

National Lake Assessment Survey Design and Extent Estimates

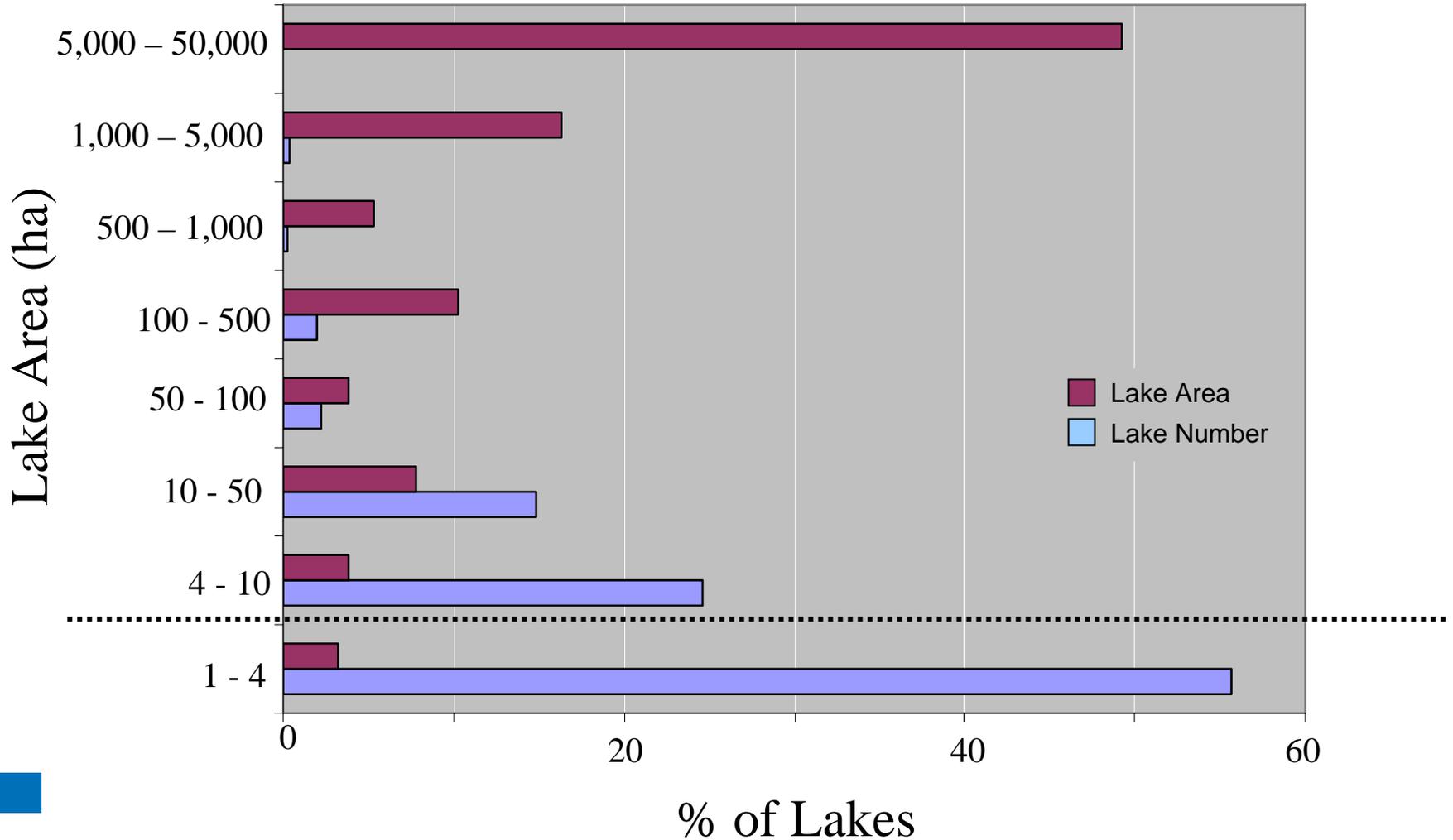
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Goals of National Lake Assessment: 2006

- Report on the condition of the Nation's Lakes
 - Statistically-valid design so dataset represents the condition of all lakes in regions that share similar ecological characteristics
 - Provide regional and national estimates of the condition of lakes, with option for State-scale estimates
 - Use consistent sampling and analysis procedures to ensure the results can be compared across the country
- Promote collaboration across jurisdictional boundaries in the assessment of water quality
- Help build State and Tribal capacity for monitoring and assessment

Lake Size Classes



Survey Design Steps

- Define target population of lakes
- Create sample frame best matches definition
- Determine the survey design
- Select lakes

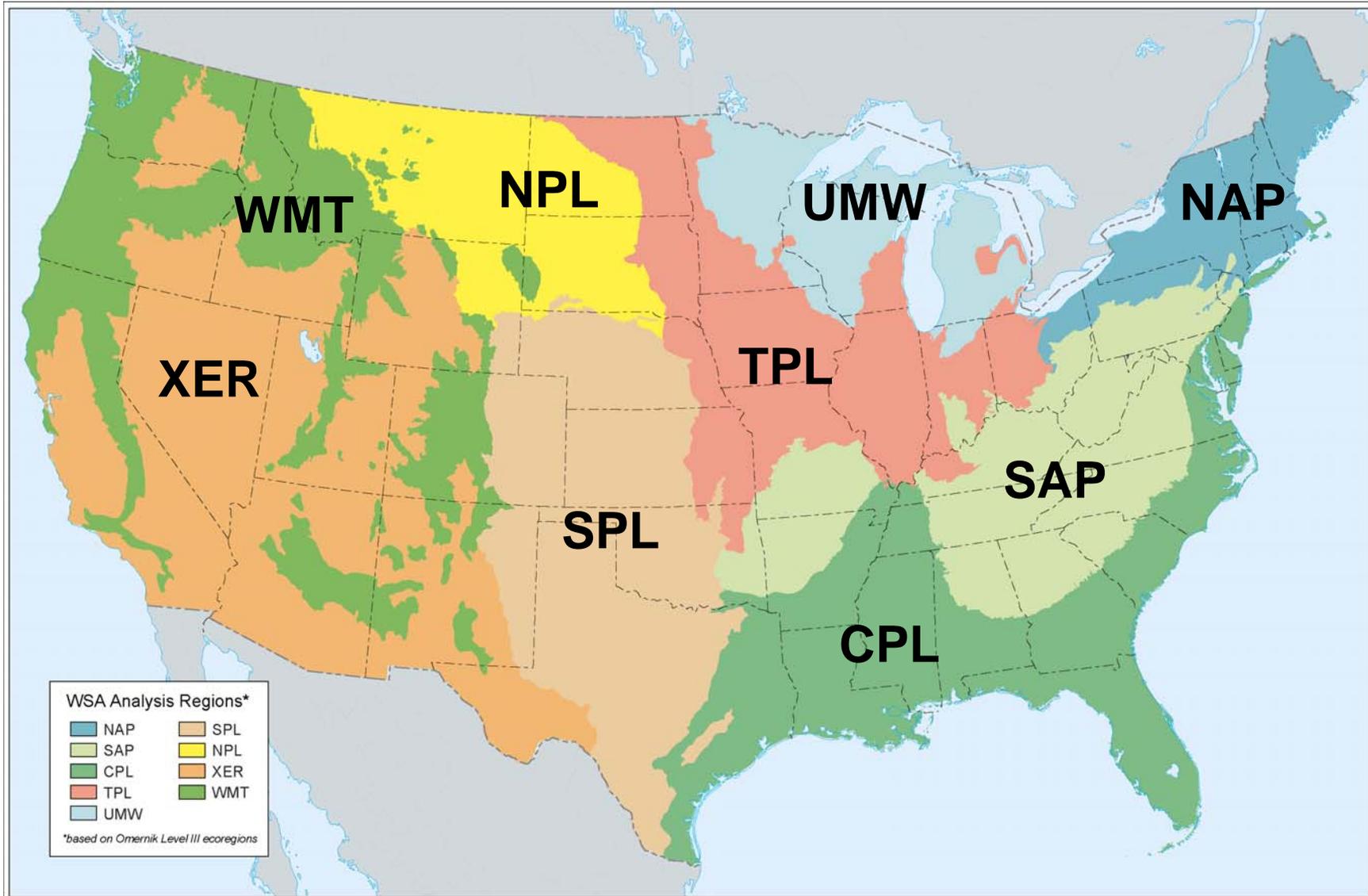
Target Population: Lakes and Reservoirs

- Definition: natural and man-made freshwater lakes, ponds, and reservoirs greater than 10 acres (4 hectares) in the conterminous U.S., excluding the Great Lakes.
- Waterbody characteristics
 - Permanent waterbody, >4 hectares, > 1 meter depth, >1000 m² open water, non-saline
 - Not private aquaculture waterbody, disposal pond, sewage treatment pond, or evaporation pond

Sample Frame: NHD 1:100,000

- Created single polygon for multiple polygon lakes and reservoirs
- Included all lakes and reservoirs > 4 ha (10 acres)
- Identified 791 National Eutrophication Study lakes
- Assigned each lake to WSA aggregated ecoregion
- Restricted to 48 conterminous United States
- Assigned lakes to lake area category:
 - 4-10 ha, 10-20 ha, 20-50 ha, 50-100 ha, >100 ha

Aggregated Ecoregions



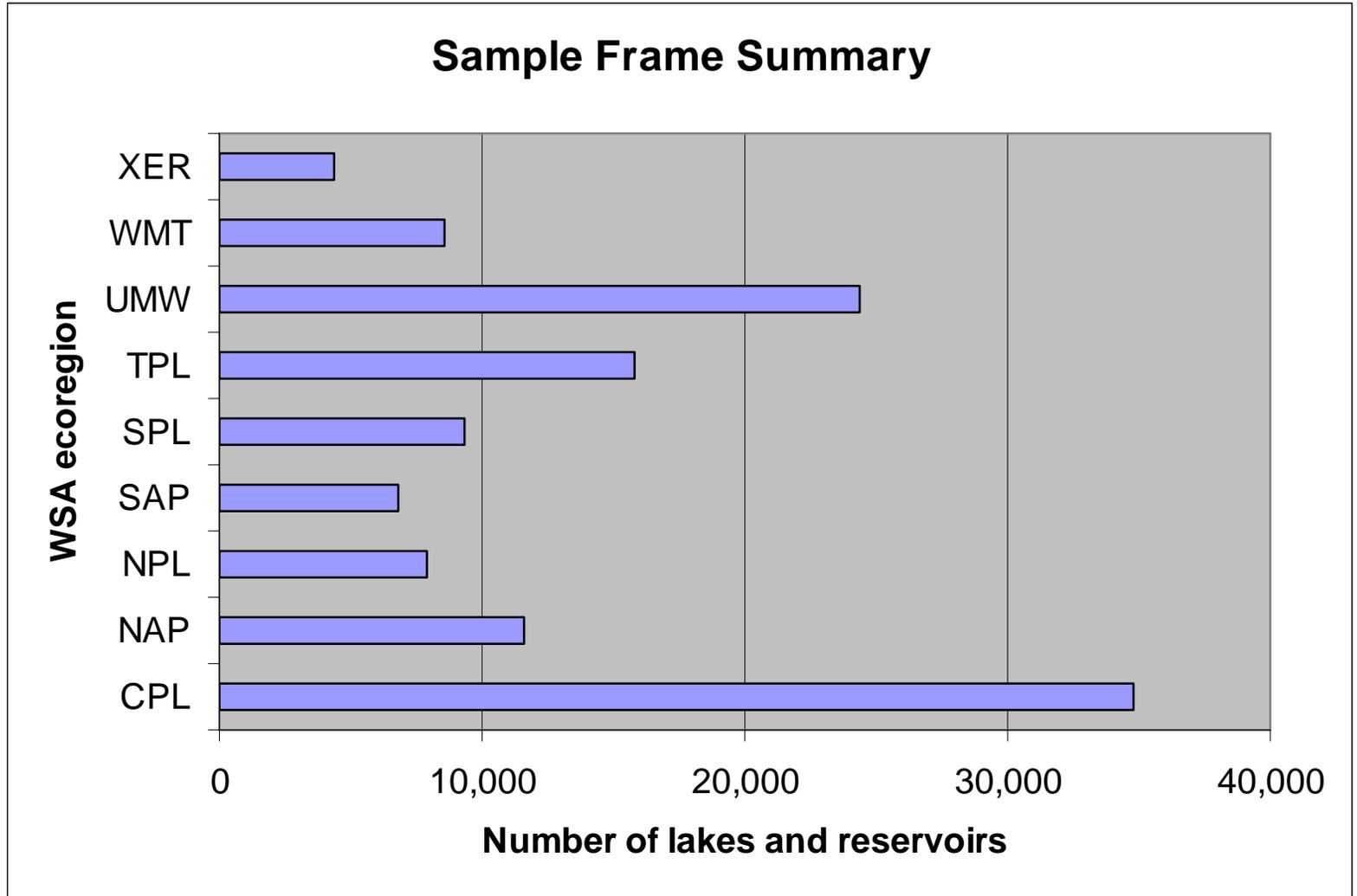


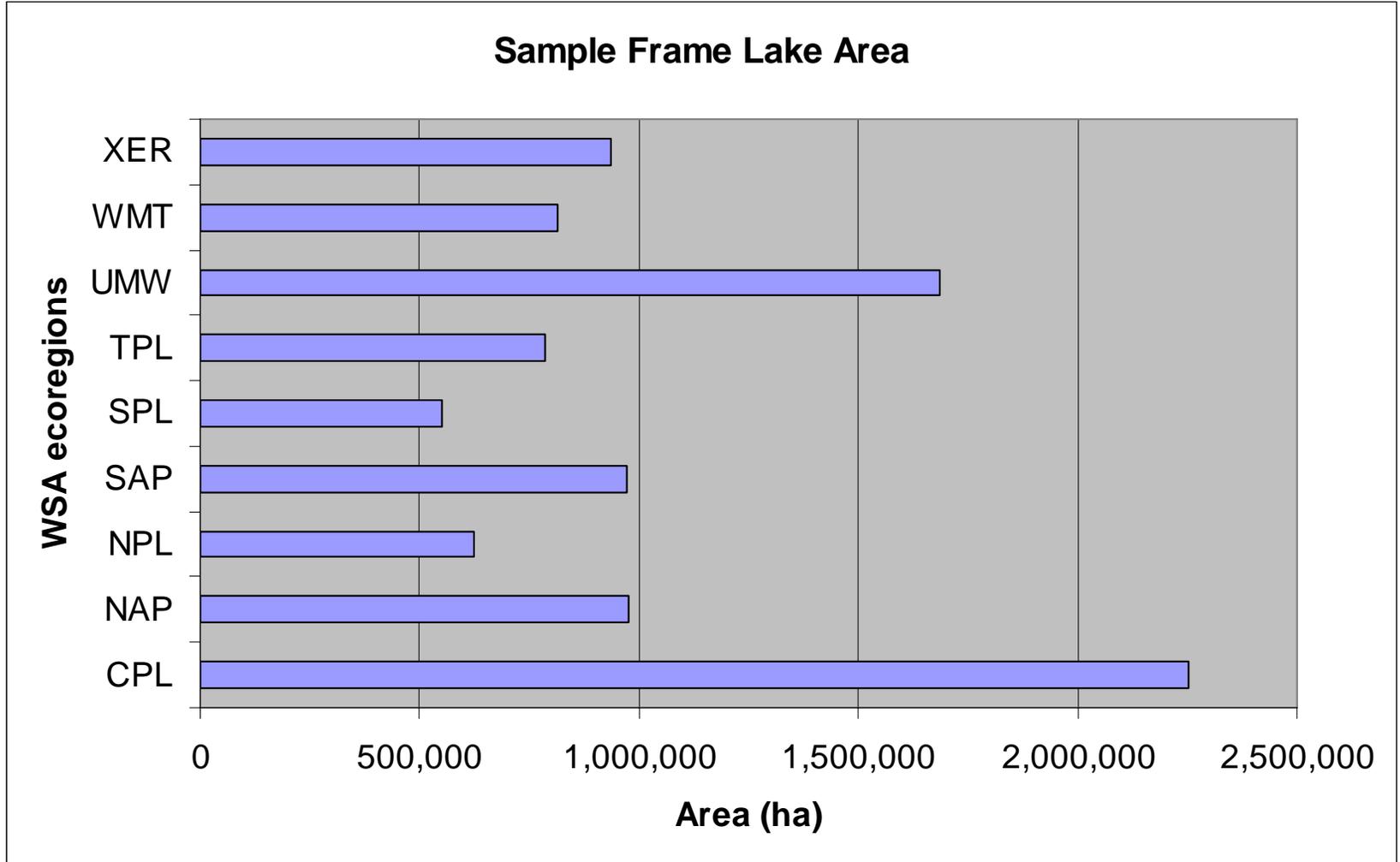
Sample Frame Summary

Number of Lakes

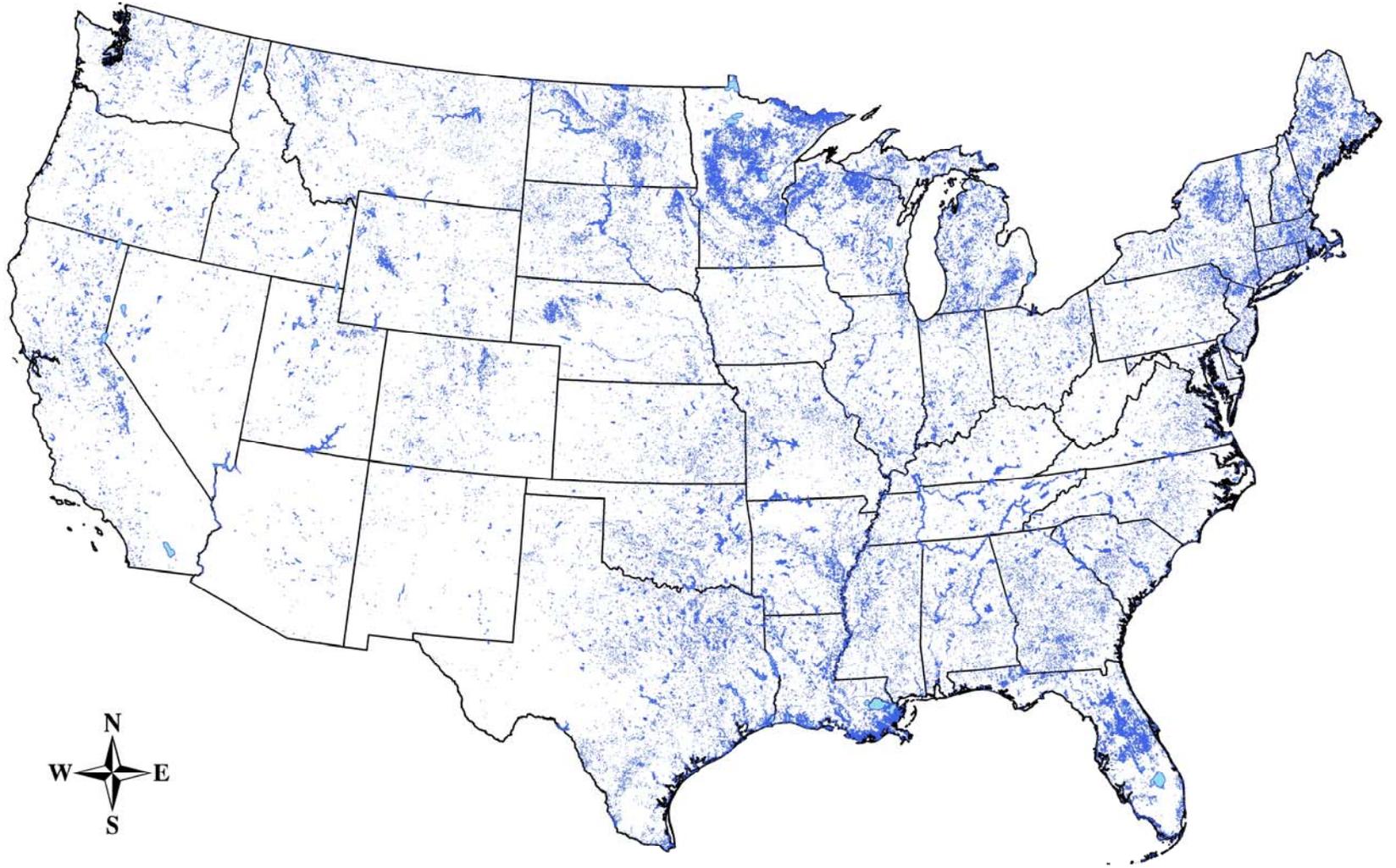
Lake area (ha) categories

	(4,10]	(10,20]	(20,50]	(50,100]	>100	Total
Coastal Plains CPL	20,781	7,018	4,199	1,334	1,475	34,807
Northern Apps NAP	5,335	2,421	1,923	838	1,047	11,564
Northern Plains NPL	5,137	1,438	764	286	235	7,860
Southern Apps SAP	4,256	1,275	672	247	365	6,815
Southern Plains SPL	6,006	1,863	881	252	351	9,353
Temperate Prairies TPL	9,114	3,041	2,026	775	809	15,765
Upper Mid-West UMW	10,979	5,202	4,339	1,797	2,016	24,333
Western Mtns WMT	4,804	1,763	1,039	351	598	8,555
Xeric West XER	2,147	881	645	254	460	4,387
Total	68,559	24,902	16,488	6,134	7,356	123,439

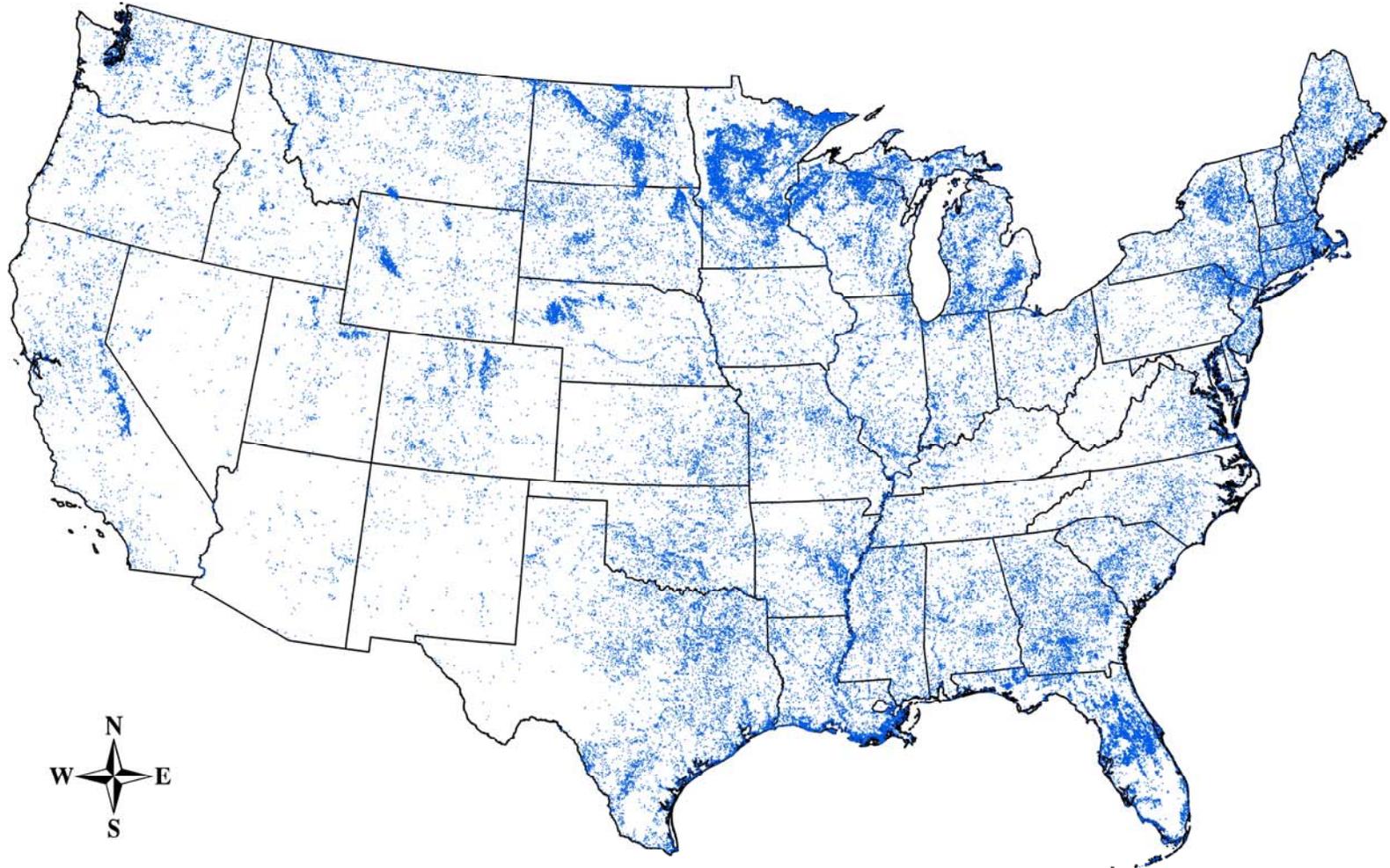




National Lake Assessment Sample Frame Lakes (as polygons)



National Lake Assessment Sample Frame Lakes
(as points)



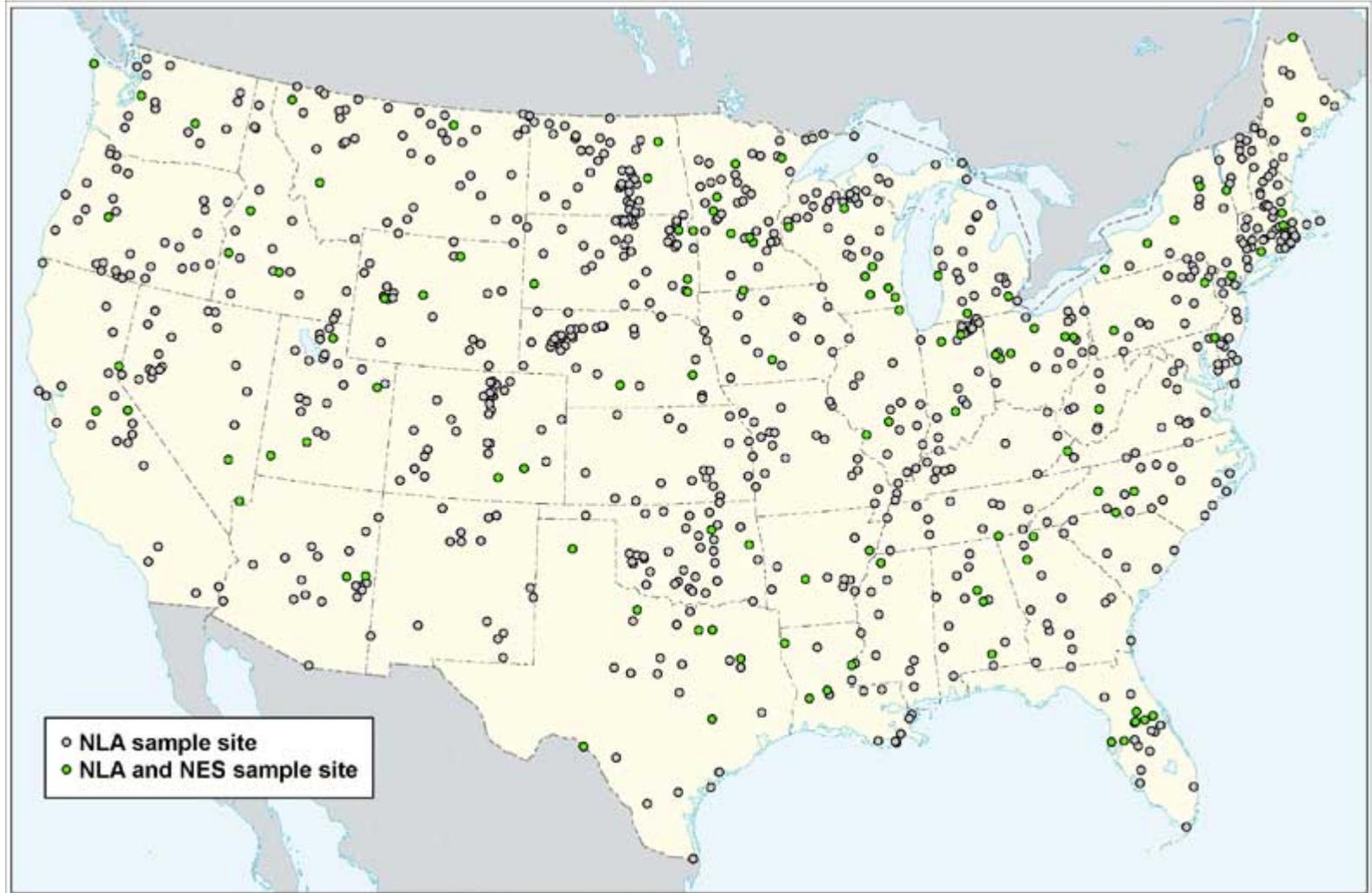
Survey Design Objectives

- Determine the proportion of lakes (+/-5%) in the conterminous U.S. that exceed a threshold of concern using selected indicators with 95% confidence.
- Determine the proportion of lakes (+/-15%) in a specific ecoregion grouping that exceed a threshold of concern using selected indicators with 95% confidence.
- Determine change in status for 1970s National Eutrophication Study (NES) lakes

Survey Design Lake Selection Steps

- 4-10 ha lakes equal probability (n=90)
- >10 ha lakes unequal probability (n=720)
 - Generate inclusion probability so that
 - Equal # lakes per state
 - Equal # lakes by 5 lake area categories:
4-10, 10-20, 20-50, 50-100, >100 ha
 - Adjust inclusion probabilities so that expected sample size is 80 for each aggregated ecoregion
- NES lakes selected with equal probability (n=100)

NLA Sample Lakes: Planned



Number of Lakes Selected

Ecoregion	(4,10]	(10,20]	(20,50]	(50,100]	>100	Total
CPL	39	19	23	19	19	119
NAP	7	15	21	26	25	94
NPL	7	30	22	22	11	92
SAP	5	22	16	12	29	84
SPL	12	28	19	13	30	102
TPL	10	31	28	16	31	116
UMW	16	11	19	20	35	101
WMT	8	18	19	25	44	114
XER	0	11	17	19	40	87
Total	104	185	184	172	264	909

Summary of Lakes Selected

- Total number of lake visits: 1,000
 - 909 unique lakes
 - 91 lakes for repeat sampling
- Number of Lakes from 1972-76 National Lake Eutrophication Study (NES): 113
- Number of Lakes per state:
 - Range: 4-41
 - Median: 18
- Number of lakes per aggregated ecoregion:
 - Range: 84-119
 - Median: 101

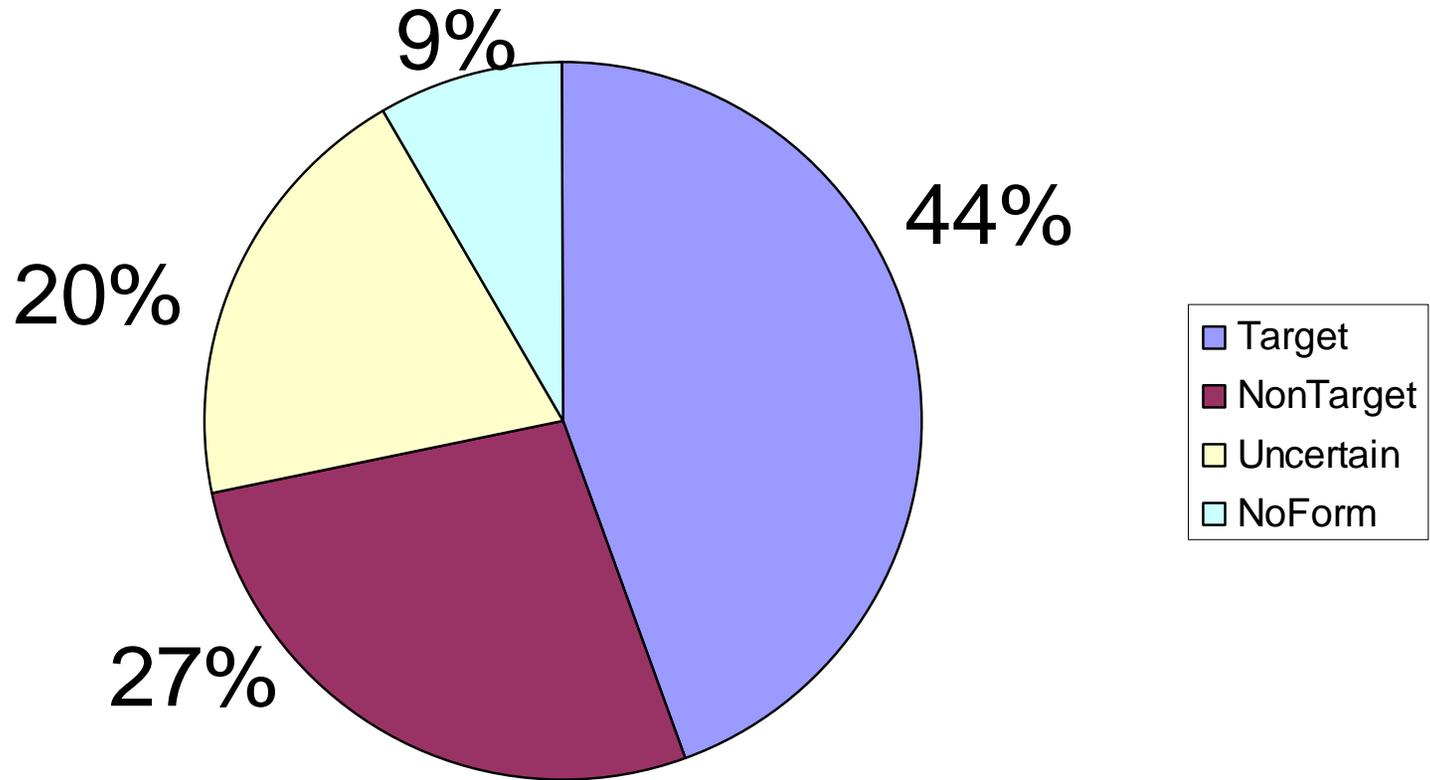


Number of Lakes Evaluated (Preliminary)

Aggregated Ecoregion

Status	CPL	NAP	NPL	SAP	SPL	TPL	UMW	WMT	XER	Total
Target Sampled	103	79	67	116	129	137	148	155	84	1018
Target Probable	8	14	16	1	29	5	3	1	2	79
Denied Access	16	18	5	7	33	14	1	7	6	107
Inaccessible	13	1	3	2	2	0	1	32	3	57
Non Target	97	12	69	26	45	42	16	20	110	437
Non Target Probable	70	26	43	16	37	32	9	34	56	323
No Form	14	40	60	6	25	28	13	11	8	205
Total	321	190	263	174	300	258	191	260	269	2226

Estimated Number of Lakes by Status



Margin of Error $\pm 4\%$

Target Lake Status

