

# ***INTEGRATING PROBABILISTIC AND TARGETED SURVEYS***

*The New Hampshire Experience  
So Far and Some Insights*

*Paul Currier, Phil Trowbridge, Dave Neils,  
Ken Edwardson and Gregg Comstock  
New Hampshire Department of Environmental Services*

*8<sup>th</sup> EMAP Symposium  
April 10-11, 2007                      Washington, DC*

# THE PROBLEM:

*Not enough assessment coverage with targeted sampling*

# THE SOLUTION: (maybe?)

*State level probabilistic surveys supplemented with watershed-level targeted sampling*

# NH ASSESSMENT UNITS<sup>1</sup>

WATERBODY TYPE	AGGREGATE SIZE	NUMBER OF ASSESSMENT UNITS (AUs)	AVERAGE AU SIZE	MIN. AU SIZE	MAX. AU SIZE
Estuary	11,520 ac.	57	192	1.3	2,880
Impoundment	21,406 ac.	811	26.4	0.01	3,800
Lake	164,472 ac.	1,134	145	0.097	44,585
Ocean	44,800 ac.	26	1,728	0.2	39,296
River	9,628 mi.	3,183	3	0.01	19

***Total assessment units 5211***

<sup>1</sup>NH Waterbody Atlas is based on 1:100K NHD

# NH DESIGNATED USES

- *Aquatic Life*
- *Primary Contact Recreation*
- *Secondary Contact Recreation*
- *Fish/Shellfish Consumption<sup>1</sup>*
- *Drinking Water Supply<sup>2</sup>*
- *Wildlife<sup>3</sup>*

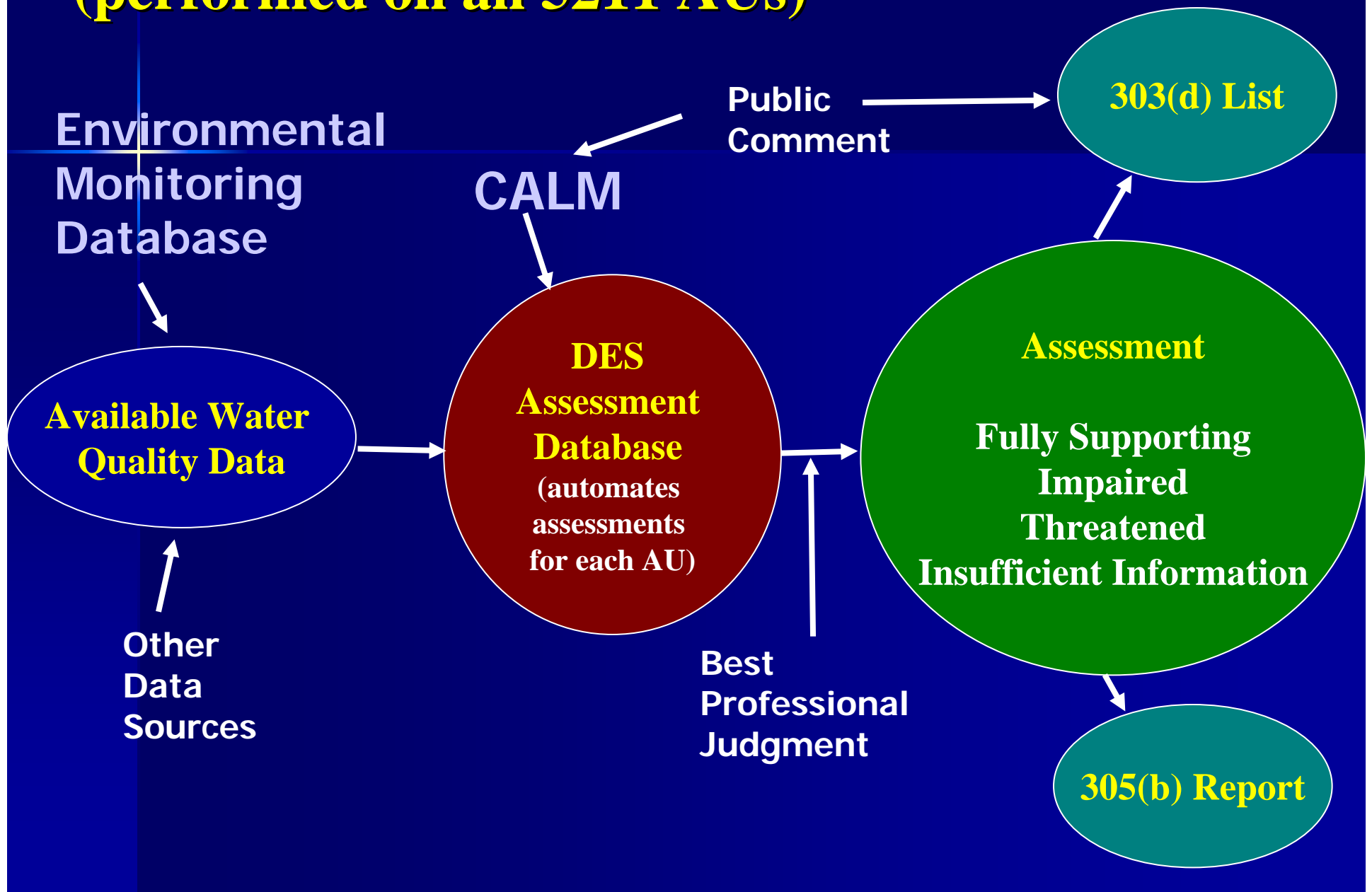
## NOTES:

1 Statewide Fish Consumption Advisory for Hg

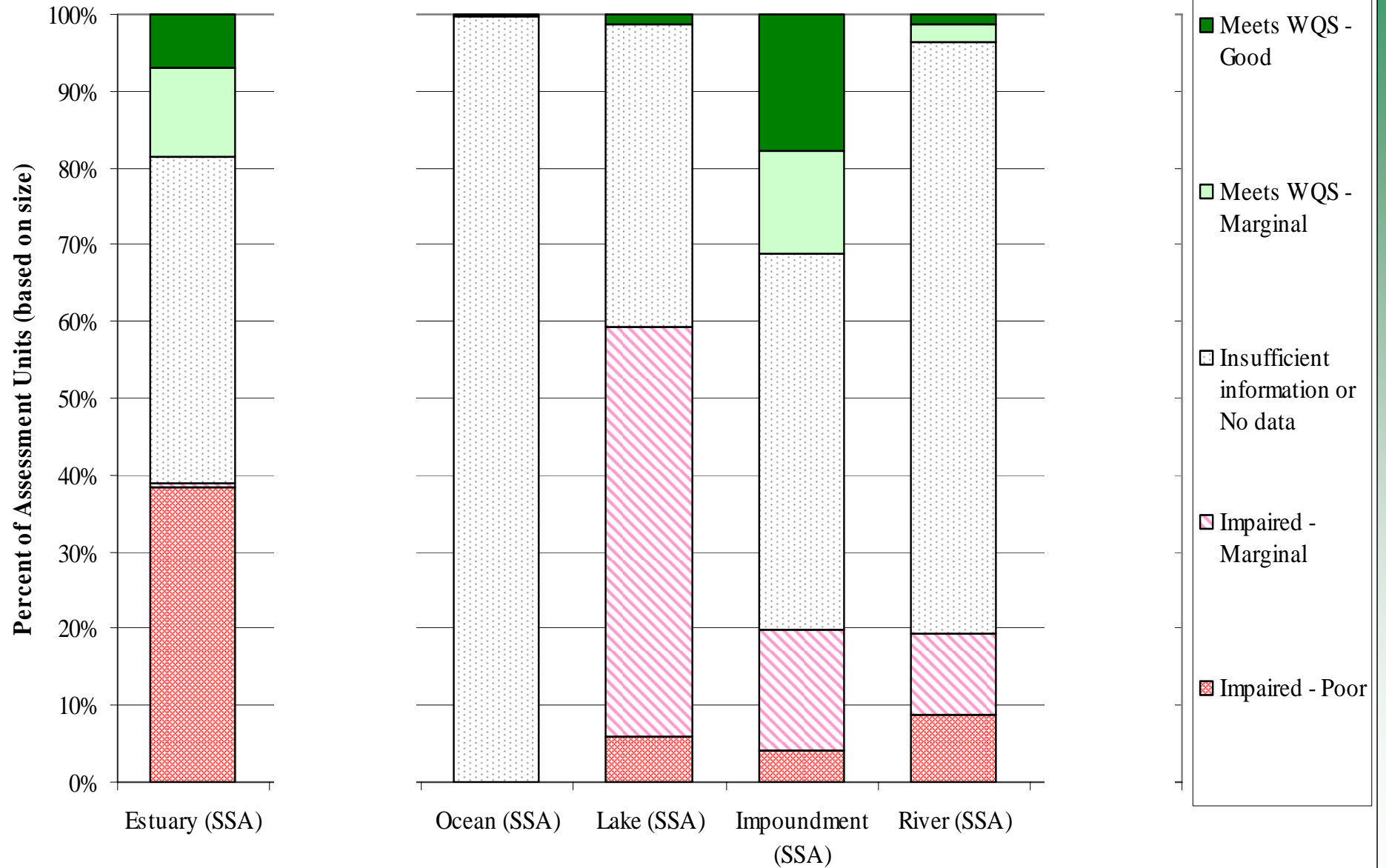
2 All waters suitable after adequate treatment

3 Assessment methodology not yet developed

# The Assessment Process (performed on all 5211 AUs)

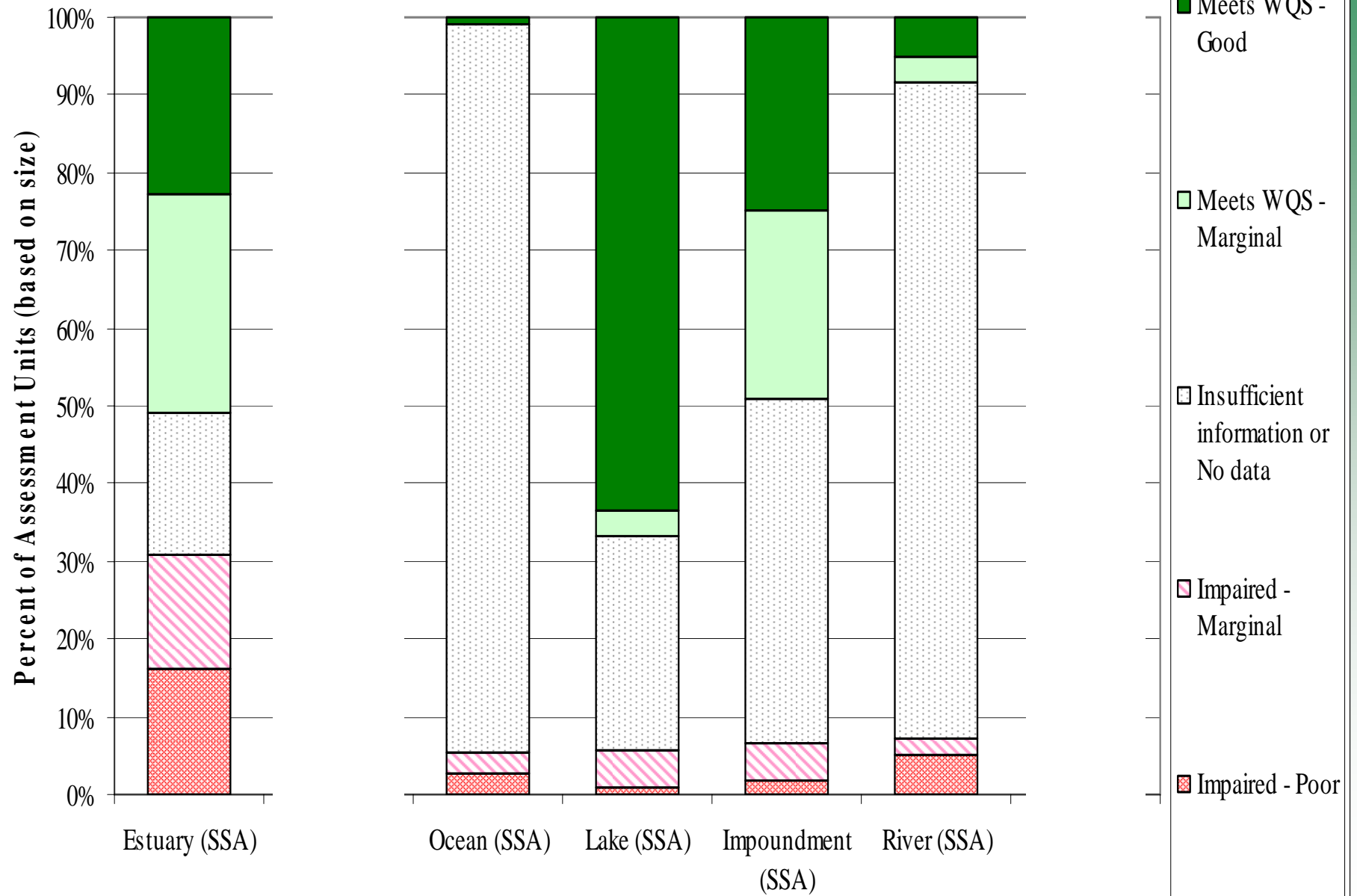


# AQUATIC LIFE



SSA = Site Specific Assessment,

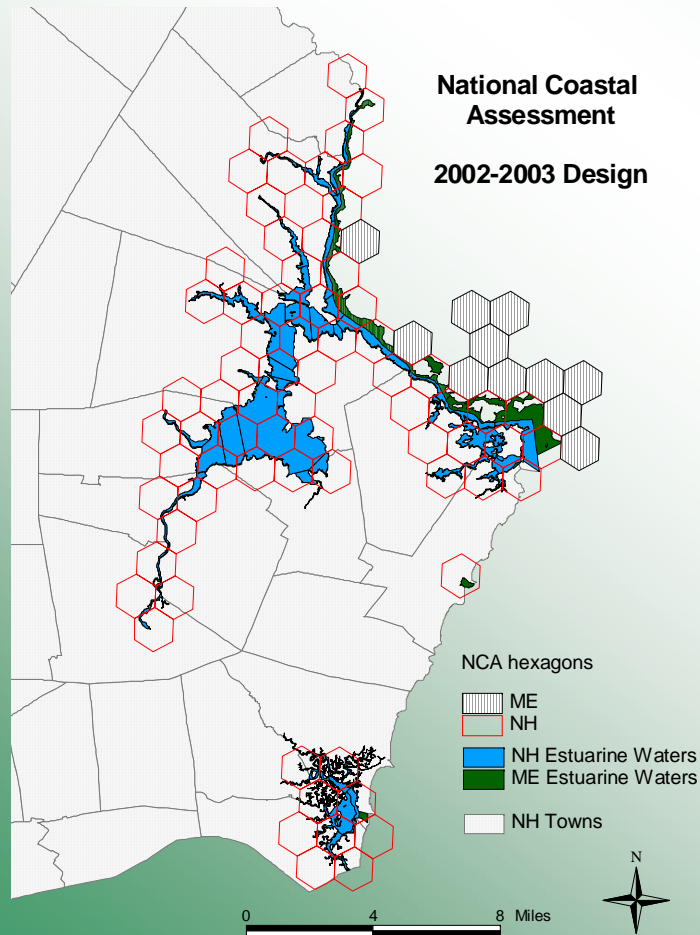
# PRIMARY CONTACT RECREATION



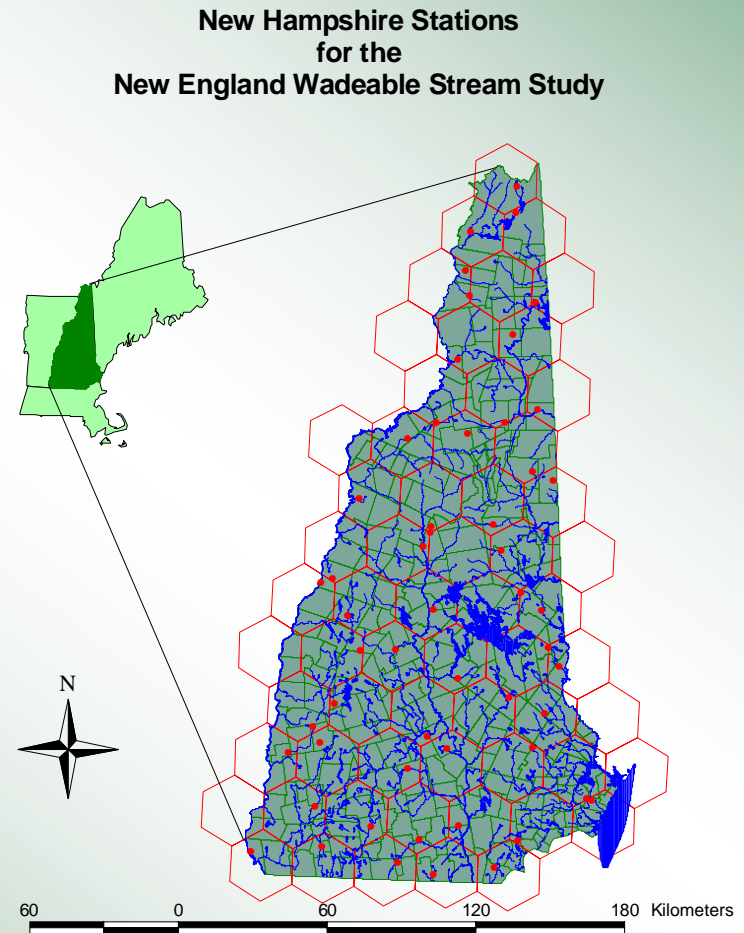
SSA = Site Specific Assessment,

# TWO TRIAL DATASETS

- *National Coastal Assessment*



- *New England Wadeable Streams*





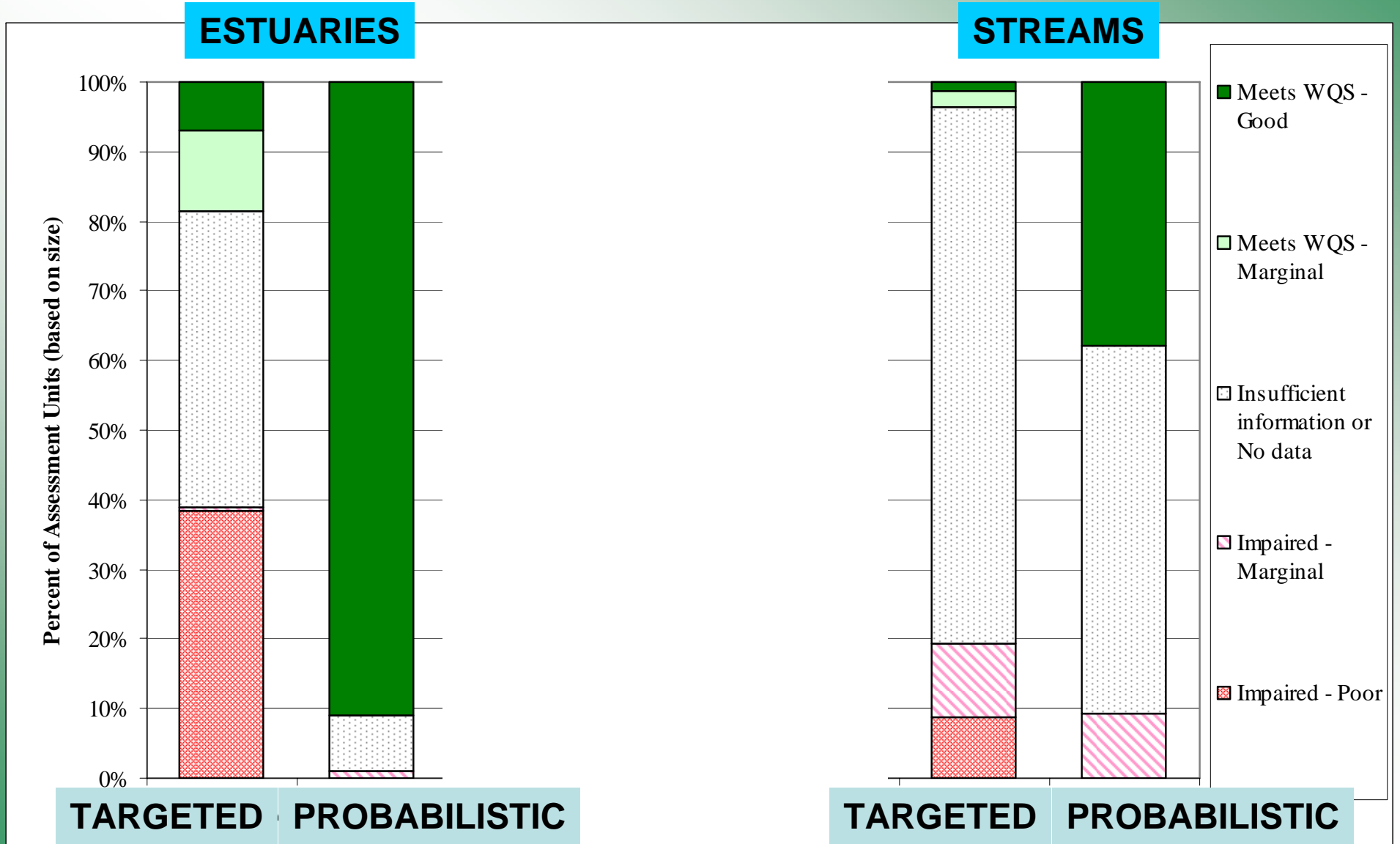
# PROBABILISTIC DESIGN

- *Put a hex grid over all waters of the selected type*
- *Use NHD to select area in hex that has waters*
- *Do a random draw of successive random points on the waters in each hex*
- *Attempt sampling at selected points in priority order until success*
- *Minimize # of station visits at each point*

# CALMing INFORMATION

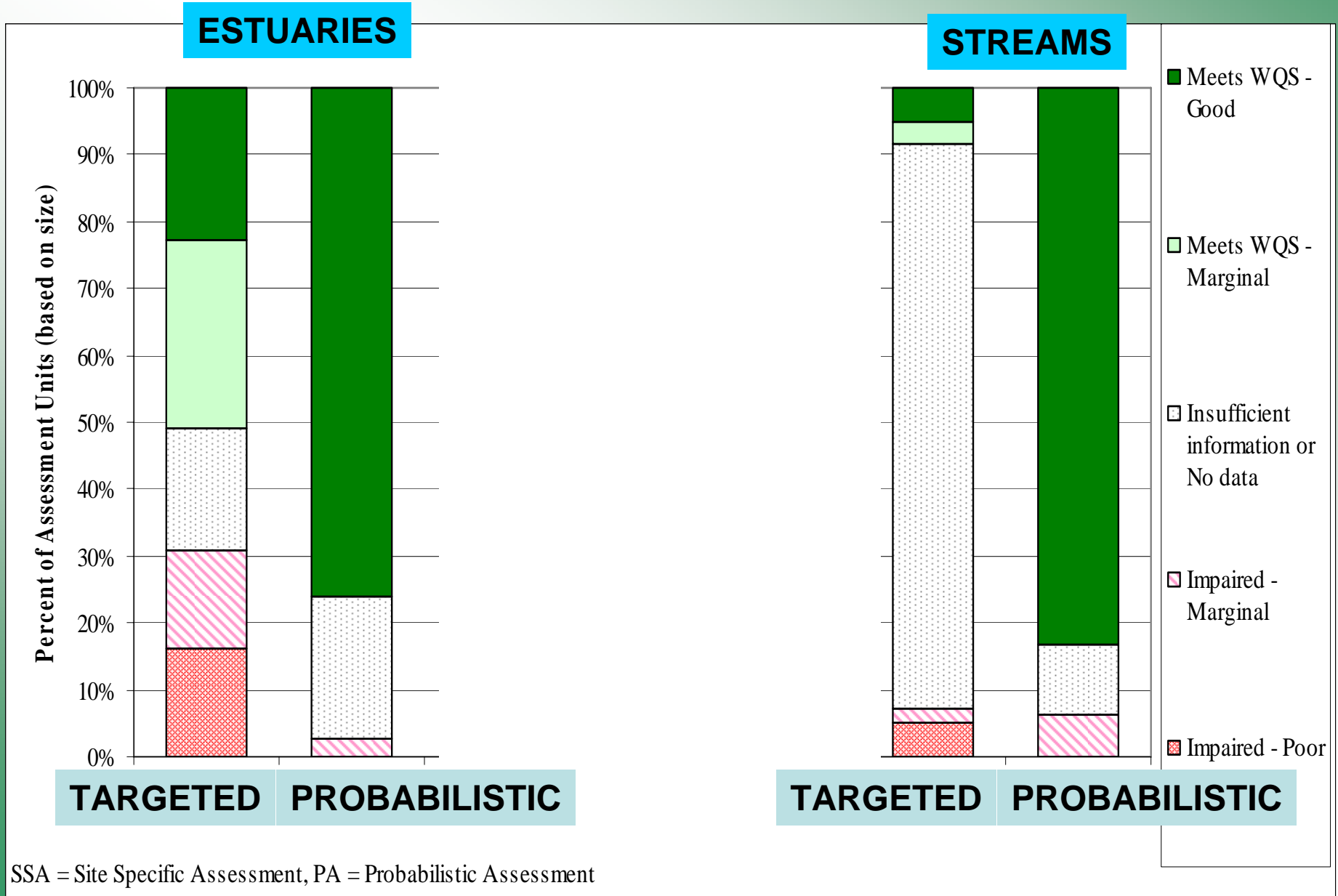
- *NH has biological metrics only for wadeable streams (benthic IBI)*
  - *Wadeable streams are ~ 94% of total stream miles*
- *ALUS is assessed for other types by*
  - *Instantaneous minimum DO*
  - *Daily average DO*
  - *pH*
- *PRIMARY CONTACT RECREATION (all types)*
  - *60 d. Geometric mean of 3+ ecoli samples (FW)*
  - *60 d. Geometric mean of 3+ enterococci samples (tidal)*

# COMPARISON - AQUATIC LIFE



SSA = Site Specific Assessment, PA = Probabilistic Assessment

# COMPARISON - PCR



# WHAT DID WE LEARN?

- *Need CALM redesign for probabilistic sampling*
  - *Could not assess avg daily DO*
  - *Could not meet minimum sample set for pH*
  - *Could not get geo mean for PCR (estuaries)*
  - *Needed revisits at streams for geo mean*

# WADEABLE STREAM METRICS DIDN'T WORK WELL

- *Metrics constructed for moderate gradient stream reaches*
- *Many selected locations were low gradient - could not use metrics*
  - *Large reduction in assessment coverage*

# APPARENT DIFFERENCE IN % IMPAIRED

- *Probabilistic assessment seems to yield less impairments than targeted assessments*
  - *Even in the estuaries where the targeted data are close to a complete census*
  - *Outside the 95% confidence limit - unlikely*
- *?????*

# CONCLUSIONS

- *Probabilistic sampling is still the only feasible way to get a comprehensive assessment*
- *CALM revision is needed: Current sampling methods are for targeted sampling*
- *To work, probabilistic sampling must yield an assessment in most all spatial units.*
- *The differing conclusions in estuaries and streams from targeted and probabilistic sampling need to be understood and resolved*



THANKS TO THE NEW  
HAMPSHIRE ASSESSMENT  
TEAM WHO DID THE NUMBER  
CRUNCHING!

- *Gregg Comstock - WQ Planning*
- *Dave Neils - Biomonitoring*
- *Phil Trowbridge - Coastal Scientist*
- *Ken Edwardson - 305(b) and ADB guru*