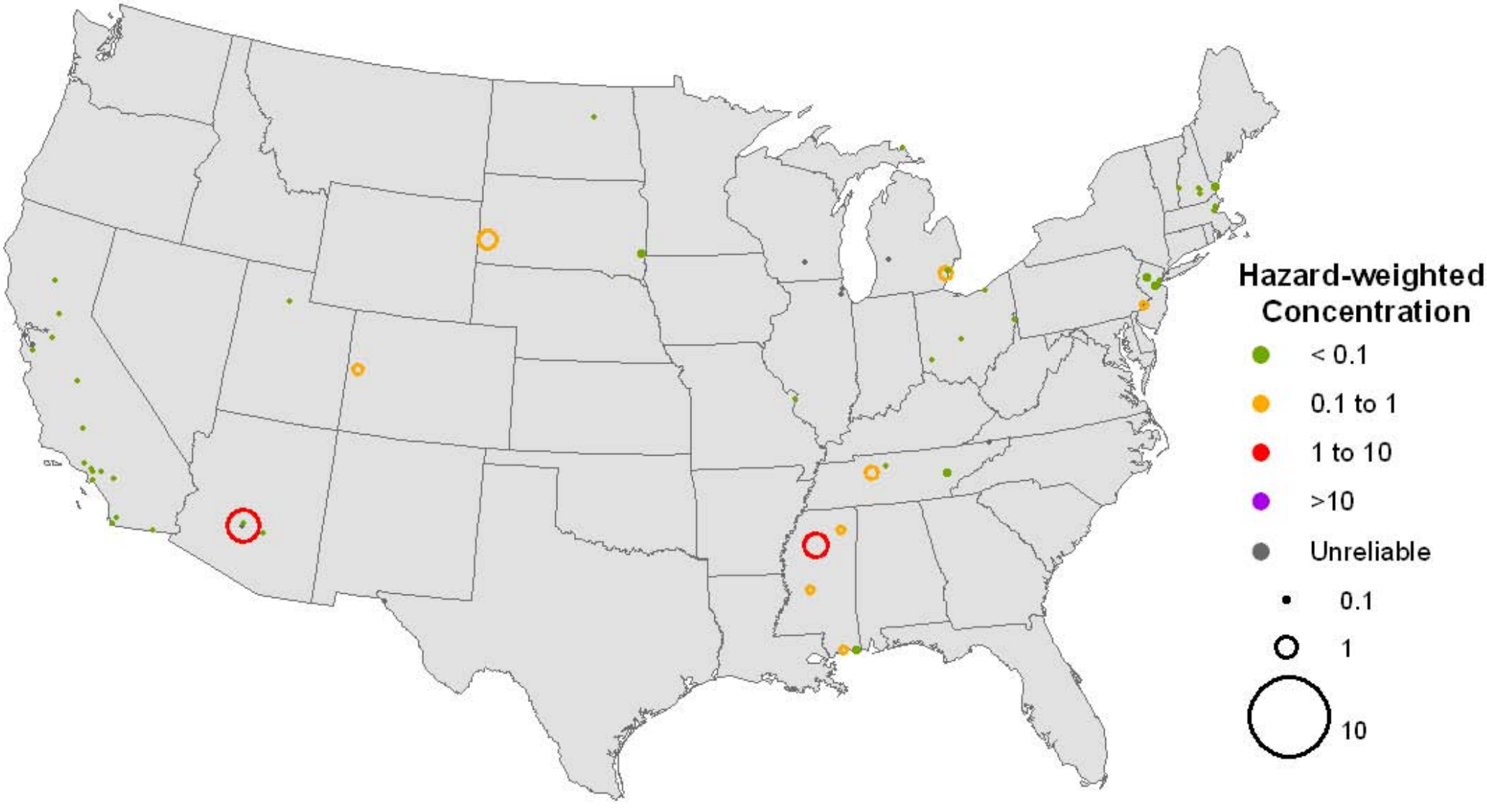
PARAMETER = '3-Chloropropene'

Supplemental Figure 85. Chronic noncancer risk for site averages, 2003-2005.



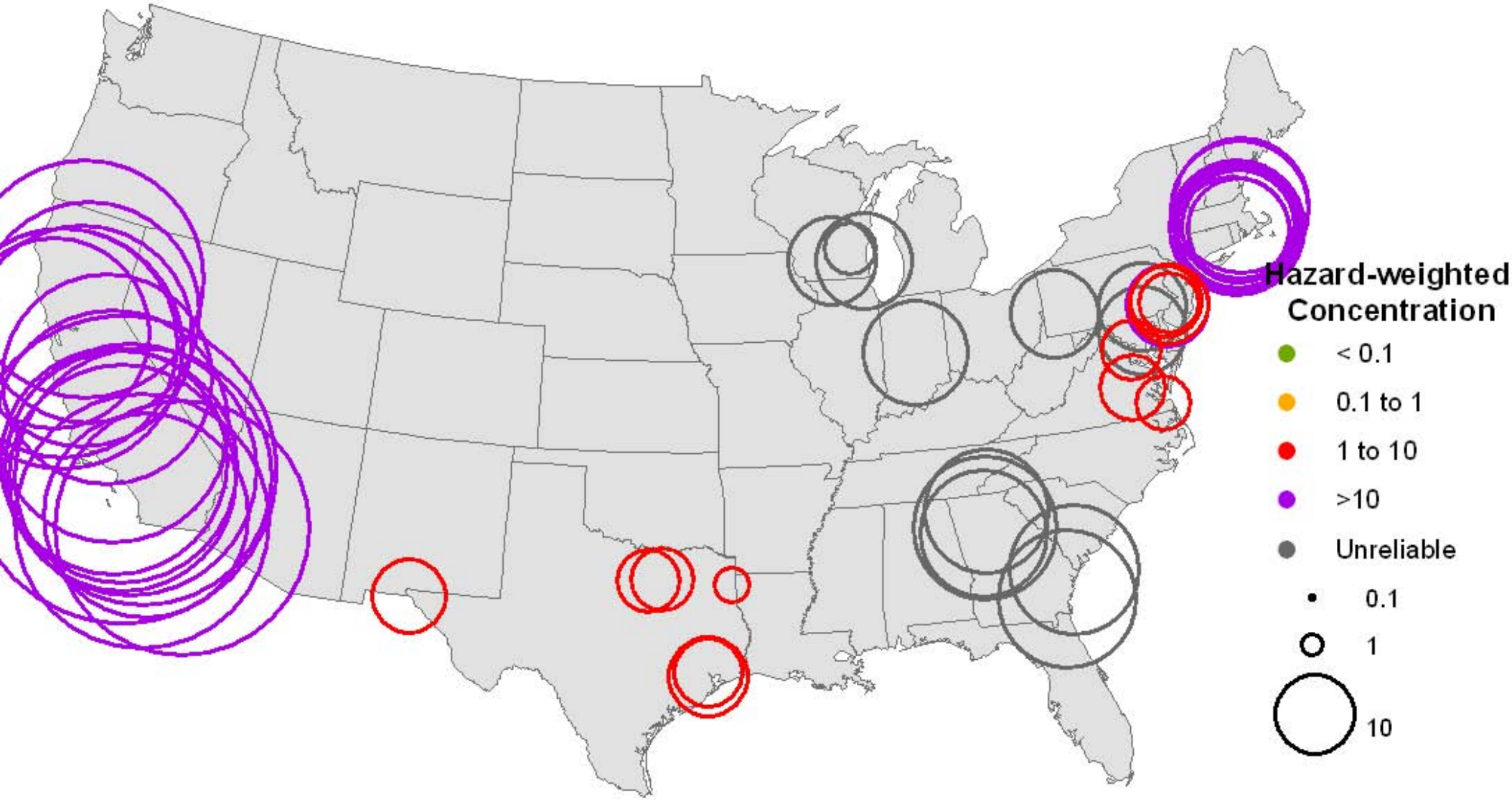
PARAMETER = 'Acetaldehyde'

Supplemental Figure 86. Chronic noncancer risk for site averages, 2003-2005.



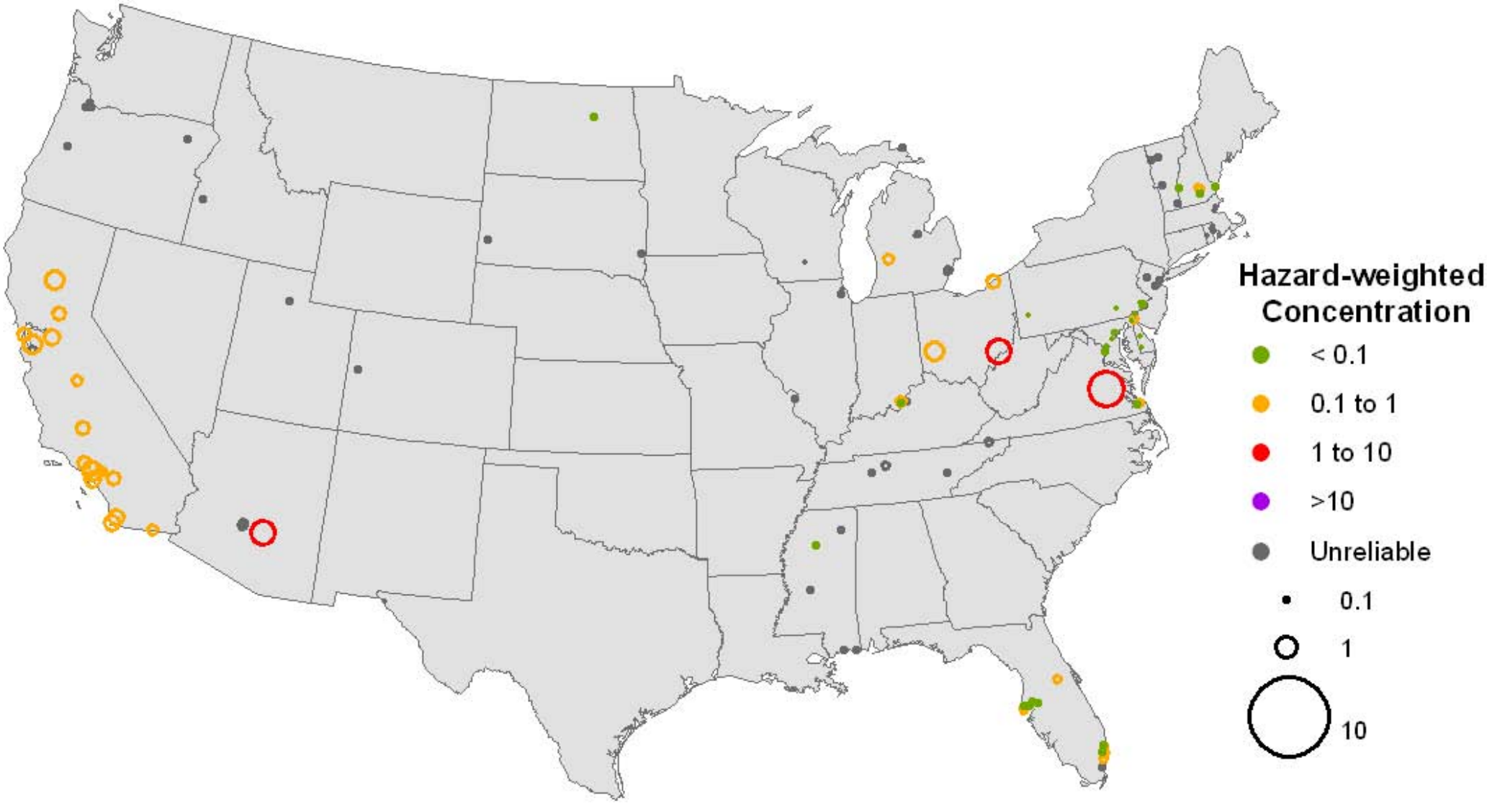
PARAMETER = 'Acetonitrile'

Supplemental Figure 87. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Acrolein'

Supplemental Figure 88. Chronic noncancer risk for site averages, 2003-2005.

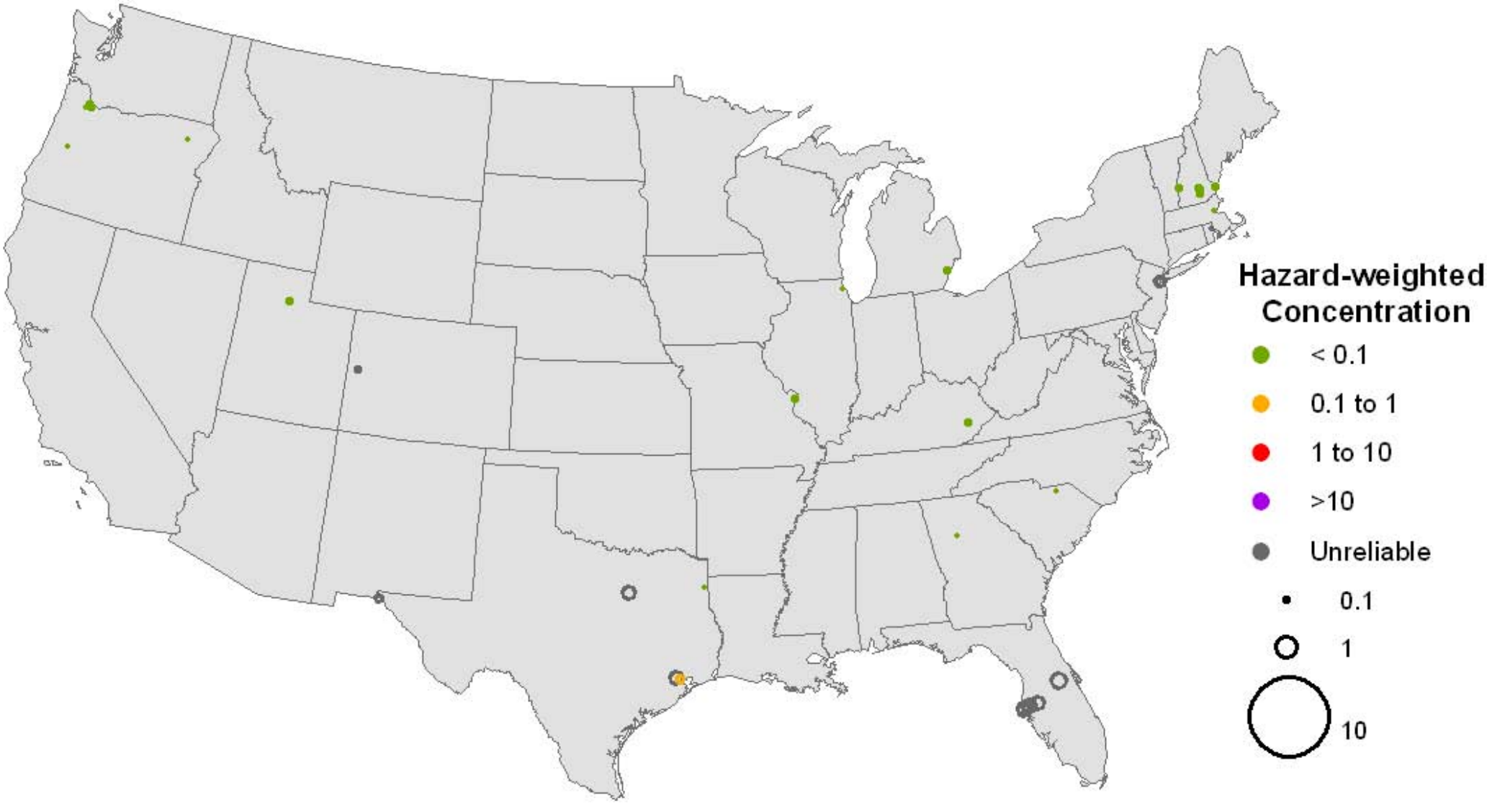


PARAMETER = 'Acrylonitrile'

Supplemental Figure 89. Chronic noncancer risk for site averages, 2003-2005.

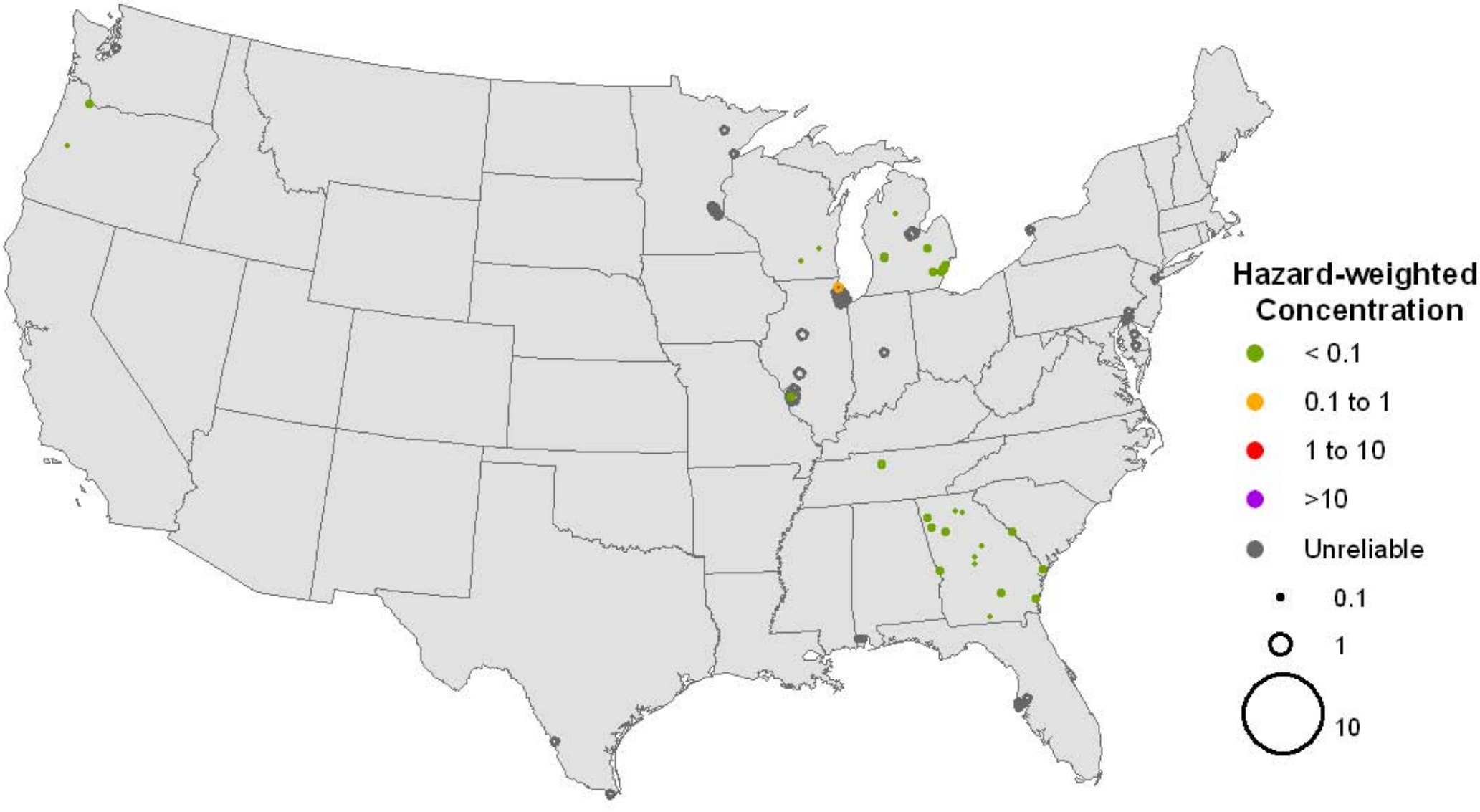
PARAMETER = 'Aniline'

Supplemental Figure 90. Chronic noncancer risk for site averages, 2003-2005.



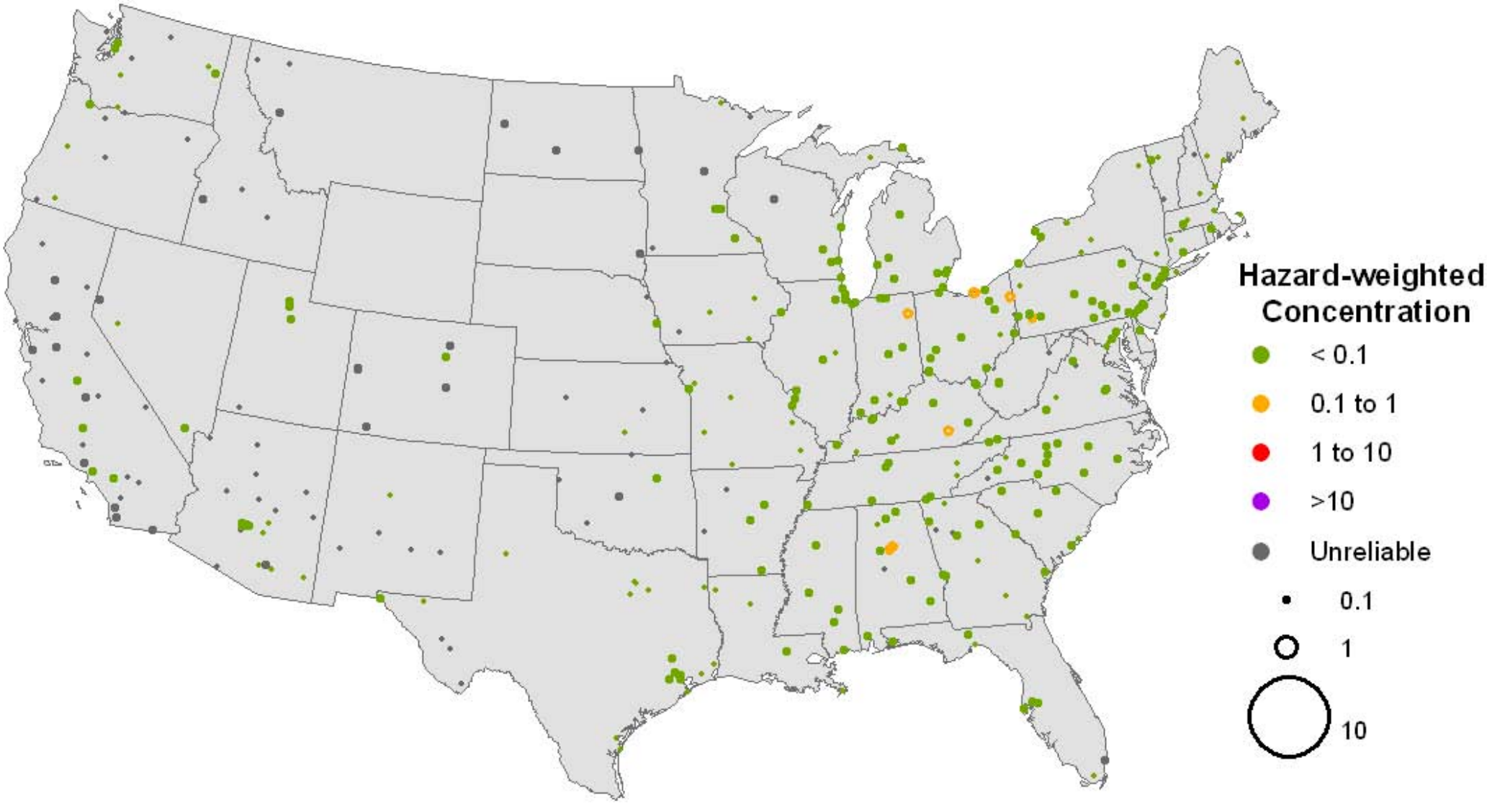
PARAMETER = 'Arsenic (Pm10) Stp'

Supplemental Figure 91. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Arsenic (Tsp)'

Supplemental Figure 92. Chronic noncancer risk for site averages, 2003-2005.

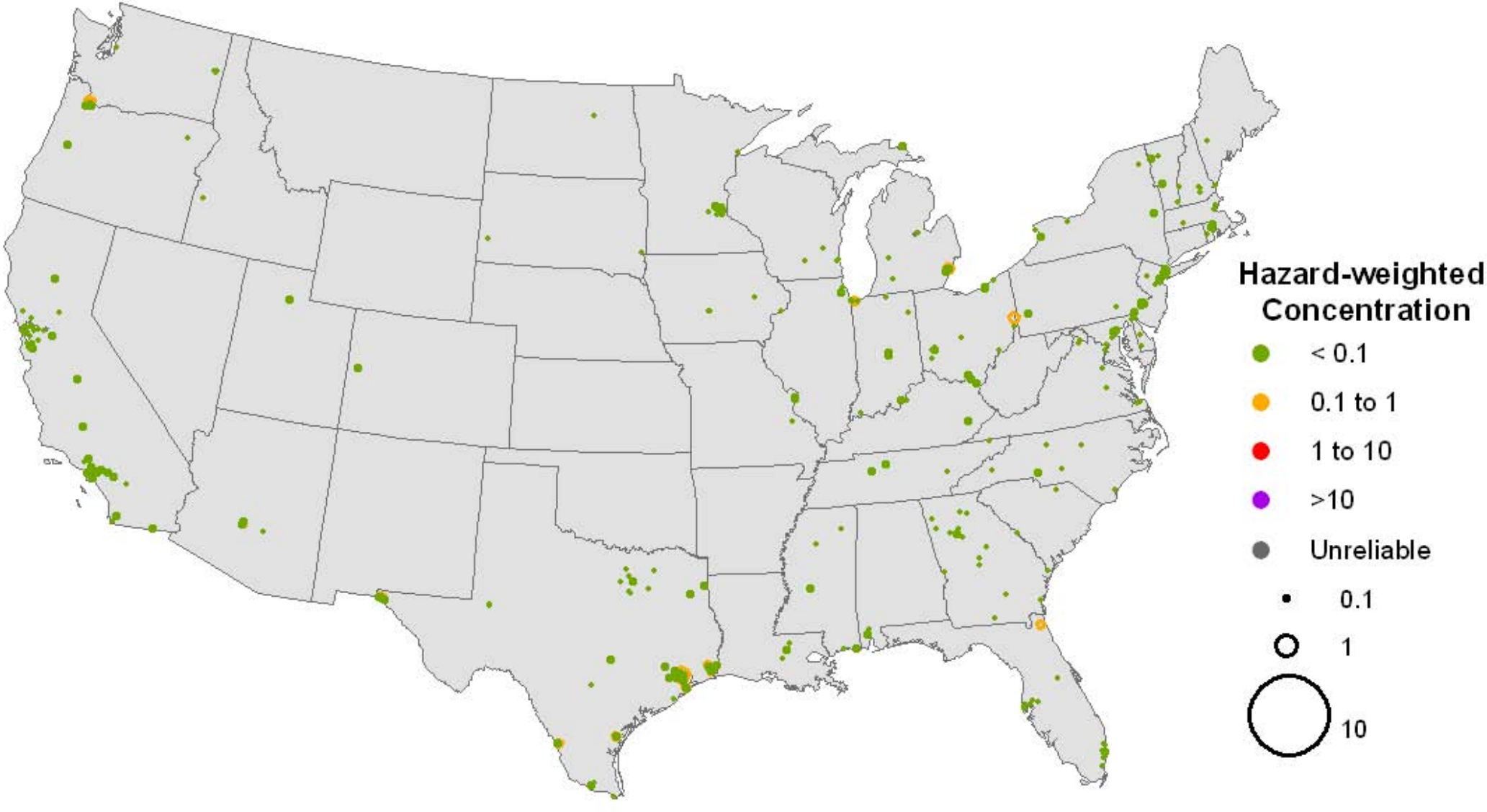


PARAMETER = 'Arsenic Pm2.5 Lc'

Supplemental Figure 93. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Arsenic Pm10 Lc'

Supplemental Figure 94. Chronic noncancer risk for site averages, 2003-2005.

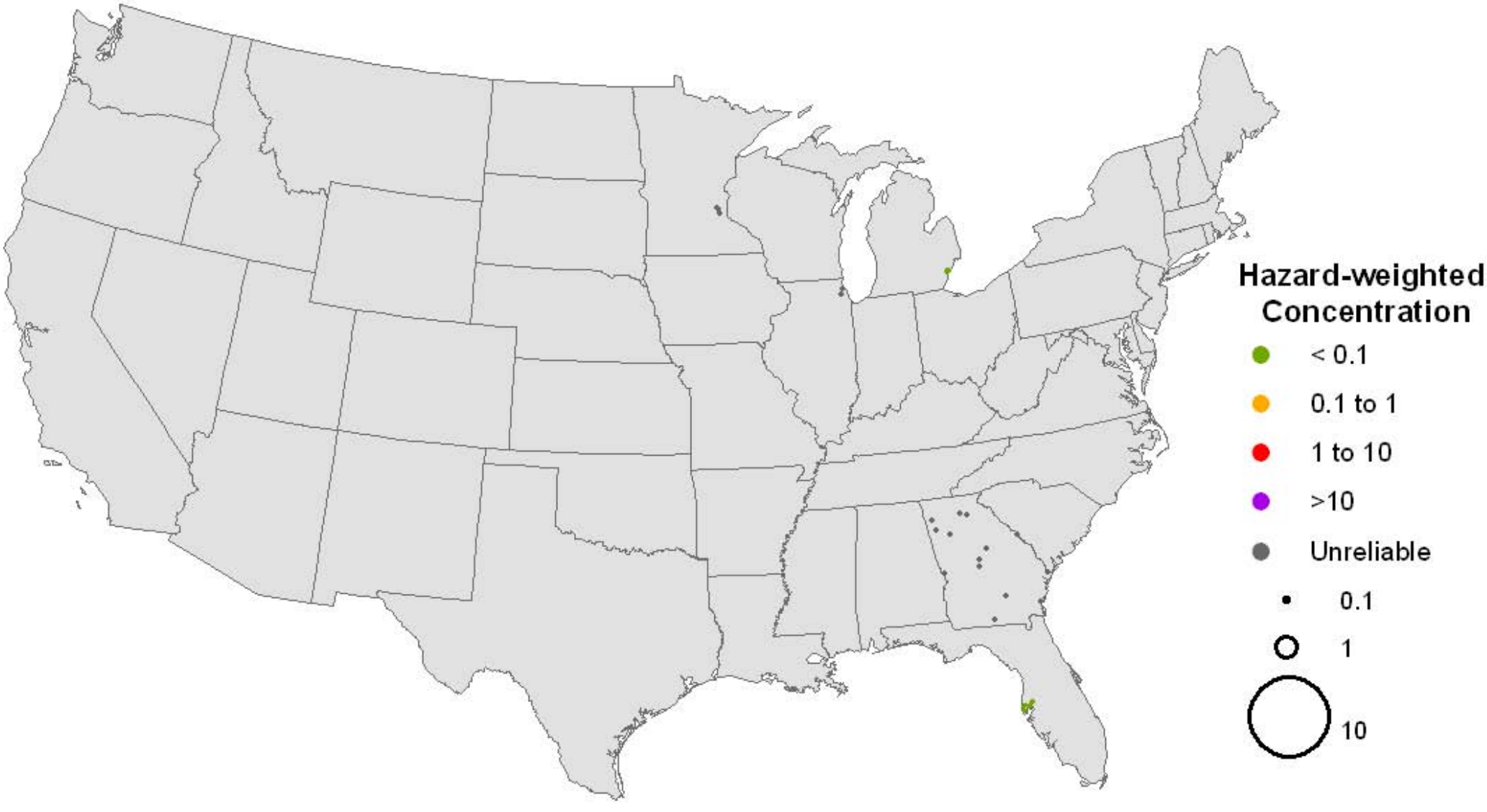


PARAMETER = 'Benzene'

Supplemental Figure 95. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Beryllium (Pm10) Stp'

Supplemental Figure 96. Chronic noncancer risk for site averages, 2003-2005.

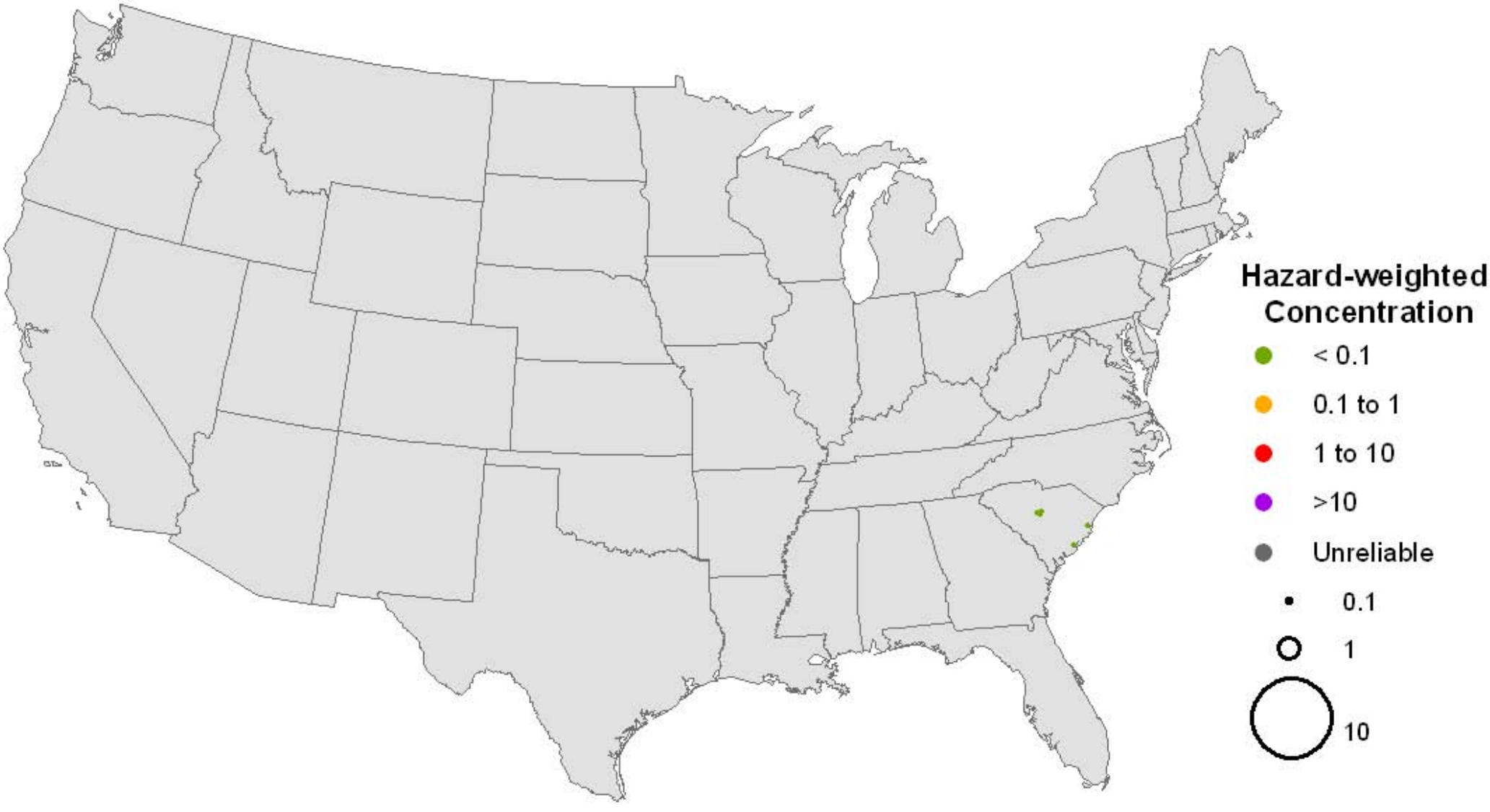


PARAMETER = 'Beryllium (Tsp)'

Supplemental Figure 97. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Beryllium Pm10 Lc'

Supplemental Figure 98. Chronic noncancer risk for site averages, 2003-2005.

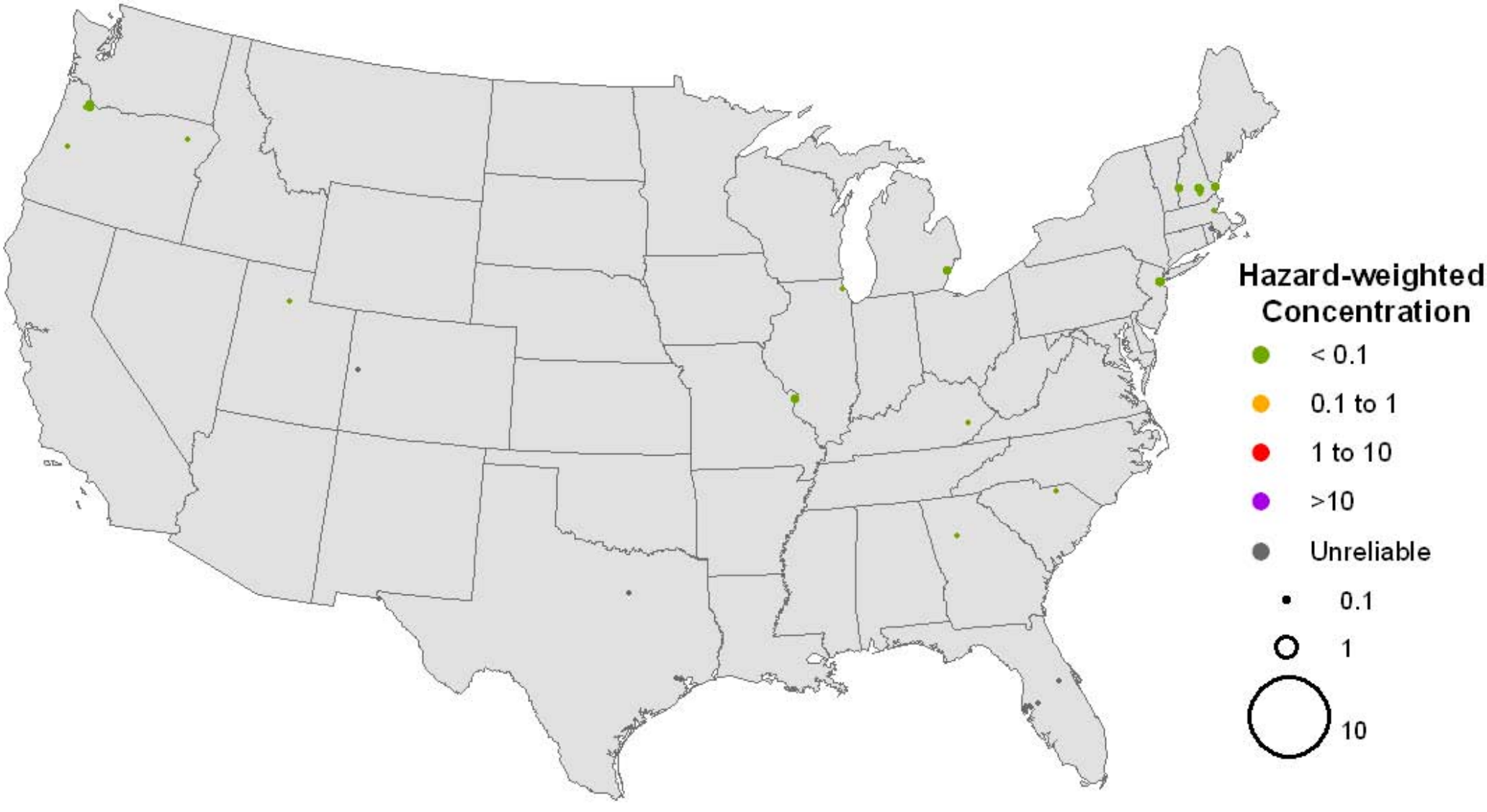


PARAMETER = 'Bis(2-Ethylhexyl)Phthalate'

Supplemental Figure 99. Chronic noncancer risk for site averages, 2003-2005.

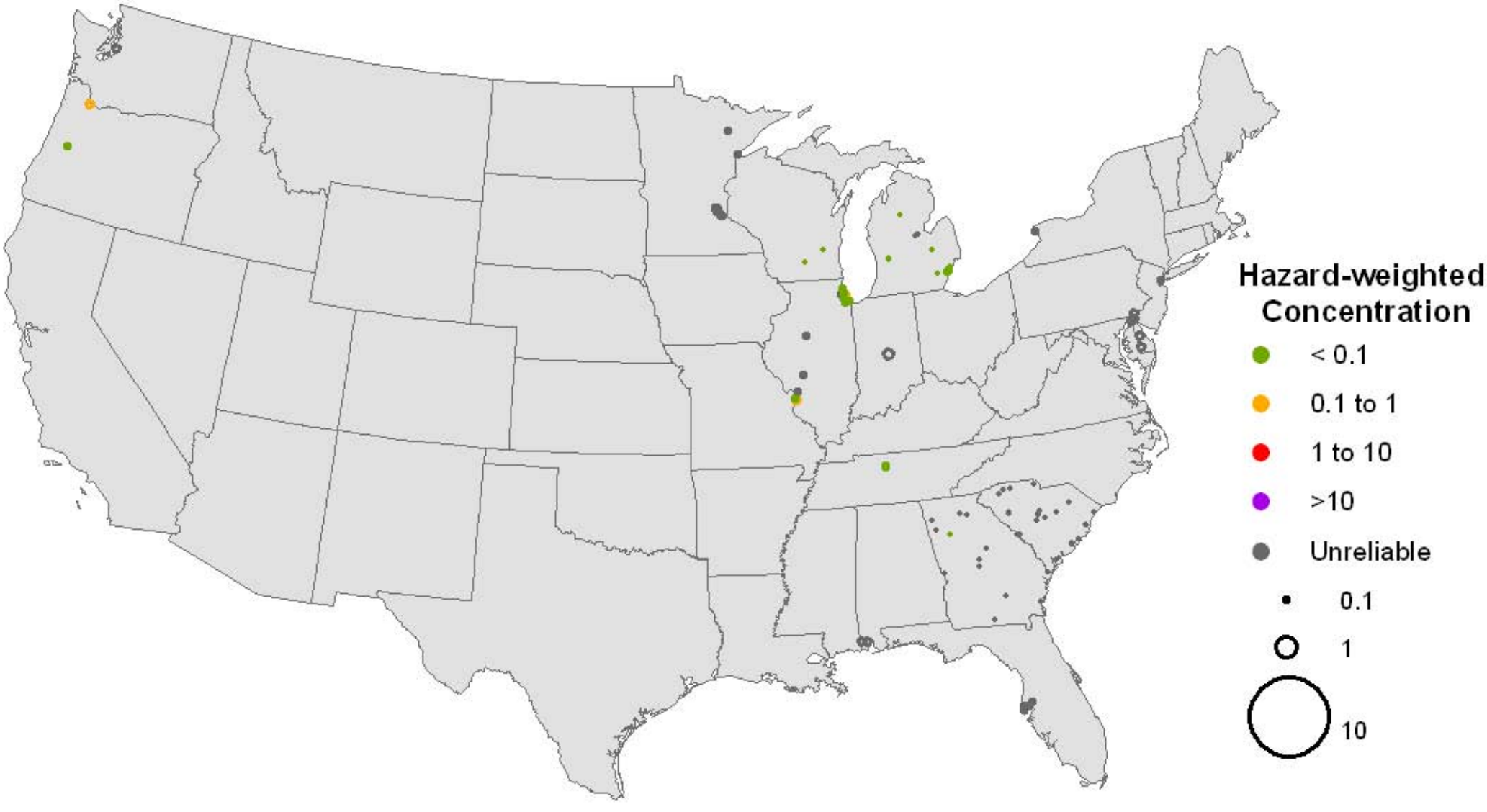
PARAMETER = 'Bromomethane'

Supplemental Figure 100. Chronic noncancer risk for site averages, 2003-2005.



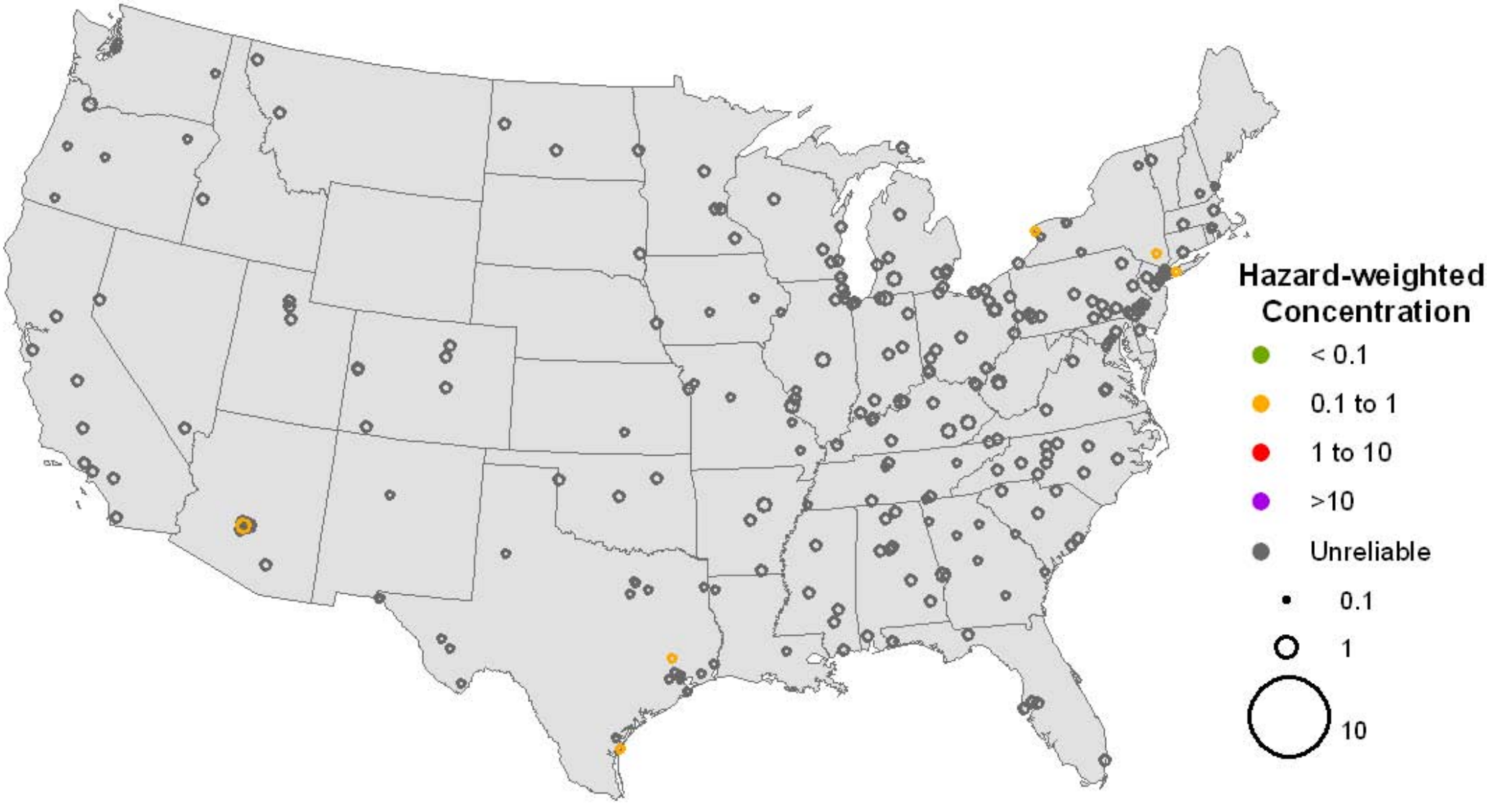
PARAMETER = 'Cadmium (Pm10) Stp'

Supplemental Figure 101. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Cadmium (Tsp)'

Supplemental Figure 102. Chronic noncancer risk for site averages, 2003-2005.

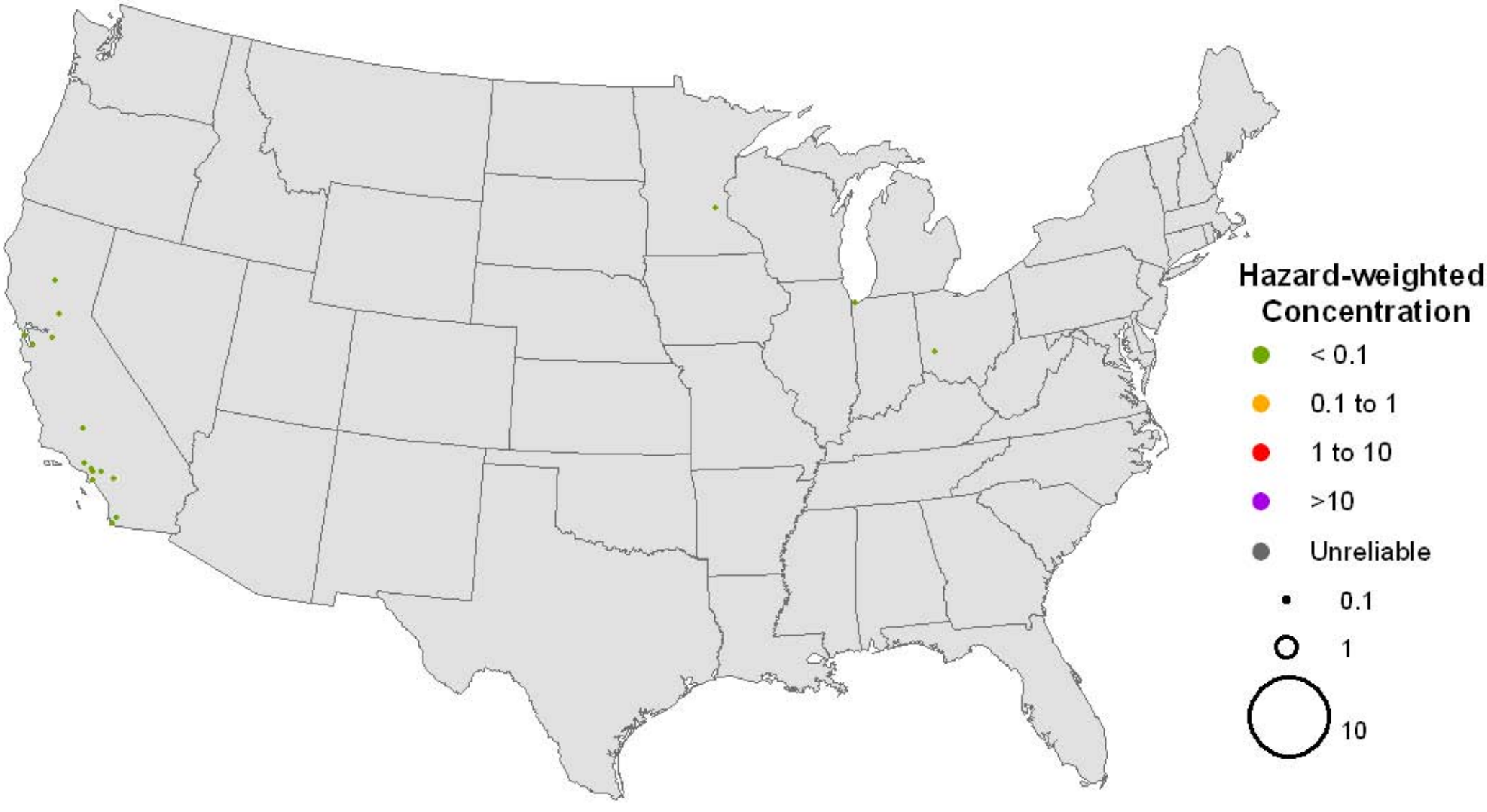


PARAMETER = 'Cadmium Pm2.5 Lc'

Supplemental Figure 103. Chronic noncancer risk for site averages, 2003-2005.

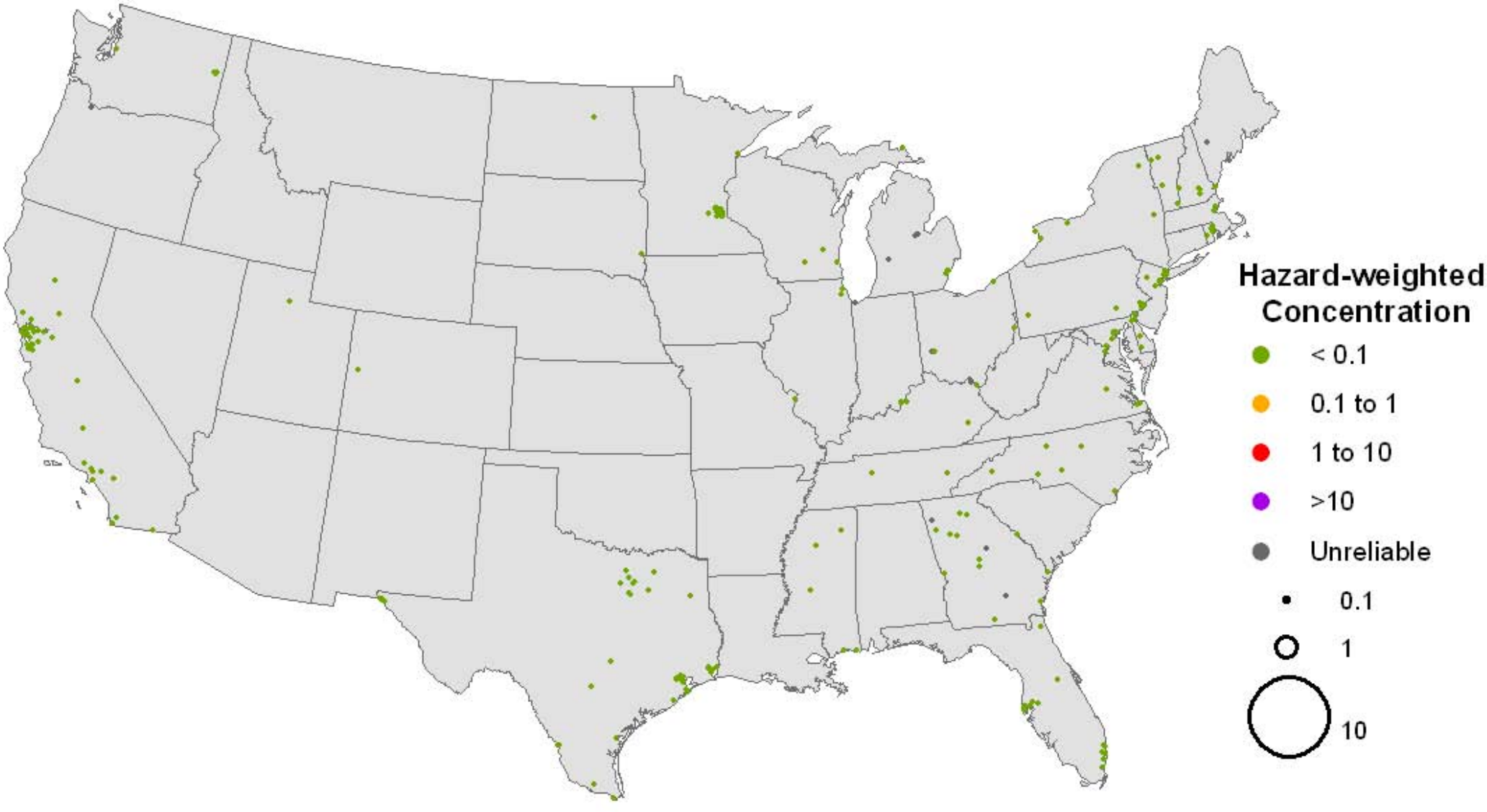
PARAMETER = 'Cadmium Pm10 Lc'

Supplemental Figure 104. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Carbon Disulfide'

Supplemental Figure 105. Chronic noncancer risk for site averages, 2003-2005.

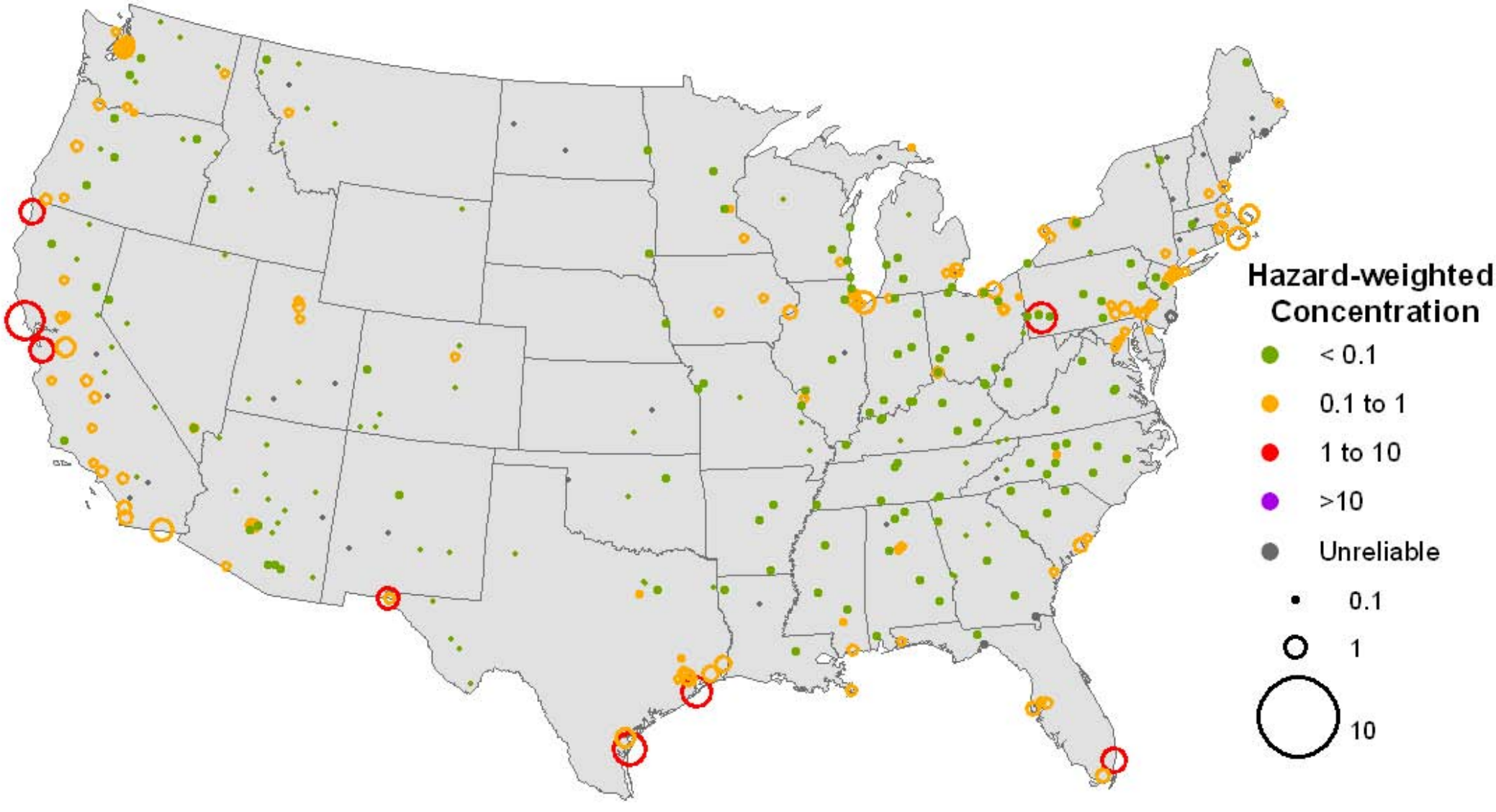


PARAMETER = 'Carbon Tetrachloride'

Supplemental Figure 106. Chronic noncancer risk for site averages, 2003-2005.

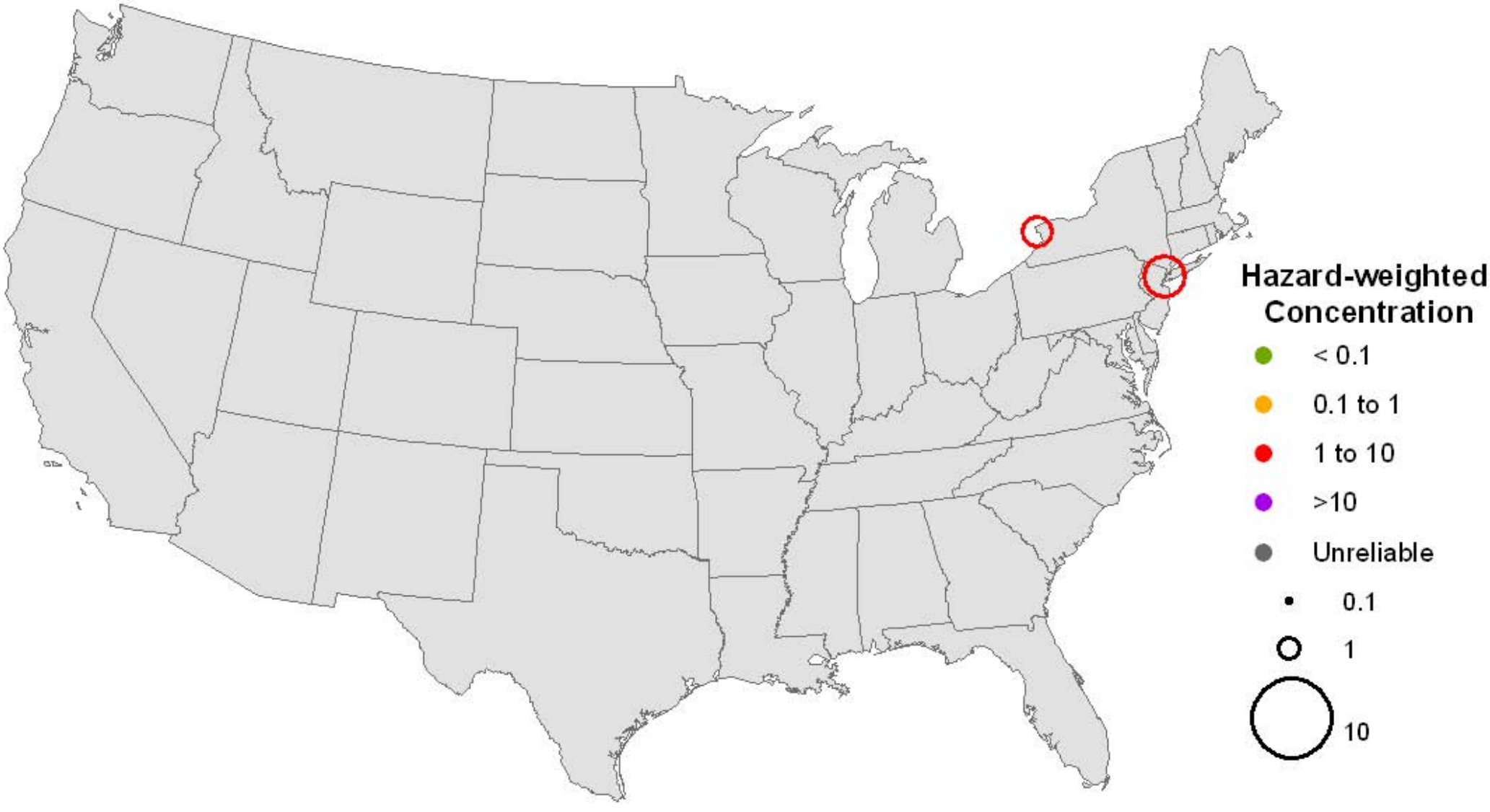
PARAMETER = 'Chlorine (Tsp)'

Supplemental Figure 107. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Chlorine Pm2.5 Lc'

Supplemental Figure 108. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Chlorine Pm10 Lc'

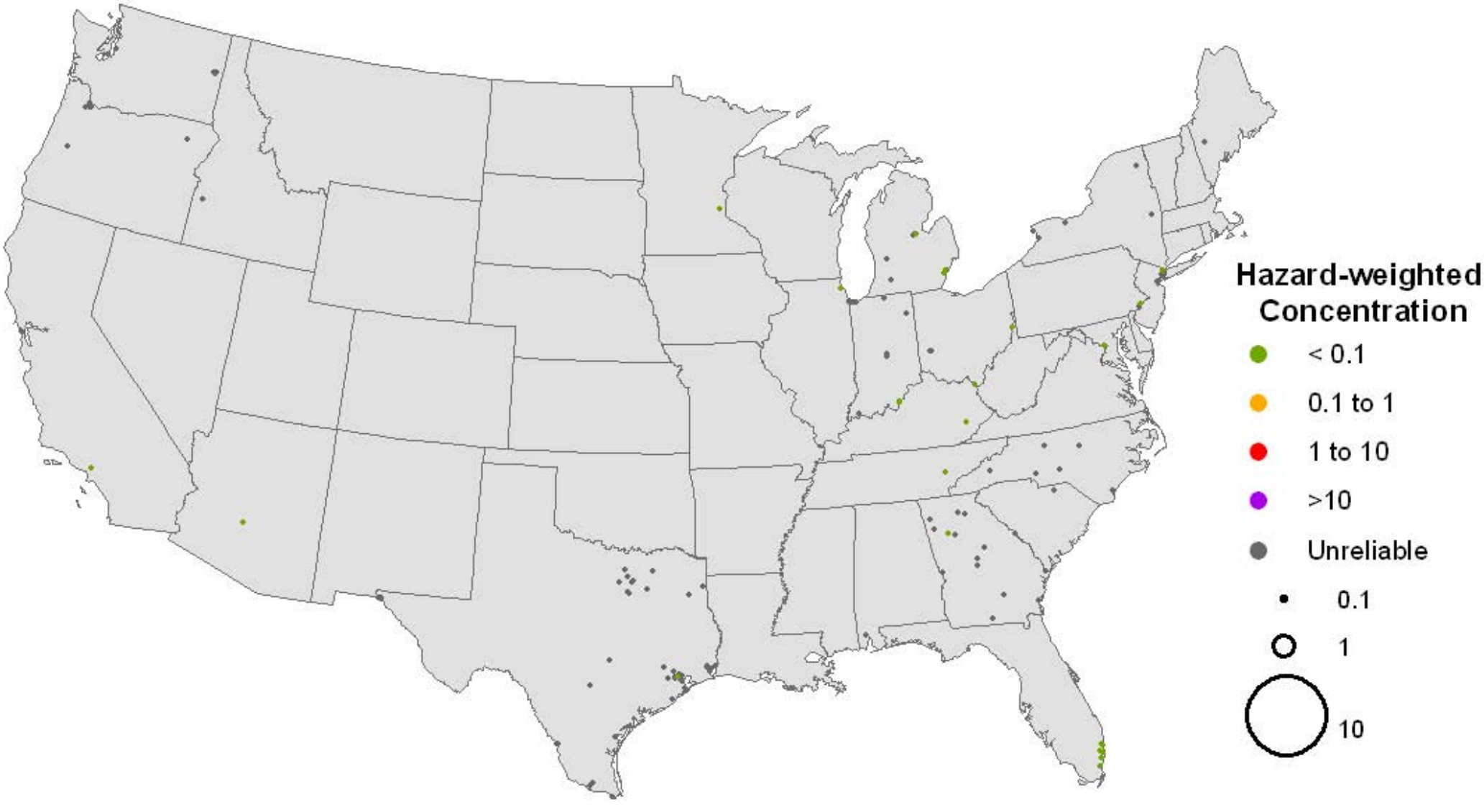
Supplemental Figure 109. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Chlorobenzene'

Supplemental Figure 110. Chronic noncancer risk for site averages, 2003-2005.

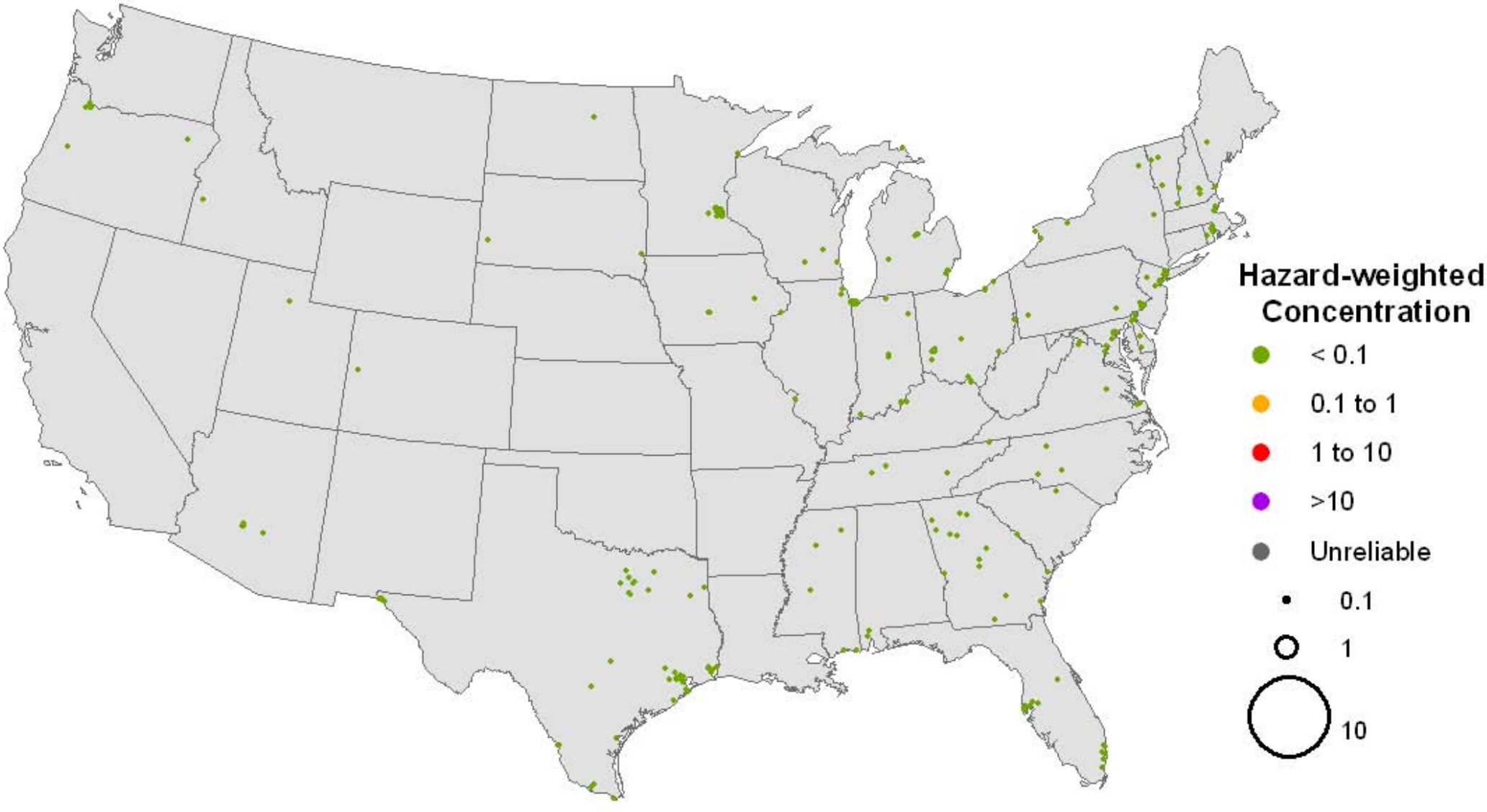
PARAMETER = 'Chloroethane'

Supplemental Figure 111. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Chloroform'

Supplemental Figure 112. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Chloromethane'

Supplemental Figure 113. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Chloroprene'

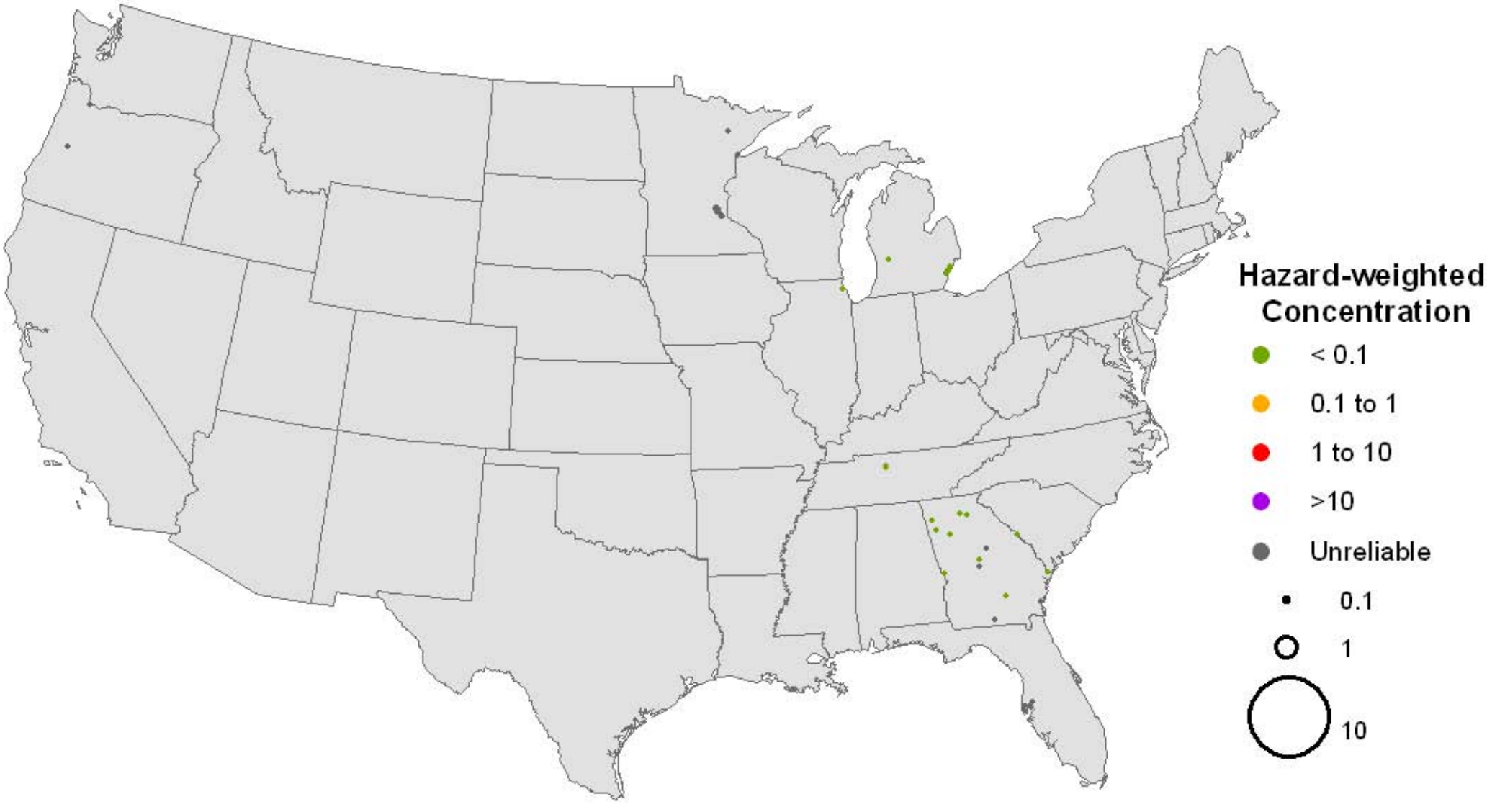
Supplemental Figure 114. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Chromium Vi(Tsp)'

Supplemental Figure 115. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Cobalt (Pm10) Stp'

Supplemental Figure 116. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Cobalt (Tsp)'

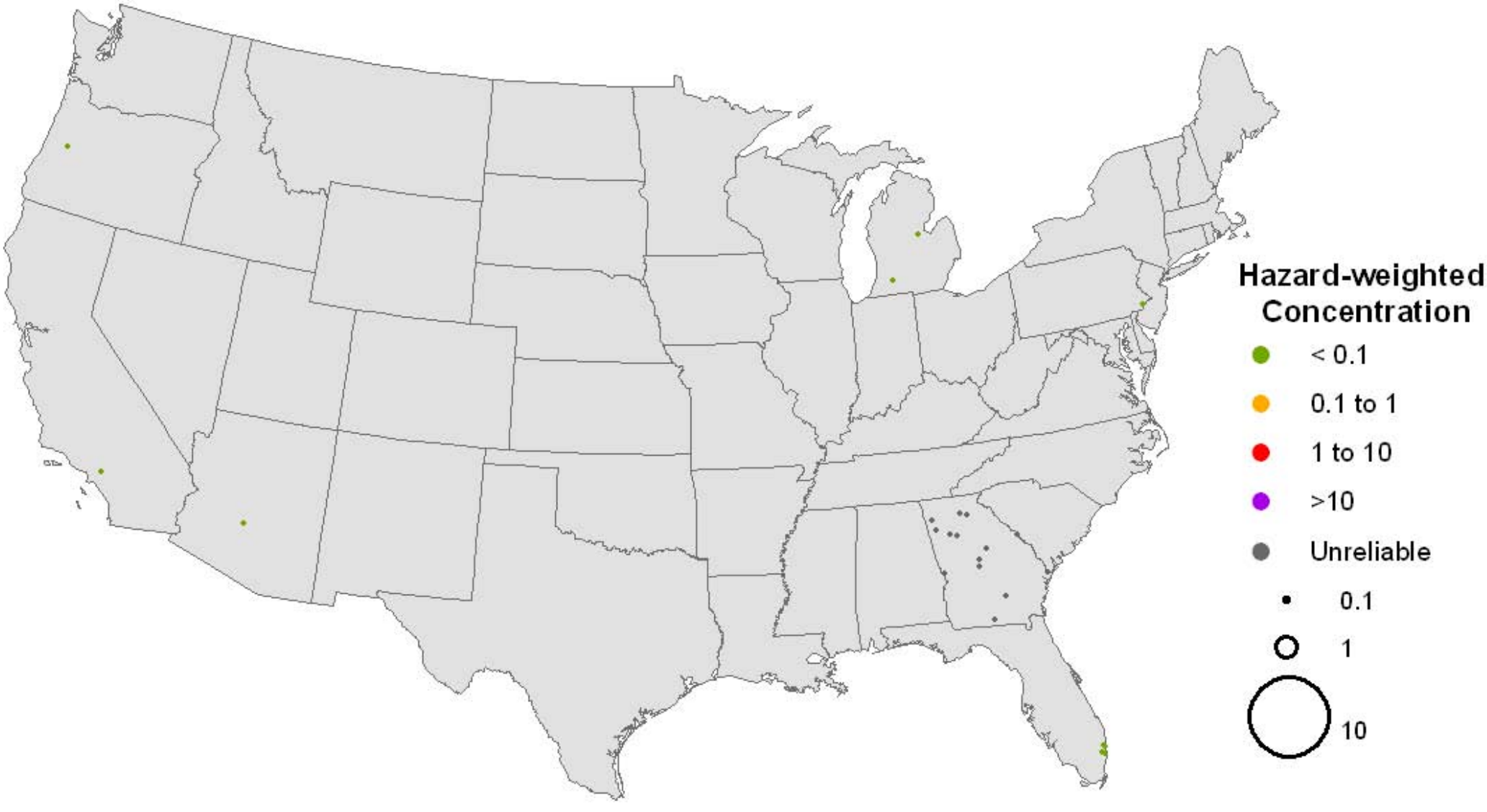
Supplemental Figure 117. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Cobalt Pm2.5 Lc'

Supplemental Figure 118. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Cobalt Pm10 Lc'

Supplemental Figure 119. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Dichloromethane'

Supplemental Figure 120. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Ethylbenzene'

Supplemental Figure 121. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Ethylene Dibromide'

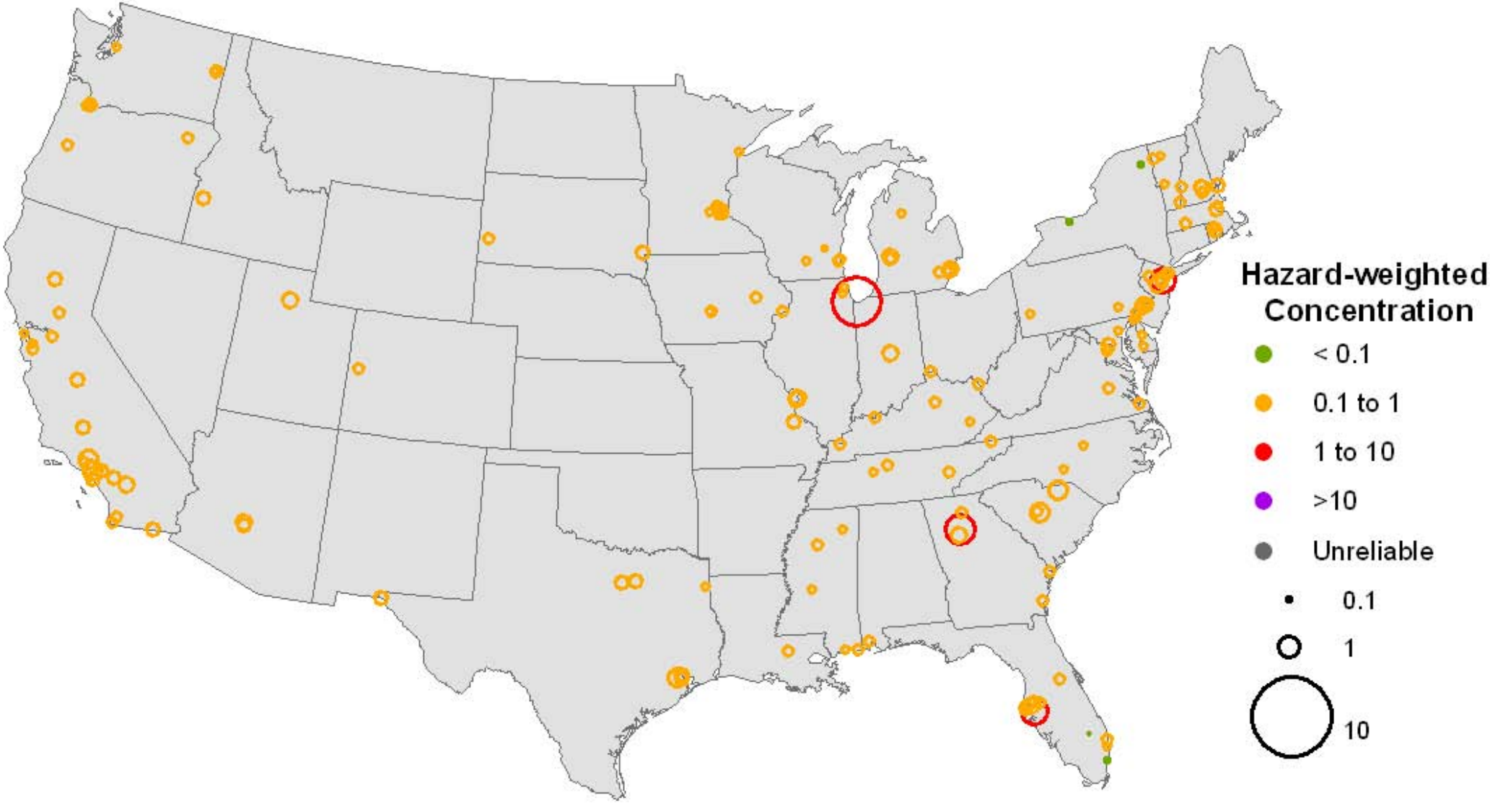
Supplemental Figure 122. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Ethylene Dichloride'

Supplemental Figure 123. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Ethylene Oxide'

Supplemental Figure 124. Chronic noncancer risk for site averages, 2003-2005.

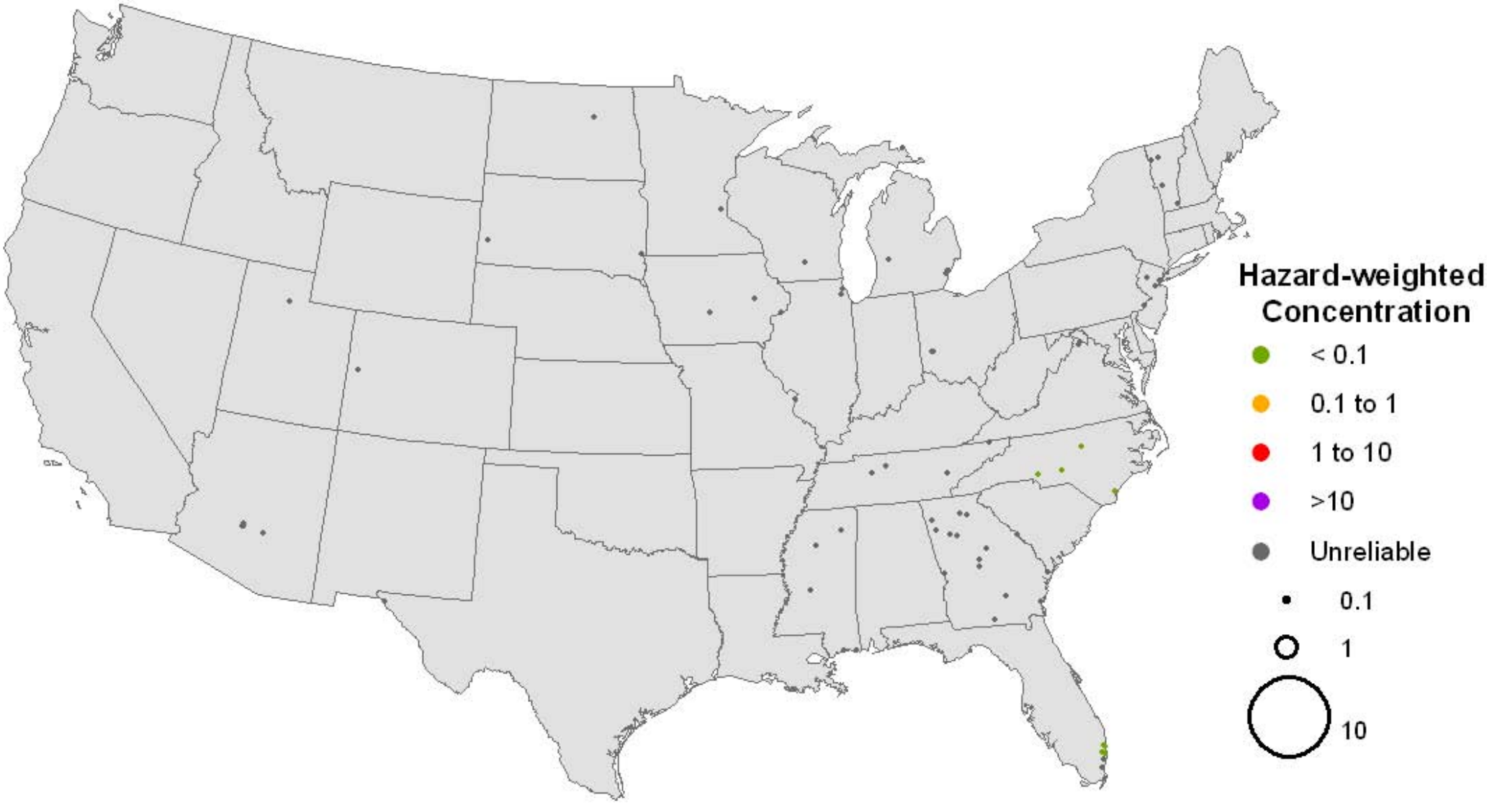


PARAMETER = 'Formaldehyde'

Supplemental Figure 125. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Hexachlorobenzene'

Supplemental Figure 126. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Hexachlorobutadiene'

Supplemental Figure 127. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Hexachlorocyclopentadiene'

Supplemental Figure 128. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Hexachloroethane'

Supplemental Figure 129. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Hydrogen Sulfide'

Supplemental Figure 130. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Isophorone'

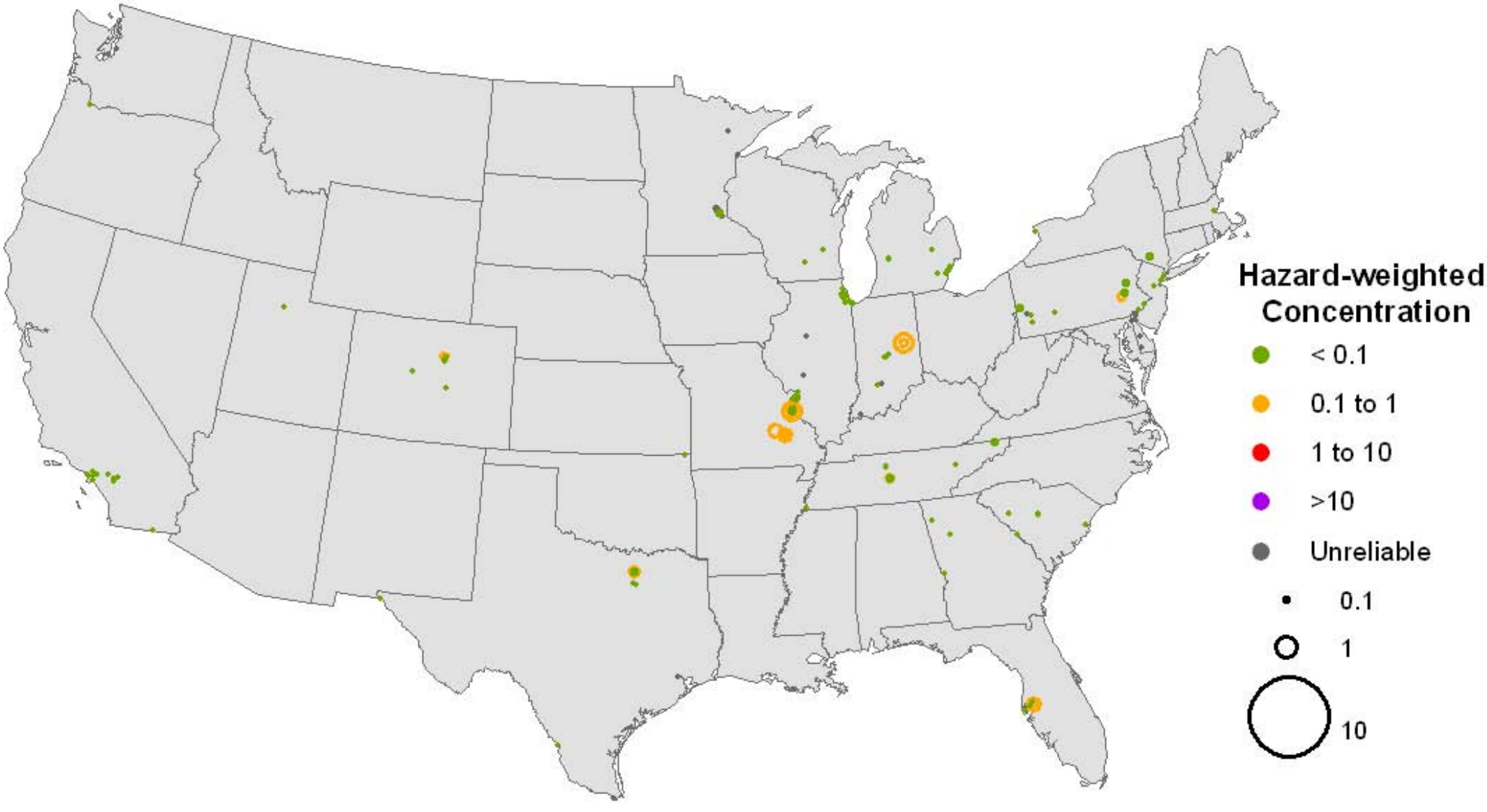
Supplemental Figure 131. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Isopropylbenzene'

Supplemental Figure 132. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Lead (Pm10) Stp'

Supplemental Figure 133. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Lead (Tsp)'

Supplemental Figure 134. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Lead Pm2.5 Lc'

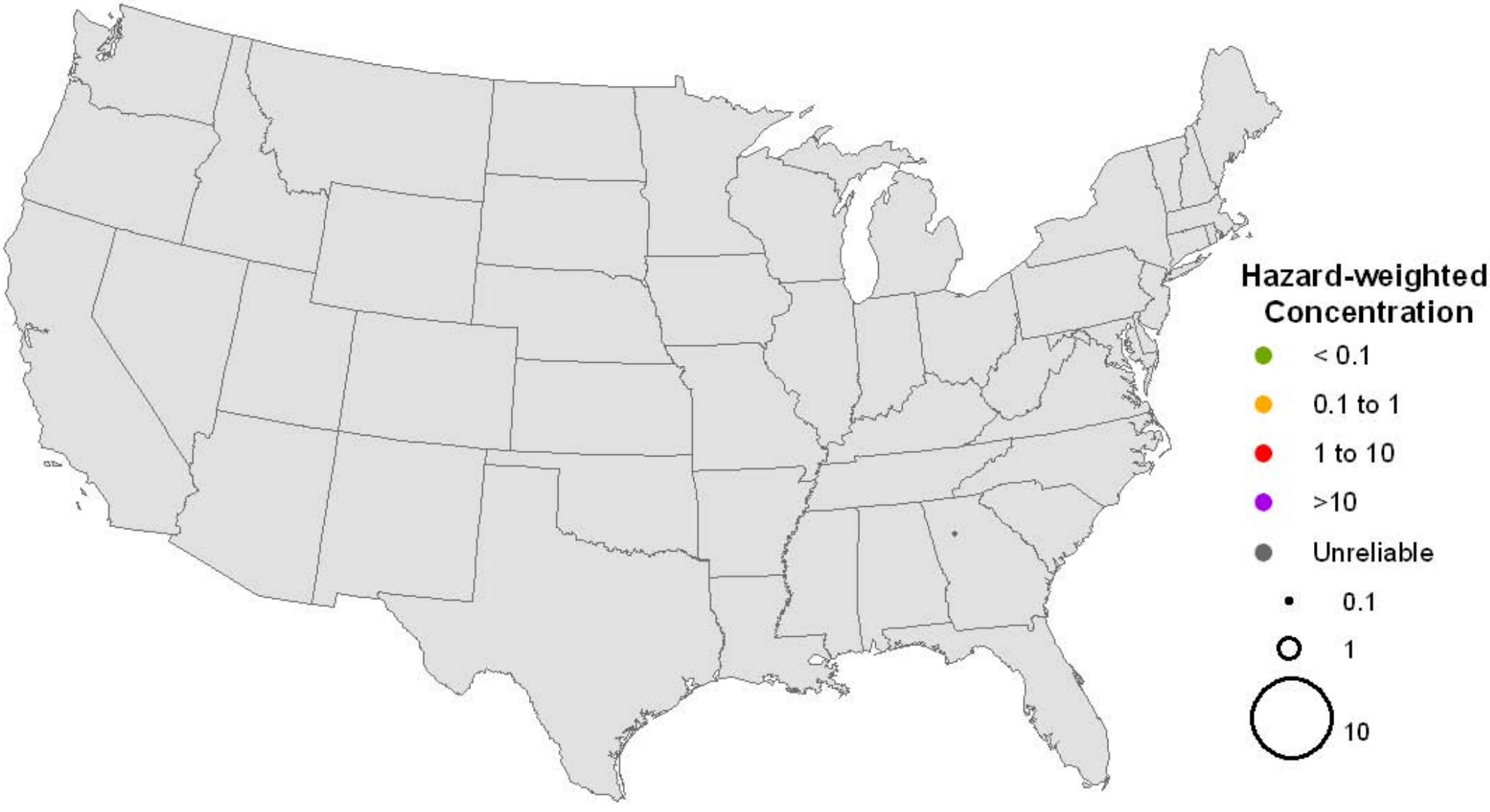
Supplemental Figure 135. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Lead Pm10 Lc'

Supplemental Figure 136. Chronic noncancer risk for site averages, 2003-2005.

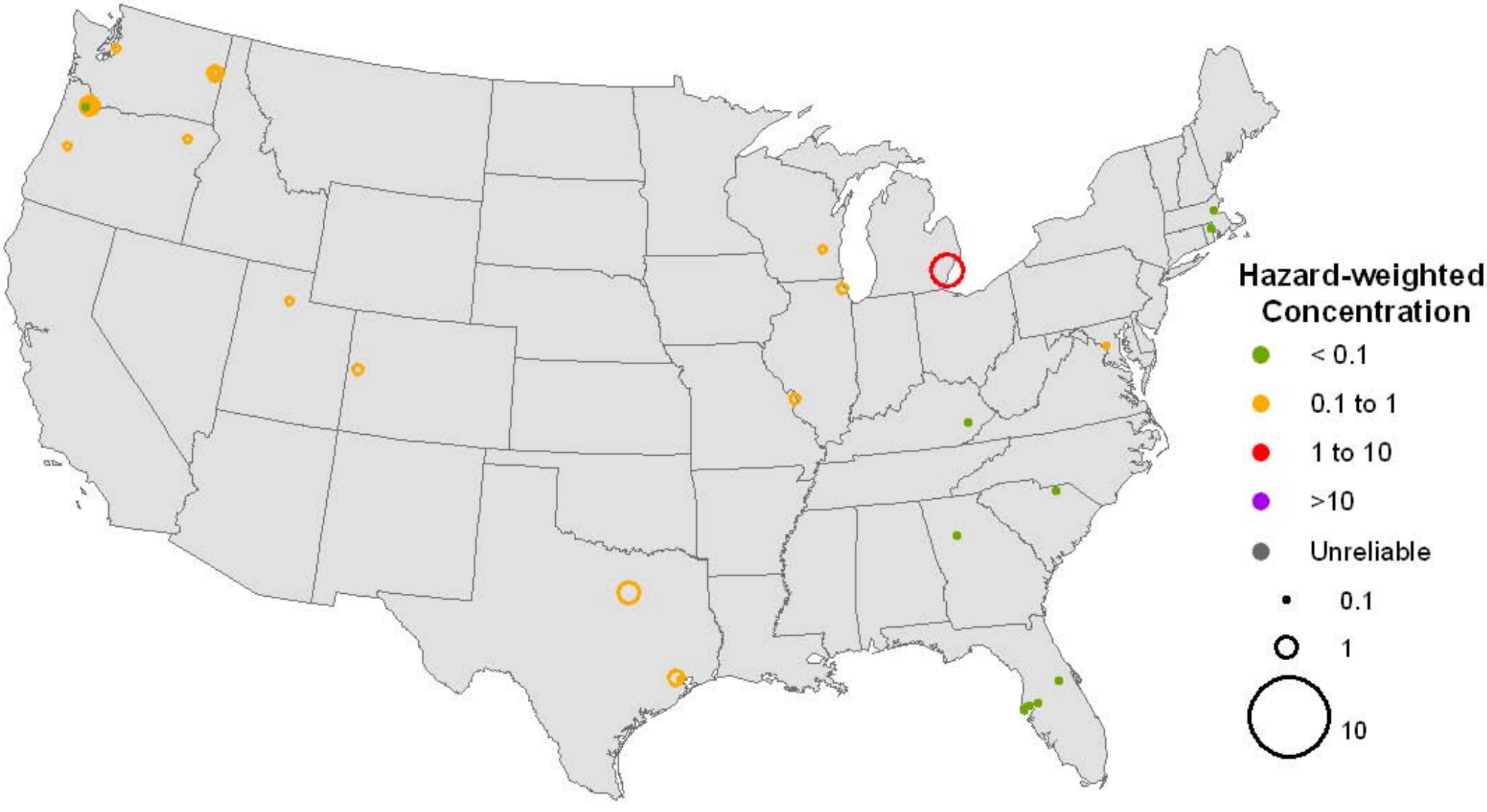
PARAMETER = 'Lindane'

Supplemental Figure 137. Chronic noncancer risk for site averages, 2003-2005.



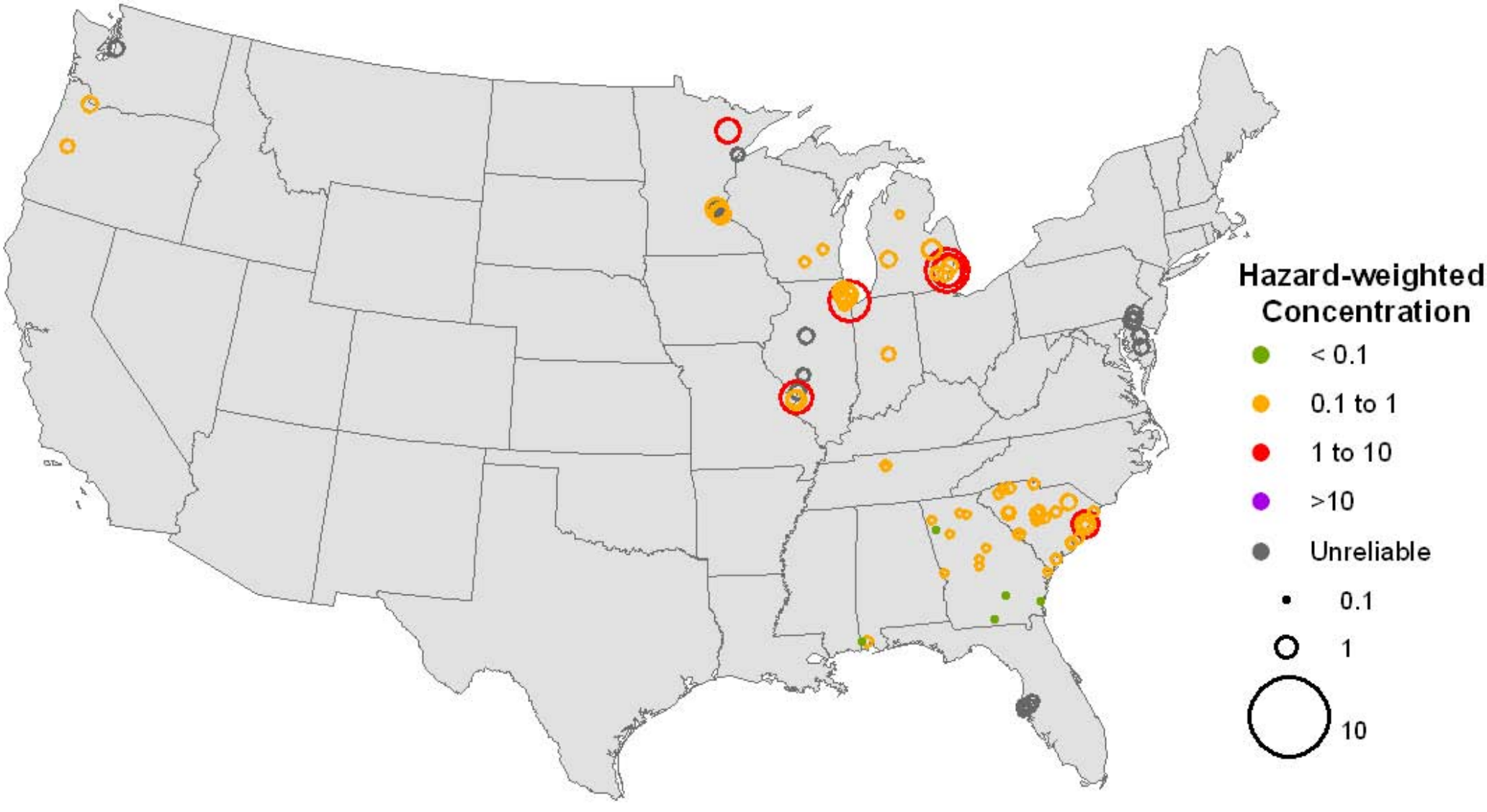
PARAMETER = 'Manganese (Coarse Particulate)'

Supplemental Figure 138. Chronic noncancer risk for site averages, 2003-2005.



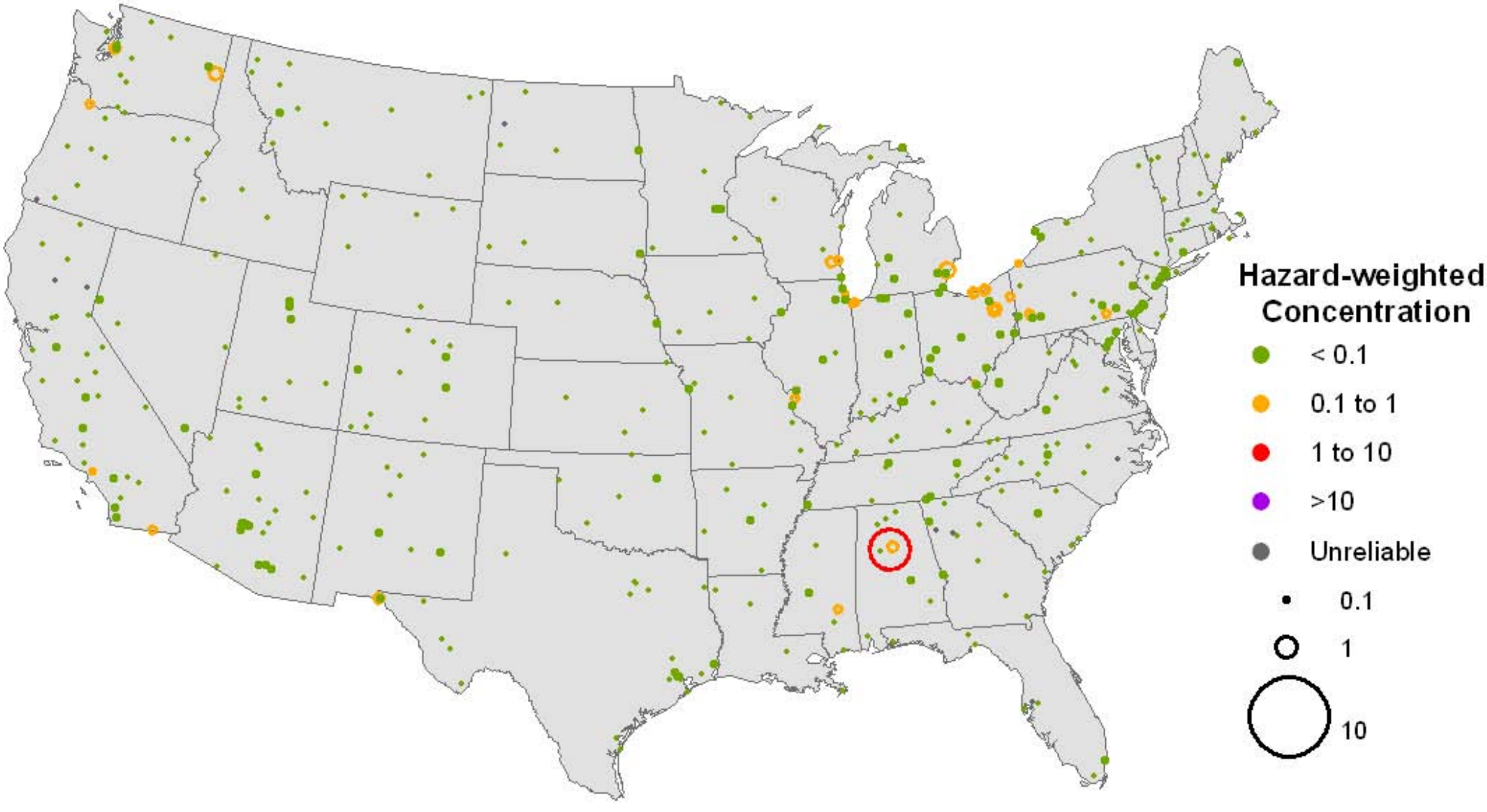
PARAMETER = 'Manganese (Pm10) Stp'

Supplemental Figure 139. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Manganese (Tsp)'

Supplemental Figure 140. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Manganese Pm2.5 Lc'

Supplemental Figure 141. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Manganese Pm10 Lc'

Supplemental Figure 142. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Mercury (Pm10) Stp'

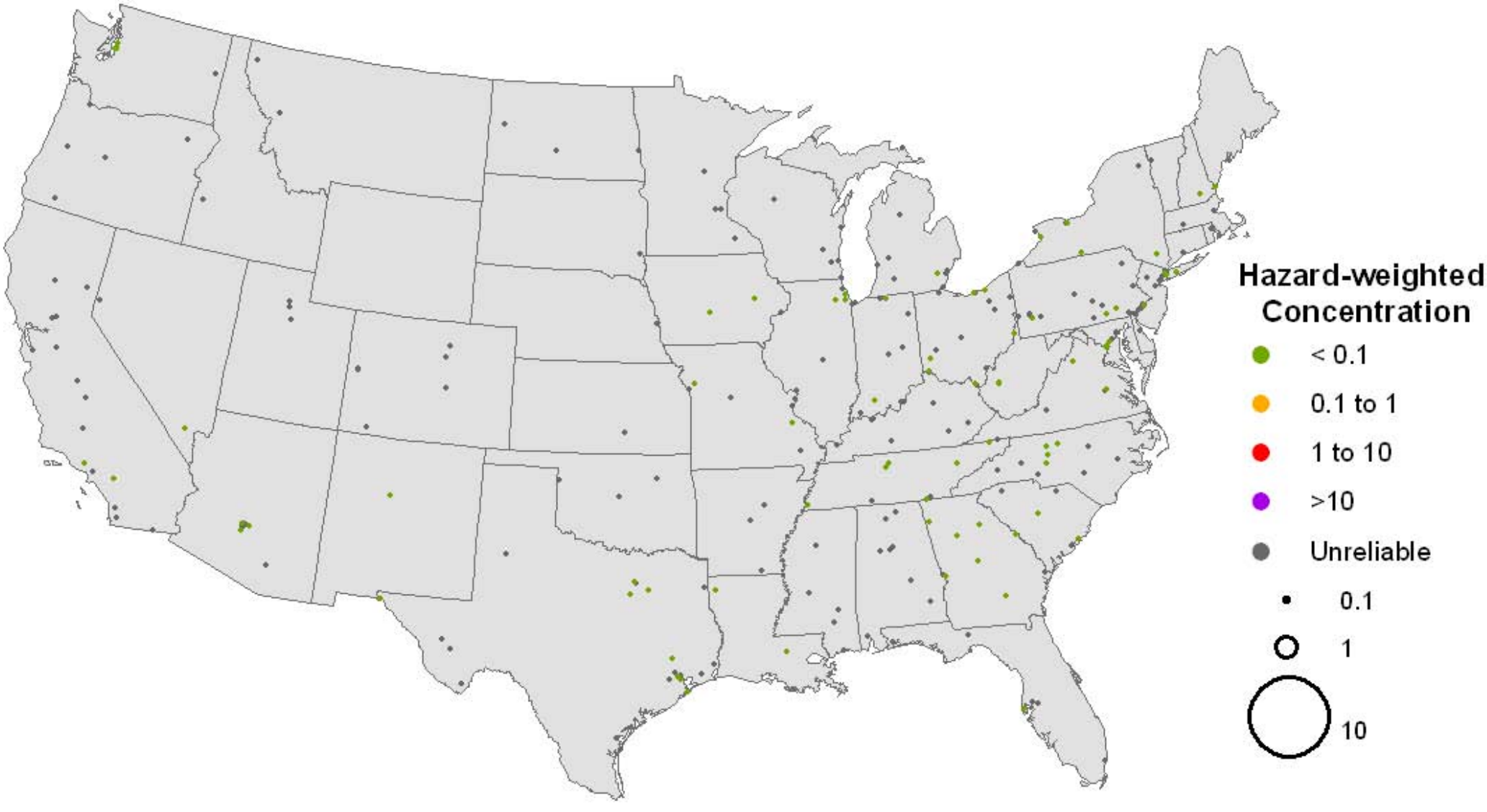
Supplemental Figure 143. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Mercury (Tsp)'

Supplemental Figure 144. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Mercury (Vapor)'

Supplemental Figure 145. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Mercury Pm2.5 Lc'

Supplemental Figure 146. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Mercury Pm10 Lc'

Supplemental Figure 147. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Methanol'

Supplemental Figure 148. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Methyl Chloroform'

Supplemental Figure 149. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Methyl Isobutyl Ketone'

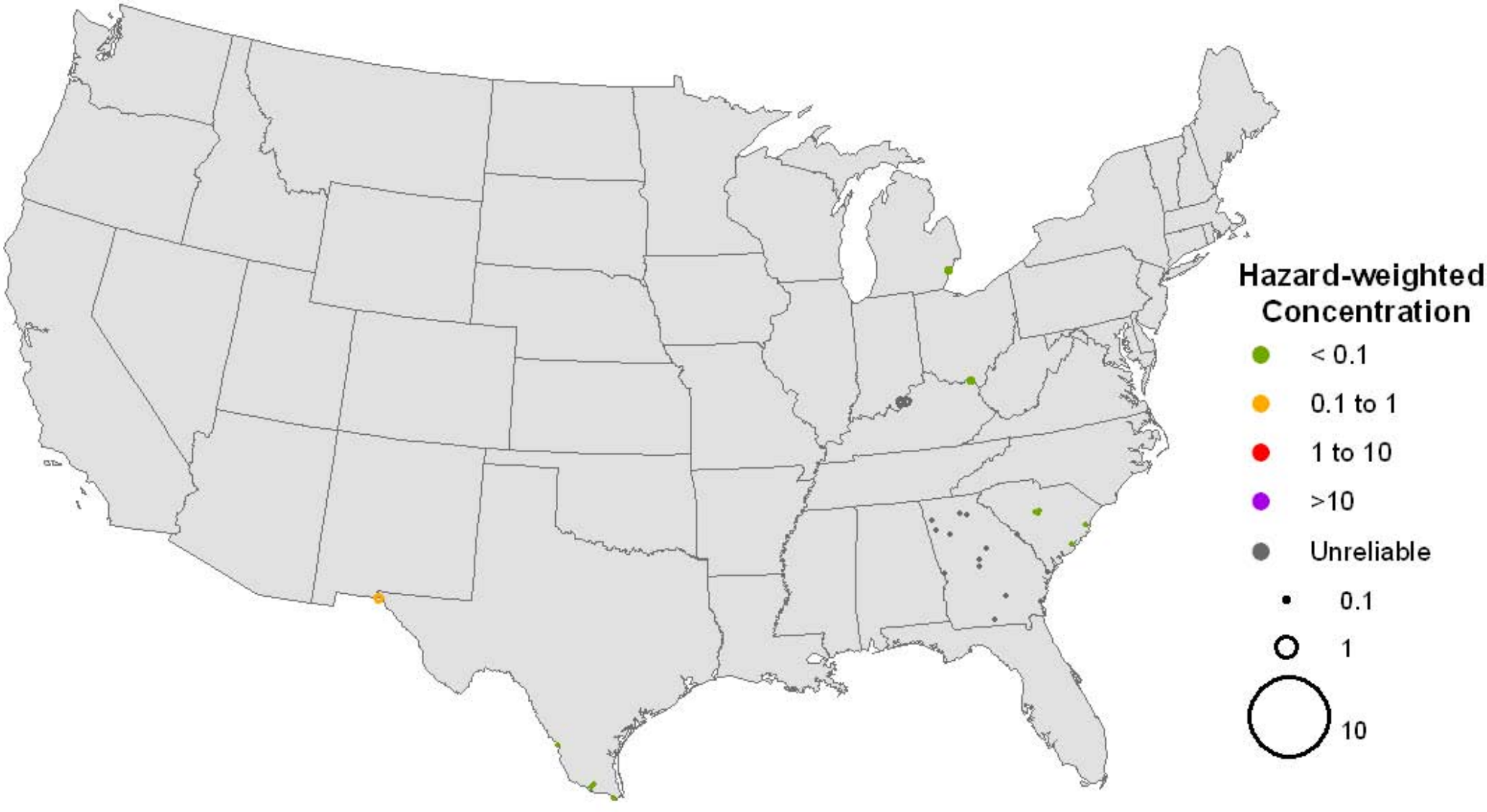
Supplemental Figure 150. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Methyl Methacrylate'

Supplemental Figure 151. Chronic noncancer risk for site averages, 2003-2005.

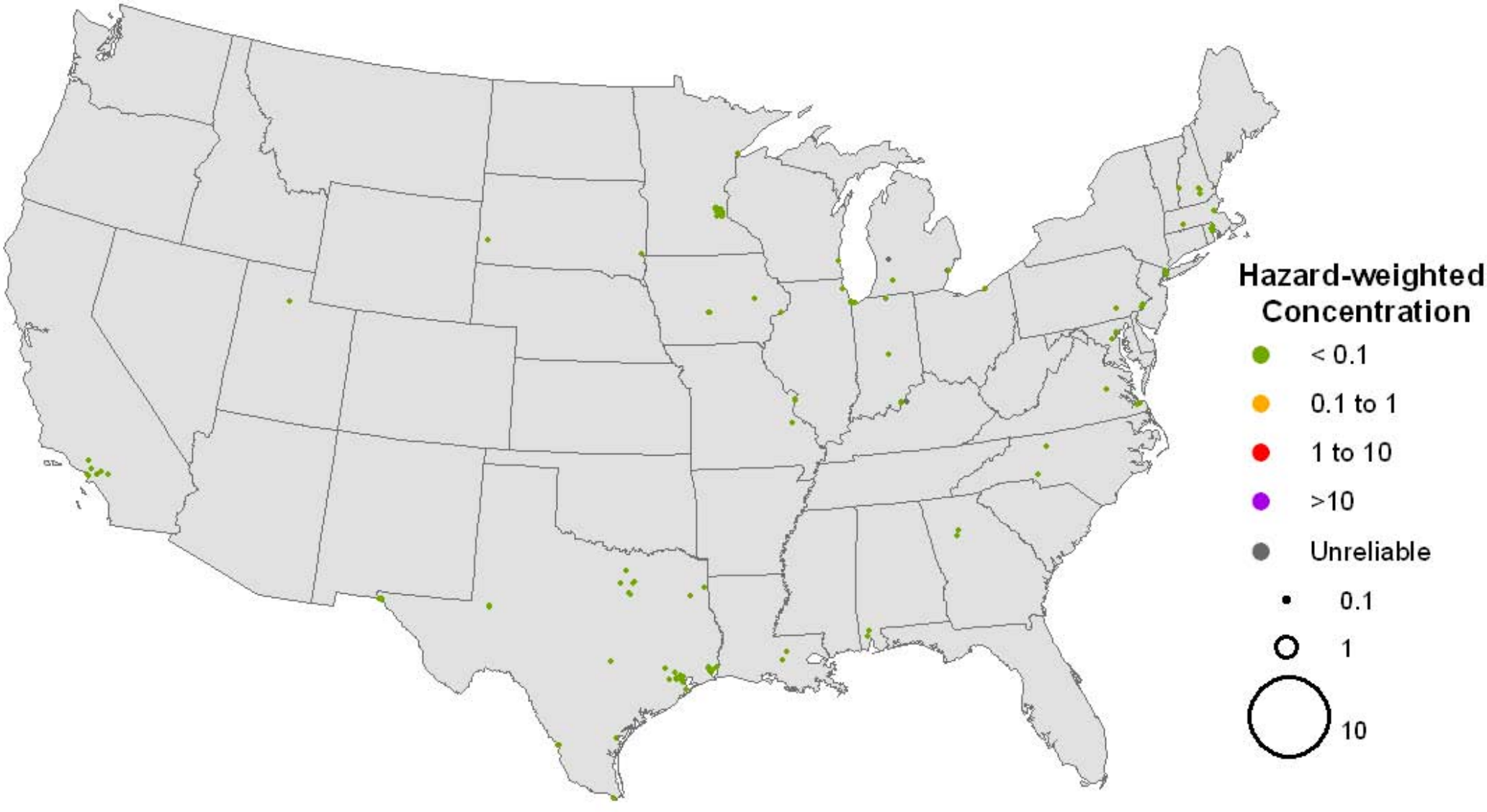
PARAMETER = 'Methyl Tert-Butyl Ether'

Supplemental Figure 152. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Naphthalene'

Supplemental Figure 153. Chronic noncancer risk for site averages, 2003-2005.

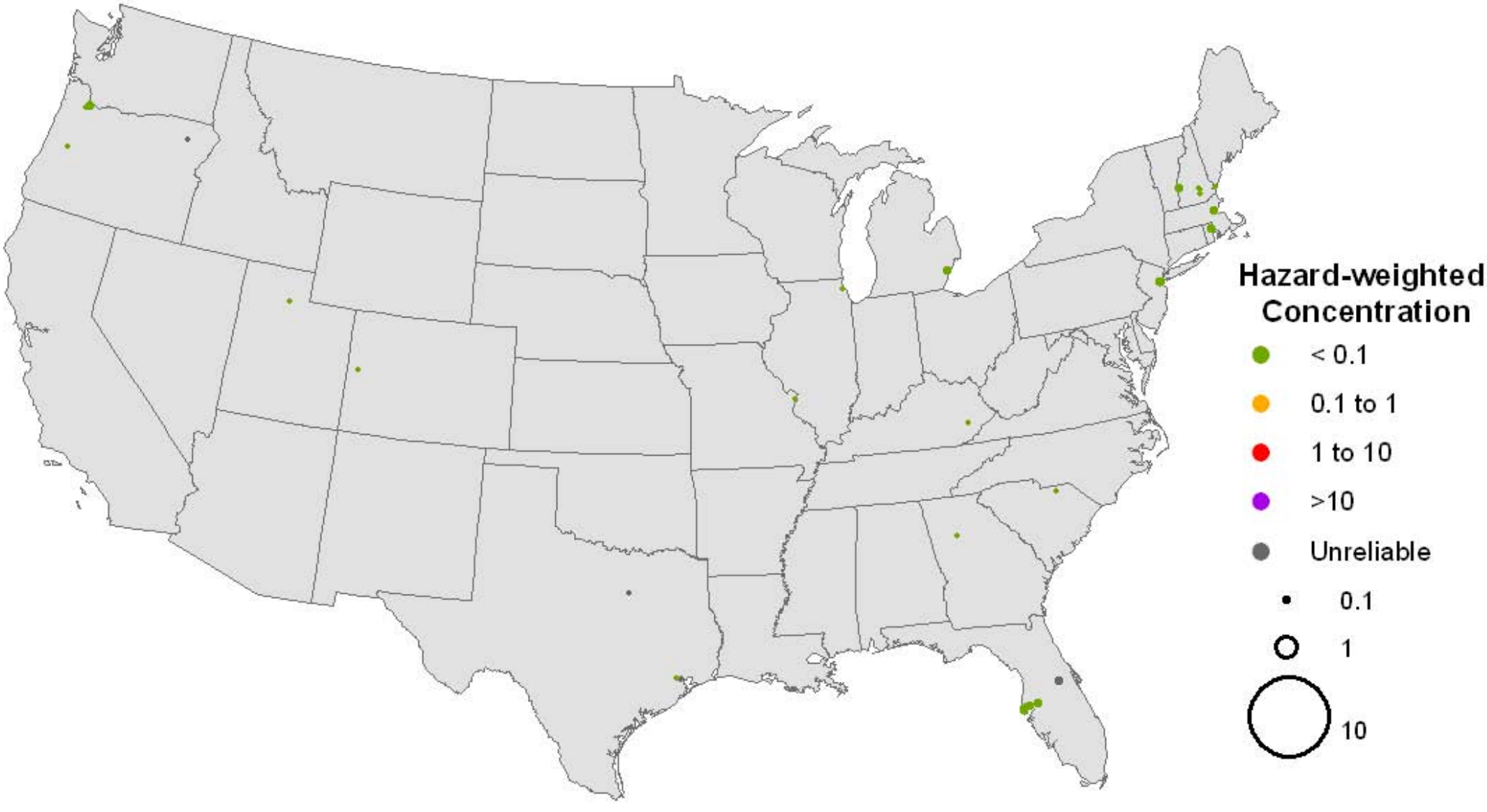


PARAMETER = 'N-Hexane'

Supplemental Figure 154. Chronic noncancer risk for site averages, 2003-2005.

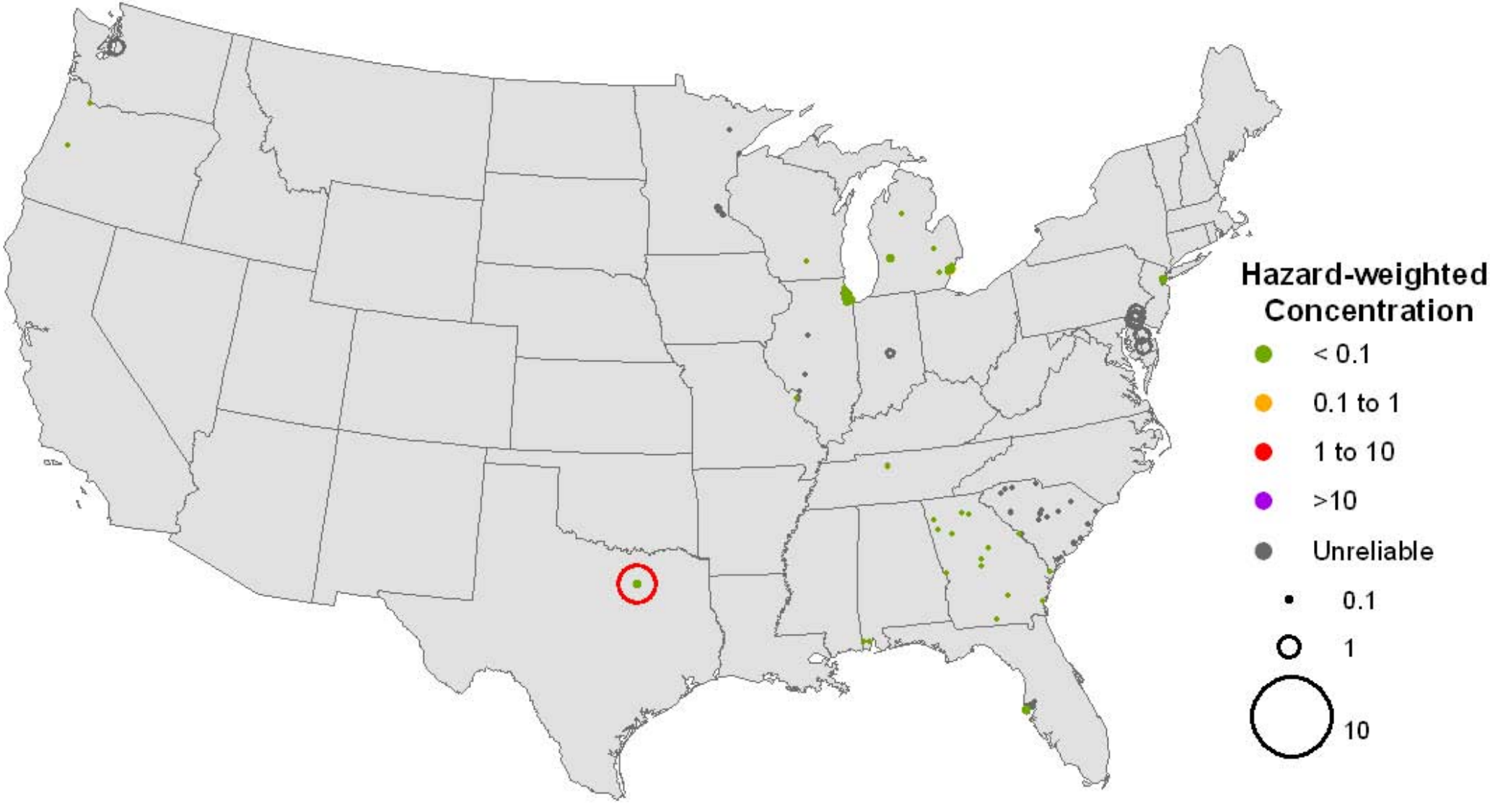
PARAMETER = 'Nickel (Coarse Particulate)'

Supplemental Figure 155. Chronic noncancer risk for site averages, 2003-2005.



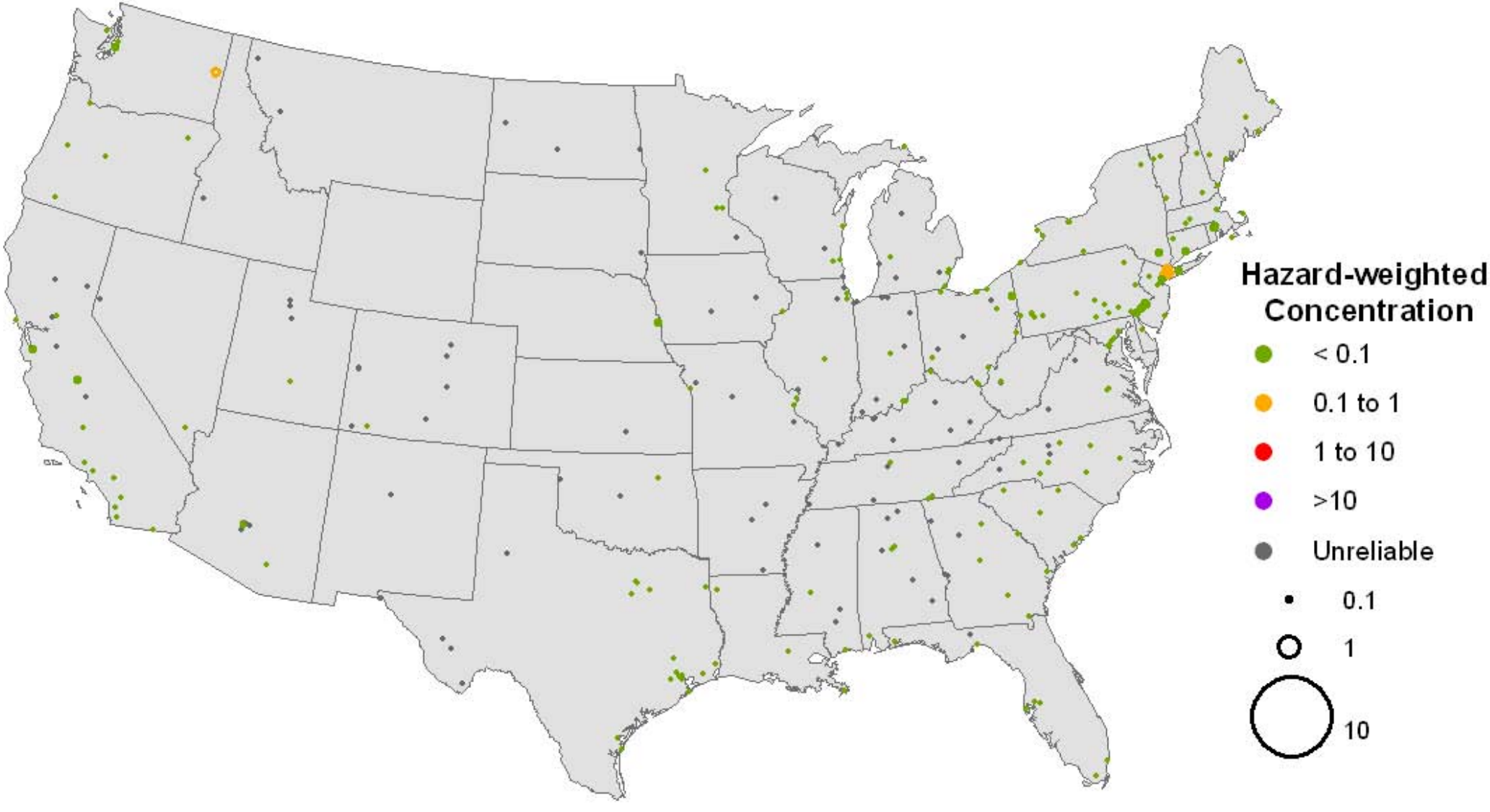
PARAMETER = 'Nickel (Pm10) Stp'

Supplemental Figure 156. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Nickel (Tsp)'

Supplemental Figure 157. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Nickel Pm2.5 Lc'

Supplemental Figure 158. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Nickel Pm10 Lc'

Supplemental Figure 159. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Nitrobenzene'

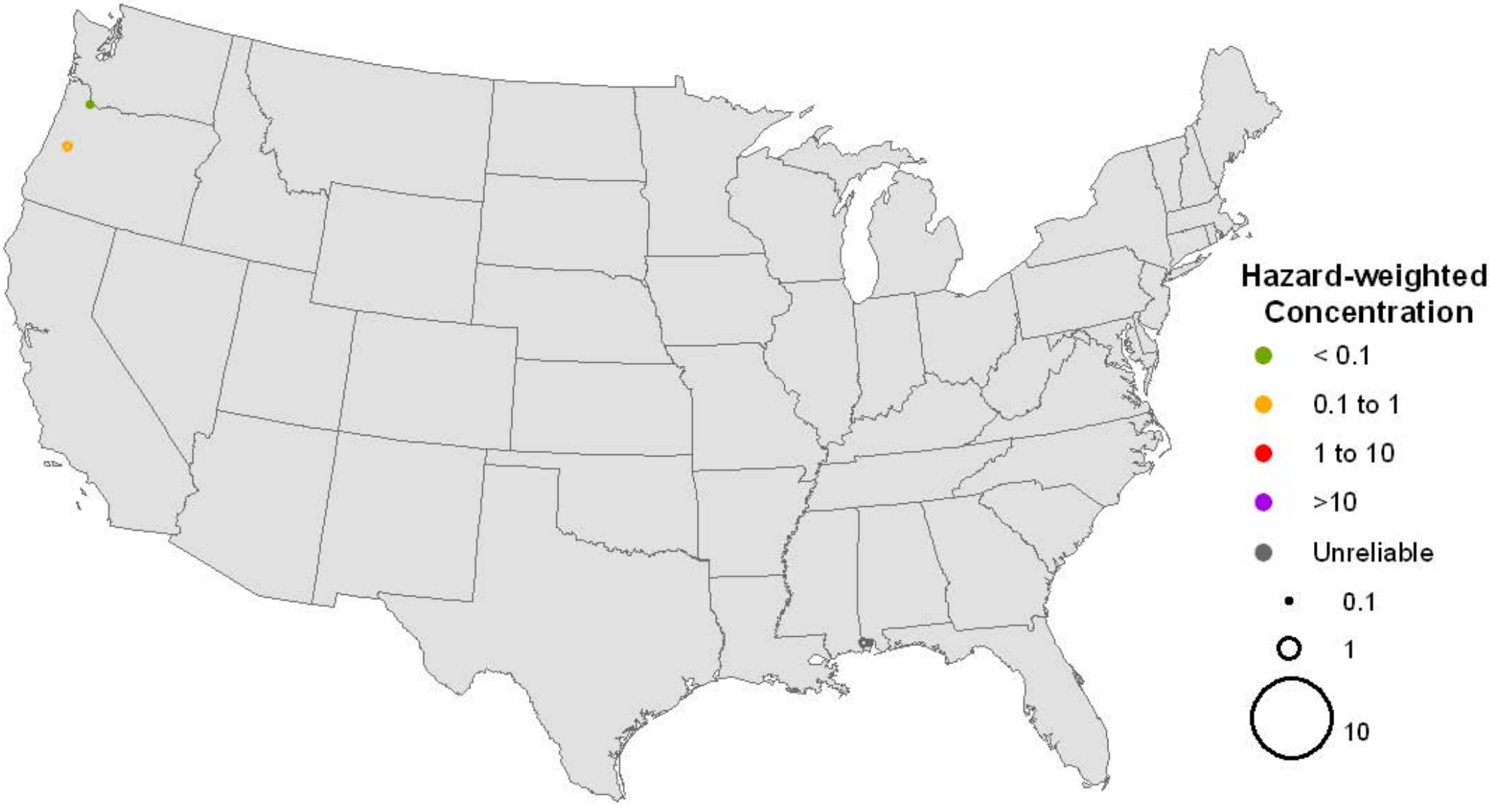
Supplemental Figure 160. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Pentachlorophenol'

Supplemental Figure 161. Chronic noncancer risk for site averages, 2003-2005.

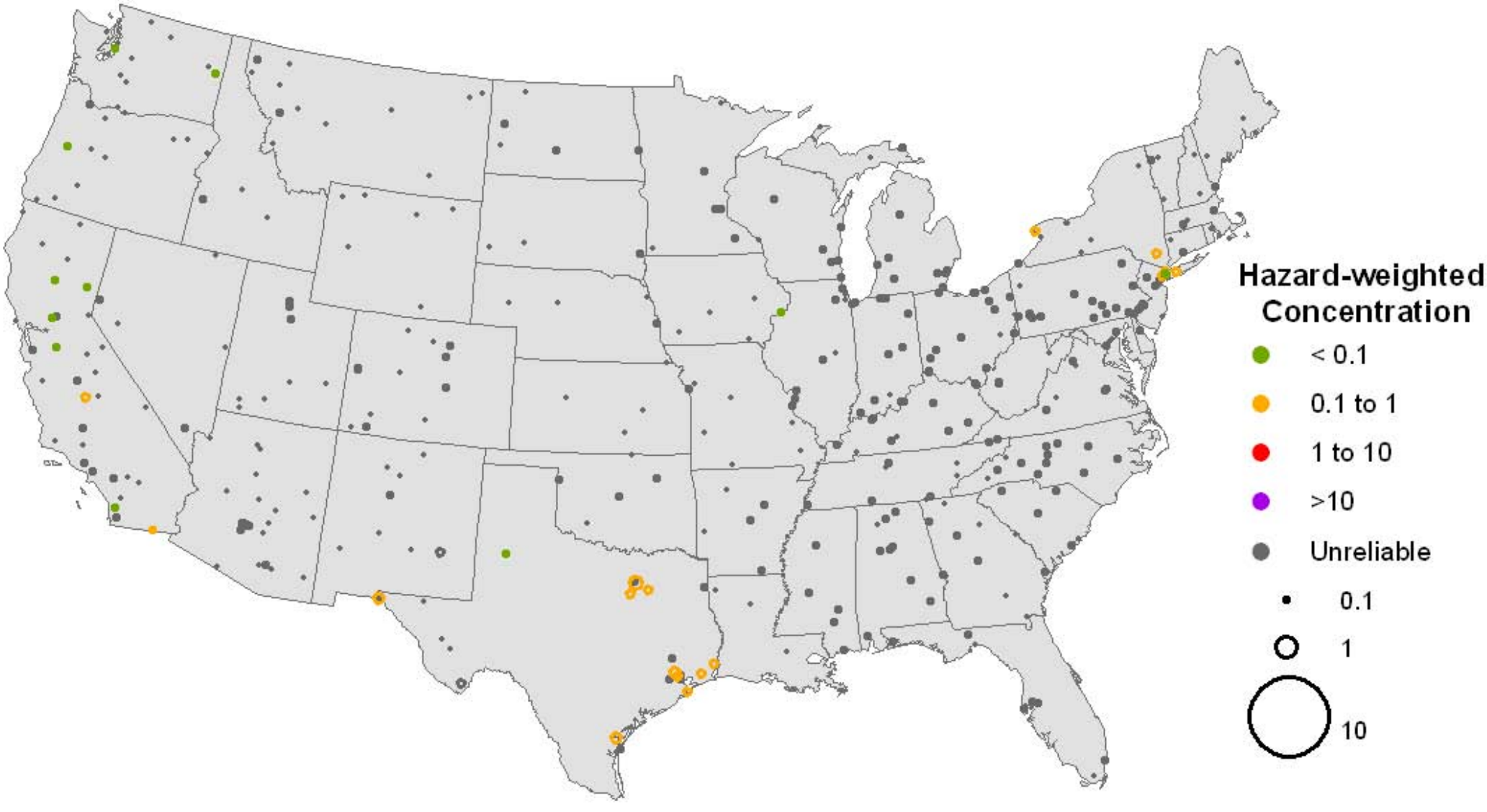
PARAMETER = 'Phenol'

Supplemental Figure 162. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Phosphorus (Tsp)'

Supplemental Figure 163. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Phosphorus Pm2.5 Lc'

Supplemental Figure 164. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Phosphorus Pm10 Lc'

Supplemental Figure 165. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Selenium (Pm10) Stp'

Supplemental Figure 166. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Selenium (Tsp)'

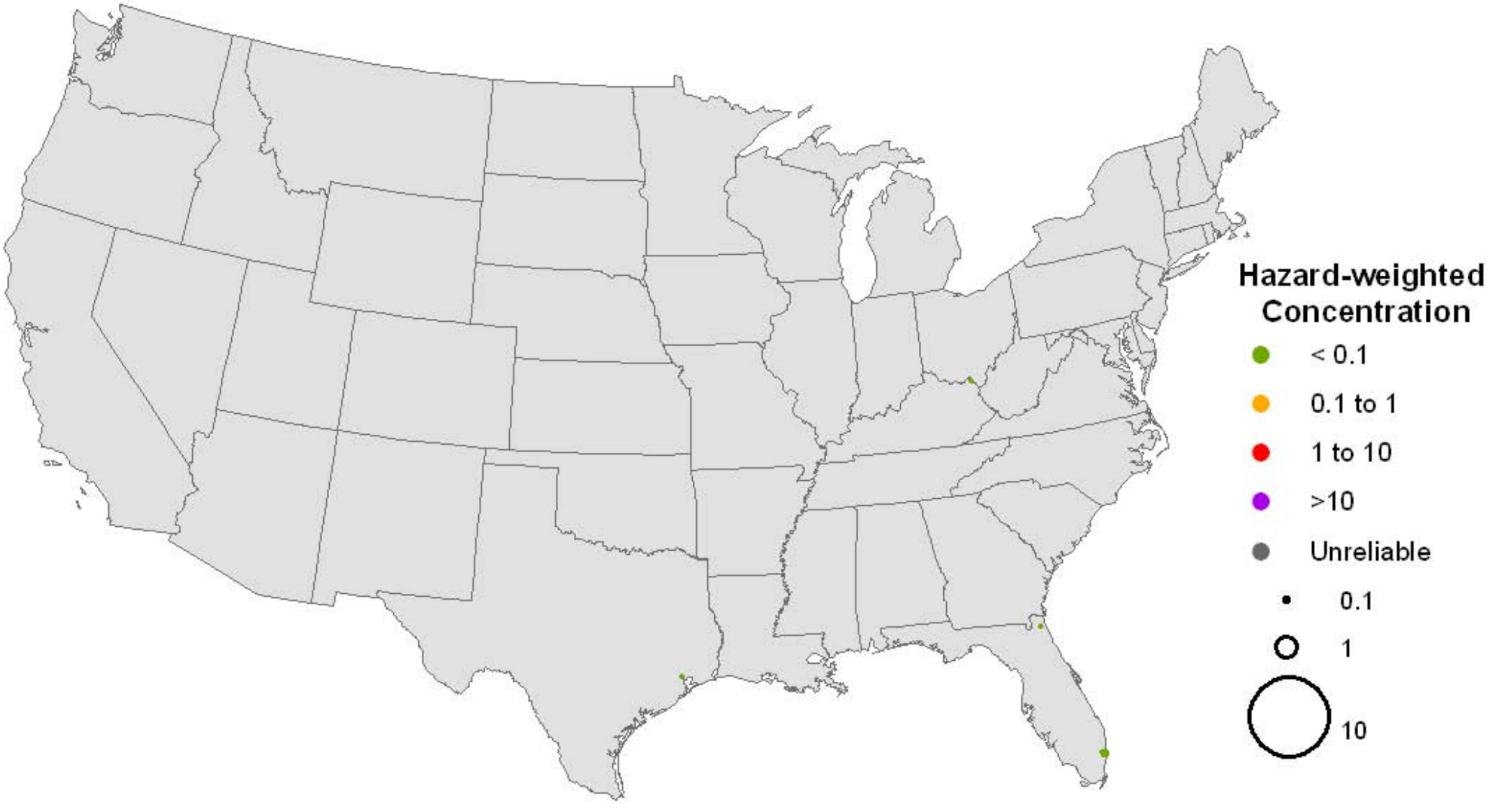
Supplemental Figure 167. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Selenium Pm2.5 Lc'

Supplemental Figure 168. Chronic noncancer risk for site averages, 2003-2005.

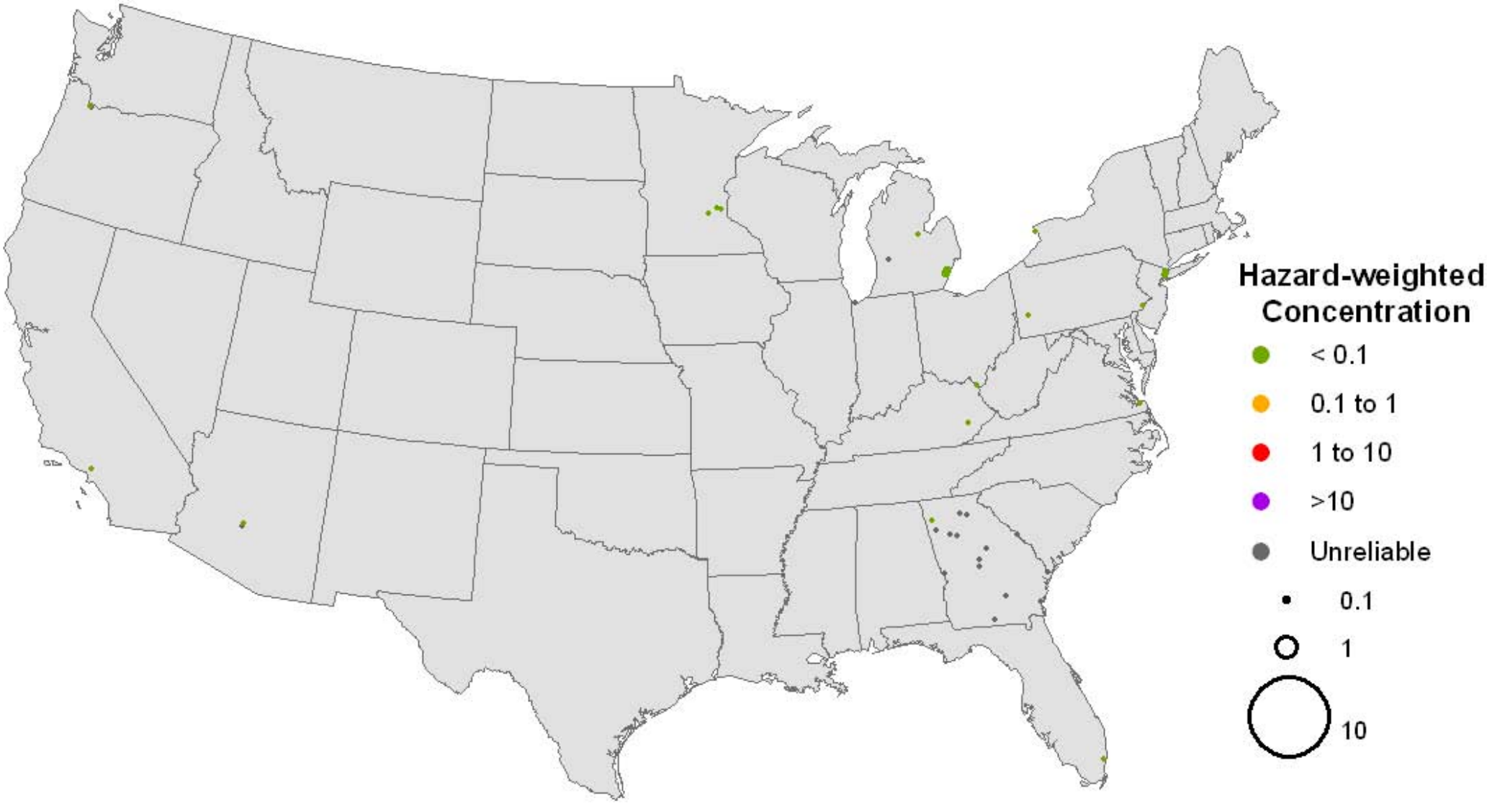
PARAMETER = 'Selenium Pm10 Lc'

Supplemental Figure 169. Chronic noncancer risk for site averages, 2003-2005.



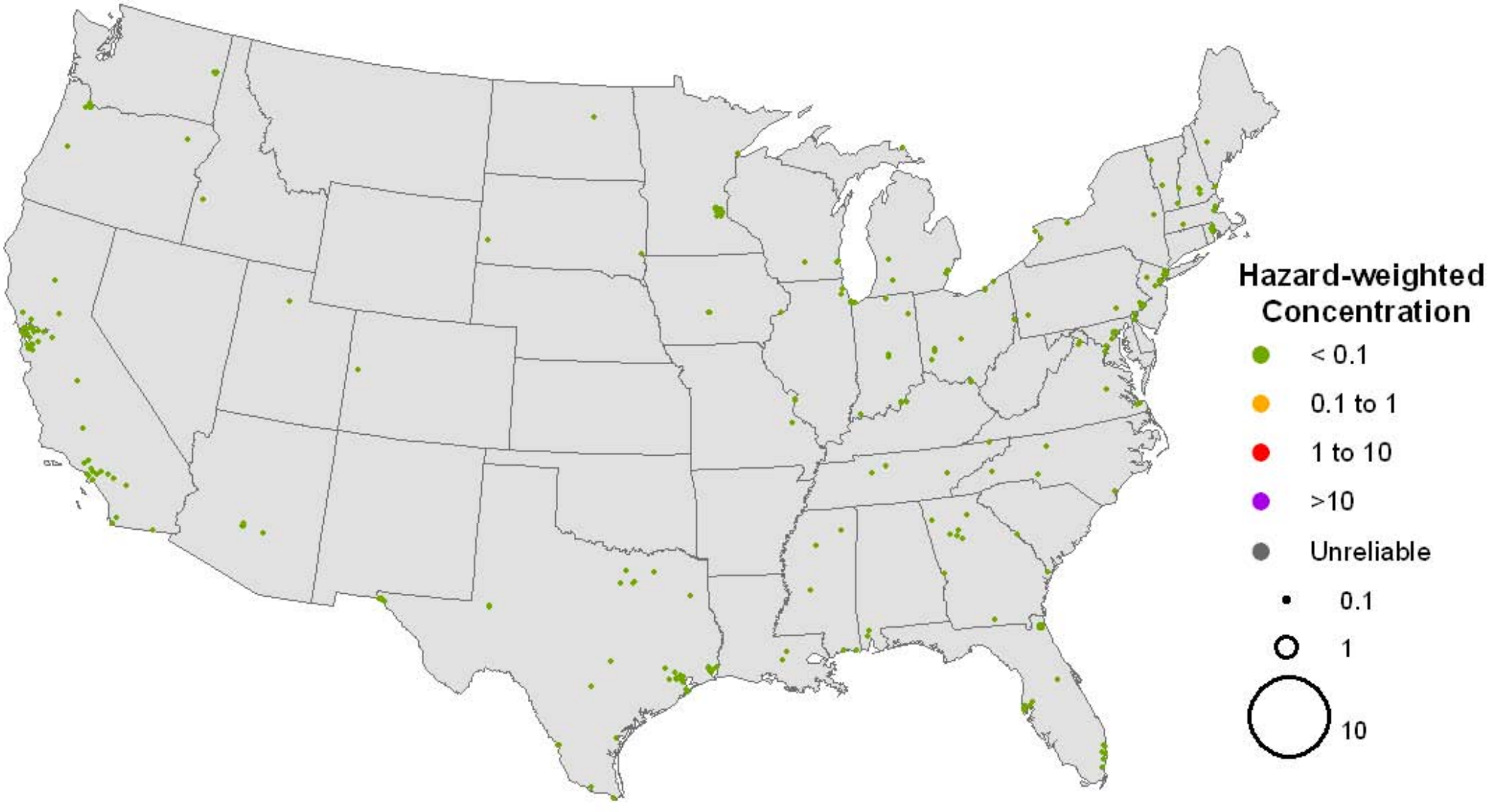
PARAMETER = 'Styrene'

Supplemental Figure 170. Chronic noncancer risk for site averages, 2003-2005.



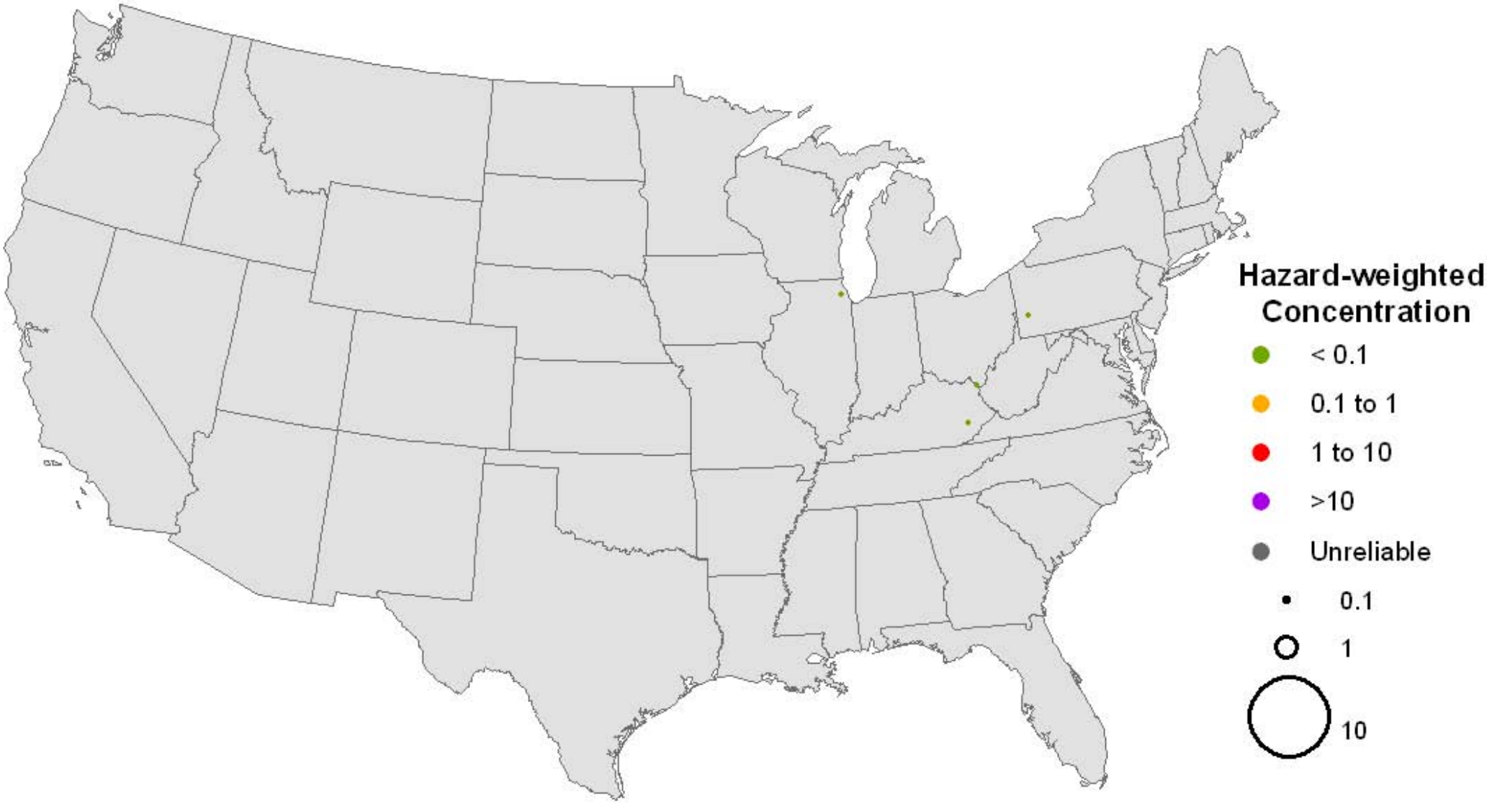
PARAMETER = 'Tetrachloroethylene'

Supplemental Figure 171. Chronic noncancer risk for site averages, 2003-2005.



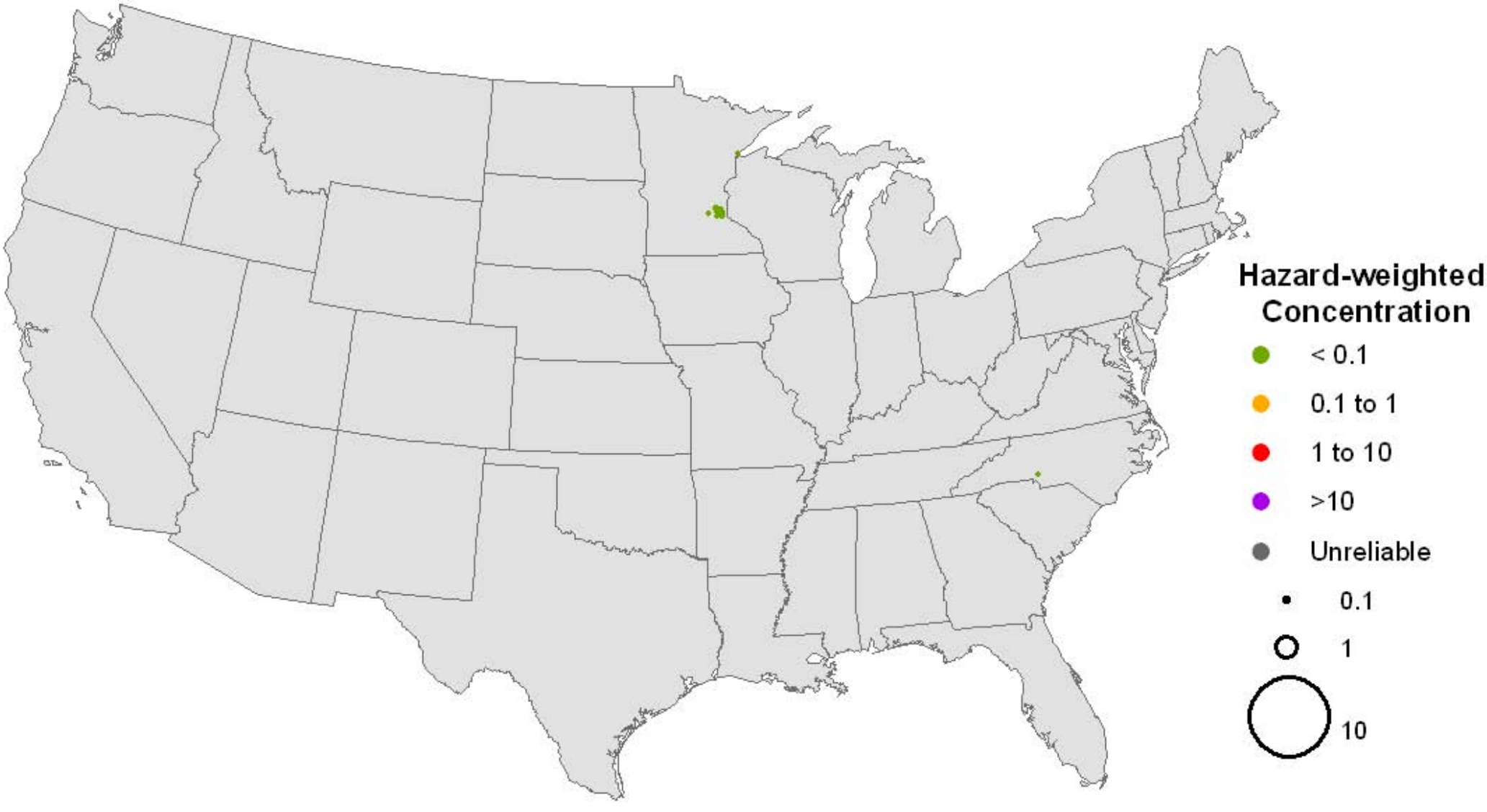
PARAMETER = 'Toluene'

Supplemental Figure 172. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Trichloroethylene'

Supplemental Figure 173. Chronic noncancer risk for site averages, 2003-2005.



PARAMETER = 'Vinyl Acetate'

Supplemental Figure 174. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Vinyl Chloride'

Supplemental Figure 175. Chronic noncancer risk for site averages, 2003-2005.

PARAMETER = 'Xylene(S)'

Supplemental Figure 176. Chronic noncancer risk for site averages, 2003-2005.