

Pollen Count Variation Within and Among Regions of North America

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Disclosures

- Nothing to disclose
- Views expressed are my own and not that of WRNMMC, USA or USN

Objectives

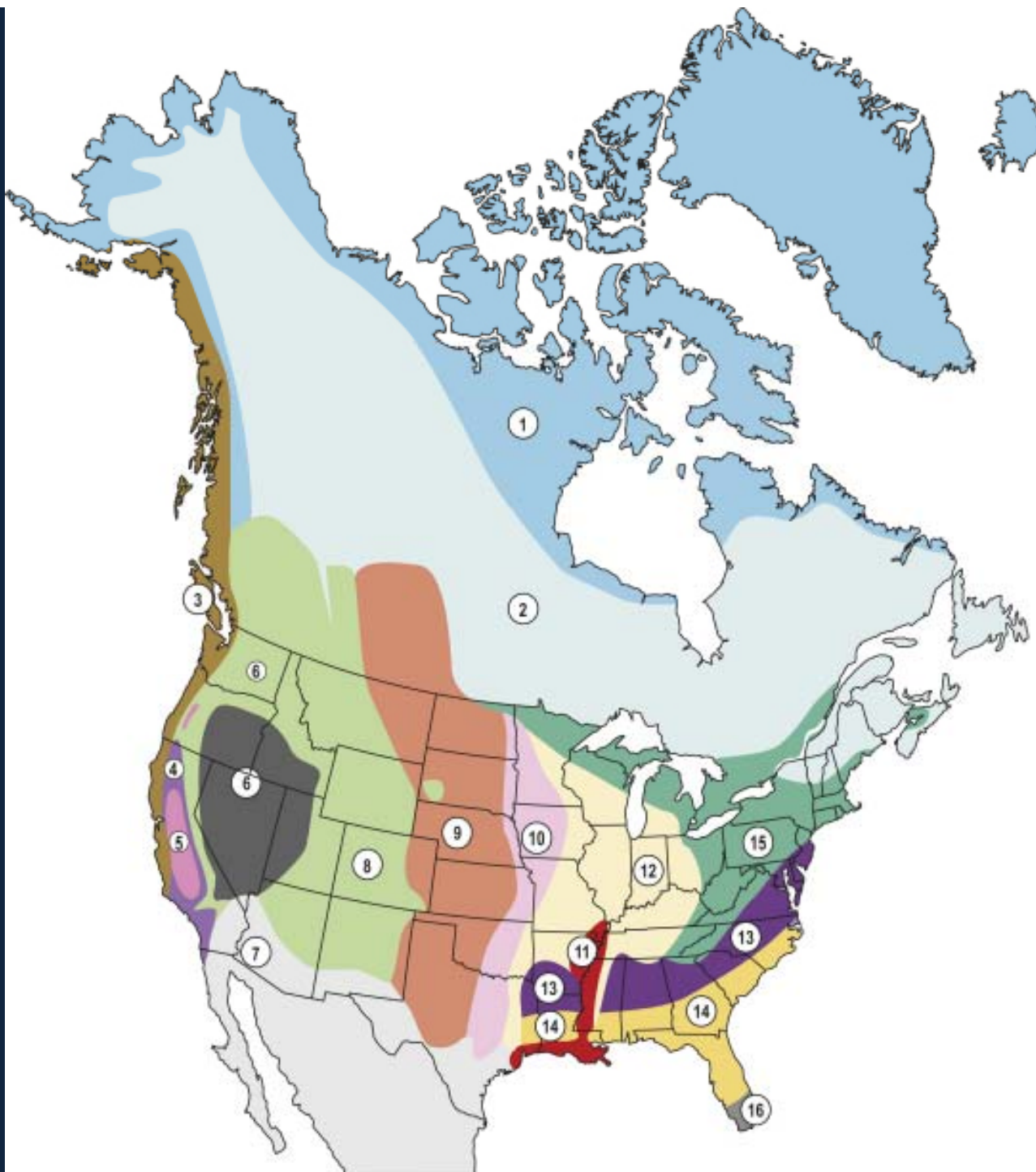
- ❑ Identify changes in pollen detection as a function of time in North America
- ❑ Identify factors contributing to pollen variation
- ❑ Determine utility of pollen counts with respect to the care of patients

- 1. Do pollen counts actually vary beyond seasonal variation in various locales?**
- 2. If so, how and over what time frame?**
3. How can pollen counts best be utilized in the care of patients?

BLUF: Pollen Count Variation Factors

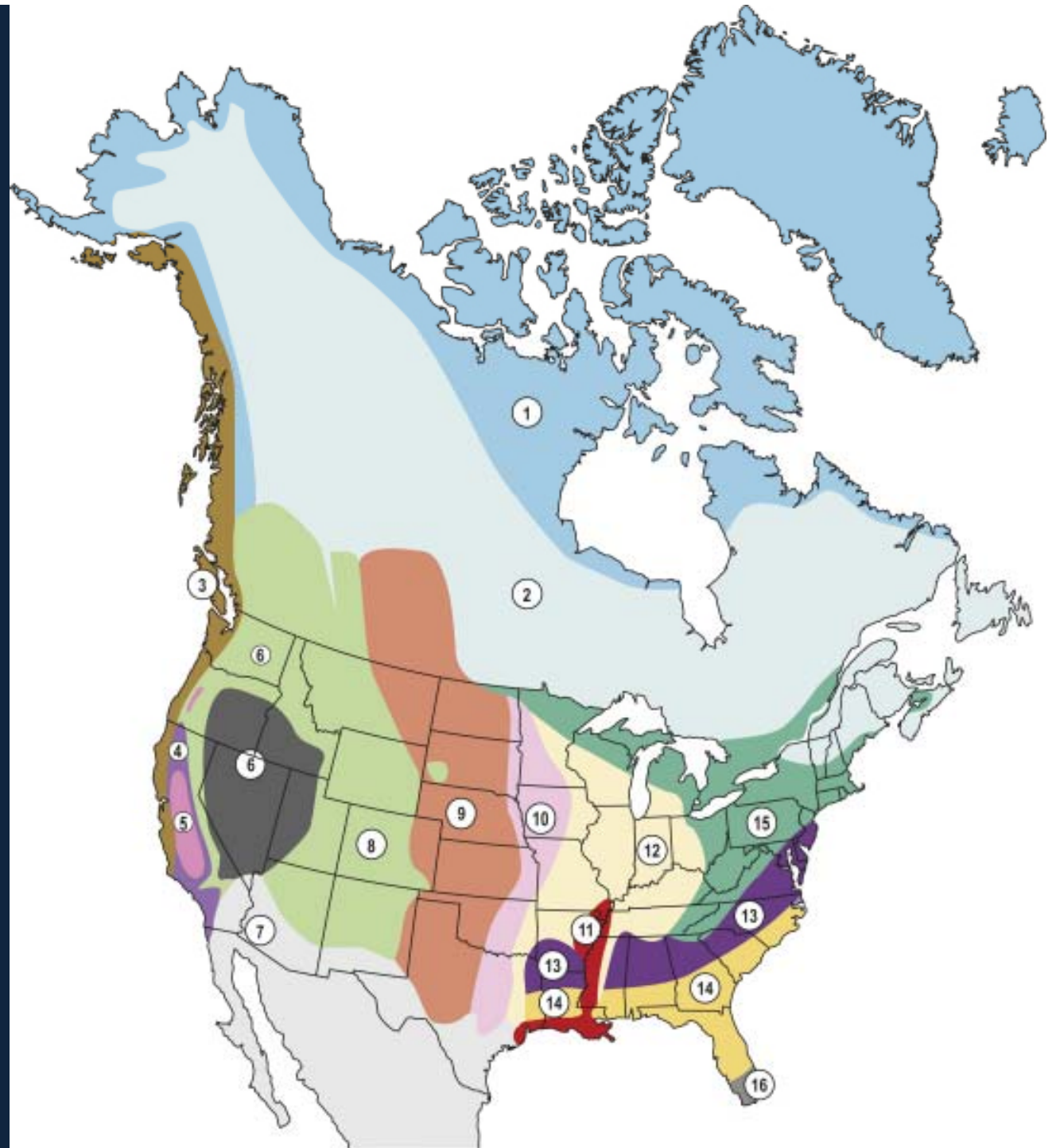
- Temporal
 - Daily
 - Seasonal
 - Annual
 - Longer??
- Geographic
 - Local
 - Regional
 - National
 - Global
- Clinical relevance
 - Sensitization
 - Onset & exacerbations
 - Rate
 - Magnitude
 - Species vs aggregate
 - Biphasic & “offseason” exacerbations

GEOGRAPHIC VARIATION



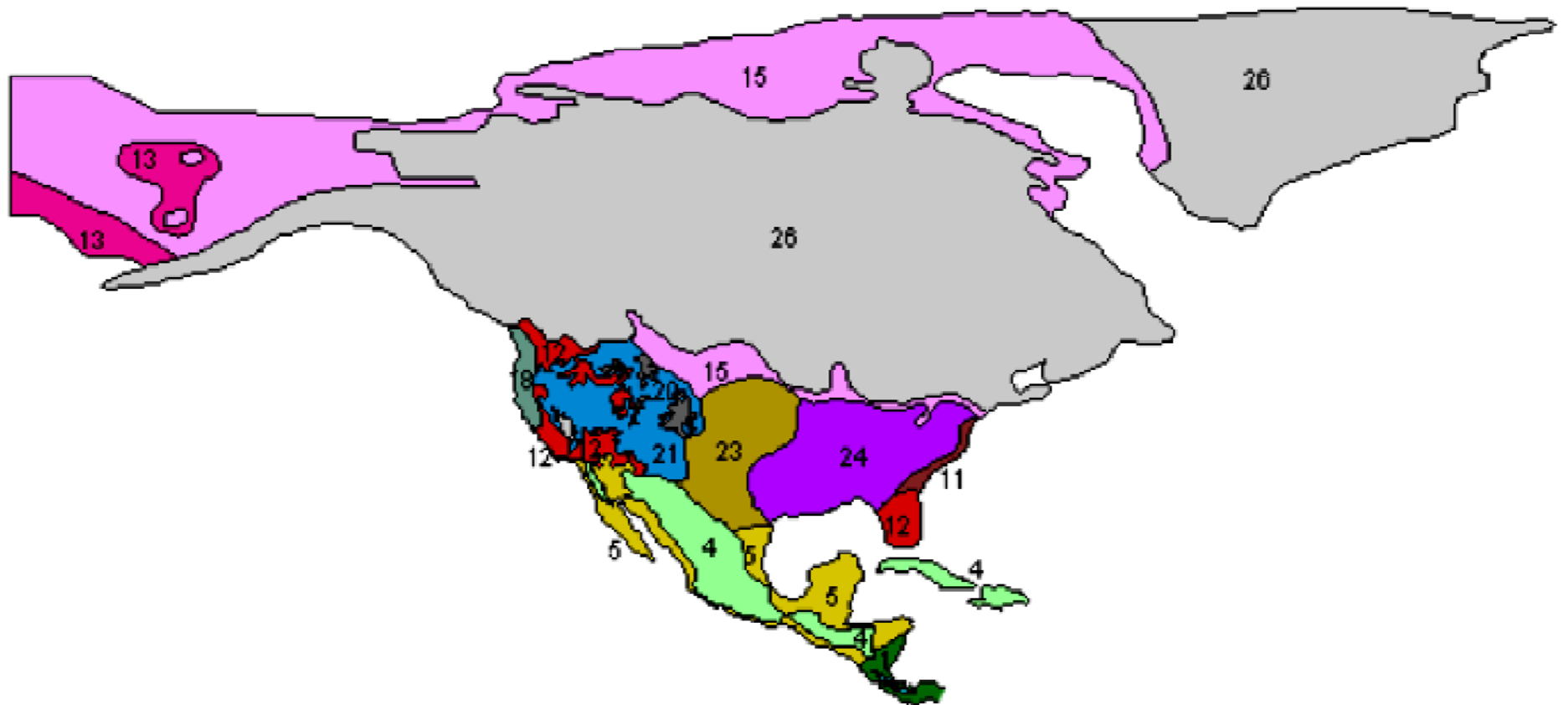
Zone	Grasses	Weeds	Trees
Northern Region			
1.Tundra	<i>Phleum, Poa, Agrostis</i>		
2.Boreal Forests	<i>Phleum, Lolium, Poa, Festuca, Dactylis, Agrostis</i>	<i>Rumex, Artemisia</i>	<i>Pinus, Betula, Alnus, Populus, Salix</i>
3.Pacific Coast Maritime Forest	<i>Phleum, Lolium, Poa</i>	<i>Chenopodium, Amaranthus, Ambrosia, Rumex, Artemisia</i>	<i>Betula, Alnus, Ulmus, Acer, Quercus, Populus, Salix</i>
Western Region			
4.California	<i>Phleum, Lolium, Poa, Festuca, Cynodon, Sorghum</i>	<i>Chenopodium, Amaranthus, Ambrosia, Rumex, Artemisia, Salsola</i>	<i>Alnus, Ulmus, Acer, Quercus, Olea, Populus, Fraxinus, Salix, Platanus</i>
5.California Prairie	<i>Phleum, Lolium, Poa, Festuca, Cynodon, Sorghum</i>	<i>Chenopodium, Amaranthus, Atriplex, Ambrosia, Rumex, Salsola</i>	<i>Ulmus, Acer, Quercus, Olea, Populus, Fraxinus</i>
6.Great Basin/ Columbia Plateau	<i>Phleum, Lolium, Poa, Dactylis, Cynodon, Sorghum</i>	<i>Chenopodium, Amaranthus, Atriplex, Ambrosia, Rumex, Artemisia, Salsola, Xanthium</i>	<i>Ulmus, Populus, Juniperus</i>
7.Hot Desert Region	<i>Cynodon, Sorghum</i>	<i>Chenopodium, Amaranthus, Atriplex, Ambrosia, Baccharis, Rumex, Artemisia, Salsola, Xanthium</i>	<i>Ulmus, Quercus, Populus, Juniperus, Acacia, Fraxinus, Tamarix</i>
8.Western Cordillera	<i>Festuca, Phleum, Dactylis, Lolium, Cynodon, Sorghum</i>	<i>Chenopodium, Amaranthus, Atriplex, Ambrosia, Rumex, Plantago, Artemisia, Salsola, Xanthium</i>	<i>Pinus, Ulmus, Quercus, Populus, Acer, Juniperus, Alnus</i>
Central Region			
9.Short-Grass Prairie	<i>Festuca, Phleum, Poa, Dactylis, Lolium, Cynodon, Sorghum</i>	<i>Chenopodium, Kochia, Amaranthus, Ambrosia, Rumex, Plantago, Artemisia, Salsola, Xanthium</i>	<i>Quercus, Populus, Ulmus, Fraxinus</i>
10.Tall-Grass Prairie	<i>Festuca, Phleum, Poa, Dactylis, Lolium, Cynodon, Sorghum</i>	<i>Chenopodium, Kochia, Amaranthus, Ambrosia, Rumex, Plantago, Artemisia, Salsola, Xanthium</i>	<i>Quercus, Populus, Acer, Ulmus, Carya, Fraxinus</i>
11.Lower Mississippi Valley Flood Plain	<i>Phleum, Poa, Dactylis, Lolium, Cynodon, Sorghum, Paspalum</i>	<i>Chenopodium, Kochia, Amaranthus, Ambrosia, Rumex, Plantago, Artemisia, Xanthium</i>	<i>Quercus, Populus, Acer, Ulmus, Salix, Taxodium, Carya</i>
12.Central Hardwoods	<i>Phleum, Poa, Dactylis, Lolium, Cynodon, Sorghum</i>	<i>Chenopodium, Kochia, Amaranthus, Ambrosia, Rumex, Plantago, Artemisia, Xanthium</i>	<i>Quercus, Populus, Acer, Ulmus, Carya, Celtis</i>
Eastern Region			
13.Upland SE Forests	<i>Phleum, Poa, Dactylis, Lolium, Cynodon, Sorghum</i>	<i>Chenopodium, Amaranthus, Ambrosia, Rumex, Plantago, Artemisia, Xanthium</i>	<i>Quercus, Populus, Acer, Ulmus, Carya, Pinus</i>
14.Lowland SE Forests	<i>Phleum, Poa, Dactylis, Lolium, Cynodon, Sorghum, Paspalum</i>	<i>Chenopodium, Kochia, Amaranthus, Ambrosia, Rumex, Plantago, Artemisia, Salsola, Xanthium, Baccharis</i>	<i>Quercus, Populus, Acer, Ulmus, Carya, Myrica, Pinus, Liquidambar</i>
15.Northern Hardwood Forests	<i>Phleum, Poa, Dactylis, Lolium, Cynodon, Sorghum</i>	<i>Chenopodium, Amaranthus, Ambrosia, Rumex, Plantago, Artemisia, Xanthium</i>	<i>Quercus, Populus, Acer, Ulmus, Betula, Pinus</i>
16.Southern Florida	<i>Cynodon, Sorghum, Paspalum</i>	<i>Chenopodium, Amaranthus, Ambrosia</i>	<i>Quercus, Casuarina, Myrica, Schinus, Taxodium</i>

TEMPORAL VARIATION



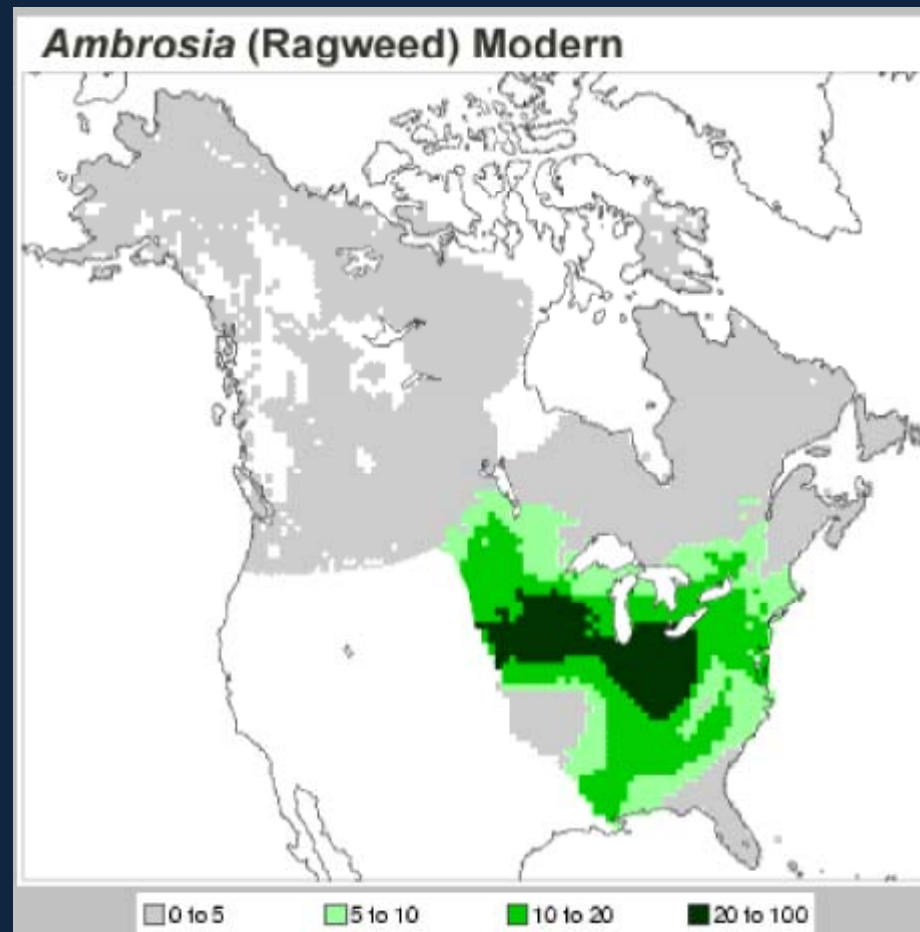
Last Glacial Maximum 18,000 BP

- | | |
|--|---------------------------------------|
| 1. Tropical rainforest | 14. Steppe-tundra |
| 2. Monsoon or dry forest | 15. Polar and alpine desert |
| 3. Tropical woodland | 16. Temperate desert |
| 4. Tropical thorn scrub and scrub woodland | 17. Temperate semi-desert |
| 5. Tropical semi-desert | 18. Forest steppe |
| 6. Tropical grassland | 19. Montane mosaic |
| 7. Tropical extreme desert | 20. Alpine tundra |
| 8. Savanna | 21. Subalpine parkland |
| 9. Broadleaved temperate evergreen forest | 22. Dry steppe |
| 10. Montane tropical forest | 23. Temperate steppe grassland |
| 11. Open boreal woodlands | 24. Main taiga |
| 12. Semi-arid temperate woodland or scrub | 25. Lakes and open water |
| 13. Tundra | 26. Ice sheet and other permanent ice |

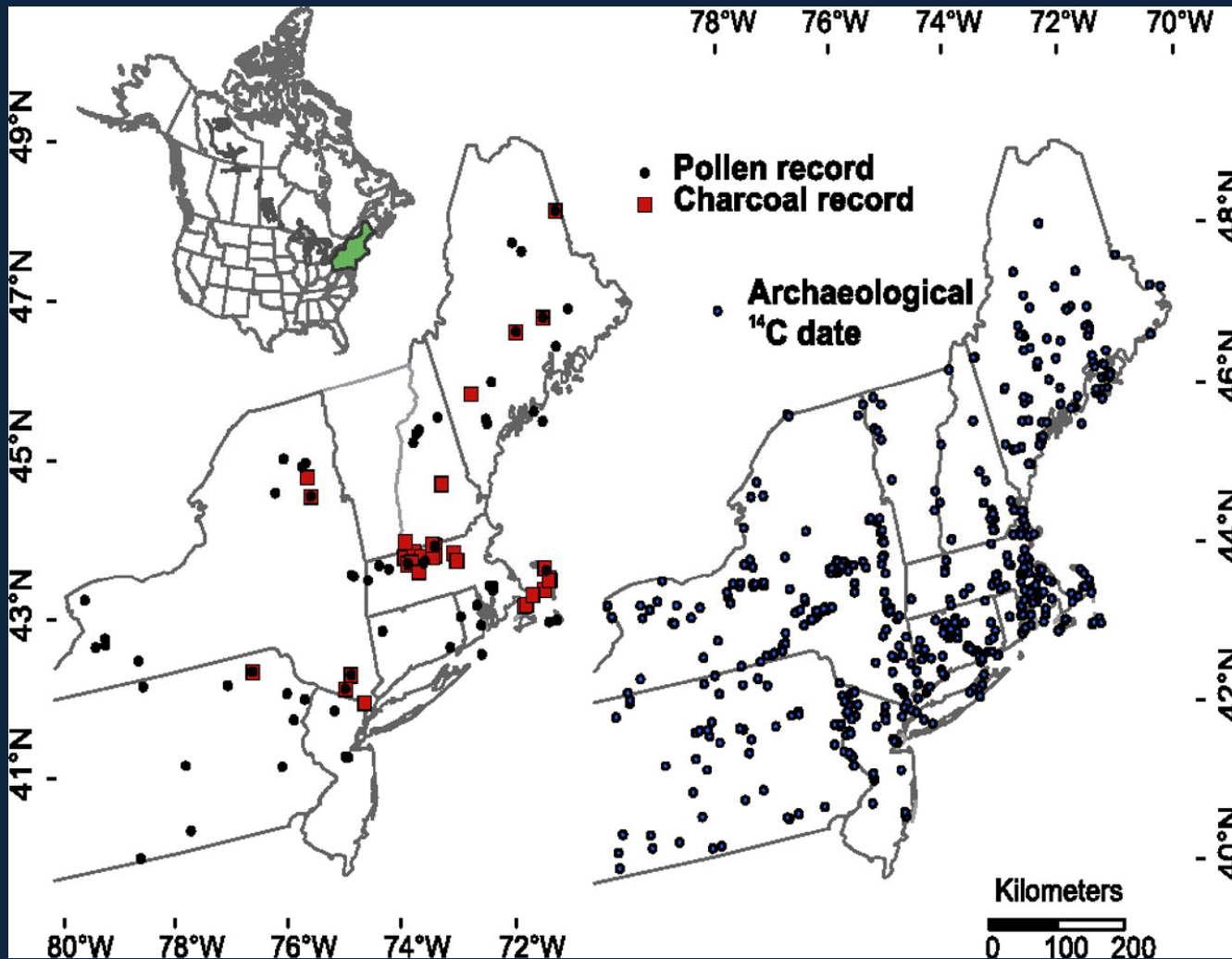


Temporal Changes: Ragweed Continental & more than 10-30 yrs

Lake Sediment Pollen

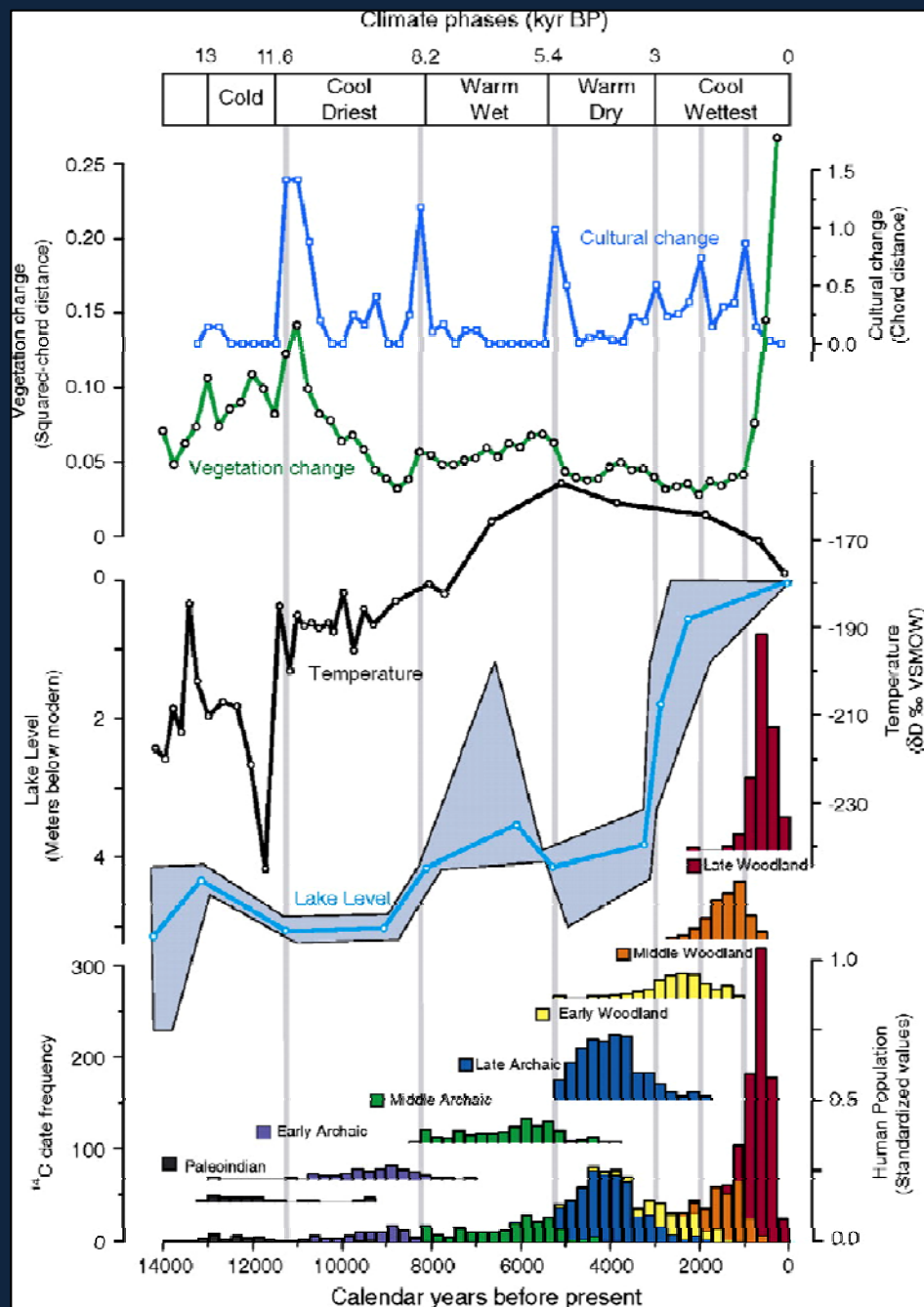


Temporal Changes: Regional

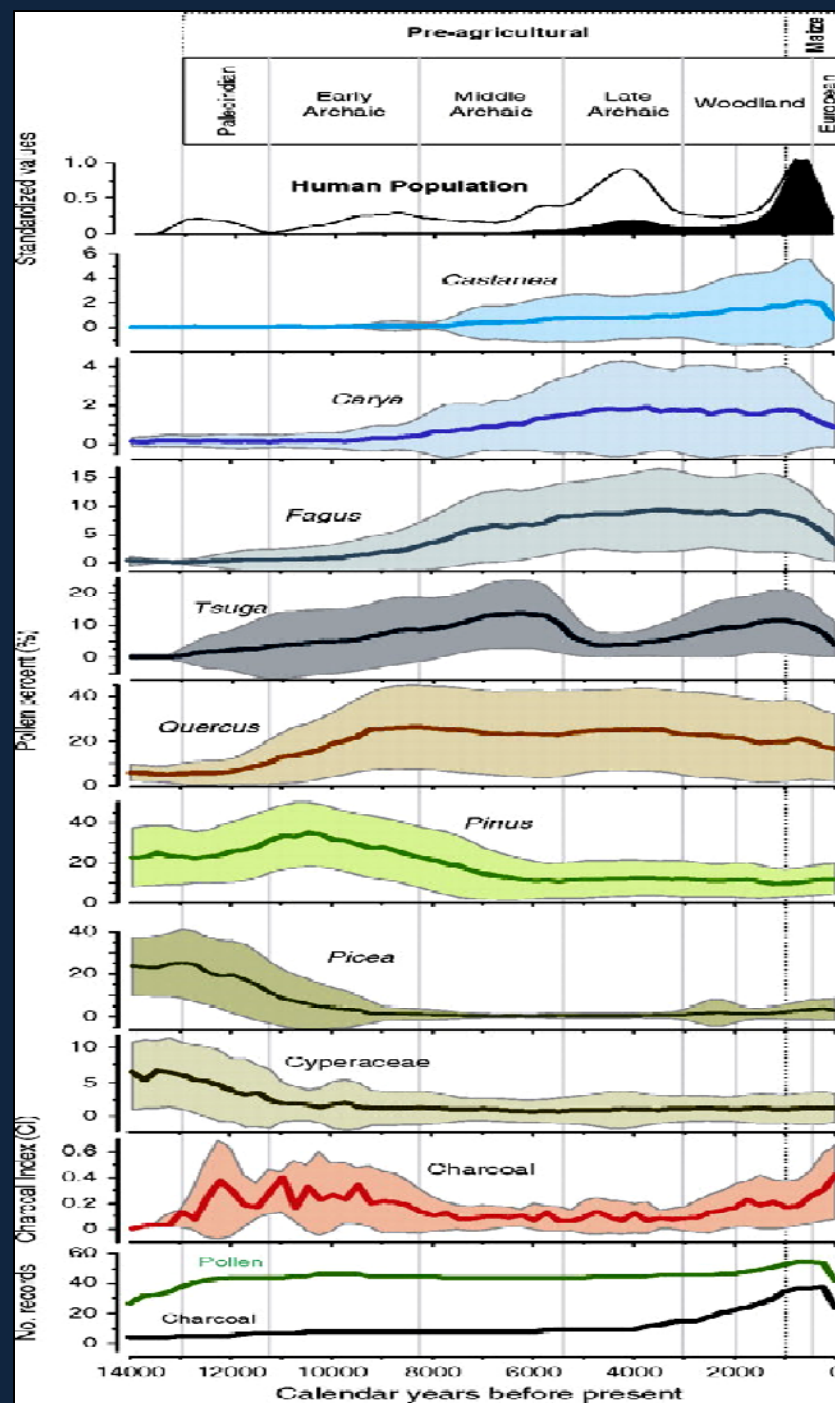


Location of study region in relation to modern Canada and the United States (inset).

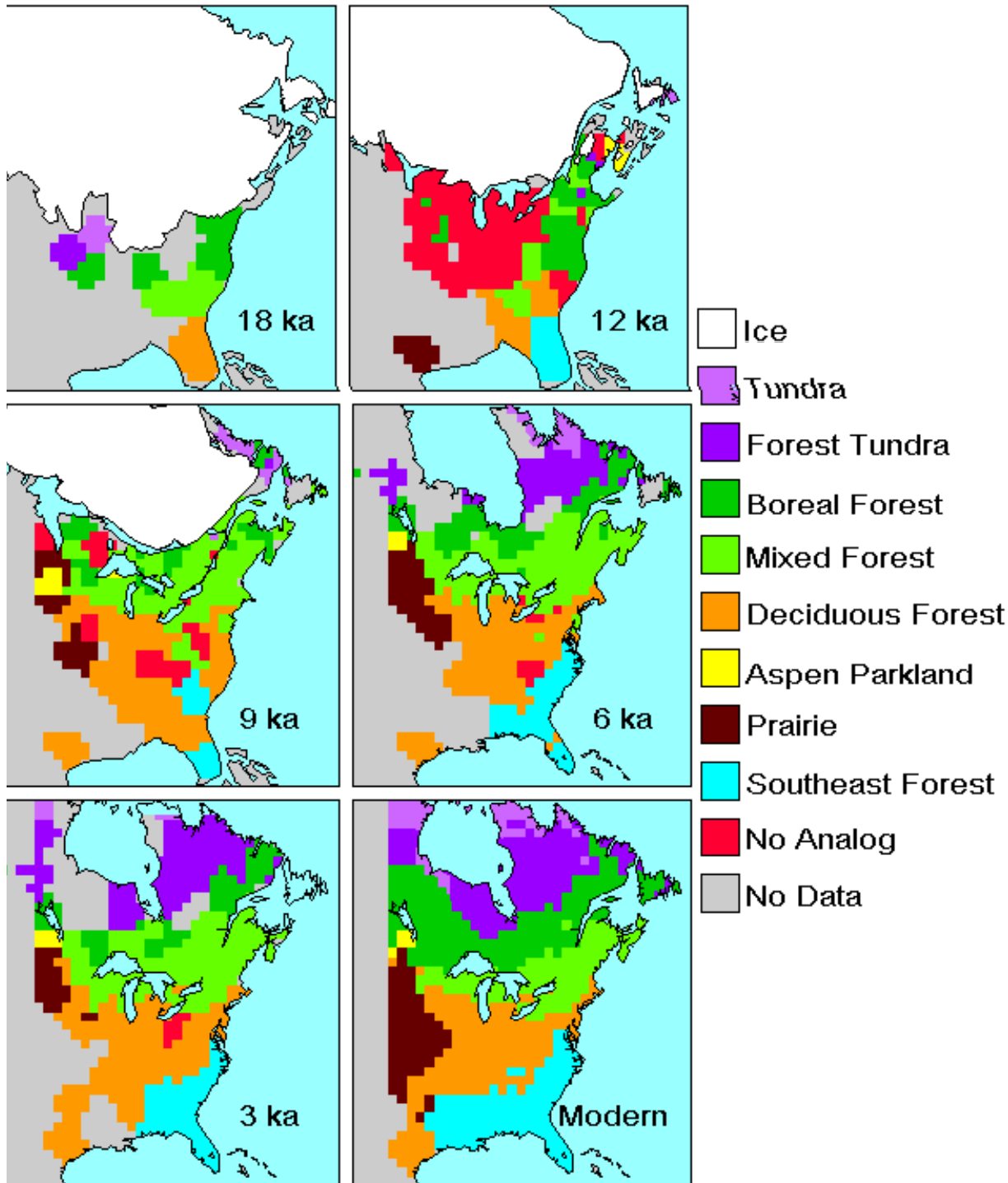
Associations between archaeological, climate, and vegetation records for the study region from initial settlement (13,500 yr BP) to European contact (500 yr BP)



Regional-scale pollen and charcoal records in relation to cultural periods and population size



Temporal Changes: Regional

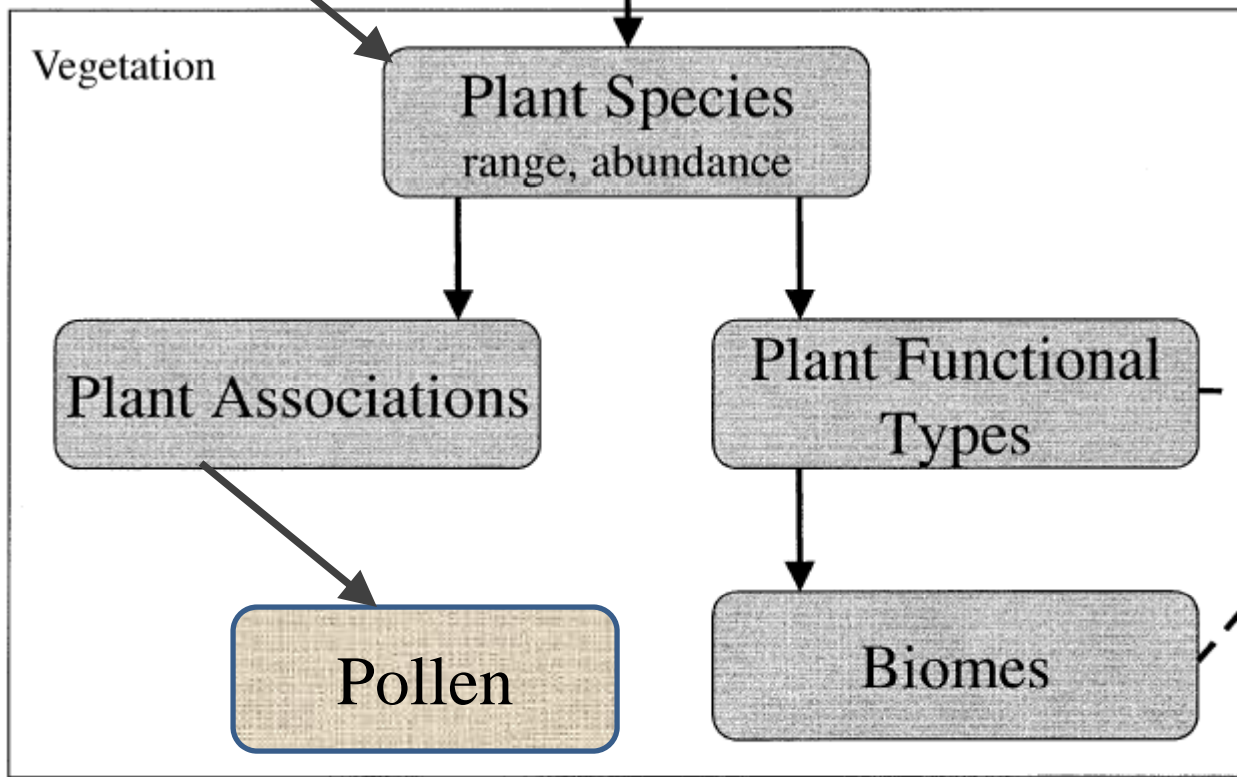


<http://www.ncdc.noaa.gov>
(Accessed 30AUG2011)

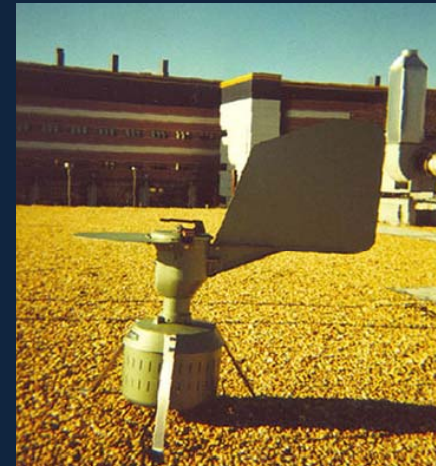
Humans

Atmosphere
Temp., Ppt., CO₂?

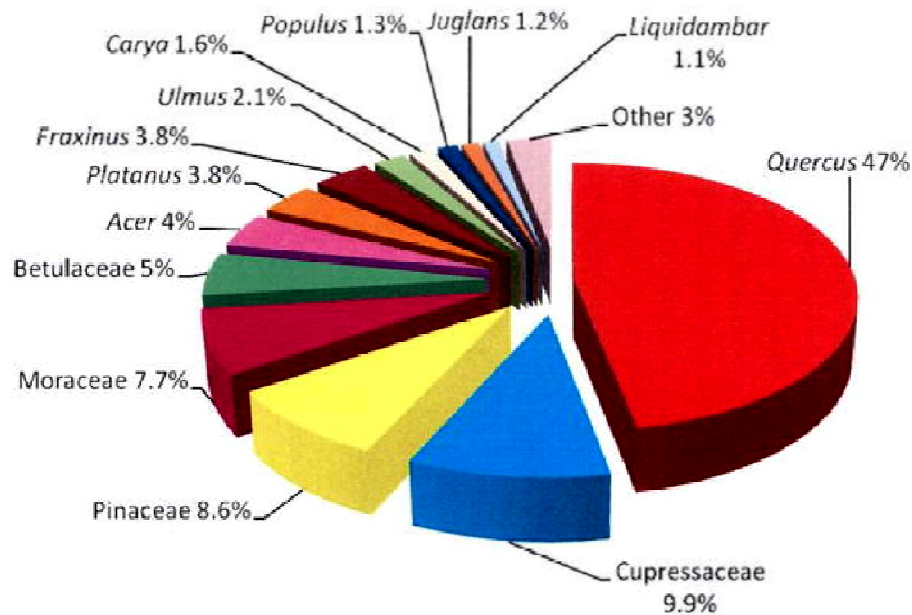
*albedo
surface roughness
evapotranspiration
trace gases*



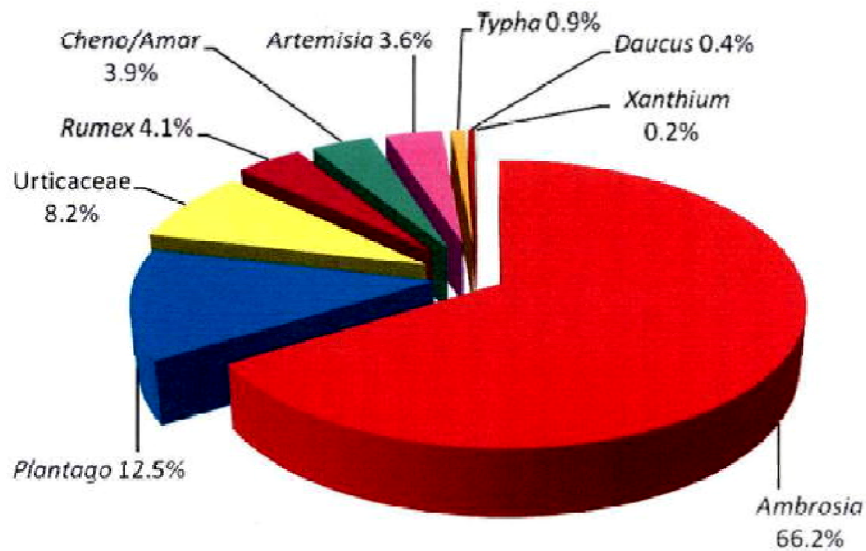
Changes over time: Local US Army Centralized Allergen Extract Laboratory



A Tree Pollen



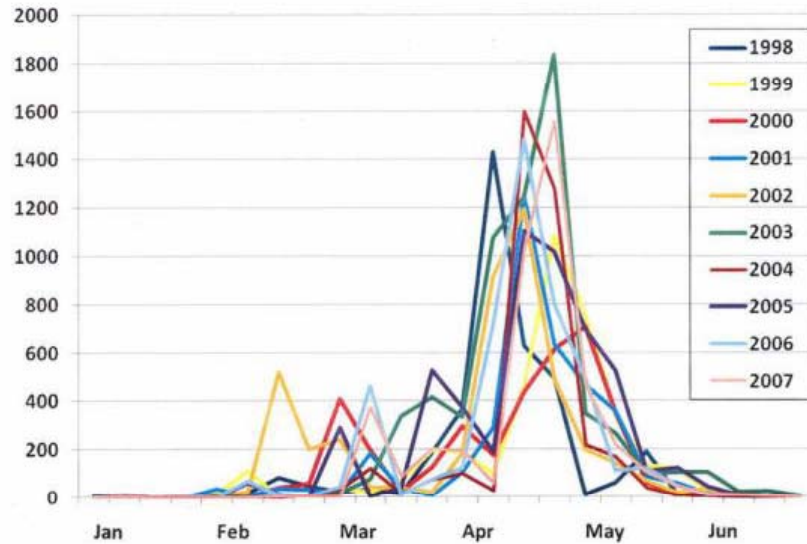
B Weed Pollen



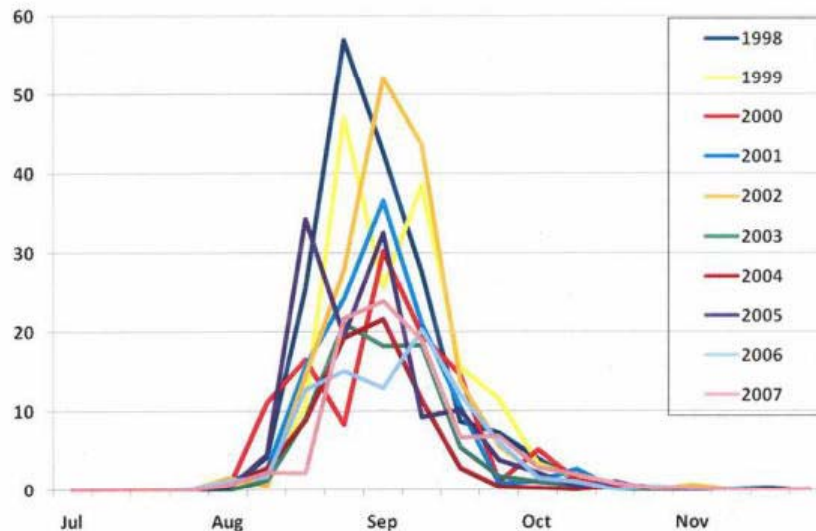
Local Pollen Species

Pollen aeroallergens in the Washington, DC, metropolitan area: a 10-year volumetric survey (1998-2007)

A *Quercus* Pollen Profile

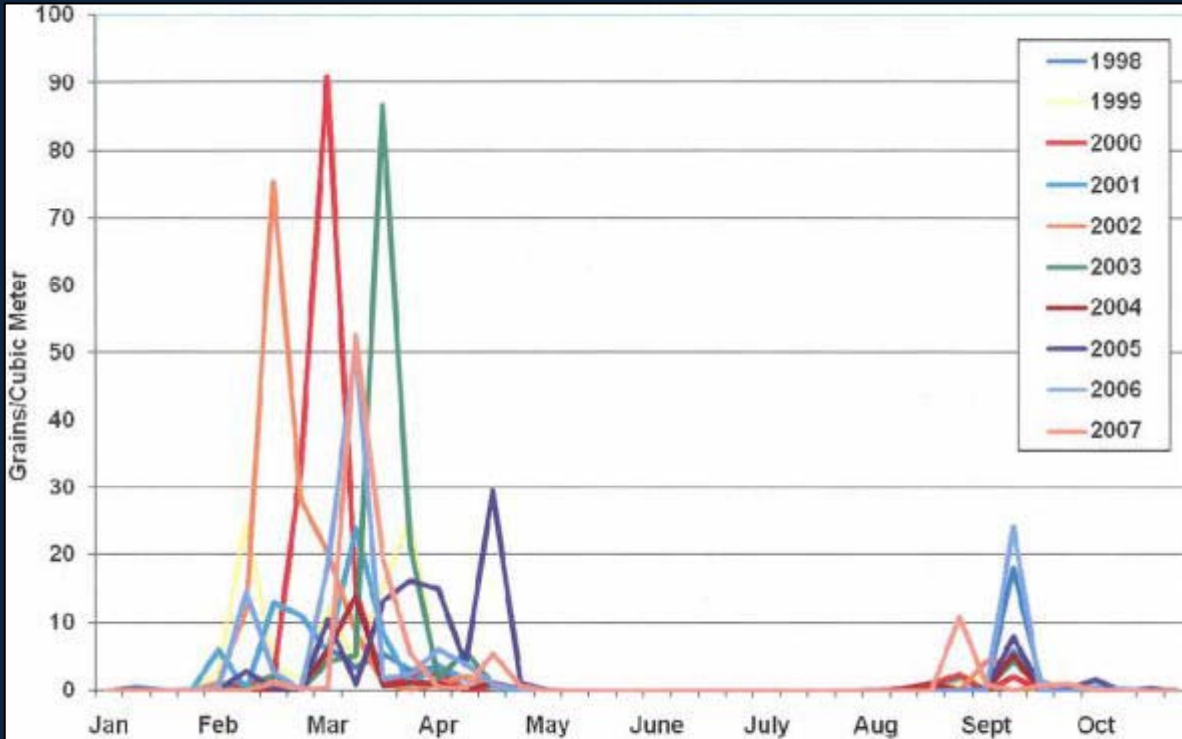


B *Ambrosia* Pollen Profile



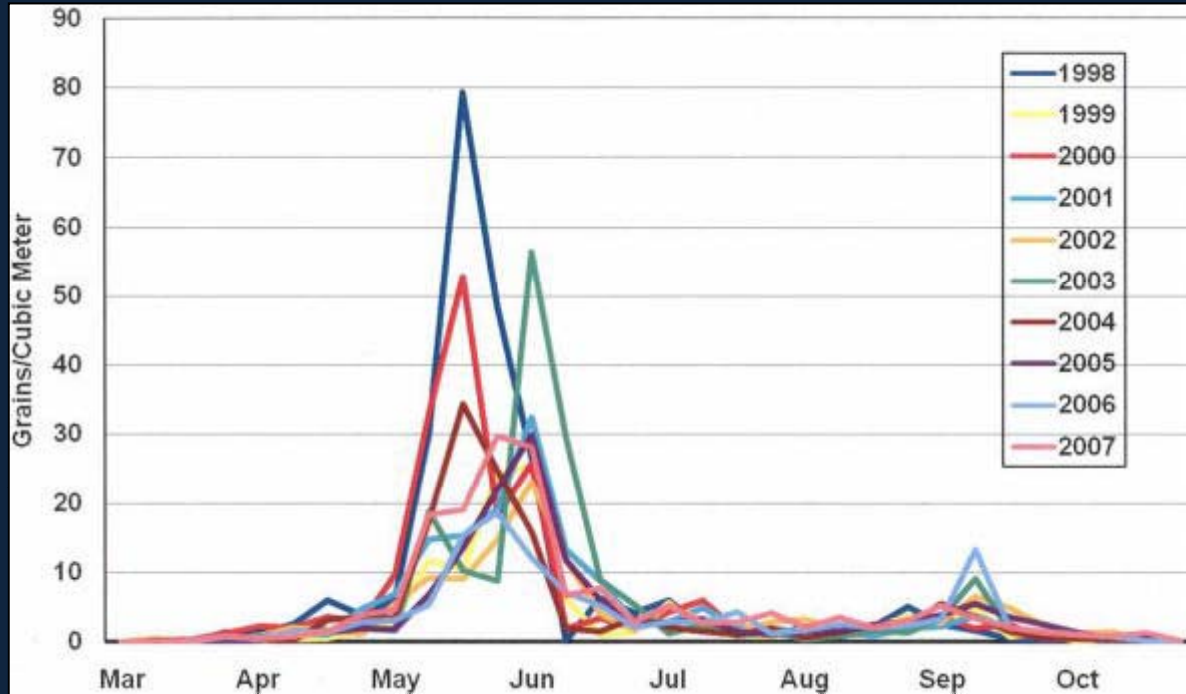
Individual Pollen Species Variation

Pollen aeroallergens in the Washington, DC, metropolitan area: a 10-year volumetric survey (1998-2007)



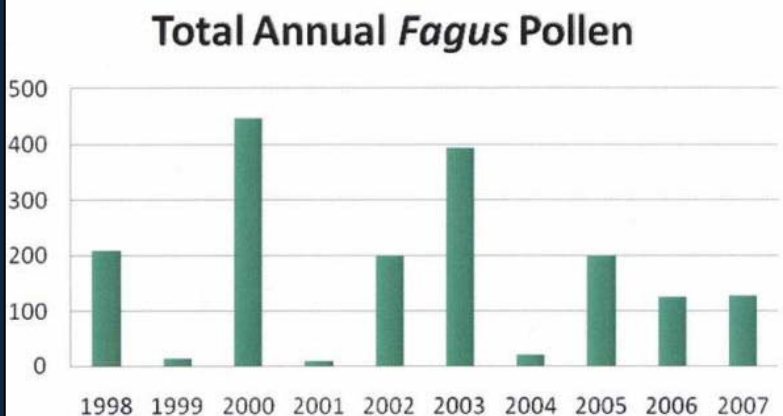
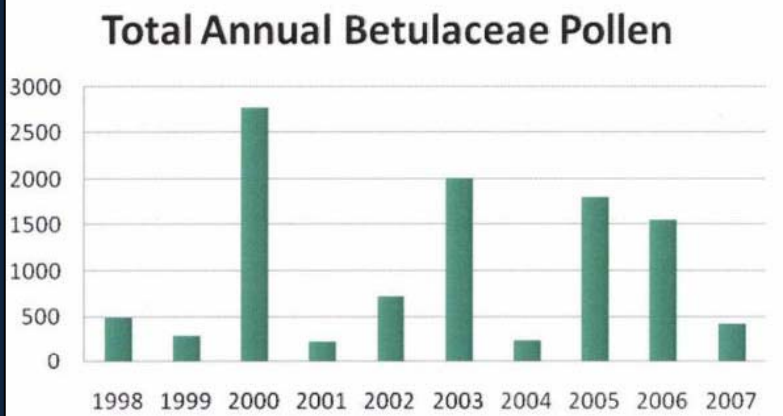
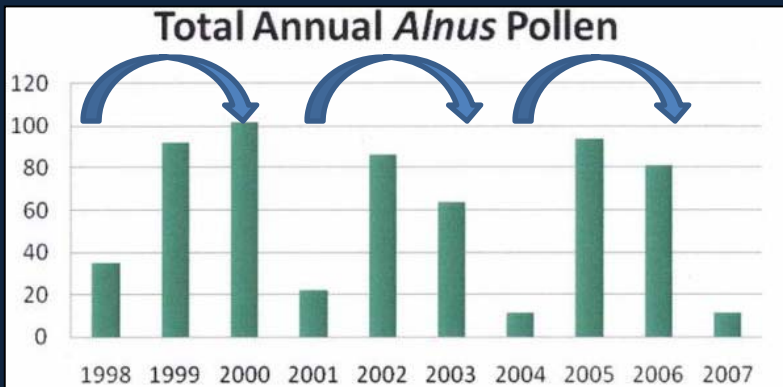
Pollen aeroallergens in the Washington, DC, metropolitan area: a 10-year volumetric survey (1998-2007)

Bimodal ELM Pollen



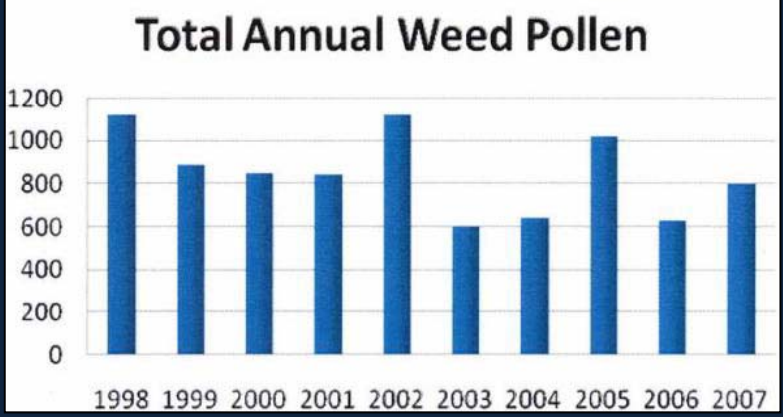
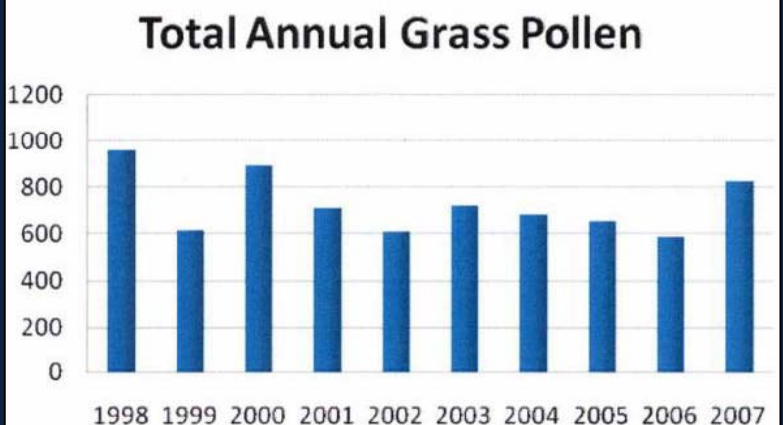
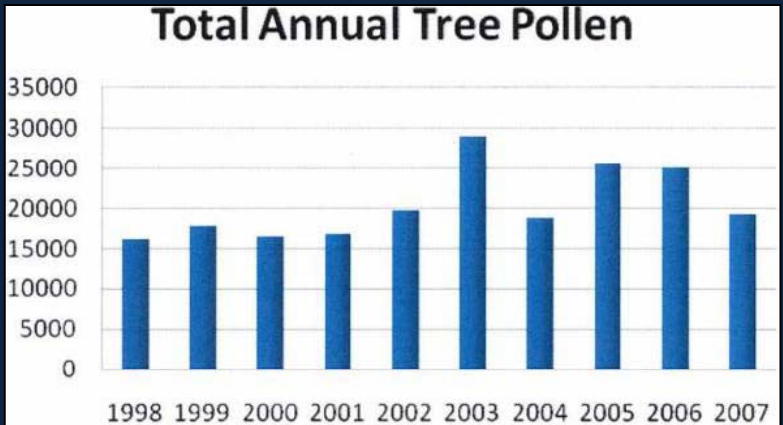
Pollen aeroallergens in the Washington, DC, metropolitan area: a 10-year volumetric survey (1998-2007)

Bimodal Grass Pollen



Pollen Cycles

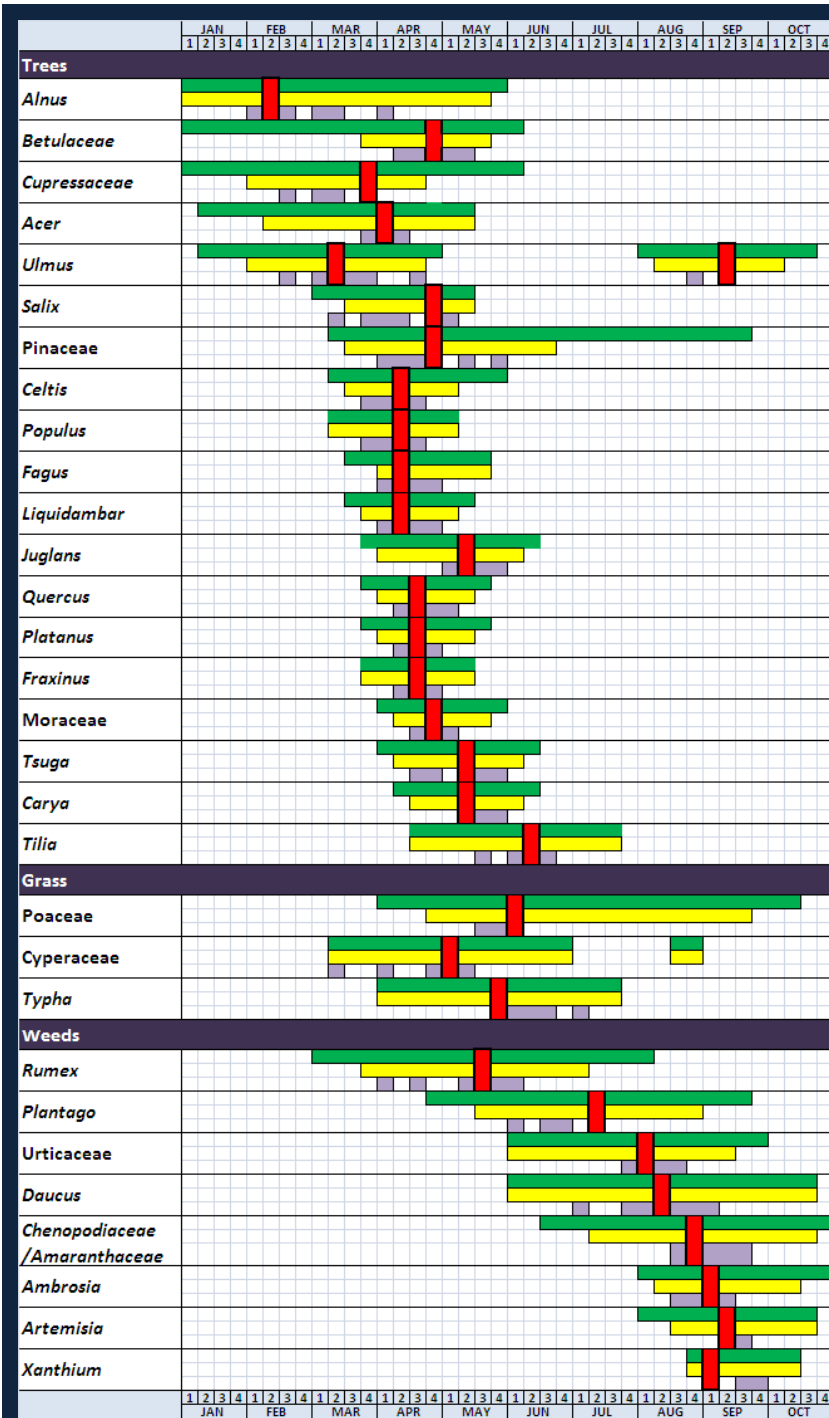
Pollen aeroallergens in the Washington, DC, metropolitan area: a 10-year volumetric survey (1998-2007)



Total Seasonal Burden

Pollen aeroallergens in the Washington, DC, metropolitan area: a 10-year volumetric survey (1998-2007)

Pollen Calendar for Major Tree, Grass and Weed Pollen in the Washington, DC Area (1998-2007)



- Week with >1% total annual pollen species during any year
- Week with >5% total annual pollen species during any year
- Week when "peak" daily averages were noted during any year
- "Peak Week" = Week with the highest overall daily average

1. Do pollen counts actually vary beyond seasonal variation in various locales?
2. If so, how and over what time frame?
3. **How can pollen counts best be utilized in the care of patients?**

Pollen changes and clinical implications

Aeroallergen (lag days)	Relative risk (95% CI)*	Estimated increase in daily asthma visits (95% CI)
Oak/maple pollen (3)	1.23 (1.02–1.49)	23% (2–49%)
Pinaceae pollen (5)	1.34 (1.24–1.45)	34% (24–45%)
Ragweed pollen (5)	1.54 (1.02–2.33)	54% (2–133%)

*RR for an increase of 100 counts/m³

- Questions raised
 - 100 count increase from what baseline
 - Individual vs aggregate pollen increases
 - Within vs interseasonal pollen variation
 - Local vs national data

NAB Pollen Scale (#/cubic meter)

NAB SCALE							
* MOLD		GRASS		TREE		WEED	
0	Absent	0	Absent	0	Absent	0	Absent
1 - 6499	Low	1 - 4	Low	1 - 14	Low	1 - 9	Low
6500 - 12999	Moderate	5 - 19	Moderate	15 - 89	Moderate	10 - 49	Moderate
13000 - 49999	High	20 - 199	High	90 - 1499	High	50 - 499	High
>50000	Very High	>200	Very High	>1500	Very High	>500	Very High

Local Percentile	Low <50 th	Moderate 50 th –75 th	High 75 th –99 th	Very high >99 th
Trees				
Alder	0–0.64	0.65–1.92	1.93–30.13	>30.13
Ash	0–6.71	6.72–32.29	32.30–205.4	>205.4
Beech	0–1.28	1.29–4.79	4.80–69.46	>69.46
Birch family	0–3.82	3.83–16.61	16.62–398.33	>398.33
Cottonwood/poplar	0–3.19	3.20–12.15	12.16–70.50	>70.50
Cedar/Cyp/Jun	0–1.03	1.04–6.75	6.76–511.33	>511.33
Elm	0–1.60	1.61–7.03	7.04–115.33	>115.33
Hackberry	0–1.28	1.29–3.19	3.20–25.08	>25.08
Hemlock	0–0.96	0.97–1.92	1.93–11.64	>11.64
Hickory	0–3.82	3.83–13.07	13.08–70.67	>70.67
Linden	0–0.32	0.33–0.88	0.89–7.59	>7.59
Maple/Boxelder	0–5.29	5.30–17.45	17.46–167.56	>167.56
Mulberry Family	0–9.40	9.41–59.1	59.11–401.79	>401.79
Oak	0–26.52	26.53–235.15	235.16–1,749.55	>1,749.55
Pine Family	0–0.96	0.97–13.74	13.75–233.96	>233.96
Sweetgum	0–2.64	2.65–9.85	9.86–109.17	>109.17
Sycamore	0–8.88	8.89–30.76	30.77–202.13	>202.13
Walnut	0–3.74	3.75–12.14	12.15–49.08	>49.08
Willow	0–0.96	0.97–2.00	2.01–18.52	>18.52
Weeds				
Cattail	0–0.59	0.60–0.96	0.97–3.97	>3.97
Chenopod/Amaranth	0–0.64	0.65–0.96	0.97–3.27	>3.27
Dock/Sorrel	0–0.64	0.65–1.28	1.29–4.52	>4.52
Nettle Family	0–0.96	0.97–1.92	1.93–8.71	>8.71
Plantain	0–1.17	1.18–2.06	2.07–8.38	>8.38
Ragweed	0–4.47	4.48–14.98	14.99–75.91	>75.91
Sage	0–0.64	0.65–1.92	1.93–11.5	>11.5
Grasses	0–2.24	2.25–5.29	5.30–51.79	>51.79

Establishing Local Pollen Ranges in Wash DC

	Low <50 th	Mod. 50 th –75 th	High 75 th –99 th	Very high >99 th
Trees				
NAB	0–14	15–89	90–1,499	>1,500
Wash, DC	0–3.53	3.54–79.59	79.60–2,028.15	>2,028.15
Grasses				
NAB	0–4	5–19	20–199	>200
Wash, DC	0–2.24	2.25–5.29	5.30–51.79	>51.79
Weeds				
NAB	0–9	10–49	50–499	>500
Wash, DC	0–4.70	4.71–10.41	10.42–58.8	>58.8

NAB Pollen Level Precautions

ABSENT

No symptoms

LOW

Very sensitive patients will experience symptoms

MODERATE

Many sufferers will experience symptoms

HIGH

Most allergy sufferers will experience symptoms

VERY HIGH

Almost all allergy sufferers will experience symptoms, those extremely sensitive could have severe symptoms



USA CAEL Pollen and Spore Report

Pollen Nation









Date

30-Aug-11

Provided by Susan E. Kosisky and Mariko S. Marks, Walter Reed AMC

Daily Volumetric Count (Grains/Spores per Cubic Meter)

		Pollen Range Comparison		
		Grains/ Cubic Meter	National Allergy Bureau	Washington, DC
Trees		2.24	LOW	LOW
Grasses		12.14	MODERATE	HIGH
Weeds		17.89	MODERATE	HIGH
Mold Spores		21356.9	HIGH	N/A

		Low	Moderate	High	Very High
	Percentile	< 50th	50th - 75th	75th - 99th	> 99th
Trees	NAB	0 - 14	15 - 89	90 - 1499	> 1500
	Wash, DC	0 - 3.53	3.54 - 79.59	79.60 - 2028.15	> 2028.15
Grasses	NAB	0 - 4	5 - 19	20 - 199	> 200
	Wash, DC	0 - 2.24	2.25 - 5.29	5.30 - 51.79	> 51.79
Weeds	NAB	0 - 9	10 - 49	50 - 499	> 500
	Wash, DC	0 - 4.70	4.71 - 10.41	10.42 - 58.8	> 58.8
Molds	NAB	0 - 6500	6500 - 13,000	13,000 - 50,000	> 50,000

Low, moderate, high and very high ranges for the Washington, DC region are based on 12 years of our pollen count data. National ranges were determined by the National Allergy Bureau and represent pollen data from 51 stations nationwide.

Summary

- ❑ Pollen counts do vary beyond seasonal variation
 - Geographic
 - Temporal variation
- ❑ Multiple factors contribute to pollen variation
 - Climate & cultural influences
- ❑ Clinical application of pollen count includes a balance of local vs national variation data

National Allergy Bureau/AAAAI

Welcome to the AAAAI's National Allergy Bureau™ (NAB™), your most reliable resource for actual pollen and mold levels. View levels in your area and create a personalized email alert account through My NAB.

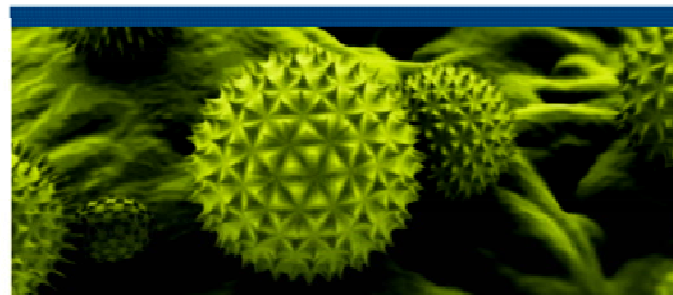


Pollen Count Stations

Alabama - Birmingham

Pollen Count Regions

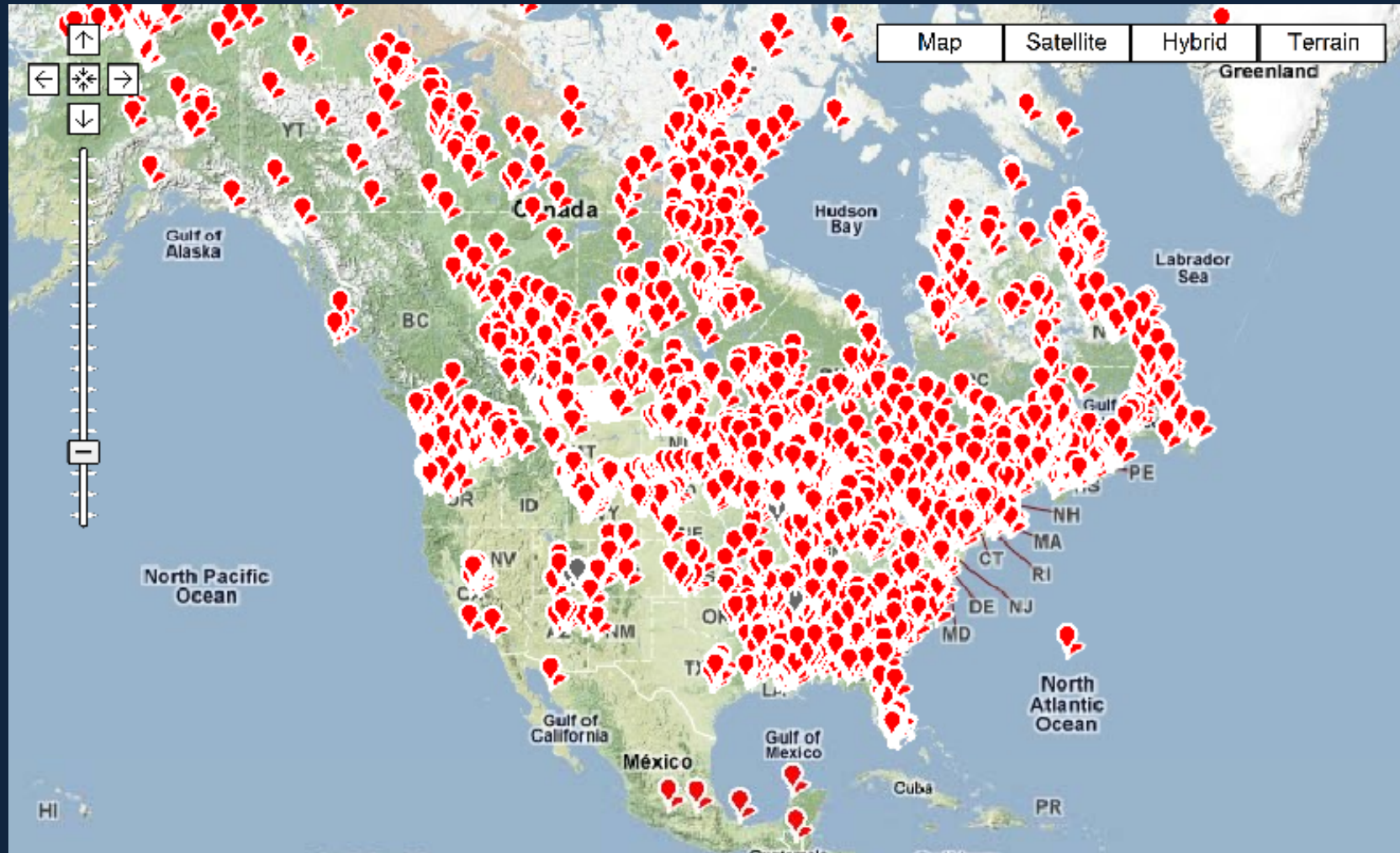
- United States: [Western Region](#) | [South Central](#) | [South Atlantic](#) | [Midwest](#) | [Northeast](#)
- [Canada](#)
- [Argentina](#)



NAB TOOLBOX

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- [Learn about Allergies >](#)
- [Pollen and Mold Links >](#)
- [Reading the Charts >](#)
- [View Images >](#)

National Oceanic & Atmospheric Administration Global Pollen Database



Resources

36 international links

WAO World Pollen Network
Director: Fares Hamad Zaitoun, MD
Email: info@worldallergy.org

Region	Country	Organization/Site Name
North America	Canada	The Weather Network http://www.theweathernetwork.com/pollenfx/canpollen_en/
North America	USA	Allergy Report, CNN.com/Weather http://weather.cnn.com/weather/WeatherAllergy.jsp
North America	USA	Betrocks Allergenica http://www.allergenica.com
North America	USA	AAAAI National Allergy Bureau http://www.aaaai.org/nab/index.cfm
North America	USA	Pollen Count for Seattle/King County area http://www.asthmainc.org/resources/pollen.asp
North America	USA	Pollen.com, local and national counts http://www.pollen.com
North America	USA	The Pollen Counter, WebMD, National http://www.webmd.com/allergies/healthtool-pollen-counter-calculator
North America	USA	The Weather Channel http://www.weather.com/outlook/health/allergies/

Questions

