Appendix B-1: NYS DEC 303(d) listing

(MW6.1e) GB..FB,FB-111	* Flanders Bay, West/Lower Sawmill Cr (1701-0254)	Suffolk	Estuary	SC	D.O./Oxygen Demand	Urb/Storm Runoff	2002
(MW6.1e) GB..FB-110	* Meetinghouse/Terrys Creeks and tribs (1701-0256)	Suffolk	Estuary	SC	D.O./Oxygen Demand	Agric (sediment beds)	2002
(MW6.2) GB..FB-112 (portion 1)	* Peconic River, Lower, and tidal tribs (1701-0259)	Suffolk	Estuary	SC	D.O./Oxygen Demand	Urb/Storm Runoff	2002

Appendix B-2: Information on Groundwater Management Zones & Nutrient Loading Factors

TMDL Management Alternative Scenarios			5	6	7	8	10	11	13	14
GW Management Zone	**Total Acres in Each Zone**	**Current/Baseline GW Loadings in Model (mg/l)**	**Loading from Zone with 25% Ag reduction (13 mg/l to 9.75 mg/l)**	**Loading from Zone with 25% Non-Ag Reduction (6 mg/l to 4.5, 4 mg/l to 3, gc from 3.58 to 2.69)**	**Loading from Zone with 25% Reduction in ag and non-ag sources (excluding open space)**	**Loading from Zone with 50% Reduction in ag and non-ag sources (excluding open space)**	**Full Build Out**	**Worst Case Full Build Out**	**GW #'s for Cumulative Improvements - Existing Conditions,** inc. 0.2 mg/l reduction from atm dep.(still have to account for STP effluent out of system May-Sept and 31.3% reduction in NOx Atm.	**GW #'s for Cumulative Improvements - Full Build Out,** inc. 0.2 mg/l reduction from atm. dep. (still have to acct for STP effluent out of system and 31.3% reduction in NOx Atm Dep.)
Shelter Island (SHE)	7,172.97	3	2.9	2.35	2.28	1.56	3.13	3.38	2.08	2.38
South Fork Inland (SF-I)	3,177.06	3	3.0	2.88	2.88	2.76	3.22	3.22	2.68	2.83
South Fork Central (SF-C)	1,776.95	3	3.0	2.52	2.52	2.05	3.08	3.11	2.32	2.58
Peconic River Middle (PR-M)*	4,679.02	0.65	0.6	0.6	0.6	0.5	0.6	0.7	0.54	0.52
Peconic River East (PR-E)	6,884.02	5	4.81	4.51	4.32	3.64	4.88	5.18	4.12	3.98
North Fork Inland (NF-I)	1,409.47	8	7.39	7.73	8.20	5.47	6.53	8.09	8.00	4.50
North Fork Central (NF-C)	1,797.92	8	6.52	7.51	6.02	4.05	6.18	8.35	5.82	4.37
Montauk (MONT)	8,515.18	4	3.98	3.71	3.69	3.38	4.07	4.13	3.49	3.59
Little Peconic South (LP-S)	15,090.26	4	3.86	3.21	3.07	2.13	4.05	4.34	2.87	3.03
Little Peconic North (LP-N)	9,356.84	9	8.47	8.19	7.66	6.32	8.61	9.44	7.46	6.34
Great Peconic South (GP-S)	10,001.38	4	4.00	3.32	3.32	2.64	4.28	4.38	3.12	3.33
Great Peconic North (GP-N)	7,010.52	9	7.90	8.32	7.22	5.43	7.72	9.34	7.02	5.55
Gardiners Bay South (GB-S)	15,997.73	4	3.98	3.22	3.20	2.40	4.16	4.32	3.00	3.24
Gardiners Bay North (GB-N)	3,202.20	9	8.30	8.69	7.98	6.97	8.11	9.13	7.78	6.85
Meetinghouse Creek (MC)	1,236.24	9	7.97	8.34	7.31	5.61	7.87	9.52	7.11	5.61
TOTAL	97,308									

* although located upstream of USGS gauge and out of model domain (accounted for in stream flow loading inputs to model) it may be good to vary this loading in the management alternative runs. PR-M estimations were calculated as a ratio of PR-E.

Build Out Potential According to Groundwater Management Zones

Residential Properties***

Sewer District	GW Management Zone	Total Acres in Each Zone	Vacant & Developed but Subdividable Parcels: Total Existing # of lots	Total Acreage	Sewer District Total Acreage	Total # of Potential Additional Lots	Total Acreage of Additional Lots* (Vacant)	Total Acreage of Additional Lots** (Developed but Subdividable)	Overall Total Acreage of Additional Lots	Developed Acreage - LB (4 mg/l)	SEWER Vacant and Developed but Subdiv. (a subset of Vacant & Developed but Subdividable Parcels): SEWER District Total Acreage of Additional Lots (Vacant)	SEWER District Total Acreage of Additional Lots (Developed but Subdividable)	SEWER District Overall Acreage of Additional Lots	SEWER Acreage Developed (2 mg/l)	Developed & Not Subdividable: Total # of Lots	Total Acreage (6 mg/l)	SEWER Developed Total Acreage (3 mg/l)	Protected: Total # of Lots	Total Acreage	Agricultural: Total # of Lots	Total Acreage
	Shelter Island (SHE)	7,172.97	1,009	2,241.48		1,168	427.47	547.07	974.54	1266.94					2,234	2,158		115	2,462	10	156
	South Fork Inland (SF-I)	3,177.06	114	378.06		61	268.64	0.00	268.64	109.42					156	180		178	2,619	-	-
	South Fork Coastal (SF-C)	1,776.95	326	178.95		140	43.64	28.29	71.93	107.02					1,053	494		55	1,104	-	-
	Peconic River Middle (PR-M)	4,679.02	263	760.83		625	344.94	77.92	422.86	337.97					479	1,163		21	171	63	2,242
Riverhead	Peconic River East (PR-E)	6,884.02	104	914.38		974	351.69	134.13	485.82	428.56	38.32	25.41	63.73	124.29	3,731	2,281	798	159	3,089	15	409
	North Fork Inland (NF-I)	1,409.47	52	106.47		85	17.40	28.74	46.14	60.33					233	215		1	20	41	1,068
	North Fork Coastal (NF-C)	1,797.92	250	400.92		501	122.72	102.60	225.32	175.60					1,112	476		18	102	44	819
	Montauk (MONT)	8,515.18	831	1,019.18		436	264.92	138.08	403.00	616.18					2,346	1,249		191	6,195	26	52
Sag Harbor	Little Peconic South (LP-S)	15,090.26	1,930	4,700.12		1,349	1171.04	712.60	1883.64	2816.48	0.00	0.00	0.00	0.93	6,794	5,694	30	484	3,329	65	658
Greenport	Little Peconic North (LP-N)	9,356.84	1,062	2,715.84		1,615	1080.08	471.79	1551.87	1163.97	6.40	6.92	13.32	21.50	5,372	4,405	285	123	705	106	1,531
	Great Peconic South (GP-S)	10,001.38	1,694	2,990.33		1,480	921.63	476.20	1397.83	1592.50					3,586	2,895		377	3,161	4	14
	Great Peconic North (GP-N)	7,010.52	663	1,620.17		767	529.91	335.08	864.99	755.18					3,542	2,503		59	267	113	2,374
	Gardiners Bay South (GB-S)	15,997.73	2,779	4,141.37		1,331	720.26	1093.87	1814.13	2327.24					7,580	6,713		683	4,904	7	78
	Gardiners Bay North (GB-N)	3,202.20	234	400.20		120	80.26	67.96	148.22	251.98					793	499		51	1,609	38	694
	Meetinghouse Creek (MC)	1,236.24	89	428.24		538	87.80	139.93	227.73	200.51					348	412		2	4	16	392
	TOTAL	**97,307.76**	**11,400**	**22,996.54**		**11,170**	**6432.40**	**4354.26**	**10786.66**						**39,359**	**31,437**		**2,517**	**29,741**	**548**	**10,487**
	PR-M (Brookhaven/Non-PE)		**N/A**	**N/A**		**N/A**									**608**	**496**		**517**	**3,065**	**-**	**-**

* These vacant acreages were calculated by taking the vacant properties that had subdivision potential and subtracting the acreage of one lot.

** Properties that already have development have the potential to be completely cleared. For these scenarios: 1) Properties not already located in an Overlay District where clearing restricitons were in place, were assumed to have 50% of the lot still in a natural state. Therefore, these developed but subdividable acreages were calculated by taking the developed but subdividable acreages and dividing by two. 2) Properties which are located in an Overlay District (within the Towns of East Hampton or Southampton and within Ground Water Management Zones: South Fork Inland; South Fork Central; Peconic River East; Montauk; Little Peconic South; Great Peconic South; or Gardiners Bay South) have clearing restrictions in place. In order to calculate acreages for these developed but subdividable totals, the amount of allowable clearing under the Overlay District regulations was removed from the total acreage.

*** Properties were put into the management zone in which the majority of the acreage was located

Build Out Potential According to Groundwater Management Zones

Golf Course Properties

GW Management Zone	Subdividable Golf Courses on CLPS: Total Existing #	Total Acreage	Total # of Potential	Golf Courses not on CLPS: Total # of Lots	Total Acreage
Shelter Island (SHE)	3	155.49	90	0	0
South Fork Inland (SF-I)	-	-	-	0	0
South Fork Central (SF-C)	-	-	-	0	0
Peconic River Middle (PR-M)	6	342.19	17	0	0
Peconic River East (PR-E)	-	-	-	3	190.641
North Fork Inland (NF-I)	-	-	-	0	0
North Fork Central (NF-C)	-	-	-	0	0
Montauk (MONT)	-	-	-	0	0
Little Peconic South (LP-S)	3	709.14	516	0	0
Little Peconic North (LP-N)	-	-	-	0	0
Great Peconic South (GP-S)	9	933.63	3,380	1	7.419
Great Peconic North (GP-N)	4	134.49	73	1	11.86
Gardiners Bay South (GB-S)	4	161.36	88	0	0
Gardiners Bay North (GB-N)	-	-	-	0	0
TOTAL	29	2,436.30	4,164	5	209.92

Build Out Potential According to Proposed Sewer Districts

Residential Properties

			Vacant & Developed but Subdividable CLPS Parcels					Developed & Not Subdivid			Protected		Agricultural	
	Sewer District	Total in each zone	Total Existing # of lots	Total Acreage	Total # of Potential Additional Lots	Total Acreage of Additional Lots* (Vacant)	Total Acreage of Additional Lots** (Developed but Subdividable	Overall Total Acreage of Additional Lots	Total # of Lots	Total Acreage	Total # of Lots	Total Acreage	Total # of Lots	Total Acreage
PR-E Zone	Riverhead		252.00	188.02	143	38.32	25.41	63.73	1697	797.5	12	77.563	4	61.985
LP-S Zone	Southampton		4.00	0.925	0	0	n/a	0	171	29.744	4	2.957	0	0
LP-N	Southold		68.00	34.82	44	6.4	6.92	13.32	791	285.07	11	208.51	0	0
	TOTAL		**324.00**	**223.765**	**187**	**44.72**	**32.33**	**77.05**	**2659**	**1112.314**	**27**	**289.03**	**4**	**61.985**

* These vacant acreages were calculated by taking the vacant properties that had subdivision potential and subtracting the acreage of one lot.

** Properties that already have development have the potential to be completely cleared. For these scenarios: 1) Properties not already located in an Overlay District where clearing restricitons were in place, were assumed to have 50% of the lot still in a natural state. Therefore, these developed but subdividable acreages were calculated by taking the developed but subdiviable acreages and dividing by two. 2) Properties which are located in an Overlay District (within the Towns of East Hampton or Southampton and within Ground Water Management Zones: South Fork Inland; South Fork Central; Peconic River East; Montauk; Little Peconic South; Great Peconic South; or Gardiners Bay South) have clearing restrictions in place. In order to calculate acreages for these developed but subdividable totals, the amount of allowable clearing under the Overlay District regulations was removed from the total acreage.

TMDL Management Alternatives

GW Management Zone	Total Acres in Each Zone	Current/Baseline GW Loadings in Model (mg/l)	Calculated GW loading per zone w/0.5 mg/l for open space and 10 mg/l for Ag	Calculated GW Loading Zone w/1 mg/l for open space and 13.0 mg/l for ag	Loading coming from sources other than Ag in Zone	Loading from Zone with 25% Ag reduction (13 mg/l to 9.75 mg/l)	Loading from Zone with 50% Ag reduction (13 mg/l to 6.5 mg/l)	Loading from sources other than residential and golf in Zone	Loading from Zone with 25% Non-Ag Reduction (6 mg/l to 4.5, 4 mg/l to 3, gc from 3.58 to 2.69)	Loading from sources other than ag, residential and golf courses in zone	Loading from Zone with 25% Reduction in ag and non-ag sources (excluding open space)	Loading from Zone with 50% Reduction in ag and non-ag sources (excluding open space)	Loading from sources other than ag and additional vacant and subdividable lots (i.e., loading from protected, golf courses, existing resid.)	% golf courses and existing resid from golf courses, existing resid and protected	Full Build Out	Loading from sources other than additional vacant and subdividable lots	Worst Case Full Build Out	GW #'s for Cumulative Improvements - Existing Conditions, inc. 0.2 mg/l reduction from atm dep (still have to account for STP effluent out of system May-Sept and 31.3% reduction in Atm.	GW #'s for Cumulative Improvements - Full Build Out (still have to account for STP effluent out of system and 31.3% Atm Dep.
Shelter Island (SHE)	7,172.97	3	3.05	3.35	2.78	2.63	2.86	0.82	2.35	0.27	2.28	1.56	3.06	0.59	3.13	3.31	3.38	2.08	2.38
South Fork Inland (SF-I)	3,177.06	3	0.93	1.39	3	3	3	2.78	2.68	2.78	2.68	2.78	3.18	0.10	3.22	3.18	3.22	2.68	2.63
South Fork Coastal (SF-C)	1,776.95	3	2.24	2.57	3	3	3	1.65	2.52	1.65	2.52	2.05	3.08	0.35	3.08	3.08	3.11	2.32	2.58
Peconic River Middle (PR-M)	4,679.02	[redacted]																	
Peconic River East (PR-E)	6,864.02	5	3.19	3.63	4.49	4.81	4.61	5.27	4.51	4.38	4.32	3.64	4.78	0.46	4.88	5.30	5.18	4.12	3.98
North Fork Inland (NF-I)	1,409.47	8	8.69	10.98	-	7.39	4.93	8.59	7.73	-	8.20	5.47	-	0.93	6.53	8.24	8.09	8.00	4.50
North Fork Coastal (NF-C)	1,797.92	8	6.63	8.08	3.82	6.52	5.04	9.44	7.51	0.54	6.02	4.05	4.66	0.56	6.18	9.00	8.35	5.62	4.37
Montauk (MONT)	8,515.18	4	1.62	2.02	3.94	3.98	3.96	3.62	3.71	3.55	3.69	3.38	4.09	0.23	4.07	4.15	4.13	3.49	3.59
Little Peconic South (LP-S)	15,090.26	4	3.79	4.09	3.59	3.86	3.72	2.13	3.21	0.75	3.07	2.13	3.98	0.73	4.05	4.43	4.34	2.67	3.03
Little Peconic North (LP-N)	9,356.84	9	5.08	5.69	8.22	8.47	7.94	14.28	8.19	15.12	7.66	6.32	10.00	0.89	8.61	10.59	9.44	7.46	6.34
Great Peconic South (GP-S)	10,001.38	4	2.95	3.18	3.99	4.00	3.99	2.62	3.32	2.79	3.32	2.64	4.47	0.63	4.28	4.49	4.38	3.12	3.33
Great Peconic North (GP-N)	7,010.52	9	6.20	7.30	6.95	7.90	6.80	12.53	8.32	11.55	7.22	5.43	8.32	0.93	7.72	10.13	9.34	7.02	5.55
Gardiners Bay South (GB-S)	15,997.73	4	3.39	3.62	3.96	3.98	3.97	2.03	3.22	1.91	3.20	2.40	4.34	0.65	4.16	4.38	4.32	3.00	3.24
Gardiners Bay North (GB-N)	3,202.20	9	4.14	5.06	7.69	8.30	7.59	10.12	8.69	8.99	7.98	6.97	8.33	0.32	8.11	9.39	9.13	7.78	6.85
Meetinghouse Creek (MC)	1,236.24	9	7.15	8.20	7.14	7.97	6.94	12.59	8.34	11.89	7.31	5.61	9.41	0.99	7.87	10.81	9.52	7.11	5.61
TOTAL	97,307.76																		

Appendix C: Agricultural Environmental Management/Agricultural Stewardship

Implementation Highlight: Agricultural Environmental Management/ Agricultural Stewardship

Introduction

The Suffolk County Agricultural Stewardship Program was established in response to growing concerns about nitrate levels and pesticide residues in Long Island ground and surface waters. Cornell Cooperative Extension, the coordinating agency of the Stewardship Program, works together with Suffolk County Soil and Water Conservation District and USDA Natural Resource Conservation Service to protect the Long Island's water resources while at the same time preserving the region's viable and sustainable agricultural industry. This program is funded by the Suffolk County Water Quality Protection and Restoration Program.

Background

The Long Island Agricultural Stewardship Committee was formed in 1999 to address environmental concerns with the intent of preserving farmland while protecting groundwater. The goals of the stewardship committee are to promote the use of agricultural inputs in a responsible and environmentally sound manner while maintaining a strong, viable agricultural industry. The committee has begun to develop and implement a voluntary management plan that addresses groundwater and surface water protection by appropriately using nitrogen (fertilizer) and pesticides registered for use on Long Island.

The stewardship committee originally developed thirteen environmental risk assessment worksheets for Long Island growers modeled after the NYS Agricultural Environmental Management (AEM) Program. Worksheet topics include pesticides, nutrients, soil, irrigation, water, and well management. These worksheets are part of the AEM five-step program, which allows growers to address environmental concerns on their farms, while maintaining a healthy agricultural economy. Other important aspects of the stewardship program include providing information on Best Management Practices and conducting various pilot projects to evaluate practices to reduce nitrogen and pesticide loading into the groundwater.

What is AEM?

Agricultural Environmental Management (AEM) is a voluntary, incentive-based program that helps farmers operate environmentally sound and economically viable businesses. The AEM program coordinates agricultural and environmental conservation agencies and programs, as well as private sector consultants, to provide one-stop shopping for services. The AEM program benefits both farmers and the environment by helping to manage fertilizer nutrients, protect drinking water, conserve soil, improve neighbor and community relations, and comply with environmental regulations.

How does AEM work?

Using AEM's 5-tiered approach, farmers work with the Agricultural Stewardship Program, including Suffolk County's Soil and Water Conservation District (SWCD) and National Resource Conservation Service (NRCS) staff, to develop and implement comprehensive, site-specific farm plans.

Tier 1: A short questionnaire identifies current farm activities, future plans and potential environmental concerns.

Tier 2: AEM worksheets document current environmental stewardship while identifying and prioritizing environmental concerns. The Stewardship Program has focused the worksheets on nutrient and pest management, highlighting the agricultural practices that have the greatest impact on Long Island's ground and surface waters.

Tier 3: A plan is developed providing solutions to environmental concerns identified in Tiers 1 and 2. Plans are designed with a farm's mission, goals, and objectives in mind.

Tier 4: SWCD, NRCS, the Stewardship Program staff and consultants provide farms with technical and educational assistance to implement best management practices (BMPs).

Tier 5: Ongoing evaluations ensure that AEM helps protect both the environment and the viability of farm businesses.

What Assistance Does AEM Provide?

Technical Assistance and Information:
- Environmental farm plan development
- Best Management Practice design and installation
- Education programs to help farmers operate viable and environmentally sound farms

Financial Assistance:
Sources of cost-share funds for environmental farm plans and BMP implementation on Long Island include:
- NYS Agricultural Non-point Source Abatement and Control Grant Program
- USDA Farm Bill Programs such as the Environmental Quality Incentive Program (EQIP) and the Wildlife Habitat Incentives Program (WHIP)
- Agrichemical Mixing Facility

Components of the Stewardship Program
There is always room for improvement in every farm operation when it comes to best management practices. Participation in the Stewardship Program is voluntary and confidential.

Confidential Nutrient and Pest Management worksheets (AEM Tier II Worksheets) help growers evaluate farm management practices and address issues such as:
- Fertilizer/pesticide storage, mixing and loading practices, calibration, nitrogen management, pesticide use, and integrated crop management practices.
- Growers receive recommendations, technical assistance and conservation management plans tailored to meet specific stewardship needs.
- Cost-Share opportunities are available to assist growers in implementing changes in management practices to improve stewardship.

- Educational programs, On-farm demonstration projects, and DEC credits are available to growers who chose to participate.

Farm Site Evaluation
The Agricultural Stewardship Program has developed a list to help growers determine if they are using Best Management Practices (BMPs) which help protect ground water and surface water. The grower is first asked to review the conditions within the growing areas on their farm. If they check NO to any of the questions, they are then asked to determine Best Management Practices designed to address the particular point made in the question. Cornell Cooperative Extension of Suffolk County, Suffolk County Soil and Water Conservation District, or Natural Resources Conservation Service may be contacted for information on practices they should be following. If the grower uses a custom applicator or dealer who offers a full service program, he or she can inform the grower of steps they can take to protect the water resources on and near their property. Growers may contact the NYS Department of Environmental Conservation or their local agricultural chemical representative for more information.

Agricultural Demonstration Projects and Research Summary
Suffolk County agricultural growers and farmers participate in voluntary on-farm demonstration projects, and a growing number of others are requesting information on becoming involved. Commodity groups participating in these programs include vegetable crops, nursery, greenhouse, sod farms and vineyard. In addition research experiments continue to be conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead.

Several of these project reports are included as an attachment to this document (see Appendix C). Reports included summarize work to evaluate fertilizer and pesticide application rates as related to crop yield and quality, show the effect of slow release nitrogen fertilizers in nursery stock and vegetable crops, evaluate the reduced rates of fertilizer application on growth of ornamental plants, and reducing nitrogen groundwater contamination from sod production.

Agricultural Demonstration Projects and Research Summary
Suffolk County agricultural growers and farmers participate in voluntary on-farm demonstration projects, and a growing number of others are requesting information on becoming involved. Commodity groups participating in these programs include vegetable crops, nursery, greenhouse, sod farms and vineyard. In addition research experiments continue to be conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead.

VEGETABLE / POTATO PRODUCTION

EVALUATION OF CONTROLLED RELEASE NITROGEN FERTILIZER IN SWEET CORN PRODUCTION
Investigators: S. Menasha, D. Moyer, K. Sanwald
Location: Long Island Horticultural Research and Extension Center

‘Providence’ sweet corn was grown to evaluate the performance of three controlled release nitrogen fertilizers in sweet corn production compared to a standard water-soluble nitrogen fertilizer by assessing yields and plant nitrogen content at two nitrogen (N) rates, 100 and 150 lbs per acre. The controlled release fertilizer treatments included granular products from Georgia Pacific, GP-43G (43-0-0) a methylene urea polymer; ESN® (44-0-0), a polymer, coated urea from Agrium; and Agrocote® (38-0-0), a polymer, sulfur-coated urea from Scotts. All of the controlled release nitrogen fertilizer treatments were compared to ammonium nitrate (34-0-0), a standard water-soluble nitrogen fertilizer. The experiment was grouped as a 4x2 factorial arranged in a randomized complete block design with 4 replications. Plots were 20’ long by 4 rows wide spaced on 34” centers. Seeds were planted 8.8” apart on July 3rd with a Mater Macc precision vacuum planter. At planting, all treatments received 300 lbs per acre 13-13-13, equivalent to 39 lbs N per acre, banded slightly below and to the side of the seed. Nitrogen was in the form of monoammonium phosphate (11-52-0) and ammonium sulphate (20-0-0). On July 12th, when plants were 2-4” tall, all treatments were sidedressed with either 60 lbs or 110 lbs N per acre with N source and rate determined by the treatment. Corn was irrigated throughout the season as needed, worm pests were managed with Warrior, and weeds were controlled with Prowl H_2O and Aatrex 4L. The center 2 rows from each plot were harvested on September 22nd and data on number of dozen ears per acre and weight were recorded. To further evaluate the performance of the N fertilizer programs examined, leaf and stalk samples were taken as a means of monitoring nitrogen sufficiency levels in the plant. Ear leaf samples were taken on Sept 8th, about 2 weeks before harvest. Stalk samples were taken 3 days after harvest on Sept 25th.

Results from the study indicate that although numerically the number of marketable ears per acre was greatest in the ammonium nitrate treatment of 150 lbs N per acre, there were no significant differences between this treatment and three of the controlled release nitrogen treatments; ESN® at 150 lbs and both Agrocote® treatments at 100 and 150 lbs. Furthermore, all the controlled release nitrogen fertilizer treatments produced marketable ear counts statistically similar to the ammonium nitrate treatment at 100 lbs N per acre except the GP-43G at 150 lbs N per acre treatment. The low yields in the GP-43G at 150 lbs N per acre treatment is believed to be a result of possible ammonia toxicity to plant roots. Multiple plants had lodged in these plots shortly after sidedressing due to a minimal to non-existent root system. Looking at the effect N source alone had on marketable dozen ears/A and ignoring all other effects, we see that N source did

not significantly impact ear counts per acre. So, in this study, controlled release nitrogen fertilizers were able to perform as well as ammonium nitrate and although there were numeric differences, the number of marketable ears per acre was not statistically influenced by N source.

Percent foliar N levels tested within the adequate range for all treatments and did not statistically differ. Stalk N tests indicate nitrogen levels at harvest to be either deficient or marginal possibly due to the release rate of the products. Looking solely at the effect N source had on stalk N levels, we see that stalk N levels from Agrocote® treatments were significantly lower than all other N fertilizer treatments. This suggests that N release may have been too slow or too fast to match crop demands. When looking at the effects N rate had on stalk N levels and ignoring all other effects, the lower N rate of 100 lbs N produced stalk N levels significantly lower than the high N rate of 150 lbs N. Moreover, high rainfall amounts that occurred during the trial could have contributed to deficient or marginal stalk N levels regardless of N source or N rate.

In conclusion, marketable yields of controlled release nitrogen fertilizer treatments, except GP-43G at 150 lbs N per acre, were comparable to marketable yields obtained when using ammonium nitrate at 100 lbs or 150 lbs N per acre. Therefore, controlled release fertilizers have shown the promising ability to supply sufficient nitrogen for growth in order to obtain statistically similar marketable dozen ears/A as with ammonium nitrate in sweet corn production.

ON-FARM EVALUATION OF CONTROLLED RELEASE NITROGEN FERTILIZER IN SWEET CORN PRODUCTION; ANDERSON'S FARM, RIVERHEAD

Investigators: S. Menasha, D. Moyer, K. Sanwald
Cooperators: Anderson's Farm, Agricultural Stewardship Program
Location: Riverhead, NY

An experiment was conducted to evaluate the use of controlled release nitrogen fertilizer in sweet corn production by assessing impacts on yield and plant nitrogen (N) content. The study took place at Anderson's Farm in Riverhead, NY. The controlled release nitrogen fertilizer treatments included GP-43G (43-0-0), composed of methylene urea polymers by Georgia Pacific and ESN® (44-0-0), a polymer, coated urea by Agrium. These treatments were compared to ammonium nitrate (34-0-0) a standard, soluble nitrogen fertilizer source. The experiment was arranged in a randomized complete block design with four replications. Plots were 40' long by four rows wide, and rows were spaced on 34" centers. At planting, 500 lbs per acre 10-10-10 fertilizer was applied. On July 20th, when plants were 6-8" tall, treatments were sidedressed

with 70 lbs N per acre with N source at sidedress determined by treatment. Fertilizer was applied 2-4" to one side of the plant and then cultivated in. Corn was irrigated throughout the season as needed. Ears were harvested on September 18th from two, 20 foot sections from the center two rows of each plot. Ear numbers and weights were recorded. In order to further evaluate the different N fertility programs, leaf samples were taken at mid-silk on September 5th to determine plant tissue nitrogen content. Stalk samples were collected on September 18th to identify the nitrogen status of the corn crop at harvest. Non replicated data was collected from the grower's standard fertility program for comparison.

Results indicate that there were no significant differences in the number of marketable ears produced per acre among the nitrogen fertility programs analyzed. When compared to the grower standard, the controlled release fertilizer treatments produced similar or a greater number of marketable ears per acre. Marketable ear weights also did not statistically differ among the treatments analyzed and were comparable to the grower's standard treatment. Numerically, the GP-43G treatment yielded the lowest for both ear weight and the number of ears per acre. Tip fill was statistically similar among the treatments analyzed and was comparable to the grower standard treatment. Percent foliar N content did not statistically differ among the analyzed treatments or to the grower's standard treatment and all N levels were within the adequate range. Percent stalk N levels fell in the marginal range for the GP-43G treatment and the grower standard treatment while the ammonium nitrate and ESN® treatment values were within the optimal range. Although these differences were not significant, N release in controlled release fertilizers can be sufficient for crop production and indicates the potential use for controlled release nitrogen fertilizers in sweet corn production as a means of increasing fertilizer use efficiency by the crop and reducing nitrate contamination in groundwater.

ON-FARM NITROGEN DEMONSTRATIONS: USING THE "END-OF-SEASON CORNSTALK TEST" TO EVALUATE SWEET CORN NITROGEN FERTILITY PROGRAMS

Investigators: S. Menasha, D. Moyer, K. Sanwald
Cooperators: Cornell Cooperative Extension Agricultural Stewardship Program
Location: Long Island Horticultural Research and Extension Center and the North and South Forks, Long Island, NY

The end-of-season cornstalk test is a diagnostic tool useful for determining the nitrogen (N) status of a corn crop at the end of the growing season. The test is based on studies that determined corn plants will accumulate excess N in the

basal stalk tissue when abundant amounts of N are available in the soil. This information in turn can be used to evaluate grower sweet corn fertility programs and to adjust N rates accordingly for economic and environmental benefits. Although, the test does not directly indicate how much nitrogen rates should be increased or decreased, it does allow growers to make adjustments toward optimal N rates when conducted over several years. In 2006, the same eight growers from 2005 participated in this experiment and 5 of the 8 in 2004.

At harvest, approximately twenty, 8" stalk samples were cut beginning at the 6" mark above the ground. Any leaves and leaf sheaths were removed from the stalks before drying. Samples were dried at 70º C for twenty-four hours prior to analysis. Samples were sent to Brookside Laboratories Inc., Ohio and were analyzed using the Total Nitrogen by Combustion Test. Sampling procedures were the same for all years.

When interpreting test results, it is important to consider weather conditions that occurred during the growing season as dry years may minimize N leaching potential and wet years may increase it. For that reason, N rates most profitable over many years can be expected to test deficient in some years and excessive in other years. So, after multiple years of testing, trends become apparent and N rates can be increased or decreased depending on whether those N rates usually test deficient or excessive.

During the 2006 growing season, precipitation was above the 20 year average and resulted in 6 of the 9 sample sites testing in the marginal range possibly due to increased nitrogen leaching. So, in drier years, the latter 6 sample sites may test in the optimal or excessive range. For example, Grower 8 applied 120 lbs N per acre and tested in the marginal range this season and tested optimal in 2005, which was a very dry year (driest in 25 years). Therefore, although data isn't sufficient to make recommendations yet, an N rate of 120 lbs/A may be optimal over time for this particular site.

EVALUATION OF CONTROLLED RELEASE NITROGEN FERTILIZERS IN POTATO PRODUCTION

Investigators: S. Menasha, D. Moyer, K. Sanwald
Location: Long Island Horticultural Research and Extension Center

Three granular and one liquid controlled release nitrogen fertilizer were evaluated against two soluble nitrogen fertilizers to determine effects on yield, tuber quality, and plant tissue nitrogen content of 'Reba' potatoes. Two rates of

nitrogen (N), 150 and 200 lbs per acre, were applied either as a split application or all at planting. Fertilizer treatments included: Agrocote®, a polymer, sulfur-coated urea produced by Scott's (38-0-0); Scott's Potato Blen (13-15-15-2(Mg)) containing 80% controlled release N in the form of Agrocote® and the other 20% as soluble N in the form of diammonium phosphate; a granular product by Georgia Pacific, GP-43G (43-0-0); a liquid product, Nitamin® 30L, (30-0-0) also from Georgia Pacific; and two water soluble nitrogen fertilizers: urea (46-0-0) and ammonium nitrate (34-0-0) as the standard nitrogen fertilizer. The experiment was grouped as a 2x7 factorial arranged in a randomized complete block design with 4 replications. Plots were 20 feet long by 4 rows wide spaced on 34" centers. Potatoes were planted 9.3" apart within the rows on April 17th and 18th. At planting, fertilizer was applied using a two-row planter designed for fertilizer experiments, in furrows 2" to the side and slightly below the seed piece. Liquid fertilizer treatments received 30 lbs N per acre soluble fertilizer at planting in the form of ammonium nitrate (34-0-0). Also at planting, 200 lbs/A of both Triple Super Phosphate (0-46-0) and Muriate of Potash (0-0-60) were applied to all treatments except the Potato Blen treatments which received 173 lbs/A, both phosphorus (P) and potassium (K), in the low N rate treatment and 230 lbs/A, both P and K, in the high N rate treatment. On May 23rd, when plants were 1-2" tall, liquid fertilizer treatments were sidedressed with Nitamin® 30L. Liquid fertilizer was knifed in about 6" to each side of the plant. On May 31st granular sidedress treatments were fertilized by hand 2" to the side of the plant and then cultivated in. Plants were 4" to 8" tall. Sidedress N for the granular treatments was from the same N source as was applied at planting.

Leaf samples were collected on June 6th, June 30th, and July 27th to determine plant tissue nitrogen content throughout the growing season as a means of evaluating nitrogen release and plant uptake. Plant vigor and maturity ratings were recorded. The experiment was irrigated 7 times with approximately 1" of water per week to supplement rainfall. Pests were managed according to Cornell Guidelines. Plants were vine-killed on September 5th with Gramoxone Max (paraquat) at a rate of 1 pt/A. Potatoes were harvested on September 19th from the center two rows of each plot and then graded. Data collected included yield, specific gravity, and tuber quality.

Results show that Agrocote® at 150 and 200 lbs, Potato Blen at 200 lbs, and Nitamin® 30L at 200 lbs produced significantly greater marketable yields than the standard (ammonium nitrate at 200 lbs N per acre). All controlled release fertilizer treatments produced statistically similar or greater marketable yields than both ammonium nitrate treatments, except for the high rate of GP-

43G applied all at planting which produced significantly lower yields than the standard. However, the lower yields associated with the at-planting, GP-43G treatments is believed to be a result of possible ammonia toxicity to plant roots. Plants from these treatments were stunted and light green during most of the growing season. Furthermore, when looking at the effect N source had on marketable yields, ignoring all other effects, it is again confirmed that controlled release N fertilizers Potato Blen®, Agrocote®, and Nitamin® 30L produced significantly greater yields than the standard ammonium nitrate. Total and marketable yields between the high and low rates of water soluble fertilizer treatments were not significant. Additionally, within each controlled release nitrogen fertilizer treatment, marketable yields were not significantly increased when a higher rate of nitrogen was applied except in the Nitamin® 30L treatment where a higher rate of N per acre (200 lbs) produced significantly greater marketable yields than Nitamin® 30L at a lower rate of 150 lbs N per acre. This is further backed by the fact that when looking at the effect N rate had on marketable yields, ignoring all other effects, the results show there was no significant difference between the high, 200 lbs/A, or the low rate, 150 lbs/A of nitrogen among the N sources evaluated.

Tuber size distribution was similar in most treatments except the percentage of small tubers was greatest in the at-planting, GP-43G treatments which most likely is a result of the assumed ammonia toxicity to plant roots to plants in this treatment. A greater percentage of misshapen tubers occurred in the Agrocote® treatments and the high rate, at-planting, GP-43G treatment. Internal defects were greatest in GP-43G at 200 lbs, split application; Nitamin® 30L at 200 lbs; and ammonium nitrate at 150 lbs. Foliar nitrogen content on all three dates showed N levels to be within the adequate range or above for all treatments illustrating that nitrogen release of the controlled release nitrogen fertilizers met the demands of the crop.

In summary, controlled release fertilizers were capable of maintaining or significantly increasing marketable yields over the standard, 200 lbs N per acre of ammonium nitrate. Further, nitrogen rates reduced to 150 lbs N per acre using controlled release fertilizers maintained or increased marketable yields over the standard. Therefore, it may be possible to even further reduce N rates with controlled release fertilizers in potato production without decreasing yields over the standard with the use of controlled release nitrogen fertilizers. Reduced N rates and greater yields with controlled release fertilizers suggest improved nitrogen use efficiency by the crop and thus reduce nitrate leaching potential into groundwater.

ON-FARM EVALUATION OF CONTROLLED NITROGEN RELEASE-FERTILIZER IN POTATO PRODUCTION; FOSTER FARMS, SAGAPONACK

Investigators: S. Menasha, D. Moyer, K. Sanwald

Location: Foster Farms, Sagaponack, NY

An on-farm demonstration was conducted to compare a controlled release nitrogen fertilizer source to a soluble nitrogen fertilizer source, each at two nitrogen (N) rates. Effects on yield, specific gravity, and plant tissue nitrogen content of 'Reba' potatoes were evaluated. Four fertilizer programs were assessed. All plots received 3.5 lbs N/acre liquid fertilizer (9-18-9) at planting which is represented in the total N rates for each treatment. The fertilizer programs included the grower's standard fertilization program at a total of 198.5 lbs N per acre where 165 lbs N/acre (11-14-16-4(Mg)) was applied at planting and 30 lbs N/acre liquid (30-0-0) was sidesressed; the grower program at a reduced rate of 168.5 lbs total N per acre (11-14-16-4(Mg)); Scotts controlled release fertilizer Potato Blen (13-15-15-2(Mg)) at a high rate of 198.5 lbs total N per acre; and Scotts controlled release fertilizer Potato Blen (13-15-15-2(Mg)) at a low rate of 159.5 lbs total N per acre. Scotts Potato Blen contains 80% controlled release N in the form of Agrocote® (38-0-0) and 20% N in the form of diammonium phosphate (18-46-0). Potatoes were planted at the end of April.

Leaf samples were collected on June 8th, June 27th, and July 27th to determine plant tissue nitrogen content through the growing season as a means of evaluating nitrogen release and plant uptake. All foliar N levels fell above the adequate range for growth and production. Within each treatment, foliar N levels decreased gradually throughout the growing season. While, on June 27th, foliar N levels in the controlled release nitrogen treatments were clearly greater than the foliar N levels in the grower's programs and maintained above adequate foliar N levels on the last sampling date signifying the likelihood of greater nitrogen use efficiency by the crop with controlled release nitrogen fertilizers.

Potatoes were hand-dug and graded on September 27th and 28th, respectively. Yield results from hand-dug sampling indicate that the controlled release nitrogen fertilizer produced higher yields than the grower's fertilizer programs. The high rate of the controlled release nitrogen fertilizer produced the greatest yield, followed by the reduced rate of the controlled release fertilizer. The low N rate of 159.5 lbs N/A with controlled release nitrogen fertilizer increased marketable yields by 65 cwt per acre over the grower's standard program of 198.5 lbs N/A. Therefore, controlled release nitrogen fertilizers

increased marketable yields over soluble N fertilizers and were able to outperform with a reduced rate of nitrogen over the grower's standard program. This suggests greater nitrogen use efficiency and uptake by the crop with controlled release nitrogen fertilizers and the ability to reduce N leaching potential.

SOD PRODUCTION

REDUCING NITROGEN GROUNDWATER CONTAMINATION FROM SOD PRODUCTION ON LONG ISLAND, NY

Sponsor: Cooperative Extension of Suffolk County, Agricultural Stewardship Program
Duration: March 15, 2005 – December 31, 2007
Investigators: A. Martin Petrovic, Dept. of Horticulture, Cornell University, D. Moyer,
K. Sanwald, L. Loizos, L. Mickaliger
Participating Grower: DeLea Sod Farms, Millerplace NY

Introduction

Many of the surface waters in the US, including New York State and the New York City watershed, as well as most of the northeastern US are at risk from the negative impacts of nitrogen and phosphorus runoff and leaching into groundwater. As example, fertilization during sod production on Long Island resulted in groundwater consistently above drinking water standard (nitrate concentration averaged 18.6 mg/L in 2001 and 24.8 mg/L in 2002). The Peconic Estuary Program recommends a 25% reduction in nitrogen loading from sod production with the implementation of best management practices (PEP CCMP, Appendix H, August 2000). Sod production, accounting for about 3,000 acres on Long Island, is constantly in the establishment phase where the potential for nitrogen leaching is the greatest. During spring and fall, leaching losses of nitrogen and phosphorus can be significant. Furthermore, the application of soluble nutrients needed to establish a dense stand of turf has the potential to contaminate ground and surface water. The need to develop sound best management practices for nitrogen management for sod production is imperative.

Objectives

The goal of the research and outreach project is to develop a sod production fertilization program that will minimize the contribution of nitrogen fertilization to groundwater quality degradation. A great deal of work has been done on nutrient losses from agricultural crops, however, due to the nature of turfgrass systems (i.e. perennial ground cover, no tillage) application of crop research to turfgrass

can lead to erroneous conclusions. Our hypothesis is that BMPs (nitrogen rate and sources) can be developed to minimize the contamination of groundwater from managed turfgrass areas like sod production while maintaining a rapid sod production rate.

Materials and Methods

The study was initiated in the early fall 2005 and will continue thru 2007 on an actual sod production field in eastern Long Island (Delea Sod Farms). Following the normal establishment practices and seeding, two 30 cm dia. by 30 cm long polyvinalchloride (PVC) lysimeters were installed in each plot. An ion exchange resign bag will be placed at the bottom of each lysimeters to capture nitrate and ammonium leaching passed the root zone. Plots will be 3 m X 3 m, with 4 replication of each fertilizer treatment and plots arrange in a completely random design. Plots were seeded on Sept 15, 2005 with 75%-25% Midnight Moon Kentucky bluegras-Fescue mix at a rate of 100-120 lbs/acre.

Nine treatments included: the conventional establishment fertilization practice at full rate and half nitrogen rate that the sod farm uses, three nitrogen sources (quick, moderate and slow release sources) applied at 3 and 6 lbs N/1000 sq.ft. /yr (6 lbs. N/1000 sq. ft./yr is standard rate for sod production on Long Island, PEP CCMP, Appendix H, August 2000), and an unfertilized control plot to determine the amount of residue N in the soil and the amount of N that was mineralized during the study. Plots were fertilized on Oct. 20, 2005, May 2, 2006 and July 25, 2006. Sod strength measurements Sod strength testing was done on July 25, 2006, Aug 24, 2006, Sept. 18, 2006, Oct. 25, 2006. Sod was cut with a 18” wide sod cutter at a length of 4’ by ¾-1” thick. Each plot had two tensile measurements per date taken. Once the sod strength reaches the value for commercially harvestable sod (as determined from sod samples sod by this sod grower), the resign bags were removed on Oct. 25, 2006 from all plots. The bags were frozen and are being analyzed for the amount of nitrate and ammonium that was leached.

Results to Date

Sod is determined to be harvestable if it is dense, dark green foliage and will not fall apart when handled. In the first year of this study we record sod strength measurements over time as seen in Table 1. (In the second year of this study we will record sod strength measurements, as well as visual ratings based on color using the National Turfgrass Evaluation Guidelines (NETP). Generally, the source or rate of fertilizers applied had little affect on sod strength during the first year of the study. Commercially available sod (Briarcliff Sod Farm) was determined to have an average sod strength measurement of 99 lbs by the way we tested it. Based on the sod strength measurements from the first year of the

study, almost all fertilizer sources and rates had acceptable sod strength by Oct 25, 2006, 13 months after seeding. Only on the August 24, 2006 sampling date were there any treatment differences, the slow release sources of Nitroform (1X rate), half the amount of the growers program was statistically higher than the regular growers program.

Table 1. Impact of fertilizer sources and rates on sod strength for 2006.

Treatment	7/25/2006	8/24/2006	9/18/2006	10/25/2006
	---------- lbs ----------			
IBDU at 1X	60a*	65ab	90a	108a
IBDU at 0.5X	58a	67ab	85a	109a
Nitroform at 0.5X	52a	72ab	87a	110a
Nitroform at 1X	52a	80a	90a	112a
IBDU at 1.5X	52a	72ab	87a	101a
Nitroform at 1.5X	51a	76ab	86a	114a
Control (unfertilized)	49a	70ab	87a	105a
IBDU at 2X	49a	65ab	82a	100a
Urea at 1.5X	49a	68ab	78a	96a
Urea at 1X	48a	73ab	87a	96a
BMP	48a	65ab	77a	95a
Grower Program at 0.5X	48a	82a	83a	99a
Grower Program at 1X	46a	53b	74a	93a
Nitroform at 2X	46a	70ab	85a	101a
Urea at 0.5X	45a	70ab	93a	110a
Urea at 2X	42a	57ab	73a	95a

*Lbs of sod tensile strength, average of 2 samples per plot and 4 replicates. Values in the same column not connected by same letter are significantly different.

Plans for 2007

The study was repeated in the fall of 2006, two new sites were established and treated as down in 2005-2006. The sod strength will be determined as done previously. In addition, turfgrass quality measurement will be made to help determine when the sod is harvestable, must have good quality and high tensile strength.