Phase II

MURDERKILL RIVER CORRIDOR REPORT

Kent Conservation District 1987

REPORT ON PHASE II OF THE MURDERKILL RIVER CORRIDOR PROJECT

prepared by

Kent Conservation District
and
Cooperating Agencies and Organizations

September 1987

This project was coordinated by Robert E. Williams, Natural Resource Consultant for the Kent Conservation District. The project was partially funded by a grant from the Office of Ocean and Coastal Resources, National Oceanic and Atmospheric Administration, made available through the Delaware Department of Natural Resources and Environmental Control.

KENT CONSERVATION DISTRICT

3500 SOUTH DuPONT HIGHWAY
DOVER, DELAWARE 19901
PHONE: 697-6176

Dear Friend of Conservation:

The Kent Conservation District is pleased to provide this Phase II report for the use of agencies, organizations and landowners concerned with natural resources in the Murderkill River Corridor. During Phase II, the management strategies developed on paper in the original Murderkill River Corridor Report (1986) saw the first stages of development in the field. One unusual aspect of this implementation period has been the remarkably high level of cooperation among participants representing 18 separate agencies and government groups. It is the intent of this report to detail both the work accomplished and the exemplary teamwork demonstrated during Phase II of the Murderkill River Corridor Project.

The cooperation and assistance of all participants in this effort have been appreciated. Particular thanks go to the Delaware Department of Agriculture, Agland Preservation Section, for the compilation of maps.

Finally, the District expresses appreciation to the Office of Ocean and Coastal Resources Management, for funding made available through the Delaware Department of Natural Resources and Environmental Control, and to the New Castle Conservation District for providing staff support to help with the final report.

Sincerely,

Bob Winkler

Robert Winkler, Chairman

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MURDERKILL RIVER CORRIDOR REPORT

PHASE II

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Summary

SUMMARY

The Murderkill River Corridor Project attempts to use a pro-active approach for developing and conducting a comprehensive watershed management project. This program did not emerge as a response to severe environmental problems, but rather as an attempt to develop a plan of resource management that would preserve the watershed for future generations. Many agencies have been working on independent resource management goals that overlap or complement each other. The Murderkill River Corridor Project aims at bringing these efforts together to implement common resource-management goals through interagency cooperation.

The focus of the Murderkill River Corridor Project is on implementation of alternative management options for natural resources. Management options developed earlier in the project (Phase I) provided the base from which implementing action could move forward. To attain any degree of success, however, the actions to be implemented in Phase II would depend on coordinated efforts by representatives from the state, county, and municipal governments in partnership with landowners. Once the management options undertaken have been completed, the success of this team approach should be evident to all.

The Kent Conservation District's Murderkill River Corridor Project Plan of Work – Phase II serves as a plan of action for six projects designated to receive primary attention. Through its Murderkill River involvement, the Kent Conservation District has demonstrated the ability to take a broad resource management approach and become a leader among other natural resource agencies.

INTRODUCTION

BACKGROUND

In Fiscal Year 87, the Kent Conservation District received a grant from the Office of Ocean and Coastal Resource Management (through the Department of Natural Resources and Environmental Control) to carry out Phase II of the Murderkill River Corridor Project. Phase I of the Murderkill River Corridor Project included an inventory of natural and cultural resources; analyzed current land uses and problems; and identified general options for resource management. The results are published in a comprehensive Phase I report.

The major purpose of Phase II is implementation of selected management options that can be accomplished in a relatively short time and produce significant results using a team approach.

Since the Murderkill River Corridor is a complex of diverse and relatively unspoiled resources, it provides an opportunity to develop cooperative effort in planning and implementing measures needed to protect or improve specific and intermingled kinds of land. The mix of wetlands, forests, farmland, waters, wildlife habitat, historical and cultural resources, and urbanizing areas provide several immediate opportunities to utilize the team mechanism to achieve conservation objectives.

The management options developed in the initial Murderkill River Corridor Report (1986) became the starting point for the Phase II effort.

Each participant ranked the options in his area of interest into near-term, mid-term and long-term categories. Although definite completion dates were not listed in most cases, it was understood the near-term items would receive primary effort during Phase II.

Participants in this first implementation phase included the Soil Conservation Service (SCS); the Agricultural Stabilization and Conservation Service (ASCS); the Kent County Planning Office; Delaware's Department of Natural Resources and Environmental Control (DNREC) – including the Division of Fish and Wildlife, the Division of Soil and Water Conservation, the Division of Water Resources, and the Division of Parks and Recreation; the Delaware Cooperative

Extension Service; the Bureau of Archaeology and Cultural Affairs; Delaware's Department of Agriculture – Forestry Section; and the Kent Conservation District. This technical team will form partnerships with area landowners to accomplish the resource management objectives.

PURPOSE AND OBJECTIVES

The purpose of the Phase II Report is to examine the status of resource management option implementation. Particular attention has been paid to the team approach in order to evaluate its effectiveness and detect any problems or weaknesses.

PROCESS

Initially, each agency participant pursued implementation strategies in his area of interest using priority projects of his or her agency. It was quickly recognized that any effort spent in this way would be spread over a multitude of unrelated projects. A focusing mechanism was urgently needed.

The solution was found in the selection of six multi-resource projects on which all participants would concentrate, using individual areas of expertise as needed. These designated projects were then incorporated into the Kent Conservation District's Murderkill River Corridor Plan of Work - Phase II, which is included in Section 9, Item A.

PHASE II REPORT

This report records the status of actions taken on the designated six projects as well as the broader categories covered in the plan of work. It supports the formation of technical teams, which fostered the crossing of agency lines to accomplish common tasks set before them.

PLAN OF WORK: PROJECT NUMBER 1

Ralph A. Timmons, District Conservationist, Soil Conservation Service Resource for Kent Conservation District.

PLAN OF WORK STATEMENT

Erosion and sediment control on steep farmlands adjacent to or impacting upon wetlands, natural areas, or wildlife habitat.

The Link Farm, just below Killens Pond State Park, established erosion and sediment control basins on a steeply sloped field that drains into the Murderkill River. The erosion and sediment control measures on the Link Farm will be expanded and will serve as a demonstration site for other landowners. Two additional projects on other farms will be selected, planned, and implemented. The Soil Conservation Service (SCS) will take the lead assisted by the Agricultural Stabilization and Conservation Service (ASCS). The Division of Fish and Wildlife and the Wetlands and Natural Heritage Sections of DNREC will support this effort.

BACKGROUND AND ACTIVITY

The water-and sediment-control basins established on the Link farm as part of a complete erosion-and sediment-control system showed that surface run-off could be controlled, thereby demonstrating water-quality benefits in a difficult vegetable-farming operation. These conservation measures proved that Best Management Practices (BMPs) could be successfully applied by Kent County landowners as conservation systems in their battle against erosion and sedimentation. BMP's established on one field of the Link farm can serve as a model for the rest of the farm as well as other farms in the area. The SCS is now developing a revised conservation plan that will contain grassed waterways, drop structures, terraces and tillage operations - all the BMP's needed to resolve the problems on this particular farm and create a total conservation system.

Recognizing that Delaware farmers are experiencing financial restraints, the Kent Conservation District participated in establishing, as a conservation incentive, a state-wide program to supplement federal cost-sharing for implementing BMP's. This program is intended to ease the

problem of completing a total conservation plan when installations of BMP's over a period of years exceed the the financial ability of the landowner and cost-share monies available through traditional USDA programs.

At the start of Phase II, the District and the SCS intended to target their conservation planning efforts within the Murderkill River Corridor. However, this focus was too broad, so critical areas were established. As a result, a map study was conducted and 24 potential areas were identified. By piggy-backing on a DNREC Mosquito-Control aircraft flight, 14 of the 24 were confirmed. A follow-up flight will be scheduled after crops are harvested to reconfirm areas and indicate those that are most critical.

From the critical areas list, at least two additional farms will have new or revised conservation plans developed. By working closely with landowners, the goal is to start BMP placement as weather permits in the spring of 1988. In addition, at least one farm will be signed into the Conservation Reserve Program (CRP). This is a federal program under the new "farm bill" whereby a portion of cropland acreage will be taken out of production and dedicated to wildlife planting.

For the District and SCS to reach the goals stated above, they must produce the best possible conservation plan that is in harmony with the farmer's land management goals. Even if this occurs, getting BMP's established depends on a farmer 's ability to take the action and contribute his share to the total cost. The total effort may be frustrated for many reasons. Work schedules could be destroyed, and the ultimate goal may possibly prove to be unreachable.

The erosion-control effort in the Murderkill River Corridor came to the attention of the US Department of Agriculture through the participation of the Soil Conservation Service in this study. As a result, a corridor site was included in the filming of a flatland-erosion video presentation developed by the United States Department of Agriculture for national distribution.

EVALUATION

A mission being accomplished through a cooperative team approach is very evident in this

project. Examples include the establishment and use of the state conservation cost-share, the use of a scheduled Mosquito-Control flight, the sharing of technical assistance and funds, and the cooperation needed to focus on the six designated projects.

PLAN OF WORK: PROJECT NUMBER 2

Lynn A. Herman, Regional Wildlife Biologist, Wildlife Section,
Delaware Division of Fish and Wildlife, DNREC.

PLAN OF WORK STATEMENT

Overcoming soil acidity and other problems associated with sludge disposal on the Penuel Wildlife Management Tract.

The farmland on the Penuel Tract was used, under lease to a private farmer, for disposal of sewage sludge. Application of sludge over several years reduced the pH to 4.5 or lower, making production of conventional crops impossible. A plan will be developed for all lands in the tract to raise soil pH, improve productivity, and to integrate the use of farmland with overall wildlife management objectives. The Wildlife Section, DNREC, will take the lead assisted by the Division of Water Resources; the SCS, Extension Service, and ASCS; the Forestry Section of Delaware's Department of Agriculture; and the Kent Conservation District.

BACKGROUND AND ACTIVITY:

The Penuel Tract of the Milford Neck Wildlife Area has had a history of sewage sludge disposal. During the years 1983-86, The Kent County sewage treatment plant had an agreement with the agricultural leases of the Penuel Tract to dispose of sewage sludge on the agricultural soils of the area. Because of a general lack of communication between Kent County and the lessee, a responsible program of sludge application was not followed. A crop failure during the 1986-87 growing season resulted in the cancellation of the agricultural lease and discontinued use of sewage sludge in the agricultural practices of the area. Further investigation by the Wildlife Section revealed pH values of from 4.6 - 5.1 on the fields of the tract. Public concern over the operation of the Treatment Plant during 1986-87 focused attention on the Penuel Tract as an example of an improperly administered program of sewage sludge disposal. Increased public attention resulted in the loss to the county of most of the 240 farmers who had been accepting sludge as an integral part of their agricultural planning.

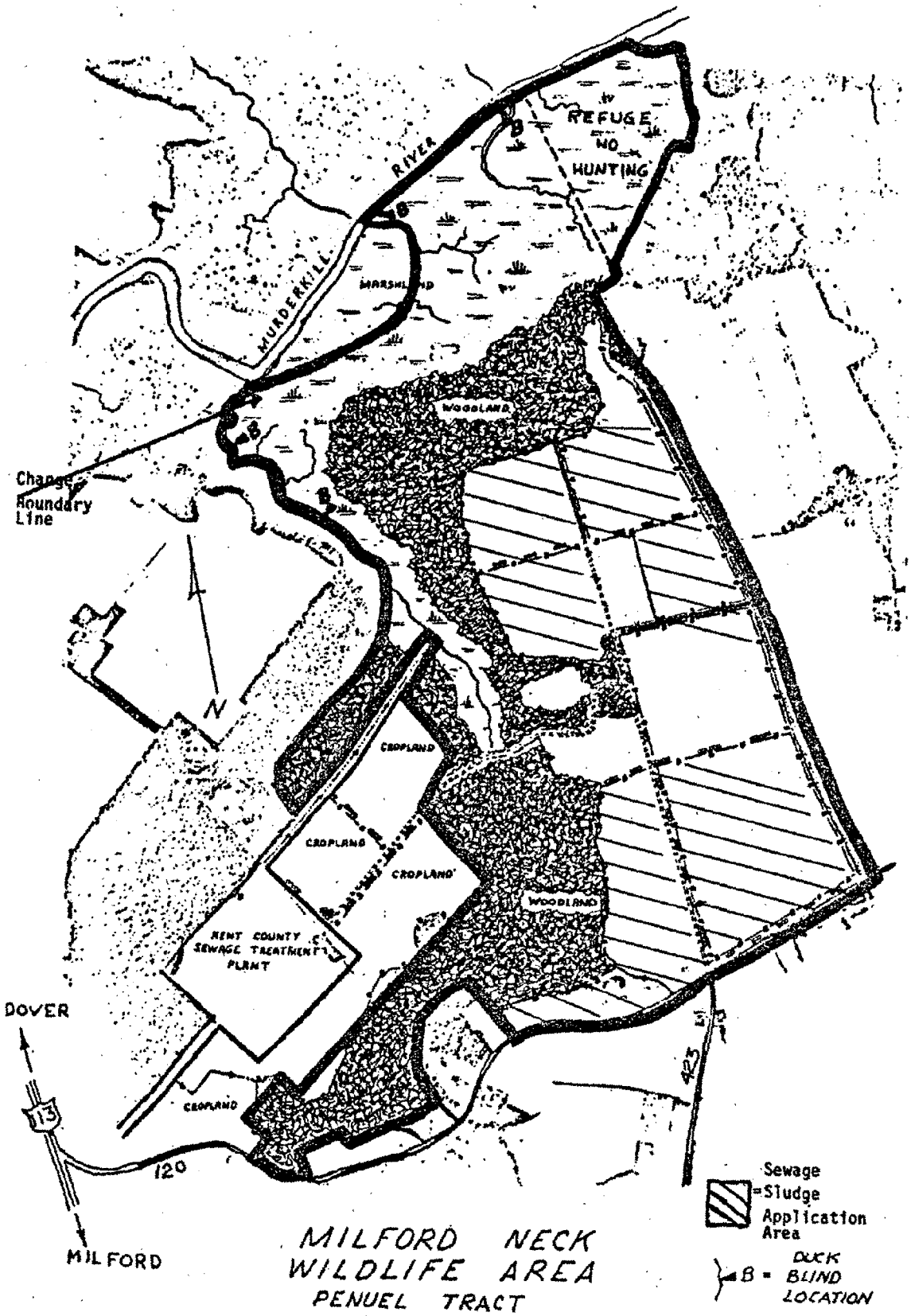
As sludge volume approached maximum storage capacity at the plant in the spring of 1987,

DNREC's Division of Fish and Wildlife and Division of Water Resources, together with the Delaware Cooperative Extension Service and Kent County, developed a plan whereby sewage sludge would be applied to two tracts administered by the Wildlife Section. These include the Penuel portion of the Milford Neck Wildlife Area and the Buckaloo portion of the Ted Harvey Conservation Area. (Exhibits 1 & 2.)

The outcome has been a three-year lease by the county, effective with the 1987 growing season, which permits only one application of sewage sludge per year, with rates determined by a crop's capacity for nitrogen. Grain sorghum was chosen for the Penuel site because of its high nitrogen uptake and drought resistance characteristics. The conservation plan on file for the Penuel Tract, prepared by the Soil Conservation Service, was modified to accommodate the crop changes. A complete update is scheduled for the fall of 1987. Soil-pH monitoring, ground-water analysis through the use of test wells, and grain testing for the uptake of heavy metals will be used as a basis for ensuring compliance with provisions of the agreement. For more details, see Section 9, Item B, of this report.

EVALUATION BY COORDINATOR

The team approach was used to develop a quick reaction plan for resolution of the problem existing at the Penuel Tract. A joint effort was undertaken by DNREC and Kent County to address sewage-sludge disposal regulations. The resulting agreement provides a regulated basis for the disposal of sludge on the Penuel and Buckaloo Tracts.


REFUGE
NO
HUNTING
RIVER
MURDERKILL
MARSHLAND
WOODLAND
B
Change
Boundary
Line
N
CROPLAND
CROPLAND
CROPLAND
WOODLAND
KENT COUNTY
SEWAGE TREATMENT
PLANT
DOVER
13
CROPLAND
120
MILFORD
423
Sewage
Sludge
Application
Area
B = DUCK
BLIND
LOCATION
MILFORD NECK
WILDLIFE AREA
PENUEL TRACT
ONE MILE
771 ACRES

MILFORD NECK WILDLIFE AREA
PENUEL TRACT

A. Hunting permitted in season (see note below).
B. The Refuge, located in the Northeast corner of this tract (see map, other side) is closed to all forms of hunting and other activities.
C. Persons may hunt on the Milford Neck Wildlife Area only as directed by the rules stated herein, which have been established by Regulation 25 of the Division of Fish and Wildlife, pursuant to Section 103, 7 Delaware Code.
D. For further information, contact the Division of Fish and Wildife, Dover, Delaware (telephone 736-5297).
E. All waterfowl hunters must have proper boat safety equipment. See the Delaware Hunting & Trapping Guide.

William C. Wagner II, Director
1987

STATE WILDLIFE AREA USE REGULATIONS

FIREARMS	- no firearms permitted from March 1 through August 31 or on Sundays, except on designated ranges. No firearms are permitted on dikes at any time.
HUNTING	- Permitted only as designated on area maps. No trapping except by valid contract holders.
VEHICLES/BOATS	- No off highway vehicles, either registered or unregistered, permitted. Speed limit 20 m.p.h. No excessive noise; adequate mufflers required. NO AIR BOATS.
TRESPASS	- No entry into closed areas.
HOURS	- Entry limited from sunrise to sunset except to lawfully hunt and fish.
CAMPING, SWIMMING, DUMPING	- No unauthorized camping or swimming. Dumping is strictly prohibited.

PLEASE OBSERVE THE COURTESIES OF A GOOD SPORTSMAN
HAVE A SAFE AND ENJOYABLE OUTING

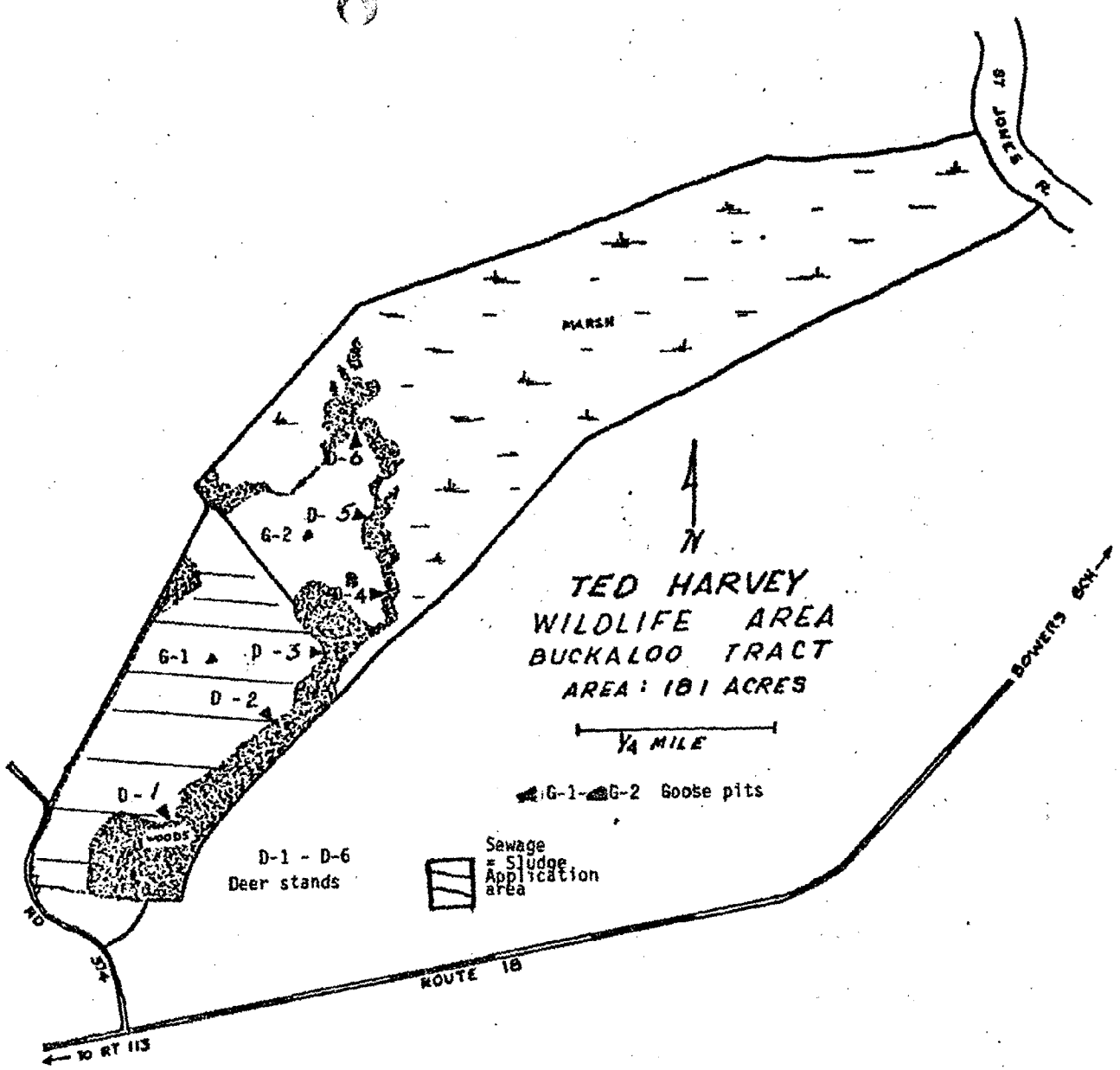
State and Federal law prohibit discrimination on the basis of race, color, national origin, age, sex, religion and/or handicap or disability. If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information, please write to:

Office for Equal Opportunity
U. S. Department of Interior
Washington, D. C. 20240

Division of Fish & Wilflife
P.o. Box 1401
Dover, DE 19903

Federal Aid Project W-5-D

Ex. 2


ST JOHNS R
MARSH
D-6
D-5
G-2
D-4
G-1
D-3
D-2
D-1
WOODS
N
TED HARVEY
WILDLIFE AREA
BUCKALOO TRACT
AREA : 181 ACRES
¼ MILE
G-1 G-2 Goose pits
D-1 - D-6
Deer stands
Sewage
Sludge
Application
area
BOWERS BOX
ROUTE 18
TO RT 113

TED HARVEY WILDLIFE AREA
BUCKALOO TRACT

A. WATERFOWL HUNTING

1. Hunters will hunt from state blinds G1 and G2 only, by lottery held at the Little Creek checking station.
2. Ted Harvey drawing and hunting rules apply to Buckaloo.

B. DEER - ARCHERY

1. Archers may hunt from the six state-built stands during September and October.
2. No permit is needed.

C. DEER - SHOTGUN & MUZZLELOADER

Ted Harvey drawing and hunting rules, including the pre-season drawing, apply.

D. A special steel shot demonstration dove hunt will be allowed around goose pit G2. Dove hunting will be allowed September 5-19, Wednesdays and Saturdays only. Hunters are required to leave the field by 4:00 P.M. Steel shot is required in all gauges. Hunters must check in with attendant at the field

E. STEEL SHOT

Waterfowl and dove hunters are required to use steel shot in all gauges. It is unlawful to possess any lead shot loads while hunting waterfowl or doves in this area.

F. NO OTHER HUNTING ALLOWED ON THIS TRACT

G. Persons may hunt on the Buckaloo Tract only as directed by the above rules, which have been established by Regulation 25 of the Division of Fish and Wildlife, pursuant to Section 103, 7 Delaware Code.

H. For further information, contact the Division of Fish and Wildlife, Dover, Delaware 19903 (telephone 736-5297).

William C. Wagner II, Director
1987

State and Federal law prohibit discrimination on the basis of race, color, national origin, age, sex, religion and/or handicap or disability. If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information, please write to:

Office for Equal Opportunity
U. S. Department of Interior
Washington, D.C. 20240

Division of Fish and Wildlife
P. O. Box 1401
Dover, Delaware 19903

Federal Aid Project W-5-D

PLAN OF WORK: PROJECT NUMBER 3

Michael Petit De Mange, Planner I, Kent County Planning Office

PLAN OF WORK STATEMENT

Work with Charles West to develop a plan for his proposed subdivision just south of Coursey Pond.

A zoning application has been approved by Kent County for a large subdivision (240 units) just south of Coursey Pond. Since this subdivision lies within the Murderkill River Corridor, a concentrated effort will be made to contact the landowner and work with him on a plan containing such considerations as setbacks, erosion and sediment control, conservation areas and easements, archaeological and cultural resources, parks, recreation areas, and reforestation. The District will take the lead assisted by the Division of Parks and Recreation, Division of Fish and Wildlife, SCS, Forestry Section of the Dept. of Agriculture, the County Planning Office, and Delaware's Bureau of Archaeological and Cultural Affairs.

BACKGROUND AND ACTIVITY

Subsequent to the publication of the Kent Conservation District's Plan of Work - Phase II, a rezoning application from Calvin Meyers was approved by Kent County for the development of land he owns north of Coursey Pond. The study group desired to expand the statement of work and incorporate the second tract. As a result, the District met and discussed the situation with the two landowners and both accepted the offer of assistance.

The rezoned tracts were incorporated into a Coursey Pond regional map produced for the Corridor Report (Section 9, Item C) and a copy was distributed to each study group participant. Their comments were to be submitted to the Kent County Planning Office, where they would be compiled into a guidance package for the developers. Although simple to state, this has not been rapidly done because it was not a routine case of checking accomplished work against regulations and policies for compliance. This was a case of considering the regulations and policies first, and then recommending what to do to best use the existing resources and/or ensure compliance with

policies and regulations. Obviously the developers' desire to change the lake front will conflict with policies against construction of piers and bulkheads and policies *for* preservation of fish and wildlife habitats. Some discussions have taken place, but more are foreseen before the guidance packages are complete.

Exhibit 1 is the draft guidance package for the Charles West tract that was reviewed at a September 1987 participant meeting. The discussion triggered additional ideas, so expansion of the package is anticipated. Attention is directed to the fact that the rezoning authorized 240 units. However, the draft recommends a Planned Unit Development (PUD) approach and set-asides, which will reduce this number.

Future steps will include forwarding the guidance packages to the landowners and participating, upon request, in site-plan preparation as well as critique of the completed site plans before their submission to Kent County for review and approval. Since the landowner can choose when and how to proceed, no timetable or schedule can be forecast.

Action was taken by the Delaware Department of Agriculture when the zoning applications were filed. A report on Agland Preservation was prepared using the Kent County Land Evaluation and Site Assessment (LESA) system. A copy of the report submitted on the Meyers tract is included in Section 9, Item D of this report.

EVALUATION

A true team involvement is seen in this project. Interaction between various levels of government, as well as within the DNREC agencies, has been very pronounced. The guidance package requirement removed many participants from their normal regulatory or reactive postures by demanding response from a pro-active position. This project has so far proved to be an excellent test of the pro-active involvement of traditional regulatory agencies.

Murderkill River Corridor Project
Site Development Recommendations
For The Charles West Tract

In keeping with the goals and objectives of the Murderkill River Corridor Project the Kent County Planning Office believes that the major objective for development of this site should be to minimize land coverage and to designate uses that foster a sense of place and individual responsibility. The Planning Staff offers the following recommendations:

1) Development plan should be prepared by a professional site development firm which has expertise in structural and landscape architecture and in the development of waterfront property.

2) Site should be developed as a PUD (Planned Unit Development) that would:

    a) Permit reduced lot sizes.

    b) Permit a variety of housing types (single-family, multi-plexes, etc.)

    c) Reduce the amount of land coverage and increase the area that could be designated for other uses such as conservation and recreation areas.

3) At least seventy percent of the permitted lots should occur in cluster development. The remainder could be used for larger individual lots.

4) Development along the shoreline of Coursey Pond should be limited as follows:

    a) 40% into residential lots.

    b) 40% conservation/passive recreation.

    c) 20% community facilities.

5) Building coverage on individual lots should be limited as follows:

    a) On wooded lots, no more than 20% of the lot shall be cleared for development.

    b) Building coverage for any lot within the development shall be limited to 15% of the total lot area.

6) The development should incorporate a variety of community facilities which reflect the uniqueness of this

Ex. 1

site such as:

a) Nature trails.

b) Boat ramp and picnic area.

c) Garden plots.

d) Recreation center and game fields.

e) Conservation areas.

7) Country lane type cul-de-sac streets are recommended with the following specifications:

a) Cartway width not to exceed 18 feet(20 feet if curbing is required).

b) Cul-de-sac turnaround radius not to exceed 38 feet.

c) Irregularly shaped cul-de-sac turnarounds would be permitted. Planted islands in cul-de-sac turnarounds are encouraged.

9/03/87
MJP

PLAN OF WORK: PROJECT NUMBER 4

Charles Salkin, Manager of Technical Services Section, Division of Parks and Recreation, DNREC

PLAN OF WORK STATEMENT

Survey private lands within the Killens Pond State Park Area.

The varied uses of private lands within the Killens Pond State Park area have some impact on the park and the Murderkill River Corridor. A survey, with landowner cooperation, is needed to identify land uses, possible conservation and/or recreation uses, problems, and opportunities. The survey is needed for developing the overall management objectives of the park area. The Division of Parks and Recreation will take the lead, assisted by the SCS, Division of Fish and Wildlife, and the Forestry Section. A map of Killens Pond State Park is found in Section 9, Item E.

BACKGROUND AND ACTIVITY

Project participants undertaking the Killens Pond project were faced with outdated management options for the park that included provisions for a mass parkland acquisition. In reality, though, state officials had last acted on acquisitions for Killens Pond Park in 1978, and no immediate plans consider new expansion. In addition, owners of private lands contiguous to existing park boundaries may not support new acquisitions since the number of landowners have increased and the land is more residential. Obviously, a proposal was needed to trigger cooperative effort before a survey could be undertaken to show constructive ways of mutually benefitting both landowners and the Park's overall objectives.

The original Killens Pond Park master plan highlighted the need to preserve all natural and cultural resources along the Murderkill River. Action had been taken in the immediate vicinity of the public ponds in the area, but the remaining acreage was left in private ownership. A general action was needed to help the park and nearby landowners.

The catalyst for joint public/private action for the total area appears to lie in establishment of a greenway that would include Killens Pond, McCauley Pond, and Coursey Pond. The greenway would link up with the nature preserve to be established between McCauley and Coursey Ponds,

and Frederica and the Murderkill River Corridor would be covered.

Exhibit 1 shows an action plan for establishment of this greenway .

EVALUATION

A resource conservation vehicle, the greenway, is to be used to enlist the efforts of landowners, a school district, a conservation district, and multiple state agencies to develop a coordinated land-use plan for this segment of the watershed. This project is an example of how group interaction led to a new approach to a problem.

MURDERKILL RIVER CORRIDOR PROJECT - PHASE II

Private Lands in the Vicinity of Killens Pond State Park

This segment of the Murderkill River Corridor Project is a plan for Phase III for the preservation and conservation of private lands in the vicinity of Killens Pond State Park. Long-range plans have called for the expansion of the park to include adjoining private property and nearby lands and waters of the Division of Fish and Wildlife. This plan will describe present conditions, summarize the recreation and conservation history of the area, explain the "geenway" concept, and outline a strategy for application of that concept along the Murderkill at Killens Pond.

Description of Killens Pond State Park

Killens Pond State Park comprises 582 acres including the 66-acre pond itself. Since the initial acquisitions in 1965, comprehensive outdoor recreation facilities with a family orientation have been developed. Original development included a boat ramp, picnic facilities, a natural swimming beach, hiking trails, small-boat rental, playgrounds and primitive youth camping. In the late 1970's and early 1980's a major expansion project included a 59-site family campground, a modern swimming pool complex, new boat rental facilities and expanded picnic/day-use areas. Present development was completed in 1986 with the addition of a sports/day-use complex, expanded picnicking facilities and a new park office. (See attached pamphlet.)

History of Acquisition

The first 485 acres of Killens Pond State Park was acquired in 1965 from private landowners. This was the first use of federal Land and Water Conservation Fund monies in Kent County and created the county's first and only state park. In three separate transactions between 1967 and 1978, 96 additional acres were acquired bringing the total acreage to 582.

In January of 1970, a master plan report was completed for the Division of Parks and Recreation by a private consultant (Charles T. Main, Inc., Boston, Mass.) for the proposed "Murderkiln State Park." It was anticipated that this large, multipurpose outdoor recreation resource area would encompass several thousand acres including Killens, Coursey, and McColley Pond and all of the lands surrounding and connecting those ponds. Phase I was to be acquired and implemented by 1980 and have an instant capacity for over 11,000 visitors. (See outline on attached map.) Needless to say, this ambitious plan has been implemented only on a small scale. No additional lands have been purchased since 1978 and state officials have given no serious consideration to implementation of Phases II and III of the 1970

Ex. 1

master plan. Wholesale acceptance of this plan at this time would be seriously limited by escalating land costs, conflicting land uses and the continued intrusion of private residences within the proposed take lines. However, the need to meet ever-growing recreation demand and to protect natural resources along the Murderkill River Corridor remains.

Need for Expansion

While Delaware's State Park system has grown to include 5 parks each in New Castle and Sussex Counties, Killens Pond is the only state park located in Kent County. Even though Kent County may have its "fair share" of public outdoor recreation lands, much of this is currently dedicated to fish and wildlife activities and has not been set aside for active public recreational use. Further, Kent County government owns and manages only one small park near Dover and does not have a long-range plan for a countywide system of regional parks. There are no significant municipal parks in southern Kent County.

There are many reasons that Killens Pond State Park should be expanded in the general direction proposed in Phase I of the 1970 master plan. First, there is no room within the State's present land holdings for the addition of any major new recreation facilities. Second, expansion of existing use would push public activity very close to the park boundaries increasing the likelihood of conflicts with adjacent land uses. Third, additional lands are needed to facilitate efficient management, i.e., eliminate troublesome inholdings, reduce encroachments, develop internal road system, etc. Fourth, attendance at Killens Pond continues to increase; in recent years, average annual visitor days have been over 150,000. Fifth, the 1984 Statewide Comprehensive Outdoor Recreation Plan (SCORP) calls for more facilities in Kent County to meet the need for bicycling, camping, swimming, fishing, tennis, golf, and sport fields; all of these activities could be accommodated within an expanded state park at Killens Pond. Finally, the original park master plan highlighted the need for preservation of all natural and cultural resources along what we now call the Murderkill Corridor; these objectives have been met only in the areas immediately surrounding the public ponds.

Planning for a Killens Pond Greenway

A greenway is a stream corridor or other linear section of the landscape which is protected in the public interest by joint public/private efforts or through multiagency public action. The purpose of the greenway is to protect individual elements of natural and cultural heritage into a cohesive whole while providing expanded opportunities for linear recreation activities. This concept has direct applicability to the portion of the Murderkill River near Killens Pond, if not to the entire corridor. This holistic approach would enable other public

conservation agencies to join with the Department of Natural Resources and Environmental Control to protect a Killens Pond Greenway in a more satisfactory and comprehensive manner than if only potential state park resources were addressed.

The primary benefits of acquisition/conservation of this corridor include:

1. Protection of water resources to promote water quality, aquatic life, fishing and boating.

2. Connecting existing state-owned lands and providing opportunities for linear recreation such as hiking and canoeing.

3. Conservation of wildlife by connecting otherwise disconnected habitat.

4. Aesthetic enhancement including scenic vistas for those within and outside of the geenway corridor.

5. Expanded protection of historic and prehistoric cultual resources, the value of which alone may not warrant acquisition or governmental action.

6. Linking Killens Pond State Park with the Murderkill River Natural Area/Nature Preserve to extend the benefits of the greenway to Frederica.

7. Inclusion of public and privately-owned buffer areas to protect resource values which might not be justified solely for state park purposes.

8. Utilization of conservation methods such as conservation easements, best management practices, etc. as alternatives to acquisition.

Interagency Cooperation

The following agencies and interests should be included in future efforts to expand Killens Pond State Park and/or establish the greenway:

Division of Parks and Recreation
- *Killens Pond State Park
- *SCORP
- *Natural Areas
- *Rare Plant Conservation
- *Interpretation

Division of Fish and Wildlife
*Coursey Pond Access Area
*Fish and Wildlife Management
*Mosquito Control
*Endangered Species

Department of Agriculture
*LESA Evaluation
*AgLand Preservation
*Forestry

Division of Historical and Cultural Affairs
*Historic and Prehistoric Sites
*Cultural Surveys

Kent Conservation District
*Landowner Contacts
*Erosion and Sediment Control
*Floodplain Management
*Agricultural Conservation Practices

Lake Forest School District
*Lake Forest High School
*Outdoor Education

Recommendations

To advance the cause of expanding Killens Pond State Park utilizing the concept of greenway planning, the following steps should be undertaken:

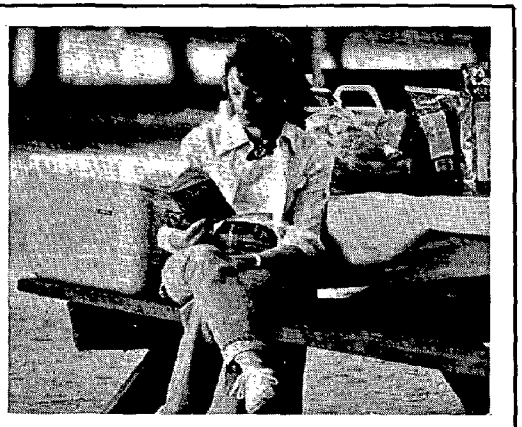
1. Representatives from the above-mentioned agencies (and others as appropriate) should join together to form a planning team to further define and carry out this effort.

2. This group should do a parcel-by-parcel review of all private lands identified on the attached map to evaluate the conservation values of each property and their significance to the state park and the greenway.

3. Appropriate boundaries or "take lines" should be redefined according to the findings of the evaluations and the interests of the participating agencies.

4. Citizen participation, including landowners from the immediate neighborhood, should be promoted to encourage citizen support and to insure the success of the effort.

5. As strategies are developed, individual landowners should be contacted to educate them and begin implementation, as appropriate.



puts the sparkle in The Diamond State.

VISIT OUR OTHER DELAWARE STATE PARKS!

Bellevue State Park
Carr Rd., Wilmington

Brandywine Creek State Park
Rt. 100 and 92, Rockland

Cape Henlopen State Park
Lewes

Walter S. Carpenter Jr. State Park
Rt. 896, north of Newark

Delaware Seashore State Park
Rt. 1, south of Rehoboth Beach

Fenwick Island State Park
Rt. 1, south of Bethany

Fort Delaware State Park
Delaware City

Holts Landing State Park
Rt. 26, Millville

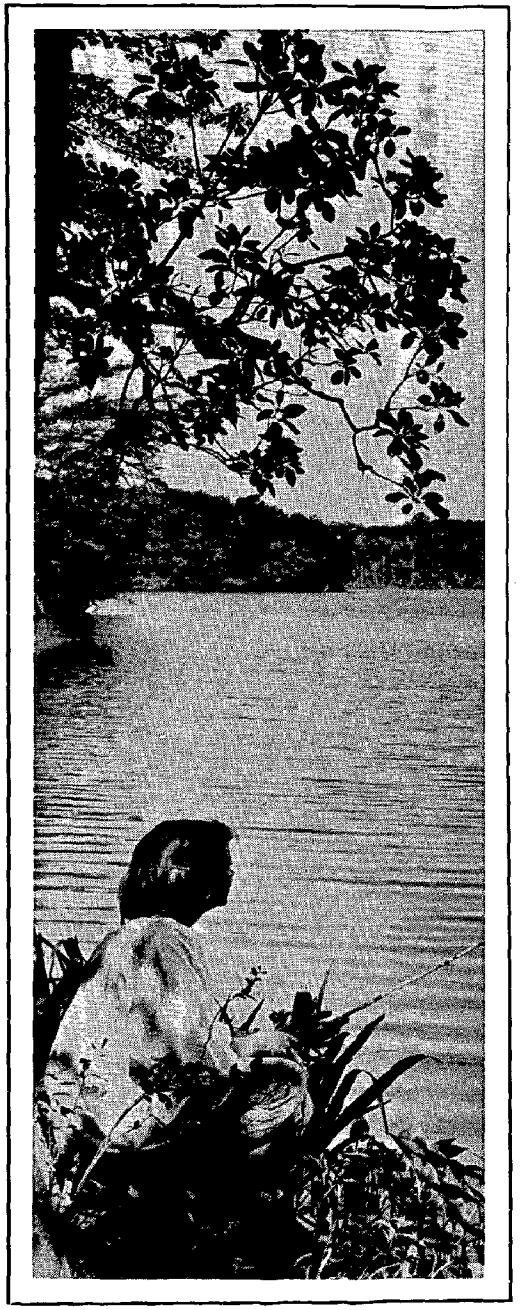
Lums Pond State Park
Rt. 896, Kirkwood

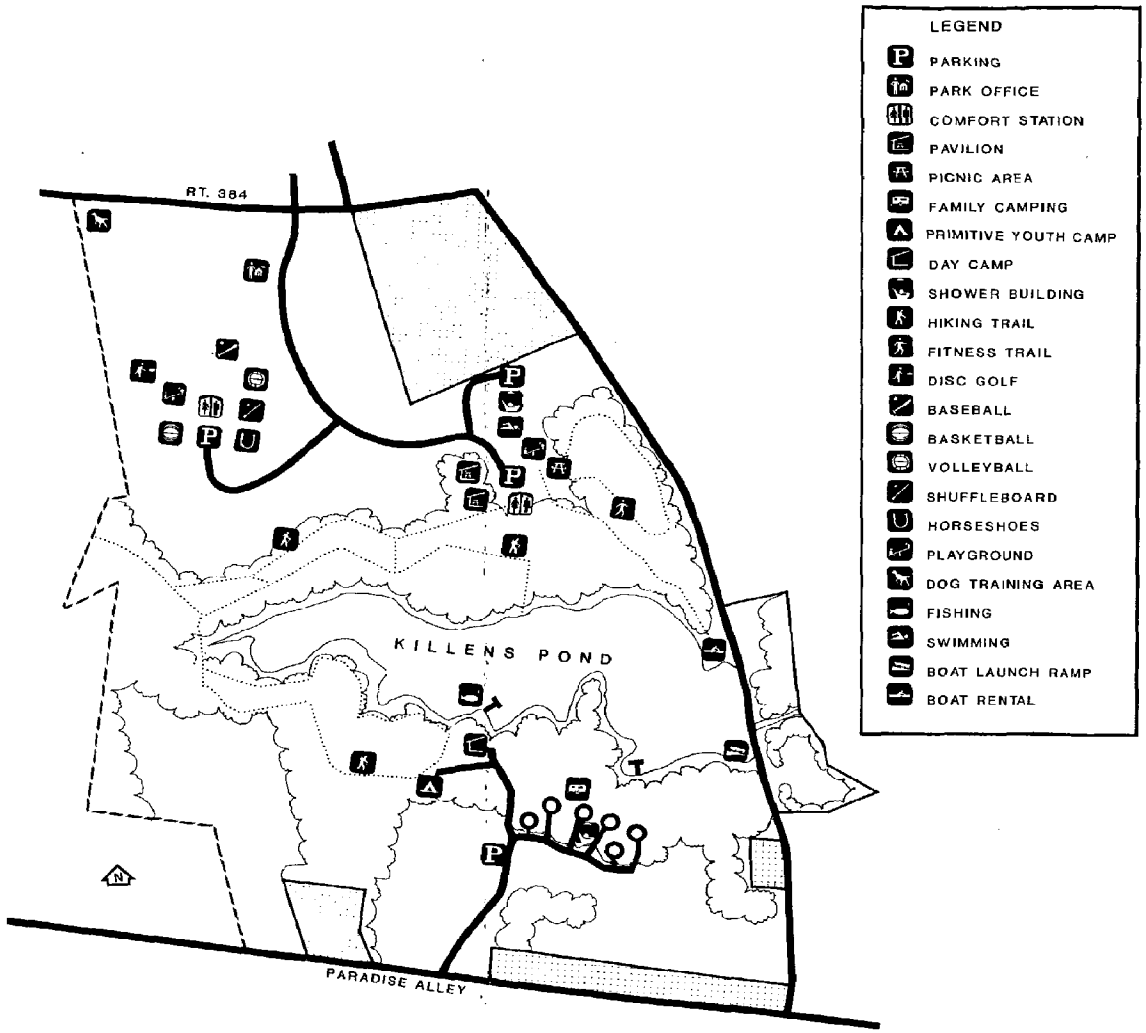
Trap Pond State Park
Rt. 24, east of Laurel

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DELAWARE
SMALL WONDER

Killens Pond State Park...





Killens Pond may be the only state park in Delaware's central county, but this diversified facility offers almost everything an outdoor enthusiast could want. Recreational opportunities abound amid grassy fields, woods carpeted with pine needles and sparkling waters.

The 66-acre picturesque mill pond is the main attraction, offering fishing and boating opportunities. Largemouth bass, pickerel, crappie and bluegills wait to bend those rods. A boat launching area is available, as well as paddleboat, rowboat and canoe rentals.

Blue waters of a 25-meter pool invite visitors to take a plunge while the little ones splash in a separate wading pool. A ramp for the disabled leads into the pool, and wet wheelchairs are provided. Afterward, bathers may shower and dress in a modern bathhouse, also accessible to the disabled.

Hikers enjoy the Lakeside Nature Trail, that winds along the wooded slopes of the pond to its source, the Murderkill River, and back along sun-splashed open fields. For additional exercise, a physical fitness trail and a nine-hole Frisbee golf course provide a challenge.

Camping is a primary Killens Pond draw, with 59 wooded campsites featuring hookups for water and electric, a modern shower house and a sewage dumping station. The sites are available on a first come, first served basis. Also, a primitive camping area is available for youth groups.

Picnic sites, athletic fields, new game courts such as shuffleboard and horseshoes, and a dog training area add to Killens Pond State Park's appeal.

A pleasant day of fun and relaxation in a beautiful, natural setting await Killens visitors. For more information, write Killens Pond State Park, R.D. #1, Box 198, Felton, DE 19943, or call (302) 284-4526.

Location: Killens Pond is one mile southeast of Felton, between U.S. Route 13 and U.S. 113 in Kent County.

PLAN OF WORK: PROJECT NUMBER 5

Virginia A. Gruwell, District Manager, Kent Conservation District

PLAN OF WORK STATEMENT

Contact Bowers Beach, South Bowers Beach, Frederica, and the Kent County governments to determine if needs for assistance exist with respect to their participation in the National Flood Insurance Program (NFIP).

Kent County and the towns of Bowers, South Bowers, and Frederica all participate in the NFIP under ordinances approved by the Federal Emergency Management Agency. The Division of Soil and Water Conservation will take the lead in determining their interest in and need for additional assistance in order to carry out the provisions of the floodplain ordinances.

BACKGROUND AND ACTIVITY

In the years since the ordinances were approved by the Federal Emergency Management Agency (FEMA), there have been numerous changes in land use and government personnel. It was obvious a review would be beneficial for orientation purposes as well as to determine if needs existed.

During this phase, repeated in-person and telephone contacts were made to obtain information needed by the Conservation District and Kent County officials to evaluate the participation of FEMA in each community. To fully assess needs, the Conservation District also asked the three towns and Kent County to complete a modified Association of State Floodplain Managers' questionnaire (Exhibit 1).

As a result of the extensive contact process, the needs in the communities are now known. But, at the conclusion of the Phase II period, completed questionnaires had been submitted by only Kent County and Bowers Beach. This return rate, though not unexpected, demonstrated the need to track personnel changes in the small communities in the county and arrange orientations as quickly as possible to keep interest sustained.

The effort to obtain completed questionnaires will continue, particularly for their value to the municipalities involved. Non-receipt of the finished forms, however, will not bar further

ASSOCIATION OF STATE FLOODPLAIN MANAGERS
AND THE CONSERVATION DISTRICT
COMMUNITY ASSISTANCE QUESTIONNAIRE

Your community is participating in the National Flood Insurance Program (NFIP) and you may have found a need for additional technical advice or assistance on various aspects of floodplain management. Such assistance could be provided by services of our Conservation District technicians.

In order to improve floodplain management assistance programs, we are trying to find out in what areas communities need the most help. On a scale of 0 to 3, please circle the score for each of the following activities.

0 = We don't need any outside help
1 = We could use some assistance
2 = Assistance is very important
3 = We may have to drop from the program if we don't receive additional help

		Activity	Score (Circle One)			
Flood Hazard Identification	A.	Obtaining floodplain maps	0	1	2	3
	B.	Revising maps to reflect changed conditions	0	1	2	3
	C.	Obtaining flood elevations in unstudied areas	0	1	2	3
	D.	Identifying floodways	0	1	2	3
	E.	Understanding floodplain maps and data	0	1	2	3
	F.	Identifying unique hazards (alluvial fans, mud flows, coastal erosion areas, etc.)	0	1	2	3
Floodplain Management Assistance	G.	Wise uses of floodplains	0	1	2	3
Regulatory Assistance	H.	Develop local floodplain building standards	0	1	2	3
	I.	Understanding the NFIP regulations	0	1	2	3
	J.	Preparing or revising the ordinance	0	1	2	3
Assistance to Administer	K.	Administering a permit & inspection program	0	1	2	3
	L.	Reviewing building/development plans	0	1	2	3
	M.	Obtaining and certifying building floor elevations	0	1	2	3
	N.	Reviewing requests for variances and waivers	0	1	2	3
	O.	Pursuing and correcting violations	0	1	2	3
Information	P.	Flood warning and evacuation	0	1	2	3
	Q.	Stormwater management techniques	0	1	2	3
	R.	Floodproofing techniques	0	1	2	3
	S.	Flood insurance coverage and claims	0	1	2	3
	T.	NFIP banking and lending rules	0	1	2	3
	U.	Public information on flood programs	0	1	2	3

Please return this form by November 20, 1986, to:

_____

_____

_____

Ex. 1

assistance. The Kent Conservation District and Kent County representatives will evaluate the forms that have been received (Section 9, Items F1 and F2) and develop a program to satisfy the needs identified. This program can be revised if additional needs are revealed by the two late reports.

Finally, both Kent County and the Kent Conservation District fully realize that any assistance to facilitate local compliance with the National Flood Insurance Program (NFIP) must include an educational program for realtors and landowners as well as for agency and government representatives.

EVALUATION

The Kent Conservation District and Kent County have learned that local interest in a program like NFIP will wane as government agency contacts diminish. Personnel changes can result in the loss of experience and knowledge, thus re-orientation after a personnel change is strongly suggested. This project demonstrates how the Conservation District can and does interact with government in small communities.

PLAN OF WORK: PROJECT NUMBER 6

Ron Vickers, Chief, Natural Heritage Programs, Division of Parks and Recreation, DNREC.

PLAN OF WORK STATEMENT

Contact landowners within defined natural areas to encourage registration and dedication of land. Individual letters will be written to landowners in natural areas to be followed by personal visits. The effort will be to encourage protection of the total area - public and private. The Division of Parks and Recreation will take the lead, assisted by the SCS, Wildlife Section, Wetlands Section, and others as appropriate.

BACKGROUND AND ACTIVITY

The Office of Nature Preserves within DNREC is mandated under the 1978 Natural Areas Preservation System Act to administer a statewide system of nature preserves and natural areas. These lands contain unique or significant examples of Delaware's diverse natural heritage: unspoiled wetlands, old growth forests, rare plant and animal communities, and geological or archaeological sites. These natural landscapes provide endangered species habitats, scientific research sites, reservoirs of native ecosystems, critical areas benefitting the environment, and buffers against modern-day pressures.

Protection of natural areas is encouraged by a voluntary three-step process:

(1) inventory - locate the most significant sites;

(2) registration - recognition by the state and landowner of the significance of the area and a good-faith agreement to protect it; and

(3) dedication - permanent legal restriction placed on the area through a conservation easement or articles of dedication. Once a natural area is dedicated, it is a nature preserve.

Part of the Murderkill River Corridor Project area contains a site on the statewide natural areas inventory. This large expanse of undeveloped waterway and wooded swamp includes the river and adjacent woodlands and wetlands from Frederica to Coursey Pond and Brown's Branch to McCauley Pond.

A packet of information was mailed to natural-area landowners to inform them of the

Murderkill River Corridor Project and to encourage them to protect the natural heritage values of their land. The packet included a cover letter, two handouts on the natural areas program, a map of the defined area, and a site description. (Section 9, Item G-1.)

A completed nomination-registration form for a natural-area landowner and a deed to a dedicated nature preserve, which includes a management plan, are found in Section 9, Items G-2 and G-3. Followup site visits are being scheduled and, when necessary or requested, technical assistance will be provided by other agencies.

This project required creating a list, by tract and address, of at least a portion of the landowners. After discussion, it was decided that this information should be compiled for the entire corridor area. Later, it became apparent that the information should be presented in both a typed list and a map.

The quantity of human resources needed to do this compilation manually was staggering, so the Conservation District queried Kent County to see if the requirement could be met by extraction of data from their data-processing files. Investigation proved this to be feasible, and the agencies agreed to share production costs.

The landowner data was processed through the Department of Agriculture digitizer and the map in Section 9, Item G-4 came into being.

EVALUATION

Here again is interaction of government agencies to produce a procedure and documents of use to the study group. Of greater import in this project, however, was the cost-saving method devised for obtaining the required current data. Also seen is the ability of the Kent Conservation District to bridge the gap between agencies and assist in funding a solution.

OTHER ACTIVITIES

PURPOSE

Resource management in Delaware has become a complex system of agencies pursuing resource management goals that often complement each other. The Murderkill River Corridor Project pointed out that many activities undertaken in Delaware by resource management agencies were helping the effort without any special coordination of the project committee.

In addition to the six designated projects, the Plan of Work - Phase II contains management options for other general categories. These include *Farmland, Recreation,* and *Water Quality,* among others. This section addresses activity in the general categories during this reporting period.

FARMLAND

1. Food Security Act of 1985

This "farm bill" produced new Conservation Reserve, Conservation Compliance, Sodbuster, and Swampbuster provisions. The landowners in Kent County had to be informed of these provisions because anyone growing crops had to select options.

Kent Conservation District joined with the SCS and ASCS in use of newsletters and radio spot announcements for a total of seven releases during this phase. Examples are in Section 9, Items H-1 through H-3. In addition, the Kent Conservation District passed out several hundred slick cover packets on this subject at the Delaware State Fair in August.

By encouraging full participation in the farm bill program, many acres of highly erodible lands can be removed from production and stabilized to prevent erosion. The result will be significant water-quality benefits and better land-use over the long term.

2. Development of Alternative Crops and Cropping Systems.

a - Grain Sorghum

More commonly known as *milo,* this item has been proposed as an

alternative crop, and poultry integrators have been encouraged to consider it as part of poultry rations. As a result, in 1986, contracts were offered in the amount of 320,000 bushels.

Milo's advantages are good production on droughty soils, input costs which are 30 percent those of corn, and more consistent yields than corn. The grain also can provide a needed crop rotation in Delaware. (Section 9, Item I-1.)

b - Dry Edible Bean Cultivars

Insight into the process of developing an alternative crop, such as edible dry beans, is found in a project to evaluate upright dry edible bean cultivars in Delaware (Section 9, Item I-2) and an accompanying briefing (Section 9, Item I-3).

c - Research

Funding for University of Delaware research and on-farm research for eight new commodities (which included four bean varieties, two potato varieties and a watermelon) was provided by the Department of Agriculture through the Market and Research Program (Section 9, Item I-4). By promoting these alternative crops, Delaware farmers can begin to reduce irrigation requirements and therefore improve water quality.

3. Alternative Opportunities

An Agricultural Producer Processing Committee has been formed to evaluate producer processing opportunities in Delaware. A successful Texas program is being considered for possible implementation in Delaware. (Section 9, Item J-1.) A committee agenda is in Section 9, Item J-2.

This committee concluded that they should explore areas such as

aquaculture and non-food products. The latter would include domestic rubber, kenaf fiber to manufacture newsprint, and erucic acid for industrial consumption (Section 9, Item J-3).

The committee also found different approaches contained in a TV special presented by the National Audubon Society in April 1987. The theme was cost-effective methods of raising crops toward a style called regenerative farming. Many farmers in the US have changed patterns and methods to reduce or eliminate the use of chemicals (Section 9, Item J-3).

Pertinent information concerning these new approaches is being sought and evaluated by the committee and will be supported as more details become available. Again, regenerative farming has major production and water-quality benefits.

4. Economics

a - Financial Management

1. The Cooperative Extension Service has organized a Farm Financial Management Center to focus on economics in agriculture. A typical conference agenda covers subjects such as new crops, new livestock ventures, producer processing and alternative dollar-producing opportunities (Section 9, Item K-1).
2. Extension Circular 148 was published in April 1987. This document reveals current information on farm financial conditions, based on surveys conducted in 1986 and 1987. (Section 9, Item K-2).
3. Another Extension publication available for purchase is *Methods of Soils Analysis & Irrigated Corn Production.* This is a guide to yields based on decades of research and encourages maximum-

profit yields instead of maximum-production yields. A financial review of a farm may show where dollars can be saved by changing wasteful management techniques. An example is the overuse of fertilizers. Not only does cutting back save money, but water-quality problems are reduced in the process.

b - Financial Assistance

A legislative initiative generated by the Delaware Department of Agriculture during Phase II of the Murderkill Corridor Study proposed establishment of a "Center for Alternative Agriculture." Its suggested placement in the Commodity Development Section indicates concern for markets for the new crops and financial support, particularly for young people desiring to start farming in Delaware. Another initiative addressed low interest funding to support irrigation activities (Section 9, Item K-3). Even though interest in each initiative was high, funding was not currently available and neither initiative was passed by Delaware's legislature.

Maintaining agriculture in Delaware promotes open space, large land ownership, and the ability to manage natural resources. A loss of agriculture will promote smaller land ownership and increased residential development in rural areas. A healthy farm community can help in the Murderkill River Corridor by preserving its natural resource base.

5. Soil Erosion

The Delaware No-Till Council annual meeting attracted 250 producers. The program featured no-till operations and use of poultry manure on no-till ground. (Section 9, Item I-1.) The agricultural agencies commend the water-quality

benefits being realized through no-till farming. Even though soil erosion is naturally reduced through no-till operations, wise use of chemicals is a concern. The Delaware No-Till Council can reach producers and effect positive changes.

6. Pesticides

a - A Department of Agriculture report on the certification and use enforcement of pesticides is in Section 9, Item L-1. The report reveals that a national certification program review identified Delaware as one of the states needing major changes in this area. As a result, all commitments for inspections and sampling under the EPA Cooperative Enforcement Agreement were met or exceeded.

b - The Cooperative Extension Service provided supporting education materials such as:

Commercial Vegetable Production Recommendations for 1987

Commercial Fruit Production for 1987

Tri-State Commercial Pesticide Recommendations for Field Crops in 1987

(See Section 9, Item I-1).

c - Better pesticides can only benefit the Murderkill River Corridor.

7. Water Quality

a - Best Management Practices

The Cooperative Extension Service has developed fact sheets on Best Management Practices for Agricultural Wastes (Section 9, Item I-1).

b - Manure

1. Demonstrations on manure management with small grains and corn were successfully conducted (Section 9, Item I-1).
2. Representatives from federal, state, and local government and industry have formed a committee named PLUS (Poultry Litter

Utilization and Storage) to deal with manure storage. (Section 9, Item I-1.) Again, this effort should produce major water-quality benefits.

c - Delaware Stream Watch

Monitoring is being accomplished in the Murderkill River Corridor under Delaware Nature Education Society (DNES) and DNREC coordination. A station for Brown's Branch is located in Harrington, Delaware and the Murderkill River mainstream is patrolled from Frederica to Bowers Beach. The DNES, which strongly supports projects like this, is actively seeking additional volunteers to expand coverage.

8. Natural Heritage

a - Rare Plant Survey

Funding is being sought to support this operation. Initial field work would begin on the dedicated nature reserve within the Murderkill River Corridor.

b - Natural Areas Directory

The existing directory is being revised and will reflect areas in the Murderkill River Corridor.

Recommendations

RECOMMENDATIONS

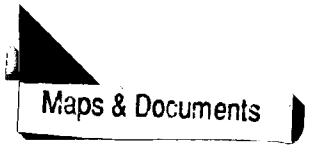
The sheer amount of work undertaken and accomplished during Phase II of this study clearly demonstrates that a group of agency and government representatives with diverse concerns or areas of responsibility can successfully address conservation issues through a team approach.

The Kent Conservation District's Plan of Work, which focused on designated projects, facilitated the study group participants' ability to jointly develop definitive action plans. The new-found ability for many project participants to shift temporarily from the role of reactive regulator to proactive technical assistant is a clear benefit of this endeavor.

Overall the Murderkill River Corridor Report has been an excellent vehicle for opening lines of communication, developing appreciation for other concerns or areas of responsibility, and development of new end-products or techniques that will be applicable in areas other than the Murderkill River basin.

Based on these remarks, it is recommended that:

1. The study be continued using the team approach for the six targeted projects.
2. Meetings be scheduled on a more regular basis.
3. The Kent Conservation District prepare meeting agendas which reserve time to address other resource management options not directly linked to the six projects.
4. The Kent County Planning Office conduct an orientation briefing for study group participants. Presentation should cover the zone and development process and related codes and regulations.


Maps & Documents

MAPS AND DOCUMENTATION

SEQUENCES	ITEM
A.	Kent Conservation District, *Murderkill River Corridor Report, Phase II, Plan of Work, 1987.*
B.	DNREC, Wildlife Section, Memorandum to Delaware Advisory Council on Fish & Game, *Sewage Sludge Application on State Wildlife Areas.* June 26, 1987.
C.	Map: Coursey Pond Region
D.	Department of Agriculture, Letter to Kent County Planning Office. RE: *Petition Z-87-9.* February 5, 1987.
E.	Map: Killens Pond State Park Area
F-1	Questionnaire for Kent County
F-2	Questionnaire for Bowers Beach
G-1	Information Packet for Natural-Area Landowners.
G-2	Example of Completed Nomination - Registration of Natural Areas Form
G-3	Example of Deed for a Dedicated Nature Preserve
G-4	Map of Tracts and Landowners
H-1	SCS Public Service Announcement RE: *Farm Bill Slide Show Available.* December 12, 1986.
H-2	Kent County ASCS News, Volume 27 No. 1 *Sodbuster/Swampbuster Reminder.* January 21, 1987.
H-3	Kent Conservation District Newsletter, Volume 12 Issue 3, *Don't Lose Your Eligibility.*
I-1	University of Delaware, College of Agricultural Sciences & Cooperative Extension System, *1986 Annual Report.*
I-2	Delaware Department of Agriculture Files Project Title: *Evaluation of Upright Dry Edible Bean Cultivars in Delaware to Assist Market Development.* Undated, 3 pp.
I-3	Delaware Department of Agriculture Files, Briefing Script. Dated 2/11/87, 3 pp.
I-4	Delaware Department of Agriculture Files Commodity Development Section, *Annual Report, Fiscal 1987.* 4 pp.
J-1	Delaware Cooperative Extension Memorandum RE: *Agricultural Producer Processing.* January 12, 1987.

MAPS & DOCUMENTATION (Continued)

J-2 Proceedings - Producer Processing Committee, January 16, 1987.

J-3 Delaware Cooperative Extension Memorandum RE: *Alternative Opportunities for Farmers*, April 6, 1987.

K-1 Delaware Department of Agriculture, Division of Production and Promotion, Memorandum. RE: *Strategies for Tomorrow's Farmer*. December 16, 1987.

K-2 Delaware Cooperative Extension. *Extension Circular 148*, April 1987.

K-3 Proposal: To establish a center for alternative agriculture within the Commodity Development Section. Delaware Department of Agriculture. Undated. 2 pp.

L-1 Report on Pesticide Certification and Use Enforcement. No Letterhead. Undated, 2 pp.

KENT CONSERVATION DISTRICT
3500 South duPont Highway
P.O. Box 864
Dover, Delaware 19903

MURDERKILL RIVER CORRIDOR PROJECT - PHASE II
Plan of Work - 1987

The Kent Conservation District received a grant from the Office of Ocean and Coastal Resource Management through the Department of Natural Resources and Environmental Control to carry out Phase II of the Murderkill River Corridor Project. The Murderkill River Corridor Project included an inventory of natural and cultural resources; analyzed current land uses and problems; and identified general options for resource management.

The major purpose of Phase II is implementation of selected management options that can be accomplished in a relatively short time and produce significant results using a team approach.

Since the Murderkill River Corridor is a complex of diverse and relatively unspoiled resources, it provides an opportunity to develop cooperative effort in planning and implementing measures needed to protect or improve specific and intermingled kinds of land. The mix of wetlands, forests, farmland, waters, wildlife habitat, historical and cultural resources, and urbanizing areas provide several immediate opportunities to utilize the team mechanism to achieve conservation objectives. The following projects will be developed under the overall coordination of the Kent Conservation District particularly the relationship between private landowners and state agencies.

1. Erosion and sediment control on steep farmlands adjacent to or impacting upon wetlands, natural areas, wildlife habitat, etc.

   The Link Farm just below the Killens Pond State Park established erosion and sediment control basins on a field with rather steep slopes which drains into the Murderkill River. The erosion and sediment control measures on the Link Farm will be expanded and will serve as a demonstration to use with other landowners. Two additional projects on other farms will be selected, planned, and implemented. The Soil Conservation Service (SCS) will take the lead assisted by the Agricultural Stabilization and Conservation Service (ASCS). Fish and Wildlife, Wetlands, and Natural Heritage sections of DNREC will provide consultation.

2. Overcoming soil acidity and other problems associated with sludge disposal on the Penuel Wildlife Management Tract.

   The farmland on the Penuel Tract was used, under lease to a private farmer, for disposal of sewage sludge. Excessive application of sludge over several years reduced the pH to 4.5 or lower making production of conventional crops impossible. A plan will be developed to raise soil pH, improve productivity, and to integrate use of farmland with overall wildlife management objectives for all lands

DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DIVISION OF FISH AND WILDLIFE

M E M O R A N D U M

TO : Delaware Advisory Council on Fish & Game and Interested Citizens of Delaware

FROM : Delaware Division of Fish and Wildlife

SUBJECT : Sewage Sludge Application on State Wildlife Areas

DATE : June 26, 1987

The DNREC in conjunction with the Division of Water Resources has developed draft regulations concerning the use of sludge on farm lands (See attached letter to interested citizens and Discussion Draft - Land Treatment of Wastes, Guidance and Rules of Practice). The Division of Water Resources will hold two public workshops on Thursday, July 2, 1987 at 1:30 p.m. and 7:30 p.m. in the auditorium of the Richardson and Robbins Building. At that time, concerns about sludge application guidelines should be expressed to the Water Resources Division.

Attached find a news release from the Department of natural Resources and Environmental Control (DNREC) dated May 25, 1987. This information was provided as a public service to reiterate the serious problem faced by the Kent County Sewage Treatment Plant in terms of its mounting sludge buildup, and to announce a plan developed by the DNREC which uses the Penuel Tract of the Milford Neck Wildlife Area and Buckaloo Tract of the Ted Harvey Wildlife Area as sludge (application) sites for three years beginning with the 1987 growing season.

In addition to the terms specified in the news release, the following points need to be clarified:

1. The three year agreement is for one application of sewage sludge per year, with application rates determined by the amount of nitrogen the selected agricultural crop is capable of utilizing. Renewal of the contract for the next growing season will be approved only if compliance with the terms of the contract have satisfactorily been met. Soil pH monitoring and grain testing for uptake of heavy metals are the main criteria which will be used by the Wildlife Division to renew the contract. Application of the sludge by the county must be done just prior to the growing season and follow land treatment of waste, guidance and rules of practice (Public workshop 1:30 and 7:30 p.m., July 2, 1987, R&R Building).

2. The total agricultural area of the Penuel Tract is 275 acres. The negotiated amount of land available for sludge application by the County is 190 acres of the total. The Delaware Division of Wildlife will maintain the remaining 75 acres, of which 50 acres will be planted with Sudex, 15 acres in winter wheat (dove fields) and 10 acres with a mixture of soybeans, buckwheat, sunflowers and sorghum (mini milo), our standard wildlife food plot planting. The total agricultural area of the Buckaloo Tract is 45 acres. The negotiated amount of land available for sludge application by the County is 40 acres, with the remaining 5 acres maintained by the Wildlife Division in winter wheat cover. Sludge will not be applied on Wildlife Division maintained fields on both tracts. Revision of the area maps, which are given to hunters, has just been completed and will show those areas where sludge has been applied.

3. The entire acreage of the Penuel Tract was limed at a rate of two tons per acre prior to the agreement reached by Kent County and the DNREC. The Buckaloo Tract was limed during the 1986 growing season and did not require treatment in 1987.

4. Federal guidelines suggest that where sewage sludge is applied to land, access should be controlled. While this is not a federal regulation, it is important to note that a majority of the people (hunters) visiting our wildlife areas do so during the regulated hunting seasons from September through February. During the remainder of the year we have regulations which restrict usage of our areas. We do, therefore, control access during that time of the year when sludge is being applied (April-June). Kent County has also agreed to post with appropriate information signs, those areas where sludge has been applied. In addition, the Division is initiating a plan which will limit vehicle access at the main entrance road to the Penuel Tract. A parking lot is being built which will restrict access from April 1 through August 31 each year. This parking lot was planned prior to concern about sludge being applied to the area and it will reduce vandalism, dumping, unlawful shooting and other violations of the Division's regulations.

5. Division personnel are monitoring the application of sludge on a routine basis. The net result of our efforts has been a more responsible approach by the County in applying the sludge, particularly with respect to application rates.

6. The Penuel Tract has been singled out as an example of what negative effects the application of sewage sludge does to agricultural lands. Criticism has been based only on visible crop failures with no scientific evidence to support these claims. Numerous soil tests conducted by the Division in conjunction with the Cooperative Extension Service show that pH is the problem. Heavy metal loading of the soils has not been detected, even though the tract has a history of annual sludge applications. The most recent agricultural lessee of the Penuel Tract attributed crop failures to the application of sewage sludge. Extensive soil tests indicated that the primary reason for crop problems was caused by low pH of the land, that was a result of failure to adequately lime the property as required in the lease.

7. A variety of wildlife species are harvested on the Penuel Tract. The following table provides information on those species which are hunted or trapped during the legal seasons and which may come in contact with sludge treated soils:

Species	Time At Penuel Tract	Food	Habitat	Resident/Migratory		Hunting Season
Rabbit	Year round	Grass	Field/woods	X		Nov.16-Jan.13 Jan.18-Jan.30
Quail	Year round	Insects, Grain,	Field/woods	X		Nov.16-Jan.13 Jan.18-Feb.29
Waterfowl	Feb.-Oct.	Aquatic Bugs, Veg.	Marsh, water	X		Nov.2-Nov.7 Nov.24-Nov.28 Dec.5-Jan.2
Waterfowl	Oct.-Feb.	Grain, Ag. Veg.	Marsh, fields		X	
Dove	Mar.-Sept.	Insects, Grain	Woods, fields	X		Sept.5-Sept.26 Oct.12-oct.24 Dec.7-Jan.9
Dove	Oct.-Feb.	Grain Harvested (Aug-Jan)	Fields		X	
Deer	Year round	Grasses	Fields, Woods, Marsh	X		Oct.8-10 Nov.6-14 Jan.14-16
Muskrat	Year round	Marsh Vegetation	Marsh	X		Dec.15-March15

In order for the consumption of these species by humans to pose a threat, whatever was contained in the sludge must be contained in the food they consume. Although we cannot find any direct testing of the animal flesh, EPA has tested grains and silage grown with the assistance of septic sludge. EPA has found that these grains and silage are suitable to feed poultry and livestock intended for human consumption. There is no information about the relationship between sludge and earthworms that may affect woodcock. The take of woodcock on the Penuel Tract is, however, minimal or nonexistant. In Delaware woodcock are usually taken coincidentally to quail hunting and are a very lightly harvested species. Waterfowl which migrate from the northern tier of states and provinces may come in contact with sewage sludge or effluent at any time during their migration. Interestingly sewage lagoons and settling basins are often favorite resting and feeding areas for waterfowl during migration. It is naive assumption that all waterfowl species which are hunted in Delaware have never come in contact with sewage sludge or effluent.

It has been represented to us by a public health specialist that the consumption of wildlife from sludge treated areas does not represent a significant human health risk. Questions about the health risks of consuming wildlife species taken from sludge treated lands should be directed to the Department of Public Health. The final decision to hunt and consume wildlife species taken on sludge treated lands rests with each individual sportsman. Although the consumption of game animals from areas receiving sludge is outside the area of expertise of the Division of Fish and Wildlife, the information we have received indicated that there is no known health risk involved.

8. In March of this year, we collected fish samples from the outfall stream of the Kent County sewer plant. The species were those that spent their total life cycle within the Murderkill River System. It has been represented to us by public health specialists that consumption of these fish at these levels represent no health hazards. We will be taking fish samples again in August and having the analysis repeated.

May 25, 1987

Vol. 17, No. 122

SLUDGE APPLICATION ON STATE LANDS

The Department of Natural Resources and Environmental Control today signed a contract with Kent County that will allow 530 tons of treated sludge from the Kent County Sewage Treatment Plant to be applied on two tracts in the Division of Fish and Wildlife's Milford Neck Wildlife Area before the end of June.

The 40 acre Buckaloo tract will receive 123 tons, or 3 tons per acre. The 190 acre Penuel tract will receive 408 tons, or 2 tons per acre. Both areas were approved previously for sludge application at a rate of up to five tons per acre. The lower application rates have been established based upon recommendations from the Delaware Cooperative Extension Service. These rates were set using the county's new sludge management manual for land application and represents a significant reduction from that orignially permitted. Sorghum, the crop selected for the Penuel tract, should utilize all available nitrogen in the sludge that is to be applied.

J. Ross Harris, an environmental quality specialist with the Cooperative Extension Service, in conjunction with researchers at the University of Delaware's College of Agriculture, provided a soil analysis, interpretation and cropping recommendations for sludge utilization and long term management of the Penuel tract.

According to his evaluation, the major problem with soils on the property is not metals concentrations but low pH. He recommended liming as a solution and the county will be required to elevate the pH of the soils on the site to 6.5.

According to the contract, the county will install and sample two groundwater monitoring wells, and analyze its sewage sludge on a monthly basis for the total nitrogen, ammonia and nitrate nitrogen, phosphorus, potassium, lead, zinc, nickel, copper and cadmium content. The county has also agreed to deliver sludge which is well stabilized and will not present a severe odor nuisance to DNREC or nearby residents. The property will be posted to indicate where sludge has been applied.

What to do with the nine tons of sludge the Kent County Sewage Treatment Plant generates daily has created difficulties for both the state and county in recent months. Concerns over the health effects of sludge, the refusal of some canning companies to accept produce that has been fertilized with sludge, and odors caused most farmers to back out of the county's sludge application program. The mounting inventory of sludge at the plant - 900 tons at present - contributed to an enforcement

action taken by the state in March.

As part of a Secretary's Order issued at that time, the county was required to prepare an operations manual for land application of sewage sludge by June 1, and hold workshops on the topic for appropriate agencies and farmers. Two sessions have been held to date, and on Friday, May 22 the Department received the completed manual.

The new state guidelines for land treatment of wastes have also been completed and have been distributed for comment.

-Jamison-

Doc. No. 40-01/87/05/23

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY, P.O. BOX 1401
DOVER, DELAWARE 19903

SURFACE WATER MANAGEMENT SECTION

TELEPHONE: (302) 736-5731

June 8, 1987

Dear Interested Citizen:

As part of our plans for adopting revised Guidance and Rules of Practice for Land Treatment of Wastes, the Division of Water Resources has prepared the enclosed Discussion Draft for your review and comment.

The Division will hold two public workshops on Thursday, July 2, 1987 at 1:30 p.m. and 7:30 p.m. The workshops will be held in the Auditorium of the Richardson and Robbins Building, 89 Kings Highway, Dover, Delaware. The workshops will include a brief presentation by Division of Water Resources staff, followed by an open forum for statements and/or questions from the audience.

Presentations at the workshop will be limited initially to five minutes to afford each participant the opportunity to present their views. Those who cannot be present at the workshop are requested to submit a written copy of their comments to the Division of Water Resources, Water Pollution Control Branch, 89 Kings Highway, P.O. Box 1401, Dover, DE 19903 by July 9, 1987. Substantive comments are invited and will be considered in preparing the final document which will be the subject of a subsequent hearing. The date and location of the public hearing will be published after July 9, 1987.

Sincerely,

Robert J. Zimmerman
Supervisor
Water Pollution Control Branch

bab

Enclosure

STATE OF DELAWARE
DEPARTMENT OF AGRICULTURE
2320 SOUTH DUPONT HIGHWAY
DOVER, DELAWARE 19901

OFFICE OF THE
SECRETARY

TELEPHONE: (302) 736-4811

February 5, 1987

Mr. Alan O. Thompson
Planning Director
Kent County Planning Office
414 Federal Street
Dover, Delaware 19901

Re: Z-87-9

Dear Mr. Thompson:

Thank you for this opportunity to comment on Petition Z-87-9 to amend the Kent County Zoning District map.

We regret the possibility of this farmland being developed into residential lots, but we feel it highlights the shortcomings in the present Kent County zoning code regarding the protection of farmland. In this instance the difference between the A-C and A-R categories is innocuous. Both allow development, albeit on 1 acre versus 0.5 acre minimum lot sizes, and neither provide any real protection for Kent County's productive agricultural land. We believe that the smaller lot size permitted in the A-R category may allow the owners to retain a larger percentage of the parcel in agricultural production, while potentially realizing an equal amount of total income from the sale of the 0.5 acre lots rather than the presently allowed 1 acre lots.

We have analyzed this parcel using the Kent County Land Evaluation and Site Assessment (LESA) system. This parcel scored 85 land evaluation points and 169 site assessment points for a total LESA score of 254 points out of 300. The fields along Delaware Route 15 (Canterbury to Milford Road) are primarily Sassafras loam soils which are some of Kent County's best agricultural soils. The surrounding land use is primarily agricultural and the presence of Coursey's Pond results in a high limiting site factor score. The high LESA score indicates that

D

this parcel has a high potential for long-term agricultural production and without Coursey's Pond as an attraction would probably not be developed.

Should this petition be granted, we urge the owners and the county to direct the first phase of the development towards the wooded areas and the poorer soils on the western portion of the property. By phasing the development the owners may be able to continue to farm the majority of the tillable land along Route 15 and allow it to remain productive and more in character with the surrounding land use.

We must defer to the experts at the Department of Natural Resources and Environmental Control for their comments concerning the possible effects on Coursey's Pond of in-ground septic systems being located on this parcel.

Finally, our comments would not be complete if we did not state that the soon to be completed update of Kent County's comprehensive plan must address the issue of true agricultural zoning rather than current agricultural-conservation and agricultural-residential categories. With a true agricultural zoning district in place comments on proposed zoning changes will be more meaningful.

Sincerely,

Kevin C. Donnelly

Kevin C. Donnelly
Planner
Agland Preservation Section

KCD:cmm
Enclosure
cc: Michael R. Owen, (w/encl)
Michael McGrath, (w/encl)
John Sherman, (w/encl)

LESA Analysis for Application Z-87-9
Calvin and Grace Meyers

PROJECT REVIEWS FORM
AGLANDS SECTION

PROJECT I.D. NUMBER: Z-87-9

COUNTY: Kent LOCATION: Coursey Pond/Rd. 387

TYPE OF ACTION: Rezoning request

CHANGED FROM: A-C

CHANGED TO: A-R

LEGAL OWNER: Calvin & Grace Meyers

EQUITABLE OWNER:

TOTAL ACRES IN PARCEL: 108.00
CROPLAND: 91.70
FOREST: 16.30
OTHER: -0.00

TOTAL ACRES
MINUS: ACRES USED IN LE

DIFF: 0.00 <<SHOULD BE ZER
ELSE CHECK LE A

LAND EVALUATION SCORE: 85
SITE ASSESSMENT SCORE: 169

TOTAL LESA SCORE: 254

PROJECT NOTICE RECEIVED: 2/03/87

NEXT ACTION DATE: 2/05/87

FINAL ACTION DATE:

DATE OF REPLY: 2/05/87

AGLANDS' DECISION:

FINAL DISPOSITION OF THIS PROJECT:

NOTES: Z-87-9

THIS BEGINS THE PROFESSIONAL ANALYSIS SECTION

>>LAND EVALUATION SECTION<<

CROPLAND AGRICULTURAL GROUP	ACRES	ACRES AC 1 TO AC 10: 91.7
**********	*****	ACS. CROP\OTHER LAND: 91.
1	AC 1: 6.75	**CHECK TOTAL**
2	AC 2:	
3	AC 3: 59.6	NOTE: REFER TO SOILS REFER
4	AC 4:	SHEET TO MATCH MAP
5	AC 5: 19.3	SYMBOLS TO AG GROUP
6	AC 6:	
7	AC 7:	

8	AC 8: 6.05
9	AC 9:
10	AC 10:

FOREST AGRICULTURAL GROUP	ACRES	
**********	*****	ACRES FOREST: 16.30
		ACRES AF 1 TO AF 6: 16.30
1	AF 1: 16.3	**CHECK TOTAL**
2	AF 2:	
3	AF 3:	
4	AF 4:	
5	AF 5:	
6	AF 6:	

>>SITE ASSESSMENT SECTION<<

QUESTIONS 1 - 7 FOR ALL COUNTIES

ANSWER WITH 1 - 6

1. WHAT PERCENTAGE OF THE SURROUNDING AREA IS IN AGRICULTURE?
   [USE 1.5 MI RADIUS IN SUSSEX; 1 MI IN KENT & NEW CASTLE]

   1) 90 - 100% IN AGRICULTURE
   2) 80 - 89% IN AGRICULTURE
   3) 50 - 79% IN AGRICULTURE
   4) 0 - 49% IN AGRICULTURE — SA1: 1

2. HOW DO YOU RATE THE INVESTMENT FOR AGRICULTURE ON THIS PARCEL?

   1) UPPER 1/3 FOR FARMS OF THIS TYPE
   2) MIDDLE 1/3 FOR FARMS OF THIS TYPE
   3) LOWER 1/3 FOR FARMS OF THIS TYPE — SA2: 2

3. SITE FACTORS THAT MAY LIMIT CONVERSION
   ARE ANY OF THE FOLLOWING FACTORS PRESENT?
   FLOODPLAINS, HISTORIC SITES, ENDANGERED SPECIES, POTENTIAL FOR DAMAGE TO WATER QUALITY

   1) 3 OR MORE ARE PRESENT
   2) 2 ARE PRESENT
   3) 1 IS PRESENT
   4) NONE ARE PRESENT — SA3: 2

4. IMPACT OF THE PROPOSED CONVERSION ON THE RETENTION OF FARMLAND

   1) SIGNIFICANT AND IMMEDIATE IMPACT
   2) SIGNIFICANT BUT LONG RANGE
   3) LITTLE, IF ANY, IMPACT — SA4: 2

5. ZONING FOR THE SITE AND ADJACENT LAND

1) SITE AND ALL ADJOINING ZONED FOR AG
2) 1 - 25% OF PERIMETER ZONED NON-AG
3) 26 - 50% OF PERIMETER ZONED NON-AG
4) 51 - 75% OF PERIMETER ZONED FOR NON-AG
5) 76 - 100% OF PERIMETER ZONED FOR NON-AG
6) 100% OF PERIMETER AND THE SITE ARE ZONED FOR NON-AG

SA5: 1

6. COMPATIBILITY OF THE PROPOSED USE WITH THE COMPREHENSIVE DEVELOPMENT PLAN

1) SITE IS AN AREA PLANNED FOR AGRICULTURE
2) SITE IS NOT PLANNED FOR AGRICULTURE

SA6: 1

7. CENTRAL, SANITARY SEWER SYSTEM WITHIN 1/4 MILE

1) NO
2) YES

SA7: 1

QUESTIONS 8 AND 9 ARE FOR KENT AND SUSSEX

8. DISTANCE TO URBAN CENTER

1) SITE IS MORE THAN 5 MILES FROM AN URBAN CENSUS TRACT
2) SITE IS 3 - 5 MILES FROM AN URBAN CENSUS TRACT
3) SITE IS 1 - 3 MILES FROM AN URBAN CENSUS TRACT
4) SITE IS LESS THAN 1 MILE FROM AN URBAN CENSUS TRACT

SA8: 1

9. LAND USE ADJACENT TO THE SITE

1) ALL ADJACENT PROPERTY ENGAGED IN AGRICULTURE OR VACANT
2) ONE OR MORE SIDES IN INDUSTRIAL; NO RESIDENTIAL OR COMMERCIAL
3) ONE OR MORE SIDES IN COMMERCIAL; NO RESIDENTIAL
4) ONE SIDE IN RESIDENTIAL OTHER THAN ACCESSORY TO FARMING
5) TWO OR MORE SIDES IN RESIDENTIAL

SA9: 1

QUESTION 10 IS FOR NEW CASTLE AND SUSSEX

10. PERCENTAGE OF SITE FARMED IN 4 OF LAST 5 YEARS

1) 90 - 100% OF SITE
2) 50 - 89% OF SITE
3) 0 - 49% OF SITE

SA10:

ESTION 11 IS FOR SUSSEX ONLY

11. AVAILABILITY OF ADDITIONAL LAND FOR PROPOSED USE IN THE AREA

1) VACANT, BUILDABLE LAND WITH FACILITIES IS AVAILABLE
2) VACANT, BUILDABLE LAND IS AVAILABLE BUT WITH FEW FACILITIES
3) LITTLE VACANT, BUILDABLE LAND REMAINS IN THE PROJECT AREA

SA11:

QUESTION 12 IS FOR NEW CASTLE ONLY

12. EXISTENCE OF OFF-SITE AGRICULTURAL SUPPORT SYSTEM

1) ALL AG SUPPORT SYSTEMS AVAILABLE
2) 1 OR MORE AG SUPPORT SYSTEMS NOT AVAILABLE
3) NO AG SUPPORT SYSTEMS AVAILABLE

SA12:

CROPLAND LE: 70
FOREST LE: 15

WORK1: 55.5555555555556
WORK2: 16.6666666666667
WORK3: 22.2222222222222
WORK4: 13.8888888888889
WORK5: 16.6666666666667
WORK6: 16.6666666666667
WORK7: 5.55555555555556
WORK8: 5.55555555555556
WORK9: 16.6666666666667
WORK10: 0
WORK11: 0
WORK12: 0

ASSOCIATION OF STATE FLOODPLAIN MANAGERS
AND THE Kent County CONSERVATION DISTRICT
COMMUNITY ASSISTANCE QUESTIONNAIRE

Your community is participating in the National Flood Insurance Program (NFIP) and you may have found a need for additional technical advice or assistance on various aspects of floodplain management. Such assistance could be provided by services of our Conservation District technicians.

In order to improve floodplain management assistance programs, we are trying to find out in what areas communities need the most help. On a scale of 0 to 3, please circle the score for each of the following activities.

0 = We don't need any outside help
1 = We could use some assistance
2 = Assistance is very important
3 = We may have to drop from the program if we don't receive additional help

	Activity	Score (Circle One)			
Flood Hazard Identification	A. Obtaining floodplain maps	(0)	1	2	3
	B. Revising maps to reflect changed conditions	0	1	(2)	3
	C. Obtaining flood elevations in unstudied areas	0	1	(2)	3
	D. Identifying floodways	0	1	(2)	3
	E. Understanding floodplain maps and data	(0)	1	2	3
	F. Identifying unique hazards (alluvial fans, mud flows, coastal erosion areas, etc.)	0	(1)	2	3
Floodplain Management Assistance	G. Wise uses of floodplains	(0)	1	2	3
Regulatory Assistance	H. Develop local floodplain building standards	0	1	(2)	3
	I. Understanding the NFIP regulations	0	(1)	2	3
	J. Preparing or revising the ordinance	(0)	1	2	3
Assistance to Administer	K. Administering a permit & inspection program	(0)	1	2	3
	L. Reviewing building/development plans	0	(1)	2	3
	M. Obtaining and certifying building floor elevations	0	(1)	2	3
	N. Reviewing requests for variances and waivers	(0)	1	2	3
	O. Pursuing and correcting violations	(0)	1	2	3
Information	P. Flood warning and evacuation	0	(1)	2	3
	Q. Stormwater management techniques	0	1	(2)	3
	R. Floodproofing techniques	0	(1)	2	3
	S. Flood insurance coverage and claims	0	(1)	2	3
	T. NFIP banking and lending rules	0	(1)	2	3
	U. Public information on flood programs	0	1	(2)	3

Please return this form by November 20, 1986, to:

_____

_____

_____

ASSOCIATION OF STATE FLOODPLAIN MANAGERS
AND THE Bowers Beach CONSERVATION DISTRICT
COMMUNITY ASSISTANCE QUESTIONNAIRE

Your community is participating in the National Flood Insurance Program (NFIP) and you may have found a need for additional technical advice or assistance on various aspects of floodplain management. Such assistance could be provided by services of our Conservation District technicians.

In order to improve floodplain management assistance programs, we are trying to find c t in what areas communities need the most help. On a scale of 0 to 3, please circle the score for each of the following activities.

0 = We don't need any outside help
1 = We could use some assistance
2 = Assistance is very important
3 = We may have to drop from the program if we don't receive additional help

		Activity	Score (Circle One)			
Flood Hazard Identification	A.	Obtaining floodplain maps	**0**	1	2	3
	B.	Revising maps to reflect changed conditions	**0**	1	2	3
	C.	Obtaining flood elevations in unstudied areas	**0**	1	2	3
	D.	Identifying floodways	**0**	1	2	3
	E.	Understanding floodplain maps and data	**0**	1	2	3
	F.	Identifying unique hazards (alluvial fans, mud flows, coastal erosion areas, etc.)	**0**	1	2	3
Floodplain Management Assistance	G.	Wise uses of floodplains	**0**	1	2	3
Regulatory Assistance	H.	Develop local floodplain building standards	**0**	1	2	3
	I.	Understanding the NFIP regulations	0	**1**	2	3
	J.	Preparing or revising the ordinance	0	**1**	2	3
Assistance to Administer	K.	Administering a permit & inspection program	**0**	1	2	3
	L.	Reviewing building/development plans	0	**1**	2	3
	M.	Obtaining and certifying building floor elevations	**0**	1	2	3
	N.	Reviewing requests for variances and waivers	0	**1**	2	3
	O.	Pursuing and correcting violations	0	1	**2**	3
Information	P.	Flood warning and evacuation	**0**	1	2	3
	Q.	Stormwater management techniques	**0**	1	2	3
	R.	Floodproofing techniques	**0**	1	2	3
	S.	Flood insurance coverage and claims	0	**1**	2	3
	T.	NFIP banking and lending rules	0	**1**	2	3
	U.	Public information on flood programs	0	**1**	2	3

Please return this form by November 20, 1986, to:

Elizabeth C Banks Mayor
William H. Cain Vice Mayor
Arthur W. Penrose Councilman
Jane H Boone Sec.

F-2

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF PARKS & RECREATION
89 KINGS HIGHWAY
P.O. BOX 1401
DOVER, DELAWARE 19903

Dear

The Murderkill River and its tributaries is one of the few undisturbed waterways in Delaware. This area contains a diverse mixture of natural habitats, agricultural lands and some residential development. In order to better understand these resources and how to manage and protect them for the future, a study known as the Murderkill River Corridor Project is underway. This study is assessing the natural, cultural and agricultural resources within the defined corridor. It is also addressing resource conservation and management options on a cooperative basis between landowners and natural resources management agencies. The Project is coordinated by the Kent Conservation District with the assistance of the Department of Natural Resources and Environmental Control and the Department of Agriculture.

One part of the overall Project deals with natural areas preservation. Natural areas are lands containing unique or significant examples of Delaware's natural heritage. The Murderkill River natural area is an unspoiled waterway with diverse, high quality natural habitats. It is home to many wildlife, fish and plant species. The undisturbed vegetation along the river helps control erosion and maintain good water quality. The defined natural area, which is within the larger Murderkill River Corridor Project, is outlined on the attached map. The Office of Nature Preserves is responsible for the natural areas preservation system. The attached handouts explain more about the program.

As a landowner within the Murderkill River natural area, the Office of Nature Preserves is contacting you to encourage you to help protect the natural features of this area. Our natural areas program is voluntary. Our efforts succeed only with your cooperation. As a natural area landowner there are several options available to you for preserving your part of Delaware's natural heritage. One way is by registering the portion of your property within the defined natural area with the Office of Nature Preserves. Although not legally binding, registration is recognition by this office and you of the significance of the area and represents a good-faith agreement to protect it.

Another legally-binding option for protection of the natural area is dedication. There are two different ways of dedicating land. One way is for you to retain title to the land and set up a conservation easement. Deed restrictions are placed on the land for protection of the natural values of the site. A second way to dedicate a natural area is through a donation or gift of the land. Again, deed restrictions are applied to the site and ownership transfers to the Office of Nature Preserves. (Two landowners have donated part of their land to this office and dedicated them as a nature preserve. See attached map.) For either option, conervation easement or donation, you may be afforded tax benefits. Depending on your specific circumstances, property, income, estate, and inheritance taxes may be reduced.

Our office hopes you agree that the Murderkill River natural area is worthy of preservation for present and future generations. We would be very willing to discuss with you the protection of your portion of this natural area. Our office can be reached in Dover at 736-5285. If you want more information about the Murderkill River Corridor Project, please contact the Kent Conservation District at 697-6176.

Thank you for your time and consideration.

Sincerely,

Ron Vickers, Chief
Natural Heritage Programs

RV:db

MURDERKILL RIVER NATURAL AREA

Extensive areas of visually attractive wooded swamp fringing a major Kent County river and two of its tributaries bind the Murderkill River west of Frederica, Browns Branch, and Ash Gut into a notable natural unit. A pleasant upstream voyage on the Murderkill from Road 389 would begin in tidal waters of low salinity--less than two parts per thousand. Big cordgrass is the dominant vegetative feature, with hightide-bush at higher elevations, grading quickly into a fresher marsh situation, with abundant cattail and marsh mallow. A short distance upstream are red maple and bayberry, first on the north bank and rapidly followed on both sides of the river by the well-developed, wooded Big Cripple Swamp. Here red maple, green ash, and American holly comprise the tallest vegetation, with winterberry, sweetbay magnolia, and sweet pepper-bush profuse beneath. Swamp rose and poison ivy occur frequently, and switchgrass and tidemarsh water hemp appear in small, intermittent open areas.

Above the confluence, some surprisinginly steep banks, with an elevation change of 20 feet, occur along both Murderkill River and Browns Branch. Here a true canopy is developed, consisting of red maple, white oak, tulip, Virginia scrub pine, and some American beech. Atlantic white cedar, American holly, and sweetbay magnolia constitute an understory. A dense shrub layer consists of hazel alder, sweet pepper-bush, winterberry, southern arrowwood, red chokeberry, silky dogwood, and swamp rose. Common and laurel-leaf greenbrier are prominent, and water-willow is found at stream edges.

At higher elevations, oaks assume increasing prominence in the canopy, and flowering dogwood and eastern red cedar are conspicuous in the understory. Japanese honeysuckle is prolific in open, disturbed areas near roadways. West of Road 35, red maple predominates in the canopy but is accompanied by sycamore, black gum, Spanish oak, and American beech. Mountain laurel is prominent on the steep banks. Mistletoe growth was luxuriant in the taller streamside woody vegetation at the time of field reconnaissance.

The area is especially attractive to wood ducks. It is a productive feeding area for long-legged wading birds and kingfishers and the breeding ground for a variety of songbirds.

The tidal range in the Murderkill River is approximately 3.5 feet. Channel depth at Frederica on flood tide approaching highwater slack is 7.0 feet; however, the channel depth in the Murderkill River at the western end of the natural area is only about 18 inches at low water slack.

Elevation over the area varies from less than 10 feet to slightly more than 30 feet above sea level. Soils in the furthest downstream portion of the natural area are classified primarily as tidal marsh, as are those on the southern side of the Murderkill River from just below its confluence

with Browns Branch. Soils in the flood plain of Ash Gut are very wet, very poorly drained Johnston silt loam. The remainder of the area is designated as swamp, with perimeter soils including Evesboro sandy loam, mixed alluvial land, made land, Rumford loamy sand, Sassafras sandy loam, and Sassafras and Evesboro soils.

Pleistocene sands and gravels of the Columbia Formation are approximately 48 feet thick over this area. The Frederica aquifer - a Miocene aged sandy zone in the Chesapeake Group - begins approximately 120 to 138 feet below sea level and is between 25 and 50 feet thick here. The Cheswold aquifer, also Miocene, occurs between 250 and 300 feet below sea level.

Air quality is excellent, but water quality is moderately reduced. There is considerable sediment visible, due in part to tidal action and in part to runoff from agriculatural areas, roadways, and the few developed areas in the vicinity. Dissolved oxygen is moderately high in this portion of the Murderkill River segment; however, fecal coliform counts exceed the state standard for primary contact recreation. Water quality has remained fairly constant over the past four years.

The noise level is modestly elevated, particularly in relation to seasonal recreational activities; however, summer boat traffic is comparatively light. The visual appeal of the area is generally high.

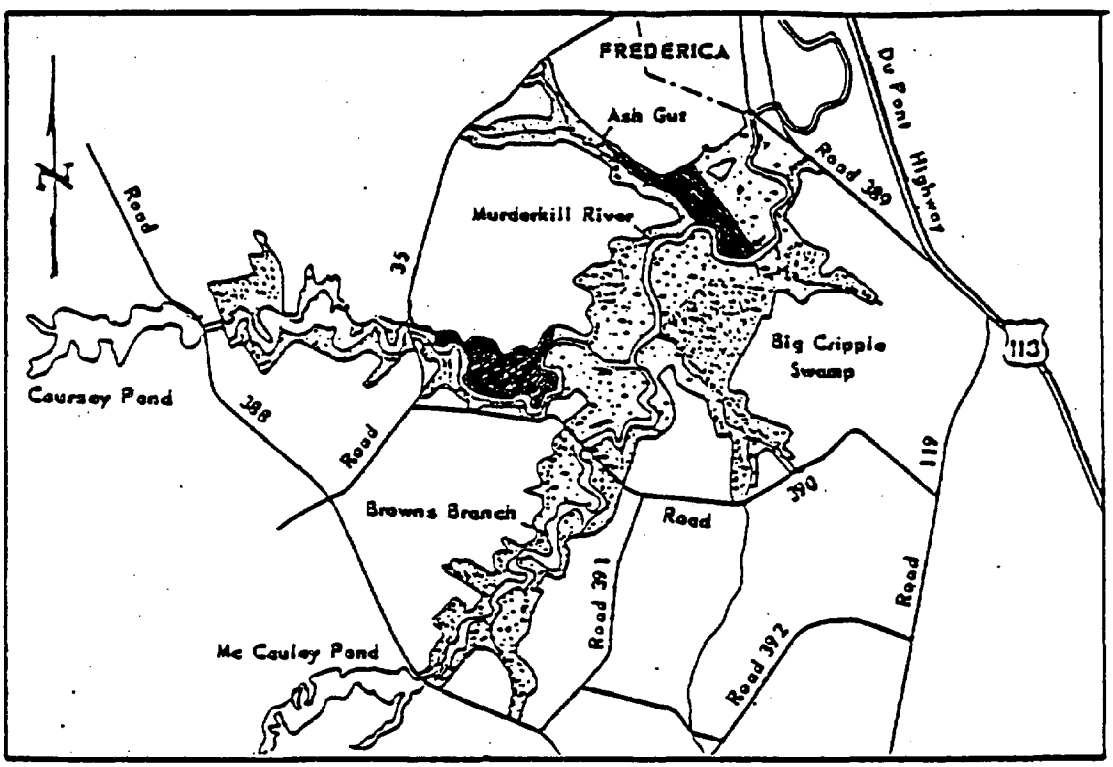
Prehistoric occupation of the valley was dense throughout the Woodland Period, spanning some 2,600 years from approximately 1000 B.C. to Contact time. Major archaeological sites within the natural area are Frederica-Adena site of the Delmarva-Adena Phase--400 B.C. to A.D. 100; Coulborne type site for Coulborne ceramics dated about 500 B.C.; and Hollager Middle Woodland site. The boundaries also include numerous small sites.

An earlier appellation for Murderkill River was Murther Kill, a combination of the seventeenth century English spelling of murder and the Dutch word for creek. Legend relates that an expedition of Dutchmen sailed up the creek to trade with the Indians. During a drunken melee, the Dutchmen were "barbarously" murdered.

The Murderkill River drainage basin west of the Murderkill-Browns Branch confluence was studied by consultants to the state Division of Parks and Recreation. The bulk of the defined natural area within this portion of the basin was designated as "most suitable for preservation and protection". The natural area complex defined involves multiple property ownerships. Appropriate legal techniques for preservation in private holdings should be applied.

From: Fleming, L. M. 1978. Delaware's Outstanding Natural Areas and their Preservation. DNES, Hockessin, DE 422 pp.

MURDERKILL RIVER NATURAL AREA



Outline of Natural Area

Dedicated Nature Preserve

DELAWARE'S
NATURAL AREAS PRESERVATION SYSTEM

WHAT IS A NATURAL AREA?

In a broad sense, Delaware's natural areas are remnants of the landscape which greeted the first settlers. They are "living museums" which represent the best examples of our diverse natural heritage: marshes, forests, waterways, plant and animal communities and important geological and archaeological sites. These special areas can serve as outdoor classrooms that provide opportunities for field study in the sciences, education in natural history, outdoor recreation, and enjoyment of nature's scenic beauty. Notable examples of natural areas in Delaware include Trussum Pond, Cape Henlopen, Bombay Hook, Island Field Site, Great Cypress Swamp, White Clay Creek, and portions of Brandywine Creek State Park.

HOW ARE THESE SPECIAL PLACES PROTECTED?

In 1978, the Delaware Legislature established the Natural Areas Preservation System to be administered by the Department of Natural Resources and Environmental Control (DNREC). The legislation provides for an Office of Nature Preserves (ONP) within the Department whose staff is assisted by the Natural Areas Advisory Council, a group of private citizens appointed by the Governor. A three-step process was established to encourage the preservation of our state's outstanding natural areas:

1. Inventory - The first step is to identify and inventory Delaware's most significant natural areas. The preliminary field study and research was conducted by the Delaware Nature Education Society who identified about 100 areas, located in all three counties. The natural areas on the inventory are in both public and private ownership and range in size from just a few acres to several thousand acres. These sites represent about 3.5 percent of Delaware's land area. A few of the areas on the inventory have already been lost to pressures of development but other sites with unique natural features are being identified and may be added to the inventory.

2. Registration - Owners of natural areas included in the statewide inventory may nominate their properties for listing on the Delaware Registry of Natural Areas. This is strictly a voluntary program and is not legally binding. It is, however, a mutual recognition by the State and the property owner of the significance of the site. Each party is then pledged to protect the natural area and to refrain from any activities which would diminish its natural values. Final determination for inclusion on the Registry rests with the Secretary of DNREC acting on recommendations of ONP staff and the Natural Areas Advisory Council. In some cases, this is the last step of the preservation process.

3. Dedication - Permanent and legal protection of natural areas is accomplished through a process known as dedication. Through the use of either a Conservation Easement or Articles of Dedication, owners of sites listed on the Registry may voluntarily place restrictions on the use of their property. Management practices for the natural area are formulated with the advice of a team of experts from State agencies who are familiar with the specific natural features of the property. In some cases, there may be financial benefits, e.g., tax incentives, to the owners who participate in the dedication of their properties. Dedication does not mean that private property owners must open their land for public use; conversely, restrictions on publicly-owned properties may limit certain human activities but will not close them for public use. Following approval of the management plan by the Advisory Council and the Secretary of DNREC, the area is officially recorded as a Nature Preserve. This will insure its preservation for the benefit of future generations.

Many properties throughout Delaware have now been registered as natural areas and several are being protected as Nature Preserves. Others are being protected by related regulations such as the Wetlands Act. But the job of protecting all of Delaware's critical natural areas is far from complete.

An important part of preserving our natural heritage is public understanding of the significance of these places. You can help by visiting those locations that are open to the public and learning more about these unusual and beautiful areas which make up Delaware's Natural Areas Preservation System.

For more information contact:

Office of Nature Preserves
Division of Parks and Recreation
P.O. Box 1401
Dover, DE 19901
(302) 736-5284

PROTECTING DELAWARE'S NATURAL AREAS

What Is A Natural Area?

A natural area is a portion of Delaware's landscape containing unique or significant examples of our diverse natural heritage: wetlands, forests, rare plant and animal communities, and geological or archaeological sites.

How Are These Special Places Protected?

In 1978 the Delaware legislature established the Natural Areas Preservation System. Voluntary protection of our state's outstanding natural areas is encouraged by a 3-step process: (1) Inventory - locate the most significant natural areas; (2) Registration - recognition by the state and landowner of the significance of the area and a good faith agreement to protect it; (3) Dedication - legal restrictions placed on the area. Once a natural area is dedicated then it is a nature preserve.

How Are Natural Areas And Nature Preserves Different From Parks?

Designating a site as a natural area recognizes its value to Delaware's natural heritage. Nature preserve status legally protects a natural area for the benefit of present and future generations. Parks are developed for outdoor recreational needs such as swimming and camping. If these activities took place in a nature preserve, they would destroy the significant natural features that preserves were meant to protect.

Why Do We Need Nature Preserves?

We need these unique areas as (1) classrooms for field study in the natural sciences, (2) reservoirs of natural materials which may have future value, (3) habitat for rare and endangered species, and (4) an opportunity to commune with the natural world.

What Can I Do At A Nature Preserve?

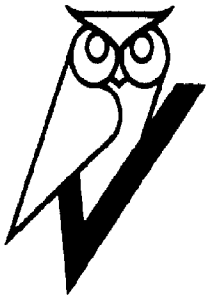
Visitors can enjoy many outdoor pleasures including hiking, nature study, photography, and birdwatching.

What Can't I Do At A Nature Preserve?

Visitors are prohibited from doing things that harm the natural features of the preserve such as collecting plants or animals, camping, or using motorized vehicles in the preserve.

What Can I Do To Help?

You can help by giving to the Nongame Wildlife, Endangered Species, Natural Areas Preservation Fund directly or on the Delaware state income tax form. These tax-deductible contributions are the only funding source for natural areas preservation in Delaware.



How Can I Get More Information About Delaware's Natural Areas Preservation System?

By contacting the administering agency:

Delaware Department of Natural Resources and
Environmental Control
Division of Parks and Recreation
Office of Nature Preserves
P.O. Box 1401, 89 Kings Highway
Dover, DE 19903
(302) 736 - 5285

Doc. No. 40-06/85/02/02

NOMINATION-REGISTRATION OF NATURAL AREAS

RETURN TO:
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF PARKS & RECREATION
TECHNICAL SERVICES SECTION
OFFICE OF HERITAGE, PLANNING & RESEARCH
EDWARD TATNALL BUILDING, P.O. BOX 1401
DOVER, DELAWARE 19901

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DNREC FORM # _____

FOR DNREC USE ONLY
Date Received 6-15-81
Date Evaluated 7-23-81
Date Entered 8-12-81

Type or clearly print all entries - Complete all applicable sections

1. IDENTITY

NAME OF SITE

Murderkill River & Browns Branch

FOR DNREC USE ONLY
Nomination # N-723
Registration # R-723

2. LOCATION

STREET & NUMBER

CITY, TOWN
Frederica

HUNDRED
South Murderkill

STATE
Delaware

COUNTY
Kent

USGS GRID
Lat. 38° 59' 20" N, Long. 75° 28' 35" W

STATE MODIFIED GRID
126-118-178
~~126-124-178~~
126-122-174
130-128-176
~~130-124-172~~

Harrington, Milford, and Frederica quads.

__Property map enclosed (optional) __Aerial photo enclosed (optional)

3. GENERAL INFORMATION

A. Theme (s)
X upland area
X wetland area
__unique habitat
__geological area
__marine & subaqueous area
X archaeological area

B. Acreage
approx. 1,000

C. Title Rights
__Fee Simple (without easements or restrictions)
__Restricted or Eased

D. Ownership
__public
X private
__both

E. Occupancy
__occupied
X unoccupied

F. Public Accessibility
__unrestricted
__restricted
X none

4. OWNER OF PROPERTY

NAME Attachment 1

STREET & NUMBER

CITY,TOWN STATE

PHONE NUMBER

5. BOUNDARIES

A. Legal Description:

B. Documentation: at least one of the following must be enclosed:
__property survey (preferred)
x drawn on USGS topographic map (7½ x 15 series); where boundaries do not conform to existing property lines, please use natural boundaries such as streams, topographic contours, etc.

---

6. LAND USE: describe as completely as possible

A. Master Plan description (if any)
The Murderkill State Park master plan states that portion of the natural area along the Murderkill Branch west of Browns Branch confluence is designated as most suitable for preservation and protection.

B. Comprehensive Plan Allocation Parks & permanent open space

C. Zoning farmland, forest, farm residences
widely scattered non-farm residences

1. State ordinances - e.g. Wetlands or Coastal Zones
Wetlands Act

2. Local ordinances - e.g. Zoning class by ordinance
Agricultural-conservation

D. Deed Restrictions, existing Rights-of-Way, etc.; please attach a copy of the Certificate of Title.

E. Current human activities:

1. Interior: What human practices are occurring within the site?
Seasonal recreational activities, e.g., summer boat traffic, hunting, fishing; timbering

2. Exterior: What practices are occurring in the site's immediate environment or the ecosystem of which it is a part?
Recreation on Coursey's Pond and McCauley's Pond; small summer cottage development, hunting, fishing, boating, dumping ~~near roadways, agricultural area primarily~~

7. SITE CHARACTERISTICS

A. Themes

Check		Circle as Appropriate
x	Upland Areas:	hardwood forests, steep slopes, mixed hardwood or pine forests
x	Aquatic and Wetland Areas:	flood zones, freshwater marshes and bogs, tidal marshes
__	Unique Habitats:	rare, threatened or endangered plant and animal species; unusual species associations; representations of vegetative succession
__	Geological Areas:	fossil deposits and representations of geophysical processes
__	Marine and Subaqueous	spawning grounds; habitats of rare, unique or endangered marine species; scientific baseline and demonstration areas; migratory routes of important marine species
x	Archeological Areas:	remnants of earlier cultural patterns and products

B. Describe present physical appearance and character such as: landscape, soils, slopes, water quality and flow, air quality and noise, vegetative cover, wildlife habitats and other important characteristics. Be specific about the taxonomy of biotic, geophysical and/or cultural materials found within the site. (If additional space is required, please make attachments to this page.)

Attachments 2, 3, 4

C. Photographic requirement.
__Enclose at least four color 35mm slides of the most significant features described above.

---

8. SIGNIFICANCE (if additional space is required, please make attachments to this page)

A. What makes this area unique or representative of natural/cultural diversity?

Pleasant waterways with attractive wooded fringe, undeveloped & unspoiled remains of a large river system

B. Detail sufficiently to allow for understanding of its importance. Focus upon individual features and/or associations which are the most outstanding characteristics.

1. spawning grounds for fish; 2. productive feeding area for long-legged wading birds; 3. major archaeological sites; 4. breeding ground for a variety of song birds

C. Describe the recreational, educational and scientific values of the site.

Murderkill River and Browns Branch offer not only opportunities for boating and hunting, but also excellent educational examples of archaeological sites spanning some 2,600 years from approx. 1000 B.C. to contact time

---

9. THREATS

A. How do existing or potential activities impact the feasibility of preservation or restoration?

Timbering Water quality in this natural site is moderately reduced by run-off from agri. areas, roadways, & developed areas in the vicinit Noise levels are modestly elevated by seasonal rec. activities. There is some evidence of dumping near roadways & in the waterwa

B. What can be mediated? What cannot be mediated?

Future development of homesites, littering, and agri. run-off can be mediated through educational programs, it is hoped.

---

10. SPECIAL CONDITIONS

A. Public Sensitivity: Will the site be seriously threatened by publicity or notoriety?

No, as long as it doesn't encourage trespassing on priv. prop.

B. Owner Involvement: To what degree has the owner been involved in this nomination?

Prior discussion with landowners

11. BIBLIOGRAPHIES & DOCUMENTATIONS

LIST AND MAKE APPROPRIATE ATTACHMENTS

Attachment 5

12. ENCLOSURES (check and describe as appropriate)

A. x Maps Attachments 6, 7

B. x Photos

C. __ Deeds & Land Records

D. __ 4 or more 35mm slides

E. __ Qualifications of experts

F. x Other pertinent documents

13. NOMINATION BY

NAME/TITLE

7/28/80

ORGANIZATION — DATE

Delaware Nature Education Society (302) 239-2334

STREET & NUMBER — TELEPHONE

P. O. Box 700

CITY OR TOWN — STATE

Hockessin Delaware 19707

14. LANDOWNER CONCURRENCE

X Mary Derrickson McCurdy — 3/10/81

OWNER — WITNESS — DATE

Harold E. McCurdy

(FOR DNREC USE ONLY)

15. RECOMMENDATION

X Registration

__ Reevaluation

__ Rejection

RATIONALE:

16. STAFF OFFICE OF NATURE PRESERVES

J. Patrick Sullivan — Nelle E. Lane — 7/28/81

Signature — Witness — Date

17. NATURAL AREAS ADVISORY COUNCIL

[signature] — Nelle E. Lane — 7/31/81

Chairperson — Witness — Date

18. DEPARTMENTAL APPROVAL

Hon. Secretary

[signature] — 8/11/81

Name — Witness — Date

BS.S.
MPMcC
HGMc

D E E D

THIS DEED, made this 23rd day of ~~December~~ January A.D. ~~1984~~, 1985.

BETWEEN

MARY DERRICKSON McCURDY and HAROLD G. McCURDY, her husband, of 6 Gooseneck Road, Chapel Hill, North Carolina, Parties of the First Part,

AND

THE STATE OF DELAWARE for the use of the Department of Natural Resources and Environmental Control, Party of the Second Part.

WITNESSETH: That the Parties of the First Part, for and in consideration of the sum of One Dollar ($1.00), current lawful money of the United States of America, and other valuable and lawful considerations, the receipt whereof is hereby acknowledged, hereby grants and conveys by donation unto the Party of the Second Part:

All that certain tract, piece, or parcel of land situate in South Murderkill Hundred, Kent County, and State of Delaware, and being part of the lands of Mary B. D. McCurdy lying on the southerly side of State Route 12 and County Road No. 35 and being bounded on the North by other lands of Mary B. D. McCurdy, and lands of William R. Erb; on the East and South by the Murderkill River, Ash Branch, and lands of Charlotte H. Cooper; and on the West by lands of Louis R. Wooten, as shown on a survey prepared

Plot reference concerning this deed is Plot Book 18, Page 36 1

by Harry P. Carroll, R.L.S., and dated December 17, 1984, attached hereto as Exhibit 'A', and being more particularly bounded and described as follows to wit:

Beginning at a point on the division line between lands of Mary B. D. McCurdy and lands of William R. Erb, said point being located the following four courses and distances from a point in the centerline of State Route 12 where it is intersected by the westerly line of lands of the State Board of Education of the State of Delaware;

1) thence along line of lands of the State Board of Education of the State of Delaware, S 13° 30' 08" W, 1364 feet to a point in line of lands of William R. Erb; thence thereby

2) S 79° 33' 41" W, 453.35 feet to a point in line of lands of Erb; thence thereby,

3) S 17° 14' 30" W, 1012.11 feet to a point in line of lands of Erb; thence thereby

4) S 42° 34' 20" E, 1235.28 feet to the point of beginning, thence from said point of beginning, and along line of lands of Erb, S 42° 34' 20" E, 2360 feet, more or less, to a point on the westerly edge of the Murderkill River; thence along the westerly and northerly edge of the Murderkill River in a southerly and westerly direction, with the various meanderings thereof, a distance of 3000 feet more or less to a point in Ash Branch; thence thereby in a northwesterly direction, with the various meanderings thereof 3680 feet more or less to a point in line of lands of Louis R. Wooten, thence thereby, N 8° 29' 06" E, 120 feet more or less to a point in line of lands of Mary B. D. McCurdy; thence thereby the following twenty courses and distances:

1) S 44° 09' 08" E, 179.85 feet to a point;
2) S 27° 02' 10" E, 215.42 feet to a point;
3) S 61° 26' E, 167.74 feet to a point;
4) S 53° 13' 30" E, 84.57 feet to a point;
5) S 35° 30' 20" E, 110.21 feet to a point;
6) S 40° 49' 13" E, 94.78 feet to a point;
7) S 61° 33' 59" E, 117.40 feet to a point;
8) S 44° 17' 27" E, 203.38 feet to a point;
9) S 18° 47' 02" E, 339.04 feet to a point;
10) S 56° 22' 10" E, 157.90 feet to a point;
11) S 40° 30' 59" E, 140.03 feet to a point;
12) S 8° 35' 51" E, 149.98 feet to a point;
13) S 36° 10' 33" E, 67.53 feet to a point;
14) S 56° 49' 48" E, 274.45 feet to a point;
15) N 64° 09' 52" E, 99.41 feet to a point;
16) N 89° 13' 57" E, 51.51 feet to a point;
17) S 41° 44' 59" E, 89.79 feet to a point;
18) N 66° 14' 17" E, 202.64 feet to a point;
19) S 82° 25' 38" E, 90.15 feet to a point;
20) N 63° 33' 10" E, 111.03 feet to the point and place of beginning.

Containing 72 acres of land more or less.

TOGETHER with an easement across other lands of McCurdy between County Road No. 35 or State Route 12 and the property described above. Said easement shall be for vehicular ingress and egress to the above described property and shall be on the existing roadway or hereafter created roadways.

BEING a part of the lands heretofore willed unto Mary Derrickson McCurdy by Mary Lewis Burton Derrickson, her mother, in and by Will dated December 11, 1950, which is of record in the Office of the Register of Wills in and for Kent County at Dover, Delaware, in Will Book G-3, Page 349.

The above described property, consisting of woods and wooded swamp is on the Delaware Registry of Natural Areas and is hereby conveyed to the State of Delaware for the express purpose of establishing thereon a Nature Preserve in accordance with 7 Del. Code, Chapter 73. The property will be known as the Burton-Derrickson Tract of the Murderkill River Nature Preserve and will be maintained by the Department of Natural Resources and Environmental Control in accordance with the Management Plan attached hereto as Exhibit 'B'.

The State of Delaware, by John E. Wilson, III, Secretary of the Department of Natural Resources and Environmental Control, joins in the execution of this deed for the purpose of accepting the aforementioned property subject to the restrictions contained therein.

IN WITNESS WHEREOF, the Parties of the First Part have hereunto set their hand and seal the day and year aforesaid.

Witness:

Mary Derrickson McCurdy (SEAL)
Mary Derrickson McCurdy

Witness:

Harold G. McCurdy (SEAL)
Harold G. McCurdy

IN WITNESS WHEREOF, The State of Delaware, under the hand and seal of John E. Wilson, III, Secretary of the Department of Natural Resources and Environmental Control, has executed and accepted delivery of this deed.

Witness:

THE STATE OF DELAWARE

(SEAL)
John E. Wilson, III
Secretary
Department of Natural
Resources and
Environmental Control

STATE OF NORTH CAROLINA)
) SS
COUNTY OF ORANGE)

1985 -

BE IT REMEMBERED, that on this 23rd day of ~~December~~ January, A.D. ~~1984~~ 1985, personally appeared before me, the Subscriber, a Notary Public for the State and County aforesaid, MARY DERRICKSON McCURDY AND HAROLD G. McCURDY, parties to this Indenture, known to me personally to be such, and acknowledged said Indenture to be their act and deed.

GIVEN under my hand and seal of office the day and year aforesaid.

Brenda L. Hooker
Notary Public

NOTARY PUBLIC ORANGE COUNTY, N.C.

STATE OF DELAWARE)
) SS
COUNTY OF KENT)

BE IT REMEMBERED, that on this 19th day of December, 1984, personally came before me, the Subscriber, a Notary Public for the State and County aforesaid, John E. Wilson, III, Secretary of the Department of Natural Resources and Environmental Control, known to me personally to be such, and acknowledged this Indenture to be the act and deed of the State of Delaware.

Nell Kelly
Notary Public

NOTARY PUBLIC STATE OF DELAWARE

MURDERKILL RIVER NATURE PRESERVE

BURTON-DERRICKSON TRACT

MANAGEMENT PLAN

The function of a nature preserve is to protect important features of the natural heritage of the State of Delaware and guarantee their existence for future generations. The State of Delaware through the Department of Natural Resources and Environmental Control and specifically the Office of Nature Preserves agrees to administer the following management plan to protect and maintain the nature preserve in its natural ecological condition as specified below.

The construction or placing of buildings or other permanent structures on, above or under the ground is prohibited except for observation blinds,nesting structures, etc., which are associated with approved educational and scientific uses of the tract. There shall be no signs, billboards or advertising except those necessary for resource protection, safety, boundary identification or interpretation. The construction of utilities, roads or other public works structures is prohibited except for existing utility rights-of-way.

The dumping or placing of soil, material as landfill, trash, waste or other unsightly or offensive materials is prohibited. The dredging, excavation or removal of loam, peat, gravel, soil, rock or other material is prohibited. Exceptions are for archaeological investigations authorized by the State Division of Historical and Cultural Affairs and legitimate mosquito control activities authorized by 16 Delaware Code, Chapter 19. Said mosquito control activities shall be limited to those requiring no physical alterations - no ditching or alteration of existing drainageways.

There shall be no surface use except for compatible outdoor education and scientific activities which must allow the tract to remain in its natural condition. There shall be no activities adversely effecting drainage, flood control, water conservation, erosion control and soil conservation. Activities adversely affecting aquatic and terrestrial organisms and their habitats including hunting, shoreline fishing and trapping are prohibited except for public health and safety purposes.

There shall be no removal or destruction of trees, shrubs or other vegetation except as may be necessary for control of disease, pests, undesirable species and for safety purposes or for creation and maintenance of trails.

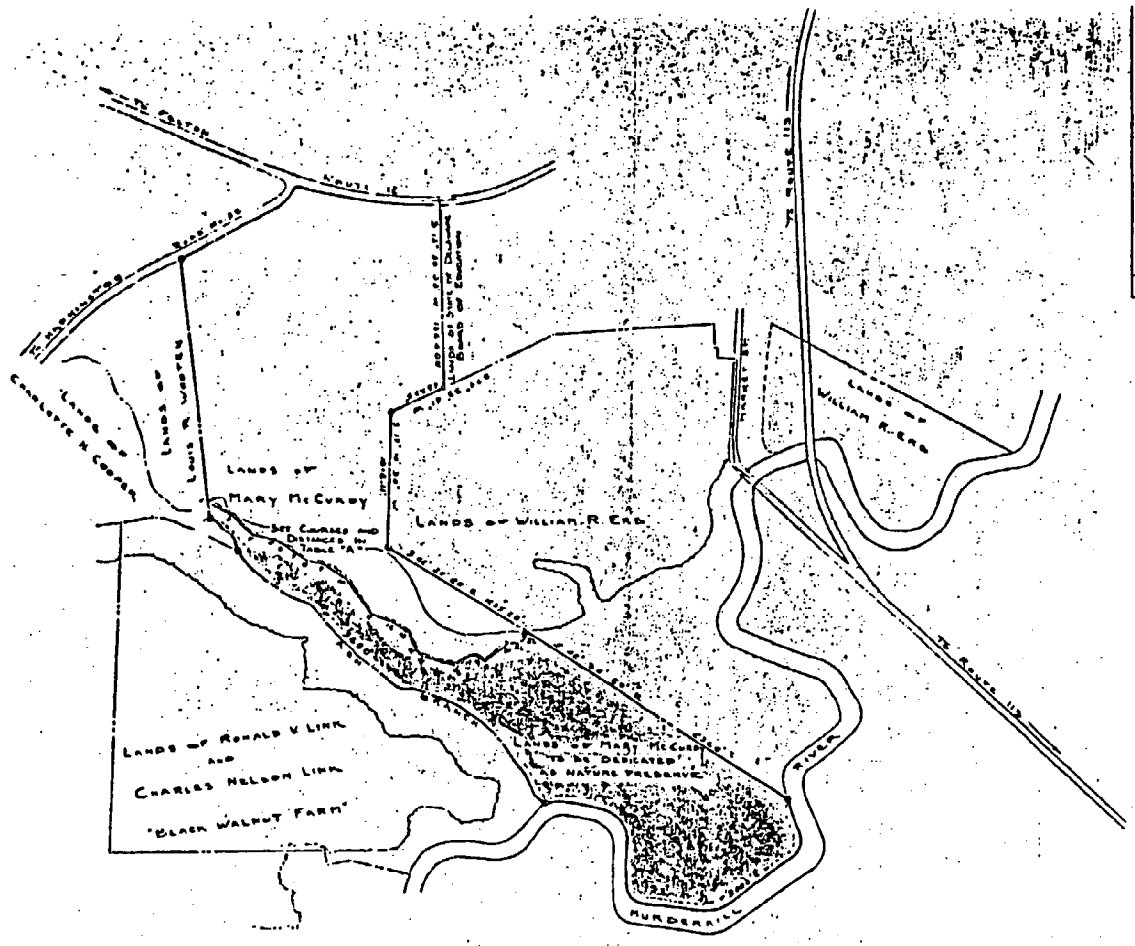
Intentional introduction of exotic plant and animal species will not be permitted. In the rare instance where the natural balance of a biological area is seriously upset, control measures may be employed compatible with maintenance of other natural

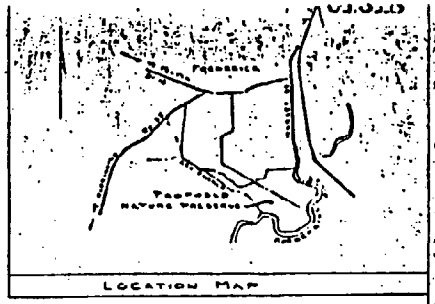
features. The reintroduction of extirpated species shall be undertaken only after careful consideration and evaluation of environmental and socio-economic effects by qualified ecologists and resource managers.

There shall be no collecting of plants and animals where such collecting threatens indigenous species on the tract. Collecting of plants, animals, fossils, minerals or artifacts shall be for scientific and nature study only and shall be subject to State regulations and permits.

Non-destructive research, educational and scientific activities shall be permitted and shall be compatible with the function and resources of the tract. Such uses shall be considered case-by-case by the Office of Nature Preserves.

Recreation and other uses of the tract are strictly limited to those authorized by the State but may include non-motorized boating, photography, nature study, etc., and then only on existing trails and waterways.





RECEIVED FOR RECORD
Jan 25 A.D. 1985
Robert J. Sweeney
RECORDER

Area of Proposed Nature Preserve: 78 Acres

Plan of Property of
Mary Burton Derrickson McCurdy
showing
Property To Be Dedicated As
Burton - Derrickson Tract
of Murderkill River Nature Preserve
South Murderkill Hundred
Kent County Delaware

Table A

d reference concerning this Plot is
d Book G, Vol. 40, Page 76.

Plat Book 18 Page 36

United States Department of Agriculture
Soil Conservation Service
3500 S. duPont Highway
Dover, Delaware 19901

Contact: Frederick T. Mott
(302) 697-9549

December 12, 1986

FOR IMMEDIATE RELEASE

FARM BILL SLIDE SHOW AVAILABLE

Want to learn if the conservation provisions of The Food Security Act of 1985, better known as the Farm Bill, will affect your farm operation? A slide show, now available from the U.S. Soil Conservation Service details this significant legislation and its impact on farmers says Fred T. Mott, SCS, District Conservationist.

The show, entitled CONSERVATION PROVISIONS OF THE FOOD SECURITY ACT OF 1985, explains how farmers who grow crops on highly erodible land or who clear wetlands for farming could lose eligibility for some USDA benefits.

The program details the four parts of the Farm Bill - sodbuster, swampbuster, conservation compliance, and conservation reserve. Furthermore, it tells which USDA benefits are denied if conservation provisions are not met.

The slide show operates on a carousel projector and has a narrated tape. It is approximately 11 minutes long.

Organizations interested in loaning the program should contact the Soil Conservation Service at 3500 S. duPont Highway, Dover, Delaware or call 697-9549.

KENT COUNTY ASCS NEWS

FILE

January 21, 1987 Vol. 27 No. 1

THE RESULTS ARE IN...

Maurice Blessing was elected chairman of the county ASC committee at the county ASCS convention, held December 9.

Jacob Bishop was elected vice-chairman and Dale Scuse as a regular member.

Many thanks to George Wilson for his dedicated service to Kent County farmers during the past 9 years.

The CCC interest rate for commodity loans disbursed in January is ... 5 7/8%

FOREIGN-OWNED AGRICULTURAL LAND

Foreign investors who have bought or sold agricultural land in Kent County are reminded to report the transaction to this office within 90 days.

The report is required by law and persons who fail to report, or who are late in reporting, face possible fines.

As of December 31, 1986, foreign investors had reported owning about 12.1 million acres of agricultural land in the U.S.

DID YOU KNOW?

Kent County farmers can now sign up for the 1987 Feed Grain and Wheat Acreage Reduction Programs.

The programs offer price support loans and deficiency payments with a portion of the payments available in advance. Feed Grain program participants are also eligible for land diversion payments.

Acreage reduction requirements are: 27.5% for wheat and 20% with an optional 15% paid land diversion for feed grains.

Target prices are: $3.03 for corn, $2.88 for sorghum, $2.60 for barley, $1.60 for oats, and $4.38 for wheat.

Signup ends March 30, 1987.

H-2

SODBUSTER/SWAMPBUSTER REMINDER

Farmers who plant agricultural commodities on highly erodible land or converted wetlands after December 23, 1985, will not be eligible for certain USDA programs.

Contact the Soil Conservation Service or this office if you plan to do any clearing or will be planting a field that was not tilled in 1981-1985 crop years.

THE CHAIRMAN'S CORNER
By Bob Winkler

The loss of crops from excessive water has taught all of us farmers, to develop and maintain good drainage systems on our farms.

The droughts of recent years, and those of the past, have also left their damage and caused us to wonder "can we have good drainage and still conserve the water in our ditches when we need this precious resource.

All of the supervisors of the Kent Conservation District join me in saying "yes" to this question. It's almost like having your cake and eating it too. Several years of research and studies at North Carolina State University (NCSU) and the practical experience of farmers in eastern North Carolina agree that this can be done.

With proper planning, which can be provided through our District, a simple metal structure with removable boards can be placed in many of our drainage ditches. The boards will hold the water when we need it. The boards can be removed when we want to have the desired drainage. Not all drainage systems and sites will lend themselves to this type of water control structure, but I know we have a great potential for controlled drainage and total water management in Kent County.

Now that the technique has been developed we expect this practice to be a very popular one. Two systems have already been established in Kent County. Our District has received requests for five more at this time.

Our District has invited all resource agencies to join with us to help our cooperating landowners receive the best controlled drainage assistance possible. We are doing this because there are other advantages besides water conservation and improved water tables. Controlled drainage results in better ditch maintenance and better wildlife habitat. Water running through water control structures has improved water quality. NCSU studies have shown there is a significant reduction in nitrogen through denitrification while water is held in ditches.

The ASCS County Committee as well as our District have arranged for 75% cost sharing funds to help initiate this concept of total water management in old drainage systems as well as new ones.

If you are interested, please call our District office for more information and assistance.

DON'T LOSE YOUR ELIGIBILITY

If you are a farmer and clearing up new land or planning to clear new land you could lose your eligibility to partake in certain U.S. Department of Agriculture programs such as price and income supports, disaster payments, crop insurance, FmHa loans, C.C.C. storage payments, farm storage facility loans and other farm commodity programs.

At this time it is not well known that this provision is included in The Food & Security Act of 1985 called the "Farm Bill". This provision of the "Farm Bill" is found under the names of "Sodbuster", "Swampbuster" and "Conservation Compliance". The intention is to discourage converting highly erodible land to cropland "sodbuster"; converting wetlands, including much of our poorly drained woodlands in Kent County, to cropland "swampbuster"; and continuing to farm any highly erodible lands in annual crops "Conservation Compliance".

Space does not allow for me to explain the details of these provisions. Farmers are advised to become well informed of these provisions as more information becomes available. I strongly urge anyone converting or planning to convert any land to cropland to contact our office at 697-9549 for a determination if you will be affected by these provisions and learn what to do if you are.

F. T. Mott

*****IMPORTANT NOTICE*****

There will be an Upper Chester River Watershed Public Information meeting on December 2, 1986 at 7:30 p.m. at the fire hall in Sudlersville, MD.

All affected landowners should plan to attend.

ITEM I-1

1986 Annual Report

College of Agricultural Sciences, Agricultural Experiment Station, and Cooperative Extension System at the University of Delaware

Contents

1986 Annual Report

College of Agricultural Sciences, Agricultural Experiment Station, and Cooperative Extension System at the University of Delaware

DESIGNER: Susan Paul
EDITOR: Claire McCabe
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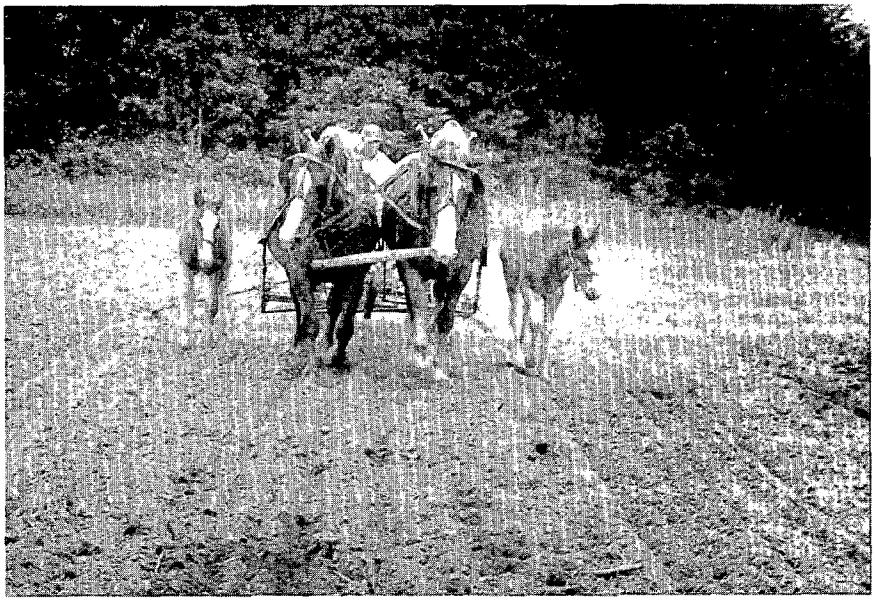
Michael Roberts

100 years of agricultural research - a look back - a look ahead



This annual report of the College of Agricultural Sciences at the University of Delaware is dedicated to the 100th year celebration of the establishment of Agricultural Experiment Stations at the nation's land-grant colleges. On March 2, 1887, Congress passed an act, subsequently known as the Hatch Act, that established Experiment Stations "to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severely subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; ....etc....; and such other researches or experiments bearing directly on the agricultural industry of the United States...." The Hatch Act further provided for grants of money to states to be used by Experiment Stations at various land-grant colleges of agriculture and, in addition, sought state legislative consent to the provisos of the act. The Trustees of Delaware College, located in Newark, Delaware, agreed to the establishment of the Experiment Station and sought and obtained the consent of the state legislature and governor. By June 30, 1888, the Delaware Agricultural Experiment Station had published its first annual report.

Research activities carried out in Delaware since 1887 can be divided into a series of efforts. Initially several professors began to identify areas of concern by working closely with individual farmers and by conducting research at farm locations. Cattle and plant disease problems were diagnosed, and remedies sought. The growing awareness of the usefulness of inorganic fertilizers resulted in considerable analysis and evaluation of available materials. New varieties of plants and new breeds of poultry and livestock were compared. These kinds of essentially empirical investigations resulted in major improvements in animal and plant productivity, and in fact continue today.

During this early formative period, steady advances in biology, chemistry, engineering and economics occurred; and by the 1940s, the laboratory became a much more important part of agricultural research. Basic studies were coupled with field studies resulting in a greater depth of understanding of how to improve crop yields and animal productivity. The organic pesticides, better vaccines, and machinery were developed; and marketing strategies were explored.

The knowledge base became extensive, but by the 1970s it was evident that improvement in many crops would come at longer intervals and in smaller increments. Within the last decade, however, fundamental studies at the cellular level have opened up the potential for a whole new era of improved plants and animals. Looking ahead, the ability to identify a specifically useful area of a chromosome in a cell presents major opportunities to improve the quality of plants and animals and economically produce useful chemicals that until now have been prohibitively expensive.

Research at the Delaware Agricultural Experiment Station now involves this latest technology in basic studies of the genetic makeup of important poultry viruses. The goal is to use genetically manipulated viruses to produce more efficient vaccines to control diseases. These and similar efforts at the Delaware Station are very much in tune with the original intent of the Hatch Act "to conduct original researches.... bearing directly on the agricultural industry of the United States."

Donald F. Crossan
Dean of the College and Director, Delaware Agricultural Experiment Station

Teaching and research - a dynamic interdependence

Doris H. Crowley

Both research and teaching have benefited from Congress' 1887 decision to locate state agricultural experiment stations at state land-grant universities. The current soils curriculum in the department of plant science illustrates the dynamic interaction which exists between research and teaching in the College of Agricultural Sciences at Delaware's own 1862 land-grant university.

Experiment station researchers have been studying problems associated with the fertility of Delaware soils since 1888. And soil science has long been an integral part of the college curriculum. But during the last seven years both efforts have intensified greatly, thanks in part to a department decision to increase the number of soil scientists on its staff (from two to four) and to add more soils courses (particularly upper level ones) to the department roster, along with special laboratories and seminars. These changes have allowed for Ph.D. level research in soil science.

"Research and teaching go hand in hand," says soil chemist Dr. Donald L. Sparks, who has been conducting basic research on the availability of potassium in Delaware soils since he joined the faculty in 1979. "If you do research that's very current, that makes the courses you teach more current."

Soil scientist Dr. J. Thomas Sims, who arrived two years later, agrees. "The longer you're involved in your research area, the better you can become at teaching, because you can bring more things into it from outside the textbooks. To me, it's the difference between just making a list and being able to explain why something is important. Lists are fine, but reality sometimes contradicts lists." His own research centers primarily around the relationships between agricultural practices and environmental quality and includes studies of organic waste management, efficient fertilization practices and the movement of agricultural chemicals into groundwater.

As teachers, both scientists have developed new courses, upgraded old ones and done much to awaken student enthusiasm for the challenges of soils-related research. Last year soil mineralogist Dr. Russell A. Rebertus and soil microbiologist Dr. Jeffry J. Fuhrmann were appointed to further strengthen the department's teaching and research programs in this important subject area.

The College of Agricultural Science's first Ph.D. student in soils was accepted in 1982. He received his degree three years later and is now

doing post-doctoral research at the University of Florida. Seven other students are conducting doctoral level research in soil science, four are working towards master's degrees in the field, and one is completing work towards an undergraduate degree with distinction. The degree with distinction program gives outstanding undergraduates an opportunity to do basic research, and sometimes even publish papers, before they enter graduate school.

"We have as many doctoral students now as some very large soils programs at other institutions," says Sparks. "Many of our graduate students in soils come from major institutions in other parts of the country. All of them are on assistantships. Since 1982 two Delaware students have received National Potash Institute fellowships. These are competitive grants open to outstanding graduate students in soils in the United States and Canada. Only six are offered each year."

As part of their training, graduate students in the college's soils program are expected to work part-time for their advisors in order to obtain practical experience beyond their own research involvements. Sims explains, "We try to afford students opportunities outside of class to become educated in other areas—how to use the computer, how to use analytical equipment, how to do field work. People who do that have a real advantage when it comes time to look for a job."

Both undergraduate and graduate students are also encouraged to attend and participate in professional meetings. Last winter, for example, 16 members of the department—including eight students and four faculty—attended the national meeting of the American Society of Agronomy and Soil Science Society of America in New Orleans. Students gave nine of the 12 University of Delaware research papers presented at the meeting.

Master's candidate Maria Sadusky was among those reporting. She began studying the dynamics of mineral potassium release from coastal plain soils as a junior and wrote a thesis on the subject for a degree with distinction, which she received in June 1985. For her master's, under Sparks' guidance she has been investigating the rate of potassium release from feldspars in the sand fractions of coastal soils. Many of these soils contain 80 percent or more sand.

Dr. Donald L. Sparks works closely with graduate research fellow Christian Schulthess as they conduct soil chemistry analyses.

Sadusky has found that these sands release considerable potassium, which she and Sparks believe is coming from the feldspars in them. Their findings on the availability of mineral potassium for plant uptake in sandy coastal plain soils have potential application for crop production all along the East Coast. Farmers from Florida to New Jersey often have noted a lack of crop response to applied potassium on Atlantic coastal plain soils. The reason for this behavior has not been fully explained. The release of potassium from feldspars in the sand fractions of such soils could be the answer.

Two of Sims' students—degree with distinction candidate Karen Schilke and doctoral candidate Scott Kline—have been conducting research on the movement of sulfates through the soil. Both presented papers at the same meeting.

Recent graduates of Delaware's soil science program have done very well academically and professionally. A number who began as candidates for undergraduate degrees with distinction and went on to earn their master's degrees in the department have since entered doctoral programs at other universities. (It is against department policy for students to earn all three of their degrees here.)

One Delaware soils graduate is an

environmental chemist at the Philadelphia Academy of Science; another recently joined the DuPont company as a research chemist. One of Sparks' first undergraduate advisees now has a Ph.D. and works in Tennessee for the Oakridge National Laboratory, which specializes in environmental research.

"I'm very excited about our teaching program," Sparks says, looking back at its achievements over the past seven years. "I think we have unlimited potential to excell."

As for the research side of the department's soil program, the soil chemist describes that as "very basic but applicable. We're trying to answer questions of vital concern to us all." Sims, for example, is currently studying pesticide movement through soils.

"Much of what we're doing will help us manage the environment better," Sparks says, "and also manage our fertilizer inputs very economically. So we're doing a lot of nutrient management research that will help farmers. That's why we started all our potassium work —to find out how to reduce leaching of fertilizer."

Research results are interpreted and passed on to Delaware farmers by extension specialists such as agronomist Dr. Richard W. Taylor and county extension agents. The results are also used by the university's soil test laboratory to upgrade fertilizer recommendations for Delaware crops. Studies of nitrogen fixation and nitrogen management now being conducted by Fuhrmann should help refine those recommendations further. Sims' research on poultry manure has already shown farmers how to make better use of this resource, while Sparks' own work on potassium availability in coastal plain soils is providing valuable practical information on this nutrient.

The soil chemist's long-term studies of banded potassium and residual potassium are helping explain why corn plants show no yield decline on these sandy soils despite declining potassium levels.

Sparks says, "Our research is very original. We've pretty much pioneered kinetics work with soils here. Kinetics concern the rate of reaction between plant nutrients and chemicals in the soil. We've been able to relate the kinetics of potassium, boron, sulfur and nitrogen to rates of movement through the soil. This work has tremendous practical implications in the area of groundwater quality and pollution. To understand what is happening to sulfate, nitrate, borate and other leachates, we must have kinetic information."

One of Sparks' doctoral students, Charles Toner, has a grant from the U. S. Geological Survey to study the rate at which nitrates move through different soils. Sims' advisees Karen Schilke and Scott Kline are doing similar research on the movement of sulfate through the soil.

Thus research and teaching go hand in hand, both benefiting from the land-grant/experiment station juxtaposition. "I rely tremendously on students—undergraduate and graduate—in my research program," says Sims. "They assist in all aspects of research, including field studies, laboratory analyses and statistical analysis of the data, using the university's computer facilities.

"It's a cooperative effort, where you sit down and talk about what students think they should do next," he continues. "You aren't really telling them what to do, you're discussing their ideas with them and giving them some feedback, giving them suggestions, editing, and trying to give them financial support through university and outside grants. You're also getting feedback, which is very productive. I've talked with people at other research institutions who say they prefer working with technicians. That may be more efficient, but personally, I prefer the interaction with the students."

Extension - the vital link

Delaware extension is helping farmers and their families adjust to the demands of a more competitive agriculture.

Integrating knowledge and new technology into educational programs which have immediate, practical application is a major function of the Cooperative Extension System. For this reason, Extension has a special relationship with research at the University of Delaware and other land-grant colleges across the U.S.

For more than 70 years federal, state and local governments have worked together in Delaware and other states in a vital and productive partnership—the Cooperative Extension System. Extension's purpose is to "help people put knowledge to work," bringing research-based information from the nation's storehouses of science and technology to Americans where they live and work.

The federal investment in this partnership, through the U.S. Department of Agriculture, assures that extension educators are able to respond to critical national issues affecting agriculture, the food system and rural communities. The state and university investment assure that this response is relevant to local needs and has the research base to back it up.

Surveys indicate that in Delaware, Extension links one in four families with the University of Delaware. The programs our specialists and agents deliver to farmers, consumers and other users are built on research. Extension specialists work out of the university; extension agents, from offices in each county. This arrangement makes it possible to respond quickly to local needs and to tailor programs to meet them.

Like shoppers in a supermarket of ideas, extension educators are always looking for vital, relevant, up-to-date information from a variety of research sources. Extension programs presently emphasize five priority areas:

- Improving the profitability of agriculture,
- Maintaining and improving water quality,
- Providing food, nutrition and health education,
- Developing youth and adult leadership skills,
- Revitalizing rural Delaware.

These programs address current needs. At the same time, the Cooperative Extension System must be relevant to the needs of tomorrow. Besides the traditional support it receives from federal, state and local governments, Extension is calling increasingly on the private sector, including local industry and commodity groups, as active partners. Volunteer participation is also on the rise. Volunteers in Delaware contribute thousands of hours each year to the Cooperative Extension System.

The following examples show how Extension is helping the people of Delaware better their lives in just one program area—farm profitability—through application of the results of research.

Richard E. Fowler

Dr. Richard E. Fowler, Director
Delaware Cooperative Extension System

Increasing farm profitability

American agriculture is in the midst of a major economic crisis. Unprecedented high interest rates, overproduction and slackening demand for farm commodities both at home and abroad have forced many farmers to go out of business because of unserviceable debts, poor income prospects and the declining value of their land and other assets.

The number of farmers likely to be forced out for these reasons is very high. For those who leave, the adjustment is often difficult and painful. Many farm families are losing everything they've worked for over a lifetime. Because young farmers are more likely to have heavier debt loads, they are more vulnerable than older, more established farmers.

Concerned over the severity of the farm crisis and its disastrous effects—economic and emotional—on farm families and rural communities, Delaware extension professionals and experiment station scientists are working to help local farmers and their families weather this crisis, whether they remain in farming or seek other ways to earn a living.

Much of the information farmers need to become more efficient and to raise their net incomes already exists, generated by years of on-going experiment station research—particularly in the areas of crop nutrition and pest management, and poultry management and disease control. Much of this research effort is directed toward improving resource management in ways which will increase agricultural profitability while protecting the environment—especially groundwater.

However, even relatively efficient producers are discovering that they lack information and skills in the area of farm financial management—the most critical requirement for survival.

Better farm business management decisions begin with better financial record keeping and analysis.

Checking the farm financial pulse

In April 1986, Cooperative Extension published a bulletin, "Delaware Farm Financial Conditions and Public Policy Implications for State Government." The 21-page bulletin was written by extension economist Gerald F. Vaughn and analyzes local farm financial conditions and their implications in terms of farm family stress and impact on the agricultural industry and other sectors of the Delaware economy. The report also discusses some state government policy alternatives that might be considered to assist farmers and/or ease the transition of distressed farm families out of agriculture.

Vaughn based his analysis on the results of two surveys of Delaware farm lenders and farm operators funded by the Delaware Department of Agriculture and conducted in January 1986 by the Delaware Agricultural Statistics Service. Although the state's farm economy is healthier on the whole than agriculture in many other parts of the United States, the surveys showed that as many as one in five Delaware farmers with debt could be in financial trouble, while one in 10 expected to leave farming in 1986 if current trends in income and expenses persist. The 1986 drought has not improved the picture.

The bulletin discusses the implications of these findings in terms of farm family stress and the impact such farm losses could have on Delaware's agricultural industry and other sectors of the local economy. It then explores state government policy alternatives which might be considered to assist farmers and/or ease the transition out of agriculture.

One section of the publication describes steps now being taken by Cooperative Extension to help producers and their families make better management decisions. Those families in a position to improve their farms' financial status are being helped to do so. Those whose future in farming is less certain and who want to explore or prepare for other occupations and lifestyles can also receive counseling.

Extension farm financial management center

To help local farmers and their families adjust to the demands of a more competitive agriculture, in the fall of 1986 the Delaware Cooperative Extension System established a Farm Financial Management Center. The center, which is housed in the College of Agricultural Sciences, is staffed by a statewide corps of 10 extension economists and county agents, including a home economist and an agricultural agent from each county. A number of these people have received special training in farm financial analysis and family financial counseling. Center services include helping families with a future in farming strengthen their farm businesses by showing them how to keep better financial records and prepare the balance sheets, income statements, cash flow projections and marketing plans necessary in making sound farm business decisions.

In addition, extension personnel are working through the center to provide educational services to families whose future in farming is less certain and who wish to explore or prepare for alternative occupations and lifestyles.

Extension farm management specialist Dr. Don Tilmon uses a computer to show farmers how to compare inputs for more cost-effective production decisions.

Farmer micro-computer user group formed

Farmers may soon spend more time in front of their computers than behind the steering wheels of their tractors. A key component of agricultural profitability is better decision making. And micro-computers have proven themselves to be useful farm management tools.

Early last year University of Delaware extension community resource development specialist Daniel S. Kuennen and Delaware State College extension agricultural agent Glenn Layton teamed up to start a Delaware farm micro-computer users group. The idea of forming such a group was the result of talks between extension director Dr. Richard E. Fowler and farmers already using micro-computers in their operations.

Since February 1986, the group has met about once a month (except during July and August) to discuss a variety of topics including buying hardware and software, spread sheets, modems, data bases, software exchange and batch files. Guest speakers at the meetings have included economists from the college's department of food and resource economics as well as representatives of the state department of agriculture and private industry.

"Many of the farmers involved in our meetings are what economists call early adopters," Kuennen says. "They've tested the technology and found it useful." Historically, early adopters of new technology have been most likely to benefit financially from the increased efficiency it gives them over competitors.

To make other farmers aware of the group and its meetings, the Delaware Electric Cooperative, Inc. has run free ads in its monthly newsletter. And since meetings aren't always convenient to attend, Mike McGrath, manager of the agricultural lands preservation section of the Delaware Department of Agriculture and an enthusiastic supporter of the group, has arranged for it to use the department's new electronic bulletin board as a means of sharing information.

Though still growing, the Farmers' Computer User Group has published a users directory to encourage information sharing. "The ease of getting the group up and running is due to the information we've been able to attain through the nationwide Extension System link with other universities," Kuennen says. "We've also benefited from cooperation from other public agencies such as the State Department of Agriculture. The group is still finding its way in a relatively new technology, but early results are already evident."

Smart farming for tough times

What does it cost to grow an acre of corn? What are your break-even costs? How can you cut your production costs? What production costs can you eliminate without sacrificing yield? Can you afford the land rent you're paying?

These are some of the questions extension agricultural agents and specialists asked the farmers who turned out last winter for a statewide series of meetings on "Smart Farming for Tough Times." At each of the nine informal sessions—most of them held in farm shops—grain producers were shown how to calculate their production costs for every field they farm. Using this analysis as a guide, they learned ways to trim costs for greater efficiency. They also learned how to set target prices for marketing their crops.

The information presented at these "Smart Farming" meetings was revised later for use in a special late winter supplement by the same title published by *The Delmarva Farmer* newspaper, which reaches most of Delaware's farmers.

"Many producers were complimentary of the information covered at these meetings, even though some of the production advice given was directly counter to various industry recommendations," says Sussex County extension agricultural agent Derby Walker. "They appreciated the fact that our extension recommendations are backed by research."

"As a result of our Smart Farming educational meetings, more farmers are taking our advice," reports New Castle County extension agent Dean Belt. "One producer told me recently that by following our fertilizer recommendations to the letter he reduced his annual fertilizer bill by $18,000, with no visible differences in his crop. This farmer was barely able to pay his bills in 1985, with no money left over for living expenses. With the low price for 1986 corn and soybeans he may be

in the same financial position again, but at least he made a sizeable dent in his production costs."

Many other producers have experienced similar savings by adjusting their cropping practices according to Extension's research-based guidelines. A Sussex County farmer, for example, learned that he had been over-liming and -fertilizing his corn and soybeans for years. By following university soil test recommendations, he was able to cut his fertilizer bill by 50 percent on 1,000 acres for a savings of $20,000.

Another farmer was able to adjust both his herbicide and fertilizer programs for a savings of $3,500 on 400 acres and still attain the same amount of weed control and yield.

In one case, a grower who regularly harvests 135 bushels of corn per acre had been applying enough nitrogen for a crop of 180 bushels—just to be sure he had enough. Last summer he took the advice of his county extension agent and applied only enough for his average yield. By doing so he saved $6 per acre on 600 acres, for a total savings of $3,600.

Soils research helps farmers cut costs

Fertilizer recommendations from the University of Delaware soil test laboratory are based on decades of research in Delaware and other states with similar soils and crops, and are in close agreement with those of neighboring states. Reviewed and updated annually, these recommendations serve as guidelines that can be modified by extension agronomists, county agents and growers according to individual needs, management techniques, production capabilities and yield histories in order to produce maximum economic yields.

Nitrogen is one of the most costly crop production inputs. Since a reliable soil test for this nutrient is not presently available, the amount needed to grow a corn crop is based on anticipated yield. The University of Delaware soil testing laboratory recommends that farmers use a five-year-average yield to arrive at a realistic goal for each field.

For irrigated corn, extensive field and laboratory studies have shown that a *realistic* yield goal is 175 to 200 bushels per acre, depending on soil type. Because of their lower moisture-holding capacity, light sandy soils generally have a lower yield goal than silt loam soils.

Field corn IPM program

Field corn production on 160,000 acres in Delaware results in an estimated $48 million in cash farm income each year. Routine pesticide applications, weed competition and improper fertilizer management have resulted in decreased net profits for producers of this crop.

During the past four growing seasons, extension pest management specialist Joanne Whalen and her assistants have conducted a field corn integrated pest management (IPM) program to help producers control crop pests more efficiently and thus increase profitability.

Twenty-two growers from all three counties participated in the 1986 program. Over 5,000 acres were scouted on a weekly basis for insect, weed, disease and agronomic problems. Farmers involved in the program saved over $60,000 by reducing insecticide use for black cutworm and corn borers on 90 percent of the scouted acreage. A 22 percent reduction in soil insecticide use resulted in a savings of over $13,000.

In-season identification of annual and perennial weed pests, followed by timely control recommendations, resulted in a savings of over $10,000 in crop loss from weed competition. Weed mapping will result in improved weed control next year on all of the scouted acreage. Fertilizer practices based on leaf tissue and soil test results are expected to result in improved fertility on 20 percent of the acreage involved in the program.

In the future, the program will be expanded to include new, research-based information on treatment thresholds, fertility management and sampling techniques to help producers make more efficient and profitable management decisions.

Reducing cyst nematode losses in soybeans

Delaware soybean growers lose an average 2 percent of their potential soybean yield—230,000 bushels in 1985—to the soybean cyst nematode (SCN). Figures are not available for 1986 losses, but were probably at least that much. At $5.25 a bushel, that amounts to a $600,000 loss. Sussex County producers were hardest hit; though some in Kent County also suffered losses. According to extension plant pathologist Robert P. Mulrooney, the nematode is the number one disease problem in Delaware soybeans. "In general," he says, "growers with heavily infested fields can expect a 33 percent yield loss."

The problem is limited primarily to land where soybeans have been grown continuously. At a conservative estimate, approximately 20,000 of Delaware's 240,000 acres of soybeans are infested to some degree.The pest, first detected in Delaware in 1978, has now spread as far north as Dover. It has been a serious problem in soybeans in the southeastern United States for many years.

Working with extension agricultural agents in the infested counties, Mulrooney is showing soybean farmers how to reduce losses from this pest. He has developed a control program which incorporates the results of field trials by extension workers and researchers at the University of Delaware and the University of Maryland, as well as with scientists at the U.S. Department of Agriculture's soybean breeding program in Illinois and Mississippi.

A cooperator in this program since 1979, Mulrooney has conducted yearly soybean variety trials on nematode-infested land to identify current commercial and potential new varieties for resistance to SCN and adaptability to Delaware growing conditions. Farmers who can't rotate out of soybeans, are encouraged to plant varieties which have performed well in these plots.

"Nematode levels in infested fields can easily be reduced by rotating to another crop, or by using resistant varieties," the plant pathologist says. "Farmers are finding it really pays to follow recommendations from our annual SCN-resistant soybean and state soybean variety trials. Use of resistant varieties alone can increase the yield of SCN-infested fields from 10 bushels to 30 bushels an acre. Farmers who rotate crops such as corn, grain sorghum or vegetables into their cropping sequence also benefit in increased soybean yields."

Alternative enterprises for farmers

Many Delaware corn and soybean farmers would benefit by diversifying their production to spread economic risk, improve cash flow and increase income. Growing a few acres of high-value vegetable crops such as carrots or cucumbers for processing or fresh market use is one way to boost income. There is also a need to identify new markets for crops suitable for Delaware growing conditions, provided markets can be developed for these crops. More information on cultural practices is also needed. Following are three examples of farm enterprises that are benefiting from extension and/or research programs.

Insecticide labeling saves day for Delaware carrot growers

Delaware farmers produce approximately $12.5 million worth of carrots a year. Without adequate control of the carrot weevil, they could not grow this valuable cash crop. The weevil, which thrives in this part of the U. S., injures carrots by tunneling into and scarring the surface of the tap root, making them unacceptable for either fresh market or processing use.

In 1985, the Environmental Protection Agency banned the use of the only insecticide which had proved effective against this pest—a compound that had been used for nine years under an emergency exemption state registration. Because of this action, extension entomologist Mark Graustein initiated insecticide evaluation studies for carrot weevil control as part of his field program.

The data from these studies were pooled with those from similar studies conducted in Ohio and evaluated for efficacy. One insecticide was identified as being as effective as the previously used material and much safer to human applicators and the environment. This information was submitted to the EPA.

After reviewing the data, the EPA gave full federal approval for the use of this insecticide on carrots for the 1986 growing season as well as future seasons. Most growers and processors are pleased with the weevil control provided by this new material and feel it has probably saved Delaware's carrot production industry.

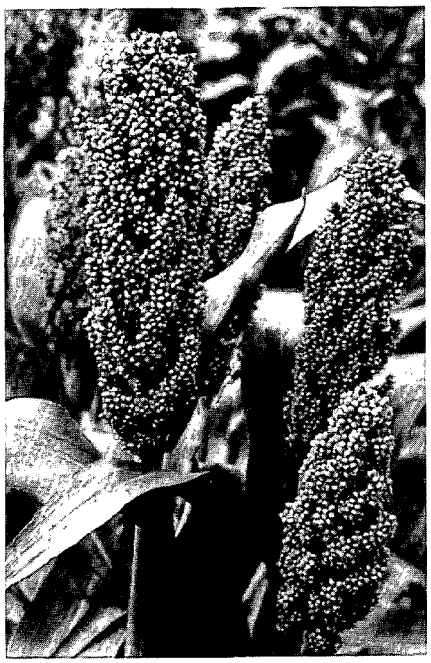
Grain sorghum evaluated for Delaware

Many dryland farmers now grow continuous soybeans on the droughty soils of Sussex and lower Kent counties because corn yields on these soils are so uncertain. The practice has led to a sharp decline in soybean yields due to the buildup of diseases and soybean cyst nematode infestations.

Planting grain sorghum (milo)—which, unlike corn, tolerates drought—could be one way to break out of this unprofitable monoculture. However, before sorghum can be considered a viable crop alternative for Delaware, farmers must have an assured market. Broiler industry demand for milo on Delmarva will depend on the price of this grain compared to that of corn, as well as the price of corn and soybeans. For example, at the currently very low prices for these grains, poultry operators have little if any economic incentive to switch to lower priced grain sorghum.

The amount and consistency of sorghum supply will also affect demand. And a cost effective production system tailored to local growing conditions is needed before this crop can be recommended.

For several years a study has been under way at the College of Agricultural Sciences' Research and Education



Researchers and extension specialists are investigating the potential for growing sorghum as an alternative grain crop on droughty Delaware soils.

Center near Georgetown to demonstrate the potential savings to growers who switch from dryland corn to grain sorghum. At present this would be most viable for those farmers who raise grain crops such as corn for feeding livestock, swine or cattle. This could involve a sizeable portion of the dryland corn acreage grown in southern Delaware.

Two extension specialists and an experiment station economist are currently investigating grain sorghum production and market development opportunities in the state, with the aid of a $9,000 grant from the Delaware Department of Agriculture.

Extension crops marketing specialist Carl German and agricultural marketing specialist Dr. Ulrich C. Toensmeyer hope to determine the per acre cost of growing grain sorghum as well as the economic feasibility of substituting milo for corn in poultry and livestock rations. They are also analyzing the potential impact on the state agricultural economy of growing more sorghum and less corn and soybeans.

Since March 1986 German and Toensmeyer have collected production cost data from approximately 10 Delaware farmers who now grow or recently grew sorghum. The economists have also met with all of the grain dealers identified as having an interest in the project. Their preliminary findings indicate that:

- It now costs farmers $70 to $130 per acre to grow grain sorghum (excluding land and management).
- One reason for the extreme variation in input costs is over-fertilization on the part of some growers.
- A critical production mass is needed to establish a market. This may warrant the running of a test market where cash contracts are offered in the spring.
- In some areas timely harvest may be essential to avoid heavy bird damage. (Fields near marshy areas with large blackbird populations are probably the most vulnerable.)

The same state grant is helping agronomist Dr. Richard W. Taylor, who holds a joint extension/research appointment, evaluate commercially available grain sorghum varieties for their agronomic and chemical traits. He is preparing a report on the characteristics of the varieties tested, to help farmers assess their market potential. Milo can be substituted for corn in poultry, swine or beef cattle rations, but varieties differ in palatability, depending on their tannin content.

Taylor has also conducted field trials on large, replicated blocks of both grain sorghum and corn under dryland conditions to compare yields from the two crops. Data from the 1984 and 1985 trials show an average yield advantage of 26.4 bushels per acre for bird-resistant milo over corn, with milo yields topping corn by 47.5 bushels in 1985, which was a typically dry year for Delmarva. At the same time, seeding and fertilizer costs for the sorghum were about $35 lower than for corn.

Yield differences between the two crops were even more dramatic in 1986. Average grain sorghum yields last summer ranged between 52.4 and 58.4 bushels an acre despite the severe drought. Corn grown in the same experiment yielded an average of only 22.2 bushels an acre.

Farmers who grow sorghum, must know how to harvest and store it properly. Two members of the department of agricultural engineering—Dr. Sundaram Gunasekaran, a specialist in electric power and processing, and Thomas H. Williams, extension specialist in power and machinery—recently produced a four-page fact sheet, "Harvesting, Drying and Storage of Grain Sorghum," for use by Delmarva farmers.

Besides outlining appropriate harvest procedures, the publication illustrates appropriate dryer bin construction and describes the airflow, air temperature and static pressure requirements for drying the grain. In addition, it tells how to adapt existing corn drying bins for sorghum and discusses correct storage procedures. The fact sheet recently won an award from the American Society of Agricultural Engineers. It was available to Delaware farmers through county extension offices in time for the 1986 harvest season.

Computer program for Delmarva broiler growers

"Delmarva farmers are fortunate to have a strong poultry industry during these times of low grain prices," says extension poultry specialist Daniel H. Palmer. "Broilers offer the opportunity to diversify and to make more efficient use of existing farm labor. In the face of today's high fertilizer costs and low crop prices, poultry manure has acquired greater economic importance. And existing farm equipment can be used in handling this valuable by-product. The trick is to put dollar figures on each of these potential benefits."

Approximately 300 new broiler houses were constructed on Delmarva in 1986. Most growout companies are anxious to see more constructed. The future looks good indeed for the chicken meat industry. However, individual growers must examine their own special set of circumstances closely before deciding to build. First-time growers have even more homework to do than existing producers who wish to expand. Assembling and analyzing all the information which must be collected before the construction crew arrives can be difficult. This is where a computer can help.

University of Delaware extension farm management specialist Dr. Don Tilmon has developed three computer programs designed to help people interested in putting up new poultry housing. The programs are for broiler, roaster and cornish production. The grower committee of Delmarva Poultry Industry, Inc. (DPI) helped Tilmon gather the basic input information and helps update this information each year. It has also been updated to agree with tax law changes.

Items covered in the analyses include number of houses to be built, capacity per house, flocks to be raised per year, construction cost per house, number of years for which house will be financed, costs to buy and finance equipment, interest rate, estimated annual utility costs, anticipated annual repair costs, taxes and insurance, annual cleanout cost, anticipated contract payment per bird, labor costs plus inflation factors on all these costs.

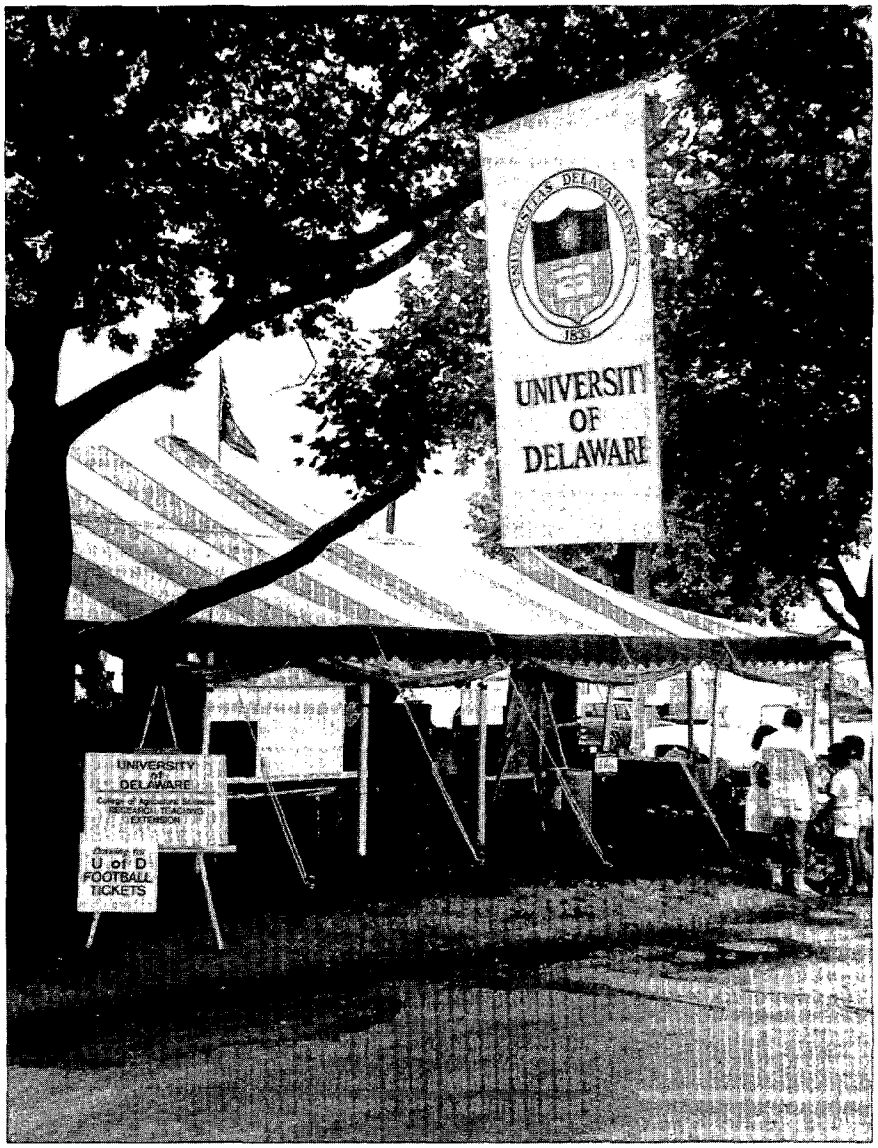
Once the prospective grower has entered these figures, the computer will analyze the information and print the results. The printout gives yearly totals, costs per 1,000 birds, costs per square foot, cumulative totals and net income per hour of labor, projecting these for each year up to a total of 20 years.

All this information can be analyzed before the grower or potential grower has made any commitments regarding financing or construction. The service is free, confidential and the printout may be kept for study and future use.

Over the years, with the help of Tilmon or Palmer, dozens of farmers have used the program. In some cases—especially when interest rates were high—some decided it wouldn't pay to put up a new broiler house. The program is now being used in Maryland, too, and Eastern Shore broiler companies have copies of it.

Research and extension briefs

Community



Dr. Patricia Tanner Nelson, extension family and child development specialist, answering the public's questions at the 1986 Delaware State Fair.

Extension goes to the fair

Reaching out for new audiences, University of Delaware extension professionals took a tent to the Delaware State Fair in Harrington last July. The 40 foot by 60 foot, blue and white striped tent featured extension and research exhibits on topics including profitable farm management, water quality, food and nutrition, leadership development, drip irrigation for field crops and home gardens, and careers in agriculture.

Scientists from the Delaware Agricultural Experiment Station were on hand each day to explain aspects of their research. And extension master gardeners prepared a special groundcover display, in addition to landscaping the tent, inside and out. A stage at one end of the large, shaded area provided a place for special presentations and entertainment, as well as 4-H demonstration contests.

Looking back over their week-long stint at the fair, extension planners declared themselves well-satisfied with the results of this outreach effort.

Survey shows strong public support for extension system

Approximately 60 percent of the Delawareans interviewed during a random household survey said they are aware of the Delaware Cooperative Extension System and its programs. Ninety-five percent of those using the system said they are highly satisfied with the services they receive.

Conducted by the Delaware Household Survey of the College of Urban Affairs, the survey was commissioned by Extension to assess public awareness of and attitudes toward its programs. The survey team reached 434 households throughout the state by telephone during the spring of 1985.

"Extension's job is education," says extension community development specialist Dan Kuennen, in explaining the rationale behind the survey. "We must be responsive to local needs. A survey is one way to find out how well we're doing."

Extension staff work out of five offices around the state. They present information through public meetings, demonstration projects, tours, personal visits, telephone calls, direct mailings, publications, computers and the mass media (newspapers, radio and TV). The survey has helped determine which of these methods are best suited for serving specific extension audiences.

Master gardener Earl Favinger conducting a turf and lawn weed clinic during the 1986 Ag Day at the university.

Nursery industry newsletter

Extension horticulture specialist Susan S. Barton works closely with the Delaware Association of Nurserymen, whose 85 members include growers, wholesalers, retailers, landscapers, greenhouse operators and florists. As executive coordinator of the DAN, Barton regularly receives information from the American Association of Nurserymen which can be of use to local producers. As extension horticulturist, she also attends regional and national meetings in her subject area and receives numerous trade journals and newsletters related to aspects of ornamental horticulture.

To pass on all this information, last year Barton developed a quarterly newsletter that goes out to members of the Delaware nursery industry. The newsletter contains association news, pesticide updates, marketing information, research reports and other material pertinent to the Delaware nursery industry.

"The response from readers has been excellent," Barton reports. "By reading the newsletter they can keep abreast of what's happening nationally, locally and in the scientific community in the field of horticulture. The new production or maintenance procedures or marketing techniques they learn can help them save or make valuable dollars."

Master gardeners sow skills throughout the community

A novel cadre of trained volunteers known as "master gardeners" has been cultivated by the Delaware Cooperative Extension System and scattered throughout the community to conduct plant clinics, address garden groups, design demonstration gardens and answer common homeowner questions.

The first class of 20 master gardeners graduated last spring in New Castle County. Since then they have answered over 1,200 questions by telephone, created groundcover displays at the Delaware State Fair and Newark Community Day, conducted turfgrass and weed clinics, written news releases on gardening topics for mass media use and designed a courtyard for the University of Delaware's adult day care center. In addition, they have developed a landscape design for the Wilmington Library, given talks before garden clubs and garden centers and led walking tours of the university's Clark Garden.

Last December their ranks more than doubled when a second class, taught jointly in Kent and Sussex counties, completed the free eight-week course required for certification. A third class began in February 1987 in New Castle County. Although committed to serve only 45 hours in exchange for their training, a number of members of the original class are still actively involved.

Originating in 1972 in the state of Washington, the master gardener volunteer concept has now spread to 39 states. The program makes it possible for Cooperative Extension to disseminate its home gardening programs to larger audiences. University of Delaware extension horticulturist Sue Barton, who organized Delaware's program, says the ideal master gardener is "someone with both gardening experience and a strong desire to help others enjoy gardening."

Members of Delaware's first class ranged in age from mid-20s to mid-60s and included a former estate gardener, patent attorney, florist, minister, nurse and several homemakers. Most were retired.

These budding master gardeners were given 45 hours of instruction on plant identification, soils, insect identification and control, landscaping, turf management, plant disease and control, houseplant care and vegetable gardening. Their instructors included university faculty, extension specialists and county agents. Once certified, the volunteers began work under the supervision of New Castle County extension agent Dave Tatnall.

Last fall, several New Castle County master gardeners began a project to catalogue, label and rejuvenate the Clark Garden, a demonstration garden located in front of Townsend Hall, home of the College of Agricultural Sciences. The project should make the garden more useful to area residents as a source of information on landscape plants suitable for Delaware growing conditions.

Possible future master gardener activities include working on community demonstration gardens and providing horticulture therapy programs for rehabilitation centers or nursing homes. Master gardeners with writing or photography skills may help develop slide sets, fact sheets and other educational materials for use by fellow volunteers.

Facilitating farm accident rescue

Agriculture is Delaware's leading industry. It's also one of the most dangerous. Cooperative Extension, farm organizations and many other groups have combined resources to help reduce the state's farm accident rate. One approach is to provide safety education for the farm community. Another is to teach rescue teams about agricultural hazards and farm rescue procedures. Tractor rollovers, animal-related mishaps, exposure to manure gas, electrocution with power lines, grain bin drownings, chemical spills and entanglement in power take-off (PTO) shafts are among the common hazards of farming.

Rescue from farm equipment is similar in many ways to rescue from motor vehicles, with which most rescue squads are familiar. However, poor accessibility to the scene and lack of advice on disassembly of equipment and the extrication of victims often hamper rescue efforts. Standard rescue equipment which easily removes automobile pieces from around trapped victims may not work when applied to much more ruggedly built farm equipment.

Extension safety specialist Ron Jester is working with the Delaware State Fire School, in cooperation with farm equipment dealers and local farmers, to train qualified personnel in farm rescue procedures. Over the past three years hundreds of rescue personnel have received training.

Eventually Jester plans to modify the training materials being used in these workshops for presentation to farm and rural audiences. The objective of this educational program is to develop a corps of individuals in each county with the skill and technical know-how to handle the unique and challenging problems involved in farm rescue and transport.

Helping neighbor help neighbor

In December 1985, in response to a call from a county agent, extension farm management specialist Dr. Don Tilmon visited a Delaware dairy farm. He found a farmer recovering from major surgery, a feed supply getting very low, and a family unable to analyze their alternatives. The wife was attempting to finish a degree program at Delaware State College.

Tilmon called in extension dairy specialist Dr. George F. W. Haenlein to formulate a ration using the coarse forages that were in storage. The cows made it through winter, but by spring the farmer's medical condition had deteriorated. Unable to manage his dairy operation, his losses were running between $1,200 and $1,500 a month.

Subsequent visits revealed a neighbor who was willing to lease the herd for one year until the farmer's health improved and he could resume operations. The question was, what value should be put on the lease arrangement for the cows? Tilmon worked independently with each party, helping the ailing owner determine the least amount of payment he could afford to take and helping the neighbor determine how much he could afford to pay for use of the herd. After counseling both farmers as to clauses that should be in the lease for the protection of each, he let the families negotiate the final agreement.

The owner now has a cash surplus each month from his resources instead of a deficit, and his spouse has an off-farm job that helps support the family until his health improves.

Extension home economist Deborah J. Amsden trains a volunteer to provide financial counseling to Delaware families.

Family financial counseling

Cooperative Extension recognizes that financial and emotional stress are not limited to farm families. Extension educators also work with non-farm families to help them become more economically secure.

Frequent requests for financial counseling and a community survey conducted by the United Way of Delaware indicated a need to increase community resources to aid financially stressed families. In response to this need, New Castle County extension home economists Deborah J. Amsden (University of Delaware) and Mary Alice Morris (Delaware State College) have adapted materials prepared by University of Maryland extension family resource management specialist Dr. Mary Stephenson and are using them to train volunteers to help families develop financial management skills. The United Way of Delaware provided funds to purchase the training manuals.

As of October 1986, 29 community volunteers and 13 professionals representing local agencies in New Castle County have completed the six-week course for volunteers in financial counseling. Classes provide in-depth training in the areas of credit, debt loads, budgeting, dealing with creditors, figuring interest payments, financial decision making, financial goal setting and related topics.

In return for this training each volunteer agrees to provide financial counseling for four families over the coming year. The commitment involves meeting with each family four or five times, making telephone follow-ups, providing encouragement and monitoring progress.

Impressed with the success of their volunteer training program, the Division of State Service Centers asked the home economists to design a financial management class for personnel and volunteers who would be working with families requesting public assistance funds. The 18 people who completed this class are now trained to provide budget counseling for service center clients.

Amsden and Morris have also taught classes on personal financial management to workers involved in job training programs and have presented information on basic life skills at meetings sponsored by public agencies, local colleges and corporations. This preventive approach to money management is aimed at individuals whose lives are in transition, or those setting up households for the first time.

Extension home economists in Delaware's other two counties are providing similar money management information. For example, Sussex home economist Sally Foulke has trained 20 state social workers in her county. She is also working with retired couples and widows who need help learning how to maximize their resources.

After a survey showed that over 100 subscribers to her county home economics newsletter wanted additional information on family financial management, Foulke created a second monthly newsletter, "Money Matter$." This new publication carries articles on such topics as goal setting, individual retirement annuity plans, calculating needed rate of return, taxes, refinancing a home and record keeping.

Family stress management

Over the past three years, extension family stress management workshops have reached 3,622 parents, homemakers, factory workers, managers, farm families and other interested Delawareans. In on-site evaluations at the conclusion of workshops,

- 88 percent of the participants felt the workshop had increased their knowledge of the causes and effects of stress;
- 77 percent reported being better able to recognize personal stress symptoms;
- 62 percent said they had learned more effective ways to manage stress;
- 70 percent felt more confident that they could manage stress positively in the future.

When workshop participants were contacted in random sample follow-up telephone surveys nine to 11 months later,

- All said they were attempting to interpret their problems in a positive light;
- 96 percent felt more in control of their lives;
- 96 percent were spending quality time with their families;
- 92 percent said they were more effective stress managers.

To obtain an outside expert's opinion on the impact of this extension program on individual and family well-being, extension family life specialist Dr. Patricia Tanner Nelson asked Richard Pryor, director of Catholic Social Services in Wilmington, to comment on the survey results. Here is part of his reply:

"In one year... in our family counseling program [Catholic Social Services], we serve about 700 cases.... The total cost of delivering that service was more than half a million dollars last year. The clients and other third party contractors pay about 20 percent of that, United Way pays 40 to 45 percent of that cost. That's a lot of money the community could be using in other ways if more families were strong enough to not need our intensive services.

"I believe the response to all your programs is dramatically positive. Based on my experience, I think it's fair to say that a significant portion of the population you have served will not... need services like ours.... your data is essentially on target. You've got valid responses."

Helping farm families weather tough times

"Too much stress in your life can affect your health, safety, family relationships and your decision-making capacity," says extension family life specialist Dr. Patricia Tanner Nelson. "So it makes good sense to be the very best stress manager you can."

Even under normal circumstances, farming is one of the 10 most stressful occupations in the U.S. The current economic crisis in American agriculture has greatly intensified the pressures on farmers. To help Delaware farm families understand the stressors in their lives and cope with them more effectively, Nelson has written a newsletter, "Strategies for Farm Families in Tough Times." She decided to write the newsletter, rather than hold meetings on the subject, because she felt that individuals experiencing difficulties in their farm businesses had a desire and need for the privacy that a newsletter would provide.

The newsletter is available free to Delaware residents. Out-of-state subscribers are asked to pay a modest fee to cover postage and handling. The newsletter covers the nature of stress and situations in farming which can cause irritation, fatigue, uncertainty, conflict, depression and similar reactions. Each issue also contains practical suggestions for managing or reducing stress.

To help publicize the newsletter and alert farm families to available help, the college's communication office prepared a series of related articles on the pressures of farming and how to cope with them. The series was sent to area newspapers, radio and TV stations.

Research contributions, Delaware Experiment Station - 1888-1986

Agricultural Experiment Stations all over the United States are celebrating their 100th anniversary this year. The federal Hatch Act which brought them into being was passed in March 1887.

Delaware's Experiment Station was established nearly a year later on February 21, 1888, in connection with Delaware College (now the University of Delaware). The following are some of its achievements since then.

- On-going, poultry-related research has led to improved control of respiratory diseases, Marek's disease, infectious bursal condition, anemia-dermatitis syndrome and infectious synovitis. During the broiler industry's early development, the Delaware Agricultural Experiment Station was active in developing coccidiostats and sulfa drug treatments for the control of coccidiosis in poultry. By applying research results the industry has saved millions of dollars.

- The Delaware Experiment Station has been a leader in providing information on the best temperature range for optimum broiler growth, broiler house insulation and mechanical ventilation. Fuel consumption data generated in the 1970s by a computer program developed by agricultural engineers in cooperation with poultry producers has resulted in significant savings for the industry.

- Delaware economists and poultry nutritionists were among the first in the U. S. to use computers to formulate least-cost broiler rations. Now a standard practice nationwide, the process annually saves Eastern Shore producers millions of dollars. By 1961 a number of Delmarva firms were using least-cost formulas provided by the Experiment Station; one company representative estimated his firm saved over $200,000 the first year it switched to the new system.

- Analyses of the flow of funds from purchases and sales in agriculture, tourism, banking, transportation, manufacturing, construction, professional services and other sectors of Delaware's state and county economies has made it possible for station economists to measure the effect a change in sales in any one sector would have on the state's or county's total economy. Such input/output studies help policy- and decision-makers develop plans more likely to favor local economic growth.

- Improved crop production practices including fertilizer use, irrigation and tillage methods have been developed at the Delaware Station, which led the way in no-tillage crop production systems for corn and soybeans. Delaware now leads the nation in percentage of no-till acreage.

- The Delaware Station has been a leader in irrigation water management research in the region. Agricultural engineers and agronomists have been active in determining irrigation water use requirements for corn, soybeans and vegetables in the mid-Atlantic states. With the help of this information, Delaware's irrigated cropland has more than doubled over the past decade, with drought-susceptible corn becoming the state's major irrigated crop.

- The Delaware Station has been a leader in surface and groundwater quality studies. The state of Delaware has used results from these studies to establish water quality management and regulatory policies to reduce groundwater contamination by fertilizer, herbicides and domestic sewage.

- The Delmar soybean was developed at the Experiment Station, along with two green-seeded varieties—Verde and Emerald—that are to be eaten as vegetables.

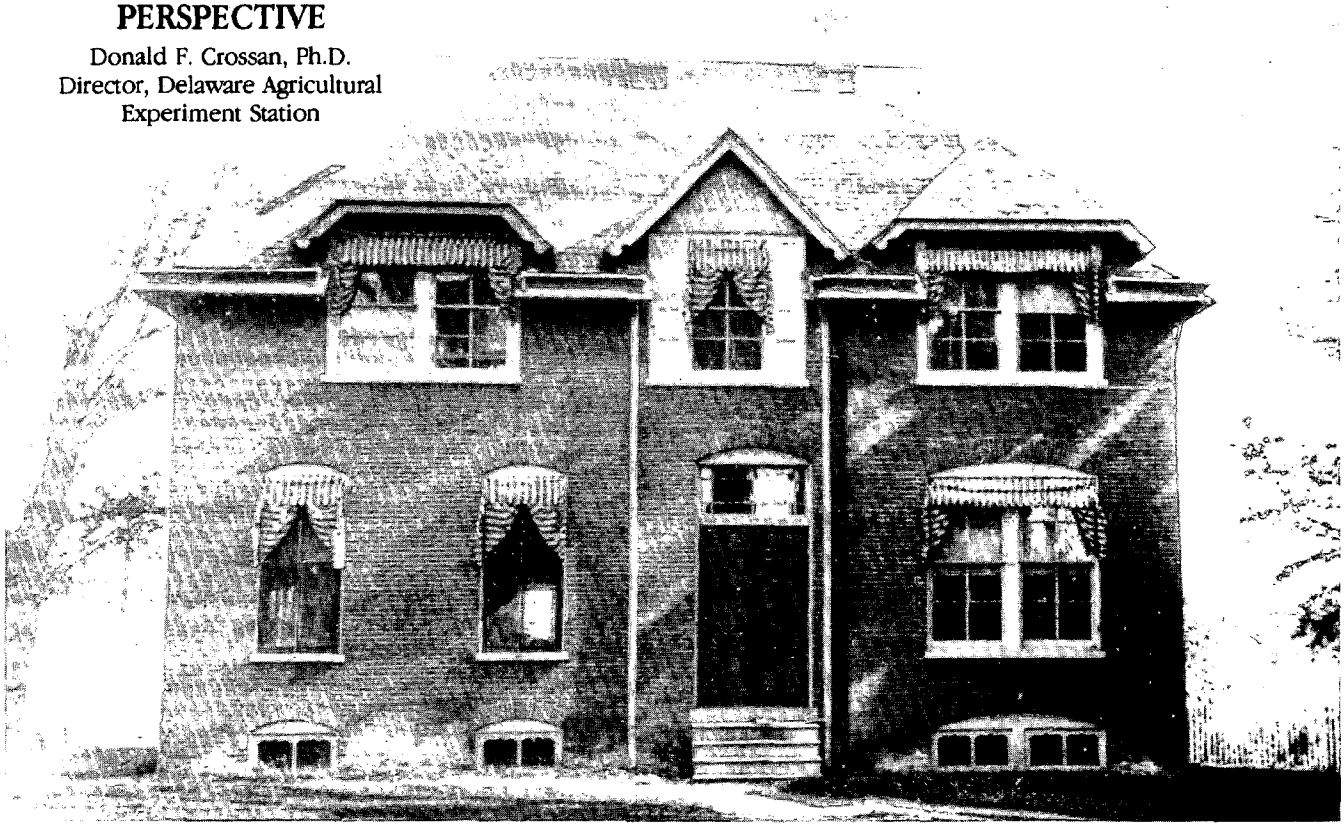
- Years of field trials and new knowledge on the basic chemistry of potassium in Delaware soils have led soil scientists at the Experiment Station to lower their fertilizer recommendations for this basic element on crops, thus reducing farm production costs.

- The Delaware Agricultural Experiment Station has developed chemical methods for insect, weed and disease control in plants. Plant pathologists at the Station were involved in development of the fungicide Zineb, with one researcher named in the initial patent.

- Experiment station entomologists were instrumental in developing salt-marsh management systems for integrated mosquito control and marshland use. The first truly selective insecticide, Abate, was first tested against mosquitoes and non-target organisms at the Station.

THE STATE AGRICULTURAL RESEARCH SYSTEM AND THE DELAWARE AGRICULTURAL EXPERIMENT STATION: A CENTENNIAL PERSPECTIVE

Donald F. Crossan, Ph.D.
Director, Delaware Agricultural
Experiment Station



The first Delaware Agricultural Experiment Station building still stands on the University of Delaware campus. Renamed Recitation Annex, it now houses graphic arts studios.

March 2, 1987, marks the 100th anniversary of the passage of the Hatch Act that established agricultural experiment stations at land-grant colleges in each of the United States. This act was the result of hard-won cooperation between the federal government and the individual states. It was preceded by years of debate on whether or not there should be centralized control by the United States Department of Agriculture, in effect creating a series of federal research stations, or whether control should rest primarily with each state and its affiliated land-grant agricultural college.

The very premise that there should be agricultural experimentation had its roots in Europe. There were successful institutions in Scotland, England and Germany in the 1800s that applied science to the problems of agriculture. In the 1840s, American visitors to laboratories in Europe were impressed that various professors' research and subsequent lectures were stimulating farmers to accept scientific methods to improve their farming. There was nothing comparable in the United States.

One visiting professor from Yale University, John P. Norton, was intrigued with the idea of an agricultural research center that would help solve practical problems. He returned to Connecticut as a professor in agricultural chemistry at Yale and began to conduct soil and manure analyses, charging a fee to support his lab. He wrote reports on all samples and sent them to the respective clients. He also established a two-month series of lectures designed particularly for farmers.

Other states began joining in a growing movement to establish state agricultural colleges. Some of the proponents wanted agricultural research to be part of the college system, others did not. The basic idea of teaching agriculture took a formal turn in the 1850s with the drafting of a legislative proposal by Senator Justin Morrill of Vermont to establish colleges for agriculture and the mechanic arts, to be financed by the sale of grants of government-owned land. Southern congressmen felt that federal intervention into the education system was an infringement on states' rights. Thus they fought the passage of Morrill's proposal. The intervention of the Civil War removed the Southerners' objections; and in 1862, the Land-Grant College Act (Morrill Act) was passed. Each state was provided a grant of federal land, proceeds from the sale of which would provide an endowment for an agricultural

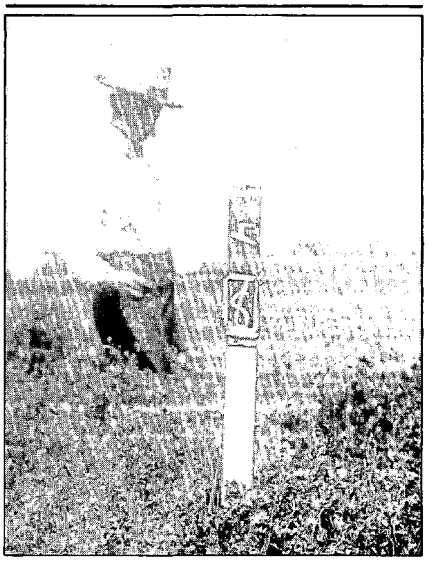
and mechanic arts college. Delaware College at Newark, Delaware, was designated as the state's land-grant college. The college made efforts to interest young people in the study of agricultural subjects and offered short courses on agricultural topics. The Delaware State Grange was very active in encouraging the college to live up to the intent of the Land-Grant Act.

One issue that was raised by the passage of the Morrill Act was whether or not the agricultural colleges should do research. Until that time it was assumed that professors taught, and that was their primary responsibility. There was disagreement as to what constituted research and what agricultural research should be. Irrespective of this, there was general agreement that research in agricultural subjects had to be done if agriculture was to advance.

In 1880, a group of research-minded professors from Midwestern land-grant colleges formed an association of teachers of agriculture. These teachers carefully recommended and explained why they thought publicly financed experiment stations should be established at the land-grant colleges. First, the colleges already possessed land, laboratories and trained specialists on their teaching staffs. Thus, to associate experiment stations with colleges made both economic and scientific sense. Second, the association noted that research would be valuable in educating students. And finally, a college-based experiment station, rather than a federally controlled one, would allow researchers to attack the large variety of national agricultural problems at a more easily managed state level.

In 1862, a number of land-grant colleges had entered into agricultural research at the same time that they accepted their land-grant status, but not under the aegis of a formally organized experiment station. During the following years, a number of persons began advocating in the press, in national magazines and at various agricultural conventions that the federal government should follow the principle of the Morrill Act that had established the land-grant colleges and provide support for the establishment of agricultural experiment stations at these same colleges.

Corn has long been an important crop on the Delmarva peninsula. In the early 1900s, husking corn was a labor-intensive part of production. Modern machinery has since reduced the need for hand labor.



Since the early years of the Experiment Station, researchers have run field trials on various crops. They use their findings to make recommendations on varieties, fertilizer and water needs to local farmers. In this picture, the scientist notes the height of a cover crop in a trial field in Felton.

One of the first editorials in the newly founded magazine *Science* (1884) supported agricultural research. Letters were exchanged between scientists and the magazine as to whether or not science and practical work should not or could not be separated. The editors of *Science* replied that, in their judgment, there was little danger that the scientific experiments would be so scientific as to be too far removed from the needs of the farmers. This debate was central in building national awareness of the need for organized agricultural research.

A professor of agriculture at Iowa State College drafted a bill for consideration at a convention called by the Secretary of Agriculture in 1882. The bill asked for $15,000 annually from the federal government to pay for agricultural experimentation at each station. The bill suggested an association of the experiment stations with the U.S.D.A., yet would allow the trustees of each college general control over agricultural research. This bill was introduced into the House Committee on Agriculture; and for the next four years, many aspects of the bill were discussed and debated. A committee of college presidents worked with several federal legislators and convinced Representative William H. Hatch and Senator James Z. George to champion the experiment station bill. Debate in the Senate revealed strong support for federal subsidies of agricultural research in state experiment stations. But there was concern about federal control.

The final version, known as the Hatch Act, made state legislative assent a necessary part of creating a college agricultural experiment station. The act also made clear the autonomy of the stations with respect to the U.S.D.A. The Hatch Act became law on March 2, 1887. It provided for the establishment of land-grant college agricultural experiment stations, and as a consequence, set a new precedent for federal-state cooperation in agricultural research.

Professor Frederick D. Chester championed agricultural research at experiment stations and recommended that the officers of the stations meet with farmers in different parts of each state, noting that "the work, present and prospectivee, of the stations could in this way, be brought directly to the farmer."

In the state of Delaware, the trustees of Delaware College held a regular meeting on March 22, 1887, and appointed a committee consisting of J. Alexander Fulton, Esq., the Hon. John B. Pennington and Dr. Hugh Martin to prepare and present to the legislature of Delaware a bill giving assent to the establishment of an experiment station and to the acceptance of grants of money authorized by the Hatch Act. The General Assembly assented to the provisions of the act on March 28, 1889.

A special convention of the Association of American Agricultural Colleges and Experiment Stations was held at the Department of Agriculture in Washington, D.C., in October 1887. Professor F. D. Chester represented Delaware. At the convention, various representatives voiced opinions on the proper role of experiment stations in the different states. Chester voiced the opinion that "the work of the stations should be specialized as far as possible, each station having in view the dominant agricultural interest of the state in which it is located. If any station can choose any one question, or limited number of questions, it will accomplish more than by frittering its energies over the whole field of experimental agriculture."

Chester suggested that the subject of plant pathology should be a special feature of work in Delaware since the problem of peach yellows was threatening the decline of an important peach industry. Delaware College scientists were among the first to show that "yellows" was an insect transmitted pathogen thought to be a virus. The absence of effective insecticides to prevent disease transmission allowed yellows to decimate Delaware's peach orchards.

In addition to each station focusing on specialized areas of agricultural research, Chester recommended that the officers of the stations meet with farmers in different parts of each state noting that "the work, present and prospective, of the stations could, in this way, be brought directly to the farmer." By 1911, Delaware supported an extension effort, but it was not until 1914 that a formal extension system was established in all the states.

Extension has long been involved with encouraging farmers to spray orchards for disease and insect control.

Chester also raised an insightful question asking, "Would it not be to the advantage of workers in special lines of research to meet at the same time and place, whether delegates or not, in sections for discussion of matters of purely technical interest?" Today, agricultural scientists meet in annual meetings, or in regional research projects to discuss "matters of purely technical interest." It is now an accepted way of exchanging knowledge. The foundation of a sound philosophy for the Delaware Agricultural Experiment Station was thus established.

As noted before, the trustees of Delaware College favored the establishment of an experiment station and obtained legislative approval. But action was delayed until the federal Congress, by special act in February 1888, appropriated funds for the various stations. When that was done, the trustees proceeded at once to specifically establish the Delaware College Agricultural Experiment Station on February 21, 1888. At the same time, they notified the federal Secretary of the Treasury in Washington that Delaware College at Newark was the recipient of the benefits of the land-grant bill, was the only agricultural college in the state, and was entitled to the benefits provided by the Hatch Act. Dr. George D. Purington of Missouri was appointed director of the station and professor of agriculture in the college on May 8, 1888.

By June 30, 1888, the trustees of Delaware College had a specially designed, two-story, brick building erected to house the research of the experiment station. The first annual report of the Delaware College Agricultural Experiment Station notes that building construction cost $2,980. This building still stands on the University of Delaware campus and is known as Recitation Annex. The first annual report also listed laboratory equipment costs at $4,921. Books for the library were $1,428; furniture cost $887, and salaries amounted to $650. These items plus supplies, tools, postage, travel and other expenses totaled $14,438.84 of the $15,000 appropriation that first year.

In the early part of this century, whole fish was a commonly used fertilizer. Although we now have more modern techniques to ensure crop fertility, the peach tree pictured below is testimony that old-fashioned methods did indeed do the job.

The 1888 annual report notes that in keeping with the intent of the Hatch Act, the chemist at the station would devote time to soil analyses, the chemical composition of plants, and many other analytical tasks. The report further noted that others besides the chemist must devote time to studies of crop rotation and suggested that the evaluation of grasses and forages be done in many sections of the state.

Purington remained less than a year as director of the experiment station. He was replaced in 1889 by Arthur T. Neale who served until 1906. Neale helped eradicate cattle anthrax in Delaware by showing that imported cattle hides carried the bacillus that was spread through wash water to fields and streams. He also led a program of testing cattle for tuberculosis that led to the reduction of that problem to minor status.

From its earliest years, the experiment station made strides in solving state agricultural problems. In 1891, Delaware's governor praised the experiment station for its valuable work on insects and diseases of fruit crops. The 1892 annual report notes experiments with red clover for soil improvement, sprays with copper to try to control peach brown rot and potato late blight, and testing of milk and cream separation, among other items of interest. The 1903 report noted that in six years out of 10, the annual total of precipitation was adequate, but the distribution was such that it wasn't available at the critical times for plant growth. The report also noted 10 years of experimental results on light, sandy land that used crimson clover as a winter cover crop with corn as the summer crop. In those tests, by the tenth year, corn was not affected by mid-season drought compared to similar fields without the clover. The average yields in 1903 were reported as 37.8 bushels per acre for New Castle County, 28.3 for Kent County, and 17.5 for Sussex County.

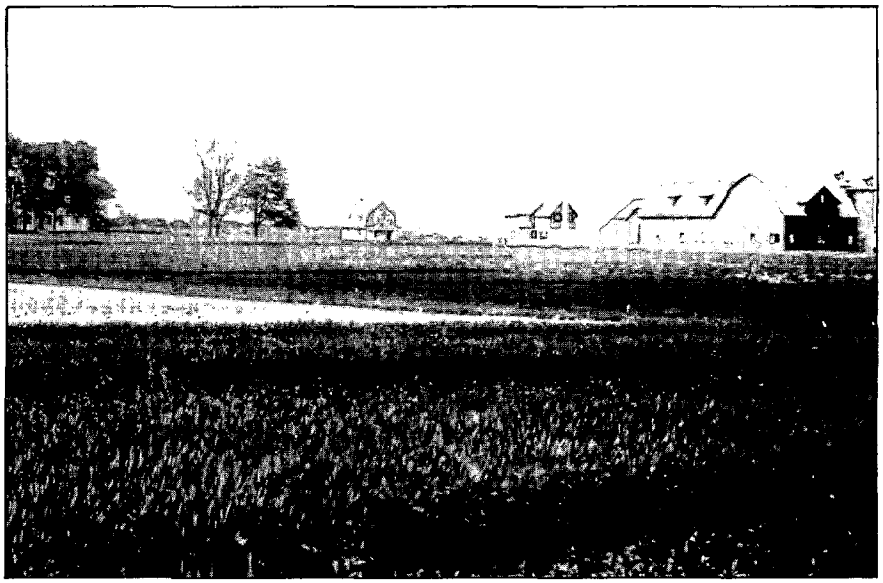
By 1906 Harry Hayward had replaced Neale as director. In 1908 Hayward was referred to as a dean in Delaware College, the first in the college's history. He served as dean of agriculture and director

of the experiment station until 1919. During his tenure, the General Assembly voted $20,000 (1907) for the college to acquire the 220 acre Pie farm just south of the Pennsylvania Railroad tracks and voted additional funds in 1909 to build a barn and other farm buildings. Under Hayward's direction, enrollment of students in agriculture began to grow. And by this time, the Hatch Act with amendments was providing $30,000 to support the agricultural research which grew in scope under Hayward.

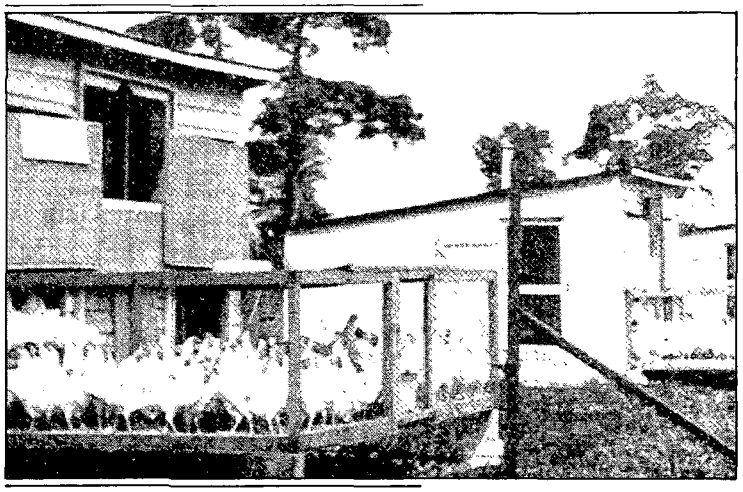
In 1919 Charles McCue became dean and director and served in those posts until 1939. During his tenure, the need to increase efforts to disseminate the results of the experiment station research became evident. In 1911 the General Assembly appropriated $4,500 for agricultural extension work, specifically to carry out field demonstrations with fertilizers, crops and tillage systems, and to interest youth in agriculture. This predated the national system of a federally supported state extension system by three years. In 1914, a state cooperative extension system was established at each of the land-grant colleges. During the 1920s and 1930s research focused on extensive investigations into the use of fertilizers, varietal testing of agronomic and horticultural crops, plant disease and insect control experiments, dairy cattle improvement, the beginning of experimentation on poultry (particularly the rearing of chicks in confinement), buffering action of soils and marketing of farm products, as well as studies on farm taxation and farm tenure.

In 1921, Delaware College was merged with the Women's College to become the University of Delaware. The school of agriculture continued to contain the experiment station and the extension system as part of its organizational structure.

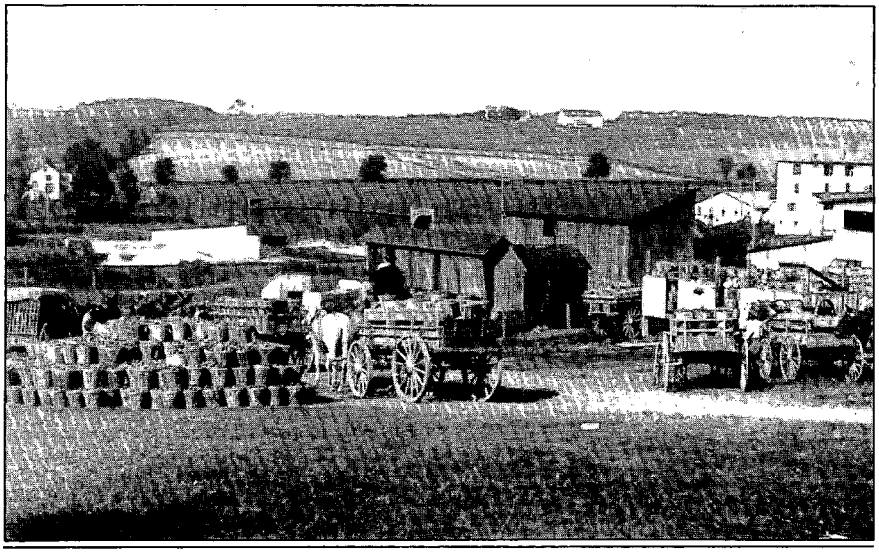
In 1939, George Schuster became dean and director, serving both roles until 1943, when he continued as dean of the school of agriculture and George M. Worrilow became director of the experiment station. Worrilow became dean upon Schuster's retirement and served until 1965 when he was replaced by Wil-



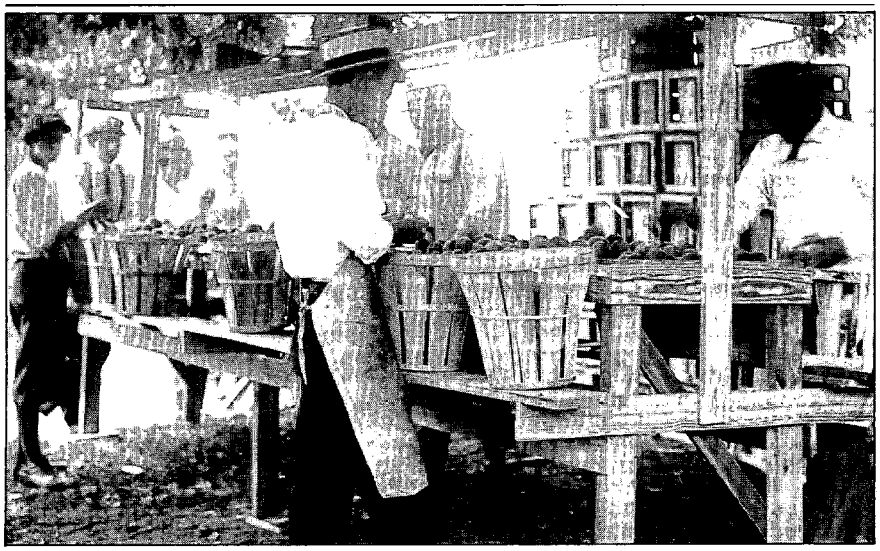
The Experiment Station farm in Newark allows researchers to work with livestock as well as vegetable and grain crops. The buildings pictured above are still in use.



During the 1930s, the university's chicken flocks were housed in the structures pictured. University flocks are now raised indoors in a controlled environment.



Tomatoes were once an important crop in Delaware. In 1911, the site near Paper Mill Road in Newark, pictured above, was home to a busy tomato canning factory. Below, a 1915 photograph depicts the hand-packing of peaches.



liam E. McDaniel who served as dean and director of the experiment station until his retirement in 1977. Those positions were then assumed by Donald F. Crossan, the first native Delawarean and graduate of the University of Delaware to hold the two posts.

During the fall of 1938 efforts were begun to obtain state support for increased agricultural research facilities. Governor W. W. Bacon appointed a commission to look for a suitable farm site in Sussex County. On August 30, 1941, the John A. Tyndall farm of 310 acres was purchased at public auction for $7,555. Research on apple orchard soil management studies, strawberry fertilization and watermelon and peach variety trials were among the first experimentations. Plans for a broiler house were also initiated that year. In the decades of the 1940s and 1950s, research in the experiment station continued to be largely applied to solving problems of a current nature, with continued emphasis on grain crops, vegetable crops, crop fertilization, soil testing and dairy herd improvement. The beginning poultry industry stimulated research in poultry nutrition and broiler management and early studies on the control of avian leucosis and coccidiosis diseases. In addition, studies on the economics of broiler production were initiated.

The Delaware station also helped discover and develop an important group of fungicides known as the Dithiocarbamates. This chemical group dominated the field of commercial fungicides for several decades. The station carried out significant research on pectins and pectin chemistry, and the first efforts were begun on efforts to control mosquitoes. They were a major pest due to the prevalence of tidal streams and marshes throughout the state.

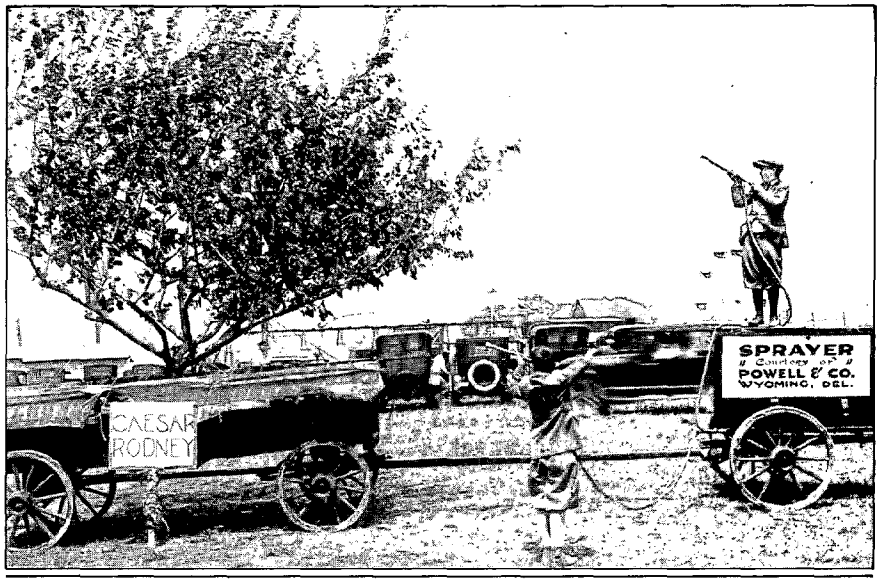
By the 1960s, the Delaware station was well-known for its leadership in the development of the least-cost-diet concept of feeding broiler chickens. This required an integration of the knowledge of the poultry nutritionist, the statistician and the economist to develop alternative nutrition and energy sources

to produce efficient growth rates at the least possible cost. Experiment station scientists worked closely with broiler industry personnel for a number of years until the industry was trained in the concept and could take over the calculations for themselves. Computer data-handling spurred this development to the highly refined procedure it is today.

The 1960s also saw the beginning of intensified research on poultry diseases, particularly those involving viruses, and continued research on the control of leucosis, coccidiosis and Gumboro disease. Poultry housing and management research along with nutrition research was increased. Research on poultry marketing and food distribution gained national recognition. Similarly, the research on mosquito control through marsh management practices and the assistance in the discovery of an environmentally safe mosquito larvacide brought national recognition to those efforts. In the decade of the 1960s, a slow evolution toward a balance of basic and applied research began. The increasing sophistication of agribusiness, including production agriculture, demanded more detailed research that often had objectives that were not of the short-range, immediate-problem-solving mode. Rather, the research programs often had at least an objective of digging deeper into the basic cause of current problems. This evolution continued to mature through the 1970s and into the 1980s.

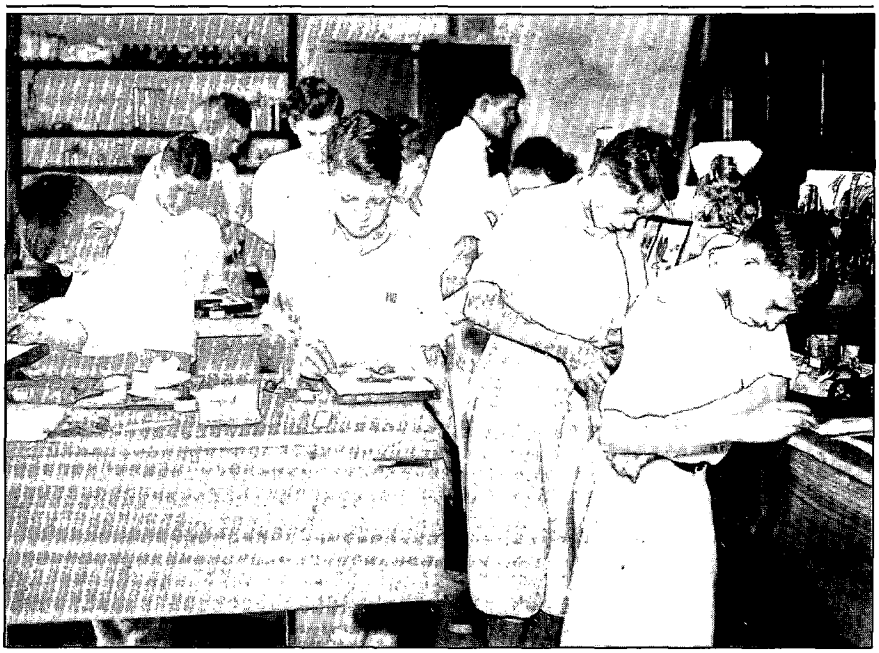
Currently, the University of Delaware Agricultural Experiment Station leads the Mid-Atlantic states in a number of areas and is contributing significantly to solving some of the more important agri-industry challenges. Faculty researchers in the college are nationally recognized leaders in avian disease investigations, viral vaccine development, efficient poultry housing, and poultry growth and management. The college has established an exceptionally close relationship with the poultry industry. The benefits to the poultry industry in all of its aspects can be measured in the millions of dollars.

Delaware faculty lead the studies on dairy cattle management in urban prox-



Two Delaware youth take aim at a State Fair display. The portable sprayer spewed pesticides on afflicted plants, trees and shrubs.

Below, an experiment station entomologist works on a 4-H project with youth, circa 1934.



Farm tours help acquaint both the farming and the non-farming public with agricultural research.

imity and are among the first to use computer-assisted feeding programs to reduce costs without reducing productivity. In addition, a team of soil scientists and plant nutritionists has evolved to bring their area of agricultural research to regional recognition. Delaware farmers have access to an excellent soil testing service backed by in-depth research that results in sound, unbiased fertility recommendations.

Closely linked to the soils area is that of investigations into agricultural impacts on water quality. Again, Delaware researchers lead the way in understanding nitrate and other chemical movement in the soil water. This knowledge makes possible intelligent recommendations on the proper application of manures and commercial fertilizers in irrigated and non-irrigated field situations.

Additionally, a strong research program in biological insect control coupled with a major integrated pest management program has resulted in significant savings to those farmers using insecticides. As a consequence the program has enhanced the quality of the environment by reducing potential surface and groundwater contamination. Faculty are also providing meaningful economic impact assessments to the state of Delaware as it grapples with challenges of resource considerations such as land use.

Faculty in the department of food and resource economics (formerly agricultural and food economics) have contributed significantly to understanding Delaware's rural and agricultural economies. Information generated via research in the department is frequently sought and used by state planners, policy makers and government agencies. A particular interest since the late 1960s has been the nature and impact of the tourism industry in the state. In the early 1970s, a survey-based, input-output model was developed for Sussex County which assisted in identifying the significant impact of the broiler industry on the economy and contributed to several policy decisions in that county. More recently, departmental research has identified the role and characteristics of small farm operators in the state. In addition, further research in input-output analysis has identified economic interrelationships in the entire state economy. Most recently, department faculty cooperating with extension personnel and Delaware's Department of Natural Resources and Environmental Control contributed extensive information on residents' views about growth and environmental quality to the Governor's Task Force on the Inland Bays. These examples demonstrate the department's focus on and success in applied research in rural and agricultural economics.

The Hatch Act of 1887, and its amended 1955 version, was very clear about the goals of the act, specifically "to aid in inquiring and diffusing among the people of the United States useful and practical information on subjects connected to agriculture, and to promote scientific investigation and experience respecting the principles and applications of agricultural science."

The Delaware Agricultural Experiment Station continues to work toward those goals. In many areas it has succeeded and excelled. The decade ahead will see even more sophisticated areas of science evolve, and University of Delaware Agricultural Experiment Station scientists will be at the forefront of more than a few of them. A mission accepted 100 years ago is reaffirmed today.

Extension food and nutrition specialist Dr. Sue Snider and area 4-H agent Joy Sparks collaborating on a videotape that teaches 4-H'ers baking skills and nutritional guidelines.

Videos teach 4-H'ers the science of bread making

Delaware 4-H leaders are taking today's video technology into the kitchen to teach youngsters how to bake bread, and the programs they're using may soon be available to other youth nationwide through Cooperative Extension.

Last year, with a $2,000 grant from Nabisco Brands, Delaware area 4-H agent Joy Sparks and extension food specialist Dr. Sue Snider developed, videotaped and demonstrated five educational programs on the science of bread making. As a result, more than 140 young people in 10 4-H clubs are participating in breads projects this year.

"Youth today seem entranced by the television set," says Sparks. "We decided to see if we could build on that fascination to create interest in baking breads."

The video demonstrations she and Snider produced include such topics as the functions and measurement of ingredients, making muffins, making biscuits, making yeast breads and shaping yeast breads. The tapes are in Beta, VHS and 3/4-inch format and are available from the extension office in each county.

In addition to the five tapes, Sparks and Snider developed a nine-page leader's guide which outlines the key points made in each video lesson and provides questions to ask 4-H'ers to make sure they understand the concepts presented. The training also stresses the nutritional value of bread in the diet.

Videotapes were chosen as the medium for the breads message because of their portability and availability. "More than one-third of America's 86 million households and over three-fourths of the schools have VCRs," Snider says. "The electronics industry predicts another 12½ million will be sold next year."

Sparks and Snider also discovered that volunteer leaders like using videotapes. "Many leaders have a VCR in their home, so they feel comfortable having their club watch the videotape and then move into the kitchen to practice and develop the skills observed," Sparks says.

The leaders prefer videotapes over slides that get bent or movie film that gets stuck in the projector. "Plus a tape can easily be rewound so you can look at a segment over and over," Snider adds.

In the fall of 1985 Sparks and Snider trained 21 adult and teen volunteers from nine clubs in the use of the videos and in their actual preparation of breads from different flours. Trainees learned to shape different rolls from one type of dough. They were also introduced to a range of yeast bread and quick bread recipes including whole wheat bread and sweet potato biscuits.

When the leaders returned to their clubs, the response to the new project was overwhelming. During the first six months after the project was introduced, at least 250 4-H'ers participated in breads evaluation as part of county and state food judging contests.

Club members demonstrated their new expertise in several other ways as well. The Hollymount Club (Lewes) made 50 small loaves of bread for their local Meals on Wheels Christmas dinner. While practicing their yeast bread shaping skills, the Westville 4-H Club (Camden-Wyoming) went even further and created a dough basket to hold the many different shapes of rolls they made. Newark's Fantastics 4-H Club decorated a Christmas tree with dough ornaments.

In October 1986, Snider presented a portion of the breads training program at the Northeast Regional 4-H Leader Forum, which was hosted by Delaware Extension.

Teachers praise 4-H embryology project

Take five incubators, five dozen eggs, one 4-H agent, plenty of willing teachers, and what do you get? An embryology project that teaches students reading, writing and 'rithmetic skills, in addition to enhancing their understanding of biology. The most remarkable aspect of the project—aside from the fluffy yellow chicks—is the impact that just one 4-H agent, using one project, can have on so many youngsters. This project illustrates Cooperative Extension's outreach. An agent gives information to members of the community—in this case, teachers—who in turn give it to others—their students.

The embryology project has been used by 4-H agents in all three of Delaware's counties since the early 70s. Mark Manno is the energetic 4-H agent who coordinates the embryology project in New Castle County's public and private schools. Armed with incubators and fertile eggs, he's been visiting schools since 1980 to help students witness the miracle of life firsthand. During the county's 1985-86 school year, 203 classes with a total of 4,994 students participated in the project.

"The project has tremendous flexibility," says Manno. "It's been used by kids of all ages, by teachers in all grade levels, and in all kinds of classes from science to religion and math to English. The project is limited only by the imagination of the teachers and their students."

4-H, the youth education branch of Cooperative Extension, supplies plenty of supporting materials. In addition to the incubators and eggs from the University of Delaware farm, teachers receive a comprehensive folder that includes information on fowl anatomy, embryological development, egg incubation, and even a trouble-shooting chart for eggs gone awry.

Throughout the year, Manno gives numerous presentations on the project at both public and private schools in the county. Typically, he conducts a meeting with teachers several days before he brings incubators and eggs to the classrooms.

To educate the teachers, Manno uses lecture, a film of hatching chicks, and a set of jars containing chicken embryos that document the development of a red dot of tissue on an egg yolk to a yellow chick folded upon itself waiting to be born. He also opens the floor to a question-and-answer session.

"The project is really quite easy, but inevitably some of the chicks won't hatch," he says. "However the class can still learn about development by opening an unhatched egg and determining at what stage the embryo stopped growing." Manno gets a lot of repeat customers for the embryology project. "Schools that use this project for successive years seem to get more and more innovative," he says.

For example, advanced science students often make a window in an eggshell to observe a growing embryo. They carefully remove a small portion of the shell, taking care not to destroy the underlying membrane. A clear protective cover is placed over the window and carefully sealed with wax. The embryo can then be observed with its heart beating and limbs moving.

The 4-H embryology project grows bigger every year as more teachers learn of its many applications and want to share the experience with their students.

Breeding and screening corn for disease resistance

A major objective of the Delaware Agricultural Experiment Station's corn breeding program is the identification and development of disease resistance. In 1984, plant geneticist Dr. James A. Hawk, plant pathologist Dr. Robert B. Carroll and master's degree candidate Jose Ureta evaluated 770 plant introductions and 573 inbreds for their resistance to the fungus that causes gray leaf spot, a leaf blight on corn. This disease has been associated primarily with no-till and, depending on field conditions, can cause severe yield losses.

Based on the 1984 results, 41 inbreds and 10 plant introductions were re-evaluated the next year in replicated trials for resistance to the fungus. All the plant introductions that were grown rated resistant. And highly resistant inbreds were also identified. Low moisture conditions due to the 1986 drought did not favor gray leaf spot development last summer, but Hawk and two graduate students plan to conduct extensive screenings for the disease during the 1987 growing season.

Under Hawk's direction master's degree candidate James F. Ulrich, using tissue culture techniques, is attempting to develop a laboratory method for identifying corn hybrids with gray leaf spot resistance. Ulrich obtained embryos of several resistant and susceptible corn inbreds last summer and used them to produce corn tissue (callus) in artificial culture. He is using this callus to see if he can detect resistance to the fungus. If the idea works, he may be able to develop a rapid laboratory screening procedure which plant breeders could use to develop resistant corn lines.

Resistance to gray leaf spot is only one of the traits Hawk looks for in his yearly search for promising genetic material which commercial seed companies could use to produce the hybrids planted in Delmarva cornfields. He routinely develops and screens over 100 new corn lines each year.

A graduate student pollinates a corn plant as part of an experiment station research project designed to develop corn hybrids tailored to Delmarva needs.

The plant geneticist, who holds a joint research/extension appointment, also supervises the university's annual commercial corn hybrid trials. In the 1986 trials, he and extension assistant Robert Uniatowski evaluated 137 hybrids from 22 companies at three locations throughout Delaware. The hybrids were grown under irrigated and non-irrigated conditions, using both no-till and conventional tillage. Each entry was rated for yield and grain moisture, as well as standability, stay green and other desirable agronomic traits. Results of each year's trial are shared with area farmers for use in making cropping decisions.

Corn borer survey passes half century mark

For the past 50 years entomologists with the Delaware Agricultural Experiment Station have conducted an annual European corn borer (ECB) fall abundance survey. During September, designated cornfields throughout the state are scouted as part of a plant pest survey and detection program. The survey provides valuable information for researchers and also helps farmers control this pest.

The program began in 1936 when 30 sites were selected, 10 in each county, to be examined for borer infestation. Each year since then cornfields nearest the original sites are examined. A mean number of borers per plant is used to anticipate relative pest abundance the following year. ECB infestations are counted on 20 consecutive plants at five spots in each field. Two cornstalks in each spot are sliced open and borers are counted and collected.

Insect ecologist Dr. Charles E. Mason then rears the borers in the laboratory to determine how many are parasitized by the insects and diseases that provide natural population control for this pest. If any borers die, he tries to determine the cause of death. The surviving borers are then added to those in the department of entomology's ECB research colony to refresh its gene pool.

Delaware usually has two broods of corn borers each year. The second brood, which is surveyed in September, gives rise to a partial third brood. But it is the second one which overwinters in cornstalks, becoming the first brood to damage plants the following year.

By comparing the estimated overwintering ECB population with data from past years, Mason can determine changes in population trends in various parts of the state; and extension pest management specialist Joanne Whalen can advise growers on cropping activities that will minimize corn borer injury the following year. Results of each fall abundance survey are available to farmers via Delaware Extension's crop pest telephone hotline as well as through College of Agricultural Sciences progress reports, USDA releases and local newspapers.

Bursal disease variant vaccine developed

Abnormally high losses in Delmarva broiler flocks from respiratory diseases prompted a massive cooperative effort two years ago among University of Delaware and University of Maryland research and extension personnel and representatives of Delmarva Poultry Industry, Inc. (DPI) to uncover the causes and possible solutions to this problem. As part of the effort, in May 1985 University of Delaware virologist Dr. John K. Rosenberger began a modified sentinel bird survey involving eight commercial flocks belonging to three integrated broiler companies.

The survey showed that the vaccine currently being used to protect chicks against infectious bursal disease (IBD) was not providing protection against four virus isolates. Infectious bursal disease (also known as Gumboro disease) destroy's the chicken's immune system, leaving the bird more susceptible to respiratory diseases that produce high mortality rates in Delmarva flocks.

Rosenberger, who was involved in much of the original research leading to the characterization and control of bursal disease, immediately set out to develop a new vaccine that would protect broilers against the variant isolates as well as standard IBD viruses. By December 1985 he and his coworkers were field testing an experimental vaccine, with good results. When flocks were immunized with the new vaccine, mortality on problem farms was decreased by 60 to 70 percent as compared to controls. By February 1986 the vaccine was in commercial use on Delmarva.

Experimental vaccine for infectious bronchitis

Infectious bronchitis is an acute and highly contagious respiratory viral disease of chickens. It exists in nearly all areas where chickens are raised. Coughing, sneezing and nasal and eye discharges are common signs. Broiler chickens suffer from slowed development, increased mortality (especially in young chicks) and increased carcass condemnations at the processing plant due to virus damage to respiratory tissues and internal organs. Laying flocks stricken by this virus-caused disease experience a sharp decline in egg production. The disease costs the U.S. poultry industry millions of dollars annually, despite routine vaccination.

Live respiratory virus vaccines, when given by the spray method, often cause severe reactions and mortality in commercial chickens. With partial assistance from a three-year U.S. Department of Agriculture competitive animal health research grant, Dr. Jack Gelb Jr., a virologist in the department of animal science and agricultural biochemistry, is developing a less virulent temperature-sensitive (ts) experimental vaccine to control infectious bronchitis virus (IBV).

Laboratory experiments indicate the ts IBV virus grows poorly at temperatures approximating internal body temperatures of poultry. Results of preliminary laboratory trials in chickens are encouraging and show the ts vaccine to be less virulent than the conventional vaccine.

Gelb hopes to have his experimental new ts vaccine ready for field testing within a year.

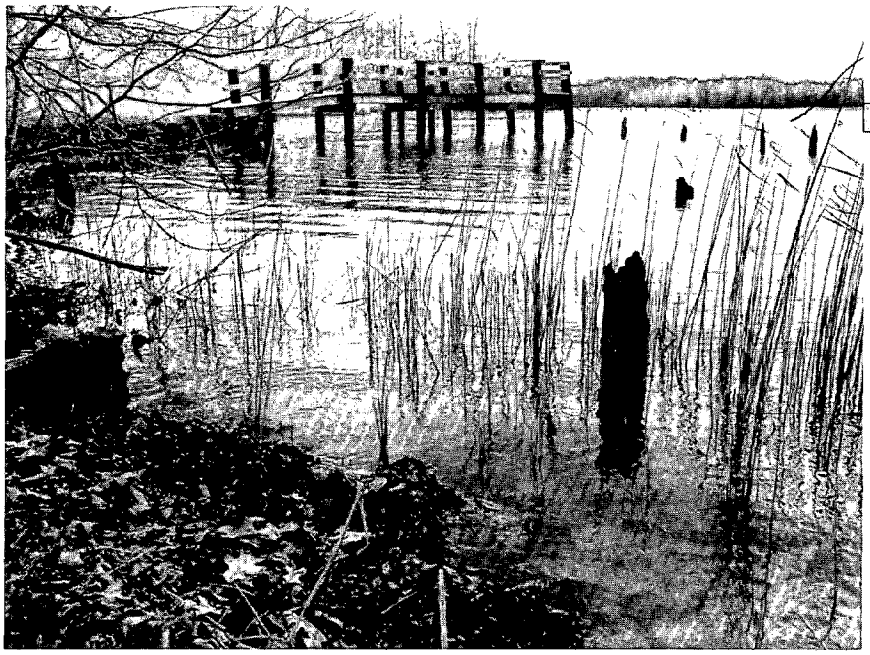
Broiler house misting systems

Broiler producers on the Delmarva peninsula use overhead misting systems for evaporative cooling in broiler houses on hot days. The standard nozzle size and operating pressure (100 psi or less) used by most growers provide adequate emergency cooling but leave an unacceptable amount of water in the litter. This water contributes to the formation of a crust on litter, increased ammonia release and other problems, and precludes routine use of misting for dust, humidity and temperature control. A recent University of Delaware study indicates that switching to high pressure spray nozzles can minimize this problem.

Extension agricultural engineer Dr. James N. Scarborough tested various nozzle and pressure combinations in the laboratory and an empty broiler house to determine the amount of water deposited on the litter by various nozzle/pressure combinations. He then developed equations relating the wetting rate to operating pressure and relative humidity. The procedure he used also provided an indirect method of measuring misting-system cooling capacity.

Scarborough found that high pressure systems (250 to 600 psi) with relatively smaller nozzles deposited significantly less water on the floor than the systems currently in use. This improves litter quality and bird comfort, and can reduce condemnation rates at processing. A higher cooling rate per unit of water was also achieved.

An integrated broiler company on the peninsula is now testing the system.



Protecting Delaware water resources

Clean water is important for Delaware's recreation, manufacturing and agricultural industries. Residents of Kent and Sussex counties depend on groundwater for their water supply. Research has shown that septic tanks, poultry manure and fertilizer are causing high nitrate concentrations in the groundwater in certain parts of Sussex County. There has also been a gradual degradation of water quality in the Inland Bays.

Since the early 1970s researchers and extension specialists in the College of Agricultural Sciences have been working to protect and improve the quality of Delaware water resources. This effort involves people with a wide range of expertise—engineers, poultry and livestock scientists, agronomists and soil scientists, economists, and entomologists.

To help state residents develop better water management practices, agricultural engineers have gathered information on the movement of potential pollutants from agricultural sources through the soil, surveyed groundwater supplies for the presence of nitrates and other chemicals, studied crop water uptake rates, experimented with manure storage and handling methods, evaluated the impact of agricultural drainage on water quality, and designed irrigation schedules to maximize yields of various crops while minimizing nutrient leaching and runoff.

Extension and experiment station engineers have also played a leading role in developing the no-tillage production systems now used extensively in Delaware to grow corn and soybeans. Besides their economic advantages, these cropping systems are considered BMPs (best management practices) because they reduce soil erosion and in some cases may reduce nutrient loss.

Irrigation management

Delaware's irrigated cropland acreage has more than doubled over the past decade, thanks in large part to extension and research efforts. Studies at the College of Agricultural Sciences have shown that irrigation can more than double corn yields on the sandy soils of southern Delaware. Because of the likelihood of drought during the growing season, irrigation is a valuable form of yield insurance on these soils.

A well-managed irrigation program can also benefit producers in other parts of the state. Irrigation allows farmers to diversify into vegetable production, making them less dependent on declining grain prices for their income.

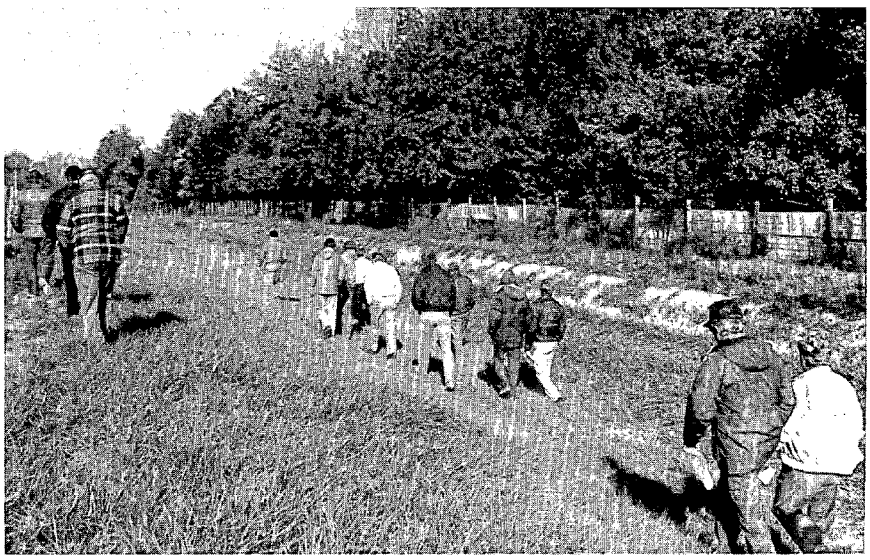
Using data on crop water use collected at the Delaware Agricultural Experiment Station, extension agricultural engineer Tom Williams has helped develop irrigation schedules which make it possible for growers to irrigate according to crop needs and soil water-holding capacity, rather than by some fixed timetable or rule-of-thumb approach. Proper irrigation scheduling can save a minimum of $5 an acre in pumping costs while improving yields.

With today's low corn prices farmers who irrigate this crop also need to know how much nitrogen they should apply during the growing season to produce an economic bushel.

Based on long-term research on corn nutrient needs, the University of Delaware soil testing laboratory recommends applying between 180 and 220 pounds of nitrogen per acre. The lower rate can be used if the nitrogen is put on in multiple applications. Generally, farmers are advised to apply no more than one-fourth of the nitrogen at planting, with the balance applied by sidedressing, fertigation or a combination of the two.

Research at the Experiment Station has also shown how much the nitrogen fertilizer rate can be reduced if leguminous cover crops or animal manures are used. As economic pressures increase, more Delaware farmers are contacting their extension agricultural agents for information on adjusting the rate to account for these organic nitrogen sources.

Farmers who design and manage their irrigation systems properly not only reap a more economic harvest, they also help protect groundwater supplies by reducing runoff and leaching from their fields.



Top photo shows typical erosion problem facing feedlot managers. The bottom photo shows how soil management practices can solve such problems.

Managing feedlot and cannery waste

In the spring of 1984, the president of the Draper-King Cole company in Milton met with the chairman of the Sussex Conservation District (SCD) to request help in solving waste management problems associated with the company's beef feedlot operation. This operation uses potato pulp and other cannery by-products to finish cattle housed on five farms. Water and manure runoff from the lots was causing erosion and other environmental problems.

In response, SCD developed a task force involving experts from the U.S. Department of Agriculture Soil Conservation Service, Delaware Department of Natural Resources and Environmental Control (divisions of environmental control, fish and wildlife, and soil and water conservation), the Delaware Department of Agriculture (division of forestry), Cooperative Extension and the Agricultural Stabilization and Conservation Service, plus Draper-King Cole representatives.

Soil Conservation Service personnel developed alternative structural and vegetative plans for each site to control water flow and reduce runoff and presented these plans to the task force. University of Delaware extension environmental quality specialist J. Ross Harris submitted a manure management plan.

At the request of the committee, extension farm management specialist Dr. Don Tilmon developed a computer program to evaluate the costs of alternative waste and water management proposals, as well as possible returns or savings which might result. This made it possible for Draper-King Cole management to determine which options were economically feasible and which were likely to have the best long-term impact on company operations. In some instances, Tilmon's analysis showed that feedlot carrying capacity could actually be increased by making certain modifications, thus increasing potential profitability.

Since extensive changes and a sizeable investment are involved, the overall project is expected to take a number of years to complete. However, after two seasons, grass filter channels, water diversion terraces with water control outlets, grass filter areas, ditches and grass waterways have been implemented on three farms to control water flow and to reduce runoff. Progress is evident and impressive, though some problems remain to be solved. Plans for the other four feedlots are still being developed.

At the same time that Draper-King Cole initiated the feedlot management project through SCD, the company approached extension specialist Harris directly for help on another problem—handling of waste water from their vegetable cannery. Working with consulting engineers and processing plant managers, Harris designed a spray irrigation plan that applies this waste water to cropland used to grow feed for the cattle operation.

Following that plan, 18 center pivot irrigation systems capable of delivering 1.5 million gallons of water per day have been installed on eight spray fields totalling 541 acres. Using the water this way makes it possible to bypass the cannery's waste water treatment plant, thus reducing treatment costs. Irrigation with the nutrient-rich water has significantly reduced fertilizer costs while increasing crop

yields on the acreage involved. The irrigation equipment and related underground piping represents a sizeable capital investment that will eventually be offset by the savings realized.

One problem which had to be solved before implementing this innovative system was the presence of high levels of salt in the water. Harris suggested and Draper-King Cole engineers developed an in-plant modification which makes it possible to recycle some of the salt water. In the process, the amount of salt needed by the cannery was reduced by 500 tons per year, for an estimated annual savings of $25,000. The change also improved quality of the water for spray irrigation purposes.

On-site sewage systems

In some parts of southern Delaware on-site residential sewage treatment systems have been identified as a major source of nitrate contamination of groundwater. As a result, two years ago the Delaware Department of Natural Resources and Environmental Control (DNREC) developed new sewage regulations which include significant changes involving residential on-site systems. Kent and Sussex County residents are most affected by the regulations—particularly people who own property on the sandy soils surrounding the Inland Bays.

Sussex lot owners and developers have expressed concern that they might have to install more expensive systems than anticipated. In some cases, certain undeveloped lots are now ineligible for either a traditional septic system or an even more expensive type.

With the partial assistance of DNREC and Sea Grant funds,University of Delaware agricultural engineers Dr. Kenneth M. Lomax and Dr. William F. Ritter have been studying the technical aspects of improved sewage disposal and alternatives to the system written into the new state regulations.

One alternative low pressure pipe (LPP) system has been studied extensively by agricultural researchers in North Carolina and seemed appropriate for Delaware. With DNREC approval, in 1986 one of these systems was installed for a house on the grounds of the College of Agricultural Sciences' Research and Education Center near Georgetown. Even before the first year's evaluation was complete, DNREC accepted the LPP for regular use in Delaware. According to Lomax, the characteristics of this system, which has a pump to uniformly distribute effluent, make it useful for the high water table conditions in Sussex County. Specifically, DNREC regulations permit the LPP system for sites where the seasonal water table is 24 inches or deeper from the ground surface.

The agricultural engineers are also studying an experimental waste management system which uses evapotranspiration technology new to the on-site treatment of domestic sewage. The idea for this system was suggested to DNREC by William Pleasants, a civil engineer who lives in Bethel, Del. Pleasants proposed this approach be considered because he felt it might be less expensive than any of the systems that currently meet DNREC requirements, and it would still be environmentally sound. DNREC gave Lomax and Ritter a second grant to test the idea, which Lomax has developed into a prototype system that is now being studied.

Tracking nitrogen release from poultry manure

Poultry manure contains valuable plant nutrients—especially nitrogen—but it varies considerably in nutrient content due to animal diet, bedding, storage practices, moisture content and handling. Determining the optimum manure rate for a crop is thus more complex than determining how much inorganic nitrogen fertilizer to apply. To further complicate matters, most of the nitrogen in poultry manure is in organic forms which must be microbially broken down to become plant available.

Applying too much manure wastes valuable crop nutrients, costs farmers money and contributes to groundwater contamination—particularly in areas of intensive poultry production such as the Delmarva peninsula, where roughly one-tenth of the nation's broilers are produced.

Soil scientist Dr. J. Thomas Sims is studying the rate of nitrogen release from various poultry manures for corn production in an effort to help farmers use this valuable resource more efficiently while protecting the environment.

With partial support from a Delmarva Poultry Industry, Inc. (DPI) grant, Sims has developed a model for estimating available and residual nitrogen in poultry manure. The model is based on a three-year field study using laboratory and field measurements of nitrogen release from the manure and subsequent corn uptake.

Sims' research shows that by adopting the management practices he used, farmers should be able to optimize yields and minimize nitrogen losses when using poultry manure and so increase returns without sacrificing yields or polluting groundwater.

The soil scientist compared the effects of poultry manure and fertilizer nitrogen applied at four rates in the production of irrigated corn, using

both conventional and no-tillage methods. His findings suggest that it is possible to attain equivalent yields with poultry manure while reducing nitrate leaching.

Since Delaware farmers no-till much of their corn acreage, Sims looked closely at the effect of poultry manure versus commercial fertilizer (ammonium nitrate) on no-till yields. Based on three years of data, he found that when poultry manure was used in a no-tillage system, yields approximated those from ammonium nitrate. The same was true for conventional tillage. This suggests that corn farmers should encounter no major problems from surface applications of poultry manure.

Tillage method had no effect on soil nitrogen when poultry manure was used, but no-till treatments which received ammonium nitrate had greater levels of inorganic nitrogen in the soil at the June and July sampling dates. Sims suspects that nitrogen leached below 24 inches by June 4 may be unavailable to corn plants later in the season, a fact which could reduce yields. He found no excessive levels of inorganic nitrogen in plots receiving poultry manure at any of the application rates used.

In a related research project one of Sims' advisees, Carolyn C. Bitzer, conducted a laboratory study aimed at determining how fast soil microorganisms release nitrogen from 20 different poultry manures. Bitzer, who received her master's degree in August 1986, looked at both broiler and roaster manures—some direct from poultry houses and some stockpiled under various storage conditions.

She found that when mixed with soil in the laboratory, a major portion of the organic nitrogen fraction in poultry manure became mineralized to a plant available form within two weeks. Mineralization occurred at a similar rate regardless of manure type.

These findings challenge the commonly held view of poultry manure as a slow-release source of nitrogen. They could also mean that farmers will need to change their management schemes for using manure.

In a related field study of nitrogen release, Bitzer compared plant response to three very different poultry manures in conventional corn grown under irrigation on two soil types at the College of Agricultural Science's Research and Education Center near Georgetown.

Using the nitrogen availability formula developed by Sims, she achieved corn yields comparable to those of ammonium nitrate-fertilized controls. (Sims bases his availability formula on both the amount of immediately available nitrogen and the potentially mineralizable organic nitrogen in the manure.)

At the highest rate of nitrogen applied (240 pounds per acre), yields at one site ranged from 216 to 228 bushels per acre with poultry manure, versus 212 bushels with ammonium nitrate. At the second site, yields at the same nitrogen rate ranged from 153 to 191 bushels per acre with manure, versus 182 bushels with ammonium nitrate.

During the 1986 growing season, Bitzer and Sims grew unfertilized corn on the same plots in order to measure the amount of residual nitrogen provided by the manure which was applied in 1985. Results of this work are still being analyzed.

New high-tech equipment speeds soil test procedures

Computerized equipment purchased with the aid of a special appropriation of $29,000 from the state of Delaware is now being used in the college's soil test laboratory to analyze soil samples from growers, home gardeners and researchers. This equipment is helping expedite routine analyses of the more than 10,000 samples submitted each year.

The new instrumentation allows laboratory personnel to take advantage of recent technological advances when testing samples for soil pH and extractable phosphorus, potassium, magnesium and calcium. Many of these procedures depend on microprocessors built into the equipment.

The upgrading includes a powerful microcomputer able to interface with these microprocessors through the university's main frame computer. The interfacing computer will eventually be able to take data from several instruments and transfer it electronically to the software used to computerize fertilizer recommendations.

By eliminating most of the time-consuming paperwork involved in graphing, reading charts and transferring numbers to report forms, the new equipment speeds the reporting process and reduces the chance of human error. Some test results are also more precise. The new technology also makes lab procedures more flexible and should facilitate adoption of future analytical equipment as this becomes available.

Looking ahead - Biotechnology at the Delaware Experiment Station

Donald F. Crossan

Biotechnology, the "in" word for the 1980s, means the use of living organisms or their components in industrial processes. The concept is not new to agricultural scientists, who have used many biotechniques to improve animals and plants. But today's emerging techniques allow manipulation of living cells in ways that were either impossible or very difficult a few years ago.

The new techniques include plant cell and protoplast (the basic cellular material minus a cell wall) culture, animal embryo splitting and transfer, and the recombining of basic genetic material by direct action on the hereditary units (genes) of all cells.

These approaches to biotechnical research have resulted in modification of microbial and plant cells to an extent not possible before. For example, nearly 50 difficult-to-propagate plant species have been regenerated from protoplasts—single, naked cells originating from the tissue of a mother plant. A single cell can be manipulated to produce sister cells and, finally, a whole plant.

This opens up the possibility of fusing naked protoplasts from different plants and creating shared genetic backgrounds, a process both difficult and time-consuming to carry out by normal pollination techniques.

It is also possible to detect genetic diversity in the protoplasts that might not be expressed in the whole plant. Using protoplast culture, scientists have developed varieties of corn that are resistant to damage by a specific herbicide. This, in turn, allows for a more efficient spectrum of weed control in that crop.

A common problem in regular pollination between related species of plants is a tendency toward genetic incompatibility and the consequent abortion of embryos. Through the technique of tissue culture it has been possible to culture the embryo tissue before abortion. Using this application, new varieties of citrus have been developed that otherwise would not have been possible from normal genetic approaches.

Dr. Sherry Kitto, a specialist in ornamental horticulture at the Delaware Agricultural Experiment Station, has developed the technology for producing synthetic seeds, using carrots to develop her model system. The procedure involves initiating asexual plant embryos from callus tissue taken from seedling carrot stem tissue. The embryos (tiny plants) thus generated are given a protective synthetic coating that quickly dissolves when the "seeds" are watered, allowing healthy plants to emerge. Synthetic seeds would be very useful for establishing uniform stands of high-value commercial crops such as hybrid celery.

Plant pathologist Dr. Allen Morehart has an experiment station project, using funds from the federal McIntire-Stennis Forestry Research Act, designed to identify variants of hardwood tree tissue cultures which resist invasion by *Nectria galligena*, a canker-producing fungus. This laboratory approach allows the screening of much more material than would be possible in the field and may greatly shorten the search for resistance to this disease.

In animals, embryo transfer and manipulation now permit production of more offspring of superior genetic backgrounds. The use of recombinant DNA techniques with viruses opens up the potential for producing more efficient vaccines against serious viral diseases afflicting animals. Viral genes that are responsible for development of immunity to an infection by producing protein antigens may be identified, chemically isolated, and introduced into a bacterial host that is used to produce commercial quantities of the antigen.

Similarly, it is possible through this type of biotechnology to place genes that influence growth or feed efficiency into bacterial cells and subsequently produce quantities of the growth-regulating substances. These can then be injected into animals or fed to them to increase growth and feed conversion efficiency.

Experiment station molecular biologist Dr. Robin Morgan is using recombinant DNA techniques to identify key genes and gene products of Marek's disease virus. Such genes and gene products may supply the tools for constructing recombinant vaccine strains for use in the control of this disease. Genetically engineered vaccines may be more effective than those developed using conventional techniques.

Avian physiologist Dr. Larry A. Cogburn, another experiment station scientist, is experimenting with thyrotropin-releasing hormone (TRH) secreted by the chicken's hypothalamus. Unlike pituitary growth hormone, which must be injected, this hormone can be administered in the feed. Preliminary tests showed that chickens fed this natural hormone grew to market weight 14 percent faster on 10 percent less feed. Trials are underway now at the College of Agricultural Sciences Research and Education Center near Georgetown to evaluate the effects of TRH on a broiler flock under simulated field conditions.

If the hormone works as Cogburn hopes, it would greatly reduce poultry production costs and radically shorten growout time. A 10 percent reduction in feed costs would mean an annual savings to the poultry industry of between $450 and $500 million nationwide—$45 million on the Delmarva peninsula alone.

Biotechnology is a science in transition. The opportunity to use this science to improve agricultural productivity and efficiency is evident. The challenge is to use it wisely for the benefit of mankind.

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Clifford B. Keil, Ph.D.
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Genetics of Insect Resistance

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Charles E. Mason, Ph.D.
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Richard G. Weber, Ph.D.
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Joanne M. Whalen, M.S.
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Thomas K. Wood, Ph.D.
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FOOD AND RESOURCE ECONOMICS

Gerald L. Cole, Ph.D.
Professor & Chairperson of Department
Resource Economics

J. Richard Bacon, M.S.
Research Associate I

Sharon M. Brucker, M.A.
Research Associate III

Joachim G. Elterich, Ph.D.
Professor, Production Economics
Farm Management

Conrado M. Gempesaw, Ph.D.
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Production Economics
Farm Management

Carl L. German, M.S.
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Rural Development

Mark G. Kooker, M.S.
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John D. Pesek, Ph.D.
Senior Programmer/Analyst

R. Dean Shippy, D.Ed.
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Head Teacher Educator

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U. Carl Toensmeyer, Ph.D.
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Agricultural & Natural
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LONGWOOD GRADUATE PROGRAM

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Adjunct Professor, Plant Science

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PLANT SCIENCE

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Turf Management

Kirk J. Himelick, M.L.A.
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State Leader, Home Economics

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State Leader, Agriculture,
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George F. W. Haenlein, D.Ag., Ph.D.
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KENT COUNTY

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GEORGETOWN RESEARCH AND EDUCATION CENTER

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Ralph V. Lowe, Jr., B.S.
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George W. Malone, M.S.
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Edwin M. Odor, D.V.M.
Poultry Pathologist &
Senior Scientist

Edward L. Wisk, M.S.
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Crops

AGRICULTURAL EXPERIMENT STATION FARM—NEWARK

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Superintendent

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Research Associate II
Poultry

Paul H. Dennison, B.S.
Research Associate I
Greenhouse

James F. Insinga
Research Associate I
Livestock & Gen. Maintenance

Richard E. Morris, B.S.
Research Associate II
Dairy

Anthony A. Timko
Research Associate I
Agriculture

A. PROJECT TITLE:

Evaluation of Upright Dry Edible Beans Cultivars in Delaware To Assist Market Development

B. PERSONNEL:

Richard W. Taylor
Extension Specialist--Soil Fertility and Crop Management
Delaware Cooperative Extension System

Robert Uniatowski
Extension Assistant
Delaware Cooperative Extension System

C. OBJECTIVES:

1. To evaluate at several locations in Delaware the yield potential of dry edible bean cultivars currently available.

2. To describe the agronomic characteristics of available dry edible bean cultivars.

3. As appropriate identify insect and disease problems as related to varietal responses.

D. PROJECT DURATION:

April 1, 1987 to March 31, 1988

E. JUSTIFICATION:

Diversification of farm cropping systems is needed to boost farm income in Delaware. Current cropping systems rely on corn, soybeans and small grains although there are current surpluses of each of these crops. Additionally, on a large proportion of Delaware's arable acreage corn must be grown under irrigation in order to reduce risk.

Edible dry beans were successfully grown at several locations in Delaware during the 1986 growing seasons. Farmer success and acceptance of black turtle beans indicates potential for dry edible bean production in Delaware. New upright bush or semi-bush types of beans mean that this new crop can be harvested with equipment presently in the inventory of most farmers.

Dry edible beans when properly produced currently offer a marketable product. Information describing available cultivars' adaptability to Delaware conditions is not available. To successfully develop a viable production system for dry edible beans will require evaluation of available cultivars' yield potential and their important agronomic characteristics. Since gross return for dry edible beans and potential profits

are based on a price per pound basis, high yielding cultivars adapted for Delaware conditions must be identified for the major soil types in the state.

F. PREVIOUS WORK:

During the 1986 growing season several growers were successful in growing black turtle beans in Delaware. Yields although below the level which could be expected were encouraging when considered in the light of the drought situation in Delaware during a large portion of the growing season for dry edible beans. Information is available from other dry bean producing regions but must be successfully transferred to Delaware conditions.

G. PROCEDURE:

Available cultivars of black turtle beans, red beans, and pink beans which have either an upright bush growth habit or a short vine upright habit will be solicited from all identifiable sources. These growth habits have been selected because they offer the possibility of using currently available combines for harvesting dry edible beans. Adjustments must be made on the combines but harvest of these beans should not interfere with soybean harvest so as to allow combines to be readjusted for soybean harvest. This will be important since the dry edible bean cultivars will be incorporated as a separate group in the testing program for public soybean cultivars. Incorporation into an existing program should facilitate the testing procedure as well as conveniently allow testing in a number of locations across the state.

Dry edible beans will be seeded about 1.5 inches deep in a well prepared seedbed on 30 inch or narrower rows. Narrow rows between 12 and 20 inches wide are best for bean production. Seeding rate will be about 60 lbs/A or 6 seeds per row foot on 30 inch rows. Fertility will be 50 lbs N/A. Phosphorus and potassium fertilizer will be added where soil test results indicate a shortage of these nutrients. A separate herbicide program may be needed since herbicide tolerances are narrow for dry edible beans as compared to soybeans. The studies will use a randomized, complete block design and have a minimum of four replications.

All cultivars will be carefully observed throughout the growing season to identify desirable and undesirable agronomic characteristics and to identify insect and disease problems which may be important. For insect and disease problems which are severe enough, varieties will be evaluated for their resistance or tolerance.

H. Budget:

1. Funds Requested
   a. Travel (seeding, fertilization, collect data)---$2,500
   b. Supplies (seed, fertilizer, chemicals, etc.)----$1,000
   c. Contracted student hourly services----------$3,500

2. Total Amount Requested----------$7,000

2/1/87

1. WHY HAVE WE SELECTED DRIED EDIBLE BEANS AS AN ALTERNATIVE CROP?

WE MUST ALL RECOGNIZE THE FACT THAT WE NEED TO DO THINGS IN THE FUTURE A LITTLE DIFFERENT THAN WE HAVE IN THE PAST IN ORDER TO SURVIVE ON THE FARM.

RIPPLES ARE STARTING TO APPEAR ON THE SURFACE OF THE WASHINGTON POND. IF ANY OF YOU SAW THE CBS NEWS BROADCAST LAST THURSDAY NIGHT, YOU HEARD DAN RATHER REPORT THAT CERTAIN FACTIONS OF THE GOVERNMENT ARE BEGINNING TO CALL FOR AN END TO FARM SUPPORT PROGRAMS.

THIS PAST YEAR (1986), THE SUPPORT PROGRAMS FOR ALL OF AGRICULTURE COST THE COUNTRY MORE THAN THE TOTAL NET FARM INCOME OF ALL U.S. FARMERS. THIS IS A SHOCKING REVEALATION WHEN WE STOP TO THINK ABOUT IT!

FARM PROGRAMS ARE PROJECTED TO COST IN THE RANGE OF 28 BILLION DOLLARS FOR 1986/87 OR ABOUT $140.00 FOR EVERY MAN, WOMAN AND CHILD IN THE UNITED STATES.

SUPPORT PROGRAMS, ON THE SCALE THAT WE HAVE SEEN THEM ARE NOT AT ALL LIKELY TO CONTINUE.

THE GRAMM-RUDMAN ACT IS ALREADY FORCING MANY BUDGET CUTS AND WE HAVE NOT EVEN GOTTEN INTO THE SECOND YEAR OF THE FIVE YEAR PLAN. WE MUST PLAN NOW TO LIVE WITHOUT THESE PROGRAMS.

THIS FACT, COUPLED WITH THE FACT THAT THE CURRENT OUTLOOK FOR CORN AND SOYBEANS IN 1987 IS NO BETTER THAN 1986 (OR 1985 FOR THAT MATTER), HAS PROMPTED A NEW WAVE IN AGRICULTURE.

DIVERSIFICATION HAS BECOME THE NEW BUZZ WORD.

IT IS DIFFICULT FOR US, THE DEPARTMENT OF AGRICULTURE TO COME TO YOU, THE GRAIN FARMER AND SAY, "YOU NEED TO CHANGE AND GROW VEGETABLES", OR "YOU NEED TO CHANGE AND GROW FRUIT". THAT IS ALMOST LIKE TRYING TO CONVERT AN AUTOMOBILE MECHANIC TO AN AIRPLANE MECHANIC---!

ASSUMING THAT YOU HAD THE DESIRE, (WHICH YOU PROBABLY WOULD NOT), FIRST OF ALL YOU WOULD NEED A COMPLETE NEW SET OF TOOLS AND EQUIPMENT.

AND SO, YOU HAVE IMMEDIATELY REACHED THE FIRST MAJOR OBSTACLE - A CAPITAL EXPENDITURE FOR NEW EQUIPMENT.

BY BRINGING DRIED EDIBLE BEANS TO YOUR ATTENTION, WE ARE TRYING TO PROVIDE YOU WITH AN ALTERNATIVE CROP WHICH CAN BE GROWN AND HARVESTED WITH MUCH THE SAME EQUIPMENT THAT YOU HAVE NOW.

WE ARE TRYING TO PROVIDE GROWING INFORMATION, CONTACTS, MARKETING INFORMATION, AND ANY OTHER ASSISTANCE THAT WE CAN IN ORDER TO HELP INTERESTED FARMERS IN MAKING THE DECISION TO GROW OR NOT TO GROW.

BLACK TURTLE BEANS ARE NOT THE ONLY ANSWER AND WE CERTAINLY ARE NOT TRYING TO TURN YOU AWAY (100%) FROM CORN AND SOYBEANS FOR WHICH WE HAVE A GOOD LOCAL MARKET.

2. CURRENT AREAS OF PRODUCTION IN THE UNITED STATES.

PLEASE OPEN YOUR INFORMATION PACKET AND LOOK FOR THE APPENDIX B AND C PAGES THAT I HAVE COPIED.

BLACK TURTLE BEANS ARE CURRENTLY PRODUCED IN NEW YORK STATE AND MICHIGAN. MICHIGAN PRODUCES ABOUT 70% OF ALL BLACK TURTLES AND NEW YORK STATE PRODUCES ABOUT 30% OR THE REMAINDER.

TOTAL UNITED STATES PRODUCTION FOR 1985 WAS 237,000 CWT OR 23,700,000 POUNDS.

3. THE MARKET - WHERE DO WE SELL AND WHEN?

FOR OUR LIMITED PRODUCTION LAST YEAR THE ANSWER WAS SIMPLE.

OUR FARMERS, RICK AND MARK, TRUCKED THEIR BEANS TO FRED FRYER'S OPERATION AT HANEY GRAIN NEAR HANOVER.

IF WE WERE TO GET INTO SOMETHING SUBSTANTIAL IN THE WAY OF PRODUCTION WE MAY WANT TO STORE THE BEANS HERE ON THE SHORE AND TRUCK THEM UP LATER AT A TIME MUTUALLY CONVENIENT FOR FRED AND THE FARMER.

BEANS CAN BE STORED IN BINS WITH NO PROBLEMS IF THE MOISTURE IS DOWN IN THE 16-18% RANGE. FRED FRYER WILL EXPLAIN MORE ON THIS LATER.

4. WHAT ADVANTAGES MIGHT WE HAVE IN THE MARKET?

WE HAVE TWO DISTINCT ADVANTAGES HERE IN DELAWARE.

ONE IS THAT WE COULD COME ON THE MARKET WITH OUR BEANS SOMEWHAT AHEAD OF MICHIGAN AND NEW YORK.

THE EDIBLE BEAN MARKET IS OF SUCH A NATURE THAT THE BUYERS ALWAYS WANT THE FRESHEST BEANS AVAILABLE OVER BEANS THAT HAVE BEEN IN STORAGE.

THE SECOND ADVANTAGE IS OUR GEOGRAPHIC LOCATION. BEAN BROKERS AND BUYERS KNOW HOW TO TURN THIS INTO PROFIT DOLLARS FOR THEMSELVES.

HAVING THESE TWO ADVANTAGES THOUGH IS NOT ALL _____, WE MUST NOT LOSE SIGHT OF QUALITY AND TO MAKE A REAL NICHE IN THE MARKET FOR OURSELVES WE NEED TO PRODUCE A QUALITY BEAN LIKE THOSE TWO GENTLEMEN PRODUCED LAST YEAR.

5. WHAT IS A REASONABLE PRICE TO EXPECT FOR EDIBLE BEANS GROWN IN DELAWARE?

LAST YEAR BLACK BEANS GROWN IN DELAWARE BROUGHT 17¢ AND 19¢ RESPECTIVELY FOR TWO LOTS. THE DIFFERENCE BEING THAT RICK CLENDANIEL CLEANED AND BAGGED HIS CROP AND HE WAS ABLE TO GET A PREMIUM FOR THIS EFFORT.

AS MANY OF YOU HAVE SEEN IN THE "BEAN MARKET NEWS BULLETIN" (THAT WE HAVE BEEN MAILING TO THOSE PERSONS WHO CAME TO LAST YEARS' EDIBLE BEAN MEETING), BLACK TURTLE GROWER PRICES HAVE FALLEN SLIGHTLY TO ABOUT $14.00 CWT CURRENTLY.

THIS IS A SEASON NORM AND PRICES WILL FIRM AND RISE AGAIN NOW THRU JUNE.

6. HOW DOES THIS COMPARE WITH CORN AND SOYBEANS?

TRIALS RUN IN 1984 IN DELAWARE BY A LARGE SEED COMPANY SHOW RESULTS OF 2,712 POUNDS OF TURTLE BEANS PER ACRE.

ASSUMING WE COULD GET A CONSISTANT YIELD OF 2,500 POUNDS PER ACRE AT .17, THE GROSS WOULD BE $425.00 PER ACRE.

OUR AVERAGE YIELD OF SOYBEANS AT 30 BUSHELS PER ACRE (1985 CROP) AND A $5.00 PRICE PRODUCES AN INCOME OF $150.00 PER ACRE.

IF WE DROP THE TURTLES TO 2,000 POUNDS PER ACRE THE GROSS WOULD BE $340.00 PER ACRE.

I DON'T THINK I HAVE TO TELL YOU THAT SOYBEAN PRICES HAVEN'T BEEN QUITE THAT GOOD - - - .

CORN PRICES AT THE CURRENT LEVELS OF 1.70 TO 1.75 PRODUCE SIMILAR COMPARISONS.

ONE WORD OF CAUTION HOWEVER, THE PRICES WE ARE DISCUSSING HERE LOOK ENTICING - - - BUT, EACH OF YOU SHOULD LOOK AND LISTEN CAREFULLY TONIGHT.

WE HAVE BROUGHT TO OUR MEETING, SOME GOOD MEN TO GIVE US THEIR VIEWS, BOTH PRO AND CON.

COMMODITY DEVELOPMENT SECTION
ANNUAL REPORT

FISCAL 1987

The Commodity Development Section is charged with improving the market position of Delaware agricultural and food products. This is done through programs of Market Development; Market and Product Research; Product Promotion; and Agricultural Statistics Collection and Dissemination.

The section consists of 2 marketing specialists, 1 secretary, and a program manager.

Major activities undertaken in FY 1987 in each of the above-mentioned program areas include:

MARKET DEVELOPMENT

---BUYER VISITS. Marketing specialists visited terminal markets, chainstore warehouses, and other major produce buyers in Philadelphia, New York City, Boston, Portland, Washington, Baltimore and Norristown. 37 major buyers were met personally and given crop and marketing information, plus a sample of merchandising materials available from the department.

Approximately 50 in-state buyer visits were made to supermarkets, large farm markets, and other retail food outlets. It is impossible to measure the effectiveness of these visits, however we have had many shippers tell us they made sales as a result of our contacts.

---TRADE SHOWS. The Delaware Agricultural Products exhibit and marketing specialists traveled to 6 major trade shows, and 5 small shows. Samples, literature, merchandising materials, and general information was distributed at these shows again resulting in definite sales by Delaware farms and companies. Major shows include: Produce Marketing Association, San Antonio; Philadelphia-Delaware Valley Restaurant and Food Show, Philadelphia; United Fresh Fruit and Vegetable Show, Orlando; Puerto Rico Food Exposition, San Juan, PR; Mid-Atlantic Food Processors, Baltimore; and Mid-Atlantic Direct Marketing Assoc. Show, Wilmington, DE.

---EXPORT SERVICES. The section provided 250 foreign trade leads to about 12 companies mainly through arrangement with Foreign Agricultural Service. At least 4 shipments of Delaware product was moved through trade leads provided by this department. Section also published first-ever Delaware Food and Agriculture Export Director for distribution to over 300 buyers Worldwide and all U.S. Agricultural Trade Offices overseas. In addition, free use of the Section's Telex equipment was made available to small exporters. International Trade Specialist also coordinated several visits by potential foreign buyers.

---LOGO. The Delaware Agricultural Products Logo program was expanded with an increase in consumer advertising, mainly

targeted at 18-65 year old Delaware area consumers. DELAWARE TODAY, NEWS JOURNAL, and the DELAWARE STATE NEWS were used. National trade publications were also targeted. They included THE PACKER, and the PRODUCE NEWS. Mailings encouraging the use of the logo were sent to over 400 packers, processors, and shippers. The potato industry is the highest percentage user with almost 100% of the growers using the logo on their bags. Other uses include: waxed vegetable boxes, plastic bags, bread bags, certified seed, apple boxes and bags, stickers on melons and other produce, and numerous point of sale items such as posters, price cards, and shelf strips. A Delaware Household Survey revealed that approximately 20% of adult Delawareans are familiar with the Logo. 93% say they would show preference to a product bearing the logo if it were of similar quality to product not bearing logo. Informal tests have proven this.

---CHECK-OFF MANAGEMENT. This Section coordinated the check-off for the Delaware Soybean Board and the Delaware Potato Board. In addition, we coordinated market development and promotion projects for these Boards using their funds with matching state funds. Election for these Board members were also handled by our section. Although not an official state-legislated check-off Board, the Delaware Fruit Growers assessment and market development programs are also coordinated by Commodity Development.

---SPECIAL ASSISTANCE. These programs were handled by various marketing staff on an 'as-needed' basis. They included working with the Legislature and Campbell Soup Co. officials to encourage Campbell officials not to sell the Wheatley Processing facility in Clayton; working with the Laurel Auction Market to develop a national advertising program, to increase the number of buyers at the Market; and the coordination of the Emergency Hay Allocation Program. 145 Delaware farmers received over 60,000 bales of hay during the drought from 11 states. Our marketing specialists helped locate the hay and arranged transportation, allocation and unloading.

MARKET AND PRODUCT RESEARCH

---NEW CROPS. Commodity Development is responsible for researching the production and marketing potential of several new commodities. Funding for University research and actual on-farm research of 8 new commodities was provided. The crops include navy beans, pink beans, kidney beans, small red Mexican beans, yellow-flesh potatoes, size b potatoes (Small Wonders), and seedless watermelon. On farm research support included locating and paying for seed, packaging design and development, and promotion.

---AG MARKET SEARCH. A major survey of bulk food buyers in the Coastal Sussex County area revealed an immediate market potential of $4.5 million for local vegetables, dairy products, meats, poultry and fruit. Names of bulk food buyers willing to buy direct were distributed to growers who expressed an interest in selling to them. 81% of the bulk food buyers returning the survey indicated a willingness to purchase products locally.

---DIRECT MARKETING PRICE SURVEY. We began what we hope will be a yearly survey of prices received by direct marketers of fruits and vegetables in Delaware. Season high, low, and average prices for most of the top produce items were reported. This information was made available to all survey respondents. Tracking of the prices on a year to year basis should be helpful to the industry in determining competitive prices.

PRODUCT PROMOTION

---PUBLICATIONS. Commodity Development compiled and printed 6 different product brochures (produce, apples, pork, Christmas tree, strawberries, and sheep & wool). A total of approximately 45,000 copies were distributed. 25,000 copies of the Delaware Farm Markets Director were distributed. About 5000 Delaware Dairy bookcovers were given to school children, and a coloring book for school children was intiated for distribution in the fall of 1987. A 4-color wall poster featuring Delaware grown foods was printed and about 2000 copies were distributed. Finally, the Delaware AGenda, a monthly newspaper style publication was compiled and mailed to 1200 people each month and an additional 3800 copies were placed at various locations around the state.

---PROMOTIONAL EVENTS. These included the Delaware Food Festival, Laurel Melon Festival, Rehoboth Beach Watermelon Day, Harrington Raceway Apple Night, Middletown Strawberry Festival, Delmarva Chicken Festival, Milford Harvest Festival, Harrington Heritage Days, Farm and Home Field Day, Delaware State Fair, Ag Week at Dover Mall, Delaware Agricultural Industry Dinner and more. In excess of 275,000 people were exposed to Delaware agriculture through these promotions. Over 51,000 promotional handouts were distributed at these events. They included custom imprinted corn butterers, hand fans, rulers, pencil caddies, bumper stickers, jar openers, caps, book covers, shirts, and aprons.

---TRI-STATE PROMOTION. Commodity Development coordinated the Delmarva Produce Promotion program involving the departments of agriculture of Delaware, Maryland and Virginia. Using a shared budget of about $9000. Delmarva produce was promoted using TV ads, radio ads, newspaper, billboards, and in-store materials. Approximately 120 stores representing 8 major chains participated in the three state region.

AGRICULTURAL STATISTICS COLLECTION AND DISSEMINATION

---DELAWARE AGRICULTURAL STATISTICS SUMMARY. This Summary is funded by Commodity Development with actual collection of data being conducted by the Delaware Agricultural Statistics Service, USDA. We are responsible for overseeing the data collection and publishing an annual Summary. Data includes crop and livestock production, prices received, marketing channels, weather summaries, crop conditions, production expenditures, and meat inventory and slaughter. A weekly summary on crop conditions and weather is mailed to the media, agricultural leaders, and

other subscribers.

---MARKET NEWS. Daily prices, movement, and other marketing information is provided to the public daily through our Market News Line, 302-697-2345. FOB prices on potatoes leaving Delaware and prices from Philadelphia, New York and Baltimore are updated daily at 4 p.m. during the potato season. In addition, prices and quantities for produce sold at the Laurel Auction Market is reported.

---INFORMATION SERVICES. The section maintains communication services including PRONET, AGNET and DIALCOM for use by the public. Instant market information, weather, prices, etc. is available using a PC and modem. Growers and brokers call daily for this vital information. Membership is also maintained in the United Fresh Fruit and Vegetable Association and the Produce Marketing Association. Membership gives us discounts when exhibiting at trade shows and also allows us instant access to both organization's huge library of marketing and merchandising resources.

Delaware Cooperative Extension
University of Delaware — Delaware State College

Richard E. Fowler, Director
Townsend Hall
Newark, DE 19717-1303
302-451-2504

January 12, 1987

MEMORANDUM

TO: Senator Thurman G. Adams
Representative G. Wallace Caulk, Jr.
Mr. Roland Derrickson
Mr. Bill Sammons
Mr. Grover Biddle
Dr. Jerry Cole
Mr. Carl German
Mr. Ed Kee
Mr. Jerry Vaughn
Mr. Dave Woodward

FROM: R. E. Fowler R. E. Fowler

RE: Agricultural Producer Processing

Cooperative Extension, the Small Business Development Center at the University of Delaware, and the Delaware Department of Agriculture are working to explore opportunities for agricultural producer processing and marketing in Delaware.

David Park has gathered the attached information about the Texas program. I would like to have a meeting to discuss the subject further and to discuss a study tour to Texas to see how the program can be applied to Delaware.

I propose that we meet for breakfast at Anthony's Restaurant, in Wyoming, at 7:30 a.m. on Friday, January 16.

If you cannot make it, would you please call me at 451-2504? The meeting will take about one hour.

Thank you for your consideration of this matter.

REF/ma
Att.

cc: Dr. D. F. Crossan

Delaware
Small Business Development Center
Suite 005 Purnell Hall, University of Delaware,
Newark, Delaware 19716 (302) 451-2747

MEMORANDUM

January 6, 1987

TO: R. E. Fowler

FROM: David Park

SUBJECT: Producer Processing

I am sorry for the delay in relaying this information. I did not speak with the Texas people until December 19th, and left for a vacation before I could bring you up to date.

I was able to speak at some length with Sal Valdez, Director of Agricultural Development in Texas.

As their program was described to me, they have integrated the "Producer Processing Assistance" (PPA) with two other developmental programs that are targeted at promoting Texas products to international markets and domestic markets.

The nature of services provided to PPA clients is quite varied. In some cases they may simply provide information, using an automated data base or an established list of contacts with market information. At the opposite end of the spectrum, they will perform feasibility studies for clients. As one would expect, the extent of the services are, more or less, determined by the needs and capabilities of the clients. As you can see from the enclosed sample studies, this work is quite extensive. (The samples represent the extremes of report complexity). In fact, Mr. Valdez estimates that the average project requires 300 man hours to complete, and often requires a team effort.

To deliver these services, they have assembled a field staff of approximately 30 people of varied backgrounds. The variety of skills was intended to provide the broad capability and facilitate a team approach. Industries or products have not been targeted for service. Instead, they prioritize projects as they receive requests based on philosophical guidelines and apparent feasibility of project. The field personnel are charged with performing outreach in order to promote the service. The annual direct appropriation for the Texas program is approximately $2 million.

Clearly the scope of the Texas program is larger than we could expect to develop in Delaware. Nevertheless, the nature of the work does suggest that the PPA function could be introduced to the State.

The studies tend to be organized with an agricultural component and a business component. It is obvious that the Extension could provide the agricultural element and the SBDC could provide the business element. However, it is equally obvious that development of the program would require that both parties be able to commit substantial personnel and monies dedicated solely to this program. For our part, this would mean the addition of staff and securing additional federal and/or matching funding.

My feeling is that the development of a similar, scaled down program for Delaware warrants additional study. I think this means that we need to have more detailed discussions with Texas so that we can develop concrete ideas regarding the program elements, delivery mechanism, organizational structure, cost of the project and potential funding sources. I believe that this will likely require an on-site visitation of the Texas program by interested parties.

cc: Jerry Vaughn
Dave Woodward

Proceedings - Producer Processing Committee

January 16, 1987 - 7:30 a.m.
Anthony's Restaurant

Those present:
Grover Biddle
Jerry Cole
Roland Derrickson
Dick Fowler
Carl German
Ed Kee
Dave Park
Bill Sammons
John Smolko
Jerry Vaughn
Jay Windsor
Dave Woodward

(Please note: See attached list for title, address and telephone.)

The following are comments and observations shared at the meeting.

There is about a nine- to one-dollar return in processing.

There is a need to provide strong marketing support of Delaware agriculture.

There may not be sufficient crops for export in Delaware.

We need this type of group discussion. The input of agriculture is import

Insufficient production may be a problem for certain commodities so far as export potential is concerned.

Processing is the focus of this group's effort:

a) producer processing
b) sales to existing processors

Current processors are looking for new products.

How can this effort mesh with current processing and possibilities for expansion.

Limitations:

a) labor
b) environmental impacts (regulations)

Labor situation will become more critical.

Vermont has started production processing:

a) cheese
b) honey

A restructuring of the family farm may turn up some labor that is now not fully utilized.

The Delaware Development Office is committed to the food processing industry.

Is this producer processing?

Governor Castle has a Commission on High Technology and Biotechnology. Some of this relates to the food industry.

This group needs to make linkages with representatives of these high technology study groups.

Cooperation is important.

Should we involve processors such as Vlasic and San-Del?

Target of this group is to increase profitability.

We want to make a Value Added Enterprises list for Delaware that will include vegetables, fruits, and meats.

The Laurel Block Auction, with the help of the Delaware Department of Agriculture, is conducting a survey of vegetable growers to see if growers would participate in a cooperative packing effort.

A bulk food buyer survey is being conducted of Delaware food businesses to determine need and possible uses of Delaware grown products.

An awareness of this group's activities should be shared with growers at vegetable growers and direct marketing meetings. Input should be encouraged from growers.

Currently, many food firms buy out-of-state produce.

Out of 3,000 farmers, only about 200-300 would be affected by a processing initiative.

Future mailings will include:

a) Alternative Agricultural Opportunities survey from the National Agricultural Library
b) Peasibility list (opportunities for producer processing)
c) Potential members of this task force
d) Schedule of agent training workshops - marketing
e) Schedules of training - Alternative Agricultural Opportunities

Next meeting: Thursday, February 26, 1987, 8:30 a.m., Anthony's Restaurant.

Production Processing Task Force

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April 6, 1987

MEMORANDUM

TO: Producer Processing Committee

FROM: R. E. Fowler *R E Fowler*

RE: Alternative Opportunities for Farmers

The primary purpose of our ad hoc committee is to explore producer processing.

Within that context is a broader mission -- to explore alternative agricultural opportunities.

Since Don Tilmon and I are on the National Extension Task Force, I will share pertinent information as it comes.

Thank you for your interest and support.

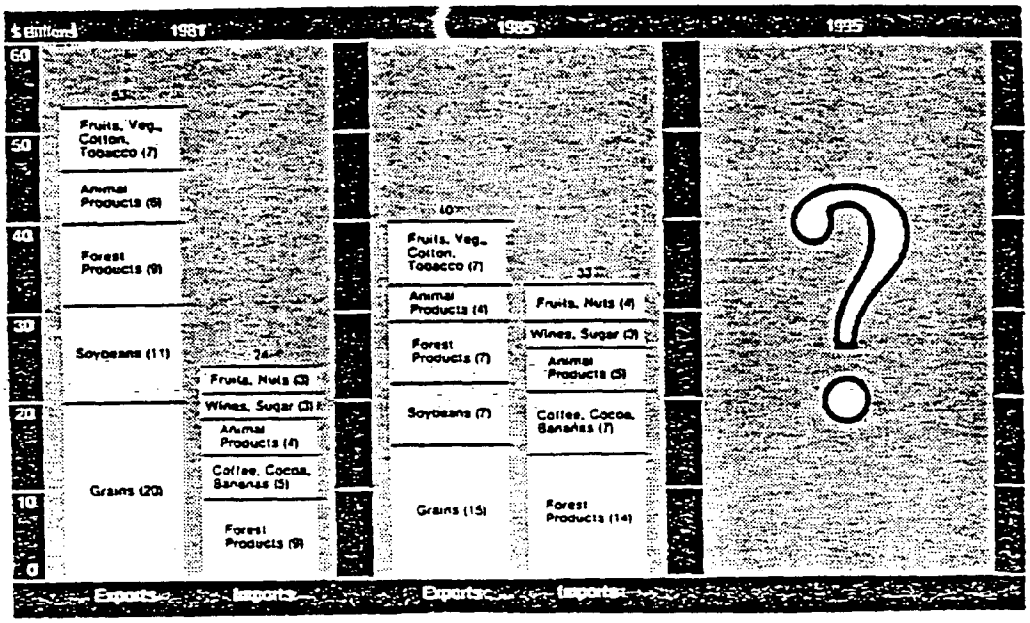
REF/ma
Encl.

Dr. Paul F. O'Connell
Hatch Act Centennial Speech
March 2, 1987

ALTERNATIVE OPPORTUNITIES FOR U.S. FARMERS

Finding new or alternative opportunities for U.S. Farmers is not a new topic, but is even more important today because of intense international competition and changing consumption patterns. Despite past successes in productivity gains, global economic change of the past five years have resulted in a considerable reduction in the export/import trade balance for the U.S., approximately a $22 billion drop from 1981 to 1985 (Figure 1). This development has had a reverberating impact on rural america, resulting in a considerable reduction in land values and financial hardships for many farmers.

Agricultural and Forestry Products
(Changing Trade Balance for U.S.)



To provide a more promising future, U.S. agriculture needs to diversify -- into both food and non-food production areas — moving away from overconcentration in a few major crop and animal products. American and foreign customers have many and changing tastes and preferences. To meet this volatile market situation requires an opportunistic agro-industry.

Alternative opportunities fall into two major categories:

1. Expanded uses for traditional farm products -- especially those in surplus, e.g., corn, wheat, cotton, soybeans, and dairy products.

2. Alternative enterprises like aquaculture and non-food products for industry, e.g., fats, oils, fibers, adhesives, and natural rubber.

At the Department of Agriculture, the Agriculture Research Service has expanded it's research efforts with surplus crops. Scientists are looking for more efficient conversion processes for fats, oils, and starch. In addition, the Cooperative Extension Service is implementing a three point education program in alternative opportunities.

There are several states giving special attention to this topic. A few that come to mind are Ohio, Iowa, Texas, Nebraska, and Oregon. Essentially all states are now looking for ways to diversify their agriculture.

The main thrust of this speech will be on commercialization, which is providing a market for a product. Finding ways to commercialize U.S. grown products is a prime responsibility of a small group in the office of Grants and Program Systems(OGPS), Cooperative State Research Service. Primary methods used are demonstration projects that bridge the gap between research results and commercialization. The projects are short-term, usually 2-4 years, with public/private partnerships established through USDA Cooperative Agreements. The demonstration projects are production size projects with real markets that provide plant managers with hands on experience. Capitalizing on millions of dollars and decades of research and development, projects are designed to build, within the private sector, an infrastructure which will initiate and sustain new emerging agro-industries.

But new ideas do not flow easily from the research bench to the market place. Scientific laboratories and libraries are overflowing with alternative techniques for producing, processing, and marketing goods and services. While some of these techniques are ready for adoption, others are not, and OGPS uses many sources of information, both within and outside of government, to determine which crops are commercially viable.

The private sector has a key role in the process. People experienced in buying and selling goods must identify the market. The government has tried developing markets in the past and have generally not done well. The synfuels project is an example of one failed attempt. A product champion should also come from the private sector i.e., someone who has faith in the potential success of a particular product. The probability of developing new outlets must be high and based on good solid analysis, but success of a project most often depends on an individual who strongly believes in the product. The private sector should be a major investor in the demonstration project. This is generally not limited to one firm, but a group of firms representing processing, marketing, equipment manufacturers, etc.

The philosophy underlying government involvement in demonstration projects recognizes that the processing and market sector cannot be expected to have a vested interest in U.S. agriculture. A third party is often needed to develop mutual interests. Also, studies at the Commerce Department and elsewhere show that long-term investment strategies in new enterprises can be encouraged by private/public partnerships. The public sector can fill in the following gaps for emerging industries:

-- Provides technical expertise through scientists at universities and in USDA agencies

-- Brings production, processing, and marketing sectors together. There is often not enough incentive present in any one sector to start a new domestic industry, but together the incentives are often sufficient.

-- When necessary, provides seed money to begin the project

-- Reduce regulatory roadblocks. Often, it is easier for government personnel to obtain clearance from federal, state, and local regulatory bodies that may have rules governing the establishment of any industry. These rules range from environmental restrictions to shipping plant or animal species across state lines.

To provide more insight into how demonstration projects function, the status and plans of the following project are highlighted -- GUAYULE, KENAF, CRAMBE/RAPESEED, AND HYBRID STRIPED BASSS.

A twenty-seven-month JOINT GUAYULE DOMESTIC RUBBER PROJECT between the Department of Defense (DoD) and Department of Agriculture was signed in 1986. Under the agreement, DoD is providing $11.1 million in funding. From this amount, $1.3 million is targeted for shrub maintenance at the Gila River Indian Community (GRIC) in Arizona. Ground will be broken in 1987 on an $8.3 million prototype plant in Arizona operated by The Firestone Tire & Rubber Company. The goal is to produce about 50 tons of rubber for test and evaluation to see if the rubber meets DoD's standards of heat-resistance and durability. A significant point is that DoD has agreed to purchase up to 20 percent of its annual tire-rubber requirements if the process works.

USDA will utilize an additional $1.5 million of DoD funds for technical assistance and cooperative agreements with universities and others to strengthen R&D efforts and explore alternative market opportunities. Within the same time period, the USDA, in partnership with the State Agricultural Experiment Stations, will provide an additional $5 million for guayule research.

The KENAF Demonstration Project was initiated in 1986 with a Cooperative Agreement between CSRS and Kenaf International. The objective is to demonstrate the economic viability of kenaf as a fiber of choice for use in manufacturing newsprint--a commodity that we currently import at a cost of $3.0 billion annually. The use of this crop will not replace wood chips as the major raw material source, but in some markets there are price and quality advantages, e.g., uses less ink, results in whiter paper, and requires less energy for processing. The growing area for kenaf is across the southern tier of the U.S.

Work in 1987 includes commercial paper machine and pressroom runs and evaluations which will affirm acceptance of the kenaf newsprint system from seed production to daily newspaper. Large-scale kenaf farming for newsprint manufacturing is not expected until the 1989 or 1990 growing seasons. Until this time, work will focus on conversion at existing mills, evaluating a second noncompeting market in the felt industry, planting more acreages in selected states, improvement of harvest and fiber handling methods, and development of public/private partnerships towards the commercialization of kenaf.

HIGH ERUCIC ACID FROM CRAMBE/WINTER RAPESEED INDUSTRIAL OILS. A planning conference was recently held as a cooperative effort sponsored by the USDA, Iowa State University, Kansas State University, and the University of Missouri. Conclusions provide evidence that current erucic acid oil markets rely on foreign sources but that production technology is sufficiently promising that a domestic production system can be established.

Uses of high erucic acid include selected nylon products used in gears, fasteners, tubing, and lubricants. For 1987, a strategic plan is being developed for directing efforts, with private industry providing input on the most promising markets to explore.

THE U.S. AQUACULTURE INDUSTRY is growing rapidly. Production in 1985 reached 535 million pounds and generated over $500 million to producers. The U.S. trade deficit in fish and shellfish continues to climb while per capita consumption of aquatic foods also continues to climb. In 1985, the net deficit for edible fish products was $3 billion. The total U.S. trade deficit in fish products, including those used for both edible and industrial needs, was $8.6 billion.

By the acts passed in 1980 and 1985, Congress encouraged the development of the aquaculture industry by authorizing the establishment of four aquaculture research, development, and demonstration centers in the U.S. in association with colleges and universities, State Departments of Agriculture, Federal facilities, and non-profit private research institutions. The Centers are located in Hawaii, Massachusetts, Mississippi, and Washington. Funding for FY 87 is $3.0 million.

THE HYBRID/STRIPED BASS (HSB) DEMONSTRATION PROJECT is intended to demonstrate the economic viability of HSB farming as a crop alternative for east coast farmers and watermen. Midwest production is also a possiblity.

East coast populations of striped bass have declined and most coastal states have prohibited fishing. The seafood industry is seeking alternative sources and farmers are seeking production alternatives. Production is intended to fill a market void at a premium price. A small, ongoing research project on the eastern shore of Maryland is being expanded to a production level demonstration farm for HSB using the expertise of federal, state, university and private interests. Approximately 30 acres will be involved initially and will produce at least 60,000 pounds of fish on 24 water acres. Production costs are estimated at about $1.00-$1.50/lb and gross sales at about $2.25-$2.75/lb. with the current New York price for larger striped bass about $4.00. Market areas will be identified, and a private marketing firm selected to handle marketing and contribute to market tests.

In addition to alternative crops USDA is exploring the potential of alternative farming methods. One is LOW-INPUT AGRICULTURE. This approach represents a counterpoint to technologies that emphasize yield enhancing. The key to this approach is the use of technologies that encourage internal generation of nutrients, e.g., use of nitrogen fixing species; and pest control that depends more on using rotation, spacial diversity, and cover crops. Purchased fertilizers and pesticides are still required, but at a reduced level. With lower commodity prices, farmers must find ways to reduce input costs and hopefully enhance net returns.

Some of these approaches are similar to practices more common several decades ago. What makes them more feasible now is improved understanding of how the various components of a cropping system operate and interact. In cooperation with in-house USDA agencies, State Agricultural Experiment Stations, the Cooperative Extension Service, and several non-profit institutions--such as, Rodale Institute, American Farmland Trust, and Rockefeller Brothers' Fund--a program is being developed to explore the potential of low-input systems and to monitor the performance of such systems in different climatic regions, soil types, and farm sizes.

Conclusion

In the overall consideration of the diversity of programs being examined — from guayule production for natural rubber to exploring the potential of a low-input system — A renewed push on finding alternative opportunities for farmers won't solve the current supply/demand imbalance in U.S. agriculture. However, it represents a positive, market-oriented response and the best long-term hope for farmers to gain back prosperity.

STATE OF DELAWARE
DEPARTMENT OF AGRICULTURE
DIVISION OF PRODUCTION AND PROMOTION
DRAWER D
DOVER, DELAWARE 19903

OFFICE OF THE
DIRECTOR

TELEPHONE: (302) 736 - 4811

MEMORANDUM

December 16, 1987

TO: Dave Woodward

FR: Bill Sammons BLS

RE: Strategies for Tomorrow's Farmer

I think we can boil down the Alternatives portion of the program into four areas:

1. Specialty or New crops

A. dry beans, sorghum, sunflowers, popcorn, certified seed, blueberries, yellow potatoes, ethnic vegetables, forestry

2. Specialty or New livestock ventures

A . crayfish, catfish, bass, buffalo, rabbits, broilers/roasters,

3. Producer processing

A . mushrooms, potato chips, herbs, jellies, honey blends, pork, beef, lamb, veal, winery, apple sauce, cheeses, butter,

4. Alternative opportunities

A . custom field work, grass mowing for highway department, schools, industry; hunting rights; vacation farms; bed and breakfast;

We could easily fill an entire day with these topics. But since we only have an hour and a half, we'll have to limit the speakers to about 10 minutes each.

Please consider these topics just a place to begin discussion on actual topics for the conference . Input from the county agents, the committee, and others is needed.

Let me know how we should proceed with the program.

ITEM K-2

Extension Circular 148
April 1987

1987 SUMMARY OF DELAWARE FARM FINANCIAL CONDITIONS

Gerald F. Vaughn

Delaware Agricultural Statistics Service
Delaware Department of Agriculture
Delaware Cooperative Extension

Delaware Cooperative Extension
University of Delaware — Delaware State College

Townsend Hall
Newark, DE 19717-1303

1987 SUMMARY OF DELAWARE FARM FINANCIAL CONDITIONS

Gerald F. Vaughn
Coordinator
Farm Financial Management Center

Annual surveys of Delaware farm operators and farm lenders were conducted to determine farm financial conditions as of January 1987. The surveys were funded by the State Department of Agriculture. The Delaware Agricultural Statistics Service conducted the surveys, and Cooperative Extension is reporting the findings.

* 223 farm operators responded, out of 443 who were sent questionnaires. The sample was generally representative of Delaware farmers, except for possible under-representation of the largest commercial farm businesses. The following findings are based on this sample.

* Nearly half (47.1 percent) of Delaware farmers have debt outstanding.

* 30.6 percent of Delaware farm operators with debt have debt/asset ratios greater than 40 percent. This is an increase from 20.4 percent in 1986. Debt/asset ratio measures farm debt as a percentage of the value of farm assets.

Percent of Farmers with Debt by Debt/Asset Ratio

Debt/Asset Ratio	Year 1986		Year 1987	
	Percent of farmers			
0-40 %	79.6		69.4	
41-70%	6.8]		24.8]	
71-100%	8.5]	20.4	4.8]	30.6
Above 100%	5.1]		1.0]	

Fewer farmers now have debt/asset ratios of over 70 percent, suggesting that those most highly leveraged have taken steps to reduce debt, either voluntarily or as required by their lenders . . . in some cases leaving farming.

However, the sizeable increase in the share of farmers with debt/asset ratios of 41-70 percent suggests that financial adjustments are ahead for many farmers moving into this position, especially those who have lost equity due to falling farm real estate values.

Summary of Farmers' Actions to Improve Their Financial Situation

Delaware farmers are taking various actions to improve their financial situations. The following table shows, based upon the 1986 and 1987 surveys, actions that survey respondents reported taking during the past three years.

	1986	1987
	Percent	
Kept Debt to a Minimum	63.1	47.1
Used Older Equipment as Opposed to Replacing	58.2	39.5
Tightened Management	43.4	38.6
Adopted Minimum Tillage Methods	37.7	19.7
Reduced Expenses for Repairs/Supplies	27.0	26.0
Reduced Fertilizer Use	23.0	27.4
Reduced Hired Labor	18.9	17.9
Reduced Insecticide/Herbicide Use	18.0	18.8
Switched to Different Crops	14.8	10.8
Taken Off-Farm Employment (Operator or Family Member)	13.9	15.7
Reduced Crop Acreage	12.3	13.5
Liquidated Livestock	4.1	8.5
Sold Land	4.1	4.9
Sold Equipment	1.6	6.3
Switched to Different Livestock	0	3.1
Other	5.7	2.2

* More farmers liquidated livestock, sold land, and/or sold equipment by 1987. These actions are taken most reluctantly, since they reduce a farmer's production capacity.

* There was a rise in off-farm employment by farm operators and/or their family members.

* In the 1987 survey, only 28.7 percent of the respondents said they haven't taken any action. Therefore nearly three-fourths of Delaware farmers are feeling the financial squeeze and taking action to cope.

* From the 1987 survey, 34.6 percent of Delaware farmers did not make a profit (net cash farm income) in 1986. Even 25 percent of the largest commercial farms (sales of $100,000 or more) did not make a profit. Net cash farm income was determined by subtracting the farmer's 1986 estimated cash operating expenses from his or her 1986 total gross farm income (including CCC forfeitures and government payments). This does not include the costs of depreciation, unpaid labor, and interest on farm equity (return on investment), which also should be subtracted if return to operator's management and risk is to be determined.

Other Findings

* The state's farm lenders also were surveyed. A few of the smaller lenders who responded in 1986 did not do so in 1987.

* The survey of Delaware's farm lenders revealed 9.65 percent of farm borrowers are expected to be unable to qualify for financing in 1987 . . . up from 6.2 percent in 1986.

* Of those borrowers who do not qualify for continued financing, 38.0 percent lack sufficient equity to borrow money compared to 18.4 percent in 1986.

* In the 1987 survey, 71.9 percent of those who had increased debt did so to refinance long-term debt or cover operating losses . . . possible signs of financial stress. This compared to 52.3 percent a year earlier.

* 24.6 percent of farm borrowers had decreased their debt, compared to 17.6 percent a year earlier.

* 29.0 percent of farm borrowers used off-farm income to decrease debt, compared to 6.8 percent a year earlier.

* The causes and effects of farm financial difficulties, and state government policy alternatives, were discussed in an in-depth report titled DELAWARE FARM FINANCIAL CONDITIONS AND PUBLIC POLICY IMPLICATIONS FOR STATE GOVERNMENT, Extension Bulletin 144, April 1986, by Gerald F. Vaughn. Copies can be obtained from county Extension offices or the State Department of Agriculture.

ACKNOWLEDGMENTS

Much appreciation is expressed to farmers and lenders who responded to the surveys and to those personnel of the State Department of Agriculture, Delaware Agricultural Statistics Service, and University of Delaware, and others who contributed to the surveys and this report in any way. Without your help, the report would not have been possible.

PROPOSAL:

To establish a Center for Alternative Agriculture within the Commodity Development Section, Delaware Department of Agriculture.

OBJECTIVE:

To explore options for innovative farm enterprise development in Delaware. To direct targeted financial assistance for alternative agricultural ventures.

PRECEDURES:

Professional staff would assist in research and implementation of new approaches to marketing, input-reducing production systems, production of new or non-traditional crops, livestock, food and forest products.

Staff would consist of professionals in agricultural, forest and food business areas. Services would range from feasibility studies to detailed market analysis and assistance in product development.

Special target areas of assistance would include:

1. **Diversification.** Assisting producers in finding new or non-traditional crops or livestock opportunities.

2. **Producer Processing.** Exploring options for adding value to raw farm products at the producer level. Also includes finding new uses for existing commodities.

3. **Exports.** Expanding current program to encourage exploitation of the International marketplace by Delaware producers and processors.

4. **Young farmers.** Providing research, financial backing and other resources for young farmers wishing to begin farming in Delaware.

5. **Irrigation.** Provide a sum of money to be used for low interest financing of irrigation systems, well drilling, etc.

PART III - Certifications

3 DEL C., Section 1216 requires that any person purchasing or using a restricted use pesticide must be certified by the Department. Upon passing a written examination and payment of a $10.00/year fee (for commercial applicators only), the Department will issue a pesticide applicator certification card. Revenues from certification fees were $8,124 in FY87. There are currently 891 commercial and 1,782 private applicators certified in Delaware.

New procedures for the examination of applicators have been proposed in a draft regulation. These changes have been recommended to utilize our manpower more efficiently.

Recertification training credits have been awarded to 71 workshops, seminars and classes. The Pesticide Section has attended many of these seminars and has presented regulatory updates for the audiences.

A National certification program review by EPA has identified Delaware as one of the states needing major changes to its program. With our limited resources it may be difficult to completely satisfy EPA's expectations, but every effort will be made to do so.

PART III - Use Enforcement

The objective of the Pesticide Enforcement program is to encourage the proper and safe use of pesticides and to minimize the adverse effects of these products on humans and the environment. While the primary goal continues toward voluntary compliance, the importance of effective enforcement is understood and continues to be an integral part of the entire program.

A priority setting process is in place which helps in identifying problem areas of pesticide use/misuse within the State. From this process, the Section has been able to target its limited resources and activities to those areas which pose significant risk to health and/or the environment. The process has disclosed that 52% of the documented incidents are home/yard related and 48% are related to agricultural use.

The Section has met or exceeded all of its projected commitments for inspections and sampling under the EPA Cooperative Enforcement Agreement. These accomplishments were as follows:

Activity	FY87 Accomplishments
Producer Est.	3
Samples	2
Ag Use/Misuse	30
Samples	20
Non-Ag Use/Misuse	40
Samples	30
Marketplace*	120
Samples	10
Experimental Use Permits	2
Applicator Licensing	60
Dealer/Applicator Records	50

*Includes only EPA Marketplace Inspections

The following actions were taken in connection with the enforcement of the statute and represent a 376% increase over FY86:

Administrative Hearings	3
Field Notices	25
Notices of Warning	12
Suspension	1
Stop Sale Orders	31
Civil Fines	3
Criminal Penalties	2
FORWARDED TO REGION	2
Total	79

The Section has established guidelines for penalty assessments and also has an enforcement response policy to help insure that actions taken are consistent and unbiased. The Attorney General's Office has reviewed and supports our policy.

Laboratory support for the program has improved tremendously. There is a concern that with the resignation of the residue chemist we may have difficulty in getting residue analyses completed. Efficient and accurate laboratory analyses are critical to the success and credibility of the program.

Statistics

Registrations

Products Registered	7,162
Registrants	743
Special Local Need Registrations	46
Emergency Exemptions	1
Revenues	107,425

Licenses

Companies Licensed	248
Ag-Plant	47
Structural Pest	125
Ornamental and Turf	86
Other	63
Revenues	6,435

Certification

Total Commercial	891
Ag-Plant	222
Ag-Animal	6
Forest	45
Ornamental and Turf	366
Seed Treatment	16
Aquatic	27
Right-of-Way	99
Structural/Termite	322
Fumigation	63
Public Health	46
Regulatory	10
Demonstration and Research	95
Other	77
Private Applicators	1,782
Training Courses Approved	71
Revenues	8,142

Total Revenues (approx.)