RUTGERS COOPERATIVE RESEARCH & EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

VEGETABLE CROPS EDITION $1.50 OCTOBER 5, 2005

INSIDE

Benefits of Applying Municipal Collected Leaves to Farmland

Review of Bob and Leda Muth's Farm, Glassboro, NJ

Jack Rabin, Associate Director for Farm Services, NJAES

Strategic Management of the Whole Farm

Many years ago Bob Muth recognized his gravelly sandy loam soils were capable of producing profitable crops, but deficient in soil organic matter. He began a multi-year search for alternatives.

Ultimately Bob worked with his community to utilize municipal collected deciduous leaves, despite three concerns:

1. **Biological.** Un-composted leaves might cause soil Carbon:Nitrogen imbalances;
2. **Practical and Social.** Foreign matter in collected leaves from diapers to beer cans or leaves blowing from his fields to neighbors;
3. **Regulatory.** State Department of Environmental Protection treating leaves as a regulated waste instead of–well–leaves.

Bob evolved a successful community supported approach. After years of working together, the community works with Bob on everything from specifying machinery their municipal works department uses to collect leaves to teaching residents to keep foreign material out of leaf piles.

An initial 6" deep layer of leaves (about 20 tons) is applied into a standing cover crop on frozen ground in late winter. It is incorporated in late spring, and so begins a five-year rotation on Bob's farm. Less deep maintenance applications occur in later years.

Concerns raised about the physical labor, time, effort, and hassle Bob devotes to leaf application misses something fundamental and essential in his pursuit of sustainable farming practices and profits. Instead of simply "integrating" the beneficial un-composted municipal collected leaf incorporation into his existing vegetable production, Muth's whole crop management system has changed. Bob uses *whole farm planning*. The farm now profitably revolves around these practices, instead of just incorporating them, while providing the benefits noted below. Bob's practices are not a "tactical" measure (like IPM scouting), they are a "strategic" long-term approach. This essential difference is not always clear when reading profiles of Bob Muth in places like The New American Farmer, Profiles of Agricultural Innovation, published in 2001 by USDA SARE or during Bob's excellent presentations.

SEE LEAF BENEFITS ON PAGE 2

Leaf Benefits from page 1

Benefits of Leaf Incorporation at Muth Farm

1. **Beneficial re-use of potential community landfill waste.** Deciduous leaves are an organic community waste material. They would otherwise be transported to landfills, with approximately $60 per ton tipping fees and environmental risks. On Bob's farm they are beneficially re-used within the community, in an agricultural system that's productive–but low native fertility–soils are naturally deficient in soil organic matter (OM).
2. **Nitrogen Fertilizer.** Nitrogen, in the nitrate NO_3-N form plants require, is accepted as the most yield limiting, costly, and petro-chemical manufacturing dependent essential crop nutrient.

   Demonstration calculation: The purchase price of typical 15.5% Calcium Nitrate ($CaN0_3$) fertilizer in summer of 2005 is approximately $370+/ton. As a 15.5% material, one ton of $CaN0_3$ provides .155 x 2,000 lbs. = 310 lbs. per ton actual N. If Muth's estimates of approximately 400 lbs./A mineralized ***N*** being released over a subsequent four year period from a 6" leaf application are correct, then a grower is saving at least $480 per acre from not applying 1.3 tons of fertilizer. Since N releases more slowly from mineralizing organic material than fertilizer, there is potentially less N leaching loss.
3. **Soil OM increases aiding low native fertility soils.** Atlantic Coastal Plain soils naturally oxidize OM rapidly. Even without intense cropping and tillage practices contributing to OM reduction, the natural state of this money-making, productive farming soil is low native fertility, poor cation exchange capacity (CEC), ease of compaction, ease of nutrient leaching, drought tendency from poor water holding capacity, and poor root zone tilth, etc. Increasing OM changes these dynamics, but is difficult for farms to achieve with green manure cover crops alone. Un-amended, Muth's gravelly sandy loam soils (with 12%+/- clay) have low OM typically ranging from 0.5-1.5%. After years of his leaf incorporation practice, Muth's soils routinely test in the 3-5+% OM range, and as high as 8% for periods, unheard of in the region.

   Demonstration calculation: Assume a 6-inch furrow slice of typical soil weighs about 2,000,000 lbs. Then 20,000 lbs. of dry OM (20,000 lbs. ÷ 2,000,000 lbs. = 0.01 = 1%) is needed to change soil OM by 1%. Since green manure plant materials are mostly water, plowing down 20,000 lbs. Sudax (vigorous Sorghum-Sudan grass hybrid used as a summer cover crop) likely provides only 3,000+ lbs. of actual dry OM to the soil. Thus, even with intense annual cover cropping, while OM is continually oxidized, it could take a decade to change soil OM by 1%.

   In Muth's 6-inch layer leaf mulch incorporation practice, 40,000 lbs of dry OM is applied. This has the potential to change OM by 1-2% in one crop rotation cycle instead of 10-20+ years.
4. **Phytophthora blight crop destruction dramatically declines.** *P. capsicii* is the most destructive and economically devastating soil-borne fungal pathogen of both Solanaceous and Cucurbit crops in intensive production in our region. Control with fungicides, while an essential part of an integrated crop management approach, is costly. Results are frequently marginal, resistant pathogen races emerge, and devastated farmers lose income. Free soil moisture for only two hours around the crop root zone is a sufficient condition for Phytophthora infection, thus fast removal of standing water after precipitation or irrigation is an essential ecological approach to managing this pathogen. Modifying soil OM and improving tilth changed the soil-root-water environment on Muth's farm. Combined with the longer rotations associated with Muth's leaf mulch cropping system, a dramatic decline in Phytophthora blight incidence is observed.
5. **Soil test results show beneficial release of Ca^{++} from mineralization of deciduous leaves.** Pre-practice adoption, the commonly held local view advised Muth that leaves would acidify his soil (lowering the pH) and raise his purchased lime requirement to balance soil pH. However, Muth's soil test results in years after leaf incorporation showed unexpected slight beneficial rises in Ca^{++} levels and pH. Calcium is an essential plant nutrient, usually requiring liming amendments to soils. The added cation exchange capacity of the higher OM soils buffers nutrients on soil particles, such as Ca^{++}, against leaching.

Muth Creatively Avoids Soil C:N Ratio Imbalance Problems

From page 133 of Knott's Handbook for Vegetable Growers (4th ed. 1997. Maynard, D.N. and G. J. Hochmuth. John Wiley & Sons. ISBN: 0-471-13151-2) we learn the following about "Decomposition of Soil-Improving Crops:"

"The *normal Carbon:Nitrogen (C:N) ratio in soils is [between] 10:1 [and 12:1].* Turning under organic matter alters this ratio because most organic matter is richer in carbon than in nitrogen. Unless the residue contains at least 1.5% nitrogen, the decomposing organisms will utilize [native] soil nitrogen as the energy source for the decomposition process. Soil organisms can tie up as much as 25 lb. of nitrogen per acre from the soil in the process of decomposition of carbon-rich fresh organic matter.

A soil-improving crop should be fertilized adequately with nitrogen. This fertilization will increase the nitrogen content somewhat and improve layer decomposition. Nitrogen may have to be added as the soil-improving crop is incorporated into the soil. This speeds the decom-

See C:N on page 4

Vegetable Disease: A Look Back in 2005

Andy Wyenandt, Ph.D., Specialist in Vegetable Pathology

Unfortunately, *one problem which wasn't expected so early again this year was Downy mildew in cucurbit crops***.** Under normal circumstances Downy mildew isn't a concern for growers until late-summer into early fall. However, Downy mildew was first diagnosed in early-June in eastern Cumberland County in cucumber transplants brought up from the south. Shortly thereafter the disease was present in much of the southern part of the state. There are a number of fungicides labeled for Downy mildew control in cucurbits and, for most, controlling it this year was much improved compared to last season. Remember that timing and tenacity was critical for Downy mildew control! Once Downy mildew is detected, growers should immediately adjust their fungicide programs to include Downy mildew fungicide(s) and follow a strict weekly fungicide program. One thing we have learned over the past 2 years is that spraying for the disease in a fungicide rotation which includes Downy control every 14 days is too long between applications. Once Downy is detected growers need to spray for it weekly. For growers who buy transplants from the south it is critical that plants are inspected carefully upon arrival and frequently examined carefully thereafter for potential problems. Although transplants may look 'clean' upon arrival they may be harboring pathogens and protectant fungicides may need to be applied sooner rather than later.

Late blight on potato and tomato.

Late blight appeared on potato and tomato this summer and the good news is that it did not cause any major problems. In each case, Late blight was found in single isolated incidences on either crop during the summer months and in an isolated case this fall on fresh-market tomato. Although the hot, dry weather this summer probably helped keep Late blight pressure low, many growers did an excellent job of taking the appropriate action and adjusting their fungicide schedules accordingly. Controlling Late blight always begins with preventative measures such as regular scouting, using the TOM-CAST disease forecasting system and applying the appropriate fungicides.

Phytophthora blight continues to be destructive on pepper and Cucurbit crops.

Phytophthora blight continues to affect pepper and Cucurbit crops throughout the state. There are a number of management strategies growers can use to help minimize the destructiveness of the disease. First and foremost should be proper crop rotations. *One reason why blight is such a problem is the fact that not only is it destructive on peppers, but the same pathogen can cause fruit rot in tomato, fruit and stem rot in eggplant, and crown and fruit rot in Cucurbits.* Therefore, growers should always follow strict rotations and never follow peppers with tomatoes or eggplant and/or cucurbit crops and vice versa. *Poor crop rotations with these crops will only help exacerbate the Phytophthora problem and will make it more difficult to control***.** If strict and long crop rotation cannot be done, then strides need to be taken to improve surface drainage and run-off. Standing water in low lying areas is a major problem and this is most likely the place where Phytophthora epidemics are going to start in your fields. If you know there are low-lying areas in a particular field and you have had Phytophthora problems in that field in the past *you should never start your season by planting in those areas***.** Do yourself a tremendous favor this winter and map out (not only in your head, but on paper) all those areas on your farm where standing water and/or poor drainage has always been a problem and develop a simple plan on how you are going to deal with that area. This may be as simple as avoiding the area all together. Ask yourself a simple question, how much money do I lose to Phytophthora each time I plant in this one area, and how much time and money could I save if I just avoided it by not planting in it or by just planting another crop? Plant a cover crop to remind yourself to stay out of that area, as well as bring back the natural waterways on your farm. Natural waterways are there for a purpose, they allow water to efficiently drain off your fields. Removing or altering natural waterways can lead to poor drainage and standing water and planting in them can only lead to problems. These are just a few ideas on how growers can approach the Phytophthora problem heading into the growing season. Unfortunately, there are a number of other issues that haven't been addressed here. However, understanding the factors which may increase the chances for Phytophthora development in your fields and having a plan to deal with those issues is a good start to any season.

2005 cucurbit virus survey update.

The Vegetable Pathology lab in coordination with county agricultural agents and the Rutgers Plant Diagnostic Laboratory in New Brunswick are conducting a survey of virus-infected cucurbit crops this fall. To date, 97% of the samples sent in for screening have tested positive for WMV (Watermelon mosaic virus), 42% have tested positive for ZYMV (Zucchini yellow mosaic virus), 8% have tested positive for PRSV (Papaya Ringspot Virus), 0% have tested positive for CMV (Cucumber mosaic virus), 42% have tested positive for 2 viruses and 3% have tested positive for 3 of the viruses. What does this all mean? In practicality, although WMV seems to be the most prevalent virus this season, it's impossible to determine what virus may be most prevalent next season.

See Virus Survey on page 4

VIRUS SURVEY FROM PAGE 3

So quite simply, when it comes to reducing the chances for virus-related problems, growers should plant cucurbit varieties which express the most virus resistance/tolerance. There are a number of cucurbits (summer squash in particular) with resistance/tolerance to one or more of these viruses. The more resistance/tolerance the variety carries (i.e. for multiple viruses) the better the chances are for reducing virus-related issues. ❑

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position and prevents a temporary shortage of nitrogen for the succeeding vegetable crop.

As a general rule, about 20 lb of nitrogen should be added for each ton of dry matter for a nonlegume green-manure crop."

Deciduous leaves Muth obtains likely have a Carbon:Nitrogen ratio somewhere around 60:1 to 75:1. These are far from the ratio found in soils or even the 30:1 suggested for compost piles. Muth uses a fallow cropping rotation (and time) instead of supplemental nitrogen to achieve his results without more inputs.

How can I easily see and learn more about using cover crops?

A convenient practical video highlighting these and similar strategies for vegetable growers entitled: *"Farmers and their Innovative Cover Cropping Techniques"* is available. The practices of Bob Muth plus nine other farmers are demonstrated. Please specify VHS or DVD format and send $15 to: Center for Sustainable Agriculture, University of Vermont, 63 Carrigan Drive, Burlington, VT 05405-0004. (802) 656-5459.

Visit the Northeast Sustainable Agriculture Research and Education website at:
http://www.uvm.edu/~nesare/grants.html. ❑

IPM Update

Kristian Holmstrom, Research Project Coordinator II, Vegetable IPM Program

Sweet Corn

Adult **European corn borer (ECB)** activity has declined to nearly nothing over the past week. It is not likely that we will see further adult moth activity for the remainder of the season. The highest trap catches are from the border area of Warren, Morris and Hunterdon Counties at this time (see ECB map). Scouting is not necessary at this time as it is not likely that there are any non-silking sweet corn plantings left. Current **corn earworm (CEW)** adult numbers require silk spray schedules that will be sufficient to prevent ECB damage to developing ears by larvae that have been deposited on or near the ears themselves. The highest average nightly ECB blacklight catches are:

Califon	1	Denville	1	Long Valley	1
Chapel Heights	1	Farmingdale	1	Oldwick	1
Chester	1	Hackettstown	1	Shirley	1
Croton	1	Hopewell	1		

Adult CEW activity has decreased significantly over the past week. It is not likely that we will see high moth numbers again this season, although a tropical storm system may cause a temporary increase in adults. Generally, with cooler weather on the way, CEW catches should come to an end over the next 2-3 weeks. The highest recorded catches are currently in Warren and Morris Counties (see CEW map), although actual activity may be somewhat lower than indicated as these catches were made prior to the weekend. In general, the current population is one that requires a 4-5-day silk spray schedule to manage effectively. On the map, shaded areas (blue on the web version) http://www.pestmanagement.rutgers.edu/IPM/Vegetable/Pest%20Maps/maparchive.htm) warrant a 4-5 day silk spray schedule. The highest average nightly CEW blacklight catches are:

Hackettstown	4	Califon	2	Elmer	1
Oldwick	4	Flanders	2	Hammonton	1
Chester	3	Long Valley	2	Hopewell	1
Denville	3	Tabernacle	2	Shirley	1

Fall armyworm (FAW) is still active throughout the state, with infestations common. Damage is quite high in some cases. The silking stage spray schedule necessary for CEW management should also control FAW.

General Silking Spray Schedules*:

North – 5 days
Central - 4-5 days
South - 4-5 days

*Note: These are general recommendations. Local trap catches may indicate some variation in the frequency of insecticide applications to silking sweet corn.

Peppers

Aphids and **TSSM** are all appearing in peppers at this time. At this late time of the season, the severity of the infestation should be considered before treating. Aphids are a potential problem because of the sticky droppings they produce. This can result in cosmetic injury to fruit, and may be worth treating. TSSM treatments, on the other hand may not

SEE IPM ON PAGE 5

IPM FROM PAGE 4

be economically justifiable at this time unless there is obvious and widespread injury to the plants or fruit. Light or spotty TSSM infestations may not warrant a treatment now that we are into October, with mite reproduction declining as cooler weather prevails. Monitor fields weekly for the presence of these organisms. Check 2 leaves and 2 fruit per plant on 5 consecutive plants in 10 random locations in the field. Observe the under sides of leaves for aphids and mites. Consider treating if aphid numbers exceed 100 per 100 leaf sample or there are fruit on the plants that are being disfigured by the sticky droppings of the aphids. Consider treating for TSSM if the infestation is widespread with numerous mites on sampled leaves. Observe fruit and leaves for the light or silver-colored streaks caused by thrips feeding. Consider treating if thrips are found on 10% or more fruit, or 10% or more plants or fruit are showing signs of fresh feeding.

Beet armyworm (**BAW**) activity has decreased somewhat over the past week, although numbers are still quite high in some locations. On the BAW map, the shaded area indicates a light population that is not likely to be injurious at present levels. The crosshatched area represents a moderate population, and scouting of peppers for injury should be undertaken in that area. The black region on the map indicates a potentially damaging population. Fields in this area should be scouted frequently for the first signs of BAW feeding. BAW catches remained high in Cumberland, Salem and Atlantic Counties over the past week. High catches over the past week include 123 adult BAW per night near Woodstown and 106 per night near East Vineland. Initial BAW feeding occurs on leaves near the growing terminals. Foliage has numerous ragged holes, and the small green larvae may be found curled up near the buds. As the larvae enlarge, they begin to damage fruit, and become much harder to control. Scouting is critical to optimizing control of BAW.

Cole Crops

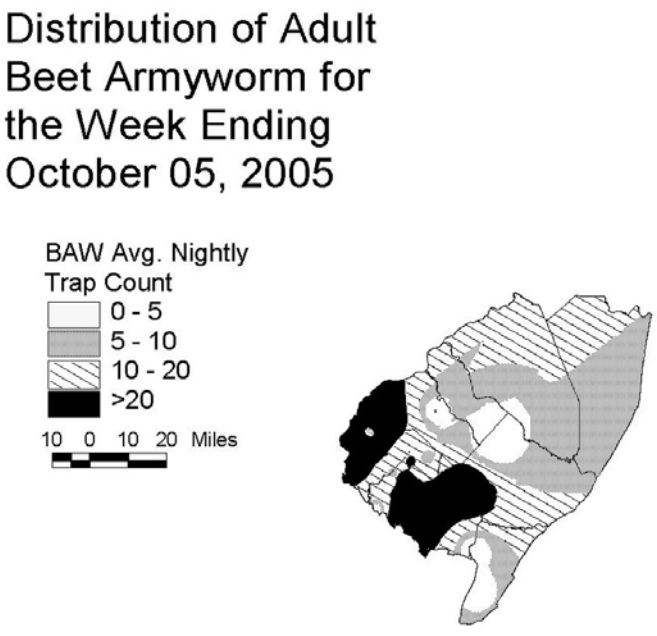
Cabbage looper (CL), **imported cabbageworm (ICW)**, and **diamondback moth larvae (DBM)** infestations remain high in many cabbage, broccoli and other cole crop plantings at this time, with re-infestations occurring quickly after treatments. These caterpillars do considerable damage to the larger leaves before moving onto developing heads as the plants mature. They are capable of causing significant loss on all crops, but especially on collards and kale, where the mature leaf is the saleable portion. Check 5 consecutive plants each in 10 random locations in the field. Be sure to check the younger tissue near the forming heads. Consider treating if greater than 20% of heading type cole crops are infested prior to head formation and if greater than 5% are infested when heads are present. For leafy greens, consider treating if 10% or more plants are infested at any time.

StrawberryUpdate

Pete Probasco, Agricultural Agent

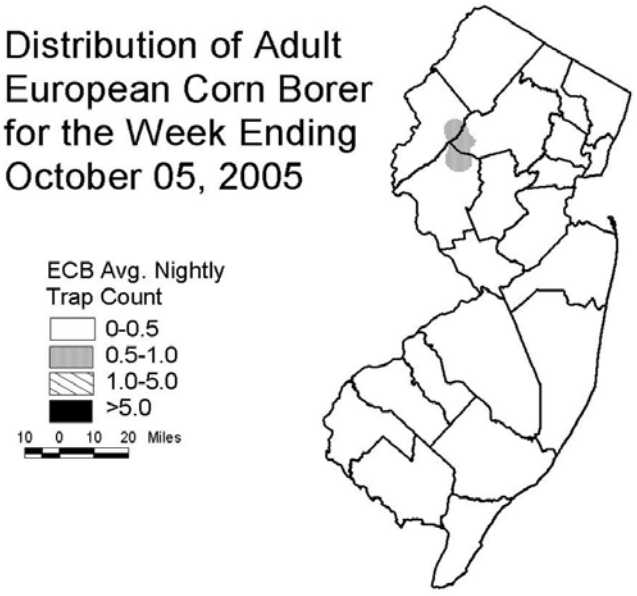
Leaf spot control on fall plantings should be made this month before applying the winter row cover. Deer control is a must on strawberry fields. Over the winter, work on your strawberry marketing. New Jersey grows far less strawberries than it consumes in supermarkets and roadside markets. Working with these markets to deliver quality strawberries on a regular basis, will give you higher prices. ❑

Editor's Note: This is the last issue of the Vegetable Crops edition of the Plant & Pest Advisory for the 2005 season. Thank you for subscribing.



Data collected by Joe Mahar and processed by Kris Holmstrom Rutgers Cooperative Research and Extension

SEE ECB AND CEW MAPS ON PAGE 6



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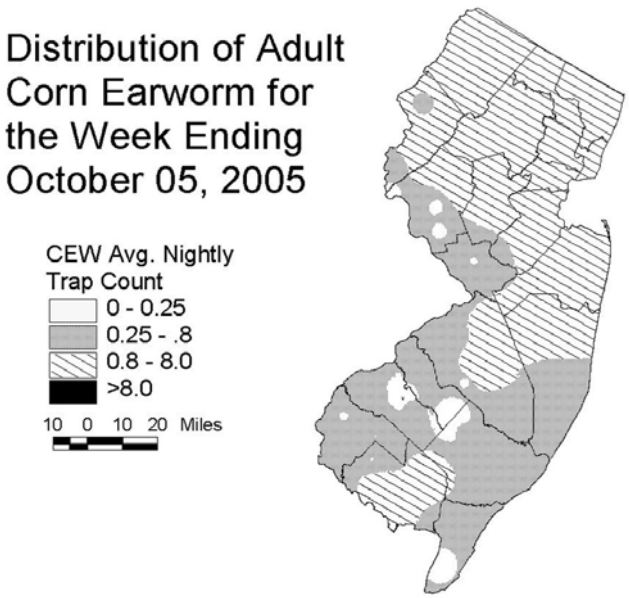

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Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged above normal, averaging 60 degrees north, 62 degrees central and 63 degrees south. Extremes were 86 degrees at Hammonton on the 27th, and 38 degrees at Flemington on the 8th. Weekly rainfall averaged 0.33 inches north, 0.29 inches central, and 0.20 inches south. The heaviest 24 hour total reported was 0.34 inches at New Brunswick on the 26th to 27th. Estimated soil moisture, in percent of field capacity, this past week averaged 76 percent north, 61 percent central and 42 percent south. Four inch soil temperatures averaged 55 degrees north, 64 degrees central and 65 degrees south.

Weather Summary for the Week Ending 8 am Monday 10/ 3/ 5

	RAINFALL			TEMPERATURE				GDD BASE50		MON
WEATHER STATIONS	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	%FC
BELVIDERE BRIDGE	missing									
CANOE BROOK	.34	22.73	-7.55	82	41	61.	3	3336	691	82
CHARLOTTEBURG	.46	24.10	-6.51	79	39	58.	3	2873	784	67
FLEMINGTON	.18	25.37	-3.50	82	38	60.	2	3260	549	67
NEWTON	missing									
FREEHOLD	.33	24.55	-3.48	84	40	62.	2	3311	416	69
LONG BRANCH*	.21	22.93	-5.44	80	43	63.	3	3304	464	49
NEW BRUNSWICK	.45	25.69	-2.82	81	40	62.	2	3460	434	74
TOMS RIVER	.15	24.09	-4.95	81	39	61.	2	3238	399	43
TRENTON	.33	27.14	.19	81	40	64.	3	3517	366	50
CAPE MAY COURT HOUSE	.16	25.84	.66	80	43	62.	-1	3110	203	39
DOWNSTOWN	.16	20.36	-5.99	84	39	62.	0	3346	173	40
HAMMONTON	.19	22.01	-5.72	86	39	63.	2	3447	308	30
POMONA	.25	21.05	-3.92	81	40	63.	3	3366	451	39
SEABROOK	.25	23.84	-1.62	84	45	64.	2	3727	533	41
SOUTH HARRISON	.14	25.12	-2.05	82	43	64	NA	3454	NA	NA

*SOME CUMULATIVE VALUES ESTIMATED DUE TO MISSING PAST DATA

WES KLINE — GDD BASE 40 PINEY HOLLOW Last Week 219 (Ending 9/26/05) This Week 156 (Ending 10/3/05)

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