Science & Technical Advisory Committee
TEAMS Online Meeting
November 30, 2023 – Meeting Summary

In Attendance:
STAC Members: Jim Ammerman, Vincent Breslin, Chris Conroy, Sylvain De Guise, Melissa Duvall, Michele Golden, Dianne Greenfield, Jim Hagy, Shauna Kamath, Jason Krumholz, Darcy Lonsdale, Kamazima Lwiza (New York Co-chair), Robin Miller, Jim O'Donnell, Evelyn Powers, Paul Stacey, Kelly Streich, Mark Tedesco, Jamie Vaudrey, Penny Vlahos (Connecticut Co-chair), Nils Volkenborn, Laura Wehrmann, Michael Whitney, Emily Wilson

CAC Liaisons to STAC: Sarah Crosby (The Maritime Aquarium), Mickey Weiss (Project Oceanology)

Others: Samantha Apgar (USFWS), Zosia Baumann (U Conn), Robert Burg (LISS/NEIWPCC), Finnian Cashel (EPA), Margaret Cozens (U Conn), Emma Cross (SCSU), Holly Drinkuth (CAC/TNC), Christopher Eagler (NYSDEC), Lillit Genovesi (NYSG), Alison Kocek (USFWS), Beth Lawrence (U Conn), Dave Lipsky (ret), Bill Lucey (STS), Luis Medina (Stony Brook U), Esther Nelson (EPA), Katie O'Brien-Clayton (CTDEEP), Kayla Mladinich Poole (U Conn), Roy Price (Stony Brook U), Matthew Pruden (Cornell), Kaylan Randolph (U Conn), Emlyn Resetarits, Leonel Romero (U Conn), Luciana Santoferrara (Hofstra), Judith Sarkodee-Adoo (NYCDEP), Rebecca Shuford (NYSG), Nancy Seligson (CAC), Youngmi Shin (EPA ORISE), Lane Smith (NYSG), Cayla Sullivan (EPA), Elizabeth Suter (Molloy U), Nikki Tachiki (EPA), Gregory Wilkerson (NYCDEP), Kimarie Yap (IEC)

Introductions, Updates: Penny Vlahos, UConn (STAC CT Co-Chair)
Penny Vlahos welcomed everyone one to the last STAC meeting of the year. Penny mentioned that the meeting was divided into two parts, presentations from LISS-funded projects and other presentations from new investigators. She reminded speakers to stay on time and focus on the results of their projects. She also noted that the joint CAC/STAC meeting in September was "wonderful" in her words and wanted to thank Nancy Seligson, Holly Drinkuth, and the entire CAC for their efforts in organizing the meeting. She suggested having such a joint meeting every year. She suggested responses to that suggestion should be put in the chat. Penny also mentioned the CAC trip to Washington, DC, which she attended. She noted that they talked to several Senators and Congressmen and that the STAC should stay informed about such trips. Nancy Seligson added her thanks for the STAC participation in both the joint meeting and the trip to Washington. She said that STAC participation in the trip was important, and she also agreed that the joint CAC/STAC meetings should continue. Holly Drinkuth and Kamazima Lwiza agreed and Kamazima thanked Nancy and Holly for their important contributions to the CCMP revision. Penny reminded all STAC members to consider joining the Washington trip next year as it is both educational and important to the LISS. Jim Ammerman concurred on the importance of the meeting with elected officials in Washington, which he has done in the past.

Program Updates and Revision of LISS CCMP: Mark Tedesco, EPA
Mark added his thanks for the success of the joint CAC/STAC meeting as well as STAC participation in the October Management meeting which focused on budget issues as well as the CCMP revision. He noted that the LISS was doing a complete revision of the CCMP by the end of 2024 and invited STAC members to participate in writing teams, noting that they will receive email invitations to join these teams. Mark said that Nikki Tachiki was leading a Revision Oversight Group (ROG) which has been meeting regularly to outline the new CCMP, including the Vision and Mission Statements and Goals. Within each Theme (or Goal), the most important components are the Objectives (formerly Ecosystem Targets) and Action Plans. These will be the focus of the writing teams for the next months before the plan is released for public review. He noted that the plan is the blueprint for the next ten years and that each Objective will follow the SMARTIE structure-Specific, Measurable, Achievable, Relevant, Time-Bound, Inclusive, and Equitable.

Discussion:
-Paul Stacey asked about the opportunities for Management Conference, STAC, and public input during the writing process. Mark replied that the writing teams will develop detailed material for internal review by normal processes including work groups, the STAC, etc. Public input will come from listening sessions in the spring with input provided before the plan is completed followed by a formal public input process in the summer and fall after a draft of the plan is completed. Each comment and response will need to be formally documented. In addition to regular Management Conference review, the new CCMP must meet EPA requirement and undergo state and EPA approval processes. Mark also introduced Youngmi Shin, the new EPA ORISE Fellow, and noted that Melissa Duvall will be describing her planned work later in the meeting.

Quantifying How Experimental Sediment Addition Alters Plant, Water Chemistry, and Greenhouse Gas Responses Across Connecticut Salt Marshes: Beth Lawrence, UConn
Since 2021, Beth has been working with her team on how experimental thin layer sediment placement on submerging marshes alters the parameters listed above. The project is still a work in progress, but she will share currently available information. Southern New England salt marshes and the ecosystem services that they provide like carbon sequestration, nitrogen removal, and habitat, are being “squeezed” between rising sea levels and developed shorelines. A potential medium-term management solution is adding sediment to submerging marshes, referred to as thin-layer placement. Adding sediment increases elevation, decreases inundation frequency, reduces phytotoxins like sulfides, and improves plant growth. Beneficial use of dredged material can promote salt marsh restoration and ultimately coastal resilience.

Early experiments with sediment additions of different depths showed that plant grew quickly through low sediment additions (5-7 cm) but took several years to grow through medium to high additions (10-20 cm), the results of the various additions converging after about four years. After demonstrating clear effects of varying sediment depth additions, they developed an experiment to examine different sediment textures. The experiments started in the spring of 2021 and were

focused on three Connecticut locations going from west to east, Great Meadows Marsh in Stratford, Sluice Creek in Guilford, and Bride Brook in East Lyme. The western Sound tidal range of about 2 m is double the range in the eastern Sound. In each of the three sites they set up experiments in both low marsh and high marsh habitats with five different sediment texture treatments, control, silt-loam dredge, loam, sand, and cobble, representing the different types of sediment available across LIS. This totaled 150 treatment plots each with about 7 cm of sediment added and was a lot of work involving many volunteers.

Monitoring from 2021 through 2023 included numerous parameters for vegetation, greenhouse gas emissions and porewater concentrations, porewater chemistry, and other measurements including crab activity, water level, and LiDAR elevation. In year 1, plant growth in the unamended sediments was three times that of the amended ones. Year 2 had more above ground growth in the high marsh compared with the low marsh. There was also differential growth of plants by habitat, site, and treatment. For example, above ground biomass increased over the control at Sluice Creek and Bride Brook but decreased at Great Meadows. There also appears to be a relationship between growth and the number of crab burrows, with an increase in growth with increasing crab burrows up to a threshold where further increases in the number of burrows leads to a decline in growth in some treatments. Preliminary greenhouse gas emission measurements show higher methane fluxes at Bride Brook, which is poorly flushed, and in low marsh as opposed to high marsh. Nitrous oxide emissions were highest in the dredge texture treatments, perhaps because of a high nitrogen content, and in the high marsh which is more aerated and oxidized. Preliminary greenhouse gas conclusions suggest that sediment texture does not affect carbon fluxes, but nitrous oxide emissions may increase with high nitrogen sediment additions. Sediment additions to submerging marshes may decrease methane fluxes but increase nitrous oxide fluxes.

Beth's group is working with federal and state partners to help assess management scale thin layer placement (TLP), which occurred in 2022 in at Great Meadows and undergoing permitting at the other two sites. They will therefore have both pre- and post-management scale data at Great Meadows and several years of pre-TLP data at the other two. Project outreach activities include an interactive case study developed with a high school master teacher and including hands-on experiments, video, and data interpretation and prediction, all of which meet next generation science standards. Finally, the project has trained high school, undergraduate, and graduate students, communicated findings to diverse audiences, and leveraged the funding to support further studies.

Discussion:

-Sarah Crosby asked about below ground biomass and Beth replied that additional funding from Connecticut Sea Grant will allow them to continue monitoring in Years 4 and 5 (2024 and 2025) and that they were trying to limit the number of core samples needed. Therefore, they have core samples from Years 1 and 3, Year 1 had little below ground biomass and Year 3 is still being analyzed. Beth concluded by noting that these plots take a couple of years to come into

equilibrium and so the additional monitoring period will be very valuable.

Establishing Robust Bioindicators of Microplastics in Long Island Sound: Implications for Reliable Estimates of Concentration Distribution and Impacts: Kayla Mladinich Poole, UConn
Kayla started by summarizing the sources of plastics in the ocean as well as some of the impacts. In this presentation she is focused on microplastics, those weathered particles less than 5 mm in size and how they interact with marine biota. She focused on microplastics as particles and their interactions with suspension feeders as they feed. Bivalves have been suggested as good model organisms because they have been used to monitor other dissolved pollutants for a long time. A good microplastics bioindicator organism should be abundant, be easy to collect, be an indiscriminate suspension feeder, and therefore reflect the size, shape, and polymers found in the environment. However, bivalve mollusks are not indiscriminate suspension feeders and can select the particles that they will ingest or reject.

In addition to the bivalve mollusks, oysters and mussels, Kayla also considered the Slipper snail (*Crepidula fornicata*, a gastropod mollusk) and the Sea grape (Molgula manhattensis, a tunicate) as potential bioindicator species because they meet most of the criteria listed above. She started by discussing suspension feeding mechanisms. Oysters are the most selective, they draw particles in and capture them on their gill filaments but have several mechanisms for rejecting as pseudofeces any particles that they do not want to ingest. Slipper snails have similar digestive systems but tend to reject particles in bulk and only when they are in excess. Sea grapes have the simplest linear digestive systems but are also capable of bulk rejection if particles are too large or too abundant. Kayla then fed each of the animals with a variety of different microplastic polymers of different lengths and as well as microbeads of different polymers and diameters. All were aged for three days to allow biofilm development, and none were fed to the animals at high concentrations which could trigger bulk rejection.

Animals were exposed to microplastics by additions of particles to the beaker containing them every twenty minutes for a total of two hours followed by an additional hour of time to allow for particle rejection. Food was also provided every other time that plastics were added. Feces and pseudofeces in each container were distinguished with a dissecting microscope, centrifuged, and washed with distilled water, and digested with NaOH, which did not damage the microplastics, which were then counted under the microscope. In oysters, pseudofeces rejected and feces egested within three hours (not undergoing full digestion) showed no significant differences among three different nylon fiber lengths. With polyester fibers, longer fibers were rejected in higher proportions in the pseudofeces, but the proportion egested in feces within three hours showed no difference with fiber length. Mussels showed no differences in pseudofeces rejection with nylon fiber length but retained more long fibers in feces (less egestion). The rejection and egestion patterns with polyester fibers in mussels were the same as in oysters, though the mussels rejected significantly fewer particles overall. Oysters always reject and egest a higher proportion of microplastics than mussels regardless of the type of fiber or bead polymer. Slipper snails rejected and egested higher proportions of longer nylon fibers but not of polyester fibers. Sea grapes rejected and egested the longest nylon fibers more than the shortest fibers, but all

the rejection rates were less than 20%, less than any other species tested. No polyester fibers were rejected by the sea grapes, though longer fibers were egested in higher proportions. Slipper snails and sea grapes both retained all short fibers and small beads ingested, whether nylon or polyester. Egestion of fibers and beads was not different between the two species or types of polymers, but the egestion of the beads was much lower overall.

In conclusion, size matters, the longer fibers were more frequently rejected, especially the nylon ones. There were no polymer preferences for small fibers and beads. Oysters were more selective than mussels, and slipper snails were more selective than previously thought. No species studied ingested all the particles encountered, all species egested a proportion of microplastics quickly. Oysters were the most selective and sea grapes ingested the widest variety of particles less than 100 um in size. Kayla would not suggest using any of the species as a microplastics bioindicator. The lab has also collected each species at three sites in LIS and compared the microplastics with those in the water and sediments. Her studies showed less than four microplastic particles in ten liters of water and other studies found less than eight particles in oysters and a review showed less than ten particles in bivalve tissues with proper QA/QC procedures.

Constraining Models of Metabolism and Ventilation of Bottom Water in Long Island Sound Using Oxygen Isotopes: Jim O'Donnell, UConn

Jim discussed some of the results from a project conducted with Craig Tobias (lead PI) and Mark Altabet on a model of the Oxygen-18 (O-18) distributions in Long Island Sound. Biological and gas exchange processes in the Sound favor the lighter isotope resulting in isotope fractionation. This can be used to constrain the uncertainty in the rates of both respiration and turbulent mixing, this uncertainty has made it difficult to understand the LIS oxygen budget. The focus area of this study is the area of the western Sound between the Execution Rocks (EXRX) and the Western Long Island Sound buoys. This is an area of frequent hypoxia beginning in July and running through late August during most summers, though it is variable from year to year.

Jim showed a one-dimensional model for the distribution of oxygen in western LIS. Past studies with this model have suggested that in summer when hypoxia is prevalent, horizontal transport is weak compared to vertical transport and respiration rates. He showed in this vertical structure model how the O-18 ratio is influenced by production, respiration, and mixing. The surface lighted layer has biological production which produces oxygen and decreases the O-18 value. Below the surface lighted layer is a dark layer which has no production but does have respiration and therefore a different O-18 fractionation factor. He went through the model equations in detail with a focus on the poorly understood parameters, production, respiration, turbulent eddy diffusivity, the oxygen exchange coefficient between the water and the sediment, and the exchange coefficient between the air and the surface water.

He then chose benthic and water column respiration rate data from the sparse LIS literature and compared it with the model. Production was estimated from daily light values in the western Sound without clouds so that it was a maximum value but was consistent with available data. Vertical eddy diffusion was also simulated from temperature, salinity, winds, and currents, and

compared to in situ ship and buoy measurements. Diffusion was highest at the surface and bottom of the water column and lowest in the middle. With large vertical gradients these equations must be solved at high resolution. Jim used the Crank Nicholson method to solve them, this method is very fast, but the results are complex and must be checked. He developed analytical solutions for simple cases with uniform initial conditions which were then allowed to attain a steady state which was compared to the numerical solution. Adjustment to a periodic steady state took five days at the surface and fifteen days at the bottom.

Using his best estimates of the parameters, Jim concluded that the oxygen budget is as follows. Most of the oxygen produced by photosynthesis is respired in the water column. A smaller amount is lost to the atmosphere and a very small amount is used by the sediments. He then showed graphs of oxygen concentrations versus delta O-18 (the amount of fractionation) for two different late summer cruises. The measured values, with some scatter, largely tracked the model values over the entire range of oxygen concentrations from near zero to almost 350 umoles/liter. Jim varied the parameters to study the effects, halving or doubling the production gave a poorer fit to the model and did not change the oxygen demand of the sediment. Increasing the vertical mixing by a factor of five or ten increased the sediment oxygen demand but the model became inconsistent with the measured oxygen and O-18 data. The results of this parameter sensitivity work suggest that physical vertical mixing is more important than benthic respiration and the model was insensitive to phytoplankton deposition in late summer.

Discussion:
-Jim Ammerman asked Jim to mention the CIRCA Resilient Connecticut Conference scheduled for December 1 at the U Conn School of Law in Hartford. It will summarize a four-year effort to improve Connecticut's resiliency to climate change and is already oversubscribed. It will summarize two large projects, one near the shore at Fair Haven, and another inland in Danbury.
-Leonel Romero said that the one-dimensional model did not include waves, and asked whether waves would be added? Jim replied that waves do contribute to the surface vertical eddy diffusivity in the model that he showed, which is predicted to increase in September and October. This issue needs to be better addressed in models than it currently is, but it has been overshadowed by the uncertainty in respiration rates until recently. Mixing has been a key failure in past LIS water quality models.
-Robin Miller and Kamazima Lwiza asked about the contribution of benthic respiration to oxygen demand in late winter and spring for the onset of the summer conditions, the past assumption has been about 20%. Jim replied that during hypoxic period shown in the model it was probably less than 20%, though the rate could have been higher during the transition from oxygenated to hypoxic earlier in the summer. Jim also mentioned the 2022 Masters' thesis by Mudahy pertaining to water column respiration rates and that Greg Tobias has the benthic respiration rate data.

New Investigator Presentation-Coastal Physical Oceanography: Leonel Romero, UConn
Leonel introduced himself and noted that his early research was on surface wave dynamics and air-sea interactions, and more recently he has branched out into coastal processes such as

dilution and dispersion from small coastal streams. Most of his studies include both observations and numerical models, such as ROMS, which he believes is the most powerful approach. Another study used a dye patch in the Gulf of Mexico to demonstrate Langmuir circulation driven by winds and waves. Langmuir circulation can mix the upper ocean more deeply than just winds and waves alone.

Leonel noted that air-sea interactions were one of his greatest interests, breaking waves produce sea spray, bubbles, and turbulence. These in turn drive heat flux, gas exchange, and mixing. This mixing, along with the mixing of Langmuir circulation, ultimately drives ocean currents. He has also studied wave-current interactions, how currents affect waves and how waves affect currents. He is also interested in models of breaking waves and predicting when waves will break as well as bubble and aerosol-mediated CO_2 transfer from breaking waves.

Leonel discussed observational and numerical methods that he will use to contribute to LIS research. With improved technology, observational methods are now more widely available to a diverse group of investigators. The UConn Department of Marine Science has recently acquired a Wave Powered Wirewalker Vertical Profiler through the efforts of Leonel and his colleague Cara Manning. It can measure many physical and water quality parameters and has advantages over both shipboard and moored instruments. It needs a research vessel with a crane or A-frame for deployment, which can be either moored or free-drifting. Battery replacements are needed every two weeks but can be made from small boats. Profiling speeds are about ten meters per minute and only small waves are needed to power the profiler. Another current project is development of a Portable Airborne Mapping System (PAMS), a drone coupled with both LiDAR and imagery measures wave-current interactions. His lab is also set up to run the model WaveWatchIII coupled with the Regional Ocean Modeling System (ROMS).

Addressing questions important to LIS and the LISS, Leonel suggested that the WireWalker could contribute to a better understanding of hypoxia through deployments in embayments during critical periods. He also asked about the importance of wave-current interactions for circulation and surge in LIS as well as for controlling bottom water oxygen levels. A more detailed wave model could contribute to the model Jim O'Donnell described earlier. He finished by inviting collaboration and questions.

Discussion:
-Nancy Seligson asked how the WireWalker works. Leonel replied that you can anchor it at the bottom or let it free drift. Small waves are sufficient to power it, but heavy seas are even better.

LISS Water Quality Modeling: Melissa Duvall, EPA
Melissa said that she would provide an overview of LISS water quality modeling including the major regional model currently in development to better inform program partners. She began by showing three major nitrogen sources which demonstrate the long-term decline in nitrogen loading to LIS, wastewater treatment plants, major tributaries, and atmospheric deposition. This reduced loading has led to a decrease in bottom water hypoxia throughout the Sound, except for

an increase in hypoxia in the far western Sound in recent years. Improvements in hypoxia have largely been at the eastern end of the hypoxic zone. Hypoxia remains an issue both in the open waters and numerous embayments around the Sound.

Current reductions in nitrogen loading because of the 2000 TMDL have been largely achieved through $2.5 billion in NY and CT treatment plant upgrades which have reduced nitrogen loading by 60% or 49 million pounds annually. This raises questions about the focus of nitrogen reduction strategies for a new TMDL, such as further treatment plant upgrades versus a focus on non-point sources. This leads to the need for the development of models to inform both regulatory actions and other management decisions. Models can address: 1. Spatiotemporal changes in water quality associated with reduced nitrogen loading, 2. Effects on water quality of current changes in nutrient loading and climate, 3. Water quality standards needed to protect or restore aquatic species, and 4. Effects of water quality on ecosystem services. The current modeling framework includes watershed and groundwater nutrient loads which will be incorporated into coastal embayment models and the regional coastal model. Access to these models will be facilitated by a graphic user interface and a decision support tool.

Development of the regional coastal model stems from a multimillion-dollar cooperative agreement between EPA and the New York City Department of Environmental Protection (NYCDEP). It is a coupled three-dimensional hydrodynamic-biogeochemical model developed using ROMS-RCA. It will simulate changes in LIS water quality resulting from management-driven changes in nitrogen loading. The model is currently being developed and calibrated by the contractor, HDR, and once completed will be hosted on EPA's high-performance computing cluster *(Atmos).* This will facilitate implementing code changes, updating forcing files, changing model parameters, coupling ROMS with other biogeochemical models, and running coupled nutrient and climate change scenarios. Simulated climate change model projections will use downscaled information from Phase 6 of the Climate Model Intercomparison Project (CMIP6) under different IPCC climate scenarios.

Hydrodynamic models often use a delta method to simulate future conditions, adding the projected change in various parameters, such as air temperatures, to the historical trends. However, this method does not work or parameters like riverine discharge, which is very important to nutrient loading. This information is not available from global climate models, so an empirical model for discharge is currently being developed for varying temperature and rainfall conditions. Once this model is trained for current conditions it can be adjusted for future changes in freshwater forcing. She showed a figure from a recent paper, Zhao et al., 2023, suggesting that both the time period and IPCC scenario selected were both very important in predicting future nitrogen loading.

Melissa then briefly commented on the user interface and decision support tool. The user interface will allow any individuals to visualize, analyze, and download existing model output stored in a database and allow some individuals to run new model scenarios with a focus on changes in nutrient loading. The model code will also be publicly available to be run on other

computing clusters. These multiple levels of interaction with the model will allow others to collaborate on the project. She also showed an example of the user interface which will allow users to examine model output, compare it with data, and conduct other analyses.

Another component of the regional modeling effort is living resource models for eelgrass, oysters, and sugar kelp. These models may be coupled with the main ROMS-RCA model or with nested embayment models. These modeling efforts will start in the next year and can potentially inform future restoration efforts. Melissa also mentioned a NEIWPCC study with its own TAC driven by the LISS Habitat workgroup which reviewed LMR models in Fall 2022. She concluded by describing other data-driven models currently under development, in addition to the regional mechanistic model. These include a generalized additive model (GAM) to forecast oxygen in LIS under changing nitrogen loading and climate conditions. This combination of mechanistic and empirical models should enable an ensemble model approach to important management issues. She concluded by showing a slide of the future modeling framework with the impacts of variations in watershed and groundwater nitrogen loads as well as climate change addressed by a variety of different models in LIS.

Discussion:
-Nancy Seligson asked about the time frame for the regional model. Melissa replied that the ROMS hydrodynamic calibration is mostly complete, and the biogeochemical modeling was currently being calibrated. She hopes that the model will be available to access from EPA computers by this spring or summer.
-Kamazima Lwiza said that making the model code available to the public was a great idea. He asked about presentation slide 11, why no watershed was indicated on Long Island. Melissa responded that the watersheds shown were sub-basins downscaled from global climate models and are still under development.

Discussion of Strategies for Improving LISS Research Applications to Management: Mark Tedesco, EPA; Jim Ammerman, LISS/NEIWPCC; Sylvain De Guise, CT Sea Grant, Becky Shuford, NY Sea Grant
Mark began saying that this was meant to be a general discussion about improving the connection of research to management as we look forward to the next research proposal cycle. It will not get into the specifics of the RFP, but rather how we can we help the research community better address “actionable science” which can be applied to management.

Jim Ammerman noted that the next LISS RFP run by CT and NY Sea Grants will be conducted in the spring of 2024. Improving the connection between research and management has become a perennial issue. We are looking to support actionable research for which one prominent model is the National Estuarine Research Reserve’s (NERR’s) Science Collaborative. The research topic areas also must reflect the current 2015 CCMP, as the new CCMP as discussed earlier, will not be in place before 2025. Applicants must explicitly address specific themes and Ecosystem Targets (or Objectives). There is a Science Needs document on the LISS website which is organized by Ecosystem Targets and lists many specific research needs, though it is by no means complete or

exclusive. The LISS defines research as natural or social science efforts with explicit and testable hypotheses to answer "how" and "why" questions. Jim then reviewed the specific components of the previous RFP released in 2022 and stated that the 2024 RFP was likely to be similar.

While the NERR Science Collaborative's model is probably beyond the scope of what the LISS needs, we nonetheless want to better connect researchers with potential end users. There is a very wide range of potential end users, public agencies, private businesses, non-profit organizations, the LISS, and many others. Proposers must explicitly identify the end users in their proposals and the research results that can be applied to specific coastal management issues. The research project on thin layer sediment placement on submerging marshes discussed earlier in this meeting is a good example of a project of potential importance to several end users. Previous LISS RFP's have had mixed results in engaging end users and addressing important management needs and we need better methods for pairing researchers with end users. LISS and Sea Grant staffs can help researchers to make these connections, but we also need end users to develop additional research needs that are important to their management efforts. Jim concluded his presentation with the question of how can the LISS help potential investigators to develop the partnerships needed to produce successful collaborative research projects? In addition, at what state of the proposal process, pre-proposal, full-proposal, or other, would this assistance be most useful?

Discussion:

-Sylvain de Guise added that the Sea Grant programs are used to competing research funds and do it with their own research program as well as with LISS funds. He emphasized that their review process includes outside experts who participate in review panels. The are often from outside the Long Island Sound area and are not familiar with the LISS CCMP so it is important for proposers to make their hypotheses clear and explicit as well as explicitly supporting management goals. Proposals that are not funded usually have not convinced the review panel that they have sufficiently addressed the above criteria. During the last round of proposal review, not all the available research funds were awarded because the review panel did not find enough quality proposals. Proposers should not expect an easier review process because of the regional nature of the LISS, the process is as rigorous as National Science Foundation (NSF) or National Institutes of Health (NIH) review.

-Becky Shuford added that she agreed with Sylvain and noted that the proposers should be specific about how the end users would use the research results.

-Lane Smith suggested that new or junior researchers who may not be familiar with potential end users should reach out to Sea Grant staff and senior researchers who could help them to find appropriate management partners. (The LISS can also provide contact information.)

-Paul Stacey added that this is a timely discussion as he has been arguing for improved research to management connections for a long time. He noted that the LISS has supported a lot of quality research but its publication record and application to management has been substandard. He suggested that some of the research and modeling is just repeating what has been done before and that a better partnership must be developed between researchers and managers. He suggested a group be assembled to examine the findings and actionable recommendations of

each research project upon completion. The LISS needs basic and applied research and monitoring and must apply that information to adaptive management. Paul said that the LISS has done no adaptive management since the TMDL and needs to set the direction going forward.
-Mathew Pruden said that he wanted to echo Lane Smith's suggestions. He has colleagues who are challenged in both finding the appropriate agencies to address as well as learning about their research needs. This is especially true because of the many agencies involved with the LISS. He suggested listing the agencies involved alongside the objectives and strategies in the CCMP.
-Mark Tedesco added that this discussion was focused on how we can help new investigators who don't have the established contacts of more experienced investigators make the contacts they need to establish partnerships with managers. He reiterated what Lane and Mathew said about investigators reaching out for assistance and doing it early in the process, before developing pre-proposals. Since the LISS includes an additional requirement for naming end users in the proposal, the program does not want to unfairly favor senior investigators who already have the needed connections. The LISS also has full confidence in the Sea Grant review process and the review panels that they convene. The LISS wants to continue to increase collaboration and communication and the presentations from previous research projects earlier in this meeting are just part of this effort.
-Becky Shuford mentioned that the LISS website lists memberships in working groups and advisory committees which can provide additional contacts.
-Penny Vlahos added that most investigators know who their potential end users would be but refrain from cold calling. Anyone who can provide an introduction for a new investigator, even if just a cc: on an email, can make a big difference.
-Jim O'Donnell said that he disagreed with Paul that the research program has been failing in any way. He thinks that it has made substantial progress in justifying the regulations that have been imposed on people in NY and CT, including the billions of dollars spent on upgrading sewage treatment plants. In terms of how to get effective applied research completed, the LISS should take responsibility to articulate what is needed in a systematic way. He gave the example of the past focus on respiration rates in several research projects to better under the variability in respiration rates and better contribute to the new models. As a senior researcher he also said that that the best way to get more involved with the LISS is to attend a lot of meetings, particularly those of the work groups where current issues are discussed. Most of them are staffed by state agency people and few academics participate.
-Paul was asked by Kamazima to respond and said he still believes that much of the research is not forward looking. The LISS has paid little attention to the watershed and needs to do more. Paul said that Jim was right about the LISS doing a good job in the past but is keeping researchers and the public guessing on where it is going in the future. Current implementation actions are out of date and current modeling efforts are repeating the past.
-Penny Vlahos thanked everyone for presenting and participating in a very interesting meeting with lots of good discussions. Kamazima Lwiza added his thanks and said that one end user group not represented on the LISS website was Environment Justice (EJ) communities. He said that people interested in working with EJ communities should inquire further with NY and CT Sea Grant or the LISS. Penny added that after these discussions everyone should now be thinking

about their hypothesis-driven research proposals in response to the needs of end users which the LISS will help you to contact. She also requested ideas for the next meeting.