

TESTING VARIABLES FOR MONITORING ESTUARINE NUTRIENT ENRICHMENT WITHIN NORTH ATLANTIC PARKS

(NORTHEASTERN COASTAL AND BARRIER ISLAND NETWORK PLUS
BOSTON HARBOR ISLANDS & ACADIA NATIONAL PARK)

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INTRODUCTION

Nutrient enrichment of the coastal zone is a worldwide consequence of human population growth. Land clearing, fertilizer production and application, discharge of sewage and septic systems, and fossil fuel combustion have accelerated nitrogen and phosphorus loading to coastal ecosystems since the 1950's (Nixon 1995, Cloern 2001). Estuaries in the northeastern US are particularly threatened by human disturbances within the densely populated coastal zone (Roman et al. 2000). The Northeast (from Maine to Maryland) currently accounts for about one-third of the coastal population of the entire United States (NOAA 1998). The population density of this narrow coastal fringe is more than double that of any other region of the country, and it continues to grow. The consequent residential, agricultural, and urban expansion will result in a continued increase in anthropogenic nutrient loading to the region's coastal zone. Estuaries can generally assimilate some degree of enrichment without major ecological ramifications, but excessive nutrient inputs typically lead to dense blooms of phytoplankton and fast-growing macroalgae, loss of seagrasses, and decreased oxygen availability in sediments and bottom waters (Valiela et al. 1992, Nixon 1995, Borum 1996, Bricker et al. 1999). Cascading effects may include changes in the species composition and abundance of invertebrates, decline in fish and wildlife habitat value, and the collapse of commercially harvestable fin- and shellfish stocks.

National Park units along the North Atlantic coast protect a total of about 1,891 square kilometers between Virginia and Maine. Approximately one quarter of this land area is submerged, including many coastal bays, estuaries, and lagoons (NPS 2000). These areas serve as islands of relatively pristine coastal habitat within the northeastern urban corridor. Much of the watershed area of NPS coastal ecosystems, however, lies outside protective park boundaries and is thus subject to intense developmental pressures. Therefore, there is great potential for human disturbances to coastal watersheds to result in increased nutrient loading to park estuaries. Protecting the ecological integrity of park estuaries depends on implementing a scientifically-based monitoring program that is capable of detecting and predicting changes in ecosystem status (cf. NRC 2000). The ideal monitoring program will also identify causes and consequences of changes in estuarine condition so that remedial management actions can be developed as needed.

The NPS Vital Signs Monitoring Program was initiated to provide all national park units with scientifically

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sound information on the status and trends of their natural resources. Long-term ecological monitoring protocols are being developed for biogeographic networks of parks that share similar natural resource characteristics. The Northeast Coastal and Barrier Island Network consists of nine parks from Massachusetts to Virginia. The four largest parks include extensive estuarine habitat (Assateague Island National Seashore, Maryland/Virginia; Cape Cod National Seashore, Massachusetts; Gateway National Recreation Area, New York/New Jersey; Fire Island National Seashore, New York). Colonial National Historic Park, Virginia, is a park of almost 8000 ha with a moderate amount of estuarine shoreline, and two small parks (Sagamore Hill National Historic Site, New York; George Washington Birthplace National Monument, Virginia) also include short stretches of estuarine shoreline. The last of the network parks, Thomas Stone National Historic Site, neither contains nor directly abuts any estuarine resources. In addition, two parks within the adjacent Northeast Temperate Network also include extensive estuarine habitat (Acadia National Park, Maine; Boston Harbor Islands, Massachusetts). Collectively, these park units represent a wide range of sizes (33 ha to almost 20,000 ha), latitudes (37°11.3'N to 44°25.6'N or more than 800km of latitude), watershed geologies (shallow soils overlying granite bedrock vs. thick sandy glacial deposits), tidal range (micro-tidal to over 3m), and fresh water sources (surface water vs. ground water; Roman et al. 2000). Estuaries within these parks share fundamental characteristics, however, including temperate zone flora and fauna and the threat of nutrient enrichment as a primary management concern (Roman et al. 2000). These broad similarities are the basis for development of a uniform regional protocol for monitoring estuarine nutrient enrichment within the coastal park units of both the Northeastern Coastal and Barrier Network and the Northeastern Temperate Network.

Vital Signs Monitoring Protocols will be based on a core group of critical monitoring variables, or "vital signs" that collectively provide diagnostic information regarding the integrity of park ecosystems. Vital signs for estuarine nutrient enrichment have been identified by this workgroup (Table 1, report to NPS in preparation). The work described in this proposal represents the steps necessary to translate the identified vital signs into operational monitoring protocols for the network. This approach is consistent with National Park Service and Environmental Protection Agency guidance on developing ecological indicators and monitoring programs (Jackson et al. 2000, Kurtz et al. 2001, Peterson et al. 1995).

OBJECTIVE: TO DEVELOP OPERATIONAL VITAL SIGNS MONITORING PROTOCOLS

The objective of this next phase of work is to fully develop and test operational monitoring protocols for each of the vital signs identified in the previous phase of work. A draft copy of the work report to NPS has been distributed to project collaborators for review and comment. Vital Sign variables are divided into two broad functional categories – "Agents of Change," and "Ecosystem Responses" (Table 1). Work objectives for development of operational monitoring protocols are similarly divided into two tasks, with investigators at the University of Rhode Island working on Agents of Change (Task I), and investigators at the U.S. Geological Survey working on Ecosystem Responses (Task II).

The final variable list of candidate vital signs is further divided into two categories. One set of variables is proposed for regional implementation (Table 1). These variables are well justified scientifically, and collection of data for the entire suite is deemed feasible from both practical and economic perspectives. All of the variable within this set are being addressed in Tasks I and II. A second set of variables includes parameters that require additional evaluation. Existing scientific information suggests strong, predictive relationships between nutrient loading and each these additional variables; however, further evaluation is needed to establish their utility for regional monitoring. We have identified one of these, SAV parameters, for inclusion in Task II. Justification is provided in the relevant sections below.

APPROACH

TASK I – AGENTS OF CHANGE: LAND USE, POINT SOURCES, AND ATMOSPHERIC DEPOSITION.

To be completed by Co-Principal Investigators at the University of Rhode Island.

While it would obviously be most desirable to obtain direct measures of nutrient inputs, especially nitrogen (N), to the estuarine waters of the Coastal and Barrier Network of parks, we believe that such an effort would not prove to be sustainable over the long term. Surface discharges are event driven and therefore difficult to predict and sample adequately. And while the field collection of surface waters for nutrient analyses is relatively

[illegible]

particular concern with individual parks. This approach does not preclude the use of targeted monitoring stations, nor does it necessitate the reconfiguration of existing monitoring stations at parks with established monitoring protocols. EPA staff scientists have agreed to work with us and with natural resource managers at network parks to evaluate the suitability of existing monitoring stations for probability-based sampling. They will also assist with identifying supplemental stations where they may be necessary.

4. Sampling frequency within each park. Continuous monitoring at a limited number of stations and discrete temporal sampling with better spatial representation both have merits for monitoring purposes. Some parks in the network with existing monitoring programs (Gateway & Assateague) have found it feasible to conduct both types of sampling. Accordingly, we will evaluate both type of sampling regimen for each of the network parks, as well as evaluate the utility of a limited duration "index period" with more frequent discrete sampling events.

At a small subset of parks we will implement a 1-year field trial for all sampling variables. Suggested subset: Assateague, Colonial, Gateway or Fire Island, to span range of complexity and existing capabilities of parks in network. Select 1 or 2 parks only for SAV characteristics to test potential for use of vbls with greater anticipatory capabilities. In addition to these "ready-to-go" vital signs, we have included a small amount of money to test a variable that shows great promise but requires additional development. We selected SAV parameters (a more detailed description is provided in our report) for additional testing along enrichment gradients at Assateague Island National Seashore. Variables related to plant anatomy, tissue nutrient ratios and concentrations, and plant population parameters have been shown to be highly sensitive to the nutrient environment in which the plants develop (Lee et al. 2001, Kopp 1999). As such, and because they integrate over greater time scales than phytoplankton and many macroalgae, they are expected to be the most anticipatory of the response variables available. To test SAV response parameters, we propose to adopt the SeagrassNet protocol and contract with its organizer, Dr. Fred Short at the University of New Hampshire, to assist in setting up our sites and training our field staff. SeagrassNet is a global seagrass monitoring effort with a research component based on recently compiled seagrass research techniques for global application (Short and Coles 2001). The SeagrassNet aim is to build a global network of compatible and integrated monitoring locations. This will be a mutually beneficial collaboration whereby the SeagrassNet is expanded and the NPS gains additional insights. Because the NPS protocol will be consistent with those of the global network, our results can be interpreted in a non-parochial framework. It will also capitalize on existing programs (SeagrassNet and NPS feasibility testing), making it less expensive to pursue than if we were to mount a new effort in the future. We will work with the network coordinator to select the most appropriate park for this testing, but Assateague Island National Seashore is suggested as a strong candidate.

WORK PLAN AND COSTS

Work on this project would begin in FY-03 and continue through FY-04 for both tasks I and II. Final deliverable products will be fully developed and tested operational monitoring protocols for each of the identified vital sign variables. The allocation of human resource time is detailed in the attached budget sheets and timelines are addressed under the respective task descriptions.

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Table 1. Candidate variables proposed for regional monitoring implementation for estuarine nutrient enrichment. Summary of relevant data available from the National Park Service and other programs for each of the Maryland and Virginia North Atlantic coastal parks.

	Assateague ASIS	Colonial COLO	G. Washington GEWA
Agents of Change			
Watershed Land Use & Land Cover Mapping	Land use / land cover data are available for all Network Parks from the NOAA C-CAP. Also, national land cover data (15 land classes) are available from the MRLC Consortium from 1991 and 1992 imagery.		
	Additional land-use tracking is proposed within existing eutrophication monitoring plan		
Inventory of Nutrient Point Sources	Nutrient point sources relevant to each park unit are inventoried and permitted by states and/or EPA under NPDES permitting laws.		
Atmospheric Deposition of Nitrogen	NADP monitoring of wet deposition of nutrients at stations throughout the country. Several parks have NADP station within their boundaries (++) and others rely on data from stations that are nearby (+). Some parks are not represented by nearby NADP stations (-).		
Ecosystem Responses	++		
Chlorophyll-a	NPS: monthly at 18 stations	CBNERR-VA: monthly monitoring on the lower York River. Other portions of COLO are inadequately monitored (VA DEQ) for Vital Signs needs.	
Attenuation of PAR	NPS: K_d measured monthly at 18 stations	CBNERR-VA: monthly at 4 stations on lower York R. VA DEQ: 6x/yr in the York R. and James R. but inadequate in bays and tidal creeks of COLO.	
SAV Distribution Mapping	Mapping (with biomass estimates) conducted annually by R. Orth @ VIMS	Mapping (with biomass estimates) conducted annually by R. Orth @ VIMS	Mapping (with biomass estimates) conducted annually by R. Orth @ VIMS
Sediment Organic Carbon			
Dissolved Oxygen	NPS: monthly at 18 stations & continuous at 3 stations	CBNERR-VA: continuous monitoring on York R. AOB: weekly Citizen Shoreline Monitoring along York R. & James R. Other portions of COLO are inadequately monitored (VA DEQ) for Vital Signs needs.	ACB Citizens Monitoring Program: summertime weekly in Popes Creek. VA DEQ: One station in Popes Creek, and three in Potomac River in proximity to GEWA. 6x/yr.
Benthic Community Structure		VA DEQ: 6x/yr in the York R. and James R. but inadequate in bays and tidal creeks of COLO.	none with GEWA. CBP quarterly main stem monitoring.
Required Ancillary Data			
Temperature & Salinity	NPS: monthly at 18 stations & continuous at 3 stations. MD CBP Volunteer Monitoring: 30 nearshore stations, 2x per month April through November, and monthly thereafter.	CBNERR-VA: continuous and monthly monitoring on the lower York River. Other portions of COLO are inadequately monitored (VA DEQ) for Vital Signs needs.	ACB Citizens Monitoring Program: summertime weekly in Popes Creek. VA DEQ: One station in Popes Creek, and three in Potomac River in proximity to GEWA. 6x/yr.
List of Acronyms	ACB- Alliance for Chesapeake Bay; CBNERR-VA- Chesapeake Bay National Estuarine Research Reserve Virginia; FOB- Friends of the Bay; IEC- Interstate Environmental Commission (CT, NY, NJ); MA DEP- Massachusetts Department of Environmental Protection; MD CBP- Maryland Coastal Bays Program; MRLC- Multi-Resolution Land Characteristics Consortium; MWRA- Massachusetts Water Resource Authority; NADP- National Atmospheric Deposition Program; NOAA C-CAP- NOAA Coastal Change Analysis Program; NPDES- National Pollutant Discharge Elimination System; NPS- National Park Service; NYC DEP- New York City, Department of Environmental Protection; SSER- South Shore Estuary Reserve; VA DEQ- Virginia Department of Environmental Quality; VIMS- Virginia Institute of Marine Science.		

Table 1 (cont). Candidate variables proposed for regional monitoring implementation for estuarine nutrient enrichment. Summary of relevant data available from the National Park Service and other programs for each of the New York North Atlantic coastal parks.

	Gateway	Fire Is.	Sagamore
Agents of Change	GATE	FIS	SAHI
Watershed Land Use & Land Cover Mapping	Land use / land cover data are available for all Network Parks from the NOAA C-CAP. Also, national land cover data (15 land classes) are available from the MRLC Consortium from 1991 and 1992 imagery.		
Inventory of Nutrient Point Sources	Nutrient point sources relevant to each park unit are inventoried and permitted by states and/or EPA under NPDES permitting laws.		
Atmospheric Deposition of Nitrogen	NADP monitoring of wet deposition of nutrients at stations throughout the country. Several parks have NADP station within their boundaries (++) and others rely on data from stations that are nearby (+). Some parks are not represented by nearby NADP stations (-).		
Ecosystem Responses			
Chlorophyll-a	NPS: JB Unit. Weekly mid-May - Sept. & monthly thereafter at 9-15 bay stations & 2 Atl. beach stations. IEC: Stations in NY/NJ Harbor (relevant to SI and SH units). Bi-weekly summer sampling, monthly thereafter. NYC DEP: 8 JB stations & 1 Lower NY Harbor. Weekly samples from mid-May - Sept. & 1-2x per month thereafter.	SSER: 20+ stations within reserve boundary visited 3-15 times per year.	
Attenuation of PAR			
SAV Distribution Mapping	No SAV known in GATE except for a small bed at Sandy Hook unit.		
Sediment Organic Carbon			
Dissolved Oxygen	NPS: JB Unit. Weekly mid-May through Sept. & monthly thereafter at 9-15 bay & 2 Atl. beach stations. Three continuous stations will be deployed in 2002. IEC: stations in NY/NJ Harbor relevant to SI & SH units. Bi-weekly summer sampling, monthly thereafter.	SSER: 20+ stations within reserve boundary visited 3-15 times per year.	FOB: weekly summertime measurements (@6AM) at 2 stations in Cold Spring Harbor.
Benthic Community Structure			
Required Ancillary Data			
Temperature & Salinity	NPS: All units, weekly mid-May - Sept. & monthly thereafter. IEC: 67 stations in NY/NJ Harbor and LI Sound (relevant to SI & SH units). Bi-weekly summer sampling & monthly thereafter. NYC DEP: 8 JB stations & 1 Lower NY Harbor. Weekly from mid-May - Sept. & 1-2x per month thereafter.	SSER: 20+ stations within reserve boundary visited 3-15 times per year.	FOB: weekly summertime measurements (@6AM) at 2 stations in Cold Spring Harbor.
List of Acronyms	ACB- Alliance for Chesapeake Bay. CBNERR-VA- Chesapeake Bay National Estuarine Research Reserve-Virginia. FOB- Friends of the Bay. IEC- Interstate Environmental Commission (CT, NY, NJ). MA DEP- Massachusetts Department of Environmental Protection. MD CBP- Maryland Coastal Bays Program. MRLC- Multi-Resolution Land Characteristics Consortium. MWRA- Massachusetts Water Resource Authority. NADP- National Atmospheric Deposition Program. NOAA C-CAP- NOAA, Coastal Change Analysis Program. NPDES- National Pollutant Discharge Elimination System. NPS- National Park Service. NYC DEP- New York City, Department of Environmental Protection. SSER- South Shore Estuary Reserve. VA DEQ- Virginia Department of Environmental Quality. VIMS- Virginia Institute of Marine Science.		

Table 1 (cont). Candidate variables proposed for regional monitoring implementation for estuarine nutrient enrichment. Summary of relevant data available from the National Park Service and other programs for each of the New England North Atlantic coastal parks.

	Cape Cod CACO	Boston BOHA	Acadia ACAD
Agents of Change			
Watershed Land Use & Land Cover Mapping	Land use / land cover data are available for all Network Parks from the NOAA C-CAP. Also, national land cover data (15 land classes) are available from the MRLC Consortium from 1991 and 1992 imagery.		
	Additional land-use tracking is proposed within existing eutrophication monitoring plan		
Inventory of Nutrient Point Sources	Nutrient point sources relevant to each park unit are inventoried and permitted by states and/or EPA under NPDES permitting laws.		
Atmospheric Deposition of Nitrogen	NADP monitoring of wet deposition of nutrients at stations throughout the country. Several parks have NADP station within their boundaries (++) and others rely on data from stations that are nearby (+). Some parks are not represented by nearby NADP stations (-).		
Ecosystem Responses	++	+	++
Chlorophyll-a	NPS: Estuarine Monitoring Protocol is under development, inclusion of this vital sign is anticipated.	MWRA: Weekly at 9 receiving-water stations May - October and fortnightly thereafter.	
Attenuation of PAR		MWRA: Weekly at 9 receiving-water stations May - October and fortnightly thereafter.	
SAV Distribution Mapping	MA DEP: Target mapping interval of 5 years	MA DEP: Target mapping interval of 5 years	
Sediment Organic Carbon		MWRA: annual August survey	
Dissolved Oxygen	NPS: Estuarine Monitoring Protocol is under development, inclusion of this vital sign is anticipated.	MWRA: Weekly at 9 receiving-water stations May - October and fortnightly thereafter; weekly at 5 outfall (former outfall) stations throughout the year.	
Benthic Community Structure		MWRA: annual August survey	
Required Ancillary Data			
Temperature & Salinity	NPS: Estuarine Monitoring Protocol is under development, inclusion of this vital sign is anticipated.	MWRA: Weekly at 9 receiving-water stations May - October and fortnightly thereafter; weekly at 5 outfall (former outfall) stations throughout the year.	
List of Acronyms	ACB- Alliance for Chesapeake Bay; CBNERR-VA- Chesapeake Bay National Estuarine Research Reserve-Virginia; FOB- Friends of the Bay; IEC- Interstate Environmental Commission (CT, NY, NJ); MA DEP- Massachusetts Department of Environmental Protection; MD CBP- Maryland Coastal Bays Program; MRLC- Multi-Resolution Land Characteristics Consortium; MWRA- Massachusetts Water Resource Authority; NADP- National Atmospheric Deposition Program; NOAA C-CAP- NOAA, Coastal Change Analysis Program; NPDES- National Pollutant Discharge Elimination System; NPS- National Park Service; NYC DEP- New York City, Department of Environmental Protection; SSER- South Shore Estuary Reserve; VA DEQ- Virginia Department of Environmental Quality; VIMS- Virginia Institute of Marine Science.		

URI BUDGET REQUEST - TASK I	Year 1 / FY-03	Year 2 / FY-04
Scott Nixon, University of Rhode Island See attached budget worksheet	\$ 64,541	\$ 66,099

USGS BUDGET REQUEST - TASK II	Year 1 / FY-03	Year 2 / FY-04
Salary & Fringe	FTE	FTE
GS 11 project coordinator	9 mo. \$ 36,985	7 mo. \$ 30,633
GS-4 technician (1/2 time lab support & sample analysis)	3 mo. \$ 5,740	
Neckles, GS-13, In kind	(3 mo.) \$ -	(3 mo.) \$ -
Fringe	\$ 12,205	\$ 10,109
Supplies and Purchased Services		
Boat time/rental & fuel	\$ 3,000	
Annual DOI boat safety training (cost split with PWRC)	\$ 1,000	
GSA vehicle rental (for field crew)	\$ 3,760	
Analytical costs for chlorophyll- <i>a</i> and CHN	\$ 2,200	
Operating supplies	\$ 4,200	\$ 500
Publication Costs		\$ 500
Travel	\$ 5,500	\$ 1,500
Sub Award		
Short, UNH, to establish SeagrassNet protocol at 1 park (includes equipment + 1 wk PI salary + travel)	\$ 7,000	
Direct Cost SubTotals	\$ 81,591	\$ 43,242
Overhead		
US Geological Survey	11% \$ 8,975	\$ 4,757
Patuxent Wildlife Research Center	25% \$ 22,641	\$ 12,000
USGS PROJECT TOTALS	\$113,207	\$ 59,999

NPS-RETAINED PROJECT EXPENDITURES	Year 1 / FY-03	Year 2 / FY-04
Salary & Fringe	FTE	FTE
GS 5-technicians (3 for summer sampling season)	3 x 3 mo. \$ 19,267	
Equipment		
YSI Model 6600 EDS (CTD)	4 \$ 20,484	
YSI dissolved oxygen sensor w/ membrane wiper	4 \$ 1,800	
YSI in vivo fluorescence sensor w/ optical wiper	4 \$ 9,468	
LiCor LI14000 loggers, sensors, cables and parts	4 \$ 13,332	
TOTAL NPS-RETAINED EXPENDITURES	\$ 64,351	\$ -

GRAND TOTAL	\$177,748	\$126,098
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*Note: Patuxent Wildlife Research Center has not historically charged overhead to its clients. Recent efforts to build consistency in the business practices of the various USGS divisions has resulted in a change to this practice starting in FY-03. Implementation policies are still being established.



UNIVERSITY OF RHODE ISLAND BUDGET FORM

GRANTEE:

PROJECT NUMBER:

FISCAL YEAR 2003

PRINCIPAL INVESTIGATOR(S):

SALARIES AND WAGES

MAN MONTHS

SENIOR PERSONNEL

No. of
People Amount
of Effort

1 Principal Investigator(s) Co-Principal Investigator Associate(s)		2.5	13,305
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OTHER PERSONNEL

Clerical			
Staff			
Technical			
Research			
Other			

STUDENTS

1 Graduate Assistant(s) Hourly Student(s)	20,906
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PERSONNEL TOTALS

34,211

FRINGE BENEFITS

5,631

PERMANENT EQUIPMENT

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EQUIPMENT TOTALS

SUPPLIES TOTALS

750

TRAVEL

Domestic	3,400
Foreign	

TRAVEL TOTALS

1,700

PUBLICATION TOTALS

OTHER COSTS

GIS data	
Tuition	
Postage, Telephone, photocopy, Illustration	
Equipment Rental/Use, Maintenance, Repair	
Truck Ins./Maintenance/Repair	
Other	11,676

OTHER TOTALS

11,676

DIRECT COST TOTALS

53,968

INDIRECT COSTS

RATES

On Campus
Off Campus
Reduced
Negotiated
Subcontract

Sea Grant

25.00%

Match

25.00%

10,573

INDIRECT COST TOTALS

10,573

WAIVED OVERHEAD

TOTAL COST

64,541

(incl. OH on Fringe)

UNIVERSITY OF RHODE ISLAND BUDGET FORM

GRANTEE:

PROJECT NUMBER:

FISCAL YEAR

2004

PRINCIPAL INVESTIGATOR(S):

SALARIES AND WAGES

MAN MONTHS

SENIOR PERSONNEL

No. of People	Amount of Effort
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1 Principal Investigator(s) Co-Principal Investigator Associate(s)	2.5	13,704
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OTHER PERSONNEL

Clerical			
Staff			
Technical			
Research			
Other			

STUDENTS

1 Graduate Assistant(s) Hourly Student(s)	21,638
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PERSONNEL TOTALS

35,342

FRINGE BENEFITS

5,746

PERMANENT EQUIPMENT

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EQUIPMENT TOTALS

SUPPLIES TOTALS

750

TRAVEL

Domestic	3,400
Foreign	

TRAVEL TOTALS

1,700

PUBLICATION TOTALS

OTHER COSTS

GIS data	
Tuition	
Postage, Telephone, photocopy, Illustration	
Equipment Rental/Use, Maintenance, Repair	
Truck Ins./Maintenance/Repair	
Other	11,676

OTHER TOTALS

11,676

DIRECT COST TOTALS

55,214

INDIRECT COSTS

RATES

On Campus
Off Campus
Reduced
Negotiated
Subcontract

Sea Grant

25.00%

Match

25.00%

10,885

INDIRECT COST TOTALS

10,885

WAIVED OVERHEAD

TOTAL COST

66,099

(incl. OH on Fringe)



Bryan Milstead, Network Coordinator
National Park Service
University of Rhode Island
Kingston, RI 02881

July 26, 2002

Bryan:

Attached you will find the proposal that Hilary and I have been preparing to address the goal of developing operational monitoring protocols for estuarine nutrient enrichment in coastal Atlantic National Parks. As you know, Hilary has been away from the office all this week. Although we worked together to plan this proposal, Hilary hasn't seen the final version and she may choose to make some revisions after reviewing it. We would also like to get your input so that, together with any of Hilary's changes, we can revise the proposal as needed. Once we've agreed upon a strategy and budget, we will need to involve Patuxent for a formal review of the proposal and work plan.

This represents a complete package and provides what we think is best for the final phase of developing operational vital signs monitoring protocols for the network. The work is divided into two tasks. The first, monitoring agents of change, would be lead by Scott Nixon at the University of Rhode Island. The second, monitoring ecosystem responses, would be lead by Hilary Neckles here at the USGS.

The URI component is larger than you had originally discussed with Hilary because of some changes Scott has suggested. "Agents of change" include variables that best anticipate the adverse consequences of estuarine nutrient enrichment. It is the trajectory of these variables that allows us to predict future system states and respond with appropriate management actions. Rather than initiate monitoring now and wait for ten years to establish an initial trajectory, Scott has proposed to "monitor" retroactively to 1970 in decade-long time steps. We believe this is a very useful and worthwhile use of financial resources.

For ecosystem response monitoring (USGS – Task II), we have limited our testing (with one exception) to those response variables that are well justified scientifically and deemed feasible from both practical and economic perspectives. Some of these variables will still require on-the-ground feasibility testing in order to work out spatial and temporal sampling requirements and to assess logistical feasibility. We have proposed to do this in the first project year at three parks. These will then serve as functionally equivalent parks for developing the remainder of the network's park-specific protocols.

In addition to these "ready-to-go" vital signs, we have included a small amount of money to test a variable that shows great promise but requires additional testing and development. We selected SAV parameters (a more detailed description is provided in our report) for additional testing along enrichment gradients at Assateague Island National Seashore. Variables related to plant anatomy, tissue nutrient ratios and concentrations, and plant population parameters have been shown to be highly sensitive to the nutrient environment in which the plants develop. For a modest budget, we feel that the NPS can leverage existing resources to further develop this next generation of ecological indicators for estuarine nutrient enrichment.

Please note that Patuxent Wildlife Research Center has not historically charged overhead to its clients. Recent efforts to build consistency in the business practices of the various USGS divisions has resulted in a change to this practice starting in FY-03. Implementation policies are still being established, however, and we don't yet know how DOI partners will be assessed. For the moment, however, I have budgeted for both the bureau-wide overhead assessment of 11% and the Patuxent assessment of 25%. Whether there is room to negotiate a reduced Patuxent assessment remains to be seen.

As per your conversations with Hilary, I have held back some of the budget items as an NPS-retained contribution to the project. This includes the summer field crew for the first year, and all of the multi-parameter water quality probes and light sensors that would logically be kept by the Park Service after the project period anyway. Please note that we are in a position to accept FY-02 funds. Hilary believes she has a mechanism to roll funds forward into next FY, and I know that Scott already has a student in mind to take on some of the major work for Task I. That student would ideally be funded on an student assistantship for this upcoming academic year.

Hilary and I are scheduled to be back in the office on August 1. That would be an ideal time to for you to give us some feedback on what I've provided.

On behalf of Hilary, Scott and myself, thank you very much.

Best Regards,

Blaine Kopp

cc Beth Johnson