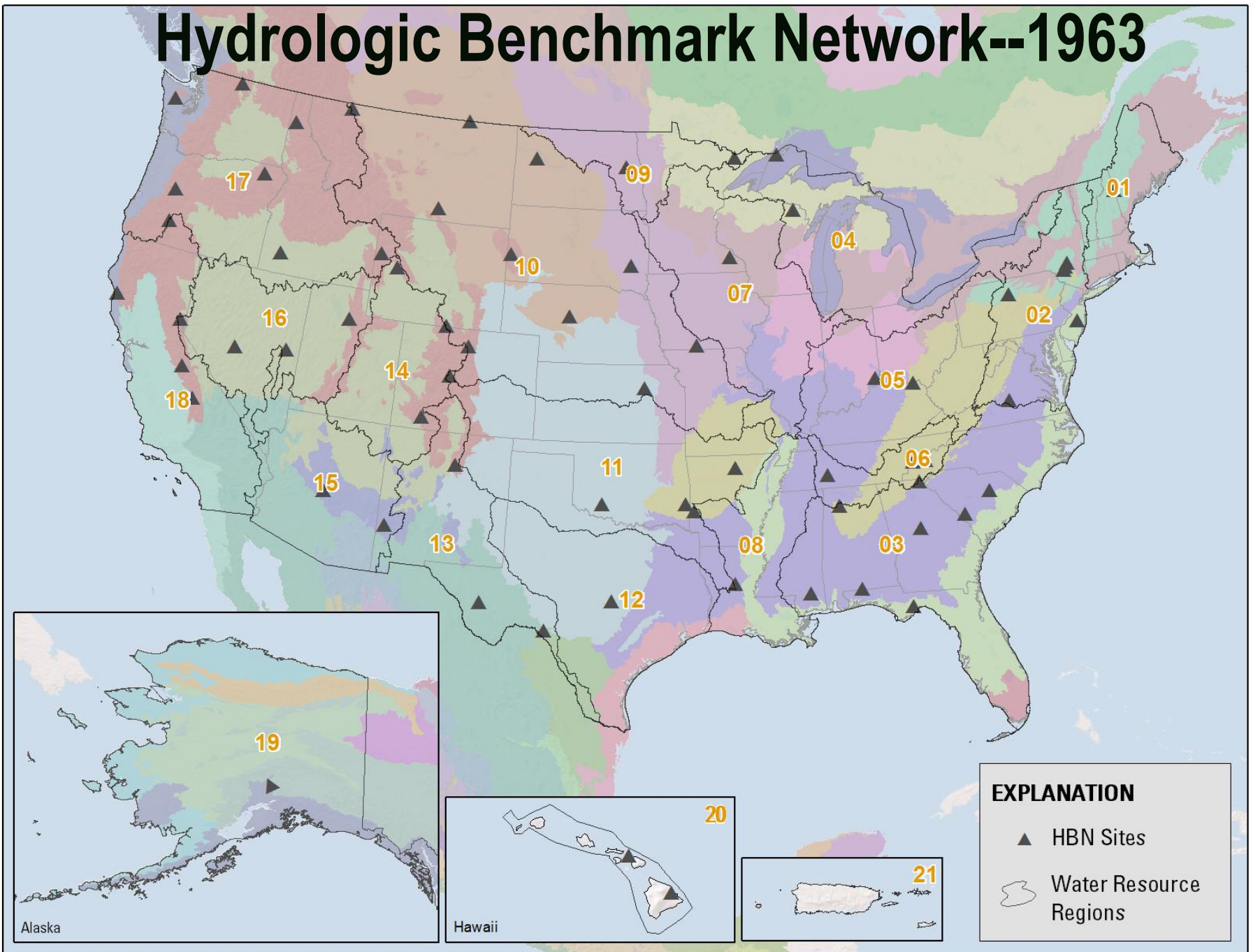


Building a Collaborative, Multipurpose, Long-Term National Reference Site Network for Freshwater Streams in the United States

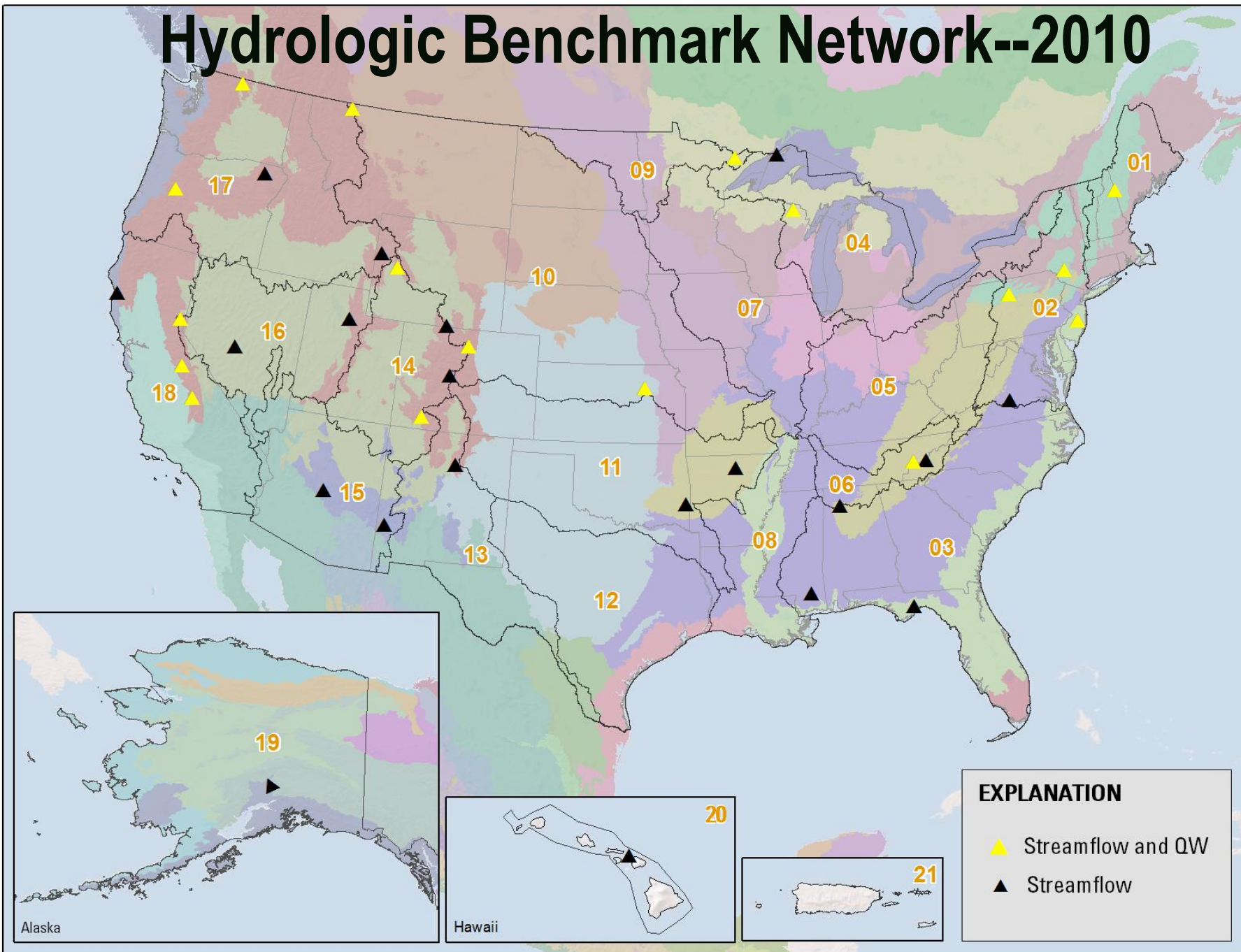
NADP Annual Meeting
October 21, 2010

Bill Wilber wgwilber@usgs.gov
Jeff Deacon jrdeacon@usgs.gov

Hydrologic Benchmark Network--1963



Hydrologic Benchmark Network--2010



Why is this important now?

- Increased need for long-term data and information on the status and trends in stream flow and water quality of relatively unimpaired watersheds that is not being met by existing programs
 - Climate Effects
 - Atmospheric Deposition
 - Frame of Reference for Stream Assessments
 - Nutrient Criteria
 - TMDLs
 - Bio-criteria

Committee Composition

- Bill Wilber (Chair)
- Daren Carlisle
- Dave Clow
- Charlie Crawford
- Jeff Deacon
- James Falcone
- Earl Greene
- Jurate Landwehr
- Harry Lins
- Alisa Mast
- Michael McHale
- Pete Murdoch
- Mark Nilles
- Mike Norris

Others Involved

Denise Argue

Marilee Horn

Martyn Smith

Committee Objectives

- **Develop a plan for a shared, multipurpose, long-term, National reference site network for freshwater streams that will provide data to:**
 - **Detect and predict changes in stream flow, water chemistry, and aquatic communities due to changes in: climate, atmospheric deposition, and land use.**

Vision Elements

Collaborative Coordination Structure (NADP/NWQMC)

- Protocols
- Data elements
- Laboratory analysis
- Quality control
- Data management
- Assessment products

Tiered-Design suitable for multiple objectives

- Routine and real-time monitoring
- Synoptic monitoring
- Modeling and remote sensing

Monitoring Networks

USGS



**NSIP Sentinel,
HBN, NAWQA,
HCDN, GAGES**

USEPA



**NARS, LTM, TIME
Wadeable Streams**

USFS



**Experimental
Forest's, Stream
Assessments**

NPS



National Parks

NSF



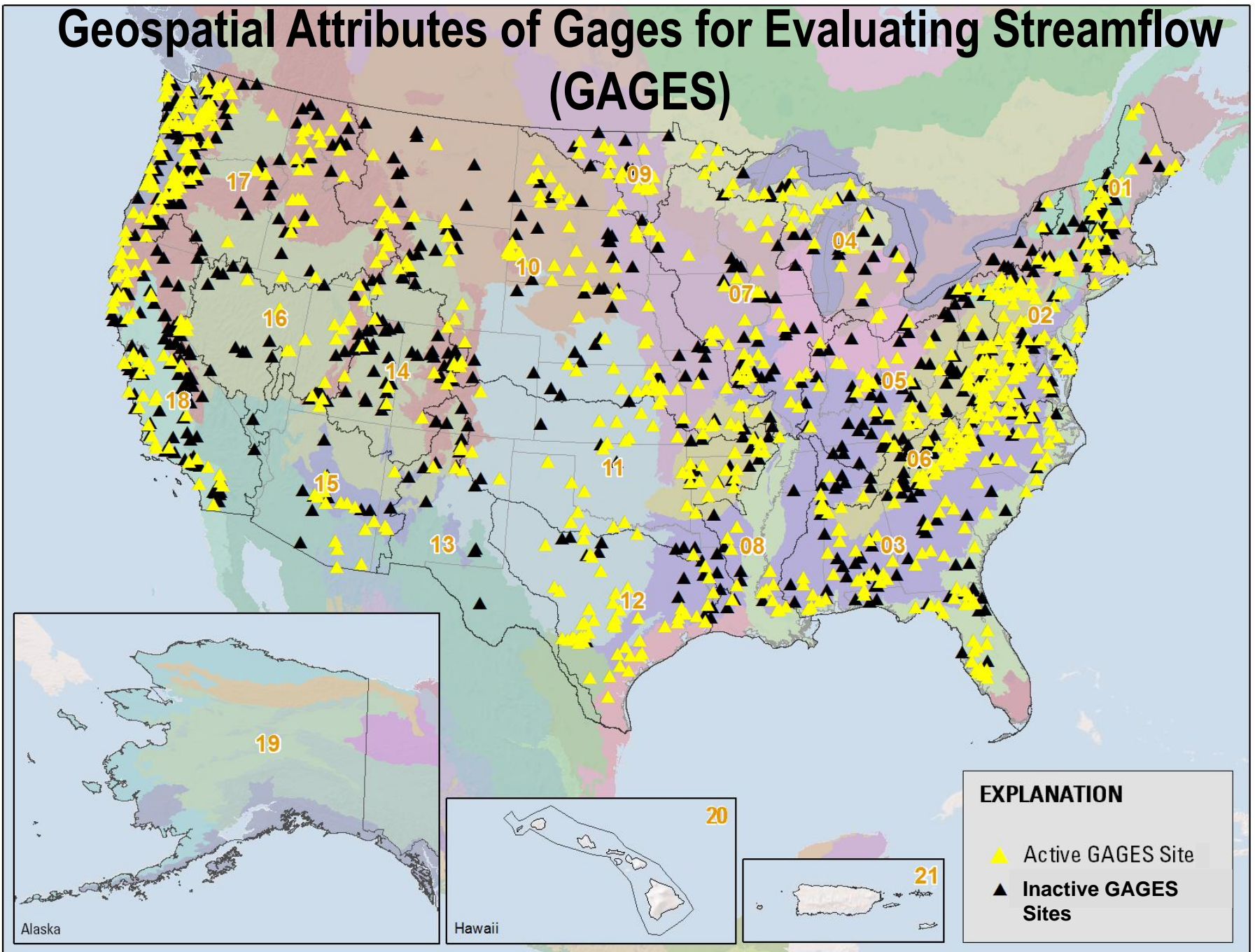
NEON, STREON

States

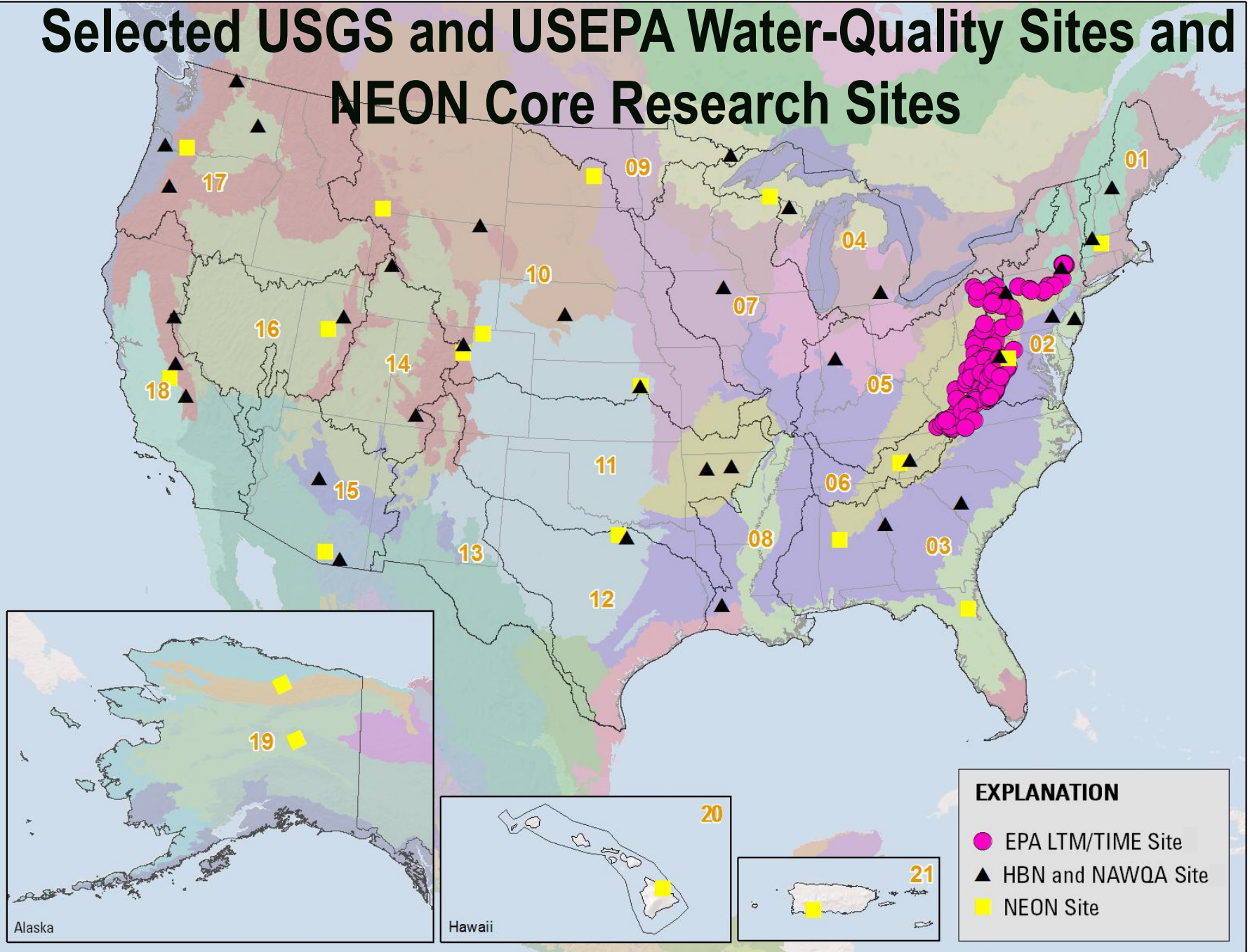


**305 (b), 303 (d),
Biomonitoring**

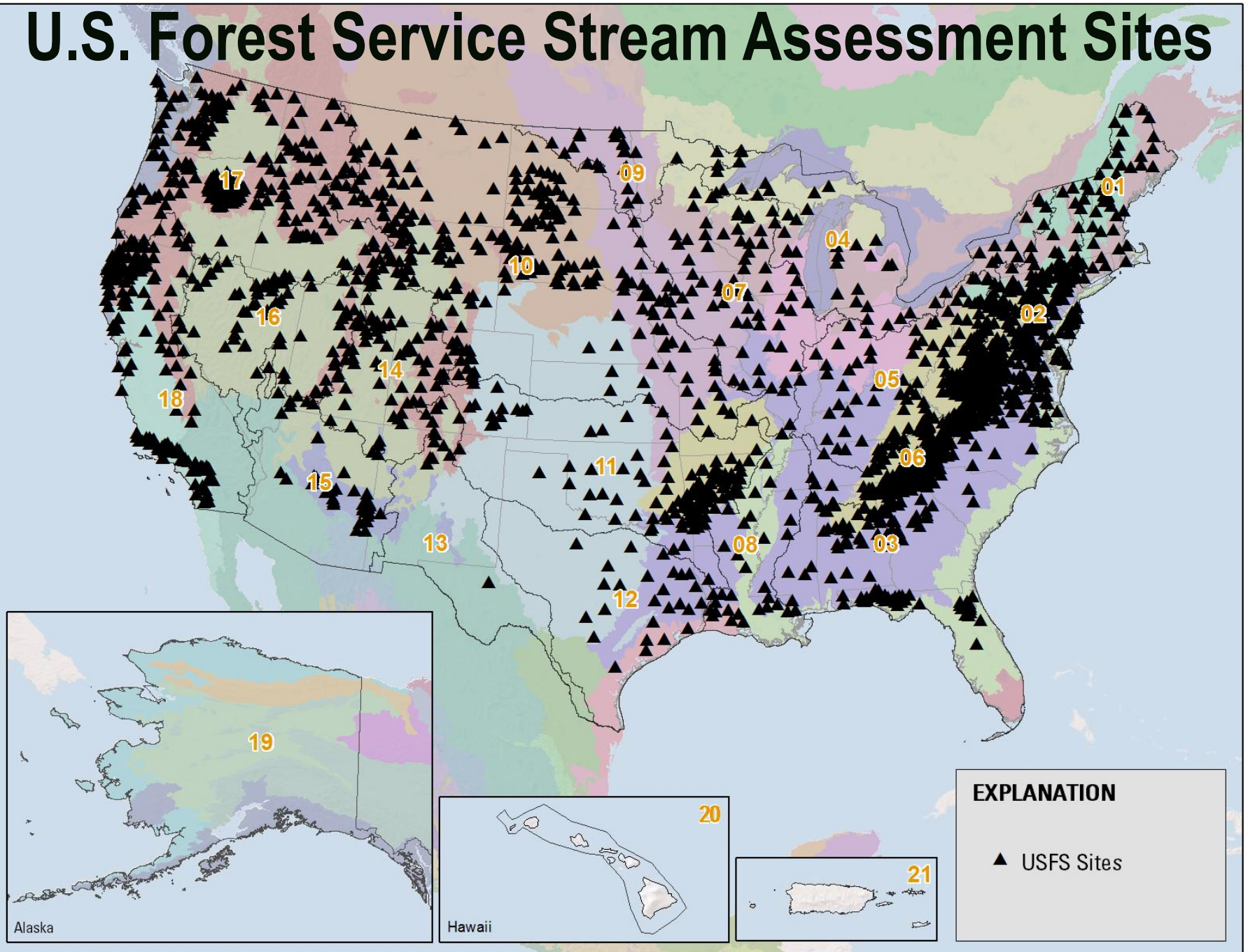
Geospatial Attributes of Gages for Evaluating Streamflow (GAGES)



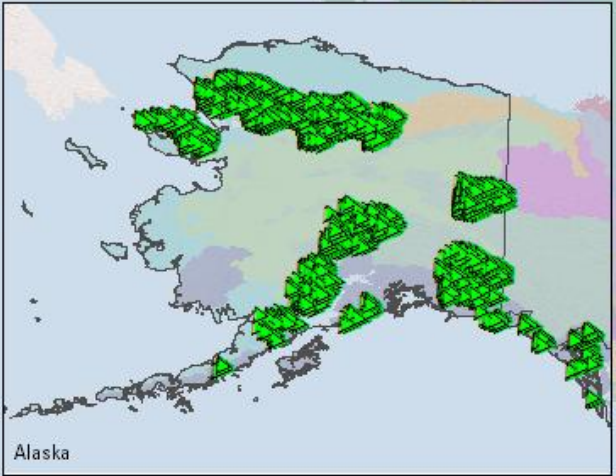
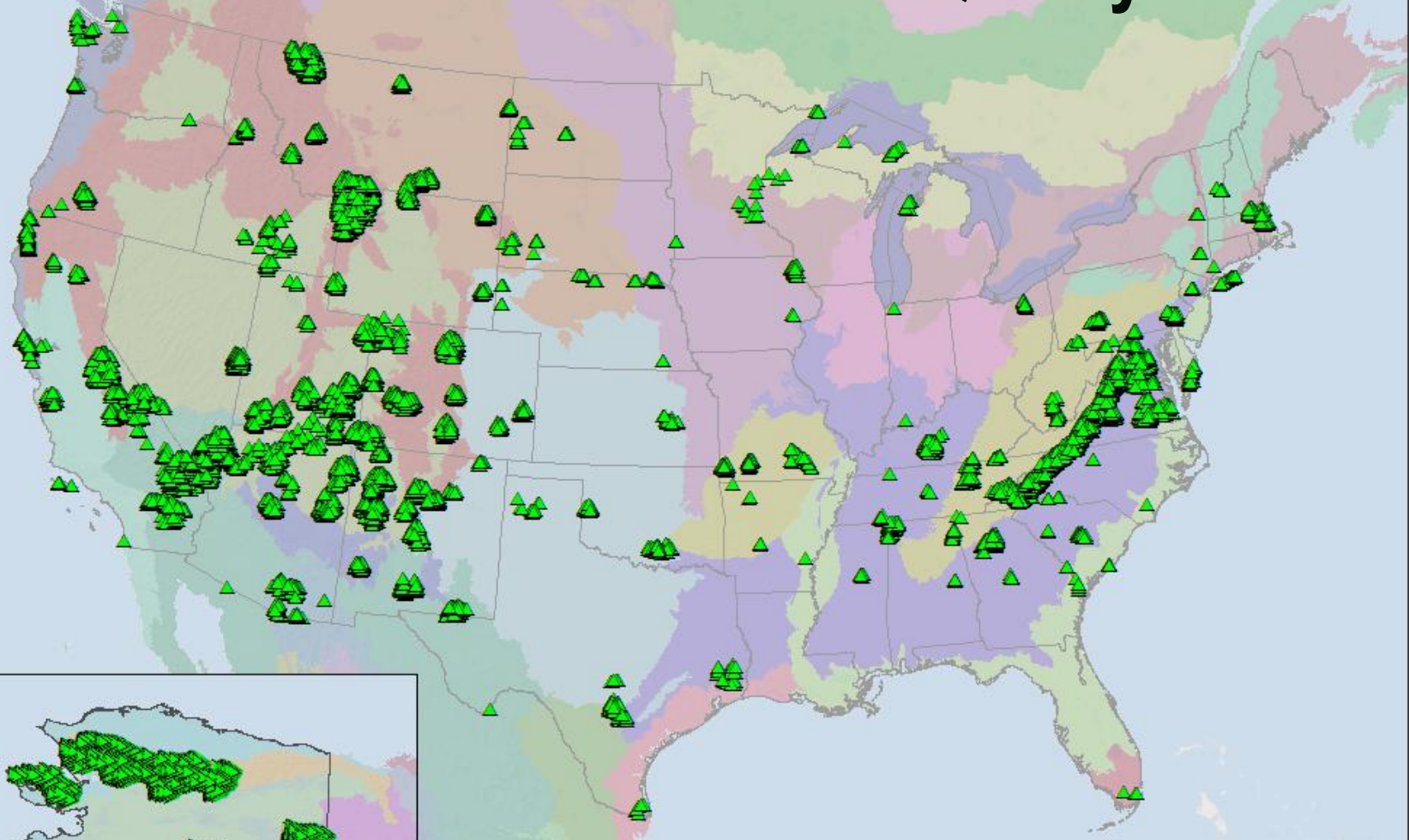
Selected USGS and USEPA Water-Quality Sites and NEON Core Research Sites



U.S. Forest Service Stream Assessment Sites



National Park Service Water-Quality Sites



Alaska



Hawaii

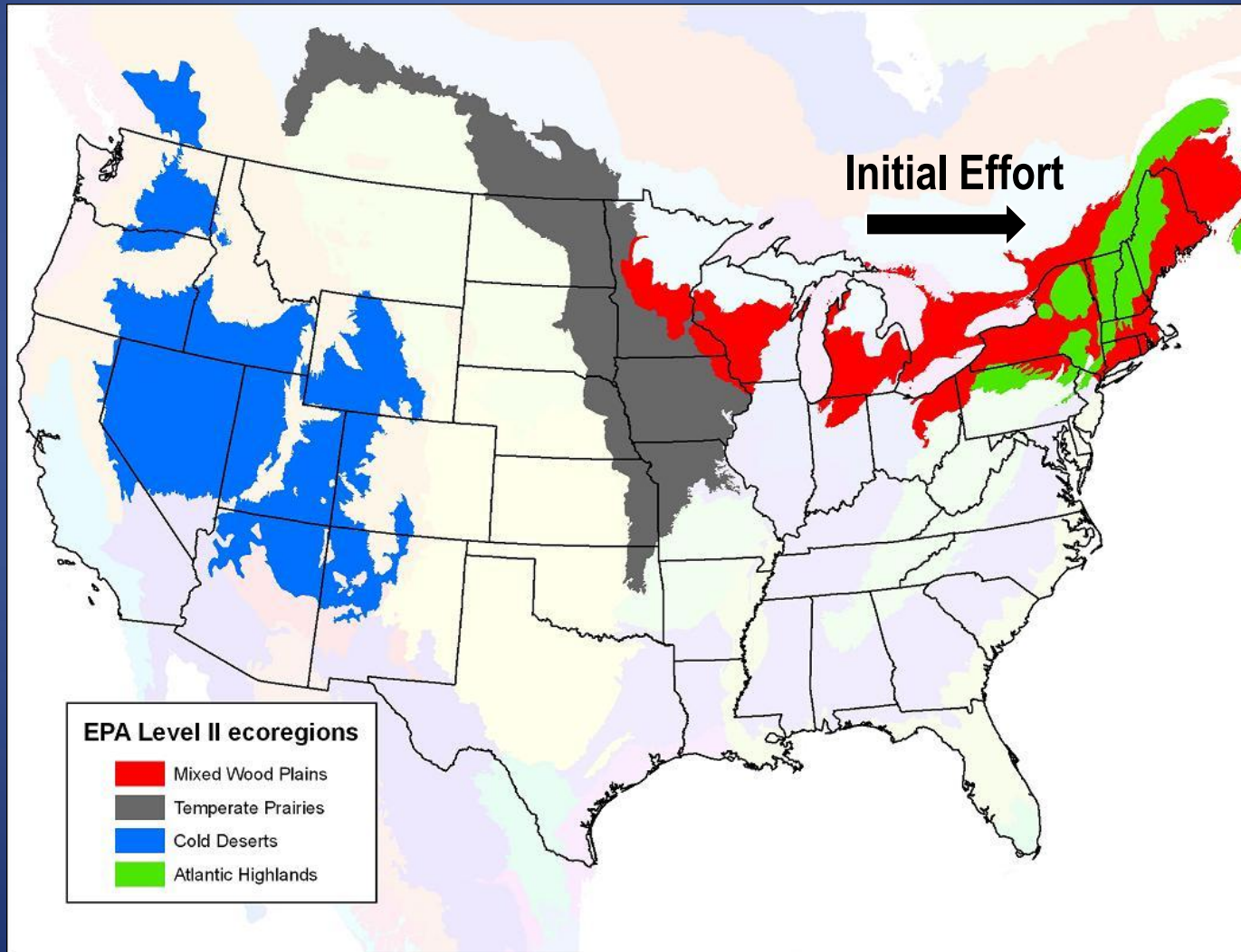


Caribbean

EXPLANATION

▲ NPS Sites

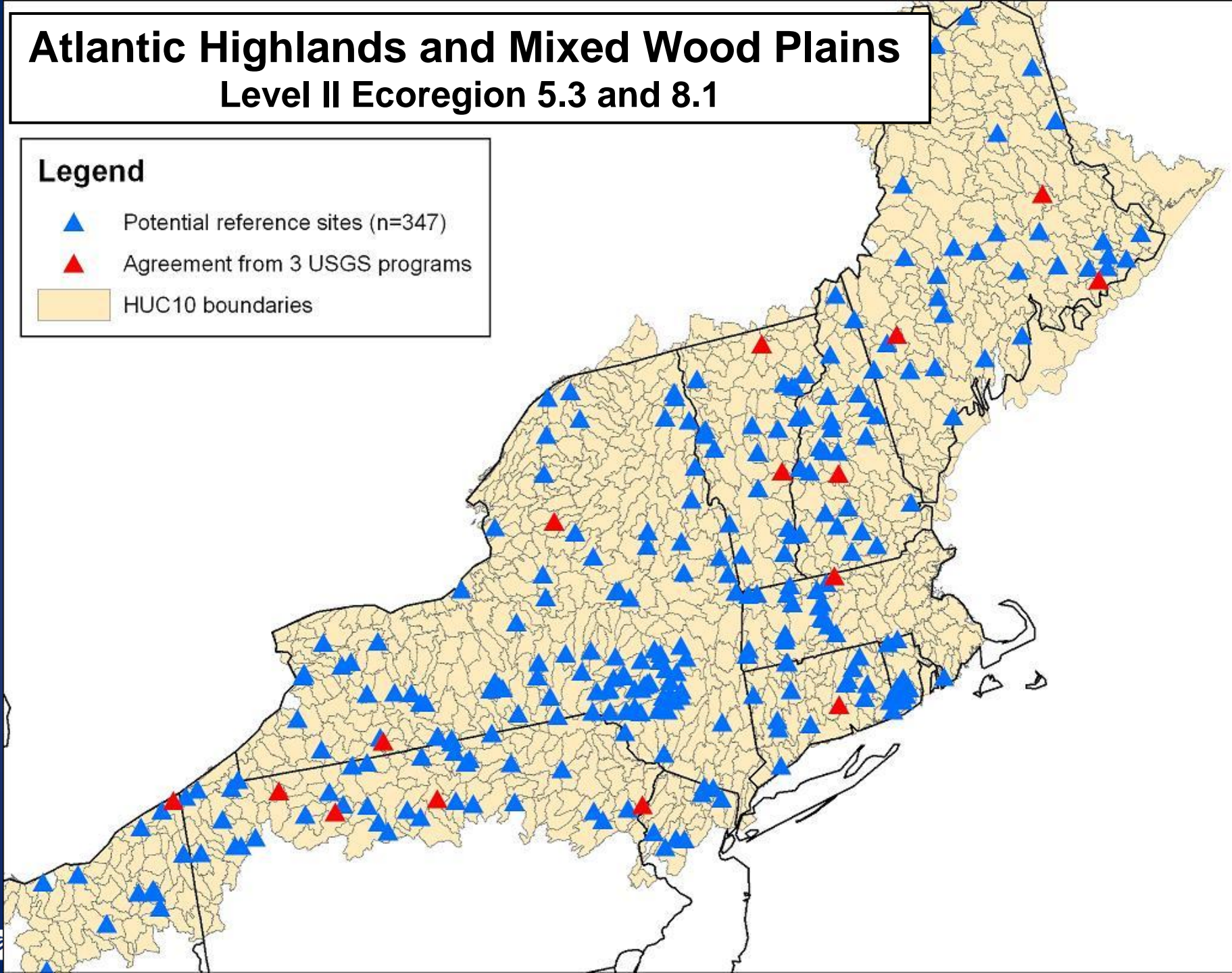
Testing an approach using Level-2 Ecoregions that could be used across the conterminous U.S.



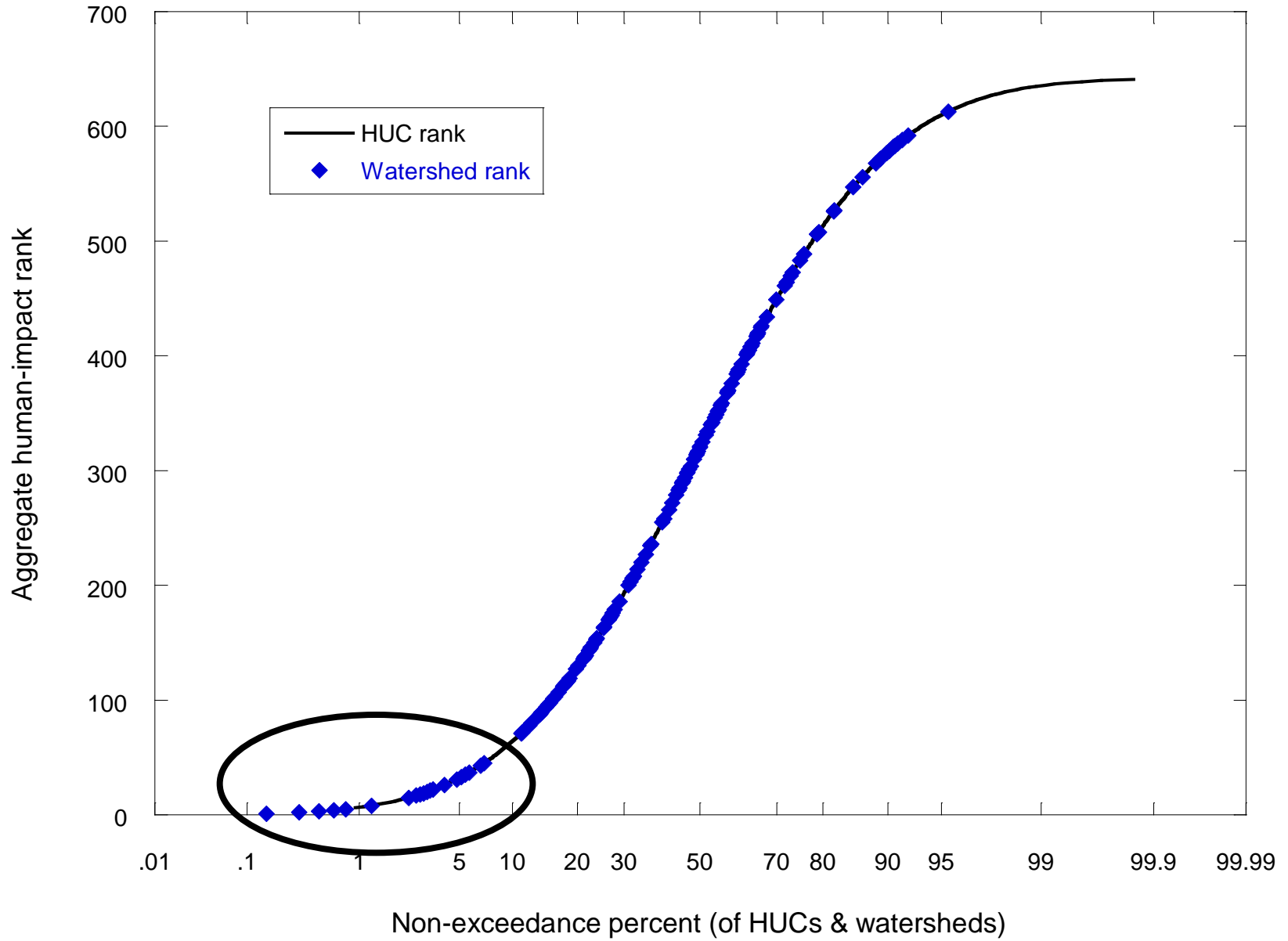
Atlantic Highlands and Mixed Wood Plains Level II Ecoregion 5.3 and 8.1

Legend

- ▲ Potential reference sites (n=347)
- ▲ Agreement from 3 USGS programs
- HUC10 boundaries



Eco-region 5.3



Legend

▲ Top 50 GIS-ranked sites from each Level II ecoregion

Level III ecoregions

5.3.1

5.3.3

8.1.1

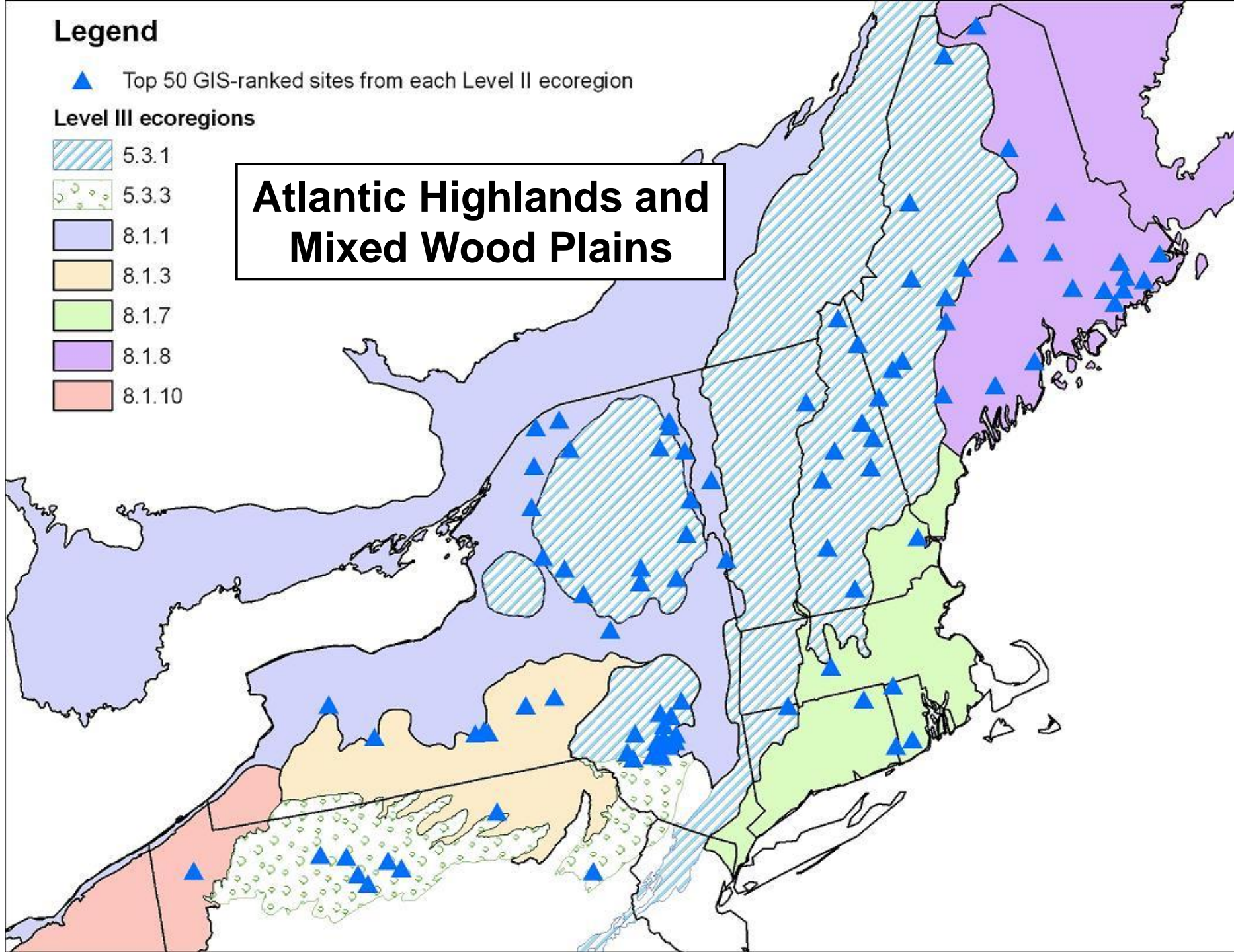
8.1.3

8.1.7

8.1.8

8.1.10

Atlantic Highlands and Mixed Wood Plains



Streamgauge Status

Legend

Active

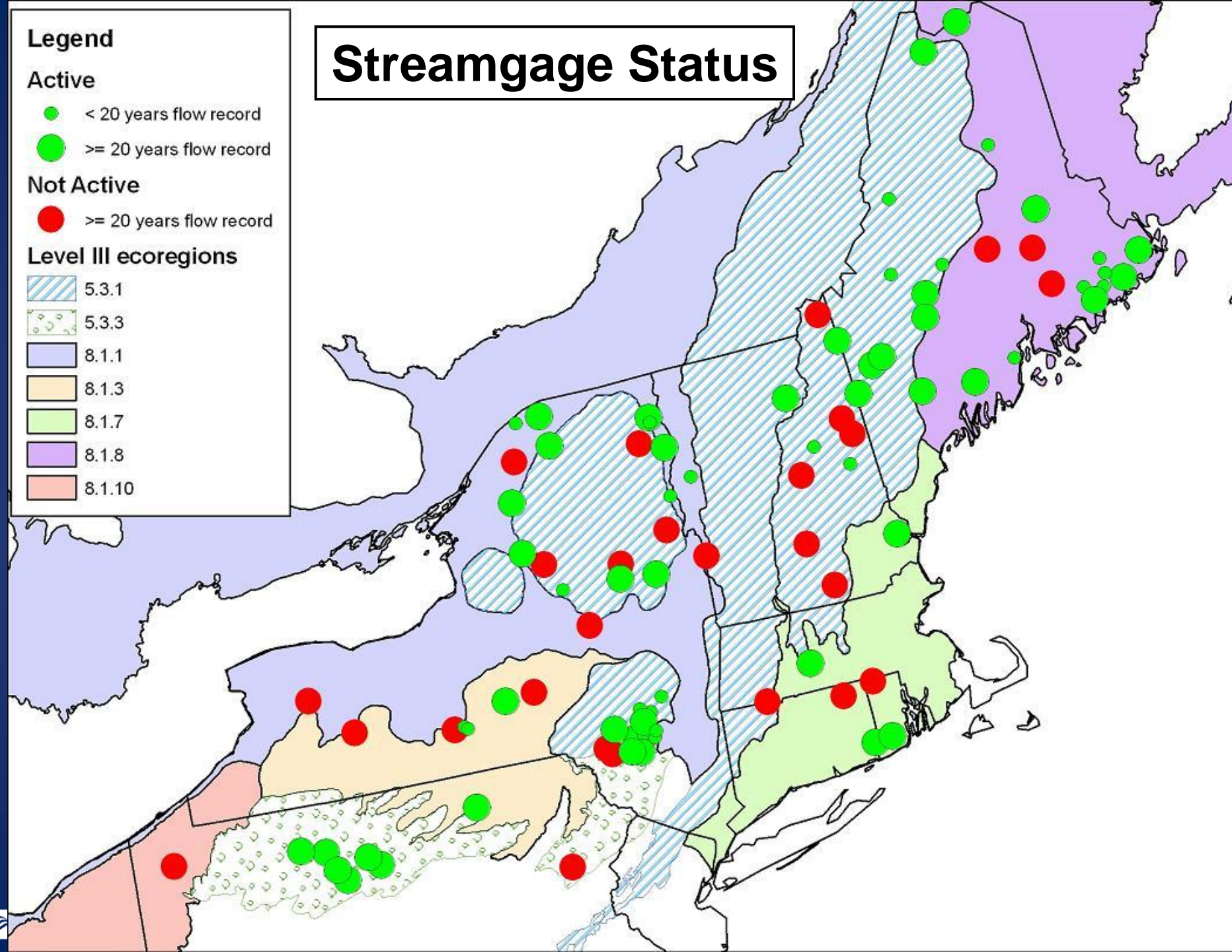
- < 20 years flow record
- \geq 20 years flow record

Not Active

- \geq 20 years flow record

Level III ecoregions

- 5.3.1
- 5.3.3
- 8.1.1
- 8.1.3
- 8.1.7
- 8.1.8
- 8.1.10



Legend

QW active 2007

- < 20 years nutrient record
- \geq 20 years nutrient record

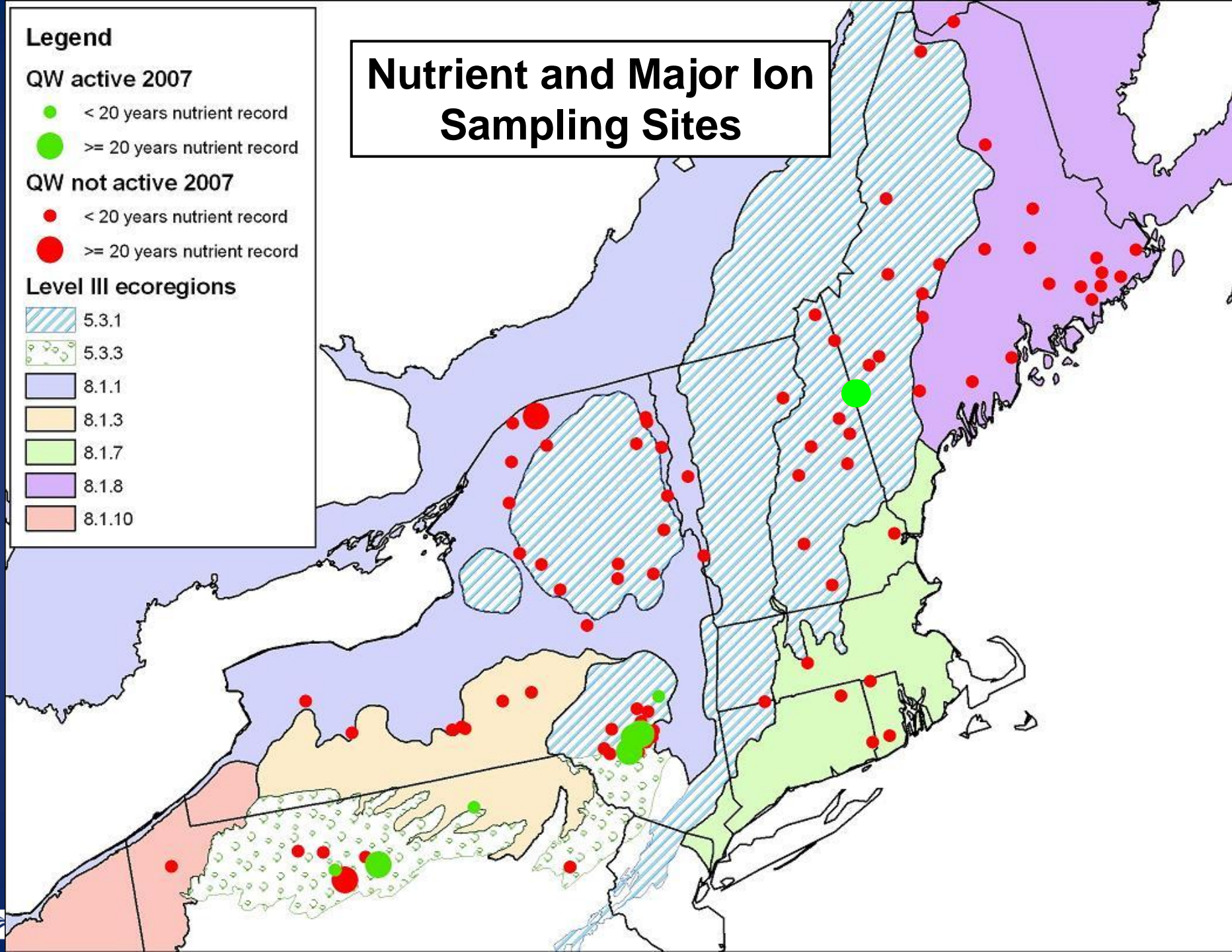
QW not active 2007

- < 20 years nutrient record
- \geq 20 years nutrient record

Level III ecoregions

- 5.3.1
- 5.3.3
- 8.1.1
- 8.1.3
- 8.1.7
- 8.1.8
- 8.1.10

Nutrient and Major Ion Sampling Sites



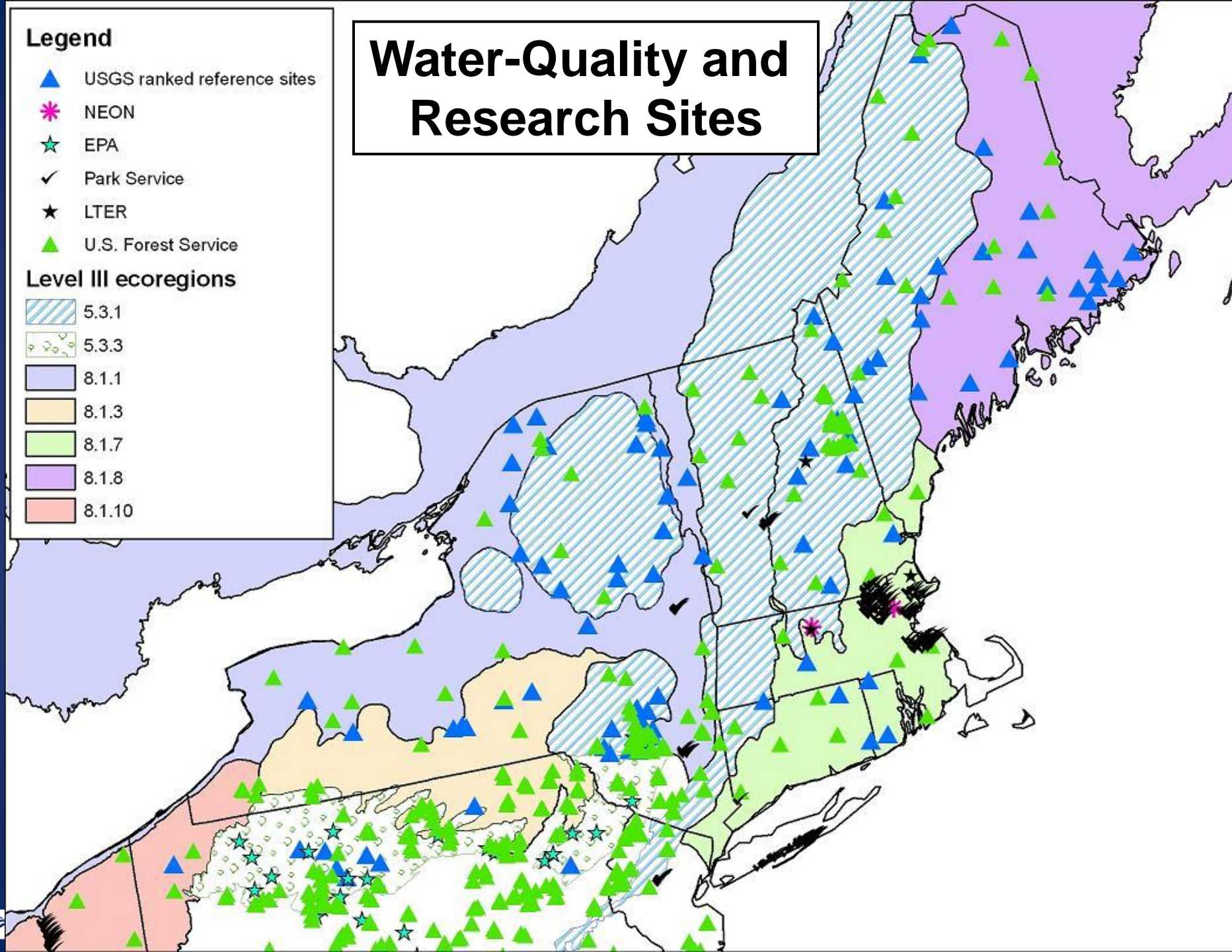
Water-Quality and Research Sites

Legend

- ▲ USGS ranked reference sites
- ✱ NEON
- ★ EPA
- ✓ Park Service
- ★ LTER
- ▲ U.S. Forest Service

Level III ecoregions

- 5.3.1
- 5.3.3
- 8.1.1
- 8.1.3
- 8.1.7
- 8.1.8
- 8.1.10



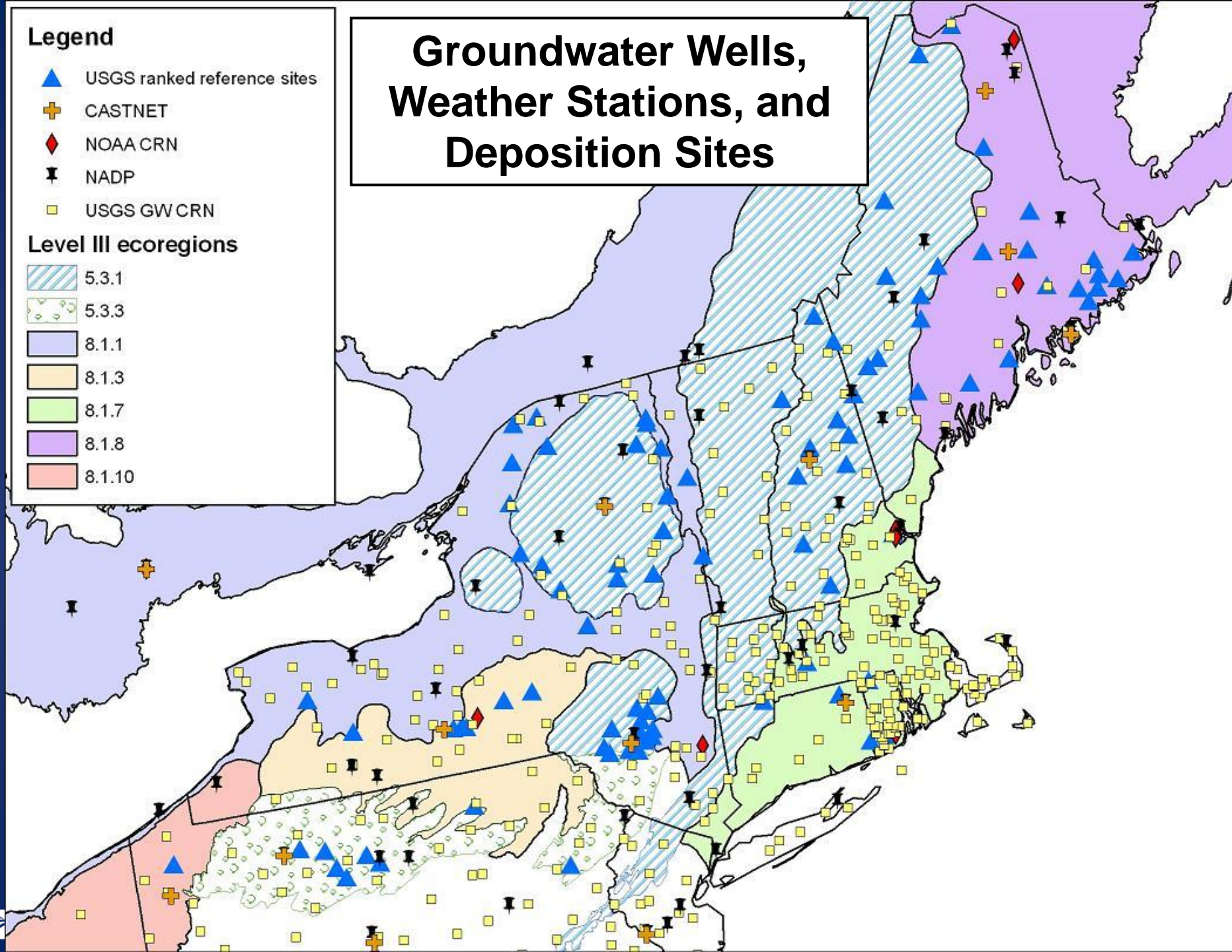
Legend

- ▲ USGS ranked reference sites
- ✚ CASTNET
- ◆ NOAA CRN
- ⚡ NADP
- ◻ USGS GWCRN

Level III ecoregions

- 5.3.1
- 5.3.3
- 8.1.1
- 8.1.3
- 8.1.7
- 8.1.8
- 8.1.10

Groundwater Wells, Weather Stations, and Deposition Sites



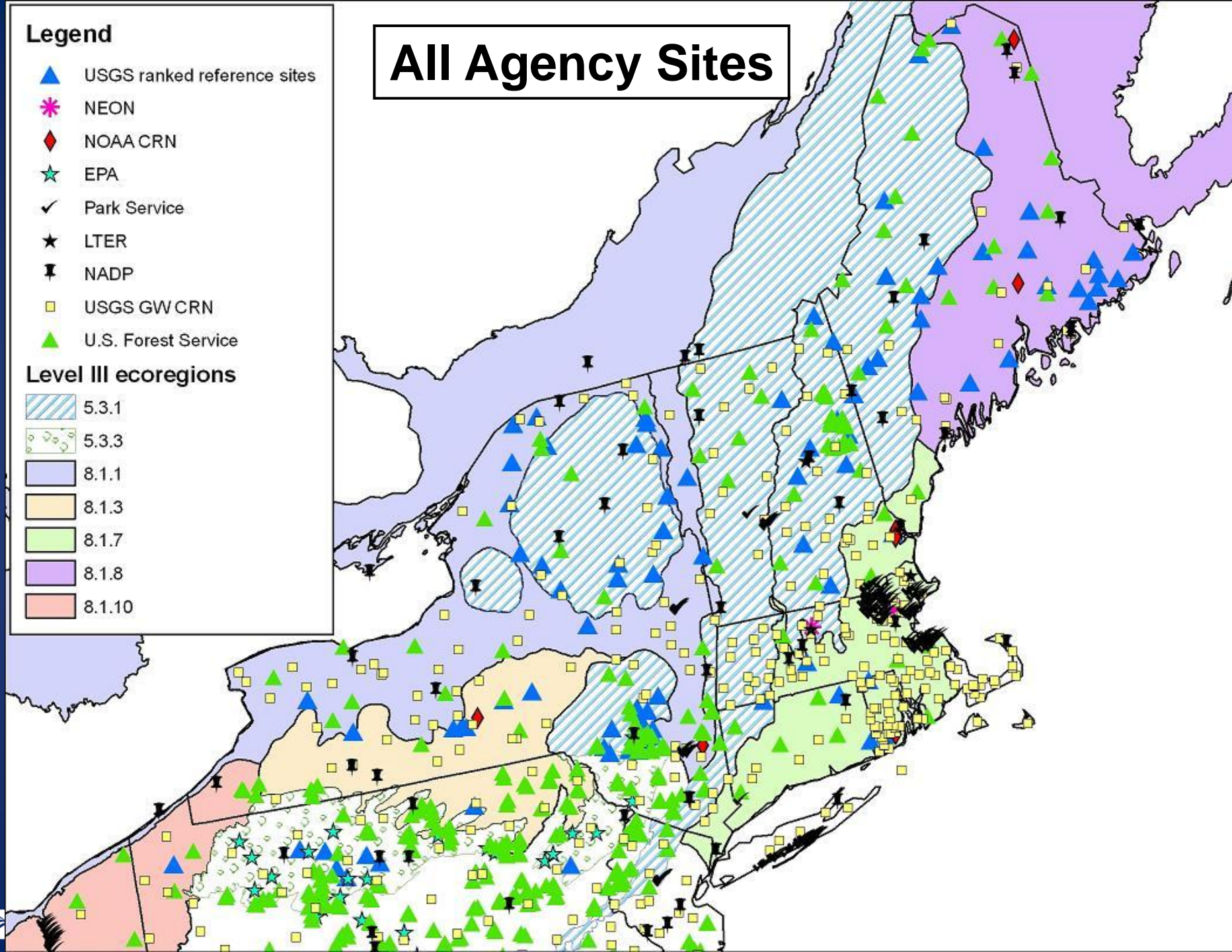
Legend

- ▲ USGS ranked reference sites
- ✱ NEON
- ◆ NOAA CRN
- ★ EPA
- ✓ Park Service
- ★ LTER
- ⊥ NADP
- USGS GWCRN
- ▲ U.S. Forest Service

Level III ecoregions

- 5.3.1
- 5.3.3
- 8.1.1
- 8.1.3
- 8.1.7
- 8.1.8
- 8.1.10

All Agency Sites



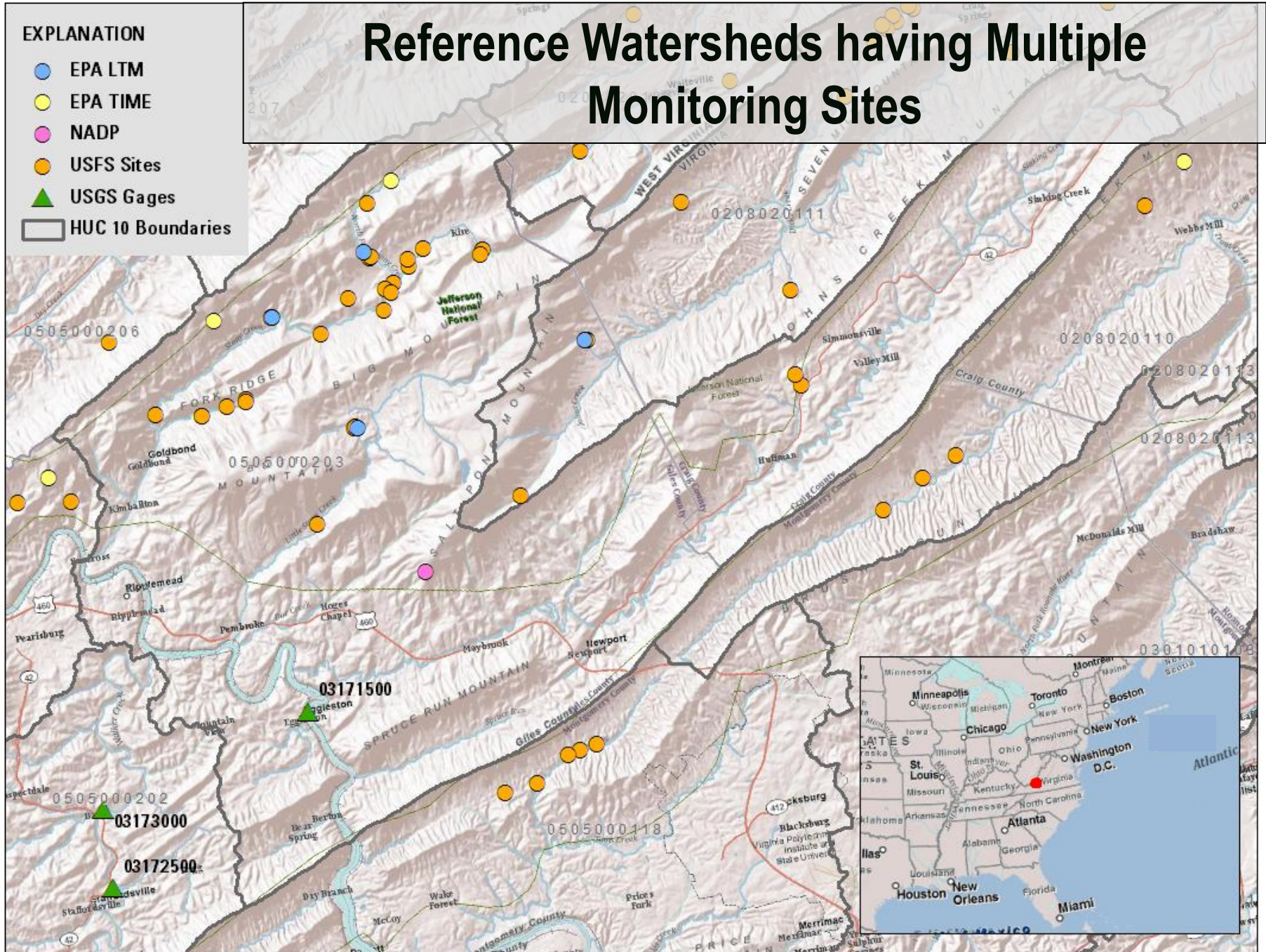
Anticipated Outcomes and Next Steps

- **Contact and develop collaborative relations with other Federal, non-Federal and State agencies**
- **Complete inventory and assessments of streamflow and water quality capabilities in the northeast and other regions**
- **Identify gaps for a network of reference sites for tracking climate, atmospheric, and land use effects on streamflow and water quality**
- **Discuss key network design issues, operational and management issues, and develop recommendations**
- **Conduct systematic review and prioritization of existing and candidate sites to meet multiple data needs**

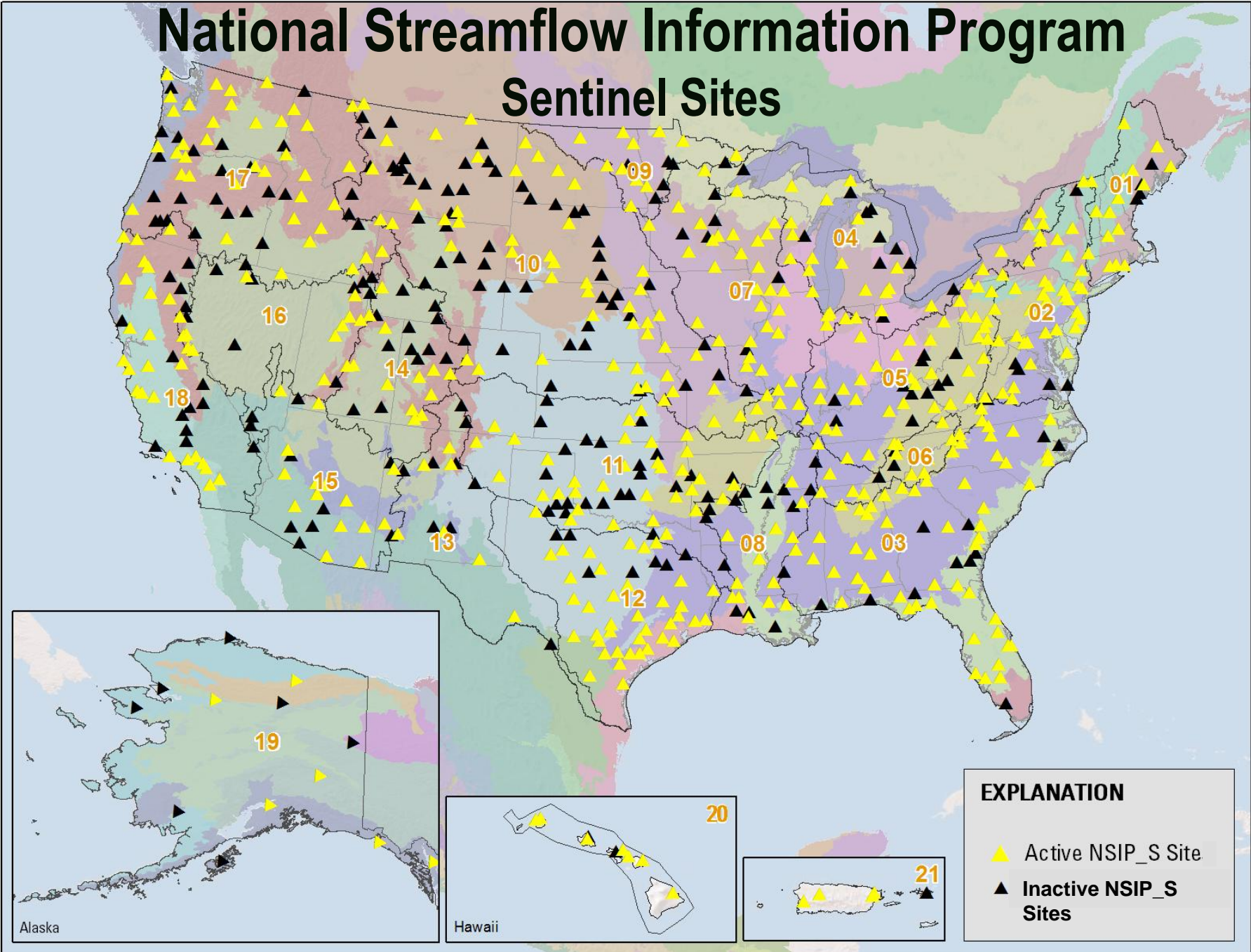
Reference Watersheds having Multiple Monitoring Sites

EXPLANATION

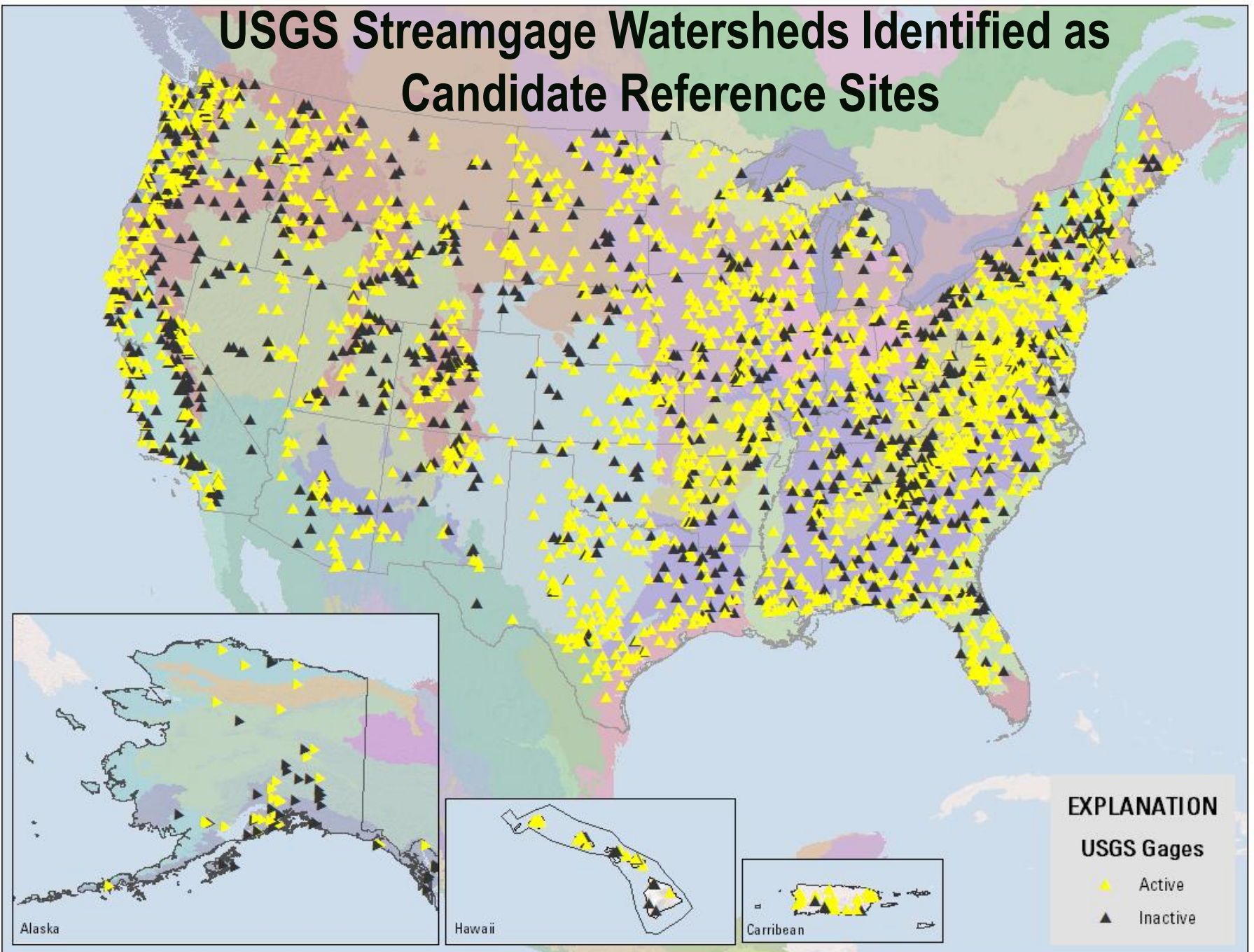
- EPA LTM
- EPA TIME
- NADP
- USFS Sites
- ▲ USGS Gages
- HUC 10 Boundaries



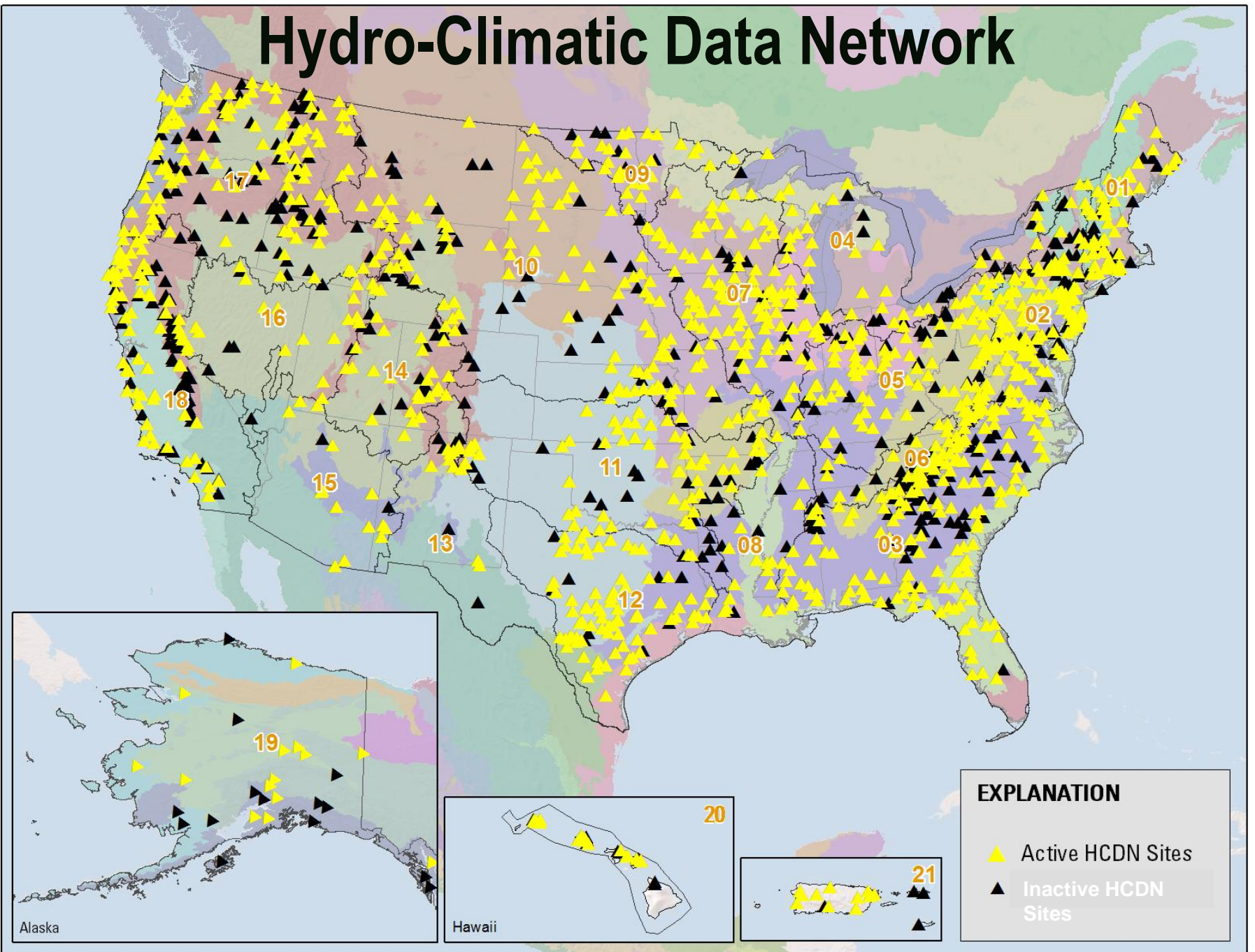
National Streamflow Information Program Sentinel Sites



USGS Streamgauge Watersheds Identified as Candidate Reference Sites



Hydro-Climatic Data Network



Initial steps for evaluating watersheds

- Determine characteristics for each Hydrologic Unit Code (HUC) 10 basin in an ecoregion
- Determine characteristics for potential reference site basins
- Score HUC10s and sites based on a rank-scoring
 - %urban, %ag, %protected land, storage, NPDES
- Evaluate sites having low rank-score

Committee Activities

- **Assessment and inventory of existing monitoring site networks for streams in USGS and other agencies**
- **Outreach--Contact and develop collaborative relations with other agencies**
- **Discuss key network design issues**
- **Conduct systematic review and prioritization of existing and candidate sites to meet data needs**
- **Discuss and develop alternative network designs, operational and management scenarios and develop recommendations**

Inventory Process

