LISS Science and Technical Advisory Committee Meeting
Room 132, University of Connecticut – Stamford Campus
Wednesday, April 2, 2003

Meeting called to order at 10:15am by Yarish.

Hans Dam moved to make a change to the April 2, 2003 LISS STAC agenda to discuss the budget prior to the review of the budget proposals under discussion. Larry Swanson seconded the move to postpone until the budget was discussed and the motion was passed.

John St. John stated that some proposals were programmatic and not technical. Jim O'Donnell concurred, and suggested that there seemed to be two competitions for science proposals. Mark Tedesco stated that at the last Management Committee (MC) meeting, all of the proposals were discussed, and a subset was presented to the Science and Technical Advisory Committee (STAC) for review (Attachment A). The members of the MC felt that the technical proposals needed to be reviewed by the STAC. This allows for a double review of the technical proposals. The technical proposals are meant to address the priorities of the program, but the review by the STAC will allow determination of whether the proposals demonstrate that the research would be of value to the priorities of the CCMP. Jack Mattice and Dam suggested that the STAC should rate rather than rank the proposals, however the committee agreed to use the format already proposed.

Action 1: Ranking will be postponed until after the budget discussion. The programmatic proposals will be separated from the technical proposals and then the proposals will be rated and presented by the fellows.

1. STAC Subcommittee Reports

   a. *Eutrophication*
   Dam gave a brief summary of action items from the Feb. 28, 2003 meeting (Attachment B). The STAC briefly discussed the five proposed ranking criteria suggested by the Eutrophication Subcommittee followed, and how it differs from the criteria that were sent out. Mattice suggested that we should be focusing efforts on the five criteria. Duty of the management committee should be to evaluate its relevance to the goals of the CCMP, and the STAC should provide a technical review of each proposal and evaluate its relevance to furthering the scientific goals of the LISS. While some proposals may be interesting science, they may not add to our understanding and needs for LISS goals. Yarish reiterated that it will be important for the subcommittees to provide recommendations on needed research to develop the research budget.

   b. *Food Web*
   Latimer gave a brief summary of the Mar. 5, 2003 meeting (Attachment C). He handed out amended minutes from the April 1, 2003 conference call that focused on the Food Web Charter that further elaborates the Charge, Long-term Goal, Methods, Frequency of the Meetings, and update of the membership of the committee (Attachment D). Action items included extending an invitation to the Chesapeake

Bay researchers for food web insight, assess proposals for research and identify high priority areas. Subcommittee recommended working with the CT SAV team.

c. *Updates*

i. SAV Subcommittee
Latimer reported that few people were able to make the conference call. SAV subcommittee members suggested that the focus of the committee to be Sound wide. Tedesco related a suggestion from Robert Armstrong that the SAV and Eutrophication committees should work together given the overlap between the two committees.

ii. Tidal Wetlands Workshop Update
Charles deQuillfeldt provided an update on the Tidal Wetlands workshop. The date is set for June 24 – 25, with invited speakers participating on June 24, and break out sessions on June 25. There will be a field trip during the conference to a tidal wetland site associated with Young's Island. deQuillfeldt provided the members with a copy of the preliminary announcement of the workshop (Attachment E). A request was made for the use of the LISS STAC fellows to provide minutes and assistance to the workshop. Yarish said they would consider it.

2. SYSTEM WIDE EUTROPHICATION MODEL

a. *Model Overview*
John St. John provided a preliminary review of the HydroQual Model for the entire committee. Further detailed presentations will be made to the subcommittees at a later date.

b. *Presentation Summary*
The modeling effort was begun as part of the LISS 15 years ago, and has been followed by the NYC DEP. Combined workgroups of NY/NJ harbor working on hydrodynamics. The water quality models have evolved over the last 15 years and the SWEM model has been designed as a tool to be used for planning purposes.

Topics of discussion included a history of the LIS H_20 Quality Model, an overview of the SWEM, an overview of the model calibration / validation data, the hydrodynamic submodel, the eutrophication submodel, the features of the sediment flux submodel, calibration / validation, and the modeling evaluation groups. The topics discussed today will be followed up by a detailed 2-day workshop to be arranged. The following summary includes a brief review of the slides presented and the questions and discussion that followed. Copies of the presentation slides are available to STAC members.

LIS Water Quality Modeling

- Modeling began in 1987 and includes water quality and hydrodynamics.
- Three generations of the model, LIS 1.0 – 3.0, have been developed with version 1.0 a 2D steady state and 2.0-3.0 including time variation.
- Two hydrodynamic models have been developed; NOAA – 3D for the LIS 3.0 and an East River model developed by HydroQual
- Objectives are to evaluate the effect of C and nutrient inputs on DO balance of LIS to assess severe hypoxia in WLIS (the boundaries of which are NYC out through the Race, with a 7 vertical dimensions)

Applications of LIS 3.0 Model

- Calibrated with comprehensive data from April 1988 through Aug 1989
- N was identified as the limiting nutrient in LIS, and a response matrix was developed based on impacts of C, N loads from 15 management zones
- Evaluate the response of water quality to reductions in load
- Analyzed five nutrient loading scenarios, 1) Base-case, 2) Predevelopment (pastoral) conditions, and 3-5) three nutrient control cases
- Modeling work reviewed by modeling evaluation group (MEG)

Questions/Discussion: Johan Varekamp asked how determinations of pastoral conditions were made. Fitzpatrick responded that Paul Stacey helped HydroQual to make that determination. Paul Stacey explained that long term averages of N, P concentrations from cleanest tributaries in CT were used to identify pastoral conditions. Waliser asked if the pastoral case developed hypoxia or came close. Fitzpatrick responded that minimum DO levels in the hotspot fall below 5 mg/L in the pastoral simulation. Jim O'Donnell asked how benthic oxygen demand was incorporated. St. John explained that it was computed by a sediment submodel; benthic conditions come along for the ride. When loads are reduced, the benthos improves over 5 years. O'Donnell asked if changes in the geometry were considered. St. John said they were not. Waliser asked if the atmospheric forcing variable was mean steady state. St. John stated they used what was observed in 88 and 89.

LIS 3.0 Model Limitations

- Model boundaries impacted by internal loads; The Battery in Lower East River, Block Island Sound
- Uncertainty of "true" boundary conditions
- Somewhat coarse model grid for western LIS, and the East River
- Lack of explicit interactions of LIS with: NY/NJ Harbor and the NY Bight

Development of a System Wide Model

- Referenced in regional NEP CCMPs ; For LISS a system wide model is needed and will supplement LISS actions; For NY/NJ Harbor Estuary Program develop system-wide model that will be used to define actions to eliminate hypoxia
- NYC DEP undertakes development of SWEM and handles evaluations for Newtown Creek WPCP upgrade, compliance with LISS requirements and development of East River Plan
- Individual models of the Bight and LIS to be merged and basic info for the construction of unified model lead to development of SWEM. The SWEM model includes all LIS, NY/NJ Harbor and much of the Bight, approximately 100-110 miles to shelf break and extends to head of tide in all major tributaries in NY/NJ Harbor

What were the needs for study?

- DO below standards, target N reductions from LISS, potential N reductions from NY/NJ Harbor Estuary Program and NY Bight Restoration Plan, and potential impending N waste load allocations

Objectives of Modeling Analysis

- Calculate DO balance, define cause of DO depression, such as N, Organic Carbon (BOD), define impacts of pollutant sources, such as STPs, CSOs, storm water runoff, tributary inputs, atmospheric deposition and boundary inputs
- Evaluate planning alternatives for NY DEP

Questions/Discussion: Waliser asked if variability of atmospheric forcing was considered as a cause for changes in DO. St. John noted it was important in stratification.

Characterization of SWEM

- Coupled 3D hydrodynamic/water quality model that includes ten vertical layers, intra-tidal calculations, modern eutrophication kinetics and interactive water column bed sedimentation dynamics

Characteristics of Drainage Area of SWEM

- ½ of New England drains to LIS through 7 CT tributatries and ¼ NYS – Hudson and Mohawk tributaries drain into NYH and parts of NJ and includes eleven major tributary basins. Bordering states are NY, CT, NJ with a total drainage area of 34,500 sq mi, a population of 26,250,000, and 325 STPs and CSOs: 750

SWEM Calibration / Validation Data

- 1994-95 NYC DEP synoptic field program for SWEM included physical oceanography, ambient water quality, sediment surveys and water column primary production
- 1994-95 NJ Harbor Discharges Group – ambient water quality in NJ tributaries
- 1993-94 ISC/ HEP included sediment surveys, point source/tributary monitoring, boundary conditions
- 1988-89 LIS/NYC DEP available historical data
- 100 stations were used with roughly 30 in NY/NJ Harbor, 30-35 in LIS and 30-35 in NY Bight to 100 miles off shore
- Measurements taken at the stations include; Hydrographic profiles (vertical) of salinity, temperature, DO, light extinction and transmissometry; Laboratory measurements include Chlorophyll a, dissolved inorganic carbon/Alk/pH, dissolved inorganic nutrients, DOC, DON, DOP, particulate C, N and P, total phosphate, biogenic silica, total and filtered BODs, and total suspended solids

Features of SWEM

- Basic hydrodynamic equations include conservation of mass, conservation of momentum (x and y directions) and conservation of energy
- Variables computed by the hydrodynamic model include water surface elevation, x, y and z components of velocity, temperature, density and horizontal and vertical viscosity and diffusion
- Model forcing functions include boundary water surface elevations, temperature and density, surface wind stress, heat flux (sensible, latent, long wave and solar radiation) and freshwater inflows

Questions/Discussion: Ed Monahan asked whether diffusion was computed. Fitzpatrick informed the committee the model computes diffusion.

Comparisons of Surface Elevations between the Model and the Data

- For tidal velocities, salinity, temperature and surface residual currents

Question/Discussion: O'Donnell asked whether moored CTD sensors were being used. Fitzpatrick stated that there were no moored sensors being used.

Features of Eutrophication Model

- Coupled phytoplankton, nutrient, and DO dynamics
- Two functional algal groups are identified; winter diatoms and summer mixed assemblage
- Algal growth as a function of temperature, light, N
- Winter diatoms – favor low temp, low light, high Si requirements
- Summer mixed assemblages – favor higher temperatures, light and decreased Si requirement compared to winter group
- Self shading by algae is included in determination of extinction coefficients

Question/Discussion: Varekamp asked whether silica flux back into system was being included. Fitzpatrick, yes. Dam asked whether a mortality term because of

grazing was included. Fitzpatrick, not in as state variable, but included as a relationship.

Features of the SWEM Eutrophication Submodel

- Nutrient limitation follows Michaelis-Menton kinetics
- Nutrient recycle a function of algal biomass and labile detrital C (surrogate for the bacterial loop)
- Recognition of variable C to nutrient stoichiometry
- Considers labile and refractory forms of organic nutrients (N, P) and organic C
- Kinetic framework has been applied in numerous estuary and lake settings
- Applied in Estuarine Settings: Massachusetts Bay, Jamaica Bay, Delaware Estuary

Brief Discussion: O'Donnell – what fraction of C is refractory? Fitzpatrick – not sure, the carbon (labile and refractory) is accounted for separately but no transformation between the two. Additional measurements of short-term (BOD_5) and long-term BOD (BOD_{50}) could approach this question.

Features of the SWEM Sediment Flux Submodel

- Accounts for the following physical, chemical and biological processes: disposition of particulate OM (algae and detritus) to the sediment bed, subsequent diagnosis or decay of the settled POM, flux of the resulting end-products (SOD and nutrients) back to the overlying H2O column, fluxes dependent on temp, overlying H2O column DO, pore H2O / H2O column nutrient gradients, and bioturbation is parameterized as a function of settling of POM and overlying water column and DO
- Sediment nutrient flux sub-model originally calibrated against 4 years of Chesapeake Bays SONE data and further validated against the MERL nutrient addition mesocosms (URI)
- SWEM used data collected by Stony Brook University (LISS) and Battelle (SWEM)
- Sediment flux model has also been used in Chesapeake Bay, Jamaica Bay, and the Massachusetts Bay system with a consistent set of model coefficients

Question/Discussion: Dam asked what criteria were used to compare data to observations. Fitzpatrick discussed how HydroQual looks at plots and how the model reproduces seasonal trends, e.g. nutrients and blooms. Dam, so you are doing an eye fit? Fitzpatrick, correct, we are doing an eye fit.

Preliminary Findings

- C (BOD) causes most DO depression in NY/NJ Harbor on an average summer basis
- Primary Production causes most instantaneous DO depression in: WLIS, Jamaica Bay, Raritan Bay, with N as the limiting nutrient
- NYC sources account for < 50% DO deficit in NY/NJ Harbor, < 25% DO deficit in Western LIS
- Watershed and boundary impacts are significant

SWEM Modeling Evaluation Group

- HEP MEG (1994-1997), 4-8 members, 6 review meetings
- System wide (HEP, LISS) MEG 1999, 4 members, 4 review meetings
- Principal comments; SWEM represents state-of-the-art analysis, calibration good – captures features of the region, recommend calibration improvement in NJ tributaries and recommend adoption for regional planning

Break for lunch – 12:40

Yarish proposed change to the agenda, 1:00 working discussion with HydroQual. STAC members agreed.

Meeting reconvened at 1:20 PM

c. *Discussion of HydroQual Model with Fitzpatrick and St. John*

Fitzpatrick opened the discussion with questions about the format of the proposed workshop. He suggested the workshop could go through H2O column model, hydrodynamic assumptions. O'Donnell suggested the goal would be to identify and disseminate how well the model works, what weaknesses exist and focus identifying weaknesses. He also suggested additional expertise could be brought in to help us improve the model, and determine how well the model is doing in certain areas by comparing data of benthic exchanges, hydrodynamics, and production. Fitzpatrick proposed a DO point of view, focused on how primary production moves up the food web. He felt it would be useful to look at what has been done in Chesapeake Bay, where a focus on tertiary production has been useful. He reported that Chesapeake Bay has a 10-year model of sequence responses to freshwater inputs, which allow questions of natural variability extend to other years and allow the addition of water quality and hydrodynamic data. Senjie Lin suggested the next step was to look at each component and weight of each the components to see how sensitive they are to variation.

Larry Swanson suggested the model is not being used to our benefit, e.g. the 1999 lobster die off, to examine the physical ocean dilution of spraying. What will it take to allow for use of the model; will there be a cost? Ed Monahan what roles if any does HydroQual see for physical oceanographers in this group in helping run the model? What role can they play? To what extent would you accommodate them?

Yarish wanted clarification over who has ownership of the model? When will we get to the point that we can use the model? Can it be made available for use on a CD with a users manual? St. John reported code of the model is proprietary to HydroQual, but HydroQual's goal is to make the code available. Currently the ECOM code is available on HydroQual's website and the water quality model code will be available by this summer. The SWEM Model is owned by NYC DEP who paid for its development, but it has been made available to the HEP and LISS for application to regional planning, and would be available to all who would like to use it. As of now a user's manual has not been developed.

Fitzpatrick discussed the interest in incorporating the hydrological and biological processes in STPs and CSOs in the model from a management standpoint, with some arguing that the microbial loop needs to be added. Milan Keser suggested that HydroQual could sell parts of the model for use, and make money. Are you working on it? St. John reported parts are available right now. Fitzpatrick reported that you couldn't evaluate portions of the model without running the whole model.

Yarish suggested that the Eutrophication subcommittee should manage the workshop, as there appears to be a need for it. Jack Mattice proposed that much consideration needs to be made for the format of the front end; otherwise, no one will be satisfied. For example, what does LIS need? What do the scientists need? What can we use the model for now? Do we have what we need to make predictions or does it need to be modified? Once these things are decided, we can determine the focus of the workshop. Fitzpatrick asked that subcommittee members be solicited to

determine what they would want to see addressed and then tailor the workshop to address those needs. Swanson asked what monitoring data is needed on a long-term basis to run the model in real-time. Yarish proposed that the STAC will need to decide on the questions for the workshop and determine how the model can help improve monitoring programs. Yarish thanked the HydroQual staff for their presentation.

Action 2: The two-day workshop will be held in the fall of 2003.

3. 2003 LISS BUDGET DISCUSSION

a. *Introduction of the Budget*
Tedesco provided an overview of the LISS Budget.

- Implementation funds – $3.6 million congressional earmark
- Program funds; $477,000 EPA LIS line item support, $2,023,000 congressional earmark, $510,000 NEP share - LIS is one of 28 NEP participants, Total Program funds - $3,010,000
- Decision Process: Develop internal call 11/02 due 12/21/02, Management Committee Review Jan. 23, Citizens Advisory Committee review Mar. 13, and STAC review on April 2, management decision on April 10.
- Fund – projects funded for one calendar year, e.g. 10/1/03 – 9/30/04
- Management Framework: Hypoxia, N reduction targets, work with upstream states, ATM deposition; H2O Quality - nominates NDZ, decrease closed shellfish areas, decrease bathing beach closures, update contaminants of concern; Review approach for consumption advisory
- Dredged Material: designate dredged material sites
- Living Resources and Habitat: habitat restoration goals, map eel grass beds, investigate tidal wetlands loss, lobster mortality, invasive species list, develop LIS Stewardship System strategy
- Watershed Management: expand local community based watershed planning and build capacity; identify impervious surface changes; assess/restore riparian buffer areas
- Public Involvement and Education: report on state of the Sound and CCMP implementation progress; support curricula development; increase understanding of LIS, issues and LISS
- Monitoring and Modeling: continue and refine LIS water quality monitoring; use SWEM Model and compare to LIS 3.0; ensure STAC review; CT River initiative monitoring, SPARROW
- Research and Assessment: STAC research priorities (eutrophication, food webs, SAVs, tidal wetlands); coordination, evaluation and reporting; implementation tracking; load allocation tracking system combined with impervious surface; development and use of environmental indicators for assessment and decision making

Questions/Discussion: Tedesco provided an overview of the STAC responsibility in reviewing proposals, the STAC has certain responsibilities and commitments. The STAC should focus on how to fulfill those responsibilities. Yarish stated the STAC needs to decide if the proposals are relevant or not. Tedesco reminded the committee that increasing the research budget was recommended. Stacey reported that the Implementation Team was surprised at the amount of funding that was left, and suggested the book is not closed on how the money should be spent. Joe Salata reminded the STAC that the money is available for two years. Yarish asked the STAC to consider how we want the projects to move forward. Dam asked who advocates for research in the implementation program. Tedesco answered that a commitment to support research has been made, but now we need to determine the

right dollar amount. We need to be able to show what has been done with money. Stacey suggested the STAC needs to go through, eliminate the program funding, and identify the research proposals that need technical evaluation.

b. *Proposal Ranking*

STAC Committee members were provided with a list of the research proposals and ranking criteria with values from 1 – 5. Research proposals were circulated to the full STAC membership 4 weeks prior to the ranking to allow adequate time for members to review and evaluate each proposal. LISS Fellow Fried read the totals and the mean rank value for proposals.

Proposal Title	Mean Score	Total Score
CT Sea Grant: Continuation of the LISS Scholar Program in Support of the STAC	4.3	60
NY Sea Grant: Continuation of the LISS Scholar Program in Support of the STAC	4.4	61
NYSDEC: Continuous Water Temperature Monitoring in LIS	3.3	46
NYSDEC: North Shore Bays Benthic Community Index (Habitat Team**)**	3.1	43
UCONN: MYSound - A Realtime Partnership	4.5	63
Coalition to Save Hempstead Harbor: Citizens Water Quality Monitoring Programs around LIS	1.8	25
CTDEP: Assessment of Lower Connecticut River Tidal Wetland Restorations (Great Island)	3.2	42
NYSDEC: Aerial Infrared Survey of NY Tidal Wetlands in LIS	2.7	35
NYSDEC: Installation of SET Stations in LIS	3.3	30
NEIWPCC: CT River Nitrogen Monitoring	3.6	50
UCONN: Mapping and Monitoring Changes in the Impervious Surfaces in the LIS Watershed	3.2	45
Pace University: Land Use Workshops on Reducing Nonpoint Source Pollution	1.9	26
CT Sea Grant: Establish LISS Economic Fellow Program in Support of Appropriate Economic Analysis of LIS	2.5	35
STS/RPA/Audubon: Long Island Sound Stewardship System	2.9	41

Action 3: Proposals 3 D, and 5A were identified as research, were not ranked as a result, and should be considered only through the RFP process. The remaining proposals rankings will be forwarded for discussion at the Management Committee budget meeting.

4. LISS STEWARDSHIP SYSTEM UPDATE

Tom Halavik provided an overview of the LISS Stewardship System Update. Slide printouts are available upon request.

Vision

- A network of sites that encompass immediate coastal upland and underwater areas, have significant ecologic, open space and/or public access values and will sustain the Sound's productivity, diversity and enjoyment

Primary Objectives

- (1) Encompass ecologic, open space and public access values, (2) Capitalize on existing programs, (3) Target public investment to most exemplary sites, and (4) Create real benefits that include more funding for existing programs, improved access to technical expertise, enhanced constituency of support and new funding sources

Define the stewardship region

- The immediate coastal upland and underwater areas with an upland boundary based on USFWS mapping of core and contiguous habiatat

Define stewardship site categories

- (1) Significant ecological value, (2) Significant open space and public access values, (3) Sites can be publicly or privately owned, protected and managed for conservation/recreational purposes or currently unprotected

Establish site assessment criteria

- Each site would be evaluated independently for ecological value and open space/public access with preference for sites meeting both sets of criteria
- Ecological value criteria (by USFWS) includes fish and wildlife productivity, biodiversity, scientific value, water quality protection, habitat restoration characteristics and connectivity to other significant Sound habitat
- Open space and public access criteria (by RPA) includes land cover, size and connectivity, recreational facilities, water quality, wetlands, riparian/recharge, steep slopes, greenways/trails, wildlife viewing, historic resources, floodplains/floodways, coastal bluffs, environmental justice, schools, recreation demand and risk of development

Ecological Reserve Component

- Long Island Sound Study definition: Create and LIS reserve system consisting of areas of land and water of outstanding or exemplary scientific, educational, or biological value to reflect regional differentiation and variety of ecosystems and to include representatives of all the significant natural habitats found in the Sound (LISS CCMP)
- Objectives of a LIS ecological reserve system: Establish a network of ecological reserve sites in LIS to preserve representative examples of native plant and animal communities, protect rare and endangered plants and animals in their natural habitat, preserve unique habitat types, serve as benchmarks for long-term scientific, research and educational use, and maintain and restore important ecological processes
- Steps to identify and protect important habitat areas for inclusion in the reserve included (1) determine spatial scope of the study, (2) determine key species and habitat types, (3) map and describe habitats and species, and (4) compile information about sites from existing documentation, data collection and expert consultation
- Develop and implement criteria for inclusion; (1) habitat inclusion categories include Exemplary/representative, critical (rare/endangered), unique/outstanding, research/education, management area of concern, (2) habitat types in LIS including migratory corridors, tidal wetlands, freshwater wetlands, beaches and dunes, coastal grasslands, intertidal flats, cliffs and bluffs, islands, benthic and water column habitats, coastal and island forests, scrub shrub habitats and riverine rocky intertidal zones which include shellfish reefs, submerged aquatic vegetation, submarine embayments and others
- Select and map exemplary sites

Marine Habitats Working Group

- Develop a LIS marine habitats map, enable a workshop discussion on “critical areas, MPAs, and/or wilderness areas”, and work on a Sound-wide protection strategy

Integrate Results of the Studies to Create a Stewardship System

- Select a suite of stewardship areas using both the ecological, open space and access parameters, secure new funding for acquisition and/or management and develop management plans and as time goes on apply adaptive management to achieve success

5. FUTURE AGENDA ITEMS

(1) Frequency of STAC meetings, (2) Setting timing for call for RFP's for a date in the summer.

Adjourned by Yarish 3:19 PM