2011 LIS Spatial Prioritization Workshop Executive Summary – Outcomes and Decisions:

Dates: 8/3/2011 & 8/4/2011

Location: UNH Saw Mill Rd. Campus, West Haven, CT

Attendees:
CT DEEP: Brian Thompson, Kate Brown, Kevin O'Brien, Mark Johnson
EPA Long Island Sound - Mark Tedesco
NYDEC: Karen Chytalo, Sarah Deonarine, Heather Young
CT Sea Grant: Sylvain DeGuise
NY SeaGrant: Jim Ammerman
NOAA: Tim Battista, Bryan Costa (Biogeography Branch), Cmdr. Jim Crocker (Hydrographic Survey)
LISMARC Collaborative: Ivar Babb, Peter Auster & Jim O'Donnell (UCONN); Roman Zajac (UNH); Larry Poppe (USGS)
Lamont-Doherty Collaborative: Frank Nitsche & Vicki Ferrini (Lamont-Doherty); Cecilia McHugh (Queens College)
TNC: Nathan Frohling
USFWS: Pam Loring
Facilitators/Notetakers: Joe Siegel, Ernie Waterman, & Julian Gonzalez (US EPA)

Findings:
- The group was presented with the results of the spatial survey and analysis. The group agreed with the survey analysis, and generally accepted the priority boundary areas. However, a smoothing approach was suggested to more generally define the areas.
    - NOTE: CTDEEP will perform a smoothing function to create a new priority boundary map
- The group agreed a pilot project was appropriate. This should try to take into account as many elements of anticipated project tasks (collection, processing, delivery) and be as reflective of a representative area as possible. In terms of location, out of the priority areas previously discussed, a subset of the corridor running over Stratford Shoal (specifically in the areas surrounding the shoal) seemed to be well suited for a pilot. This site could assess the use of existing USGS seafloor data and data products. Other objectives would be to test technology for shallow water mapping, test logistics and QA/QC protocols, resolve sampling design, assess and refine data products, and develop estimates of time and costs for scaling up the sampling.
- A presentation and subsequent breakout sessions focusing on useful sea-floor mapping products identified key outcomes that spanned multiple issue areas. The results highlighted several components that represented both data sources and derived products.
    - Key data sources required:
        - Bathymetry & backscatter
        - Bio/Physical/Chem observational & sampling data (more robust than what's typically needed for ground-truthing acoustic data as they will be needed to support one of the derived products)
    - Key Derived Products:
        - Geology

- Benthic Habitats Characterization
- Topography (Slope/Rugosity)
  - Policy issues to be resolved include:
    - Desired map resolution, which will influence sampling design
    - Production of stand-alone data products versus a data portal analysis tool
- In order to develop both the terms of the pilot and general direction of the larger mapping effort, a Habitat Mapping Subgroup will be constituted. It will be comprised of 2 representatives from each of the 3 partners (Lamont-Doherty, LISMARC, NOAA) plus 2 members of the Cable Fund Steering Committee. It will:
  - Develop a work plan to recommend to the steering committee including
    - Develop pilot proof of concept requirements and details
    - Define data acquisition approach and finalize survey areas
    - Address data acquisition standards
    - Conduct Gap analysis of existing data & products
    - Determine products methodology and standards
    - Develop data mgmt. strategy (internal and external dissemination & archival)
    - Develop communication and outreach strategy
    -
  - Be drafted by November 2011 for approval by December 2011.
  - Be led by NOAA staff based on previous scope/experience, with support from team members
  - Be ready to coordinate and leverage efforts with anticipated NOAA Hydrographic Survey vessels scheduled to perform survey work in LIS during the 2012 field season (~Spring – Fall)
- While the Habitat Mapping Subgroup is developing a workplan, the Cable Fund Steering Committee will be meeting to develop policies and procedures to address funding mechanisms, internal administrative organization, etc.

Agenda for LIS Spatial Prioritization Workshop

Day 1:
1. Welcome and Introductions: (B. Thompson & Facilitator; 0900-0915)
   a. Workshop Objectives and Expected Outcomes
      (Intent – The workshop findings will be submitted as recommendations to the LIS Steering Committee for their consideration & approval).
   b. Comments on the Agenda or changes. Participant sign-in, Lunch sign-up
   c. How to address sidebar issues and ground rules for the workshop.

2. LIS Project Details: (B. Thompson & M. Tedesco, 0915-0930)
   a. Brief synopsis of past and recent efforts in LIS.
   b. Description of the Current Effort (RFI&Q): What are the drivers, needs, and requirements? How is this process and partnership envisioned to work? What are the Project Objectives and Expected Outcomes?

3. Summarization of the Spatial Prioritization Results (O'Brien, 0930-1030)
   a. Broad scale spatial priority patterns, tiered priority region options, individual respondent submission findings, criteria/management issue findings to inform data collection requirements.

Break (1030-1045)

4. Consensus on Spatial Prioritization - Reach agreement on areas we need to focus for collection and analysis. (O'Brien and Facilitator, 1045-1200 min)
   a. Reach Agreement on the Priority Sites Identified
   b. Identifying "Pilot" project area - Develop criteria for selecting priority areas and then select the priority area(s).
   c. Summarize the recommendations to the Steering Committee.

Lunch (1200-1245)

5. Discussion on Developing Mapping Products (1245-1430)
   a. Review outcomes and findings of the 2007 LIS Workshop (Battista, 1245-1300)
   b. Mapping Products Presentation (Costa, 1300-1330 incl 10 min of questions, See detailed agenda attached)
   c. Break-out Sessions (1330-1400, 5 groups)
   d. Report Break Out Session Findings to Group (1400-1430)

Break (1430-1445)

   e. Classification scheme – Brief synopsis of LIS scheme. What and why are these classes relevant to management needs? (Auster, 1445-1515) Discussion (1515-1530)

f. Criteria on "How to evaluate *existing* Data and Products" (Battista, 1530-1545)
      Discussion (1545-1600)

6. Steering Committee Discussion of the day's events (1600-1700).

Day 2:

7. Opening Remarks/Q&A – CT DEEP Commissioner Dan Esty (0830-845)

8. Recap of previous day discussion: (O'Brien & Moderator, 0845-0915):
   a. New thoughts since yesterday.
   b. Brief review of spatial prioritization summary
   c. Review Ground rules
   d. Steering Committee Report Out

9. Developing a Data Portal and Project Status Portal (Battista, 0915-0945)

10. Data Sharing Agreements – Past, present, and future data (Brown, 0945-1000)

11. Partner Briefing of Capabilities 30 min briefing + 15 minutes of questions:
Lamont-Doherty (1000-1045), **Break (1045-1100)**, LISMaRC (1100-1145), and NOAA
(1145-1230)

Lunch (1230-1300 on site),

12. Workshop Summary
   a. Forming Habitat Mapping Sub-Group (Battista, 1300-1315)
   b. Discuss Habitat Mapping Sub-Group Tasks and Schedule (Battista 1315-1330)
   c. Summarize Workshop Findings (Facilitator, 1330-1400)
   d. Steering Committee Next Steps (B. Thompson, 1400-1430)
   e. General Comments or concerns (All, 1430-1500)

LIS WORKSHOP

Day 1

1. Welcome and Introductions
   a. Expectations for the workshop
      - Results of survey = great for providing direction. Now, focus direction even more in context of limited funds and specific needs of communities
      - Important question: what are needs of the communities in terms of regulatory, management, etc.? What products would be best for these needs? Where do we want to work with these products? Logistically, who will do what and when (not expected to be solved today, but at least begin discussions).
      - We want a synopsis to provide steering committee, ultimately.

   b. Background
      - Genesis of this situation comes from cross sound cable fund, from settlement in 2004
        - Fund was created, $6M for development of data, information, research on habitat and env. conditions in LIS, particularly with how they relate to energy infrastructure
        - Fund now is $7.1M, 7 years later. However that won't get us too far in terms of mapping seafloor of LIS, thus creating a need to prioritize needs and resources
        - In agreement from cross sound cable fund, a steering committee was created. Recommendations from said committee go to policy committee (who approves expenditures) providing suggestions to CT and NY agencies as well as EPA
          - Steering Committee composed of members from EPA and, rant [??]
          - It got up and running a year and half ago
      - 3 groups identified that could bring expertise to the program, bringing partnerships and synergy

2. Summarization of the Spatial Prioritization Results
   a. Survey Review
      i. Grid created to help map areas of LIS.
      ii. Created list of issues, criteria, and priority levels.
      iii. Within grid spacial context (i.e. per grid cell), what are the main issues and how soon must they be addressed?
      iv. Yielded useful targeted responses, useful topical areas of interest
   b. Comments on survey created

      i.   Some were useful responses, others generated important questions that are to be discussed

c. Big Picture Issues
      i.   Regulatory issues most important according to survey, CMSP next, Resource mgmt. third, several others followed
      ii.   CMSP was kind of a catch all issue

d. Big Picture Criteria
      i.   Most important criteria were knowledge gap and significant natural areas

e. Ideally, would be able to derive relationship between issues, criteria, and priority
      i.   This problem yielded a statistics analysis focusing on a chi-square analysis for non-numeric data
      ii.   Results: regulatory issues were lowest priority, CMSP as high priority. RM as medium
            1.   Survey does have limits. Only two regulatory agencies were surveyed, so maybe that is why regulatory is so low, for example. Also, regulatory had the highest pure # of responses. The survey is not the be all end all...must remember who was surveyed, etc. Of course more information would be better for regulatory agencies.
      iii.   Results: also yielded which criteria were most important for the different issues

f. Spatial Analysis Process
      i.   Reponses translated into GIS data , to combine with grid
      ii.   Data consolidated into a composite number for each grid cell specifically based on total for each priority, issue, and frequency
            1.   Frequency of responses of cells shows which areas are of most importance.
            2.   Doesn't necessarily mean low freq areas are not to be cared about at all. More useful in determining where to start
      iii.   Combined "complex weighted scoring" used. Then, cluster analysis used to try and find larger important or nonimportant zones, turns out they are about 11 km. Finally, quantile analysis used to further define how many important areas there are (there are about 4).

g. Priority Area Review
      i.   Summary of issues in high priority areas (there is a table showing this)
            1.   1 summary sheet for each of the 4 priority areas
            2.   What are most important criteria and supporting criteria for each area, comments for each issue in each priority area? Helps give a more composite view of what exactly is important in each area
      ii.   Other important notes
            1.   The 4 areas account for the top 25% of the LIS
            2.   Commonalities between them, shows a degree of consistency
            3.   Later specifics would likely differentiate them in terms of products, etc

h. Important to note that the focus was seafloor mapping not coastal marine spatial planning on a broader scale (shipping, etc.). Seafloor mapping is more of a support component for CMSP.

    i. Next steps (in no particular order)
- i. Agreement on where to focus initial efforts
    1. The blocks are not definitive. They just help guide and direct. Along those lines, spatial averaging in the future could be useful.
    2. Just because this survey did not identify an area as important does not mean it is not important. This survey is more important for determining merely where to begin. Especially when you consider pipelines for many proposed projects go through "blue/less urgent" areas.
- ii. If we want to ID a pilot area
    1. Objective of a pilot is to pick an area configured such that pilot world provide knowledge of how useful certain products are, in variety of habitats. This would allow evaluation of products usable in more specific fashion for CMSP issues, for example
- iii. Question: does the fact that CMSP is a kind of catchall create a problem of being too broad in terms of future discussion and analysis? Not necessarily because there is already some solid data to help individualize and specify direction in the future.

3. Consensus on Spatial Prioritization - Reach agreement on areas we need to focus for collection and analysis
    a. Did any consensus emerge?
        - i. Everyone seems to agree that some smoothing algorithm / analysis should happen on mapped hot/warm/cold
            1. However, discrete cells are still useful for cost analysis in the future...would be easier. That is for the future though.
        - ii. One area came out of the data but didn't intuitively "pop"
        - iii. The fact that regulatory and CMSP are two of top 3 is in line, intuitively
            1. Regarding resource use/mgmt., it may have been less important because it was "less hot" when agreement was made 7 yrs. ago. No consensus on why.
            2. Resource mgmt. data would still be useful for future infrastructure, to see where it fits within priority context, or upcoming permits in areas, etc.
                a. Other information layers would be very helpful
    b. Steams of thought noticed by Joe
        - i. More useful criteria?
        - ii. What would be useful criteria for selecting pilot?
            1. Again, maybe adding more information (such as upcoming permits), would help for selecting one of the areas for a pilot
        - iii. Do we have enough information to say that these are the 4 project zones? Can we agree that these are the 4 areas?
            1. They don't encompass all the interest areas, but for a pilot program they seem adequate.

2. After this workshop, we want to have priority areas, do not want to have to do this again
3. Reds may not go far enough geographically
4. Need a feedback loop, community wise, and thinking of utility of products, before deciding pilot
5. This analysis is what needs are, not considering what data is currently available. Any available data and additional data requirements must be considered in deciding a pilot, and those 2 things are not really accounted for in this survey
6. There will always be a risk that a project will be decided in a location deemed not a priority by this survey. Predicting where a project or controversy will arise is pretty difficult, so a focus should be strengthening an ability to respond to a future situation.
    a. On the other hand, maybe the survey presumes ability to do too much and a less extensive work on a larger area (instead of select priority areas) would be better.
        i. Maybe it would be better to consolidate to 2 areas. [minority idea]
        ii. Maybe to one area of the whole sound. [Another minority idea]. A less comprehensive data extraction over the whole sound may be better because data is very outdated.
        iii. Maybe to take one existing area (NE area] and expanding it (to the SW) due to infrastructure expectations. [Only about 3 grid cells or so]. This is a smaller change and seems to be agreed on.
iv. **So, what should the pilot be?**
    1. Should we even move forward without consensus on the pilot? Will it cause less buy in? On the other hand, it IS a pilot. Some money should go to that, but MORE will go to sound wide project after the pilot.
    2. Need to keep in mind, once a priority area is picked for a pilot theoretically, it would be optimized...possibly enlarged, shrunken, and expanded into "yellow and blue" possibly. Refinement process.
    3. Another point: even a specific priority area pilot should yield sound wide helpful data. It may be hard to pick without knowing what will be done.
    4. How big is a pilot anyway?
    5. ****_later in day, we will revisit data after more discussion and decide pilot specifics now that the right questions have been asked._ ****
v. Criteria for pilot, consolidated somewhat:
    1. Different constituencies
    2. Is there existing data? That allows measuring of how much things have changed
        a. On the other hand, value from doing it from scratch since it is development of a prototype blueprint of sorts.
    3. Nexus to fund
    4. Be sure to be cross sound , shallow to deep, in terms of application of data
    5. CT & NY

6. Wide variety of habitats
7. Impacted and nonimpacted areas (cable or pipeline running through area)
8. Habitat for significant at risk resource
9. Testing unproven technology...see if it is cost effective, how it can be married with other tech, etc. etc. etc.
10. Logistics, i.e. timing
11. Disturbance regime
12. Avoiding redundancy
13. Collecting data that is useful for??? Correlate physical to biological question
14. Cost of pilot
15. Time frame for results

vi. ***Pilot issue, continued in afternoon***
1. Proposal: 2nd area from west
   a. Not eastern LIS area because too large, and we already have data acquired for that bathymetrically and geologically. Biologically is lacking though.
   b. The 2nd area from west has habitat diversity
   c. Also contains Stratford shoal area, has CT and NY if you "smooth" area out
   d. Pipelines to capture as well -- Iroquois pipeline/cable

4. Discussion on developing Mapping Products
   a. Reviewing outcome of prior LIS Workshop Findings
      i. 2004 LIS symposium study of Benthic Habitats
      ii. 2007 LIS Seafloor Mapping Workshop
   b. Mapping Products Presentation
      i. Operational constraints for mapping
         1. Size, depth of survey area
         2. Desired data products and resolutions
         3. Uncertainty
         4. Sensor type (influenced by 1,2, and 3)
         5. Desired data uses
         6. Cost/budget
      ii. Environmental Constraints
         1. Env considerations like depth, tides, hazards
         2. Restricted areas
         3. Shipping lanes, boat traffic
   c. Considerations for Characterization
      i. Synthesis and analysis of information about seafloor
      ii. Size of survey area
      iii. Integrate new imagery with existing data

      iv.   Habitat classification scheme
      v.   Ground truthing
      vi.   Accuracy
      vii.   Cost/budget

- d. Potential acoustic products...some needed for others to function
    - i. Bathymetry (depth)
    - ii. Backscatter (intensity)
    - iii. Topography
    - iv. Seismic profiles, isopach, depth to basement
    - v. Seafloor geology
    - vi. Seafloor biological habitats
    - vii. Monitoring sampling plan
    - viii. Animal environ models
    - ix. Animal spatial prediction
- e. Management Applications of Products
    - i. Slideshow on examples of the above mentioned 10 products and how they were used, as well as how they relate to identified issues and criteria from earlier in the workshop

5. Group Breakout Sessions
   - a. Impact Assessment
       - i. Impact = impact of a project on the environment
       - ii. Assumed bathym. And backscatt.
       - iii. 5 votes for animal spatial predictors (plant and animal), which would depend on broader sampling program including water sediments and biological contaminants.
       - iv. Identified circulation as an additional product critical for defining erosion rates, transport pathways
       - v. Comment on seafloor biological habitats which got support" assumption of environmental parameters (such as Temperature)
       - vi. General emphasis on higher level impacts on the system, and broader sampling program
       - vii. Regarding uniformity: need to assess scales of variation
           1. Local sampling determined by spatial distribution

   - b. Research
       - i. Assumed bathym. And backscatt. Were needed and implied at greater res
       - ii. Biological habitats was highest ranked product
           1. Expanded
           2. Why? Because we don't know, need to know the type of things as well as change
       - iii. Sediment properties was important (physical and chemical)
       - iv. Seafloor geology (finer spatial scales needed) and sediment samples (evolution of contaminant, recording of patterns and change) third important

c. Resource Management
   i. Bathym and Backscatt implied
   ii. Added Water Chemistry category. Not highly ranked though
   iii. Highest issues: topography, seafloor biological habitats, animal spatial predictors
   iv. Topo= primary driver needed for other ones
   v. Animal spatial predictors to examine potential impact to particular areas, ability to do hypothetical analysis
   vi. Low uniformity areas not as important

d. CMSP
   i. Seafloor biological habitats = most critical.
      1. Protecting habitats as they relate to LIS ecology
      2. Caveat: models and predictors would come from that, to be used in biological inventory of LIS areas
   ii. Seafloor geology would be good to use as broad assessment of seafloor landscape
   iii. Backscatter is important for seafloor composition
   iv. "Using data" as separate important implied category
   v. Note: biological inventory would be tough along shores, east and western shore areas especially. Important, but difficult.

e. Regulatory
   i. Comes down to being able to asses potential impact of a project to habitat
   ii. Seafloor geol. And biological habitats = primary needs and drivers of project
      1. Comprehensive analysis for assessment purposes
      2. Also for understanding how a disturbed area may be restored after a project is completed

f. **Totals**
   i. Backscatter and bathymetry were implied in most groups so those are clearly very important
   ii. Seafloor biological and biological habitats had most votes , consistently
   iii. Next highest = topography
   iv. Next : animal spatial predictors (but concentrated in 2 groups)
   v. So basically only (i) is consistently true
   vi. There was a theme of physical sampling as well
      1. Sampling comprised of not only physical biological, but also sediment and water column chemistry and analysis
      2. **B/K/A _habitat characterization_ when those 3 types of sampling combined with acoustic sampling methods and the biology and habitat analysis**

6. LIS Seafloor Habitat Classification

a. Project goal: produce a single flexible habitat classification scheme that can be used by a range of workers focused on the LIS region
    i. Approach: link development of the classification scheme to those who will implement and use the map products derived from the protocol
b. A very detailed analysis of the system followed (on a PPT)
c. Questions:
    i. Timeframe for getting through to delivery of maps? Relatively quickly because we have some existing data to get started
    ii. How much human intervention is required? This is linked on what you want to dol.
d. Uniform sampling plan doesn't make sense...scale dependent , should resolve variations in the structures

7. How to evaluate Existing Data and Products
    a. A CA seafloor mapping initiative has similar product usage
    b. Offshore Massachusetts portfolio: also similar
    c. Challenges for existing LIS Data and products
        i. Need to use, integrate existing products? Probably
        ii. Developing Decision Rules: best available or best possible?
        iii. How to evaluate utility of existing data
            1. Analog v digital
            2. Areas where coverage is not 100%
            3. What is usable quality of data that is noisy or low resolution? ("Skunk stripe")? How much interpolation between line soundings do you want to use?
        iv. How to evaluate existing products
            1. Functional scale?
            2. Any measure of uncertainty or thematic accuracy?
            3. Do these reflect current conditions, and should/could we improve it?

8. *Back to the Issue of the Pilot [I just added on to earlier part of notes]*

9. Steering Committee Discussion of the day's events
    a. Eastern region work would be more expensive...not very logistical for this time frame also.
    b. There should be discussion of cost allocations, and the process of that
    c. Overlap of data acquisition and data analysis and product development... Has to be compatible if data acquired by diff people and ships etc. coordination….but on the other hand don't want repetition and redundancy of work.
    d. 2 ideas: "super consortium" of people working together or separate teams with a little bit of overlap of equipment. Have to be able to swap data if different teams, knit them together to create a full picture. Pilot should test this inoperability of data.
    e. Scale and quality assurance (inoperability and seamless data).
    f. Problem: compatibility of academic research and NOAA's research

g. This parallel tracks situation (tracks being NOAA and academics) is not common. The difficulty is not the data collection, but it's the getting it to product part (the integration, so to speak) that is difficult because usually there is a discrete entity (as opposed to two teams splitting up)

    i. Then again, point of pilot is to get groups able to do this on a smaller area and then be able to extend it to larger area

h. Pilot can be used to experiment with scale

i. Predicting how much money it takes upfront is prudent

    i. Could divide into parcels and request cost predictions

    ii. Could take a competitive approach for cost predictions...but that means you may lose the ability to have a consortium later after the pilot

j. We have a decision on the area, more or less. We generally believe the consortium idea is a good thing. Timeframe is 2012, space focus is "western 2" area, and finer level of details of area is going to take more time.

    i. The way in which consortia would be used, i.e. bidding or noncompetitively, or partitioning, should be decided soon. Should possibly see which part of project diff contractors of consortia are most interested in, comfortable with, etc.

k. Subgroup (NOAA + contractors + possibly others) --> what to tell then? Are we in position to inform them? Get back to them later on process? What about substance?

    i. Need to have a separate meeting and figure that out, possibly

Day 2

1. Dan Esty, CT DEEP
   a. Direction matters now that protection and academics in env. Mgmt. is so advanced
   b. Action agenda (deadlines, timelines, accountability, boats on water...etc.), practical operation rather than legal mandate...because that is faster and more likely to happen.
   c. Integration of organizational efforts
   d. Because of budget cuts, re-engaging the public is even more important.
   e. Importance of breaking into smaller tasks to help ensure accountability and progress

2. Recap of previous day discussion
   a. Yesterday, prioritization survey review was important

       i. General agreement on the results

   b. Agreement on necessity of pilot project

       i. Consensus on 2 possible areas, with favorite being Stratford shoal area. This is the area steering committee would go on to discuss

c. Evaluation of products on issue-by-issue basis in order to see what most useful products would be as a whole
   i. Sampling was not initially part of product list but it became included, along with a couple of projects, under umbrella of Habitat Characterization
d. Key points of agreement by steering committee
   i. Clearly want the broad partnership/consortium to continue, in order to leverage resources, and develop products that are broadly usable in an effective manner
   ii. Agreed, again, on Stratford shoal area for location of pilot, however scope and specific location needs more detail
   iii. Regarding timeframe, 2012 summer timeframe seemed to emerge as leading idea
   iv. Concept of creating a habitat mapping subgroup made of members of steering company and other workshop members
      1. Within team create lines of accountability and responsibility
      2. The outcome should reflect ideas of broader group, not just team committee
e. Addition to Recap by Moderator (Joe)
   i. Not quite ready "to give marching orders"
   ii. Further definition of subgroup needed
   iii. Need personal views on direction
   iv. Question: Any new thoughts or comments?
      1. Hash out a more explicit long term vision
      2. Timing, not just of the pilot, but the whole project
         a. Tough to answer without financial data

f. New ideas
   i. Technical committee?
   ii. Availability of data collection quickly for all the members

3. Developing a data portal and project status portal (Tim Battista)
   a. Objective: In 2004 and 2007, there was a lack of centralized location for data-- it was spread across diff govt and NGO databases
      i. We need to make it discoverable for these organizations, but also for public
   b. An interactive spatial prioritization map is available currently for users to query and access data sets. This is an example of what is needed. Another example is the St John, USVI "biomapper" which has map interaction with varied data overlays and dynamic tables as well as data and video for individual points
      i. Very useful for a manager
   c. NOAA currently leading efforts for NIMS: National Information Management System dedicated to coastal and marine scientific data (mostly federal, but in future ideally it would consist of more)
      i. Currently 15 federal agencies
      ii. Federal agency databases feed into NIMS system, and regional ones theoretically will in the same way

        iii.   First regional networks being set up now

        iv.   The question now is how are the LIS agencies going to engage in this

    d. We need data portal to serve state, regional nodes, and NIMS

    e. Problem: parallel data portals

4. Data Sharing Agreements (Kim Brown)

    a. Goal of collaborative partnership: gather data together, make it available, and therefore get partners to agree to share and make it available

    b. As funding is delivered, conditions in contracts would likely dictate specifics and timeframes.

    c. Data sharing agreement is vital

    d. Question: are there impediments for any groups here regarding sharing data (collected and derived)? Are there any certain types of data which *cannot* be shared (endangered spp data etc.)?

    e. Another issue: publishing delays in academic research

    f. Anyone who has data sharing information or suggestions on how it is done by other organizations, contact Kim

    g. Are there going to be issues in how data collection sharing vs. data mining coexists? May want contracts not only for future data mining, and older data as well. Also, is it worth the expense for some old data to be prepared for usage (creating Meta data is not free, quality may be questionable, etc). Is it going to be data which can be manipulated or just PDF maps?

    h. Who is going to have this conversation? **Possibility**: create a subcommittee for data issues? This needs to be resolved before we figure out what funds are needed.

    i. **<u>Suggestion:</u>** habitat workgroup, technical workgroup, data workgroup? There would be overlap.

5. Partner Briefing of capabilities

    a. Lamont-Doherty

        i.   Previous experience

             1. Hudson river mapping project for NYS

             2. LIS

             3. CT River

             4. Also some Global work: continental shelf areas, Haitian earthquake, etc

        ii.   The important previous work is the Hudson River benthic Mapping Project

             1. Started off as a pilot in 98-99, funded by NYS DEC

             2. Mapping the river from Manhattan to Troy

             3. Objectives:

                  a. Mapping benthic habitats, lateral dist of sediments, and more

             4. ~ $2M

             5. Acoustics: swath bathym, sidescan sonar, seismic subbottom profiling

6. Sediments: sediment grabs, sediment cores, physical properties
7. Biology: sed. Profile imagery (SPI), sediment grabs
8. Benthic Mapping: grain size, sedimentary environment analysis, linking physical environment and biology (i.e. invasive species density plotted against different environments)
9. Project that used data from Hudson mapping--application and value of their data
   a. Sturgeon habitats analysis, Deposition Thickness, Analyzing Metal Content
10. Visualization and outreach
    a. Presentations, public lectures, k12 classes, history channel animation, NY Magazine, museum exhibitions

iii. Western LIS Study
1. Queens college, CUNY, Queensborough Community College, CUNY, LD Earth Observatory
2. Objectives:
   a. Temporal and spatial distribution of sediments and contaminants
   b. Causes of hypoxia
3. Showed examples of bathymetry data and visualization, as well as hi resolution chirp profile. And metal analysis and radioisotopes and radiocarbon aging of gravity cores

iv. Data Portals
1. LD has several large data mgmt. efforts underway
2. Marine Geosciences Data System (MGDS)
   a. Around for 20 yrs
   b. Integrated data system
      i. Geospatially enabled relational database
      ii. Primarily sensor data (field raw data and derived data)
      iii. Organized by expedition as well
      iv. Searchable, links to documentation, attribution, external repositories
   c. Several Different Data portals , handled through one relational database system
3. Global multires topography (GMRT) synthesis: accessible through diff database, usable for specialists and non specialists. It is in base map for Google as well
4. Visualization: geomapapp = main tool. Gives direct access to data in addition to visualization. Virtual ocean = similar to GMA but 3d, good for classrooms. Earth observer = for iphone and ipads.
5. Education outreach: the visualization tools, mediabank, YouTube, Google tours, FaceBook, Google earth services, lessons, classroom exercises, workshops, demos
6. Rolling Deck to Repository (R2R)
   a. Gateway for routine underway data from US Academic Research Fleet

b. Routine documentation and delivery of data to NOAA data centers
        c. Event logger on ships being built,
        d. Quality assessment for data users as well as operators
    7. Standards
        a. Collaborative with NOAA/CCOM
  v. Capabilities of Vessels and Platforms
    1. Lamont has one large vessel, but stony brook has a large variety of vessels
    2. Equipment: several sidescan systems, multibeam echosounders, subbottom profiler, experience with AUV
    3. Several Sediment Sampling Systems and types of Sediment Analysis
    4. Biological equipment: Bottom Deployed video/photo, towed camera sleds, grab sampler, trawl nets
    5. Very varied scientific interests
    6. No real preference in terms of areas of the LIS.

b. Long Island Sound Mapping and Research Collaborative (LISMaRC)
  i. Uconn, UNewHaven, URI, Stony Brook, USGS, CARIS universal systems limited
  ii. Objectives: support new projects that enhance LIS, promote improved scientific understanding of existing and potential cable and pipeline crossings and mitigation of their impacts, emphasize benthic mapping as a priority need
  iii. 30 yrs of experience
  iv. Have done some work in Stratford Shoal
  v. Ecological Characterization of sea floor habitats and communities in mapped seafloor patches
    1. Video as well in addition to acoustics
    2. Analysis of Not only habitats, but subhabitats such as transitional habitats
    3. Inshore mapping and ecological characterization
    4. Classification and ground truthing
  vi. Vessels and Equipment
    1. Stony Brook Vessels, Uconn and URI vessels
    2. Many capabilities
  vii. Experience producing derived maps and assessments such as those identified in the Prioritization survey
    1. Overlaying of data and derived maps to solve problems such as those this pilot is looking at...effect of pipelines, connectedness of rare habitats, conservation models, etc
    2. Experience in MSP exercises
  viii. Ability to look at various inter-relationships between seafloor observations and chemistry and sedimentation, etc
    1. "integrating data and geospatial attributes of environmental factors and sea floor mapping products / results"
    2. Expertise in ecosystem based approaches

        ix.   Linkage of data to Google earth, formal and informal education sources, searchable database archived, and more

   c.   NOAA's Seafloor Mapping Capabilities for LIS
      i.   Specialize in acquiring data and nautical charting over large areas, efficiently
      ii.   NOAA has deemed 85% of LIS as important to survey so they are willing to work with others to complete it. There is some overlap in their planned area and the priority area
          1.   Plan on allocating 80 days to NOAA ship Thomas Jefferson, + a smaller field unit ship
     iii.   Equipment and capability of the TJ vessel
          1.   Long thorough list on PowerPoint
     iv.   Data to Decision Making
          1.   Provides fundamental spatial framework through comprehensive consistent products
     v.   Mapping Process
          1.   Not just acoustic
          2.   Satellites and more
          3.   Methodologies: Manual delineation and attribution, Not very time efficient, so they are developing more repeatable and efficient mapping...semi-automated mapping
             a.   Consists of: data pre-processing, delineation of features, classification of features
          4.   Have experience combining map from different technologies to create a unified project usable across technologies
          5.   Optical verification of procedures. Evaluation of maps also: "confusion matrices." How good is the map?
     vi.   Data Processing and Visualization expertise
          1.   Thought: can't have good visualizations without good data
     vii.   Fish Sonar and Multibeam analysis: chiefly for fisheries, but useful in other capacities
    viii.   Geophysical modeling, bathymetric modeling (looking for ways to improve models derived from raw data)
     ix.   Data Standards

6.   Habitat Mapping Sub-Group
   a.   Objective:
      i.   Develop a smaller functional working group that would develop and make recommendations to the steering committee
      ii.   Charged with scoping out key project planning design, concepts and approaches
     iii.   Will take significant time for subgroup members
     iv.   Small enough to be manageable and large enough to include the breadth and depth of knowledge needed

b. Tasks and Schedule
    i. Capture findings from prioritization survey
    ii. Develop pilot proof of concept requirements and details
    iii. Define data acquisition approach and finalize survey areas for NOAA TJ and NRT
    iv. Establish data acquisition standards for new collection efforts (MBES, SSS, subbottom, ground truthing)
    v. Conduct Gap analysis of existing data
    vi. Conduct gap analysis of existing products
    vii. Determine what products will be produced, methodology and product standards
    viii. Develop data mgmt. strategy for internal and external dissemination , as well as archival
    ix. Develop communication and outreach strategy
    x. Develop data collection and processing plan

c. Creating the subgroup
    i. Define the pilot
        1. Pilot follows from the project
        2. Decide on what products we want from dot-exercise
        3. What products we want is also based on an iterative process of sorts
        4. Define mapping
        5. Data analysis
        6. Testing integration compatibility
            a. Consistent data acquisition / metadata protocol, procedural protocol
        7. Purposes
            a. Permitting decisions
            b. Impact decisions
            c. Conflict assessment
            d. Broader zoning for future uses
        8. Create a type of habitat scheme
        9. Should be implementable on larger scale
    ii. Subgroup name is a bit narrow, a slight misnomer
    iii. Not only scoping the pilot (work wise and geographically speaking too), but also directing the rest of the experts here, and being ready to have a draft by November 1 and final by December 1.
    iv. Structure of the group
        1. "Work plan development team" is big so split it up into….
            a. 8 people (2 from each partner, 2 from steering committee)
            b. Fall -- Work plan completed
            c. No exclusion of consortium members
            d. Frank, Tim, Yval send names by 2 weeks from August 18, to Kevin who will organize steering committee to see who their 2 representatives are
            e. Tim's team, because of experience, continues to lead

v.   Need way to check in with end users, non-3-partner/steering-committee people involved in workshop, etc.

Seafloor Mapping Workshop
August 3 – August 4, 2011

Tim will circulate to the group a document share option for posting the workshop ppts and summary.

1. **GOALS BRAINSTORM**
   - Pilot follows project
   - Decide on products using dot results as start point
   - Characterize hard bottom habitats
     - Decide on habitat types
     - Create maps and then do quantities/classifications
   - Know which areas to protect and where to develop examples where to put aquaculture
     - Biological status
     - Where are important marine-life areas in Long Island Sound
     - Characterize impacts of prior projects and recovery levels
     - Produce different data layers
       - Can re-quantify and reclassify
       - Use for other classifications
   Maps Support:
   - Support permit decisions
   - Resolve use conflicts
   - Zoning – future uses
   - Impact assessment

2. **WORK PLAN DEVELOPMENT TEAM (WDT)**
   - Subgroups of the Team
     - Data
     - Education and Outreach
   - Start with Work Plan; WDT: keep track of future tasks for subgroups
   - Scope out pilot
   - Data and Habitat Mapping is initial focus of WDT
   - Timing should result in 2012 goal
   - Pick area for scope of work
   - Develop measures of success
   - Eight people (Institutional)
     - Fall Workshop completed November 1
     - December 1 final draft
   - Three consulti__?? Develop work plan together

- Three types of reps (functional)
  1. Geosystems expert
  2. Ecosystems expert
  3. Data systems expert
- Ivar, Frank, and Tim – send names by 8/18/11, two reps
- Kevin will be point person for Steering Committee right now
- National Oceanic and Atmospheric Administration (NOAA) – lead role

3. PILOT BRAINSTORM
- Pilot – products won't be defined up-front
  - Must define mapping – what resolutions?
  - Sampling Strategy for erosion and deposition
  - Data analysis – acquire and analyze
  - Retrospective analysis
- Integrative Capability
  - Test integration of compatibility of data acquisition and existing data
  - Different groups, instruments, platforms
- Establish sampling protocols
- Logistics – Cooperation among groups
- Identify habitat targets up-front and assign a scale for each habitat type
  - Start with habitat classification scheme
- Develop approach scalable to broader area
- Get metrics on level of effort for data acquisition, etc.
- Acquisition, delivery and dissemination of products
- How can we do it effectively?
- Test tech. for shallow habitat designation
- What is critical (in pilot) to be able to scale up?
- Can we share it cooperatively?
- Establish metrics to measure success

4. BIKE RACK
- Discuss hot to evaluate existing products
- NOAA can perhaps replicate CA funding mechanism for data collection
- Evaluate potential for pumpout facility to accommodate T.J. while in LIS? Use pumpout vessels: Need to know holding tank volume of T.J.

5. **THE PRODUCTS**
   - Habitat map of entire Sound
     - Derivative info
     - Type abundance
       - @ useful scale
       - Hard bottom types
   - Developing an interactive process
   - Communities and location status

6. **CHALLENGES AND OBSTACLES**
   - Clear work plans/responsibilities
   - Long-term vision
   - Master time frame
   - Leveraging funds to continue
   - Data sharing agreements
     - Any impediments (to Kate Brown)
     - Protected info, sp., shipwrecks
     - Publication holds
   - Data platforms/portals
     - Develop
     - Use existing
   - Data mining, metadata issues
   - What products (unique and compelling as part of leveraging funds)?

7. **NEXT STEPS**
   - Refine areas
     - Consider costs of shifting away from grid cells
   - Work Plan subgroups?
   - Data subgroup?

8. **PILOT CRITERIA (SITE)**
   - Different constituencies
   - Is there existing data, for example base maps?
     - Might be advantage to no existing data.
   - Nexus to fund – existing/proposed infrastructure
   - Be sure it's cross-Sound
   - Be sure it's shallow to deep
   - Cover Connecticut and New York
   - Wide variety of habitats
     - Hard and soft bottom

- Area with data gaps
- ***** Cost of product
- Time frame for results
- Has impacted (for example cable/pipeline) and non-impacted areas
- Significant resource at risk
- ***** Can test unproven technology
- Need info on an area – lacking currently
- ***** Logistics, example three groups
  - Time together
- Disturbance regime
- Avoid redundancy
- Collect data that is useful for permit
  - Correlate physical to biological
- Size
- ***** Coordinate/build synergies with NOAA

9. PILOT PROPOSAL
- Second area from West Stratford shoal and shore-to-shore

10. SELECTING ZONES
- Consolidate into two zones: SW and NE
- Entire Sound at 5 kilometer spacing
- Expand NE areas due and SW due infrastructure expectations
- Uncertainty about second area from west

Summary Scores for Products across Issues

Products	Resource Management	Research	Regulatory	Impact Assessment	CMSP	Total
Bathymetry (taken for granted, must happen)			1		1	**2**
Backscatter (taken for granted, must happen)					8	**8**
Topography (slope, rugosity, …)	6	3	3			**12**
Seismic Profiles		2				**2**
Isopach & Depth to Basement						
Seafloor Geology	4	4	5	3	7	**23**
Seafloor Biological Habitats	8	7	7	4	9	**35**
Animal Environmental Models	1		4			**5**
Animal Spatial Predictors	5			5		**10**
Characterization: Water Quality, Sediment, Biological	1	9		8		**18**
TOTAL	**25**	**25**	**20**	**20**	**25**	**115**

Uniformity:

Comments:

2011 LIS Spatial Prioritization Survey Results - Summary

Refresher:
Earlier this spring, you were asked to provide the spatial extent and a description of priority management issues and criteria for critical areas of Long Island Sound. (The primary survey contents are provided below.) This document summarizes the processes used to analyze and prepare the results that will be discussed at the August workshop.

Survey Content: Respondents were asked to identify priority areas on an LIS map & for each area answer the following.
Priority: How soon the area should be addressed (based on data collection/ analysis, not deliverables)?
- High (1-2 yrs), Medium (2-5 yrs), Low (5-10 yrs)

Management Issue: What is the overarching management issue driving the "Priority" designation?
- Regulatory - Data needed to inform permitting or regulatory assessments
- Impact Assessment - Data needed to inform a non-regulatory impact assessment
- Resource Management - Data needed to inform resource management decisions including harvested as well as protected species (e.g., fisheries, shellfisheries, aquaculture, SAV, etc.)
- Monitoring/Research Design - Data needed to inform the design of monitoring strategies or research programs.
- Evaluate Management Success - Data need to inform or assess management decisions
- CMSP - Data needed to inform Coastal Marine Spatial Planning processes.
- Other - brief description on other management issue not included above.

Ranking Criteria (1-3): Why the area is relevant? (1 = most important; 2 & 3 = optional; successively less important.)
- Multiple Use Conflict - multiple non-authoritative competing uses (e.g., commercial fishing, recreational boating)
- Managed Areas - Special use, managed resource areas, or other designated State/Federal/Local managed areas (e.g., shellfish beds, channels/anchorages, dredge disposal sites) with well delineated existing boundaries.
- Significant Natural Areas - Areas of unique or important natural value, but not having any official or political designation or boundary (e.g., eelgrass beds, etc)
- High Use Areas - (e.g., shipping lanes, fishing areas, economic development zones, etc.)
- Existing Infrastructure – in-situ items (e.g., cable, pipeline, etc)
- Potential Infrastructure - looking forward and considering the capacity of the area, could it be targeted for future infrastructure projects (e.g., cable, pipeline, wind/wave turbines, tidal energy devices, etc)
- Knowledge Gap - Areas where there is no/limited/dated information
- Other Conflict – Other areas where conflict may occur (e.g., military exclusion zone, cultural resources, etc.)
- Other General - Brief description of another criterion that captures an activity or theme not included above.

IMPORTANT NOTE: Please read through and consider the list of questions at the end of this document and come prepared to the workshop to address these further.
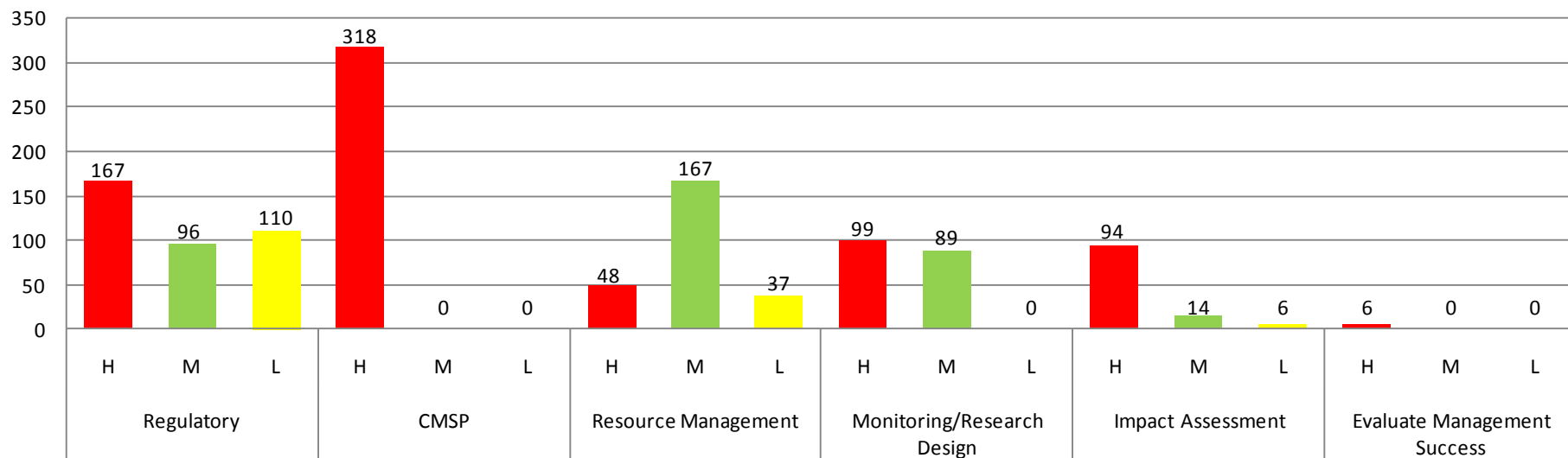
1.1 Data Compilation:
Survey data was provided either by e-mail content or on pre-provided data sheets. Responses were extracted and compiled into a master Excel Workbook with worksheets identifying the content from each respondent. Information was received from the following groups:
- CTDEP, NYDEC, NYDOS, LDOE, UCONN, The Nature Conservancy (CT) USDA-NRCS, USACOE, USEPA Regions 1 & 2.
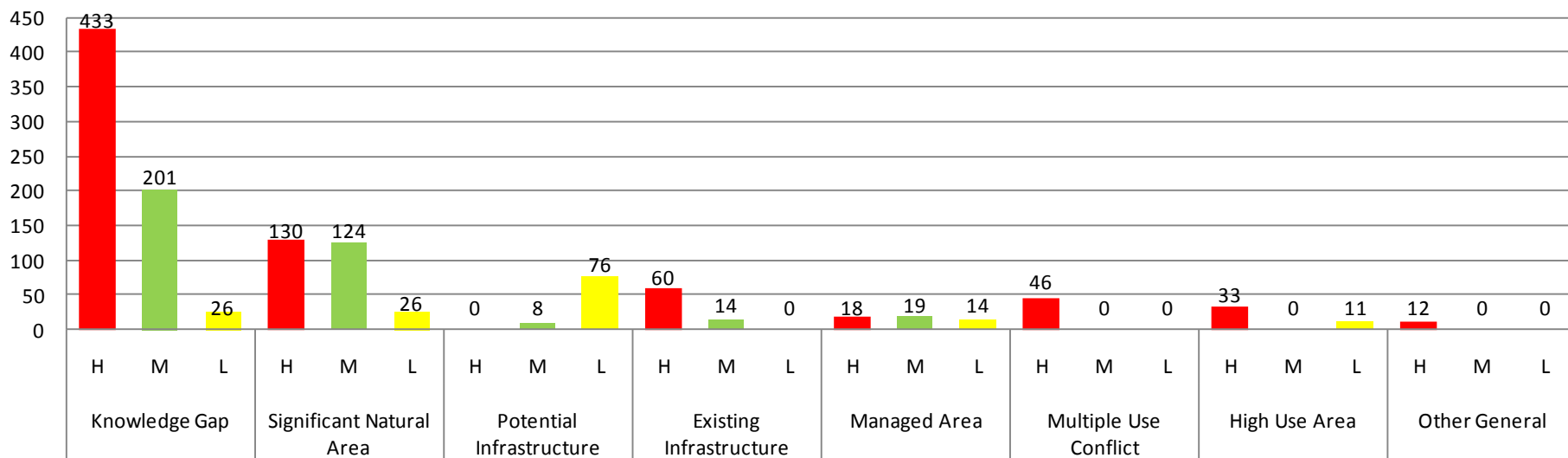
The graphs on the next page synthesize the responses across groups into a breakdown of the issues and the first (i.e., most important) criteria. We provide only the first criteria as it is the most complete picture; some respondents did not include a second or third criteria. The synthesis provides counts, by priority, for each issue and criteria selection. (Individual response tables were also calculated, but for brevity were not included in this summary.)

2011 LIS Spatial Prioritization Survey Results - Summary

Total - Management Issue

	Regulatory			CMSP			Resource Management			Monitoring/Research Design			Impact Assessment			Evaluate Management Success		
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
	167	96	110	318	0	0	48	167	37	99	89	0	94	14	6	6	0	0

Total - Ranking Criteria 1

	Knowledge Gap			Significant Natural Area			Potential Infrastructure			Existing Infrastructure			Managed Area			Multiple Use Conflict			High Use Area			Other General		
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
	433	201	26	130	124	26	0	8	76	60	14	0	18	19	14	46	0	0	33	0	11	12	0	0

2011 LIS Spatial Prioritization Survey Results - Summary

2.1 Chi-Squared Statistical Analysis:
Once the data was summarized, we conducted an Investigation to determine if there were statistically significant relationships between issues and priorities and/or issues and criteria that could be used to help identify or describe priority areas. To address this we used a chi-squared test; this is a statistical tool commonly used to compare observed data with data one would expect to obtain according to a specific hypothesis. (Chi-square test assumptions: http://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage28.htm) For example, were the deviations (differences between observed and expected) the result of chance, or were they due to other factors? How much deviation can occur before one must conclude that something other than chance is at work, causing the observed to differ from the expected?   The chi-square test is always testing the **null hypothesis,** which states that there is no significant difference between the expected and observed results.

The following table summarizes the issues, priorities and criteria that were most frequently and strongly associated with each other at 95% confidence level ($p \leq 0.05$). The statistically significant results of the chi-squared test were ranked, and the relationships with the highest scores are reported below.

Issue	Priority	Crit 1	Crit 2	Crit 3
Regulatory	Low	Potential Infrastructure	-	Existing Infrastructure
CMSP	High	Multiple Use Conflicts	*No Criteria provided*	Potential Infrastructure
Resource Management	Medium	Significant Natural Areas	High Use Area	Knowledge Gaps
Monitoring/Research Design	-	Knowledge Gaps	*No Criteria provided*	*No Criteria provided*
Impact Assessment	-	-	Potential Infrastructure	Significant Natural Areas
Evaluate Management Success	-	-	-	-

3.1 Spatial Processing:
One of the primary goals of this effort is to use the survey data grid and responses to spatially locate and assess areas where a LIS mapping effort should focus on. The following steps identify the process used and the resulting priority areas.

3.1.1. Basic & Composite GIS layers:
Using the spreadsheet response compilations, we created individual spatial data layers representing location and interests provided by respondents. From these we next created a composite layer. This provides an assessment of the study area on a grid-cell by grid-cell basis, displaying data from the individual spatial data layers. Here, multiple instances of the same grid cells are preserved, thus showing all unique responses at that location.

3.1.2. Merged GIS layer & Scoring Strategy:
From the composite layer we then created a merged data layer that reduces multiple instances of grid cells to a single instance with sums for the associated high, medium and low priority fields as well as fields totaling the sums of each survey issue category. A frequency field was provided to capture the number of times each cell received a response as well as the ability to provide a score to each grid cell, described below.

- Scoring Strategy: A scenario based on calculated priority counts from the survey responses (High, Med, Low) as well as priority inferences derived from the statistical Chi-Squared analysis (Coastal/Marine Spatial Planning (CMSP) is highest, Resource Management (RM) is medium, and Regulatory (Reg) is lowest.) The following assigns equal weights (50%-50%) to the stated priority from the survey (Wp) and issue priority (Wi) components;

2011 LIS Spatial Prioritization Survey Results - Summary

the individual weights within each component is reflected by a 50%-30%-20% breakdown for the high, medium, and low priority elements:

Wp = 0.5

Wi = 0.5

[Wp*((0.5 * [SUM_Rank_H]) + (0.3 * [SUM_Rank_M]) + (0.2 * [SUM_Rank_L]))] + [Wi*((0.5 * [SUM_CMSP]) + (0.3 * [SUM_RM]) + (0.2 * [SUM_Reg]))]

3.1.3. Spatial Clustering Analysis:

The ArcGIS Hot Spot Analysis tool calculates the Getis-Ord Gi* statistic (pronounced G-i-star) for each feature in the merged dataset. The resultant Z-scores (standard deviations) and P-values (probability of random chance) tell you where features with either high or low values cluster spatially. This tool works by looking at each feature within the context of neighboring features. To be a statistically significant hot spot, a feature will have a high value and be surrounded by other features with high values as well. For statistically significant positive Z-scores, the larger the Z-score is, the more intense the clustering of high values (hot spot). For statistically significant negative Z-scores, the smaller the Z-score is, the more intense the clustering of low values (cold spot). To assess the neighboring features, we use a fixed band Euclidean metric:

- Fixed Band-Euclidean: Uses a moving window of influence based on a fixed distance. Per the suggested methodology, we define it by first iteratively running a spatial autocorrelation process on the input data with varying thresholds to determine at what distance the Z-score values peak. Here, that distance is roughly 11000m.

3.1.4. Spatial Clustering Results & Interpretation:

Most statistical tests begin by identifying a null hypothesis. The null hypothesis for the pattern analysis tools is Complete Spatial Randomness (CSR). The Z-scores and P-values returned by the pattern analysis tools tell you whether you can reject that null hypothesis or not.

The P-value is the probability that the observed spatial pattern was created by some random process. When the P-value is very small, it is very unlikely (i.e., a small probability) that the observed spatial pattern is the result of random processes, so you can reject the null hypothesis. Z-scores are simply standard deviations. If the tool returns a Z-score of +2.5, you would say that the result is 2.5 standard deviations.

Very high or very low (negative) Z-scores associated with very small P-values are found in the tails of the normal distribution. When you run a feature pattern analysis tool and it yields small P-values and either a very high or a very low Z-score, this indicates it is unlikely that the observed spatial pattern reflects the theoretical random pattern represented by your null hypothesis (CSR).

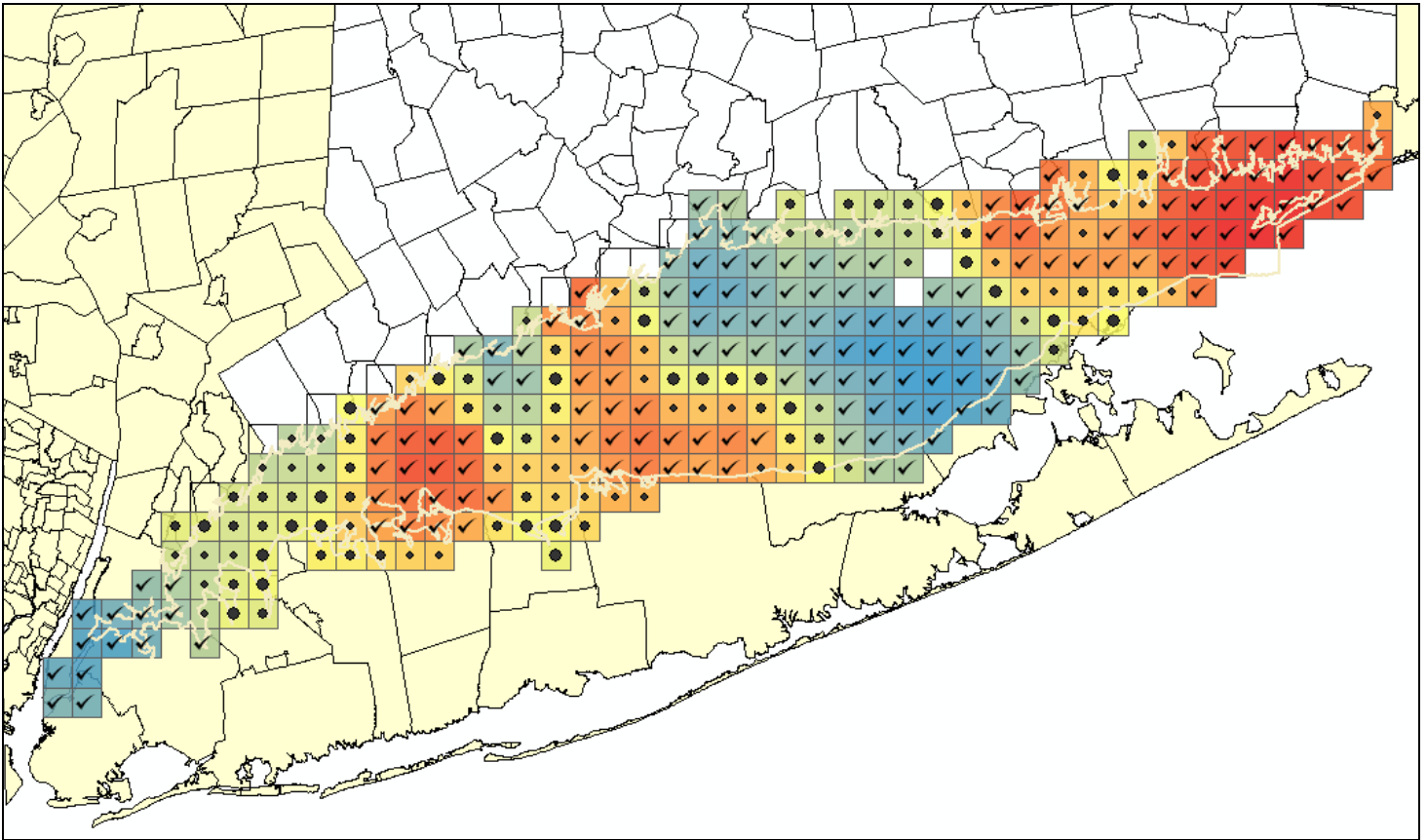# 2011 LIS Spatial Prioritization Survey Results - Summary

Figure 1: Hot Spot Analysis - Z & P Scores

Figure 1 (above) uses a multiple attribute scheme to simultaneously show Z-scores and P-values All Z-scores are color-graded blue to red (low negative "cold spots" to high positive "hot spots") and all P-values are symbol & size scaled (less than ~20% probability are check marks; other values are increasing larger dots by roughly 10% step increments.) Here, the data is not classified into any artificial grouping.

This approach gives some visual clues to prioritize (i.e., take every warm-colored cell with a check-box) but may not be rigorous enough to create meaningful zones. For example what threshold values should be applied and why? How warm is warm – what statistical measure is the cut-off? How probable is probable?

Another approach is to consider that all of the grid cells represent the total area of LIS, so if we ask to see Z-scores delineated by groupings of equal quantity, we are in effect asking to see the highest priority areas by increments of X%. Put another way, what's the highest priority % of LIS? Too few groupings (2 or 3; i.e., 50% or 33%) may not give enough granularity. Too many groupings (5 or 10; i.e., 20% or 10%) diminishes the benefit of clustering and cycles back to the original problem above. Therefore, a 4-bin approach seems to make the most sense and was used.

In **Figure 2** (below,) the top 25% = red, next 25% = orange, next 25% = green, last 25% = blue. Compared to the above graphic, the overall areas of importance are retained but codified into reasonable, manageable sections to work with.
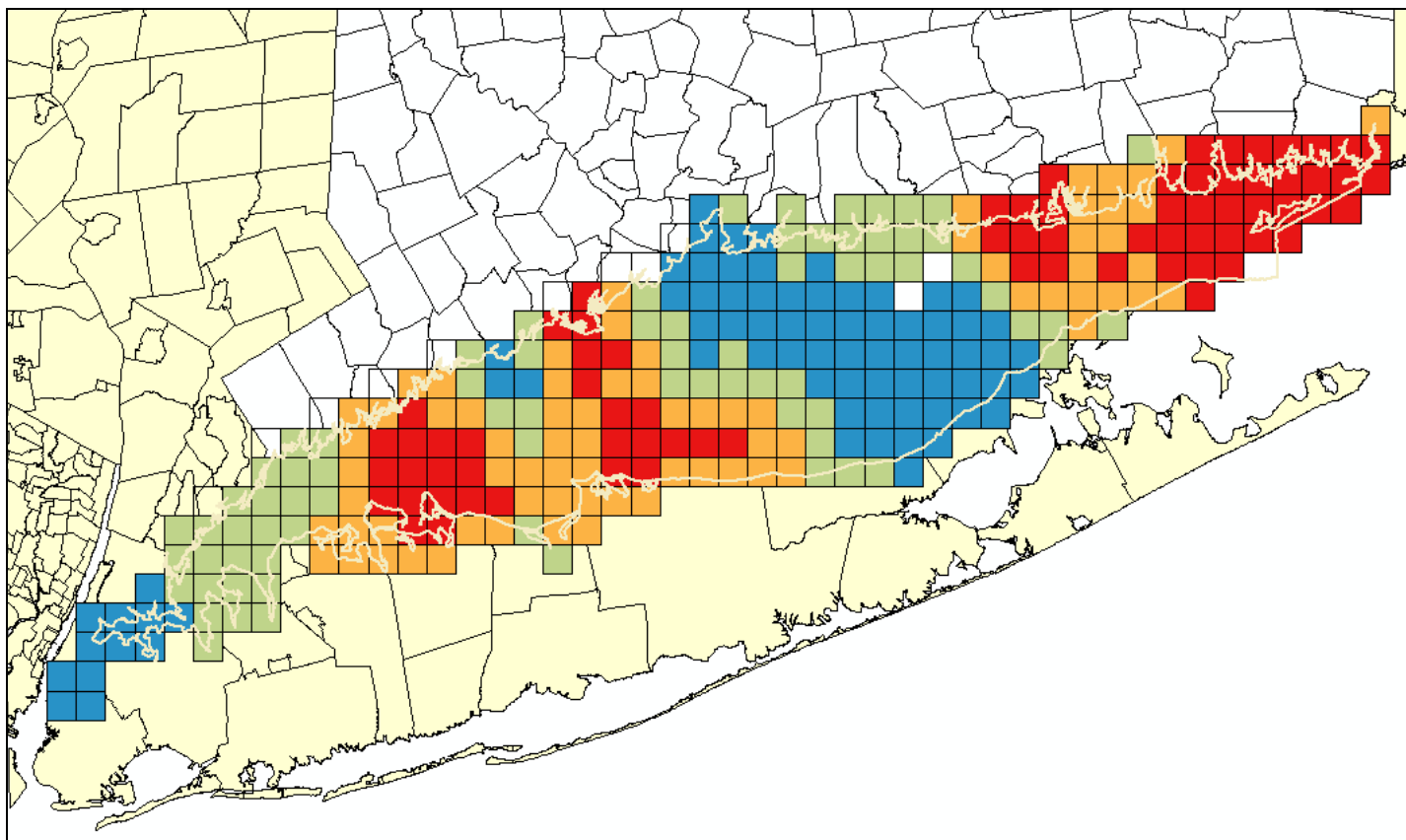
2011 LIS Spatial Prioritization Survey Results - Summary

Figure 2: Hot Spot 4-bin Quantile Analysis – Red cells represent high-priority areas.

3.1.5. Spatial Clustering Caveats:
- Hotspot approach susceptible to edge effects on the Area of Interest boundary where there are no surrounding data.
- Results are scale dependent based on size of the grid cell. Smaller or larger cells may have modified results.
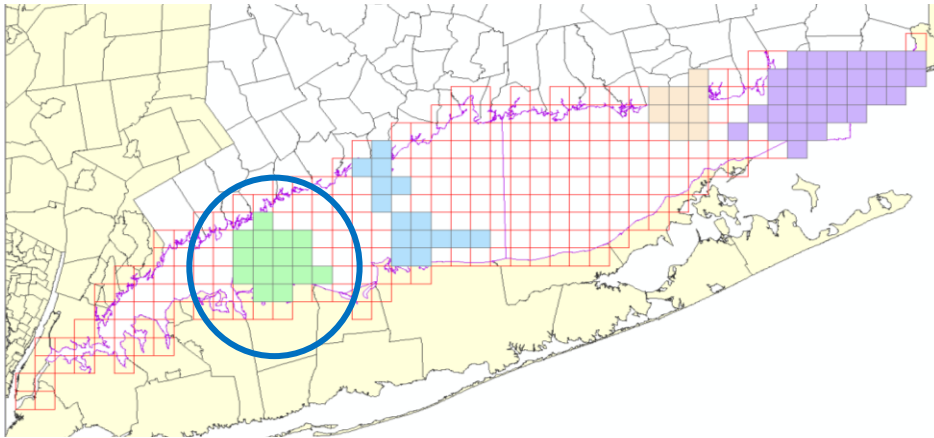- User input was unconstrained and input unequally allocated.

4.1 Conclusions and Priority Area Details:
The prioritization resulting from the statistical analysis and subsequent spatial processing can be used to define a set of locations in LIS considered as high-priority zones to focus mapping efforts on. Those zones are more completely analyzed in the following pages. As a general note the boundaries are simply taken from the grid and should not be considered absolute but somewhat fluid; the results of the analysis, however, indicate that the maximum level of interest is concentrated in these vicinities.

The zone analyses aim to characterize the top issues for the area and summarize the survey responses. Any issue that had less than 5% of the responses was omitted from the breakdown. The entry listed most frequently for each of the three criteria categories (#1, #2, #3) was marked as the top criteria response for a given issue. General comments were compiled and included as well.

2011 LIS Spatial Prioritization Survey Results - Summary

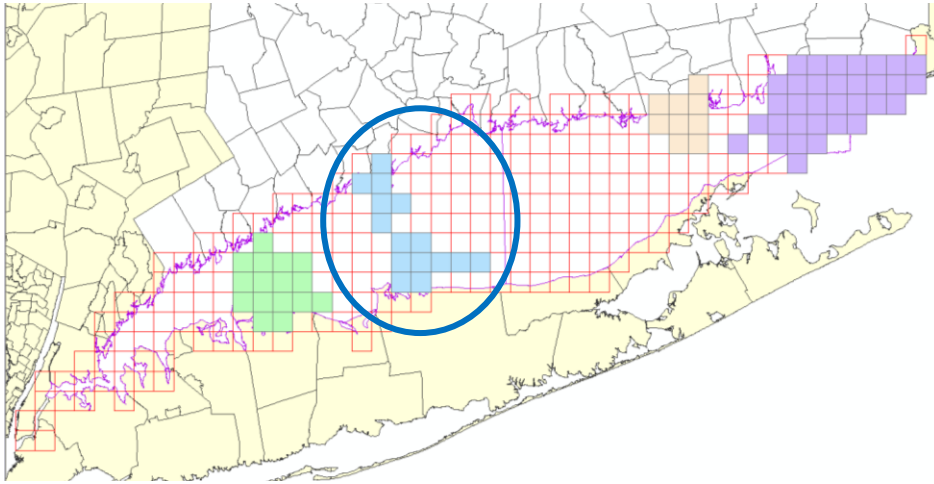## **Western LIS Area 1: (~ 89 square miles)**

Western LIS Area 1 Summary:

- CMSP, Monitoring/Research Design, & Regulatory are the top three issues in this area (71.4%)
- The predominant criteria across all issues involve knowledge gaps and significant natural areas. Other criteria suggest interest in use and infrastructure.
- Several comments point to the following specific needs/topics (infrastructure alternatives analysis, reefs, high topographic roughness/species, lobster/fisheries resources, scientific interest)

Issue Listed	# Responses	% Responses	Listed Criteria 1 (per results)	Comment / Description	Listed Criteria 2 (per results)	Listed Criteria 3 (per results)
CMSP	29	27.6%	*Knowledge Gaps*	*All NY waters in LIS*	*Multiple Use Conflict*	*Potential Infrastructure*
Monitoring / Research Design	25	23.8%	*Knowledge Gaps*	*areas of scientific interest; not enough info to subset further*	*Significant Natural Area*	*<none listed>*
				DEP Fisheries Trawl data holes. These are areas in which we clearly need more data and/or they are important ecologically and to any CMSP efforts that may emerge.		
Regulatory	21	20.0%	*Knowledge Gaps*	*Information needed to support alternative analyses, application review/evaluation relative to large scale energy infrastructure projects (cables, pipelines, etc.)*	*Potential Infrastructure*	*Existing Infrastructure*
Resource Management	15	14.3%	*Significant Natural Area*	*better, more refined data required to characterize/understand areas in vicinity of reefs/shoals to enhance management options, protective measures.*	*High Use Area*	*Knowledge Gaps*
				important lobster/fisheries resources		
				stewardship and SCFWH's (Significant coastal fish & wildlife habitats)		
Impact Assessment	14	13.3%	*Knowledge Gaps*	*High TRI values that are spatially rare in LIS and, based on preliminary empirical analyses, represent spatially rare habitats and associated assemblages of species.*	*Potential Infrastructure*	*Significant Natural Area*
Evaluate Management Success	1	1.0%				
Total	**105**	**100%**				

2011 LIS Spatial Prioritization Survey Results - Summary

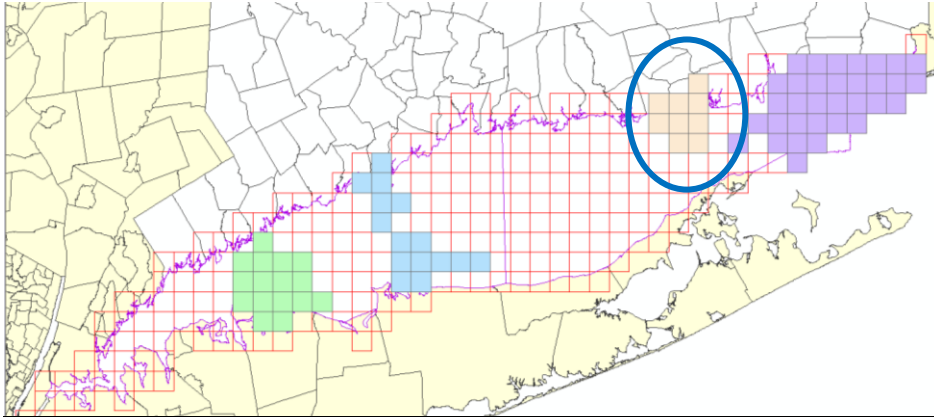## **Western LIS Area 2: (~80 square miles)**

Western LIS Area 2 Summary:

- Regulatory, CMSP, & Resource Management are the top three issues in this area (77.6%)
- The predominant criteria across all issues involve knowledge gaps and significant natural areas. Other criteria suggest interest in use and infrastructure.
- Several comments point to the following specific needs/topics (infrastructure alternatives analysis, sediment management, topo/bathy, reefs, high topographic roughness/species, lobster/fisheries resources)

Issue Listed	# Responses	% Responses	Listed Criteria 1 (per results)	Comment / Description	Listed Criteria 2 (per results)	Listed Criteria 3 (per results)
Regulatory	33	37.1%	*Knowledge Gap*	*Information needed to support alternative analyses, application review/evaluation relative to large scale energy*	*Potential Infrastructure*	*Existing Infrastructure*
				information needed to support nearshore sediment management disposal / beneficial reuse options		
				Areas of urban harbors/high land use development require detailed bathymetry/topography and sediment		
CMSP	20	22.5%	*Knowledge Gap*	*all NY waters in LIS*	*Multiple Use Conflicts*	*Potential Infrastructure*
Resource Management	16	18.0%	*Significant Natural Area*	*better, more refined data required to characterize/understand areas in vicinity of reefs/shoals to enhance*	*High Use Area*	*Knowledge Gaps*
				important lobster/fisheries resources		
				stewardship and SCFWH's (Significant coastal fish & wildlife habitats)		
Impact Assessment	13	14.6%	*Knowledge Gap*	*High TRI values that are spatially rare in LIS and, based on preliminary empirical analyses, represent spatially rare habitats and associated assemblages of species.*	*Potential Infrastructure*	*Significant Natural Area*
Monitoring/Research Design	7	7.9%	*Knowledge Gap*	*areas of scientific interest; not enough info to subset further*	*Significant Natural Area*	*<none listed>*
				DEP Fisheries Trawl data holes. These are areas in which we clearly need more data and/or they are important ecologically and to any CMSP efforts that may emerge.		
Total	***89***	***100%***				

2011 LIS Spatial Prioritization Survey Results - Summary
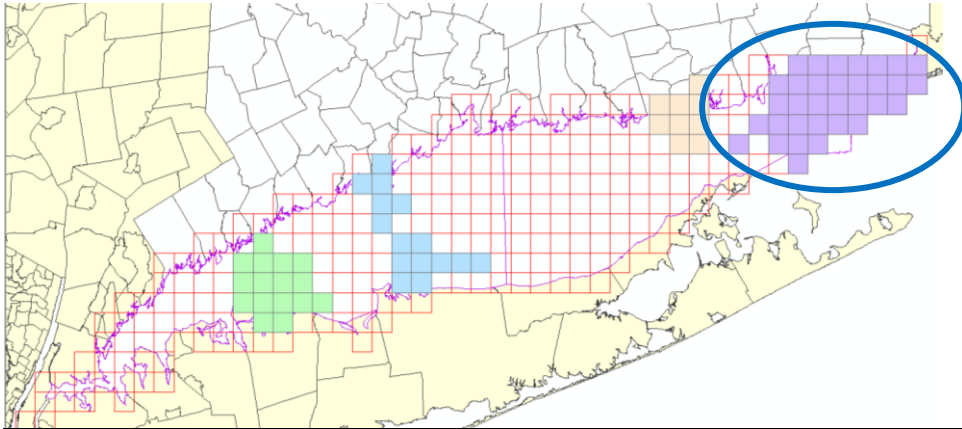
Eastern LIS Area 1: (~35 square miles)

Eastern LIS Area 1 Summary:

- Resource Management, Regulatory, & CMSP are the top three issues in this area (88.3%)
- The predominant criteria across all issues involve knowledge gaps and significant natural areas. Other criteria suggest interest in use and infrastructure.
- Several comments point to specific needs/topics (bathy/topo, sediment management, eelgrass, reefs, high topographic roughness/species)

Issue Listed	# Responses	% Responses	Listed Criteria 1 (per results)	Comment / Description	Listed Criteria 2 (per results)	Listed Criteria 3 (per results)
Resource Management	24	40.0%	Significant Natural Areas	*bathymetry/topography, sediment, species, WQ data needed to support eelgrass restoration*	Potential Infrastructure / Knowledge Gaps	Multiple Use Conflicts
				better, more refined data required to characterize/understand areas in vicinity of reefs/shoals to enhance management		
				Eelgrass is a priority habitat within TNC's Long Island Program		
Regulatory	23	38.3%	Knowledge Gaps	*information needed to support nearshore sediment management disposal / beneficial reuse options*	Multiple Use Conflicts	High Use Areas
				Nearshore areas (non urban harbors/high landuse development) also require detailed bathymetry/topography and sediment analysis (physical/chemical) to support water planning and standards, but at a lower priority level		
CMSP	6	10.0%	Significant Natural Areas	*TNC Priority sites. We are interested in obtaining a better depiction of the rocky hard bottom that include relatively high relief; more complete/current infaunal bottom data; fisheries information to supplement data gaps*	Multiple Use Conflicts	Potential Infrastructure
Impact Assessment	4	6.7%	Knowledge Gaps	*High TRI values that are spatially rare in LIS and, based on preliminary empirical analyses, represent spatially rare habitats and associated assemblages of species.*	Potential Infrastructure	Significant Natural Areas
Monitoring/Research Design	2	3.3%				
Evaluate Management Success	1	1.7%				
Total	**60**	**100%**				

2011 LIS Spatial Prioritization Survey Results - Summary

Eastern LIS Area 2: (~121 square miles)

Eastern LIS Area 2 Summary:

- Resource Management, Regulatory, and CMSP are the top three issues for this area (78.3%)
- The predominant criteria across all issues revolve around knowledge gaps, use, and significant natural areas. Other criteria suggest an interest in infrastructure.
- Several comments point to the following specific needs/topics (eelgrass, fisheries, topographic roughness/species, bathy/topo, sediment, reefs)

Issue Listed	# Responses	% Responses	Listed Criteria 1 (per results)	Comment / Description	Listed Criteria 2 (per results)	Listed Criteria 3 (per results)
Resource Management	64	30.9%	Significant Natural Area	bathymetry/topography, sediment, species, WQ data needed to support eelgrass restoration	Significant Natural Area	Knowledge Gap
				better, more refined data required to characterize/understand areas in vicinity of reefs/shoals to enhance management options, protective measures		
				Eelgrass is a priority habitat within TNC's Long Island Program		
Regulatory	55	26.6%	High Use Area	Fisher's Island Sound	Significant Natural Area	Existing Infrastructure
CMSP	43	20.8%	Knowledge Gap	all NY waters in LIS	Multiple Use Conflicts	Potential Infrastructure
Monitoring/Research Design	32	15.5%	Knowledge Gap	DEP Fisheries Trawl data holes. These are areas in which we clearly need more data and/or they are important ecologically and to any CMSP efforts that may emerge.	<none listed>	<none listed>
Impact Assessment	12	5.8%	Knowledge Gap	High TRI values that are spatially rare in LIS and, based on preliminary empirical analyses, represent spatially rare habitats and associated assemblages of species.	Potential Infrastructure	Significant Natural Area
Evaluate Management Success	1	0.5%				
Total	**207**	**100.0%**				

2011 LIS Spatial Prioritization Survey Results - Summary

Follow up Questions:

- What specifically is the knowledge gap for all NY waters in LIS?
- With respect to knowledge gaps for areas with high TRI values – what is the missing data? Do we need to further ID high TRI areas, refine the existing ones, or provide supplementary/ancillary info?
- What do we need to know more about regarding the use in Fisher's Island Sound?
- What is it about eelgrass as priority habitat area that requires mapping – any existing areas, or do we need to look for other potential areas?
- What is it about lobster fisheries as significant natural areas that requires mapping – any existing areas, or do we need to look for other potential areas?
- What is it about stewardship and SCFWH's (Significant coastal fish & wildlife habitats) as significant natural areas that requires mapping – any existing areas, or do we need to look for other potential areas?
- With respect to areas of scientific interest, can we be more specific on the nature of the interest, even if only by general classification (biologic, physical, etc.?)
- Are there specific use elements in these areas that should be focused on? Can be disregarded?
- Please review the existing data and products in the LIS Spatial Prioritization Portal (http://ccma.nos.noaa.gov/ecosystems/coastalocean/lis/msp_lis.html) to determine if any known datasets are missing. Bring data or references as to where the additional data can be requested.
- Given what has been shown thus far, can you identify an area or areas that would make a sensible location to implement a pilot project?